
8 RRC

Editor's note: Intended to capture tests of RRC Layer defined in TS 38.331 and capabilities defined in TS 38.306.

- a) SN Measurements and Reporting (various bearer options as in Impact#2)
- b) UE Capability Co-ordination (FFS in RAN2)
- c) SN Release (various bearer options as in Impact#2)
- d) SN Modifications including SCG SRBs
- e) Handover Scenarios (various bearer options as in Impact#2)
- f) Handovers with combination E-UTRA + NR (various bearer options as in Impact#2)
- g) Carrier Aggregation in NR
- h) Failure Handling with combinations of E-UTRA+NR (various bearer options as in Impact#2)
- i) SN System Information Handling

Non-Standalone resp. Standalone deployments may be handled in the following options sub-structure:

8.1 RRC 5G NR Standalone / Single Connectivity (Option 2, 5)

8.2 RRC 5G NR Non-Standalone / Dual Connectivity (Option 3, 4, 7)

8.1 NR RRC

Editor's note: Core Spec completion for Standalone NR (Option 2) to happen at RAN#80 and this section will be updated after RAN5#79 (August 2018).

8.1.1 RRC connection management procedures

8.1.1.1 Paging

8.1.1.1.1 RRC / Paging for connection / Multiple paging records

8.1.1.1.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_IDLE state }

ensure that {

when { UE receives a Paging message including only unmatched identities }

then { UE does not establish any RRC connection }

}

(2)

with { UE in NR RRC_IDLE state }

ensure that {

when { UE receives a Paging message including a matched identity *ng-5G-S-TMSI* }

then { UE successfully establishes the RRC connection }

}

(3)

with { UE in NR RRC_INACTIVE state }

ensure that {

when { UE receives a Paging message including only unmatched identities }

then { UE does not resume RRC connection }

}

(4)

with { UE in NR RRC_INACTIVE state }

ensure that {

when { UE receives a Paging message including a matched identity *fullI-RNTI* }

then { UE successfully resumes the RRC connection }

}

8.1.1.1.1.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 38.331 clause 5.3.2.3.

[TS 38.331, clause 5.3.2.3]

Upon receiving the *Paging* message, the UE shall:

1> if in RRC_IDLE, for each of the *PagingRecord*, if any, included in the *Paging* message:

2> if the *ue-Identity* included in the *PagingRecord* matches the UE identity allocated by upper layers:

3> forward the *ue-Identity* and *accessType* (if present) to the upper layers;

1> if in RRC_INACTIVE, for each of the *PagingRecord*, if any, included in the *Paging* message:

2> if the *ue-Identity* included in the *PagingRecord* matches the UE's stored *fullI-RNTI*:

3> if the UE is configured by upper layers with Access Identity 1:

4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mps-PriorityAccess*;

3> else if the UE is configured by upper layers with Access Identity 2:

4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mcs-PriorityAccess*;

3> else if the UE is configured by upper layers with one or more Access Identities equal to 11-15:

4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *highPriorityAccess*;

3> else:

4> initiate the RRC connection resumption procedure according to 5.3.13 with *resumeCause* set to *mt-Access*;

2> else if the *ue-Identity* included in the *PagingRecord* matches the UE identity allocated by upper layers:

3> forward the *ue-Identity* to upper layers and *accessType* (if present) to the upper layers;

3> perform the actions upon going to RRC_IDLE as specified in 5.3.11 with release cause 'other'.

8.1.1.1.1.3 Test Description

8.1.1.1.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1
- System information combination NR-1 as defined in TS 38.508-1 [4] clause 4.4.3.1.3 is used in NR cell.

UE:

- None.

Preamble:

- The UE is in 5GS state 1N-A according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-1.

8.1.1.1.1.3.2 Test procedure sequence

Table 8.1.1.1.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a <i>Paging</i> message including only unmatched identities (incorrect <i>ng-5G-S-TMSI</i>).	<--	NR RRC: <i>Paging</i>	-	-
2	Check: Does the UE transmit an <i>RRCSetupRequest</i> message within 10s?	-->	NR RRC: <i>RRCSetupRequest</i>	1	F
3	The SS transmits a <i>Paging</i> message including two unmatched identities (incorrect <i>ng-5G-S-TMSI</i>) and a matched identity (correct <i>ng-5G-S-TMSI</i>).	<--	NR RRC: <i>Paging</i>	-	-
4	Check: Does the UE transmit an <i>RRCSetupRequest</i> message?	-->	NR RRC: <i>RRCSetupRequest</i>	2	P
5	The SS transmits an <i>RRCSetup</i> message.	<--	NR RRC: <i>RRCSetup</i>	-	-
6	The UE transmit an <i>RRCSetupComplete</i> message including SERVICE REQUEST to confirm the successful completion of the connection establishment.	-->	NR RRC: <i>RRCSetupComplete</i> 5GMM: SERVICE REQUEST	-	-
7-10	Steps 5 to 8 of the NR RRC_CONNECTED procedure in TS 38.508-1 Table 4.5.4.2-3 are executed to successfully complete the service request procedure.	-	-	-	-
11	The SS transmits an <i>RRCRelease</i> message including <i>suspendConfig</i> .	<--	NR RRC: <i>RRCRelease</i>	-	-
12	The SS transmits a <i>Paging</i> message including only unmatched identities (incorrect <i>fullI-RNTI</i>).	<--	NR RRC: <i>Paging</i>	-	-
13	Check: Does the UE transmit an <i>RRCResumeRequest</i> message within 10s?	-->	NR RRC: <i>RRCResumeRequest</i>	3	F

14	The SS transmits a <i>Paging</i> message including two unmatched identities (incorrect <i>fullI-RNTI</i>) and a matched identity (correct <i>fullI-RNTI</i>).	<--	NR RRC: <i>Paging</i>	-	-
15	Check: Does the UE transmit an <i>RRCResumeRequest</i> message?	-->	NR RRC: <i>RRCResumeRequest</i>	4	P
16	The SS transmits an <i>RRCResume</i> message.	<--	NR RRC: <i>RRCResume</i>	-	-
17	The UE transmits an <i>RRCResumeComplete</i> message.	-->	NR RRC: <i>RRCResumeComplete</i>	-	-

8.1.1.1.3.3 Specific message contents

Table 8.1.1.1.3.3-1: *Paging* (step 1, Table 8.1.1.1.3.2-1)

Derivation Path: 38.508-1 Table 4.6.1-9			
Information Element	Value/remark	Comment	Condition
Paging ::= SEQUENCE {			
pagingRecordList SEQUENCE (SIZE(1..maxNrofPageRec)) OF SEQUENCE {	3 entries		
ue-Identity[1] CHOICE {			
ng-5G-S-TMSI	Set to the different value from the NG-5G-S-TMSI of the UE		
}			
ue-Identity[2] CHOICE {			
ng-5G-S-TMSI	Set to the different value from the NG-5G-S-TMSI of the UE		
}			
ue-Identity[3] CHOICE {			
ng-5G-S-TMSI	Set to the different value from the NG-5G-S-TMSI of the UE		
}			
}			
}			

Table 8.1.1.1.3.3-2: *Paging* (step 3, Table 8.1.1.1.3.2-1)

Derivation Path: 38.508-1 Table 4.6.1-9			
Information Element	Value/remark	Comment	Condition
Paging ::= SEQUENCE {			

pagingRecordList SEQUENCE (SIZE(1..maxNrofPageRec)) OF SEQUENCE {	3 entries		
ue-Identity[1] CHOICE {			
ng-5G-S-TMSI	Set to the different value from the NG-5G-S-TMSI of the UE		
}			
ue-Identity[2] CHOICE {			
ng-5G-S-TMSI	Set to the different value from the NG-5G-S-TMSI of the UE		
}			
ue-Identity[3] CHOICE {			
ng-5G-S-TMSI	Set to the value of the NG-5G-S-TMSI of the UE		
}			
}			
}			

Table 8.1.1.1.1.3.3-3: *RRCSetupRequest* (step 4, Table 8.1.1.1.1.3.2-1)

Derivation Path: 38.508-1 Table 4.6.1-23			
Information Element	Value/remark	Comment	Condition
RRCSetupRequest ::= SEQUENCE {			
rrcSetupRequest SEQUENCE {			
establishmentCause	mt-Access		
}			
}			

Table 8.1.1.1.1.3.3-4: *Paging* (step 12, Table 8.1.1.1.1.3.2-1)

Derivation Path: 38.508-1 Table 4.6.1-9			
Information Element	Value/remark	Comment	Condition
Paging ::= SEQUENCE {			
pagingRecordList SEQUENCE (SIZE(1..maxNrofPageRec)) OF SEQUENCE {	3 entries		
ue-Identity[1] CHOICE {			
<i>fullI</i> -RNTI	Set to the different value from the I-RNTI-Value		

	of the UE		
}			
ue-Identity[2] CHOICE {			
<i>fullI</i> -RNTI	Set to the different value from the I-RNTI-Value of the UE		
}			
ue-Identity[3] CHOICE {			
<i>fullI</i> -RNTI	Set to the different value from the I-RNTI-Value of the UE		
}			
}			
}			

Table 8.1.1.1.1.3.3-5: *Paging* (step 14, Table 8.1.1.1.1.3.2-1)

Derivation Path: 38.508-1 Table 4.6.1-9			
Information Element	Value/remark	Comment	Condition
Paging ::= SEQUENCE {			
pagingRecordList SEQUENCE (SIZE(1..maxNrofPageRec)) OF SEQUENCE {	3 entries		
ue-Identity[1] CHOICE {			
<i>fullI</i> -RNTI	Set to the different value from the I-RNTI-Value of the UE		
}			
ue-Identity[2] CHOICE {			
<i>fullI</i> -RNTI	Set to the different value from the I-RNTI-Value of the UE		
}			
ue-Identity[3] CHOICE {			
<i>fullI</i> -RNTI	Set to the value of the I-RNTI-Value of the UE		
}			
}			
}			

8.1.1.1.2 RRC / Paging for connection / Shared network environment

8.1.1.1.2.1 Test Purpose (TP)

(1)

with { UE in NR RRC_IDLE state having been registered in the TA of the current cell which has broadcasted a SIB1 message including multiple PLMN identities }

ensure that {

when { UE receives a Paging message including an IE ue-Identity set to the ng-5G-S-TMSI which was allocated to the UE during the UE registration procedure }

then { UE initiates RRCSetupRequest with ue-Identity set to ng-5G-S-TMSI-Part1 }

}

(2)

with { UE having sent RRCSetupRequest with ue-Identity set to ng-5G-S-TMSI-Part1 }

ensure that {

when { the UE receives RRCSetup message }

then { UE will set the ng-5G-S-TMSI-Value to ng-5G-S-TMSI-Part2 in RRCSetupComplete message }

}

(3)

with { UE in NR RRC_INACTIVE state having been registered in the TA of the current cell which has broadcasted a SIB1 message including multiple PLMN identities }

ensure that {

when { UE receives a Paging message including an IE ue-Identity set to the ng-5G-S-TMSI which was allocated to the UE during the UE registration procedure }

then { UE releases RRC connection with release cause 'other' and goes to NR RRC_IDLE state }

}

8.1.1.1.2.2 Conformance requirements

Editor's note: conformance requirements will be updated according to latest core specification.

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clause 5.3.2.3, 5.3.3.3, 5.3.3.4 and 5.3.11, TS 24.501, clause 5.3.1.4 and 5.6.1.1 . Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.2.3]

Upon receiving the *Paging* message, the UE shall:

1> if in RRC_IDLE, for each of the *PagingRecord*, if any, included in the *Paging* message:

2> if the *ue-Identity* included in the *PagingRecord* matches the UE identity allocated by upper layers:

- 3> forward the *ue-Identity* and *accessType* (if present) to the upper layers;
- 1> if in RRC_INACTIVE, for each of the *PagingRecord*, if any, included in the *Paging* message:
- 2> if the *ue-Identity* included in the *PagingRecord* matches the UE's stored *fullI-RNTI*:
 - ...
- 2> else if the *ue-Identity* included in the *PagingRecord* matches the UE identity allocated by upper layers:
- 3> forward the *ue-Identity* to upper layers and *accessType* (if present) to the upper layers;
- 3> perform the actions upon going to RRC_IDLE as specified in 5.3.11 with release cause 'other'.

[TS 38.331, clause 5.3.3.3]

The UE shall set the contents of *RRCSetupRequest* message as follows:

- 1> set the *ue-Identity* as follows:
- 2> if upper layers provide an *5G-S-TMSI*:
- 3> set the *ue-Identity* to *ng-5G-S-TMSI-Part1*;
- 2> else:
- 3> draw a 39-bit random value in the range $0..2^{39}-1$ and set the *ue-Identity* to this value;

NOTE 1: Upper layers provide the *5G-S-TMSI* if the UE is registered in the TA of the current cell.

- 1> set the *establishmentCause* in accordance with the information received from upper layers;

The UE shall submit the *RRCSetupRequest* message to lower layers for transmission.

The UE shall continue cell re-selection related measurements as well as cell re-selection evaluation. If the conditions for cell re-selection are fulfilled, the UE shall perform cell re-selection as specified in 5.3.3.6.

[TS 38.331, clause 5.3.3.4]

The UE shall perform the following actions upon reception of the *RRCSetup*:

- ...
- 1> set the content of *RRCSetupComplete* message as follows:
- 2> if upper layers provide an *5G-S-TMSI*:
- 3> if the *RRCSetup* is received in response to an *RRCSetupRequest*:
- 4> set the *ng-5G-S-TMSI-Value* to *ng-5G-S-TMSI-Part2*;
- 3> else:
- 4> set the *ng-5G-S-TMSI-Value* to *ng-5G-S-TMSI*;
- ...
- 1> submit the *RRCSetupComplete* message to lower layers for transmission, upon which the procedure ends

[TS 38.331, clause 5.3.11]

UE shall:

- 1> reset MAC;
- 1> if T302 is running:
- 2> stop timer T302;

- 2> perform the actions as specified in 5.3.14.4;
- 1> stop all timers that are running except T320 and T325;
- 1> discard the UE Inactive AS context;
- 1> set the variable *pendingRnaUpdate* to *false*, if that is set to *true*;
- 1> discard the K_{gNB} , the K_{RRcenc} key, the K_{RRcint} , the K_{UPint} key and the K_{UPenc} key, if any;
- 1> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity and SDAP for all established RBs;
- 1> indicate the release of the RRC connection to upper layers together with the release cause;
- 1> enter RRC_IDLE and perform cell selection as specified in TS 38.304 [20], except if going to RRC_IDLE was triggered by selecting an inter-RAT cell while T311 was running;
- 1> if going to RRC_IDLE was triggered by reception of the *RRCRelease* message including a *waitTime*:
- 2> start timer T302 with the value set to the *waitTime*;
- 2> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2'.

[TS 24.501, clause 5.3.1.4]

...

Upon receiving AMF paging indication from the lower layers, the UE shall transition from 5GMM-CONNECTED mode with RRC inactive indication to 5GMM-IDLE mode over 3GPP access and handle the AMF paging same as the paging request received in the 5GMM-IDLE mode over 3GPP access as specified in subclause 5.6.1.

[TS 24.501, clause 5.6.1.1]

...

The UE shall invoke the service request procedure when:

- a) the UE, in 5GMM-IDLE mode over 3GPP access, receives a paging request from the network;

8.1.1.1.2.3 Test description

8.1.1.1.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1.

UE:

- None.

Preamble:

- The UE is in state 1N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1 and 5G-GUTI is allocated in REGISTRATION ACCEPT.

8.1.1.1.2.3.2 Test procedure sequence

Table 8.1.1.1.2.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		

1	The SS transmits a <i>Paging</i> message including a matched ng-5G-S-TMSI.	<--	NR RRC: <i>Paging</i>	-	-
2	Check: Does the UE transmit an <i>RRCSetupRequest</i> message with ue-Identity set to ng-5G-S-TMSI-Part1?	-->	NR RRC: <i>RRCSetupRequest</i>	1	P
3	The SS transmits an <i>RRCSetup</i> message.	<--	NR RRC: <i>RRCSetup</i>	-	-
4	Check: Does the UE transmit an <i>RRCSetupComplete</i> message including ng-5G-S-TMSI-Part2 and a SERVICE REQUEST message and an IE <i>selectedPLMN-Identity</i> corresponding to the PLMN on which the UE has been registered to confirm the successful completion of the connection establishment?	-->	NR RRC: <i>RRCSetupComplete</i>	2	P
5-8	Steps 5 to 8 of the generic radio bearer establishment procedure (TS 38.508-1 [4] Table 4.5.4.2-3) are executed to successfully complete the service request procedure.	-	-	-	-
9	The SS transmits an <i>RRCRelease</i> message with suspendConfig to suspend RRC connection and move to RRC_INACTIVE state.	<--	NR RRC: <i>RRCRelease</i>	-	-
10	Wait 5s and the SS transmits a <i>Paging</i> message including a matched ng-5G-S-TMSI.	<--	NR RRC: <i>Paging</i>	-	-
11	Check: Does the UE transmit an <i>RRCSetupRequest</i> message on the cell specified in the test case?	-->	NR RRC: <i>RRCSetupRequest</i>	3	P
12-18	Steps 3-9 of Generic procedure for checking UE is in state 5GC RRC_IDLE on a certain cell as specified in Table 4.9.4-1 of TS 38.508-1 [4] are performed.	-	-	-	-

8.1.1.1.2.3.3 Specific message contents

Table 8.1.1.1.2.3.3-1: *SIB1* (preamble and all steps, Table 8.1.1.1.2.3.2-1)

Derivation Path: 38.508-1 [4] Table 4.6.1-28			
Information Element	Value/remark	Comment	Condition
SIB1 ::= SEQUENCE {			
CellAccessRelatedInfo SEQUENCE {			
plmn-IdentityList	PLMN-IdentityInfoList		
}			
}			

Table 8.1.1.1.2.3.3-2: *PLMN-IdentityInfoList* (Table 8.1.1.1.2.3.3-1)

Derivation Path: 38.508-1 [4] Table 4.6.3-108			
Information Element	Value/remark	Comment	Condition

PLMN-IdentityInfoList ::= SEQUENCE (SIZE (1..maxPLMN)) OF SEQUENCE {	1 entry		
plmn-IdentityList SEQUENCE (SIZE (1..maxPLMN)) OF PLMN-Identity {	2 entries		
plmn-Identity[1] SEQUENCE {			
mcc	See Table 8.1.1.1.2.3.3-2A	PLMN1	
mnc	See Table 8.1.1.1.2.3.3-2A	PLMN1	
}			
plmn-Identity[2] SEQUENCE {			
mcc	See Table 8.1.1.1.2.3.3-2A	PLMN2	
mnc	See Table 8.1.1.1.2.3.3-2A	PLMN2	
}			
}			
}			

The PLMN Identity list broadcasted on the BCCH in NR Cell 1 shall be configured as defined in the table below.

Table 8.1.1.1.2.3.3-2A: PLMN Identity List broadcasted for NR Cell 1

Cell	PLMN Identity [1]		PLMN Identity [2]	
	MCC digits	MNC digits	MCC digits	MNC digits
1	PLMN 1	PLMN 1	PLMN 2	PLMN 2

The definition of each PLMN code is found in table below:

Table 8.1.1.1.2.3.3-2B: definition of each PLMN code

PLMN	MCC digit			MNC digit		
	1	2	3	1	2	3
1	(NOTE 2)			(NOTE 2)		
2	(NOTE 3)			0	2	-

NOTE 1: “-“ (dash) denotes “not present”

NOTE 2: Set to the same Mobile Country Code and Mobile Network Code stored in EF_{IMSI} on the test USIM card for PLMN 1.

NOTE 3: Set to the same Mobile Country Code stored in EF_{IMSI} on the test USIM card for PLMN 2.

Table 8.1.1.1.2.3.3-3: *RRCSetupRequest* (step 2,11, Table 8.1.1.1.2.3.2-1)

Derivation Path: 38.508-1 [4], Table 4.6.1-23			
Information Element	Value/remark	Comment	Condition
RRCSetupRequest ::= SEQUENCE {			
rrcSetupRequest SEQUENCE {			
ue-Identity CHOICE {			
ng-5G-S-TMSI-Part1	ng-5G-S-TMSI-Part1	ng-5G-S-TMSI-Part1 is rightmost 39 bits of 5G-S-TMSI. 5G-S-TMSI is derived from 5G-GUTI in REGISTRATION ACCEPT according to TS 23.003 [34]	
}			
establishmentCause	mt-Access		
}			
}			

Table 8.1.1.1.2.3.3-4: RRCSetupComplete (step 4, Table 8.1.1.1.2.3.2-1)

Derivation Path: 38.508-1 [4], Table 4.6.1-22			
Information Element	Value/remark	Comment	Condition
RRCSetupComplete ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
rrcSetupComplete SEQUENCE {			
ng-5G-S-TMSI-Value	ng-5G-S-TMSI-Part2	ng-5G-S-TMSI-Part2 is the leftmost 9 bits of 5G-S-TMSI. 5G-S-TMSI is derived from 5G-GUTI in REGISTRATION ACCEPT according to TS 23.003 [34]	
selectedPLMN-Identity	1 or 2	PLMN1 or PLMN2 Note1	
}			
}			

}			
}			
Note1: If RPLMN is PLMN1, UE will select PLMN1; if RPLMN is PLMN2, UE will select PLMN2			

Table 8.1.1.1.2.3.3-5: *RRCRelease* (step 9, Table 8.1.1.1.2.3.2-1)

Derivation Path: 38.508-1 [4] Table 4.6.1-16			
Information Element	Value/remark	Comment	Condition
RRCRelease ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
suspendConfig SEQUENCE {			
fullI-RNTI	I-RNTI-Value	38.508-1[4] Table 4.6.3-64	
shortI-RNTI	ShortI-RNTI-Value	38.508-1[4] Table 4.6.3-170	
ran-PagingCycle	rf256		
ran-NotificationAreaInfo CHOICE {			
cellList SEQUENCE (SIZE (1..maxPLMNIdentities)) OF SEQUENCE {	2 entries		
plmn-Identity[1]	PLMN1		
ran-AreaCells[1] SEQUENCE (SIZE (1..32)) OF {	1 entry		
CellIdentity[1]	CellIdentity of NR Cell 1		
}			
plmn-Identity[2]	PLMN2		
ran-AreaCells[2] SEQUENCE (SIZE (1..32)) OF {	1 entry		
CellIdentity[1]	CellIdentity of NR Cell 1		
}			
}			
}			
}			
}			
t380	Not Present		
nextHopChainingCount	NextHopChainingCount	38.508-1[4] Table 4.6.3-83	
}			

}			
}			
}			

8.1.1.2 RRC connection establishment

8.1.1.2.1 RRC connection establishment / Return to idle state after T300 expiry

8.1.1.2.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_IDLE state having sent an RRCSetupRequest message }

ensure that {

when { the SS does not answer to the UE during T300 }

then { UE goes to RRC_IDLE state }

}

(2)

with { UE in NR RRC_IDLE state }

ensure that {

when { T300 has expired a consecutive *connEstFailCount* times on the same cell for which *connEstFailureControl* is included in SIB1 for a period as indicated by *connEstFailOffsetValidity* }

then { UE uses *connEstFailOffset* for the parameter *Qoffsettemp* when performing cell selection back to the concerned cell }

}

8.1.1.2.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clause 5.3.3.7.

Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.3.7]

The UE shall:

1> if timer T300 expires:

2> reset MAC, release the MAC configuration and re-establish RLC for all RBs that are established;

2> if the T300 has expired a consecutive *connEstFailCount* times on the same cell for which *connEstFailureControl* is included in SIB1:

3> for a period as indicated by *connEstFailOffsetValidity*:

4> use *connEstFailOffset* for the parameter *Qoffsettemp* for the concerned cell when performing cell selection and reselection according to TS 38.304 [20] and TS 36.304 [27];

NOTE: When performing cell selection, if no suitable or acceptable cell can be found, it is up to UE implementation whether to stop using *connEstFailOffset* for the parameter *Qoffsettemp* during *connEstFailOffsetValidity* for the concerned cell.

2> inform upper layers about the failure to establish the RRC connection, upon which the procedure ends;

8.1.1.2.1.3 Test description

8.1.1.2.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1.

UE:

- None.

Preamble:

- The UE is in state 1N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1 and 5G-GUTI is allocated in REGISTRATION ACCEPT.

8.1.1.2.1.3.2 Test procedure sequence

Table 8.1.1.2.1.3.2-1/2 illustrates the downlink power levels and other changing parameters to be applied for the NR cells at various time instants of the test execution. The exact instants on which these values shall be applied are described in the texts in this clause. The configuration "T0" indicates the initial conditions. Subsequent configuration marked "T1" is applied at the points indicated in the Main behaviour description in Table 8.1.1.2.1.3.2-3.

Table 8.1.1.2.1.3.2-1: Time instances of cell power level and parameter changes for FR1

	Parameter	Unit	NR Cell 1	NR Cell 10	Remark
T0	SS/PBCH SSS EPRE	dBm/SCS	-76	Off	
T1	SS/PBCH SSS EPRE	dBm/SCS	Off	Off	
T2	SS/PBCH SSS EPRE	dBm/SCS	-76	-88	
Note: Power level "Off" is defined in TS38.508-1 [4] Table 6.2.2.1-3.					

Table 8.1.1.2.1.3.2-2: Time instances of cell power level and parameter changes for FR2

	Parameter	Unit	NR Cell 1	NR Cell 10	Remark
T0	SS/PBCH SSS EPRE	dBm/SCS	-82	Off	
	Qrxlevmin	dBm	91+Delta(NRf1)	-	
T1	SS/PBCH	dBm/SCS	Off	Off	

	SSS EPRE				
T2	SS/PBCH	dBm/SCS	-82	-91	
	SSS EPRE				
	Qrxlevmin	dBm	91+Delta(NRf1)	100+Delta(NRf5)	

Table 8.1.1.2.1.3.2-3: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a <i>Paging</i> message including a matched ng-5G-S-TMSI.	<--	NR RRC: <i>Paging</i>	-	-
2	The UE transmits an <i>RRCSetupRequest</i> message.	-->	NR RRC: <i>RRCSetupRequest</i>	-	-
3	The SS waits for 2s (T300 expire).	-	-	-	-
4	Check: does UE send <i>RRCSetupRequest</i> in 5 second?	-	-	1	F
5	Check: does the test result of generic test procedure step 1-8 in TS 38.508-1 [4] Table 4.9.4.2.2-1 indicate that the UE is in RRC_IDLE?	-	-	1	-
6	SS transmits an <i>RRCRelease</i> message to release RRC connection and move the UE to RRC_IDLE	<--	NR RRC: <i>RRCRelease</i>		
7	The SS remove connEstFailOffset in SIB1.				
8	The SS transmits a Short message on PDCCH using P-RNTI indicating a <i>systemInfoModification</i> .	-	PDCCH (DCI 1_0): Short Message	-	-
9	The SS transmits a <i>Paging</i> message including a matched identity (correct <i>fullI-RNTI</i>).				
10	The SS transmits a <i>Paging</i> message including a matched ng-5G-S-TMSI.	<--	NR RRC: <i>Paging</i>		
11	The UE transmits an <i>RRCSetupRequest</i> message.	-->	NR RRC: <i>RRCSetupRequest</i>		
11A	SS re-adjusts the SS levels according to row "T1" in table 8.1.1.2.1.3.2-1/2.				
11B	5s after step 11A the SS re-adjusts the SS levels according to row "T2" in table 8.1.1.2.1.3.2-1/2.				
12	The SS waits for 2s to let T300 expire.				
13	The SS transmits a <i>Paging</i> message including a matched ng-5G-S-TMSI.	<--	NR RRC: <i>Paging</i>		
14	Check: does UE send <i>RRCSetupRequest</i> in 5 second?	-	-	2	F

15	Check: does the test result of generic test procedure step 1-8 in TS 38.508-1 [4] Table 4.9.4.2.2-1 indicate that the UE is in RRC_IDLE on NR Cell 10?	-	-	2	P
16	The SS waits 30s.	-	-	-	-
17	Check: does the test result of generic test procedure step 1-8 in TS 38.508-1 [4] Table 4.9.4.2.2-1 indicate that the UE is in RRC_IDLE on NR Cell 1?	-	-	2	P

8.1.1.2.1.3.3 Specific message contents

Table 8.1.1.2.1.3.3-1: *RRCSetupRequest* (step 2 and 11 Table 8.1.1.2.1.3.2-1)

Derivation Path: 38.508-1 [4], Table 4.6.1-23			
Information Element	Value/remark	Comment	Condition
RRCSetupRequest ::= SEQUENCE {			
rrcSetupRequest SEQUENCE {			
establishmentCause	mt-Access		
}			
}			

Table 8.1.1.2.2.3.3-2: *SIB1* (step 7, Table 8.1.1.2.1.3.2-1)

Derivation Path: TS 38.508-1 [4], Table 4.6.1-28			
Information Element	Value/remark	Comment	Condition
SIB1 ::= SEQUENCE {			
connEstFailureControl	ConnEstFailureControl	Table 8.1.1.2.2.3.3-3	
}			

Table 8.1.1.2.2.3.3-3: *ConnEstFailureControl* (Table 8.1.1.2.2.3.3-2)

Derivation Path: TS 38.508-1 [4], Table 4.6.3-27			
Information Element	Value/remark	Comment	Condition
ConnEstFailureControl ::= SEQUENCE {			
connEstFailOffset	Not present	Value of infinity shall be used for $Q_{\text{offset}_{\text{temp}}}$	
}			

8.1.1.2.2 Void

8.1.1.2.3 RRC connection establishment / RRC Reject with wait time

8.1.1.2.3.1 Test Purpose (TP)

(1)

with { UE in NR RRC_IDLE state and has sent an RRCSetupRequest message }

ensure that {
when { UE receives an RRCReject message including an IE waitTime }
then { UE doesn't re-send RRCSetupRequest message before the waitTime is expired }
}

8.1.1.2.3.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 38.331 clause 5.3.15.2.

[TS 38.331, clause 5.3.15.2]

The UE shall:

- 1> stop timer T300, if running;
- 1> stop timer T319, if running;
- 1> stop timer T302, if running;
- 1> reset MAC and release the default MAC Cell Group configuration;
- 1> if *waitTime* is configured in the *RRCReject*:
 - 2> start timer T302, with the timer value set to the *waitTime*;
- 1> if *RRCReject* is received in response to a request from upper layers:
 - 2> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2';
- 1> if *RRCReject* is received in response to an *RRCSetupRequest*:
 - 2> inform upper layers about the failure to setup the RRC connection, upon which the procedure ends;
- 1> else if *RRCReject* is received in response to an *RRCResumeRequest* or an *RRCResumeRequest1*:
 - 2> if resume is triggered by upper layers:
 - 3> inform upper layers about the failure to resume the RRC connection;
 - 2> if resume is triggered due to an RNA update:
 - 3> set the variable *pendingRnaUpdate* to true;
 - 2> discard the current K_{gNB} key, the K_{RRCenc} key, the K_{RRCint} key, the K_{UPint} key and the K_{UPenc} key derived in accordance with 5.3.13.3;
 - 2> suspend SRB1, upon which the procedure ends;

The RRC_INACTIVE UE shall continue to monitor paging while the timer T302 is running.

8.1.1.2.3.3 Test Description

8.1.1.2.3.3.1 Pre-test conditions

System Simulator:

- NR Cell 1
- System information combination NR-1 as defined in TS 38.508-1 [4] clause 4.4.3.1.3 is used in NR cell.

UE:

- None.

Preamble:

- The UE is in 5GS state 3N-A according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-3 and Test Loop Function (On) with UE test loop mode B is established.

8.1.1.2.3.3.2 Test procedure sequence

Table 8.1.1.2.3.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits one IP packet to the UE on the DRB associated with the default PDU session on NR Cell 1.	-	-	-	-
2	Wait for 1 second after the IP packet has been transmitted in step 1. (Note 1)	-	-	-	-
3	The SS transmits an <i>RRCRelease</i> message on NR Cell 1.	<--	NR RRC: <i>RRCRelease</i>	-	-
4-4A	Steps 1-2 of the NR RRC_CONNECTED procedure in table 4.5.4.2-3 in TS 38.508-1[4] are performed.	-	-	-	-
5	The SS responds with <i>RRCReject</i> message with IE <i>waitTime</i> set to 10s.	<--	NR RRC: <i>RRCReject</i>	-	-
6	Check: Does the UE transmit an <i>RRCSetupRequest</i> message while timer T302 is running?	-->	NR RRC: <i>RRCSetupRequest</i>	1	F
7	Check: Does UE transmit <i>RRCSetupRequest</i> message for sending the IP packet received in step 1 after timer T302 expires?	-	NR RRC: <i>RRCSetupRequest</i>	1	P
8-12	Steps 3 to 7 of the NR RRC_CONNECTED procedure in TS 38.508-1 [4] Table 4.5.4.2-3 are executed.	-	-	-	-
-	EXCEPTION: Steps 13 and 14 can occur in any order.	-	-	-	-
13	The UE transmits an <i>RRCReconfigurationComplete</i> message on Cell 1.	-->	NR RRC: <i>RRCReconfigurationComplete</i>	-	-
14	The UE loops back the IP packet received in step 1 on the DRB associated with the default PDU session on Cell 1.	-	-	-	-
Note 1: The 1 second delay is used to secure that the UE has received and forwarded the IP Packet transmitted by the SS in step 1 to the UE test loop function before the <i>RRCRelease</i> message is sent by the SS in step 3.					

8.1.1.2.3.3.3 Specific message contents

Table 8.1.1.2.3.3.3-1: *RRCReject* (step 5, table 8.1.1.2.3.3.2-1)

Derivation path: 38.508-1 [4] Table 4.6.1-15			
Information Element	Value/remark	Comment	Condition
RRCReject ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReject SEQUENCE {			
waitTime	10	10 seconds	
}			
}			
}			

Table 8.1.1.2.3.3.3-2: CLOSE UE TEST LOOP (Preamble, Table 8.1.1.2.3.3.2-1)

Derivation Path: 36.508 [7], Table 4.7A-3, condition UE TEST LOOP MODE B			
Information Element	Value/remark	Comment	Condition
UE test loop mode B LB setup			
IP PDU delay	'0000 0101'B	5 seconds	

Table 8.1.1.2.3.3.3-3: SERVICE REQUEST (Step 9, Table 8.1.1.2.3.3.2-1)

Derivation Path: 38.508-1[4], Table 4.7.1-16			
Information Element	Value/remark	Comment	Condition
Service type	'0000 0001'B	data	

8.1.1.3 RRC release

8.1.1.3.1 RRC connection release / Redirection to another NR frequency

8.1.1.3.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }**ensure that** {

when { UE receives an RRCRelease message including an IE redirectedCarrierInfo with nr and carrierFreq different from the frequency UE was on in RRC_CONNECTED state }

then { UE enters RRC_IDLE state on new frequency included in IE redirectedCarrierInfo }

}

8.1.1.3.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clause 5.3.8.3, TS 38.304, clause 5.2.4.1. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.8.3]

The UE shall:

1> delay the following actions defined in this sub-clause 60ms from the moment the *RRCRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCRelease* message has been successfully acknowledged, whichever is earlier;

1> stop timer T320, if running;

1> if the *RRCRelease* message includes *redirectedCarrierInfo* indicating redirection to *eutra*:

2> if *cnType* is included:

3> the received *cnType* is provided to upper layers;

NOTE: Handling the case if the E-UTRA cell selected after the redirection does not support the core network type specified by the *cnType*, is up to UE implementation.

1> if the *RRCRelease* message includes the *cellReselectionPriorities*:

2> store the cell reselection priority information provided by the *cellReselectionPriorities*;

2> if the *t320* is included:

3> start timer T320, with the timer value set according to the value of *t320*;

1> else:

2> apply the cell reselection priority information broadcast in the system information;

...

[TS 38.304, clause 5.2.4.1]

...

The UE shall only perform cell reselection evaluation for NR frequencies and inter-RAT frequencies that are given in system information and for which the UE has a priority provided.

...

[TS 38.304, clause 5.2.6]

On transition from RRC_CONNECTED to RRC_IDLE state or RRC_INACTIVE state, UE shall attempt to camp on a suitable cell according to *redirectedCarrierInfo* if included in the *RRCRelease* message used for this transition. If the UE cannot find a suitable cell, the UE is allowed to camp on any suitable cell of the indicated RAT. If the *RRCRelease* message does not contain the *redirectedCarrierInfo*, UE shall attempt to select a suitable cell on an NR carrier. If no suitable cell is found according to the above, the UE shall perform cell selection using stored information in order to find a suitable cell to camp on.

When returning to RRC_IDLE state after UE moved to RRC_CONNECTED state from *camped on any cell* state, UE shall attempt to camp on an acceptable cell according to *redirectedCarrierInfo*, if included in the *RRCRelease* message. If the UE cannot find an acceptable cell, the UE is allowed to camp on any acceptable cell of the indicated RAT. If the *RRCRelease* message does not contain *redirectedCarrierInfo* UE shall attempt to select an acceptable cell on an NR frequency. If no acceptable cell is found according to the above, the UE shall continue to search for an acceptable cell of any PLMN in state *any cell selection*.

8.1.1.3.1.3 Test description

8.1.1.3.1.3.1 Pre-test conditions

System Simulator:

- 2 cells on different NR frequencies and different tracking areas:
- NR Cell 1 (TAI-1) serving cell
- NR Cell 23 (TAI-2) suitable neighbour inter-frequency cell
- Cell power levels are selected according to 38.508-1 [4] Table 6.2.2.1-3 for FR1 or Table 6.2.2.2-2 for FR2. NR Cell 23 is switched on after UE has registered on NR Cell 1.
- System information combination NR-4 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.1.3.1.3.2 Test procedure sequence

Table 8.1.1.3.1.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits an <i>RRCRelease</i> message (IE <i>redirectedCarrierInfo</i> including NR Cell 23).	<--	<i>RRC:RRCRelease</i>	-	-
2	Check: does the test result of generic test procedure in TS 38.508-1 [4] subclause 4.9.5.2.2-1 indicate that the UE is camped on NR Cell 23?	-	-	1	P

8.1.1.3.1.3.3 Specific message contents

Table 8.1.1.3.1.3.3-1: SIB4 for NR cells 1 and 23 (preamble and all steps, Table 8.1.1.3.1.3.2-1)

Derivation Path: 38.508-1 [4] Table 4.6.2-3			
Information Element	Value/remark	Comment	Condition
SIB4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {			
dl-CarrierFreq[n]	Same downlink NR ARFCN as used for NR Cell 23		NR Cell 1
	Same downlink NR ARFCN as used for NR Cell 1		NR Cell 23

cellReselectionPriority[n]	Not present		
}			
}			

Table 8.1.1.3.1.3.3-2: *RRCRelease* message (step 1, Table 8.1.1.3.1.3.2-1)

Derivation Path: 38.508-1 [4] Table 4.6.1-16			
Information Element	Value/remark	Comment	Condition
<i>RRCRelease</i> ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
redirectedCarrierInfo CHOICE {			
nr SEQUENCE {			
carrierFreq	ARFCN-ValueNR for NR Cell 23 frequency		
ssbSubcarrierSpacing	Subcarrier spacing of SSB for NR Cell 23		
smtc	SSB-MTC	38.508-1 [4] Table 4.6.3-185	
}			
}			
}			
}			
}			

8.1.1.3.2 RRC connection release / Redirection from NR to E-UTRA

8.1.1.3.2.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }**ensure that** { **when** { UE receives an *RRCRelease* message including an IE *redirectionInformation* with E-UTRA frequency } **then** { UE enters RRC_IDLE state on E-UTRA frequency included in IE *redirectionInformation* }

}

8.1.1.3.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clause 5.3.8.3, TS 38.304, clause 5.2.6.

[TS 38.331, clause 5.3.8.3]

The UE shall:

1> delay the following actions defined in this sub-clause 60ms from the moment the *RRCRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCRelease* message has been successfully acknowledged, whichever is earlier;

1> stop timer T320, if running;

1> if the *RRCRelease* message includes *redirectedCarrierInfo* indicating redirection to *eutra*:

2> if *cnType* is included:

3> after the cell selection, indicate the available CN Type(s) and the received *cnType* to upper layers;

NOTE: Handling the case if the E-UTRA cell selected after the redirection does not support the core network type specified by the *cnType*, is up to UE implementation.

[TS 38.304, clause 5.2.6]

At reception of *RRCRelease* message to transition the UE to RRC_IDLE or RRC_INACTIVE, UE shall attempt to camp on a suitable cell according to *redirectedCarrierInfo* if included in the *RRCRelease* message used for this transition. If the UE cannot find a suitable cell, the UE is allowed to camp on any suitable cell of the indicated RAT. If the *RRCRelease* message does not contain the *redirectedCarrierInfo*, UE shall attempt to select a suitable cell on an NR carrier. If no suitable cell is found according to the above, the UE shall perform cell selection using stored information in order to find a suitable cell to camp on.

When returning to RRC_IDLE state after UE moved to RRC_CONNECTED state from *camped on any cell* state, UE shall attempt to camp on an acceptable cell according to *redirectedCarrierInfo*, if included in the *RRCRelease* message. If the UE cannot find an acceptable cell, the UE is allowed to camp on any acceptable cell of the indicated RAT. If the *RRCRelease* message does not contain *redirectedCarrierInfo* UE shall attempt to select an acceptable cell on an NR frequency. If no acceptable cell is found according to the above, the UE shall continue to search for an acceptable cell of any PLMN in state *any cell selection*.

8.1.1.3.2.3 Test description

8.1.1.3.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell. System information combination NR-6 as defined in TS 38.508 -1 [4] clause 4.4.3.1.2 is used
- E-UTRA Cell 1 is a suitable neighbour cell. System information combination 31 as defined in TS 38.508 [7], subclause 4.4.3.1.1
- The parameters settings and power levels for NR Cell 1, E-UTRA Cell 1 are selected to ensure that camping on NR Cell 1 is guaranteed and no cell re-selection to E-UTRA Cell 1 can take place (E -UTRA Cell 1 priority is lower than serving NR Cell 1).

UE:

- None

Preamble:

- With E-UTRA Cell 1 "Serving cell" and NR Cell 1 "Non-suitable "Off" cell", the UE is brought to state 1E-A, RRC_IDLE Connectivity (EUTRA), in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1.

- the UE is switched-off
- With E-UTRA Cell 1 and NR Cell 1 power levels set according to T0, the UE is brought to state 3N-A as defined in TS 38.508-1 [4], clause 4.4A.2.

8.1.1.3.2.3.2 Test procedure sequence

Tables 8.1.1.3.2.3.2-1/ 8.1.1.3.2.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1, E-UTRA Cell 1 for the test execution.

Table 8.1.1.3.2.3.2-1: Time instances of cell power level and parameter changes for FR1

	Parameter	Unit	NR Cell 1	E-UTRA Cell 1	Remark
T0	Cell-specific RS EPRE	dBm/15kHz		-91	The power levels are such that camping on NR Cell 1 is guaranteed.
	SS/PBCH SSS EPRE	dBm/S CS	-85	-	

Table 8.1.1.3.2.3.2-1A: Time instances of cell power level and parameter changes for FR2

	Parameter	Unit	NR Cell 1	E-UTRA Cell 1	Remark
T0	Cell-specific RS EPRE	dBm/15kHz		-96	The power levels are such that camping on NR Cell 1 is guaranteed.
	SS/PBCH SSS EPRE	dBm/S CS	-82	-	

Table 8.1.1.3.2.3.2-2: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS transmits an <i>RRCRelease</i> message (IE <i>redirectionInformation</i> including ARFCN-ValueEUTRA of E-UTRA Cell 1).	<--	NR RRC: <i>RRCRelease</i>	-	-
2	Check: Does the test result of generic test procedure in TS 36.508 Table 6.4.2.7A-1 is performed and the UE is camped on E-UTRAN Cell 1?	-	-	1	-

8.1.1.3.2.3.3 Specific message contents

Table 8.1.1.3.2.3.3-1 *RRCRelease* (step 1, Table 8.1.1.3.2.3.2-2)

Derivation Path: 38.508-1 table 4.6.1-16			
Information Element	Value/remark	Comment	Condition

8.1.1.3.3.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clause 5.3.8.3 and TS38.304, clause 5.2.4.1, 5.2.4.2 and 5.2.4.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.8.3]

The UE shall:

1> delay the following actions defined in this sub-clause 60 ms from the moment the *RRCRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCRelease* message has been successfully acknowledged, whichever is earlier;

1> stop timer T380, if running;

1> stop timer T320, if running;

1> stop timer T390, if running;

1> if the security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

1> if the *RRCRelease* message includes *redirectedCarrierInfo* indicating redirection to *eutra*:

2> if *cnType* is included:

3> after the cell selection, indicate the available CN Type(s) and the received *cnType* to upper layers;

NOTE: Handling the case if the E-UTRA cell selected after the redirection does not support the core network type specified by the *cnType*, is up to UE implementation.

1> if the *RRCRelease* message includes the *cellReselectionPriorities*:

2> store the cell reselection priority information provided by the *cellReselectionPriorities*;

2> if the *t320* is included:

3> start timer T320, with the timer value set according to the value of *t320*;

1> else:

2> apply the cell reselection priority information broadcast in the system information;

1> if *deprioritisationReq* is included:

2> start or restart timer T325 with the timer value set to the *deprioritisationTimer* signalled;

2> store the *deprioritisationReq* until T325 expiry;

1> if the *RRCRelease* includes *suspendConfig*:

2> apply the received *suspendConfig*;

2> reset MAC and release the default MAC Cell Group configuration, if any;

2> re-establish RLC entities for SRB1;

2> if the *RRCRelease* message with *suspendConfig* was received in response to an *RRCResumeRequest* or an *RRCResumeRequest1*:

3> stop the timer T319 if running;

3> in the stored UE Inactive AS context:

4> replace the K_{gNB} and K_{RRInt} keys with the current K_{gNB} and K_{RRInt} keys;

4> replace the C-RNTI with the temporary C-RNTI in the cell the UE has received the *RRCRelease* message;

- 4> replace the *cellIdentity* with the *cellIdentity* of the cell the UE has received the *RRCRelease* message;
- 4> replace the physical cell identity with the physical cell identity of the cell the UE has received the *RRCRelease* message;
- 4> replace the *suspendConfig* with the current *suspendConfig*;
- 2> else:
 - 3> store in the UE Inactive AS Context the received *suspendConfig*, all current parameters configured with *RRCReconfiguration* or *RRCResume*, the current K_{gNB} and K_{RRCint} keys, the ROHC state, the C-RNTI used in the source PCell, the *cellIdentity* and the physical cell identity of the source PCell;
 - 2> suspend all SRB(s) and DRB(s), except SRB0;
 - 2> indicate PDCP suspend to lower layers of all DRBs;
 - 2> if the *t380* is included:
 - 3> start timer T380, with the timer value set to *t380*;
 - 2> if the *RRCRelease* message is including the *waitTime*:
 - 3> start timer T302 with the value set to the *waitTime*;
 - 3> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2';
 - 2> indicate the suspension of the RRC connection to upper layers;
 - 2> enter RRC_INACTIVE and perform cell selection as specified in TS 38.304 [20];
- 1> else
 - 2> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with the release cause 'other'.

[TS 38.331, clause 5.3.8.4]

The UE shall:

- 1> if T320 expires:
 - 2> if stored, discard the cell reselection priority information provided by the *cellReselectionPriorities* or inherited from another RAT;
 - 2> apply the cell reselection priority information broadcast in the system information.

[TS 38.304, clause 5.2.4.1]

Absolute priorities of different NR frequencies or inter-RAT frequencies may be provided to the UE in the system information, in the *RRCRelease* message, or by inheriting from another RAT at inter-RAT cell (re)selection. In the case of system information, an NR frequency or inter-RAT frequency may be listed without providing a priority (i.e. the field *cellReselectionPriority* is absent for that frequency). If priorities are provided in dedicated signalling, the UE shall ignore all the priorities provided in system information. If UE is in *camped on any cell* state, UE shall only apply the priorities provided by system information from current cell, and the UE preserves priorities provided by dedicated signalling and *deprioritisationReq* received in *RRCRelease* unless specified otherwise. When the UE in *camped normally* state, has only dedicated priorities other than for the current frequency, the UE shall consider the current frequency to be the lowest priority frequency (i.e. lower than any of the network configured values).

The UE shall only perform cell reselection evaluation for NR frequencies and inter-RAT frequencies that are given in system information and for which the UE has a priority provided.

In case UE receives *RRCRelease* with *deprioritisationReq*, UE shall consider current frequency and stored frequencies due to the previously received *RRCRelease* with *deprioritisationReq* or all the frequencies of NR to be the lowest priority frequency (i.e. lower than any of the network configured values) while T325 is running irrespective of *camped* RAT. The UE shall delete the stored *deprioritisationReq*(s) when a PLMN selection is performed on request by NAS (TS 23.122 [9]).

NOTE: UE should search for a higher priority layer for cell reselection as soon as possible after the change of priority. The minimum related performance requirements specified in TS 38.133 [8] are still applicable.

The UE shall delete priorities provided by dedicated signalling when:

- the UE enters a different RRC state; or
- the optional validity time of dedicated priorities (T320) expires; or
- a PLMN selection is performed on request by NAS (TS 23.122 [9]).

NOTE 2: Equal priorities between RATs are not supported.

The UE shall not consider any black listed cells as candidate for cell reselection.

The UE shall inherit the priorities provided by dedicated signalling and the remaining validity time (i.e. T320 in NR and E-UTRA), if configured, at inter-RAT cell (re)selection.

NOTE 3: The network may assign dedicated cell reselection priorities for frequencies not configured by system information.

[TS 38.304, clause 5.2.4.1]

Absolute priorities of different NR frequencies or inter-RAT frequencies may be provided to the UE in the system information, in the *RRCRelease* message, or by inheriting from another RAT at inter-RAT cell (re)selection. In the case of system information, an NR frequency or inter-RAT frequency may be listed without providing a priority (i.e. the field *cellReselectionPriority* is absent for that frequency). If priorities are provided in dedicated signalling, the UE shall ignore all the priorities provided in system information. If UE is in *camped on any cell* state, UE shall only apply the priorities provided by system information from current cell, and the UE preserves priorities provided by dedicated signalling and *deprioritisationReq* received in *RRCRelease* unless specified otherwise. When the UE in *camped normally* state, has only dedicated priorities other than for the current frequency, the UE shall consider the current frequency to be the lowest priority frequency (i.e. lower than any of the network configured values).

The UE shall only perform cell reselection evaluation for NR frequencies and inter-RAT frequencies that are given in system information and for which the UE has a priority provided.

In case UE receives *RRCRelease* with *deprioritisationReq*, UE shall consider current frequency and stored frequencies due to the previously received *RRCRelease* with *deprioritisationReq* or all the frequencies of NR to be the lowest priority frequency (i.e. lower than any of the network configured values) while T325 is running irrespective of *camped* RAT. The UE shall delete the stored *deprioritisationReq* request(s) when a PLMN selection is performed on request by NAS (TS 23.122 [9]).

NOTE: UE should search for a higher priority layer for cell reselection as soon as possible after the change of priority. The minimum related performance requirements specified in TS 38.133 [8] are still applicable.

The UE shall delete priorities provided by dedicated signalling when:

- the UE enters a different RRC state; or
- the optional validity time of dedicated priorities (T320) expires; or
- a PLMN selection is performed on request by NAS (TS 23.122 [9]).

NOTE 2: Equal priorities between RATs are not supported.

The UE shall not consider any black listed cells as candidate for cell reselection.

The UE shall inherit the priorities provided by dedicated signalling and the remaining validity time (i.e. T320 in NR and E-UTRA), if configured, at inter-RAT cell (re)selection.

NOTE 3: The network may assign dedicated cell reselection priorities for frequencies not configured by system information.

[TS 38.304, clause 5.2.4.2]

Following rules are used by the UE to limit needed measurements:

- If the serving cell fulfils $S_{rxlev} > S_{IntraSearchP}$ and $S_{qual} > S_{IntraSearchQ}$, the UE may choose not to perform intra-frequency measurements.
- Otherwise, the UE shall perform intra-frequency measurements.
- The UE shall apply the following rules for NR inter-frequencies and inter-RAT frequencies which are indicated in system information and for which the UE has priority provided as defined in 5.2.4.1:
 - For a NR inter-frequency or inter-RAT frequency with a reselection priority higher than the reselection priority of the current NR frequency, the UE shall perform measurements of higher priority NR inter-frequency or inter-RAT frequencies according to TS 38.133 [8].
 - For a NR inter-frequency with an equal or lower reselection priority than the reselection priority of the current NR frequency and for inter-RAT frequency with lower reselection priority than the reselection priority of the current NR frequency:
 - If the serving cell fulfils $S_{rxlev} > S_{nonIntraSearchP}$ and $S_{qual} > S_{nonIntraSearchQ}$, the UE may choose not to perform measurements of NR inter-frequencies or inter-RAT frequency cells of equal or lower priority;
 - Otherwise, the UE shall perform measurements of NR inter-frequencies or inter-RAT frequency cells of equal or lower priority according to TS 38.133 [8].

[TS 38.304, clause 5.2.4.5]

If *threshServingLowQ* is broadcast in system information and more than 1 second has elapsed since the UE camped on the current serving cell, cell reselection to a cell on a higher priority NR frequency or inter-RAT frequency than the serving frequency shall be performed if:

- A cell of a higher priority NR or EUTRAN RAT/frequency fulfils $S_{qual} > Thresh_{X, HighQ}$ during a time interval $T_{reselection_{RAT}}$

Otherwise, cell reselection to a cell on a higher priority NR frequency or inter-RAT frequency than the serving frequency shall be performed if:

- A cell of a higher priority RAT/ frequency fulfils $S_{rxlev} > Thresh_{X, HighP}$ during a time interval $T_{reselection_{RAT}}$; and
- More than 1 second has elapsed since the UE camped on the current serving cell.

Cell reselection to a cell on an equal priority NR frequency shall be based on ranking for intra-frequency cell reselection as defined in sub-clause 5.2.4.6.

If *threshServingLowQ* is broadcast in system information and more than 1 second has elapsed since the UE camped on the current serving cell, cell reselection to a cell on a lower priority NR frequency or inter-RAT frequency than the serving frequency shall be performed if:

- The serving cell fulfils $S_{qual} < Thresh_{Serving, LowQ}$ and a cell of a lower priority NR or E-UTRAN RAT/ frequency fulfils $S_{qual} > Thresh_{X, LowQ}$ during a time interval $T_{reselection_{RAT}}$.

Otherwise, cell reselection to a cell on a lower priority NR frequency or inter-RAT frequency than the serving frequency shall be performed if:

- The serving cell fulfils $S_{rxlev} < Thresh_{Serving, LowP}$ and a cell of a lower priority RAT/ frequency fulfils $S_{rxlev} > Thresh_{X, LowP}$ during a time interval $T_{reselection_{RAT}}$; and
 - More than 1 second has elapsed since the UE camped on the current serving cell.

Cell reselection to a higher priority RAT/frequency shall take precedence over a lower priority RAT/frequency if multiple cells of different priorities fulfil the cell reselection criteria.

If more than one cell meets the above criteria, the UE shall reselect a cell as follows:

- If the highest-priority frequency is an NR frequency, the highest ranked cell among the cells on the highest priority frequency(ies) meeting the criteria according to clause 5.2.4.6;
- If the highest-priority frequency is from another RAT, the highest ranked cell among the cells on the highest priority frequency(ies) meeting the criteria of that RAT.

[TS 38.304, clause 5.2.4.6]

The cell-ranking criterion R_s for serving cell and R_n for neighbouring cells is defined by:

$$R_s = Q_{\text{meas},s} + Q_{\text{hyst}} - Q_{\text{offset}_{\text{temp}}}$$

$$R_n = Q_{\text{meas},n} - Q_{\text{offset}} - Q_{\text{offset}_{\text{temp}}}$$

where:

Q_{meas}	RSRP measurement quantity used in cell reselections.
Q_{offset}	For intra-frequency: Equals to $Q_{\text{offset}_{s,n}}$, if $Q_{\text{offset}_{s,n}}$ is valid, otherwise this equals to zero. For inter-frequency: Equals to $Q_{\text{offset}_{s,n}}$ plus $Q_{\text{offset}_{\text{frequency}}}$, if $Q_{\text{offset}_{s,n}}$ is valid, otherwise this equals to $Q_{\text{offset}_{\text{frequency}}}$.
$Q_{\text{offset}_{\text{temp}}}$	Offset temporarily applied to a cell as specified in TS 38.331 [3].

The UE shall perform ranking of all cells that fulfil the cell selection criterion S , which is defined in 5.2.3.2.

The cells shall be ranked according to the R criteria specified above by deriving $Q_{\text{meas},n}$ and $Q_{\text{meas},s}$ and calculating the R values using averaged RSRP results.

If *rangeToBestCell* is not configured, the UE shall perform cell reselection to the highest ranked cell. If this cell is found to be not-suitable, the UE shall behave according to clause 5.2.4.4.

If *rangeToBestCell* is configured, then the UE shall perform cell reselection to the cell with the highest number of beams above the threshold (i.e. *absThreshSS-BlocksConsolidation*) among the cells whose R value is within *rangeToBestCell* of the R value of the highest ranked cell. If there are multiple such cells, the UE shall perform cell reselection to the highest ranked cell among them. If this cell is found to be not-suitable, the UE shall behave according to clause 5.2.4.4.

In all cases, the UE shall reselect the new cell, only if the following conditions are met:

- the new cell is better than the serving cell according to the cell reselection criteria specified above during a time interval $T_{\text{reselection}_{\text{RAT}}}$;
- more than 1 second has elapsed since the UE camped on the current serving cell.

NOTE: If *rangeToBestCell* is configured but *absThreshSS-BlocksConsolidation* is not configured on an NR frequency, the UE considers that there is one beam above the threshold for each cell on that frequency.

8.1.1.3.3.3 Test description

8.1.1.3.3.3.1 Pre-test conditions

System Simulator:

- NR Cell 1, NR Cell 3 and NR Cell 6.
 - NR Cell 1 (TAI-1) serving cell.
- System information combination NR-4 as defined in TS 38.508-1 [4] clause 4.4.3.1.2-1 is used in NR cells.

NOTE: For Cell 3 and 6 TAI is set to TAI-2

UE:

- None.

Preamble:

- The UE is in state 3N-A on NR Cell 1(serving cell) according to TS 38.508-1 [4] Table 4.4A.2-3.

8.1.1.3.3.3.2 Test procedure sequence

Table 8.1.1.3.3.3.2-1/2 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.1.3.3.3.2-1: Time instances of cell power level and parameter changes for FR1

	Parameter	Unit	NR Cell 1	NR Cell 3	NR Cell 6	Remark
T0	SS/PBCH SSS EPRE	dBm/ SCS	-88	Off	Off	The power level values are assigned to satisfy $S_{rxlev_{Cell\ 1}} > S_{intra search}$. (NOTE 1)
T1	SS/PBCH SSS EPRE	dBm/ SCS	-88	-76	-76	The power level values are assigned to satisfy both $Thresh_{x, low} < S_{rxlev_{Cell\ 3}}$ and $Thresh_{x, high} < S_{rxlev_{Cell\ 6}}$.
T2	SS/PBCH SSS EPRE	dBm/ SCS	-88	Off	-73	The power level values are assigned to satisfy $Thresh_{x, high} < S_{rxlev_{Cell\ 6}}$.
NOTE 1: Power level "Off" is defined in TS38.508 Table 6.2.2.1-3.						

Table 8.1.1.3.3.3.2-2 Time instances of cell power level and parameter changes for FR2

	Parameter	Unit	NR Cell 1	NR Cell 3	NR Cell 6	Remark
T0	SS/PBCH SSS EPRE	dBm/ SCS	FFS	Off	Off	The power level values are assigned to satisfy $S_{rxlev_{Cell\ 1}} > S_{intra search}$. (NOTE 1)
T1	SS/PBCH SSS EPRE	dBm/ SCS	FFS	FFS	FFS	The power level values are assigned to satisfy both $Thresh_{x, low} < S_{rxlev_{Cell\ 3}}$ and $Thresh_{x, high} < S_{rxlev_{Cell\ 6}}$.
T2	SS/PBCH SSS EPRE	dBm/ SCS	FFS	Off	FFS	The power level values are assigned to satisfy $Thresh_{x, high} < S_{rxlev_{Cell\ 6}}$.
NOTE 1: Power level "Off" is defined in TS38.508 Table 6.2.2.1-3.						

Table 8.1.1.3.3.3.2-3: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS changes NR Cell 1, NR Cell 3 and NR Cell 6 power level according to the row "T1" in table 8.1.1.3.3.3.2-1/2.	-	-	-	-
2	The SS transmits an <i>RRCRelease</i> message including the <i>freqPriorityListNR</i> on NR Cell	<--	NR RRC: <i>RRCRelease</i>	-	-

	1.				
3	Check: Does the UE perform on NR Cell 6 the Registration procedure for mobility registration update as specified in TS 38.508-1 [4] subclause 4.9.5?	-	-	1	P
4	The SS changes NR Cell 1, NR Cell 3 and NR Cell 6 power level according to the row "T0" in table 8.1.1.3.3.3.2-1/2.	-	-	-	-
5	Performs the generic procedure defined in TS 38.508-1 table 4.9.5, 'connected without release', to get UE into RRC_CONNECTED state on NR Cell 1	-	-	-	-
6	The SS transmits an <i>RRCRelease</i> message containing IE <i>freqPriorityListNR</i> to update the cell reselection priority of NR Cell 6 and the timer T320.	<--	NR RRC: <i>RRCRelease</i>	-	-
7	The SS changes NR Cell 1, NR Cell 3 and NR Cell 6 power level according to the row "T2" in table 8.1.1.3.3.3.2-1/2.	-	-	-	-
8	Check: Does the UE transmit an <i>RRCSetupRequest</i> message within T320 running?	-->	NR RRC: <i>RRCSetupRequest</i>	2	F
9	Check: After timer T320 expiry, does the test result of generic test procedure in TS 38.508-1 subclause 4.9.5 indicate that the UE is camped on NR Cell 6? NOTE: The UE performs a "REGISTRATION REQUEST" procedure with type "mobility registration updating".	-	-	2	P

8.1.1.3.3.3.3 Specific message contents

Table 8.1.1.3.3.3.3-1: *RRCRelease* (step 2, Table 8.1.1.3.3.3.2-3)

Derivation Path: 38.508 Table 4.6.1-16			
Information Element	Value/remark	Comment	Condition
<i>RRCRelease</i> ::= SEQUENCE {			
criticalExtensions CHOICE {			
c1 CHOICE {			
rrcRelease SEQUENCE {			
cellReselectionPriorities SEQUENCE {	3 entries		
freqPriorityListEUTRA	Not present		
freqPriorityListNR SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {			
carrierFreq[1]	Same downlink ARFCN		

	as used for NR Cell 1		
cellReselectionPriority[1]	4		
carrierFreq[2]	Same downlink ARFCN as used for NR Cell 3		
cellReselectionPriority[2]	1		
carrierFreq[3]	Same downlink ARFCN as used for NR Cell 6		
cellReselectionPriority[3]	5		
}			
}			
}			
}			
}			
}			
}			

Table 8.1.1.3.3.3.2-2: *SystemInformationBlockType4* for Cell 1 (preamble and all steps, Table 8.1.1.3.3.3.2-3)

Derivation path: 38.508-1 [4], Table 4.6.2-3			
Information Element	Value/Remark	Comment	Condition
SystemInformationBlockType4 ::= SEQUENCE {			
interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	2 entries		
dl-CarrierFreq[1]	Same downlink NR ARFCN as used for NR Cell 3		
cellReselectionPriority[1]	1		
dl-CarrierFreq[2]	Same downlink NR ARFCN as used for NR Cell 6		
cellReselectionPriority[2]	5		
}			
}			

Table 8.1.1.3.3.3.3-3: *SystemInformationBlockType4* for Cell 6 (all steps, Table 8.1.1.3.3.3.2-3)

Derivation path: 38.508-1 [4], Table 4.6.2-3			
Information Element	Value/Remark	Comment	Condition
SystemInformationBlockType4 ::= SEQUENCE {			

interFreqCarrierFreqList SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	2 entries		
dl-CarrierFreq[1]	Same downlink NR ARFCN as used for NR Cell 1		
cellReselectionPriority[1]	4		
dl-CarrierFreq[2]	Same downlink NR ARFCN as used for NR Cell 3		
cellReselectionPriority[2]	1		
}			
}			

Table 8.1.1.3.3.3.3-4: RRCRelease (step 6, Table 8.1.1.3.5.3.2-3)

Derivation Path: TS 38.508-1 [4], Table 4.6.1-16			
Information Element	Value/remark	Comment	Condition
RRCRelease ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
cellReselectionPriorities SEQUENCE {			
freqPriorityListNR SEQUENCE {			
carrierFreq	ARFCN-ValueNR of NR Cell 6		
cellReselectionPriority	3		
cellReselectionSubPriority	Not present		
}			
t320	min5		
}			
}			
}			
}			

8.1.1.3.4 RRC connection release / Success / With priority information / E-UTRA

8.1.1.3.4.1 Test Purpose (TP)

(1)

with { UE in NR RRC_IDLE state having received an RRCRelease message with the freqPriorityListEUTRA with higher priority frequency }

ensure that {

when { UE detects the cell re-selection criteria are met for the cell which belongs to the higher priority EUTRA frequency }

then { UE reselects the cell which belongs to the higher priority EUTRA frequency }

}

(2)

with { UE in NR RRC_IDLE state having received an RRCRelease message with the freqPriorityListEUTRA with higher priority frequency and timer T320 }

ensure that {

when { T320 timer expires }

then { UE discards the cell reselection priority information provided by the cellReselectionPriorities and apply the cell reselection priority information broadcast in the system information to perform reselection to an E-UTRA cell }

}

8.1.1.3.4.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clause 5.3.8.3 and T 38.304, clause 5.2.4.1. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.8.3]

The UE shall:

1> delay the following actions defined in this sub-clause 60 ms from the moment the *RRCRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCRelease* message has been successfully acknowledged, whichever is earlier;

1> stop timer T380, if running;

1> stop timer T320, if running;

1> stop timer T390, if running;

1> if the security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

...

1> if the *RRCRelease* message includes the *cellReselectionPriorities*:

2> store the cell reselection priority information provided by the *cellReselectionPriorities*;

2> if the *t320* is included:

3> start timer T320, with the timer value set according to the value of $t320$;

1> else:

2> apply the cell reselection priority information broadcast in the system information;

[TS 38.304, clause 5.2.4.1]

Absolute priorities of different NR frequencies or inter-RAT frequencies may be provided to the UE in the system information, in the *RRCRelease* message, or by inheriting from another RAT at inter-RAT cell (re)selection. In the case of system information, an NR frequency or inter-RAT frequency may be listed without providing a priority (i.e. the field *cellReselectionPriority* is absent for that frequency). If priorities are provided in dedicated signalling, the UE shall ignore all the priorities provided in system information. If UE is in *camped on any cell* state, UE shall only apply the priorities provided by system information from current cell, and the UE preserves priorities provided by dedicated signalling and *deprioritisationReq* received in *RRCRelease* unless specified otherwise. When the UE in camped normally state, has only dedicated priorities other than for the current frequency, the UE shall consider the current frequency to be the lowest priority frequency (i.e. lower than any of the network configured values).

The UE shall only perform cell reselection evaluation for NR frequencies and inter-RAT frequencies that are given in system information and for which the UE has a priority provided.

In case UE receives *RRCRelease* with *deprioritisationReq*, UE shall consider current frequency and stored frequencies due to the previously received *RRCRelease* with *deprioritisationReq* or all the frequencies of NR to be the lowest priority frequency (i.e. lower than any of the network configured values) while T325 is running irrespective of camped RAT. The UE shall delete the stored deprioritisation request(s) when a PLMN selection is performed on request by NAS (TS 23.122 [9]).

NOTE: UE should search for a higher priority layer for cell reselection as soon as possible after the change of priority. The minimum related performance requirements specified in TS 38.133 [8] are still applicable.

The UE shall delete priorities provided by dedicated signalling when:

- the UE enters a different RRC state; or
- the optional validity time of dedicated priorities (T320) expires; or
- a PLMN selection is performed on request by NAS (TS 23.122 [9]).

NOTE 2: Equal priorities between RATs are not supported.

The UE shall not consider any black listed cells as candidate for cell reselection.

The UE shall inherit the priorities provided by dedicated signalling and the remaining validity time (i.e. T320 in NR and E-UTRA), if configured, at inter-RAT cell (re)selection.

NOTE 3: The network may assign dedicated cell reselection priorities for frequencies not configured by system information.

[TS 38.331, clause 5.3.8.4]

The UE shall:

1> if T320 expires:

2> if stored, discard the cell reselection priority information provided by the *cellReselectionPriorities* or inherited from another RAT;

2> apply the cell reselection priority information broadcast in the system information.

[TS 38.304, clause 5.2.4.2]

Following rules are used by the UE to limit needed measurements:

- If the serving cell fulfils $S_{rxlev} > S_{IntraSearchP}$ and $S_{qual} > S_{IntraSearchQ}$, the UE may choose not to perform intra-frequency measurements.
- Otherwise, the UE shall perform intra-frequency measurements.

- The UE shall apply the following rules for NR inter-frequencies and inter-RAT frequencies which are indicated in system information and for which the UE has priority provided as defined in 5.2.4.1:
- For a NR inter-frequency or inter-RAT frequency with a reselection priority higher than the reselection priority of the current NR frequency, the UE shall perform measurements of higher priority NR inter-frequency or inter-RAT frequencies according to TS 38.133 [8].
- For a NR inter-frequency with an equal or lower reselection priority than the reselection priority of the current NR frequency and for inter-RAT frequency with lower reselection priority than the reselection priority of the current NR frequency:
- If the serving cell fulfils $S_{rxlev} > S_{nonIntraSearchP}$ and $S_{qual} > S_{nonIntraSearchQ}$, the UE may choose not to perform measurements of NR inter-frequencies or inter-RAT frequency cells of equal or lower priority;
 - Otherwise, the UE shall perform measurements of NR inter-frequencies or inter-RAT frequency cells of equal or lower priority according to TS 38.133 [8].

[TS 38.304, clause 5.2.4.5]

If *threshServingLowQ* is broadcast in system information and more than 1 second has elapsed since the UE camped on the current serving cell, cell reselection to a cell on a higher priority NR frequency or inter-RAT frequency than the serving frequency shall be performed if:

- A cell of a higher priority NR or EUTRAN RAT/frequency fulfils $S_{qual} > Thresh_{X, HighQ}$ during a time interval $T_{reselection_{RAT}}$

Otherwise, cell reselection to a cell on a higher priority NR frequency or inter-RAT frequency than the serving frequency shall be performed if:

- A cell of a higher priority RAT/ frequency fulfils $S_{rxlev} > Thresh_{X, HighP}$ during a time interval $T_{reselection_{RAT}}$; and
- More than 1 second has elapsed since the UE camped on the current serving cell.

Cell reselection to a cell on an equal priority NR frequency shall be based on ranking for intra-frequency cell reselection as defined in sub-clause 5.2.4.6.

If *threshServingLowQ* is broadcast in system information and more than 1 second has elapsed since the UE camped on the current serving cell, cell reselection to a cell on a lower priority NR frequency or inter-RAT frequency than the serving frequency shall be performed if:

- The serving cell fulfils $S_{qual} < Thresh_{Serving, LowQ}$ and a cell of a lower priority NR or E-UTRAN RAT/ frequency fulfils $S_{qual} > Thresh_{X, LowQ}$ during a time interval $T_{reselection_{RAT}}$.

Otherwise, cell reselection to a cell on a lower priority NR frequency or inter-RAT frequency than the serving frequency shall be performed if:

- The serving cell fulfils $S_{rxlev} < Thresh_{Serving, LowP}$ and a cell of a lower priority RAT/ frequency fulfils $S_{rxlev} > Thresh_{X, LowP}$ during a time interval $T_{reselection_{RAT}}$; and
 - More than 1 second has elapsed since the UE camped on the current serving cell.

Cell reselection to a higher priority RAT/frequency shall take precedence over a lower priority RAT/frequency if multiple cells of different priorities fulfil the cell reselection criteria.

If more than one cell meets the above criteria, the UE shall reselect a cell as follows:

- If the highest-priority frequency is an NR frequency, the highest ranked cell among the cells on the highest priority frequency(ies) meeting the criteria according to clause 5.2.4.6;
- If the highest-priority frequency is from another RAT, the highest ranked cell among the cells on the highest priority frequency(ies) meeting the criteria of that RAT.

[TS 38.304, clause 5.2.4.6]

The cell-ranking criterion R_s for serving cell and R_n for neighbouring cells is defined by:

$$R_s = Q_{\text{meas},s} + Q_{\text{hyst}} - Q_{\text{offset,temp}}$$

$$R_n = Q_{\text{meas},n} - Q_{\text{offset}} - Q_{\text{offset,temp}}$$

where:

Q_{meas}	RSRP measurement quantity used in cell reselections.
Q_{offset}	For intra-frequency: Equals to $Q_{\text{offset},s,n}$, if $Q_{\text{offset},s,n}$ is valid, otherwise this equals to zero. For inter-frequency: Equals to $Q_{\text{offset},s,n}$ plus $Q_{\text{offset,frequency}}$, if $Q_{\text{offset},s,n}$ is valid, otherwise this equals to $Q_{\text{offset,frequency}}$.
$Q_{\text{offset,temp}}$	Offset temporarily applied to a cell as specified in TS 38.331 [3].

The UE shall perform ranking of all cells that fulfil the cell selection criterion S, which is defined in 5.2.3.2.

The cells shall be ranked according to the R criteria specified above by deriving $Q_{\text{meas},n}$ and $Q_{\text{meas},s}$ and calculating the R values using averaged RSRP results.

If *rangeToBestCell* is not configured, the UE shall perform cell reselection to the highest ranked cell. If this cell is found to be not-suitable, the UE shall behave according to subclause 5.2.4.4.

If *rangeToBestCell* is configured, then the UE shall perform cell reselection to the cell with the highest number of beams above the threshold (i.e. *absThreshSS-BlocksConsolidation*) among the cells whose R value is within *rangeToBestCell* of the R value of the highest ranked cell. If there are multiple such cells, the UE shall perform cell reselection to the highest ranked cell among them. If this cell is found to be not-suitable, the UE shall behave according to subclause 5.2.4.4.

In all cases, the UE shall reselect the new cell, only if the following conditions are met:

- the new cell is better than the serving cell according to the cell reselection criteria specified above during a time interval $T_{\text{reselection,RAT}}$;
- more than 1 second has elapsed since the UE camped on the current serving cell.

8.1.1.3.4.3 Test description

8.1.1.3.4.3.1 Pre-test conditions

System Simulator:

- NR Cell 1, E-UTRA Cell 1 and E-UTRA Cell 3.
- System information combination NR-6 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cell.
- System information combination 1 as defined in TS 36.508 [7] clause 4.4.3.1 is used in E-UTRA cells.

UE:

None.

Preamble:

- With E-UTRA Cell 1 "Serving cell", E-UTRA Cell 3 "Non-suitable "Off" cell" and NR Cell 1 "Non-suitable "Off" cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state RRC_IDLE Connectivity (E-UTRA/EPC) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established.
- the UE is switched-off.

- With E-UTRA Cell 1 "Non-suitable "Off" cell" and NR Cell 1 "Serving cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state 3N-A, NR RRC_CONNECTED, in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.

8.1.1.3.4.3.2 Test procedure sequence

Table 8.1.1.3.4.3.2-1/2 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.1.3.4.3.2-1: Time instances of cell power level and parameter changes in FR1

	Parameter	Unit	NR Cell 1	E-UTRA Cell 1	E-UTRA Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-	"off"	"off"	
	SS/PBCH SSS EPRE	dBm/SCS	-88	-	-	
T1	Cell-specific RS EPRE	dBm/15kHz	-	-73	-73	The power level values are assigned to satisfy both $\text{Thresh}_{x, \text{low}} < \text{Srxlev}_{\text{E-UTRACell 1}}$ and $\text{Thresh}_{x, \text{high}} < \text{Srxlev}_{\text{E-UTRACell 3}}$ but not to satisfy $\text{Srxlev}_{\text{NR Cell 1}} < \text{Thresh}_{\text{serv, low}}$
	SS/PBCH SSS EPRE	dBm/SCS	-88	-	-	
T2	Cell-specific RS EPRE	dBm/15kHz	-	"off"	"off"	The power level values are assigned to satisfy $\text{Srxlev}_{\text{NR Cell 1}} > \text{S}_{\text{nonintrasearch}}$. (NOTE 1)
	SS/PBCH SSS EPRE	dBm/SCS	-88	-	-	
T3	Cell-specific RS EPRE	dBm/15kHz	-	-73	"off"	The power level values are assigned to satisfy $\text{Thresh}_{x, \text{high}} < \text{Srxlev}_{\text{E-UTRA Cell 1}}$.
	SS/PBCH SSS EPRE	dBm/SCS	-88	-	-	
NOTE 1: Power level "Off" is defined in TS36.508 [7] Table 6.2.2.1-3.						

Table 8.1.1.3.4.3.2-2: Time instances of cell power level and parameter changes in FR2

	Parameter	Unit	NR Cell 1	E-UTRA Cell 1	E-UTRA Cell 3	Remark
T0	Cell-specific RS EPRE	dBm/15kHz	-	"off"	"off"	
	SS/PBCH SSS EPRE	dBm/SCS	FFS	-	-	

T1	Cell-specific RS EPRE	dBm/15kHz	-	FFS	FFS	The power level values are assigned to satisfy both $\text{Thresh}_{x, \text{low}} < \text{Srxlev}_{\text{E-UTRACell 1}}$ and $\text{Thresh}_{x, \text{high}} < \text{Srxlev}_{\text{E-UTRACell 3}}$ but not to satisfy $\text{Srxlev}_{\text{NR Cell 1}} < \text{Thresh}_{\text{Serving, low}}$
	SS/PBCH SSS EPRE	dBm/SCS	FFS	-	-	
T2	Cell-specific RS EPRE	dBm/15kHz	-	"off"	"off"	The power level values are assigned to satisfy $\text{Srxlev}_{\text{NR Cell 1}} > \text{S}_{\text{nonintrasearch}}$ (NOTE 1)
	SS/PBCH SSS EPRE	dBm/SCS	FFS	-	-	
T3	Cell-specific RS EPRE	dBm/15kHz	-	FFS	"off"	The power level values are assigned to satisfy $\text{Thresh}_{x, \text{high}} < \text{Srxlev}_{\text{E-UTRA Cell 1}}$
	SS/PBCH SSS EPRE	dBm/SCS	FFS	-	-	
NOTE 1: Power level "Off" is defined in TS36.508 [7] Table 6.2.2.1-3.						

Table 8.1.1.3.4.3.2-3: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS changes NR Cell 1, E-UTRA Cell 1 and E-UTRA Cell 3 level according to the row "T1" in Table 8.1.1.3.4.3.2-1/2	-	-	-	-
2	The SS transmits an <i>RRCRelease</i> message including the <i>freqPriorityListEUTRA</i> on NR Cell 1.	<--	NR RRC: <i>RRCRelease</i>	-	-
3	Check: Does the test result of generic test procedure in TS 38.508-1 [4] subclause 4.9.7 indicate that the UE is camped on E-UTRA Cell 3?	-	-	1	-
4	The SS changes NR Cell 1, E-UTRA Cell 1 and E-UTRA Cell 3 level according to the row "T2" in Table 8.1.1.3.4.3.2-1/2	-	-	-	-
5	UE perform on the NR Cell 1 the mobility and periodic registration update procedure in TS 38.508-1[4] subclause 4.9.9.2.2	-	-	-	-
6	The SS transmits an <i>RRCRelease</i> message containing IE <i>freqPriorityListEUTRA</i> to update the cell reselection priority of E-UTRA Cell 1 and the timer T320.	<--	NR RRC: <i>RRCRelease</i>	-	-
7	The SS changes power levels of E-UTRA Cell 1 according to row "T3" in Table	-	-	-	-

	8.1.1.3.4.3.2-1/2.				
8	Check: While timer T320 is running, does the UE transmit an RRCSetupRequest message?	-	-	2	F
9	Check: After timer T320 expiry, does the test result of generic test procedure in TS 38.508-1[4] subclause 4.9.7 indicate that the UE is camped on E-UTRA Cell 1?	-	-	2	-

8.1.1.3.4.3.3 Specific message contents

Table 8.1.1.3.4.3.3-1: *RRCRelease* (step 1, Table 8.1.1.3.4.3.2-3)

Derivation Path: 38.508-1 [4] Table 4.6.1-16			
Information Element	Value/remark	Comment	Condition
RRCRelease ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
cellReselectionPriorities SEQUENCE {			
freqPriorityListEUTRA SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	2 entries		
carrierFreq[1]	ARFCN-ValueEUTRA for EUTRA Cell 1 frequency		
cellReselectionPriority[1]	3		
carrierFreq[2]	ARFCN-ValueEUTRA for EUTRA Cell 3 frequency		
cellReselectionPriority[2]	5		
}			
freqPriorityListNR SEQUENCE (SIZE (1..maxFreq)) OF SEQUENCE {	1 entry		
carrierFreq[1]	ARFCN-ValueNR for NR Cell 1 frequency		
cellReselectionPriority[1]	4		
}			
t320	Not Present		
}			
}			
}			

}			
---	--	--	--

Table 8.1.1.3.4.3.3-2: SIB5 for NR cell 1 (preamble and all steps, Table 8.1.1.3.4.3.2-3)

Derivation Path: TS 38.508-1 [4] Table 4.6.2-4			
Information Element	Value/remark	Comment	Condition
SIB5 ::= SEQUENCE {			
carrierFreqListEUTRA SEQUENCE (SIZE (1..maxEUTRA-Carrier)) OF SEQUENCE {	2 entries		
carrierFreq[1]	ARFCN-ValueEUTRA for EUTRA Cell 1 frequency		
cellReselectionPriority[1]	5		
threshX-High[1]	2 (4 dB)		
threshX-Low[1]	1 (2 dB)		
carrierFreq[2]	ARFCN-ValueEUTRA for EUTRA Cell 3 frequency		
cellReselectionPriority[2]	3		
threshX-High[2]	2 (4 dB)		
threshX-Low[2]	1 (2 dB)		
}			
}			

Table 8.1.1.3.4.3.3-3: RRCRelease (step 6, Table 8.1.1.3.4.3.2-3)

Derivation Path: TS 38.508-1 [4], Table 4.6.1-16			
Information Element	Value/remark	Comment	Condition
RRCRelease ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
cellReselectionPriorities SEQUENCE {			
freqPriorityListEUTRA SEQUENCE {			
carrierFreq	ARFCN-ValueEUTRA of E-UTRA Cell 1		
cellReselectionPriority	3		
cellReselectionSubPriority	Not present		

}			
t320	min5		
}			
}			
}			
}			

8.1.1.3.5 Void

8.1.1.3.6 Void

8.1.1.4 RRC resume

8.1.1.4.1 RRC resume / Suspend-Resume / RNA update / Success

8.1.1.4.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_INACTIVE state, with stored shortI-RNTI and useFullResumeID is not signalled in SIB1 }

ensure that {

when { UE receives a Paging message to resume RRC connection }

then { UE sends RRCResumeRequest message by setting resumeIdentity to the stored shortI-RNTI value }

}

(2)

with { UE in NR RRC_INACTIVE state, with stored fullI-RNTI and useFullResumeID is signalled in SIB1 }

ensure that {

when { UE receives a Paging message to resume RRC connection }

then { UE sends RRCResumeRequest1 message by setting resumeIdentity to the stored fullI-RNTI value }

}

(3)

with { UE in NR RRC_INACTIVE state }

ensure that {

when { UE performs cell reselection and enters an RNA not belonging to the configured ran-NotificationAreaInfo }

then { UE shall initiate RRC connection resume procedure with cause value set to rna-Update }

}

8.1.1.4.1.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 38.331 clause 5.2.2.4.2, 5.3.8.3, 5.3.13.2, 5.3.13.3 and 5.3.13.8. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.2.2.4.2]

Upon receiving the *SIB1* the UE shall:

1> store the acquired *SIB1*;

1> if the *cellAccessRelatedInfo* contains an entry with the *PLMN-Identity* of the selected PLMN:

2> in the remainder of the procedures use *plmn-IdentityList*, *trackingAreaCode*, and *cellIdentity* for the cell as received in the corresponding *PLMN-IdentityInfo* containing the selected PLMN;

...

1> else:

...

2> if the UE supports the bandwidth of the initial uplink BWP and of the initial downlink BWPs indicated in the *locationAndBandwidth* fields in *uplinkConfigCommon*:

3> select the first frequency band in the *frequencyBandList* which the UE supports and for which the UE supports at least one of the *additionalSpectrumEmission* values in *nr-NS-PmaxList*, if present;

3> forward the *cellIdentity* to upper layers;

3> if *trackingAreaCode* is not provided for the selected PLMN nor the registered PLMN nor PLMN of the equivalent PLMN list:

4> consider the cell as barred in accordance with TS 38.304 [20];

4> if *intraFreqReselection* is set to *notAllowed*:

5> consider cell re-selection to other cells on the same frequency as the barred cell as not allowed, as specified in TS 38.304 [20];

4> else:

5> consider cell re-selection to other cells on the same frequency as the barred cell as allowed, as specified in TS 38.304 [20];

3> else:

4> forward the *trackingAreaCode* to upper layers;

3> forward the PLMN identity to upper layers;

3> if in *RRC_INACTIVE* and the forwarded information does not trigger message transmission by upper layers:

4> if the serving cell does not belong to the configured *ran-NotificationAreaInfo*:

5> initiate an RNA update as specified in 5.3.13.8;

[TS 38.331, clause 5.3.8.3]

The UE shall:

...

1> if the *RRCRelease* includes *suspendConfig*:

- 2> apply the received *suspendConfig*;
- 2> reset MAC and release the default MAC Cell Group configuration, if any;
- 2> re-establish RLC entities for SRB1;
- 2> if the *RRCRelease* message with *suspendConfig* was received in response to an *RRCResumeRequest* or an *RRCResumeRequest1*:
 - 3> stop the timer T319 if running;
 - 3> in the stored UE Inactive AS context:
 - 4> replace the K_{gNB} and K_{RRCint} keys with the current K_{gNB} and K_{RRCint} keys;
 - 4> replace the C-RNTI with the temporary C-RNTI in the cell the UE has received the *RRCRelease* message;
 - 4> replace the *cellIdentity* with the *cellIdentity* of the cell the UE has received the *RRCRelease* message;
 - 4> replace the physical cell identity with the physical cell identity of the cell the UE has received the *RRCRelease* message;
 - 4> replace the *suspendConfig* with the current *suspendConfig*;
- 2> else:
 - 3> store in the UE Inactive AS Context the configured *suspendConfig*, the current K_{gNB} and K_{RRCint} keys, the ROHC state, the C-RNTI used in the source PCell, the *cellIdentity* and the physical cell identity of the source PCell, and all other parameters configured except with *ReconfigurationWithSync*;

...

[TS 38.331, clause 5.3.13.2]

The UE initiates the procedure when upper layers or AS (when responding to RAN paging or upon triggering RNA updates while the UE is in RRC_INACTIVE) requests the resume of a suspended RRC connection.

The UE shall ensure having valid and up to date essential system information as specified in clause 5.2.2.2 before initiating this procedure.

Upon initiation of the procedure, the UE shall:

- 1> if the resumption of the RRC connection is triggered by response to NG-RAN paging:
 - 2> select '0' as the Access Category;
 - 2> perform the unified access control procedure as specified in 5.3.14 using the selected Access Category and one or more Access Identities provided by upper layers;
 - 3> if the access attempt is barred, the procedure ends;
- 1> else if the resumption of the RRC connection is triggered by upper layers:
 - 2> if the upper layers provide an Access Category and one or more Access Identities:
 - 3> perform the unified access control procedure as specified in 5.3.14 using the Access Category and Access Identities provided by upper layers;
 - 4> if the access attempt is barred, the procedure ends;
 - 2> set the *resumeCause* in accordance with the information received from upper layers;
- 1> else if the resumption of the RRC connection is triggered due to an RNA update as specified in 5.3.13.8:
 - 2> if an emergency service is ongoing:

NOTE: How the RRC layer in the UE is aware of an ongoing emergency service is up to UE implementation.

- 3> select '2' as the Access Category;
- 3> set the *resumeCause* to *emergency*;
- 2> else:
 - 3> select '8' as the Access Category;
- 2> perform the unified access control procedure as specified in 5.3.14 using the selected Access Category and one or more Access Identities to be applied as specified in TS 24.501 [23];
- 3> if the access attempt is barred:
 - 4> set the variable *pendingRnaUpdate* to *true*;
 - 4> the procedure ends;
- ...
- 1> release the MCG SCell(s) from the UE Inactive AS context, if stored;
- 1> apply the default L1 parameter values as specified in corresponding physical layer specifications, except for the parameters for which values are provided in *SIB1*;
- 1> apply the default SRB1 configuration as specified in 9.2.1;
- 1> apply the default MAC Cell Group configuration as specified in 9.2.2;
- 1> release *delayBudgetReportingConfig* from the UE Inactive AS context, if stored;
- 1> stop timer T342, if running;
- 1> release *overheatingAssistanceConfig* from the UE Inactive AS context, if stored;
- 1> stop timer T345, if running;
- 1> apply the CCCH configuration as specified in 9.1.1.2;
- 1> apply the *timeAlignmentTimerCommon* included in *SIB1*;
- 1> start timer T319;
- 1> set the variable *pendingRnaUpdate* to *false*;
- 1> initiate transmission of the *RRCResumeRequest* message or *RRCResumeRequest1* in accordance with 5.3.13.3.

[TS 38.331, clause 5.3.13.3]

The UE shall set the contents of *RRCResumeRequest* or *RRCResumeRequest1* message as follows:

- 1> if field *useFullResumeID* is signalled in *SIB1*:
 - 2> select *RRCResumeRequest1* as the message to use;
 - 2> set the *resumeIdentity* to the stored *fullI-RNTI* value;
- 1> else:
 - 2> select *RRCResumeRequest* as the message to use;
 - 2> set the *resumeIdentity* to the stored *shortI-RNTI* value;
- ...
- 1> submit the selected message *RRCResumeRequest* or *RRCResumeRequest1* for transmission to lower layers.

NOTE 2: Only DRBs with previously configured UP ciphering shall resume ciphering.

...

[TS 38.331, clause 5.3.13.8]

In RRC_INACTIVE state, the UE shall:

- 1> if T380 expires; or
- 1> if RNA Update is triggered at reception of SIB1, as specified in 5.2.2.4.2:
- 2> initiate RRC connection resume procedure in 5.3.13.2 with *resumeCause* set to *rna-Update*;
- 1> if barring is alleviated for Access Category '8', as specified in 5.3.14.4:
- 2> if upper layers do not request RRC the resumption of an RRC connection, and
- 2> if the variable *pendingRnaUpdate* is set to *true*:
- 3> initiate RRC connection resume procedure in 5.3.13.2 with *resumeCause* value set to *rna-Update*.

If the UE in RRC_INACTIVE state fails to find a suitable cell and camps on the acceptable cell to obtain limited service as defined in TS 38.304 [20], the UE shall:

- 1> perform the actions upon going to RRC_IDLE as specified in 5.3.11 with release cause 'other'.

NOTE: It is left to UE implementation how to behave when T380 expires while the UE is camped neither on a suitable nor on an acceptable cell.

8.1.1.4.1.3 Test Description

8.1.1.4.1.3.1 Pre-test conditions

System Simulator:

- 2 NR cells with different tracking areas: NR Cell 1 is the serving cell and NR Cell 2 is a suitable neighbour intra-frequency cell.
- Cell power levels are selected according to 38.508-1 [4] Table 6.2.2.1-3 and NR Cell 2 is switched on after UE has registered on NR Cell 1.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- If *pc_IP_Ping* is set to TRUE then, the UE is in 5GS state 2N-A according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-3.
- Else, the UE is in 5GS state 2N-A and Test Loop Function (*On*) with UE test loop mode B on NR Cell 1 according to 38.508-1[4], clause 4.4A.2 Table 4.4A.2-3.

8.1.1.4.1.3.2 Test procedure sequence

Table 8.1.1.4.1.3.2-1 for FR1 and table 8.1.1.4.1.3.2-2 for FR2 illustrate the downlink power levels to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" is to be applied subsequently in the Main behaviour. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.1.4.1.3.2-1: Cell configuration changes over time for FR1

	Parameter	Unit	NR Cell 1	NR Cell 2	Remarks

T0	SS/PBCH SSS EPRE	dBm/SCS	-70	-65	
T1	SS/PBCH SSS EPRE	dBm/SCS	"Off"	-65	Power level "Off" is defined in TS 38.508-1 [4] Table 6.2.2.1-3

Table 8.1.1.4.1.3.2-2: Cell configuration changes over time for FR2

	Parameter	Unit	NR Cell 1	NR Cell 2	Remarks
T0	SS/PBCH SSS EPRE	dBm/SCS	-82	-91	
	Qrxlevmin	dBm	110+Delta(NRf1)	110+Delta(NRf1)	
T1	SS/PBCH SSS EPRE	dBm/SCS	"Off"	-91	Power level "Off" is defined in TS 38.508-1 [4] Table 6.2.2.1-3
	Qrxlevmin	dBm	-	110+Delta(NRf1)	

Table 8.1.1.4.1.3.2-3: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a <i>Paging</i> message including a matched identity (correct <i>fullI-RNTI</i>).	-	NR RRC: <i>Paging</i>	-	-
2	Check: Does the UE transmit an <i>RRCResumeRequest</i> message by setting <i>resumeIdentity</i> to the stored <i>shortI-RNTI</i> value?	-->	NR RRC: <i>RRCResumeRequest</i>	1	P
3	The SS transmits an <i>RRCResume</i> message.	<--	NR RRC: <i>RRCResume</i>	-	-
4	The UE transmits an <i>RRCResumeComplete</i> message.	-->	NR RRC: <i>RRCResumeComplete</i>	-	-
5	Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on DRB#n associated with default Internet PDU session?	-	-	1	P
6	The SS transmits an <i>RRCRelease</i> message including both <i>fullI-RNTI</i> and <i>shortI-RNTI</i> in <i>suspendConfig</i> .	<--	NR RRC: <i>RRCRelease</i>	-	-
7	The SS changes the SIB1 of NR Cell 1 to set the <i>useFullResumeID</i> to True.	-	-	-	-
8	The SS transmits a Short message on PDCCH using P-RNTI indicating a <i>systemInfoModification</i> .	-	PDCCH (DCI 1_0): Short Message	-	-

9	Wait for 2.1* modification period second for the UE to receive new system information. (Note 1)	-	-	-	-
10	The SS transmits a <i>Paging</i> message including a matched identity (correct <i>fullI-RNTI</i>).	-	NR RRC: <i>Paging</i>	-	-
11	Check: Does the UE transmit an <i>RRCResumeRequest1</i> message by setting <i>resumeIdentity</i> to the stored <i>fullI-RNTI</i> value?	-->	NR RRC: <i>RRCResumeRequest1</i>	2	P
12	The SS transmits an <i>RRCResume</i> message.	<--	NR RRC: <i>RRCResume</i>	-	-
13	The UE transmits an <i>RRCResumeComplete</i> message.	-->	NR RRC: <i>RRCResumeComplete</i>	-	-
14	The SS transmits an <i>RRCRelease</i> message including both <i>fullI-RNTI</i> and <i>shortI-RNTI</i> in <i>suspendConfig</i> .	<--	NR RRC: <i>RRCRelease</i>	-	-
15	The SS adjusts cell levels according to row T1 of table 8.1.1.4.1.3.2-1 for FR1 and table 8.1.1.4.1.3.2-2 for FR2.	-	-	-	-
16	Check: Does the UE transmit an <i>RRCResumeRequest</i> message with <i>resumeCause</i> set to <i>rna-Update</i> on NR Cell 2 within 60s?	-->	NR RRC: <i>RRCResumeRequest</i>	3	P
17	The SS transmits an <i>RRCResume</i> message.	<--	NR RRC: <i>RRCResume</i>	-	-
18	The UE transmit an <i>RRCResumeComplete</i> message.	-->	NR RRC: <i>RRCResumeComplete</i>	-	-
19	Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on DRB#n associated with default Internet PDU session?	-	-	3	P
Note 1: The modification period, expressed in number of radio frames = $\text{modificationPeriodCoeff} * \text{defaultPagingCycle}$.					

8.1.1.4.1.3.3 Specific message contents

Table 8.1.1.4.1.3.3-1: Paging (step 1, Table 8.1.1.4.1.3.2-3)

Derivation Path: TS 38.508-1 [4], Table 4.6.1-9 with condition NR_RRC_RESUME

Table 8.1.1.4.1.3.3-2: RRCRelease (step 5, 13, Table 8.1.1.4.1.3.2-3)

Derivation Path: TS 38.508-1 [4], Table 4.6.1-16 with condition NR_RRC_INACTIVE

Table 8.1.1.4.1.3.3-3: SIB1 (step 6, Table 8.1.1.4.1.3.2-1)

Derivation Path: TS 38.508-1 [4], Table 4.6.1-28

Information Element	Value/remark	Comment	Condition
---------------------	--------------	---------	-----------

SIB1 ::= SEQUENCE {			
useFullResumeID	true		
}			

Table 8.1.1.4.1.3.3-4: Paging (step 9, Table 8.1.1.4.1.3.2-3)

Derivation Path: TS 38.508-1 [4], Table 4.6.1-9 with condition NR_RRC_RESUME

Table 8.1.1.4.1.3.3-5: *RRCResumeRequest* (step 14, Table 8.1.1.4.1.3.2-3)

Derivation Path: 38.508-1 [4], Table 4.6.1-19			
Information Element	Value/remark	Comment	Condition
RRCResumeRequest ::= SEQUENCE {			
rrcResumeRequest SEQUENCE {			
resumeCause	rma-Update		
}			
}			

Table 8.1.1.4.1.3.3-6: RRCResume (step 17, Table 8.1.1.4.1.3.2-3)

Derivation Path: TS 38.508-1 [4], Table 4.6.1-17			
Information Element	Value/remark	Comment	Condition
RRCResume ::= SEQUENCE {			
rrc-TransactionIdentifier	RRC-TransactionIdentifier		
criticalExtensions CHOICE {			
rrcResume SEQUENCE {			
radioBearerConfig	Not present		
masterCellGroup := SEQUENCE {	Not present		
rlcBearerToAddModList := SEQUENCE OF{			
RLC-Bearer-Config[1] := SEQUENCE {			
logicalChanelIdentity	Logical channel ID for SRB 2		
servedRadioBearer	Not present		
reestablishRLC	True		
RLC-Config	Not present		

Mac-LogicalChannelConfig	Not present		
RLC-Bearer-Config[k+1] := SEQUENCE {		The value of k ranges from 1 to n where n is the number of PDU sessions established during preamble	
logicalChanelIdentity	Logical channel ID for DRB k		
servedRadioBearer	Not present		
reestablishRLC	True		
RLC-Config	Not present		
Mac-LogicalChannelConfig	Not present		
fullConfig	Not present		
lateNonCriticalExtension	Not present		
nonCriticalExtension	Not present		
}			
}			
}			

8.1.1.4.2 RRC resume / Suspend-Resume / RRC setup / T319 expiry

8.1.1.4.2.1 Test Purpose (TP)

(1)

with { UE in NR RRC_INACTIVE state and sends RRCResumeRequest message to resume RRC Connection }

ensure that {

when { UE receives a RRCSetup message }

then { UE shall discards any stored UE Inactive AS context, suspendConfig and send RRCSetupComplete message with ng-5G-S-TMSI-Value set to ng-5G-S-TMSI }

}

(2)

with { UE in NR RRC_INACTIVE state and sends RRCResumeRequest message to resume RRC Connection }

ensure that {

when { T319 expires }

then { UE shall release RRC connection with release cause RRC Resume failure and go to NR RRC_IDLE state }

}

8.1.1.4.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clauses 5.3.3.4, 5.3.11, 5.3.13.5 and 5.3.13.7 and TS 24.501 clause 5.3.1.4. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.3.4]

The UE shall perform the following actions upon reception of the *RRCSetup*:

...

- 1> if the *RRCSetup* is received in response to an *RRCResumeRequest* or *RRCResumeRequest1*:
- 2> discard any stored UE Inactive AS context and *suspendConfig*;
- 2> discard any current AS security context including the K_{RRCEnc} key, the K_{RRCint} key, the K_{UPint} key and the K_{UPenc} key;
- 2> release radio resources for all established RBs except SRB0, including release of the RLC entities, of the associated PDCP entities and of SDAP;
- 2> release the RRC configuration except for the default MAC Cell Group configuration and CCCH configuration;
- 2> indicate to upper layers fallback of the RRC connection;
- 2> stop timer T380, if running;
- 1> perform the cell group configuration procedure in accordance with the received *masterCellGroup* and as specified in 5.3.5.5;
- 1> perform the radio bearer configuration procedure in accordance with the received *radioBearerConfig* and as specified in 5.3.5.6;
- 1> if stored, discard the cell reselection priority information provided by the *cellReselectionPriorities* or inherited from another RAT;
- 1> stop timer T300, T301 or T319 if running;
- 1> if T390 is running:
- 2> stop timer T390 for all access categories;
- 2> perform the actions as specified in 5.3.14.4.
 - 1> stop timer T302, if running;
- 1> stop timer T320, if running;
- 1> if the *RRCSetup* is received in response to an *RRCResumeRequest*, *RRCResumeRequest1* or *RRCSetupRequest*:
- 2> enter RRC_CONNECTED;
- 2> stop the cell re-selection procedure;
- 1> consider the current cell to be the PCell;
- 1> set the content of *RRCSetupComplete* message as follows:
- 2> if upper layers provide an *5G-S-TMSI*:
- 3> if the *RRCSetup* is received in response to an *RRCSetupRequest*:
- 4> set the *ng-5G-S-TMSI-Value* to *ng-5G-S-TMSI-Part2*;
- 3> else:
- 4> set the *ng-5G-S-TMSI-Value* to *ng-5G-S-TMSI*;

2> set the *selectedPLMN-Identity* to the PLMN selected by upper layers (TS 24.501 [23]) from the PLMN(s) included in the *plmn-IdentityList* in *SIB1*;

2> if upper layers provide the 'Registered AMF':

3> include and set the *registeredAMF* as follows:

4> if the PLMN identity of the 'Registered AMF' is different from the PLMN selected by the upper layers:

5> include the *plmnIdentity* in the *registeredAMF* and set it to the value of the PLMN identity in the 'Registered AMF' received from upper layers;

4> set the *amf-Identifier* to the value received from upper layers;

3> include and set the *guami-Type* to the value provided by the upper layers;

2> if upper layers provide one or more S-NSSAI (see TS 23.003 [21]):

3> include the *s-nssai-List* and set the content to the values provided by the upper layers;

2> set the *dedicatedNAS-Message* to include the information received from upper layers;

1> submit the *RRCSetupComplete* message to lower layers for transmission, upon which the procedure ends

[TS 38.331, clause 5.3.11]

UE shall:

1> reset MAC;

1> if T302 is running:

2> stop timer T302;

2> perform the actions as specified in 5.3.14.4;

1> stop all timers that are running except T320 and T325;

1> discard the UE Inactive AS context;

1> set the variable *pendingRnaUpdate* to *false*, if that is set to *true*;

1> discard the K_{gNB} , the K_{RRCEnc} key, the K_{RRCint} , the K_{UPint} key and the K_{UPenc} key, if any;

1> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity and SDAP for all established RBs;

1> indicate the release of the RRC connection to upper layers together with the release cause;

1> enter RRC_IDLE and perform cell selection as specified in TS 38.304 [20], except if going to RRC_IDLE was triggered by selecting an inter-RAT cell while T311 was running;

[TS 38.331, clause 5.3.13.5]

The UE shall:

1> if timer T319 expires or upon receiving Integrity check failure indication from lower layers while T319 is running:

2> perform the actions upon going to RRC_IDLE as specified in 5.3.11 with release cause 'RRC Resume failure'.

[TS 38.331, clause 5.3.13.7]

The UE shall:

1> perform the RRC connection setup procedure as specified in 5.3.3.4.

[TS 24.501, clause 5.3.1.4]

...

If the UE in 5GMM-CONNECTED mode with RRC inactive indication receives an indication from the lower layers that the resumption of the RRC connection has failed, and:

a) if the lower layers indicate that access barring is applicable for all access categories except categories 0 and 2, the UE shall:

1) stay in 5GMM-CONNECTED mode with RRC inactive indication;

b) else, the UE shall:

1) enter 5GMM-IDLE mode; and

2) initiate the registration procedure for mobility and periodic registration update used for mobility (i.e. the 5GS registration type IE set to "mobility registration updating" in the REGISTRATION REQUEST message) for N1 NAS signalling connection recovery as specified in subclause 5.5.1.3.2.

NOTE 2: An indication from the lower layer that the RRC connection has been released with cause "RRC resume failure" can be considered as an indication that the resumption of the RRC connection has failed.

8.1.1.4.2.3 Test description

8.1.1.4.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell.
- System information combination NR-1 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cell.

UE:

- None.

Preamble:

- The UE is in state 2N-A as defined in TS 38.508-1 [4], Table 4.4A.2-2 on NR Cell 1.

8.1.1.4.2.3.2 Test procedure sequence

Table 8.1.1.4.2.3.2-1: Main behaviour

St	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	The SS transmits a <i>Paging</i> message including a matched identity (correct <i>fullI-RNTI</i>).	-	NR RRC: <i>Paging</i>	-	-
2	The UE transmit an <i>RRCResumeRequest</i> message to resume RRC Connection by setting <i>resumeIdentity</i> to the stored <i>shortI-RNTI</i> value?	-->	NR RRC: <i>RRCResumeRequest</i>	-	-
3	The SS transmits an <i>RRCSetup</i> message in response to <i>RRCResumeRequest</i> message.	<--	NR RRC: <i>RRCSetup</i>	-	-
4	Check: Does the UE transmits an <i>RRCSetupComplete</i> message and a REGISTRATION REQUEST message by discarding any stored UE Inactive AS context and suspendConfig, setting the <i>ng-5G-S-</i>	-->	NR RRC: <i>RRCSetupComplete</i> 5GMM: REGISTRATION REQUEST	1	P

	<i>TMSI-Value to ng-5G-S-TMSI?</i>				
4A-4B	Steps 4-5 as defined in TS 38.508-1 [4] Table 4.9.5.2.2-1.	-	-	-	-
4C-4F	Steps 5-8 as defined in TS 38.508-1 [4] Table 4.5.4.2-3.	-	-	-	-
5	The SS transmits an <i>RRCRelease</i> message including both <i>fullI-RNTI</i> and <i>shortI-RNTI</i> in <i>suspendConfig</i> .	<--	NR RRC: <i>RRCRelease</i>	-	-
6	The SS transmits a <i>Paging</i> message including a matched identities (correct <i>fullI-RNTI</i>).	<--	NR RRC: <i>Paging</i>	-	-
7	The UE transmits an <i>RRCResumeRequest</i> message to resume RRC Connection by setting <i>resumeIdentity</i> to the stored <i>shortI-RNTI</i> value?	-->	NR RRC: <i>RRCResumeRequest</i>	-	-
8	The SS waits for T319 expiry.	-	-	-	-
9	Check: Does the test result of test procedure in TS 38.508-1 [4] subclause 4.9.5 indicate that the UE has performed mobility registration on NR cell 1 started in NR RRC_IDLE?	-	-	2	-

8.1.1.4.2.3.3 Specific message contents

Table 8.1.1.4.2.3.3-1: *RRCRelease* (preamble and step 5 in Table 8.1.1.4.2.3.2-1)

Derivation Path: 38.508-1 [4], Table 4.6.1-16			
Information Element	Value/remark	Comment	Condition
<i>RRCRelease</i> ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcRelease SEQUENCE {			
suspendConfig SEQUENCE {			NR_RRC_I NACTIVE
fullI-RNTI	I-RNTI-Value		
shortI-RNTI	ShortI-RNTI-Value		
}			
}			
}			
}			

Table 8.1.1.4.2.3.3-1a: *RRCReconfiguration* (step 4E in Table 8.1.1.4.2.3.2-1)

Derivation Path: 38.508-1 [4], Table 4.6.1-13 condition NR and SRB2			
Information Element	Value/remark	Comment	Condition

RRCReconfiguration ::= SEQUENCE {			
dedicatedNAS-MessageList	Not present		
}			

Table 8.1.1.4.2.3.3-2: *RRCResumeRequest* (step 2 and 7 Table 8.1.1.4.2.3.2-1)

Derivation Path: 38.508-1 [4], Table 4.6.1-19			
Information Element	Value/remark	Comment	Condition
RRCResumeRequest ::= SEQUENCE {			
rrcResumeRequest SEQUENCE {			
resumeCause	mt-Access		
}			
}			

Table 8.1.1.4.2.3.3-3: *RRCSetupComplete* (step 4 in Table 8.1.1.4.2.3.2-1)

Derivation Path: 38.508-1 [4], Table 4.6.1-22			
Information Element	Value/remark	Comment	Condition
RRCSetupComplete ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcSetupComplete SEQUENCE {			
ng-5G-S-TMSI-Value	ng-5G-S-TMSI		
}			
}			
}			

Table 8.1.1.4.2.3.3-4: REGISTRATION REQUEST (step 4 in Table 8.1.1.4.2.3.2-1)

Derivation Path: 38.508-1 [4], Table 4.7.1-6			
Information Element	Value/remark	Comment	Condition
5GS registration type			
5GS registration type value	'010'B	Mobility registration updating	
Uplink data status	Present but contents not checked		

8.1.1.4.3 Void

8.1.2 RRC reconfiguration

8.1.2.1 Radio bearer establishment / reconfiguration / release

8.1.2.1.1 RRC reconfiguration / DRB / SRB / Establishment / Modification / Release / Success

8.1.2.1.1.1 Test Purpose (TP)

(1)

with { UE having completed the RRC connection establishment procedure }

ensure that {

when { SS sends in sequence a SecurityModeCommand and an RRCReconfiguration message to establish a DRB }

then { UE establishes the initial security configuration in accordance with the received securityConfigSMC included in SecurityModeCommand and successfully completes the reconfiguration }

}

(2)

with { UE in NR RRC_CONNECTED state without SRB2 }

ensure that {

when { SS sends an RRCReconfiguration message including SRB2 configuration }

then { UE successfully establish the signalling radio bearer }

}

(3)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE receives an RRCReconfiguration message to reconfigure the current UE configuration of SRB and DRB }

then { UE reconfigures the data and signalling radio bearers and sends an RRCReconfigurationComplete message }

}

(4)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE receives an RRCReconfiguration message including a drb-ToReleaseList }

then { for each drb-Identity release the PDCP entity and RLC entity and logical channel and indicate release of the DRB(s) to upper layers }
}

8.1.2.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clauses 5.3.4.3, 5.3.5.6.3, 5.3.5.6.4, and 5.3.5.6.5]. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.4.3]

The UE shall:

- 1> derive the K_{gNB} key, as specified in TS 33.501 [11];
- 1> derive the K_{RRCint} key associated with the *integrityProtAlgorithm* indicated in the *SecurityModeCommand* message, as specified in TS 33.501 [11];
- 1> request lower layers to verify the integrity protection of the *SecurityModeCommand* message, using the algorithm indicated by the *integrityProtAlgorithm* as included in the *SecurityModeCommand* message and the K_{RRCint} key;
- 1> if the *SecurityModeCommand* message passes the integrity protection check:
 - 2> derive the K_{RRCenc} key and the K_{UPenc} key associated with the *cipheringAlgorithm* indicated in the *SecurityModeCommand* message, as specified in TS 33.501 [11];
 - 2> derive the K_{UPint} key associated with the *integrityProtAlgorithm* indicated in the *SecurityModeCommand* message, as specified in TS 33.501 [11];
 - 2> configure lower layers to apply SRB integrity protection using the indicated algorithm and the K_{RRCint} key immediately, i.e. integrity protection shall be applied to all subsequent messages received and sent by the UE, including the *SecurityModeComplete* message;

[TS 38.331, clause 5.3.5.6.3]

The UE shall:

- 1> for each *srb-Identity* value included in the *srb-ToAddModList* that is not part of the current UE configuration (SRB establishment or reconfiguration from E-UTRA PDCP to NR PDCP):
 - 2> establish a PDCP entity;
 - 2> if AS security has been activated:
 - 3> if target RAT of handover is E-UTRA/5GC, or;
 - 3> if the UE is only connected to E-UTRA/5GC:
 - 4> configure the PDCP entity with the security algorithms and keys (K_{RRCenc} and K_{RRCint}) configured/derived as specified in TS 36.331 [10];
 - 3> else:
 - 4> configure the PDCP entity with the security algorithms according to *securityConfig* and apply the keys (K_{RRCenc} and K_{RRCint}) associated with the master key (K_{eNB}/K_{gNB}) or secondary key ($S-K_{gNB}$) as indicated in *keyToUse*, if applicable;
 - 2> if the current UE configuration as configured by E-UTRA in TS 36.331 [10] includes an SRB identified with the same *srb-Identity* value:
 - 3> associate the E-UTRA RLC entity and DCCH of this SRB with the NR PDCP entity;
 - 3> release the E-UTRA PDCP entity of this SRB;
 - 2> if the *pdcp-Config* is included:

- 3> configure the PDCP entity in accordance with the received *pdcp-Config*;
- 2> else:
 - 3> configure the PDCP entity in accordance with the default configuration defined in 9.2.1 for the corresponding SRB;
 - 1> for each *srb-Identity* value included in the *srb-ToAddModList* that is part of the current UE configuration:
 - 2> if the *reestablishPDCP* is set:
 - 3> if target RAT of handover is E-UTRA/5GC, or;
 - 3> if the UE is only connected to E-UTRA/5GC:
 - 4> configure the PDCP entity to apply the integrity protection algorithm and K_{RRCint} key configured/derived as specified in TS 36.331 [10], i.e. the integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
 - 4> configure the PDCP entity to apply the ciphering algorithm and K_{RRCenc} key configured/derived as specified in TS 36.331 [10], i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
 - 3> else:
 - 4> configure the PDCP entity to apply the integrity protection algorithm and K_{RRCint} key associated with the master key ($K_{\text{eNB}}/K_{\text{gNB}}$) or secondary key ($S\text{-}K_{\text{gNB}}$), as indicated in *keyToUse*, i.e. the integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
 - 4> configure the PDCP entity to apply the ciphering algorithm and K_{RRCenc} key associated with the master key ($K_{\text{eNB}}/K_{\text{gNB}}$) or secondary key ($S\text{-}K_{\text{gNB}}$) as indicated in *keyToUse*, i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
 - 4> re-establish the PDCP entity of this SRB as specified in TS 38.323 [5];
 - 2> else, if the *discardOnPDCP* is set:
 - 3> trigger the PDCP entity to perform SDU discard as specified in TS 38.323 [5];
 - 2> if the *pdcp-Config* is included:
 - 3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*.

[TS 38.331, clause 5.3.5.6.4]

The UE shall:

- 1> for each *drb-Identity* value included in the *drb-ToReleaseList* that is part of the current UE configuration; or
- 1> for each *drb-Identity* value that is to be released as the result of full configuration according to 5.3.5.11:
 - 2> release the PDCP entity and the *drb-Identity*;
 - 2> if SDAP entity associated with this DRB is configured:
 - 3> indicate the release of the DRB to SDAP entity associated with this DRB (TS 37.324 [24], clause 5.3.3);
 - 2> if the UE is operating in EN-DC:
 - 3> if a new bearer is not added either with NR or E-UTRA with same *eps-BearerIdentity*;
 - 4> indicate the release of the DRB and the *eps-BearerIdentity* of the released DRB to upper layers.

NOTE 1: The UE does not consider the message as erroneous if the *drb-ToReleaseList* includes any *drb-Identity* value that is not part of the current UE configuration.

NOTE 2: Whether or not the RLC and MAC entities associated with this PDCP entity are reset or released is determined by the *CellGroupConfig*.

[TS 38.331, clause 5.3.5.6.5]

The UE shall:

- 1> for each *drb-Identity* value included in the *drb-ToAddModList* that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):
 - 2> establish a PDCP entity and configure it in accordance with the received *pdcp-Config*;
 - 2> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:
 - 3> if target RAT of handover is E-UTRA/5GC, or;
 - 3> if the UE is only connected to E-UTRA/5GC:
 - 4> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key configured/derived as specified in TS 36.331 [10];
 - 3> else:
 - 4> configure the PDCP entity with the ciphering algorithms according to *securityConfig* and apply the K_{UPenc} key associated with the master key (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;
 - 2> if the PDCP entity of this DRB is configured with *integrityProtection*:
 - 3> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;
 - 2> if an *sdap-Config* is included:
 - 3> if an SDAP entity with the received *pdu-Session* does not exist:
 - 4> establish an SDAP entity as specified in TS 37.324 [24] clause 5.1.1;
 - 4> If an SDAP entity with the received *pdu-Session* did not exist prior to receiving this reconfiguration:
 - 5> indicate the establishment of the user plane resources for the *pdu-Session* to upper layers;
 - 3> configure the SDAP entity in accordance with the received *sdap-Config* as specified in TS 37.324 [24] and associate the DRB with the SDAP entity;
 - 2> if the UE is operating in EN-DC:
 - 3> if the DRB was configured with the same *eps-BearerIdentity* either by NR or E-UTRA prior to receiving this reconfiguration:
 - 4> associate the established DRB with the corresponding *eps-BearerIdentity*;
 - 3> else:
 - 4> indicate the establishment of the DRB(s) and the *eps-BearerIdentity* of the established DRB(s) to upper layers;

8.1.2.1.1.3 Test description

8.1.2.1.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1

UE:

- None

Preamble:

- If `pc_IP_Ping` is set to TRUE then, the UE is in 5GS state 1N-A, PDU SESSION ACTIVE according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-1
- Else, the UE is in 5GS state 1N-A and Test Loop Function (*On*) with UE test loop mode B on NR Cell 1 according to 38.508-1[4], clause 4.4A.2 Table 4.4A.2-3.

8.1.2.1.1.3.2 Test procedure sequence

Table 8.1.2.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | SS transmits a <i>Paging</i> message to the UE on the appropriate paging block, and including the UE identity in one entry of the IE <i>pagingRecordList</i> . | <-- | NR RRC: <i>Paging</i> | - | - |
| 2 | UE transmits an <i>RRCSetupRequest</i> message. | --> | NR RRC:
<i>RRCSetupRequest</i> | - | - |
| 3 | SS transmit an <i>RRCSetup</i> message | <-- | NR RRC: <i>RRCSetup</i> | - | - |
| 4 | The UE transmits an <i>RRCSetupComplete</i> to confirm the successful completion of the connection establishment. | --> | NR RRC:
<i>RRCSetupComplete</i> | - | - |
| 5 | SS transmits a <i>SecurityModeCommand</i> message to activate AS security. | <-- | NR RRC:
<i>SecurityModeCommand</i> | - | - |
| 6 | Using the same slot as the <i>SecurityModeCommand</i> message in step 5, the SS transmits an <i>RRCReconfiguration</i> message to establish a data radio bearer, DRB1. | <-- | NR RRC:
<i>RRCReconfiguration</i> | - | - |
| 7 | Check: Does the UE transmit a <i>SecurityModeComplete</i> message? | --> | NR RRC:
<i>SecurityModeComplete</i> | 1 | P |
| 8 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message to confirm the establishment of data radio bearer, DRB1? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 1 | P |
| 9 | SS transmits an <i>RRCReconfiguration</i> message to establish SRB2. | <-- | NR RRC:
<i>RRCReconfiguration</i> | - | - |
| 10 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message to confirm the establishment of signalling radio bearer, SRB2? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 2 | P |
| 11 | The SS transmits an <i>RRCReconfiguration</i> message to modify SRB and DRB configuration. | <-- | NR RRC:
<i>RRCReconfiguration</i> | - | - |
| 12 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 3 | P |
| 12A | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on DRB#1 established in Step 11? | - | - | - | - |
| 13 | The SS transmits an <i>RRCReconfiguration</i> message | <-- | NR RRC: | - | - |

| | | | | | |
|----|---|-----|---|---|---|
| | with a drb-ToReleaseList and PDU SESSION RELEASE COMMAND | | <i>RRCReconfiguration</i>
5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMMAND | | |
| 14 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 4 | P |
| 16 | The UE transmits an <i>ULInformationTransfer</i> message and a UL NAS TRASPORT containing PDU SESSION RELEASE COMPLETE. | --> | NR RRC:
<i>ULInformationTransfer</i>
5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMPLETE | - | - |

8.1.2.1.1.3.3 Specific message contents

Table 8.1.2.1.1.3.3-1: *RRCReconfiguration* (Step 6 Table 8.1.2.1.1.3.2-1)

| Derivation Path: TS 38.508-1, table 4.6.1-13 | | | |
|--|---------------------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig with condition DRB1 | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | OCTET STRING (CONTAINING CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.1.1.3.3-1A: *CellGroupConfig* (Table 8.1.2.1.1.3.3-1)

| Derivation Path: TS 38.508-1, table 4.6.1-3 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>CellGroupConfig</i> ::= SEQUENCE { | | | |

| | | | |
|---|----------------------------------|--|--|
| rlc-BearerToAddModList SEQUENCE (SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| RLC-Bearer-Config[2] { | | | |
| logicalChannelIdentity[2] | LogicalChannelIdentity | | |
| servedRadioBearer[2] CHOICE { | | | |
| drb-Identity | DRB-Identity with condition DRB1 | | |
| } | | | |
| reestablishRLC[2] | Not present | | |
| RLC-Config[2] | Not present | | |
| mac-LogicalChannelConfig[2] | Not present | | |
| } | | | |
| } | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig SEQUENCE { | Not present | | |
| } | | | |

Table 8.1.2.1.1.3.3-2: RRCReconfiguration (Step 9 Table 8.1.2.1.1.3.2-1)

| Derivation Path: TS 38.508-1, table 4.6.1-13 | | | |
|--|---------------------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig with condition SRB2 | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | OCTET STRING (CONTAINING CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.1.1.3.3-2A: CellGroupConfig (Table 8.1.2.1.1.3.3-2)

| |
|---|
| Derivation Path: TS 38.508-1, table 4.6.1-3 |
|---|

| Information Element | Value/remark | Comment | Condition |
|--|-------------------------------------|---------|-----------|
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList SEQUENCE
(SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| RLC-Bearer-Config[1] { | | | |
| logicalChannelIdentity[1] | LogicalChannelIdentity | | |
| servedRadioBearer[1] CHOICE { | | | |
| srb-Identity | SRB-Identity with
condition SRB2 | | |
| } | | | |
| reestablishRLC[1] | Not present | | |
| RLC-Config[1] | Not present | | |
| mac-LogicalChannelConfig[1] | Not present | | |
| } | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig SEQUENCE { | Not present | | |
| } | | | |

Table 8.1.2.1.1.3.3-3: RRCReconfiguration (Step 11 Table 8.1.2.1.1.3.2-1)

| Derivation Path: TS 38.508-1, table 4.6.1-13 | | | |
|--|-----------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | OCTET STRING
(CONTAINING
CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.1.1.3.3-4: CellGroupConfig (Step 11 Table 8.1.2.1.1.3.2-1)

| Derivation Path: TS 38.508-1, table 4.6.1-13 |
|--|
|--|

| Information Element | Value/remark | Comment | Condition |
|--|-------------------------------------|---------|-----------|
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList SEQUENCE
(SIZE(1..maxLCH)) OF SEQUENCE { | 2 entries | | |
| RLC-Bearer-Config[1] { | | | |
| logicalChannelIdentity[1] | LogicalChannelIdentity | | |
| servedRadioBearer[1] CHOICE { | | | |
| srb-Identity | SRB-Identity with
condition SRB2 | | |
| } | | | |
| reestablishRLC[1] | true | | |
| RLC-Config[1] | Not present | | |
| mac-LogicalChannelConfig[1] | Not present | | |
| } | | | |
| RLC-Bearer-Config[2] { | | | |
| logicalChannelIdentity[2] | LogicalChannelIdentity | | |
| servedRadioBearer[2] CHOICE { | | | |
| drb-Identity | DRB-Identity with
condition DRB1 | | |
| } | | | |
| reestablishRLC[2] | true | | |
| RLC-Config[2] | Not present | | |
| mac-LogicalChannelConfig[2] | Not present | | |
| } | | | |
| } | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig SEQUENCE { | Not present | | |
| } | | | |

Table 8.1.2.1.1.3.3-5: RRCReconfiguration (Step 13 Table 8.1.2.1.1.3.2-1)

| Derivation Path: TS 38.508-1, table 4.6.1-3 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |

| | | | |
|-----------------------------------|-------------------|---|--|
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | OCTET STRING
(CONTAINING
CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.1.1.3.3-6: *RadioBearerConfig* (Table 8.1.2.1.1.3.3-5)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToReleaseList | 1 | DRB1 | |
| } | | | |

Table 8.2.1.1.1.3.3-7: *CellGroupConfig* (Table 8.2.1.1.1.3.3-7)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| rlc-BearerToAddModList | Not Present | | |
| rlc-BearerToReleaseList SEQUENCE
(SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| logicalChannelIdentity[1] | LogicalChannelIdentity | | |
| } | | | |
| mac-CellGroupConfig | Not Present | | |
| tag-Config | Not Present | | |
| phr-Config | Not Present | | |
| physicalCellGroupConfig | Not Present | | |
| rlf-TimersAndConstants | Not Present | | |
| } | | | |

8.1.2.1.2 RRC reconfiguration / RRC bearer establishment / uplinkTxDirectCurrentList

8.1.2.1.2.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }**ensure that** {**when** { UE receives a RRCReconfiguration message containing reportUplinkTxDirectCurrent }**then** { UE will include the uplinkTxDirectCurrentList in RRCReconfigurationComplete message. }

}

8.1.2.1.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331 clauses 5.3.5.3. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> set the content of *RRCReconfigurationComplete* message as follows:2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*;3> include the *uplinkTxDirectCurrentList*;

8.1.2.1.2.3 Test description

8.1.2.1.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1.
- System information combination NR-1 as defined in TS 38.508-1 [4] clause 4.4.3.1 is used in NR cell.

UE:

- None.

Preamble:

- The UE is in state 3N-A according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-3.

8.1.2.1.2.3.2 Test procedure sequence

Table 8.1.2.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|-----------|------------------|---------|----|---------|
| | | U - S | Message | | |
| | | | | | |

| | | | | | |
|---|--|-----|------------------------------------|---|---|
| 1 | The SS transmits a <i>RRCReconfiguration</i> message containing uplinkBWP-ToAddModList IE to add BWP#1 and including reportUplinkTxDirectCurrent IE. | <-- | NR RRC: RRCReconfiguration | - | - |
| 2 | Check: Does the UE transmit the <i>RRCReconfigurationComplete</i> message including the uplinkTxDirectCurrentList? | --> | NR RRC: RRCReconfigurationComplete | 1 | P |

8.1.2.1.2.3.3 Specific message contents

Table 8.1.2.1.2.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.2.1.2.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.1.2.3.3-2: *CellGroupConfig* (Table 8.1.2.1.2.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | | |
| } | | | |
| reportUplinkTxDirectCurrent-v1530 | true | | |
| } | | | |

Table 8.1.2.1.2.3.3-3: *ServingCellConfig* (Table 8.1.2.1.2.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-167 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| uplinkConfig SEQUENCE { | | | |

| | | | |
|---|------------|--|--|
| uplinkBWP-ToAddModList SEQUENCE (SIZE (1..maxNrofBWPs)) OF BWP-Uplink { | 1 entry | | |
| BWP-Uplink[1] | BWP-Uplink | TS 38.508-1 [4],
Table 4.6.3-13 to
add BWP#1 | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.1.2.3.3-4: *RRCReconfigurationComplete* (step 2, Table 8.1.2.1.2.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-14 | | | |
|--|------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfigurationComplete ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | Not checked | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfigurationComplete SEQUENCE { | | | |
| lateNonCriticalExtension | Not checked | | |
| nonCriticalExtension SEQUENCE { | | | |
| UplinkTxDirectCurrentList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | | |
| UplinkTxDirectCurrentCell SEQUENCE { | | | |
| servCellIndex | 0 | | |
| UplinkTxDirectCurrentBWP SEQUENCE { | 2 entries | | |
| UplinkTxDirectCurrentBWP[1] SEQUENCE { | | | |
| bwp-Id | 0 | | |
| shift7dot5kHz | Not checked | | |
| txDirectCurrentLocation | Any value between 0 and 3299 | | |
| } | | | |
| UplinkTxDirectCurrentBWP[2] SEQUENCE { | | | |
| bwp-Id | 1 | | |
| shift7dot5kHz | Not checked | | |
| txDirectCurrentLocation | Any value between 0 and 3299 | | |
| } | | | |

| | | | |
|----------------------|-------------|--|--|
| } | | | |
| } | | | |
| } | | | |
| nonCriticalExtension | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.2.1.3 Void

8.1.2.1.4 RRC reconfiguration / Dedicated RLF timer

8.1.2.1.4.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state configured with timers according *rlf-TimersAndConstants* }

ensure that {

when { UE detecting radio link failure on expiring of timer T310 }

then { UE sends an *RRCReestablishmentRequest* message according *rlf-TimersAndConstants* }

}

(2)

with { UE in NR RRC_CONNECTED state with *rlf-TimersAndConstants* released }

ensure that {

when { UE detecting radio link failure on expiring of timer T310 }

then { UE sends an *RRCReestablishmentRequest* message according *ue-TimersAndConstants* }

}

8.1.2.1.4.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331 clauses 5.3.5.3, 5.3.5.5, 5.3.5.5.6 and 5.3.5.5.7.

[TS 38.331 clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

[TS 38.331 clause 5.3.5.5]

The UE performs the following actions based on a received *CellGroupConfig* IE:

...

1> if the *CellGroupConfig* contains the *spCellConfig*:

2> configure the SpCell as specified in 5.3.5.5.7;

[TS 38.331 clause 5.3.5.5.7]

The UE shall:

1> if the *SpCellConfig* contains the *rlf-TimersAndConstants*:

2> configure the RLF timers and constants for this cell group as specified in 5.3.5.5.6;

[TS 38.331 clause 5.3.5.5.6]

The UE shall:

1> if the received *rlf-TimersAndConstants* is set to *release*:

2> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SIB1*;

1> else:

2> (re-)configure the value of timers and constants in accordance with received *rlf-TimersAndConstants*;

8.1.2.1.4.3 Test description

8.1.2.1.4.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 and NR Cell 2.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.2.1.4.3.2 Test procedure sequence

Table 8.1.2.1.4.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR
Cell 1 | NR
Cell 2 |
|----|-----------|---------|--------------|--------------|
| T1 | SS/PBCH | dBm/SCS | “Off” | -88 |

| | | | | |
|----|---------------------|---------|-------|-------|
| | SSS EPRE | | | |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | “-88” | “Off” |

Table 8.1.2.1.4.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR
Cell 1 | NR
Cell 2 |
|----|---------------------|---------|--------------|--------------|
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | “Off” | -82 |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | “-82” | “Off” |

Table 8.1.2.1.4.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS changes NR Cell 1 and NR Cell 2 parameters according to the row "T1" in table 8.1.2.1.4.3.2-1 or 8.1.2.1.4.3.2-2 in order that the radio link quality of NR Cell 1 is degraded, and NR Cell 2 is suitable for camping. | - | - | - | - |
| 2 | Check: Does the UE send <i>RRCReestablishmentRequest</i> message on NR Cell 2 after T310 expired (ms6000)? | --> | NR RRC:
<i>RRCReestablishmentRequest</i> | 1 | P |
| 3 | The SS transmits an <i>RRCReestablishment</i> message. | <-- | NR RRC: <i>RRCReestablishment</i> | - | - |
| 4 | The UE transmits an <i>RRCReestablishmentComplete</i> message. | --> | NR RRC:
<i>RRCReestablishmentComplete</i> | - | - |
| 5 | The SS transmits an <i>RRCReconfiguration</i> message containing <i>RLF-TimersAndConstants</i> set to release. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 6 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 7 | The SS changes NR Cell 1 and NR Cell 2 parameters according to the row "T2" in table 8.1.2.1.4.3.2-1 or 8.1.2.1.4.3.2-2 in order that the radio link quality of NR Cell 2 is degraded, and NR Cell 1 is suitable for camping. | - | - | - | - |
| 8 | Check: Does the UE send <i>RRCReestablishmentRequest</i> message on NR Cell 1 after T310 expired (ms1000)? | --> | NR RRC:
<i>RRCReestablishmentRequest</i> | 2 | P |

| | | | | | |
|----|--|-----|--|---|---|
| 9 | The SS transmits <i>RRCReestablishment</i> message. | <-- | NR RRC: <i>RRCReestablishment</i> | - | - |
| 10 | The UE transmits an <i>RRCReestablishmentComplete</i> message. | --> | NR RRC:
<i>RRCReestablishmentComplete</i> | - | - |
| 11 | The SS transmits an <i>RRCReconfiguration</i> message to establish SRB2 and DRB. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 12 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |

8.1.2.1.4.3.3 Specific message contents

Table 8.1.2.1.4.3.3-1: *RLF-TimersAndConstants* (preamble)

| Derivation Path: 38.508-1 [4] Table 4.6.1-150 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RLF-TimersAndConstants</i> ::= SEQUENCE { | | | |
| <i>t310</i> | ms6000 | | |
| <i>n310</i> | n20 | | |
| } | | | |

Table 8.1.2.1.4.3.3-2: *RRCReconfiguration* (step 5, Table 8.1.2.1.4.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.1.4.3.3-3: *CellGroupConfig* (Table 8.1.2.1.4.3.2-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-19 with condition PCell_change | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>CellGroupConfig</i> ::= SEQUENCE { | | | |

| | | | |
|---------------------------------|------|--|--|
| rlf-TimersAndConstants CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |

8.1.2.1.5 NR CA / RRC reconfiguration / SCell addition / modification / release / Success

8.1.2.1.5.1 NR CA / RRC reconfiguration / SCell addition / modification / release / Success / Intra-band Contiguous CA

8.1.2.1.5.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE receives an *RRCReconfiguration* message containing *sCellToAddModList* }

then { UE sends an *RRCReconfigurationComplete* message }

 }

(2)

with { UE in NR RRC_CONNECTED state with SCell configured }

ensure that {

when { UE receives an *RRCReconfiguration* message containing *sCellToAddModList* }

then { UE sends an *RRCReconfigurationComplete* message }

 }

(3)

with { UE in NR RRC_CONNECTED state with SCell configured }

ensure that {

when { UE receives an *RRCReconfiguration* message containing *sCellToReleaseList* }

then { UE sends an *RRCReconfigurationComplete* message }

 }

8.1.2.1.5.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331 clauses 5.3.5.3, and 5.3.5.5.

[TS 38.331 clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

[TS 38.331 clause 5.3.5.5]

The UE performs the following actions based on a received *CellGroupConfig* IE:

...

1> if the *CellGroupConfig* contains the *sCellToReleaseList*:

2> perform SCell release as specified in 5.3.5.5.8;

...

1> if the *CellGroupConfig* contains the *sCellToAddModList*:

2> perform SCell addition/modification as specified in 5.3.5.5.9.

8.1.2.1.5.1.3 Test description

8.1.2.1.5.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, NR Cell 3 is the SCell.

None.

Preamble:

- The UE is in state 3N-A, and with UE test loop mode A active if *pc_IP_Ping* is set to FALSE, as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.2.1.5.1.3.2 Test procedure sequence

Table 8.1.2.1.5.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message containing an <i>sCellToAddModList</i> with SCell NR Cell 3 addition | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | Check: Does the UE transmits an <i>RRCReconfigurationComplete</i> message? | --> | NR RRC: <i>RRCReconfigurationComplete</i> | 1 | P |
| 3 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging | - | - | 1 | P |

| | | | | | |
|---|--|-----|---|---|---|
| | IP data on DRB1 and Cell 3? | | | | |
| 4 | The SS transmits an <i>RRCReconfiguration</i> message containing an <i>sCellToAddModList</i> with SCell NR Cell 3 modification. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 5 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message? | --> | NR RRC: <i>RRCReconfigurationComplete</i> | 2 | P |
| 6 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on DRB1 and Cell 3? | - | - | 2 | P |
| 7 | The SS transmits an <i>RRCReconfiguration</i> message containing an <i>sCellToReleaseList</i> with SCell NR Cell 3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 8 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message? | --> | NR RRC: <i>RRCReconfigurationComplete</i> | 3 | P |

Editor's Note: Subclause 4.9.1, check user plane connectivity on DRB#n, does not support verifying data on a specific cell. It's FFS on how to update the procedure.

8.1.2.5.1.1.3.3 Specific message contents

Table 8.1.2.5.1.1.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.2.1.5.1.3.2-1)

| |
|---|
| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition SCell_add |
|---|

Table 8.1.2.5.1.1.3.3-2: *RRCReconfiguration* (step 4, Table 8.1.2.1.5.1.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition SCell_add | | | |
|---|-----------------|----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | | |
| dedicatedSIB1-Delivery | Not present | SCell modification for NR Cell 2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.5.1.1.3.3-3: *CellGroupConfig* (Table 8.1.2.5.1.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-19 with condition SCell_add | | | |
|---|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellConfigCommon | Not present | | |
| sCellConfigDedicated | ServingCellConfig | | |
| } | | | |
| } | | | |

Table 8.1.2.5.1.1.3.3-4: *ServingCellConfig* (Table 8.1.2.5.1.1.3.3-3)

| Derivation Path: 38.508-1 [4] Table 4.6.3-167 | | | |
|---|-------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { | | | |
| pdsch-ServingCellConfig CHOICE { | | | |
| setup | PDSCH-ServingCellConfig | | |
| } | | | |
| } | | | |

Table 8.1.2.5.1.1.3.3-5: *PDSCH-ServingCellConfig* (Table 8.1.2.5.1.1.3.3-4)

| Derivation Path: 38.508-1 [4] Table 4.6.3-102 | | | |
|---|--------------|-------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDSCH-ServingCellConfig ::= SEQUENCE { | | | |
| nrofHARQ-ProcessesForPDSCH | Not present | The UE uses 8 HARQ processes. | |
| } | | | |

Table 8.1.2.5.1.1.3.3-6: *RRCReconfiguration* (step 7, Table 8.1.2.1.5.1.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition SCell_add | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE{ | | | |

| | | | |
|------------------------|-----------------|----------------------------|--|
| masterCellGroup | CellGroupConfig | | |
| dedicatedSIB1-Delivery | Not present | SCell release of NR Cell 2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.2.5.1.1.3.3-7: *CellGroupConfig* (Table 8.1.2.5.1.1.3.3-6)

| Derivation Path: 38.508-1 [4] Table 4.6.3-19 with condition SCell_add | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToAddModList | Not present | | |
| sCellToReleaseList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex | 1 | | |
| } | | | |
| } | | | |

8.1.2.1.5.2 NR CA / RRC reconfiguration / SCell addition / modification / release / Success / Inter-band CA

8.1.2.1.5.2.1 Test Purpose (TP)

Same as TC 8.1.2.1.5.1 but applied to Inter-band CA.

8.1.2.1.5.2.2 Conformance requirements

Same as TC 8.1.2.1.5.1 but applied to Inter-band CA.

8.1.2.1.5.2.3 Test description

8.1.2.1.5.2.3.1 Pre-test conditions

Same as TC 8.1.2.1.5.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA
- Cells configuration: NR Cell 10 replaces NR Cell 3

8.1.2.1.5.2.3.2 Test procedure sequence

Same as TC 8.1.2.1.5.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA
- Cells configuration: NR Cell 10 replaces NR Cell 3

8.1.2.1.5.3 NR CA / RRC reconfiguration / SCell addition / modification / release / Success / Intra-band non-contiguous CA

8.1.2.1.5.3.1 Test Purpose (TP)

Same as TC 8.1.2.1.5.1 but applied to Intra-band non-contiguous CA.

8.1.2.1.5.3.2 Conformance requirements

Same as TC 8.1.2.1.5.1 but applied to Intra-band non-contiguous CA.

8.1.2.1.5.3.3 Test description

8.1.2.1.5.3.3.1 Pre-test conditions

Same as TC 8.1.2.1.5.1 with the following differences:

- CA configuration: Intra-band non-contiguous replaces Intra-band Contiguous CA

8.1.2.1.5.3.3.2 Test procedure sequence

Same as TC 8.1.2.1.5.1 with the following differences:

- CA configuration: Intra-band non-contiguous replaces Intra-band Contiguous CA

8.1.3 Measurement configuration control and reporting

8.1.3.1 Intra NR measurements

8.1.3.1.1 Measurement configuration control and reporting / Intra NR measurements / Event A1 / Event A2

8.1.3.1.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED and measurement configured for event A1 and event A2 with event based periodical reporting }

ensure that {

when { Serving cell becomes better than absolute threshold plus hysteresis and entering condition for event A1 is met }

then { UE sends MeasurementReport message at regular intervals while entering condition for event A1 is satisfied }

}

(2)

with { UE in NR RRC_CONNECTED and periodical measurement reporting triggered by event A1 ongoing }

ensure that {

when { Serving cell becomes worse than absolute threshold minus hysteresis }

then { UE stops sending MeasurementReport message }

}

(3)

with { UE in NR RRC_CONNECTED and measurement configured for event A1 and event A2 with event based periodical reporting }

ensure that {

when { Serving cell becomes worse than absolute threshold minus hysteresis and entering condition for event A2 is met }

then { UE sends MeasurementReport message at regular intervals while entering condition for event A2 is satisfied }

}

(4)

with { UE in NR RRC_CONNECTED state and periodical measurement reporting triggered by event A2 ongoing }

ensure that {

when { Serving cell becomes better than absolute threshold plus hysteresis }

then { UE stops sending *MeasurementReport* message }

}

(5)

with { UE in NR RRC_CONNECTED and measurements are re-configured for event A1 with event based periodical reporting to report on leaving condition }

ensure that {

when { Serving cell becomes worse than absolute threshold minus hysteresis }

then { UE sends MeasurementReport message while leaving condition for event A1 is satisfied }

}

8.1.3.1.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clause 5.3.5.3, 5.5.2, 5.5.4.1, 5.5.4.2, 5.5.4.3 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

1> if the received *measConfig* includes the *quantityConfig*:

2> perform the quantity configuration procedure as specified in 5.5.2.8;

1> if the received *measConfig* includes the *measIdToRemoveList*:

2> perform the measurement identity removal procedure as specified in 5.5.2.2; 1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;

3> if the corresponding *measObject* concerns NR;

4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*:

5> consider only the serving cell to be applicable;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

...

2> else if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:

3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:

4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> stop the periodical reporting timer for this *measId*, if running;

...

2> upon expiry of the periodical reporting timer for this *measId*:

3> initiate the measurement reporting procedure, as specified in 5.5.5.

...

[TS 38.331, clause 5.5.4.2]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A1-2, as specified below, is fulfilled;

1> for this measurement, consider the NR serving cell corresponding to the associated *measObjectNR* associated with this event.

Inequality A1-1 (Entering condition)

$$Ms - Hys > Thresh$$

Inequality A1-2 (Leaving condition)

$$Ms + Hys < Thresh$$

The variables in the formula are defined as follows:

Ms is the measurement result of the serving cell, not taking into account any offsets.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh is the threshold parameter for this event (i.e. *a1-Threshold* as defined within *reportConfigNR* for this event).

Ms is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Hys is expressed in dB.

Thresh is expressed in the same unit as **Ms**.

[TS 38.331, clause 5.5.4.3]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A2-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A2-2, as specified below, is fulfilled;

1> for this measurement, consider the serving cell indicated by the *measObjectNR* associated to this event.

Inequality A2-1 (Entering condition)

$$Ms + Hys < Thresh$$

Inequality A2-2 (Leaving condition)

$$Ms - Hys > Thresh$$

The variables in the formula are defined as follows:

Ms is the measurement result of the serving cell, not taking into account any offsets.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh is the threshold parameter for this event (i.e. *a2-Threshold* as defined within *reportConfigNR* for this event).

Ms is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Hys is expressed in dB.

Thresh is expressed in the same unit as **Ms**.

[TS 38.331, clause 5.5.5]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingMOList* to include , for each NR serving cell that is configured with *servingCellMO*, RSRP, RSRQ and the available SINR derived based on the *rsType* if indicated in the associated *reportConfig* , otherwise based on SSB if available, otherwise based on CSI-RS;

1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;

...

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

1> else:

2> if the *reportType* is set to *periodical*:

3> remove the entry within the *VarMeasReportList* for this *measId*;

3> remove this *measId* from the *measIdList* within *VarMeasConfig*;

1> if the UE is configured with EN-DC:

...

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.1.3 Test description

8.1.3.1.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1

8.1.3.1.1.3.2 Test procedure sequence

Table 8.1.3.1.1.3.2-1/2 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" and "T2", are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.3.1.1.3.2-1: Time instances of cell power level and parameter changes in FR1

| | Parameter | Unit | NR Cell 1 | Remark |
|----|---------------------|---------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/SCS | -88 | Power level is such that entry condition for event A2 is satisfied $M_s + H_{ys} < Thresh$ |
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | -65 | Power level is such that entry condition for event A1 is satisfied $M_s - H_{ys} > Thresh$ and exit condition for event A2 is satisfied too. |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | -88 | Power level is such that exit condition for event A1 is satisfied $M_s + H_{ys} < Thresh$ |

Table 8.1.3.1.1.3.2-2: Time instances of cell power level and parameter changes in FR2

| | Parameter | Unit | NR Cell 1 | Remark |
|----|-----------|---------|-----------|--|
| T0 | SS/PBCH | dBm/SCS | FFS | Power level is such that entry condition |

| | | | | |
|----|---------------------|---------|-----|--|
| | SSS EPRE | | | for event A2 is satisfied $M_s + H_{ys} < Thresh$ |
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | FFS | Power level is such that entry condition for event A1 is satisfied $M_s - H_{ys} > Thresh$ and exit condition for event A2 is satisfied too. |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | FFS | Power level is such that exit condition for event A1 is satisfied $M_s + H_{ys} < Thresh$ |

Table 8.1.3.1.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup intra NR measurement and reporting for event A1 and event A2. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A2 with the measured RSRP, RSRQ and SINR value for NR Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | 3 | P |
| - | EXCEPTION: Step 4 below is repeated until 3 <i>MeasurementReport</i> messages are received from the UE and Interval between two <i>MeasurementReport</i> is same as the IE <i>reportInterval</i> configured in <i>MeasConfig</i> . | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MeasurementReport</i> message at regular intervals, with the measured RSRP, RSRQ and SINR value for NR Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | 3 | P |
| 5 | SS re-adjusts the SS/PBCH EPRE level according to row "T1" in Table 8.1.3.1.1.3.2-1/2. | - | - | - | - |
| 6 | Wait and ignore <i>MeasurementReport</i> messages for 15 s to allow change of power levels for NR Cell 1 and UE measurement. | - | - | - | - |
| - | EXCEPTION: In parallel with step 7, parallel behaviour defined in table 8.1.3.1.1.3.2-3 is executed | - | - | - | - |
| 7 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A1 with the measured RSRP, RSRQ and SINR value for NR Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| - | EXCEPTION: Step 8 below is repeated until 3 <i>MeasurementReport</i> messages are received from the UE and Interval between two | - | - | - | - |

| | | | | | |
|----|--|-----|--|---|---|
| | <i>MeasurementReport</i> is same as the IE <i>reportInterval</i> configured in <i>MeasConfig</i> . | | | | |
| 8 | Check: Does the UE transmit a <i>MeasurementReport</i> message at regular intervals, with the measured RSRP, RSRQ and SINR value for NR Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| 9 | SS re-adjusts the SS/PBCH EPRE level according to row "T2" in Table 8.1.3.1.1.3.2-1/2. | - | - | - | - |
| 10 | Wait and ignore <i>MeasurementReport</i> messages for 15 s to allow change of power levels for NR Cell 1 and UE measurement. | - | - | - | - |
| 11 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A1 with the measured RSRP, RSRQ and SINR value for NR Cell 1 within the next 10s?

NOTE: SS ignore <i>MeasurementReport</i> message for event A2. | - | - | 2 | F |
| 12 | SS transmits an <i>RRCReconfiguration</i> message to re-configure for event A1 with event based periodical reporting to report on leaving condition and release event A2. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 13 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 14 | SS re-adjusts the SS/PBCH EPRE level according to row "T1" in Table 8.1.3.1.1.3.2-1/2. | - | - | - | - |
| 15 | SS receive four <i>MeasurementReport</i> messages for A1 and then wait 5s. | - | - | - | - |
| 16 | SS re-adjusts the SS/PBCH EPRE level according to row "T2" in Table 8.1.3.1.1.3.2-1/2. | - | - | - | - |
| 17 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A1 with the measured RSRP, RSRQ and SINR value for NR Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | 5 | P |
| 18 | Check: Does the UE attempt to transmit <i>MeasurementReport</i> message within the next 10s? | - | - | 5 | F |

Table 8.1.3.1.1.3.2-3: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A2 with the measured RSRP, RSRQ and SINR | - | - | 4 | F |

| | | | | | |
|--|----------------------|--|--|--|--|
| | value for NR Cell 1? | | | | |
|--|----------------------|--|--|--|--|

8.1.3.1.1.3.3 Specific message contents

Table 8.1.3.1.1.3.3-1: RRCReconfiguration (step 1 Table 8.1.3.1.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13 | | | |
|--|---------------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.1.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.1.3.3-2: MeasConfig (Table 8.1.3.1.1.3.3-1)

| Derivation path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|------------------|---------------------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | MeasObjectIdNR-f1 | |
| measObject CHOICE { | | | |
| measObjectNR[1] | MeasObjectNR(57) | Thres=57(-100dBm
≤ SS-RSRP<-99dBm) | |
| } | | | |
| } | | | |

| | | | |
|---|----------------------|--|--|
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 2 entries | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] | ReportConfig-EventA1 | | |
| reportConfigId[2] | 2 | | |
| reportConfig[2] | ReportConfig-EventA2 | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| measId[2] | 2 | | |
| measObjectId[2] | 1 | | |
| reportConfigId[2] | 2 | | |
| } | | | |
| quantityConfig | QuantityConfig | | |
| } | | | |

Table 8.1.3.1.1.3.3-3: MeasObjectNR (Table 8.1.3.1.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR cell 1 SSB | | |
| } | | | |

Table 8.1.3.1.1.3.3-4: ReportConfig-EventA1 (Table 8.1.3.1.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A1 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA1 SEQUENCE { | | | |

| | | | |
|-----------------------|----------|-------|-----|
| a1-Threshold CHOICE { | | | |
| rsrp | 80 | 76dBm | FR1 |
| rsrp | FFS | | FR2 |
| } | | | |
| reportOnLeave | false | | |
| } | | | |
| } | | | |
| reportAmount | Infinity | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.1.3.3-5: ReportConfig-EventA2 (Table 8.1.3.1.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A2 | | | |
|---|--------------|--------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA2 SEQUENCE { | | | EVENT_A2 |
| a2-Threshold CHOICE { | | | |
| rsrp | 80 | -77dBm | FR1 |
| | | ≤ SS-RSRP < -76dBm | |
| rsrp | 73 | -84dBm | FR2 |
| | | ≤ SS-RSRP < -83dBm | |
| } | | | |
| reportOnLeave | false | | |
| } | | | |
| } | | | |
| reportAmount | Infinity | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.1.3.1.1.3.3-6: QuantityConfig (Table 8.1.3.1.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-127 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| QuantityConfig ::= SEQUENCE { | | | |
| quantityConfigNR-List SEQUENCE (SIZE (1..maxNrofQuantityConfig)) OF SEQUENCE { | 1 entry | | |
| quantityConfigCell[1] SEQUENCE { | | | |
| ssb-FilterConfig SEQUENCE { | | | |
| filterCoefficientRSRP | fc4 | | |
| filterCoefficientRSRQ | fc4 | | |
| filterCoefficientRS-SINR | fc4 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.1.3.3-7: MeasurementReport (steps 3, 4, 7, 8, 17, Table 8.1.3.1.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-5A | | | |
|--|----------------------------------|---------|-------------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport ::= SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 2 | | Step3,4 |
| measId | 1 | | Step 7,8,17 |
| measResultServingMOList SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |

| | | | |
|------|----------|--|--|
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.1.3.3-8: RRCReconfiguration (step 12, Table 8.1.3.1.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13 | | | |
|--|---------------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.1.3.3-9 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.1.3.3-9: MeasConfig (Table 8.1.3.1.1.3.3-8)

| Derivation path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |

| | | | |
|---|----------------------|------------------|--|
| measObjectToAddModList | Not Present | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] | ReportConfig-EventA1 | | |
| } | | | |
| measIdToAddModList | Not Present | | |
| measIdToRemoveList SEQUENCE (SIZE (1..maxNrofMeasId)) OF MeasId { | | | |
| measId[1] | 2 | Release event A2 | |
| } | | | |
| quantityConfig | Not Present | | |
| } | | | |

Table 8.1.3.1.1.3.3-10: ReportConfig-EventA1 (Table 8.1.3.1.1.3.3-8)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A1 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA1 SEQUENCE { | | | |
| a1-Threshold CHOICE { | | | |
| rsrp | 80 | 76dBm | FR1 |
| rsrp | FFS | | FR2 |
| } | | | |
| reportOnLeave | true | | |
| } | | | |
| } | | | |
| } | | | |
| reportAmount | r4 | | |
| } | | | |
| } | | | |

8.1.3.1.2 Measurement configuration control and reporting / Event A3 / Measurement of Neighbor NR cell / Intra-frequency measurements

8.1.3.1.2.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and intra-frequency measurements configured for event A3 }

ensure that {

when { Entry condition for event A3 is not met for neighbor cell }

then { UE does not send MeasurementReport }

}

(2)

with { UE in NR RRC_CONNECTED state and intra-frequency measurements configured for event A3 }

ensure that {

when { Neighbor cell becomes offset better than serving cell }

then { UE sends MeasurementReport with correct measId for event A3 }

}

8.1.3.1.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clause 5.3.5.3, 5.5.2, 5.5.4.1, 5.5.4.4 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

1> if the received *measConfig* includes the *quantityConfig*:

2> perform the quantity configuration procedure as specified in 5.5.2.8;

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;

3> if the corresponding *measObject* concerns NR;

4> if the *eventA3* or *eventA5* is configured in the corresponding *reportConfig*;

5> if a serving cell is associated with a *measObjectNR* and neighbors are associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighboring cell as well;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

[TS 38.331, clause 5.5.4.4]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

1> use the SpCell for *Mp*, *Ofp* and *Ocp*.

NOTE The cell(s) that triggers the event has reference signals indicated in the *measObjectNR* associated to this event which may be different from the NR SpCell *measObjectNR*.

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$$

Inequality A3-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighboring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the reference signal of the neighbor cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbor cell).

Ocn is the cell specific offset of the neighbor cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the frequency of the neighbor cell), and set to zero if not configured for the neighbor cell.

Mp is the measurement result of the SpCell, not taking into account any offsets.

Ofp is the measurement object specific offset of the SpCell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the SpCell).

Ocp is the cell specific offset of the SpCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the SpCell), and is set to zero if not configured for the SpCell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigNR* for this event).

Mn, **Mp** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, **Ocn**, **Ofp**, **Ocp**, **Hys**, **Off** are expressed in dB.

[TS 38.331, clause 5.5.5]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include, for each NR serving cell that is configured with *servingCellMO*, RSRP, RSRQ and the available SINR, derived based on the *rsType* if indicated in the associated *reportConfig*, otherwise based on SSB if available, otherwise based on CSI-RS;
- 1> set the *servCellId* within *measResultServingMOList* to include each NR serving cell that is configured with *servingCellMO*, if any;
- ...
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
- 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
- 1> if there is at least one applicable neighboring cell to report:
- 2> if the *reportType* is set to *eventTriggered* or *periodical*:
- 3> set the *measResultNeighCells* to include the best neighboring cells up to *maxReportCells* in accordance with the following:
- 4> if the *reportType* is set to *eventTriggered*:

- 5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
- 4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
- 4> if the *reportType* is set to *eventTriggered* or *periodical*:
- 5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 6> if the *measObject* associated with this *measId* concerns NR:
- 7> if *rsType* in the associated *reportConfig* is set to *ssb*:
- 8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first:

8.1.3.1.2.3 Test description

8.1.3.1.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell,
- NR Cell 2 is the intra-frequency neighbor cell.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.1.2.3.2 Test procedure sequence

Table 8.1.3.1.2.3.2-1 and 8.1.3.1.2.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" and "T2", are applied at the point indicated in the Main behaviour description in Table 8.1.3.1.2.3.2-3.

Table 8.1.3.1.2.3.2-1: Time instances of cell power level and parameter changes for NR Cell 1 and NR Cell 2 in FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -91 | Power levels are such that entry condition for event A3 is not satisfied for the neighbour NR cell: $M_n + O_{fn} + O_{cn} - H_{ys} > M_p + O_{fp} + O_{cp} + O_{ff}$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -79 | Power levels are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell (measId 1): $M_n + O_{fn} + O_{cn} - H_{ys} > M_p + O_{fp} + O_{cp} + O_{ff}$ |
| T2 | SS/PBCH | dBm/ | -85 | -91 | Power levels are such that leaving |

| | | | | | |
|--|----------|-----|--|--|--|
| | SSS EPRE | SCS | | | condition for event A3 is satisfied (measId 1):
$M_n + O_{fn} + O_{cn} + H_{ys} < M_p + O_{fp} + O_{cp} + O_{ff}$ |
|--|----------|-----|--|--|--|

Table 8.1.3.1.2.3.2-2: Time instances of cell power level and parameter changes for NR Cell 1 and NR Cell 2 in FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that entry condition for event A3 is not satisfied for the neighbour NR cell: $M_n + O_{fn} + O_{cn} - H_{ys} > M_p + O_{fp} + O_{cp} + O_{ff}$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell (measId 1): $M_n + O_{fn} + O_{cn} - H_{ys} > M_p + O_{fp} + O_{cp} + O_{ff}$ |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that leaving condition for event A3 is satisfied (measId 1):
$M_n + O_{fn} + O_{cn} + H_{ys} < M_p + O_{fp} + O_{cp} + O_{ff}$ |

Table 8.1.3.1.2.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup NR measurement and reporting for inter-frequency event A3 (<i>measId</i> 1). | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.1.3.1.2.3.2-1/2. | - | - | - | - |
| - | EXCEPTION: Step 4 is repeated for value indicated by the <i>reportAmount</i> IE. | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 (<i>measId</i> 1) with the measured RSRP value for NR Cell 3? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| 5 | SS re-adjusts the cell-specific reference signal level according to row "T2" in table 8.1.3.1.2.2-1/2. | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| 6 | Check: Does the UE transmit a <i>MeasurementReport</i> message within the next 10s? | - | - | 2 | F |
|---|---|---|---|---|---|

8.1.3.1.2.3.3 Specific message contents

Table 8.1.3.1.2.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.1.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|---------------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.2.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.2.3.3-2: *MeasConfig* (Table 8.1.3.1.2.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR | Table 8.1.3.1.2.3.3-3 | |
| } | | | |
| } | | | |

| | | | |
|--|------------------------|-----------------------|--|
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA3 | Table 8.1.3.1.2.3.3-4 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.1.3.1.2.3.3-3: *MeasObjectNR* (Table 8.1.3.1.2.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.2.3.3-4: *ReportConfigNR-EventA3* (Table 8.1.3.1.2.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| A3-Threshold CHOICE { | | | |
| rsrp | 2 | 1 dB (2*0.5 dB) | FR1 |

| | | | |
|-------------------------------|-------|------|-----|
| | | | |
| | FFS | | FR2 |
| } | | | |
| hysteresis | 4 | 2 dB | |
| } | | | |
| } | | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.2.3.3-5: *MeasurementReport* (step 4, Table 8.1.3.1.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|----------------------------|----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | Measurement report for NR Cell 1 | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PCI of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |

| | | | |
|---|---|----------------------------------|-----------------|
| Sinr | (0..127) | | pc_ss_SINR_Meas |
| | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Measurement report for NR Cell 2 | |
| physCellId | Physical layer cell identity of NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.1.3 Measurement configuration control and reporting / Event A3 / Measurement of Neighbour NR cell / Inter-frequency measurements

8.1.3.1.3.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and inter-frequency measurements configured for event A3 }

ensure that {

when { Entry condition for event A3 is not met for neighbour cell }

```
    then { UE does not send MeasurementReport }  
  }
```

(2)

with { UE in NR RRC_CONNECTED state and inter-frequency measurements configured for event A3 }

ensure that {

when { Neighbour cell becomes offset better than serving cell }

then { UE sends MeasurementReport with correct measId for event A3 }

 }

8.1.3.1.3.2 Conformance requirements

Same as test case 8.1.3.1.2 with the following difference:

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

1> if *gapUE* is set to *setup*:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = $gapOffset \bmod 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

...

8.1.3.1.3.3 Test description

8.1.3.1.3.3.1 Pre-test conditions

Same as test case 8.1.3.1.2 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.
- System information combination: NR-4 replaces NR-2.

8.1.3.1.3.3.2 Test procedure sequence

Same as test case 8.1.3.1.2 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

8.1.3.1.3.3.3 Specific message contents

Same as test case 8.1.3.1.2 with the following difference:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

Table 8.1.3.1.3.3.3-1: *MeasConfig* (Table 8.1.3.1.2.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|-------------------------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.1.3.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.1.3.1.3.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA3 | Table 8.1.3.1.2.3.3-4 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| measGapConfig | MeasGapConfig with condition GAP_UE | | |
| } | | | |

Table 8.1.3.1.3.3.3-2: *MeasObjectNR-f1* (Table 8.1.3.1.3.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.3.3.3-3: *MeasObjectNR-f2* (Table 8.1.3.1.3.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.1.3.1.4 Measurement configuration control and reporting / Event A3 / Measurement of Neighbour NR cell / Inter-band measurements

8.1.3.1.4.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and inter-band measurements configured for event A3 }

ensure that {

when { Entry condition for event A3 is not met for neighbour cell }

then { UE does not send MeasurementReport }

 }

(2)

with { UE in NR RRC_CONNECTED state and inter-band measurements configured for event A3 }

ensure that {

```

when { Neighbour cell becomes offset better than serving cell }
  then { UE sends MeasurementReport with correct measId for event A3 }
}

```

8.1.3.1.4.2 Conformance requirements

Same as test case 8.1.3.1.2 with the following difference:

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

1> if *gapUE* is set to *setup*:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = $gapOffset \bmod 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

...

8.1.3.1.4.3 Test description

8.1.3.1.4.3.1 Pre-test conditions

Same as test case 8.1.3.1.2 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.
- System information combination: NR-4 replaces NR-2.

8.1.3.1.4.3.2 Test procedure sequence

Same as test case 8.1.3.1.2 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

8.1.3.1.4.3.3 Specific message contents

Same as test case 8.1.3.1.222 with the following difference:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

Table 8.1.3.1.4.3.3-1: *MeasConfig* (Table 8.1.3.1.2.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |

| | | | |
|--|-------------------------------------|-----------------------|--|
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.1.4.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.1.3.1.4.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA3 | Table 8.1.3.1.2.3.3-4 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| measGapConfig | MeasGapConfig with condition GAP_UE | | |
| } | | | |

Table 8.1.3.1.4.3.3-2: MeasObjectNR-f1 (Table 8.1.3.1.4.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |

| | | | |
|---------------------------------|-------------|--|--|
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.4.3.3-3: MeasObjectNR-f2 (Table 8.1.3.1.4.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|-------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 10 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.1.3.1.5 Measurement configuration control and reporting / Event A4 / Measurement of Neighbour NR cell / Intra-frequency measurements

8.1.3.1.5.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and intra-frequency measurements configured for event A4 with event based periodical reporting }

ensure that {

when { Neighbour cell becomes better than absolute threshold }

then { UE sends MeasurementReport message at regular intervals while entering condition for event A4 is satisfied }

}

(2)

with { UE in NR RRC_CONNECTED state and periodical measurement reporting triggered by event A4 ongoing }

ensure that {

when { Neighbour cell becomes worse than absolute threshold }

then { UE stops sending MeasurementReport message }

}

8.1.3.1.5.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2.1, 5.5.4.1, 5.5.4.5 and 5.5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

...

[TS 38.331, clause 5.5.4.1]

If AS security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;

3> if the corresponding *measObject* concerns NR;

...

4> for measurement events other than *eventA1* or *eventA2*:

...

5> else:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

...

4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*:

...

4> else:

5> for events involving a serving cell associated with a *measObjectNR* and neighbours associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:

3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

...

3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:

4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> stop the periodical reporting timer for this *measId*, if running;

...

2> upon expiry of the periodical reporting timer for this *measId*:

3> initiate the measurement reporting procedure, as specified in 5.5.5.

...

[TS 38.331, clause 5.5.4.5]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A4-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A4-2, as specified below, is fulfilled.

Inequality A4-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Thresh$$

Inequality A4-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Thresh$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the neighbour cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell).

Ocn is the measurement object specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the neighbour cell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh is the threshold parameter for this event (i.e. *a4-Threshold* as defined within *reportConfigNR* for this event).

Mn is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, Ocn, Hys are expressed in dB.

Thresh is expressed in the same unit as **Mn**.

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful AS security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;

1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;

...

1> if there is at least one applicable neighbouring cell to report:

2> if the *reportType* is set to *eventTriggered* or *periodical*:

3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

4> if the *reportType* is set to *eventTriggered*:

5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

...

4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

4> if the *reportType* is set to *eventTriggered* or *periodical*:

5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

6> if the *measObject* associated with this *measId* concerns NR:

7> if *rsType* in the associated *reportConfig* is set to *ssb*:

8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

...

2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

3> if the *reportType* is set to *eventTriggered*:

4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

...

3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

3> if the *reportType* is set to *eventTriggered*:

4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

5> if the *measObject* associated with this *measId* concerns NR:

6> if *rsType* in the associated *reportConfig* is set to *ssb*:

7> set *results SSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first:

...

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

...

...

1> if the UE is configured with EN-DC:

...

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.5.3 Test description

8.1.3.1.5.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell, NR Cell 2 is the intra-frequency neighbour cell of NR Cell 1.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.1.5.3.2 Test procedure sequence

Table 8.1.3.1.5.3.2-1 and 8.1.3.1.5.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" and "T2", are applied at the point indicated in the Main behaviour description in Table 8.1.3.1.5.3.2-3.

Table 8.1.3.1.5.3.2-1: Time instances of cell power level and parameter changes in FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -91 | Power levels are such that entry condition for event A4 (measId 1) is not satisfied:

$Mn + Ofn + Ocn - Hys \leq Thresh$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -79 | Power levels are such that entry condition for event A4 (measId 1) is satisfied:

$Mn + Ofn + Ocn - Hys > Thresh$ |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -93 | Power levels are such that leaving condition for event A4 (measId 1) is satisfied:

$Mn + Ofn + Ocn + Hys < Thresh$ |

Table 8.1.3.1.5.3.2-2: Time instances of cell power level and parameter changes in FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that entry condition for event A4 (measId 1) |

| | | | | | |
|----|---------------------|-------------|-----|-----|---|
| | | | | | is not satisfied:
$Mn + Ofn + Ocn - Hys \leq Thresh$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that entry condition for event A4 (measId 1) is satisfied:
$Mn + Ofn + Ocn - Hys > Thresh$ |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that leaving condition for event A4 (measId 1) is satisfied:
$Mn + Ofn + Ocn + Hys < Thresh$ |

Table 8.1.3.1.5.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup NR measurement and reporting for intra-frequency event A4 (<i>measId</i> 1). | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.1.3.1.5.3.2-1/2. | - | - | - | - |
| - | EXCEPTION: In parallel to events described in step 4 the steps specified in table 8.1.3.1.5.3.2-4 shall take place | - | - | - | - |
| 4 | Wait for 30 seconds to ensure that the UE performs a periodical intra-frequency reporting for NR Cell 2 | - | - | 1 | - |
| 5 | SS re-adjusts the cell-specific reference signal level according to row "T2" in table 8.1.3.1.5.3.2-1/2. | - | - | - | - |
| 6 | Wait and ignore <i>MeasurementReport</i> messages for 10s to allow change of power levels for NR Cell 2 and UE measurement | - | - | - | - |
| 7 | Check: Does the UE transmit a <i>MeasurementReport</i> message within the next 10s? | - | - | 2 | F |

Table 8.1.3.1.5.3.2-4: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|-------------------------------------|------------------|---------|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: After the 1st message is | - | - | - | - |

| | | | | | |
|---|--|-----|----------------------------------|---|---|
| | received, step 1 below shall be repeated every time the duration indicated in the IE <i>reportInterval</i> has elapsed | | | | |
| 1 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A4 (<i>measId</i> 1) with the measured RSRP value for NR Cell 2? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |

8.1.3.1.5.3.3 Specific message contents

Table 8.1.3.1.5.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.1.5.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|-------------------------------|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| <i>rrc-TransactionIdentifier</i> | RRC-
TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| <i>rrcReconfiguration</i> ::= SEQUENCE { | | | |
| <i>radioBearerConfig</i> | Not present | | |
| <i>secondaryCellGroup</i> | Not present | | |
| <i>measConfig</i> | MeasConfig | Table
8.1.3.1.5.3.3-2 | |
| <i>lateNonCriticalExtension</i> | Not present | | |
| <i>nonCriticalExtension</i> | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.5.3.3-2: *MeasConfig* (Table 8.1.3.1.5.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>MeasConfig</i> ::= SEQUENCE { | | | |
| <i>measObjectToAddModList</i> SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| <i>measObjectId</i> [1] | 1 | MeasObjectIdN
R-f1 | |
| <i>measObject</i> [1] CHOICE { | | | |
| <i>measObjectNR</i> SEQUENCE { | | | |

| | | | |
|--|--|-----------------------|--|
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 2 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA4 | Table 8.1.3.1.5.3.3-3 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.1.3.1.5.3.3-3: *ReportConfigNR-EventA4* (Table 8.1.3.1.5.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-142 with condition EVENT_A4 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA4 SEQUENCE { | | | |
| a4-Threshold CHOICE { | | | |
| rsrp | 70 | -86dBm | FR1 |
| | FFS | | FR2 |
| } | | | |
| } | | | |
| hysteresis | 2 | 1 dB | |
| } | | | |
| } | | | |

| | | | |
|-------------------------------|----------|--|--|
| } | | | |
| reportAmount | infinity | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.5.3.3-4: *MeasurementReport* (step 1, Table 8.1.3.1.5.3.2-4)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|---|------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | Report NR Cell 1 | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if $mgta$ is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement $mgta$ ms before the gap subframe occurrences);

...

8.1.3.1.6.3 Test description

8.1.3.1.6.3.1 Pre-test conditions

Same as test case 8.1.3.1.5 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.
- System information combination: NR-4 replaces NR-2.

8.1.3.1.6.3.2 Test procedure sequence

Same as test case 8.1.3.1.5 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

8.1.3.1.6.3.3 Specific message contents

Same as test case 8.1.3.1.5 with the following difference:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

Table 8.1.3.1.6.3.3-1: *MeasConfig* (Table 8.1.3.1.5.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|-----------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.1.6.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.1.3.1.6.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |

| | | | |
|---|-------------------------------------|-----------------------|--|
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA4 | Table 8.1.3.1.5.3.3-3 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| measGapConfig | MeasGapConfig with condition GAP_UE | | |
| } | | | |

Table 8.1.3.1.6.3.3-2: *MeasObjectNR-f1* (Table 8.1.3.1.6.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.6.3.3-3: *MeasObjectNR-f2* (Table 8.1.3.1.6.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.1.3.1.7 Measurement configuration control and reporting / Event A4 / Measurement of Neighbour NR cell / Inter-band measurements

8.1.3.1.7.1 Test Purpose (TP)

Same as test case 8.1.3.1.5 but applied to inter-band case.

8.1.3.1.7.2 Conformance requirements

Same as test case 8.1.3.1.5 with the following differences:

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

1> if *gapUE* is set to *setup*:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = $gapOffset \bmod 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

...

8.1.3.1.7.3 Test description

8.1.3.1.7.3.1 Pre-test conditions

Same as test case 8.1.3.1.5 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.
- System information combination: NR-4 replaces NR-2.

8.1.3.1.7.3.2 Test procedure sequence

Same as test case 8.1.3.1.5 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

8.1.3.1.7.3.3 Specific message contents

Same as test case 8.1.3.1.5 with the following difference:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

Table 8.1.3.1.7.3.3-1: *MeasConfig* (Table 8.1.3.1.5.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |

| | | | |
|--|-------------------------------------|-----------------------|--|
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.1.7.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.1.3.1.7.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA4 | Table 8.1.3.1.5.3.3-3 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| measGapConfig | MeasGapConfig with condition GAP_UE | | |
| } | | | |

Table 8.1.3.1.7.3.3-2: *MeasObjectNR-f1* (Table 8.1.3.1.7.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |

| | | | |
|---------------------------------|-------------|--|--|
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.7.3.3-3: *MeasObjectNR-f2* (Table 8.1.3.1.7.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|-------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 10 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.1.3.1.8 Measurement configuration control and reporting / Event A5 / Measurement of Neighbour NR cell / Intra-frequency measurements

8.1.3.1.8.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and intra-frequency measurements configured for event A5 with event based periodical reporting }

ensure that {

when { Serving cell becomes worse than absolute threshold1 and neighbour cell becomes better than absolute threshold2 }

then { UE sends MeasurementReport message at regular intervals while entering conditions for event A5 are satisfied }

 }

(2)

with { UE in NR RRC_CONNECTED state and periodical measurement reporting triggered by event A5 ongoing }

ensure that {

when { Serving cell becomes better than absolute threshold1 or neighbour cell becomes worse than absolute threshold2 }

then { UE stops sending MeasurementReport message }

 }

8.1.3.1.8.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2.1, 5.5.4.1, 5.5.4.6 and 5.5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

...

[TS 38.331, clause 5.5.4.1]

If AS security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;

3> if the corresponding *measObject* concerns NR;

...

4> if the *eventA3* or *eventA5* is configured in the corresponding *reportConfig*:

5> if a serving cell is associated with a *measObjectNR* and neighbours are associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

...

4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*:

...

4> else:

5> for events involving a serving cell associated with a *measObjectNR* and neighbours associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:

3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

...

3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:

4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> stop the periodical reporting timer for this *measId*, if running;

...

2> upon expiry of the periodical reporting timer for this *measId*:

3> initiate the measurement reporting procedure, as specified in 5.5.5.

...

[TS 38.331, clause 5.5.4.6]

The UE shall:

1> consider the entering condition for this event to be satisfied when both condition A5-1 and condition A5-2, as specified below, are fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A5-3 or condition A5-4, i.e. at least one of the two, as specified below, is fulfilled;

1> use the SpCell for *Mp*.

NOTE: The parameters of the reference signal(s) of the cell(s) that triggers the event are indicated in the *measObjectNR* associated to the event which may be different from the *measObjectNR* of the NR SpCell.

Inequality A5-1 (Entering condition 1)

$$Mp + Hys < Thresh1$$

Inequality A5-2 (Entering condition 2)

$$Mn + Ofn + Ocn - Hys > Thresh2$$

Inequality A5-3 (Leaving condition 1)

$$Mp - Hys > Thresh1$$

Inequality A5-4 (Leaving condition 2)

$$Mn + Ofn + Ocn + Hys < Thresh2$$

The variables in the formula are defined as follows:

Mp is the measurement result of the NR SpCell, not taking into account any offsets.

Mn is the measurement result of the neighbouring cell/SCell, not taking into account any offsets.

Ofn is the measurement object specific offset of the neighbour/SCell cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell/SCell).

Ocn is the cell specific offset of the neighbour cell/SCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the neighbour cell/SCell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh1 is the threshold parameter for this event (i.e. *a5-Threshold1* as defined within *reportConfigNR* for this event).

Thresh2 is the threshold parameter for this event (i.e. *a5-Threshold2* as defined within *reportConfigNR* for this event).

Mn*, *Mp are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn*, *Ocn*, *Hys are expressed in dB.

Thresh1 is expressed in the same unit as ***Mp***.

Thresh2 is expressed in the same unit as ***Mn***.

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful AS security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingMOList* to include, for each NR serving cell that is configured with *servingCellMO*, RSRP, RSRQ and the available SINR derived based on the *rsType* if indicated in the associated *reportConfig*, otherwise based on SSB if available, otherwise based on CSI-RS; for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;

set the *servCellId* within *measResultServingMOList* to include each NR serving cell that is configured with *servingCellMO*, if any;

1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;

...

1> if there is at least one applicable neighbouring cell to report:

2> if the *reportType* is set to *eventTriggered* or *periodical*:

3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

4> if the *reportType* is set to *eventTriggered*:

5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

...

4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

4> if the *reportType* is set to *eventTriggered* or *periodical*:

5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

6> if the *measObject* associated with this *measId* concerns NR:

7> if *rsType* in the associated *reportConfig* is set to *ssb*:

8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

...

2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

3> if the *reportType* is set to *eventTriggered*:

4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

...

3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

3> if the *reportType* is set to *eventTriggered*:

4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

5> if the *measObject* associated with this *measId* concerns NR:

6> if *rsType* in the associated *reportConfig* is set to *ssb*:

7> set *results SSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first:

...

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

...

...

1> if the UE is configured with EN-DC:

...

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.8.3 Test description

8.1.3.1.8.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, NR Cell 2 is the intra-frequency neighbour cell of NR Cell 1.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.1.8.3.2 Test procedure sequence

Table 8.1.3.1.8.3.2-1 and 8.1.3.1.8.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" and "T2" are applied at the point indicated in the Main behaviour description in Table 8.1.3.1.8.3.2-3.

Table 8.1.3.1.8.3.2-1: Time instances of cell power level and parameter changes in FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------|------|-----------|-----------|----------------------------------|
| T0 | SS/PBCH | dBm/ | -85 | -91 | Power levels are such that entry |

| | | | | | |
|----|---------------------|-------------|-----|-----|--|
| | SSS EPRE | SCS | | | condition for event A5 (measId 1) is not satisfied:
$Mp + Hys \geq Thresh1$ or $Mn + Ofn + Ocn + Hys \leq Thresh2$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -79 | Power levels are such that entry condition for event A5 (measId 1) is satisfied:
$Mp + Hys < Thresh1$ and $Mn + Ofn + Ocn - Hys > Thresh2$ |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -93 | Power levels are such that leaving condition for event A5 (measId 1) is satisfied:
$Mp - Hys > Thresh1$ or $Mn + Ofn + Ocn + Hys < Thresh2$ |

Table 8.1.3.1.8.3.2-2: Time instances of cell power level and parameter changes in FR2

| | Parameter | Unit | NR
Cell 1 | NR
Cell 2 | Remark |
|----|---------------------|-------------|--------------|--------------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that entry condition for event A5 (measId 1) is not satisfied:
$Mp + Hys \geq Thresh1$ or $Mn + Ofn + Ocn + Hys \leq Thresh2$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that entry condition for event A5 (measId 1) is satisfied:
$Mp + Hys < Thresh1$ and $Mn + Ofn + Ocn - Hys > Thresh2$ |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that leaving condition for event A5 (measId 1) is satisfied:
$Mp - Hys > Thresh1$ or $Mn + Ofn + Ocn + Hys < Thresh2$ |

Table 8.1.3.1.8.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup NR measurement and reporting for intra-frequency event A5 (<i>measId</i> 1) | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| | 8.1.3.1.8.3.2-1/2. | | | | |
| - | EXCEPTION: In parallel to events described in step 4 the steps specified in table 8.1.3.1.8.3.2-4 shall take place | - | - | - | - |
| 4 | Wait for 30 seconds to ensure that the UE performs a periodical intra-frequency reporting for NR Cell 2 | - | - | 1 | - |
| 5 | SS re-adjusts the cell-specific reference signal level according to row "T2" in table 8.1.3.1.8.3.2-1/2. | - | - | - | - |
| 6 | Wait and ignore MeasurementReport messages for 10s to allow change of power levels for NR Cell 2 and UE measurement | - | - | - | - |
| 7 | Check: Does the UE transmit a <i>MeasurementReport</i> message within the next 10s? | - | - | 2 | F |

Table 8.1.3.1.8.3.2-4: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--------------------------|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: After the 1st message is received, step 1 below shall be repeated every time the duration indicated in the IE <i>reportInterval</i> has elapsed | - | - | - | - |
| 1 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A5 (<i>measId</i> 1) with the measured RSRP value for NR Cell 2? | --> | <i>MeasurementReport</i> | 1 | P |

8.1.3.1.8.3.3 Specific message contents

Table 8.1.3.1.8.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.1.8.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|---------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table | |

| | | | |
|--------------------------|-------------|-----------------|--|
| | | 8.1.3.1.8.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| | | | |

Table 8.1.3.1.8.3.3-2: *MeasConfig* (Table 8.1.3.1.8.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | MeasObjectIdNR-f1 | |
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 2 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA5 | Table 8.1.3.1.8.3.3-3 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |

| | | | |
|-------------------|---|--|--|
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.1.3.1.8.3.3-3: *ReportConfigNR-EventA5* (Table 8.1.3.1.8.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-142 with condition EVENT_A5 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA5 SEQUENCE { | | | |
| a5-Threshold1 CHOICE { | | | |
| rsrp | 76 | -80dBm | FR1 |
| | FFS | | FR2 |
| } | | | |
| a5-Threshold2 CHOICE { | | | |
| rsrp | 70 | -86dBm | FR1 |
| | FFS | | FR2 |
| } | | | |
| hysteresis | 4 | 2 dB | |
| } | | | |
| } | | | |
| reportAmount | infinity | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.8.3.3-4: *MeasurementReport* (step 1, Table 8.1.3.1.8.3.2-4)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|---|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | Report NR Cell 1 | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Report NR neighbour cell | |
| physCellId | Physical layer cell identity of NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.1.9 Measurement configuration control and reporting / Event A5 / Measurement of Neighbour NR cell / Inter-frequency measurements

8.1.3.1.9.1 Test Purpose (TP)

Same as test case 8.1.3.1.8 but applied to inter-frequency case.

8.1.3.1.9.2 Conformance requirements

Same as test case 8.1.3.1.8 with the following difference:

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

1> if *gapUE* is set to *setup*:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

$subframe = gapOffset \bmod 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

...

8.1.3.1.9.3 Test description

8.1.3.1.9.3.1 Pre-test conditions

Same as test case 8.1.3.1.8 with the following difference:

- Cells configuration: NR Cell 3 replaces NR Cell 2.
- System information combination: NR-4 replaces NR-2.

8.1.3.1.9.3.2 Test procedure sequence

Same as test case 8.1.3.1.8 with the following difference:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

8.1.3.1.9.3.3 Specific message contents

Same as test case 8.1.3.1.5 with the following difference:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

Table 8.1.3.1.9.3.3-1: *MeasConfig* (Table 8.1.3.1.8.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|-------------------------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.1.9.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.1.3.1.9.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA5 | Table 8.1.3.1.8.3.3-3 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| measGapConfig | MeasGapConfig with condition GAP_UE | | |
| } | | | |

Table 8.1.3.1.9.3.3-2: *MeasObjectNR-f1* (Table 8.1.3.1.9.3.3-1)

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 | | | |
|---|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.9.3.3-3: *MeasObjectNR-f2* (Table 8.1.3.1.9.3.3-1)

| Derivation Path: TS 38.508-1 [14], Table 4.6.3-76 | | | |
|---|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.1.3.1.10 Measurement configuration control and reporting / Event A5 / Measurement of Neighbour NR cell / Inter-band measurements

8.1.3.1.10.1 Test Purpose (TP)

Same as test case 8.1.3.1.8 but applied to inter-band case.

8.1.3.1.10.2 Conformance requirements

Same as test case 8.1.3.1.8 with the following difference:

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

1> if *gapUE* is set to *setup*:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = $gapOffset \bmod 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

...

8.1.3.1.10.3 Test description

8.1.3.1.10.3.1 Pre-test conditions

Same as test case 8.1.3.1.8 with the following difference:

- Cells configuration: NR Cell 10 replaces NR Cell 2.
- System information combination: NR-4 replaces NR-2.

8.1.3.1.10.3.2 Test procedure sequence

Same as test case 8.1.3.1.8 with the following difference:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

8.1.3.1.10.3.3 Specific message contents

Same as test case 8.1.3.1.8 with the following difference:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

Table 8.1.3.1.10.3.3-1: *MeasConfig* (Table 8.1.3.1.8.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|-----------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.1.10.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.1.3.1.10.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |

| | | | |
|---|-------------------------------------|-----------------------|--|
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA5 | Table 8.1.3.1.8.3.3-3 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| measGapConfig | MeasGapConfig with condition GAP_UE | | |
| } | | | |

Table 8.1.3.1.10.3.3-2: *MeasObjectNR-f1* (Table 8.1.3.1.10.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.10.3.3-3: *MeasObjectNR-f2* (Table 8.1.3.1.10.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|-------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 10 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.1.3.1.11 Measurement configuration control and reporting / Intra NR measurements / Two simultaneous events A3 (intra and inter-frequency measurements) / RSRQ based measurements

8.1.3.1.11.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state, measurements configured for two event A3 at the same time **and** *triggerQuantity* set to *rsrq* }

ensure that {

when { Entry condition for event A3 is not met }

then { UE does not send *MeasurementReport* }

}

(2)

with { UE in NR RRC_CONNECTED state, measurements configured for two event A3 at the same time **and** *triggerQuantity* set to *rsrq* }

ensure that {

when { Neighbour becomes offset better than serving }

then { UE sends *MeasurementReport* with correct *measId* for event A3 }

}

8.1.3.1.11.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clause 5.3.5.3, 5.5.2.1, 5.5.2.9, 5.5.4.1, 5.5.4.4 and 5.5.5.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

[TS 38.331, clause 5.5.2.1]

The UE shall:

1> if the received *measConfig* includes the *measObjectToRemoveList*:

2> perform the measurement object removal procedure as specified in 5.5.2.4;

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

1> if the received *measConfig* includes the *reportConfigToRemoveList*:

- 2> perform the reporting configuration removal procedure as specified in 5.5.2.6;
- 1> if the received *measConfig* includes the *reportConfigToAddModList*:
 - 2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;
- 1> if the received *measConfig* includes the *quantityConfig*:
 - 2> perform the quantity configuration procedure as specified in 5.5.2.8;
- 1> if the received *measConfig* includes the *measIdToRemoveList*:
 - 2> perform the measurement identity removal procedure as specified in 5.5.2.2;
- 1> if the received *measConfig* includes the *measIdToAddModList*:
 - 2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;
- 1> if the received *measConfig* includes the *measGapConfig*:
 - 2> perform the measurement gap configuration procedure as specified in 5.5.2.9;
- 1> if the received *measConfig* includes the *measGapSharingConfig*:
 - 2> perform the measurement gap sharing configuration procedure as specified in 5.5.2.11;
- 1> if the received *measConfig* includes the *s-MeasureConfig*:
 - 2> if *s-MeasureConfig* is set to *ssb-RSRP*, set parameter *ssb-RSRP* of *s-MeasureConfig* within *VarMeasConfig* to the lowest value of the RSRP ranges indicated by the received value of *s-MeasureConfig*;
 - 2> else, set parameter *csi-RSRP* of *s-MeasureConfig* within *VarMeasConfig* to the lowest value of the RSRP ranges indicated by the received value of *s-MeasureConfig*.

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

- 1> if *gapUE* is set to setup:
 - 2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;
 - 2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:
 - $\text{SFN mod } T = \text{FLOOR}(\text{gapOffset}/10)$;
 - $\text{subframe} = \text{gapOffset mod } 10$;
 - with $T = \text{MGRP}/10$ as defined in TS 38.133 [14];
 - 2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);
- 1> else if *gapUE* is set to release:
 - 2> release the per UE measurement gap configuration.

NOTE 1: For *gapFR2* configuration, the SFN and subframe of a serving cell on FR2 frequency is used in the gap calculation

NOTE 2: For *gapFR1* or *gapUE* configuration, the SFN and subframe of the PCell is used in the gap calculation.

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*:
 - 3> if the corresponding *measObject* concerns NR;
- 4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*:
...
- 4> else:
 - 5> for events involving a serving cell associated with a *measObjectNR* and neighbours associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;
 - 5> if *useWhiteCellList* is set to *TRUE*:
...
 - 5> else:
 - 6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;
...
 - 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):
 - 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5;
 - 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5;
 - 2> if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:
 - 3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:
 - 4> initiate the measurement reporting procedure, as specified in 5.5.5;
 - 3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:
 - 4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> stop the periodical reporting timer for this *measId*, if running;

...

[TS 38.331, clause 5.5.4.4]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

1> use the SpCell for *Mp*, *Ofp* and *Ocp*.

NOTE The cell(s) that triggers the event has reference signals indicated in the *measObjectNR* associated to this event which may be different from the NR SpCell *measObjectNR*.

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$$

Inequality A3-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the reference signal of the neighbour cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Mp is the measurement result of the SpCell, not taking into account any offsets.

Ofp is the measurement object specific offset of the SpCell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the SpCell).

Ocp is the cell specific offset of the SpCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the SpCell), and is set to zero if not configured for the SpCell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigNR* for this event).

Mn, ***Mp*** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, ***Ocn***, ***Ofp***, ***Ocp***, ***Hys***, ***Off*** are expressed in dB.

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
 - 2> for each serving cell *measObjectId* referenced in the *measIdList*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:
 - 3> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured SINR;
 - 3> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
- 4> for each best non-serving cell included in the measurement report:
- 5> include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if there is at least one applicable neighbouring cell to report:
 - 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
 - 4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
 - 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 3> if the *reportType* is set to *eventTriggered*:
- 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 5> if the *measObject* associated with this *measId* concerns NR:
- 6> if *rsType* in the associated *reportConfig* is set to *ssb*:

7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first:

8> if *reportQuantityRSIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;

...

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

...

1> if the UE is configured with EN-DC:

...

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.11.3 Test description

8.1.3.1.11.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell, NR Cell 2 is the intra-frequency neighbour cell, and NR Cell 3 is the inter-frequency neighbour cell.
- System information combination NR-5 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.3.1.11.3.2 Test procedure sequence

Table 8.1.3.1.11.3.2-1 and 8.1.3.1.11.3.2-2 illustrate the downlink power levels to be applied for NR Cell 1, NR Cell 2 and NR Cell 3 at various time instants of the test execution for FR1 and FR2 respectively. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.3.1.11.3.2-1: Time instances of cell power level and parameter changes in FR1

| Parameter | Unit | NR Cell 1 | NR Cell 2
(DL only) | NR Cell 3
(DL only) | Remark |
|-----------|------|-----------|------------------------|------------------------|--------|
| | | | | | |

| | | | | | | |
|--|---------------------|-------------|--------|--------|--------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/S
CS | -88 | -100 | "Off" | Power levels are such that entry condition for event A3 (<i>measId</i> 1 & 2) is not satisfied:
$Mn + Ofn + Ocn - Hys < Mp + Ofp + Ocp + Off$ |
| | SS-RSRQ | dB | -11.95 | -23.95 | - | |
| | Noc | dBm/S
CS | -94 | | -94 | |
| T1 | SS/PBCH
SSS EPRE | dBm/S
CS | -100 | -88 | "Off" | Power levels are such that entry condition for event A3 (<i>measId</i> 1) is satisfied:
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |
| | SS-RSRQ | dB | -23.95 | -11.95 | - | |
| | Noc | dBm/S
CS | -94 | | -94 | |
| T2 | SS/PBCH
SSS EPRE | dBm/S
CS | -100 | "Off" | -88 | Power levels are such that entry condition for event A3 (<i>measId</i> 2) is satisfied:
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |
| | SS-RSRQ | dB | -17.76 | - | -11.74 | |
| | Noc | dBm/S
CS | -94 | | -94 | |
| NOTE 1: The total tolerance used is the sum of downlink signal level uncertainty (TS 38.508-1 Table 6.2.2.1-4) and absolute UE measurement accuracy (TS 38.133 clause 10). | | | | | | |

Table 8.1.3.1.11.3.2-2: Time instances of cell power level and parameter changes in FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 2
(DL only) | NR Cell 10
(DL only) | Remark |
|--|---------------------|-------------|-----------|------------------------|-------------------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/S
CS | FFS | FFS | "Off" | Power levels are such that entry condition for event A3 (<i>measId</i> 1 & 2) is not satisfied:
$Mn + Ofn + Ocn - Hys < Mp + Ofp + Ocp + Off$ |
| | RSRQ | dB | FFS | FFS | - | |
| | Noc | dBm/S
CS | FFS | | FFS | |
| T1 | SS/PBCH
SSS EPRE | dBm/S
CS | FFS | FFS | "Off" | Power levels are such that entry condition for event A3 (<i>measId</i> 1) is satisfied:
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |
| | RSRQ | dB | FFS | FFS | - | |
| | Noc | dBm/S
CS | FFS | | FFS | |
| T2 | SS/PBCH
SSS EPRE | dBm/S
CS | FFS | "Off" | FFS | Power levels are such that entry condition for event A3 (<i>measId</i> 2) is satisfied:
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |
| | RSRQ | dB | FFS | - | FFS | |
| | Noc | dBm/S
CS | FFS | | FFS | |
| NOTE 1: The total tolerance used is the sum of downlink signal level uncertainty (TS 38.508-1 Table 6.2.2.2-TBD) | | | | | | |

and absolute UE measurement accuracy (TS 38.133 clause 10).

Table 8.1.3.1.11.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message on NR Cell 1 including <i>MeasConfig</i> to setup NR measurement and reporting for two event A3 (<i>measId</i> 1 and <i>measId</i> 2) (intra and inter frequency measurement). | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message on NR Cell 1. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit a <i>MeasurementReport</i> message on NR Cell 1 within the next 10s? | --> | NR RRC: <i>MeasurementReport</i> | 1 | F |
| 4 | The SS re-adjusts the cell-specific reference signal level according to row "T1" in Table 8.1.3.1.11.3.2-1/2. | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MeasurementReport</i> message on NR Cell 1 to report event A3 (<i>measId</i> 1) with the measured RSRP and RSRQ values for NR Cell 2? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |
| 6 | The SS re-adjusts the cell-specific reference signal level according to row "T2" in Table 8.1.3.1.11.3.2-1/2. | - | - | - | - |
| 7 | Check: Does the UE transmit a <i>MeasurementReport</i> message on NR Cell 1 to report event A3 (<i>measId</i> 2) with the measured RSRP and RSRQ values for NR Cell 3? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |

8.1.3.1.11.3.3 Specific message contents

Table 8.1.3.1.11.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.1.11.3.2-3)

| Derivation Path: 38.508-1 [4] table 4.6.1-13 | | | |
|--|-------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| <i>rrc-TransactionIdentifier</i> | RRC-
TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| <i>rrcReconfiguration</i> ::= SEQUENCE { | | | |
| <i>radioBearerConfig</i> | Not present | | |
| <i>secondaryCellGroup</i> | Not present | | |

| | | | |
|--------------------------|-------------|---------------------------|--|
| measConfig | MeasConfig | Table
8.1.3.1.11.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.11.3.3-2: *MeasConfig* (step 1, Table 8.1.3.1.11.3.2-3)

| Derivation path: 38.508-1[4] table 4.6.3-69 | | | |
|--|-------------------|---------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table
8.1.3.1.11.3.3-3 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table
8.1.3.1.11.3.3-4 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-A3 | Table
8.1.3.1.11.3.3-5 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |

| | | | |
|-------------------|----------------|-------------------------------|--|
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | ReportConfigId | | |
| measId[2] | 2 | | |
| measObjectId[2] | 2 | | |
| reportConfigId[1] | ReportConfigId | | |
| } | | | |
| measGapConfig | MeasGapConfig | Table
8.1.3.1.11.3.3-
6 | |
| } | | | |

Table 8.1.3.1.11.3.3-3: MeasObjectNR-f1 (Table 8.1.3.1.11.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR
Cell 1 SSB | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

Table 8.1.3.1.11.3.3-4: MeasObjectNR-f2 (Table 8.1.3.1.11.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR
Cell 3 SSB | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

Table 8.1.3.1.11.3.3-5: ReportConfigNR-A3 (Table 8.1.3.1.11.3.3-2)

| Derivation Path: 38.508-1 [4] table 4.6.3-142 with condition EVENT_A3 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |

| | | | |
|---------------------------|----|-----|--|
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrq | 0 | 0dB | |
| } | | | |
| } | | | |
| } | | | |
| reportAmount | r1 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.11.3.3-6: *MeasGapConfig* (Table 8.1.3.1.11.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-70 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 0 | | |
| mgl | ms6 | | |
| mgrp | ms160 | | |
| mgta | ms0dot25 | | FR2 |
| | ms0dot5 | | FR1 |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.11.3.3-7: *MeasurementReport* (steps 5 and 7, Table 8.1.3.1.11.3.2-3)

| Derivation Path: TS 38.508-1 [4], table 4.6.1-5A | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|--|----------------------------|--|--------|
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | Step 5 |
| | 2 | | Step 7 |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | | Step 5 |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| } | | | |
| measResultBestNeighCell | Not present | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | | |
| physCellId | PhysCellId of NR Cell 2 | | Step 5 |
| | PhysCellId of NR Cell 3 | | Step 7 |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |

| | | | |
|--------------------|-------------|--|--|
| } | | | |
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.1.12 Measurement configuration control and reporting / Intra NR measurements / Two simultaneous events A5 (intra and inter-frequency measurements) / SINR based measurements

8.1.3.1.12.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state, measurements configured for two event A5 at the same time **and** *triggerQuantity* set to *sinr* }

ensure that {

when { Entry condition for event A5 is not met }

then { UE does not send *MeasurementReport* }

}

(2)

with { UE in NR RRC_CONNECTED state, measurements configured for two event A5 at the same time **and** *triggerQuantity* set to *sinr* }

ensure that {

when { SpCell becomes worse than threshold1 and neighbour becomes better than threshold2 }

then { UE sends *MeasurementReport* with correct *measId* for event A5 }

}

8.1.3.1.12.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clause 5.3.5.3, 5.5.2.1, 5.5.2.9, 5.5.4.1, 5.5.4.4 and 5.5.5.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

[TS 38.331, clause 5.5.2.1]

The UE shall:

1> if the received *measConfig* includes the *measObjectToRemoveList*:

2> perform the measurement object removal procedure as specified in 5.5.2.4;

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

1> if the received *measConfig* includes the *reportConfigToRemoveList*:

2> perform the reporting configuration removal procedure as specified in 5.5.2.6;

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

1> if the received *measConfig* includes the *quantityConfig*:

2> perform the quantity configuration procedure as specified in 5.5.2.8;

1> if the received *measConfig* includes the *measIdToRemoveList*:

2> perform the measurement identity removal procedure as specified in 5.5.2.2;

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

1> if the received *measConfig* includes the *measGapConfig*:

2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

1> if the received *measConfig* includes the *measGapSharingConfig*:

2> perform the measurement gap sharing configuration procedure as specified in 5.5.2.11;

1> if the received *measConfig* includes the *s-MeasureConfig*:

2> if *s-MeasureConfig* is set to *ssb-RSRP*, set parameter *ssb-RSRP* of *s-MeasureConfig* within *VarMeasConfig* to the lowest value of the RSRP ranges indicated by the received value of *s-MeasureConfig*;

2> else, set parameter *csi-RSRP* of *s-MeasureConfig* within *VarMeasConfig* to the lowest value of the RSRP ranges indicated by the received value of *s-MeasureConfig*.

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

1> if *gapUE* is set to setup:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = *gapOffset* mod 10;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapUE* is set to release:

2> release the per UE measurement gap configuration.

NOTE 1: For *gapFR2* configuration, the SFN and subframe of a serving cell on FR2 frequency is used in the gap calculation

NOTE 2: For *gapFR1* or *gapUE* configuration, the SFN and subframe of the PCell is used in the gap calculation.

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;

3> if the corresponding *measObject* concerns NR;

4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*;

...

4> else:

5> for events involving a serving cell associated with a *measObjectNR* and neighbours associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

5> if *useWhiteCellList* is set to TRUE:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is included in the *whiteCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

5> else:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more

applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

- 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:
 - 3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:
 - 4> initiate the measurement reporting procedure, as specified in 5.5.5;
 - 3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:
 - 4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 4> stop the periodical reporting timer for this *measId*, if running;

...

[TS 38.331, clause 5.5.4.4]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when both condition A5-1 and condition A5-2, as specified below, are fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition A5-3 or condition A5-4, i.e. at least one of the two, as specified below, is fulfilled;
- 1> use the SpCell for *Mp*.

NOTE: The parameters of the reference signal(s) of the cell(s) that triggers the event are indicated in the *measObjectNR* associated to the event which may be different from the *measObjectNR* of the NR SpCell.

Inequality A5-1 (Entering condition 1)

$$M_p + H_{ys} < Thresh1$$

Inequality A5-2 (Entering condition 2)

$$M_n + O_{fn} + O_{cn} - H_{ys} > Thresh2$$

Inequality A5-3 (Leaving condition 1)

$$M_p - H_{ys} > Thresh1$$

Inequality A5-4 (Leaving condition 2)

$$M_n + O_{fn} + O_{cn} + H_{ys} < Thresh2$$

The variables in the formula are defined as follows:

M_p is the measurement result of the NR SpCell, not taking into account any offsets.

M_n is the measurement result of the neighbouring cell/SCell, not taking into account any offsets.

O_{fn} is the measurement object specific offset of the neighbour/SCell cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell/SCell).

Ocn is the cell specific offset of the neighbour cell/SCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the neighbour cell/SCell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh1 is the threshold parameter for this event (i.e. *a5-Threshold1* as defined within *reportConfigNR* for this event).

Thresh2 is the threshold parameter for this event (i.e. *a5-Threshold2* as defined within *reportConfigNR* for this event).

Mn, **Mp** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, **Ocn**, **Hys** are expressed in dB.

Thresh1 is expressed in the same unit as **Mp**.

Thresh2 is expressed in the same unit as **Mn**.

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
 - 2> for each serving cell *measObjectId* referenced in the *measIdList*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:
 - 3> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured SINR;
 - 3> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:

- 4> for each best non-serving cell included in the measurement report:
- 5> include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if there is at least one applicable neighbouring cell to report:
 - 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
 - 4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
 - 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
 - 5> if the *measObject* associated with this *measId* concerns NR:
 - 6> if *rsType* in the associated *reportConfig* is set to *ssb*:
 - 7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
 - 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
 - 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
 - ...
 - 2> if the UE is configured with EN-DC:
 - ...
- 1> else:
 - 2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.12.3 Test description

8.1.3.1.12.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell, NR Cell 2 is the intra-frequency neighbour cell, and NR Cell 3 is the inter-frequency neighbour cell.
- System information combination NR-5 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.3.1.12.3.2 Test procedure sequence

Table 8.1.3.1.12.3.2-1 and Table 8.1.3.1.12.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, NR Cell 2 and NR Cell 3 at various time instants of the test execution for FR1 and FR2 respectively. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.3.1.12.3.2-1: Time instances of cell power level and parameter changes in FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2
(DL only) | NR Cell 3
(DL only) | Remark |
|--|---------------------|-------------|-----------|------------------------|------------------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/S
CS | -88 | -94 | "Off" | Power levels are such that either one entry condition for event A5 (<i>measId</i> 1 & 2) is not satisfied:
$Mp + Hys > Thresh1$ or $Mn + Ofn + Ocn - Hys < Thresh2$ |
| | SINR | dB | 2.99 | -6.97 | - | |
| | Noc | dBm/S
CS | -94 | | -94 | |
| T1 | SS/PBCH
SSS EPRE | dBm/S
CS | -94 | -88 | "Off" | Power levels are such that both entry conditions for event A5 (<i>measId</i> 1) is satisfied:
$Mp + Hys < Thresh1$ and $Mn + Ofn + Ocn - Hys > Thresh2$ |
| | SINR | dB | -6.97 | 2.99 | - | |
| | Noc | dBm/S
CS | -94 | | -94 | |
| T2 | SS/PBCH
SSS EPRE | dBm/S
CS | -100 | "Off" | -88 | Power levels are such that both entry conditions for event A5 (<i>measId</i> 2) is satisfied:
$Mp + Hys < Thresh1$ and $Mn + Ofn + Ocn - Hys > Thresh2$ |
| | SINR | dB | -6 | - | 6 | |
| | Noc | dBm/S
CS | -94 | | -94 | |
| NOTE 1: The total tolerance used is the sum of downlink signal level uncertainty (TS 38.508-1 Table 6.2.2.1-4) and absolute UE measurement accuracy (TS 38.133 clause 10). | | | | | | |

Table 8.1.3.1.12.3.2-2: Time instances of cell power level and parameter changes in FR2

| | Parameter | Unit | Cell 1 | Cell 2 (DL only) | Cell 10 (DL only) | Remark |
|----|---------------------|-------------|--------|------------------|-------------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/S
CS | FFS | FFS | "Off" | Power levels are such that either one entry condition for event A5 (<i>measId</i> 1 & 2) is not satisfied:
$Mp + Hys > Thresh1$ or $Mn + Ofn + Ocn - Hys < Thresh2$ |
| | SINR | dB | FFS | FFS | - | |
| | Noc | dBm/S
CS | FFS | | FFS | |
| T1 | SS/PBCH
SSS EPRE | dBm/S
CS | FFS | FFS | "Off" | Power levels are such that both entry conditions for event A5 (<i>measId</i> 1) is satisfied:
$Mp + Hys < Thresh1$ and $Mn + Ofn + Ocn - Hys > Thresh2$ |
| | SINR | dB | FFS | FFS | - | |
| | Noc | dBm/S
CS | FFS | | FFS | |
| T2 | SS/PBCH
SSS EPRE | dBm/S
CS | FFS | "Off" | FFS | Power levels are such that both entry conditions for event A5 (<i>measId</i> 2) is satisfied:
$Mp + Hys < Thresh1$ and $Mn + Ofn + Ocn - Hys > Thresh2$ |
| | SINR | dB | FFS | - | FFS | |
| | Noc | dBm/S
CS | FFS | | FFS | |

NOTE 1: The total tolerance used is the sum of downlink signal level uncertainty (TS 38.508-1 Table 6.2.2.2-TBD) and absolute UE measurement accuracy (TS 38.133 clause 10).

Table 8.1.3.1.12.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message on NR Cell 1 including <i>MeasConfig</i> to setup NR measurement and reporting for two event A5 (<i>measId</i> 1 and <i>measId</i> 2) (intra and inter frequency measurement). | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message on NR Cell 1. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit a <i>MeasurementReport</i> message on NR Cell 1 within the next 10s? | --> | NR RRC: <i>MeasurementReport</i> | 1 | F |
| 4 | The SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.1.3.1.12.3.2-1/2. | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MeasurementReport</i> message on NR Cell 1 to report event A3 (<i>measId</i> 1) with the measured RSRP and SINR values for NR Cell 2? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |
| 6 | The SS re-adjusts the cell-specific reference signal level according to row "T2" in table 8.1.3.1.12.3.2-1/2. | - | - | - | - |
| 7 | Check: Does the UE transmit a <i>MeasurementReport</i> message on NR Cell 1 to report event A5 (<i>measId</i> 2) with the measured RSRP and SINR values for NR Cell 3? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |

8.1.3.1.12.3.3 Specific message contents

Table 8.1.3.1.12.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.1.12.3.2-3)

| Derivation Path: 38.508-1 [4] table 4.6.1-13 | | | |
|--|---------------------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.12.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.12.3.3-2: *MeasConfig* (step 1, Table 8.1.3.1.12.3.2-3)

| Derivation path: 38.508-1 [4] table 4.6.3-69 | | | |
|---|-----------------|------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.1.12.3.3-3 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.1.3.1.12.3.3-4 | |
| } | | | |

| | | | |
|--|-------------------|------------------------|--|
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-A5 | Table 8.1.3.1.12.3.3-6 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | ReportConfigId | | |
| measId[2] | 2 | | |
| measObjectId[2] | 2 | | |
| reportConfigId[1] | ReportConfigId | | |
| } | | | |
| measGapConfig | MeasGapConfig | Table 8.1.3.1.12.3.3-5 | |
| } | | | |

Table 8.1.3.1.12.3.3-3: MeasObjectNR-f1 (Table 8.1.3.1.12.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR Cell 1 SSB | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

Table 8.1.3.1.12.3.3-3A: MeasObjectNR-f2 (Table 8.1.3.1.12.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |

| | | | |
|---------------------------------|---------------------------------|--|--|
| ssbFrequency | Downlink ARFCN of NR Cell 3 SSB | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

Table 8.1.3.1.12.3.3-4: *MeasGapConfig* (Table 8.1.3.1.12.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-70 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 0 | | |
| mgl | ms6 | | |
| mgrp | ms160 | | |
| mgta | ms0dot25 | | FR2 |
| | ms0dot5 | | FR1 |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.12.3.3-5: *ReportConfigNR-A5* (Table 8.1.3.1.12.3.3-2)

| Derivation Path: 38.508-1 [4] table 4.6.3-142 with condition EVENT_A5 | | | |
|--|--------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA5 SEQUENCE { | | | |
| a5-Threshold1 CHOICE { | | | |
| sinr | 47 | 0dB
≤ SS-SINR<0.5dB | |
| } | | | |
| a5-Threshold2 CHOICE { | | | |
| sinr | 47 | 0dB | |

| | | | |
|-------------------------------|------|------------------------|--|
| | | $\leq SS-SINR < 0.5dB$ | |
| } | | | |
| } | | | |
| } | | | |
| reportQuantityCell SEQUENCE { | | | |
| sinr | true | | |
| } | | | |
| reportAmount | r1 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.12.3.3-6: *MeasurementReport* (steps 5 and 7, Table 8.1.3.1.12.3.2-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-5A | | | |
|--|----------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | Step 5 |
| | 2 | | Step 7 |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | | Step 5 |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|-------------------------|--|--------|
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| } | | | |
| measResultBestNeighCell | Not present | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | | |
| physCellId | PhysCellId of NR Cell 2 | | Step 5 |
| | PhysCellId of NR Cell 3 | | Step 7 |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | |
| } | | | |
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.1.13 Measurement configuration control and reporting / SS/PBCH block based / CSI-RS based intra-frequency measurements / Measurement of Neighbour NR cell

8.1.3.1.13.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and measurement configured for SS/PBCH measurement reporting of intra-frequency on specified frequency }

ensure that {

when { SS/PBCH block sorting quantity is above absThreshSS-BlocksConsolidation for each beam of Neighbour Cell }

then { UE sends MeasurementReport message containing rsIndexResults with resultsSSB-Indexes }

}

(2)

with { UE in NR RRC_CONNECTED state and measurement configured for SS/PBCH measurement reporting of intra-frequency on specified frequency }

ensure that {

when { SS/PBCH block sorting quantity is below absThreshSS-BlocksConsolidation for one beam of Neighbour Cell and another beam(s) is above absThreshSS-BlocksConsolidation }

then { UE sends MeasurementReport message containing rsIndexResults with resultsSSB-Indexes includes RsIndex above absThreshSS-BlocksConsolidation and excludes RsIndex below absThreshSS-BlocksConsolidation }

}

(3)

with { UE in NR RRC_CONNECTED state and measurement configured for CSI-RS measurement reporting of intra frequency on specified frequency }

ensure that {

when { CSI-RS sorting quantity is above absThreshCSI-RS-Consolidation for each beam of Neighbour Cell }

then { UE sends MeasurementReport message containing rsIndexResults with resultsSSB-Indexes }

}

(4)

with { UE in NR RRC_CONNECTED state and measurement configured for CSI-RS measurement reporting of intra frequency on specified frequency }

ensure that {

when { CSI-RS sorting quantity is below absThreshCSI-RS-Consolidation for one beam of Neighbour Cell and another beam(s) is above absThreshCSI-RS-Consolidation }

then { UE sends MeasurementReport message containing rsIndexResults with resultsSSB-Indexes includes RsIndex above absThreshCSI-RS-Consolidation and excludes RsIndex below absThreshCSI-RS-Consolidation }

}

8.1.3.1.13.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clauses 5.5.5.1 and 5.5.5.2]. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.5.5.1]

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingFreqList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;
- 1> set the *measResultServingCell* within *measResultServingFreqList* to include for each NR serving cell that is configured, if any, the *servFreqId*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 2> for each configured serving cell, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
 - 2>for each serving frequency for which *measObjectId* is referenced in the *measIdList*, other than the frequency corresponding with the *measId* that triggered the measurement reporting:
 - 3> set the *measResultBestNeighCell* within *measResultServingFreqList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell on the concerned serving frequency with the highest measured RSRP if RSRP measurement results are available for cells on this frequency, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells on this frequency, otherwise with the highest measured SINR;
 - 3> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 4> for each best non-serving cell included in the measurement report:
 - 5>include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if there is at least one applicable neighbouring cell to report:
 - 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
 - 4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;

- 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
- 3> if the *reportType* is set to *eventTriggered*:
- 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
 - 5> if the *measObject* associated with this *measId* concerns NR:
 - 6> if *rsType* in the associated *reportConfig* is set to *ssb*:
 - 7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
 - 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
 - 6> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:
 - 7> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
 - 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are, include beam measurement information as described in 5.5.5.2;

[TS 38.331, clause 5.5.5.1]

- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
 - 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
- 1> else:
 - 2> if the *reportType* is set to *periodical*:
 - 3> remove the entry within the *VarMeasReportList* for this *measId*;
 - 3> remove this *measId* from the *measIdList* within *VarMeasConfig*;
 - 1> if the UE is configured with EN-DC:
 - 2> if SRB3 is configured:
 - 3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;
 - 2>else:
 - 3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].
 - 1> else:
 - 2>submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

[TS 38.331, clause 5.5.5.2]

For beam measurement information to be included in a measurement report the UE shall:

- 1> if *reportType* is set to *eventTriggered*:

- 2> consider the trigger quantity as the sorting quantity;
- 1> if *reportType* is set to *periodical*:
- 2> if a single reporting quantity is set to TRUE in *reportQuantityRsIndexes*;
- 3> consider the configured single quantity as the sorting quantity;
- 2> else:
- 3> if *rsrp* is set to TRUE;
- 4> consider RSRP as the sorting quantity;
- 3> else:
- 4> consider RSRQ as the sorting quantity;
- 1> set *rsIndexResults* to include up to *maxNrofRsIndexesToReportSS/PBCH* block indexes or CSI-RS indexes in order of decreasing sorting quantity as follows:
- 2> if the measurement information to be included is based on SS/PBCH block:
- 3> include within *resultsSSB-Indexes* the index associated to the best beam for that SS/PBCH block sorting quantity and the remaining beams whose sorting quantity is above *absThreshSS-BlocksConsolidation* defined in the *VarMeasConfig* for the corresponding *measObject*;
- 3> if *includeBeamMeasurements* is configured, include the SS/PBCH based measurement results for the quantities in *reportQuantityRsIndexes* set to TRUE for each SS/PBCH blockindex; 2> else if the beam measurement information to be included is based on CSI-RS:
- 3> include within *resultsCSI-RS-Indexes* the index associated to the best beam for that CSI-RS sorting quantity and the remaining beams whose sorting quantity is above *absThreshCSI-RS-Consolidation* defined in the *VarMeasConfig* for the corresponding *measObject*;
- 3> if *includeBeamMeasurements* is configured, include the CSI-RS based measurement results for the quantities in *reportQuantityRsIndexes* set to TRUE for each CSI-RS index.

8.1.3.1.13.3 Test description

8.1.3.1.13.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the P Cell and NR Cell 2 is the intra-frequency neighbour cell of NR Cell 1. NR Cell2 has two beams with index#0 and index#1

UE:

- None

Preamble:

- The UE is in 5GS state 1N-A, PDU SESSION ACTIVE according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-1

8.1.3.1.13.3.2 Test procedure sequence

Table 8.1.3.1.13.3.2-1 and Table 8.1.3.1.13.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.3.1.13.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2 Beam Index# 0 | NR Cell 2 Beam Index# 1 | Remark |
|----|------------------|---------|-----------|-------------------------|-------------------------|--|
| T0 | SS/PBCH SSS EPRE | dBm/SCS | -94 | -98 | -98 | |
| T1 | SS/PBCH SSS EPRE | dBm/SCS | -106 | -98 | -98 | $Mn + Ofn + Ocn - Hys > Mp + Ofp + C$
Power level is such that SS/PBCH quality of NR Cell 3, BeamIndex#0 and BeamIndex#1 is above <i>absThreshSS-BlocksConsolidation</i> . |
| T2 | SS/PBCH SSS EPRE | dBm/SCS | -106 | -98 | -106 | Power level is such that SS/PBCH quality of NR Cell 3 is BeamIndex#0 is above <i>absThreshSS-BlocksConsolidation</i> and BeamIndex#1 is below <i>absThreshSS-BlocksConsolidation</i> . |

Table 8.1.3.1.13.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 2 Beam Index# 0 | NR Cell 2 Beam Index# 1 | Remark |
|----|------------------|---------|-----------|-------------------------|-------------------------|--|
| T0 | SS/PBCH SSS EPRE | dBm/SCS | [FFS] | [FFS] | [FFS] | |
| T1 | SS/PBCH SSS EPRE | dBm/SCS | [FFS] | [FFS] | [FFS] | $Mn + Ofn + Ocn - Hys > Mp + Ofp + C$
Power level is such that SS/PBCH quality of NR Cell 3, BeamIndex#0 and BeamIndex#1 is above <i>absThreshSS-BlocksConsolidation</i> . |
| T2 | SS/PBCH SSS EPRE | dBm/SCS | [FFS] | [FFS] | [FFS] | Power level is such that SS/PBCH quality of NR Cell 3 is BeamIndex#0 is above <i>absThreshSS-BlocksConsolidation</i> and BeamIndex#1 is below <i>absThreshSS-BlocksConsolidation</i> . |

Table 8.1.3.1.13.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an NR <i>RRCReconfiguration</i> | <-- | NR RRC: | - | - |

| | | | | | |
|----|--|-----|--|---|---|
| | message including <i>measConfig</i> to setup SS/PBCH block based intra- frequency NR measurement for NR Cell 1 and reporting for event A3. | | <i>RRCReconfiguration</i> | | |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> . | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured [Results] for NR Cell 2 with beam information containing RsIndex[0] and RsIndex[1]? | --> | NR RRC:
<i>MeasurementReport</i> | 1 | P |
| 5 | SS re-adjusts the cell-specific reference signal level according to row "T2". | - | - | - | - |
| 6 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured [Results] for NR Cell 2 with beam information containing RsIndex[0] and excludes RsIndex[1]? | --> | NR RRC:
<i>MeasurementReport</i> | 2 | P |
| 7 | The SS transmits an NR <i>RRCReconfiguration</i> including <i>measConfig</i> to remove SS/PBCH block based intra- frequency NR measurement for NR Cell 1 and reporting for event A3. | <-- | NR RRC:
<i>RRCReconfiguration</i> | - | - |
| 8 | The UE transmits an <i>RRCReconfigurationComplete</i> message | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 9 | The SS transmits an NR <i>RRCReconfiguration</i> including <i>measConfig</i> to setup CSI-RS based intra- frequency NR measurement for NR Cell 1 and reporting for event A3. | <-- | NR RRC:
<i>RRCReconfiguration</i> | - | - |
| 10 | The UE transmits an <i>RRCReconfigurationComplete</i> . | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 11 | SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 12 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured [Results] for NR Cell 2 with beam information containing RsIndex[0] and RsIndex[1]? | --> | NR RRC:
<i>MeasurementReport</i> | 3 | P |
| 13 | SS re-adjusts the cell-specific reference signal level according to row "T2". | - | - | - | - |
| 14 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured [Results] for NR Cell 2 with beam information containing RsIndex[0] and excludes RsIndex[1]? | --> | NR RRC:
<i>MeasurementReport</i> | 4 | P |

8.1.3.1.13.3.3 Specific message contents

FFS

8.1.3.1.14 Void

8.1.3.1.14A Measurement configuration control and reporting / SS/PBCH block based / CSI-RS based inter-frequency measurements / Measurement of Neighbour NR cell

8.1.3.1.14A.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and measurement configured for SS/PBCH measurement reporting of inter-frequency on specified frequency }

ensure that {

when { SS/PBCH block sorting quantity is above absThreshSS-BlocksConsolidation for each beam of Neighbour Cell }

then { UE sends MeasurementReport message containing rsIndexResults with resultsSSB-Indexes }

 }

(2)

with { UE in NR RRC_CONNECTED state and measurement configured for SS/PBCH measurement reporting of inter-frequency on specified frequency }

ensure that {

when { SS/PBCH block sorting quantity is below absThreshSS-BlocksConsolidation for one beam of Neighbour Cell and another beam(s) is above absThreshSS-BlocksConsolidation }

then { UE sends MeasurementReport message containing rsIndexResults with resultsSSB-Indexes includes RsIndex above absThreshSS-BlocksConsolidation and excludes RsIndex below absThreshSS-BlocksConsolidation }

 }

(3)

with { UE in NR RRC_CONNECTED state and measurement configured for CSI-RS measurement reporting of inter frequency on specified frequency }

ensure that {

when { CSI-RS sorting quantity is above absThreshCSI-RS-Consolidation for each beam of Neighbour Cell }

then { UE sends MeasurementReport message containing rsIndexResults with resultsSSB-Indexes }

 }

(4)

with { UE in NR RRC_CONNECTED state and measurement configured for CSI-RS measurement reporting of inter frequency on specified frequency }

ensure that {

when { CSI-RS sorting quantity is below `absThreshCSI-RS-Consolidation` for one beam of Neighbour Cell and another beam(s) is above `absThreshCSI-RS-Consolidation` }

then { UE sends MeasurementReport message containing `rsIndexResults` with `resultsSSB-Indexes` includes `RsIndex` above `absThreshCSI-RS-Consolidation` and excludes `RsIndex` below `absThreshCSI-RS-Consolidation` }

}

8.1.3.1.14A.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clauses 5.5.5.1 and 5.5.5.2]. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.5.5.1]

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingFreqList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;

1> set the *measResultServingCell* within *measResultServingFreqList* to include for each NR serving cell that is configured, if any, the *servFreqId*;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:

2> for each configured serving cell, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:

2>for each serving frequency for which *measObjectId* is referenced in the *measIdList*, other than the frequency corresponding with the *measId* that triggered the measurement reporting:

3> set the *measResultBestNeighCell* within *measResultServingFreqList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell on the concerned serving frequency with the highest measured RSRP if RSRP measurement results are available for cells on this frequency, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells on this frequency, otherwise with the highest measured SINR;

3> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:

4> for each best non-serving cell included in the measurement report:

5>include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;

1> if there is at least one applicable neighbouring cell to report:

2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

3> if the *reportType* is set to *eventTriggered*:

4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

3> else:

4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;

3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

3> if the *reportType* is set to *eventTriggered*:

4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

5> if the *measObject* associated with this *measId* concerns NR:

6> if *rsType* in the associated *reportConfig* is set to *ssb*:

7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first:

8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;

6> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:

7> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first:

8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are, include beam measurement information as described in 5.5.5.2;

[TS 38.331, clause 5.5.5.1]

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

1> else:

2> if the *reportType* is set to *periodical*:

3> remove the entry within the *VarMeasReportList* for this *measId*;

3> remove this *measId* from the *measIdList* within *VarMeasConfig*;

1> if the UE is configured with EN-DC:

2> if SRB3 is configured:

3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;

2>else:

3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

1> else:

2>submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

[TS 38.331, clause 5.5.5.2]

For beam measurement information to be included in a measurement report the UE shall:

1> if *reportType* is set to *eventTriggered*:

2> consider the trigger quantity as the sorting quantity;

1> if *reportType* is set to *periodical*:

2> if a single reporting quantity is set to TRUE in *reportQuantityRsIndexes*;

3> consider the configured single quantity as the sorting quantity;

2> else:

3> if *rsrp* is set to TRUE;

4> consider RSRP as the sorting quantity;

3> else:

4> consider RSRQ as the sorting quantity;

1> set *rsIndexResults* to include up to *maxNrofRsIndexesToReportSS/PBCH* block indexes or CSI-RS indexes in order of decreasing sorting quantity as follows:

2> if the measurement information to be included is based on SS/PBCH block:

3> include within *resultsSSB-Indexes* the index associated to the best beam for that SS/PBCH block sorting quantity and the remaining beams whose sorting quantity is above *absThreshSS-BlocksConsolidation* defined in the *VarMeasConfig* for the corresponding *measObject*;

3> if *includeBeamMeasurements* is configured, include the SS/PBCH based measurement results for the quantities in *reportQuantityRsIndexes* set to TRUE for each SS/PBCH blockindex;2> else if the beam measurement information to be included is based on CSI-RS:

3> include within *resultsCSI-RS-Indexes* the index associated to the best beam for that CSI-RS sorting quantity and the remaining beams whose sorting quantity is above *absThreshCSI-RS-Consolidation* defined in the *VarMeasConfig* for the corresponding *measObject*;

3> if *includeBeamMeasurements* is configured, include the CSI-RS based measurement results for the quantities in *reportQuantityRsIndexes* set to TRUE for each CSI-RS index.

8.1.3.1.14A.3 Test description

8.1.3.1.14A.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the P Cell and NR Cell 3 is the inter-frequency neighbour cell of NR Cell 1. NR Cell 3 has two beams with index#0 and index#1

UE:

- None

Preamble:

- The UE is in 5GS state 1N-A, PDU SESSION ACTIVE according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-1

8.1.3.1.14A.3.2 Test procedure sequence

Table 8.1.3.1.14A.3.2-1 and Table 8.1.3.1.14A.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 3 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.3.1.14A.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 3 Beam Index# 0 | NR Cell 3 Beam Index# 1 | Remark |
|----|------------------|---------|-----------|-------------------------|-------------------------|--|
| T0 | SS/PBCH SSS EPRE | dBm/SCS | -94 | -98 | -98 | |
| T1 | SS/PBCH SSS EPRE | dBm/SCS | -106 | -98 | -98 | $Mn + Ofn + Ocn - Hys > Mp + Ofp + C$
Power level is such that SS/PBCH quality of NR Cell 3, BeamIndex#0 and BeamIndex#1 is above <i>absThreshSS-BlocksConsolidation</i> . |
| T2 | SS/PBCH SSS EPRE | dBm/SCS | -106 | -98 | -106 | Power level is such that SS/PBCH quality of NR Cell 3 is BeamIndex#0 is above <i>absThreshSS-BlocksConsolidation</i> and BeamIndex#1 is below <i>absThreshSS-BlocksConsolidation</i> . |

Table 8.1.3.1.14A.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 3 Beam Index# 0 | NR Cell 3 Beam Index# 1 | Remark |
|----|------------------|---------|-----------|-------------------------|-------------------------|--|
| T0 | SS/PBCH SSS EPRE | dBm/SCS | [FFS] | [FFS] | [FFS] | |
| T1 | SS/PBCH SSS EPRE | dBm/SCS | [FFS] | [FFS] | [FFS] | $Mn + Ofn + Ocn - Hys > Mp + Ofp + C$
Power level is such that SS/PBCH quality of NR Cell 3, BeamIndex#0 and BeamIndex#1 is above <i>absThreshSS-BlocksConsolidation</i> . |
| T2 | SS/PBCH SSS EPRE | dBm/SCS | [FFS] | [FFS] | [FFS] | Power level is such that SS/PBCH quality of NR Cell 3 is BeamIndex#0 is above <i>absThreshSS-BlocksConsolidation</i> and BeamIndex#1 is below <i>absThreshSS-BlocksConsolidation</i> . |

Table 8.1.3.1.14A.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an NR <i>RRCReconfiguration</i> message including <i>measConfig</i> to setup SS/PBCH block based intra- frequency NR measurement for NR Cell 1 and reporting for event A3. | <-- | NR RRC:
<i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> . | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured [Results] for NR Cell 3 with beam information containing RsIndex[0] and RsIndex[1]? | --> | NR RRC:
<i>MeasurementReport</i> | 1 | P |
| 5 | SS re-adjusts the cell-specific reference signal level according to row "T2". | - | - | - | - |
| 6 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured [Results] for NR Cell 3 with beam information containing RsIndex[0] and excludes RsIndex[1]? | --> | NR RRC:
<i>MeasurementReport</i> | 2 | P |
| 7 | The SS transmits an NR <i>RRCReconfiguration</i> including <i>measConfig</i> to remove SS/PBCH block based intra- frequency NR measurement for NR Cell 1 and reporting for event A3. | <-- | NR RRC:
<i>RRCReconfiguration</i> | - | - |
| 8 | The UE transmits an <i>RRCReconfigurationComplete</i> message | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 9 | The SS transmits an NR <i>RRCReconfiguration</i> including <i>measConfig</i> to setup CSI-RS based inter-frequency NR measurement for NR Cell 1 and reporting for event A3. | <-- | NR RRC:
<i>RRCReconfiguration</i> | - | - |
| 10 | The UE transmits an <i>RRCReconfigurationComplete</i> . | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 11 | SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 12 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured [Results] for NR Cell 3 with beam information containing RsIndex[0] and RsIndex[1]? | --> | NR RRC:
<i>MeasurementReport</i> | 3 | P |

| | | | | | |
|----|--|-----|-------------------------------------|---|---|
| 13 | SS re-adjusts the cell-specific reference signal level according to row "T2". | - | - | - | - |
| 14 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured [Results] for NR Cell 3 with beam information containing RsIndex[0] and excludes RsIndex[1]? | --> | NR RRC:
<i>MeasurementReport</i> | 4 | P |

8.1.3.1.14A.3.3 Specific message contents

FFS

8.1.3.1.15 Void

8.1.3.1.15A Measurement configuration control and reporting / Intra NR measurements / Blacklisting

8.1.3.1.15A.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state **and** measurement configured for event A3 reporting }

ensure that {

when { Blacklisted neighbour cell satisfies entry condition for event A3 }

then { It is not considered in event evaluation and UE does not send *MeasurementReport* message }

}

(2)

with { UE in NR RRC_CONNECTED state **and** measurement reporting triggered by event A3 is ongoing and no neighbour cells are blacklisted }

ensure that {

when { Neighbour cells satisfies entry condition for event A3 }

then { Neighbour cells are considered in measurement reporting }

}

8.1.3.1.15A.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.5.1, 5.5.4.1, and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.5.1]

The network may configure an RRC_CONNECTED UE to perform measurements and report them in accordance with the measurement configuration. The measurement configuration is provided by means of dedicated signalling i.e. using the *RRCReconfiguration*

...

- For intra-frequency and inter-frequency measurements a measurement object indicates the frequency/time location and subcarrier spacing of reference signals to be measured. Associated with this measurement object, the network may configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not applicable in event evaluation or measurement reporting. Whitelisted cells are the only ones applicable in event evaluation or measurement reporting.

...

[TS 38.331, clause 5.5.4.1]

The UE shall:

1> for each measId included in the measIdList within VarMeasConfig:

...

2> if the corresponding reportConfig includes a reportType set to eventTriggered or periodical;

3> if the corresponding measObject concerns NR;

3> if the corresponding measObject concerns EUTRA:

4> consider any neighbouring cell detected based on parameters in the associated measObjectNR to be applicable when the concerned cell is not included in the blackCellsToAddModList defined within the VarMeasConfig for this measId;

...

2> if the reportType is set to eventTriggered and if the entry condition applicable for this event, i.e. the event corresponding with the eventId of the corresponding reportConfig within VarMeasConfig, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during timeToTrigger defined for this event within the VarMeasConfig, while the VarMeasReportList does not include a measurement reporting entry for this measId (a first cell triggers the event):

3> include a measurement reporting entry within the VarMeasReportList for this measId;

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> include the concerned cell(s) in the cellsTriggeredList defined within the VarMeasReportList for this measId;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the reportType is set to eventTriggered and if the entry condition applicable for this event, i.e. the event corresponding with the eventId of the corresponding reportConfig within VarMeasConfig, is fulfilled for one or more applicable cells not included in the cellsTriggeredList for all measurements after layer 3 filtering taken during timeToTrigger defined for this event within the VarMeasConfig (a subsequent cell triggers the event):

3> set the numberOfReportsSent defined within the VarMeasReportList for this measId to 0;

3> include the concerned cell(s) in the cellsTriggeredList defined within the VarMeasReportList for this measId;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the reportType is set to eventTriggered and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the cellsTriggeredList defined within the VarMeasReportList for this measId for all measurements after layer 3 filtering taken during timeToTrigger defined within the VarMeasConfig for this event:

3> remove the concerned cell(s) in the cellsTriggeredList defined within the VarMeasReportList for this measId;

3> if reportOnLeave is set to TRUE for the corresponding reporting configuration:

- 4> initiate the measurement reporting procedure, as specified in 5.5.5;
- 3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:
- 4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 4> stop the periodical reporting timer for this *measId*, if running;
- ...

[TS 38.331, clause 5.5.5.1]

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
 - 2> for each serving cell *measObjectId* referenced in the *measIdList*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:
 - 3> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured SINR;
- 3> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 4> for each best non-serving cell included in the measurement report:
 - 5> include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if there is at least one applicable neighbouring cell to report:
 - 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

- 4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
- 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
- 3> if the *reportType* is set to *eventTriggered*:
 - 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
 - 5> if the *measObject* associated with this *measId* concerns NR:
 - 6> if *rsType* in the associated *reportConfig* is set to *ssb*:
 - 7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
 - 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
 - 6> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:
 - 7> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
 - 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are, include beam measurement information as described in 5.5.5.2;
 - 5> if the *measObject* associated with this *measId* concerns E-UTRA:
 - 6> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfigInterRAT* in order of decreasing E-UTRA trigger quantity, i.e. the best cell is included first;
 - 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
 - 1> stop the periodical reporting timer, if running;
 - 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
 - 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
 - 1> else:
 - 2> if the *reportType* is set to *periodical*:
 - 3> remove the entry within the *VarMeasReportList* for this *measId*;
 - 3> remove this *measId* from the *measIdList* within *VarMeasConfig*;
 - 1> if the UE is configured with EN-DC:
 - 2> if SRB3 is configured:
 - 3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;
 - 2>else:
 - 3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].
 - 1> else:
 - 2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

[TS 38.331, clause 5.5.2.5]

The UE shall:

- 1> for each *measObjectId* included in the received *measObjectToAddModList*:
- 2> if an entry with the matching *measObjectId* exists in the *measObjectList* within the *VarMeasConfig*, for this entry:
 - 3> reconfigure the entry with the value received for this *measObject*, except for the fields *cellsToAddModList*, *blackCellsToAddModList*, *whiteCellsToAddModList*, *cellsToRemoveList*, *blackCellsToRemoveList* and *whiteCellsToRemoveList*;
 - 3> if the received *measObject* includes the *cellsToRemoveList*:
 - 4> for each *physCellId* included in the *cellsToRemoveList*:
 - 5> remove the entry with the matching *physCellId* from the *cellsToAddModList*;
 - 3> if the received *measObject* includes the *cellsToAddModList*:
 - 4> for each *physCellId* value included in the *cellsToAddModList*:
 - 5> if an entry with the matching *physCellId* exists in the *cellsToAddModList*:
 - 6> replace the entry with the value received for this *physCellId*;
 - 5> else:
 - 6> add a new entry for the received *physCellId* to the *cellsToAddModList*;
 - 3> if the received *measObject* includes the *blackCellsToRemoveList*:
 - 4> for each *pci-RangeIndex* included in the *blackCellsToRemoveList*:
 - 5> remove the entry with the matching *pci-RangeIndex* from the *blackCellsToAddModList*;
 - NOTE: For each *pci-RangeIndex* included in the *blackCellsToRemoveList* that concerns overlapping ranges of cells, a cell is removed from the black list of cells only if all cell indexes containing it are removed.
 - 3> if the received *measObject* includes the *blackCellsToAddModList*:
 - 4> for each *pci-RangeIndex* included in the *blackCellsToAddModList*:
 - 5> if an entry with the matching *pci-RangeIndex* is included in the *blackCellsToAddModList*:
 - 6> replace the entry with the value received for this *pci-RangeIndex*;
 - 5> else:
 - 6> add a new entry for the received *pci-RangeIndex* to the *blackCellsToAddModList*;
 - 3> for each *measId* associated with this *measObjectId* in the *measIdList* within the *VarMeasConfig*, if any:
 - 4> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;
 - 4> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;
 - 2> else:
 - 3> add a new entry for the received *measObject* to the *measObjectList* within *VarMeasConfig*.

[TS 38.331, clause 5.5.4.4]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

1> use the SpCell for *Mp*, *Ofp* and *Ocp*.

NOTE The cell(s) that triggers the event has reference signals indicated in the *measObjectNR* associated to this event which may be different from the NR SpCell *measObjectNR*.

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$$

Inequality A3-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the reference signal of the neighbour cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Mp is the measurement result of the SpCell, not taking into account any offsets.

Ofp is the measurement object specific offset of the SpCell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the SpCell).

Ocp is the cell specific offset of the SpCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the SpCell), and is set to zero if not configured for the SpCell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigNR* for this event).

Mn*, *Mp are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn*, *Ocn*, *Ofp*, *Ocp*, *Hys*, *Off are expressed in dB.

8.1.3.1.15.3A Test description

8.1.3.1.15.3A.1 Pre-test conditions

System Simulator:

- NR Cell 1, Cell 2 and Cell 4:
- NR Cell 1 is the serving cell
- NR Cell 2 and Cell 4 are intra-frequency neighbour cells
- System information combination NR-2 as defined in TS 38.508-1[4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None

Preamble:

- The UE is in state NR RRC_CONNECTED in Established (state 3) according to [18].

8.1.3.1.15A.3.2 Test procedure sequence

Table 8.1.3.1.15A.3.2-1 illustrates the downlink power levels to be applied for NR Cell 1, Cell 2 and Cell 4 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.3.1.15A.3.2-1 : Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2
(DL only) | NR Cell 4
(DL only) | Remark |
|----|---------------------|-------------|-----------|------------------------|------------------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -97 | -97 | Power levels are such that leaving condition for event A3 is satisfied for all neighbour NR cells:
$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -79 | -97 | Power levels are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell 2 [<i>measId 1</i>]
$Mn + Ofn + Ocn - Hys > Ms + OfS + Ocs + Off$ |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -79 | -79 | Power levels are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell 4 [<i>measId 2</i>]
$Mn + Ofn + Ocn - Hys > Ms + OfS + Ocs + Off$ |

Table 8.1.3.1.15A.3.2-1A : Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 2
(DL only) | NR Cell 4
(DL only) | Remark |
|----|---------------------|-------------|-----------|------------------------|------------------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | FSS | FSS | FSS | Power levels are such that leaving condition for event A3 is satisfied for all neighbour NR cells:
$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | FSS | FSS | FSS | Power levels are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell 2 [<i>measId 1</i>]
$Mn + Ofn + Ocn - Hys > Ms + OfS + Ocs + Off$ |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | FSS | FSS | FSS | Power levels are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell 4 [<i>measId 2</i>]
$Mn + Ofn + Ocn - Hys > Ms + OfS + Ocs + Off$ |

Table 8.1.3.1.15A.3.2-2 : Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|-----------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | SS transmits an <i>RRCReconfiguration</i> message including <i>measConfig</i> to setup intraNR | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |

| | | | | | |
|----------|--|-----|---|---|---|
| | measurement and reporting for event A3. | | | | |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal levels according to row "T1" in table 8.1.3.1.15A.3.2.-1. | - | - | - | - |
| 4 | Check: does the UE transmit a <i>MeasurementReport</i> messages within the next 10s? | - | NR RRC: <i>MeasurementReport</i> | 1 | F |
| 5 | SS re-adjusts the cell-specific reference signal levels according to row "T2" in table 8.1.3.1.15A.3.2.-1. | - | - | - | - |
| 6 | Check: does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured RSRP values for Cell 1 and Cell 4 without Cell 2 results? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| 7 | SS transmits an <i>RRCReconfiguration</i> message including <i>measConfig</i> to remove Cell 2 from the blacklisted cell list. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 8 | The UE transmits an <i>RRCReconfigurationComplete</i> message | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| - | EXCEPTION: Steps 8Aa1 to 8Ab1 describe a transaction that depends on the UE behaviour; the "lower case letter" identifies a step sequence that takes place if a specific behaviour happens. | - | - | - | - |
| 8A
a1 | IF the UE detects event A3 for Cell 4 before event A3 for Cell 2 THEN the UE may transmit <i>MeasurementReport</i> message to report event A3 with the measured RSRP values for Cell 1 and Cell 4. | --> | NR RRC: <i>MeasurementReport</i> | - | - |
| 8A
b1 | IF the UE detects event A3 for Cell 2 before event A3 for Cell 4 THEN the UE may transmit <i>MeasurementReport</i> message to report event A3 with the measured RSRP values for Cell 1 and Cell 2. | --> | NR RRC: <i>MeasurementReport</i> | - | - |
| 9 | Check: does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured RSRP values for Cell 1, Cell 2 and Cell 4? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |

8.1.3.1.15A.3.3 Specific message contents

Table 8.1.3.1.15A.3.3-1: *RRCReconfiguration* (step 1 and Step 7 Table 8.1.3.1.15A.3.2-2)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |

| | | | |
|-----------------------------------|---------------------------|-------------------------|--|
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.15A.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.15A.3.3-2: *MeasConfig* (Table 8.1.3.1.15A.3.3-1)

| Derivation path: 38.508 clause 4.6.3 table 4.6.3-69 | | | |
|---|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | MeasObjectId | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(2)
Same as TS 38.508-1 Table 4.6.3-142 except for reportAmount set to 'r1' | a3-Offset value set to -1 dB (2*0.5 dB) | EVENT_A3 |
| } | | | |
| } | | | |
| measIdToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | [1 entries] | | |

| | | | |
|-------------------|---|--|--|
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.15A.3.3-3: MeasObjectNR (Table 8.1.3.1.15A.3.3-2)

| Derivation path: 38.331 clause 4.3.2 | | | |
|--|------------------------------------|------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| blackCellsToAddModList ::= SEQUENCE (SIZE (1.. maxNrofPCI-Ranges)) OF PCI-RangeElement { | 1 entry | Add Cell 2 | |
| PCI-RangeIndex [1] | 1 | | |
| pci-Range[1] SEQUENCE { | | | |
| start | physicalCellIdentity-Cell2 | | |
| range | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.15A.3.3-4: *MeasurementReport* (step 6, Table 8.1.3.1.15A.3.2-2)

| Derivation Path: TS 38.508-1 [4] clause 4.6.1 table 4.6.1-5A | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 1 | | |

| | | | |
|---|----------------------------|---------------|-----------------|
| measResultServingMOList ::= SEQUENCE (SIZE (1.. maxNrofServingCells)) OF SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex - Cell1 | | |
| measResultServingCell ::= SEQUENCE { | | Report Cell 1 | |
| physCellId | physicalCellIdentity-Cell1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | A3 |
| measResultListNR ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Report Cell 4 | |
| physCellId [1] | physicalCellIdentity-Cell4 | | |
| measResult [1] SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.15A.3.3-5: MeasObjectNR (Step 7 Table 8.1.3.1.15A.3.3-2)

| Derivation path: 38.331 clause 4.3.2 | | | |
|--|------------------------------------|---------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| blackCellsToRemoveList ::= SEQUENCE (SIZE (1.. maxNrofPCI-Ranges)) OF PCI-RangeElement { | 1 entry | Remove Cell 2 | |
| PCI-RangeIndex [1] | physicalCellIdentity-Cell2 | | |
| } | | | |

Table 8.1.3.1.15A.3.3-6: MeasurementReport (step 8Aa1, Table 8.1.3.1.15A.3.2-2)

| Derivation Path: TS 38.508-1 [4] clause 4.6.1 table 4.6.1-5A | | | |
|---|----------------------------|---------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList ::= SEQUENCE (SIZE (1.. maxNrofServingCells)) OF SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex - Cell1 | | |
| measResultServingCell ::= SEQUENCE { | | Report Cell 1 | |
| physCellId | physicalCellIdentity-Cell1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |

| | | | |
|--|--------------------------------|---------------|---------------------|
| | | | |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList ::= SEQUENCE
(SIZE (1.. maxNrofServingCells)) OF SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex - Cell1 | | |
| measResultServingCell ::= SEQUENCE { | | Report Cell 1 | |
| physCellId | physicalCellIdentity-
Cell1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SIN
R_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR ::= SEQUENCE (SIZE
(1..maxCellReport)) OF SEQUENCE { | | Report Cell 2 | |
| physCellId[1] | physicalCellIdentity-
Cell2 | | |
| measResult [1] SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SIN |

| | | | |
|---|--|--|--------|
| | | | R_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.15A.3.3-8: *MeasurementReport* (step 9, Table 8.1.3.1.15A.3.2-2)

| Derivation Path: TS 38.508-1 [4] clause 4.6.1 table 4.6.1-5A | | | |
|--|--------------------------------|---------------|---------------------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList ::= SEQUENCE
(SIZE (1.. maxNrofServingCells)) OF SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex - Cell1 | | |
| measResultServingCell ::= SEQUENCE { | | Report Cell 1 | |
| physCellId | physicalCellIdentity-
Cell1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SIN
R_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|----------------------------|--------------------------|-----------------|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR ::= SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Report Cell 2 and Cell 4 | |
| physCellId [1] | physicalCellIdentity-Cell2 | | |
| measResult [1] SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| } | | | |
| } | | | |
| } | | | |
| physCellId[2] | physicalCellIdentity-Cell4 | | |
| measResult [2] SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

8.1.3.1.16 Measurement configuration control and reporting / Intra NR measurements / Whitelisting

8.1.3.1.16.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and measurement configured for event A3 reporting }

ensure that {

when { Neighbour cell not listed as a white cell satisfies entry condition for event A3 }

then { It is not considered in event evaluation and UE does not send MeasurementReport message }

}

(2)

with { UE in NR RRC_CONNECTED state and measurement reporting triggered by event A3 is ongoing and all of the neighbour cells are whitelisted }

ensure that {

when { Neighbour cells satisfies entry condition for event A3 }

then { Neighbour cells are considered in measurement reporting }

}

8.1.3.1.16.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2.1, 5.5.2.9, 5.5.4.1, 5.5.4.6 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

...

[TS 38.331, clause 5.5.4.1]

If AS security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*:

3> if the corresponding *measObject* concerns NR:

...

4> if the *eventA3* or *eventA5* is configured in the corresponding *reportConfig*:

5> if a serving cell is associated with a *measObjectNR* and neighbours are associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> else if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:
- 3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- ...
- 3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:
- 4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 4> stop the periodical reporting timer for this *measId*, if running;
- ...
- 2> upon expiry of the periodical reporting timer for this *measId*:
- 3> initiate the measurement reporting procedure, as specified in 5.5.5.
- ...

[TS 38.331, clause 5.5.4.4]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;
- 1> use the SpCell for *Mp*, *Ofp* and *Ocp*.

NOTE The cell(s) that triggers the event has reference signals indicated in the *measObjectNR* associated to this event which may be different from the NR SpCell *measObjectNR*.

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$$

Inequality A3-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the reference signal of the neighbour cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Mp is the measurement result of the SpCell, not taking into account any offsets.

Ofp is the measurement object specific offset of the SpCell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the SpCell).

Ocp is the cell specific offset of the SpCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the SpCell), and is set to zero if not configured for the SpCell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigNR* for this event).

Mn, *Mp* are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, *Ocn*, *Ofp*, *Ocp*, *Hys*, *Off* are expressed in dB.

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful AS security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include, for each NR serving cell that is configured with *servingCellMO*, RSRP, RSRQ and the available SINR, derived based on the *rsType* if indicated in the associated *reportConfig*, otherwise based on SSB if available, otherwise based on CSI-RS;
- 1> set the *servCellId* within *measResultServingMOList* to include each NR serving cell that is configured with *servingCellMO*, if any;
- ...
- 1> if there is at least one applicable neighbouring cell to report:
- 2> if the *reportType* is set to *eventTriggered* or *periodical*:
- 3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
- 4> if the *reportType* is set to *eventTriggered*:
- 5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
- ...
- 4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
- 4> if the *reportType* is set to *eventTriggered* or *periodical*:
- 5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 6> if the *measObject* associated with this *measId* concerns NR:
- 7> if *rsType* in the associated *reportConfig* is set to *ssb*:
- 8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;
- ...
- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

...

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.16.3 Test description

8.1.3.1.16.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, NR Cell 2 and NR Cell 4 are the intra-frequency neighbour cells of NR Cell 1.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.1.16.3.2 Test procedure sequence

Table 8.1.3.1.16.3.2-1 and 8.1.3.1.16.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, NR Cell 2 and NR Cell 4 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" is applied at the point indicated in the Main behaviour description in Table 8.1.3.1.16.3.2-3.

Table 8.1.3.1.16.3.2-1: Time instances of cell power level and parameter changes for NR Cell 1, 2, 4 in FR1

| | Parameter | Unit | NR
Cell 1 | NR
Cell 2 | NR
Cell 4 | Remark |
|----|---------------------|-------------|--------------|--------------|--------------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -91 | -91 | Power levels are such that entry condition for event A3 (measId 1) is not satisfied:
$Mn + Ofn + Ocn - Hys \leq Mp + Ofp + Ocp + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -78 | -91 | Power levels are such that entry condition for event A3 (measId 1) is satisfied:
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |

Table 8.1.3.1.16.3.2-2: Time instances of cell power level and parameter changes for NR Cell 1, 2, 4 in FR2

| | Parameter | Unit | NR
Cell 1 | NR
Cell 2 | NR
Cell 4 | Remark |
|----|---------------------|-------------|--------------|--------------|--------------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | FFS | Power levels are such that entry condition for event A3 (measId 1) is not satisfied:

$Mn + Ofn + Ocn - Hys \leq Mp + Ofp + Ocp + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | FFS | Power levels are such that entry condition for event A3 (measId 1) is satisfied:

$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |

Table 8.1.3.1.16.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup NR measurement and reporting for intra-frequency event A3 (<i>measId</i> 1) | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.1.3.1.16.3.2-1/2. | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MeasurementReport</i> message within the next 10s? | - | - | 1 | F |
| 5 | The SS transmits an <i>RRCReconfiguration</i> message including both NR Cell 2 and NR Cell 4 in <i>whiteCellsToAddModList</i> | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 6 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 7 | Wait and ignore <i>MeasurementReport</i> messages for 10s to allow UE measurement | - | - | - | - |
| 8 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 (<i>measId</i> 1) with the measured RSRP value for NR Cell 2? | --> | <i>MeasurementReport</i> | 2 | P |

8.1.3.1.16.3.3 Specific message contents

Table 8.1.3.1.16.3.3-1: *RRCReconfiguration* (step 1 and 5, Table 8.1.3.1.16.3.2-3)

| |
|--|
| Derivation Path: 38.508-1 [4] Table 4.6.1-13 |
|--|

| Information Element | Value/remark | Comment | Condition |
|-----------------------------------|---------------------------|------------------------|-----------|
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.16.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.16.3.3-2: *MeasConfig* (Table 8.1.3.1.16.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|-------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | | Step 1 |
| | MeasObjectNR-whitelist | | Step 5 |
| } | | | |
| } | | | |
| reportConfigToAddModList | Not present | | Step 5 |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | Step 1 |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA3 | | |
| } | | | |

| | | | |
|---|-------------|--|--------|
| } | | | |
| measIdToAddModList | Not present | | Step 5 |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | Step 1 |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.1.3.1.16.3.3-3: *MeasObjectNR-f1* (Table 8.1.3.1.16.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.16.3.3-4: *MeasObjectNR-whitelist* (Table 8.1.3.1.16.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| whiteCellsToAddModList SEQUENCE (SIZE (1..maxNrofPCI-Ranges)) OF SEQUENCE { | 2 entries | | |
| pci-RangeIndex[1] | 1 | | |
| pci-Range[1] SEQUENCE { | | | |
| start | PhyCellId of NR Cell 2 | | |
| range | n4 | | |
| } | | | |
| } | | | |

| | | | |
|-------------------------|------------------------|--|--|
| pci-RangeIndex[2] | 2 | | |
| pci-Range[2] SEQUENCE { | | | |
| start | PhyCellId of NR Cell 4 | | |
| range | n4 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.16.3.3-5: *ReportConfigNR-EventA3* (Table 8.1.3.1.16.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | 0 | 0dB | FR1 |
| | FFS | | FR2 |
| } | | | |
| hysteresis | 4 | 2 dB | |
| useWhiteCellList | TRUE | | |
| } | | | |
| } | | | |
| reportAmount | infinity | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.16.3.3-6: *MeasurementReport* (step 8, Table 8.1.3.1.16.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|----------------------------|----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | Measurement report for NR Cell 1 | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Measurement report for NR Cell 2 | |
| physCellId | PhysCellId of NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.1.17 NR CA / Measurement configuration control and reporting / Intra NR measurements / Event A6

8.1.3.1.17.1 NR CA / Measurement configuration control and reporting / Intra NR measurements / Event A6 / Intra-band Contiguous CA

8.1.3.1.17.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and measurements configured for event A6 }

ensure that {

when { Entry condition for event A6 is not met }

then { UE does not send *MeasurementReport* }

}

(2)

with { UE in NR RRC_CONNECTED state and measurements configured for event A6 }

ensure that {

when { Intra-frequency neighbour becomes offset better than SCell }

then { UE sends *MeasurementReport* with correct measId for event A6 }

}

(3)

with { UE in NR RRC_CONNECTED state and measurements configured for event A6 }

ensure that {

when { UE receives a *RRCReconfiguration* message containing *sCellToReleaseList* with a *sCellIndex* equal to one of the current UE SCell configuration }

then { UE remove measId associated with event A6 and stops sending *MeasurementReport* message }

}

8.1.3.1.17.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.3.5.5.9, 5.5.2.1, 5.5.4.1, 5.5.4.7 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.3.5.5.9]

The UE shall:

1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (SCell addition):

2> add the SCell, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;

2> configure lower layers to consider the SCell to be in deactivated state;

Editor's Note: FFS Check automatic measurement handling for SCells.

2> for each *measId* included in the *measIdList* within *VarMeasConfig*:

3> if SCells are not applicable for the associated measurement; and

3> if the concerned SCell is included in *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*:

1. 4> remove the concerned SCell from *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (SCell modification):

2> modify the SCell configuration in accordance with the *sCellConfigDedicated*.

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToRemoveList*:

2> perform the measurement identity removal procedure as specified in 5.5.2.2;

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

...

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;

3> if the corresponding *measObject* concerns NR;

4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*;

...

4> else:

5> for events involving a serving cell associated with a *measObjectNR* and neighbours associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:
- 3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:
- 4> initiate the measurement reporting procedure, as specified in 5.5.5;
- 3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:
- 4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 4> stop the periodical reporting timer for this *measId*, if running;
- ...
- 2> upon expiry of the periodical reporting timer for this *measId*:
- 3> initiate the measurement reporting procedure, as specified in 5.5.5.

...

[TS 38.331, clause 5.5.4.7]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when condition A6-1, as specified below, is fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition A6-2, as specified below, is fulfilled;
- 1> for this measurement, consider the (secondary) cell corresponding to the *measObjectNR* associated to this event to be the serving cell.

NOTE: The reference signal(s) of the neighbour(s) and the reference signal(s) of the SCell are both indicated in the associated *measObjectNR*.

Inequality A6-1 (Entering condition)

$$Mn + Ocn - Hys > Ms + Ocs + Off$$

Inequality A6-2 (Leaving condition)

$$Mn + Ocn + Hys < Ms + Ocs + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within the associated *measObjectNR*), and set to zero if not configured for the neighbour cell.

Ms is the measurement result of the serving cell, not taking into account any offsets.

Ocs is the cell specific offset of the serving cell (i.e. *cellIndividualOffset* as defined within the associated *measObjectNR*), and is set to zero if not configured for the serving cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a6-Offset* as defined within *reportConfigNR* for this event).

Mn, **Ms** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ocn, Ocs, Hys, Off are expressed in dB.

[TS 38.331, clause 5.5.5]



Figure 5.5.5-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;
- ...
- 1> if there is at least one applicable neighbouring cell to report:
- 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
- 3> if the *reportType* is set to *eventTriggered*:
 - 2. 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3. ...
- 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
- 3> if the *reportType* is set to *eventTriggered*:
 - 4. 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 5> if the *measObject* associated with this *measId* concerns NR:
- 6> if *rsType* in the associated *reportConfig* is set to *ssb*:
- 7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
- ...
- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

...

1> if the UE is configured with EN-DC:

...

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.17.1.3 Test description

8.1.3.1.17.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, NR Cell 3 is the SCell to be added, and NR Cell 12 is the intra-frequency neighbour cell of NR Cell 3.
- NR Cell 3 is an Inactive SCell according to TS 38.508-1 [4] clause 6.3.1.
- System information combination NR-5 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.1.17.1.3.2 Test procedure sequence

Table 8.1.3.1.17.1.3.2-1 and 8.1.3.1.17.1.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, NR Cell 3 and NR Cell 12 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" is applied at the point indicated in the Main behaviour description in Table 8.1.3.1.17.1.3.2-3.

Table 8.1.3.1.17.1.3.2-1: Time instances of cell power level and parameter changes in FR1

| | Parameter | Unit | NR
Cell 1 | NR
Cell 3 | NR
Cell 12 | Remark |
|----|---------------------|---------|--------------|--------------|---------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/SCS | -82 | -88 | -94 | Power levels are such that entry condition for event A6 (measId 1) is not satisfied:
$Mn + Ocn + Hys < Ms + Ocs + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | -82 | -88 | -78 | Power levels are such that entry condition for event A6 (measId 1) is satisfied:
$Mn + Ocn - Hys > Ms + Ocs + Off$ |

Table 8.1.3.1.17.1.3.2-2: Time instances of cell power level and parameter changes in FR2

| | Parameter | Unit | NR | NR | NR | Remark |
|--|-----------|------|----|----|----|--------|
|--|-----------|------|----|----|----|--------|

| | | | Cell 1 | Cell 3 | Cell 12 | |
|----|---------------------|---------|--------|--------|---------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/SCS | FFS | FFS | FFS | Power levels are such that entry condition for event A6 (measId 1) is not satisfied:
$Mn + Ocn + Hys < Ms + Ocs + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | FFS | FFS | FFS | Power levels are such that entry condition for event A6 (measId 1) is satisfied:
$Mn + Ocn - Hys > Ms + Ocs + Off$ |

Table 8.1.3.1.17.1.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>sCellToAddModList</i> with NR Cell 3 as SCell addition. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 3 | The SS transmits an <i>RRCReconfiguration</i> message including <i>measConfig</i> to setup intra NR measurement and reporting for event A6. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 4 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 5 | Check: Does the UE transmit a <i>MeasurementReport</i> message within the next 10s? | --> | NR RRC: <i>MeasurementReport</i> | 1 | F |
| 6 | The SS re-adjusts the SS/PBCH EPRE level according to row "T1" in table 8.1.3.1.17.1.3.2-1/2. | - | - | - | - |
| 7 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A6 with the measured RSRP value for NR Cell 12? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |
| 8 | The SS transmits an <i>RRCReconfiguration</i> message including <i>sCellToReleaseList</i> with NR Cell 3 as SCell release. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 9 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 10 | Check: Does the UE attempt to transmit an uplink message for the next 15s? | - | - | 3 | F |

8.1.3.1.17.1.3.3 Specific message contents

Table 8.1.3.1.17.1.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.1.17.1.3.2-3)

| |
|---|
| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition SCell_add |
|---|

Table 8.1.3.1.17.1.3.3-2: Void

Table 8.1.3.1.17.1.3.3-3: Void

Table 8.1.3.1.17.1.3.3-4: *RRCReconfiguration* (step 3, Table 8.1.3.1.17.1.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|---------------------------|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.17.1.3.3-5 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.17.1.3.3-5: *MeasConfig* (Table 8.1.3.1.17.1.3.3-4)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--|--------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | MeasObjectIdN R-f1 | |
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 1 | | |

| | | | |
|--|--|--------------------------|--|
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| measObjectId[2] | 2 | MeasObjectIdNR-f2 | |
| measObject[2] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA6 | Table 8.1.3.1.17.1.3.3-6 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.1.3.1.17.1.3.3-6: *ReportConfigNR-EventA6* (Table 8.1.3.1.17.1.3.3-5)

| Derivation Path: 38.508-1 [4] Table 4.6.3-142 with condition EVENT_A6 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA6 SEQUENCE { | | | |

| | | | |
|-------------------------------|---------|------|--|
| a6-Offset CHOICE { | | | |
| rsrp | 0 | | |
| } | | | |
| hysteresis | 4 | 2 dB | |
| } | | | |
| } | | | |
| reportInterval | ms10240 | | |
| reportAmount | r2 | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.17.1.3.3-7: *MeasurementReport* (step 7, Table 8.1.3.1.17.1.3.2-3)

| Derivation Path: TS 38.508-1 [4] Table 4.6.1-5A | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.17.1.3.3-8: *MeasResults* (Table 8.1.3.1.17.1.3.3-7)

| Derivation Path: 38.508-1 [4] Table 4.6.3-79 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { | | | |
| measId | 1 | | |

| | | | |
|--|--|-------------------|--|
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | | |
| servCellId[1] | ServCellIndex of NR Cell 1 | | |
| measResultServingCell[1] SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| servCellId[2] | ServCellIndex of NR Cell 3 | | |
| measResultServingCell[2] SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Report NR Cell 12 | |
| physCellId | Physical layer cell identity of NR Cell 12 | | |
| measResult SEQUENCE { | | | |

| | | | |
|----------------------------|-------------|--|--|
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| } | | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.17.1.3.3-9: *RRCReconfiguration* (step 8, Table 8.1.3.1.17.1.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition SCell_add | | | |
|---|-----------------|----------------------------------|--------------------------------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | Table
8.1.3.1.17.1.3.3-
10 | SCell release for
NR Cell 3 |
| dedicatedSIB1-Delivery | Not present | SCell release | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.17.1.3.3-10: *CellGroupConfig* (Table 8.1.3.1.17.1.3.3-9)

| Derivation Path: 38.508-1 [4] Table 4.6.3-19 with condition SCell_add | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToAddModList | Not present | | |

| | | | |
|---|---------|-----------------------------|--|
| sCellToReleaseList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex | 1 | SCell release for NR Cell 3 | |
| } | | | |
| } | | | |

8.1.3.1.17.2 NR CA / Measurement configuration control and reporting / Intra NR measurements / Event A6 / Inter-band CA

8.1.3.1.17.2.1 Test Purpose (TP)

Same as TC 8.1.3.1.17.1 but applied to Inter-band CA case.

8.1.3.1.17.2.2 Conformance requirements

Same as TC 8.1.3.1.17.1 but applied to Inter-band CA case.

8.1.3.1.17.2.3 Test description

8.1.3.1.17.2.3.1 Pre-test conditions

Same as test case 8.1.3.1.17.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.
- Cells configuration: NR Cell 10 replaces NR Cell 3, NR Cell 30 replaces NR Cell 12.
- NR Cell 10 is an Inactive SCell according to TS 38.508-1 [4] clause 6.3.1.

8.1.3.1.17.2.3.2 Test procedure sequence

Same as test case 8.1.3.1.17.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.
- Cells configuration: NR Cell 10 replaces NR Cell 3, NR Cell 30 replaces NR Cell 12.

8.1.3.1.17.2.3.3 Specific message contents

Same as test case 8.1.3.1.17.1 with the following differences.

NOTE: For simplicity the steps referred below are steps in test case 8.1.3.1.17.1.

Table 8.1.3.1.17.2.3.3-1: *MeasConfig* (Table 8.1.3.1.17.1.3.3-5)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--------------|--------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | MeasObjectIdN R-f1 | |

| | | | |
|--|---|-------------------|--|
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| measObjectId[2] | 2 | MeasObjectIdNR-f5 | |
| measObject[2] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 10 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA6 | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

8.1.3.1.17.3 NR CA / Measurement configuration control and reporting / Intra NR measurements / Event A6 / Intra-band non Contiguous CA

8.1.3.1.17.3.1 Test Purpose (TP)

Same as TC 8.1.3.1.17.1 but applied to Intra-band non Contiguous CA case.

8.1.3.1.17.3.2 Conformance requirements

Same as TC 8.1.3.1.17.1 but applied to Intra-band non Contiguous CA case.

8.1.3.1.17.3.3 Test description

8.1.3.1.17.3.3.1 Pre-test conditions

Same as test case 8.1.3.1.17.1 with the following differences:

- CA configuration: Intra-band non Contiguous CA replaces Intra-band Contiguous CA.

8.1.3.1.17.3.3.2 Test procedure sequence

Same as test case 8.1.3.1.17.1 with the following differences:

- CA configuration: Intra-band non Contiguous CA replaces Intra-band Contiguous CA.

8.1.3.1.17.3.3.3 Specific message contents

Same as test case 8.1.3.1.17.1 but applied to Intra-band non Contiguous CA case..

NOTE: For simplicity the steps referred below are steps in test case 8.1.3.1.17.1.

8.1.3.1.18 NR CA / Measurement configuration control and reporting / Intra NR measurements / Additional measurement reporting

8.1.3.1.18.1 NR CA / Measurement configuration control and reporting / Intra NR measurements / Additional measurement reporting / Intra-band Contiguous CA

8.1.3.1.18.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and measurements configured for event A2 reporting include *reportAddNeighMeas* }

ensure that {

when { Entry condition for event A2 of the concerned frequency that triggered measurement reporting is met }

then { UE sends *MeasurementReport* that does not include the best non-serving cell of the concerned frequency in the *measResultBestNeighCell* }

}

(2)

with { UE in NR RRC_CONNECTED state and measurements configured for event A2 reporting include *reportAddNeighMeas* }

ensure that {

when { Entry condition for event A2 of other than the concerned frequency that triggered measurement reporting is met }

then { UE sends *MeasurementReport* that includes the best non-serving cell of the concerned frequency in the *measResultBestNeighCell* }

}

8.1.3.1.18.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.3.5.5.9, 5.5.2.1, 5.5.4.1, 5.5.4.7 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.3.5.5.9]

The UE shall:

1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (SCell addition):

2> add the SCell, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;

2> configure lower layers to consider the SCell to be in deactivated state;

Editor's Note: FFS Check automatic measurement handling for SCells.

2> for each *measId* included in the *measIdList* within *VarMeasConfig*:

3> if SCells are not applicable for the associated measurement; and

3> if the concerned SCell is included in *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*:

4> remove the concerned SCell from *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (SCell modification):

2> modify the SCell configuration in accordance with the *sCellConfigDedicated*.

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

- 1> if the received *measConfig* includes the *measObjectToAddModList*:
- 2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

- 1> if the received *measConfig* includes the *reportConfigToAddModList*:
- 2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

- 1> if the received *measConfig* includes the *measIdToAddModList*:
- 2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;
- 3> if the corresponding *measObject* concerns NR;
- 4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*;
- 5> consider only the serving cell to be applicable;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

- 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

- 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:

- 3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:
- 4> initiate the measurement reporting procedure, as specified in 5.5.5;

- 3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty;
- 4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 4> stop the periodical reporting timer for this *measId*, if running;
- ...
- 2> upon expiry of the periodical reporting timer for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5.

...

[TS 38.331, clause 5.5.4.7]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when condition A2-1, as specified below, is fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition A2-2, as specified below, is fulfilled;
- 1> for this measurement, consider the serving cell indicated by the *measObjectNR* associated to this event.

Inequality A2-1 (Entering condition)

$$Ms + Hys < Thresh$$

Inequality A2-2 (Leaving condition)

$$Ms - Hys > Thresh$$

The variables in the formula are defined as follows:

Ms is the measurement result of the serving cell, not taking into account any offsets.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh is the threshold parameter for this event (i.e. *a2-Threshold* as defined within *reportConfigNR* for this event).

Ms is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Hys is expressed in dB.

Thresh is expressed in the same unit as ***Ms***.

[TS 38.331, clause 5.5.5]



Figure 5.5.5-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;

1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;

...

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:

2> for each serving cell *measObjectId* referenced in the *measIdList*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:

3> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured SINR;

...

1> if there is at least one applicable neighbouring cell to report:

2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

3> if the *reportType* is set to *eventTriggered*:

4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

...

3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

3> if the *reportType* is set to *eventTriggered*:

4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

5> if the *measObject* associated with this *measId* concerns NR:

6> if *rsType* in the associated *reportConfig* is set to *ssb*:

7> set *results SSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first:

...

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

...

1> if the UE is configured with EN-DC:

...

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.18.1.3 Test description

8.1.3.1.18.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, NR Cell 3 is the SCell to be added, NR Cell 12 (broadcast only cell) and NR Cell 23 (broadcast only cell) is the intra-frequency neighbour cell of NR Cell 3.
- NR Cell 3 is an Inactive SCell according to TS 38.508-1 [4] clause 6.3.1.
- Relative SS signal level uncertainty between Intra-freq cells is +/-1 dB for FR1 and FFS for FR2.
- System information combination NR-5 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.1.18.1.3.2 Test procedure sequence

Table 8.1.3.1.18.1.3.2-1 and 8.1.3.1.18.1.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, NR Cell 3, NR Cell 12 and NR Cell 23 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" and "T2" are applied at the point indicated in the Main behaviour description in Table 8.1.3.1.18.1.3.2-3.

Table 8.1.3.1.18.1.3.2-1: Time instances of cell power level and parameter changes in FR1

| | Parameter | Unit | NR
Cell 1 | NR
Cell 3 | NR
Cell 12 | NR
Cell 23 | Remark |
|----|---------------------|-------------|--------------|--------------|---------------|---------------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -72 | -72 | -91 | Off | Power levels are such that entry condition for event A2 is not satisfied:
$Ms + Hys > Thresh$ for NR Cell 1 and NR Cell 3 |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -72 | -90 | -91 | -88 | Power levels are such that entry condition for event A2 in NR Cell 3 is satisfied:
$Ms + Hys < Thresh$ |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | -90 | -72 | -69 | -73 | Power levels are such that entry condition for event A2 in NR Cell 1 is satisfied:
$Ms + Hys < Thresh$ |

Table 8.1.3.1.18.1.3.2-2: Time instances of cell power level and parameter changes in FR2

| | Parameter | Unit | NR | NR | NR | NR | Remark |
|--|-----------|------|----|----|----|----|--------|
| | | | | | | | |

| | | | Cell 1 | Cell 3 | Cell 12 | Cell 23 | |
|----|---------------------|-------------|--------|--------|---------|---------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | FFS | Off | Power levels are such that entry condition for event A2 is not satisfied:
$M_s + H_{ys} > Thresh$ for NR Cell 1 and NR Cell 3 |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | FFS | Off | Power levels are such that entry condition for event A2 in NR Cell 3 is satisfied:
$M_s + H_{ys} < Thresh$ |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | FFS | FFS | Power levels are such that entry condition for event A2 in NR Cell 1 is satisfied:
$M_s + H_{ys} < Thresh$ |

Table 8.1.3.1.18.1.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>sCellToAddModList</i> with NR Cell 3 as SCell addition. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 3 | The SS transmits an <i>RRCReconfiguration</i> message including <i>measConfig</i> to setup intra NR measurement and for event A2 reporting configuration and include <i>reportAddNeighMeas</i> . | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 4 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 5 | The SS re-adjusts the SS/PBCH EPRE level according to row "T1" in table 8.1.3.1.18.1.3.2-1/2. | - | - | - | - |
| 6 | Check: Does the UE transmit a <i>MeasurementReport</i> message that does not include the RSRP value of the best non-serving cell on the concerned serving frequency in <i>measResultBestNeighCell</i> ? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| 7 | The SS re-adjusts the cell-specific reference signal level according to row "T2" in table 8.1.3.1.18.1.3.2-1/2. | - | - | - | - |
| 8 | Check: Does the UE transmit a <i>MeasurementReport</i> message included the RSRP value of the best non-serving cell (NR Cell 12) on the concerned serving frequency in <i>measResultBestNeighCell</i> ? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |

8.1.3.1.18.1.3.3 Specific message contents

Table 8.1.3.1.18.1.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.1.18.1.3.2-3)

| |
|---|
| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition SCell_add |
|---|

Table 8.1.3.1.18.1.3.3-2: Void

Table 8.1.3.1.18.1.3.3-3: Void

Table 8.1.3.1.18.1.3.3-4: *RRCReconfiguration* (step 3, Table 8.1.3.1.18.1.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|---------------------------|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.18.1.3.3-5 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.18.1.3.3-5: *MeasConfig* (Table 8.1.3.1.18.1.3.3-4)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--|--------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | MeasObjectIdN R-f1 | |
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell | | |

| | | | |
|--|--|--------------------------|--|
| | 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| measObjectId[2] | 2 | MeasObjectIdNR-f2 | |
| measObject[2] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA2 | Table 8.1.3.1.18.1.3.3-6 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| measId[2] | 2 | | |
| measObjectId[2] | 2 | | |
| reportConfigId[2] | 1 | | |
| } | | | |
| } | | | |

Table 8.1.3.1.18.1.3.3-6: *ReportConfigNR-EventA2* (Table 8.1.3.1.18.1.3.3-5)

| Derivation Path: 38.508-1 [4] Table 4.6.3-142 with condition EVENT_A2 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |

| | | | |
|-------------------------------|-------|--------|-----|
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA2 SEQUENCE { | | | |
| a2-Threshold SEQUENCE { | | | |
| rsrp | 77 | -79dBm | FR1 |
| | FFS | | FR2 |
| } | | | |
| hysteresis | 4 | 2 dB | |
| } | | | |
| } | | | |
| reportAmount | r1 | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| reportAddNeighMeas | setup | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.18.1.3.3-7: *MeasurementReport* (step 6, step 8, Table 8.1.3.1.18.1.3.2-3)

| Derivation Path: TS 38.508-1 [4] Table 4.6.1-5A | | | |
|---|--------------|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults1 | Table 8.1.3.1.18.1.3.3-8 | Step 6 |
| | MeasResults2 | Table 8.1.3.1.18.1.3.3-9 | Step 8 |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 8.1.3.1.18.1.3.3-8: *MeasResults1* (Table 8.1.3.1.18.1.3.3-7)

| Derivation Path: 38.508-1 [4] Table 4.6.3-79 with Condition A2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { | | Step 6 | |
| measId | 2 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | 2 entries | | |
| servCellId[1] | ServCellIndex of NR Cell 1 | | |
| measResultServingCell[1] SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| servCellId[2] | ServCellIndex of NR Cell 3 | | |
| measResultServingCell[2] SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.18.1.3.3-9: *MeasResults2* (Table 8.1.3.1.18.1.3.3-7)

| Derivation Path: 38.508-1 [4] Table 4.6.3-79 with Condition A2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { | | Step 8 | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | 2 entries | | |
| servCellId[1] | ServCellIndex of NR Cell 1 | | |
| measResultServingCell[1] SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| servCellId[2] | ServCellIndex of NR Cell 3 | | |
| measResultServingCell[2] SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |

| | | | |
|---------------------------------------|--|-------------------|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultBestNeighCell[2] SEQUENCE { | | Report NR Cell 12 | |
| physCellId | Physical layer cell identity of NR Cell 12 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| } | | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.1.18.2 NR CA / Measurement configuration control and reporting / Intra NR measurements / Additional measurement reporting / Inter-band CA

8.1.3.1.18.2.1 Test Purpose (TP)

Same as TC 8.1.3.1.18.1 but applied to Inter-band CA case.

8.1.3.1.18.2.2 Conformance requirements

Same as TC 8.1.3.1.18.1 but applied to Inter-band CA case.

8.1.3.1.18.2.3 Test description

8.1.3.1.18.2.3.1 Pre-test conditions

Same as test case 8.1.3.1.18.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.
- Cells configuration: NR Cell 10 replaces NR Cell 3, NR Cell 30 replaces NR Cell 12 and NR Cell 31 replaces NR Cell 23.
- NR Cell 10 is an Inactive SCell according to TS 38.508-1 [4] clause 6.3.1.

8.1.3.1.18.2.3.2 Test procedure sequence

Same as test case 8.1.3.1.18.1 with the following differences:

- CA configuration: Inter-band CA replaces Inter-band Contiguous CA
- Cells configuration: NR Cell 10 replaces NR Cell 3, NR Cell 30 replaces NR Cell 12 and NR Cell 31 replaces NR Cell 23.

8.1.3.1.18.2.3.3 Specific message contents

Same as test case 8.1.3.1.18.1 with the following differences.

NOTE: For simplicity the steps referred below are steps in test case 8.1.3.1.18.1.

Table 8.1.3.1.18.2.3.3-1: *MeasConfig* (Table 8.1.3.1.18.1.3.3-5)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|---|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | MeasObjectIdN
R-f1 | |
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals
the ARFCN for NR Cell
1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| measObjectId[2] | 2 | MeasObjectIdN
R-f5 | |
| measObject[2] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals
the ARFCN for NR Cell
10 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |

| | | | |
|---|------------------------|--|--|
| reportConfigNR | ReportConfigNR-EventA2 | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| measId[2] | 2 | | |
| measObjectId[2] | 2 | | |
| reportConfigId[2] | 1 | | |
| } | | | |
| } | | | |

8.1.3.1.18.3 NR CA / Measurement configuration control and reporting / Intra NR measurements / Additional measurement reporting / Intra-band non Contiguous CA

8.1.3.1.18.3.1 Test Purpose (TP)

Same as TC 8.1.3.1.18.1 but applied to Intra-band non Contiguous CA case.

8.1.3.1.18.3.2 Conformance requirements

Same as TC 8.1.3.1.18.1 but applied to Intra-band non Contiguous CA case.

8.1.3.1.18.3.3 Test description

8.1.3.1.18.3.3.1 Pre-test conditions

Same as test case 8.1.3.1.18.1 with the following differences:

- CA configuration: Intra-band non Contiguous CA replaces Intra-band Contiguous CA.

8.1.3.1.18.3.3.2 Test procedure sequence

Same as test case 8.1.3.1.18.1 with the following differences:

- CA configuration: Intra-band non Contiguous CA replaces Inter-band Contiguous CA.

8.1.3.1.18.3.3.3 Specific message contents

Same as test case 8.1.3.1.18.1 but applied to Intra-band non Contiguous CA case.

8.1.3.1.19

8.1.3.1.20 Measurement configuration control and reporting / Measurement Gaps / gapFR1

8.1.3.1.20.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }**ensure that** {**when** { UE receives RRCReconfiguration message containing MeasConfig to setup gapFR1 and report periodical measurements for neighbor cell on FR1 frequency }**then** { UE applies gapFR1 and sends periodical measurements for neighbor cell on FR1 frequency }

}

8.1.3.1.20.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2.1, 5.5.2.9, 5.5.4.1, 5.5.4.5 and 5.5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

...

1> if the received *measConfig* includes the *measGapConfig*:

2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

...

[TS 38.331, clause 5.5.2.9]

The UE shall:

1> if *gapFR1* is set to *setup*:

2> if an FR1 measurement gap configuration is already setup, release the FR1 measurement gap configuration;

2> setup the FR1 measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$\text{SFN mod } T = \text{FLOOR}(\text{gapOffset}/10)$;

$\text{subframe} = \text{gapOffset mod } 10$;

with $T = \text{MGRP}/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

...

[TS 38.331, clause 5.5.4.1]

If AS security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*:

3> if the corresponding *measObject* concerns NR:

...

4> for measurement events other than *eventA1* or *eventA2*:

5> else:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

...

2> if *reportType* is set to *periodical* and if a (first) measurement result is available:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> if the *reportAmount* exceeds 1:

4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell;

3> else (i.e. the *reportAmount* is equal to 1):

4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell and for the strongest cell among the applicable cells;

- 2> upon expiry of the periodical reporting timer for this *measId*;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5.
- ...

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful AS security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
 - 1> set the *measResultServingCell* within *measResultServingMOList* to include, for each NR serving cell that is configured with *servingCellMO*, RSRP, RSRQ and the available SINR, derived based on the *rsType* if indicated in the associated *reportConfig*, otherwise based on SSB if available, otherwise based on CSI-RS;
 - 1> set the *servCellId* within *measResultServingMOList* to include each NR serving cell that is configured with *servingCellMO*, if any;
- ...
- 1> if there is at least one applicable neighbouring cell to report:
 - 2> if the *reportType* is set to *eventTriggered* or *periodical*:
 - 3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - ...
 - 4> else:
 - 5> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
 - 4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 4> if the *reportType* is set to *eventTriggered* or *periodical*:
 - 5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
 - 6> if the *measObject* associated with this *measId* concerns NR:
 - 7> if *rsType* in the associated *reportConfig* is set to *ssb*:
 - 8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

...

- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
- 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
- 1> else:
- 2> if the *reportType* is set to *periodical*:
- 3> remove the entry within the *VarMeasReportList* for this *measId*;
- 3> remove this *measId* from the *measIdList* within *VarMeasConfig*;
- ...
- 1> else:
- 2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.20.3 Test description

8.1.3.1.20.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell, NR Cell 3 is the inter-frequency neighbour cell of NR Cell 1.
- System information combination NR-4 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.1.20.3.2 Test procedure sequence

Table 8.1.3.1.20.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message to setup FR1 independent gap (pattern #0) and inter-frequency measurement on NR Cell 3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit at least 10 <i>MeasurementReport</i> messages to periodically report the measured RSRP value for NR Cell 3 within the next 30 seconds? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| 4 | The SS transmits an | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |

| | | | | | |
|---|--|-----|--|---|---|
| | <i>RRCConnectionReconfiguration</i> to change gap pattern to pattern #1. | | | | |
| 5 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message to confirm the change of pattern. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 6 | Check: Does the UE transmit at least 10 <i>MeasurementReport</i> messages to periodically report the measured RSRP value for NR Cell 3 within the next 30 seconds? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| - | EXCEPTION: Steps 7 to 9 shall be repeated for each gap pattern among #2 - #11 and supported by UE (indicated in <i>supportedGapPattern</i>). | | | | |
| 7 | The SS transmits an <i>RRCConnectionReconfiguration</i> to change gap pattern to the next pattern supported by UE. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 8 | The UE transmits an <i>RRCReconfigurationComplete</i> message to confirm the change of gap pattern. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 9 | Check: Does the UE transmit at least 10 <i>MeasurementReport</i> messages to periodically report the measured RSRP value for NR Cell 3 within the next 30 seconds? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |

8.1.3.1.20.3.3 Specific message contents

Table 8.1.3.1.20.3.3-1: *RRCReconfiguration* (step 1, 4 and 7, Table 8.1.3.1.20.3.2-2)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|---------------------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.20.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.20.3.3-2: *MeasConfig* (Table 8.1.3.1.20.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|---|---------------------------|---------------------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | Not present | | Step 4 OR
Step 7 |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | Step 1 |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table
8.1.3.1.20.3.3-3 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table
8.1.3.1.20.3.3-4 | |
| } | | | |
| } | | | |
| reportConfigToAddModList | Not present | | Step 4 OR
Step 7 |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | Step 1 |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR with
condition PERIODICAL | | |
| } | | | |
| } | | | |
| measIdToAddModList | Not present | | Step 4 OR
Step 7 |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | Step 1 |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |

| | | | |
|---------------|----------------------|------------------------|--|
| measGapConfig | MeasGapConfig-gapFR1 | Table 8.1.3.1.20.3.3-5 | |
| } | | | |

Table 8.1.3.1.20.3.3-3: *MeasObjectNR-f1* (Table 8.1.3.1.20.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| smtc1 SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sf20 | 10 | To make sure SMTc for intra-frequency measurement is non-overlapping with MG | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.20.3.3-4: *MeasObjectNR-f2* (Table 8.1.3.1.20.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 3 | | |
| smtc1 SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sf20 | 0 | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.1.3.1.20.3.3-5: MeasGapConfig-gapFR1 (Table 8.1.3.1.20.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-70 with condition GAP_FR1 | | | |
|---|--------------|---------|----------------------------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapFR1 CHOICE { | Not present | | |
| setup SEQUENCE { | | | |
| gapOffset | 0 | | |
| mgl | ms3 | | Pattern #2, #3, #10 or #11 |
| | ms4 | | Pattern #6, #7, #8 or #9 |
| | ms6 | | Pattern #0, #1, #4 or #5 |
| mgrp | ms20 | | Pattern #4, #6 or #10 |
| | ms40 | | Pattern #0, #2 or #7 |
| | ms80 | | Pattern #1, #3 or #8 |
| | ms160 | | Pattern #5, #9 or #11 |
| mgta | ms0 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.20.3.3-6: MeasurementReport (step 1, Table 8.1.3.1.20.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|----------------------------|----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | Measurement report for NR Cell 1 | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |

| | | | |
|---|---|----------------------------------|--|
| physCellId | PCI of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Measurement report for NR Cell 3 | |
| physCellId | Physical layer cell identity of NR Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.1.21 Measurement configuration control and reporting / Measurement Gaps / gapFR2

8.1.3.1.21.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }**ensure that** {**when** { UE receives RRCReconfiguration message containing MeasConfig to setup gapFR2 and report periodical measurements for neighbor cell on FR2 frequency }**then** { UE applies gapFR2 and sends periodical measurements for neighbor cell on FR2 frequency }

}

8.1.3.1.21.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2.1, 5.5.2.9, 5.5.4.1, 5.5.4.5 and 5.5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

...

- 1> if the received *measConfig* includes the *measGapConfig*:
- 2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

...

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

- 1> if *gapFR2* is set to *setup*:
- 2> if an FR2 measurement gap configuration is already setup, release the FR2 measurement gap configuration;
- 2> setup the FR2 measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:
$$\text{SFN mod } T = \text{FLOOR}(\text{gapOffset}/10);$$

subframe = *gapOffset* mod 10;
with $T = \text{MGRP}/10$ as defined in TS 38.133 [14];
- 2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

...

[TS 38.331, clause 5.5.4.1]

If AS security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
 - 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*:
 - 3> if the corresponding *measObject* concerns NR:
- ...
- 4> for measurement events other than *eventA1* or *eventA2*:
 - 5> else:
 - 6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;
- ...
- 2> if *reportType* is set to *periodical* and if a (first) measurement result is available:
 - 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> if the *reportAmount* exceeds 1:
 - 4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell;
 - 3> else (i.e. the *reportAmount* is equal to 1):
 - 4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell and for the strongest cell among the applicable cells;

- 2> upon expiry of the periodical reporting timer for this *measId*;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5.
- ...

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful AS security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
 - 1> set the *measResultServingCell* within *measResultServingMOList* to include, for each NR serving cell that is configured with *servingCellMO*, RSRP, RSRQ and the available SINR, derived based on the *rsType* if indicated in the associated *reportConfig*, otherwise based on SSB if available, otherwise based on CSI-RS;
 - 1> set the *servCellId* within *measResultServingMOList* to include each NR serving cell that is configured with *servingCellMO*, if any;
- ...
- 1> if there is at least one applicable neighbouring cell to report:
 - 2> if the *reportType* is set to *eventTriggered* or *periodical*:
 - 3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - ...
 - 4> else:
 - 5> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
 - 4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 4> if the *reportType* is set to *eventTriggered* or *periodical*:
 - 5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
 - 6> if the *measObject* associated with this *measId* concerns NR:
 - 7> if *rsType* in the associated *reportConfig* is set to *ssb*:
 - 8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

...

- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
- 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
- 1> else:
- 2> if the *reportType* is set to *periodical*:
- 3> remove the entry within the *VarMeasReportList* for this *measId*;
- 3> remove this *measId* from the *measIdList* within *VarMeasConfig*;
- ...
- 1> else:
- 2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.1.21.3 Test description

8.1.3.1.21.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell, NR Cell 3 is the inter-frequency neighbour cell of NR Cell 1.
- System information combination NR-4 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.1.21.3.2 Test procedure sequence

Table 8.1.3.1.21.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message to setup FR2 independent gap (pattern #13) and inter-frequency measurement on NR Cell 3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit at least 3 <i>MeasurementReport</i> messages to periodically report the measured RSRP value for NR Cell 3 within the next 30 seconds? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| 4 | The SS transmits an | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |

| | | | | | |
|---|---|-----|--|---|---|
| | <i>RRCConnectionReconfiguration</i> to change gap pattern to pattern #14. | | | | |
| 5 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message to confirm the change of pattern. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 6 | Check: Does the UE transmit at least 3 <i>MeasurementReport</i> messages to periodically report the measured RSRP value for NR Cell 3 within the next 30 seconds? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| - | EXCEPTION: Steps 7 to 9 shall be repeated for each gap pattern among #12 and #15 - #23 and supported by UE (indicated in <i>supportedGapPattern</i>). | | | | |
| 7 | The SS transmits an <i>RRCConnectionReconfiguration</i> to change gap pattern to the next pattern supported by UE. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 8 | The UE transmits an <i>RRCReconfigurationComplete</i> message to confirm the change of gap pattern. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 9 | Check: Does the UE transmit at least 3 <i>MeasurementReport</i> messages to periodically report the measured RSRP value for NR Cell 3 within the next 30 seconds? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |

8.1.3.1.21.3.3 Specific message contents

Table 8.1.3.1.21.3.3-1: *RRCReconfiguration* (step 1, 4 and 7, Table 8.1.3.1.21.3.2-2)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition NR and MEAS | | | |
|---|---------------------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.1.21.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.1.3.1.21.3.3-2: *MeasConfig* (Table 8.1.3.1.21.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--|------------------------|------------------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | Not present | | Step 4 OR Step 7 |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | Step 1 |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.1.21.3.3-3 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.1.3.1.21.3.3-4 | |
| } | | | |
| } | | | |
| reportConfigToAddModList | Not present | | Step 4 OR Step 7 |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | Step 1 |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR with condition PERIODICAL | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE | Not present | | Step 4 OR Step 7 |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | Step 1 |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |

| | | | |
|---------------|----------------------|------------------------|--|
| } | | | |
| measGapConfig | MeasGapConfig-gapFR2 | Table 8.1.3.1.21.3.3-5 | |
| } | | | |

Table 8.1.3.1.21.3.3-3: *MeasObjectNR-f1* (Table 8.1.3.1.21.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| smtc1 SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sf20 | 10 | To make sure SMTc for intra-frequency measurement is non-overlapping with MG | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.21.3.3-4: *MeasObjectNR-f2* (Table 8.1.3.1.21.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 3 | | |
| smtc1 SEQUENCE { | | | |
| periodicityAndOffset CHOICE { | | | |
| sf20 | 0 | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not present | | |

| | | | |
|------------------------|-------------|--|--|
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.1.21.3.3-5: MeasGapConfig-gapFR2 (Table 8.1.3.1.21.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-70 with Condition GAP_FR2 | | | |
|---|--------------|---------|------------------------------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapFR2 CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 0 | | |
| mgl | ms1dot5 | | Pattern #20, #21, #22 or #23 |
| | ms3dot5 | | Pattern #16, #17, #18 or #19 |
| | ms5dot5 | | Pattern #12, #13, #14 or #15 |
| mgrp | ms20 | | Pattern #12, #16 or #20 |
| | ms40 | | Pattern #13, #17 or #21 |
| | ms80 | | Pattern #14, #18 or #22 |
| | ms160 | | Pattern #15, #19 or #23 |
| mgta | ms0 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.21.3.3-6: MeasurementReport (step 1, Table 8.1.3.1.21.3.2-4)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|----------------------------|----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | Measurement report for NR Cell 1 | |
| servCellId | ServCellIndex of NR Cell 1 | | |

| | | | |
|---|---|----------------------------------|--|
| measResultServingCell SEQUENCE { | | | |
| physCellId | PCI of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Measurement report for NR Cell 3 | |
| physCellId | Physical layer cell identity of NR Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.1.22

8.1.3.1.23 Measurement configuration control and reporting / Intra NR measurements / Continuation of the measurements after RRC Resume

8.1.3.1.23.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }**ensure that** {**when** { UE receives RRCReconfiguration including measConfig to setup periodical measurement reporting }**then** { UE sends RRCReconfigurationComplete and starts sending periodic measurement reports }

}

(2)

with { UE in NR RRC_INACTIVE state and measurement configured for periodical reporting }**ensure that** {**when** { UE receives RRCResume message without including measconfig }**then** { UE resumes RRC connection and performs periodic measurements as per the measurement configuration }

}

8.1.3.1.23.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clause 5.3.13.4, 5.5.2 and 5.5.4.1.

[TS 38.331, clause 5.3.13.4]

The UE shall:

...

1> release the *suspendConfig* except the *ran-NotificationAreaInfo*;

...

1> resume SRB2 and all DRBs;

...

1> if the *RRCResume* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> resume measurements if suspended;

...

1> enter RRC_CONNECTED;

1> indicate to upper layers that the suspended RRC connection has been resumed;

...

1> consider the current cell to be the PCell;

...

1> submit the *RRCResumeComplete* message to lower layers for transmission;

1> the procedure ends.

[TS 38.331, clause 5.3.13.4]

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

1> if the received *measConfig* includes the *quantityConfig*:

2> perform the quantity configuration procedure as specified in 5.5.2.8;

1> if the received *measConfig* includes the *measIdToRemoveList*:

2> perform the measurement identity removal procedure as specified in 5.5.2.2;

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

[TS 38.331, clause 5.5.4.1]

If AS security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*:

3> if the corresponding *measObject* concerns NR:

...

4> if corresponding *reportConfig* includes *reportType* set to *periodical*; or

4> for measurement events other than *eventA1* or *eventA2*:

5> if *useWhiteCellList* is set to *true*:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is included in the *whiteCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

5> else:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

...

- 2> if *reportType* is set to *periodical* and if a (first) measurement result is available:
 - 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> if the *reportAmount* exceeds 1:
 - 4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell;
 - 3> else (i.e. the *reportAmount* is equal to 1):
 - 4> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell and for the strongest cell among the applicable cells;
- 2> upon expiry of the periodical reporting timer for this *measId*:
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5.

8.1.3.1.23.3 Test description

8.1.3.1.23.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell, NR Cell 2 is the intra-frequency neighbour cell of NR Cell 1.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A in NR Cell 1 as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.1.23.3.2 Test procedure sequence

Tables 8.1.3.1.23.3.2-1 and 8.1.3.1.23.3.2-2 illustrate the downlink power levels to be applied for NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble.

Table 8.1.3.1.23.3.2-1: Power levels in FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|------------------|---------|-----------|-----------|--------|
| T0 | SS/PBCH SSS EPRE | dBm/SCS | -85 | -91 | |

Table 8.1.3.1.23.3.2-2: Power levels in FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------|------|-----------|-----------|--------|
| T0 | SS/PBCH | dBm/ | FFS | FFS | |

| | | | | | |
|--|----------|-----|--|--|--|
| | SSS EPRE | SCS | | | |
|--|----------|-----|--|--|--|

Table 8.1.3.1.23.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup intra NR periodic measurement reporting. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit at least 10 <i>MeasurementReport</i> messages within the next 30 seconds? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| 4 | The SS transmits an <i>RRCRelease</i> message with <i>suspendConfig</i> . | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| 5 | The SS waits for 5 sec and transmits a <i>Paging</i> message including a matched identity (correct <i>fullI-RNTI</i>). | - | NR RRC: <i>Paging</i> | - | - |
| 6 | UE transmits <i>RRCResumeRequest</i> message | --> | NR RRC: <i>RRCResumeRequest</i> | - | - |
| 7 | The SS transmits an <i>RRCResume</i> message without including <i>MeasConfig</i> . | <-- | NR RRC: <i>RRCResume</i> | - | - |
| 8 | The UE transmits an <i>RRCResumeComplete</i> message. | --> | NR RRC: <i>RRCResumeComplete</i> | - | - |
| 9 | Check: Does the UE transmit at least 10 <i>MeasurementReport</i> messages within the next 30 seconds? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |
| 10 | The SS transmits an <i>RRCRelease</i> message | <-- | NR RRC: <i>RRCRelease</i> | - | - |

8.1.3.1.23.3.3 Specific message contents

Table 8.1.3.1.23.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.1.23.3.2-3)

| |
|--|
| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition MEAS |
|--|

Table 8.1.3.1.23.3.3-2: *MeasConfig* (Table 8.1.3.1.23.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--------------|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>MeasConfig</i> ::= SEQUENCE { | | | |
| <i>measObjectToAddModList</i> SEQUENCE (SIZE (1.. <i>maxNrofMeasId</i>)) OF SEQUENCE { | 1 entry | | |
| <i>measObjectId</i> [1] | 1 | <i>MeasObjectIdNR-f1</i> | |

| | | | |
|--|--|--|--|
| measObject[1] CHOICE { | | | |
| measObjectNR[1] SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 2 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR with condition PERIODICAL | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.1.3.1.23.3.3-3: *MeasurementReport* (step 3 and step 9, Table 8.1.3.1.23.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|---------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | 1 entry | | |
| servCellId[1] | Cell index corresponding to NR Cell 1 | | |

| | | | |
|--|---|--|--|
| measResultServingCell[1] SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1.. maxCellReport)) OF SEQUENCE { | 1 entry | | |
| physCellId[1] | Physical layer cell identity of NR Cell 2 | | |
| measResult[1] | Not Checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.1.23.3.3-4: *RRCRelease* (step 4, Table 8.1.3.1.23.3.2-3)

| |
|---|
| Derivation Path: 38.508-1 [4] Table 4.6.1-16 with condition NR_RRC_INACTIVE |
|---|

Table 8.1.3.1.23.3.3-5: *Paging* (step 5, Table 8.1.3.1.23.3.2-3)

| |
|--|
| Derivation Path: 38.508-1 [4] Table 4.6.1-9 with condition NR_RRC_RESUME |
|--|

Table 8.1.3.1.23.3.3-6: *RRCResumeRequest* (step 6, Table 8.1.3.1.23.3.2-3)

| Derivation Path: TS 38.331 [6], clause 6.2.2 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCResumeRequest ::= SEQUENCE { | | | |
| rrcResumeRequest SEQUENCE { | | | |
| resumeCause | mt-Access | | |
| } | | | |
| } | | | |

8.1.3.2 Inter-RAT measurements

8.1.3.2.1 Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of E-UTRA cells

8.1.3.2.1.1 Test Purpose (TP)

(1)

with { UE is NR RRC_CONNECTED state and inter-RAT measurement event B1 to measure neighbour E-UTRA cell is configured }

ensure that {

when { Entering condition for the event B1 is not met }

then { UE does not transmit any MeasurementReport }

}

(2)

with { UE is NR RRC_CONNECTED state and inter-RAT measurement event B1 to measure neighbour E-UTRA cell is configured }

ensure that {

when { Entering condition for the event B1 is met }

then { UE transmits a MeasurementReport }

}

8.1.3.2.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2, 5.5.4.1, 5.5.4.8 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRConnectionReconfigurationComplete* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

5. 4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

6. 4> the procedure ends;

NOTE: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case *RRCReconfiguration* is received via SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case *RRCReconfiguration* is received via SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

2> if this is the first *RRCReconfiguration* message after successful completion of the RRC re-establishment procedure;

3> resume SRB1 and DRBs that are suspended;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

1> if the received *measConfig* includes the *measGapConfig*:

2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

...

[TS 38.331, clause 5.5.2.9]

The UE shall:

1> if *gapFR1* is set to setup:

2> if an FR1 measurement gap configuration is already setup, release the FR1 measurement gap configuration;

2> setup the FR1 measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = $gapOffset \bmod 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapFR1* is set to release:

2> release the FR1 measurement gap configuration;

1> if *gapFR2* is set to setup:

2> if an FR2 measurement gap configuration is already setup, release the FR2 measurement gap configuration;

2> setup the FR2 measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = $gapOffset \bmod 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapFR2* is set to release:

2> release the FR2 measurement gap configuration;

1> if *gapUE* is set to setup:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = $gapOffset \bmod 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapUE* is set to release:

2> release the per UE measurement gap configuration.

NOTE 1: For *gapFR2* configuration, the SFN and subframe of a serving cell on FR2 frequency is used in the gap calculation

NOTE 2: For *gapFR1* or *gapUE* configuration, the SFN and subframe of the PCell is used in the gap calculation.

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;

3> if the corresponding *measObject* concerns NR;

...

4> for measurement events other than *eventA1* or *eventA2*:

5> if *useWhiteCellList* is set to TRUE:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is included in the *whiteCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

5> else:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

3> else if the corresponding *measObject* concerns E-UTRA;

4> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModListEUTRAN* defined within the *VarMeasConfig* for this *measId*;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:

3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:

4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> stop the periodical reporting timer for this *measId*, if running;

...

2> upon the expiry of T321 for this *measId*:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> initiate the measurement reporting procedure, as specified in 5.5.5.

[TS 38.331, clause 5.5.4.8]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition B1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition B1-2, as specified below, is fulfilled;

Inequality B1-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Thresh$$

Inequality B1-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Thresh$$

The variables in the formula are defined as follows:

Mn is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the frequency of the inter-RAT neighbour cell (i.e. *eutra-Q-OffsetRange* as defined within the *measObjectEUTRA* corresponding to the frequency of the neighbour inter-RAT cell).

Ocn is the cell specific offset of the inter-RAT neighbour cell (i.e. *cellIndividualOffset* as defined within the *measObjectEUTRA* corresponding to the neighbour inter-RAT cell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

Thresh is the threshold parameter for this event (i.e. *b1-ThresholdEUTRA* as defined within *reportConfigInterRAT* for this event).

Mn is expressed in dBm or in dB, depending on the measurement quantity of the inter-RAT neighbour cell.

Ofn*, *Ocn*, *Hys are expressed in dB.

Thresh is expressed in the same unit as ***Mn***.

[TS 38.331, clause 5.5.5]



Figure 5.5.5-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingMOList* to include, for each NR serving cell that is configured with *servingCellMO*, RSRP, RSRQ and the available SINR, derived based on the *rsType* if indicated in the associated *reportConfig*, otherwise based on SSB if available, otherwise based on CSI-RS;

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.2.1.3 Test description

8.1.3.2.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, E-UTRA Cell 1 is the inter-RAT neighbour cell of NR Cell 1.
- System information combination NR-6 as defined in TS 38.508-1 [4] clause 4.4.3.1.2.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.2.1.3.2 Test procedure sequence

Table 8.1.3.2.1.3.2-1 and 8.1.3.2.1.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, and E-UTRA Cell 1 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" is applied at the point indicated in the Main behaviour description in Table 8.1.3.2.1.3.2-3.

Table 8.1.3.2.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell 1 | Remark |
|----|-----------------------|---------------|-----------|---------------|---|
| T0 | SS/PBCH | dBm/ | -85 | - | Power levels are such that entry condition for event B1 is not satisfied: |
| | SSS EPRE | SCS | | | |
| | Cell-specific RS EPRE | dBm/1
5kHz | | -93 | |
| T1 | SS/PBCH | dBm/ | -85 | - | Power levels are such that entry condition for event B1 is satisfied: |
| | SSS EPRE | SCS | | | |
| | Cell-specific RS EPRE | dBm/1
5kHz | | -73 | |

Table 8.1.3.2.1.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell 1 | Remark |
|----|-----------------------|---------------|-----------|---------------|---|
| T0 | SS/PBCH | dBm/ | FFS | - | Power levels are such that entry condition for event B1 is not satisfied: |
| | SSS EPRE | SCS | | | |
| | Cell-specific RS EPRE | dBm/1
5kHz | | FFS | |

| | | | | | |
|----|-----------------------|------------|-----|-----|--|
| T1 | SS/PBCH | dBm/ | FFS | - | Power levels are such that entry condition for event B1 is satisfied:
$Mn + Ofn + Ocn - Hys > Thresh$ |
| | SSS EPRE | SCS | | | |
| | Cell-specific RS EPRE | dBm/1 5kHz | | FFS | |

Table 8.1.3.2.1.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup inter-RAT measurement and reporting for event B1. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit a <i>MeasurementReport</i> message within the next 10s? | --> | NR RRC: <i>MeasurementReport</i> | 2 | F |
| 4 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.1.3.2.1.3.2-1/2. | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event B1 with the measured RSRP value for NR Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |

8.1.3.2.1.3.3 Specific message contents

Table 8.1.3.2.1.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.2.1.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|---------------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.2.1.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 8.1.3.2.1.3.3-2: *MeasConfig* (Table 8.1.3.2.1.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | MeasObjectIdNR-f1 | |
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| measObjectId[2] | 2 | MeasObjectIdE-UTRA-f1 | |
| measObject[2] CHOICE { | | | |
| measObjectEUTRA SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueEUTRA for E-UTRA Cell 1 | | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-EventB1 | Table 8.1.3.2.1.3.3-3 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |

| | | | |
|-------------------|---|--|--|
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| quantityConfig | QuantityConfig with condition INTER-RAT | | |
| measGapConfig | MeasGapConfig | | |
| } | | | |

Table 8.1.3.2.1.3.3-3: *ReportConfigInterRAT-EventB1* (Table 8.1.3.2.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-142 with condition EVENT_B1 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB1 SEQUENCE { | | | |
| b1-ThresholdEUTRA SEQUENCE { | | | |
| rsrp | 61 | -80dBm | FR1 |
| | FFS | FFS | FR2 |
| } | | | |
| hysteresis | 4 | 2 dB | |
| } | | | |
| } | | | |
| reportAmount | r1 | | |
| } | | | |
| } | | | |

Table 8.1.3.2.1.3.3-4: *MeasurementReport* (step 5, Table 8.1.3.2.1.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|--|---|------------------------------|--------|
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | Step 5 |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | Report NR Cell 1 | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Report E-UTRA neighbour cell | |
| eutra-PhysCellId | Physical layer cell identity of E-UTRA Cell 1 | | Step 5 |
| measResult SEQUENCE { | | | |
| rsrp | (0..97) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.2.2 Measurement configuration control and reporting / Inter-RAT measurements / Event B2 / Measurement of E-UTRA cells

8.1.3.2.2.1 Test Purpose (TP)

(1)

with { UE is NR RRC_CONNECTED state and inter-RAT measurement event B2 to measure neighbor E-UTRA cell is configured }

ensure that {

when { Entering condition 1 for event B2 is not met but Entering condition 2 is met }

then { UE does not transmit any MeasurementReport }

}

(2)

with { UE is NR RRC_CONNECTED state and inter-RAT measurement event B2 to measure neighbor E-UTRA cell is configured }

ensure that {

when { Entering condition 1 and 2 for event B2 is met }

then { UE transmits a MeasurementReport }

}

8.1.3.2.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2, 5.5.4.1, 5.5.4.9 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case *RRCReconfiguration* is received via SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case *RRCReconfiguration* is received via SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

2> if this is the first *RRCReconfiguration* message after successful completion of the RRC re-establishment procedure;

3> resume SRB2 and DRBs that are suspended;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

1> if the received *measConfig* includes the *measGapConfig*:

2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

...

[TS 38.331, clause 5.5.2.9]

The UE shall:

1> if *gapFR1* is set to setup:

2> if an FR1 measurement gap configuration is already setup, release the FR1 measurement gap configuration;

2> setup the FR1 measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$\text{SFN mod } T = \text{FLOOR}(\text{gapOffset}/10)$;

subframe = $\text{gapOffset mod } 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapFR1* is set to release:

2> release the FR1 measurement gap configuration;

1> if *gapFR2* is set to setup:

2> if an FR2 measurement gap configuration is already setup, release the FR2 measurement gap configuration;

2> setup the FR2 measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$$SFN \bmod T = \text{FLOOR}(gapOffset/10);$$

$$\text{subframe} = gapOffset \bmod 10;$$

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapFR2* is set to release:

2> release the FR2 measurement gap configuration;

1> if *gapUE* is set to setup:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$$SFN \bmod T = \text{FLOOR}(gapOffset/10);$$

$$\text{subframe} = gapOffset \bmod 10;$$

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapUE* is set to release:

2> release the per UE measurement gap configuration.

NOTE 1: For *gapFR2* configuration, the SFN and subframe of a serving cell on FR2 frequency is used in the gap calculation

NOTE 2: For *gapFR1* or *gapUE* configuration, the SFN and subframe of the PCell is used in the gap calculation.

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;

3> if the corresponding *measObject* concerns NR;

...

4> for measurement events other than *eventA1* or *eventA2*:

5> if *useWhiteCellList* is set to TRUE:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is included in the *whiteCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

5> else:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

3> else if the corresponding *measObject* concerns E-UTRA;

4> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModListEUTRAN* defined within the *VarMeasConfig* for this *measId*;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> else if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:

3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:

4> initiate the measurement reporting procedure, as specified in 5.5.5;

3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:

4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> stop the periodical reporting timer for this *measId*, if running;

...

2> upon the expiry of T321 for this *measId*:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> initiate the measurement reporting procedure, as specified in 5.5.5.

[TS 38.331, clause 5.5.4.9]

The UE shall:

1> consider the entering condition for this event to be satisfied when both condition B2-1 and condition B2-2, as specified below, are fulfilled;

1> consider the leaving condition for this event to be satisfied when condition B2-3 or condition B2-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality B2-1 (Entering condition 1)

$$Mp + Hys < Thresh1$$

Inequality B2-2 (Entering condition 2)

$$Mn + Ofn + Ocn - Hys > Thresh2$$

Inequality B2-3 (Leaving condition 1)

$$Mp - Hys > Thresh1$$

Inequality B2-4 (Leaving condition 2)

$$Mn + Ofn + Ocn + Hys < Thresh2$$

The variables in the formula are defined as follows:

Mp is the measurement result of the PCell, not taking into account any offsets.

Mn is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the frequency of the inter-RAT neighbour cell (i.e. *eutra-Q-OffsetRange* as defined within the *measObjectEUTRA* corresponding to the frequency of the inter-RAT neighbour cell).

Ocn is the cell specific offset of the inter-RAT neighbour cell (i.e. *cellIndividualOffset* as defined within the *measObjectEUTRA* corresponding to the neighbour inter-RAT cell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

Thresh1 is the threshold parameter for this event (i.e. *b2-Threshold1* as defined within *reportConfigInterRAT* for this event).

Thresh2 is the threshold parameter for this event (i.e. *b2-Threshold2EUTRA* as defined within *reportConfigInterRAT* for this event).

Mp is expressed in dBm in case of RSRP, or in dB in case of RSRQ and SINR.

Mn is expressed in dBm or dB, depending on the measurement quantity of the inter-RAT neighbour cell.

Ofn*, *Ocn*, *Hys are expressed in dB.

Thresh1 is expressed in the same unit as ***Mp***.

Thresh2 is expressed in the same unit as ***Mn***.

[TS 38.331, clause 5.5.5]



Figure 5.5.5-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingMOList* to include, for each NR serving cell that is configured with *servingCellMO*, RSRP, RSRQ and the available SINR, derived based on the *rsType* if indicated in the associated *reportConfig*, otherwise based on SSB if available, otherwise based on CSI-RS;

1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:

2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;

...

1> if there is at least one applicable neighbouring cell to report:

2> if the *reportType* is set to *eventTriggered* or *periodical*:

3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

4> if the *reportType* is set to *eventTriggered*:

5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

...

4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

4> if the *reportType* is set to *eventTriggered* or *periodical*:

5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

6> if the *measObject* associated with this *measId* concerns NR:

7> if *rsType* in the associated *reportConfig* is set to *ssb*:

8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first:

9> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;

...

6> if the *measObject* associated with this *measId* concerns E-UTRA:

7> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfigInterRAT* in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

...

- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- ...
- 1> if the UE is configured with EN-DC:
- 2> if SRB3 is configured:
- 3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;
- 2> else:
- 3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].
- 1> else:
- 2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.2.2.3 Test description

8.1.3.2.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, E-UTRA Cell 1 is the inter-RAT neighbour cell of NR Cell 1.
- System information combination NR-6 as defined in TS 38.508-1 [4] clause 4.4.3.1.2.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.2.2.3.2 Test procedure sequence

Table 8.1.3.2.2.3.2-1 and 8.1.3.2.2.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, and E-UTRA Cell 1 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" is applied at the point indicated in the Main behaviour description in Table 8.1.3.2.2.3.2-3.

Table 8.1.3.2.2.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell 1 | Remark |
|----|--------------------------|---------------|-----------|---------------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -75 | - | Power levels are such that entry condition 1 for event B2 is not satisfied and entry condition 2 is satisfied:

Mp - Hys > Thresh1 and
Mn + Ofn + Ocn - Hys > Thresh2 |
| | Cell-specific
RS EPRE | dBm/1
5kHz | | -73 | |

| | | | | | |
|----|-----------------------|---------------|-----|-----|---|
| T1 | SS/PBCH | dBm/ | -85 | - | Power levels are such that entry condition for event B2 is satisfied:

$Mp + Hys < Thresh1$ and

$Mn + Ofn + Ocn - Hys > Thresh2$ |
| | SSS EPRE | SCS | | | |
| | Cell-specific RS EPRE | dBm/1
5kHz | | -73 | |

Table 8.1.3.2.2.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell 1 | Remark |
|----|-----------------------|---------------|-----------|---------------|--|
| T0 | SS/PBCH | dBm/ | FFS | - | Power levels are such that entry condition 1 for event B2 is not satisfied and entry condition 2 is satisfied:

$Mp + Hys > Thresh1$ and
$Mn + Ofn + Ocn - Hys > Thresh2$ |
| | SSS EPRE | SCS | | | |
| | Cell-specific RS EPRE | dBm/1
5kHz | | FFS | |
| T1 | SS/PBCH | dBm/ | FFS | - | Power levels are such that entry condition for event B2 is satisfied:

$Mp + Hys < Thresh1$ and

$Mn + Ofn + Ocn - Hys > Thresh2$ |
| | SSS EPRE | SCS | | | |
| | Cell-specific RS EPRE | dBm/1
5kHz | | FFS | |

Table 8.1.3.2.2.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup inter-RAT measurement and reporting for event B2. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit a <i>MeasurementReport</i> message within the next 10s? | --> | NR RRC: <i>MeasurementReport</i> | 2 | F |
| 4 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.1.3.2.2.3.2-1/2. | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event B2 with the measured RSRP value for NR Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |

8.1.3.2.2.3.3 Specific message contents

Table 8.1.3.2.2.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.2.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|-----------------------------------|---------------------------|-----------------------|--|
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.2.2.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.2.2.3.3-2: *MeasConfig* (Table 8.1.3.2.2.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | MeasObjectIdNR-f1 | |
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| measObjectId[2] | 2 | MeasObjectIdE-UTRA-f1 | |
| measObject[2] CHOICE { | | | |
| measObjectEUTRA SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueEUTRA for E-UTRA Cell 1 | | |

| | | | |
|--|---|-----------------------|--|
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-EventB2 | Table 8.1.3.2.2.3.3-3 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| quantityConfig | QuantityConfig with Condition INTER-RAT | | |
| measGapConfig | MeasGapConfig | | |
| } | | | |

Table 8.1.3.2.2.3.3-3: ReportConfigInterRAT-EventB2 (Table 8.1.3.2.2.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-142 with condition EVENT_B2 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB2 SEQUENCE { | | | |
| b2-Threshold1 SEQUENCE { | | | |
| rsrp | 76 | -80dBm | FR1 |
| | FFS | FFS | FR2 |
| } | | | |
| b2-Threshold2EUTRA SEQUENCE { | | | |
| rsrp | 58 | -83dBm | FR1 |

| | | | |
|--------------|-----|------|-----|
| | | | |
| | FFS | FFS | FR2 |
| } | | | |
| hysteresis | 4 | 2 dB | |
| } | | | |
| } | | | |
| reportAmount | r1 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.2.2.3.3-4: *MeasurementReport* (step 5, Table 8.1.3.2.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|---|------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | Step 5 |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | Report NR Cell 1 | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|--|---|------------------------------|--------|
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Report E-UTRA neighbour cell | |
| eutra-PhysCellId | Physical layer cell identity of E-UTRA Cell 1 | | Step 5 |
| measResult SEQUENCE { | | | |
| rsrp | (0..97) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.2.3 Measurement configuration control and reporting / Inter-RAT measurements / Event B2 / Measurement of E-UTRA cells / RSRQ based measurements

8.1.3.2.3.1 Test Purpose (TP)

(1)

with { UE is NR RRC_CONNECTED state **and** inter-RAT measurement event B2 to measure neighbor E-UTRA cell is configured **and** *triggerQuantity* set to *rsrq* }

ensure that {

when { Entering condition 1 and 2 for event B2 is not met }

then { UE does not send *MeasurementReport* }

}

(2)

with { UE is NR RRC_CONNECTED state **and** inter-RAT measurement event B2 to measure neighbor E-UTRA cell is configured **and** *triggerQuantity* set to *rsrq* }

ensure that {

when { Entering condition 1 and 2 for event B2 is met }

then { UE transmits a *MeasurementReport* }

}

8.1.3.2.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clause 5.3.5.3, 5.5.2.1, 5.5.4.1, 5.5.4.9 and 5.5.5.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

[TS 38.331, clause 5.5.2.1]

The UE shall:

1> if the received *measConfig* includes the *measObjectToRemoveList*:

2> perform the measurement object removal procedure as specified in 5.5.2.4;

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

1> if the received *measConfig* includes the *reportConfigToRemoveList*:

2> perform the reporting configuration removal procedure as specified in 5.5.2.6;

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

1> if the received *measConfig* includes the *quantityConfig*:

2> perform the quantity configuration procedure as specified in 5.5.2.8;

1> if the received *measConfig* includes the *measIdToRemoveList*:

2> perform the measurement identity removal procedure as specified in 5.5.2.2;

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

1> if the received *measConfig* includes the *measGapConfig*:

2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

1> if the received *measConfig* includes the *measGapSharingConfig*:

2> perform the measurement gap sharing configuration procedure as specified in 5.5.2.11;

1> if the received *measConfig* includes the *s-MeasureConfig*:

2> if *s-MeasureConfig* is set to *ssb-RSRP*, set parameter *ssb-RSRP* of *s-MeasureConfig* within *VarMeasConfig* to the lowest value of the RSRP ranges indicated by the received value of *s-MeasureConfig*;

2> else, set parameter *csi-RSRP* of *s-MeasureConfig* within *VarMeasConfig* to the lowest value of the RSRP ranges indicated by the received value of *s-MeasureConfig*.

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;
...
- 3> else if the corresponding *measObject* concerns E-UTRA;
- 4> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModListEUTRAN* defined within the *VarMeasConfig* for this *measId*;
...
- 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):
 - 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> else if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> else if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:
 - 3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:
 - 4> initiate the measurement reporting procedure, as specified in 5.5.5;
 - 3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:
 - 4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 4> stop the periodical reporting timer for this *measId*, if running;
 - ...
 - 2> upon the expiry of T321 for this *measId*:
 - 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5.

[TS 38.331, clause 5.5.4.9]

The UE shall:

1> consider the entering condition for this event to be satisfied when both condition B2-1 and condition B2-2, as specified below, are fulfilled;

1> consider the leaving condition for this event to be satisfied when condition B2-3 or condition B2-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality B2-1 (Entering condition 1)

$$M_p + Hys < Thresh1$$

Inequality B2-2 (Entering condition 2)

$$M_n + Ofn + Ocn - Hys > Thresh2$$

Inequality B2-3 (Leaving condition 1)

$$M_p - Hys > Thresh1$$

Inequality B2-4 (Leaving condition 2)

$$M_n + Ofn + Ocn + Hys < Thresh2$$

The variables in the formula are defined as follows:

M_p is the measurement result of the PCell, not taking into account any offsets.

M_n is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the frequency of the inter-RAT neighbour cell (i.e. *eutra-Q-OffsetRange* as defined within the *measObjectEUTRA* corresponding to the frequency of the inter-RAT neighbour cell).

Ocn is the cell specific offset of the inter-RAT neighbour cell (i.e. *cellIndividualOffset* as defined within the *measObjectEUTRA* corresponding to the neighbour inter-RAT cell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

Thresh1 is the threshold parameter for this event (i.e. *b2-Threshold1* as defined within *reportConfigInterRAT* for this event).

Thresh2 is the threshold parameter for this event (i.e. *b2-Threshold2EUTRA* as defined within *reportConfigInterRAT* for this event).

M_p is expressed in dBm in case of RSRP, or in dB in case of RSRQ and SINR.

M_n is expressed in dBm or dB, depending on the measurement quantity of the inter-RAT neighbour cell.

Ofn*, *Ocn*, *Hys are expressed in dB.

Thresh1 is expressed in the same unit as ***M_p***.

Thresh2 is expressed in the same unit as ***M_n***.

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5.1-1: Measurement reporting

8.1.3.2.3.3 Test description

8.1.3.2.3.3.1 Pre-test conditions

System Simulator:

- Cell 1 is the NR serving cell, E-UTRA Cell 1 is the inter-RAT neighbour cell.
- System information combination NR-6 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.3.2.3.3.2 Test procedure sequence

Table 8.1.3.2.3.3.2-1 and 8.1.3.2.3.3.2-2 illustrate the downlink power levels to be applied for NR Cell 1 and E-UTRA Cell 1 at various time instants of the test execution for FR1 and FR2 respectively. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.3.2.3.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell | Remark |
|--------|-----------------------|-----------|-----------|-------------|---|
| T
0 | SS/PBCH | dBm/SCS | -88 | - | Power levels are such that entry condition for event B2 is not satisfied:

$Mp + Hys \geq Thresh1$ or $Mn + Ofn + Ocn - Hys \leq Thresh2$ |
| | SSS EPRE | | | | |
| | SS-RSRQ | dB | -11.74 | - | |
| | Cell-specific RS EPRE | dBm/15kHz | - | -94 | |
| | RSRQ | dB | - | -3.01 | |
| | Noc | dBm/SCS | -94 | - | |
| T
1 | SS/PBCH | dBm/SCS | -94 | - | Power levels are such that entry condition for event B2 is satisfied:

$Mp + Hys < Thresh1$ and $Mn + Ofn + Ocn - Hys > Thresh2$ |
| | SSS EPRE | | | | |
| | SS-RSRQ | dB | -13.78 | - | |
| | Cell-specific RS EPRE | dBm/15kHz | - | -85 | |
| | RSRQ | dB | - | -0.52 | |

Table 8.1.3.2.3.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell 2 | Remark |
|--|-----------|------|-----------|---------------|--------|
| | | | | | |

| | | | | | |
|--------|-----------------------|-----------|-----|-----|---|
| T
0 | SS/PBCH | dBm/SCS | FFS | - | Power levels are such that entry condition for event B2 is not satisfied:

$M_p + H_{ys} \geq Thresh1$ or $M_n + Ofn + Ocn - H_{ys} \leq Thresh2$ |
| | SSS EPRE | | | | |
| | SS-RSRQ | dB | FFS | - | |
| | Cell-specific RS EPRE | dBm/15kHz | - | FFS | |
| | RSRQ | dB | - | FFS | |
| | Noc | dBm/SCS | FFS | - | |
| | Noc | dBm/15kHz | - | FFS | |
| T
1 | SS/PBCH | dBm/SCS | FFS | - | Power levels are such that entry condition for event B2 is satisfied:

$M_p + H_{ys} < Thresh1$ and $M_n + Ofn + Ocn - H_{ys} > Thresh2$ |
| | SSS EPRE | | | | |
| | SS-RSRQ | dB | FFS | - | |
| | Cell-specific RS EPRE | dBm/15kHz | - | FFS | |
| | RSRQ | dB | - | FFS | |

Table 8.1.3.2.3.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message on NR Cell 1 including <i>MeasConfig</i> to setup inter-RAT measurement and reporting for event B2 | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message on NR Cell 1. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit a <i>MeasurementReport</i> message on NR Cell 1 within the next 10s? | --> | NR RRC: <i>MeasurementReport</i> | 1 | F |
| 4 | The SS re-adjusts the cell-specific reference signal level according to row "T1" in Table 8.1.3.2.3.3.2-1/2. | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MeasurementReport</i> message on Cell 1 to report event B2 with the measured RSRP and RSRQ values for E-UTRA Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |

8.1.3.2.3.3.3 Specific message contents

Table 8.1.3.2.3.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.2.3.3.2-3)

| Derivation Path: 38.508-1 [4] table 4.6.1-13 | | | |
|--|---------------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | Table 8.1.3.2.3.3.3-2 | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.2.3.3.3-2: *MeasConfig* (step 1, Table 8.1.3.2.3.3.2-3)

| Derivation path: 38.508-1 [4] table 4.6.3-69 | | | |
|---|--------------------|-----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.2.3.3.3-3 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectEUTRA | MeasObjectEUTRA-f2 | Table 8.1.3.2.3.3.3-4 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE | 1 entry | | |

| | | | |
|---|---|-----------------------|--|
| (1..maxReportConfigId)) OF SEQUENCE { | | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-B2 | Table 8.1.3.2.3.3.3-5 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | ReportConfigId | | |
| } | | | |
| quantityConfig | QuantityConfig with condition INTER-RAT | | |
| measGapConfig | MeasGapConfig | Table 8.1.3.2.3.3.3-6 | |
| } | | | |

Table 8.1.3.2.3.3.3-3: MeasObjectNR-f1 (Table 8.1.3.2.3.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR cell 1 SSB | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |

Table 8.1.3.2.3.3.3-4: MeasObjectEUTRA-f2 (Table 8.1.3.2.3.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-74 | | | |
|--|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectEUTRA ::= SEQUENCE { | | | |
| carrierFreq | Downlink ARFCN of E-UTRA Cell 1 | | |
| } | | | |

Table 8.1.3.2.3.3.3-5: *ReportConfigInterRAT-B2* (Table 8.1.3.2.3.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-141 with condition EVENT_B2 | | | |
|--|----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigInterRAT::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB2 SEQUENCE { | | | |
| b2-Threshold1 CHOICE { | | | |
| rsrq | 0 | 0dB | |
| } | | | |
| b2-Threshold2EUTRA CHOICE { | | | |
| rsrq | 0 | 0dB | |
| } | | | |
| reportOnLeave | False | | |
| hysteresis | Hysteresis | | |
| timeToTrigger | ms0 | | |
| } | | | |
| } | | | |
| rsType | ssb | | |
| reportInterval | ReportInterval | | |
| reportAmount | infinity | | |
| reportQuantity SEQUENCE { | | | |
| rsrp | True | | |
| rsrq | True | | |
| sinr | False | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.2.3.3.3-6: *MeasGapConfig* (Table 8.1.3.2.3.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-70 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|------------------------------|------|--|--|
| | | | |
| MeasGapConfig ::= SEQUENCE { | | | |
| gapUE CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset | 0 | | |
| mgl | ms6 | | |
| mgrp | ms40 | | |
| mgta | ms0 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.2.3.3.3-7: *MeasurementReport* (steps 5, Table 8.1.3.2.3.3.3-2)

| Derivation Path: TS 38.508-1 [4], table 4.6.1-5A | | | |
|--|----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | Step 5 | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | | |
| servCellId | ServCellIndex of NR serving cell | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId of NR serving cell | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|--|-----------------------------|--------|--|
| rsIndexResults | Not present | | |
| } | | | |
| } | | | |
| measResultBestNeighCell | Not present | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| MeasResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | | |
| eutra-PhysCellId | PhysCellId of E-UTRA Cell 1 | Step 5 | |
| measResult SEQUENCE { | | | |
| rsrp | (0..97) | | |
| rsrq | (0..34) | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.2.4 Measurement configuration control and reporting / Inter-RAT measurements / Event B2 / Measurement of E-UTRA cells / SINR based measurements

8.1.3.2.4.1 Test Purpose (TP)

(1)

with { UE is NR RRC_CONNECTED state and inter-RAT measurement event B2 to measure neighbor E-UTRA cell is configured and triggerQuantity set to sinr }

ensure that {

when { Entering condition 1 and 2 for event B2 is not met }

then { UE does not transmit any MeasurementReport }

 }

(2)

with { UE is NR RRC_CONNECTED state and inter-RAT measurement event B2 to measure neighbor E-UTRA cell is configured and triggerQuantity set to sinr }

ensure that {

when { Entering condition 1 and 2 for event B2 is met }

then { UE transmits a MeasurementReport }

 }

8.1.3.2.4.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2.1, 5.5.2.9, 5.5.4.1, 5.5.4.9 and 5.5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

...

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

...

- 1> if the received *measConfig* includes the *measGapConfig*:
- 2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

...

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

- 1> if *gapUE* is set to *setup*:
- 2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;
- 2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = $gapOffset \bmod 10$;

with $T = MGRP/10$ as defined in TS 38.133 [14];

- 2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

...

[TS 38.331, clause 5.5.4.1]

If AS security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*:
- ...
- 3> else if the corresponding *measObject* concerns E-UTRA:
- 4> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModListEUTRAN* defined within the *VarMeasConfig* for this *measId*;

...

- 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

- 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;

- 2> else if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

- 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> else if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:
- 3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> if *reportOnLeave* is set to *true* for the corresponding reporting configuration:
- 4> initiate the measurement reporting procedure, as specified in 5.5.5;
- 3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:
- 4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 4> stop the periodical reporting timer for this *measId*, if running;
- ...
- 2> upon expiry of the periodical reporting timer for this *measId*:
- 3> initiate the measurement reporting procedure, as specified in 5.5.5.

...

[TS 38.331, clause 5.5.4.9]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when both condition B2-1 and condition B2-2, as specified below, are fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition B2-3 or condition B2-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality B2-1 (Entering condition 1)

$$M_p + H_{ys} < Thresh1$$

Inequality B2-2 (Entering condition 2)

$$M_n + Ofn + Ocn - H_{ys} > Thresh2$$

Inequality B2-3 (Leaving condition 1)

$$M_p - H_{ys} > Thresh1$$

Inequality B2-4 (Leaving condition 2)

$$M_n + Ofn + Ocn + H_{ys} < Thresh2$$

The variables in the formula are defined as follows:

M_p is the measurement result of the PCell, not taking into account any offsets.

M_n is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the frequency of the inter-RAT neighbour cell (i.e. *eutra-Q-OffsetRange* as defined within the *measObjectEUTRA* corresponding to the frequency of the inter-RAT neighbour cell).

Ocn is the cell specific offset of the inter-RAT neighbour cell (i.e. *cellIndividualOffset* as defined within the *measObjectEUTRA* corresponding to the neighbour inter-RAT cell), and set to zero if not configured for the neighbour cell.

H_{ys} is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

Thresh1 is the threshold parameter for this event (i.e. *b2-Threshold1* as defined within *reportConfigInterRAT* for this event).

Thresh2 is the threshold parameter for this event (i.e. *b2-Threshold2EUTRA* as defined within *reportConfigInterRAT* for this event).

Mp is expressed in dBm in case of RSRP, or in dB in case of RSRQ and SINR.

Mn is expressed in dBm or dB, depending on the measurement quantity of the inter-RAT neighbour cell.

Ofn, Ocn, Hys are expressed in dB.

Thresh1 is expressed in the same unit as **Mp**.

Thresh2 is expressed in the same unit as **Mn**.

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful AS security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include, for each NR serving cell that is configured with *servingCellMO*, RSRP, RSRQ and the available SINR, derived based on the *rsType* if indicated in the associated *reportConfig*, otherwise based on SSB if available, otherwise based on CSI-RS;
- 1> set the *servCellId* within *measResultServingMOList* to include each NR serving cell that is configured with *servingCellMO*, if any;
- ...
- 1> if there is at least one applicable neighbouring cell to report:
 - 2> if the *reportType* is set to *eventTriggered* or *periodical*:
 - 3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 4> if the *reportType* is set to *eventTriggered*:
 - 5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - ...
 - 4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 4> if the *reportType* is set to *eventTriggered* or *periodical*:
 - 5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

...

6> if the *measObject* associated with this *measId* concerns E-UTRA:

7> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfigInterRAT* in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

...

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

...

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.2.4.3 Test description

8.1.3.2.4.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell, EUTRA Cell 1 is the inter-RAT neighbour cell of NR Cell 1.
- System information combination NR-7 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.2.4.3.2 Test procedure sequence

Table 8.1.3.2.4.3.2-1 and 8.1.3.2.4.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1 and EUTRA Cell 1 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1", is applied at the point indicated in the Main behaviour description in Table 8.1.3.2.4.3.2-3.

Table 8.1.3.2.4.3.2-1: Time instances of cell power level and parameter changes for NR Cell 1 and E-UTRA Cell 1 in FR1

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell 1 | Remark |
|----|---------------------|-------------|-----------|---------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -79 | - | Power levels are such that entry conditions for event B2 are not satisfied: |

| | | | | | |
|----|-----------------------|------------|-----|-----|--|
| | Cell-specific RS EPRE | dBm/1 5kHz | - | -91 | $Mp + Hys \geq Thresh1$ and
$Mn + Ofn + Ocn - Hys \leq Thresh2$ |
| | Noc | dBm/1 5kHz | - | -82 | |
| | Noc | dBm/ SCS | -82 | - | |
| | SINR | - | 3 | -9 | |
| T1 | SS/PBCH SSS EPRE | dBm/ SCS | -91 | - | Power levels are such that entry condition for event B2 are satisfied:

$Mp + Hys < Thresh1$ and
$Mn + Ofn + Ocn - Hys > Thresh2$ |
| | Cell-specific RS EPRE | dBm/1 5kHz | - | -73 | |
| | Noc | dBm/1 5kHz | - | -82 | |
| | Noc | dBm/ SCS | -82 | - | |
| | SINR | - | -9 | 9 | |

Table 8.1.3.2.4.3.2-2: Time instances of cell power level and parameter changes for NR Cell 1 and E-UTRA Cell 1 in FR2

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell 1 | Remark |
|----|-----------------------|------------|-----------|---------------|---|
| T0 | SS/PBCH SSS EPRE | dBm/ SCS | FFS | - | Power levels are such that entry conditions for event B2 are not satisfied:

1) $Mp + Hys \geq Thresh1$ and
2) $Mn + Ofn + Ocn - Hys \leq Thresh2$ |
| | Cell-specific RS EPRE | dBm/1 5kHz | - | FFS | |
| | Noc | dBm/1 5kHz | - | FFS | |
| | Noc | dBm/ SCS | FFS | - | |
| | SINR | - | FFS | FFS | |
| T1 | SS/PBCH SSS EPRE | dBm/ SCS | FFS | - | Power levels are such that entry condition for event B2 are satisfied:

$Mp + Hys < Thresh1$ and
$Mn + Ofn + Ocn - Hys > Thresh2$ |
| | Cell-specific RS EPRE | dBm/1 5kHz | - | FFS | |
| | Noc | dBm/1 5kHz | - | FFS | |
| | Noc | dBm/ SCS | FFS | - | |

| | | | | | |
|--|------|---|-----|-----|--|
| | SINR | - | FFS | FFS | |
|--|------|---|-----|-----|--|

Table 8.1.3.2.4.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup EUTRA measurement and reporting for inter-RAT event B2. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE transmit a <i>MeasurementReport</i> message with event B2 for EUTRA Cell 1 within the next 10s? | - | - | 1 | F |
| 4 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.1.3.2.4.3.2-1/2. | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MeasurementReport</i> message with event B2 for EUTRA Cell 1 within the next 10s? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |

8.1.3.2.4.3.3 Specific message contents

Table 8.1.3.2.4.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.2.4.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|-------------------------------|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| <i>rrc-TransactionIdentifier</i> | RRC-
TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| <i>rrcReconfiguration</i> ::= SEQUENCE { | | | |
| <i>radioBearerConfig</i> | Not present | | |
| <i>secondaryCellGroup</i> | Not present | | |
| <i>measConfig</i> | MeasConfig | Table
8.1.3.2.4.3.3-2 | |
| <i>lateNonCriticalExtension</i> | Not present | | |
| <i>nonCriticalExtension</i> | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.2.4.3.3-2: *MeasConfig* (Table 8.1.3.2.4.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|---|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.1.3.2.4.3.3-3 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectEUTRA | MeasObjectEUTRA-f2 | Table 8.1.3.2.4.3.3-4 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-EventB2 | Table 8.1.3.2.4.3.3-5 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| quantityConfig | QuantityConfig with condition INTER-RAT | | |
| measGapConfig | MeasGapConfig | | |
| } | | | |

Table 8.1.3.2.4.3.3-3: *MeasObjectNR-f1* (Table 8.1.3.2.4.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.1.3.2.4.3.3-4: *MeasObjectEUTRA-f2* (Table 8.1.3.2.4.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-74 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectEUTRA ::= SEQUENCE { | | | |
| carrierFreq | ARFCN-ValueEUTRA for CRS of E-UTRA Cell 1 | | |
| } | | | |

Table 8.1.3.2.4.3.3-5: *ReportConfigInterRAT-EventB2* (Table 8.1.3.2.4.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-141 with condition EVENT_B2 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB2 SEQUENCE { | | | |
| b2-Threshold1 CHOICE { | | | |
| sinr | 46 | 0dB | FR1 |
| | FFS | | FR2 |
| } | | | |
| b2-Threshold2EUTRA CHOICE { | | | |
| sinr | 46 | 0dB | |
| } | | | |
| hysteresis | 4 | 2 dB | |

| | | | |
|---------------------------|------|--|--|
| } | | | |
| } | | | |
| reportQuantity SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | true | | |
| sinr | true | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.2.4.3.3-6: *MeasurementReport* (step 5, Table 8.1.3.2.4.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|----------------------------|----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | Measurement report for NR Cell 1 | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PCI of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|--|----------------------------|-------------------------------------|--|
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | Measurement report for EUTRA Cell 1 | |
| eutra-PhysCellId | PhysCellId of EUTRA Cell 1 | | |
| measResult SEQUENCE { | | | |
| rsrp | (0..97) | | |
| rsrq | (0..34) | | |
| sinr | (0..127) | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.2.5 Void

8.1.3.3 Measurement for self-optimized networks

8.1.3.3.1 Measurement configuration control and reporting / CGI reporting of NR cell

8.1.3.3.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { Neighbour NR cell becomes offset better than serving }

then { UE sends MeasurementReport for event A3 }

 }

(2)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE is commanded to report the global cell identity of the neighbour NR cell }

then { UE determines the global cell identity of the cell included in the associated measurement object by acquiring the relevant system information from the concerned cell and reports the global cell identity in the MeasurementReport }

}

8.1.3.3.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2.3, 5.5.3.1, 5.5.4.8 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> else (MCG *RRCReconfiguration*):

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

...

[TS 38.331, clause 5.5.2.3]

...

The UE shall:

1> for each *measId* included in the received *measIdToAddModList*:

- 2> if an entry with the matching *measId* exists in the *measIdList* within the *VarMeasConfig*:
- 3> replace the entry with the value received for this *measId*;
- 2> else:
- 3> add a new entry for this *measId* within the *VarMeasConfig*;
- 2> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;
- 2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;
- 2> if the *reportType* is set to *reportCGI* in the *reportConfig* associated with this *measId*:
- ...
- 3> if the *measObject* associated with this *measId* concerns NR:
- 4> if the *measObject* associated with this *measId* concerns FR1:
- 5> start timer T321 with the timer value set to 2 seconds for this *measId*;
- 4> if the *measObject* associated with this *measId* concerns FR2:
- 5> start timer T321 with the timer value set to 16 seconds for this *measId*.

[TS 38.331, clause 5.5.3.1]

The UE shall:

- 1> whenever the UE has a *measConfig*, perform RSRP and RSRQ measurements for each serving cell for which *servingCellMO* is configured as follows:
- 2> if the *reportConfig* associated with at least one *measId* included in the *measIdList* within *VarMeasConfig* contains an *rsType* set to *ssb* and *ssb-ConfigMobility* is configured in the *measObject* indicated by the *servingCellMO*:
- ...
- 3> derive serving cell measurement results based on SS/PBCH block, as described in 5.5.3.3;
- ...
- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 2> if the *reportType* for the associated *reportConfig* is set to *reportCGI* and timer T321 is running:
- 3> perform the corresponding measurements on the frequency and RAT indicated in the associated *measObject* using available idle periods;
- 3> if the cell indicated by *reportCGI* field for the associated *measObject* is an NR cell and that indicated cell is broadcasting *SIB1* (see TS 38.213 [13], clause 13):
- 4> try to acquire *SIB1* in the concerned cell;
- ...
- 2> if the *reportType* for the associated *reportConfig* is *periodical* or *eventTriggered*:
- ...
- 3> if the UE does not require measurement gaps to perform the concerned measurements:
- 4> if *s-MeasureConfig* is not configured
- ...
- 5> if the *measObject* is associated to NR and the *rsType* is set to *ssb*:

6> if *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* for the associated *reportConfig* are configured:

7> derive layer 3 beam measurements only based on SS/PBCH block for each measurement quantity indicated in *reportQuantityRS-Indexes*, as described in 5.5.3.3a;

6> derive cell measurement results based on SS/PBCH block for the trigger quantity and each measurement quantity indicated in *reportQuantityCell* using parameters from the associated *measObject*, as described in 5.5.3.3;

...

2> perform the evaluation of reporting criteria as specified in 5.5.4.

[TS 38.331, clause 5.5.4.1]

If AS security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*:

3> if the corresponding *measObject* concerns NR:

...

4> if the *eventA3* or *eventA5* is configured in the corresponding *reportConfig*:

5> if a serving cell is associated with a *measObjectNR* and neighbours are associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

4> if corresponding *reportConfig* includes *reportType* set to *periodical*; or

4> for measurement events other than *eventA1* or *eventA2*:

...

5> else:

6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

...

2> else if the corresponding *reportConfig* includes a *reportType* set to *reportCGI*:

3> consider the cell detected on the associated *measObject* which has a physical cell identity matching the value of the *cellForWhichToReportCGI* included in the corresponding *reportConfig* within the *VarMeasConfig* to be applicable;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

...

2> upon expiry of the periodical reporting timer for this *measId*:

3> initiate the measurement reporting procedure, as specified in 5.5.5.

...

2> if *reportType* is set to *reportCGI*:

3> if the UE acquired the *SIB1* or *SystemInformationBlockType1* for the requested cell; or

3> if the UE detects that the requested NR cell is not transmitting *SIB1* (see TS 38.213 [13], clause 13):

4> stop timer T321;

4> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

4> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

4> initiate the measurement reporting procedure, as specified in 5.5.5;

2> upon the expiry of T321 for this *measId*:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> initiate the measurement reporting procedure, as specified in 5.5.5.

[TS 38.331, clause 5.5.4.4]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

1> use the SpCell for *Mp*, *Ofp* and *Ocp*.

NOTE The cell(s) that triggers the event has reference signals indicated in the *measObjectNR* associated to this event which may be different from the NR SpCell *measObjectNR*.

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$$

Inequality A3-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the reference signal of the neighbour cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Mp is the measurement result of the SpCell, not taking into account any offsets.

Ofp is the measurement object specific offset of the SpCell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the SpCell).

Ocp is the cell specific offset of the SpCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the SpCell), and is set to zero if not configured for the SpCell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigNR* for this event).

Mn, **Mp** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, Ocn, Ofp, Ocp, Hys, Off are expressed in dB.

[TS 38.331, clause 5.5.5]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful AS security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> for each serving cell configured with *servingCellMO*:
 - 2> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *rsType*:
 - 3> if the serving cell measurements based on the *rsType* included in the *reportConfig* that triggered the measurement report are available:
 - 4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on the *rsType* included in the *reportConfig* that triggered the measurement report;
 - 2> else:
 - 3> if SSB based serving cell measurements are available:
 - 4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on SSB;
 - 3> else if CSI-RS based serving cell measurements are available:
 - 4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on CSI-RS;
 - 1> set the *servCellId* within *measResultServingMOList* to include each NR serving cell that is configured with *servingCellMO*, if any;
 - ...
 - 1> if there is at least one applicable neighbouring cell to report:
 - 2> if the *reportType* is set to *eventTriggered* or *periodical*:
 - 3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 4> if the *reportType* is set to *eventTriggered*:
 - 5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - ...
 - 4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 4> if the *reportType* is set to *eventTriggered* or *periodical*:

- 5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 6> if the *measObject* associated with this *measId* concerns NR:
- 7> if *rsType* in the associated *reportConfig* is set to *ssb*:
- 8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;
- ...
- 2> else:
- 3> if the cell indicated by *cellForWhichToReportCGI* is an NR cell:
- 4> if *plmn-IdentityInfoList* of the *cgi-Info* for the concerned cell has been obtained:
- 5> include the *plmn-IdentityInfoList* including *plmn-IdentityList*, *trackingAreaCode* (if available), *ranac* (if available) and *cellIdentity* for each entry of the *plmn-IdentityInfoList*;
- 5> include *frequencyBandList* if available;
- 4> else if *MIB* indicates the *SIB1* is not broadcast:
- 5> include the *noSIB1* including the *ssb-SubcarrierOffset* and *pdccch-ConfigSIB1* obtained from *MIB* of the concerned cell;
- ...
- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
- 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
- ...
- 1> else:
- 2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.3.1.3 Test description

8.1.3.3.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, NR Cell 2 is the intra-frequency neighbour cell of NR Cell 1.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.3.1.3.2 Test procedure sequence

Table 8.1.3.3.1.3.2-1 and 8.1.3.3.1.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" is applied at the point indicated in the Main behaviour description in Table 8.1.3.3.1.3.2-3.

Table 8.1.3.3.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-----------------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm
/
SCS | -85 | -91 | Power levels are such that entry condition for event A3 is not satisfied:
$Mn + Ofn + Ocn - Hys < Mp + Ofp + Ocp + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm
/
SCS | -85 | -79 | Power levels are such that entry condition for event A3 is satisfied:
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |

Table 8.1.3.3.1.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-----------------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm
/
SCS | FFS | FFS | Power levels are such that entry condition for event A3 is not satisfied:
$Mn + Ofn + Ocn - Hys < Mp + Ofp + Ocp + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm
/
SCS | FFS | FFS | Power levels are such that entry condition for event A3 is satisfied:
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |

Table 8.1.3.3.1.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup intra-frequency measurement and reporting for event A3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.1.3.3.1.3.2-1/2. | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured RSRP value for NR Cell 2? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| 5 | The SS transmits an <i>RRCConnectionReconfiguration</i> message | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |

| | | | | | |
|---|---|-----|--|---|---|
| | including <i>measConfig</i> including <i>reportCGI</i> for Cell 2 and sufficient idle periods for UE to acquire the relevant system information from Cell 2 | | | | |
| 6 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 7 | Check: Does the UE transmit a <i>MeasurementReport</i> message with CGI of Cell 2 within 2 sec if Cell 2 is in FR1 (or within 16 sec if Cell 2 is in FR2)? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |

8.1.3.3.1.3.3 Specific message contents

Table 8.1.3.3.1.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.3.1.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|---------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig-A3 | Table 8.1.3.3.1.3.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-DRX | Table 8.1.3.3.1.3.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.3.1.3.3-2: *CellGroupConfig-DRX* (Table 8.1.3.3.1.3.3-1)

| Derivation Path: TS 508-1 [4], Table 4.6.3-19 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| mac-CellGroupConfig | MAC-CellGroupConfig with Condition DRX | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig | Not present | | |
| } | | | |

Table 8.1.3.3.1.3.3-3: *MeasConfig-A3* (Table 8.1.3.3.1.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 2 entries | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-A3 | Table 8.1.3.3.1.3.3-4 | |
| } | | | |
| reportConfigId[2] | 1 | | |
| reportConfig[2] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-CGI | Table 8.1.3.3.1.3.3-5 | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | reportConfigId for event A3 | |
| } | | | |
| } | | | |

Table 8.1.3.3.1.3.3-4: *ReportConfigNR-A3* (Table 8.1.3.3.1.3.3-2)

| Derivation Path: TS 38.508-1 [4] Table 4.6.3-142 with Condition EVENT_A3 | | | |
|--|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | 2 | 1 dB (2*0.5 dB) | |
| } | | | |
| } | | | |
| } | | | |
| reportAmount | r1 | | |
| } | | | |
| } | | | |

Table 8.1.3.3.1.3.3-5: ReportConfigNR-CGI (Table 8.1.3.3.1.3.3-2)

| Derivation Path: TS 38.508-1 [4] Table 4.6.3-142 with Condition CGI | | | |
|---|-------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| reportCGI SEQUENCE { | | | |
| cellForWhichToReportCGI | PhysCellId of NR Cell 2 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.3.1.3.3-6: RRCReconfiguration (step 5, Table 8.1.3.3.1.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|-----------------------------------|----------------|--------------------------|--|
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig-CGI | Table
8.1.3.3.1.3.3-6 | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.3.1.3.3-7: *MeasConfig-CGI* (Table 8.1.3.3.1.3.3-6)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | Not present | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 2 | reportConfigId
for CGI
measurement | |
| } | | | |
| } | | | |

Table 8.1.3.3.1.3.3-8: *MeasurementReport* (step 4 and step 7, Table 8.1.3.3.1.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|-------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | | |
| servCellId | ServCellIndex of NR Cell
1 | | |
| measResultServingCell SEQUENCE { | | | |

| | | | |
|---|---|--|-----------------|
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell | Not present | | Step 7 |
| resultsSSB-Cell SEQUENCE { | | | Step 4 |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell | Not present | | Step 7 |
| resultsSSB-Cell SEQUENCE { | | | Step 4 |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| } | | | |
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| cgi-Info | Not present | | Step 4 |
| cgi-Info SEQUENCE { | | | Step 7 |
| plmn-IdentityInfoList | Set according to specific | | |

| | | | |
|-------------------|---|--|--|
| | message content | | |
| frequencyBandList | Set according to specific message content | | |
| noSIB1 | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.3.3.2 Measurement configuration control and reporting / CGI reporting of E-UTRA cell

8.1.3.3.2.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE detects that entering condition 1 and 2 for event B2 is met }

then { UE transmits a MeasurementReport for event B2 }

}

(2)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE is commanded to report the global cell identity of the neighbour E-UTRA cell }

then { UE determines the global cell identity of the cell included in the associated measurement object by acquiring the relevant system information from the concerned cell and reports the global cell identity in the MeasurementReport }

}

8.1.3.3.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.5.2.3, 5.5.3.1, 5.5.4.8 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

- 1> if the *RRCReconfiguration* message includes the *measConfig*:
- 2> perform the measurement configuration procedure as specified in 5.5.2;

...

- 1> else (MCG RRCReconfiguration):
- 2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

...

[TS 38.331, clause 5.5.2.1]

...

The UE shall:

...

- 1> if the received *measConfig* includes the *measObjectToAddModList*:
- 2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

- 1> if the received *measConfig* includes the *reportConfigToAddModList*:
- 2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

- 1> if the received *measConfig* includes the *measIdToAddModList*:
- 2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

- 1> if the received *measConfig* includes the *measGapConfig*:
- 2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

...

[TS 38.331, clause 5.5.2.3]

...

The UE shall:

- 1> for each *measId* included in the received *measIdToAddModList*:
- 2> if an entry with the matching *measId* exists in the *measIdList* within the *VarMeasConfig*:
- 3> replace the entry with the value received for this *measId*;
- 2> else:
- 3> add a new entry for this *measId* within the *VarMeasConfig*;
- 2> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;
- 2> stop the periodical reporting timer or timer T321, whichever one is running, and reset the associated information (e.g. *timeToTrigger*) for this *measId*;
- 2> if the *reportType* is set to *reportCGI* in the *reportConfig* associated with this *measId*:
- 3> if the *measObject* associated with this *measId* concerns E-UTRA:

4> start timer T321 with the timer value set to 1 second for this *measId*;

...

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

1> if *gapUE* is set to *setup*:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$SFN \bmod T = \text{FLOOR}(gapOffset/10)$;

subframe = *gapOffset* mod 10;

with $T = MGRP/10$ as defined in TS 38.133 [14];

2> apply the specified timing advance *mgta* to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapUE* is set to *release*:

2> release the per UE measurement gap configuration.

[TS 38.331, clause 5.5.3.1]

The UE shall:

1> whenever the UE has a *measConfig*, perform RSRP and RSRQ measurements for each serving cell for which *servingCellMO* is configured as follows:

2> if the *reportConfig* associated with at least one *measId* included in the *measIdList* within *VarMeasConfig* contains an *rsType* set to *ssb* and *ssb-ConfigMobility* is configured in the *measObject* indicated by the *servingCellMO*:

...

3> derive serving cell measurement results based on SS/PBCH block, as described in 5.5.3.3;

...

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the *reportType* for the associated *reportConfig* is set to *reportCGI* and timer T321 is running:

3> perform the corresponding measurements on the frequency and RAT indicated in the associated *measObject* using available idle periods;

...

3> if the cell indicated by *reportCGI* field is an E-UTRA cell:

4> try to acquire *SystemInformationBlockType1* in the concerned cell;

2> if the *reportType* for the associated *reportConfig* is *periodical* or *eventTriggered*:

3> if a measurement gap configuration is setup

...

4> if *s-MeasureConfig* is not configured

...

5> if the *measObject* is associated to E-UTRA:

6> perform the corresponding measurements associated to neighbouring cells on the frequencies indicated in the concerned *measObject*, as described in 5.5.3.2;

...

2> perform the evaluation of reporting criteria as specified in 5.5.4.

[TS 38.331, clause 5.5.4.1]

If AS security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*:

...

3> else if the corresponding *measObject* concerns E-UTRA:

4> if *eventB1* or *eventB2* is configured in the corresponding *reportConfig*:

5> consider a serving cell, if any, on the associated E-UTRA frequency as neighbour cell;

4> else:

5> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModListEUTRAN* defined within the *VarMeasConfig* for this *measId*;

...

2> else if the corresponding *reportConfig* includes a *reportType* set to *reportCGI*:

3> consider the cell detected on the associated *measObject* which has a physical cell identity matching the value of the *cellForWhichToReportCGI* included in the corresponding *reportConfig* within the *VarMeasConfig* to be applicable;

...

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

...

2> upon expiry of the periodical reporting timer for this *measId*:

3> initiate the measurement reporting procedure, as specified in 5.5.5.

...

2> if *reportType* is set to *reportCGI*:

3> if the UE acquired the *SIB1* or *SystemInformationBlockType1* for the requested cell

...

4> stop timer T321;

- 4> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 4> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
- 4> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> upon the expiry of T321 for this *measId*:
- 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5.

[TS 38.331, clause 5.5.4.9]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when both condition B2-1 and condition B2-2, as specified below, are fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition B2-3 or condition B2-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality B2-1 (Entering condition 1)

$$M_p + H_{ys} < Thresh1$$

Inequality B2-2 (Entering condition 2)

$$M_n + O_{fn} + O_{cn} - H_{ys} > Thresh2$$

Inequality B2-3 (Leaving condition 1)

$$M_p - H_{ys} > Thresh1$$

Inequality B2-4 (Leaving condition 2)

$$M_n + O_{fn} + O_{cn} + H_{ys} < Thresh2$$

The variables in the formula are defined as follows:

M_p is the measurement result of the PCell, not taking into account any offsets.

M_n is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets.

O_{fn} is the measurement object specific offset of the frequency of the inter-RAT neighbour cell (i.e. *eutra-Q-OffsetRange* as defined within the *measObjectEUTRA* corresponding to the frequency of the inter-RAT neighbour cell).

O_{cn} is the cell specific offset of the inter-RAT neighbour cell (i.e. *cellIndividualOffset* as defined within the *measObjectEUTRA* corresponding to the neighbour inter-RAT cell), and set to zero if not configured for the neighbour cell.

H_{ys} is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

Thresh1 is the threshold parameter for this event (i.e. *b2-Threshold1* as defined within *reportConfigInterRAT* for this event).

Thresh2 is the threshold parameter for this event (i.e. *b2-Threshold2EUTRA* as defined within *reportConfigInterRAT* for this event).

M_p is expressed in dBm in case of RSRP, or in dB in case of RSRQ and SINR.

M_n is expressed in dBm or dB, depending on the measurement quantity of the inter-RAT neighbour cell.

O_{fn}, ***O_{cn}***, ***H_{ys}*** are expressed in dB.

Thresh1 is expressed in the same unit as ***M_p***.

Thresh2 is expressed in the same unit as **Mn**.

[TS 38.331, clause 5.5.5]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful AS security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> for each serving cell configured with *servingCellMO*:
 - 2> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *rsType*:
 - 3> if the serving cell measurements based on the *rsType* included in the *reportConfig* that triggered the measurement report are available:
 - 4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on the *rsType* included in the *reportConfig* that triggered the measurement report;
 - ...
 - 1> set the *servCellId* within *measResultServingMOList* to include each NR serving cell that is configured with *servingCellMO*, if any;
 - ...
 - 1> if there is at least one applicable neighbouring cell to report:
 - 2> if the *reportType* is set to *eventTriggered* or *periodical*:
 - 3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 4> if the *reportType* is set to *eventTriggered*:
 - 5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - ...
 - 4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 4> if the *reportType* is set to *eventTriggered* or *periodical*:
 - 5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
 - ...
 - 6> if the *measObject* associated with this *measId* concerns E-UTRA:

7> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfigInterRAT* in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;

2> else:

...

3> if the cell indicated by *cellForWhichToReportCGI* is an E-UTRA cell:

4> if all mandatory fields of the *cgi-Info-EPC* for the concerned cell have been obtained:

5> include in the *cgi-Info-EPC* the fields broadcasted in E-UTRA *SystemInformationBlockType1* associated to EPC;

4> if the UE is E-UTRA/5GC capable and all mandatory fields of the *cgi-Info-5GC* for the concerned cell have been obtained:

5> include in the *cgi-Info-5GC* the fields broadcasted in E-UTRA *SystemInformationBlockType1* associated to 5GC;

4> if the mandatory present fields of the *cgi-Info* for the cell indicated by the *cellForWhichToReportCGI* in the associated *measObject* have been obtained:

5> include the *freqBandIndicator*;

5> if the cell broadcasts the *multiBandInfoList*, include the *multiBandInfoList*;

5> if the cell broadcasts the *freqBandIndicatorPriority*, include the *freqBandIndicatorPriority*;

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

...

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.1.3.3.2.3 Test description

8.1.3.3.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, E-UTRA Cell 1 is the inter-RAT neighbour cell of NR Cell 1.
- System information combination NR-6 as defined in TS 38.508-1 [4] clause 4.4.3.1.2.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.3.3.2.3.2 Test procedure sequence

Table 8.1.3.3.2.3.2-1 and 8.1.3.3.2.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" is applied at the point indicated in the Main behaviour description in Table 8.1.3.3.2.3.2-3.

Table 8.1.3.3.2.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell 1
(DL only) | Remark |
|----|-----------------------|------------|-----------|----------------------------|---|
| T0 | SS/PBCH SSS EPRE | dBm/S CS | -85 | - | Power levels are such that entry condition for event B2 is not satisfied: |
| | Cell-specific RS EPRE | dBm/1 5kHz | - | -91 | $Mp + Hys < Thresh1$ and
$Mn + Ofn + Ocn - Hys < Thresh2$ |
| T1 | SS/PBCH SSS EPRE | dBm/S CS | -85 | - | Power levels are such that entry condition for event B2 is satisfied: |
| | Cell-specific RS EPRE | dBm/1 5kHz | - | -79 | $Mp + Hys < Thresh1$ and
$Mn + Ofn + Ocn - Hys > Thresh2$ |

Table 8.1.3.3.2.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | E-UTRA Cell 1
(DL only) | Remark |
|----|-----------------------|------------|-----------|----------------------------|---|
| T0 | SS/PBCH SSS EPRE | dBm/S CS | FFS | - | Power levels are such that entry condition for event B2 is not satisfied: |
| | Cell-specific RS EPRE | dBm/1 5kHz | - | FFS | $Mp + Hys < Thresh1$ and
$Mn + Ofn + Ocn - Hys < Thresh2$ |
| T1 | SS/PBCH SSS EPRE | dBm/S CS | FFS | - | Power levels are such that entry condition for event B2 is satisfied: |
| | Cell-specific RS EPRE | dBm/1 5kHz | - | FFS | $Mp + Hys < Thresh1$ and
$Mn + Ofn + Ocn - Hys > Thresh2$ |

Table 8.1.3.3.2.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup inter-RAT measurement and reporting for event B2. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal | - | - | - | - |

| | | | | | |
|---|---|-----|---|---|---|
| | level according to row "T1" in table 8.1.3.3.2.3.2-1/2. | | | | |
| 4 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event B2 with the measured RSRP value for E-UTRA Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | 1 | P |
| 5 | The SS transmits an <i>RRCConnectionReconfiguration</i> message including <i>measConfig</i> including <i>reportCGI</i> for E-UTRA Cell 1 and sufficient idle periods for UE to acquire the relevant system information from E-UTRA Cell 1 | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 6 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 7 | Check: Does the UE transmit a <i>MeasurementReport</i> message with CGI of E-UTRA Cell 1 within 1 sec? | --> | NR RRC: <i>MeasurementReport</i> | 2 | P |

8.1.3.3.2.3.3 Specific message contents

Table 8.1.3.3.2.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.3.3.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|---------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig-B2 | Table 8.1.3.3.2.3.3-3 | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-DRX | Table 8.1.3.3.2.3.3-2 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.3.2.3.3-2: *CellGroupConfig-DRX* (Table 8.1.3.3.2.3.3-1)

| Derivation Path: TS 508-1 [4], Table 4.6.3-19 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>CellGroupConfig</i> ::= SEQUENCE { | | | |

| | | | |
|-------------------------|--|--|--|
| mac-CellGroupConfig | MAC-CellGroupConfig with Condition DRX | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig | Not present | | |
| } | | | |

Table 8.1.3.3.2.3.3-3: *MeasConfig-B2* (Table 8.1.3.3.2.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectEUTRA | MeasObjectEUTRA | MO for E-UTRA Cell 1 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 2 entries | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT-B2 | Table 8.1.3.3.2.3.3-4 | |
| } | | | |
| reportConfigId[2] | 2 | | |
| reportConfig[2] CHOICE { | | | |
| reportConfigInterRAT | ReportConfigInterRAT- | Table | |

| | | | |
|---|---|-----------------------------|--|
| | CGI | 8.1.3.3.2.3.3-5 | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | reportConfigId for event B2 | |
| } | | | |
| quantityConfig | QuantityConfig with Condition INTER-RAT | | |
| measGapConfig | MeasGapConfig | | |
| } | | | |

Table 8.1.3.3.2.3.3-4: ReportConfigInterRAT-B2 (Table 8.1.3.3.2.3.3-2)

| Derivation Path: TS 38.508-1 [4] Table 4.6.3-141 with Condition EVENT_B2 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB2 SEQUENCE { | | | |
| b2-Threshold1 CHOICE { | | | |
| rsrp | 77 | -79 dBm | FR1 |
| | FFS | | FR2 |
| } | | | |
| b2-Threshold2EUTRA CHOICE { | | | |
| rsrp | 56 | -85dBm | |
| } | | | |
| } | | | |
| } | | | |
| reportAmount | r1 | | |
| } | | | |
| } | | | |

Table 8.1.3.3.2.3.3-5: *ReportConfigInterRAT-CGI* (Table 8.1.3.3.2.3.3-2)

| Derivation Path: TS 38.508-1 [4] Table 4.6.3-141 with Condition CGI | | | |
|--|-----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigInterRAT ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| reportCGI SEQUENCE { | | | |
| cellForWhichToReportCGI | EUTRA-PhysCellId of E-UTRA Cell 1 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.3.2.3.3-6: *RRCReconfiguration* (step 5, Table 8.1.3.3.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|---|----------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig-CGI | Table 8.1.3.3.2.3.3-6 | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.3.3.2.3.3-7: *MeasConfig-CGI* (Table 8.1.3.3.2.3.3-6)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | Not present | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |

| | | | |
|-------------------|---|--|--|
| reportConfigId[1] | 2 | reportConfigId
for CGI
measurement | |
| } | | | |
| } | | | |

Table 8.1.3.3.2.3.3-8: *MeasurementReport* (step 4 and step 7, Table 8.1.3.3.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | 1 entry | | |
| servCellId[1] | ServCellIndex of NR Cell 1 | | |
| measResultServingCell[1] SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell | Not present | | Step 7 |
| resultsSSB-Cell SEQUENCE { | | | Step 4 |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListEUTRA SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | | |

8.1.4 Handover

8.1.4.1 Intra NR handover

8.1.4.1.1 Void

8.1.4.1.2 Intra NR handover / Success / Inter-frequency

8.1.4.1.2.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and having performed the inter-frequency measurements for the neighbour cell }

ensure that {

when { UE receives an RRCReconfiguration message including a reconfigurationWithSync with rach-ConfigDedicated }

then { UE performs handover to the target cell and transmits an RRCReconfigurationComplete message }

 }

(2)

with { UE in NR RRC_CONNECTED state and having performed the inter-frequency measurements for the neighbour cell }

ensure that {

when { UE receives an RRCReconfiguration message including a reconfigurationWithSync without rach-ConfigDedicated }

then { UE performs handover to the target cell and transmits an RRCReconfigurationComplete message }

 }

(3)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE receives an RRCReconfiguration message including dedicatedSIB1-Delivery containing SIB1 information with a change of trackingAreaCode }

then { UE reads the updated SIB1 information and sends an RRCReconfigurationComplete message followed by registration on the new tracking area }

 }

(4)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE receives an RRCReconfiguration message including a reconfigurationWithSync and keySetChangeIndicator set to 'true' in MasterKeyUpdate for handover to the target cell }

then { UE performs handover to the target cell with security key update and transmits an RRCReconfigurationComplete message }

}

8.1.4.1.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clauses 5.3.5.3, 5.3.5.5.1, 5.3.5.5.2, 5.5.4.4, 5.2.2.4.2 and 5.3.5.7. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

1> if the *RRCReconfiguration* includes the *masterKeyUpdate*:

2> perform security key update procedure as specified in 5.3.5.7;

...

1> if the *RRCReconfiguration* message includes the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

...

1> if the *RRCReconfiguration* message includes the *dedicatedSIB1-Delivery*:

2> perform the action upon reception of *SIB1* as specified in 5.2.2.4.2;

...1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if T390 is running:

4> stop timer T390 for all access categories;

4> perform the actions as specified in 5.3.14.4.

- 3> if *RRCReconfiguration* does not include *dedicatedSIB1-Delivery* and
- 3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured by *searchSpaceSIB1*:
- 4> acquire the *SIB1*, which is scheduled as specified in TS 38.213 [13], of the target SpCell of the MCG;
- 4> upon acquiring *SIB1*, perform the actions specified in clause 5.2.2.4.2;
- 2> the procedure ends.

NOTE: The UE is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.3.5.5.1]

The network configures the UE with Master Cell Group (MCG), and zero or one Secondary Cell Group (SCG). In (NG)EN-DC, the MCG is configured as specified in TS 36.331 [10], and for NE-DC, the SCG is configured as specified in TS 36.331 [10]. The network provides the configuration parameters for a cell group in the *CellGroupConfig* IE.

The UE performs the following actions based on a received *CellGroupConfig* IE:

- 1> if the *CellGroupConfig* contains the *spCellConfig* with *reconfigurationWithSync*:
- 2> perform Reconfiguration with sync according to 5.3.5.5.2;
- 2> resume all suspended radio bearers and resume SCG transmission for all radio bearers, if suspended;
- ...
- 1> if the *CellGroupConfig* contains the *mac-CellGroupConfig*:
- 2> configure the MAC entity of this cell group as specified in 5.3.5.5.5;
- ...
- 1> if the *CellGroupConfig* contains the *spCellConfig*:
- 2> configure the SpCell as specified in 5.3.5.5.7;

[TS 38.331, clause 5.3.5.5.2]

The UE shall perform the following actions to execute a reconfiguration with sync.

- 1> if the security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause '*other*' upon which the procedure ends;
- 1> stop timer T310 for the corresponding SpCell, if running;
- 1> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;
- 1> if the *frequencyInfoDL* is included:
 - 2> consider the target SpCell to be one on the SSB frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;
- 1> else:
 - 2> consider the target SpCell to be one on the SSB frequency of the source SpCell with a physical cell identity indicated by the *physCellId*;
- 1> start synchronising to the DL of the target SpCell;
- 1> apply the specified BCCH configuration defined in 9.1.1.1;
- 1> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

NOTE 1: The UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message.

NOTE 2: The UE may omit reading the MIB if the UE already has the required timing information, or the timing information is not needed for random access.

1> reset the MAC entity of this cell group;

1> consider the SCell(s) of this cell group, if configured, to be in deactivated state;

1> apply the value of the *newUE-Identity* as the C-RNTI for this cell group;

1> configure lower layers in accordance with the received *spCellConfigCommon*;

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *reconfigurationWithSync*.

[TS 38.331, clause 5.5.4.4]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

1> use the SpCell for *Mp*, *Ofp* and *Ocp*.

NOTE The cell(s) that triggers the event has reference signals indicated in the *measObjectNR* associated to this event which may be different from the NR SpCell *measObjectNR*.

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$$

Inequality A3-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the reference signal of the neighbour cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Mp is the measurement result of the SpCell, not taking into account any offsets.

Ofp is the measurement object specific offset of the SpCell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the SpCell).

Ocp is the cell specific offset of the SpCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the SpCell), and is set to zero if not configured for the SpCell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigNR* for this event).

Mn, **Mp** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, **Ocn**, **Ofp**, **Ocp**, **Hys**, **Off** are expressed in dB.

[TS 38.331, clause 5.2.2.4.2]

Upon receiving the *SIB1* the UE shall:

- 1> store the acquired *SIB1*;
- 1> if the *cellAccessRelatedInfo* contains an entry with the *PLMN-Identity* of the selected PLMN:
 - 2> in the remainder of the procedures use *plmn-IdentityList*, *trackingAreaCode*, and *cellIdentity* for the cell as received in the corresponding *PLMN-IdentityInfo* containing the selected PLMN;
- 1> if in RRC_CONNECTED while T311 is not running:
 - 2> disregard the *frequencyBandList*, if received, while in RRC_CONNECTED;
 - 2> forward the *cellIdentity* to upper layers;
 - 2> forward the *trackingAreaCode* to upper layers;
 - 2> apply the configuration included in the *servingCellConfigCommonSIB*;

[TS 38.331, clause 5.3.5.7]

The UE shall:

- 1> if UE is connected to E-UTRA/EPC:
 - 2> upon reception of *sk-Counter* as specified in TS 36.331 [10]:
 - 3> update the $S\text{-}K_{gNB}$ key based on the K_{eNB} key and using the received *sk-Counter* value, as specified in TS 33.401 [30];
 - 3> derive the K_{RRCEnc} and K_{UPenc} keys as specified in TS 33.401 [30];
 - 3> derive the K_{RRCint} and K_{UPint} keys as specified in TS 33.401 [30].
 - 1> else:
 - 2> if the *nas-Container* is included in the received *masterKeyUpdate*:
 - 3> forward the *nas-Container* to the upper layers;
 - 2> if the *keySetChangeIndicator* is set to true:
 - 3> derive or update the K_{gNB} key based on the K_{AMF} key, as specified in TS 33.501 [11];
 - 2> else:
 - 3> derive or update the K_{gNB} key based on the current K_{gNB} key or the NH, using the *nextHopChainingCount* value indicated in the received *masterKeyUpdate*, as specified in TS 33.501 [11];
 - 2> store the *nextHopChainingCount* value;
 - 2> derive the keys associated with the K_{gNB} key as follows:
 - 3> if the *securityAlgorithmConfig* is included in *SecurityConfig*:
 - 4> derive the K_{RRCEnc} and K_{UPenc} keys associated with the *cipheringAlgorithm* indicated in the *securityAlgorithmConfig*, as specified in TS 33.501 [11];
 - 4> derive the K_{RRCint} and K_{UPint} keys associated with the *integrityProtAlgorithm* indicated in the *securityAlgorithmConfig*, as specified in TS 33.501 [11];
 - 3> else:
 - 4> derive the K_{RRCEnc} and K_{UPenc} keys associated with the current *cipheringAlgorithm*, as specified in TS 33.501 [11];
 - 4> derive the K_{RRCint} and K_{UPint} keys associated with the current *integrityProtAlgorithm*, as specified in TS 33.501 [11].

NOTE: Ciphering and integrity protection are optional to configure for the DRBs.

8.1.4.1.2.3 Test description

8.1.4.1.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the serving cell and NR Cell 3 is the inter-frequency neighbour cell of NR Cell 1.
- System information combination NR-4 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A in NR Cell 1 as defined in TS 38.508-1 [4], subclause 4.4A.

8.1.4.1.2.3.2 Test procedure sequence

Tables 8.1.4.1.2.3.2-1 and 8.1.4.1.2.3.2-2 illustrate the downlink power levels to be applied for NR Cell 1 and NR Cell 3 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1", T2 and "T3", are applied at the point indicated in the Main behaviour description in Table 8.1.4.1.2.3.2-3.

Table 8.1.4.1.2.3.2-1: Power levels in FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 3 | Remark |
|----|---------------------|-------------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -91 | Power levels are such that entry condition for event A3 is not satisfied |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -85 | -79 | Power levels are such that entry condition for event A3 is satisfied for NR Cell 3 |
| T2 | SS/PBCH
SSS EPRE | dBm/
SCS | -79 | -85 | Power levels are such that entry condition for event A3 is satisfied for NR Cell 1 |
| T3 | SS/PBCH
SSS EPRE | dBm/
SCS | -88 | -76 | |

Table 8.1.4.1.2.3.2-2: Power levels in FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 3 | Remark |
|----|---------------------|-------------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that entry condition for event A3 is not satisfied |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | Power levels are such that entry condition for event A3 is satisfied for NR Cell 3 |
| T2 | SS/PBCH | dBm/ | FFS | FFS | Power levels are such that entry |

| | | | | | |
|----|---------------------|-------------|-----|-----|---|
| | SSS EPRE | SCS | | | condition for event A3 is satisfied for NR Cell 1 |
| T3 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | |

Table 8.1.4.1.2.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|------|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup intra NR measurement and reporting for inter-frequency event A3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 3 | SS adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured RSRP value for NR Cell 3? | --> | NR RRC: <i>MeasurementReport</i> | - | - |
| 5 | The SS transmits an <i>RRCReconfiguration</i> message including <i>reconfigurationWithSync</i> with <i>rach-ConfigDedicated</i> and <i>keySetChangeIndicator</i> set to <i>true</i> to order the UE to perform inter-frequency handover to NR Cell 3 | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 6 | Check: Does the UE transmit <i>RRCReconfigurationComplete</i> message in NR Cell 3? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 1, 4 | P |
| 7 | The SS transmits an <i>RRCReconfiguration</i> message including <i>MeasConfig</i> to setup intra NR measurement and reporting for inter-frequency event A3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 8 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 9 | SS adjusts the cell-specific reference signal level according to row "T2". | - | - | - | - |
| 10 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured RSRP value for NR Cell 1? | --> | NR RRC: <i>MeasurementReport</i> | - | - |
| 11 | The SS transmits an <i>RRCReconfiguration</i> message including <i>reconfigurationWithSync</i> without <i>rach-ConfigDedicated</i> and <i>keySetChangeIndicator</i> set to <i>true</i> to order the UE to perform inter-frequency handover to NR Cell 1 | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 12 | Check: Does the UE transmit <i>RRCReconfigurationComplete</i> message in NR | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 2, 4 | P |

| | | | | | |
|----|--|-----|--|---|---|
| | Cell 1? | | | | |
| 13 | SS adjusts the cell-specific reference signal level according to row "T3". | - | - | - | - |
| 14 | The SS transmits an <i>RRCReconfiguration</i> including dedicated SIB1-Delivery containing SIB1 of NR Cell 3 to order the UE to perform handover to NR Cell 3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 15 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message on NR Cell 3? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 3 | P |
| 16 | Check: Does UE transmit a REGISTRATION REQUEST message to update the registration of the actual tracking area? | --> | NR RRC:
<i>ULInformationTransfer</i>

5GMM: REGISTRATION REQUEST | 3 | P |
| 17 | SS responds with REGISTRATION ACCEPT message. | <-- | NR RRC:
<i>DLInformationTransfer</i>

5GMM: REGISTRATION ACCEPT | - | - |
| 18 | The UE send a REGISTRATION COMPLETE message. | --> | NR RRC:
<i>ULInformationTransfer</i>

5GMM: REGISTRATION COMPLETE | - | - |

8.1.4.1.2.3.3 Specific message contents

Table 8.1.4.1.2.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.4.1.2.3.2-3)

| |
|--|
| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition MEAS |
|--|

Table 8.1.4.1.2.3.3-2: *MeasConfig* (Table 8.1.4.1.2.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |

| | | | |
|--|--|--|--|
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA3 | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| measGapConfig | MeasGapConfig | | |
| } | | | |

Table 8.1.4.1.2.3.3-3: *ReportConfigNR-EventA3* (Table 8.1.4.1.2.3.3-2 and Table 8.1.4.1.2.3.3-8)

| Derivation Path: 38.508-1 [4] Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | EVENT_A3 |

| | | | |
|-------------------------------|-------|------|-----|
| a3-Offset CHOICE { | | | |
| rsrp | 6 | 3dB | FR1 |
| | FFS | | FR2 |
| } | | | |
| hysteresis | 0 | 0 dB | |
| timeToTrigger | ms640 | | |
| } | | | |
| } | | | |
| reportAmount | r1 | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.2.3.3-4: *MeasurementReport* (step 4, Table 8.1.4.1.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | 1 entry | | |
| servCellId | Cell index corresponding to NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---|--|--|
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | 1 entry | | |
| physCellId | Physical layer cell identity of NR Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| } | | | |
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.2.3.3-5: *RRCReconfiguration* (step 5, Table 8.1.4.1.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.8.1-1A with condition RBConfig_KeyChange | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | OCTET STRING (CONTAINING CellGroupConfig) | | |
| masterKeyUpdate SEQUENCE { | | | |
| keySetChangeIndicator | True | | |
| nextHopChainingCount | 2 | | |
| nas-Container | Not Present | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.2.3.3-6: *CellGroupConfig* (Table 8.1.4.1.2.3.3-5)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 with condition PCell_change and CFRA | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | Same as default
ServingCellConfigCommon | | |
| physCellId | Physical cell Id of NR
Cell 3 | | |
| } | | | |
| rach-ConfigDedicated CHOICE { | | | |
| Uplink | RACH-ConfigDedicated | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.2.3.3-7: *RRCReconfiguration* (step 7, Table 8.1.4.1.2.3.2-3)

| |
|--|
| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition MEAS |
|--|

Table 8.1.4.1.2.3.3-8: *MeasConfig* (Table 8.1.4.1.2.3.3-7)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |

| | | | |
|--|--|--|--|
| measObject[1] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR-EventA3 | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.1.4.1.2.3.3-9: *MeasurementReport* (step 10, Table 8.1.4.1.2.3.2-3)

| | | | |
|--|--------------|---------|-----------|
| Derivation Path: 38.508-1 [4] Table 4.6.1-5A | | | |
| Information Element | Value/remark | Comment | Condition |

| | | | |
|--|---|--|--|
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | 1 entry | | |
| servCellId | Cell index corresponding to NR Cell 3 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 3 | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | 1 entry | | |
| physCellId | Physical layer cell identity of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| Rsrp | (0..127) | | |
| } | | | |
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.2.3.3-10: *RRCReconfiguration* (step 11, Table 8.1.4.1.2.3.2-3)

| Derivation Path: 38.508-1 [4] Table 4.8.1-1A with condition RBCConfig_KeyChange | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | OCTET STRING
(CONTAINING
CellGroupConfig) | | |
| masterKeyUpdate SEQUENCE { | | | |
| keySetChangeIndicator | True | | |
| nextHopChainingCount | 3 | | |
| nas-Container | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.2.3.3-11: *CellGroupConfig* (Table 8.1.4.1.2.3.3-10)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 with condition PCell_change | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | Same as default
ServingCellConfigCommon | | |
| physCellId | Physical cell Id of NR
Cell 1 | | |
| } | | | |
| rach-ConfigDedicated | Not Present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.2.3.3-12: RRCReconfiguration (step 14 Table 8.1.4.1.2.3.2-3)

| Derivation Path: 38.508-1 [4], Table 4.8.1-1A with condition RBConfig_NoKeyChange | | | |
|---|--------------|--------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| dedicatedSIB1-Delivery | SIB1 | OCTET STRING
(CONTAINING
SIB1) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.2.3.3-13: SIB1 (Table 8.1.4.1.2.3.3-12)

| Derivation Path: 38.508-1 [4], Table 4.6.1-28 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | | | |
| cellAccessRelatedInfo ::= SEQUENCE { | | | |
| plmn-IdentityList ::= SEQUENCE (SIZE (1..maxPLMN)) OF SEQUENCE { | 1 entry | | |
| trackingAreaCode | 2 | | |
| } | | | |
| } | | | |
| } | | | |

8.1.4.1.3 Void

8.1.4.1.4 Void

8.1.4.1.5 Intra NR handover / Failure / Re-establishment successful

8.1.4.1.5.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and having received an RRCReconfiguration message including a reconfigurationWithSync for handover to the target cell }

ensure that {

when { UE detects handover failure and the initial cell is selectable }

then { UE performs an RRCReestablishment procedure on the source cell }

}

(2)

with { UE detects handover failure and having transmitted an RRCReestablishmentRequest message }

ensure that {

when { UE receives an RRCReestablishment message with a nextHopChainingCount which is different from the NCC associated with the currently active KgNB }

then { UE derives new KgNB from the nextHopChainingCount and completes RRCReestablishment procedure on the source cell }

}

(3)

with { UE detects handover failure and having transmitted an RRCReestablishmentRequest message }

ensure that {

when { UE receives an RRCReestablishment message with a nextHopChainingCount which is same as the NCC associated with the currently active KgNB }

then { UE derives new KgNB from the currently active KgNB and completes RRCReestablishment procedure on the source cell }

}

8.1.4.1.5.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 38.331, clauses 5.3.5.5.2, 5.3.5.7, 5.3.5.8.3 and 5.3.7.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.5.2]

The UE shall perform the following actions to execute a reconfiguration with sync.

1> if the AS security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

1> stop timer T310 for the corresponding SpCell, if running;

1> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;

1> if the *frequencyInfoDL* is included:

2> consider the target SpCell to be one on the SSB frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;

1> else:

2> consider the target SpCell to be one on the SSB frequency of the source SpCell with a physical cell identity indicated by the *physCellId*;

1> start synchronising to the DL of the target SpCell;

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

NOTE 1: The UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message.

NOTE 2: The UE may omit reading the *MIB* if the UE already has the required timing information, or the timing information is not needed for random access.

1> reset the MAC entity of this cell group;

1> consider the SCell(s) of this cell group, if configured, to be in deactivated state;

1> apply the value of the *newUE-Identity* as the C-RNTI for this cell group;

1> configure lower layers in accordance with the received *spCellConfigCommon*;

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *reconfigurationWithSync*.

[TS 38.331, clause 5.3.5.7]

The UE shall:

...

1> else:

2> if the *nas-Container* is included in the received *masterKeyUpdate*:

3> forward the *nas-Container* to the upper layers;

2> if the *keySetChangeIndicator* is set to *true*:

3> derive or update the K_{gNB} key based on the K_{AMF} key, as specified in TS 33.501 [11];

2> else:

3> derive or update the K_{gNB} key based on the current K_{gNB} key or the NH, using the *nextHopChainingCount* value indicated in the received *masterKeyUpdate*, as specified in TS 33.501 [11];

2> store the *nextHopChainingCount* value;

2> derive the keys associated with the K_{gNB} key as follows:

3> if the *securityAlgorithmConfig* is included in *SecurityConfig*:

4> derive the K_{RRCEnc} and K_{UPenc} keys associated with the *cipheringAlgorithm* indicated in the *securityAlgorithmConfig*, as specified in TS 33.501 [11];

4> derive the K_{RRCint} and K_{UPint} keys associated with the *integrityProtAlgorithm* indicated in the *securityAlgorithmConfig*, as specified in TS 33.501 [11];

3> else:

4> derive the K_{RRCEnc} and K_{UPenc} keys associated with the current *cipheringAlgorithm*, as specified in TS 33.501 [11];

4> derive the K_{RRCint} and K_{UPint} keys associated with the current *integrityProtAlgorithm*, as specified in TS 33.501 [11].

NOTE: Ciphering and integrity protection are optional to configure for the DRBs.

[TS 38.331, clause 5.3.5.8.3]

The UE shall:

- 1> if T304 of the MCG expires:
- 2> release dedicated preambles provided in *rach-ConfigDedicated* if configured;
- 2> revert back to the UE configuration used in the source PCell;
- 2> initiate the connection re-establishment procedure as specified in subclause 5.3.7.

NOTE 1: In the context above, "the UE configuration" includes state variables and parameters of each radio bearer.

- 1> else if T304 of a secondary cell group expires:
- 2> release dedicated preambles provided in *rach-ConfigDedicated*, if configured;
- 2> initiate the SCG failure information procedure as specified in subclause 5.7.3 to report SCG reconfiguration with sync failure, upon which the RRC reconfiguration procedure ends;
- 1> else if T304 expires when *RRCReconfiguration* is received via other RAT (HO to NR failure):
- 2> reset MAC;
- 2> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT.

[TS 38.331, clause 5.3.7.5]

The UE shall:

- 1> stop timer T301;
- 1> consider the current cell to be the PCell;
- 1> store the *nextHopChainingCount* value indicated in the *RRCReestablishment* message;
- 1> update the K_{gNB} key based on the current K_{gNB} key or the NH, using the stored *nextHopChainingCount* value, as specified in TS 33.501 [11];
- 1> derive the K_{RRCEnc} and K_{UPenc} keys associated with the previously configured *cipheringAlgorithm*, as specified in TS 33.501 [11];
- 1> derive the K_{RRCint} and K_{UPint} keys associated with the previously configured *integrityProtAlgorithm*, as specified in TS 33.501 [11].
- 1> request lower layers to verify the integrity protection of the *RRCReestablishment* message, using the previously configured algorithm and the K_{RRCint} key;
- 1> if the integrity protection check of the *RRCReestablishment* message fails:
- 2> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'RRC connection failure', upon which the procedure ends;
- 1> configure lower layers to resume integrity protection for SRB1 using the previously configured algorithm and the K_{RRCint} key immediately, i.e., integrity protection shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
- 1> configure lower layers to resume ciphering for SRB1 using the previously configured algorithm and, the K_{RRCEnc} key immediately, i.e., ciphering shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
- 1> release the measurement gap configuration indicated by the *measGapConfig*, if configured;
- 1> submit the *RRCReestablishmentComplete* message to lower layers for transmission;
- 1> the procedure ends.

8.1.4.1.5.3 Test Description

8.1.4.1.5.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the Serving cell.
- NR Cell 2 is the Suitable neighbour intra-frequency cell.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.3 is used for both NR Cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.4.1.5.3.2 Test procedure sequence

Table 8.1.4.1.5.3.2-1 and Table 8.1.4.1.5.3.2-2 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.4.1.5.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|--------|
| T1 | SS/PBCH
SSS EPRE | dBm/SC
S | -88 | -88 | |
| T2 | SS/PBCH
SSS EPRE | dBm/SC
S | -88 | “Off” | |
| T3 | SS/PBCH
SSS EPRE | dBm/SC
S | “Off” | -88 | |

Table 8.1.4.1.5.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|--------|
| T1 | SS/PBCH
SSS EPRE | dBm/SC
S | FFS | FFS | |
| T2 | SS/PBCH
SSS EPRE | dBm/SC
S | FFS | “Off” | |
| T3 | SS/PBCH
SSS EPRE | dBm/SC
S | “Off” | FFS | |

Table 8.1.4.1.5.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS changes the power level setting according to the row "T1". | - | - | - | - |
| 2 | The SS transmits an RRCReconfiguration message on NR Cell 1 to order the UE to perform handover to NR Cell 2. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| - | EXCEPTION: In parallel to the events described in step 3 the steps specified in Table 8.1.4.1.5.3.2-4 should take place. | - | - | - | - |
| 3 | The SS changes the power level setting according to the row "T2". | - | - | - | - |
| 4 | Check: Does the UE transmit an RRCReestablishmentRequest message on NR Cell 1? | --> | NR RRC: <i>RRCReestablishmentRequest</i> | 1 | P |
| 5 | The SS transmits an RRCReestablishment message to resume SRB1 operation and re-activate security on NR Cell 1. | <-- | NR RRC: <i>RRCReestablishment</i> | - | - |
| 6 | Does the UE transmit an RRCReestablishmentComplete message using the security key derived from the nextHopChainingCount on NR Cell 1? | --> | NR RRC: <i>RRCReestablishmentComplete</i> | 2 | P |
| 6A | The SS transmits an RRCReconfiguration message to resume existing radio bearers on NR Cell 1. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 6B | The UE transmits an <i>RRCReconfigurationComplete</i> message on NR Cell 1. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 7 | The SS changes the power level setting according to the row "T1". | - | - | - | - |
| 8 | The SS transmits an RRCReconfiguration message on NR Cell 1 to order the UE to perform handover to NR Cell 2. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| - | EXCEPTION: In parallel to the events described in step 9 the steps specified in Table 8.1.4.1.5.3.2-4 should take place. | - | - | - | - |
| 9 | The SS changes the power level setting according to the row "T3". | - | - | - | - |
| 10 | Check: Does the UE transmit an RRCReestablishmentRequest | --> | NR RRC: <i>RRCReestablishmentRequest</i> | - | - |

| | | | | | |
|------|---|-----|---|---|---|
| | message on NR Cell 2? | | | | |
| 11 | The SS transmits an RRCReestablishment message to resume SRB1 operation and re-activate security on NR Cell 2. | <-- | NR RRC: <i>RRCReestablishment</i> | - | - |
| 12 | Does the UE transmit an RRCReestablishmentComplete message using the security key derived from the nextHopChainingCount on NR Cell 2? | --> | NR RRC: <i>RRCReestablishmentComplete</i> | 3 | P |
| 12 A | The SS transmits an RRCReconfiguration message to resume existing radio bearers on NR Cell 2. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 12 B | The UE transmits an RRCReconfigurationComplete message on NR Cell 2. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 13 | The SS transmits an <i>RRCRelease</i> message on NR Cell 2. | <-- | NR RRC: <i>RRCRelease</i> | - | - |

Table 8.1.4.1.5.3.2-4: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: The steps 1 and 2 below are repeated for the duration of T304. | - | - | - | - |
| 1 | The UE attempts to perform the handover using MAC Random Access Preamble on NR Cell 2. | - | - | - | - |
| 2 | The SS does not respond. | - | - | - | - |

8.1.4.1.5.3.3 Specific message contents

Table 8.1.4.1.5.3.3-1: SIB1 for NR Cell 1 and NR Cell 2 (preamble and all steps, Table 8.1.4.1.5.3.2-3)

| Derivation Path: 38.508-1, Table 4.6.3-130 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| preambleTransMax | n50 | | |
| } | | | |

Table 8.1.4.1.5.3.3-2: *RRCReconfiguration-HO* (steps 2, 8, Table 8.1.4.1.5.3.2-3)

Derivation Path: 38.508-1 [4] Table 4.8.1-1A with condition RBCConfig_KeyChange

Table 8.1.4.1.5.3.3-3: *RRCReestablishmentRequest* (step 4, Table 8.1.4.1.5.3.2-3)

| Derivation Path: 38.508-1, Table 4.6.1-12 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReestablishmentRequest ::= SEQUENCE { | | | |
| ue-Identity SEQUENCE { | | | |
| c-RNTI | the value of the C-RNTI of the UE | | |
| physCellId | PhysicalCellIdentity of NR Cell 1 | | |
| shortMAC-I | The same value as the 16 least significant bits of the MAC-I value calculated by SS. | | |
| } | | | |
| reestablishmentCause | handoverFailure | | |
| } | | | |

Table 8.1.4.1.5.3.3-4: *RRCReestablishment* (step 5, Table 8.1.4.1.5.3.2-3)

| Derivation Path: 38.508-1, Table 4.6.1-10 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReestablishment ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReestablishment SEQUENCE { | | | |
| nextHopChainingCount | 2 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.5.3.3-5: *RRCReestablishmentRequest* (step 10, Table 8.1.4.1.5.3.2-3)

| Derivation Path: 38.508-1, Table 4.6.1-12 | | | |
|---|-----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReestablishmentRequest ::= SEQUENCE { | | | |
| ue-Identity SEQUENCE { | | | |
| c-RNTI | the value of the C-RNTI of the UE | | |
| physCellId | PhysicalCellIdentity of NR Cell 2 | | |

| | | | |
|----------------------|--|--|--|
| shortMAC-I | The same value as the 16 least significant bits of the MAC-I value calculated by SS. | | |
| } | | | |
| reestablishmentCause | handoverFailure | | |
| } | | | |

Table 8.1.4.1.5.3.3-6: *RRCReestablishment* (step 11, Table 8.1.4.1.5.3.2-3)

| Derivation Path: 38.508-1, Table 4.6.1-10 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReestablishment ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReestablishment SEQUENCE { | | | |
| nextHopChainingCount | 0 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.5.3.3-7: *RRCReconfiguration* (step 6A and 12A, Table 8.1.4.1.5.3.2-3)

| |
|--|
| Derivation Path: TS 38.508-1[4], table 4.6.1-13 and condition NR |
|--|

8.1.4.1.6 Intra NR handover / Failure / Re-establishment failure

8.1.4.1.6.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and having received an RRCReconfiguration message including a reconfigurationWithSync for handover to the target cell }

ensure that {

when { UE detects handover failure and fails an RRCReestablishment procedure }

then { UE enters NR RRC_IDLE state }

}

8.1.4.1.6.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 38.331, clauses 5.3.5.5.2, 5.3.5.8.3 and 5.3.7.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.5.2]

The UE shall perform the following actions to execute a reconfiguration with sync.

1> if the AS security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

1> stop timer T310 for the corresponding SpCell, if running;

1> start timer T304 for the corresponding SpCell with the timer value set to $t304$, as included in the *reconfigurationWithSync*;

1> if the *frequencyInfoDL* is included:

2> consider the target SpCell to be one on the SSB frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;

1> else:

2> consider the target SpCell to be one on the SSB frequency of the source SpCell with a physical cell identity indicated by the *physCellId*;

1> start synchronising to the DL of the target SpCell;

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

NOTE 1: The UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message.

NOTE 2: The UE may omit reading the *MIB* if the UE already has the required timing information, or the timing information is not needed for random access.

1> reset the MAC entity of this cell group;

1> consider the SCell(s) of this cell group, if configured, to be in deactivated state;

1> apply the value of the *newUE-Identity* as the C-RNTI for this cell group;

1> configure lower layers in accordance with the received *spCellConfigCommon*;

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *reconfigurationWithSync*.

[TS 38.331, clause 5.3.5.8.3]

The UE shall:

1> if T304 of the MCG expires:

2> release dedicated preambles provided in *rach-ConfigDedicated* if configured;

2> revert back to the UE configuration used in the source PCell;

2> initiate the connection re-establishment procedure as specified in subclause 5.3.7.

NOTE 1: In the context above, "the UE configuration" includes state variables and parameters of each radio bearer.

1> else if T304 of a secondary cell group expires:

2> release dedicated preambles provided in *rach-ConfigDedicated*, if configured;

2> initiate the SCG failure information procedure as specified in subclause 5.7.3 to report SCG reconfiguration with sync failure, upon which the RRC reconfiguration procedure ends;

1> else if T304 expires when *RRCReconfiguration* is received via other RAT (HO to NR failure):

2> reset MAC;

2> perform the actions defined for this failure case as defined in the specifications applicable for the other RAT.

[TS 38.331, clause 5.3.7.5]

The UE shall:

1> stop timer T301;

1> consider the current cell to be the PCell;

1> store the *nextHopChainingCount* value indicated in the *RRCReestablishment* message;

1> update the K_{gNB} key based on the current K_{gNB} key or the NH, using the stored *nextHopChainingCount* value, as specified in TS 33.501 [11];

1> derive the K_{RRCEnc} and K_{UPenc} keys associated with the previously configured *cipheringAlgorithm*, as specified in TS 33.501 [11];

1> derive the K_{RRCint} and K_{UPint} keys associated with the previously configured *integrityProtAlgorithm*, as specified in TS 33.501 [11].

1> request lower layers to verify the integrity protection of the *RRCReestablishment* message, using the previously configured algorithm and the K_{RRCint} key;

1> if the integrity protection check of the *RRCReestablishment* message fails:

2> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'RRC connection failure', upon which the procedure ends;

1> configure lower layers to resume integrity protection for SRB1 using the previously configured algorithm and the K_{RRCint} key immediately, i.e., integrity protection shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> configure lower layers to resume ciphering for SRB1 using the previously configured algorithm and, the K_{RRCEnc} key immediately, i.e., ciphering shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> release the measurement gap configuration indicated by the *measGapConfig*, if configured;

1> submit the *RRCReestablishmentComplete* message to lower layers for transmission;

1> the procedure ends.

8.1.4.1.6.3 Test Description

8.1.4.1.6.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the Serving cell.
- NR Cell 2 is the Suitable neighbour intra-frequency cell.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.3 is used for both NR Cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.4.1.6.3.2 Test procedure sequence

Table 8.1.4.1.6.3.2-1 and Table 8.1.4.1.6.3.2-2 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.4.1.6.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|--------|
| T1 | SS/PBCH
SSS EPRE | dBm/SC
S | -88 | -88 | |
| T2 | SS/PBCH
SSS EPRE | dBm/SC
S | -88 | “Off” | |

Table 8.1.4.1.6.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|--------|
| T1 | SS/PBCH
SSS EPRE | dBm/SC
S | FFS | FFS | |
| T2 | SS/PBCH
SSS EPRE | dBm/SC
S | FFS | “Off” | |

Table 8.1.4.1.6.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS changes the power level setting according to the row "T1". | - | - | - | - |
| 2 | The SS transmits an RRCReconfiguration message on NR Cell 1 to order the UE to perform handover to NR Cell 2. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| - | EXCEPTION: In parallel to the events described in step 3 the steps specified in Table 8.1.4.1.6.3.2-4 should take place. | - | - | - | - |
| 3 | The SS changes the power level setting according to the row "T2". | - | - | - | - |
| 4 | Check: Does the UE transmit an RRCReestablishmentRequest | --> | NR RRC: <i>RRCReestablishmentRequest</i> | 1 | P |

| | | | | | |
|---|---|-----|-----------------------------------|---|---|
| | message on NR Cell 1? | | | | |
| 5 | The SS transmits an RRCReestablishment message to resume SRB1 operation and re-activate security on NR Cell 1. | <-- | NR RRC: <i>RRCReestablishment</i> | - | - |
| 6 | The SS allows 1 second for UE to move to RRC_IDLE state upon integrity protection check failure of NR RRC: RRCReestablishment message | | | | |
| 7 | Check: does the test result of generic test procedure in TS 38.508-1 [4] subclause 4.9.4 indicate that the UE is in RRC_IDLE? | - | - | 1 | - |

Table 8.1.4.1.6.3.2-4: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: The steps 1 and 2 below are repeated for the duration of T304. | - | - | - | - |
| 1 | The UE attempts to perform the handover using MAC Random Access Preamble on NR Cell 2. | - | - | - | - |
| 2 | The SS does not respond. | - | - | - | - |

8.1.4.1.6.3.3 Specific message contents

Table 8.1.4.1.6.3.3-1: SIB1 for NR Cell 1 and NR Cell 2 (preamble and all steps, Table 8.1.4.1.6.3.2-3)

| Derivation Path: 38.508-1, Table 4.6.3-130 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| preambleTransMax | n50 | | |
| } | | | |

Table 8.1.4.1.6.3.3-2: *RRCReconfiguration-HO* (step 2, Table 8.1.4.1.6.3.2-3)

| |
|---|
| Derivation Path: 38.508-1 [4] Table 4.8.1-1A with condition RBConfig_KeyChange |
|---|

Table 8.1.4.1.6.3.3-3: *RRCReestablishmentRequest* (step 4, Table 8.1.4.1.6.3.2-3)

| Derivation Path: 38.508-1, Table 4.6.1-12 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReestablishmentRequest ::= SEQUENCE { | | | |
| ue-Identity SEQUENCE { | | | |

| | | | |
|----------------------|--|--|--|
| c-RNTI | the value of the C-RNTI of the UE | | |
| physCellId | PhysicalCellIdentity of NR Cell 1 | | |
| shortMAC-I | The same value as the 16 least significant bits of the MAC-I value calculated by SS. | | |
| } | | | |
| reestablishmentCause | handoverFailure | | |
| } | | | |

Table 8.1.4.1.6.3.3-4: *RRCReestablishment* (step 5, Table 8.1.4.1.6.3.2-3)

| Derivation Path: 38.508-1, Table 4.6.1-10 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReestablishment ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReestablishment SEQUENCE { | | | |
| nextHopChainingCount | 7 | | |
| } | | | |
| } | | | |
| } | | | |

8.1.4.1.7 NR CA / Intra NR handover / Success / PCell Change and SCell addition / SCell release

8.1.4.1.7.1 NR CA / Intra NR handover / Success / PCell Change and SCell addition / SCell release / Intra-band Contiguous CA

8.1.4.1.7.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and configured an SCell }

ensure that {

when { UE receives an RRCReconfiguration message including a reconfigurationWithSync for handover to one of the SCell and sCellToAddModList for an SCell addition }

then { UE transmits an RRCReconfigurationComplete message. }

}

(2)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE receives an RRCReconfiguration message including a reconfigurationWithSync for PCell change and including sCellToReleaseList with an sCellIndex set to the configured Scell }

then { UE sends an RRCReconfigurationComplete message. }

}

8.1.4.1.7.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331 clauses 5.3.5.5.2, clauses 5.3.5.5.9 and clauses 5.3.5.5.8. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.5.2]

The UE shall perform the following actions to execute a reconfiguration with sync.

1> if the AS security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

1> stop timer T310 for the corresponding SpCell, if running;

1> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;

1> if the *frequencyInfoDL* is included:

2> consider the target SpCell to be one on the SSB frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;

1> else:

2> consider the target SpCell to be one on the SSB frequency of the source SpCell with a physical cell identity indicated by the *physCellId*;

1> start synchronising to the DL of the target SpCell;

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

NOTE 1: The UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message.

NOTE 2: The UE may omit reading the *MIB* if the UE already has the required timing information, or the timing information is not needed for random access.

1> reset the MAC entity of this cell group;

1> consider the SCell(s) of this cell group, if configured, to be in deactivated state;

1> apply the value of the *newUE-Identity* as the C-RNTI for this cell group;

1> configure lower layers in accordance with the received *spCellConfigCommon*;

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *reconfigurationWithSync*.

[TS 38.331, clause 5.3.5.5.9]

The UE shall:

- 1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (SCell addition):
 - 2> add the SCell, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;
 - 2> configure lower layers to consider the SCell to be in deactivated state;
 - 2> for each *measId* included in the *measIdList* within *VarMeasConfig*:
 - 3> if SCells are not applicable for the associated measurement; and
 - 3> if the concerned SCell is included in *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 4> remove the concerned SCell from *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (SCell modification):
 - 2> modify the SCell configuration in accordance with the *sCellConfigDedicated*.

[TS 38.331, clause 5.3.5.5.8]

The UE shall:

- 1> if the release is triggered by reception of the *sCellToReleaseList*:
- 2> for each *sCellIndex* value included in the *sCellToReleaseList*:
- 3> if the current UE configuration includes an SCell with value *sCellIndex*:
- 4> release the SCell.

8.1.4.1.7.1.3 Test description

8.1.4.1.7.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, NR Cell 3 is the configured SCell. NR Cell 2 is the target SCell. NR Cell 23 is the target intra-frequency Cell of NR Cell 3, and also the target PCell.
- NR Cell 1 and NR Cell 3 are Intra-band Contiguous. NR Cell 2 and NR Cell 23 are Intra-band Contiguous.
- NR Cell 3 is an Inactive SCell according to TS 38.508-1 [4] clause 6.3.1.
- System information combination NR-5 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 3N-A according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-3.

8.1.4.1.7.1.3.2 Test procedure sequence

Table 8.1.4.1.7.1.3.2-1 and Table 8.1.4.1.7.1.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, NR Cell 3, NR Cell 2 and NR Cell 23 at various time instants of the test execution. Row marked “T0” denotes the conditions after the preamble, while rows marked “T1” are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.4.1.7.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 3 | NR Cell 2 | NR Cell 23 | Remark |
|----|---------------------|-------------|-----------|-----------|-----------|------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -88 | -88 | -88 | “off” | NR Cell 1, NR Cell 2 and NR Cell 3 are available. NR Cell 23 are not available. |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | “off” | -88 | -88 | -88 | NR Cell 3, NR Cell 2 and NR Cell 23 are available. NR Cell 1 are not available. |

Table 8.1.4.1.7.1.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 3 | NR Cell 2 | NR Cell 23 | Remark |
|----|---------------------|-------------|-----------|-----------|-----------|------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | FFS | “off” | NR Cell 1, NR Cell 2 and NR Cell 3 are available. NR Cell 23 are not available. |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | “off” | FFS | FFS | FFS | NR Cell 3, NR Cell 2 and NR Cell 23 are available. NR Cell 1 are not available. |

Table 8.1.4.1.7.1.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS changes Cell parameters according to the row “T0” in table 8.1.4.1.7.1.3.2-1/2. | - | - | - | - |
| 2 | The SS transmits an <i>RRCReconfiguration</i> message including a <i>sCellToAddModList</i> to add NR Cell 3 as a SCell. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 3 | The UE transmits the <i>RRCReconfigurationComplete</i> message? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 4 | The SS transmits an <i>RRCReconfiguration</i> message including a <i>reconfigurationWithSync</i> for handover to NR Cell 3 and <i>sCellToAddModList</i> to add NR Cell 2 as a SCell. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 5 | Check: Does UE transmit the <i>RRCReconfigurationComplete</i> message? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 1 | P |
| 6 | The SS changes Cell parameters according to the row “T1” in table 8.2.4.2.1.1.3.2-1/2. | - | - | - | - |
| 7 | The SS transmits an <i>RRCReconfiguration</i> message including a <i>reconfigurationWithSync</i> to change PCell to NR Cell 23 and including <i>sCellToReleaseList</i> with a <i>sCellIndex</i> of NR | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |

| | | | | | |
|---|--|-----|--|---|---|
| | Cell 2. | | | | |
| 8 | Check: Does the UE transmit the <i>RRCReconfigurationComplete</i> message? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 2 | P |

8.1.4.1.7.1.3.3 Specific message contents

Table 8.1.4.1.7.1.3.3-1: *RRCReconfiguration* (step 2, Table 8.1.4.1.7.1.3.2-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13 | | | |
|--|-----------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | OCTET STRING
(CONTAINING
CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.7.1.3.3-2: *CellGroupConfig* (Table 8.1.4.1.7.1.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-19 | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>CellGroupConfig</i> ::= SEQUENCE { | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex[1] | 1 | | |
| sCellConfigCommon[1] SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR
Cell 3 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.7.1.3.3-3: *RRCReconfiguration* (step 4, Table 8.1.4.1.7.1.3.2-3)

| | | | |
|---|--|--|--|
| Derivation Path: TS 38.508-1 [4] Table 4.6.1-13 | | | |
|---|--|--|--|

| Information Element | Value/remark | Comment | Condition |
|-----------------------------------|-----------------|---|-----------|
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | OCTET STRING
(CONTAINING
CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.7.1.3.3-4: *CellGroupConfig* (Table 8.1.4.1.7.1.3.3-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-19 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR
Cell 3 | | |
| } | | | |
| } | | | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE
(1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex[1] | 1 | | |
| sCellConfigCommon[1] SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR
Cell 2 | | |
| } | | | |
| } | | | |
| sCellToReleaseList | Not present | | |
| } | | | |

Table 8.1.4.1.7.1.3.3-5: *RRCReconfiguration-HO* (step 7, Table 8.1.4.1.7.1.3.2-3)

| |
|--|
| Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with condition RBConfig_KeyChange |
|--|

Table 8.1.4.1.7.1.3.3-6: *CellGroupConfig* (Table 8.1.4.1.7.1.3.3-5)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 with conditions SRB1 and SRB2 and DRBn and HO | | | |
|--|--------------------------------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR Cell 23 | | |
| } | | | |
| } | | | |
| } | | | |
| sCellToReleaseList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex[1] | 1 | SCell release for NR Cell 2 | |
| } | | | |
| } | | | |

8.1.4.1.7.2 NR CA / Intra NR handover / Success / PCell Change and SCell addition / SCell release / Inter-band CA

8.1.4.1.7.2.1 Test Purpose (TP)

Same as TC 8.1.4.1.7.1 but applied to Inter-band CA case.

8.1.4.1.7.2.2 Conformance requirements

Same as TC 8.1.4.1.7.1 but applied to Inter-band CA case.

8.1.4.1.7.2.3 Test description

8.1.4.1.7.2.3.1 Pre-test conditions

Same as test case 8.1.4.1.7.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.
- Cells configuration: NR Cell 10 replaces NR Cell 3, NR Cell 30 replaces NR Cell 23.

8.1.4.1.7.2.3.2 Test procedure sequence

Same as TC 8.1.4.1.7.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA

8.1.4.1.7.2.3.3 Specific message contents

Same as TC 8.1.4.1.7.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA
- Cells configuration: NR Cell 10 replaces NR Cell 3, NR Cell 30 replaces NR Cell 23.

Table 8.1.4.1.7.2.3.3-1: SIB3 of NR Cell 10 (step 6, Table 8.1.4.1.7.1.3.2-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.2-2 | | | |
|--|--------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SIB3 ::= SEQUENCE { | | | |
| intraFreqNeighCellList SEQUENCE (SIZE (1..maxCellIntra)) OF SEQUENCE { | 1 entry | | |
| IntraFreqNeighCellInfo [1] SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR Cell 30 | | |
| } | | | |
| } | | | |
| } | | | |

8.1.4.1.7.3 NR CA / Intra NR handover / Success / PCell Change and SCell addition / SCell release / Intra-band non-contiguous CA

8.1.4.1.7.3.1 Test Purpose (TP)

Same as TC 8.1.4.1.7.1 but applied to Intra-band non-Contiguous CA.

8.1.4.1.7.3.2 Conformance requirements

Same as TC 8.1.4.1.7.1 but applied to Intra-band non-Contiguous CA.

8.1.4.1.7.3.3 Test description

8.1.4.1.7.3.3.1 Pre-test conditions

Same as test case 8.1.4.1.7.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA.

8.1.4.1.7.3.3.2 Test procedure sequence

Same as TC 8.1.4.1.7.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA

8.1.4.1.7.3.3.3 Specific message contents

Same as TC 8.1.4.1.7.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA

8.1.4.1.8 NR CA / Intra NR handover / Success / PCell Change / SCell no Change

8.1.4.1.8.1 NR CA / Intra NR handover / Success / PCell Change / SCell no Change / Intra-band Contiguous CA

8.1.4.1.8.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and configured an SCell }

ensure that {

when { UE receives an RRCReconfiguration message including a reconfigurationWithSync for PCell change and sCellToAddModList with an SCell same from configured SCell }

then { UE transmits an RRCReconfigurationComplete message. }

}

8.1.4.1.8.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331 clauses 5.3.5.5.2, clauses 5.3.5.5.9. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.5.2]

The UE shall perform the following actions to execute a reconfiguration with sync.

1> if the AS security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

1> stop timer T310 for the corresponding SpCell, if running;

1> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;

1> if the *frequencyInfoDL* is included:

2> consider the target SpCell to be one on the SSB frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;

1> else:

2> consider the target SpCell to be one on the SSB frequency of the source SpCell with a physical cell identity indicated by the *physCellId*;

1> start synchronising to the DL of the target SpCell;

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

NOTE 1: The UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message.

NOTE 2: The UE may omit reading the *MIB* if the UE already has the required timing information, or the timing information is not needed for random access.

- 1> reset the MAC entity of this cell group;
- 1> consider the SCell(s) of this cell group, if configured, to be in deactivated state;
- 1> apply the value of the *newUE-Identity* as the C-RNTI for this cell group;
- 1> configure lower layers in accordance with the received *spCellConfigCommon*;
 - 2> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *reconfigurationWithSync*.

[TS 38.331, clause 5.3.5.5.9]

The UE shall:

- 1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (SCell addition):
 - 2> add the SCell, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;
 - 2> configure lower layers to consider the SCell to be in deactivated state;
 - 2> for each *measId* included in the *measIdList* within *VarMeasConfig*:
 - 3> if SCells are not applicable for the associated measurement; and
 - 3> if the concerned SCell is included in *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 4> remove the concerned SCell from *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (SCell modification):
 - 2> modify the SCell configuration in accordance with the *sCellConfigDedicated*.

8.1.4.1.8.1.3 Test description

8.1.4.1.8.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell, NR Cell 3 is the configured SCell. NR Cell 2 is the target intra-frequency Cell of NR Cell 1, and also the target PCell.
- NR Cell 1 and NR Cell 3 are Intra-band Contiguous.
- NR Cell 3 is an Inactive SCell according to TS 38.508-1 [4] clause 6.3.1.
- System information combination NR-5 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in test state 3N-A as defined in TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-3 on NR Cell 1.

8.1.4.1.8.1.3.2 Test procedure sequence

Table 8.1.4.1.8.1.3.2-1 and Table 8.1.4.1.8.1.3.2-2 illustrates the downlink power levels to be applied for NR Cell 1, NR Cell 1, NR Cell 3 and NR Cell 2 at various time instants of the test execution. Row marked “T0” denotes the conditions after the preamble, while rows marked “T1” are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.4.1.8.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 3 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -88 | -99 | “off” | NR Cell 1, NR Cell 3 are available. NR Cell 2 are not available. |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -88 | -99 | -88 | NR Cell 1, NR Cell 3 and NR Cell 2 are available. |

Table 8.1.4.1.8.1.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 3 | NR Cell 2 | Remark |
|----|---------------------|-------------|-----------|-----------|-----------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | “off” | NR Cell 1, NR Cell 3 are available. NR Cell 2 are not available. |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | FFS | FFS | FFS | NR Cell 1, NR Cell 3 and NR Cell 2 are available. |

Table 8.1.4.1.8.1.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS changes Cell parameters according to the row “T0” in table 8.1.4.1.8.1.3.2-1/2. | - | - | - | - |
| 2 | The SS transmits an <i>RRCReconfiguration</i> message including a <i>sCellToAddModList</i> to add NR Cell 3 as a SCell. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 3 | The UE transmits the <i>RRCReconfigurationComplete</i> message? | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 4 | The SS changes Cell parameters according to the row “T1” in table 8.1.4.1.8.1.3.2-1/2. | - | - | - | - |
| 5 | The SS transmits an <i>RRCReconfiguration</i> message including a <i>reconfigurationWithSync</i> to change PCell to NR Cell 2 and <i>sCellToAddModList</i> to add NR Cell 3 as the SCell. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 6 | Check: Does the UE transmit the <i>RRCReconfigurationComplete</i> message? | --> | NR RRC: <i>RRCReconfigurationComplete</i> | 1 | P |

8.1.4.1.8.1.3.3 Specific message contents

Table 8.1.4.1.8.1.3.3-1: *RRCReconfiguration* (step 2, Table 8.1.4.1.8.1.3.2-3)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|-----------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE{ | | | |
| masterCellGroup | CellGroupConfig | OCTET STRING
(CONTAINING
CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.8.1.3.3-2: *CellGroupConfig* (Table 8.1.4.1.8.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex[1] | 1 | | |
| sCellConfigCommon[1] SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR
Cell 3 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.8.1.3.3-3: *RRCReconfiguration-HO* (step 5, Table 8.1.4.1.8.1.3.2-3)

| Derivation Path: 38.508-1 [4], Table 4.8.1-1A with condition RBConfig_KeyChange | | | |
|---|--|--|--|
|---|--|--|--|

Table 8.1.4.1.8.1.3.3-4: *CellGroupConfig* (Table 8.1.4.1.8.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 with condition SRB1 and SRB2 and DRBn and HO | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|--|-------------------------------------|--|--|
| | | | |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR Cell 2 | | |
| } | | | |
| } | | | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex[1] | 1 | | |
| sCellConfigCommon[1] SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR Cell 3 | | |
| } | | | |
| } | | | |
| sCellToReleaseList | Not present | | |
| } | | | |

8.1.4.1.8.2 NR CA / Intra NR handover / Success / PCell Change / SCell no Change / Inter-band CA

8.1.4.1.8.2.1 Test Purpose (TP)

Same as TC 8.1.4.1.8.1 but applied to Inter-band CA case.

8.1.4.1.8.2.2 Conformance requirements

Same as TC 8.1.4.1.8.1 but applied to Inter-band CA case.

8.1.4.1.8.2.3 Test description

8.1.4.1.8.2.3.1 Pre-test conditions

Same as test case 8.1.4.1.8.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.
- Cells configuration: NR Cell 10 replaces NR Cell 3.

8.1.4.1.8.2.3.2 Test procedure sequence

Same as TC 8.1.4.1.8.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA

8.1.4.1.8.2.3.3 Specific message contents

Same as TC 8.1.4.1.8.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA
- Cells configuration: NR Cell 10 replaces NR Cell 3.

8.1.4.1.8.3 NR CA / Intra NR handover / Success / PCell Change / SCell no Change / Intra-band non-contiguous CA

8.1.4.1.8.3.1 Test Purpose (TP)

Same as TC 8.1.4.1.8.1 but applied to Intra-band non-Contiguous CA.

8.1.4.1.8.3.2 Conformance requirements

Same as TC 8.1.4.1.8.1 but applied to Intra-band non-Contiguous CA.

8.1.4.1.8.3.3 Test description

8.1.4.1.8.3.3.1 Pre-test conditions

Same as test case 8.1.4.1.8.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA.

8.1.4.1.8.3.3.2 Test procedure sequence

Same as TC 8.1.4.1.8.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA

8.1.4.1.8.3.3.3 Specific message contents

Same as TC 8.1.4.1.8.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA

8.1.4.1.9 NR CA / Intra NR handover / Failure / Re-establishment successful

8.1.4.1.9.1 NR CA / Intra NR handover / Failure / Re-establishment successful / Intra-band Contiguous CA

8.1.4.1.9.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and having received an RRCReconfiguration message including a reconfigurationWithSync for PCell change and including sCellToReleaseList with an sCellIndex set to the configured SCell }

ensure that {

when { UE detects handover failure and the source PCell is selectable }

then { UE successfully performs an RRCReestablishment procedure on source Pcell }

}

(2)

with { UE in NR RRC_CONNECTED state and having received an RRCReconfiguration message including a reconfigurationWithSync for PCell change and including sCellToReleaseList with an sCellIndex set to the configured SCell }

ensure that {

when { UE detects handover failure and the initial SCell is selectable}

then { UE successfully performs an RRCReestablishment procedure on original SCell and the original SCell becomes the PCell}

}

8.1.4.1.9.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 38.331, clause 5.3.5.5.2, 5.3.5.5.9, 5.3.5.5.8 and 5.3.7.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.5.2]

The UE shall perform the following actions to execute a reconfiguration with sync.

1> if the AS security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

1> stop timer T310 for the corresponding SpCell, if running;

1> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;

1> if the *frequencyInfoDL* is included:

2> consider the target SpCell to be one on the SSB frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;

1> else:

2> consider the target SpCell to be one on the SSB frequency of the source SpCell with a physical cell identity indicated by the *physCellId*;

1> start synchronising to the DL of the target SpCell;

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

NOTE 1: The UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message.

NOTE 2: The UE may omit reading the *MIB* if the UE already has the required timing information, or the timing information is not needed for random access.

1> reset the MAC entity of this cell group;

1> consider the SCell(s) of this cell group, if configured, to be in deactivated state;

1> apply the value of the *newUE-Identity* as the C-RNTI for this cell group;

1> configure lower layers in accordance with the received *spCellConfigCommon*;

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *reconfigurationWithSync*.

[TS 38.331, clause 5.3.5.5.9]

The UE shall:

- 1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (SCell addition):
 - 2> add the SCell, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;
 - 2> configure lower layers to consider the SCell to be in deactivated state;
 - 2> for each *measId* included in the *measIdList* within *VarMeasConfig*:
 - 3> if SCells are not applicable for the associated measurement; and
 - 3> if the concerned SCell is included in *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*:
 - 4> remove the concerned SCell from *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (SCell modification):
 - 2> modify the SCell configuration in accordance with the *sCellConfigDedicated*.

[TS 38.331, clause 5.3.5.5.8]

The UE shall:

- 1> if the release is triggered by reception of the *sCellToReleaseList*:
- 2> for each *sCellIndex* value included in the *sCellToReleaseList*:
- 3> if the current UE configuration includes an SCell with value *sCellIndex*:
- 4> release the SCell.

[TS 38.331, clause 5.3.7.5]

The UE shall:

- 1> stop timer T301;
- 1> consider the current cell to be the PCell;
- 1> store the *nextHopChainingCount* value indicated in the *RRCReestablishment* message;
- 1> update the K_{gNB} key based on the current K_{gNB} key or the NH, using the stored *nextHopChainingCount* value, as specified in TS 33.501 [11];
- 1> derive the K_{RRCEnc} and K_{UPenc} keys associated with the previously configured *cipheringAlgorithm*, as specified in TS 33.501 [11];
- 1> derive the K_{RRCint} and K_{UPint} keys associated with the previously configured *integrityProtAlgorithm*, as specified in TS 33.501 [11].
- 1> request lower layers to verify the integrity protection of the *RRCReestablishment* message, using the previously configured algorithm and the K_{RRCint} key;
- 1> if the integrity protection check of the *RRCReestablishment* message fails:
 - 2> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'RRC connection failure', upon which the procedure ends;
- 1> configure lower layers to resume integrity protection for SRB1 using the previously configured algorithm and the K_{RRCint} key immediately, i.e., integrity protection shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> configure lower layers to resume ciphering for SRB1 using the previously configured algorithm and, the K_{RRCEnc} key immediately, i.e., ciphering shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> release the measurement gap configuration indicated by the *measGapConfig*, if configured;

1> submit the *RRCReestablishmentComplete* message to lower layers for transmission;

1> the procedure ends.

8.1.4.1.9.1.3 Test Description

8.1.4.1.9.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is the PCell and NR Cell 3 is the SCell
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.3 is used in all NR cells.

UE:

- None.

Preamble:

- The UE is in 5GS state 3N-A as defined in TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-3 on NR Cell 1.

8.1.4.1.9.1.3.2 Test procedure sequence

Table 8.1.4.1.9.1.3.2-1 and Table 8.1.4.1.9.1.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 3 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1", "T2", "T3" and "T4" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.4.1.9.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 3 | Remark |
|----|---------------------|-------------|-----------|-----------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/SC
S | -85 | -91 | Power levels are such that entry condition for event A3 is not satisfied
$Mn + Ofn + Ocn - Hys < Mp + Ofp + Ocp + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm/SC
S | -85 | -79 | Power levels are such that entry condition for event A3 is satisfied
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |
| T2 | SS/PBCH
SSS EPRE | dBm/SC
S | -85 | "Off" | Power levels are assigned to satisfy $SrxLevCell3 < 0$ such that selecting Cell 1 is guaranteed |
| T3 | SS/PBCH
SSS EPRE | dBm/SC
S | -85 | -79 | Power levels are such that entry condition for event A3 is satisfied
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |

| | | | | | |
|----|---------------------|-------------|-------|-----|---|
| T4 | SS/PBCH
SSS EPRE | dBm/SC
S | “Off” | -79 | Power levels are assigned to satisfy $SrxLevCell1 < 0$ such that selecting Cell 3 is guaranteed |
|----|---------------------|-------------|-------|-----|---|

Table 8.1.4.1.9.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 3 | Remark |
|----|---------------------|-------------|-----------|-----------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/SC
S | [FFS] | [FFS] | Power levels are such that entry condition for event A3 is not satisfied
$Mn + Ofn + Ocn - Hys < Mp + Ofp + Ocp + Off$ |
| T1 | SS/PBCH
SSS EPRE | dBm/SC
S | [FFS] | [FFS] | Power levels are such that entry condition for event A3 is satisfied
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |
| T2 | SS/PBCH
SSS EPRE | dBm/SC
S | [FFS] | “Off” | Power levels are assigned to satisfy $SrxLevCell3 < 0$ such that selecting Cell 1 is guaranteed |
| T3 | SS/PBCH
SSS EPRE | dBm/SC
S | [FFS] | [FFS] | Power levels are such that entry condition for event A3 is satisfied
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |
| T4 | SS/PBCH
SSS EPRE | dBm/SC
S | “Off” | [FFS] | Power levels are assigned to satisfy $SrxLevCell1 < 0$ such that selecting Cell 3 is guaranteed |

Table 8.1.4.1.9.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|------------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an RRCReconfiguration message on NR Cell 1 to configure NR Cell 3 as an SCell | <-- | NR RRC: RRCReconfiguration | - | - |
| 2 | The UE transmits an RRCReconfigurationComplete message on NR Cell 1. | --> | NR RRC: RRCReconfigurationComplete | - | - |
| 3 | The SS transmits an RRCReconfiguration message on NR Cell 1 to setup event A3 reporting configuration. | <-- | NR RRC: RRCReconfiguration | - | - |
| 4 | The UE transmits an RRCReconfigurationComplete message on NR Cell 1. | --> | NR RRC: RRCReconfigurationComplete | - | - |
| 5 | The SS changes NR Cell 1 and NR Cell 3 parameters according to the row "T1" in table 8.1.4.1.9.1.3.2-1/1A | - | - | - | - |

| | | | | | |
|----|---|-----|---|---|---|
| 6 | The UE transmits a <i>MeasurementReport</i> message on NR Cell 1 to report event A3 with the measured RSRP, RSRQ value for NR Cell 3. | --> | NR RRC: <i>MeasurementReport</i> | - | - |
| 7 | The SS transmits an <i>RRCReconfiguration</i> message on NR Cell 1 to order the UE to perform inter frequency handover to NR Cell 3 and to release SCell NR Cell 3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| - | EXCEPTION: In parallel to the events described in step 8 the steps specified in Table 8.1.4.1.9.1.3.2-3 should take place. | - | - | - | - |
| 8 | The SS changes NR Cell 1 and NR Cell 3 parameters according to the row "T2" in table 8.1.4.1.9.1.3.2-1/1A | - | - | - | - |
| 9 | Check: Does the UE transmit an <i>RRCReestablishmentRequest</i> message on NR Cell 1? | --> | NR RRC: <i>RRCReestablishmentRequest</i> | 1 | P |
| 10 | The SS transmits an <i>RRCReestablishment</i> message to resume SRB1 operation and re-activate security on NR Cell 1. | <-- | NR RRC: <i>RRCReestablishment</i> | - | - |
| 11 | The UE transmits an <i>RRCReestablishmentComplete</i> message | --> | NR RRC: <i>RRCReestablishmentComplete</i> | - | - |
| 12 | The SS transmits an <i>RRCReconfiguration</i> message to resume existing radio bearer on NR Cell 1 and configure NR Cell 3 as an SCell | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 13 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message on NR Cell 1 | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 14 | The SS transmits an <i>RRCReconfiguration</i> message on NR Cell 1 to setup event A3 reporting configuration. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 15 | The UE transmits an <i>RRCReconfigurationComplete</i> message on NR Cell 1. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 16 | The SS changes NR Cell 1 and NR Cell 3 parameters according to the row "T3" in table 8.1.4.1.9.1.3.2-1/1A | - | - | - | - |
| 17 | The UE transmits a <i>MeasurementReport</i> message on NR Cell 1 to report event A3 with the measured RSRP, RSRQ value for NR Cell 3. | --> | NR RRC: <i>MeasurementReport</i> | - | - |
| 18 | The SS transmits an <i>RRCReconfiguration</i> message on NR Cell 1 to order the UE to perform handover to NR Cell 3 and to release SCell NR Cell3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| - | EXCEPTION: In parallel to the events described in step 19 the steps specified in Table 8.1.4.1.9.1.3.2-3 should take place. | - | - | - | - |

| | | | | | |
|----|--|-----|--|---|---|
| 19 | The SS changes NR Cell 1 and NR Cell 3 parameters according to the row "T4" in table 8.1.4.1.9.1.3.2-1/1A | - | - | - | - |
| 20 | Check: Does the UE transmit an <i>RRCReestablishmentRequest</i> message on NR Cell 3? | --> | NR RRC:
<i>RRCReestablishmentRequest</i> | 2 | P |
| 21 | The SS transmits an <i>RRCReestablishment</i> message to resume SRB1 operation and reactivate security on NR Cell 3. | <-- | NR RRC: <i>RRCReestablishment</i> | - | - |
| 22 | The UE transmits an <i>RRCReestablishmentComplete</i> message | --> | NR RRC:
<i>RRCReestablishmentComplete</i> | - | - |
| 23 | The SS transmits an <i>RRCReconfiguration</i> message to resume existing radio bearer on NR Cell 3. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 24 | The UE transmits an <i>RRCReconfigurationComplete</i> message on NR Cell 3. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |

Table 8.1.4.1.9.1.3.2-3: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: The steps 1 and 2 below are repeated for the duration of T304. | - | - | - | - |
| 1 | The UE attempts to perform the inter frequency handover using MAC Random Access Preamble on NR Cell 3. | - | - | - | - |
| 2 | The SS does not respond. | - | - | - | - |

8.1.4.1.9.1.3.3 Specific message contents

Table 8.1.4.1.9.1.3.3-1: SIB1 for NR Cell 1 and NR Cell 3 (Preamble and all the steps in Table 8.1.4.1.9.1.3.2-2)

| Derivation path: 38.508-1 [4] table 4.6.3-130 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | | | |
| servingCellConfigCommon SEQUENCE{ | | | |
| ServingCellConfigCommonSIB ::=SEQUENCE { | | | |
| UplinkConfigCommon{ | | | |
| UplinkConfigCommonSIB ::= SEQUENCE { | | | |
| initialUplinkBWP{ | | | |
| BWP-UplinkCommon ::= SEQUENCE { | | | |
| RACH-ConfigCommon ::= SEQUENCE { | | | |

| | | | |
|---|---------------------------------|-----|--|
| { | RACH-ConfigGeneric ::= SEQUENCE | | |
| | preambleTransMax | n50 | |
| | } | | |
| | } | | |
| | } | | |
| | } | | |
| | } | | |
| | } | | |
| | } | | |
| | } | | |
| | } | | |
| | } | | |
| | } | | |

Table 8.1.4.1.9.1.3.3-2: RRCReconfiguration (step 1 and 12, Table 8.1.4.1.9.1.3.2-2)

| Derivation Path: TS 38.508-1[4], table 4.6.1-13 | | | |
|---|-----------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-3: CellGroupConfig (Table 8.1.4.1.9.1.3.3-2)

| Derivation path: 38.508-1 [4] table 4.6.1-19 | | | |
|--|-------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| SCellConfig ::= SEQUENCE { | | | |
| sCellIndex | 1 | | |
| sCellConfigCommon | ServingCellConfigCommon | | |
| sCellConfigDedicated | ServingCellConfig | | |

| | | | |
|--------------------|-------------|--|--|
| } | | | |
| } | | | |
| sCellToReleaseList | Not present | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-4: ServingCellConfigCommon (Table 8.1.4.1.9.1.3.3-3)

| Derivation Path: 38.508-1 [4] Table 4.6.3-168 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| physCellId | Physical layer cell identity of NR Cell 3 | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-5: RRCReconfiguration (step 3 and 14, Table 8.1.4.1.9.1.3.2-2)

| |
|--|
| Derivation Path: TS 38.508-1[4], table 4.6.1-13 and condition MEAS |
|--|

Table 8.1.4.1.9.1.3.3-6: MeasConfig (Table 8.1.4.1.9.1.3.3-5)

| Derivation path: 38.508-1[4], table 4.6.3-69 | | | |
|--|-----------------|-----------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | NR Cell 1 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | NR Cell 3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |

| | | | |
|---|-------------------|--|--|
| reportConfigNR | ReportConfigNR-A3 | | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | ReportConfigId | | |
| measId[2] | 2 | | |
| measObjectId[2] | 2 | | |
| reportConfigId[1] | ReportConfigId | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-7: *MeasObjectNR-f1* (Table 8.1.4.1.9.1.3.3-6)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR Cell 1 SSB | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-8: *MeasObjectNR-f1* (Table 8.1.4.1.9.1.3.3-6)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR Cell 3 SSB | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-9: *ReportConfigNR-A3* (Table 8.1.4.1.9.1.3.3-5)

| Derivation Path: 38.508-1 [4], table 4.6.3-142 with condition EVENT_A3 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |

| | | | |
|--------------------|--------|--|--|
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| timeToTrigger | ms2560 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-10: *MeasurementReport* (step 6 and 17, Table 8.1.4.1.9.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], table 4.6.1-5A | | | |
|--|----------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE (SIZE (1..maxNrofServingCells)) OF SEQUENCE { | | | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | PhysCellId of NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | |
| } | | | |
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |

| | | | |
|---|-------------------------|--|--|
| } | | | |
| measResultBestNeighCell | Not present | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | | | |
| physCellId | PhysCellId of NR Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| Rsrp | (0..127) | | |
| Rsrq | (0..127) | | |
| Sinr | (0..127) | | |
| } | | | |
| resultsCSI-RS-Cell | Not present | | |
| } | | | |
| rsIndexResults | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-11: RRCReconfiguration (step 7 and 18, Table 8.1.4.1.9.1.3.2-2)

| Derivation Path: TS 38.508-1[4], table 4.6.1-13 and condition NR | | | |
|--|-----------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-12: CellGroupConfig (Table 8.1.4.1.9.1.3.3-11)

| Derivation path: 38.508-1 [4] table 4.6.1-19 | | | |
|--|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig ::= SEQUENCE { | | | |
| servCellIndex | ServCellIndex of NR Cell 3 | | |
| reconfigurationWithSync ::= SEQUENCE { | | | |
| spCellConfigCommon ::= SEQUENCE { | | | |
| physCellId | PhysCellId of NR Cell 3 | | |
| downlinkConfigCommon ::= SEQUENCE { | | | |
| frequencyInfoDL ::= SEQUENCE { | | | |
| absoluteFrequencySSB | Downlink ARFCN of NR Cell 3 SSB | | |
| } | | | |
| } | | | |
| } | | | |
| t304 | ms1000 | | |
| rach-ConfigDedicated CHOICE { | | | |
| RACH-ConfigDedicated ::= SEQUENCE { | | | |
| CFRA-SSB-Resource ::=SEQUENCE { | | | |
| ra-PreambleIndex | 63 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |

| | | | |
|---|-------------------------------------|--|--|
| SCellConfig ::= SEQUENCE { | | | |
| sCellIndex | 1 | | |
| sCellConfigCommon SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR Cell 3 | | |
| } | | | |
| } | | | |
| } | | | |
| sCellToReleaseList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | | | |
| SCellConfig ::= SEQUENCE { | | | |
| sCellIndex | 1 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-13: *RRCReestablishmentRequest* (step 9 and 20, Table 8.1.4.1.9.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], table 4.6.1-12 | | | |
|--|-------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReestablishmentRequest ::= SEQUENCE { | | | |
| ue-Identity SEQUENCE { | | | |
| physCellId | PhysCellId of NR Cell 1 | | |
| } | | | |
| reestablishmentCause | handoverFailure | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-14: *RRCReestablishment* (step 10 and 21, Table 8.1.4.1.9.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], table 4.6.1-10 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReestablishment ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReestablishment SEQUENCE { | | | |
| nextHopChainingCount | 0 | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 8.1.4.1.9.1.3.3-15: RRCReconfiguration (step 12 and 23, Table 8.1.4.1.9.1.3.2-2)

| |
|--|
| Derivation Path: TS 38.508-1[4], table 4.6.1-13 and condition NR |
|--|

8.1.4.1.9.2 NR CA / Intra NR handover / Failure / Re-establishment successful / Inter-band CA

8.1.4.1.9.2.1 Test Purpose (TP)

Same as TC 8.1.4.1.9.1 but applied to Inter-band CA case

8.1.4.1.9.2.2 Conformance requirements

Same as TC 8.1.4.1.9.1 but applied to Inter-band CA case

8.1.4.1.9.2.3 Test Description

8.1.4.1.9.2.3.1 Pre-test conditions

Same as test case 8.1.4.1.9.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.
- Cells configuration: NR Cell 10 replaces NR Cell 3.
- NR Cell 10 is an Inactive SCell according to TS 38.508-1 [4] clause 6.3.1.

8.1.4.1.9.2.3.2 Test procedure sequence

Same as test case 8.1.4.1.9.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.
- Cells configuration: NR Cell 10 replaces NR Cell 3.

8.1.4.1.9.2.3.3 Specific message contents

Same as TC 8.1.4.1.9.1 but applied to Inter-band CA case

8.1.4.1.9.3 NR CA / Intra NR handover / Failure / Re-establishment successful / Intra-band non-contiguous CA

8.1.4.1.9.3.1 Test Purpose (TP)

Same as TC 8.1.4.1.9.1 but applied to Intra-band non-contiguous CA case

8.1.4.1.9.3.2 Conformance requirements

Same as TC 8.1.4.1.9.1 but applied to Intra-band non-contiguous CA case

8.1.4.1.9.3.3 Test Description

8.1.4.1.9.3.3.1 Pre-test conditions

Same as test case 8.1.4.1.9.1 with the following differences:

- CA configuration: Intra-band Contiguous CA replaces Intra-band non-contiguous CA.

8.1.4.1.9.3.3.2 Test procedure sequence

Same as test case 8.1.4.1.9.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.

8.1.4.1.9.3.3.3 Specific message contents

Same as TC 8.1.4.1.9.1 but applied to Intra-band non-contiguous CA case

8.1.4.2 Inter-RAT handover

8.1.4.2.1 Inter-RAT handover from NR

8.1.4.2.1.1 Inter-RAT handover / From NR to E-UTRA / Success

8.1.4.2.1.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE receives a MobilityFromNRCommand message }

then { UE transmits an RRCConnectionReconfigurationComplete message on the E-UTRA cell }

}

8.1.4.2.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clause 5.4.3.2, clause 5.4.3.3 and clause 5.4.3.4 and TS 36.331, clause 5.4.2.2 and clause 5.4.2.3.

[TS.38.331, clause 5.4.3.2]

The network initiates the mobility from NR procedure to a UE in RRC_CONNECTED, possibly in response to a MeasurementReport message, by sending a MobilityFromNRCommand message. The network applies the procedure as follows:

- the procedure is initiated only when AS-security has been activated, and SRB2 with at least one DRB are setup and not suspended.

[TS 38.331, clause 5.4.3.3]

The UE shall:

- 1> if the targetRAT-Type is set to eutra:
- 2> consider inter-RAT mobility as initiated towards E-UTRA;
- 2> forward the nas-SecurityParamFromNR to the upper layers, if included;
- 1> access the target cell indicated in the inter-RAT message in accordance with the specifications of the target RAT.

[TS.38.331, clause 5.4.3.4]

Upon successfully completing the handover, at the source side the UE shall:

- 1> reset MAC;
- 1> stop all timers that are running;
- 1> release *ran-NotificationAreaInfo*, if stored;
- 1> release the AS security context including the $K_{RRCCenc}$ key, the K_{RRCint} , the K_{UPint} key and the K_{UPenc} key, if stored;
- 1> release all radio resources, including release of the RLC entity and the MAC configuration;
- 1> if delta configuration is used:
 - 2> maintain source RAT configuration of PDCP and SDAP for applicable RBs which is used for target RAT RBs;
- 1> else:
 - 2> release the associated PDCP entity and SDAP entity for all established RBs;
- 1> indicate the release of the RRC connection to upper layers together with the release cause 'other'.

[TS 36.331, clause 5.4.2.2]

The RAN using another RAT or the E-UTRA connected to a different type of CN initiates the handover to E-UTRA procedure, in accordance with the specifications applicable for the other RAT or for the E-UTRA connected to a different type of CN, by sending the *RRCConnectionReconfiguration* message via the radio access technology from which the inter-RAT handover is performed.

E-UTRAN applies the procedure as follows:

- to activate ciphering, possibly using NULL algorithm, if not yet activated in the other RAT or in the E-UTRA connected to a different type of CN;
- to establish SRB1, SRB2 and one or more DRBs, i.e. at least the DRB associated with the default EPS bearer is established if the target CN is EPC and at least one DRB is established if the target CN is 5GC.

[TS 36.331, clause 5.4.2.3]

If the UE is able to comply with the configuration included in the RRCConnectionReconfiguration message, the UE shall:

- 1> if the RRCConnectionReconfiguration message includes the fullConfig:

...

- 1> else:

- 2> apply the default physical channel configuration as specified in 9.2.4;
- 2> apply the default semi-persistent scheduling configuration as specified in 9.2.3;
- 2> apply the default MAC main configuration as specified in 9.2.2;
- 1> start timer T304 with the timer value set to t304, as included in the mobilityControlInfo;
- 1> consider the target PCell to be one on the frequency indicated by the carrierFreq with a physical cell identity indicated by the targetPhysCellId;
- 1> start synchronising to the DL of the target PCell;
- 1> set the C-RNTI to the value of the newUE-Identity;
- 1> for the target PCell, apply the downlink bandwidth indicated by the dl-Bandwidth;
- 1> for the target PCell, apply the uplink bandwidth indicated by (the absence or presence of) the ul-Bandwidth;
- 1> configure lower layers in accordance with the received radioResourceConfigCommon;
- 1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received mobilityControlInfo;
- 1> perform the radio resource configuration procedure as specified in 5.3.10;
- 1> if the handoverType in securityConfigHO is set to fivegc-ToEPC:
 - 2> indicate to higher layer that the CN has changed from 5GC to EPC;
 - 2> derive the key KeNB based on the mapped KASME key as specified for interworking between EPS and 5GS in TS 33.501 [86];
 - 2> store the nextHopChainingCount-r15 value;
- 1> else if the handoverType in securityConfigHO is set to intra5GC:
 - ...
 - 1> derive the KRRCint key associated with the integrityProtAlgorithm, as specified in TS 33.401 [32];
 - 1> derive the KRRCenc key and the KUPenc key associated with the cipheringAlgorithm, as specified in TS 33.401 [32];
 - ...
 - 1> if the handoverType in securityConfigHO is set to fivegc-ToEPC or if the handoverType-v1530 is not present:
 - 2> configure lower layers to apply the indicated integrity protection algorithm and the KRRCint key immediately, i.e. the indicated integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
 - 2> configure lower layers to apply the indicated ciphering algorithm, the KRRCenc key and the KUPenc key immediately, i.e. the indicated ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;
 - 1> if the received RRCConnectionReconfiguration includes the sCellToAddModList:
 - ...
 - 1> if the RRCConnectionReconfiguration message includes the measConfig:
 - 2> perform the measurement configuration procedure as specified in 5.5.2;
 - ...
 - 1> submit the RRCConnectionReconfigurationComplete message to lower layers for transmission using the new configuration;

- 1> if the RRCConnectionReconfiguration message does not include rlf-TimersAndConstants set to setup:
- 2> use the default values specified in 9.2.5 for timer T310, T311 and constant N310, N311;
- 1> if MAC successfully completes the random access procedure:
- 2> stop timer T304;
- 2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the target PCell, if any;
- 2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the target PCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of the target PCell;

NOTE 1: Whenever the UE shall setup or reconfigure a configuration in accordance with a field that is received it applies the new configuration, except for the cases addressed by the above statements.

- 2> enter E-UTRA RRC_CONNECTED, upon which the procedure ends;

8.1.4.2.1.1.3 Test description

8.1.4.2.1.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 and E-UTRA Cell 1.
- System information Combination NR-6 as defined in TS 38.508 [4] clause 4.4.3.1 is used in NR cells.

UE:

- None

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell.

8.1.4.2.1.1.3.2 Test procedure sequence

Table 8.1.4.2.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a MobilityFromNRCommand message on NR Cell 1. | <-- | MobilityFromNRCommand | - | - |
| 2 | Check: Does the UE transmit an RRCConnectionReconfigurationComplete message on E-UTRA Cell 1 using the security key derived from the new KeNB? | --> | RRCConnectionReconfigurationComplete | 1 | P |
| 3 | The UE transmits an ULInformationTransfer message on the cell specified in the test case.

This message includes a TRACKING AREA UPDATE REQUEST message.

UE integrity protects the TAU request message using the 5G security context. | --> | RRC: ULInformationTransfer

NAS: TRACKING AREA UPDATE REQUEST | - | - |

| | | | | | |
|---|---|-----|--|---|---|
| 4 | The SS transmits a DLInformationTransfer message on the cell specified in the test case.

This message includes a TRACKING AREA UPDATE ACCEPT message. | <-- | RRC: DLInformationTransfer

NAS: TRACKING AREA UPDATE ACCEPT | - | - |
| 5 | The UE transmits an ULInformationTransfer message on the cell specified in the test case.

This message includes a TRACKING AREA UPDATE COMPLETE message. | --> | RRC: ULInformationTransfer

NAS: TRACKING AREA UPDATE COMPLETE | - | - |

8.1.4.2.1.1.3.3 Specific message contents

Table 8.1.4.2.1.1.3.3-1: MobilityFromNRCommand (step 2, Table 8.1.4.2.1.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-8 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MobilityFromNRCommand ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| mobilityFromNRCommand ::= SEQUENCE { | | | |
| targetRAT-Type | eutra | | |
| targetRAT-MessageContainer | RRCConnectionReconfiguration | | |
| nas-SecurityParamFromNR | 8 LSB of the downlink NAS COUNT | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.2.1.1.3.3-2: RRCConnectionReconfiguration (Table 8.1.4.2.1.1.3.3-1)

| |
|--|
| Derivation Path: 36.508-1, Table 4.6.1-8, condition HO-TO-EUTRA(1,0) |
|--|

Table 8.1.4.2.1.1.3.3-3: MobilityControlInfo (Table 8.1.4.2.1.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.5-1 | | | |
|--|---------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MobilityControlInfo ::= SEQUENCE { | | | |
| targetPhysCellId | PhysicalCellIdentity of E-UTRA Cell 1 | | |
| carrierFreq SEQUENCE { | | | |

| | | | |
|-----------------------------|--|--|-------------|
| dl-CarrierFreq | Same downlink EARFCN as used for E-UTRA Cell 1 | | |
| } | | | |
| carrierFreq | Not present | | Band > 64 |
| carrierBandwidth SEQUENCE { | | | |
| dl-Bandwidth | Downlink system bandwidth under test. | | |
| ul-Bandwidth | Uplink Bandwidth under test. | | FDD |
| ul-Bandwidth | Not present | | TDD |
| } | | | |
| additionalSpectrumEmission | 1 | | HO-to-EUTRA |
| carrierFreq-v9e0 SEQUENCE { | | | Band > 64 |
| dl-CarrierFreq-v9e0 | Same downlink EARFCN as used for E-UTRA Cell 1 | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|-----------|--------------------------|
| FDD | FDD cell environment |
| TDD | TDD cell environment |
| Band > 64 | If band > 64 is selected |

Table 8.1.4.2.1.1.3.3-4: SecurityConfigHO (Table 8.1.4.2.1.1.3.3-1)

| Derivation Path: 36.508-1, Table 4.6.4-1 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SecurityConfigHO-v1530 ::= SEQUENCE { | | | |
| handoverType-v1530 CHOICE { | | | |
| fivegc-ToEPC-r15 SEQUENCE { | | | |
| securityAlgorithmConfig-r15 SEQUENCE { | | | |
| cipheringAlgorithm | Set according to PIXIT parameter for default ciphering algorithm | | |
| integrityProtAlgorithm | Set according to PIXIT parameter for default integrity protection | | |

| | | | |
|--------------------------|-----------|--|--|
| | algorithm | | |
| } | | | |
| nextHopChainingCount-r15 | 0 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.2.1.1.3.3-5: RadioResourceConfigDedicated-HO-TO-EUTRA (Table 8.1.4.2.1.1.3.3-1)

| |
|---|
| Derivation Path: 36.508-1, Table 4.6.3-18, condition HO-TO-EUTRA(1,0) |
|---|

Table 8.1.4.2.1.1.3.3-6: TRACKING AREA UPDATE REQUEST

| Derivation Path: 36.508-1 clause 4.7.2-27 | | | |
|---|--------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Old GUTI | Mapped 5G-GUTI | | |
| GUTI type | Native | | |
| UE status | UE is in 5GMM-REGISTERED state | | |

8.1.4.2.2 Inter-RAT handover to NR

8.1.4.2.2.1 Inter-RAT handover / From E-UTRA to NR / Success

8.1.4.2.2.1.1 Test Purpose (TP)

(1)

with { UE in E-UTRA RRC_CONNECTED state }**ensure that** {**when** { UE receives a MobilityFromEUTRACommand message }**then** { UE transmits a RRCReconfigurationComplete message on the NR cell }

}

8.1.4.2.2.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clause 5.4.2.2, 5.4.2.3, TS 36.331, clause 5.4.3.2, 5.4.3.3, 5.4.3.4. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.4.2.2]

The RAN using another RAT initiates the handover to NR procedure, in accordance with the specifications applicable for the other RAT, by sending the *RRCReconfiguration* message via the radio access technology from which the inter-RAT handover is performed.

The network applies the procedure as follows:

- to activate ciphering, possibly using NULL algorithm, if not yet activated in the other RAT;
- to re-establish SRBs and one or more DRBs;

[TS 38.331, clause 5.4.2.2]

The UE shall:

- 1> perform RRC reconfiguration procedure as specified in 5.3.5;

NOTE: If the UE is connected to 5GC of the source E-UTRA cell, the delta configuration for PDCP and SDAP can be used for intra-system inter-RAT handover.

[TS 36.331, clause 5.4.3.2]

E-UTRAN initiates the mobility from E-UTRA procedure to a UE in RRC_CONNECTED, possibly in response to a *MeasurementReport* message or in response to reception of CS fallback indication for the UE from MME, by sending a *MobilityFromEUTRACCommand* message. E-UTRAN applies the procedure as follows:

- the procedure is initiated only when AS-security has been activated, and SRB2 with at least one DRB are setup and not suspended;

[TS 36.331, clause 5.4.3.3]

The UE shall be able to receive a *MobilityFromEUTRACCommand* message and perform a cell change order to GERAN, even if no prior UE measurements have been performed on the target cell.

The UE shall:

- 1> stop timer T310, if running;
- 1> stop timer T312, if running;
- 1> stop timer T309, if running, for all access categories;
- 1> if the *MobilityFromEUTRACCommand* message includes the *purpose* set to *handover*:

...

- 2> else if the *targetRAT-Type* is set to *nr*:

- 3> consider inter-RAT mobility as initiated towards NR;

- 3> access the target cell indicated in the inter-RAT message in accordance with the specifications in TS 38.331 [82];

[TS 36.331, clause 5.4.3.4]

Upon successfully completing the handover, the cell change order or enhanced 1xRTT CS fallback, the UE shall:

...

- 1> else if the UE is connected to 5GC and the *targetRAT-Type* in the received *MobilityFromEUTRACCommand* is set to *nr*:

- 2> reset MAC;

- 2> stop all timers that are running;

- 2> release *ran-NotificationAreaInfo*, if stored;

- 2> release the AS security context including the K_{RRCenc} key, the K_{RRCint} , the K_{UPint} key and the K_{UPenc} key, if stored;

- 2> release all radio resources, including release of the RLC entity and the MAC configuration;

- 2> if delta configuration is used:

- 3> maintain source RAT configuration of PDCP and SDAP for applicable RBs which is used for target RAT RBs;

- 2> else:

3> release the associated PDCP entity and SDAP entity for all established RBs;

2> indicate the release of the RRC connection to upper layers together with the release cause 'other'.

8.1.4.2.2.1.3 Test description

8.1.4.2.2.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 "Serving cell" and NR Cell 1 "Non-suitable "Off" cell".
- System information combination 31 as defined in TS 36.508 [7] clause 4.4.3.1 is used in the E-UTRA cell.
- System information combination NR-6 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in the NR cell.

UE:

- None.

Preamble:

- The UE is in state Generic RB Established (state 3) on E-UTRA Cell 1 according to [7].

8.1.4.2.2.1.3.2 Test procedure sequence

Table 8.1.4.2.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 0 | The SS configures NR Cell 1 as the "Serving cell" and wait 5s. | - | - | - | - |
| 1 | The SS transmits a <i>MobilityFromEUTRACommand</i> message on E-UTRA Cell 1. | <-- | E-UTRA RRC:
<i>MobilityFromEUTRACommand</i> | - | - |
| 2 | Check: Does the UE transmit a <i>RRCReconfigurationComplete</i> message on NR Cell 1? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 1 | P |
| 3 | The UE transmits a <i>DLInformationTransfer</i> message and a REGISTRATION REQUEST message indicating "mobility registration updating" is sent to update the registration of the actual tracking area. | --> | NR RRC: <i>ULInformationTransfer</i>

5GMM: REGISTRATION REQUEST | - | - |
| 4 | SS sends an <i>ULInformationTransfer</i> message and a REGISTRATION ACCEPT message containing a 5G-GUTI. | <-- | NR RRC: <i>DLInformationTransfer</i>

5GMM: REGISTRATION ACCEPT | - | - |
| 5 | The UE transmits an <i>ULInformationTransfer</i> message and a REGISTRATION COMPLETE message. | --> | NR RRC: <i>ULInformationTransfer</i>

5GMM: REGISTRATION COMPLETE | - | - |
| - | EXCEPTION: In parallel to the events described in step 6 below, the steps specified in table 8.1.4.2.2.1.3.2-2 might take place. | - | - | - | - |

| | | | | | |
|---|--|---|---|---|---|
| 6 | The procedure in table 4.5A.7.2.2-1 in TS 38.508-1 [4] is performed. | - | - | - | - |
|---|--|---|---|---|---|

Table 8.1.4.2.2.1.3.2-2: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: Steps 1a1 to 1a2 describes behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation | - | - | - | - |
| 1a1 | IF the DNN of the established PDU session is IMS AND the UE initiates IMS re-registration on NR in the next 10s THEN perform step 1 defined in TS 34.229-1 [35] C.46 using conditions A2 AND A32 for the REGISTER request message. | - | - | - | - |
| 1a2 | Step 2 as defined in TS 34.229-1 [35] C.46. | - | - | - | - |

8.1.4.2.2.1.3.3 Specific message contents

Table 8.1.4.2.2.1.3.3-1: *MobilityFromEUTRACommand* (step 1, Table 8.1.4.2.2.1.3.2-1)

| Derivation Path: 36.508 [7] table 4.6.1-6 | | | |
|---|--------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MobilityFromEUTRACommand ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| mobilityFromEUTRACommand-r8 SEQUENCE | | | |
| { | | | |
| purpose CHOICE { | | | |
| handover SEQUENCE { | | | |
| targetRAT-Type | nr | | |
| targetRAT-MessageContainer | RRCReconfiguration | | |
| nas-SecurityParamFromEUTRA | Not present | | |
| systemInformation | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.1.4.2.2.1.3.3-2: RRCReconfiguration (Table 8.1.4.2.2.1.3.3-1)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | TS 38.508-1 [4], Table 4.6.5-12. | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig as per table 4.6.3-132 in TS 38.508-1 [4] with conditions SRB1,SRB2 and DRB1 | | |
| secondaryCellGroup | Not present | | |
| measConfig | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig with conditions SRB1,SRB2 and DRB1 | OCTET STRING (CONTAINING CellGroupConfig) | |
| fullConfig | true | | |
| dedicatedNAS-MessageList SEQUENCE (SIZE(1..maxDRB)) OF DedicatedNAS-Message {} | Not present | | |
| masterKeyUpdate | MasterKeyUpdate | | |
| dedicatedSIB1-Delivery | Not present | | |
| dedicatedSystemInformationDelivery | Not present | | |
| otherConfig | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.4.2.2.1.3.3-3: Void

Table 8.1.4.2.2.1.3.3-4: CellGroupConfig (Table 8.1.4.2.2.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-19 | | | |
|---|---------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | CellGroupId | | |
| rlc-BearerToAddModList SEQUENCE (SIZE(1..maxLCH)) OF SEQUENCE { | 3 entries | | |
| RLC-Bearer-Config[1] | RLC-Bearer-Config with condition SRB1 | | |
| RLC-Bearer-Config[2] | RLC-Bearer-Config with condition SRB2 | | |
| RLC-Bearer-Config[3] | RLC-Bearer-Config with condition DRB1 | | |
| } | | | |
| rlc-BearerToReleaseList | Not present | | |
| mac-CellGroupConfig | MAC-CellGroupConfig | | |
| physicalCellGroupConfig | PhysicalCellGroupConfig | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | Not present | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon | ServingCellConfigCommon | | |
| newUE-Identity | RNTI-Value | | |
| t304 | ms1000 | | |
| rach-ConfigDedicated CHOICE { | | | |
| uplink | RACH-ConfigDedicated | | |
| supplementaryUplink | Not present | | |
| } | | | |
| } | | | |
| rlf-TimersAndConstants CHOICE { | | | |
| setup | RLF-TimersAndConstants | | |
| } | | | |
| rlmInSyncOutOfSyncThreshold | Not present | | |
| spCellConfigDedicated | ServingCellConfig | | |
| } | | | |
| sCellToAddModList | Not present | | |

| | | | |
|--------------------|-------------|--|--|
| sCellToReleaseList | Not present | | |
| } | | | |

Table 8.1.4.2.2.1.3.3-5: ServingCellConfigCommon (Table 8.1.4.2.2.1.3.3-4)

| Derivation Path: 38.508-1 [4] Table 4.6.3-168 | | | |
|--|----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| } | | | |

Table 8.1.4.2.2.1.3.3-6: MasterKeyUpdate (Table 8.1.4.2.2.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table FFS | | | |
|--|--|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| MasterKeyUpdate ::= SEQUENCE { | | | |
| keySetChangeIndicator | True | | |
| nextHopChainingCount | NextHopChainingCount | 38.508-1 [4]
Table 4.6.3-83 | |
| nas-Container | <p>Octets 1 to 3 are Message authentication code(MAC) IE.</p> <p>Bits 1 to 4 of octet 4 are set according to PIXIT parameter for default integrity protection algorithm.</p> <p>Bits 5 to 8 of octet 4 are set according to PIXIT parameter for default cipherring algorithm.</p> <p>Bits 1 to 3 of octet 5 contains the Key set identifier in 5G.</p> <p>Bit 4 of octet 5 contains the type of security</p> | 24.501 [22]
9.11.2.9 The value part of S1 mode to N1 mode NAS transparent container | |

| | | | |
|---|--|--|--|
| | <p>context flag(TSC).</p> <p>Bits 5 to 7 of octet 5 contains the 3bit Next hop chaining counter.</p> <p>Bit 8 of octet 5 is Spare.</p> <p>Octets 6 and 7 are spare and shall be coded as zero.</p> | | |
| } | | | |

8.1.5 RRC others

8.1.5.1 UE capability transfer

8.1.5.1.1 UE capability transfer / Success

8.1.5.1.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE receives an UECapabilityEnquiry message }

then { UE transmits an UECapabilityInformation message including UE radio access capability information corresponding to the ue-CapabilityRequest variable }

}

8.1.5.1.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 38.331, clause 5.6.1.3. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.6.1.3]

The UE shall set the contents of *UECapabilityInformation* message as follows:

1> if the ue-CapabilityRAT-RequestList contains a UE-CapabilityRAT-Request with rat-Type set to nr:

2> include in the ue-CapabilityRAT-ContainerList a UE-CapabilityRAT-Container of the type UE-NR-Capability and with the rat-Type set to nr;

2> include the supportedBandCombinationList, featureSets and featureSetCombinations as specified in clause 5.6.1.4;

...

1> submit the *UECapabilityInformation* message to lower layers for transmission, upon which the procedure ends.

8.1.5.1.1.3 Test Description

8.1.5.1.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1
- System information combination NR-1 as defined in TS 38.508-1 [4] clause 4.4.3.1.3 is used in NR cell.

UE:

- None.

Preamble:

- The UE is in 5GS state 3N-A according to TS 38.508-1 [4], clause 4.4A on NR Cell 1

8.1.5.1.1.3.2 Test procedure sequence

Table 8.1.5.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a <i>UECapabilityEnquiry</i> message including <i>RAT-Type nr</i> . | <-- | <i>UECapabilityEnquiry</i> | - | - |
| 2 | Check: Does the UE transmit a <i>UECapabilityInformation</i> message including UE radio access capability information as per the <i>ue-CapabilityRequest</i> variable? | --> | <i>UECapabilityInformation</i> | 1 | P |

8.1.5.1.1.3.3 Specific message contents

Table 8.1.5.1.1.3.3-1: *UECapabilityEnquiry* (step 1, Table 8.1.5.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-31 | | | |
|---|-------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>UECapabilityEnquiry</i> ::= SEQUENCE { | | | |
| <i>rrc-TransactionIdentifier</i> | RRC-
TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| <i>ueCapabilityEnquiry</i> SEQUENCE { | | | |
| <i>ue-CapabilityRAT-RequestList</i> SEQUENCE
(SIZE (1.. <i>maxRAT-CapabilityContainers</i>)) OF
SEQUENCE { | - | | |
| <i>rat-Type</i> [1] | nr | | |
| <i>capabilityRequestFilter</i> | Not present | | |
| } | | | |
| } | | | |

| | | | |
|--------------------------------------|-------------|--|--|
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| criticalExtensionsFuture SEQUENCE {} | | | |
| } | | | |
| } | | | |

Table 8.1.5.1.1.3.3-2: *UECapabilityInformation* (step 2, Table 8.1.5.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-32 | | | |
|---|---------------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| UECapabilityInformation ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| ueCapabilityInformation SEQUENCE { | | | |
| ue-CapabilityRAT-ContainerList SEQUENCE (SIZE (0..maxRAT-CapabilityContainers)) OF SEQUENCE { | | | |
| rat-Type[1] | nr | | |
| ueCapabilityRAT-Container [1] OCTET STRING {} | UE-NR-Capability | Encoded as per TS 38.331 [12] clause 5.6.1 | |
| } | | | |
| lateNonCriticalExtension | Not checked | | |
| nonCriticalExtension SEQUENCE {} | Not checked | | |
| } | | | |
| criticalExtensionsFuture SEQUENCE {} | Not checked | | |
| } | | | |
| } | | | |

Table 8.1.5.1.1.3.3-3: *UE-NR-Capability* (Table 8.1.5.1.1.3.3-2)

| Derivation Path: 38.331 [12], clause 6.3.3 | | | |
|--|--------------|--------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE-NR-Capability ::= SEQUENCE { | | | |
| accessStratumRelease | Checked | "rel-15" or higher | |
| pdcp-Parameters SEQUENCE {} | | | |

| | | | |
|-----------------------------------|-------------|--|-----------------------|
| supportedROHC-Profiles SEQUENCE { | | | |
| profile0x0000 | Not checked | | |
| profile0x0001 | Not checked | | |
| profile0x0002 | Not checked | | |
| profile0x0003 | Not checked | | |
| profile0x0004 | Not checked | | |
| profile0x0006 | Not checked | | |
| profile0x0101 | Not checked | | |
| profile0x0102 | Not checked | | |
| profile0x0103 | Not checked | | |
| profile0x0104 | Not checked | | |
| } | | | |
| maxNumberROHC-ContextSessions | Not checked | | |
| uplinkOnlyROHC-Profiles | Not checked | | |
| continueROHC-Context | Not checked | | |
| outOfOrderDelivery | Checked | | pc_outOfOrderDelivery |
| shortSN | Checked | | pc_shortSN |
| pdcP-DuplicationSRB | Not checked | | |
| pdcP-DuplicationMCG-OrSCG-DRB | Not checked | | |
| } | | | |
| rlc-Parameters SEQUENCE { | | | |
| am-WithShortSN | Checked | | pc_am-WithShortSN |
| um-WithShortSN | Checked | | pc_um-WithShortSN |
| um-WithLongSN | Checked | | pc_um-WithLongSN |
| } | | | |
| mac-Parameters SEQUENCE { | | | |
| mac-ParametersCommon SEQUENCE { | | | |
| lcp-Restriction | Not checked | | |
| dummy | Not checked | | |
| lch-ToSCellRestriction | Not checked | | |
| recommendedBitRate | Not checked | | |

| | | | |
|-----------------------------------|------------------|--|--------------------------------|
| recommendedBitRateQuery | Not checked | | |
| } | | | |
| mac-ParametersXDD-Diff SEQUENCE { | | | |
| skipUplinkTxDynamic | Checked (NOTE 4) | | pc_skipUplinkTxDynamic |
| logicalChannelSR-DelayTimer | Checked (NOTE 5) | | pc_logicalChannelSR_DelayTimer |
| longDRX-Cycle | Checked (NOTE 6) | | pc_longDRX_Cycle |
| shortDRX-Cycle | Checked (NOTE 7) | | pc_shortDRX_Cycle |
| multipleSR-Configurations | Not checked | | |
| multipleConfiguredGrants | Not checked | | |
| } | | | |
| } | | | |
| phy-Parameters SEQUENCE { | | | |
| phy-ParametersCommon SEQUENCE { | | | |
| csi-RS-CFRA-ForHO | Checked | | pc_csi_RS_CFRA_ForHO |
| dynamicPRB-BundlingDL | Not checked | | |
| sp-CSI-ReportPUCCH | Not checked | | |
| sp-CSI-ReportPUSCH | Not checked | | |
| nzp-CSI-RS-IntefMgmt | Not checked | | |
| type2-SP-CSI-Feedback-LongPUCCH | Not checked | | |
| precoderGranularityCORESET | Not checked | | |
| dynamicHARQ-ACK-Codebook | Not checked | | |
| semiStaticHARQ-ACK-Codebook | Not checked | | |
| spatialBundlingHARQ-ACK | Not checked | | |
| dynamicBetaOffsetInd-HARQ-ACK-CSI | Not checked | | |
| pucch-Repetition-F1-3-4 | Not checked | | |
| ra-Type0-PUSCH | Checked | | pc_ra_Type0_PUSCH |
| dynamicSwitchRA-Type0-1-PDSCH | Not checked | | |
| dynamicSwitchRA-Type0-1-PUSCH | Not checked | | |

| | | | |
|-----------------------------------|-------------|--|--------------------------------|
| pdsch-MappingTypeA | Checked | | pc_pdsch_MappingTypeA |
| pdsch-MappingTypeB | Checked | | pc_pdsch_MappingTypeB |
| interleavingVRB-ToPRB-PDSCH | Checked | | pc_interleavingVRB_ToPRB_PDSCH |
| interSlotFreqHopping-PUSCH | Not checked | | |
| type1-PUSCH-RepetitionMultiSlots | Not checked | | |
| type2-PUSCH-RepetitionMultiSlots | Not checked | | |
| pusch-RepetitionMultiSlots | Checked | | pc_pusch_RepetitionMultiSlots |
| pdsch-RepetitionMultiSlots | Checked | | pc_pdsch_RepetitionMultiSlots |
| downlinkSPS | Checked | | pc_downlinkSPS |
| configuredUL-GrantType1 | Checked | | pc_configuredUL_GrantType1 |
| configuredUL-GrantType2 | Checked | | pc_configuredUL_GrantType2 |
| pre-EmptIndication-DL | Not checked | | |
| cbg-TransIndication-DL | Not checked | | |
| cbg-TransIndication-UL | Not checked | | |
| cbg-FlushIndication-DL | Not checked | | |
| dynamicHARQ-ACK-CodeB-CBG-Retx-DL | Not checked | | |
| rateMatchingResrcSetSemi-Static | Not checked | | |
| rateMatchingResrcSetDynamic | Not checked | | |
| bwp-SwitchingDelay | Not checked | | |
| dummy | Not checked | | |
| maxNumberSearchSpaces | n10 | | |
| rateMatchingCtrlResrsSetDynamic | Not checked | | |
| maxLayersMIMO-Indication | Not checked | | |
| } | | | |
| phy-ParametersXDD-Diff SEQUENCE { | | | |

| | | | |
|--|-------------|--|--|
| dynamicSFI | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| } | | | |
| phy-ParametersFRX-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| dummy1 | Not checked | | |
| twoFL-DMRS | Not checked | | |
| dummy2 | Not checked | | |
| dummy3 | Not checked | | |
| supportedDMRS-TypeDL | Not checked | | |
| supportedDMRS-TypeUL | Not checked | | |
| semiOpenLoopCSI | Not checked | | |
| csi-ReportWithoutPMI | Not checked | | |
| csi-ReportWithoutCQI | Not checked | | |
| onePortsPTRS | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| pucch-F2-WithFH | Not checked | | |
| pucch-F3-WithFH | Not checked | | |
| pucch-F4-WithFH | Not checked | | |
| freqHoppingPUCCH-F0-2 | Not checked | | |
| freqHoppingPUCCH-F1-3-4 | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot | Not checked | | |
| uci-CodeBlockSegmentation | Not checked | | |
| onePUCCH-LongAndShortFormat | Not checked | | |
| twoPUCCH-AnyOthersInSlot | Not checked | | |
| intraSlotFreqHopping-PUSCH | Not checked | | |
| pusch-LBRM | Not checked | | |
| pdccch-BlindDetectionCA | Not checked | | |

| | | | |
|---|-------------|--|--|
| tpc-PUSCH-RNTI | Not checked | | |
| tpc-PUCCH-RNTI | Not checked | | |
| tpc-SRS-RNTI | Not checked | | |
| absoluteTPC-Command | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| pusch-HalfPi-BPSK | Not checked | | |
| pucch-F3-4-HalfPi-BPSK | Not checked | | |
| almostContiguousCP-OFDM-UL | Not checked | | |
| sp-CSI-RS | Not checked | | |
| sp-CSI-IM | Not checked | | |
| tdd-MultiDL-UL-SwitchPerSlot | Not checked | | |
| multipleCORESET | Not checked | | |
| csi-RS-IM-ReceptionForFeedback | Not checked | CSI-RS-IM-
ReceptionForFeed
back | |
| csi-RS-ProcFrameworkForSRS | Not checked | CSI-RS-
ProcFrameworkF
orSRS | |
| csi-ReportFramework | Not checked | CSI-
ReportFramework | |
| mux-SR-HARQ-ACK-CSI-PUCCH-OncePerSlot
SEQUENCE { | | | |
| sameSymbol | Not checked | | |
| diffSymbol | Not checked | | |
| } | | | |
| mux-SR-HARQ-ACK-PUCCH | Not checked | | |
| mux-MultipleGroupCtrlCH-Overlap | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| dl-64QAM-MCS-TableAlt | Not checked | | |
| ul-64QAM-MCS-TableAlt | Not checked | | |
| cqi-TableAlt | Not checked | | |
| oneFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |

| | | | |
|--|-------------|---|---|
| oneFL-DMRS-ThreeAdditionalDMRS-UL | Not checked | | |
| } | | | |
| phy-ParametersFR1 SEQUENCE { | | | |
| pdccchMonitoringSingleOccasion | Not checked | | |
| scs-60kHz | Not checked | | |
| pdsch-256QAM-FR1 | Checked | | pc_pdsch_25
6QAM_FR1 |
| pdsch-RE-MappingFR1-PerSymbol | Not checked | | |
| pdsch-RE-MappingFR1-PerSlot | Not checked | | |
| } | | | |
| phy-ParametersFR2 SEQUENCE { | | | |
| dummy | Not checked | | |
| pdsch-RE-MappingFR2-PerSymbol | Not checked | | |
| pCell-FR2 | Not checked | | |
| pdsch-RE-MappingFR2-PerSlot | Not checked | | |
| } | | | |
| } | | | |
| rf-Parameters SEQUENCE { | | | |
| supportedBandListNR SEQUENCE (SIZE
(1..maxBands)) OF SEQUENCE { | | | |
| bandNR[i] | Checked | Checked for
'maxBands'
entries of
FreqBandIndicato
rNR[i] | pc_nrBandx
('x' being the
band
number/type
related PICS
listed in TS
38.508-2) |
| modifiedMPR-Behaviour[i] | Not checked | | |
| mimo-ParametersPerBand[i] | Not checked | MIMO-
ParametersPerBan
d[i] | |
| extendedCP[i] | Not checked | | |
| multipleTCI[i] | Not checked | | |
| bwp-WithoutRestriction[i] | Not checked | | |
| bwp-SameNumerology[i] | Not checked | | |
| bwp-DiffNumerology[i] | Not checked | | |
| crossCarrierScheduling-SameSCS[i] | Not checked | | |
| pdsch-256QAM-FR2[i] | Checked | | pc_pdsch_25 |

| | | | |
|--|-------------|--|-------------------------|
| | | | 6QAM_FR2 |
| pusch-256QAM[i] | Checked | | pc_pusch_25
6QAM_FR1 |
| ue-PowerClass[i] | Not checked | | |
| rateMatchingLTE-CRS[i] | Not checked | | |
| channelBWs-DL-v1530[i] CHOICE { | | | |
| fr1 SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| } | | | |
| fr2 SEQUENCE { | | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| } | | | |
| channelBWs-UL-v1530[i] CHOICE { | | | |
| fr1 SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| } | | | |
| fr2 SEQUENCE { | | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| maxUplinkDutyCycle-PC2-FR1[i] | Not checked | | |
| pucch-SpatialRelInfoMAC-CE[i] | Not checked | | |
| powerBoosting-pi2BPSK[i] | Not checked | | |
| } | | | |
| } | | | |
| supportedBandCombinationList SEQUENCE
(SIZE (1..maxBandComb)) OF SEQUENCE { | | | |
| bandList[i] SEQUENCE (SIZE
(1..maxSimultaneousBands)) OF CHOICE { | | | |

| | | | |
|---|-------------|-------------------------|--|
| eutra SEQUENCE { | | | |
| bandEUTRA | Not checked | FreqBandIndicatorEUTRA | |
| ca-BandwidthClassDL-EUTRA | Not checked | CA-BandwidthClassEUTRA | |
| ca-BandwidthClassUL-EUTRA | Not checked | CA-BandwidthClassEUTRA | |
| } | | | |
| nr SEQUENCE { | | | |
| bandNR | Not checked | FreqBandIndicatorNR | |
| ca-BandwidthClassDL-NR | Not checked | CA-BandwidthClassNR | |
| ca-BandwidthClassUL-NR | Not checked | CA-BandwidthClassNR | |
| } | | | |
| } | | | |
| featureSetCombination[i] | Not checked | FeatureSetCombinationId | |
| ca-ParametersEUTRA[i] | Not checked | CA-ParametersEUTRA | |
| ca-ParametersNR[i] | Not checked | CA-ParametersNR | |
| mrdc-Parameters[i] | Not checked | MRDC-Parameters | |
| supportedBandwidthCombinationSet[i] | Not checked | | |
| powerClass-v1530[i] | Not checked | | |
| } | | | |
| appliedFreqBandListFilter | Not checked | FreqBandList | |
| supportedBandCombinationList-v1540
SEQUENCE (SIZE (1..maxBandComb)) OF
SEQUENCE { | | | |
| bandList-v1540[i] SEQUENCE (SIZE
(1..maxSimultaneousBands)) OF SEQUENCE { | Not checked | BandParameters-v1540 | |
| srs-CarrierSwitch CHOICE { | | | |
| nr SEQUENCE [| | | |
| srs-SwitchingTimesListNR SEQUENCE | Not checked | | |

| | | | |
|---|-------------|-----------------------|-------------------------|
| (SIZE (1..maxSimultaneousBands)) OF SRS-SwitchingTimeNR | | | |
| eutra SEQUENCE { | | | |
| srs-SwitchingTimesListEUTRA SEQUENCE (SIZE (1..maxSimultaneousBands)) OF SRS-SwitchingTimeEUTRA | Not checked | | |
| } | | | |
| } | | | |
| srs-TxSwitch-v1540[i] SEQUENCE { | | | |
| supportedSRS-TxPortSwitch | Not checked | | |
| txSwitchImpactToRx | Not checked | | |
| txSwitchWithAnotherBand | Not checked | | |
| } | | | |
| } | | | |
| ca-ParametersNR-v1540[i] | Not checked | CA-ParametersNR-v1540 | |
| } | | | |
| srs-SwitchingTimeRequested | Not checked | | |
| } | | | |
| measAndMobParameters SEQUENCE { | | | |
| measAndMobParametersCommon SEQUENCE { | | | |
| supportedGapPattern | Not checked | | |
| ssb-RLM | Not checked | | |
| ssb-AndCSI-RS-RLM | Not checked | | |
| eventB-MeasAndReport | Not checked | | |
| handoverFDD-TDD | Not checked | | |
| eutra-CGI-Reporting | Not checked | | |
| nr-CGI-Reporting | Not checked | | |
| independentGapConfig | Checked | | pc_independentGapConfig |
| periodicEUTRA-MeasAndReport | Not checked | | |
| handoverFR1-FR2 | Not checked | | |
| maxNumberCSI-RS-RRM-RS-SINR | Not checked | | |
| } | | | |
| measAndMobParametersXDD-Diff SEQUENCE { | | | |

| | | | |
|---|------------------|--|---------------------------------|
| intraAndInterF-MeasAndReport | Checked (NOTE 1) | | pc_intraAndInterF-MeasAndReport |
| eventA-MeasAndReport | Checked (NOTE 2) | | pc_eventA-MeasAndReport |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| } | | | |
| measAndMobParametersFRX-Diff SEQUENCE { | | | |
| ss-SINR-Meas | Not checked | | |
| csi-RSRP-AndRSRQ-MeasWithSSB | Checked (NOTE 3) | | pc_csi-RSRP-AndRSRQ-MeasWithSSB |
| csi-RSRP-AndRSRQ-MeasWithoutSSB | Not checked | | |
| csi-SINR-Meas | Not checked | | |
| csi-RS-RLM | Not checked | | |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| maxNumberResource-CSI-RS-RLM | Not checked | | |
| } | | | |
| } | | | |
| fdd-Add-UE-NR-Capabilities SEQUENCE { | | | |
| phy-ParametersXDD-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| } | | | |

| | | | |
|---|------------------|--|---------------------------------|
| mac-ParametersXDD-Diff SEQUENCE { | | | |
| skipUplinkTxDynamic | Checked (NOTE 4) | | pc_skipUplinkTxDynamic |
| logicalChannelSR-DelayTimer | Checked (NOTE 5) | | pc_logicalChannelSR_DelayTimer |
| longDRX-Cycle | Checked (NOTE 6) | | pc_longDRX_Cycle |
| shortDRX-Cycle | Checked (NOTE 7) | | pc_shortDRX_Cycle |
| multipleSR-Configurations | Not checked | | |
| multipleConfiguredGrants | Not checked | | |
| } | | | |
| measAndMobParametersXDD-Diff SEQUENCE { | | | |
| intraAndInterF-MeasAndReport | Checked (NOTE 1) | | pc_intraAndInterF-MeasAndReport |
| eventA-MeasAndReport | Checked (NOTE 2) | | pc_eventA-MeasAndReport |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| } | | | |
| } | | | |
| tdd-Add-UE-NR-Capabilities SEQUENCE { | | | |
| phy-ParametersXDD-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| } | | | |
| mac-ParametersXDD-Diff SEQUENCE { | | | |

| | | | |
|---|------------------|--|---------------------------------|
| skipUplinkTxDynamic | Checked (NOTE 4) | | pc_skipUplinkTxDynamic |
| logicalChannelSR-DelayTimer | Checked (NOTE 5) | | pc_logicalChannelSR-DelayTimer |
| longDRX-Cycle | Checked (NOTE 6) | | pc_longDRX-Cycle |
| shortDRX-Cycle | Checked (NOTE 7) | | pc_shortDRX-Cycle |
| multipleSR-Configurations | Not checked | | |
| multipleConfiguredGrants | Not checked | | |
| } | | | |
| measAndMobParametersXDD-Diff SEQUENCE { | | | |
| intraAndInterF-MeasAndReport | Checked (NOTE 1) | | pc_intraAndInterF-MeasAndReport |
| eventA-MeasAndReport | Checked (NOTE 2) | | pc_eventA-MeasAndReport |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| } | | | |
| fr1-Add-UE-NR-Capabilities SEQUENCE { | | | |
| phy-ParametersFRX-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| dummy1 | Not checked | | |
| twoFL-DMRS | Not checked | | |
| dummy2 | Not checked | | |
| dummy3 | Not checked | | |
| supportedDMRS-TypeDL | Not checked | | |
| supportedDMRS-TypeUL | Not checked | | |
| semiOpenLoopCSI | Not checked | | |
| csi-ReportWithoutPMI | Not checked | | |
| csi-ReportWithoutCQI | Not checked | | |
| onePortsPTRS | Not checked | | |

| | | | |
|---|-------------|--|--|
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| pucch-F2-WithFH | Not checked | | |
| pucch-F3-WithFH | Not checked | | |
| pucch-F4-WithFH | Not checked | | |
| freqHoppingPUCCH-F0-2 | Not checked | | |
| freqHoppingPUCCH-F1-3-4 | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot | Not checked | | |
| uci-CodeBlockSegmentation | Not checked | | |
| onePUCCH-LongAndShortFormat | Not checked | | |
| twoPUCCH-AnyOthersInSlot | Not checked | | |
| intraSlotFreqHopping-PUSCH | Not checked | | |
| pusch-LBRM | Not checked | | |
| pdccch-BlindDetectionCA | Not checked | | |
| tpc-PUSCH-RNTI | Not checked | | |
| tpc-PUCCH-RNTI | Not checked | | |
| tpc-SRS-RNTI | Not checked | | |
| absoluteTPC-Command | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| pusch-HalfPi-BPSK | Not checked | | |
| pucch-F3-4-HalfPi-BPSK | Not checked | | |
| almostContiguousCP-OFDM-UL | Not checked | | |
| sp-CSI-RS | Not checked | | |
| sp-CSI-IM | Not checked | | |
| tdd-MultiDL-UL-SwitchPerSlot | Not checked | | |
| multipleCORESET | Not checked | | |
| csi-RS-IM-ReceptionForFeedback | Not checked | | |
| csi-RS-ProcFrameworkForSRS | Not checked | | |
| csi-ReportFramework | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-OncePerSlot
SEQUENCE { | | | |
| sameSymbol | Not checked | | |
| diffSymbol | Not checked | | |
| } | | | |

| | | | |
|---|------------------|--|---|
| mux-SR-HARQ-ACK-PUCCH | Not checked | | |
| mux-MultipleGroupCtrlCH-Overlap | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| dl-64QAM-MCS-TableAlt | Not checked | | |
| ul-64QAM-MCS-TableAlt | Not checked | | |
| cqi-TableAlt | Not checked | | |
| oneFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| oneFL-DMRS-ThreeAdditionalDMRS-UL | Not checked | | |
| } | | | |
| measAndMobParametersFRX-Diff SEQUENCE { | | | |
| ss-SINR-Meas | Not checked | | |
| csi-RSRP-AndRSRQ-MeasWithSSB | Checked (NOTE 3) | | pc_csi-
RSRP-
AndRSRQ-
MeasWithSS
B |
| csi-RSRP-AndRSRQ-MeasWithoutSSB | Not checked | | |
| csi-SINR-Meas | Not checked | | |
| csi-RS-RLM | Not checked | | |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| maxNumberResource-CSI-RS-RLM | Not checked | | |
| } | | | |
| } | | | |
| fr2-Add-UE-NR-Capabilities SEQUENCE { | | | |
| phy-ParametersFRX-Diff SEQUENCE { | Not checked | | |
| dynamicSFI | Not checked | | |
| dummy1 | Not checked | | |
| twoFL-DMRS | Not checked | | |
| dummy2 | Not checked | | |
| dummy3 | Not checked | | |

| | | | |
|--|-------------|--|--|
| supportedDMRS-TypeDL | Not checked | | |
| supportedDMRS-TypeUL | Not checked | | |
| semiOpenLoopCSI | Not checked | | |
| csi-ReportWithoutPMI | Not checked | | |
| csi-ReportWithoutCQI | Not checked | | |
| onePortsPTRS | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| pucch-F2-WithFH | Not checked | | |
| pucch-F3-WithFH | Not checked | | |
| pucch-F4-WithFH | Not checked | | |
| freqHoppingPUCCH-F0-2 | Not checked | | |
| freqHoppingPUCCH-F1-3-4 | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot | Not checked | | |
| uci-CodeBlockSegmentation | Not checked | | |
| onePUCCH-LongAndShortFormat | Not checked | | |
| twoPUCCH-AnyOthersInSlot | Not checked | | |
| intraSlotFreqHopping-PUSCH | Not checked | | |
| pusch-LBRM | Not checked | | |
| pdccch-BlindDetectionCA | Not checked | | |
| tpc-PUSCH-RNTI | Not checked | | |
| tpc-PUCCH-RNTI | Not checked | | |
| tpc-SRS-RNTI | Not checked | | |
| absoluteTPC-Command | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| pusch-HalfPi-BPSK | Not checked | | |
| pucch-F3-4-HalfPi-BPSK | Not checked | | |
| almostContiguousCP-OFDM-UL | Not checked | | |
| sp-CSI-RS | Not checked | | |
| sp-CSI-IM | Not checked | | |
| tdd-MultiDL-UL-SwitchPerSlot | Not checked | | |
| multipleCORESET | Not checked | | |
| csi-RS-IM-ReceptionForFeedback | Not checked | | |

| | | | |
|---|------------------|--|---|
| csi-RS-ProcFrameworkForSRS | Not checked | | |
| csi-ReportFramework | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-OncePerSlot
SEQUENCE { | | | |
| sameSymbol | Not checked | | |
| diffSymbol | Not checked | | |
| } | | | |
| mux-SR-HARQ-ACK-PUCCH | Not checked | | |
| mux-MultipleGroupCtrlCH-Overlap | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| dl-64QAM-MCS-TableAlt | Not checked | | |
| ul-64QAM-MCS-TableAlt | Not checked | | |
| cqi-TableAlt | Not checked | | |
| oneFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| oneFL-DMRS-ThreeAdditionalDMRS-UL | Not checked | | |
| } | | | |
| measAndMobParametersFRX-Diff SEQUENCE { | | | |
| ss-SINR-Meas | Not checked | | |
| csi-RSRP-AndRSRQ-MeasWithSSB | Checked (NOTE 3) | | pc_csi-
RSRP-
AndRSRQ-
MeasWithSS
B |
| csi-RSRP-AndRSRQ-MeasWithoutSSB | Not checked | | |
| csi-SINR-Meas | Not checked | | |
| csi-RS-RLM | Not checked | | |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| maxNumberResource-CSI-RS-RLM | Not checked | | |
| } | | | |
| } | | | |
| featureSets SEQUENCE { | | | |

| | | | |
|--|-------------|-------------------|--|
| featureSetsDownlink SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF SEQUENCE { | | | |
| featureSetListPerDownlinkCC[i] | Not checked | | |
| intraBandFreqSeparationDL[i] | Not checked | | |
| scalingFactor[i] | Not checked | | |
| crossCarrierScheduling-OtherSCS[i] | Not checked | | |
| scellWithoutSSB[i] | Not checked | | |
| csi-RS-MeasSCellWithoutSSB[i] | Not checked | | |
| dummy1[i] | Not checked | | |
| type1-3-CSS[i] | Not checked | | |
| pdccch-MonitoringAnyOccasions[i] | Not checked | | |
| dummy2[i] | Not checked | | |
| ue-SpecificUL-DL-Assignment[i] | Not checked | | |
| searchSpaceSharingCA-DL[i] | Not checked | | |
| timeDurationForQCL[i] SEQUENCE { | | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| pdsch-ProcessingType1-DifferentTB-PerSlot[i] SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| dummy3[i] | Not checked | | |
| dummy4[i] | Not checked | | |
| dummy5[i] | Not checked | | |
| dummy6[i] | Not checked | | |
| dummy7[i] | Not checked | | |
| } | | | |
| featureSetsDownlinkPerCC SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF SEQUENCE { | | | |
| supportedSubcarrierSpacingDL[i] | Not checked | SubcarrierSpacing | |
| supportedBandwidthDL[i] | Not checked | SupportedBandwi | |

| | | | |
|--|-------------|--------------------|--------------------|
| | | dth | |
| channelBW-90mhz[i] | Not checked | | |
| maxNumberMIMO-LayersPDSCH[i] | Not checked | MIMO-LayersDL | |
| supportedModulationOrderDL[i] | Not checked | ModulationOrder | |
| } | | | |
| featureSetsUplink SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF SEQUENCE { | | | |
| featureSetListPerUplinkCC[i] | Not checked | | |
| scalingFactor[i] | Not checked | | |
| crossCarrierScheduling-OtherSCS[i] | Not checked | | |
| intraBandFreqSeparationUL[i] | Not checked | | |
| searchSpaceSharingCA-UL[i] | Not checked | | |
| dummy1[i] | Not checked | | |
| supportedSRS-Resources[i] | Not checked | SRS-Resources | |
| twoPUCCH-Group[i] | Not checked | | |
| dynamicSwitchSUL[i] | Not checked | | |
| simultaneousTxSUL-NonSUL[i] | Not checked | | |
| pusch-ProcessingType1-DifferentTB-PerSlot[i] SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| dummy2[i] | Not checked | | |
| } | | | |
| featureSetsUplinkPerCC SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF SEQUENCE { | | | |
| supportedSubcarrierSpacingUL[i] | Not checked | SubcarrierSpacing | |
| supportedBandwidthUL[i] | Not checked | SupportedBandwidth | |
| channelBW-90mHz[i] | Not checked | | |
| mimo-CB-PUSCH[i] SEQUENCE { | | | |
| maxNumberMIMO-LayersCB-PUSCH | Checked | MIMO-LayersUL | pc_nrMIMO_CB_PUSCH |

| | | | |
|---|-------------|-----------------|-----------------------|
| maxNumberSRS-ResourcePerSet | Not checked | | |
| } | | | |
| maxNumberMIMO-LayersNonCB-PUSCH | Checked | MIMO-LayersUL | pc_nrMIMO_NonCB_PUSCH |
| supportedModulationOrderUL | Not checked | ModulationOrder | |
| } | | | |
| featureSetsDownlink-v1540 SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF SEQUENCE { | | | |
| oneFL-DMRS-TwoAdditionalDMRS-DL[i] | Not checked | | |
| additionalDMRS-DL-Alt[i] | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-DL[i] | Not checked | | |
| oneFL-DMRS-ThreeAdditionalDMRS-DL[i] | Not checked | | |
| pdccch-MonitoringAnyOccasionsWithSpanGap[i] SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| pdsch-SeparationWithGap[i] | Not checked | | |
| pdsch-ProcessingType2[i] SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| } | | | |
| pdsch-ProcessingType2-Limited[i] SEQUENCE { | | | |
| differentTB-PerSlot-SCS-30kHz | Not checked | | |
| } | | | |
| dl-MCS-TableAlt-DynamicIndication[i] | Not checked | | |
| } | | | |
| featureSetsUplink-v1540 SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF SEQUENCE { | | | |
| zeroSlotOffsetAperiodicSRS | Not checked | | |
| pa-PhaseDiscontinuityImpacts | Not checked | | |

| | | | |
|--|-------------|----------------------------|--|
| pusch-SeparationWithGap | Not checked | | |
| pusch-ProcessingType2 SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| } | | | |
| ul-MCS-TableAlt-DynamicIndication | Not checked | | |
| } | | | |
| featureSetsUplinkPerCC-v1540 SEQUENCE
(SIZE (1..maxPerCC-FeatureSets)) OF SEQUENCE
{ | | | |
| mimo-NonCB-PUSCH SEQUENCE { | | | |
| maxNumberSRS-ResourcePerSet | Not checked | | |
| maxNumberSimultaneousSRS-ResourceTx | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| featureSetCombinations SEQUENCE (SIZE
(1..maxFeatureSetCombinations)) OF { | | | |
| FeatureSetCombination[i] SEQUENCE (SIZE
(1..maxSimultaneousBands)) OF { | | | |
| FeatureSetsPerBand[ii] SEQUENCE (SIZE
(1..maxFeatureSetsPerBand)) OF { | | | |
| FeatureSet[iii] CHOICE { | | | |
| eutra SEQUENCE { | | | |
| downlinkSetEUTRA | Not checked | FeatureSetEUTRA-DownlinkId | |
| uplinkSetEUTRA | Not checked | FeatureSetEUTRA-UplinkId | |
| } | | | |
| nr SEQUENCE { | | | |
| downlinkSetNR | Not checked | FeatureSetDownlinkId | |
| uplinkSetNR | Not checked | FeatureSetUplinkId | |
| } | | | |
| } | | | |

| | | | |
|---|-------------|--|--|
| } | | | |
| } | | | |
| } | | | |
| lateNonCriticalExtension | Not checked | | |
| nonCriticalExtension SEQUENCE { | | | |
| fdd-Add-UE-NR-Capabilities-v1530 SEQUENCE { | | | |
| eutra-ParametersXDD-Diff SEQUENCE { | | | |
| rsrqMeasWidebandEUTRA | Not checked | | |
| } | | | |
| } | | | |
| tdd-Add-UE-NR-Capabilities-v1530 SEQUENCE { | | | |
| eutra-ParametersXDD-Diff SEQUENCE { | | | |
| rsrqMeasWidebandEUTRA | Not checked | | |
| } | | | |
| } | | | |
| dummy | Not checked | | |
| interRAT-Parameters SEQUENCE { | | | |
| eutra SEQUENCE { | | | |
| supportedBandListEUTRA SEQUENCE (SIZE (1..maxBandsEUTRA)) OF FreqBandIndicatorEUTRA | Not checked | | |
| eutra-ParametersCommon SEQUENCE { | | | |
| mfb-EUTRA | Not checked | | |
| modifiedMRP-BehaviorEUTRA | Not checked | | |
| multiNS-Pmax-EUTRA | Not checked | | |
| rs-SINR-MeasEUTRA | Not checked | | |
| } | | | |
| eutra-ParametersXDD-Diff SEQUENCE { | | | |
| rsrqMeasWidebandEUTRA | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| inactiveState | Not checked | | |

| | | | |
|---|-------------|--|-------------------------|
| delayBudgetReporting | Not checked | | |
| nonCriticalExtension SEQUENCE { | Not checked | | |
| sdap-Parameters SEQUENCE { | | | |
| as-ReflectiveQoS | Checked | | pc_as_Refle
ctiveQoS |
| } | | | |
| overheatingInd | Not checked | | |
| ims-Parameters SEQUENCE { | | | |
| ims-ParametersCommon SEQUENCE { | | | |
| voiceOverEUTRA-5GC | Not checked | | |
| } | | | |
| ims-ParametersFRX-Diff SEQUENCE { | | | |
| voiceOverNR | Not checked | | |
| } | | | |
| } | | | |
| fr1-Add-UE-NR-Capabilities-v1540 SEQUENCE { | | | |
| ims-ParametersFRX-Diff SEQUENCE { | | | |
| voiceOverNR | Not checked | | |
| } | | | |
| } | | | |
| fr2-Add-UE-NR-Capabilities-v1540 SEQUENCE { | | | |
| ims-ParametersFRX-Diff SEQUENCE { | | | |
| voiceOverNR | Not checked | | |
| } | | | |
| } | | | |
| fr1-fr2-Add-UE-NR-Capabilities SEQUENCE { | | | |
| phy-ParametersFRX-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| dummy1 | Not checked | | |
| twoFL-DMRS | Not checked | | |
| dummy2 | Not checked | | |
| dummy3 | Not checked | | |
| supportedDMRS-TypeDL | Not checked | | |

| | | | |
|--|-------------|------------------------------------|--|
| supportedDMRS-TypeUL | Not checked | | |
| semiOpenLoopCSI | Not checked | | |
| csi-ReportWithoutPMI | Not checked | | |
| csi-ReportWithoutCQI | Not checked | | |
| onePortsPTRS | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| pucch-F2-WithFH | Not checked | | |
| pucch-F3-WithFH | Not checked | | |
| pucch-F4-WithFH | Not checked | | |
| freqHoppingPUCCH-F0-2 | Not checked | | |
| freqHoppingPUCCH-F1-3-4 | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot | Not checked | | |
| uci-CodeBlockSegmentation | Not checked | | |
| onePUCCH-LongAndShortFormat | Not checked | | |
| twoPUCCH-AnyOthersInSlot | Not checked | | |
| intraSlotFreqHopping-PUSCH | Not checked | | |
| pusch-LBRM | Not checked | | |
| pdccch-BlindDetectionCA | Not checked | | |
| tpc-PUSCH-RNTI | Not checked | | |
| tpc-PUCCH-RNTI | Not checked | | |
| tpc-SRS-RNTI | Not checked | | |
| absoluteTPC-Command | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| pusch-HalfPi-BPSK | Not checked | | |
| pucch-F3-4-HalfPi-BPSK | Not checked | | |
| almostContiguousCP-OFDM-UL | Not checked | | |
| sp-CSI-RS | Not checked | | |
| sp-CSI-IM | Not checked | | |
| tdd-MultiDL-UL-SwitchPerSlot | Not checked | | |
| multipleCORESET | Not checked | | |
| csi-RS-IM-ReceptionForFeedback | Not checked | CSI-RS-IM-ReceptionForFeed
back | |

| | | | |
|--|------------------|----------------------------|---------------------------------|
| csi-RS-ProcFrameworkForSRS | Not checked | CSI-RS-ProcFrameworkForSRS | |
| csi-ReportFramework | Not checked | CSI-ReportFramework | |
| mux-SR-HARQ-ACK-CSI-PUCCH-OncePerSlot SEQUENCE { | | | |
| sameSymbol | Not checked | | |
| diffSymbol | Not checked | | |
| } | | | |
| mux-SR-HARQ-ACK-PUCCH | Not checked | | |
| mux-MultipleGroupCtrlCH-Overlap | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| dl-64QAM-MCS-TableAlt | Not checked | | |
| ul-64QAM-MCS-TableAlt | Not checked | | |
| cqi-TableAlt | Not checked | | |
| oneFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| oneFL-DMRS-ThreeAdditionalDMRS-UL | Not checked | | |
| } | | | |
| measAndMobParametersFRX-Diff SEQUENCE { | | | |
| ss-SINR-Meas | Not checked | | |
| csi-RSRP-AndRSRQ-MeasWithSSB | Checked (NOTE 3) | | pc_csi-RSRP-AndRSRQ-MeasWithSSB |
| csi-RSRP-AndRSRQ-MeasWithoutSSB | Not checked | | |
| csi-SINR-Meas | Not checked | | |
| csi-RS-RLM | Not checked | | |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| maxNumberResource-CSI-RS-RLM | Not checked | | |

| | | | |
|---|-------------|--|--|
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not checked | | |
| } | | | |
| } | | | |
| | | | |
| <p>Note 1: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and <i>intraAndInterF-MeasAndReport</i> is supported in both modes, then support of <i>intraAndInterF-MeasAndReport</i> will be signaled in <i>measAndMobParameters/measAndMobParametersXDD-Diff</i>.
If the UE is dual mode (FDD + TDD) and <i>intraAndInterF-MeasAndReport</i> is only supported in one mode, then support of <i>intraAndInterF-MeasAndReport</i> will be signaled in <i>measAndMobParameters/measAndMobParametersXDD-Diff</i> and also in one of <i>fdd-Add-UE-NR-Capabilities/measAndMobParametersXDD-Diff</i> or <i>tdd-Add-UE-NR-Capabilities/measAndMobParametersXDD-Diff</i> as appropriate.)</p> <p>Note 2: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and <i>eventA-MeasAndReport</i> is supported in both modes, then support of <i>eventA-MeasAndReport</i> will be signaled in <i>measAndMobParameters/measAndMobParametersXDD-Diff</i>.
If the UE is dual mode (FDD + TDD) and <i>eventA-MeasAndReport</i> is only supported in one mode, then support of <i>eventA-MeasAndReport</i> will be signaled in <i>measAndMobParameters/measAndMobParametersXDD-Diff</i> and also in one of <i>fdd-Add-UE-NR-Capabilities/measAndMobParametersXDD-Diff</i> or <i>tdd-Add-UE-NR-Capabilities/measAndMobParametersXDD-Diff</i> as appropriate.</p> <p>Note 3: If the UE supports single frequency range (FR1 or FR2), or the UE supports both frequency ranges (FR1 and FR2) and <i>csi-RSRP-AndRSRQ-MeasWithSSB</i> is supported in both frequency ranges, then support of <i>csi-RSRP-AndRSRQ-MeasWithSSB</i> will be signaled in <i>measAndMobParameters/MeasAndMobParametersFRX-Diff</i>.
If the UE supports both frequency ranges (FR1 + FR2) and <i>csi-RSRP-AndRSRQ-MeasWithSSB</i> is only supported in one frequency range, then support of <i>csi-RSRP-AndRSRQ-MeasWithSSB</i> will be signaled in <i>measAndMobParameters/measAndMobParametersFRX-Diff</i> and also in one of <i>fr1-Add-UE-NR-Capabilities/measAndMobParametersFRX-Diff</i> or <i>fr2-Add-UE-NR-Capabilities/measAndMobParametersFRX-Diff</i> as appropriate.)</p> <p>Note 4: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and <i>skipUplinkTxDynamic</i> is supported in both modes, then support of <i>skipUplinkTxDynamic</i> will be signaled in <i>mac-Parameters/mac-ParametersXDD-Diff</i>.
If the UE is dual mode (FDD + TDD) and <i>skipUplinkTxDynamic</i> is only supported in one mode, then <i>skipUplinkTxDynamic</i> will be signaled in <i>mac-Parameters/mac-ParametersXDD-Diff</i> and also in one of <i>fdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff</i> or <i>tdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff</i> as appropriate.</p> <p>Note 5: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and <i>logicalChannelSR-DelayTimer</i> is supported in both modes, then support of <i>logicalChannelSR-DelayTimer</i> will be signaled in <i>mac-Parameters/mac-ParametersXDD-Diff</i>.
If the UE is dual mode (FDD + TDD) and <i>logicalChannelSR-DelayTimer</i> is only supported in one mode, then support of <i>logicalChannelSR-DelayTimer</i> will be signaled in <i>mac-Parameters/mac-ParametersXDD-Diff</i> and also in one of <i>fdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff</i> or <i>tdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff</i> as appropriate.</p> <p>Note 6: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and <i>pc_longDRX_Cycle</i> is supported in both modes, then support of <i>pc_longDRX_Cycle</i> will be signaled in <i>mac-Parameters/mac-ParametersXDD-Diff</i>.
If the UE is dual mode (FDD + TDD) and <i>pc_longDRX_Cycle</i> is only supported in one mode, then support of <i>pc_longDRX_Cycle</i> will be signaled in <i>mac-Parameters/mac-ParametersXDD-Diff</i> and also in one of <i>fdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff</i> or <i>tdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff</i> as appropriate.</p> <p>Note 7: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and <i>pc_shortDRX_Cycle</i> is supported in both modes, then support of <i>pc_shortDRX_Cycle</i> will be signaled in <i>mac-Parameters/mac-ParametersXDD-Diff</i>.
If the UE is dual mode (FDD + TDD) and <i>pc_shortDRX_Cycle</i> is only supported in one mode, then support of <i>pc_shortDRX_Cycle</i> will be signaled in <i>mac-Parameters/mac-ParametersXDD-Diff</i> and also in one of <i>fdd-Add-UE-</i></p> | | | |

NR-Capabilities/mac-ParametersXDD-Diff or tdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff as appropriate.

8.1.5.2 SI change / On-demand SIB

8.1.5.2.1 SI change / Notification of BCCH modification / Short message for SI update

8.1.5.2.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_INACTIVE state }

ensure that {

when { UE receives a short message transmitted on PDCCH using P-RNTI indicating a systemInfoModification }

then { UE re-acquires and applies the new system information about the correct prach-ConfigurationIndex in random access to resume RRC connection }

}

8.1.5.2.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 38.331, clause 5.2.2.2, 5.2.2.3.1 and 6.5.

[TS 38.331, clause 5.2.2.2]

A modification period is used, i.e. updated SI (other than for ETWS and CMAS) is broadcasted in the modification period following the one where SI change indication is transmitted. The modification period boundaries are defined by SFN values for which $\text{SFN mod } m = 0$, where m is the number of radio frames comprising the modification period. The modification period is configured by system information. The UE receives indications about SI modifications and/or PWS notifications using Short Message transmitted with P-RNTI over DCI (see clause 6.5). Repetitions of SI change indication may occur within preceding modification period.

UEs in RRC_IDLE or in RRC_INACTIVE shall monitor for SI change indication in its own paging occasion every DRX cycle. UEs in RRC_CONNECTED shall monitor for SI change indication in any paging occasion at least once per modification period if the UE is provided with common search space on the active BWP to monitor paging, as specified in TS 38.213 [13], clause 13.

...

If the UE receives a Short Message, the UE shall:

...

1> if the *systemInfoModification* bit of Short Message is set:

2> apply the SI acquisition procedure as defined in sub-clause 5.2.2.3 from the start of the next modification period.

[TS 38.331, clause 5.2.2.3.1]

The UE shall:

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> if the UE is in RRC_IDLE or in RRC_INACTIVE:

2> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

- 2> if the UE is unable to acquire the *MIB*;
- 3> perform the actions as specified in clause 5.2.2.5;
- 2> else:
- 3> perform the actions specified in clause 5.2.2.4.1.
- ...
- 1> if UE is in RRC_IDLE or in RRC_INACTIVE:
- 2> if *ssb-SubcarrierOffset* indicates *SIB1* is transmitted in the cell (TS 38.213 [13]) and if *SIB1* acquisition is required for the UE:
- 3> acquire the *SIB1*, which is scheduled as specified in TS 38.213 [13];
- 3> if the UE is unable to acquire the *SIB1*:
- 4> perform the actions as specified in clause 5.2.2.5;
- 3> else:
- 4> upon acquiring *SIB1*, perform the actions specified in clause 5.2.2.4.2.
- ...

[TS 38.331, clause 6.5]

Short Messages can be transmitted on PDCCH using P-RNTI with or without associated *Paging* message using Short Message field in DCI format 1_0 (see TS 38.212 [17], clause 7.3.1.2.1).

Table 6.5-1 defines Short Messages. Bit 1 is the most significant bit.

Table 6.5-1: Short Messages

| Bit | Short Message |
|-------|--|
| 1 | <i>systemInfoModification</i>
If set to 1: indication of a BCCH modification other than <i>SIB6</i> , <i>SIB7</i> and <i>SIB8</i> . |
| 2 | <i>etwsAndCmasIndication</i>
If set to 1: indication of an ETWS primary notification and/or an ETWS secondary notification and/or a CMAS notification. |
| 3 – 8 | Not used in this release of the specification, and shall be ignored by UE if received. |

8.1.5.2.1.3 Test Description

8.1.5.2.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1
- System information combination NR-1 as defined in TS 38.508-1 [4] clause 4.4.3.1.3 is used in NR cell.

UE:

- None.

Preamble:

- The UE is in 5GS state 2N-A according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-1.

8.1.5.2.1.3.2 Test procedure sequence

Table 8.1.5.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a Short message on PDCCH using P-RNTI indicating a <i>systemInfoModification</i> . | - | PDCCH (DCI 1_0): Short Message | - | - |
| 2 | The SS changes the <i>prach-ConfigurationIndex</i> in the system information. | - | - | - | - |
| 3 | Wait for 1 second for the UE to receive system information. | - | - | - | - |
| 4 | The SS transmits a <i>Paging</i> message including a matched identity (correct <i>fullI-RNTI</i>). | - | NR RRC: <i>Paging</i> | - | - |
| 5 | Check: Does the UE transmit a random access using <i>prach-ConfigurationIndex</i> given in step 2? | - | - | 2 | P |
| 6 | The UE transmit an <i>RRCResumeRequest</i> message. | --> | <i>RRCResumeRequest</i> | - | - |
| 7 | The SS transmits an <i>RRCResume</i> message. | <-- | <i>RRCResume</i> | - | - |
| 8 | The UE transmits an <i>RRCResumeComplete</i> message. | --> | <i>RRCResumeComplete</i> | - | - |

8.1.5.2.1.3.3 Specific message contents

Table 8.1.5.2.1.3.3-1: *SIB1* (step 2, Table 8.1.5.2.1.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.6.1-28 | | | |
|--|-----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>SIB1</i> ::= SEQUENCE { | | | |
| <i>ServingCellConfigCommon</i> | <i>ServingCellConfigCommonSIB</i> | | |
| } | | | |

Table 8.1.5.2.1.3.3-2: *ServingCellConfigCommonSIB* (Table 8.1.5.2.1.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-169 | | | |
|---|------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>ServingCellConfigCommonSIB</i> ::= SEQUENCE { | | | |
| UplinkConfigCommonSIB SEQUENCE { | | | |
| <i>initialUplinkBWP</i> | BWP-UplinkCommon | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 8.1.5.2.1.3.3-3: BWP-UplinkCommon (Table 8.1.5.2.1.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-14 | | | |
|--|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| BWP-UplinkCommon ::= SEQUENCE { | | | |
| rach-ConfigCommon CHOICE { | | | |
| setup | RACH-ConfigCommon | | |
| } | | | |
| } | | | |

Table 8.1.5.2.1.3.3-4: RACH-ConfigCommon (Table 8.1.5.2.1.3.3-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-128 | | | |
|--|--------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigCommon ::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| } | | | |

Table 8.1.5.2.1.3.3-5: RACH-ConfigGeneric (Table 8.1.5.2.1.3.3-4)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-130 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 157 | Value to be used in Step 2. | FR1 |
| | 157 | Value to be used in Step 2. | FR2 |
| } | | | |

Table 8.1.5.2.1.3.3-6: Paging (step 4, Table 8.1.5.2.1.3.2-1)

| Derivation Path: 38.508-1, Table 4.6.1-9 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Paging ::= SEQUENCE { | | | |

| | | | |
|--|--|--|--|
| pagingRecordList SEQUENCE
(SIZE(1..maxNrofPageRec)) OF SEQUENCE { | 1 entry | | |
| ue-Identity[1] CHOICE { | | | |
| fullI-RNTI | Set to the value of the I-
RNTI-Value of the UE | | |
| } | | | |
| } | | | |
| } | | | |

8.1.5.2.2 SI change / Notification of BCCH modification / Short message for SI update in NR RRC_CONNECTED state

Editor's Note: FFS: How to initiate random access using updated prach-ConfigurationIndex to send uplink data when the uplink data delay timer expires.

8.1.5.2.2.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE receives a short message transmitted on PDCCH using P-RNTI indicating a systemInfoModification }

then { UE re-acquires the SIB1 }

}

8.1.5.2.2.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 38.331, clause 5.2.2.2.2, 5.2.2.3.1, 5.2.2.4.2 and 6.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.2.2.2.2]

A modification period is used, i.e. updated SI (other than for ETWS and CMAS) is broadcasted in the modification period following the one where SI change indication is transmitted. The modification period boundaries are defined by SFN values for which $SFN \bmod m = 0$, where m is the number of radio frames comprising the modification period. The modification period is configured by system information. The UE receives indications about SI modifications and/or PWS notifications using Short Message transmitted with P-RNTI over DCI (see clause 6.5). Repetitions of SI change indication may occur within preceding modification period.

UEs in RRC_IDLE or in RRC_INACTIVE shall monitor for SI change indication in its own paging occasion every DRX cycle. UEs in RRC_CONNECTED shall monitor for SI change indication in any paging occasion at least once per modification period if the UE is provided with common search space on the active BWP to monitor paging, as specified in TS 38.213 [13], clause 13.

...

If the UE receives a Short Message, the UE shall:

...

1> if the *systemInfoModification* bit of Short Message is set:

2> apply the SI acquisition procedure as defined in sub-clause 5.2.2.3 from the start of the next modification.

[TS 38.331, clause 5.2.2.3.1]

The UE shall:

1> apply the specified BCCH configuration defined in 9.1.1.1;

...

1> if the UE is in RRC_CONNECTED with an active BWP with common search space configured by *searchSpaceSIB1* and *pagingSearchSpace* and has received an indication about change of system information; or

...

NOTE: The UE in RRC_CONNECTED is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.2.2.4.2]

Upon receiving the *SIB1* the UE shall:

...

3> if the UE has a stored valid version of a SIB, in accordance with sub-clause 5.2.2.2.1, that the UE requires to operate within the cell in accordance with sub-clause 5.2.2.1:

4> use the stored version of the required SIB;

3> if the UE has not stored a valid version of a SIB, in accordance with sub-clause 5.2.2.2.1, of one or several required SIB(s), in accordance with sub-clause 5.2.2.1:

4> for the SI message(s) that, according to the *si-SchedulingInfo*, contain at least one required SIB and for which *si-BroadcastStatus* is set to broadcasting:

5> acquire the SI message(s) as defined in sub-clause 5.2.2.3.2;

Editor's Note: To be further updated when content of the *SIB1* has been completed.

[TS 38.331, clause 6.5]

Short messages can be transmitted on PDCCH using P-RNTI with or without associated *Paging* message using Short Message field in DCI format 1_0 (see TS 38.212 [17, 7.3.1.2.1]).

Table 6.5-1 defines Short Messages. Bit 1 is the most significant bit.

Table 6.5-1: Short messages

| Bit | Short message |
|---------|--|
| 1 | <i>systemInfoModification</i>
If set to 1: indication of a BCCH modification other than SIB6, SIB7 and SIB8. |
| 2 | <i>etwsAndCmasIndication</i>
If set to 1: indication of an ETWS primary notification and/or an ETWS secondary notification and/or a CMAS notification. |
| 3 – [8] | Not used in this release of the specification, and shall be ignored by UE if received. |

8.1.5.2.2.3 Test Description

8.1.5.2.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1
- System information combination NR-1 as defined in TS 38.508-1 [4] clause 4.4.3.1.3 is used in NR cell.

UE:

- None.

Preamble:

- The UE is in 5GS state 3N-A and Test Loop Function (ON) with UE test loop mode B established according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-3.

8.1.5.2.2.3.2 Test procedure sequence

Table 8.1.5.2.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS sends one IP Packet to the UE. | - | - | - | - |
| 2 | While Uplink data delay timer is running, the SS transmits a Short message on PDCCH using P-RNTI indicating a systemInfoModification. | - | PDCCH (DCI 1_0): Short Message | - | - |
| 3 | The SS changes the prach-ConfigurationIndex in the system information. | - | - | - | - |
| 4 | Wait for 1 second after the start of the modification period in which the modified system information is broadcasted for the UE to receive the modified system information. | - | - | - | - |
| 5 | Check: When the Uplink data delay timer expires, does the UE initiate a random access using prach-ConfigurationIndex given in step 3 to send pending Uplink data? | - | - | 1 | P |
| 6 | The SS transmits Random Access Response with RAPID corresponding to preamble in step 5 | - | - | - | - |

8.1.5.2.2.3.3 Specific message contents

Table 8.1.5.2.2.3.3-1: CLOSE UE TEST LOOP (Preamble, Table 8.1.5.2.2.3.2-1)

| Derivation path: 38.508-1 [4] table FFS condition UE test loop mode B | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| FFS | | | |

Table 8.1.5.2.2.3.3-2: SIB1 (step 3, Table 8.1.5.2.2.3.2-1)

| Derivation path: 38.508-1 [4] table 4.6.1-28 | | | |
|--|--------------------|------------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | | | |
| SI-RequestConfig ::= SEQUENCE { | | | |
| rach-OccasionsSI SEQUENCE { | | | |
| rach-ConfigSI | RACH-ConfigGeneric | | |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| prach-ConfigurationIndex | 159 | Value to be used in Step 10. | FR1 |
| | 151 | Value to be used in Step 10. | FR2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.5.3 PWS notification

8.1.5.3.1 PWS notification / PWS reception in NR RRC_IDLE state

8.1.5.3.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_IDLE state }

ensure that {

when { an ETWS capable UE receives a short message transmitted on PDCCH using P-RNTI indicating an etwsAndCmasIndication and the si-SchedulingInfo includes scheduling information for SIB6 }

then { the UE is able to retrieve the PWS message from SIB6 and alert the user }

}

(2)

with { UE in NR RRC_IDLE state }

ensure that {

when { an ETWS capable UE receives a short message transmitted on PDCCH using P-RNTI indicating an etwsAndCmasIndication and the si-SchedulingInfo includes scheduling information for SIB7 }

```

then { the UE is able to retrieve all the PWS message segments from SIB7, reassemble the message and alert the user
}
}

```

(3)

with { UE in NR RRC_IDLE state }

ensure that {

when { a CMAS capable UE receives a short message transmitted on PDCCH using P-RNTI indicating an *etwsAndCmasIndication* and the *si-SchedulingInfo* includes scheduling information for SIB8 }

```

then { the UE is able to retrieve all the PWS message segments from SIB8, reassemble the message and alert the user
}
}

```

8.1.5.3.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331 clause 5.2.2.2.2.

[TS 38.331 clause 5.2.2.2.2]

...

ETWS or CMAS capable UEs in RRC_IDLE or in RRC_INACTIVE shall monitor for indications about PWS notification in its own paging occasion every DRX cycle. ETWS or CMAS capable UEs in RRC_CONNECTED shall monitor for indication about PWS notification in any paging occasion at least once every *defaultPagingCycle* if the UE is provided with common search space on the active BWP to monitor paging.

For Short Message reception in a paging occasion, the UE monitors the PDCCH monitoring occasion(s) for paging as specified in TS 38.304 [20] and TS 38.213 [13].

If the UE receives a Short Message, the UE shall:

- 1> if the UE is ETWS capable or CMAS capable, the *etwsAndCmasIndication* bit of Short Message is set, and the UE is provided with *searchSpaceOtherSystemInformation* on the active BWP:
- 2> immediately re-acquire the *SIB1*;
- 2> if the UE is ETWS capable and *si-SchedulingInfo* includes scheduling information for *SIB6*:
- 3> acquire *SIB6*, as specified in sub-clause 5.2.2.3.2, immediately;
- 2> if the UE is ETWS capable and *si-SchedulingInfo* includes scheduling information for *SIB7*:
- 3> acquire *SIB7*, as specified in sub-clause 5.2.2.3.2, immediately;
- 2> if the UE is CMAS capable and *si-SchedulingInfo* includes scheduling information for *SIB8*:
- 3> acquire *SIB8*, as specified in sub-clause 5.2.2.3.2, immediately;
- 1> if the *systemInfoModification* bit of Short Message is set:
- 2> apply the SI acquisition procedure as defined in sub-clause 5.2.2.3 from the start of the next modification period.

8.1.5.3.1.3 Test description

8.1.5.3.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1.

UE:

- None.

Preamble:

- The UE is in test state 1N-A according to TS 38.508-1 [4].

8.1.5.3.1.3.2 Test procedure sequence

Table 8.1.5.3.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| - | If <i>pc_ETWS_NR</i> is true, step1-8 will be excuted. | - | - | - | - |
| 1 | The SS indicates an <i>etwsAndCmasIndication</i> by Short Message field in DCI format 1_0 and transmitted on PDCCH using P-RNTI. The SS starts transmitting SIB1 with the <i>si-SchedulingInfo</i> including scheduling information for SIB6 on NR Cell 1. | <-- | PDCCH (DCI 1_0): Short Message | - | - |
| 2 | The SS includes an ETWS message with new <i>messageIdentifier</i> and <i>serialNumber</i> in SIB6. (Note 1) | - | - | - | - |
| 3 | Check: Does the UE alert or activate alerting the user (NOTE 2)? | - | - | 1 | P |
| 4 | The SS waits for 10s. | - | - | - | - |
| 5 | The SS indicates an <i>etwsAndCmasIndication</i> by Short Message field in DCI format 1_0 and transmitted on PDCCH using P-RNTI. The SS starts transmitting SIB1 with the <i>si-SchedulingInfo</i> including scheduling information for SIB7 on NR Cell 1. | <-- | PDCCH (DCI 1_0): Short Message | - | - |
| 6 | The SS includes an ETWS message with new <i>messageIdentifier</i> and <i>serialNumber</i> in SIB7. (NOTE 3). | - | - | - | - |
| 7 | Check: Does the UE indicate the contents of the "warning message" to the user, and alert or activate alerting the user (NOTE 2)? | - | - | 2 | P |
| 8 | The SS waits for 10s. | - | - | - | - |
| - | If <i>pc_CMAS_NR</i> is true, step9-11 will be excuted. | - | - | - | - |

| | | | | | |
|----|--|-----|--------------------------------|---|---|
| 9 | The SS indicates an <i>etwsAndCmasIndication</i> by Short Message field in DCI format 1_0 and transmitted on PDCCH using P-RNTI. The SS starts transmitting SIB1 with the <i>si-SchedulingInfo</i> including scheduling information for SIB8 on NR Cell 1. | <-- | PDCCH (DCI 1_0): Short Message | - | - |
| 10 | The SS includes a CMAS message with new <i>messageIdentifier</i> and <i>serialNumber</i> in SIB8. (NOTE 4). | - | - | - | - |
| 11 | Check: Does the UE indicate the contents of the "warning message" to the user, and alert or activate alerting the user (NOTE 2)? | - | - | 3 | P |

NOTE 1: The NR-10 in Table 4.4.3.1.2-1 Combinations of system information blocks of TS 38.508-1 [4] is used.

NOTE 2: The data indication and user alerting are the UE implementation issues.

NOTE 3: The NR-11 in Table 4.4.3.1.2-1 Combinations of system information blocks of TS 38.508-1 [4] is used.

NOTE 4: The NR-9 in Table 4.4.3.1.2-1 Combinations of system information blocks of TS 38.508-1 [4] is used.

8.1.5.3.1.3.3 Specific message contents

None

8.1.5.3.2 PWS notification / PWS reception in NR RRC_INACTIVE state

8.1.5.3.2.1 Test Purpose (TP)

(1)

with { UE in NR RRC_INACTIVE state }

ensure that {

when { an ETWS capable UE receives a short message transmitted on PDCCH using P-RNTI indicating an *etwsAndCmasIndication* and the *si-SchedulingInfo* includes scheduling information for SIB6 }

then { the UE is able to retrieve the PWS message from SIB6 and alert the user }

}

(2)

with { UE in NR RRC_INACTIVE state }

ensure that {

when { an ETWS capable UE receives a short message transmitted on PDCCH using P-RNTI indicating an *etwsAndCmasIndication* and the *si-SchedulingInfo* includes scheduling information for SIB7 }

then { the UE is able to retrieve all the PWS message segments from SIB7, reassemble the message and alert the user }

}

(3)

with { UE in NR RRC_INACTIVE state }

ensure that {

when { a CMAS capable UE receives a short message transmitted on PDCCH using P-RNTI indicating an etwsAndCmasIndication and the si-SchedulingInfo includes scheduling information for SIB8 }

then { the UE is able to retrieve all the PWS message segments from SIB8, reassemble the message and alert the user }

}

8.1.5.3.2.2 Conformance requirements

Same as test case 8.1.5.3.1.

8.1.5.3.2.3 Test description

8.1.5.3.2.3.1 Pre-test conditions

System Simulator:

- NR Cell 1.

UE:

None.

Preamble:

- The UE is in state Registered, Inactive mode (state 2N-A) according to TS 38.508-1 [4].

8.1.5.3.2.3.2 Test procedure sequence

Same as test case 8.1.5.3.1

8.1.5.3.2.3.3 Specific message contents

Same as test case 8.1.5.3.1.

8.1.5.3.3 PWS notification / PWS reception in NR RRC_CONNECTED state

8.1.5.3.3.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { an ETWS capable UE receives a short message transmitted on PDCCH using P-RNTI indicating an etwsAndCmasIndication and the si-SchedulingInfo includes scheduling information for SIB6 }

then { the UE is able to retrieve all the PWS message segments from SIB6, reassemble the message and alert the user }

}

(2)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { an ETWS capable UE receives a short message transmitted on PDCCH using P-RNTI indicating an etwsAndCmasIndication and the si-SchedulingInfo includes scheduling information for SIB7 }

then { the UE is able to retrieve all the PWS message segments from SIB7, reassemble the message and alert the user }

}

(3)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { a CMAS capable UE receives a short message transmitted on PDCCH using P-RNTI indicating an etwsAndCmasIndication and the si-SchedulingInfo includes scheduling information for SIB8 }

then { the UE is able to retrieve all the PWS message segments from SIB8, reassemble the message and alert the user }

}

8.1.5.3.3.2 Conformance requirements

Same as test case 8.1.5.3.1.

8.1.5.3.3.3 Test description

8.1.5.3.3.3.1 Pre-test conditions

System Simulator:

- NR Cell 1.

UE:

None.

Preamble:

- The UE is in test state 3N-A according to TS 38.508-1 [4].

8.1.5.3.3.3.2 Test procedure sequence

Same as test case 8.1.5.3.1 except PDCCH (DCI 1_0): Short Message is sent on active BWP.

8.1.5.3.3.3.3 Specific message contents

Same as test case 8.1.5.3.1.

8.1.5.3.4 PWS notification / PWS reception using dedicatedSystemInformationDelivery

8.1.5.3.4.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }**ensure that** {**when** { UE receives an RRCReconfiguration message including dedicatedSystemInformationDelivery containing SIB6 }**then** { UE reads the SIB6 to alert the user and sends an RRCReconfigurationComplete message }

}

(2)

with { UE in NR RRC_CONNECTED state }**ensure that** {**when** { UE receives an RRCReconfiguration message including dedicatedSystemInformationDelivery containing SIB7 }**then** { UE reads the SIB7 to alert the user and sends an RRCReconfigurationComplete message }

}

(3)

with { UE in NR RRC_CONNECTED state }**ensure that** {**when** { UE receives an RRCReconfiguration message including dedicatedSystemInformationDelivery containing SIB8 }**then** { UE reads the SIB8 to alert the user and sends an RRCReconfigurationComplete message }

}

8.1.5.3.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clauses 5.2.2.4.7, 5.2.2.4.8, 5.2.2.4.9, 5.3.5.3. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

1> if the *RRCReconfiguration* message includes the *dedicatedSIB1-Delivery*:

2> perform the action upon reception of *SIB1* as specified in 5.2.2.4.2;

1> if the *RRCReconfiguration* message includes the *dedicatedSystemInformationDelivery*:

2> perform the action upon reception of System Information as specified in 5.2.2.4;

[TS 38.331, clause 5.2.2.4.7]

Upon receiving the *SIB6* the UE shall:

1> forward the received *warningType*, *messageIdentifier* and *serialNumber* to upper layers;

[TS 38.331, clause 5.2.2.4.8]

Upon receiving the *SIB7* the UE shall:

1> if there is no current value for *messageIdentifier* and *serialNumber* for *SIB7*; or

1> if either the received value of *messageIdentifier* or of *serialNumber* or of both are different from the current values of *messageIdentifier* and *serialNumber* for *SIB7*:

2> use the received values of *messageIdentifier* and *serialNumber* for *SIB7* as the current values of *messageIdentifier* and *serialNumber* for *SIB7*;

2> discard any previously buffered *warningMessageSegment*;

2> if all segments of a warning message have been received:

3> assemble the warning message from the received *warningMessageSegment*;

3> forward the received warning message, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

3> stop reception of *SIB7*;

3> discard the current values of *messageIdentifier* and *serialNumber* for *SIB7*;

2> else:

3> store the received *warningMessageSegment*;

3> continue reception of *SIB7*;

1> else if all segments of a warning message have been received:

2> assemble the warning message from the received *warningMessageSegment*;

2> forward the received complete warning message, *messageIdentifier*, *serialNumber* and *dataCodingScheme* to upper layers;

2> stop reception of *SIB7*;

2> discard the current values of *messageIdentifier* and *serialNumber* for *SIB7*;

1> else:

2> store the received *warningMessageSegment*;

2> continue reception of *SIB7*;

The UE should discard any stored *warningMessageSegment* and the current value of *messageIdentifier* and *serialNumber* for *SIB7* if the complete warning message has not been assembled within a period of 3 hours.

[TS 38.331, clause 5.2.2.4.9]

Upon receiving the *SIB8* the UE shall:

1> if the *SIB8* contains a complete warning message and the complete geographical area coordinates (if any):

2> forward the received warning message, *messageIdentifier*, *serialNumber*, *dataCodingScheme* and the geographical area coordinates (if any) to upper layers;

2> continue reception of *SIB8*;

1> else:

- 2> if the received values of *messageIdentifier* and *serialNumber* are the same (each value is the same) as a pair for which a warning message and the geographical area coordinates (if any) are currently being assembled:
- 3> store the received *warningMessageSegment*;
- 3> store the received *warningAreaCoordinatesSegment* (if any);
- 3> if all segments of a warning message and geographical area coordinates (if any) have been received:
- 4> assemble the warning message from the received *warningMessageSegment*;
- 4> assemble the geographical area coordinates from the received *warningAreaCoordinatesSegment* (if any);
- 4> forward the received warning message, *messageIdentifier*, *serialNumber*, *dataCodingScheme* and geographical area coordinates (if any) to upper layers;
- 4> stop assembling a warning message and geographical area coordinates (if any) for this *messageIdentifier* and *serialNumber* and delete all stored information held for it;
- 3> continue reception of *SIB8*;
- 2> else if the received values of *messageIdentifier* and/or *serialNumber* are not the same as any of the pairs for which a warning message is currently being assembled:
- 3> start assembling a warning message for this *messageIdentifier* and *serialNumber* pair;
- 3> start assembling the geographical area coordinates (if any) for this *messageIdentifier* and *serialNumber* pair;
- 3> store the received *warningMessageSegment*;
- 3> store the received *warningAreaCoordinatesSegment* (if any);
- 3> continue reception of *SIB8*;

The UE should discard *warningMessageSegment* and *warningAreaCoordinatesSegment* (if any) and the associated values of *messageIdentifier* and *serialNumber* for *SIB8* if the complete warning message and the geographical area coordinates (if any) have not been assembled within a period of 3 hours.

NOTE: The number of warning messages that a UE can re-assemble simultaneously is a function of UE implementation.

8.1.5.3.4.3 Test description

8.1.5.3.4.3.1 Pre-test conditions

System Simulator:

- NR Cell 1.

UE:

- None

Preamble:

- The UE is in 5GS state 3N-A according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-1

8.1.5.3.4.3.2 Test procedure sequence

Table 8.1.5.3.4.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|-----------|------------------|---------|----|---------|
| | | U - S | Message | | |
| | | | | | |

| | | | | | |
|---|---|-----|---|---|---|
| - | If pc_ETWS_NR is true, steps 1-6 will be executed. | - | - | - | - |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message containing <i>dedicatedSystemInformationDelivery</i> containing SIB6. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 2 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message? | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Check: Does the UE alert or activate alerting the user (NOTE 1)? | - | - | 1 | P |
| 4 | The SS transmits an <i>RRCReconfiguration</i> message containing <i>dedicatedSystemInformationDelivery</i> containing SIB7. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 5 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message? | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 6 | Check: Does the UE indicate the "warning message" to the user, and alert or activate alerting the user (NOTE 1)? | - | - | 2 | P |
| - | If pc_CMAS_NR is true, steps 7-9 will be executed. | - | - | - | - |
| 7 | The SS transmits an <i>RRCReconfiguration</i> message containing <i>dedicatedSystemInformationDelivery</i> containing SIB8. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 8 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message? | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 9 | Check: Does the UE alert or activate alerting the user (NOTE 1)? | - | - | 3 | P |
| NOTE 1: The data indication and user alerting are the UE implementation issues. | | | | | |

8.1.5.3.4.3.3 Specific message contents

Table 8.1.5.3.4.3.3-1: RRCReconfiguration (Steps 1, 4 and 7 Table 8.1.5.3.4.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | Not present | | |
| dedicatedNAS-MessageList | Not present | | |

| | | | |
|------------------------------------|-------------------|---|--|
| dedicatedSystemInformationDelivery | SystemInformation | OCTET STRING
(CONTAINING
SystemInformatio
n) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.3.4.3.3-2: SystemInformation (Steps 1, 4 and 7 Table 8.1.5.3.4.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-29 | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| SystemInformation ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| systemInformation-r15 SEQUENCE { | | | |
| sib-TypeAndInfo SEQUENCE (SIZE (1..maxSIB)) OF CHOICE { | 1 entry | | |
| sib6 | SIB6 | Acc to 38.508-1 [4] Table 4.6.2-5: SIB6 | Step 1 |
| sib7 | SIB7 | | Step 4 |
| sib8 | SIB8 | | Step 7 |
| } | | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.3.4.3.3-3: SIB7 (Step 4 in Table 8.1.5.3.4.3.2-1)

| Derivation Path: TS 38.331 [6], clause 6.3.1 | | | |
|--|------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| SIB7 ::= SEQUENCE { | | | |
| messageIdentifier | '0001 0001 0000 0010'B | ETWS message identifier for earthquake and tsunami message (see TS 23.041 | |

| | | | |
|--|--|--------------------------------------|--|
| | | [25]) | |
| serialNumber | '0011 0000 0000 0000'B | Note 1. | |
| warningMessageSegmentType | lastSegment | | |
| warningMessageSegmentNumber | 0 | | |
| warningMessageSegment | Octetstring of N | Containing the complete ETWS message | |
| dataCodingScheme | Bitstring (8) ID of the alphabet/coding and the applied language | see TS 23.041 [25]. | |
| lateNonCriticalExtension | Not present | | |
| } | | | |
| <p>Note 1: Geographical Scope (Octet 1 bit 7 ~ 6) set to 'Cell wide',
 Emergency User Alert (Octet 1 bit 5) set to 'Activate emergency user alert',
 Popup (Octet 1 bit 4) set to 'Activate popup',
 Update Number (Octet 2 bits 3~0) for each update, incremented by one, See TS 23.041 [25].</p> | | | |

Table 8.1.5.3.4.3.3-4: SIB8 (Step 7 in Table 8.1.5.3.4.3.2-1)

| Derivation Path: TS 38.331 [6], clause 6.3.1 | | | |
|---|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| SIB8 ::= SEQUENCE { | | | |
| messageIdentifier | '0001 0001 0001 0010'B | CMAS CBS Message Identifier for CMAS Presidential Level Alerts (see TS 23.041 [25]) | |
| serialNumber | '0011 0000 0000 0000'B | Note 1 | |
| warningMessageSegmentType | lastSegment | | |
| warningMessageSegmentNumber | 0 | | |
| warningMessageSegment | Octetstring of N | | |
| dataCodingScheme | Bitstring (8) ID of the alphabet/coding and the applied language | Containing the complete CMAS message | |
| warningAreaCoordinatesSegment | Not present | | |
| lateNonCriticalExtension | Not present | | |
| } | | | |
| <p>Note 1: Geographical Scope (Octet 1 bit 7 ~ 6) set to 'Cell wide',
 Emergency User Alert (Octet 1 bit 5) set to 'Activate emergency user alert',</p> | | | |

Popup (Octet 1 bit 4) set to 'Activate popup',
Update Number (Octet 2 bits 3~0) for each update, incremented by one, See TS 23.041 [25].

8.1.5.4 Counter check

8.1.5.4.1 Counter check / Reception of CounterCheck message by the UE

8.1.5.4.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state with two DRBs established and having received 10 data packets on each DRB }

ensure that {

when { UE receives CounterCheck message with drb-CountMSB-InfoList included for DRB3(not established) and DRB1 (with the most significant bits of the count different from the actual COUNT)}

then { UE sends CounterCheckResponse message by including the drb-Identity, the count-Uplink and the count-Downlink set to the value of TX_NEXT – 1 and RX_NEXT – 1 in drb-CountInfoList IE for each DRB established, and by including the drb-Identity, the count-Uplink and the count-Downlink with the most significant bits set identical to the corresponding values in the drb-CountMSB-InfoList and the least significant bits set to zero for the DRB that is not established }

}

8.1.5.4.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331, clause 5.3.6.3.

Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.6.3]

Upon receiving the *CounterCheck* message, the UE shall:

1> for each DRB that is established:

2> if no COUNT exists for a given direction (uplink or downlink) because it is a uni-directional bearer configured only for the other direction:

3> assume the COUNT value to be 0 for the unused direction;

2> if the *drb-Identity* is not included in the *drb-CountMSB-InfoList*:

3> include the DRB in the *drb-CountInfoList* in the *CounterCheckResponse* message by including the *drb-Identity*, the *count-Uplink* and the *count-Downlink* set to the value of TX_NEXT – 1 and RX_NEXT – 1 (specified in TS 38.323 [5]), respectively;

2> else if, for at least one direction, the most significant bits of the COUNT are different from the value indicated in the *drb-CountMSB-InfoList*:

3> include the DRB in the *drb-CountInfoList* in the *CounterCheckResponse* message by including the *drb-Identity*, the *count-Uplink* and the *count-Downlink* set to the value of TX_NEXT – 1 and RX_NEXT – 1 (specified in TS 38.323 [5]), respectively;

1> for each DRB that is included in the *drb-CountMSB-InfoList* in the *CounterCheck* message that is not established:

2> include the DRB in the *drb-CountInfoList* in the *CounterCheckResponse* message by including the *drb-Identity*, the *count-Uplink* and the *count-Downlink* with the most significant bits set identical to the corresponding values in the *drb-CountMSB-InfoList* and the least significant bits set to zero;

1> submit the *CounterCheckResponse* message to lower layers for transmission upon which the procedure ends.

8.1.5.4.1.3 Test description

8.1.5.4.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1.
- System information combination NR-1 as defined in TS 38.508-1 [4] clause 4.4.3.1.3 is used in the NR cell.

UE:

- None.

Preamble:

- The UE is in 5GS state 3N-A on NR Cell 1 with atleast one PDU session active according to TS 38.508-1 [4], clause 4.4A.3 Table 4.4A.3-1 and Test Loop Function (On) with UE test loop mode B is established. 2 DRBs are configured where DRB1 is defined as default DRB.

8.1.5.4.1.3.2 Test procedure sequence

Table 8.1.5.4.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|-------------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits 10 IP packets on each DRB (using QF1 for DRB1 and QF15 for DRB2) | - | - | - | - |
| 2 | The UE loops back the IP packets received in step 1 | - | - | - | - |
| 3 | The SS transmits CounterCheck message with <i>drb-Identity</i> not included in the <i>drb-CountMSB-InfoList</i> | <-- | NR RRC: <i>CounterCheck</i> | - | - |
| 4 | Check: Does the UE send CounterCheckResponse message by including the <i>drb-Identity</i> , the <i>count-Uplink</i> and the <i>count-Downlink</i> set to the value of TX_NEXT – 1 and RX_NEXT – 1 in <i>drb-CountInfoList</i> IE for each DRB established? | --> | NR RRC: <i>CounterCheckResponse</i> | 1 | P |

8.1.5.4.1.3.3 Specific message contents

Table 8.1.5.4.1.3.3-1: RRCReconfiguration (Preamble, Table 8.1.5.4.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], table 4.6.1-13 with condition NR | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |

| | | | |
|-----------------------------------|-------------------------|---|--|
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig-2DRBs | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig-2DRBs | OCTET STRING
(CONTAINING
CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.4.1.3.3-2: RadioBearerConfig-2DRBs (Preamble)Table 8.1.5.4.1.3.3-1)

| Derivation Path: TS 38.508-1 [4], table 4.6.3-132 and condition SRB2 and DRB1 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB))
OF SEQUENCE { | 2 entries | | |
| { | | | |
| cnAssociation[1] CHOICE { | | | |
| sdap-Config ::= SEQUENCE { | | | |
| pdu-Session | 1 | | |
| defaultDRB | true | | |
| mappedQoS-FlowsToAdd ::= SEQUENCE { | | | |
| QFI | 1 | | |
| QFI | 2 | | |
| } | | | |
| } | | | |
| } | | | |
| drb-Identity | 1 | | |
| } | | | |
| { | | | |
| cnAssociation[2] CHOICE { | | | |
| sdap-Config ::= SEQUENCE { | | | |
| pdu-Session | 1 | | |
| defaultDRB | false | | |
| mappedQoS-FlowsToAdd ::= SEQUENCE { | | | |
| QFI | 5 | | |
| QFI | 6 | | |
| } | | | |
| } | | | |
| } | | | |
| drb-Identity | 2 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.4.1.3.3-3: CellGroupConfig-2DRBs (Preamble)Table 8.1.5.4.1.3.3-1)

| Derivation Path: TS 38.508-1 [4], table 4.6.3-19 and condition SRB2_DRB1 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|--|--|--|--|
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList SEQUENCE
(SIZE(1..maxLCH)) OF SEQUENCE { | 3 entries | | |
| RLC-BearerConfig[1] | RLC-BearerConfig with
condition SRB2 | | |
| RLC-BearerConfig[2] | RLC-BearerConfig with
conditions AM and
DRB1 | | |
| RLC-BearerConfig[3] | RLC-BearerConfig with
conditions AM and
DRB2 | | |
| } | | | |
| } | | | |

Table 8.1.5.4.1.3.3-4: PDU SESSION ESTABLISHMENT ACCEPT (Preamble) (Table 8.1.5.4.1.3.2-1)

| Derivation Path: TS 38.508-1, table 4.7.2-2 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same as the PDU
session ID in PDU
SESSION
ESTABLISHMENT
REQUEST | | |
| Authorized QoS rules | 4 entries | | |
| QoS rule [1] | Reference QoS rule #3 as
defined in Table 4.8.2.1-3. | QFI=1 | |
| QoS rule [2] | Reference QoS rule #4 as
defined in Table 4.8.2.1-4. | QFI=2 | |
| QoS rule [3] | Reference QoS rule #5 as
defined in Table 4.8.2.1-5. | QFI=5 | |
| QoS rule [4] | Reference QoS rule #6 as
defined in Table 4.8.2.1-6. | QFI=6 | |
| Authorized QoS flow descriptions | 4 entries | | |
| QoS flow [1] | Reference QoS flow #1 as
defined in Table 4.8.2.3-1. | QFI=1 | |
| QoS flow [2] | Reference QoS flow #2 as
defined in Table 4.8.2.3-2. | QFI=2 | |
| QoS flow [3] | Reference QoS flow #3 as
defined in Table 4.8.2.3-3. | QFI=5 | |
| QoS flow [4] | Reference QoS flow #4 as
defined in Table 4.8.2.3-4. | QFI=6 | |

Table 8.1.5.4.1.3.3-5: CounterCheck (step 3, Table 8.1.5.4.1.3.2-1)

| Derivation path: 38.508-1 [4] table 4.6.1-1 | | | |
|---|--------------|---------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| CounterCheck ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| counterCheck SEQUENCE { | | | |
| drb-CountMSB-InfoList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 2 entries | | |
| drb-Identity[1] | 1 | DRB established | |
| countMSB-Uplink[1] | 1 | | |
| countMSB-Downlink[1] | 1 | | |
| drb-Identity[1] | 3 | DRB not established | |
| countMSB-Uplink[1] | 3 | | |
| countMSB-Downlink[1] | 3 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.4.1.3.3-6: CounterCheckResponse (step 4, Table 8.1.5.4.1.3.2-1)

| Derivation path: 38.508-1 [4] table 4.6.1-2 | | | |
|---|--------------|-----------------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| CounterCheckResponse ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| counterCheckResponse SEQUENCE { | | | |
| drb-CountInfoList SEQUENCE (SIZE (0..maxDRB)) OF SEQUENCE { | 3 entries | | |
| drb-Identity[0] | 1 | DRB established | |
| count-Uplink[0] | 10 | | |
| count-Downlink[0] | 10 | | |
| drb-Identity[1] | 2 | DRB established but not requested | |
| count-Uplink[1] | 10 | | |
| count-Downlink[1] | 10 | | |
| drb-Identity[2] | 3 | DRB not established | |
| count-Uplink[2] | 384 | MSB 3 and LSB 0 | |

| | | | |
|-------------------|-----|-----------------|--|
| count-Downlink[2] | 384 | MSB 3 and LSB 0 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.1.5.5 Redirection to NR

8.1.5.5.1 Redirection to NR / From E-UTRA / Success

8.1.5.5.1.1 Test Purpose (TP)

(1)

with { UE in E-UTRA RRC_CONNECTED state }

ensure that {

when { UE receives an RRCConnectionRelease message including a redirectedCarrierInfo for redirection to an NR cell }

then { UE enters E-UTRA RRC_IDLE state and performs redirection to NR cell }

}

8.1.5.5.1.2 Conformance requirements

References: The conformance requirements covered in the current TC is specified in: TS 36.331 clause 5.3.8.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.8.3]

The UE shall:

1> except for NB-IoT, BL UEs or UEs in CE, delay the following actions defined in this sub-clause 60 ms from the moment the *RRCConnectionRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCConnectionRelease* message has been successfully acknowledged, whichever is earlier;

1> for BL UEs or UEs in CE, delay the following actions defined in this sub-clause 1.25 seconds from the moment the *RRCConnectionRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCConnectionRelease* message has been successfully acknowledged, whichever is earlier;

1> for NB-IoT, delay the following actions defined in this sub-clause 10 seconds from the moment the *RRCConnectionRelease* message was received or optionally when lower layers indicate that the receipt of the *RRCConnectionRelease* message has been successfully acknowledged, whichever is earlier.

NOTE: For BL UEs, UEs in CE and NB-IoT, when STATUS reporting, as defined in TS 36.322 [7], has not been triggered and the UE has sent positive HARQ feedback (ACK), as defined in TS 36.321 [6], the lower layers can be considered to have indicated that the receipt of the *RRCConnectionRelease* message has been successfully acknowledged.

1> stop T380, if running;

1> if T309 is running:

2> stop timer T309 for all access categories;

- 2> perform the actions as specified in 5.3.16.4.
 - 1> if the *RRCCConnectionRelease* message is received in response to an *RRCCConnectionResumeRequest* for EDT:
 - 2> indicate to upper layers that the suspended RRC connection has been resumed;
 - 2> discard the stored UE AS context and *resumeIdentity*;
 - 2> stop timer T300;
 - 2> stop timer T302, if running;
 - 2> stop timer T303, if running;
 - 2> stop timer T305, if running;
 - 2> stop timer T306, if running;
 - 2> stop timer T308, if running;
 - 2> perform the actions as specified in 5.3.3.7;
 - 2> stop timer T320, if running;
 - 2> stop timer T322, if running;
 - 1> if the security is not activated and if UE is connected to 5GC:
 - 2> perform the actions upon leaving RRC_CONNECTED or RRC_INACTIVE as specified in 5.3.12 with the release cause 'other' upon which the procedure ends;
 - 1> if the *RRCCConnectionRelease* message includes *redirectedCarrierInfo* indicating redirection to *geran*; or
 - 1> if the *RRCCConnectionRelease* message includes *idleModeMobilityControlInfo* including *freqPriorityListGERAN*:
 - 2> if AS security has not been activated; and
 - 2> if upper layers indicate that redirect to GERAN without AS security is not allowed:
 - 3> ignore the content of the *RRCCConnectionRelease*;
 - 3> perform the actions upon leaving RRC_CONNECTED or RRC_INACTIVE as specified in 5.3.12, with release cause 'other', upon which the procedure ends;
 - 1> if AS security has not been activated:
 - 2> ignore the content of *redirectedCarrierInfo*, if included and indicating redirection to *nr*;
 - 2> ignore the content of *idleModeMobilityControlInfo*, if included and including *freqPriorityListNR*;
 - 2> if the UE ignores the content of *redirectedCarrierInfo* or of *idleModeMobilityControlInfo*:
 - 3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'other', upon which the procedure ends;
 - 1> if the *RRCCConnectionRelease* message includes *redirectedCarrierInfo* indicating redirection to *eutra* and if UE is connected to 5GC:
 - 2> if *cn-Type* is included:
 - 3> after the cell selection, indicate the available CN Type(s) and the received *cn-Type* to upper layers;
- NOTE 1: Handling the case if the E-UTRA cell selected after the redirection does not support the core network type specified by the *cn-Type*, is up to UE implementation.
- 1> if the *RRCCConnectionRelease* message includes the *idleModeMobilityControlInfo*:
 - 2> store the cell reselection priority information provided by the *idleModeMobilityControlInfo*;

2> if the *t320* is included:

3> start timer T320, with the timer value set according to the value of *t320*;

1> else:

2> apply the cell reselection priority information broadcast in the system information;

1> if the *RRCConnectionRelease* message includes the *measIdleConfig*:

2> clear *VarMeasIdleConfig* and *VarMeasIdleReport*;

2> store the received *measIdleDuration* in *VarMeasIdleConfig*;

2> start T331 with the value of *measIdleDuration*;

2> if the *measIdleConfig* contains *measIdleCarrierListEUTRA*:

3> store the received *measIdleCarrierListEUTRA* in *VarMeasIdleConfig*;

3> start performing idle mode measurements as specified in 5.6.20;

NOTE 2: If the *measIdleConfig* does not contain *measIdleCarrierListEUTRA*, UE may receive *measIdleCarrierListEUTRA* as specified in 5.2.2.12.

1> for NB-IoT, if the *RRCConnectionRelease* message includes the *redirectedCarrierInfo*:

2> if the *redirectedCarrierOffsetDedicated* is included in the *redirectedCarrierInfo*:

3> store the dedicated offset for the frequency in *redirectedCarrierInfo*;

3> start timer T322, with the timer value set according to the value of *T322* in *redirectedCarrierInfo*;

1> if the *releaseCause* received in the *RRCConnectionRelease* message indicates *loadBalancingTAURequired*:

2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'load balancing TAU required';

1> else if the *releaseCause* received in the *RRCConnectionRelease* message indicates *cs-FallbackHighPriority*:

2> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'CS Fallback High Priority';

1> else:

2> if the *waitTime* is present:

3> start timer T302, with the timer value set according to the *waitTime*;

3> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2';

2> if the *extendedWaitTime* is present; and

2> if the UE supports delay tolerant access or the UE is a NB-IoT UE:

3> forward the *extendedWaitTime* to upper layers;

2> if the *extendedWaitTime-CPdata* is present and the NB-IoT UE only supports the Control Plane CIoT EPS optimisation:

3> forward the *extendedWaitTime-CPdata* to upper layers;

2> if the *releaseCause* received in the *RRCConnectionRelease* message indicates *rrc-Suspend*:

3> perform the actions upon leaving RRC_CONNECTED as specified in 5.3.12, with release cause 'RRC suspension';

2> else if *rrc-InactiveConfig* is included:

3> perform the actions upon entering RRC_INACTIVE as specified in 5.3.8.7;

2> else:

3> perform the actions upon leaving RRC_CONNECTED or RRC_INACTIVE as specified in 5.3.12, with release cause 'other';

8.1.5.5.1.3 Test Description

8.1.5.5.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the serving cell and NR Cell 1 is the suitable neighbour cell.
- System information combination 31 as defined in TS 36.508 [7] clause 4.4.3.1 is used in the E-UTRA cell.
- System information combination NR-6 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in the NR cell.

UE:

- E-UTRA RRC_CONNECTED state.

Preamble:

- With NR Cell 1 "Serving cell" and E-UTRA Cell 1 "Non-suitable "Off" cell", the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.
- the UE is switched-off
- With E-UTRA Cell 1 "Serving cell" and NR Cell 1 "Non-suitable "Off" cell", the UE is brought to state Generic RB Established (state 3) according to TS 36.508 [7] clause 4.5.3. 4G GUTI and eKSI are assigned and security context established

8.1.5.5.1.3.2 Test procedure sequence

Table 8.1.5.5.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionRelease</i> message indicating redirection to NR Cell 1. | - | E-UTRA RRC:
<i>RRCConnectionRelease</i> | - | - |
| 2 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.9 indicate that the UE has performed mobility registration updating when it camps on NR Cell 1? | - | - | 1 | P |
| - | EXCEPTION: In parallel to the events described in steps 3 below, the steps specified in table 8.1.5.5.1.3.2-2 might take place. | - | - | - | - |
| 3 | The procedure in table 4.5A.7.2.2-1 in TS 38.508-1 [4] is performed. | - | - | - | - |

Table 8.1.5.5.1.3.2-2: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|---------|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: Steps 1a1 to 1a2 describes behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation | - | - | - | - |
| 1a1-1a7 | IF the DNN of the established PDU session is IMS AND the UE initiates IMS re-registration on NR in the next 10s THEN steps 2-8 of the procedure in table 4.5.4.2-3 in TS 38.508-1 are performed. | - | - | - | - |
| 1a8-1a9 | Steps 1-2 as defined in TS 34.229-1 [35] C.46 using conditions A2 AND A32 for the REGISTER request message. | - | - | - | - |

8.1.5.5.1.3.3 Specific message contents

Table 8.1.5.5.1.3.3-1: RRCConnectionRelease (step 1, Table 8.1.5.5.1.3.2-1)

| Derivation Path: 36.508 table 4.6.1-15 | | | |
|--|--------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionRelease-r8 SEQUENCE { | | | |
| redirectedCarrierInfo CHOICE { | | | |
| nr-r15 SEQUENCE { | | | |
| carrierFreq-r15 | ARFCN of NR Cell 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.5.1.3.3-2: RRCReconfiguration (step 1a6, Table 8.1.5.5.1.3.2-2)

| Derivation Path: 38.508-1 [4] Table 4.6.1-13 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|--|---|---|--|
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | TS 38.508-1 [4], Table 4.6.5-12. | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig as per table 4.6.3-132 in TS 38.508-1 [4] with conditions SRB1,SRB2 and the DRB associated with the IMS DNN | | |
| secondaryCellGroup | Not present | | |
| measConfig | Not present | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig with conditions SRB1,SRB2 and the DRB associated with the IMS DNN. | OCTET STRING (CONTAINING CellGroupConfig) | |
| fullConfig | true | | |
| dedicatedNAS-MessageList SEQUENCE (SIZE(1..maxDRB)) OF DedicatedNAS-Message {} | Not present | | |
| masterKeyUpdate | MasterKeyUpdate | | |
| dedicatedSIB1-Delivery | Not present | | |
| dedicatedSystemInformationDelivery | Not present | | |
| otherConfig | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.5.1.3.3-3: SERVICE REQUEST (step 1a3, Table 8.1.5.5.1.3.2-2)

| | | | |
|--|--------------|------------|-----------|
| Derivation Path: 38.508-1 [4] table 4.7.1-16 | | | |
| Information Element | Value/remark | Comment | Condition |
| Service type | '0000'B | signalling | |

8.1.5.6 Radio link failure

8.1.5.6.1 Radio link failure / RRC connection re-establishment success

8.1.5.6.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE detecting physical layer recovery while T310 was running }

then { UE resumes the RRC connection without explicit signalling }

}

(2)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE detecting physical layer problems }

then { UE shall start timer T310 and UE does not initiate any RRC connection re-establishment procedure before expiring of timer T310 }

}

(3)

with { UE in NR RRC_CONNECTED state }

ensure that {

when { UE detecting radio link failure on expiring of timer T310 }

then { UE starts timer T311 and UE initiates the RRC connection re-establishment procedure }

}

(4)

with { UE having initiated RRC connection re-establishment procedure and timer T311 running }

ensure that {

when { UE successfully completes the RRC connection re-establishment procedure }

then { UE is in NR RRC_CONNECTED state }

}

(5)

with { UE in NR RRC_CONNECTED state and upon detecting radio link failure UE sends RRCReestablishmentRequest message }

ensure that {

```
when { UE receives a RRCSetup message }  
  then { UE completes RRC setup procedure by sending RRCSetupComplete message }  
}
```

8.1.5.6.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331 clauses 5.3.3.4, 5.3.7.2, 5.3.7.8, 5.3.10.1, 5.3.10.2 and 5.3.10.3.

[TS 38.331 clause 5.3.3.4]

The UE shall perform the following actions upon reception of the *RRCSetup*:

- 1> if the *RRCSetup* is received in response to an *RRCReestablishmentRequest*; or
- 1> if the *RRCSetup* is received in response to an *RRCResumeRequest* or *RRCResumeRequest1*:
- 2> discard any stored UE Inactive AS context and *suspendConfig*;
- 2> discard any current AS security context including the K_{RRCEnc} key, the K_{RRCint} key, the K_{UPint} key and the K_{UPenc} key;
- 2> release radio resources for all established RBs except SRB0, including release of the RLC entities, of the associated PDCP entities and of SDAP;
- 2> release the RRC configuration except for the default L1 parameter values, default MAC Cell Group configuration and CCCH configuration;
- 2> indicate to upper layers fallback of the RRC connection;
- 2> stop timer T380, if running;
- 1> perform the cell group configuration procedure in accordance with the received *masterCellGroup* and as specified in 5.3.5.5;
- 1> perform the radio bearer configuration procedure in accordance with the received *radioBearerConfig* and as specified in 5.3.5.6;
- 1> if stored, discard the cell reselection priority information provided by the *cellReselectionPriorities* or inherited from another RAT;
- 1> stop timer T300, T301 or T319 if running;
- 1> if T390 is running:
- 2> stop timer T390 for all access categories;
- 2> perform the actions as specified in 5.3.14.4;
- 1> if T302 is running:
- 2> stop timer T302;
- 2> perform the actions as specified in 5.3.14.4;
- 1> stop timer T320, if running;
- 1> if the *RRCSetup* is received in response to an *RRCResumeRequest*, *RRCResumeRequest1* or *RRCSetupRequest*:
- 2> enter RRC_CONNECTED;
- 2> stop the cell re-selection procedure;
- 1> consider the current cell to be the PCell;

- 1> set the content of *RRCSetupComplete* message as follows:
- 2> if upper layers provide a 5G-S-TMSI:
- 3> if the *RRCSetup* is received in response to an *RRCSetupRequest*:
- 4> set the *ng-5G-S-TMSI-Value* to *ng-5G-S-TMSI-Part2*;
- 3> else:
- 4> set the *ng-5G-S-TMSI-Value* to *ng-5G-S-TMSI*;
- 2> set the *selectedPLMN-Identity* to the PLMN selected by upper layers (TS 24.501 [23]) from the PLMN(s) included in the *plmn-IdentityList* in *SIB1*;
- 2> if upper layers provide the 'Registered AMF':
- 3> include and set the *registeredAMF* as follows:
- 4> if the PLMN identity of the 'Registered AMF' is different from the PLMN selected by the upper layers:
- 5> include the *plmnIdentity* in the *registeredAMF* and set it to the value of the PLMN identity in the 'Registered AMF' received from upper layers;
- 4> set the *amf-Identifier* to the value received from upper layers;
- 3> include and set the *guami-Type* to the value provided by the upper layers;
- 2> if upper layers provide one or more S-NSSAI (see TS 23.003 [21]):
- 3> include the *s-NSSAI-List* and set the content to the values provided by the upper layers;
- 2> set the *dedicatedNAS-Message* to include the information received from upper layers;
- 1> submit the *RRCSetupComplete* message to lower layers for transmission, upon which the procedure ends

[TS 38.331 clause 5.3.7.2]

The UE initiates the procedure when one of the following conditions is met:

- 1> upon detecting radio link failure of the MCG, in accordance with 5.3.10; or
- 1> upon re-configuration with sync failure of the MCG, in accordance with sub-clause 5.3.5.8.3; or
- 1> upon mobility from NR failure, in accordance with sub-clause 5.4.3.5; or
- 1> upon integrity check failure indication from lower layers concerning SRB1 or SRB2, except if the integrity check failure is detected on the *RRCReestablishment* message; or
- 1> upon an RRC connection reconfiguration failure, in accordance with sub-clause 5.3.5.8.2.

Upon initiation of the procedure, the UE shall:

- 1> stop timer T310, if running;
- 1> stop timer T304, if running;
- 1> start timer T311;
- 1> suspend all RBs, except SRB0;
- 1> reset MAC;
- 1> release the MCG SCell(s), if configured;
- 1> release *spCellConfig*;
- 1> release *delayBudgetReportingConfig*, if configured, and stop timer T342, if running;

1> release *overheatingAssistanceConfig*, if configured, and stop timer T345, if running;

1> perform cell selection in accordance with the cell selection process as specified in TS 38.304 [20], clause 5.2.6.

[TS 38.331 clause 5.3.7.8]

The UE shall:

1> perform the RRC connection establishment procedure as specified in 5.3.3.4.

[TS 38.331 clause 5.3.10.1]

The UE shall:

1> upon receiving N310 consecutive "out-of-sync" indications for the SpCell from lower layers while neither T300, T301, T304, T311 nor T319 are running:

2> start timer T310 for the corresponding SpCell.

[TS 38.331 clause 5.3.10.2]

Upon receiving N311 consecutive "in-sync" indications for the SpCell from lower layers while T310 is running, the UE shall:

1> stop timer T310 for the corresponding SpCell.

NOTE 1: In this case, the UE maintains the RRC connection without explicit signalling, i.e. the UE maintains the entire radio resource configuration.

NOTE 2: Periods in time where neither "in-sync" nor "out-of-sync" is reported by L1 do not affect the evaluation of the number of consecutive "in-sync" or "out-of-sync" indications.

[TS 38.331 clause 5.3.10.3]

The UE shall:

1> upon T310 expiry in PCell; or

1> upon random access problem indication from MCG MAC while neither T300, T301, T304, T311 nor T319 are running; or

1> upon indication from MCG RLC that the maximum number of retransmissions has been reached:

2> if the indication is from MCG RLC and CA duplication is configured and activated, and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else:

3> consider radio link failure to be detected for the MCG i.e. RLF;

3> if AS security has not been activated:

4> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'other';-

3> else if AS security has been activated but SRB2 and at least one DRB have not been setup:

4> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'RRC connection failure';

3> else:

4> initiate the connection re-establishment procedure as specified in 5.3.7.

8.1.5.6.1.3 Test description

8.1.5.6.1.3.1 Pre-test conditions

System Simulator:

- 3 NR Cells. NR Cell 1 is the serving cell, NR Cell 2 and NR Cell 4 are the intra-frequency neighbour cell.

None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.5.6.1.3.2 Test procedure sequence

Table 8.1.5.6.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR
Cell 1 | NR
Cell 2 | NR
Cell 4 |
|--|---------------------|---------|--------------|--------------|--------------|
| T0 | SS/PBCH
SSS EPRE | dBm/SCS | “Off” | “Off” | “Off” |
| T0
A | SS/PBCH
SSS EPRE | dBm/SCS | -88 | “Off” | “Off” |
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | “Off” | -88 | -94 |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | “Off” | “Off” | -88 |
| Power level “Off” is defined in TS 38.508-1 [4] Table 6.2.2.1-3. | | | | | |

Table 8.1.5.6.1.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR
Cell 1 | NR
Cell 2 | NR
Cell 4 |
|--|---------------------|---------|--------------|--------------|--------------|
| T0 | SS/PBCH
SSS EPRE | dBm/SCS | “Off” | “Off” | “Off” |
| T0
A | SS/PBCH
SSS EPRE | dBm/SCS | -82 | “Off” | “Off” |
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | “Off” | -82 | -91 |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | “Off” | “Off” | -82 |
| Power level “Off” is defined in TS 38.508-1 [4] Table 6.2.2.2-2. | | | | | |

Table 8.1.5.6.1.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 0A | The SS changes NR Cell 1 parameters according to the row "T0" in table Table 8.1.5.6.1.3.2-1/2 to set NR Cell 1 to Non-suitable "Off" | - | - | - | - |
| 0B | The SS wait for 1,5 s (T310 (2s) is transmitted in SIB1). | - | - | - | - |
| 0C | The SS changes NR Cell 1 parameters according to the row "T0A" in table 8.1.5.6.1.3.2-1/2 making NR Cell 1 serving cell. | - | - | - | - |
| 0D | Check: For the next 5 s does the UE transmit any signalling message? | - | - | 1 | F |
| 0E | Check: Does the test result of generic test procedure in TS 38.508-1 [4] subclause 4.9.10 indicate that the UE is in NR RRC_CONNECTED state on NR Cell 1? | - | - | 1 | P |
| 1 | The SS changes NR Cell 1, NR Cell 2 and NR Cell 4 parameters according to the row "T1" in table 8.1.5.6.1.3.2-1/2 in order that the radio link quality of NR Cell 1 is degraded, and NR Cell 2 is suitable for camping. | - | - | - | - |
| 2 | Check: Does the UE initiate an RRC connection re-establishment procedure on Cell 1 or Cell 2. This is checked during the time T=T310? | - | - | 2 | F |
| 3 | Check: Does the UE send <i>RRCReestablishmentRequest</i> message on NR Cell 2? | --> | NR RRC:
<i>RRCReestablishmentRequest</i> | 3 | P |
| 4 | The SS transmits <i>RRCReestablishmentmessage</i> . | <-- | NR RRC: <i>RRCReestablishment</i> | - | - |
| 5 | The UE transmits <i>RRCReestablishmentCompletemessage</i> . | --> | NR RRC:
<i>RRCReestablishmentComplete</i> | - | - |
| 6 | The SS transmits an <i>RRCReconfigurationmessage</i> to resume existing radio bearer. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 7 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | 4 | P |
| 8 | The SS changes NR Cell 2 and NR Cell 4 parameters according to the row "T2" in table 8.1.5.6.1.3.2-1/2 in order that the radio link quality of NR Cell 2 is degraded and cell 4 is suitable for camping. | - | - | - | - |

| | | | | | |
|----|---|-----|--|---|---|
| 9 | Check: Does the UE send <i>RRCReestablishmentRequest</i> message on NR Cell 4? | --> | NR RRC:
<i>RRCReestablishmentRequest</i> | - | - |
| 10 | The SS transmits <i>RRCSetup</i> message. | <-- | NR RRC: <i>RRCSetup</i> | - | - |
| 11 | Check: Does the UE transmit a <i>RRCSetupComplete</i> message? | --> | NR RRC: <i>RRCSetupComplete</i> | 5 | P |
| 12 | The SS transmits a <i>SecurityModeCommand</i> message. | <-- | NR RRC:
<i>SecurityModeCommand</i> | - | - |
| 13 | The UE transmits a <i>SecurityModeComplete</i> message. | --> | NR RRC: <i>SecurityModeComplete</i> | - | - |
| 14 | The SS transmits an <i>RRCReconfiguration</i> message to establish SRB2 and DRB | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 15 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |

8.1.5.6.1.3.3 Specific message contents

Table 8.1.5.6.1.3.3-0: *SystemInformationBlockType2* for Cell 2 (all steps)

| Derivation path: 38.508-1 [4] table 4.6.1-28 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | | | |
| ue-TimersAndConstants SEQUENCE { | | | |
| t310 | ms2000 | | |
| } | | | |
| } | | | |

Table 8.1.5.6.1.3.3-1: *RRCReestablishmentRequest* (step 3, Table 8.1.5.6.1.3.2-3)

| Derivation path: 38.508-1 [4] table 4.6.1-12 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReestablishmentRequest</i> ::= SEQUENCE { | | | |
| ue-Identity SEQUENCE { | | | |
| c-RNTI | the value of the C-RNTI of the UE | | |
| physCellId | PhysicalCellIdentity of NR Cell 1 | | |
| shortMAC-I | The same value as the 16 least significant bits of the XMAC-I value calculated by SS | | |

| | | | |
|----------------------|--------------|--|--|
| } | | | |
| reestablishmentCause | otherFailure | | |
| } | | | |

Table 8.1.5.6.1.3.3-2: *RRCReestablishmentRequest* (step 9, Table 8.1.5.6.1.3.2-3)

| Derivation path: 38.508-1 [4] table 4.6.1-12 | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReestablishmentRequest ::= SEQUENCE { | | | |
| ue-Identity SEQUENCE { | | | |
| c-RNTI | the value of the C-RNTI of the UE | | |
| physCellId | PhysicalCellIdentity of NR Cell 2 | | |
| shortMAC-I | The same value as the 16 least significant bits of the XMAC-I value calculated by SS | | |
| } | | | |
| reestablishmentCause | otherFailure | | |
| } | | | |

8.1.5.6.2 Void

8.1.5.6.3 Radio link failure / T311 expiry

8.1.5.6.3.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED state and radio link failure was detected and UE attempts to select a suitable NR cell to re-establish the RRC connection }

ensure that {

when { UE cannot find a suitable NR cell within T311 }

then { UE does not try to re-establish the RRC connection and goes to NR RRC_IDLE state after T311 expired }

}

8.1.5.6.3.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 38.331 clauses 5.3.7.2, 5.3.7.6, 5.3.7.8, 5.3.10.1, 5.3.10.3 and 5.3.5.5.7.

[TS 38.331 clause 5.3.7.2]

The UE initiates the procedure when one of the following conditions is met:

- 1> upon detecting radio link failure of the MCG, in accordance with 5.3.10; or
- 1> upon re-configuration with sync failure of the MCG, in accordance with sub-clause 5.3.5.8.3; or
- 1> upon mobility from NR failure, in accordance with sub-clause 5.4.3.5; or
- 1> upon integrity check failure indication from lower layers concerning SRB1 or SRB2, except if the integrity check failure is detected on the *RRCReestablishment* message; or
- 1> upon an RRC connection reconfiguration failure, in accordance with sub-clause 5.3.5.8.2.

Upon initiation of the procedure, the UE shall:

- 1> stop timer T310, if running;
- 1> stop timer T304, if running;
- 1> start timer T311;
- 1> suspend all RBs, except SRB0;
- 1> reset MAC;
- 1> release the MCG SCell(s), if configured;
- 1> release *spCellConfig*;
- 1> release *delayBudgetReportingConfig*, if configured, and stop timer T342, if running;
- 1> release *overheatingAssistanceConfig*, if configured, and stop timer T345, if running;
- 1> perform cell selection in accordance with the cell selection process as specified in TS 38.304 [20], clause 5.2.6.

[TS 38.331 clause 5.3.7.7]

Upon T311 expiry, the UE shall:

- 1> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'RRC connection failure'.

[TS 38.331 clause 5.3.7.8]

The UE shall:

- 1> perform the RRC connection establishment procedure as specified in 5.3.3.4.

[TS 38.331 clause 5.3.10.1]

The UE shall:

- 1> upon receiving N310 consecutive "out-of-sync" indications for the SpCell from lower layers while neither T300, T301, T304, T311 nor T319 are running;
- 2> start timer T310 for the corresponding SpCell.

[TS 38.331 clause 5.3.10.3]

The UE shall:

- 1> upon T310 expiry in PCell; or
- 1> upon random access problem indication from MCG MAC while neither T300, T301, T304, T311 nor T319 are running; or
- 1> upon indication from MCG RLC that the maximum number of retransmissions has been reached:

2> if the indication is from MCG RLC and CA duplication is configured and activated, and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else:

3> consider radio link failure to be detected for the MCG i.e. RLF;

3> if AS security has not been activated:

4> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'other';-

3> else if AS security has been activated but SRB2 and at least one DRB have not been setup:

4> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'RRC connection failure';

3> else:

4> initiate the connection re-establishment procedure as specified in 5.3.7.

[TS 38.331, 5.3.5.5.7]

The UE shall:

1> if the *SpCellConfig* contains the *rlf-TimersAndConstants*:

2> configure the RLF timers and constants for this cell group as specified in 5.3.5.5.6;

1> else if *rlf-TimersAndConstants* is not configured for this cell group:

2> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SIB1*;

8.1.5.6.3.3 Test description

8.1.5.6.3.3.1 Pre-test conditions

System Simulator:

- NR Cell 1

None.

Preamble:

- The UE is in state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A on NR Cell 1.

8.1.5.6.3.3.2 Test procedure sequence

Table 8.1.5.6.3.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 |
|---|---------------------|---------|-----------|
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | “Off” |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | -88 |
| Power level “Off” is defined in TS 38.508-1 | | | |

| |
|----------------------|
| [4] Table 6.2.2.1-3. |
|----------------------|

Table 8.1.5.6.3.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR
Cell 1 |
|---|---------------------|---------|--------------|
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | “Off” |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | -82 |
| Power level “Off” is defined in TS 38.508-1
[4] Table 6.2.2.2-2. | | | |

Table 8.1.5.6.3.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | The SS changes NR Cell 1 parameters according to the row "T1" in table 8.1.5.6.3.3.2-1 in order that the radio link quality of NR Cell 1 is degraded. | - | - | - | - |
| 2 | Wait for 12s (T311 (10s) is transmitted in RRCSetup). | - | - | - | - |
| 3 | The SS changes NR Cell 1 parameters according to the row "T2" in table 8.1.5.6.3.3.2-1 making NR Cell 1 is suitable for camping. | - | - | - | - |
| 4 | Check: Does the test result of generic test procedure in TS 38.508-1 [4] subclause 4.9.5 indicate that the UE is camped on NR Cell 1? | - | - | 1 | P |

8.1.5.6.3.3.3 Specific message contents

Table 8.1.5.6.3.3.3-1: *RRCSetup(Preamble)*

| Derivation path: 38.508-1 [4] table 4.6.1-21 | | | |
|--|-------------------------------------|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCSetup ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcSetup SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig with condition SRB1 | OCTET STRING (CONTAINING | |

| | | | |
|---|--|------------------|--|
| | | CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |

Table 8.1.5.6.3.3.3-2: *CellGroupConfig* (Table 8.1.5.6.3.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| rf-TimersAndConstants SEQUENCE { | | | |
| t311-v1530 | ms10000 | | |
| } | | | |
| spCellConfigDedicated | ServingCellConfig | | |
| } | | | |

Table 8.1.5.6.3.3.3-3: *ServingCellConfig* (Table 8.1.5.6.3.3.3-2: *CellGroupConfig*)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-167 | | | |
|--|-----------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP | BWP-DownlinkDedicated | | |
| } | | | |

Table 8.1.5.6.3.3.3-4: *BWP-DownlinkDedicated* (Table 8.1.5.6.3.3.3-3: *ServingCellConfig*)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-11 | | | |
|---|---------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| BWP-DownlinkDedicated ::= SEQUENCE { | | | |
| radioLinkMonitoringConfig | RadioLinkMonitoringConfig | | |
| } | | | |

8.1.5.6.4 Void

8.1.5.6.5 NR CA / No Radio Link Failure on SCell / RRC Connection Continues on Pcell

8.1.5.6.5.1 NR CA / No Radio Link Failure on SCell / RRC Connection Continues on PCell / Intra-band Contiguous CA

8.1.5.6.5.1.1 Test Purpose (TP)

(1)

with { UE in NR RRC_CONNECTED, security activated and Scell configured }

ensure that {

when { UE drops out of service on Scell }

then { UE does not consider radio link failure to be detected and stay in NR RRC_CONNECTED state }

}

8.1.5.6.5.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clauses 5.3.5.5.6, 5.3.10.1 and 5.3.10.3.

[TS 38.331, clause 5.3.5.5.6]

The UE shall:

1> if the received *rlf-TimersAndConstants* is set to release:

2> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SystemInformationBlockType2*;

1> else:

2> reconfigure the value of timers and constants in accordance with received *rlf-TimersAndConstants*;

2> stop timer T310 for this cell group, if running;

2> reset the counters N310 and N311.

[TS 38.331, clause 5.3.10.1]

The UE shall:

1> upon receiving N310 consecutive "out-of-sync" indications for the SpCell from lower layers while neither T300, T301, T304, T311 nor T319 is running;

2> start timer T310 for the corresponding SpCell.

[TS 38.331, clause 5.3.10.3]

The UE shall:

1> upon T310 expiry in PCell; or

1> upon random access problem indication from MCG MAC while neither T300, T301, T304, T311 nor T319 are running; or

1> upon indication from MCG RLC that the maximum number of retransmissions has been reached:

2> if the indication is from MCG RLC and CA duplication is configured and activated, and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else:

3> consider radio link failure to be detected for the MCG i.e. RLF;

3> if AS security has not been activated:

4> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'other';-

3> else if AS security has been activated but SRB2 and at least one DRB have not been setup:

4> perform the actions upon going to RRC_IDLE as specified in 5.3.11, with release cause 'RRC connection failure';

3> else:

4> initiate the connection re-establishment procedure as specified in 5.3.7.

The UE shall:

1> upon T310 expiry in PSCell; or

1> upon random access problem indication from SCG MAC; or

1> upon indication from SCG RLC that the maximum number of retransmissions has been reached:

2> if the indication is from SCG RLC and CA duplication is configured and activated; and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else:

3> consider radio link failure to be detected for the SCG, i.e. SCG RLF;

3> initiate the SCG failure information procedure as specified in 5.7.3 to report SCG radio link failure.

8.1.5.6.5.1.3 Test description

8.1.5.6.5.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1, and NR Cell 3
- NR Cell 1 is PCell
- NR Cell 3 is SCell
- NR Cell 3 is an Inactive SCell according to TS 38.508-1 [4] clause 6.3.1
- System information combination NR-4 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

None.

Preamble:

- The UE is in 5GS state 3N-A according to TS 38.508-1 [4], clause 4.4A.2 Table 4.4A.2-3.

8.1.5.6.5.1.3.2 Test procedure sequence

Table 8.5.1.7.1.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.1.5.6.5.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR
Cell 1 | NR
Cell 3 | Remark |
|--------|---------------------|---------|--------------|--------------|--------------------------------------|
| T
0 | SS/PBCH
SSS EPRE | dBm/SCS | -88 | -88 | NR Cell1 and NR Cell 3 are available |
| T
1 | SS/PBCH
SSS EPRE | dBm/SCS | -88 | "Off" | Only NR Cell 1 is available.
. |

Table 8.1.5.6.5.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR
Cell 1 | NR
Cell 3 | Remark |
|--------|---------------------|---------|--------------|--------------|--------------------------------------|
| T
0 | SS/PBCH
SSS EPRE | dBm/SCS | -95 | -95 | NR Cell1 and NR Cell 3 are available |
| T
1 | SS/PBCH
SSS EPRE | dBm/SCS | -95 | "Off" | Only NR Cell 1 is available.
. |

Table 8.1.5.6.5.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|-----------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCReconfiguration</i> message on NR Cell 1 to configure Scell. | <-- | <i>RRCReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCReconfigurationComplete</i> message on NR Cell 1. | --> | <i>RRCReconfigurationComplete</i> | - | - |
| 3 | Wait for 1s. | - | - | - | - |
| 4 | The SS changes power levels according to row "T1" in Table 8.1.5.6.5.1.3.2-1. | - | - | - | - |
| 5 | Wait for 1s. | - | - | - | - |
| 6 | Check: Does the UE transmit an <i>RRCReestablishmentRequest</i> message on NR Cell 1 with in next 2 seconds? | --> | <i>RRCReestablishmentRequest</i> | 1 | F |
| 7 | The SS sends <i>UECapabilityEnquiry</i> message to the UE. | <-- | <i>UECapabilityEnquiry</i> | - | - |
| 8 | Check: Does the UE send a | --> | <i>UECapabilityInformation</i> | 1 | P |

| | | | | | |
|--|----------------------------------|--|--|--|--|
| | UECapabilityInformation message? | | | | |
|--|----------------------------------|--|--|--|--|

8.1.5.6.5.1.3.3 Specific message contents

Table 8.1.5.6.5.1.3.3-1: *RRCReconfiguration* (step 1, Table 8.1.5.6.5.1.3.2-2)

| |
|---|
| Derivation Path: 38.508-1 [4] Table 4.6.1-13 with condition SCell_add |
|---|

Table 8.1.5.6.5.1.3.3-2: Void

Table 8.1.5.6.5.1.3.3-3: Void

8.1.5.6.5.2 NR CA / No Radio Link Failure on SCell / RRC Connection Continues on PCell / Inter-band CA

8.1.5.6.5.2.1 Test Purpose (TP)

Same as TC 8.1.5.6.5.1 but applied to Inter-band CA Test Case.

8.1.5.6.5.2.2 Conformance Requirements

Same as TC 8.1.5.6.5.1 but applied to Inter-band CA Test Case.

8.1.5.6.5.2.3 Test Description

8.1.5.6.5.2.3.1 Pre-test conditions

Same as TC 8.1.5.6.5.1 but with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.
- Cells configuration: Cell 10 replaces Cell 3.
- Cell 10 is an Inactive SCell according to TS 38.508-1 [4] clause 6.3.1.

8.1.5.6.5.2.3.2 Test procedure sequence

Same as TC 8.1.5.6.5.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA.
- Cells configuration: Cell 10 replaces Cell 3.

8.1.5.6.5.2.3.3 Specific message contents

Same as TC 8.1.5.6.5.1 but applied to Inter-band CA Test Case.

8.1.5.6.5.3 NR CA / No Radio Link Failure on SCell / RRC Connection Continues on PCell / Intra-band non-Contiguous CA

8.1.5.6.5.3.1 Test Purpose (TP)

Same as TC 8.1.5.6.5.1 but applied to Intra-band non-Contiguous CA Test Case.

8.1.5.6.5.3.2 Conformance Requirements

Same as TC 8.1.5.6.5.1 but applied to Intra-band non-Contiguous CA Test Case.

8.1.5.6.5.3.3 Test Description

8.1.5.6.5.3.3.1 Pre-test conditions

Same as TC 8.1.5.6.5.1 but with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA.

8.1.5.6.5.3.3.2 Test procedure sequence

Same as TC 8.1.5.6.5.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA.

8.1.5.6.5.3.3.3 Specific message contents

Same as TC 8.1.5.6.5.1 but applied to Intra-band non-Contiguous CA Test Case.

8.2 MR-DC RRC

Editor's note: Editorial updates to test purposes and Preamble of all RRC test cases shall be updated to reflect as per generic procedure parameter for Bearers in TS 38.508-1 Table 4.5.1-1 for handling multi-PDN scenarios.

8.2.1 UE Capability

8.2.1.1 UE capability transfer / Success

8.2.1.1.1 UE capability transfer / Success / EN-DC

8.2.1.1.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only }

ensure that {

when { UE receives an UECapabilityEnquiry message that includes eutra }

then { UE transmits an UECapabilityInformation message including UE radio access capability information corresponding to the ue-CapabilityRequest variable }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only }

ensure that {

when { UE receives an UECapabilityEnquiry message that includes eutra-nr and nr }

then { UE transmits an UECapabilityInformation message including UE radio access capability information corresponding to the ue-CapabilityRequest variable }

}

8.2.1.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.6.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.6.3.3]

The UE shall:

- 1> for NB-IoT, set the contents of *UECapabilityInformation* message as follows:
 - 2> include the UE Radio Access Capability Parameters within the *ue-Capability-Container*;
 - 2> include *ue-RadioPagingInfo*;
 - 2> submit the *UECapabilityInformation* message to lower layers for transmission, upon which the procedure ends;
 - 1> else, set the contents of *UECapabilityInformation* message as follows:
 - 2> if the *ue-CapabilityRequest* includes *eutra*:
 - 3> include the *UE-EUTRA-Capability* within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *eutra*;
 - 3> if the UE supports FDD and TDD:
 - 4> set all fields of *UECapabilityInformation*, except field *fdd-Add-UE-EUTRA-Capabilities* and *tdd-Add-UE-EUTRA-Capabilities* (including their sub-fields), to include the values applicable for both FDD and TDD (i.e. functionality supported by both modes);
 - 4> if (some of) the UE capability fields have a different value for FDD and TDD:
 - 5> if for FDD, the UE supports additional functionality compared to what is indicated by the previous fields of *UECapabilityInformation*:
 - 6> include field *fdd-Add-UE-EUTRA-Capabilities* and set it to include fields reflecting the additional functionality applicable for FDD;
 - 5> if for TDD, the UE supports additional functionality compared to what is indicated by the previous fields of *UECapabilityInformation*:
 - 6> include field *tdd-Add-UE-EUTRA-Capabilities* and set it to include fields reflecting the additional functionality applicable for TDD;
- NOTE 1: The UE includes fields of *XDD-Add-UE-EUTRA-Capabilities* in accordance with the following:
- The field is included only if one or more of its sub-fields (or bits in the feature group indicators string) has a value that is different compared to the value signalled elsewhere within *UE-EUTRA-Capability*;
(this value signalled elsewhere is also referred to as the *Common value* that is supported for both XDD modes)
 - For the fields that are included in *XDD-Add-UE-EUTRA-Capabilities*, the UE sets:
 - the sub-fields (or bits in the feature group indicators string) that are not allowed to be different to the same value as the *Common value*;
 - the sub-fields (or bits in the feature group indicators string) that are allowed to be different to a value indicating at least the same functionality as indicated by the *Common value*;
- 3> else (UE supports single xDD mode):
 - 4> set all fields of *UECapabilityInformation*, except field *fdd-Add-UE-EUTRA-Capabilities* and *tdd-Add-UE-EUTRA-Capabilities* (including their sub-fields), to include the values applicable for the xDD mode supported by the UE;
 - 3> compile a list of band combinations, candidate for inclusion in the *UECapabilityInformation* message, comprising of band combinations supported by the UE according to the following priority order (i.e. listed in order of decreasing priority):

- 4> include all non-CA bands, regardless of whether UE supports carrier aggregation, only:
- if the UE includes *ue-Category-v1020* (i.e. indicating category 6 to 8); or
 - if for at least one of the non-CA bands, the UE supports more MIMO layers with TM9 and TM10 than implied by the UE category; or
 - if the UE supports TM10 with one or more CSI processes;
 - if the UE supports 1024QAM in DL;
- 4> if the *UECapabilityEnquiry* message includes *requestedFrequencyBands* and UE supports *requestedFrequencyBands*:
- 5> include all 2DL+1UL CA band combinations, only consisting of bands included in *requestedFrequencyBands*;
- 5> include all other CA band combinations, only consisting of bands included in *requestedFrequencyBands*, and prioritized in the order of *requestedFrequencyBands*, (i.e. first include remaining band combinations containing the first-listed band, then include remaining band combinations containing the second-listed band, and so on);
- 4> else (no requested frequency bands):
- 5> include all 2DL+1UL CA band combinations;
- 5> include all other CA band combinations;
- 4> if UE supports *maximumCCsRetrieval* and if the *UECapabilityEnquiry* message includes the *requestedMaxCCsDL* and the *requestedMaxCCsUL* (i.e. both UL and DL maximums are given):
- 5> remove from the list of candidates the band combinations for which the number of CCs in DL exceeds the value indicated in the *requestedMaxCCsDL* or for which the number of CCs in UL exceeds the value indicated in the *requestedMaxCCsUL*;
- 5> indicate in *requestedCCsUL* the same value as received in *requestedMaxCCsUL*;
- 5> indicate in *requestedCCsDL* the same value as received in *requestedMaxCCsDL*;
- 4> else if UE supports *maximumCCsRetrieval* and if the *UECapabilityEnquiry* message includes the *requestedMaxCCsDL* (i.e. only DL maximum limit is given):
- 5> remove from the list of candidates the band combinations for which the number of CCs in DL exceeds the value indicated in the *requestedMaxCCsDL*;
- 5> indicate value in *requestedCCsDL* the same value as received in *requestedMaxCCsDL*;
- 4> else if UE supports *maximumCCsRetrieval* and if the *UECapabilityEnquiry* message includes the *requestedMaxCCsUL* (i.e. only UL maximum limit is given):
- 5> remove from the list of candidates the band combinations for which the number of CCs in UL exceeds the value indicated in the *requestedMaxCCsUL*;
- 5> indicate in *requestedCCsUL* the same value as received in *requestedMaxCCsUL*;
- 4> if the UE supports *reducedIntNonContComb* and the *UECapabilityEnquiry* message includes *requestReducedIntNonContComb*:
- 5> set *reducedIntNonContCombRequested* to true;
- 5> remove from the list of candidates the intra-band non-contiguous CA band combinations which support is implied by another intra-band non-contiguous CA band combination included in the list of candidates as specified in TS 36.306 [5, 4.3.5.21]:
- 4> if the UE supports *requestReducedFormat* and UE supports *skipFallbackCombinations* and *UECapabilityEnquiry* message includes *requestSkipFallbackComb*:
- 5> set *skipFallbackCombRequested* to true;

5> for each band combination included in the list of candidates (including 2DL+1UL CA band combinations), starting with the ones with the lowest number of DL and UL carriers, that concerns a fallback band combination of another band combination included in the list of candidates as specified in TS 36.306 [5];

6> remove the band combination from the list of candidates;

6> include *differentFallbackSupported* in the band combination included in the list of candidates whose fallback concerns the removed band combination, if its capabilities differ from the removed band combination;

4> if the UE supports *requestReducedFormat* and *diffFallbackCombReport*, and *UECapabilityEnquiry* message includes *requestDiffFallbackCombList*:

5> if the UE does not support *skipFallbackCombinations* or *UECapabilityEnquiry* message does not include *requestSkipFallbackComb*:

6> remove all band combination from the list of candidates;

5> for each CA band combination indicated in *requestDiffFallbackCombList*:

6> include the CA band combination, if not already in the list of candidates;

6> include the fallback combinations for which the supported UE capabilities are different from the capability of the CA band combination;

5> include CA band combinations indicated in *requestDiffFallbackCombList* into *requestedDiffFallbackCombList*;

3> if the *UECapabilityEnquiry* message includes *requestReducedFormat* and UE supports *requestReducedFormat*:

4> include in *supportedBandCombinationReduced* as many as possible of the band combinations included in the list of candidates, including the non-CA combinations, determined according to the rules and priority order defined above;

3> else

4> if the *UECapabilityEnquiry* message includes *requestedFrequencyBands* and UE supports *requestedFrequencyBands*:

5> include in *supportedBandCombination* as many as possible of the band combinations included in the list of candidates, including the non-CA combinations and up to 5DL+5UL CA band combinations, determined according to the rules and priority order defined above;

5> include in *supportedBandCombinationAdd* as many as possible of the remaining band combinations included in the list of candidates, (i.e. the candidates not included in *supportedBandCombination*), up to 5DL+5UL CA band combinations, determined according to the rules and priority order defined above;

4> else

5> include in *supportedBandCombination* as many as possible of the band combinations included in the list of candidates, including the non-CA combinations and up to 5DL+5UL CA band combinations, determined according to the rules defined above;

5> if it is not possible to include in *supportedBandCombination* all the band combinations to be included according to the above, selection of the subset of band combinations to be included is left up to UE implementation;

3> indicate in *requestedBands* the same bands and in the same order as included in *requestedFrequencyBands*, if received;

3> if the UE is a category 0, M1 or M2 UE, or supports any UE capability information in *ue-RadioPagingInfo*, according to TS 36.306 [5];

4> include *ue-RadioPagingInfo* and set the fields according to TS 36.306 [5];

3> if the UE supports EN-DC and if *requestedFreqBandsNR-MRDC* is included in the request:

4> include into *featureSetsEUTRA* the feature sets that are applicable for the received *requestedFreqBandsNR-MRDC* as specified in TS 38.331 [82], clause 5.6.1.4.

NOTE: Even if the network requests (only) capabilities for *eutra*, it may include NR band numbers in the *requestedFreqBandsNR-MRDC* in order to ensure that the UE includes all necessary feature sets (i.e. E-UTRA and NR) needed for subsequently requested *eutra-nr* capabilities.

3> if the *UECapabilityEnquiry* message includes *request-sTTI-sPT-Capability* and if the UE supports short TTI and/or SPT:

4> for each band combination the UE included in a field of the *UECapabilityInformation* message in accordance with the previous:

4> if the UE supports short TTI, include the short TTI capabilities for each of the band combinations using the *sTTI-SPT-BandCombinationParameters*;

4> if the UE supports SPT, include the SPT capabilities for each of the band combinations using the *sTTI-SPT-BandCombinationParameters*;

NOTE: The UE may have to add/repeat the band combinations to the list of band combinations included earlier, to include short TTI capabilities and/or SPT capabilities.

2> if the UE supports short TTI and/or SPT:

3> include in the UE radio access capabilities the IE *sTTI-SPT-Supported* and set to *supported*;

2> if the *ue-CapabilityRequest* includes *geran-cs* and if the UE supports GERAN CS domain:

3> include the UE radio access capabilities for GERAN CS within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *geran-cs*;

2> if the *ue-CapabilityRequest* includes *geran-ps* and if the UE supports GERAN PS domain:

3> include the UE radio access capabilities for GERAN PS within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *geran-ps*;

2> if the *ue-CapabilityRequest* includes *utra* and if the UE supports UTRA:

3> include the UE radio access capabilities for UTRA within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *utra*;

2> if the *ue-CapabilityRequest* includes *cdma2000-1XRTT* and if the UE supports CDMA2000 1xRTT:

3> include the UE radio access capabilities for CDMA2000 within a *ue-CapabilityRAT-Container* and with the *rat-Type* set to *cdma2000-1XRTT*;

2> if the *ue-CapabilityRequest* includes *nr* and if the UE supports NR:

3> include the UE radio access capabilities for NR within a *ue-CapabilityRAT-Container*, with the *rat-Type* set to *nr*;

3> include band combinations and feature sets as specified in TS 38.331 [82], clause 5.6.1.4, considering the *FreqBandList* included in *requestedFreqBandsNR-MRDC* and the *eutra-nr-only* flag (if present);

2> if the *ue-CapabilityRequest* includes *eutra-nr* and if the UE supports EN-DC:

3> include the UE radio access capabilities for EUTRA-NR within a *ue-CapabilityRAT-Container*, with the *rat-Type* set to *eutra-nr*

3> include band combinations and feature sets as specified in TS 38.331 [82], clause 5.6.1.4, considering the *FreqBandList* included in *requestedFreqBandsNR-MRDC*;

1> submit the *UECapabilityInformation* message to lower layers for transmission, upon which the procedure ends;

8.2.1.1.1.3 Test description

8.2.1.1.1.3.1 Pre-test conditions

System Simulator:

- EUTRA Cell 1 is the PCell and NR Cell 1 is the PS Cell.

UE:

- None

Preamble:

- The UE is in state RRC_CONNECTED in EN-DC mode according to TS 38.508-1 [4] clause 4.5.4.2 with MCG(s) and SCG.

8.2.1.1.1.3.2 Test procedure sequence

Table 8.2.1.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a <i>UECapabilityEnquiry</i> message including eutra. | <-- | <i>UECapabilityEnquiry</i> | - | - |
| 2 | Check: Does the UE transmit a <i>UECapabilityInformation</i> message including UE radio access capability information as per the ue-CapabilityRequest variable? | --> | <i>UECapabilityInformation</i> | 1 | P |
| 3 | The SS transmits a <i>UECapabilityEnquiry</i> message including eutra-nr and nr. | <-- | <i>UECapabilityEnquiry</i> | - | - |
| 4 | Check: Does the UE transmit a <i>UECapabilityInformation</i> message including UE radio access capability information as per the ue-CapabilityRequest variable? | --> | <i>UECapabilityInformation</i> | 2 | P |

8.2.1.1.1.3.3 Specific message contents

Table 8.2.1.1.1.3.3-1: *UECapabilityEnquiry* (step 1, Table 8.2.1.1.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-22 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>UECapabilityEnquiry</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| ueCapabilityEnquiry-r8 SEQUENCE { | | | |
| ue-CapabilityRequest SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF RAT TYPE { | | | |
| RAT-Type [1] | eutra | | |

| | | | |
|---|-------------|--|--|
| } | | | |
| nonCriticalExtension SEQUENCE { | | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| requestedFrequencyBands-r11 SEQUENCE {} | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| requestReducedFormat-r13 | Not present | | |
| requestSkipFallbackComb-r13 | Not present | | |
| requestedMaxCCsDL-r13 | Not present | | |
| requestedMaxCCsUL-r13 | Not present | | |
| requestReducedIntNonContComb-r13 | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| requestDiffFallbackCombList-r14 | Not present | | |
| nonCriticalExtension SEQUENCE { | | | |
| requestedFreqBandsNR-MRDC-r15 | Not present | | |
| nonCriticalExtension SEQUENCE { | Not present | | |
| requestSTTI-SPT-Capability-r15 | true | | |
| eutra-nr-only-r15 | true | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| criticalExtensionsFuture SEQUENCE {} | | | |
| } | | | |
| } | | | |

Table 8.2.1.1.1.3.3-2: *UECapabilityInformation* (step 2, Table 8.2.1.1.1.3.2-1)

Derivation Path: 36.508 [7], Table 4.6.1-23

| Information Element | Value/remark | Comment | Condition |
|--|---------------------|--|-----------|
| UECapabilityInformation ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| ueCapabilityInformation-r8 SEQUENCE { | | | |
| ue-CapabilityRAT-ContainerList SEQUENCE
(SIZE (1..maxRAT-Capabilities)) OF SEQUENCE { | | | |
| rat-Type[1] | eutra | | pc_EUTRA |
| ueCapabilityRAT-Container [1] OCTET
STRING {} | UE-EUTRA-Capability | Encoded as per
TS 36.331 [11]
clause 6.3.6 | pc_EUTRA |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.1.1.1.3.3-3: UE-EUTRA-Capability (Table 8.2.1.1.1.3.3-2)

| Derivation Path: 36.331 [11], clause 6.3.6 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| UE-EUTRA-Capability ::= SEQUENCE { | | As per TS 36.523-
1 [13] Table
8.5.4.1.3.3-2;
details not
checked in teh
scope of the
present NR RRC
TC 8.2.1.1.1. | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|--|--------------------------|--|--|
| neighCellSI-AcquisitionParameters-v1530 | Not checked | | |
| mac-Parameters-v1530 | Not checked | | |
| phyLayerParameters-v1530 | Not checked | | |
| rf-Parameters-v1530 | Not checked | | |
| pdcp-Parameters-v1530 | Not checked | | |
| ue-CategoryDL-v1530 | Not checked | | |
| ue-BasedNetwPerfMeasParameters-v1530 | Not checked | | |
| rlc-Parameters-v1530 | Not checked | | |
| sl-Parameters-v1530 | Not checked | | |
| extendedNumberOfDRBs-r15 | Not checked | | |
| reducedCP-Latency-r15 | Not checked | | |
| laa-Parameters-v1530 | Not checked | | |
| ue-CategoryUL-v1530 | Not checked | | |
| fdd-Add-UE-EUTRA-Capabilities-v1530 SEQUENCE { | | Checked if any of the sub-IEs is present | |
| neighCellSI-AcquisitionParameters-v1530 | Not checked | | |
| reducedCP-Latency-r15 | Not checked | | |
| } | | | |
| tdd-Add-UE-EUTRA-Capabilities-v1530 SEQUENCE { | | Checked if any of the sub-IEs is present | |
| neighCellSI-AcquisitionParameters-v1530 | Not checked | | |
| reducedCP-Latency-r15 | Not checked | | |
| } | | | |
| nonCriticalExtension SEQUENCE { | | Checked if any of the sub-IEs is present | |
| phyLayerParameters-v1540 | Not checked | | |
| otherParameters-v1540 | Not checked | | |
| fdd-Add-UE-EUTRA-Capabilities-v1540 SEQUENCE { | | Checked if any of the sub-IEs is present | |
| eutra-5GC-Parameters-r15 | EUTRA-5GC-Parameters-r15 | | |

| Information Element | Value/remark | Comment | Condition |
|---------------------------------|-------------------------|---------|-----------|
| IRAT-ParameterNR-r15 SEQUENCE { | | | |
| en-DC-r15 | Not checked | | |
| eventB2-r15 | Not checked | | |
| supportedBandListEN-DC-r15 | SupportedBandListNR-r15 | | |
| } | | | |

Table 8.2.1.1.1.3.3-3B: PDCP-ParameterNR-r15 (Table 8.2.1.1.1.3.3-3)

| Derivation Path: 36.331 [11], clause 6.3.6 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCP-ParameterNR-r15 | Not checked | | |

Table 8.2.1.1.1.3.3-3C: EUTRA-5GC-Parameters-r15 (Table 8.2.1.1.1.3.3-3)

| Derivation Path: 36.331 [11], clause 6.3.6 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| EUTRA-5GC-Parameters-r15 SEQUENCE { | | | |
| eutra-5GC-r15 | Not checked | | |
| eutra-EPC-HO-EUTRA-5GC-r15 | Not checked | | |
| ho-EUTRA-5GC-FDD-TDD-r15 | Not checked | | |
| ho-InterfreqEUTRA-5GC-r15 | Not checked | | |
| ims-VoiceOverMCG-BearerEUTRA-5GC-r15 | Not checked | | |
| inactiveState-r15 | Not checked | | |
| reflectiveQoS-r15 | Not checked | | |
| } | | | |

Table 8.2.1.1.1.3.3-3D: IRAT-ParameterNR-v1540 (Table 8.2.1.1.1.3.3-3)

| Derivation Path: 36.331 [11], clause 6.3.6 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| IRAT-ParametersNR-v1540 SEQUENCE { | | | |
| eutra-5GC-HO-ToNR-FDD-FR1-r15 | Not checked | | |
| eutra-5GC-HO-ToNR-TDD-FR1-r15 | Not checked | | |
| eutra-5GC-HO-ToNR-FDD-FR2-r15 | Not checked | | |
| eutra-5GC-HO-ToNR-TDD-FR2-r15 | Not checked | | |

| | | | |
|-------------------------------|-------------------------|--|--|
| eutra-EPC-HO-ToNR-FDD-FR1-r15 | Not checked | | |
| eutra-EPC-HO-ToNR-TDD-FR1-r15 | Not checked | | |
| eutra-EPC-HO-ToNR-FDD-FR2-r15 | Not checked | | |
| eutra-EPC-HO-ToNR-TDD-FR2-r15 | Not checked | | |
| ims-VoiceOverNR-FR1-r15 | Not checked | | |
| ims-VoiceOverNR-FR2-r15 | Not checked | | |
| sa-NR-r15 | Not checked | | |
| supportedBandListNR-SA-r15 | SupportedBandListNR-r15 | | |
| } | | | |

Table 8.2.1.1.1.3.3-3E: *SupportedBandListNR-r15* (Table 8.2.1.1.1.3.3-3A and Table 8.2.1.1.1.3.3-3D)

| Derivation Path: 36.331 [11], clause 6.3.6 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SupportedBandListNR-r15 SEQUENCE (SIZE (1..maxBandsNR-r15)) OF SEQUENCE { | | | |
| bandNR-r15[i] | Not checked | | |
| } | | | |

Table 8.2.1.1.1.3.3-4: *UECapabilityEnquiry* (step 3, Table 8.2.1.1.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-22 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UECapabilityEnquiry ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| ueCapabilityEnquiry-r8 SEQUENCE { | | | |
| ue-CapabilityRequest SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF RAT TYPE { | | | |
| RAT-Type [1] | nr | | |
| RAT-Type [2] | eutra-nr | | |
| } | | | |
| nonCriticalExtension SEQUENCE { | | | |
| requestedFreqBandsNR-MRDC-r15 | OCTET STRING including the FreqBandList IE according to TS 38.508-1 [4] table [4.6.4-21] | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.1.1.1.3.3-5: *UECapabilityInformation* (step 4, Table 8.2.1.1.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-23 | | | |
|---|--------------------|--|------------------------|
| Information Element | Value/remark | Comment | Condition |
| UECapabilityInformation ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| ueCapabilityInformation-r8 SEQUENCE { | | | |
| ue-CapabilityRAT-ContainerList SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF SEQUENCE { | | | |
| rat-Type[1] | nr | | pc_NR_FDD or pc_NR_TDD |
| { ueCapabilityRAT-Container [1] OCTET STRING | UE-NR-Capability | Encoded as per TS 38.331 [12] clause 5.6.1 | pc_NR_FDD or pc_NR_TDD |
| rat-Type[2] | eutra-nr | | pc_EN_DC |
| { ueCapabilityRAT-Container [2] OCTET STRING | UE-MRDC-Capability | Encoded as per TS 38.331 [12] clause 5.6.1 | pc_EN_DC |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.1.1.1.3.3-6: *UE-NR-Capability* (Table 8.2.1.1.1.3.3-5)

| Derivation Path: 38.331 [12], clause 6.3.3 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|-----------------------------------|-------------|--------------------|-----------------------|
| UE-NR-Capability ::= SEQUENCE { | | | |
| accessStratumRelease | Checked | "rel-15" or higher | |
| pdcip-Parameters SEQUENCE { | | | |
| supportedROHC-Profiles SEQUENCE { | | | |
| profile0x0000 | Not checked | | |
| profile0x0001 | Not checked | | |
| profile0x0002 | Not checked | | |
| profile0x0003 | Not checked | | |
| profile0x0004 | Not checked | | |
| profile0x0006 | Not checked | | |
| profile0x0101 | Not checked | | |
| profile0x0102 | Not checked | | |
| profile0x0103 | Not checked | | |
| profile0x0104 | Not checked | | |
| } | | | |
| maxNumberROHC-ContextSessions | Not checked | | |
| uplinkOnlyROHC-Profiles | Not checked | | |
| continueROHC-Context | Not checked | | |
| outOfOrderDelivery | Checked | | pc_outOfOrderDelivery |
| shortSN | Checked | | pc_shortSN |
| pdcip-DuplicationSRB | Not checked | | |
| pdcip-DuplicationMCG-OrSCG-DRB | Not checked | | |
| } | | | |
| rlc-Parameters SEQUENCE { | | | |
| am-WithShortSN | Checked | | pc_am_WithShortSN |
| um-WithShortSN | Checked | | pc_um_WithShortSN |
| um-WithLongSN | Checked | | pc_um_WithLongSN |
| } | | | |
| mac-Parameters SEQUENCE { | | | |
| mac-ParametersCommon SEQUENCE { | | | |
| lcp-Restriction | Not checked | | |

| | | | |
|-----------------------------------|------------------|--|--------------------------------|
| dummy | Not checked | | |
| lch-ToSCellRestriction | Not checked | | |
| recommendedBitRate | Not checked | | |
| recommendedBitRateQuery | Not checked | | |
| } | | | |
| mac-ParametersXDD-Diff SEQUENCE { | | | |
| skipUplinkTxDynamic | Checked (NOTE 4) | | pc_skipUplinkTxDynamic |
| logicalChannelSR-DelayTimer | Checked (NOTE 5) | | pc_logicalChannelSR_DelayTimer |
| longDRX-Cycle | Checked (NOTE 6) | | pc_longDRX_Cycle |
| shortDRX-Cycle | Checked (NOTE 7) | | pc_shortDRX_Cycle |
| multipleSR-Configurations | Not checked | | |
| multipleConfiguredGrants | Not checked | | |
| } | | | |
| } | | | |
| phy-Parameters SEQUENCE { | | | |
| phy-ParametersCommon SEQUENCE { | | | |
| csi-RS-CFRA-ForHO | Checked | | pc_csi_RS_CFRA_ForHO |
| dynamicPRB-BundlingDL | Not checked | | |
| sp-CSI-ReportPUCCH | Not checked | | |
| sp-CSI-ReportPUSCH | Not checked | | |
| nzp-CSI-RS-IntefMgmt | Not checked | | |
| type2-SP-CSI-Feedback-LongPUCCH | Not checked | | |
| precoderGranularityCORESET | Not checked | | |
| dynamicHARQ-ACK-Codebook | Not checked | | |
| semiStaticHARQ-ACK-Codebook | Not checked | | |
| spatialBundlingHARQ-ACK | Not checked | | |
| dynamicBetaOffsetInd-HARQ-ACK-CSI | Not checked | | |
| pucch-Repetition-F1-3-4 | Not checked | | |
| ra-Type0-PUSCH | Checked | | pc_ra_Type0 |

| | | | |
|-----------------------------------|-------------|--|--------------------------------|
| | | | _PUSCH |
| dynamicSwitchRA-Type0-1-PDSCH | Not checked | | |
| dynamicSwitchRA-Type0-1-PUSCH | Not checked | | |
| pdsch-MappingTypeA | Checked | | pc_pdsch_MappingTypeA |
| pdsch-MappingTypeB | Checked | | pc_pdsch_MappingTypeB |
| interleavingVRB-ToPRB-PDSCH | Checked | | pc_interleavingVRB_ToPRB_PDSCH |
| interSlotFreqHopping-PUSCH | Not checked | | |
| type1-PUSCH-RepetitionMultiSlots | Not checked | | |
| type2-PUSCH-RepetitionMultiSlots | Not checked | | |
| pusch-RepetitionMultiSlots | Checked | | pc_pusch_RepetitionMultiSlots |
| pdsch-RepetitionMultiSlots | Checked | | pc_pdsch_RepetitionMultiSlots |
| downlinkSPS | Checked | | pc_downlinkSPS |
| configuredUL-GrantType1 | Checked | | pc_configuredUL_GrantType1 |
| configuredUL-GrantType2 | Checked | | pc_configuredUL_GrantType2 |
| pre-EmptIndication-DL | Not checked | | |
| cbg-TransIndication-DL | Not checked | | |
| cbg-TransIndication-UL | Not checked | | |
| cbg-FlushIndication-DL | Not checked | | |
| dynamicHARQ-ACK-CodeB-CBG-Retx-DL | Not checked | | |
| rateMatchingResrcSetSemi-Static | Not checked | | |
| rateMatchingResrcSetDynamic | Not checked | | |
| bwp-SwitchingDelay | Not checked | | |
| dummy | Not checked | | |
| maxNumberSearchSpaces | Checked | | pc_maxNumberSearchSpaces |

| | | | |
|--|-------------|--|--|
| rateMatchingCtrlResrsSetDynamic | Not checked | | |
| maxLayersMIMO-Indication | Not checked | | |
| } | | | |
| phy-ParametersXDD-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| } | | | |
| phy-ParametersFRX-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| dummy1 | Not checked | | |
| twoFL-DMRS | Not checked | | |
| dummy2 | Not checked | | |
| dummy3 | Not checked | | |
| supportedDMRS-TypeDL | Not checked | | |
| supportedDMRS-TypeUL | Not checked | | |
| semiOpenLoopCSI | Not checked | | |
| csi-ReportWithoutPMI | Not checked | | |
| csi-ReportWithoutCQI | Not checked | | |
| onePortsPTRS | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| pucch-F2-WithFH | Not checked | | |
| pucch-F3-WithFH | Not checked | | |
| pucch-F4-WithFH | Not checked | | |
| freqHoppingPUCCH-F0-2 | Not checked | | |
| freqHoppingPUCCH-F1-3-4 | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot | Not checked | | |
| uci-CodeBlockSegmentation | Not checked | | |
| onePUCCH-LongAndShortFormat | Not checked | | |

| | | | |
|---|-------------|--|--|
| twoPUCCH-AnyOthersInSlot | Not checked | | |
| intraSlotFreqHopping-PUSCH | Not checked | | |
| pusch-LBRM | Not checked | | |
| pdccch-BlindDetectionCA | Not checked | | |
| tpc-PUSCH-RNTI | Not checked | | |
| tpc-PUCCH-RNTI | Not checked | | |
| tpc-SRS-RNTI | Not checked | | |
| absoluteTPC-Command | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| pusch-HalfPi-BPSK | Not checked | | |
| pucch-F3-4-HalfPi-BPSK | Not checked | | |
| almostContiguousCP-OFDM-UL | Not checked | | |
| sp-CSI-RS | Not checked | | |
| sp-CSI-IM | Not checked | | |
| tdd-MultiDL-UL-SwitchPerSlot | Not checked | | |
| multipleCORESET | Not checked | | |
| csi-RS-IM-ReceptionForFeedback | Not checked | CSI-RS-IM-
ReceptionForFeed
back | |
| csi-RS-ProcFrameworkForSRS | Not checked | CSI-RS-
ProcFrameworkF
orSRS | |
| csi-ReportFramework | Not checked | CSI-
ReportFramework | |
| mux-SR-HARQ-ACK-CSI-PUCCH-OncePerSlot
SEQUENCE { | | | |
| sameSymbol | Not checked | | |
| diffSymbol | Not checked | | |
| } | | | |
| mux-SR-HARQ-ACK-PUCCH | Not checked | | |
| mux-MultipleGroupCtrlCH-Overlap | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| dl-64QAM-MCS-TableAlt | Not checked | | |

| | | | |
|--|-------------|---|---|
| ul-64QAM-MCS-TableAlt | Not checked | | |
| cqi-TableAlt | Not checked | | |
| oneFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| oneFL-DMRS-ThreeAdditionalDMRS-UL | Not checked | | |
| } | | | |
| phy-ParametersFR1 SEQUENCE { | | | |
| pdccchMonitoringSingleOccasion | Not checked | | |
| scs-60kHz | Not checked | | |
| pdsch-256QAM-FR1 | Checked | | pc_pdsch_25
6QAM_FR1 |
| pdsch-RE-MappingFR1-PerSymbol | Not checked | | |
| pdsch-RE-MappingFR1-PerSlot | Not checked | | |
| } | | | |
| phy-ParametersFR2 SEQUENCE { | | | |
| dummy | Not checked | | |
| pdsch-RE-MappingFR2-PerSymbol | Not checked | | |
| pCell-FR2 | Not checked | | |
| pdsch-RE-MappingFR2-PerSlot | Not checked | | |
| } | | | |
| } | | | |
| rf-Parameters SEQUENCE { | | | |
| supportedBandListNR SEQUENCE (SIZE
(1..maxBands)) OF SEQUENCE { | | | |
| bandNR[i] | Checked | Checked for
'maxBands'
entries of
FreqBandIndicato
rNR[i] | pc_nrBandx
('x' being the
band
number/type
related PICS
listed in TS
38.508-2) |
| modifiedMPR-Behaviour[i] | Not checked | | |
| mimo-ParametersPerBand[i] | Not checked | MIMO-
ParametersPerBan
d[i] | |
| extendedCP[i] | Not checked | | |
| multipleTCI[i] | Not checked | | |
| bwp-WithoutRestriction[i] | Not checked | | |

| | | | |
|-----------------------------------|-------------|--|---------------------|
| bwp-SameNumerology[i] | Not checked | | |
| bwp-DiffNumerology[i] | Not checked | | |
| crossCarrierScheduling-SameSCS[i] | Not checked | | |
| pdsch-256QAM-FR2[i] | Checked | | pc_pdsch_256QAM_FR2 |
| pusch-256QAM[i] | Checked | | pc_pusch_256QAM_FR1 |
| ue-PowerClass[i] | Not checked | | |
| rateMatchingLTE-CRS[i] | Not checked | | |
| channelBWs-DL-v1530[i] CHOICE { | | | |
| fr1 SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| } | | | |
| fr2 SEQUENCE { | | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| } | | | |
| channelBWs-UL-v1530[i] CHOICE { | | | |
| fr1 SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| } | | | |
| fr2 SEQUENCE { | | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| maxUplinkDutyCycle-PC2-FR1[i] | Not checked | | |
| pucch-SpatialRelInfoMAC-CE[i] | Not checked | | |
| powerBoosting-pi2BPSK[i] | Not checked | | |
| } | | | |

| | | | |
|---|-------------|--------------------------------|--|
| } | | | |
| supportedBandCombinationList SEQUENCE
(SIZE (1..maxBandComb)) OF SEQUENCE { | | | |
| bandList[i] SEQUENCE (SIZE
(1..maxSimultaneousBands)) OF CHOICE { | | | |
| eutra SEQUENCE { | | | |
| bandEUTRA | Not checked | FreqBandIndicato
rEUTRA | |
| ca-BandwidthClassDL-EUTRA | Not checked | CA-
BandwidthClassE
UTRA | |
| ca-BandwidthClassUL-EUTRA | Not checked | CA-
BandwidthClassE
UTRA | |
| } | | | |
| nr SEQUENCE { | | | |
| bandNR | Not checked | FreqBandIndicato
rNR | |
| ca-BandwidthClassDL-NR | Not checked | CA-
BandwidthClassN
R | |
| ca-BandwidthClassUL-NR | Not checked | CA-
BandwidthClassN
R | |
| } | | | |
| } | | | |
| featureSetCombination[i] | Not checked | FeatureSetCombi
nationId | |
| ca-ParametersEUTRA[i] | Not checked | CA-
ParametersEUTR
A | |
| ca-ParametersNR[i] | Not checked | CA-
ParametersNR | |
| mrdc-Parameters[i] | Not checked | MRDC-
Parameters | |
| supportedBandwidthCombinationSet[i] | Not checked | | |
| powerClass-v1530[i] | Not checked | | |
| } | | | |
| appliedFreqBandListFilter | Not checked | FreqBandList | |
| supportedBandCombinationList-v1540
SEQUENCE (SIZE (1..maxBandComb)) OF
SEQUENCE { | | | |

| | | | |
|---|-------------|-----------------------|------------------------|
| bandList-v1540[i] SEQUENCE (SIZE (1..maxSimultaneousBands)) OF SEQUENCE { | Not checked | BandParameters-v1540 | |
| srs-CarrierSwitch CHOICE { | | | |
| nr SEQUENCE [| | | |
| srs-SwitchingTimesListNR SEQUENCE (SIZE (1..maxSimultaneousBands)) OF SRS-SwitchingTimeNR | Not checked | | |
| } | | | |
| eutra SEQUENCE { | | | |
| srs-SwitchingTimesListEUTRA SEQUENCE (SIZE (1..maxSimultaneousBands)) OF SRS-SwitchingTimeEUTRA | Not checked | | |
| } | | | |
| } | | | |
| srs-TxSwitch-v1540 SEQUENCE { | | | |
| supportedSRS-TxPortSwitch | Not checked | | |
| txSwitchImpactToRx | Not checked | | |
| txSwitchWithAnotherBand | Not checked | | |
| } | | | |
| } | | | |
| ca-ParametersNR-v1540[i] | Not checked | CA-ParametersNR-v1540 | |
| } | | | |
| srs-SwitchingTimeRequested | Not checked | | |
| } | | | |
| measAndMobParameters SEQUENCE { | | | |
| measAndMobParametersCommon SEQUENCE { | | | |
| supportedGapPattern | Not checked | | |
| ssb-RLM | Not checked | | |
| ssb-AndCSI-RS-RLM | Not checked | | |
| eventB-MeasAndReport | Not checked | | |
| handoverFDD-TDD | Not checked | | |
| eutra-CGI-Reporting | Not checked | | |
| nr-CGI-Reporting | Not checked | | |
| independentGapConfig | Checked | | pc_independentGapConfi |

| | | | |
|---|------------------|--|---------------------------------|
| | | | g |
| periodicEUTRA-MeasAndReport | Not checked | | |
| handoverFR1-FR2 | Not checked | | |
| maxNumberCSI-RS-RRM-RS-SINR | Not checked | | |
| } | | | |
| measAndMobParametersXDD-Diff SEQUENCE { | | | |
| intraAndInterF-MeasAndReport | Checked (NOTE 1) | | pc_intraAndInterF-MeasAndReport |
| eventA-MeasAndReport | Checked (NOTE 2) | | pc_eventA-MeasAndReport |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| } | | | |
| measAndMobParametersFRX-Diff SEQUENCE { | | | |
| ss-SINR-Meas | Not checked | | |
| csi-RSRP-AndRSRQ-MeasWithSSB | Checked (NOTE 3) | | pc_csi-RSRP-AndRSRQ-MeasWithSSB |
| csi-RSRP-AndRSRQ-MeasWithoutSSB | Not checked | | |
| csi-SINR-Meas | Not checked | | |
| csi-RS-RLM | Not checked | | |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| maxNumberResource-CSI-RS-RLM | Not checked | | |
| } | | | |
| } | | | |
| fdd-Add-UE-NR-Capabilities SEQUENCE { | | | |
| phy-ParametersXDD-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |

| | | | |
|---|------------------|--|---------------------------------|
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| } | | | |
| mac-ParametersXDD-Diff SEQUENCE { | | | |
| skipUplinkTxDynamic | Checked (NOTE 4) | | pc_skipUplinkTxDynamic |
| logicalChannelSR-DelayTimer | Checked (NOTE 5) | | pc_logicalChannelSR_DelayTimer |
| longDRX-Cycle | Checked (NOTE 6) | | pc_longDRX_Cycle |
| shortDRX-Cycle | Checked (NOTE 7) | | pc_shortDRX_Cycle |
| multipleSR-Configurations | Not checked | | |
| multipleConfiguredGrants | Not checked | | |
| } | | | |
| measAndMobParametersXDD-Diff SEQUENCE { | | | |
| intraAndInterF-MeasAndReport | Checked (NOTE 1) | | pc_intraAndInterF-MeasAndReport |
| eventA-MeasAndReport | Checked (NOTE 2) | | pc_eventA-MeasAndReport |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| } | | | |
| } | | | |
| tdd-Add-UE-NR-Capabilities SEQUENCE { | | | |
| phy-ParametersXDD-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |

| | | | |
|---|------------------|--|---------------------------------|
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| } | | | |
| mac-ParametersXDD-Diff SEQUENCE { | | | |
| skipUplinkTxDynamic | Checked (NOTE 4) | | pc_skipUplinkTxDynamic |
| logicalChannelSR-DelayTimer | Checked (NOTE 5) | | pc_logicalChannelSR_DelayTimer |
| longDRX-Cycle | Checked (NOTE 6) | | pc_longDRX_Cycle |
| shortDRX-Cycle | Checked (NOTE 7) | | pc_shortDRX_Cycle |
| multipleSR-Configurations | Not checked | | |
| multipleConfiguredGrants | Not checked | | |
| } | | | |
| measAndMobParametersXDD-Diff SEQUENCE { | | | |
| intraAndInterF-MeasAndReport | Checked (NOTE 1) | | pc_intraAndInterF-MeasAndReport |
| eventA-MeasAndReport | Checked (NOTE 2) | | pc_eventA-MeasAndReport |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| } | | | |
| fr1-Add-UE-NR-Capabilities SEQUENCE { | | | |
| phy-ParametersFRX-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |
| dummy1 | Not checked | | |
| twoFL-DMRS | Not checked | | |
| dummy2 | Not checked | | |
| dummy3 | Not checked | | |

| | | | |
|--|-------------|--|--|
| supportedDMRS-TypeDL | Not checked | | |
| supportedDMRS-TypeUL | Not checked | | |
| semiOpenLoopCSI | Not checked | | |
| csi-ReportWithoutPMI | Not checked | | |
| csi-ReportWithoutCQI | Not checked | | |
| onePortsPTRS | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| pucch-F2-WithFH | Not checked | | |
| pucch-F3-WithFH | Not checked | | |
| pucch-F4-WithFH | Not checked | | |
| freqHoppingPUCCH-F0-2 | Not checked | | |
| freqHoppingPUCCH-F1-3-4 | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot | Not checked | | |
| uci-CodeBlockSegmentation | Not checked | | |
| onePUCCH-LongAndShortFormat | Not checked | | |
| twoPUCCH-AnyOthersInSlot | Not checked | | |
| intraSlotFreqHopping-PUSCH | Not checked | | |
| pusch-LBRM | Not checked | | |
| pdccch-BlindDetectionCA | Not checked | | |
| tpc-PUSCH-RNTI | Not checked | | |
| tpc-PUCCH-RNTI | Not checked | | |
| tpc-SRS-RNTI | Not checked | | |
| absoluteTPC-Command | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| pusch-HalfPi-BPSK | Not checked | | |
| pucch-F3-4-HalfPi-BPSK | Not checked | | |
| almostContiguousCP-OFDM-UL | Not checked | | |
| sp-CSI-RS | Not checked | | |
| sp-CSI-IM | Not checked | | |
| tdd-MultiDL-UL-SwitchPerSlot | Not checked | | |
| multipleCORESET | Not checked | | |
| csi-RS-IM-ReceptionForFeedback | Not checked | | |

| | | | |
|---|------------------|--|---|
| csi-RS-ProcFrameworkForSRS | Not checked | | |
| csi-ReportFramework | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-OncePerSlot
SEQUENCE { | | | |
| sameSymbol | Not checked | | |
| diffSymbol | Not checked | | |
| } | | | |
| mux-SR-HARQ-ACK-PUCCH | Not checked | | |
| mux-MultipleGroupCtrlCH-Overlap | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| dl-64QAM-MCS-TableAlt | Not checked | | |
| ul-64QAM-MCS-TableAlt | Not checked | | |
| cqi-TableAlt | Not checked | | |
| oneFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| oneFL-DMRS-ThreeAdditionalDMRS-UL | Not checked | | |
| } | | | |
| measAndMobParametersFRX-Diff SEQUENCE { | | | |
| ss-SINR-Meas | Not checked | | |
| csi-RSRP-AndRSRQ-MeasWithSSB | Checked (NOTE 3) | | pc_csi-
RSRP-
AndRSRQ-
MeasWithSS
B |
| csi-RSRP-AndRSRQ-MeasWithoutSSB | Not checked | | |
| csi-SINR-Meas | Not checked | | |
| csi-RS-RLM | Not checked | | |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| maxNumberResource-CSI-RS-RLM | Not checked | | |
| } | | | |
| } | | | |
| fr2-Add-UE-NR-Capabilities SEQUENCE { | | | |

| | | | |
|--|-------------|--|--|
| phy-ParametersFRX-Diff SEQUENCE { | Not checked | | |
| dynamicSFI | Not checked | | |
| dummy1 | Not checked | | |
| twoFL-DMRS | Not checked | | |
| dummy2 | Not checked | | |
| dummy3 | Not checked | | |
| supportedDMRS-TypeDL | Not checked | | |
| supportedDMRS-TypeUL | Not checked | | |
| semiOpenLoopCSI | Not checked | | |
| csi-ReportWithoutPMI | Not checked | | |
| csi-ReportWithoutCQI | Not checked | | |
| onePortsPTRS | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| pucch-F2-WithFH | Not checked | | |
| pucch-F3-WithFH | Not checked | | |
| pucch-F4-WithFH | Not checked | | |
| freqHoppingPUCCH-F0-2 | Not checked | | |
| freqHoppingPUCCH-F1-3-4 | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot | Not checked | | |
| uci-CodeBlockSegmentation | Not checked | | |
| onePUCCH-LongAndShortFormat | Not checked | | |
| twoPUCCH-AnyOthersInSlot | Not checked | | |
| intraSlotFreqHopping-PUSCH | Not checked | | |
| pusch-LBRM | Not checked | | |
| pdccch-BlindDetectionCA | Not checked | | |
| tpc-PUSCH-RNTI | Not checked | | |
| tpc-PUCCH-RNTI | Not checked | | |
| tpc-SRS-RNTI | Not checked | | |
| absoluteTPC-Command | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| pusch-HalfPi-BPSK | Not checked | | |
| pucch-F3-4-HalfPi-BPSK | Not checked | | |

| | | | |
|---|------------------|--|---|
| almostContiguousCP-OFDM-UL | Not checked | | |
| sp-CSI-RS | Not checked | | |
| sp-CSI-IM | Not checked | | |
| tdd-MultiDL-UL-SwitchPerSlot | Not checked | | |
| multipleCORESET | Not checked | | |
| csi-RS-IM-ReceptionForFeedback | Not checked | | |
| csi-RS-ProcFrameworkForSRS | Not checked | | |
| csi-ReportFramework | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-OncePerSlot
SEQUENCE { | | | |
| sameSymbol | Not checked | | |
| diffSymbol | Not checked | | |
| } | | | |
| mux-SR-HARQ-ACK-PUCCH | Not checked | | |
| mux-MultipleGroupCtrlCH-Overlap | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| dl-64QAM-MCS-TableAlt | Not checked | | |
| ul-64QAM-MCS-TableAlt | Not checked | | |
| cqi-TableAlt | Not checked | | |
| oneFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| oneFL-DMRS-ThreeAdditionalDMRS-UL | Not checked | | |
| } | | | |
| measAndMobParametersFRX-Diff SEQUENCE { | | | |
| ss-SINR-Meas | Not checked | | |
| csi-RSRP-AndRSRQ-MeasWithSSB | Checked (NOTE 3) | | pc_csi-
RSRP-
AndRSRQ-
MeasWithSS
B |
| csi-RSRP-AndRSRQ-MeasWithoutSSB | Not checked | | |
| csi-SINR-Meas | Not checked | | |
| csi-RS-RLM | Not checked | | |
| handoverInterF | Not checked | | |

| | | | |
|---|-------------|--|--|
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| maxNumberResource-CSIRSRM | Not checked | | |
| } | | | |
| } | | | |
| featureSets SEQUENCE { | | | |
| featureSetsDownlink SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF SEQUENCE { | | | |
| featureSetListPerDownlinkCC[i] | Not checked | | |
| intraBandFreqSeparationDL[i] | Not checked | | |
| scalingFactor[i] | Not checked | | |
| crossCarrierScheduling-OtherSCS[i] | Not checked | | |
| scellWithoutSSB[i] | Not checked | | |
| csi-RS-MeasSCellWithoutSSB[i] | Not checked | | |
| dummy1[i] | Not checked | | |
| type1-3-CSS[i] | Not checked | | |
| pdccch-MonitoringAnyOccasions[i] | Not checked | | |
| dummy2[i] | Not checked | | |
| ue-SpecificUL-DL-Assignment[i] | Not checked | | |
| searchSpaceSharingCA-DL[i] | Not checked | | |
| timeDurationForQCL[i] SEQUENCE { | | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| pdsch-ProcessingType1-DifferentTB-PerSlot[i] SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| dummy3[i] | Not checked | | |
| dummy4[i] | Not checked | | |
| dummy5[i] | Not checked | | |

| | | | |
|--|-------------|--------------------|--|
| dummy6[i] | Not checked | | |
| dummy7[i] | Not checked | | |
| } | | | |
| featureSetsDownlinkPerCC SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF SEQUENCE { | | | |
| supportedSubcarrierSpacingDL[i] | Not checked | SubcarrierSpacing | |
| supportedBandwidthDL[i] | Not checked | SupportedBandwidth | |
| channelBW-90mhz[i] | Not checked | | |
| maxNumberMIMO-LayersPDSCH[i] | Not checked | MIMO-LayersDL | |
| supportedModulationOrderDL[i] | Not checked | ModulationOrder | |
| } | | | |
| featureSetsUplink SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF SEQUENCE { | | | |
| featureSetListPerUplinkCC[i] | Not checked | | |
| scalingFactor[i] | Not checked | | |
| crossCarrierScheduling-OtherSCS[i] | Not checked | | |
| intraBandFreqSeparationUL[i] | Not checked | | |
| searchSpaceSharingCA-UL[i] | Not checked | | |
| dummy1[i] | Not checked | | |
| supportedSRS-Resources[i] | Not checked | SRS-Resources | |
| twoPUCCH-Group[i] | Not checked | | |
| dynamicSwitchSUL[i] | Not checked | | |
| simultaneousTxSUL-NonSUL[i] | Not checked | | |
| pusch-ProcessingType1-DifferentTB-PerSlot[i] SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| dummy2[i] | Not checked | | |
| } | | | |
| featureSetsUplinkPerCC SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF SEQUENCE { | | | |
| supportedSubcarrierSpacingUL[i] | Not checked | SubcarrierSpacing | |

| | | | |
|---|-------------|--------------------|-----------------------|
| supportedBandwidthUL[i] | Not checked | SupportedBandwidth | |
| channelBW-90mHz[i] | Not checked | | |
| mimo-CB-PUSCH[i] SEQUENCE { | | | |
| maxNumberMIMO-LayersCB-PUSCH | Checked | MIMO-LayersUL | pc_nrMIMO_CB_PUSCH |
| maxNumberSRS-ResourcePerSet | Not checked | | |
| } | | | |
| maxNumberMIMO-LayersNonCB-PUSCH | Checked | MIMO-LayersUL | pc_nrMIMO_NonCB_PUSCH |
| supportedModulationOrderUL | Not checked | ModulationOrder | |
| } | | | |
| featureSetsDownlink-v1540 SEQUENCE (SIZE (1..maxDownlinkFeatureSets)) OF SEQUENCE { | | | |
| oneFL-DMRS-TwoAdditionalDMRS-DL[i] | Not checked | | |
| additionalDMRS-DL-Alt[i] | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-DL[i] | Not checked | | |
| oneFL-DMRS-ThreeAdditionalDMRS-DL[i] | Not checked | | |
| pdccch-MonitoringAnyOccasionsWithSpanGap[i] SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| scs-120kHz | Not checked | | |
| } | | | |
| pdsch-SeparationWithGap[i] | Not checked | | |
| pdsch-ProcessingType2[i] SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| } | | | |
| pdsch-ProcessingType2-Limited[i] SEQUENCE { | | | |
| differentTB-PerSlot-SCS-30kHz | Not checked | | |
| } | | | |

| | | | |
|--|-------------|----------------------------|--|
| dl-MCS-TableAlt-DynamicIndication[i] | Not checked | | |
| } | | | |
| featureSetsUplink-v1540 SEQUENCE (SIZE (1..maxUplinkFeatureSets)) OF SEQUENCE { | | | |
| zeroSlotOffsetAperiodicSRS | Not checked | | |
| pa-PhaseDiscontinuityImpacts | Not checked | | |
| pusch-SeparationWithGap | Not checked | | |
| pusch-ProcessingType2 SEQUENCE { | | | |
| scs-15kHz | Not checked | | |
| scs-30kHz | Not checked | | |
| scs-60kHz | Not checked | | |
| } | | | |
| ul-MCS-TableAlt-DynamicIndication | Not checked | | |
| } | | | |
| featureSetsUplinkPerCC-v1540 SEQUENCE (SIZE (1..maxPerCC-FeatureSets)) OF SEQUENCE { | | | |
| mimo-NonCB-PUSCH SEQUENCE { | | | |
| maxNumberSRS-ResourcePerSet | Not checked | | |
| maxNumberSimultaneousSRS-ResourceTx | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| featureSetCombinations SEQUENCE (SIZE (1..maxFeatureSetCombinations)) OF { | | | |
| FeatureSetCombination[i] SEQUENCE (SIZE (1..maxSimultaneousBands)) OF { | | | |
| FeatureSetsPerBand[ii] SEQUENCE (SIZE (1..maxFeatureSetsPerBand)) OF { | | | |
| FeatureSet[iii] CHOICE { | | | |
| eutra SEQUENCE { | | | |
| downlinkSetEUTRA | Not checked | FeatureSetEUTRA-DownlinkId | |
| uplinkSetEUTRA | Not checked | FeatureSetEUTRA-UplinkId | |
| } | | | |
| nr SEQUENCE { | | | |

| | | | |
|---|-------------|----------------------|--|
| downlinkSetNR | Not checked | FeatureSetDownlinkId | |
| uplinkSetNR | Not checked | FeatureSetUplinkId | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| lateNonCriticalExtension | Not checked | | |
| nonCriticalExtension SEQUENCE { | | | |
| fdd-Add-UE-NR-Capabilities-v1530 SEQUENCE { | | | |
| eutra-ParametersXDD-Diff SEQUENCE { | | | |
| rsrqMeasWidebandEUTRA | Not checked | | |
| } | | | |
| } | | | |
| tdd-Add-UE-NR-Capabilities-v1530 SEQUENCE { | | | |
| eutra-ParametersXDD-Diff SEQUENCE { | | | |
| rsrqMeasWidebandEUTRA | Not checked | | |
| } | | | |
| } | | | |
| dummy | Not checked | | |
| interRAT-Parameters SEQUENCE { | | | |
| eutra SEQUENCE { | | | |
| supportedBandListEUTRA SEQUENCE (SIZE (1..maxBandsEUTRA)) OF FreqBandIndicatorEUTRA | Not checked | | |
| eutra-ParametersCommon SEQUENCE { | | | |
| mfbi-EUTRA | Not checked | | |
| modifiedMRP-BehaviorEUTRA | Not checked | | |
| multiNS-Pmax-EUTRA | Not checked | | |
| rs-SINR-MeasEUTRA | Not checked | | |
| } | | | |
| eutra-ParametersXDD-Diff SEQUENCE { | | | |

| | | | |
|---|-------------|--|---------------------|
| rsrqMeasWidebandEUTRA | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| inactiveState | Not checked | | |
| delayBudgetReporting | Not checked | | |
| nonCriticalExtension SEQUENCE { | Not checked | | |
| sdap-Parameters SEQUENCE { | | | |
| as-ReflectiveQoS | Checked | | pc_as_ReflectiveQoS |
| } | | | |
| overheatingInd | Not checked | | |
| ims-Parameters SEQUENCE { | | | |
| ims-ParametersCommon SEQUENCE { | | | |
| voiceOverEUTRA-5GC | Not checked | | |
| } | | | |
| ims-ParametersFRX-Diff SEQUENCE { | | | |
| voiceOverNR | Not checked | | |
| } | | | |
| } | | | |
| fr1-Add-UE-NR-Capabilities-v1540 SEQUENCE { | | | |
| ims-ParametersFRX-Diff SEQUENCE { | | | |
| voiceOverNR | Not checked | | |
| } | | | |
| } | | | |
| fr2-Add-UE-NR-Capabilities-v1540 SEQUENCE { | | | |
| ims-ParametersFRX-Diff SEQUENCE { | | | |
| voiceOverNR | Not checked | | |
| } | | | |
| } | | | |
| fr1-fr2-Add-UE-NR-Capabilities SEQUENCE { | | | |
| phy-ParametersFRX-Diff SEQUENCE { | | | |
| dynamicSFI | Not checked | | |

| | | | |
|--|-------------|--|--|
| dummy1 | Not checked | | |
| twoFL-DMRS | Not checked | | |
| dummy2 | Not checked | | |
| dummy3 | Not checked | | |
| supportedDMRS-TypeDL | Not checked | | |
| supportedDMRS-TypeUL | Not checked | | |
| semiOpenLoopCSI | Not checked | | |
| csi-ReportWithoutPMI | Not checked | | |
| csi-ReportWithoutCQI | Not checked | | |
| onePortsPTRS | Not checked | | |
| twoPUCCH-F0-2-ConsecSymbols | Not checked | | |
| pucch-F2-WithFH | Not checked | | |
| pucch-F3-WithFH | Not checked | | |
| pucch-F4-WithFH | Not checked | | |
| freqHoppingPUCCH-F0-2 | Not checked | | |
| freqHoppingPUCCH-F1-3-4 | Not checked | | |
| mux-SR-HARQ-ACK-CSI-PUCCH-MultiPerSlot | Not checked | | |
| uci-CodeBlockSegmentation | Not checked | | |
| onePUCCH-LongAndShortFormat | Not checked | | |
| twoPUCCH-AnyOthersInSlot | Not checked | | |
| intraSlotFreqHopping-PUSCH | Not checked | | |
| pusch-LBRM | Not checked | | |
| pdcc-BlindDetectionCA | Not checked | | |
| tpc-PUSCH-RNTI | Not checked | | |
| tpc-PUCCH-RNTI | Not checked | | |
| tpc-SRS-RNTI | Not checked | | |
| absoluteTPC-Command | Not checked | | |
| twoDifferentTPC-Loop-PUSCH | Not checked | | |
| twoDifferentTPC-Loop-PUCCH | Not checked | | |
| pusch-HalfPi-BPSK | Not checked | | |
| pucch-F3-4-HalfPi-BPSK | Not checked | | |
| almostContiguousCP-OFDM-UL | Not checked | | |
| sp-CSI-RS | Not checked | | |

| | | | |
|--|------------------|---------------------------------------|---|
| sp-CSI-IM | Not checked | | |
| tdd-MultiDL-UL-SwitchPerSlot | Not checked | | |
| multipleCORESET | Not checked | | |
| csi-RS-IM-ReceptionForFeedback | Not checked | CSI-RS-IM-
eceptionForFeedb
ack | |
| csi-RS-ProcFrameworkForSRS | Not checked | CSI-RS-
ProcFrameworkF
orSRS | |
| csi-ReportFramework | Not checked | CSI-
ReportFramework | |
| mux-SR-HARQ-ACK-CSI-PUCCH-
OncePerSlot SEQUENCE { | | | |
| sameSymbol | Not checked | | |
| diffSymbol | Not checked | | |
| } | | | |
| mux-SR-HARQ-ACK-PUCCH | Not checked | | |
| mux-MultipleGroupCtrlCH-Overlap | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeA | Not checked | | |
| dl-SchedulingOffset-PDSCH-TypeB | Not checked | | |
| ul-SchedulingOffset | Not checked | | |
| dl-64QAM-MCS-TableAlt | Not checked | | |
| ul-64QAM-MCS-TableAlt | Not checked | | |
| cqi-TableAlt | Not checked | | |
| oneFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| twoFL-DMRS-TwoAdditionalDMRS-UL | Not checked | | |
| oneFL-DMRS-ThreeAdditionalDMRS-UL | Not checked | | |
| } | | | |
| measAndMobParametersFRX-Diff SEQUENCE
{ | | | |
| ss-SINR-Meas | Not checked | | |
| csi-RSRP-AndRSRQ-MeasWithSSB | Checked (NOTE 3) | | pc_csi-
RSRP-
AndRSRQ-
MeasWithSS
B |
| csi-RSRP-AndRSRQ-MeasWithoutSSB | Not checked | | |
| csi-SINR-Meas | Not checked | | |

| | | | |
|----------------------------------|-------------|--|--|
| csi-RS-RLM | Not checked | | |
| handoverInterF | Not checked | | |
| handoverLTE | Not checked | | |
| handover-eLTE | Not checked | | |
| maxNumberResource-CSI-RS-RLM | Not checked | | |
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | Not checked | | |
| } | | | |
| } | | | |

Note 1: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and *intraAndInterF-MeasAndReport* is supported in both modes, then support of *intraAndInterF-MeasAndReport* will be signaled in *measAndMobParameters/measAndMobParametersXDD-Diff*.

If the UE is dual mode (FDD + TDD) and *intraAndInterF-MeasAndReport* is only supported in one mode, then support of *intraAndInterF-MeasAndReport* will be signaled in *measAndMobParameters/measAndMobParametersXDD-Diff* and also in one of *fdd-Add-UE-NR-Capabilities/measAndMobParametersXDD-Diff* or *tdd-Add-UE-NR-Capabilities/measAndMobParametersXDD-Diff* as appropriate.)

Note 2: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and *eventA-MeasAndReport* is supported in both modes, then support of *eventA-MeasAndReport* will be signaled in *measAndMobParameters/measAndMobParametersXDD-Diff*.

If the UE is dual mode (FDD + TDD) and *eventA-MeasAndReport* is only supported in one mode, then support of *eventA-MeasAndReport* will be signaled in *measAndMobParameters/measAndMobParametersXDD-Diff* and also in one of *fdd-Add-UE-NR-Capabilities/measAndMobParametersXDD-Diff* or *tdd-Add-UE-NR-Capabilities/measAndMobParametersXDD-Diff* as appropriate.

Note 3: If the UE supports single frequency range (FR1 or FR2), or the UE supports both frequency ranges (FR1 and FR2) and *csi-RSRP-AndRSRQ-MeasWithSSB* is supported in both frequency ranges, then support of *csi-RSRP-AndRSRQ-MeasWithSSB* will be signaled in *measAndMobParameters/MeasAndMobParametersFRX-Diff*.

If the UE supports both frequency ranges (FR1 + FR2) and *csi-RSRP-AndRSRQ-MeasWithSSB* is only supported in one frequency range, then support of *csi-RSRP-AndRSRQ-MeasWithSSB* will be signaled in *measAndMobParameters/measAndMobParametersFRX-Diff* and also in one of *fr1-Add-UE-NR-Capabilities/measAndMobParametersFRX-Diff* or *fr2-Add-UE-NR-Capabilities/measAndMobParametersFRX-Diff* as appropriate.)

Note 4: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and *skipUplinkTxDynamic* is supported in both modes, then support of *skipUplinkTxDynamic* will be signaled in *mac-Parameters/mac-ParametersXDD-Diff*.

If the UE is dual mode (FDD + TDD) and *skipUplinkTxDynamic* is only supported in one mode, then *skipUplinkTxDynamic* will be signaled in *mac-Parameters/mac-ParametersXDD-Diff* and also in one of *fdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff* or *tdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff* as appropriate.

Note 5: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and *logicalChannelSR-DelayTimer* is supported in both modes, then support of *logicalChannelSR-DelayTimer* will be signaled in *mac-Parameters/mac-ParametersXDD-Diff*.

If the UE is dual mode (FDD + TDD) and *logicalChannelSR-DelayTimer* is only supported in one mode, then support of *logicalChannelSR-DelayTimer* will be signaled in *mac-Parameters/mac-ParametersXDD-Diff* and also in one of *fdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff* or *tdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff* as appropriate.

Note 6: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and *pc_longDRX_Cycle* is supported in both modes, then support of *pc_longDRX_Cycle* will be signaled in *mac-Parameters/mac-ParametersXDD-Diff*.

If the UE is dual mode (FDD + TDD) and *pc_longDRX_Cycle* is only supported in one mode, then support of

pc_longDRX_Cycle will be signaled in mac-Parameters/mac-ParametersXDD-Diff and also in one of fdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff or tdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff as appropriate.

Note 7: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and *pc_shortDRX_Cycle* is supported in both modes, then support of *pc_shortDRX_Cycle* will be signaled in mac-Parameters/mac-ParametersXDD-Diff.

If the UE is dual mode (FDD + TDD) and *pc_shortDRX_Cycle* is only supported in one mode, then support of *pc_shortDRX_Cycle* will be signaled in mac-Parameters/mac-ParametersXDD-Diff and also in one of fdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff or tdd-Add-UE-NR-Capabilities/mac-ParametersXDD-Diff as appropriate.

Table 8.2.1.1.1.3.3-7: *UE-MRDC-Capability* (Table 8.2.1.1.1.3.3-5)

| Derivation Path: 38.331 [12], clause 6.3.3 | | | |
|---|--------------|---------|-------------------------|
| Information Element | Value/remark | Comment | Condition |
| UE-MRDC-Capability ::= SEQUENCE { | | | |
| measAndMobParametersMRDC SEQUENCE { | | | |
| measAndMobParametersMRDC-Common SEQUENCE { | | | |
| independentGapConfig | Checked | | pc_independentGapConfig |
| } | | | |
| measAndMobParametersMRDC-XDD-Diff SEQUENCE { | | | |
| sftd-MeasPSCell | Not checked | | |
| sftd-MeasNR-Cell | Not checked | | |
| } | | | |
| measAndMobParametersMRDC-FRX-Diff SEQUENCE { | | | |
| simultaneousRxDataSSB-DiffNumerology | Not checked | | |
| } | | | |
| } | | | |
| phy-ParametersMRDC-v1530 SEQUENCE { | | | |
| naics-Capability-List SEQUENCE (SIZE (1..maxNrofNAICS-Entries)) OF SEQUENCE { | Not checked | | |
| numberOfNAICS-CapableCC[i] | Not checked | | |
| numberOfAggregatedPRB[i] | Not checked | | |
| } | | | |
| } | | | |
| rf-ParametersMRDC SEQUENCE { | | | |

| | | | |
|--|-------------|--------------------------------|--------------------------------|
| supportedBandCombinationList SEQUENCE {
{ (SIZE (1..maxBandComb)) OF SEQUENCE { | | | |
| bandList[i] SEQUENCE (SIZE
(1..maxSimultaneousBands)) OF CHOICE { | Not checked | | |
| eutra SEQUENCE { | | | |
| bandEUTRA | Not checked | FreqBandIndicato
rEUTRA | |
| ca-BandwidthClassDL-EUTRA | Not checked | CA-
BandwidthClassE
UTRA | |
| ca-BandwidthClassUL-EUTRA | Not checked | CA-
BandwidthClassE
UTRA | |
| } | | | |
| nr SEQUENCE { | | | |
| bandNR | Not checked | FreqBandIndicato
rNR | |
| ca-BandwidthClassDL-NR | Not checked | CA-
BandwidthClassN
R | |
| ca-BandwidthClassUL-NR | Not checked | CA-
BandwidthClassN
R | |
| } | | | |
| } | | | |
| featureSetCombination[i] | Not checked | FeatureSetCombi
nationId | |
| ca-ParametersEUTRA[i] | Not checked | CA-
ParametersEUTR
A | |
| ca-ParametersNR[i] | Not checked | CA-
ParametersNR | |
| mrdc-Parameters[i] SEQUENCE { | | | |
| singleUL-Transmission | Not checked | | |
| dynamicPowerSharing | Checked | | pc_dynamic
PowerSharin
g |
| tdm-Pattern | Not checked | | |
| ul-SharingEUTRA-NR | Not checked | | |
| ul-SwitchingTimeEUTRA-NR | Not checked | | |
| simultaneousRxTxInterBandENDC | Not checked | | |
| asyncIntraBandENDC | Not checked | | |

| | | | |
|--|-------------|-------------------------------|--|
| dualPA-Architecture | Not checked | | |
| intraBandENDC-Support-v1540 | Not checked | | |
| ul-TimingAlignmentEUTRA-NR | Not checked | | |
| } | | | |
| supportedBandwidthCombinationSet[i] | Not checked | | |
| powerClass-v1530 | Not checked | | |
| } | | | |
| appliedFreqBandListFilter | Not checked | FreqBandList | |
| srs-SwitchingTimeRequested | Not checked | | |
| supportedBandCombinationList-v1540
SEQUENCE (SIZE (1..maxBandComb)) OF
SEQUENCE { | | BandCombination
List-v1540 | |
| bandList-v1540[i] SEQUENCE (SIZE
(1..maxSimultaneousBands)) OF SEQUENCE { | | | |
| srs-CarrierSwitch CHOICE { | | | |
| nr SEQUENCE { | | | |
| srs-SwitchingTimesListNR SEQUENCE
(SIZE (1..maxSimultaneousBands)) OF SRS-
SwitchingTimeNR | Not checked | | |
| } | | | |
| eutra SEQUENCE { | | | |
| srs-SwitchingTimesListEUTRA SEQUENCE
(SIZE (1..maxSimultaneousBands)) OF SRS-
SwitchingTimeEUTRA | Not checked | | |
| } | | | |
| } | | | |
| srs-TxSwitch-v1540 SEQUENCE { | | | |
| supportedSRS-TxPortSwitch | Not checked | | |
| txSwitchImpactToRx | Not checked | | |
| txSwitchWithAnotherBand | Not checked | | |
| } | | | |
| } | | | |
| ca-ParametersNR-v1540[i] SEQUENCE { | | | |
| simultaneousSRS-AssocCSI-RS-AllCC | Not checked | | |
| csi-RS-IM-
ReceptionForFeedbackPerBandComb SEQUENCE { | | | |

| | | | |
|---|------------------|--|----------------------------------|
| maxNumberSimultaneousNZP-CSI-RS-ActBWP-AllCC | Not checked | | |
| totalNumberPortsSimultaneousNZP-CSI-RS-ActBWP-AllCC | Not checked | | |
| } | | | |
| simultaneousCSI-ReportsAllCC | Not checked | | |
| dualPA-Architecture | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| generalParametersMRDC SEQUENCE { | | | |
| splitSRB-WithOneUL-Path | Checked (NOTE 1) | | pc_splitSRB_WithOneUL_Path |
| splitDRB-withUL-Both-MCG-SCG | Checked (NOTE 2) | | pc_splitDRB_withUL_Both_MCG_SC G |
| srB3 | Checked (NOTE 1) | | pc_srb3 |
| v2x-EUTRA | Not checked | | |
| } | | | |
| fdd-Add-UE-MRDC-Capabilities SEQUENCE { | | | |
| measAndMobParametersMRDC-XDD-Diff SEQUENCE { | | | |
| sftd-MeasPSCell | Not checked | | |
| sftd-MeasNR-Cell | Not checked | | |
| } | | | |
| generalParametersMRDC-XDD-Diff SEQUENCE { | | | |
| splitSRB-WithOneUL-Path | Checked (NOTE 1) | | pc_splitSRB_WithOneUL_Path |
| splitDRB-withUL-Both-MCG-SCG | Checked (NOTE 2) | | pc_splitDRB_withUL_Both_MCG_SC G |
| srB3 | Checked (NOTE 3) | | pc_srb3 |
| v2x-EUTRA-v1530 | Not checked | | |
| } | | | |
| } | | | |

| | | | |
|--|------------------|-----------------------|----------------------------------|
| tdd-Add-UE-MRDC-Capabilities SEQUENCE { | | | |
| measAndMobParametersMRDC-XDD-Diff SEQUENCE { | | | |
| sftd-MeasPSCell | Not checked | | |
| sftd-MeasNR-Cell | Not checked | | |
| } | | | |
| generalParametersMRDC-XDD-Diff SEQUENCE { | | | |
| splitSRB-WithOneUL-Path | Checked (NOTE 1) | | pc_splitSRB_WithOneUL_Path |
| splitDRB-withUL-Both-MCG-SCG | Checked (NOTE 2) | | pc_splitDRB_withUL_Both_MCG_SC G |
| srb3 | Checked (NOTE 3) | | pc_srb3 |
| v2x-EUTRA-v1530 | Not checked | | |
| } | | | |
| } | | | |
| fr1-Add-UE-MRDC-Capabilities SEQUENCE { | | | |
| measAndMobParametersMRDC-FRX-Diff SEQUENCE { | | | |
| simultaneousRxDataSSB-DiffNumerology | Not checked | | |
| } | | | |
| } | | | |
| fr2-Add-UE-MRDC-Capabilities SEQUENCE { | | | |
| measAndMobParametersMRDC-FRX-Diff SEQUENCE { | | | |
| simultaneousRxDataSSB-DiffNumerology | Not checked | | |
| } | | | |
| } | | | |
| featureSetCombinations SEQUENCE (SIZE (1..maxFeatureSetCombinations)) OF SEQUENCE[i] (SIZE (1..maxSimultaneousBands)) OF SEQUENCE[ii] (SIZE (1..maxFeatureSetsPerBand)) OF CHOICE {{ | Not checked | FeatureSetCombination | |
| eutra SEQUENCE { | | | |
| downlinkSetEUTRA | Not checked | | |
| uplinkSetEUTRA | Not checked | | |

| | | | |
|--------------------------------------|-------------|--|--|
| } | | | |
| nr SEQUENCE { | | | |
| downlinkSetNR | Not checked | | |
| uplinkSetNR | Not checked | | |
| } | | | |
| } | | | |
| pdcp-ParametersMRDC-v1530 SEQUENCE { | | | |
| pdcp-DuplicationSplitSRB | Not checked | | |
| pdcp-DuplicationSplitDRB | Not checked | | |
| } | | | |
| lateNonCriticalExtension | Not checked | | |
| nonCriticalExtension SEQUENCE { } | Not checked | | |
| } | | | |

Note 1: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and *splitSRB-WithOneUL-Path* is supported in both modes, then support of *splitSRB-WithOneUL-Path* will be signaled in `generalParametersMRDC/generalParametersMRDC-XDD-Diff`.

If the UE is dual mode (FDD + TDD) and *splitSRB-WithOneUL-Path* is only supported in one mode, then support of *splitSRB-WithOneUL-Path* will be signaled in `generalParametersMRDC/generalParametersMRDC-XDD-Diff` and also in one of `fdd-Add-UE-MRDC-Capabilities/generalParametersMRDC-XDD-Diff` or `tdd-Add-UE-MRDC-Capabilities/generalParametersMRDC-XDD-Diff` as appropriate.)

Note 2: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and *splitDRB-withUL-Both-MCG-SCG* is supported in both modes, then support of *splitDRB-withUL-Both-MCG-SCG* will be signaled in `generalParametersMRDC/generalParametersMRDC-XDD-Diff`.

If the UE is dual mode (FDD + TDD) and *splitDRB-withUL-Both-MCG-SCG* is only supported in one mode, then support of *splitDRB-withUL-Both-MCG-SCG* will be signaled in `generalParametersMRDC/generalParametersMRDC-XDD-Diff` and also in one of `fdd-Add-UE-MRDC-Capabilities/generalParametersMRDC-XDD-Diff` or `tdd-Add-UE-MRDC-Capabilities/generalParametersMRDC-XDD-Diff` as appropriate.)

Note 3: If the UE is single mode (FDD or TDD), or the UE is dual mode (FDD and TDD) and *srB3* is supported in both modes, then support of *srB3* will be signaled in `generalParametersMRDC/generalParametersMRDC-XDD-Diff`.

If the UE is dual mode (FDD + TDD) and *srB3* is only supported in one mode, then support of *srB3* will be signaled in `generalParametersMRDC/generalParametersMRDC-XDD-Diff` and also in one of `fdd-Add-UE-MRDC-Capabilities/generalParametersMRDC-XDD-Diff` or `tdd-Add-UE-MRDC-Capabilities/generalParametersMRDC-XDD-Diff` as appropriate.)

8.2.1.2 Void

8.2.2 Radio Bearer Addition, Modification and Release

8.2.2.1 Radio Bearer Addition, Modification and Release / SRB

8.2.2.1.1 SRB3 Establishment, Reconfiguration and Release / NR addition, modification and release / EN-DC

8.2.2.1.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to add SRB3 }

then { UE establishes SRB3 and sends an RRCConnectionReconfigurationComplete message on SRB1 }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and SRB3 configured }

ensure that {

when { UE receives an RRCReconfiguration message on SRB3 to reconfigure NR MAC }

then { UE reconfigures NR MAC and sends RRCReconfigurationComplete message on SRB3 }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and SRB3 configured }

ensure that {

when { UE receives an RRCReconfiguration message on SRB3 to reestablish NR PDCP }

then { UE reestablishes NR PDCP and sends RRCReconfigurationComplete message on SRB3 }

}

(4)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to release SRB3 }

then { UE releases SRB3 and sends an RRCConnectionReconfigurationComplete message on SRB1 }

}

8.2.2.1.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.3.5.5.1, 5.3.5.5.3, 5.3.5.5.4, 5.3.5.5.8, 5.3.5.5.9, 5.3.5.6.1, 5.3.5.6.2 and 5.3.5.6.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, 5.3.5.3]

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-Config* and it is set to *release*: or

1> if the received *RRCCONNECTIONRECONFIGURATION* includes *endc-ReleaseAndAdd*:

2> perform ENDC release as specified in TS38.331 [82], clause 5.3.5.10;

...

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

...

1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;

1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCRECONFIGURATION*:

1> if the *RRCRECONFIGURATION* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCRECONFIGURATION* was received via SRB1:

3> construct *RRCRECONFIGURATIONCOMPLETE* message and submit it via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];

...

2> else (*RRCRECONFIGURATION* was received via SRB3):

3> submit the *RRCRECONFIGURATIONCOMPLETE* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: In the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

[TS 38.331, 5.3.5.5.1]

The UE performs the following actions based on a received *CellGroupConfig* IE:

...

- 1> if the *CellGroupConfig* contains the *rlc-BearerToReleaseList*:
- 2> perform RLC bearer release as specified in 5.3.5.5.3;
- 1> if the *CellGroupConfig* contains the *rlc-BearerToAddModList*:
- 2> perform the RLC bearer addition/modification as specified in 5.3.5.5.4;
- 1> if the *CellGroupConfig* contains the *mac-CellGroupConfig*:
- 2> configure the MAC entity of this cell group as specified in 5.3.5.5.5;
- 1> if the *CellGroupConfig* contains the *sCellToReleaseList*:
- 2> perform SCell release as specified in 5.3.5.5.8;

...

- 1> if the *CellGroupConfig* contains the *sCellToAddModList*:
- 2> perform SCell addition/modification as specified in 5.3.5.5.9.

[TS 38.331, 5.3.5.5.3]

1> for each *logicalChannelIdentity* value included in the *rlc-BearerToReleaseList* that is part of the current UE configuration (LCH release); or

- 1> for each *logicalChannelIdentity* value that is to be released as the result of an SCG release according to 5.3.5.4:
- 2> release the RLC entity or entities as specified in TS 38.322 [4, section 5.1.3];
- 2> release the corresponding logical channel.

[TS 38.331, 5.3.5.5.4]

For each *RLC-Bearer-Config* received in the *rlc-BearerToAddModList* IE the UE shall:

- 1> if the UE's current configuration contains a RLC bearer with the received *logicalChannelIdentity*:

...

- 2> reconfigure the RLC entity or entities in accordance with the received *rlc-Config*;

[TS 38.331, 5.3.5.5.8]

The UE shall:

- 1> if the release is triggered by reception of the *sCellToReleaseList*:
- 2> for each *sCellIndex* value included in the *sCellToReleaseList*:
- 3> if the current UE configuration includes an SCell with value *sCellIndex*:
- 4> release the SCell.

[TS 38.331, 5.3.5.5.9]

The UE shall:

1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (SCell addition):

2> add the SCell, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;

2> configure lower layers to consider the SCell to be in deactivated state;

...

1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (SCell modification):

2> modify the SCell configuration in accordance with the *sCellConfigDedicated*.

[TS 38.331, 5.3.5.6.1]

The UE shall perform the following actions based on a received *RadioBearerConfig* IE:

1> if the *RadioBearerConfig* includes the *srb3-ToRelease* and set to true:

2> perform the SRB release as specified in 5.3.5.6.2;

1> if the *RadioBearerConfig* includes the *srb-ToAddModList*:

2> perform the SRB addition or reconfiguration as specified in 5.3.5.6.3;

[TS 38.331, 5.3.5.6.2]

The UE shall:

1> release the PDCP entity of the SRB3.

[TS 38.331, 5.3.5.6.3]

The UE shall:

1> for each *srb-Identity* value included in the *srb-ToAddModList* that is not part of the current UE configuration (SRB establishment or reconfiguration from E-UTRA PDCP to NR PDCP):

2> establish a PDCP entity and configure it with the security algorithms according to *securityConfig* and apply the keys (K_{RRCEnc} and K_{RRCint}) associated with the master key (K_{eNB}/K_{gNB}) or secondary key ($S-K_{gNB}$) as indicated in *keyToUse*, if applicable;

...

2> if the *pdcp-Config* is included:

3> configure the PDCP entity in accordance with the received *pdcp-Config*;

8.2.2.1.1.3 Test description

8.2.2.1.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell
- System Information combination as defined in TS 38.508-1 [4] clause 4.4.3.1.1 is used in E-UTRA Cell 1 and NR Cell 1.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) and DC bearers (*MCG(s) and SCG*) according to TS 38.508-1 [4], Table 4.5.1-1.

8.2.2.1.1.3.2 Test procedure sequence

Table 8.2.2.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to add SRB3 sent on SRB1/E-UTRA Cell 1. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message on SRB1/E-UTRA Cell 1? | --> | <i>RRCConnectionReconfigurationComplete</i>
(<i>RRCReconfigurationComplete</i>) | 1 | P |
| 3 | The SS transmits an <i>RRCReconfiguration</i> message to reconfigure NR MAC sent on SRB3/NR Cell 1. | <-- | <i>RRCReconfiguration</i> | - | - |
| 4 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message on SRB3/NR Cell 1? | --> | <i>RRCReconfigurationComplete</i> | 2 | P |
| 5 | The SS transmits an <i>RRCReconfiguration</i> message to reestablish NR PDCP sent on SRB3/NR Cell 1. | <-- | <i>RRCReconfiguration</i> | - | - |
| 6 | Check: Does the UE transmit an <i>RRCReconfigurationComplete</i> message on SRB3/NR Cell 1? | --> | <i>RRCReconfigurationComplete</i> | 3 | P |
| 7 | The SS transmits an <i>RRCConnectionReconfiguration</i> message to release SRB3 sent on SRB1/E-UTRA Cell 1. | <-- | <i>RRCConnectionReconfiguration</i> | - | - |
| 8 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message on SRB1/E-UTRA Cell 1? | --> | <i>RRCConnectionReconfigurationComplete</i> | 3 | P |
| 9 | The SS releases the RRC connection. | - | - | - | - |

8.2.2.1.1.3.3 Specific message contents

Table 8.2.2.1.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.2.1.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon and EN-DC_Embed_RBConfig | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCConnectionReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |

| | | | |
|--|--|--|--|
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nr-Config-r15 CHOICE {} | OCTET STRING including the RRCReconfiguration message according to table 8.2.2.1.1.3.3-1A. | | |
| nr-RadioBearerConfig1-r15 | RadioBearerConfig according to 38.508-1 [4] Table 4.6.3-132 with condition SRB3 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.1.1.3.3-1A: RRCReconfiguration (Table 8.2.2.1.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|-----------------------------------|--|--|--|
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | OCTET STRING containing CellGroupConfig according to Table 8.2.2.1.1.3.3-1B. | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.1.1.3.3-1B: *CellGroupConfig* (Table 8.2.2.1.1.3.3-1A)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| rlc-BearerToAddModList SEQUENCE (SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| RLC-Bearer-Config[1] | | | |
| logicalChannelIdentity | 3 | | |
| servedRadioBearer ::= CHOICE { | | | |
| srb-Identity | 3 | | |
| } | | | |
| } | | | |
| mac-CellGroupConfig | Not Present | | |
| physicalCellGroupConfig | Not Present | | |
| spCellConfig | Not Present | | |
| } | | | |

Table 8.2.2.1.1.3.3-2: *RRCReconfiguration* (step 3, Table 8.2.2.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | OCTET STRING containing CellGroupConfig according to Table 8.2.2.1.1.3.3-3. | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 8.2.2.1.1.3.3-3: *CellGroupConfig* (Table 8.2.2.1.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| rlc-BearerToAddModList | Not present | | |
| rlc-BearerToReleaseList | Not present | | |
| mac-CellGroupConfig | MAC-CellGroupConfig according to table 8.2.2.1.1.3.3-3a | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig | Not present | | |
| } | | | |

Table 8.2.2.1.1.3.3-3a: *MAC-CellGroupConfig* (Table 8.2.2.1.1.3.3-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-68 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| drx-config | Not present. | | |
| schedulingRequestConfig | Not present. | | |
| bsr-Config SEQUENCE { | | | |
| periodicBSR-Timer | sf5 | | |
| retxBSR-Timer | sf40 | | |
| } | | | |
| tag-Config | Not present. | | |
| phr-Config | Not present. | | |
| skipUplinkTxDynamic | Not present. | | |
| } | | | |

Table 8.2.2.1.1.3.3-4: *RRCReconfiguration* (step 5, Table 8.2.2.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table: 4.6.1-13 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|--------------------------------------|--|--|--|
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig according to 38.508-1 [4] Table 4.6.3-132 with condition SRB3, EN-DC_DRB AND Re-establish_PDCP . | | |
| secondaryCellGroup | OCTET STRING containing CellGroupConfig-SRB3 | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| mrdc-SecondaryCellGroupConfig | Not Present | | |
| radioBearerConfig2 | Not Present | | |
| sk-Counter | Increment the value by 1 from the previous value | | |
| nonCriticalExtension ::= SEQUENCE {} | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.1.1.3.3-5: CellGroupConfig-SRB3

| Derivation Path: 38.508-1 [4], Table 4.6.3-19: CellGroupConfig with condition EN-DC and PCell_change | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList SEQUENCE (SIZE(1..maxLCH)) OF SEQUENCE { | 2 entry | | |
| RLC-BearerConfig[1] | RLC-BearerConfig with conditions AM and DRB2 and Re-establish_RLC | | |
| RLC-BearerConfig[2] | RLC-BearerConfig with condition SRB3 and Re-establish_RLC | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 8.2.2.1.1.3.3-6: *RRCConnectionReconfiguration* (step 7, Table 8.2.2.1.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon and EN-DC_Embed_RBConfig | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nr-Config-r15 CHOICE { } | OCTET STRING including the RRCReconfiguration message according to table 8.2.2.1.1.3.3-8. | | |
| nr-RadioBearerConfig1-r15 | RadioBearerConfig according to Table 8.2.2.1.1.3.3-7 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.1.1.3.3-7: *RadioBearerConfig* (Table 8.2.2.1.1.3.3-6)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| srb3-ToRelease | true | | |
| securityConfig | Not present | | |
| } | | | |

Table 8.2.2.1.1.3.3-8: *RRCReconfiguration* (Table 8.2.2.1.1.3.3-6)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | OCTET STRING containing CellGroupConfig according to Table 8.2.2.1.1.3.3-9. | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.1.1.3.3-9: *CellGroupConfig* (Table 8.2.2.1.1.3.3-8)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| rlc-BearerToAddModList | Not Present | | |
| rlc-BearerToReleaseList SEQUENCE (SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| logicalChannelIdentity[1] | 3 | | |
| } | | | |
| mac-CellGroupConfig | Not Present | | |
| tag-Config | Not Present | | |
| pbr-Config | Not Present | | |

| | | | |
|-------------------------|-------------|--|--|
| physicalCellGroupConfig | Not Present | | |
| rlf-TimersAndConstants | Not Present | | |
| } | | | |

8.2.2.2 Split SRB Establishment and Release

8.2.2.2.1 Split SRB Establishment and Release / EN-DC

8.2.2.2.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG }

ensure that {

when { UE receives an *RRCConnectionReconfiguration* message to configure Split SRB }

then { UE configures the Split SRB establishing SRB1/SRB2 on LTE and SRB1S/ SRB2S on NR and sends an *RRCConnectionReconfigurationComplete* message }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and Split SRB configured }

ensure that {

when { UE receives an *RRCConnectionReconfiguration* message on SRB1S on NR to release Split SRB }

then { UE releases Split SRB and sends an *RRCConnectionReconfigurationComplete* message on SRB1 on LTE }

}

8.2.2.2.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.3 and TS 38.331: clauses 5.3.5.3, 5.3.5.5, 5.3.5.5.3, 5.3.5.6, 5.3.5.6.2 and 5.3.5.6.3. Unless and otherwise stated these are Rel-15 requirements

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

...

1> set the content of *RRCConnectionReconfigurationComplete* message as follows:

...

2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the E-UTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10];

[TS 38.331, clause 5.3.5.6.1]

The UE shall perform the following actions based on a received *RadioBearerConfig* IE:

...

1> if the *RadioBearerConfig* includes the *srb-ToAddModList*:

2> perform the SRB addition or reconfiguration as specified in 5.3.5.6.3;

[TS 38.331, clause 5.3.5.6.3]

The UE shall:

1> for each *srb-Identity* value included in the *srb-ToAddModList* that is not part of the current UE configuration (SRB establishment or reconfiguration from E-UTRA PDCP to NR PDCP):

2> establish a PDCP entity;

2> if AS security has been activated:

3> if target RAT of handover is E-UTRA/5GC, or;

3> if the UE is only connected to E-UTRA/5GC:

4> configure the PDCP entity with the security algorithms and keys (K_{RRCEnc} and K_{RRCint}) configured/derived as specified in TS 36.331 [10];

3> else:

4> configure the PDCP entity with the security algorithms according to *securityConfig* and apply the keys (K_{RRCEnc} and K_{RRCint}) associated with the master key (K_{eNB} / K_{gNB}) or secondary key ($S\text{-}K_{\text{gNB}}$) as indicated in *keyToUse*, if applicable;

2> if the current UE configuration as configured by E-UTRA in TS 36.331 [10] includes an SRB identified with the same *srb-Identity* value:

3> associate the E-UTRA RLC entity and DCCH of this SRB with the NR PDCP entity;

3> release the E-UTRA PDCP entity of this SRB;

2> if the *pdcp-Config* is included:

3> configure the PDCP entity in accordance with the received *pdcp-Config*;

2> else:

3> configure the PDCP entity in accordance with the default configuration defined in 9.2.1 for the corresponding SRB;

[TS 38.331, clause 5.3.5.5.3]

The UE shall:

1> for each *logicalChannelIdentity* value included in the *rlc-BearerToReleaseList* that is part of the current UE configuration (LCH release); or

1> for each *logicalChannelIdentity* value that is to be released as the result of an SCG release according to 5.3.5.4:

2> release the RLC entity or entities as specified in TS 38.322 [4], clause 5.1.3;

2> release the corresponding logical channel

8.2.2.2.1.3 Test description

8.2.2.2.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (MCG(s) and SCG) established according to TS 38.508-1 [4], clause 4.5.4.

8.2.2.2.1.3.2 Test procedure sequence

Table 8.2.2.2.1.3.2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | SS transmits <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to configure Split SRBs. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 2 | Check: Does the UE send a <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationC</i>
<i>omplete</i>
(<i>RRCReconfigurationComplete</i>) | 1 | P |
| 2A | SS stops the UL Grant on MCG | - | - | - | - |

| | | | | | |
|----|---|-----|--|---|---|
| 3 | SS transmits <i>UECapabilityEnquiry</i> message for NR capabilities on SRB1 on NR.. | <-- | <i>UECapabilityEnquiry</i> | - | - |
| 4 | Check: Does the UE send <i>UECapabilityInformation</i> message including UE radio access capability information for NR on SRB1S? | --> | <i>UECapabilityInformation</i> | 1 | P |
| 4A | The SS resumes normal UL grant allocation on MCG | - | - | - | - |
| 5 | SS transmits <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message on SRB1S to release Split SRB. | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 6 | Check: Does the UE send <i>RRCConnectionReconfigurationComplete</i> containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 2 | P |

8.2.2.2.1.3.3 Specific message contents

Table 8.2.2.2.1.3.3-1: *RRCConnectionReconfiguration* (step 1 Table 8.2.2.2.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition MCG_and_SCG and condition HO | | | |
|--|--|-------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCConnectionReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| <i>rrcConnectionReconfiguration-r8</i> ::= SEQUENCE { | | | |
| mobilityControlInfo | MobilityControlInfo-HO-SameCell | As per Table 8.2.2.2.1.3.3-1a | |
| nonCriticalExtension SEQUENCE { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING containing <i>RRCReconfiguration-</i> | As per Table 8.2.2.2.1.3.3-1 | |

| | | | |
|---------------------------|--|---------------------------------|--|
| | SplitSRB | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING
containing
RadioBearerConfig-
SplitSRB | As per Table
8.2.2.2.1.3.3-4 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.2.1.3.3-1a: MobilityControlInfo-HO-SameCell (Table 8.2.2.2.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.5-1 | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MobilityControlInfo-HO ::= SEQUENCE { | | | |
| targetPhysCellId | PhysicalCellIdentity of
E-UTRA Cell 1 | | |
| carrierFreq | Not present | | |
| } | | | |

Table 8.2.2.2.1.3.3-2: RRCReconfiguration-SplitSRB (Table 8.2.2.2.1.3.3-1)

| |
|--|
| Derivation Path: 38.508-1 [4], Table 4.6.1-13 with condition EN-DC |
|--|

| Information Element | Value/remark | Comment | Condition |
|-----------------------------------|--------------------------|---------|-----------|
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig-SplitSRB | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.2.1.3.3-3: CellGroupConfig-SplitSRB (Table 8.2.2.2.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-8 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| rlc-BearerToAddModList SEQUENCE (SIZE(1..maxLCH)) OF SEQUENCE { | 2 entries | | |
| logicalChannelIdentity[1] | 1 | | |
| servedRadioBearer[1] CHOICE { | | | |
| srb-Identity | 1 | | |
| } | | | |
| reestablishRLC[1] | Not present | | |
| RLC-Config[1] | Not present. | | |
| mac-LogicalChannelConfig[1] | Not present | | |
| logicalChannelIdentity[2] | 2 | | |
| servedRadioBearer[1] CHOICE { | | | |
| srb-Identity | 2 | | |
| } | | | |
| reestablishRLC[2] | Not present | | |
| RLC-Config[2] | Not present | | |
| mac-LogicalChannelConfig [2] | Not present | | |
| } | | | |
| } | | | |

Table 8.2.2.2.1.3.3-4: RadioBearerConfig-SplitSRB (step 1, Table 8.2.2.2.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |

| | | | |
|---|------------------|--|--|
| srb-ToAddModList SEQUENCE (SIZE (1..2)) OF SEQUENCE { | 2 entries | | |
| srb-Identity[1] | 1 | | |
| pdcp-Config[1] | PDCP-Config-SRB1 | | |
| srb-Identity[2] | 2 | | |
| pdcp-Config[2] | PDCP-Config-SRB2 | | |
| } | | | |
| } | | | |

Table 8.2.2.2.1.3.3-5: PDCP-Config-SRB1 (Table 8.2.2.2.1.3.3-4)

| Derivation Path: 38.508-1 [4], Table 4.6.3-99 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCP-Config ::= SEQUENCE { | | | |
| drb | Not present | | |
| moreThanOneRLC SEQUENCE { | | | |
| primaryPath SEQUENCE { | | | |
| cellGroup | 1 | | |
| logicalChannel | 1 | | |
| } | | | |
| ul-DataSplitThreshold | infinity | | |
| pdcp-Duplication | Not present | | |
| } | | | |
| t-Reordering | Not present | | |
| } | | | |

Table 8.2.2.2.1.3.3-6: PDCP-Config-SRB2 (Table 8.2.2.2.1.3.3-4)

| Derivation Path: 38.508-1 [4], Table 4.6.3-99 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCP-Config ::= SEQUENCE { | | | |
| drb | Not present | | |
| moreThanOneRLC SEQUENCE { | | | |
| primaryPath SEQUENCE { | | | |
| cellGroup | 1 | | |
| logicalChannel | 2 | | |

| | | | |
|-----------------------|-------------|--|--|
| } | | | |
| ul-DataSplitThreshold | infinity | | |
| pdcp-Duplication | Not present | | |
| } | | | |
| t-Reordering | Not present | | |
| } | | | |

Table 8.2.2.2.1.3.3-7: RRCConnectionReconfigurationComplete (steps 2, 6, Table 8.2.2.2.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-9 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfigurationComplete ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcConnectionReconfigurationComplete-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| scg-ConfigResponseNR-r15 | Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.2.1.3.3-8: UECapabilityEnquiry (step 3, Table 8.2.2.2.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-22 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|---|---------|--|--|
| | | | |
| UECapabilityEnquiry ::= SEQUENCE { | | | |
| ue-CapabilityRequest SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF SEQUENCE { | 1 entry | | |
| RAT-Type[1] | nr | | |
| } | | | |
| } | | | |

Table 8.2.2.2.1.3.3-9: UECapabilityInformation (step 4, Table 8.2.2.2.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-23 | | | |
|---|------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UECapabilityInformation ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier-UL | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| ueCapabilityInformation-r8 SEQUENCE { | | | |
| ue-CapabilityRAT-ContainerList SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF SEQUENCE { | 1 entry | | |
| rat-Type | nr | | |
| ueCapabilityRAT-Container | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.2.1.3.3-10: RRCConnectionReconfiguration (step 5, Table 8.2.2.2.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 condition MCG_and_split | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|--------------------|----------------------------------|--|--|
| secondaryCellGroup | CellGroupConfig-SplitSRB-Release | | |
| measConfig | Not Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.2.1.3.3-12: CellGroupConfig-SplitSRB-Release (Table 8.2.2.2.1.3.3-11)

| Derivation Path: 38.508-1 [4], Table 4.6.3-8 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| rlc-BearerToReleaseList SEQUENCE (SIZE(1..maxLC-ID)) OF { | 2 entries | | |
| logicalChannelIdentity[1] | 1 | | |
| logicalChannelIdentity[2] | 2 | | |
| } | | | |
| } | | | |

8.2.2.3 Simultaneous SRB3 and Split SRB / Sequential message flow on SRB3 and Split SRB

8.2.2.3.1 Simultaneous SRB3 and Split SRB / Sequential message flow on SRB3 and Split SRB / EN-DC

8.2.2.3.1.1 Test Purpose (TP)

(1)

with { UE in E-UTRA RRC_CONNECTED state in EN_DC mode and SRB1 configured }

ensure that {

when { UE receives an RRCConnectionReconfiguration message on SRB1 to modify MCG DRB and reconfigure SRB1 to SRB1 S with SCG UL path }

then { UE sends RRCConnectionReconfigurationComplete message on SRB1s on the SCG path }

}

(2)

with { UE in E-UTRA RRC_CONNECTED state in EN_DC mode with SRB3 and split SRB1s configured with uplink on SCG path }

ensure that {

when { UE receives RRCReconfiguration message on SRB3 to modify SCG DRB }

then { UE sends RRCReconfigurationComplete message on SRB3/SCG }

}

(3)

with { UE in RRC_CONNECTED state in EN-DC mode with SRB3 and Split SRB1s configured with uplink on SCG path }

ensure that {

when { UE receives an RRCConnectionReconfiguration message on SRB1S on the NR leg to release SRB3 }

then { UE releases SRB3 and sends an RRCConnectionReconfigurationComplete message on SRB1s on SCG }

}

(4)

with { UE in RRC_CONNECTED state in EN-DC mode with Split SRB1s configured with uplink on SCG path }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to release SRB1s on SCG path }

then { UE releases SRB1s and sends an RRCConnectionReconfigurationComplete message on SRB1/MCG path }

}

8.2.2.3.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.3.5.3 and TS 38.331:5.3.5.3, 5.3.5.5, 5.3.5.5.3, 5.3.5.6, 5.3.5.6.2 and 5.3.5.6.3. Unless and otherwise stated these are Rel-15 requirements

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

...

1> set the content of *RRCConnectionReconfigurationComplete* message as follows:

...

2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10].

[TS 38.331, clause 5.3.5.5.3]

The UE shall:

1> for each *logicalChannelIdentity* value included in the *rlc-BearerToReleaseList* that is part of the current UE configuration (LCH release); or

1> for each *logicalChannelIdentity* value that is to be released as the result of an SCG release according to 5.3.5.4:

2> release the RLC entity or entities as specified in TS 38.322 [4, section 5.1.3];

2> release the corresponding logical channel.

[TS 38.331, clause 5.3.5.6.1]

The UE shall perform the following actions based on a received *RadioBearerConfig* IE:

...

1> if the *RadioBearerConfig* includes the *srb-ToAddModList*:

2> perform the SRB addition or reconfiguration as specified in 5.3.5.6.3;

[TS 38.331, clause 5.3.5.6.3]

The UE shall:

1> for each *srb-Identity* value included in the *srb-ToAddModList* that is not part of the current UE configuration (SRB establishment or reconfiguration from E-UTRA PDCP to NR PDCP):

2> establish a PDCP entity and configure it with the security algorithms according to *securityConfig* and apply the keys (K_{RRCenc} and K_{RRCint}) associated with the master key (K_{eNB}/K_{gNB}) or secondary key ($S-K_{gNB}$) as indicated in *keyToUse*, if applicable;

2> if the current UE configuration as configured by E-UTRA in TS 36.331 includes an SRB identified with the same *srb-Identity* value:

3> associate the E-UTRA RLC entity and DCCH of this SRB with the NR PDCP entity;

3> release the E-UTRA PDCP entity of this SRB;

2> if the *pdcp-Config* is included:

3> configure the PDCP entity in accordance with the received *pdcp-Config*;

2> else:

3> configure the PDCP entity in accordance with the default configuration defined in 9.2.1 for the corresponding SRB;

8.2.2.3.1.3 Test description

8.2.2.3.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.
- System Information combination as defined in TS 38.508-1 [4] clause 4.4.3.1.1 is used in E-UTRA Cell 1 and NR Cell 1.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) and DC bearers (MCG(s) and SCG and SRB3) according to TS 38.508-1 [4], table 4.5.1-1.

8.2.2.3.1.3.2 Test procedure sequence

Table 8.2.2.3.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message to reconfigure MCG DRB on SRB1 over MCG path/E-UTRA Cell 1. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 2 | Check: Does the UE transmits an <i>RRCConnectionReconfigurationComplete</i> message on SRB1s over the SCG path/NR Cell 1? | --> | <i>RRCConnectionReconfigurationComplete</i>
(<i>RRCReconfigurationComplete</i>) | 1 | P |
| 3 | The SS transmits an NR <i>RRCReconfiguration</i> message to reconfigure SCG DRB on SRB3/NR Cell 1. | <-- | <i>RRCReconfiguration</i> | - | - |
| 4 | Check: Does the UE transmit an NR <i>RRCReconfigurationComplete</i> message on | --> | <i>RRCReconfigurationComplete</i> | 2 | P |

| | | | | | |
|---|--|-----|---|---|---|
| | SRB3/NR Cell 1? | | | | |
| 5 | The SS transmits an <i>RRCConnectionReconfiguration</i> message to release SRB3 over SRB1s SCG path/NR Cell 1. | <-- | <i>RRCConnectionReconfiguration</i> (<i>RRCReconfiguration</i>) | - | - |
| 6 | Check: Does the UE transmits an <i>RRCConnectionReconfigurationComplete</i> message on SRB1s over the SCG path/NR Cell 1? | --> | <i>RRCConnectionReconfigurationComplete</i> (<i>RRCReconfigurationComplete</i>) | 3 | P |
| 7 | The SS transmits an <i>RRCConnectionReconfiguration</i> message to release SRB1s over SRB1s/SCG path/NR Cell 1. | <-- | <i>RRCConnectionReconfiguration</i> (<i>RRCReconfiguration</i>) | - | - |
| 8 | Check: Does the UE transmits an <i>RRCConnectionReconfigurationComplete</i> message on SRB1 over the MCG path/E-UTRA Cell 1? | --> | <i>RRCConnectionReconfigurationComplete</i> (<i>RRCReconfigurationComplete</i>) | 4 | P |

8.2.2.3.1.3.3 Specific message contents

Table 8.2.2.3.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.2.3.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|---|-------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCConnectionReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| radioResourceConfigDedicated | RadioResourceConfigDedicated according to Table 8.2.2.3.1.3.3-2 | | |
| mobilityControlInfo | MobilityControlInfo-HO-SameCell | As per Table 8.2.2.3.1.3.3-1E | |
| nonCriticalExtension SEQUENCE { | | | |
| nr-Config-r15 CHOICE { | | | |

| | | | |
|---------------------------------|--|--|--|
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING including the RRCReconfiguration message and the IE secondaryCellGroup according table 8.2.2.3.1.3.3-1A | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | RadioBearerConfig according to Table 8.2.2.3.1.3.3-1C | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-1A: RRCReconfiguration (Table 8.2.2.3.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | OCTET STRING containing CellGroupConfig according to Table 8.2.2.3.1.3.3-1B. | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-1B: *CellGroupConfig* (Table 8.2.2.3.1.3.3-1A)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| rlc-BearerToAddModList SEQUENCE (SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| RLC-BearerConfig[1] | RLC-BearerConfig with condition SRB1 | | |
| } | | | |
| mac-LogicalChannelConfig | LogicalChannelConfig according to 38.508-1 [4], table 4.6.3-66 | | |
| } | | | |

Table 8.2.2.3.1.3.3-1C: *RadioBearerConfig* (Table 8.2.2.3.1.3.3-1)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| srb-ToAddModList SEQUENCE { | | | |
| srb-Identity | 1 | | |
| reestablishPDCP | Not present | | |
| discardOnPDCP | Not present | | |
| pdcp-Config | PDCP-Config according to table 8.2.2.3.1.3.3-1D | | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-1D: *PDCP-Config* (Table 8.2.2.3.1.3.3-1C)

| Derivation Path: 38.508-1[4] table 4.6.3-99 | | | |
|---|--------------|-----------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCP-Config ::= SEQUENCE { | | | |
| drb | Not present | | |
| moreThanOneRLC SEQUENCE { | | | |
| primaryPath SEQUENCE { | | | |
| cellGroup | 1 | NR cell 1 | |
| logicalChannel | 1 | | |

| | | | |
|-----------------------|--------------|--|--|
| } | | | |
| ul-DataSplitThreshold | infinity | | |
| pdcp-Duplication | false | | |
| } | | | |
| t-Reordering | Not present. | | |
| } | | | |

Table 8.2.2.3.1.3.3-1E: *MobilityControlInfo-HO-SameCell* (Table 8.2.2.3.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.5-1 | | | |
|--|---------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MobilityControlInfo-HO ::= SEQUENCE { | | | |
| targetPhysCellId | PhysicalCellIdentity of E-UTRA Cell 1 | | |
| carrierFreq | Not present | | |
| } | | | |

Table 8.2.2.3.1.3.3-2: *RadioResourceConfigDedicated* (Table 8.2.2.3.1.3.3-1)

| Derivation Path: 36.331 [11], clause 6.3.2 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated ::= SEQUENCE { | | | |
| drb-ToAddModList | Not present | | |
| drb-ToReleaseList | Not present | | |
| mac-MainConfig CHOICE { | | | |
| explicitValue | MAC-MainConfig according to table 8.2.2.3.1.3.3-3 | | |
| } | | | |
| sps-Config | Not present | | |
| physicalConfigDedicated | Not present | | |
| } | | | |

Table 8.2.2.3.1.3.3-3: *MAC-MainConfig* (Table 8.2.2.3.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.8.2.1.5-1 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MAC-MainConfig ::= SEQUENCE { | | | |

| | | | |
|--------------------------|--------|--|--|
| ul-SCH-Config SEQUENCE { | | | |
| periodicBSR-Timer | sf32 | | |
| retxBSR-Timer | sf2560 | | |
| } | | | |
| phr-Config CHOICE { | | | |
| setup SEQUENCE { | | | |
| periodicPHR-Timer | sf1000 | | |
| prohibitPHR-Timer | sf500 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-4: *RRCReconfiguration* (step 3, Table 8.2.2.3.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | OCTET STRING containing <i>CellGroupConfig</i> according to table 8.2.2.3.1.3.3-5. | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-5: *CellGroupConfig* (Table 8.2.2.3.1.3.3-4)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| mac-CellGroupConfig | MAC-CellGroupConfig according to table 8.2.2.3.1.3.3-5a | | |
| } | | | |

Table 8.2.2.3.1.3.3-5A: *MAC-CellGroupConfig* (Table 8.2.2.3.1.3.3-5)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-68 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MAC-CellGroupConfig ::= SEQUENCE { | | | |
| bsr-Config SEQUENCE { | | | |

| | | | |
|-------------------|------|--|--|
| periodicBSR-Timer | sf5 | | |
| retxBSR-Timer | sf40 | | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-6: *RRCCONNECTIONRECONFIGURATION* (step 5, Table 8.2.2.3.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCCONNECTIONRECONFIGURATION ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING
containing
<i>RRCCONNECTIONRECONFIGURATION</i>
according to Table
8.2.2.3.1.3.3-8. | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | RadioBearerConfig
according to Table
8.2.2.3.1.3.3-7. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-7: *RadioBearerConfig* (Table 8.2.2.3.1.3.3-6)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| srb-ToAddModList | Not present | | |
| srb3-ToRelease | true | | |
| drb-ToAddModList | Not present | | |
| drb-ToReleaseList | Not present | | |
| securityConfig | Not present | | |
| } | | | |

Table 8.2.2.3.1.3.3-8: *RRCReconfiguration* (Table 8.2.2.3.1.3.3-6)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | OCTET STRING containing <i>CellGroupConfig</i> according to table 8.2.2.1.1.3.3-9. | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-9: *CellGroupConfig* (Table 8.2.2.3.1.3.3-8)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|--------------|-----------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| rlc-BearerToAddModList | Not present | | |
| rlc-BearerToReleaseList SEQUENCE (SIZE (1..maxLC-ID)) OF { | 1 entry | | |
| LogicalChannelIdentity[1] | 3 | | |
| } | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| sCellToAddModList | Not present | | |
| sCellToReleaseList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | | | |
| sCellIndex[1] | SCellIndex | NR Cell 1 | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-10: *RRCCConnectionReconfiguration* (step 7, Table 8.2.2.3.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition HO-TO-EUTRA | | | |
|---|---|-----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| mobilityControlInfo | MobilityControlInfo-HO-SameCell | As per Table 8.2.2.3.1.3.3-1E | |
| radioResourceConfigDedicated SEQUENCE { | | | |
| srb-ToAddModList SEQUENCE (SIZE (1)) OF SEQUENCE { | 1 entry | | |
| srb-ToAddMod[1] | SRB-ToAddMod-DEFAULT using condition SRB1 | See TS 36.508 [7] subclause 4.8.2 | |
| } | | | |
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|-----------------------------------|--|--|--|
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | OCTET STRING containing CellGroupConfig according to Table 8.2.2.3.1.3.3-12. | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.3.1.3.3-12: CellGroupConfig (Table 8.2.2.3.1.3.3-11)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| cellGroupId | 1 | | |
| rlc-BearerToReleaseList SEQUENCE (SIZE (1.. maxLC-ID)) OF { | 1 entry | | |
| LogicalChannelIdentity[1] | 1 | | |
| } | | | |
| mac-CellGroupConfig | MAC-CellGroupConfig according to TS 38.508-1 [4] Table 4.6.3-68 | | |
| } | | | |

8.2.2.4 PSCell addition, modification and release / SCG DRB

8.2.2.4.1 PSCell addition, modification and release / SCG DRB / EN-DC

8.2.2.4.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to add PSCell with SCG DRB }

then { UE configures the PSCell with SCG DRB and sends an RRCConnectionReconfigurationComplete message }

 }

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG }

ensure that {

```

when { UE receives an RRCConnectionReconfiguration message to modify SCG DRB }
  then { UE reconfigures the SCG DRB and sends an RRCConnectionReconfigurationComplete message }
}

```

(3)

```

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG }
ensure that {
  when { UE receives an RRCConnectionReconfiguration message to release PSCell with SCG DRB }
    then { UE releases the PSCell and SCG DRB and sends an RRCConnectionReconfigurationComplete message }
}

```

8.2.2.4.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.3.5.5.7, 5.3.5.6.4 and 5.3.5.6.5. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCConnectionReconfiguration* includes the *nr-Config* and it is set to release: or

1> if the received *RRCConnectionReconfiguration* includes *endc-ReleaseAndAdd* and it is set to *TRUE*:

2> perform ENDC release as specified in TS38.331 [82], clause 5.3.5.10;

1> if the received *RRCConnectionReconfiguration* includes the *sk-Counter*:

2> perform key update procedure as specified in TS 38.331 [82], clause 5.3.5.7;

1> if the received *RRCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

...

1> set the content of *RRCConnectionReconfigurationComplete* message as follows:

2> if the *RRCConnectionReconfiguration* message includes *perCC-GapIndicationRequest*:

3> include *perCC-GapIndicationList* and *numFreqEffective*;

2> if the frequencies are configured for reduced measurement performance:

3> include *numFreqEffectiveReduced*;

2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> set the content of *RRCReconfigurationComplete* message as follows:

2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;

2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:

3> include the *uplinkTxDirectCurrentList*;

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> construct *RRCReconfigurationComplete* message and submit it via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10].

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration.

NOTE:For EN-DC, in the case *RRCReconfiguration* is received via SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case *RRCReconfiguration* is received via SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1 > else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

- 2> if this is the first *RRCReconfiguration* message after successful completion of the RRC re-establishment procedure:
- 3> resume SRB2 and DRBs that are suspended;
- 1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;
- 2> stop timer T304 for that cell group;
- 2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;
- 2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;
- 2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG::
- 3> if T390 is running:
- 4> stop timer T390 for all access categories;
- 4> perform the actions as specified in 5.3.14.4.
- 3> if *RRCReconfiguration* does not include *dedicatedSIB1-Delivery* and
- 3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured by *searchSpaceSIB1*:
- 4> acquire the *SIB1*, which is scheduled as specified in TS 38.213 [13], of the target SpCell of the MCG;
- 4> upon acquiring *SIB1*, perform the actions specified in clause 5.2.2.4.2;
- 2> the procedure ends;

NOTE: The UE is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.3.5.5.7]

The UE shall:

...

- 1> if the *SpCellConfig* contains *spCellConfigDedicated*:
- 2> configure the SpCell in accordance with the *spCellConfigDedicated*;
- 2> consider the bandwidth part indicated in *firstActiveUplinkBWP-Id* if configured to be the active uplink bandwidth part;
- 2> consider the bandwidth part indicated in *firstActiveDownlinkBWP-Id* if configured to be the active downlink bandwidth part;
- 2> if the any of the reference signal(s) that are used for radio link monitoring are reconfigured by the received *spCellConfigDedicated*:
- 3> stop timer T310 for the corresponding SpCell, if running;
- 3> reset the counters N310 and N311.

[TS 38.331, clause 5.3.5.6.4]

Editor's Note: FFS / TODO: Add handling for the new QoS concept (mapping of flows; configuration of QFI-to-DRB mapping; reflective QoS...) but keep also EPS-Bearer handling for the EN-DC case

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToReleaseList* that is part of the current UE configuration; or:

1> for each *drb-Identity* value that is to be released as the result of full configuration according to 5.3.5.11:

2> release the PDCP entity and the *drb-Identity*;

2> if SDAP entity associated with this DRB is configured:

3> indicate the release of the DRB to SDAP entity associated with this DRB (TS 37.324 24[] clause 5.3.3);

2> if the UE is operating in EN-DC:

3> if a new bearer is not added either with NR or E-UTRA with same *eps-BearerIdentity*:

4> indicate the release of the DRB and the *eps-BearerIdentity* of the released DRB to upper layers.

NOTE: The UE does not consider the message as erroneous if the *drb-ToReleaseList* includes any *drb-Identity* value that is not part of the current UE configuration.

NOTE: Whether or not the RLC and MAC entities associated with this PDCP entity are reset or released is determined by the *CellGroupConfig*.

[TS 38.331, clause 5.3.5.6.5]

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):

2> establish a PDCP entity and configure it in accordance with the received *pdcp-Config*;

2> if the PDCP entity of this DRB is not configured with *cipheringDisabled*::

3> if target RAT of handover is E-UTRA/5GC, or;

3> if the UE is only connected to E-UTRA/5GC:

4> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key configured/derived as specified in TS 36.331 [10];

3> else:

4> configure the PDCP entity with the ciphering algorithms according to *securityConfig* and apply the K_{UPenc} key associated with the master key (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;

2> if the PDCP entity of this DRB is configured with *integrityProtection*:

3> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;

...

2> if the UE is operating in EN-DC:

3> if the DRB was configured with the same *eps-BearerIdentity* either by NR or E-UTRA prior to receiving this reconfiguration:

4> associate the established DRB with the corresponding *eps-BearerIdentity*;

3> else:

4> indicate the establishment of the DRB(s) and the *eps-BearerIdentity* of the established DRB(s) to upper layers;

- 1> for each *drb-Identity* value included in the *drb-ToAddModList* that is part of the current UE configuration:
- 2> if the *reestablishPDCP* is set:
- 3> if target RAT is E-UTRA/5GC:, or;
 - 3> if the UE is only connected to E-UTRA/5GC:
- 4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:
 - 5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key configured/derived as specified in TS 36.331 [10], clause 5.4.2.3, i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;
- 3> else:
- 4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*::
 - 5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key associated with the master key (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$), as indicated in *keyToUse*, i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;
- 4> if the PDCP entity of this DRB is configured with *integrityProtection*:
 - 5> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;
- 3> re-establish the PDCP entity of this DRB as specified in 38.323 [5], clause 5.1.2;
- 2> else, if the *recoverPDCP* is set:
- 3> trigger the PDCP entity of this DRB to perform data recovery as specified in 38.323[5];
- 2> if the *pdcp-Config* is included:
- 3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*.

...

NOTE 1: Void

NOTE 2: When determining whether a *drb-Identity* value is part of the current UE configuration, the UE does not distinguish which *RadioBearerConfig* and *DRB-ToAddModList* that DRB was originally configured in. To re-associate a DRB with a different key (K_{eNB} to $S-K_{eNB}$ or vice versa), the network provides the *drb-Identity* value in the (target) *drb-ToAddModList* and sets the *reestablishPDCP* flag. The network does not list the *drb-Identity* in the (source) *drb-ToReleaseList*.

NOTE 3: When setting the *reestablishPDCP* flag for a radio bearer, the network ensures that the RLC receiver entities do not deliver old PDCP PDUs to the re-established PDCP entity. It does that e.g. by triggering a reconfiguration with sync of the cell group hosting the old RLC entity or by releasing the old RLC entity.

NOTE 4: In this specification, UE configuration refers to the parameters configured by NR RRC unless otherwise stated.

NOTE 5: Ciphering and integrity protection can be enabled or disabled for a DRB. The enabling/disabling of ciphering or integrity protection can be changed only by releasing and adding the DRB.

8.2.2.4.1.3 Test description

8.2.2.4.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- If `pc_IP_Ping` is set to TRUE then, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC), Bearers (MCG(s) only) established according to TS 38.508-1 [4], clause 4.5.4.

- Else, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC), Bearers (MCG(s) only) established and Test Mode (On) associated with UE test loop mode B configured on E-UTRA Cell 1 according to TS 38.508-1 [4], clause 4.5.4.

8.2.2.4.1.3.2 Test procedure sequence

Table 8.2.2.4.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to add NR <i>PSCell</i> with SCG DRB. <i>RRCConnectionReconfiguration</i> message contains the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i>
(<i>RRCReconfigurationComplete</i>) | 1 | P |
| 3 | The UE transmits an <i>ULInformationTransfer</i> message containing the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message. | --> | <i>ULInformationTransfer</i> | - | - |
| - | EXCEPTION: Steps 4a1 to 4a2 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation. | - | - | - | - |
| 4a1 | IF <code>pc_IP_Ping</code> = FALSE, then, the SS transmits a CLOSE UE TEST LOOP message. | <-- | CLOSE UE TEST LOOP | - | - |
| 4a2 | The UE transmits a CLOSE UE TEST LOOP COMPLETE message. | --> | CLOSE UE TEST LOOP COMPLETE | - | - |
| 5 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on SCG DRB#2? | - | - | 1 | P |
| 6 | SS transmits <i>RRCConnectionReconfiguration</i> message containing NR <i>RadioBearerConfig</i> to modify PDCP discardTimer value of SCG DRB. | <-- | <i>RRCConnectionReconfiguration</i> | - | - |

| | | | | | |
|----|--|-----|---|---|---|
| 7 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i> | 2 | P |
| 8 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on SCG DRB#2? | - | - | 2 | P |
| 9 | SS transmits <i>RRCConnectionReconfiguration</i> message containing <i>nr-Config-r15</i> and NR <i>RadioBearerConfig</i> to release PCell and SCG DRB. <i>RRCConnectionReconfiguration</i> message contains the DEACTIVATE EPS BEARER CONTEXT REQUEST message. | <-- | <i>RRCConnectionReconfiguration</i> | - | - |
| 10 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i> | 3 | P |
| 11 | The UE transmits an <i>ULInformationTransfer</i> message containing the DEACTIVATE EPS BEARER CONTEXT ACCEPT message. | --> | <i>ULInformationTransfer</i> | - | - |

8.2.2.4.1.3.3 Specific message contents

Table 8.2.2.4.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.2.4.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCConnectionReconfiguration</i> ::= SEQUENCE { | | | |
| <i>criticalExtensions</i> CHOICE { | | | |
| c1 CHOICE { | | | |
| <i>rrcConnectionReconfiguration-r8</i> ::= SEQUENCE { | | | |
| <i>nonCriticalExtension</i> ::= SEQUENCE { | | | |
| <i>nonCriticalExtension</i> ::= SEQUENCE { | | | |
| <i>nonCriticalExtension</i> ::= SEQUENCE { | | | |
| <i>nonCriticalExtension</i> ::= SEQUENCE { | | | |
| <i>nonCriticalExtension</i> ::= SEQUENCE { | | | |
| <i>nonCriticalExtension</i> ::= SEQUENCE { | | | |
| <i>nonCriticalExtension</i> ::= SEQUENCE { | | | |
| <i>nr-Config-r15</i> CHOICE { | | | |
| <i>setup</i> SEQUENCE { | | | |

| | | | |
|---------------------------------|---|--|--|
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING including the <i>RRCReconfiguration</i> message and the IE <i>secondaryCellGroup</i> . | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING including <i>RadioBearerConfig</i> . | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.4.1.3.3-2: *RRCReconfiguration* (Table 8.2.2.4.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| <i>criticalExtensions</i> CHOICE { | | | |
| <i>rrcReconfiguration</i> ::= SEQUENCE { | | | |
| <i>secondaryCellGroup</i> | <i>CellGroupConfig</i> | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.4.1.3.3-3: *CellGroupConfig* (Table 8.2.2.4.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|--|---------|------------|--|
| | | | |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList SEQUENCE
(SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| servedRadioBearer CHOICE { | | | |
| drb-Identity | 2 | SCG DRB Id | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.4.1.3.3-4: *RadioBearerConfig* (Table 8.2.2.4.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 | | | |
|---|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE
(1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| cnAssociation CHOICE { | | | |
| eps-BearerIdentity | 6 | Dedicated EPS
bearer Id of SCG
DRB | |
| } | | | |
| drb-Identity | 2 | SCG DRB Id | |
| } | | | |
| securityConfig SEQUENCE { | | | |
| keyToUse | secondary | | |
| } | | | |
| } | | | |

Table 8.2.2.4.1.3.3-5: *RRCCConnectionReconfiguration* (step 6, Table 8.2.2.4.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |

| | | | |
|---------------------------|---|--|--|
| nr-RadioBearerConfig1-r15 | OCTET STRING
including
RadioBearerConfig. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.4.1.3.3-9: *RadioBearerConfig* (Table 8.2.2.4.1.3.3-8)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 | | | |
|--|--------------|------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToReleaseList | 2 | SCG DRB Id | |
| } | | | |

8.2.2.5 PSCell addition, modification and release / Split DRB

8.2.2.5.1 PSCell addition, modification and release / Split DRB / EN-DC

8.2.2.5.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only }

ensure that {

 when { UE receives an RRCConnectionReconfiguration message to add PSCell with Split DRB }

 then { UE configures the PSCell and sends an RRCConnectionReconfigurationComplete message }

 }

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and Split }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify Split DRB }

then { UE reconfigures the Split DRB and sends an RRCConnectionReconfigurationComplete message }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and Split }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to release PSCell with Split DRB }

then { UE releases the PSCell and Split DRB and sends an RRCConnectionReconfigurationComplete message }

}

8.2.2.5.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.3.5.5.7, 5.3.5.6.4 and 5.3.5.6.5. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCConnectionReconfiguration* includes the *nr-Config* and it is set to *release*: or

1> if the received *RRCConnectionReconfiguration* includes *endc-ReleaseAndAdd* and it is set to *TRUE*:

2> perform EN-DC release as specified in TS 38.331 [82], clause 5.3.5.10;

1> if the received *RRCConnectionReconfiguration* includes the *sk-Counter*:

2> perform key update procedure as specified in TS 38.331 [82], clause 5.3.5.7;

1> if the received *RRCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

...

1> set the content of *RRCConnectionReconfigurationComplete* message as follows:

2> if the *RRCConnectionReconfiguration* message includes *perCC-GapIndicationRequest*:

- 3> include *perCC-GapIndicationList* and *numFreqEffective*;
- 2> if the frequencies are configured for reduced measurement performance:
 - 3> include *numFreqEffectiveReduced*;
- 2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:
- 3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];
- 1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

- 1> if the *RRCReconfiguration* includes the *fullConfig*:
 - 2> perform the radio configuration procedure as specified in 5.3.5.11;
- 1> if the *RRCReconfiguration* includes the *masterCellGroup*:
 - 2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;
- 1> if the *RRCReconfiguration* includes the *masterKeyUpdate*:
 - 2> perform security key update procedure as specified in 5.3.5.7;
- 1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:
 - 2> perform the cell group configuration for the SCG according to 5.3.5.5;
- 1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:
 - 2> perform the radio bearer configuration according to 5.3.5.6;
- 1> if the *RRCReconfiguration* message includes the *measConfig*:
 - 2> perform the measurement configuration procedure as specified in 5.5.2;
- 1> if the *RRCReconfiguration* message includes the *dedicatedSIB1-Delivery*:
 - 2> perform the action upon reception of *SIB1* as specified in 5.2.2.4.2;
- 1> if the *RRCReconfiguration* message includes the *dedicatedSystemInformationDelivery*:
 - 2> perform the action upon reception of System Information as specified in 5.2.2.4;
- 1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:
 - 2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;
 - 2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:
 - 3> include the *uplinkTxDirectCurrentList*;
 - 1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):
 - 2> if *RRCReconfiguration* was received via SRB1:
 - 3> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];
 - 3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:
 - 4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];
 - 3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1 > else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured:

4> acquire the *SIB1* of the target SpCell of the MCG, as specified in 5.2.2.3.1;

2> the procedure ends.

NOTE: The UE is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.3.5.5.7]

The UE shall:

1> if the *SpCellConfig* contains the *rlf-TimersAndConstants*:

2> configure the RLF timers and constants for this cell group as specified in 5.3.5.5.6.

1> else if *rlf-TimersAndConstants* is not configured for this cell group:

2> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SIB1*;

1> if the *SpCellConfig* contains *spCellConfigDedicated*:

2> configure the SpCell in accordance with the *spCellConfigDedicated*;

2> consider the bandwidth part indicated in *firstActiveUplinkBWP-Id* if configured to be the active uplink bandwidth part;

2> consider the bandwidth part indicated in *firstActiveDownlinkBWP-Id* if configured to be the active downlink bandwidth part;

2> if the any of the reference signal(s) that are used for radio link monitoring are reconfigured by the received *spCellConfigDedicated*:

3> stop timer T310 for the corresponding SpCell, if running;

3> reset the counters N310 and N311.

[TS 38.331, clause 5.3.5.6.4]

Editor's Note: FFS / TODO: Add handling for the new QoS concept (mapping of flows; configuration of QFI-to-DRB mapping; reflective QoS...) but keep also EPS-Bearer handling for the EN-DC case

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToReleaseList* that is part of the current UE configuration (DRB release):

2> release the PDCP entity;

2> if SDAP entity associated with this DRB is configured:

3> indicate the release of the DRB to SDAP entity associated with this DRB (TS 37.324 [xx] section 5.3.3);

2> if the UE is operating in EN-DC:

3> if a new bearer is not added either with NR or E-UTRA with same *eps-BearerIdentity*:

4> indicate the release of the DRB and the *eps-BearerIdentity* of the released DRB to upper layers.

NOTE: The UE does not consider the message as erroneous if the *drb-ToReleaseList* includes any *drb-Identity* value that is not part of the current UE configuration.

NOTE: Whether or not the RLC and MAC entities associated with this PDCP entity are reset or released is determined by the *CellGroupConfig*.

[TS 38.331, clause 5.3.5.6.5]

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):

2> if an *sdap-Config* is included:

3> if an SDAP entity with the received *pdu-Session* does not exist:

4> establish an SDAP entity as specified in TS 37.324 [xx] section 5.1.1;

3> configure the SDAP entity in accordance with the received *sdap-Config* as specified in TS 37.324 [xx] and associate the DRB with the SDAP entity;

2> establish a PDCP entity and configure it in accordance with the received *pdcp-Config*;

2> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:

3> configure the PDCP entity with the ciphering algorithms according to *securityConfig* and apply the K_{UPenc} key associated with the master key (K_{eNB}/K_{gNB}) or the secondary key (S- K_{gNB}) as indicated in *keyToUse*;

2> if the PDCP entity of this DRB is configured with *integrityProtection*:

3> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key (S- K_{gNB}) as indicated in *keyToUse*;

2> if the UE is operating in EN-DC:

3> if the DRB was configured with the same *eps-BearerIdentity* either by NR or E-UTRA prior to receiving this reconfiguration:

- 4> associate the established DRB with the corresponding *eps-BearerIdentity*;
- 3> else:
 - 4> indicate the establishment of the DRB(s) and the *eps-BearerIdentity* of the established DRB(s) to upper layers;
 - 2> for each *drb-Identity* value included in the *drb-ToAddModList* that is part of the current UE configuration:
 - 2> if an *sdap-Config* is included, reconfigure the SDAP entity in accordance with the received *sdap-Config* as specified in TS 37.324 [xx];
 - 2> if the *reestablishPDCP* is set:
 - 3> if target RAT is E-UTRA/5GC:
 - 4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:
 - 5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key configured/derived as specified in TS 36.331 [10, 5.4.2.3], i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;
 - 3> else:
 - 4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:
 - 5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key associated with the master or secondary key ($K_{eNB}/S-K_{gNB}/K_{gNB}$) as indicated in *keyToUse*, i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;
 - 3> if the PDCP entity of this DRB is configured with *integrityProtection*:
 - 4> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;
 - 3> re-establish the PDCP entity of this DRB as specified in 38.323 [5], section 5.1.2;
 - 2> else, if the *recoverPDCP* is set:
 - 3> trigger the PDCP entity of this DRB to perform data recovery as specified in 38.323;
 - 2> if the *pdcp-Config* is included:
 - 3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*.

NOTE 1: Removal and addition of the same *drb-Identity* in a single *radioResourceConfig* is not supported. In case *drb-Identity* is removed and added due to reconfiguration with sync or re-establishment with the full configuration option, the network can use the same value of *drb-Identity*.

NOTE 2: When determining whether a *drb-Identity* value is part of the current UE configuration, the UE does not distinguish which *RadioBearerConfig* and *DRB-ToAddModList* that DRB was originally configured in. To re-associate a DRB with a different key (K_{eNB} to $S-K_{eNB}$ or vice versa), the network provides the *drb-Identity* value in the (target) *drb-ToAddModList* and sets the *reestablishPDCP* flag. The network does not list the *drb-Identity* in the (source) *drb-ToReleaseList*.

NOTE 3: When setting the *reestablishPDCP* flag for a radio bearer, the network ensures that the RLC receiver entities do not deliver old PDCP PDUs to the re-established PDCP entity. It does that e.g. by triggering a reconfiguration with sync of the cell group hosting the old RLC entity or by releasing the old RLC entity.

NOTE 4: In this specification, UE configuration refers to the parameters configured by NR RRC unless otherwise stated.

NOTE 5: Ciphering and integrity protection can be enabled or disabled for a DRB. The enabling/disabling of ciphering or integrity protection can be changed only by releasing and adding the DRB.

8.2.2.5.1.3 Test description

8.2.2.5.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- If `pc_IP_Ping` is set to TRUE then, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) only*) established according to TS 38.508-1 [4], clause 4.5.4.
- Else, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) only*) established and Test Mode (*On*) associated with UE test loop mode B configured on E-UTRA Cell 1 according to TS 38.508-1 [4], clause 4.5.4.

8.2.2.5.1.3.2 Test procedure sequence

Table 8.2.2.5.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to add NR PSCell with Split DRB. <i>RRCConnectionReconfiguration</i> message contains the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i>
(<i>RRCReconfigurationComplete</i>) | 1 | P |
| 3 | The UE transmits an <i>ULInformationTransfer</i> message containing the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message. | --> | <i>ULInformationTransfer</i> | - | - |
| - | EXCEPTION: Steps 4a1 to 4a2 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation. | - | - | - | - |
| 4a1 | IF <code>pc_IP_Ping</code> = FALSE, then the SS transmits a CLOSE UE TEST LOOP message. | <-- | CLOSE UE TEST LOOP | - | - |
| 4a2 | The UE transmits a CLOSE UE TEST LOOP COMPLETE message. | --> | CLOSE UE TEST LOOP COMPLETE | - | - |
| 5 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging | - | - | 1 | P |

| | | | | | |
|----|--|-----|---|---|---|
| | IP data on Split DRB#2 using NR radio path? | | | | |
| 6 | SS transmits <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR RadioBearerConfig to modify PDCP discardTimer value of Split DRB. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 7 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | 2 | P |
| 8 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on the Split DRB#2 using NR radio path? | - | - | 2 | P |
| 9 | SS transmits <i>RRCCONNECTIONRECONFIGURATION</i> message containing <i>nr-Config-r15</i> and NR RadioBearerConfig to release PSCell and Split DRB. <i>RRCCONNECTIONRECONFIGURATION</i> message contains the DEACTIVATE EPS BEARER CONTEXT REQUEST message. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 10 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | 3 | P |
| 11 | The UE transmits an <i>ULINFORMATIONTRANSFER</i> message containing the DEACTIVATE EPS BEARER CONTEXT ACCEPT message. | --> | <i>ULINFORMATIONTRANSFER</i> | - | - |

8.2.2.5.1.3.3 Specific message contents

Table 8.2.2.5.1.3.3-1: *RRCCONNECTIONRECONFIGURATION* (step 1, Table 8.2.2.5.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCCONNECTIONRECONFIGURATION</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| <i>rrcConnectionReconfiguration-r8</i> ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING including RadioBearerConfig. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.5.1.3.3-6: *RadioBearerConfig* (Table 8.2.2.5.1.3.3-5)

Derivation Path: 38.508-1 [4], Table 4.6.3-132, condition EN-DC

Table 8.2.2.5.1.3.3-7: *PDCCP-Config* (Table 8.2.2.5.1.3.3-6)

| Derivation Path: 38.508-1 [4], Table 4.6.3-99 | | | |
|---|--------------|---------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCP-Config ::= SEQUENCE { | | | |
| drb SEQUENCE { | | | |
| discardTimer | ms500 | Other than default value. | |
| } | | | |
| } | | | |

Table 8.2.2.5.1.3.3-8: *RRCConnectionReconfiguration* (step 9, Table 8.2.2.5.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nr-Config-r15 CHOICE { | | | |
| release | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING including RadioBearerConfig. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.5.1.3.3-9: *RadioBearerConfig* (Table 8.2.2.5.1.3.3-8)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 | | | |
|--|--------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToReleaseList | 2 | Split DRB Id | |
| } | | | |

8.2.2.6 Bearer Modification / MCG DRB

8.2.2.6.1 Bearer Modification / MCG DRB / SRB / PDCP version change / EN-DC

8.2.2.6.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only }

ensure that {

when { UE receives an RRCConnectionReconfiguration with mobility message to change PDCP version of the SRB1 and SRB2 from E-UTRA PDCP to NR PDCP }

then { UE performs PDCP version change and sends an RRCConnectionReconfigurationComplete message }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only with SRB1 and SRB2 using NR PDCP }

ensure that {

when { UE receives an RRCConnectionReconfiguration with mobility message to change PDCP version of the MCG DRB from E-UTRA PDCP to NR PDCP }

then { UE performs PDCP version change and sends an RRCConnectionReconfigurationComplete message }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (NR PDCP) only with SRB1 and SRB2 using NR PDCP }

ensure that {

when { UE receives an RRCConnectionReconfiguration with mobility message to change PDCP version of the MCG DRB from NR PDCP to E-UTRA PDCP }

then { UE performs PDCP version change and sends an RRCConnectionReconfigurationComplete message }

}

(4)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only with SRB1 and SRB2 using NR PDCP }

ensure that {

when { UE receives an RRCConnectionReconfiguration with mobility message to change PDCP version of the SRB1 and SRB2 from NR PDCP to E-UTRA PDCP }

then { UE performs PDCP version change and sends an RRCConnectionReconfigurationComplete message }

}

8.2.2.6.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.1.1, 5.3.5.4 and 5.3.10.3, TS 38.331, clauses 5.3.5.3, 5.3.5.5, 5.3.5.5.7, 5.3.5.6, 5.3.5.6.3 and 5.3.5.6.5. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.1.1]

Change to NR PDCP or vice versa, for both SRBs and DRBs, can be performed using an *RRCConnectionReconfiguration* message including the *mobilityControlInfo* (handover) by release and addition of the concerned RB (for DRBs) or of the concerned PDCP entity (for SRBs). The same *RRCConnectionReconfiguration* message may be used to make changes regarding the CG(s) used for transmission. For SRBs, change from E-UTRA PDCP to NR PDCP type may, before initial security activation, also be performed using an *RRCConnectionReconfiguration* message not including the *mobilityControlInfo*.

[TS 36.331, clause 5.3.5.4]

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

1> stop timer T310, if running;

1> stop timer T312, if running;

1> start timer T304 with the timer value set to *t304*, as included in the *mobilityControlInfo*;

1> stop timer T370, if running;

1> if the *carrierFreq* is included:

2> consider the target PCell to be one on the frequency indicated by the *carrierFreq* with a physical cell identity indicated by the *targetPhysCellId*;

1> else:

2> consider the target PCell to be one on the frequency of the source PCell with a physical cell identity indicated by the *targetPhysCellId*;

1> start synchronising to the DL of the target PCell;

NOTE 1: The UE should perform the handover as soon as possible following the reception of the RRC message triggering the handover, which could be before confirming successful reception (HARQ and ARQ) of this message.

1> reset MCG MAC and SCG MAC, if configured;

1> re-establish PDCP for all RBs configured with *pdcp-config* that are established;

NOTE 2: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].

1> re-establish MCG RLC and SCG RLC, if configured, for all RBs that are established;

1> apply the value of the *newUE-Identity* as the C-RNTI;

1> configure lower layers in accordance with the received *radioResourceConfigCommon*;

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *mobilityControlInfo*;

1> if the *RRConnectionReconfiguration* message includes the *radioResourceConfigDedicated*:

2> perform the radio resource configuration procedure as specified in 5.3.10;

2> store the *nextHopChainingCount* value;

2> else:

3> derive the K_{RRcInt} key associated with the current integrity algorithm, as specified in TS 33.401 [32];

3> if connected as an RN:

4> derive the K_{UPInt} key associated with the current integrity algorithm, as specified in TS 33.401 [32];

3> derive the K_{RRcEnc} key and the K_{UPenc} key associated with the current ciphering algorithm, as specified in TS 33.401 [32];

1> configure lower layers to apply the integrity protection algorithm and the K_{RRcInt} key, i.e. the integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> configure lower layers to apply the ciphering algorithm, the K_{RRcEnc} key and the K_{UPenc} key, i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

1> if the received *RRConnectionReconfiguration* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82, 5.3.5.6];

1> set the content of *RRConnectionReconfigurationComplete* message as follows:

2> else if the UE has logged measurements available for E-UTRA and if the RPLMN is included in *plmn-IdentityList* stored in *VarLogMeasReport*:

3> include the *logMeasAvailable*;

2> if the UE has connection establishment failure information available in *VarConnEstFailReport* and if the RPLMN is equal to *plmn-Identity* stored in *VarConnEstFailReport*:

3> include *connEstFailInfoAvailable*;

2> if the *RRCCONNECTIONRECONFIGURATION* message includes *perCC-GapIndicationRequest*:

3> include *perCC-GapIndicationList* and *numFreqEffective*;

2> if the frequencies are configured for reduced measurement performance:

3> include *numFreqEffectiveReduced*;

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];

1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission;

1> if MAC successfully completes the random access procedure; or

[TS 36.331, clause 5.3.10.3]

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is part of the current UE configuration (DRB reconfiguration):

2> if *drb-ToAddModListSCG* is not received or does not include the *drb-Identity* value:

3> if the DRB indicated by *drb-Identity* is an MCG DRB or configured with MCG RLC bearer in EN-DC (reconfigure MCG RLC bearer for EN-DC or reconfigure MCG DRB):

4> if the *pdcp-Config* is included:

5> reconfigure the PDCP entity in accordance with the received *pdcp-Config*;

4> if the *rlc-Config* is included:

5> if *reestablishRLC* is received, re-establish the RLC entity of this DRB;

5> reconfigure the RLC entity or entities in accordance with the received *rlc-Config*;

4> if the *logicalChannelConfig* is included:

5> reconfigure the DTCH logical channel in accordance with the received *logicalChannelConfig*;

NOTE: Removal and addition of the same *drb-Identity* in a single *radioResourceConfigDedicated* is not supported. In case *drb-Identity* is removed and added due to handover or re-establishment with the full configuration option, the eNB can use the same value of *drb-Identity*.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCRECONFIGURATION*:

1> if the *RRCRECONFIGURATION* message contains the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

1> if the *RRCRECONFIGURATION* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCRECONFIGURATION* was received via SRB1:

3> construct *RRCReconfigurationComplete* message and submit it via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: In the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1> if MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> the procedure ends.

[TS 38.331, clause 5.3.5.6.3]

The UE shall:

1> for each *srb-Identity* value included in the *srb-ToAddModList* that is not part of the current UE configuration (SRB establishment or reconfiguration from E-UTRA PDCP to NR PDCP):

2> establish a PDCP entity and configure it with the security algorithms according to *securityConfig* and apply the keys (K_{RRCEnc} and K_{RRCint}) associated with the master key (K_{eNB}/K_{gNB}) or secondary key ($S-K_{gNB}$) as indicated in *keyToUse*, if applicable;

2> if the current UE configuration as configured by E-UTRA in TS 36.331 includes an SRB identified with the same *srb-Identity* value:

3> associate the E-UTRA RLC entity and DCCH of this SRB with the NR PDCP entity;

3> release the E-UTRA PDCP entity of this SRB;

2> if the *pdcp-Config* is included:

3> configure the PDCP entity in accordance with the received *pdcp-Config*;

2> else:

3> configure the PDCP entity in accordance with the default configuration defined in 9.2.1 for the corresponding SRB;

1> for each *srb-Identity* value included in the *srb-ToAddModList* that is part of the current UE configuration:

2> if the *reestablishPDCP* is set:

3> configure the PDCP entity to apply the integrity protection algorithm and K_{RRCint} key associated with the $K_{eNB}/S-K_{gNB}$ as indicated in *keyToUse*, i.e. the integrity protection configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

3> configure the PDCP entity to apply the ciphering algorithm and K_{RRCEnc} key associated with the $K_{eNB}/S-K_{gNB}$ as indicated in *keyToUse*, i.e. the ciphering configuration shall be applied to all subsequent messages received and sent by the UE, including the message used to indicate the successful completion of the procedure;

- 3> re-establish the PDCP entity of this SRB as specified in 38.323 [5];
- 2> else, if the *discardOnPDCP* is set:
 - 3> trigger the PDCP entity to perform SDU discard as specified in TS 38.323 [5];
 - 2> if the *pdcp-Config* is included:
 - 3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*.

[TS 38.331, clause 5.3.5.6.5]

The UE shall:

- 1> for each *drb-Identity* value included in the *drb-ToAddModList* that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):
 - 2> establish a PDCP entity and configure it in accordance with the received *pdcp-Config*;
 - 2> configure the PDCP entity with the ciphering algorithms according to *securityConfig* and apply the K_{UPenc} key associated with the master key (KeNB/KgNB) or the secondary key (S-KgNB) as indicated in *keyToUse*;
 - 2> if the DRB was configured with the same *eps-BearerIdentity* either by NR or E-UTRA prior to receiving this reconfiguration:
 - 3> associate the established DRB with the corresponding *eps-BearerIdentity*;
 - 2> else:
 - 3> indicate the establishment of the DRB(s) and the *eps-BearerIdentity* of the established DRB(s) to upper layers;
 - 1> for each *drb-Identity* value included in the *drb-ToAddModList* that is part of the current UE configuration:
 - 2> if the *reestablishPDCP* is set:
 - 3> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key associated with the master or secondary key (KeNB/S-KgNB/KgNB) as indicated in *keyToUse*, i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;
 - 3> re-establish the PDCP entity of this DRB as specified in 38.323 [5], section 5.1.2;
 - 2> else, if the *recoverPDCP* is set:
 - 3> trigger the PDCP entity of this DRB to perform data recovery as specified in 38.323;
 - 2> if the *pdcp-Config* is included:
 - 3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*.

NOTE 1: Removal and addition of the same *drb-Identity* in a single *radioResourceConfig* is not supported. In case *drb-Identity* is removed and added due to reconfiguration with sync or re-establishment with the full configuration option, the network can use the same value of *drb-Identity*.

NOTE 2: When determining whether a *drb-Identity* value is part of the current UE configuration, the UE does not distinguish which *RadioBearerConfig* and *DRB-ToAddModList* that DRB was originally configured in. To re-associate a DRB with a different key (KeNB to S-KeNB or vice versa), the network provides the *drb-Identity* value in the (target) *drb-ToAddModList* and sets the *reestablishPDCP* flag. The network does not list the *drb-Identity* in the (source) *drb-ToReleaseList*.

NOTE 3: When setting the *reestablishPDCP* flag for a radio bearer, the network ensures that the RLC receiver entities do not deliver old PDCP PDUs to the re-established PDCP entity. It does that e.g. by triggering a reconfiguration with sync of the cell group hosting the old RLC entity or by releasing the old RLC entity.

NOTE 4: In this specification, UE configuration refers to the parameters configured by NR RRC unless otherwise stated.

8.2.2.6.1.3 Test description

8.2.2.6.1.3.1 Pre-test conditions

System Simulator:

- EUTRA Cell 1 is the PCell and NR Cell 1 is the PS Cell.

UE:

- None

Preamble:

- If `pc_IP_Ping` is set to TRUE then, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC), Bearers (MCG(s) only) established according to TS 38.508-1 [4], clause 4.5.4.
- Else, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC), Bearers (MCG(s) only) and Test Mode (On) associated with UE test loop mode B configured on E-UTRA Cell 1 according to TS 38.508-1 [4], clause 4.5.4.

8.2.2.6.1.3.2 Test procedure sequence

Table 8.2.2.6.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|---|------|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message including <i>MOBILITYCONTROLINFO</i> IE on E-UTRA Cell 1 to reconfigure SRB1 and SRB2 from E-UTRA PDCP to NR PDCP | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 2 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | 1 | P |
| - | EXCEPTION: Steps 3a1 to 3a2 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation. | - | - | - | - |
| 3a1 | IF <code>pc_IP_Ping</code> = FALSE, then, the SS transmits a CLOSE UE TEST LOOP message. | <-- | CLOSE UE TEST LOOP | - | - |
| 3a2 | The UE transmits a CLOSE UE TEST LOOP COMPLETE message. | --> | CLOSE UE TEST LOOP COMPLETE | | |
| 4 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message including <i>MOBILITYCONTROLINFO</i> IE on E-UTRA Cell 1 to reconfigure MCG DRB from E-UTRA PDCP to NR PDCP? | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 5 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | 1, 2 | P |

| | | | | | |
|----|--|-----|---|---|---|
| | NOTE: <i>RRCConnectionReconfiguration</i> is transmitted using SRB1. This implicitly verifies SRB1 PDCP version change. | | | | |
| 6 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on MCG DRB using NR radio path? | - | - | 2 | P |
| 7 | The SS transmits an <i>RRCConnectionReconfiguration</i> message including <i>MobilityControlInfo</i> IE on E-UTRA Cell 1 to reconfigure MCG DRB from NR PDCP to E-UTRA PDCP? | <-- | <i>RRCConnectionReconfiguration</i> | - | - |
| 8 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i> | 3 | P |
| 9 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on MCG DRB using NR radio path? | - | - | 3 | P |
| 10 | The SS transmits an <i>RRCConnectionReconfiguration</i> message including <i>MobilityControlInfo</i> IE on E-UTRA Cell 1 to reconfigure SRB1 and SRB2 from NR PDCP to E-UTRA PDCP. | <-- | <i>RRCConnectionReconfiguration</i> | - | - |
| 11 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i> | 4 | P |

8.2.2.6.1.3.3 Specific message contents

Table 8.2.2.6.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.2.6.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition HO | | | |
|--|--|------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCConnectionReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| <i>rrcConnectionReconfiguration-r8</i> ::= SEQUENCE { | | | |
| <i>mobilityControlInfo</i> | <i>MobilityControlInfo-HO-SameCell</i> | As per Table 8.2.2.6.1.3.3-2 | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|---------------------------------|---|---------------------------------|--|
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nr-Config-r15 | Not present | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING
containing
RadioBearerConfig-
MCG-SRB | As per Table
8.2.2.6.1.3.3-3 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.6.1.3.3-2: *MobilityControlInfo-HO-SameCell* (Table 8.2.2.6.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.5-1 | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MobilityControlInfo-HO ::= SEQUENCE { | | | |
| targetPhysCellId | PhysicalCellIdentity of
E-UTRA Cell 1 | | |
| carrierFreq | Not present | | |
| } | | | |

Table 8.2.2.6.1.3.3-3: *RadioBearerConfig-MCG-SRB* (Table 8.2.2.6.1.3.3-1)

| |
|---|
| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition SRB_NR_PDCP |
|---|

Table 8.2.2.6.1.3.3-4: *RRCCONNECTIONRECONFIGURATION* (step 4, Table 8.2.2.6.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition HO | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|--|---|---------------------------------|--|
| | | | |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| mobilityControlInfo | MobilityControlInfo-
HO-SameCell | As per Table
8.2.2.6.1.3.3-2 | |
| radioResourceConfigDedicated | RadioResourceConfigDe-
dicated-MCG-DRB-NR-
PDCP | As per Table
8.2.2.6.1.3.3-5 | |
| nonCriticalExtension SEQUENCE { | | | |
| nr-Config-r15 | Not present | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING
containing
RadioBearerConfig-
MCG-DRB-NR-PDCP | As per Table
8.2.2.6.1.3.3-7 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.6.1.3.3-5: *RadioResourceConfigDedicated-MCG-DRB-NR-PDCP* (Table 8.2.2.6.1.3.3-4)

| Derivation Path: 36.508 [7], 36.331 clause 6.3.2C | | | |
|--|---|------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated ::= SEQUENCE { | | | |
| srb-ToAddModList | Not present | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| drb-ToAddMod[1] | DRB-ToAddMod-MCG-DRB-NR-PDCP | As per Table 8.2.2.6.1.3.3-6 | |
| } | | | |
| drb-ToReleaseListSEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| drb-Identity[1] | Same as the DRB identity associated with the default EPS bearer | | |
| } | | | |
| mac-MainConfig | Not present | | |
| sps-Config | Not present | | |
| physicalConfigDedicated | Not present | | |
| } | | | |

Table 8.2.2.6.1.3.3-6: *DRB-ToAddMod-MCG-DRB-NR-PDCP* (Table 8.2.2.6.1.3.3-5)

| Derivation Path: 36.508 [7], Table 4.8.2.1.7-1 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| DRB-ToAddMod ::= SEQUENCE { | | | |
| eps-BearerIdentity | Same as the default EPS bearer Identity | | |
| drb-Identity | Same as the DRB identity associated with the default EPS bearer | | |
| pdcpc-Config | Not present | | |
| } | | | |

Table 8.2.2.6.1.3.3-7: *RadioBearerConfig-MCG-DRB-NR-PDCP* (Table 8.2.2.6.1.3.3-4)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| cnAssociation CHOICE { | | | |
| eps-BearerIdentity | Same as the default EPS bearer Identity | | |

| | | | |
|---------------------------|--|--|--|
| } | | | |
| drb-Identity | Same as the DRB associated with the default EPS bearer | | |
| pdcp-Config | Same as TS 38.508-1 Table 4.6.3-99 | | |
| } | | | |
| securityConfig SEQUENCE { | | | |
| keyToUse | secondary | | |
| securityAlgorithmConfig | Same as TS 38.508-1 Table 4.6.3-165 | | |
| } | | | |
| } | | | |

Table 8.2.2.6.1.3.3-8: *RRCCONNECTIONRECONFIGURATION* (step 7, Table 8.2.2.6.1.3.2-1)

| Derivation Path: 36.508 [4], Table 4.6.1-8 with condition HO | | | |
|--|---|-------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCCONNECTIONRECONFIGURATION ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| mobilityControlInfo | MobilityControlInfo-HO-SameCell | As per Table 8.2.2.6.1.3.3-2 | |
| radioResourceConfigDedicated | RadioResourceConfigDedicated-DRB-AddMod | As per Table 8.2.2.6.1.3.3-9 | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nr-Config-r15 | Not present | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING containing RadioBearerConfig-MCG-DRB-RELEASE | As per Table 8.2.2.6.1.3.3-10 | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.6.1.3.3-9: RadioResourceConfigDedicated-DRB-AddMod (Table 8.2.2.6.1.3.3-8)

| Derivation Path: 36.508 [7], Table 4.6.3-17 using DRB configuration from Table 4.8.2.1.7-1 with condition AM | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-DRB ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | | | |
| drb-Identity[1] | Same as the DRB associated with the default EPS bearer | | |
| rlc-Config | Not present | | |
| logicalChannelIdentity | Not present | | |
| logicalChannelConfig | Not present | | |
| } | | | |
| } | | | |

Table 8.2.2.6.1.3.3-10 RadioBearerConfig-MCG-DRB-RELEASE (Table 8.2.2.6.1.3.3-8)

| Derivation Path: 38.508-1 [4], Table [4.6.3-n] | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList | Not present | | |
| drb-ToReleaseList SEQUENCE (SIZE (1.. maxDRB)) OF SEQUENCE { | 1 entry | | |

| | | | |
|-----------------|--|--|--|
| drb-Identity[1] | Same as the DRB associated with the default EPS bearer | | |
| } | | | |
| } | | | |

Table 8.2.2.6.1.3.3-11: *RRCConnectionReconfiguration* (step 10, Table 8.2.2.6.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with Condition HO | | | |
|--|---|-------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| mobilityControlInfo | MobilityControlInfo-HO-SameCell | As per Table 8.2.2.6.1.3.3-2 | |
| radioResourceConfigDedicated | RadioResourceConfigDedicated-SRB-AddMod | As per Table 8.2.2.6.1.3.3-12 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.6.1.3.3-12 *RadioResourceConfigDedicated-SRB-AddMod* (Table 8.2.2.6.1.3.3-11)

| Derivation Path: 36.331 [11], Table 6.3.2 | | | |
|---|--------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated | | | |
| srb-ToAddModList SEQUENCE (SIZE (1..2)) OF SEQUENCE { | | | |
| srb-Identity[1] | Same as the SRB associated with SRB1 | | |
| pdcp-verChange-r15[1] | True | | |
| srb-Identity[2] | Same as the SRB associated with SRB2 | | |
| pdcp-verChange-r15[2] | True | | |
| } | | | |

8.2.2.7 Bearer Modification / Handling for bearer type change without security key change

8.2.2.7.1 Bearer Modification / Handling for bearer type change without security key change / EN-DC

8.2.2.7.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify SCG DRB to Split DRB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and Split }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify Split DRB to MCG DRB (NR PDCP) }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and MCG (NR PDCP) }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify MCG DRB (NR PDCP) to Split DRB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

(4)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and Split }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify Split DRB to SCG DRB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

(5)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify SCG DRB to MCG DRB (NR PDCP) }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

(6)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and MCG (NR PDCP) }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify MCG DRB (NR PDCP) to SCG DRB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

8.2.2.7.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in TS 36.331, clauses 5.3.5.3 and TS 38.331: 5.3.5.3, 5.3.5.5.1, 5.3.5.6.1 and 5.3.5.6.5. Unless and otherwise stated these are Rel-15 requirements

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

- 1> if this is the first *RRCConnectionReconfiguration* message after successful completion of the RRC connection re-establishment procedure:

...

1> else:

2> if the *RRCConnectionReconfiguration* message includes the *radioResourceConfigDedicated*:

3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 3: If the *RRCConnectionReconfiguration* message includes the establishment of radio bearers other than SRB1, the UE may start using these radio bearers immediately, i.e. there is no need to wait for an outstanding acknowledgment of the *SecurityModeComplete* message.

...

1> if the received *RRCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82, 5.3.5.3];

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82, 5.3.5.6];

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82, 5.3.5.6];

...

1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:

...

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];

1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];

[TS 38.331, clause 5.3.5.5.1]

The network configures the UE with one Secondary Cell Group (SCG). For EN-DC, the MCG is configured as specified in TS 36.331 [10]. The network provides the configuration parameters for a cell group in the *CellGroupConfig* IE.

The UE performs the following actions based on a received *CellGroupConfig* IE:

1> if the *CellGroupConfig* contains the *spCellConfig* with *reconfigurationWithSync*:

2> perform Reconfiguration with sync according to 5.3.5.5.2;

2> resume all suspended radio bearers and resume SCG transmission for all radio bearers, if suspended;

1> if the *CellGroupConfig* contains the *rlc-BearerToReleaseList*:

2> perform RLC bearer release as specified in 5.3.5.5.3;

1> if the *CellGroupConfig* contains the *rlc-BearerToAddModList*:

2> perform the RLC bearer addition/modification as specified in 5.3.5.5.4;

1> if the *CellGroupConfig* contains the *mac-CellGroupConfig*:

2> configure the MAC entity of this cell group as specified in 5.3.5.5.5;

1> if the *CellGroupConfig* contains the *sCellToReleaseList*:

2> perform SCell release as specified in 5.3.5.5.8;

1> if the *CellGroupConfig* contains the *spCellConfig*:

2> configure the SpCell as specified in 5.3.5.5.7;

1> if the *CellGroupConfig* contains the *sCellToAddModList*:

2> perform SCell addition/modification as specified in 5.3.5.5.9

[TS 38.331, clause 5.3.5.6.1]

The UE shall perform the following actions based on a received *RadioBearerConfig* IE:

...

1> if the *RadioBearerConfig* includes the *drb-ToReleaseList*:

2> perform DRB release as specified in 5.3.5.6.4;

1> if the *RadioBearerConfig* includes the *drb-ToAddModList*:

2> perform DRB addition or reconfiguration as specified in 5.3.5.6.5.

[TS 38.331, clause 5.3.5.6.5]

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):

2> establish a PDCP entity and configure it in accordance with the received *pdcp-Config*;

2> configure the PDCP entity with the security algorithms according to *securityConfig* and apply the keys (K_{UPenc}) associated with the $K_{eNB}/S-K_{gNB}$ as indicated in *keyToUse*;

2> if the DRB was configured with the same *eps-BearerIdentity* either by NR or E-UTRA prior to receiving this reconfiguration:

3> associate the established DRB with the corresponding *eps-BearerIdentity*;

2> else:

3> indicate the establishment of the DRB(s) and the *eps-BearerIdentity* of the established DRB(s) to upper layers;

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is part of the current UE configuration:

2> if *reestablishPDCP* is set:

3> configure the PDCP entity of this *RadioBearerConfig* to apply the ciphering algorithm and K_{UPenc} key associated with the $K_{eNB}/S-K_{gNB}$ as indicated in *keyToUse*, i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;

3> re-establish the PDCP entity of this DRB as specified in 38.323 [5], section 5.1.2;

2> else, if *recoverPDCP* is set:

3> trigger the PDCP entity of this DRB to perform data recovery as specified in 38.323;

2> if the *pdcp-Config* is included:

3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*.

8.2.2.7.1.3 Test description

8.2.2.7.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

None.

Preamble:

- If `pc_IP_Ping` is set to TRUE then, the UE is in state `RRC_CONNECTED` using generic procedure parameter Connectivity (EN-DC), Bearers (MCG(s) and SCG) established according to TS 38.508-1 [4], clause 4.5.4.

-Else, the UE is in state `RRC_CONNECTED` using generic procedure parameter Connectivity (EN-DC), Bearers (MCG(s) and SCG) established and Test Loop Function (On) with UE test loop mode B according to TS 38.508-1 [4], clause 4.5.4.

8.2.2.7.1.3.2 Test procedure sequence

Table 8.2.2.7.1.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR RadioBearerConfig to modify SCG DRB to Split DRB. | <-- | <i>RRCConnectionReconfiguration</i> | - | - |
| 2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i> | 1 | P |
| 3 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on split DRB using NR radio path? | - | - | 1 | P |
| 4 | The SS transmits <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify Split DRB to MCG DRB using NR PDCP. | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 5 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 2 | P |
| 6 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on MCG DRB? | - | - | 2 | P |
| 7 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify MCG DRB to Split DRB. | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 8 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 3 | P |
| 9 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on split DRB using NR radio path? | - | - | 3 | P |
| 10 | SS transmits <i>RRCConnectionReconfiguration</i> message containing NR RadioBearerConfig to | <-- | <i>RRCConnectionReconfiguration</i> | - | - |

| | | | | | |
|----|--|-----|---|---|---|
| | modify Split DRB to SCG DRB. | | (RRCReconfiguration) | | |
| 11 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | RRCConnectionReconfigurationComplete | 4 | P |
| 12 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on SCG DRB? | - | - | 4 | P |
| 13 | SS transmits <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify SCG DRB to MCG DRB. | <-- | RRCConnectionReconfiguration (RRCReconfiguration) | - | - |
| 14 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | RRCConnectionReconfigurationComplete (RRCReconfigurationComplete) | 5 | P |
| 15 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on MCG DRB? | - | - | 5 | P |
| 16 | SS transmits <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify MCG DRB to SCG DRB. | <-- | RRCConnectionReconfiguration (RRCReconfiguration) | - | - |
| 17 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | RRCConnectionReconfigurationComplete (RRCReconfigurationComplete) | 6 | P |
| 18 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on SCG DRB? | - | - | 6 | P |

8.2.2.7.1.3.3 Specific message contents

Table 8.2.2.7.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| radioResourceConfigDedicated | RadioResourceConfigDedicated-SCG-to-Split | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |

| | | | |
|-------------------------------------|--|--|--|
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE | | | |
| { | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING
including
RadioBearerConfig-
SCG-to-Split. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-2: RadioResourceConfigDedicated-SCG-to-Split (step 1, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.3-27 | | | |
|---|-----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-DRB ::= SEQUENCE { | | | |
| drb-ToAddModList | DRB-ToAddModList-
SCG-to-Split | | |
| } | | | |

Table 8.2.2.7.1.3.3-3: DRB-ToAddModList-SCG-to-Split (step 1, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.3-2A | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|--|---------|------------------------------------|--|
| DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 Entry | | |
| eps-BearerIdentity[1] | 6 | Dedicated EPS bearer Id of SCG DRB | |
| drb-Identity[1] | 2 | SCG DRB Id | |
| } | | | |

Table 8.2.2.7.1.3.3-4: RadioBearerConfig-SCG-to-Split (step 1, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC | | | |
|---|--------------|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| cnAssociation CHOICE { | | | |
| eps-BearerIdentity | 6 | Dedicated EPS bearer Id of SCG DRB | |
| } | | | |
| drb-Identity | 2 | SCG DRB Id | |
| pdcp-Config | PDCCP-Config | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-5: PDCCP-Config (step 1, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-99 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCCP-Config ::= SEQUENCE { | | | |
| moreThanOneRLC SEQUENCE { | | | |
| primaryPath SEQUENCE { | | | |
| cellGroup | 1 | | |
| } | | | |
| ul-DataSplitThreshold | infinity | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-6: *RRCConnectionReconfiguration* (step 4, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| radioResourceConfigDedicated | Not Present | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING containing RRCReconfiguration-Split-to-MCG | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING containing RadioBearerConfig-Split-to-MCG | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-7: *RRCReconfiguration-Split-to-MCG* (step 4, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 with condition EN-DC | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | OCTET STRING
containing
<i>CellGroupConfig-Split-
to-MCG</i> | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-8: *CellGroupConfig-Split-to-MCG* (step 4, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| rlc-BearerToReleaseList SEQUENCE
(SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| logicalChannelIdentity[1] | Logical channel identity
corresponding to split
bearer | | |
| } | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig | Not present | | |
| } | | | |

| | | | |
|---------------------------------|---|--|--|
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING
containing
<i>RRCReconfiguration-
MCG-to-Split</i> | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING
including
<i>RadioBearerConfig-
MCG-to-Split.</i> | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.2.4.3.3-11: *RRCReconfiguration-MCG-to-Split* (step 9, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 with condition EN-DC | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | OCTET STRING
containing
<i>CellGroupConfig-MCG-
to-Split</i> | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.2.2.7.1.3.3-12: *CellGroupConfig-MCG-to-Split* (step 9, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 with condition EN-DC | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig | Not present | | |
| } | | | |

Table 8.2.2.7.1.3.3-13: *RadioBearerConfig-MCG-to-Split* (step 9, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| cnAssociation CHOICE { | | | |
| eps-BearerIdentity | 6 | | |
| } | | | |
| drb-Identity | 2 | | |
| pdcp-Config | PDCP-Config | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-14: *PDCP-Config* (step 9, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-99 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCP-Config ::= SEQUENCE { | | | |
| moreThanOneRLC SEQUENCE { | | | |
| primaryPath SEQUENCE { | | | |
| cellGroup | 1 | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-16: *RadioResourceConfigDedicated-DRB-REL(bid)* (step 13, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.3-18C | | | |
|--|--------------|----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-DRB-REL(bid) ::= SEQUENCE { | | bid is the bearer identity | |
| drb-ToReleaseList SEQUENCE (SIZE (1..maxDRB)) OF | one entry | | |
| DRB-Identity[1] | 2 | Split DRB Id | |
| } | | | |

Table 8.2.2.7.1.3.3-17: *RadioBearerConfig-Split-to-SCG* (step 13, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC | | | |
|---|---------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| cnAssociation CHOICE { | | | |
| eps-BearerIdentity | 6 | | |
| } | | | |
| drb-Identity | 2 | | |
| recoverPDCP | true | | |
| Pdcpc-Config | PDCCP-Config-to-MCG | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-18: *RRCConnectionReconfiguration* (step 17, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |

| | | | |
|--|--|--|--|
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| radioResourceConfigDedicated | <i>RadioResourceConfigDedicated-SCG-to-MCG</i> | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING containing <i>RRCReconfiguration-SCG-to-MCG</i> | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING including <i>RadioBearerConfig-SCG-to-MCG</i> . | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-19: *RadioResourceConfigDedicated-SCG-to-MCG* (step 17, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.3-27 | | | |
|---|-----------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-DRB ::= SEQUENCE { | | | |
| drb-ToAddModList | DRB-ToAddModList-SCG-to-MCG | | |
| } | | | |

Table 8.2.2.7.1.3.3-20: *DRB-ToAddModList-SCG-to-MCG* (step 17, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.3-2A | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 Entry | | |
| eps-BearerIdentity[1] | 6 | | |
| drb-Identity[1] | 2 | | |
| } | | | |

Table 8.2.2.2.4.3.3-21: *RRCReconfiguration-SCG-to-MCG* (step 17, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 with condition EN-DC | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | OCTET STRING containing CellGroupConfig-SCG-to-MCG | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-22: *CellGroupConfig-SCG-to-MCG* (step 17, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-19 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|--|--|--|--|
| | | | |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| rlc-BearerToReleaseList SEQUENCE (SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| logicalChannelIdentity[1] | Logical channel identity corresponding to SCG Bearer | | |
| } | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig | Not present | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-23: *RadioBearerConfig-SCG-to-MCG* (step 17, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE(1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| cnAssociation CHOICE { | | | |
| eps-BearerIdentity | 6 | | |
| } | | | |
| drb-Identity | 2 | | |
| recoverPDCP | true | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-24: *RRCCONNECTIONRECONFIGURATION* (step 21, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCCONNECTIONRECONFIGURATION ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |

| | | | |
|--|--|--|--|
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| radioResourceConfigDedicated | <i>RadioResourceConfigDedicated-DRB-REL(2)</i> | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING containing <i>RRCReconfiguration-MCG-to-SCG</i> | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING including <i>RadioBearerConfig-MCG-to-SCG</i> . | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-25: *RadioResourceConfigDedicated-DRB-REL (bid)* (step 13, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.3-18C | | | |
|--|--------------|----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-DRB-REL(bid) ::= SEQUENCE { | | bid is the bearer identity | |
| drb-ToReleaseList SEQUENCE (SIZE (1..maxDRB)) OF | one entry | | |
| DRB-Identity[1] | 2 | | |
| } | | | |

Table 8.2.2.7.1.3.3-26: *RRCReconfiguration-MCG-to-SCG* (step 21, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 with condition EN-DC | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | OCTET STRING containing <i>CellGroupConfig-MCG-to-SCG</i> | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-27: *CellGroupConfig-MCG-to-SCG* (step 21, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.6.3-19 with condition EN-DC | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig | Not present | | |
| } | | | |

Table 8.2.2.7.1.3.3-28: *RadioBearerConfig-MCG-to-SCG* (step 21, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) | 1 entry | | |
| OF SEQUENCE { | | | |
| cnAssociation CHOICE { | | | |
| eps-BearerIdentity | 6 | | |
| } | | | |
| drb-Identity | 2 | | |
| recoverPDCP | true | | |
| } | | | |
| } | | | |

Table 8.2.2.7.1.3.3-29: *RRCConnectionReconfigurationComplete* (steps 6, 10, 18, 22, Table 8.2.2.7.1.3.2-1)

| Derivation Path: 36.508 [7] Table 4.6.1-9 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfigurationComplete ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcConnectionReconfigurationComplete-r8 | | | |
| SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| scg-ConfigResponseNR-r15 | Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.2.8 Bearer Modification / Handling for bearer type change with security key change

8.2.2.8.1 Bearer Modification / Handling for bearer type change with security key change / EN-DC

8.2.2.8.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify the SN terminated SCG DRB to MN terminated SCG DRB with security key change to keNB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and MN terminated SCG DRB established with security key keNB }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify the MN terminated SCG DRB to SN terminated Split DRB with security key change to s-KgNB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SN terminated Split DRB established with security key s-KgNB }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify the SN terminated Split DRB to MN terminated Split DRB with security key change to keNB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

(4)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and MN terminated Split DRB established with security key keNB }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify the MN terminated Split DRB to SN terminated MCG DRB (NR PDCP) with security key change to s-KgNB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }
}

(5)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SN terminated MCG DRB (NR PDCP) established with security key s-KgNB }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify the SN terminated MCG DRB (NR PDCP) to MN terminated MCG DRB (NR PDCP) with security key change to keNB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }
}

(6)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and MN terminated MCG DRB (NR PDCP) established with security key keNB }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify the MN terminated MCG DRB (NR PDCP) to SN terminated Split DRB with security key change to s-KgNB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }
}

(7)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SN terminated Split DRB established with security key s-KgNB }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify the SN terminated Split DRB to MN terminated SCG DRB with security key change to keNB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }
}

(8)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and MN terminated SCG DRB established with security key keNB }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify the MN terminated SCG DRB to SN terminated MCG DRB (NR PDCP) with security key change to s-KgNB }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }
}

}

(9)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SN terminated MCG DRB (NR PDCP) established with security key *s-KgNB* }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to modify the SN terminated MCG DRB (NR PDCP) to MN terminated SCG DRB with security key change to *keNB* }

then { UE reconfigures the DRB and sends an RRCConnectionReconfigurationComplete message }

}

8.2.2.8.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.3.5.6.1 and 5.3.5.6.5, TS 37.340, clause Annex A: Table A-1: L2 handling for bearer type change with and without security key change. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received RRCConnectionReconfiguration includes the *nr-Config* and it is set to *release*: or

1> if the received RRCConnectionReconfiguration includes *endc-ReleaseAndAdd* and it is set to *TRUE*:

2> perform ENDC release as specified in TS38.331 [82], clause 5.3.5.10;

1> if the received RRCConnectionReconfiguration includes the *sk-Counter*:

2> perform key update procedure as specified in TS 38.331 [82], clause 5.3.5.7;

1> if the received RRCConnectionReconfiguration includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received RRCConnectionReconfiguration includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if the received RRCConnectionReconfiguration includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if this is the first *RRCConnectionReconfiguration* message after successful completion of the RRC connection re-establishment procedure:

2> resume SRB2 and all DRBs that are suspended, if any, including RBs configured with NR PDCP;

NOTE 4: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].

NOTE 5: The UE may discard SRB2 messages and data that it receives prior to completing the reconfiguration used to resume these bearers.

...

- 1> set the content of *RRCConnectionReconfigurationComplete* message as follows:
- 2> if the *RRCConnectionReconfiguration* message includes *perCC-GapIndicationRequest*:
- 3> include *perCC-GapIndicationList* and *numFreqEffective*;
- 2> if the frequencies are configured for reduced measurement performance:
- 3> include *numFreqEffectiveReduced*;
- 2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:
- 3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;
- 1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

- 1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:
- 2> perform the cell group configuration for the SCG according to 5.3.5.5;
- 1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:
- 2> perform the radio bearer configuration according to 5.3.5.6;
- 1> if the *RRCReconfiguration* message includes the *measConfig*:
- 2> perform the measurement configuration procedure as specified in 5.5.2;

...

- 1> set the content of *RRCReconfigurationComplete* message as follows:
- 2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;
- 2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:
- 3> include the *uplinkTxDirectCurrentList*;
- 1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):
- 2> if *RRCReconfiguration* was received via SRB1:
- 3> construct *RRCReconfigurationComplete* message and submit it via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10];
- 3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:
- 4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];
- 3> else:
- 4> the procedure ends;

NOTE: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.

- 2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration .

NOTE: For EN-DC, in the case *RRCReconfiguration* is received via SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case *RRCReconfiguration* is received via SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

2> if this is the first *RRCReconfiguration* message after successful completion of the RRC re-establishment procedure:

3> resume SRB2 and DRBs that are suspended;

1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if T390 is running:

4> stop timer T390 for all access categories;

4> perform the actions as specified in 5.3.14.4.

3> if *RRCReconfiguration* does not include *dedicatedSIB1-Delivery* and

3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured by *searchSpaceSIB1*:

4> acquire the *SIB1*, which is scheduled as specified in TS 38.213 [13], of the target SpCell of the MCG;

4> upon acquiring *SIB1*, perform the actions specified in clause 5.2.2.4.2;

2> the procedure ends.

NOTE: The UE is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.3.5.6.1]

The UE shall perform the following actions based on a received *RadioBearerConfig* IE:

...

1> if the *RadioBearerConfig* includes the *drb-ToAddModList*:

2> perform DRB addition or reconfiguration as specified in 5.3.5.6.5.

[TS 38.331, clause 5.3.5.6.5]

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):

2> establish a PDCP entity and configure it in accordance with the received *pdcp-Config*;

- 2> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:
 - 3> if target RAT of handover is E-UTRA/5GC, or;
 - 3> if the UE is only connected to E-UTRA/5GC:
 - 4> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key configured/derived as specified in TS 36.331 [10];
 - 3> else:
 - 4> configure the PDCP entity with the ciphering algorithms according to *securityConfig* and apply the K_{UPenc} key associated with the master key (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;
- 2> if the PDCP entity of this DRB is configured with *integrityProtection*:
 - 3> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;
- ...
- 2> if the UE is operating in EN-DC:
 - 3> if the DRB was configured with the same *eps-BearerIdentity* either by NR or E-UTRA prior to receiving this reconfiguration:
 - 4> associate the established DRB with the corresponding *eps-BearerIdentity*;
 - 3> else:
 - 4> indicate the establishment of the DRB(s) and the *eps-BearerIdentity* of the established DRB(s) to upper layers;
 - 3> for each *drb-Identity* value included in the *drb-ToAddModList* that is part of the current UE configuration:
- 2> if the *reestablishPDCP* is set:
 - 3> if target RAT is E-UTRA/5GC, or;
 - 3> if the UE is only connected to E-UTRA/5GC:
 - 4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:
 - 5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key configured/derived as specified in TS 36.331 [10, 5.4.2.3], i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;
 - 3> else:
 - 4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:
 - 5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key associated with the master key (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$), as indicated in *keyToUse*, i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;
 - 4> if the PDCP entity of this DRB is configured with *integrityProtection*:
 - 5> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;
 - 3> re-establish the PDCP entity of this DRB as specified in 38.323 [5], clause 5.1.2;
 - 2> else, if the *recoverPDCP* is set:
 - 3> trigger the PDCP entity of this DRB to perform data recovery as specified in 38.323 [5];
 - 2> if the *pdcp-Config* is included:

3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*.

...

NOTE 1: Void.

NOTE 2: When determining whether a *drb-Identity* value is part of the current UE configuration, the UE does not distinguish which *RadioBearerConfig* and *DRB-ToAddModList* that DRB was originally configured in. To re-associate a DRB with a different key (K_{eNB} to $S-K_{eNB}$ or vice versa), the network provides the *drb-Identity* value in the (target) *drb-ToAddModList* and sets the *reestablishPDCP* flag. The network does not list the *drb-Identity* in the (source) *drb-ToReleaseList*.

NOTE 3: When setting the *reestablishPDCP* flag for a radio bearer, the network ensures that the RLC receiver entities do not deliver old PDCP PDUs to the re-established PDCP entity. It does that e.g. by triggering a reconfiguration with sync of the cell group hosting the old RLC entity or by releasing the old RLC entity.

NOTE 4: In this specification, UE configuration refers to the parameters configured by NR RRC unless otherwise stated.

NOTE 5: Ciphering and integrity protection can be enabled or disabled for a DRB. The enabling/disabling of ciphering or integrity protection can be changed only by releasing and adding the DRB.

[TS 37.340, Annex A]

This subclause provides for information an overview on L2 handling for bearer type change in EN-DC, with and without security key change (from K_{eNB} to $S-K_{gNB}$ and from $S-K_{gNB}$ to K_{eNB}), i.e. with and without a change of the termination point.

Table A-1: L2 handling for bearer type change with and without security key change

| Bearer type change from row to col | MCG | | Split | | SCG | |
|------------------------------------|---------------|--|---|--|---|---|
| | no key change | with key change ($K_{eNB} \leftrightarrow S-K_{gNB}$) | no key change | with key change ($K_{eNB} \leftrightarrow S-K_{gNB}$) | no key change | with key change ($K_{eNB} \leftrightarrow S-K_{gNB}$) |
| MCG | N/A | PDCP: Re-establish
MCG RLC: See Note 1
MCG MAC: See Note 1
SCG RLC: No action
SCG MAC: No action | PDCP: Reconfigure
MCG RLC: No action
MCG MAC: No action
SCG RLC: Establish
SCG MAC: Reconfigure | PDCP: Re-establish
MCG RLC: See Note 1
MCG MAC: See Note 1
SCG RLC: Establish
SCG MAC: Reconfigure | PDCP: Recovery
MCG RLC: See Note 3
MCG MAC: Reconfigure
SCG RLC: Establish
SCG MAC: Reconfigure | PDCP: Re-establish
MCG RLC: See Note 3
MCG MAC: Reconfigure
SCG RLC: Establish
SCG MAC: Reconfigure |

| | | | | | | |
|-------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Split | PDCP: Recovery | PDCP: Re-establish | | PDCP: Re-establish | PDCP: Recovery | PDCP: Re-establish |
| | MCG RLC: No action | MCG RLC: See Note 1 | | MCG RLC: See Note 1 | MCG RLC: See Note 3 | MCG RLC: See Note 3 |
| | MCG MAC: No action | MCG MAC: See Note 1 | N/A | MCG MAC: See Note 1 | MCG MAC: Reconfigure | MCG MAC: Reconfigure |
| | SCG RLC: See Note 4 | SCG RLC: See Note 4 | | SCG RLC: See Note 1 | SCG RLC: No action | SCG RLC: See Note 1 |
| | SCG MAC: Reconfigure | SCG MAC: Reconfigure | | SCG MAC: See Note 1 | SCG MAC: No action | SCG MAC: See Note 1 |
| SCG | PDCP: Recovery | PDCP: Re-establish | PDCP: Reconfigure | PDCP: Re-establish | | PDCP: Re-establish |
| | MCG RLC: Establish | MCG RLC: Establish | MCG RLC: Establish | MCG RLC: Establish | | MCG RLC: No action |
| | MCG MAC: Reconfigure | MCG MAC: Reconfigure | MCG MAC: Reconfigure | MCG MAC: Reconfigure | N/A | MCG MAC: No action |
| | SCG RLC: See Note 4 | SCG RLC: See Note 4 | SCG RLC: No action | SCG RLC: See Note 1 | | SCG RLC: See Note 1 |
| | SCG MAC: Reconfigure | SCG MAC: Reconfigure | SCG MAC: No action | SCG MAC: See Note 1 | | SCG MAC: See note 1 |

NOTE 1: For EN-DC and NGEN-DC MCG, NE-DC SCG: the MAC/RLC behaviour depends on the solution selected by the network. It can be PCell handover (for EN-DC and NGEN-DC) or PSCell change (for NE-DC), which triggers MAC reset and RLC re-establishment. Alternatively, the logical channel identity can be changed, either via RLC bearer release and add for the same DRB (including RLC re-establishment), or via reconfiguration of the RLC bearer with RLC-re-establishment.

For EN-DC and NGEN-DC SCG, NE-DC MCG, NR-DC MCG and SCG: the MAC/RLC behaviour depends on the solution selected by the network. It can be reconfiguration with sync, with MAC reset and RLC re-establishment. Alternatively, the logical channel identity can be changed via RLC bearer release and add.

NOTE 2: Void

NOTE 3: For EN-DC and NGEN-DC: Re-establishment and release. For NE-DC and NR-DC: Release.

NOTE 4: For NE-DC: Re-establishment and release. For EN-DC, NGEN-DC and NR-DC: Release.

8.2.2.8.1.3 Test description

8.2.2.8.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- If pc_IP_Ping is set to TRUE then, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC), Bearers (MCG(s) and SCG) established according to TS 38.508-1 [4], clause 4.5.4.

- Else, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) and SCG*) established and Test Loop Function (On) with UE test loop mode B according to TS 38.508-1 [4], clause 4.5.4.

8.2.2.8.1.3.2 Test procedure sequence

Table 8.2.2.8.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify SN terminated SCG DRB with security key s-KgNB to MN terminated SCG DRB with security key change to keNB. | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 1 | P |
| 3 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on SCG DRB#2? | - | - | 1 | P |
| 4 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify MN terminated SCG DRB with security key keNB to SN terminated Split DRB with security key change to s-KgNB. | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 5 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 2 | P |
| 6 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on Split DRB#2 using NR radio path? | - | - | 2 | P |
| 7 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify SN terminated Split DRB with security key s-KgNB to MN terminated Split DRB with security key change to keNB. | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 8 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 3 | P |
| 9 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on Split DRB#2 using NR radio path? | - | - | 3 | P |

| | | | | | |
|----|---|-----|--|---|---|
| 10 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify MN terminated Split DRB with security key keNB to SN terminated MCG DRB with security key change to s-KgNB. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 11 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i>
(<i>RRCReconfigurationComplete</i>) | 4 | P |
| 12 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on MCG DRB#2? | - | - | 4 | P |
| 13 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RadioBearerConfig</i> to modify SN terminated MCG DRB with security key s-KgNB to MN terminated MCG DRB with security key change to keNB. | <-- | <i>RRCConnectionReconfiguration</i> | - | - |
| 14 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i> | 5 | P |
| 15 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on MCG DRB#2? | - | - | 5 | P |
| 16 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify MN terminated MCG DRB with security key keNB to SN terminated Split DRB with security key change to s-KgNB. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 17 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i>
(<i>RRCReconfigurationComplete</i>) | 6 | P |
| 18 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on Split DRB#2 using NR radio path? | - | - | 6 | P |
| 19 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to modify SN terminated Split DRB with security key s-KgNB to MN terminated SCG DRB with security key change to keNB. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 20 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i>
(<i>RRCReconfigurationComplete</i>) | 7 | P |

| | | | | | |
|----|---|-----|--|---|---|
| 21 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on SCG DRB#2? | - | - | 7 | P |
| 22 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCReconfiguration</i> message to modify MN terminated SCG DRB with security key keNB to SN terminated MCG DRB with security key change to s-KgNB. | <-- | <i>RRCCONNECTIONRECONFIGURATION (RRCReconfiguration)</i> | - | - |
| 23 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE (RRCReconfigurationComplete)</i> | 8 | P |
| 24 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on MCG DRB#2? | - | - | 8 | P |
| 25 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCReconfiguration</i> message to modify SN terminated MCG DRB with security key s-KgNB to MN terminated SCG DRB with security key change to keNB. | <-- | <i>RRCCONNECTIONRECONFIGURATION (RRCReconfiguration)</i> | - | - |
| 26 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE (RRCReconfigurationComplete)</i> | 9 | P |
| 27 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on SCG DRB#2? | - | - | 9 | P |

8.2.2.8.1.3.3 Specific message contents

Table 8.2.2.8.1.3.3-1: *RRCCONNECTIONRECONFIGURATION* (step 1, Table 8.2.2.8.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCCONNECTIONRECONFIGURATION</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |

| | | | |
|-------------------------------------|--|--|--|
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING including the <i>RRCReconfiguration</i> message and the IE <i>secondaryCellGroup</i> according TS 38.508-1 [4], table 4.6.1-13 with condition EN-DC_HO. | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING including <i>RadioBearerConfig</i> . | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-2: Void

Table 8.2.2.8.1.3.3-3: Void

Table 8.2.2.8.1.3.3-4: *RadioBearerConfig* (Table 8.2.2.8.1.3.3-1)

| | | | |
|---------------------------|---|--|--|
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING including RadioBearerConfig. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-6: RadioResourceConfigDedicated-MN_SCG-to-SN_Split (Table 8.2.2.8.1.3.3-5)

| Derivation Path: 36.508 [7], Table 4.6.3-19AAAAAB | | | |
|--|--------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-EN-DC-Split ::= SEQUENCE { | | | |
| srb-ToAddModList | Not present | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| drb-ToAddMod[1] | DRB-ToAddMod-EN-DC-Split | | |
| } | | | |

Table 8.2.2.8.1.3.3-7: Void

Table 8.2.2.8.1.3.3-8: Void

Table 8.2.2.8.1.3.3-9: RadioBearerConfig (Table 8.2.2.8.1.3.3-5)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC_DRB AND Re-establish_PDCP | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |

| | | | |
|--|--------------|--|--|
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| pdcp-Config | PDCCP-Config | | |
| } | | | |
| securityConfig SEQUENCE { | | | |
| keyToUse | secondary | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-10: *PDCCP-Config* (Table 8.2.2.8.1.3.3-9)

| Derivation Path: 38.508-1 [4], Table 4.6.3-99 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCCP-Config ::= SEQUENCE { | | | |
| moreThanOneRLC SEQUENCE { | | | |
| primaryPath SEQUENCE { | | | |
| cellGroup | 1 | | |
| } | | | |
| ul-DataSplitThreshold | infinity | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-11: *RRCCOnnectionReconfiguration* (step 7, Table 8.2.2.8.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|---|-------------------------------|-----------------|
| Information Element | Value/remark | Comment | Condition |
| RRCCOnnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| mobilityControlInfo | MobilityControlInfo-HO-SameCell | As per Table 7.1.3.2.1.3.3-1A | |
| radioResourceConfigDedicated | RadioResourceConfigDedicated-SN_Split-to-MN_Split | | |
| securityConfigHO | SecurityConfigHO-DEFAULT | | HO, HO-TO-EUTRA |
| nonCriticalExtension ::= SEQUENCE { | | | |

| | | | |
|-------------------------------------|---|--|--|
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING including the <i>RRCReconfiguration</i> message and the IE secondaryCellGroup according TS 38.508-1 [4], table 4.6.1-13 with condition EN-DC_HO. | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING including RadioBearerConfig. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-12: RadioResourceConfigDedicated-SN_Split-to-MN_Split (Table 8.2.2.8.1.3.3-11)

Derivation Path: 36.508 [7], Table 4.6.3-18

| Information Element | Value/remark | Comment | Condition |
|---|---------------------------------------|---------|-----------|
| RadioResourceConfigDedicated-HO-TO-EUTRA(1, 0) ::= SEQUENCE { | | | |
| drb-ToAddModList | DRB-ToAddModList-SN_Split-to-MN_Split | | |
| } | | | |

Table 8.2.2.8.1.3.3-13: *DRB-ToAddModList-SN_Split-to-MN_Split* (Table 8.2.2.8.1.3.3-12)

| Derivation Path: 36.508 [7], Table 4.6.3-2A | | | |
|--|--------------|--------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 Entry | | |
| eps-BearerIdentity[1] | 6 | Dedicated EPS bearer Id of Split DRB | |
| drb-Identity[1] | 2 | Split DRB Id | |
| rlc-Config-v1510[1] ::= SEQUENCE { | | | |
| reestablishRLC-r15 | true | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-14: Void

Table 8.2.2.8.1.3.3-15: Void

Table 8.2.2.8.1.3.3-16: *RadioBearerConfig* (Table 8.2.2.8.1.3.3-11)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC_DRB AND Re-establish_PDCP | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| pdcp-Config | Not present | | |
| } | | | |
| securityConfig SEQUENCE { | | | |
| keyToUse | master | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-18: *RadioResourceConfigDedicated-MN_Split-to-SN_MCG* (Table 8.2.2.8.1.3.3-17)

| Derivation Path: 36.508 [7], Table 4.6.3-18 | | | |
|---|-------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-HO-TO-EUTRA(1, 0) ::= SEQUENCE { | | | |
| drb-ToAddModList | DRB-ToAddModList-MN_Split-to-SN_MCG | | |
| } | | | |

Table 8.2.2.8.1.3.3-19: *DRB-ToAddModList-MN_Split-to-SN_MCG* (Table 8.2.2.8.1.3.3-18)

| Derivation Path: 36.508 [7], Table 4.6.3-2A | | | |
|--|--------------|--------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 Entry | | |
| eps-BearerIdentity[1] | 6 | Dedicated EPS bearer Id of Split DRB | |
| drb-Identity[1] | 2 | Split DRB Id | |
| rlc-Config-v1510[1] ::= SEQUENCE { | | | |
| reestablishRLC-r15 | true | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-20: *RRCReconfiguration* (Table 8.2.2.8.1.3.3-17)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |

| | | | |
|-----------------------------------|-----------------|--|--|
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-21: *CellGroupConfig* (Table 8.2.2.8.1.3.3-20)

| Derivation Path: 38.508-1 [4] Table 4.6.3-19 with condition EN-DC | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| rlc-BearerToReleaseList SEQUENCE
(SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| logicalChannelIdentity[1] | Logical channel identity
corresponding to Split
DRB. | | |
| } | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| } | | | |

Table 8.2.2.8.1.3.3-22: *RadioBearerConfig* (Table 8.2.2.8.1.3.3-17)

Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC and Re-establish_PDCP

Table 8.2.2.8.1.3.3-23: *RRCConnectionReconfiguration* (step 13, Table 8.2.2.8.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--|----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| mobilityControlInfo | MobilityControlInfo-
HO-SameCell | As per Table
7.1.3.2.1.3.3-1A | |
| radioResourceConfigDedicated | RadioResourceConfigDe-
dicated-SN_MCG-to- | | |

| | | | |
|-------------------------------------|---|--|-----------------|
| | MN_MCG | | |
| securityConfigHO | SecurityConfigHO-DEFAULT | | HO, HO-TO-EUTRA |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING including the <i>RRCReconfiguration</i> message and the IE <i>secondaryCellGroup</i> . | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING including <i>RadioBearerConfig</i> . | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-24: *RadioResourceConfigDedicated-SN_MCG-to-MN_MCG* (Table 8.2.2.8.1.3.3-23)

| Derivation Path: 36.508 [7], Table 4.6.3-18 | | | |
|---|-----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-HO-TO-EUTRA(1, 0) ::= SEQUENCE { | | | |
| drb-ToAddModList | DRB-ToAddModList-SN_MCG-to-MN_MCG | | |
| } | | | |

Table 8.2.2.8.1.3.3-25: *DRB-ToAddModList-SN_MCG-to-MN_MCG* (Table 8.2.2.8.1.3.3-24)

| Derivation Path: 36.508 [7], Table 4.6.3-2A | | | |
|--|--------------|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 Entry | | |
| eps-BearerIdentity[1] | 6 | Dedicated EPS bearer Id of MCG DRB | |
| drb-Identity[1] | 2 | MCG DRB Id | |
| rlc-Config-v1510[1] ::= SEQUENCE { | | | |
| reestablishRLC-r15 | true | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-25a: *RRCReconfiguration* (Table 8.2.2.8.1.3.3-24a)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-25b: *CellGroupConfig* (Table 8.2.2.8.1.3.3-25a)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 with condition EN-DC | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|--------------------------------|-------------|--|--|
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| } | | | |

Table 8.2.2.8.1.3.3-26: *RadioBearerConfig* (Table 8.2.2.8.1.3.3-23)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC_DRB AND Re-establish_PDCP | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| pdcp-Config | Not present | | |
| } | | | |
| securityConfig SEQUENCE { | | | |
| keyToUse | master | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-27: *RRCConnectionReconfiguration* (step 16, Table 8.2.2.8.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|---|-------------------------------|-----------------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| mobilityControlInfo | MobilityControlInfo-HO-SameCell | As per Table 7.1.3.2.1.3.3-1A | |
| radioResourceConfigDedicated | RadioResourceConfigDedicated-MN_MCG-to-SN_Split | | |
| securityConfigHO | SecurityConfigHO-DEFAULT | | HO, HO-TO-EUTRA |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |

| | | | |
|-------------------------------------|--|--|--|
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE | | | |
| { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING
including the
<i>RRCReconfiguration</i>
message and the IE
secondaryCellGroup
according TS 38.508-1
[4], table 4.6.1-13 with
condition EN-DC.. | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING
including
RadioBearerConfig. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-28: *RadioResourceConfigDedicated-MN_MCG-to-SN_Split* (Table 8.2.2.8.1.3.3-27)

| Derivation Path: 36.508 [7], Table 4.6.3-18 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-HO-TO-EUTRA(1, 0) ::= SEQUENCE { | | | |

| | | | |
|------------------|-------------------------------------|--|--|
| drb-ToAddModList | DRB-ToAddModList-MN_MCG-to-SN_Split | | |
| } | | | |

Table 8.2.2.8.1.3.3-29: *DRB-ToAddModList-MN_MCG-to-SN_Split* (Table 8.2.2.8.1.3.3-30)

| Derivation Path: 36.508 [7], Table 4.6.3-2A | | | |
|--|--------------|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 Entry | | |
| eps-BearerIdentity[1] | 6 | Dedicated EPS bearer Id of MCG DRB | |
| drb-Identity[1] | 2 | MCG DRB Id | |
| rlc-Config-v1510[1] ::= SEQUENCE { | | | |
| reestablishRLC-r15 | true | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-30: Void

Table 8.2.2.8.1.3.3-31: Void

Table 8.2.2.8.1.3.3-32: *RadioBearerConfig* (Table 8.2.2.8.1.3.3-27)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC_DRB AND Re-establish_PDCP | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| pdcp-Config | PDCP-Config | | |
| } | | | |
| securityConfig SEQUENCE { | | | |
| keyToUse | secondary | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-33: *PDCP-Config* (Table 8.2.2.8.1.3.3-32)

| |
|---|
| Derivation Path: 38.508-1 [4], Table 4.6.3-99 |
|---|

| Information Element | Value/remark | Comment | Condition |
|----------------------------|--------------|---------|-----------|
| PDCP-Config ::= SEQUENCE { | | | |
| moreThanOneRLC SEQUENCE { | | | |
| primaryPath SEQUENCE { | | | |
| cellGroup | 1 | | |
| } | | | |
| ul-DataSplitThreshold | infinity | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-34: *RRCConnectionReconfiguration* (step 19, Table 8.2.2.8.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| radioResourceConfigDedicated | RadioResourceConfigDedicated-DRB-REL(2) | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE | | | |
| { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING including the <i>RRCReconfiguration</i> message and the IE <i>secondaryCellGroup</i> according TS 38.508-1 [4], table 4.6.1-13 with | | |

| | | | |
|---------------------------|---|--|--|
| | condition EN-DC_HO. | | |
| } | | | |
| } | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING
including
RadioBearerConfig. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-35: Void

Table 8.2.2.8.1.3.3-36: Void

Table 8.2.2.8.1.3.3-37: *RadioBearerConfig* (Table 8.2.2.8.1.3.3-34)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC AND Re-establish_PDCP | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| securityConfig SEQUENCE { | | | |
| keyToUse | master | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-38: *RRCCONNECTIONRECONFIGURATION* (step 22, Table 8.2.2.8.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCCONNECTIONRECONFIGURATION ::= SEQUENCE { | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-39: *RadioResourceConfigDedicated-MN_SCG-to-SN_MCG* (Table 8.2.2.8.1.3.3-38)

| Derivation Path: 36.508 [7], Table 4.6.3-27 | | | |
|---|-----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioResourceConfigDedicated-DRB ::= SEQUENCE { | | | |
| drb-ToAddModList | DRB-ToAddModList-MN_SCG-to-SN_MCG | | |
| } | | | |

Table 8.2.2.8.1.3.3-40: *DRB-ToAddModList-MN_SCG-to-SN_MCG* (Table 8.2.2.8.1.3.3-39)

| Derivation Path: 36.508 [7], Table 4.6.3-2A | | | |
|--|--------------|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 Entry | | |
| eps-BearerIdentity[1] | 6 | Dedicated EPS bearer Id of SCG DRB | |
| drb-Identity[1] | 2 | SCG DRB Id | |
| } | | | |

Table 8.2.2.8.1.3.3-41: *RRCReconfiguration* (Table 8.2.2.8.1.3.3-40)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-42: *CellGroupConfig* (Table 8.2.2.8.1.3.3-43)

| |
|---|
| Derivation Path: 38.508-1 [4] Table 4.6.3-19 |
|---|

| Information Element | Value/remark | Comment | Condition |
|--|--|---------|-----------|
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | Not present | | |
| rlc-BearerToReleaseList SEQUENCE (SIZE(1..maxLCH)) OF SEQUENCE { | 1 entry | | |
| logicalChannelIdentity[1] | Logical channel identity corresponding to SCG DRB. | | |
| } | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| spCellConfig | Not present | | |
| } | | | |

Table 8.2.2.8.1.3.3-43: *RadioBearerConfig* (Table 8.2.2.8.1.3.3-38)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC and Re-establish_PDCP | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE(1..maxDRB)) OF SEQUENCE { | 1 entry | | |
| pdcp-Config | Not present | | |
| } | | | |
| securityConfig SEQUENCE { | | | |
| keyToUse | secondary | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-44: *RRCCONNECTIONRECONFIGURATION* (step 25, Table 8.2.2.8.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCCONNECTIONRECONFIGURATION ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| radioResourceConfigDedicated | RadioResourceConfigDedicated-DRB-REL(2) | | |

| | | | |
|-----------------------------------|-----------------|--|--|
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-46: *CellGroupConfig* (Table 8.2.2.8.1.3.3-45)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 with condition EN-DC | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| rlc-BearerToAddModList | | | |
| mac-CellGroupConfig | Not present | | |
| physicalCellGroupConfig | Not present | | |
| } | | | |

Table 8.2.2.8.1.3.3-47: *RadioBearerConfig* (Table 8.2.2.8.1.3.3-44)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 with condition EN-DC and Re-establish_PDCP | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| pdcp-Config | Not present | | |
| } | | | |
| securityConfig SEQUENCE { | | | |
| keyToUse | master | | |
| } | | | |
| } | | | |

Table 8.2.2.8.1.3.3-48: *RRCCConnectionReconfigurationComplete* (steps 2, 5, 8, 11, 17, 20, 23, 26, Table 8.2.2.8.1.3.2-1)

| Derivation Path: 36.508 [7] Table 4.6.1-9 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCCConnectionReconfigurationComplete ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|---|---------|--|--|
| rrcConnectionReconfigurationComplete-r8
SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| scg-ConfigResponseNR-r15 | Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.2.9 Bearer Modification / Uplink data path / Split DRB Reconfiguration

8.2.2.9.1 Bearer Modification / Uplink data path / Split DRB Reconfiguration / EN-DC

8.2.2.9.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and Split }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to change the primaryPath to E-UTRA radio path from NR }

then { UE changes the uplink data path to E-UTRA radio path and sends an RRCConnectionReconfigurationComplete message }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and Split }

ensure that {

when { UE receives an *RRCCONNECTIONRECONFIGURATION* message to change the *primaryPath* from E-UTRA radio path to NR }

then { UE changes the uplink data path to NR radio path and sends an *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message }

}

8.2.2.9.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3 and 5.3.5.6.5. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCCONNECTIONRECONFIGURATION* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-Config* and it is set to *release*: or

1> if the received *RRCCONNECTIONRECONFIGURATION* includes *endc-ReleaseAndAdd* and it is set to *TRUE*:

2> perform ENDC release as specified in TS38.331 [82], clause 5.3.5.10;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *sk-Counter*:

2> perform key update procedure as specified in TS 38.331 [82], clause 5.3.5.7;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

...

1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:

2> if the *RRCCONNECTIONRECONFIGURATION* message includes *perCC-GapIndicationRequest*:

3> include *perCC-GapIndicationList* and *numFreqEffective*;

2> if the frequencies are configured for reduced measurement performance:

3> include *numFreqEffectiveReduced*;

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;

1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

- 1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:
 - 2> perform the cell group configuration for the SCG according to 5.3.5.5;
 - 1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:
 - 2> perform the radio bearer configuration according to 5.3.5.6;
 - 1> if the *RRCReconfiguration* message includes the *measConfig*:
 - 2> perform the measurement configuration procedure as specified in 5.5.2
 - ...
 - 1> set the content of *RRCReconfigurationComplete* message as follows:
 - 2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;
 - 2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:
 - 3> include the *uplinkTxDirectCurrentList*;
 - 1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):
 - 2> if *RRCReconfiguration* was received via SRB1:
 - 3> construct *RRCReconfigurationComplete* message and submit it via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];
 - 3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:
 - 4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];
 - 3> else:
 - 4> the procedure ends;
- NOTE: The order the UE sends the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message and performs the Random Access procedure towards the SCG is left to UE implementation.
- 2> else (*RRCReconfiguration* was received via SRB3):
 - 3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration.
- NOTE: For EN-DC, in the case *RRCReconfiguration* is received via SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case *RRCReconfiguration* is received via SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.
- 1 > else:
 - 2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;
 - 2> if this is the first *RRCReconfiguration* message after successful completion of the RRC re-establishment procedure:
 - 3> resume SRB2 and DRBs that are suspended;
 - 1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;
 - 2> stop timer T304 for that cell group;
 - 2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if T390 is running:

4> stop timer T390 for all access categories;

4> perform the actions as specified in 5.3.14.4.

3> if *RRCReconfiguration* does not include *dedicatedSIB1-Delivery* and

3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured by *searchSpaceSIB1*:

4> acquire the *SIB1*, which is scheduled as specified in TS 38.213 [13], of the target SpCell of the MCG;

4> upon acquiring *SIB1*, perform the actions specified in clause 5.2.2.4.2;

2> the procedure ends.

NOTE: The UE is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.3.5.6.5]

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):

2> establish a PDCP entity and configure it in accordance with the received *pdcp-Config*;

2> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:

3> if target RAT of handover is E-UTRA/5GC, or;

3> if the UE is only connected to E-UTRA/5GC:

4> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key configured/derived as specified in TS 36.331 [10];

3> else:

4> configure the PDCP entity with the ciphering algorithms according to *securityConfig* and apply the K_{UPenc} key associated with the master key (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;

2> if the PDCP entity of this DRB is configured with *integrityProtection*:

3> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;

...

2> if the UE is operating in EN-DC:

3> if the DRB was configured with the same *eps-BearerIdentity* either by NR or E-UTRA prior to receiving this reconfiguration:

4> associate the established DRB with the corresponding *eps-BearerIdentity*;

3> else:

4> indicate the establishment of the DRB(s) and the *eps-BearerIdentity* of the established DRB(s) to upper layers;

- 4> for each *drb-Identity* value included in the *drb-ToAddModList* that is part of the current UE configuration:
- 2> if the *reestablishPDCP* is set:
- 3> if target RAT is E-UTRA/5GC, or;
- 3> if the UE is only connected to E-UTRA/5GC:
- 4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:
- 5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key configured/derived as specified in TS 36.331 [10], clause 5.4.2.3, i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;
- 3> else:
- 4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:
- 5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key associated with the master key (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$), as indicated in *keyToUse*, i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;
- 4> if the PDCP entity of this DRB is configured with *integrityProtection*:
- 5> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;
- 3> re-establish the PDCP entity of this DRB as specified in 38.323 [5], clause 5.1.2;
- 2> else, if the *recoverPDCP* is set:
- 3> trigger the PDCP entity of this DRB to perform data recovery as specified in 38.323 [5];
- 2> if the *pdcp-Config* is included:
- 3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*.

...

NOTE 1: Void.

NOTE 2: When determining whether a *drb-Identity* value is part of the current UE configuration, the UE does not distinguish which *RadioBearerConfig* and *DRB-ToAddModList* that DRB was originally configured in. To re-associate a DRB with a different key (K_{eNB} to $S-K_{eNB}$ or vice versa), the network provides the *drb-Identity* value in the (target) *drb-ToAddModList* and sets the *reestablishPDCP* flag. The network does not list the *drb-Identity* in the (source) *drb-ToReleaseList*.

NOTE 3: When setting the *reestablishPDCP* flag for a radio bearer, the network ensures that the RLC receiver entities do not deliver old PDCP PDUs to the re-established PDCP entity. It does that e.g. by triggering a reconfiguration with sync of the cell group hosting the old RLC entity or by releasing the old RLC entity.

NOTE 4: In this specification, UE configuration refers to the parameters configured by NR RRC unless otherwise stated.

NOTE 5: Ciphering and integrity protection can be enabled or disabled for a DRB. The enabling/disabling of ciphering or integrity protection can be changed only by releasing and adding the DRB.

8.2.2.9.1.3 Test description

8.2.2.9.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- If `pc_IP_Ping` is set to TRUE then, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) and Split*) established according to TS 38.508-1 [4], clause 4.5.4.
- Else, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) and Split*) established and Test Loop Function (*On*) with UE test loop mode B according to TS 38.508-1 [4], clause 4.5.4.

8.2.2.9.1.3.2 Test procedure sequence

Table 8.2.2.9.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR RadioBearerConfig to change the primaryPath of the Split DRB to E-UTRA radio path from NR. | <-- | <i>RRCConnectionReconfiguration</i> | - | - |
| 2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i> | 1 | P |
| 3 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on Split DRB#2 using E-UTRA radio path in the uplink? | - | - | 1 | P |
| 4 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR RadioBearerConfig to change the primaryPath of the Split DRB from E-UTRA radio path to NR. | <-- | <i>RRCConnectionReconfiguration</i> | - | - |
| 5 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i> | 2 | P |
| 6 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on the Split DRB#2 using NR radio path in the uplink? | - | - | 2 | P |

8.2.2.9.1.3.3 Specific message contents

Table 8.2.2.9.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.2.9.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|--|---|--|--|
| RRConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nr-RadioBearerConfig1-r15 | OCTET STRING
including
RadioBearerConfig. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.2.9.1.3.3-2: *RadioBearerConfig* (Table 8.2.2.9.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-132 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToAddModList SEQUENCE (SIZE (1..maxDRB)) OF SEQUENCE { | 1 entry | | |

| | | | |
|-------------|--------------|--|--|
| pdcp-Config | PDCCP-Config | | |
| } | | | |
| } | | | |

Table 8.2.2.9.1.3.3-3: *PDCCP-Config* (Table 8.2.2.9.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-99 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCCP-Config ::= SEQUENCE { | | | |
| drb SEQUENCE { | | | |
| statusReportRequired | true | | |
| } | | | |
| moreThanOneRLC SEQUENCE { | | | |
| primaryPath SEQUENCE { | | | |
| cellGroup | 0 | | |
| } | | | |
| ul-DataSplitThreshold | infinity | | |
| } | | | |
| } | | | |

Table 8.2.2.9.1.3.3-4: *RRCCOnnectionReconfiguration* (step 4, Table 8.2.2.9.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCCOnnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |

| | | | |
|---------------------------|----------|--|--|
| moreThanOneRLC SEQUENCE { | | | |
| primaryPath SEQUENCE { | | | |
| cellGroup | 1 | | |
| } | | | |
| ul-DataSplitThreshold | infinity | | |
| } | | | |
| } | | | |

8.2.3 Measurement Configuration Control and Reporting / Handovers

8.2.3.1 Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells

8.2.3.1.1 Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells / EN-DC

8.2.3.1.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell and not detected entering condition for the event B1 is met }

ensure that {

when { UE detects entering condition for the event B1 is not met }

then { UE does not transmit any MeasurementReport }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell and not detected entering condition for the event B1 is met }

ensure that {

when { UE detects entering condition for the event B1 is met }

then { UE transmits a MeasurementReport }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell and detected entering condition for the event B1 is met }

ensure that {

when { UE detects leaving condition for the event B1 is met }

then { UE does not transmit any MeasurementReport }

}

8.2.3.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.5.1, 5.5.4.1, 5.5.4.7, 5.5.5 and 5.5.5.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.5.1]

The UE reports measurement information in accordance with the measurement configuration as provided by E-UTRAN. E-UTRAN provides the measurement configuration applicable for a UE in RRC_CONNECTED by means of dedicated signalling, i.e. using the *RRCConnectionReconfiguration* or *RRCConnectionResume* message.

The UE can be requested to perform the following types of measurements:

- Intra-frequency measurements: measurements at the downlink carrier frequency(ies) of the serving cell(s).
- Inter-frequency measurements: measurements at frequencies that differ from any of the downlink carrier frequency(ies) of the serving cell(s).
- Inter-RAT measurements of NR frequencies.

...

The measurement configuration includes the following parameters:

1. **Measurement objects:** The objects on which the UE shall perform the measurements.

- For intra-frequency and inter-frequency measurements a measurement object is a single E-UTRA carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.
- For inter-RAT NR measurements a measurement object is a single NR carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of 'blacklisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.

...

NOTE 1: Some measurements using the above mentioned measurement objects, only concern a single cell, e.g. measurements used to report neighbouring cell system information, PCell UE Rx-Tx time difference, or a pair of cells, e.g. SSTD measurements between the PCell and the PSCell.

2. **Reporting configurations:** A list of reporting configurations where each reporting configuration consists of the following:

- Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.
- Reporting format: The quantities that the UE includes in the measurement report and associated information (e.g. number of cells to report).

3. **Measurement identities:** A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is used as a reference number in the measurement report.

4. **Quantity configurations:** One quantity configuration is configured per RAT type. The quantity configuration defines the measurement quantities and associated filtering used for all event evaluation and related reporting of that measurement type. One filter can be configured per measurement quantity, except for NR where the network may configure up to 2 sets of quantity configurations each comprising per measurement quantity separate filters for cell and RS index measurement results. The quantity configuration set that applies for a given measurement is indicated within the NR measurement object.

5. **Measurement gaps:** Periods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled.

...

For E-UTRA, the UE measures and reports on the serving cell(s), listed cells, detected cells, transmission resource pools for V2X sidelink communication, and, for RSSI and channel occupancy measurements, the UE measures and reports on any reception on the indicated frequency. For inter-RAT NR, the UE measures and reports on detected cells and, if configured with EN-DC, on NR serving cell(s). For inter-RAT UTRA, the UE measures and reports on listed cells and optionally on cells that are within a range for which reporting is allowed by E-UTRAN. For inter-RAT GERAN, the UE measures and reports on detected cells. For inter-RAT CDMA2000, the UE measures and reports on listed cells. For inter-RAT WLAN, the UE measures and reports on listed cells.

[TS 36.331, clause 5.5.4.1]

If security has been activated successfully, The UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

...

2> else:

...

3> else if the corresponding *measObject* concerns NR:

4> if the *reportSFTD-Meas* is set to *pSCell* in the corresponding *reportConfigInterRAT*:

5> consider the PSCell to be applicable;

4> else if the *reportSFTD-Meas* is set to *neighborCells* in the corresponding *reportConfigInterRAT*;

5> if *cellsForWhichToReportSFTD* is configured in the corresponding *measObjectNR*:6> consider any neighbouring NR cell on the associated frequency that is included in *cellsForWhichToReportSFTD* to be applicable;

5> else:

6> consider up to 3 strongest neighbouring NR cells detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

4> else:

5> if the *eventB1* or *eventB2* is configured in the corresponding *reportConfig*:

6> consider a serving cell, if any, on the associated NR frequency as neighbouring cell;

5> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;[TS 36.331, clause 5.5.4.7]

The UE shall:

1> for UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;

1> consider the entering condition for this event to be satisfied when condition B1-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition B1-2, as specified below, is fulfilled;

Inequality B1-1 (Entering condition)

$$Mn + Ofn - Hys > Thresh$$

Inequality B1-2 (Leaving condition)

$$Mn + Ofn + Hys < Thresh$$

The variables in the formula are defined as follows:

Mn is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA 2000 measurement result, *pilotStrength* is divided by -2.

Ofn is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. *offsetFreq* as defined within the *measObject* corresponding to the frequency of the neighbour inter-RAT cell).

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

Thresh is the threshold parameter for this event (i.e. *b1-Threshold* as defined within *reportConfigInterRAT* for this event). For CDMA2000, *b1-Threshold* is divided by -2.

Mn is expressed in dBm or in dB, depending on the measurement quantity of the inter-RAT neighbour cell.

Ofn, Hys are expressed in dB.

Thresh is expressed in the same unit as **Mn**.

[TS 36.331, clause 5.5.5]

The purpose of this procedure is to transfer measurement results from the UE to E-UTRAN. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultPCell* to include the quantities of the PCell;

1> set the *measResultServFreqList* to include for each E-UTRA SCell that is configured, if any, within *measResultSCell* the quantities of the concerned SCell, if available according to performance requirements in 36.133 [16], except if *purpose* for the *reportConfig* associated with the *measId* that triggered the measurement reporting is set to *reportLocation*;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:

2> for each E-UTRA serving frequency for which *measObjectId* is referenced in the *measIdList*, other than the frequency corresponding with the *measId* that triggered the measurement reporting:

3> set the *measResultServFreqList* to include within *measResultBestNeighCell* the *physCellId* and the quantities of the best non-serving cell, based on RSRP, on the concerned serving frequency;

1> if the *triggerType* is set to *event*; and if the corresponding *measObject* concerns NR; and if *eventId* is set to *eventB1-NR* or *eventB2-NR*; or

1> if the *triggerType* is set to *event*; and if *eventId* is set to *eventA3* or *eventA4* or *eventA5*:

2> if *purpose* for the *reportConfig* associated with the *measId* that triggered the measurement reporting is set to a value other than *reportLocation*:

3> set the *measResultServFreqListNR* to include for each NR serving frequency that the UE is configured to measure according to TS 38.331 [82], if any, the following:

4> set *measResultSCell* to include the available results of the NR serving cell, as specified in 5.5.5.2;

4> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:

5> set *measResultBestNeighCell* to include the available results, as specified in 5.5.5.2, of the best non-serving cell, ordered based on the quantity determined as specified in 5.5.5.2;

3> for each (serving or neighbouring) cell for which the UE reports results according to the previous, additionally include available beam results according to the following:

4> if *maxReportRS-Index* is configured, set *measResultRS-IndexList* to include available results, as specified in 5.5.5.2, of up to *maxReportRS-Index* beams, ordered based on the quantity determined as specified in 5.5.5.3;

1> if there is at least one applicable neighbouring cell to report:

2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

3> if the *triggerType* is set to *event*:

4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

3> else:

4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

NOTE 1: The reliability of the report (i.e. the certainty it contains the strongest cells on the concerned frequency) depends on the measurement configuration i.e. the *reportInterval*. The related performance requirements are specified in TS 36.133 [16].

3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

3> if the *triggerType* is set to *event*; or the *purpose* is set to *reportStrongestCells* or to *reportStrongestCellsForSON*:

4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

5> if the *measObject* associated with this *measId* concerns E-UTRA:

6> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfig*;

6> sort the included cells in order of decreasing *triggerQuantity*, i.e. the best cell is included first;

5> if the *measObject* associated with this *measId* concerns NR:

6> set the *measResultCell* to include the quantity(ies) indicated in the *reportQuantityCellNR* within the concerned *reportConfig*;

6> if *maxReportRS-Index* and *reportQuantityRS-IndexNR* are configured, set *measResultRS-IndexList* to include results of the best beam and the beams whose quantity is above *threshRS-Index* defined in the *VarMeasConfig* for the corresponding *measObject*, up to *maxReportRS-Index* beams in total:

7> order beams based on the sorting quantity determined as specified in 5.5.5.3;

7> include *ssbIndex*;

7> for each included beam:

8> include *ssbIndex*;

8> if *reportRS-IndexResultsNR* is configured, for each quantity indicated, include the corresponding measurement result in *measResultNeighCells*;

6> sort the included cells in order of decreasing sorting quantity determined as specified in 5.5.5.3;

...

[TS 36.331, clause 5.5.5.3]

- 1> for cells on the frequency associated with the *measId* that triggered the measurement reporting, if the *reportTrigger* is set to *event*, consider the quantity used in *BN-ThresholdYNR* to be the sorting quantity;
- 1> for other cases, determine the sorting quantity as follows:
 - 2> consider the following quantities as candidate sorting quantities:
 - 3> for cells on the frequency associated with the *measId* that triggered the measurement reporting (for a *triggerType* set to *periodical*):
 - 4> the quantities defined by *reportQuantityCellNR*, when used for sorting cells;
 - 4> the quantities defined by *reportQuantityRS-IndexNR*, when used for sorting beams;
 - 3> for cells, serving or non-serving (i.e. within *reportAddNeighMeas*), on NR serving frequencies other than the one associated with the *measId* triggering reporting:
 - 4> the available quantities of available NR measurement results as specified in 5.5.5.2;
 - 2> if there is a single candidate sorting quantity;
 - 3> consider the concerned quantity to be the sorting quantity;
 - 2> else:
 - 3> if RSRP is one of the candidate sorting quantities;
 - 4> consider RSRP to be the sorting quantity;
 - 3> else:
 - 4> consider RSRQ to be the sorting quantity;

8.2.3.1.1.3 Test description

8.2.3.1.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 and NR Cell 1.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) and Bearers (*MCG(s) only*) established according to TS 38.508-1 [4].

8.2.3.1.1.3.2 Test procedure sequence

Table 8.2.3.1.3.2-1 and Table 8.2.3.1.3.2-1A illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.1.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|---------------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | The power level values are such that entering conditions for event B1 are not satisfied. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -91 | |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | The power level values are such that entering conditions for event B1 are satisfied. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -79 | |
| T2 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | The power level values are such that leaving conditions for event B1 are satisfied. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -91 | |

Table 8.2.3.1.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|---------------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | The power level values are such that entering conditions for event B1 are not satisfied. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -100 | |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | The power level values are such that entering conditions for event B1 are satisfied. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -82 | |
| T2 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | The power level values are such that leaving conditions for event B1 are satisfied. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -100 | |

Table 8.2.3.1.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|-------------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> including <i>measConfig</i> to setup inter RAT measurements | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |

| | | | | | |
|---|---|-----|---|---|---|
| | and reporting for NR Cell 1. | | | | |
| 2 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message to confirm the setup of inter RAT measurements for NR Cell 1. | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | - | - |
| 3 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message on E-UTRA Cell 1 to report the event B1 during the next 10s? | --> | <i>MEASUREMENTREPORT</i> | 1 | F |
| 4 | The SS changes NR Cell 1 parameters according to the row "T1". | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message to report the event B1 for NR Cell 1? | --> | <i>MEASUREMENTREPORT</i> | 2 | P |
| 6 | The SS changes NR Cell 1 parameters according to the row "T2". | - | - | - | - |
| 7 | Wait and ignore <i>MEASUREMENTREPORT</i> messages for 15s to allow change of power levels and UE measurements for NR Cell 1. | - | - | - | - |
| 8 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message on E-UTRA Cell 1 to report the event B1 during the next 10s? | --> | <i>MEASUREMENTREPORT</i> | 3 | F |

8.2.3.1.1.3.3 Specific message contents

Table 8.2.3.1.1.3.3-0: Conditions for specific message contents in Tables 8.2.3.1.1.3.3-2.

| Condition | Explanation |
|-----------|--------------------------|
| Band > 64 | If band > 64 is selected |

Table 8.2.3.1.1.3.3-1: *RRCCONNECTIONRECONFIGURATION* (step 1, Table 8.2.3.1.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-8, condition MEAS

Table 8.2.3.1.1.3.3-2: *MEASCONFIG* (Table 8.2.3.1.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>MeasConfig</i> ::= SEQUENCE { | | | |
| <i>measObjectToAddModList</i> SEQUENCE (SIZE (1.. <i>maxObjectId</i>)) OF SEQUENCE { | 2 entries | | |
| <i>measObjectId</i> [1] | 1 | | |
| <i>measObject</i> [1] | <i>MeasObjectEUTRA-GENERIC</i> (f1) | | |
| <i>measObject</i> [1] | <i>MeasObjectEUTRA-GENERIC</i> (<i>maxEARFCN</i>) | | Band > 64 |

| | | | |
|--|--|--|-----------|
| |) | | |
| measObjectId[2] | 2 | | |
| measObject[2] | MeasObjectNR-
GENERIC (NRf1) | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] | ReportConfig1-B1-NR-
r15(-85) | | FR1 |
| reportConfig[1] | ReportConfig2-B1-NR-
r15(-91 + Δ(NRf1)) | | FR2 |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| quantityConfig | QuantityConfig-
DEFAULT | | |
| measGapConfig | MeasGapConfig | | |
| measObjectToAddModList-v9e0 ::= SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | | | Band > 64 |
| measObjectEUTRA-v9e0[1] SEQUENCE { | | | |
| carrierFreq-v9e0 | Same downlink
EARFCN as used for f1 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.1.1.3.3-3: *QuantityConfig-DEFAULT* (Table 8.2.3.1.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-3A | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| QuantityConfig-DEFAULT ::= SEQUENCE { | | | |
| quantityConfigNRList-r15 SEQUENCE ((SIZE (1..maxQuantSetsNR-r15)) OF SEQUENCE { | | | |
| measQuantityCellNR-r15 SEQUENCE { | | | |

| | | | |
|----------------------------|-----|--|--|
| filterCoeff-RSRP-r15 | fc0 | | |
| filterCoeff-RSRQ-r15 | fc0 | | |
| filterCoefficient-SINR-r13 | fc0 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.1.1.3.3-4: *MeasObjectNR-GENERIC (NRf1)* (Table 8.2.3.1.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-2B | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR-GENERIC(Freq) ::= SEQUENCE { | | | |
| carrierFreq-r15 | Downlink carrier frequency of NR cell 1 | | |
| } | | | |

Table 8.2.3.1.1.3.3-5: *ReportConfig1-B1-NR-r15(-85)* (Table 8.2.3.1.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-7AA | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfig-B1-NR ::= SEQUENCE { | | | |
| triggerType CHOICE { | | | |
| reportAmount | infinity | | |
| reportQuantityCellNR-r15 ::= SEQUENCE { | | | |
| ss-rsrp | true | | |
| ss-rsrq | true | | |
| ss-sinr | true | | |
| } | | | |
| } | | | |

Table 8.2.3.1.1.3.3-6: *MeasurementReport* (step 5, Table 8.2.3.1.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-5 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |

| Derivation Path: 36.508 [7], Table 4.6.6-7AA | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfig-B1-NR ::= SEQUENCE { | | | |
| triggerType CHOICE { | | | |
| reportAmount | Infinity | | |
| reportQuantityCellNR-r15 ::= SEQUENCE { | | | |
| ss-rsrp | true | | |
| ss-rsrq | true | | |
| ss-sinr | true | | |
| } | | | |
| } | | | |
| NOTE 1: $\Delta(NRf1)$ is derived based on calibration procedure defined in the TS 38.508-1 [4], clause 6.1.3.3 | | | |

8.2.3.2 Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells / RSRQ based measurements

8.2.3.2.1 Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells / RSRQ based measurements / EN-DC

8.2.3.2.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell, configured b1-Threshold set to threshold-RSRQ and not detected entering condition for the event B1 is met }

ensure that {

when { UE detects entering condition for the event B1 is not met }

then { UE does not transmit any MeasurementReport }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell, configured b1-Threshold set to threshold-RSRQ and not detected entering condition for the event B1 is met }

ensure that {

when { UE detects entering condition for the event B1 is met }

then { UE transmits a MeasurementReport }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell, configured b1-Threshold set to threshold-RSRQ and detected entering condition for the event B1 is met }

ensure that {

when { UE detects leaving condition for the event B1 is met }

then { UE does not transmit any MeasurementReport }

}

8.2.3.2.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.5.1, 5.5.4.1, 5.5.4.7, 5.5.5.1 and 5.5.5.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.5.1]

The UE reports measurement information in accordance with the measurement configuration as provided by E-UTRAN. E-UTRAN provides the measurement configuration applicable for a UE in RRC_CONNECTED by means of dedicated signalling, i.e. using the *RRCConnectionReconfiguration* or *RRCConnectionResume* message.

The UE can be requested to perform the following types of measurements:

- Intra-frequency measurements: measurements at the downlink carrier frequency(ies) of the serving cell(s).
- Inter-frequency measurements: measurements at frequencies that differ from any of the downlink carrier frequency(ies) of the serving cell(s).
- Inter-RAT measurements of NR frequencies.

...

The measurement configuration includes the following parameters:

1. **Measurement objects:** The objects on which the UE shall perform the measurements.

- For intra-frequency and inter-frequency measurements a measurement object is a single E-UTRA carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.
- For inter-RAT NR measurements a measurement object is a single NR carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of 'blacklisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.

...

NOTE 1: Some measurements using the above mentioned measurement objects, only concern a single cell, e.g. measurements used to report neighbouring cell system information, PCell UE Rx-Tx time difference, or a pair of cells, e.g. SSTD measurements between the PCell and the PSCell.

2. **Reporting configurations:** A list of reporting configurations where each reporting configuration consists of the following:

- Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.
- Reporting format: The quantities that the UE includes in the measurement report and associated information (e.g. number of cells to report).

3. **Measurement identities:** A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is used as a reference number in the measurement report.

4. **Quantity configurations:** One quantity configuration is configured per RAT type. The quantity configuration defines the measurement quantities and associated filtering used for all event evaluation and related reporting of that measurement type. One filter can be configured per measurement quantity, except for NR where the network may configure up to 2 sets of quantity configurations each comprising per measurement quantity separate filters for cell and RS index measurement results. The quantity configuration set that applies for a given measurement is indicated within the NR measurement object.

5. **Measurement gaps:** Periods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled.

E-UTRAN only configures a single measurement object for a given frequency (except for WLAN and except for CBR measurements), i.e. it is not possible to configure two or more measurement objects for the same frequency with different associated parameters, e.g. different offsets and/ or blacklists. E-UTRAN may configure multiple instances of the same event e.g. by configuring two reporting configurations with different thresholds.

The UE maintains a single measurement object list, a single reporting configuration list, and a single measurement identities list. The measurement object list includes measurement objects, that are specified per RAT type, possibly including intra-frequency object(s) (i.e. the object(s) corresponding to the serving frequency(ies)), inter-frequency object(s) and inter-RAT objects. Similarly, the reporting configuration list includes E-UTRA and inter-RAT reporting configurations. Any measurement object can be linked to any reporting configuration of the same RAT type. Some reporting configurations may not be linked to a measurement object. Likewise, some measurement objects may not be linked to a reporting configuration.

[TS 36.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

...

2> else:

...

3> else if the corresponding *measObject* concerns NR:

4> if the *reportSFTD-Meas* is set to *pSCell* in the corresponding *reportConfigInterRAT*:

5> consider the PSCell to be applicable;

4> else if the *reportSFTD-Meas* is set to *neighborCells* in the corresponding *reportConfigInterRAT*:

5> if *cellsForWhichToReportSFTD* is configured in the corresponding *measObjectNR*:

6> consider any neighbouring NR cell on the associated frequency that is included in *cellsForWhichToReportSFTD* to be applicable;

5> else:

6> consider up to 3 strongest neighbouring NR cells detected on the associated frequency to be applicable when the concerned cells are not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

...

2> else if the *purpose* is included and set to *reportStrongestCells*, *reportStrongestCellsForSON*, *reportLocation sidelink* or *sensing sidelink* and if a (first) measurement result is available:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

- 3> if the *purpose* is set to *reportStrongestCells* and *reportStrongestCSI-RSs* is not included:
- 4> if the *triggerType* is set to *periodical* and the corresponding *reportConfig* includes the *ul-DelayConfig*:
- 5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after a first measurement result is provided by lower layers;
- ...
- 4> else if the *reportAmount* exceeds 1:
- 5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the PCell;
- 4> else (i.e. the *reportAmount* is equal to 1):
- 5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the PCell and for the strongest cell among the applicable cells, or becomes available for the pair of PCell and the PSCell in case of SSTD measurements, or becomes available for each requested pair of PCell and NR cell or the maximal measurement reporting delay as specified in TS 38.133 [84, 8.17.2.3] in case of SFTD measurements;
- ...
- 3> else:
- 4> initiate the measurement reporting procedure, as specified in 5.5.5, when it has determined the strongest cells on the associated frequency;
- 2> upon expiry of the periodical reporting timer for this *measId*:
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;
- ...

NOTE 2: The UE does not stop the periodical reporting with *triggerType* set to *event* or to *periodical* while the corresponding measurement is not performed due to the PCell RSRP being equal to or better than *s-Measure* or due to the measurement gap not being setup.

NOTE 3: If the UE is configured with DRX, the UE may delay the measurement reporting for event triggered and periodical triggered measurements until the Active Time, which is defined in TS 36.321 [6].

[TS 36.331, clause 5.5.4.7]

The UE shall:

- 1> for UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;
- 1> consider the entering condition for this event to be satisfied when condition B1-1, as specified below, is fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition B1-2, as specified below, is fulfilled;

Inequality B1-1 (Entering condition)

$$Mn + Ofn - Hys > Thresh$$

Inequality B1-2 (Leaving condition)

$$Mn + Ofn + Hys < Thresh$$

The variables in the formula are defined as follows:

Mn is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA 2000 measurement result, *pilotStrength* is divided by -2.

Ofn is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. *offsetFreq* as defined within the *measObject* corresponding to the frequency of the neighbour inter-RAT cell).

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

Thresh is the threshold parameter for this event (i.e. *b1-Threshold* as defined within *reportConfigInterRAT* for this event). For CDMA2000, *b1-Threshold* is divided by -2.

Mn is expressed in dBm or in dB, depending on the measurement quantity of the inter-RAT neighbour cell.

Ofn, Hys are expressed in dB.

Thresh is expressed in the same unit as **Mn**.

[TS 36.331, clause 5.5.5.1]

UE

EUTRAN



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to E-UTRAN. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultPCell* to include the quantities of the PCell;
- 1> set the *measResultServFreqList* to include for each E-UTRA SCell that is configured, if any, within *measResultSCell* the quantities of the concerned SCell, if available according to performance requirements in [16], except if *purpose* for the *reportConfig* associated with the *measId* that triggered the measurement reporting is set to *reportLocation*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
 - 2> for each E-UTRA serving frequency for which *measObjectId* is referenced in the *measIdList*, other than the frequency corresponding with the *measId* that triggered the measurement reporting:
 - 3> set the *measResultServFreqList* to include within *measResultBestNeighCell* the *physCellId* and the quantities of the best non-serving cell, based on RSRP, on the concerned serving frequency;
 - 1> if the *triggerType* is set to *event*; and if the corresponding *measObject* concerns NR; and if *eventId* is set to *eventB1* or *eventB2*; or
 - 1> if the *triggerType* is set to *event*; and if *eventId* is set to *eventA3* or *eventA4* or *eventA5*;
 - 2> if *purpose* for the *reportConfig* associated with the *measId* that triggered the measurement reporting is set to a value other than *reportLocation*;
 - 3> set the *measResultServFreqListNR* to include for each NR serving frequency, if any, the following;
 - 4> set *measResultSCell* to include the available results of the NR serving cell, as specified in 5.5.5.2;
 - 4> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*;
 - 5> set *measResultBestNeighCell* to include the available results, as specified in 5.5.5.2, of the best non-serving cell, ordered based on the quantity determined as specified in 5.5.5.3;

5> for each (serving or neighbouring) cell for which the UE reports results according to the previous, additionally include available beam results according to the following:

6> if *maxReportRS-Index* is configured, set *measResultCellRS-Index* to include available results, as specified in 5.5.5.2, of up to *maxReportRS-Index* beams, ordered based on the quantity determined as specified in 5.5.5.3;

1> if there is at least one applicable neighbouring cell to report:

2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:

3> if the *triggerType* is set to *event*:

4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;

3> else:

4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

NOTE 1: The reliability of the report (i.e. the certainty it contains the strongest cells on the concerned frequency) depends on the measurement configuration i.e. the *reportInterval*. The related performance requirements are specified in TS 36.133 [16].

3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;

3> if the *triggerType* is set to *event*; or the *purpose* is set to *reportStrongestCells* or to *reportStrongestCellsForSON*:

4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:

5> if the *measObject* associated with this *measId* concerns E-UTRA:

6> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfig* in order of decreasing *triggerQuantity*, i.e. the best cell is included first;

5> if the *measObject* associated with this *measId* concerns NR:

6> set the *measResultCell* to include the quantity(ies) indicated in the *reportQuantityCellNR* within the concerned *reportConfig* in order of decreasing quantity according to *bN-ThresholdYNR*, i.e. the best cell is included first;

6> if *maxReportRS-Index* and *reportQuantityRS-IndexNR* are configured, set *measResultCellRS-Index* to include results of the best beam and the beams whose quantity is above *threshRS-Index* defined in the *VarMeasConfig* for the corresponding *measObject*, up to *maxReportRS-Index* beams in total, and in order of decreasing quantity, same as used for cell reporting, and as follows:

7> order beams based on the sorting quantity determined as specified in 5.5.5.2;

7> include *ssbIndex*;

7> if *reportRS-IndexResultsNR* is configured, for each quantity indicated, include the corresponding measurement result;

[TS 36.331, clause 5.5.5.3]

When configured to report the best cells or beams, the UE shall determine the quantity that is used to order and select as follows:

1> consider the quantities the UE reports as candidate sorting quantities i.e. as follows:

2> for NR cells for which measurement reporting is triggered (i.e. NR cells included in *cellsTriggered*):

3> the quantities defined by *reportQuantityCellNR*, when used for sorting cells;

3> the quantities defined by *reportQuantityRS-IndexNR*, when used for sorting beams;

2> for cells on NR serving frequencies:

3> the available quantities of available NR measurement results as specified in 5.5.5.2;

1> if *reportType* is set to *eventTriggered*; and if *eventId* is set to *eventB1* or *eventB2*:

2> consider the trigger quantity to be the sorting quantity;

1> if *reportType* is set to *periodical*:

2> if there is a single candidate sorting quantity;

3> consider the concerned quantity to be the sorting quantity;

2> else:

3> if RSRP is one of the candidate sorting quantities;

4> consider RSRP to be the sorting quantity;

3> else:

4> consider RSRQ to be the sorting quantity;

8.2.3.2.1.3 Test description

8.2.3.2.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 and NR Cell 1.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) only*) established according to TS 38.508-1 [4], clause 4.5.4.

8.2.3.2.1.3.2 Test procedure sequence

Table 8.2.3.2.1.3.2-1 and Table 8.2.3.2.1.3.2-1A illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.2.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|---------------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | The power level values are such that entering conditions for event B1 are not satisfied. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -91 | |
| | SS-RSRQ | dB | - | -16.07 | |
| | Noc | dBm/SC S | - | -95 | |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | The power level values are such that entering conditions for event B1 are satisfied. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -85 | |
| | SS-RSRQ | dB | - | -12.80 | |
| | Noc | dBm/SC S | - | -95 | |
| T2 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | The power level values are such that leaving conditions for event B1 are satisfied. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -91 | |
| | SS-RSRQ | dB | - | -16.07 | |
| | Noc | dBm/SC S | - | -95 | |

Table 8.2.3.2.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|---------------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | FFS | - | The power level values are such that entering conditions for event B1 are not satisfied. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | FFS | |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | FFS | - | The power level values are such that entering conditions for event B1 are satisfied. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | FFS | |
| T2 | Cell-specific RS EPRE | dBm/15 kHz | FFS | - | The power level values are such that leaving conditions for event B1 are satisfied. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | FFS | |

Table 8.2.3.2.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|-------------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> including measConfig to setup inter RAT measurements and reporting for NR Cell 1. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 2 | The UE transmits an | --> | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |

| | | | | | |
|---|--|-----|--------------------------|---|---|
| | <i>RRCConnectionReconfigurationComplete</i> message to confirm the setup of inter RAT measurements for NR Cell 1. | | <i>Complete</i> | | |
| 3 | Check: Does the UE transmit a <i>MeasurementReport</i> message on E-UTRA Cell 1 to report the event B1 during the next 10s? | --> | <i>MeasurementReport</i> | 1 | F |
| 4 | The SS changes E-UTRA Cell 1 and NR Cell 1 parameters according to the row "T1". | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report the event B1 for NR Cell 1? | --> | <i>MeasurementReport</i> | 2 | P |
| 6 | The SS changes E-UTRA Cell 1 and NR Cell 1 parameters according to the row "T2". | - | - | - | - |
| 7 | Wait and ignore <i>MeasurementReport</i> messages for 15s to allow change of power levels and UE measurements for NR Cell 1. | - | - | - | - |
| 8 | Check: Does the UE transmit a <i>MeasurementReport</i> message on E-UTRA Cell 1 to report the event B1 during the next 10s? | --> | <i>MeasurementReport</i> | 3 | F |

8.2.3.2.1.3.3 Specific message contents

Table 8.2.3.2.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.2.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-8, condition MEAS

Table 8.2.3.2.1.3.3-2: *MeasConfig* (Table 8.2.3.2.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>MeasConfig</i> ::= SEQUENCE { | | | |
| <i>measObjectToAddModList</i> SEQUENCE (SIZE (1.. <i>maxObjectId</i>)) OF SEQUENCE { | 2 entries | | |
| <i>measObjectId</i> [1] | <i>IdMeasObject-f1</i> | | |
| <i>measObject</i> [1] | <i>MeasObjectEUTRA-GENERIC(f1)</i> | | |
| <i>measObject</i> [1] | <i>MeasObjectEUTRA-GENERIC(maxEARFCN)</i> | | Band > 64 |
| <i>measObjectId</i> [2] | <i>IdMeasObject-NRf1</i> | | |
| <i>measObject</i> [2] | <i>MeasObjectNR-GENERIC (NRf1)</i> | | |
| } | | | |

| | | | |
|---|------------------------|--|--|
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | IdReportConfig-B1-NR | | |
| reportConfig[1] | ReportConfig-B1-NR-r15 | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[2] | IdMeasObject-NRf1 | | |
| reportConfigId[1] | IdReportConfig-B1-NR | | |
| } | | | |
| quantityConfig | QuantityConfig-DEFAULT | | |
| measGapConfig | MeasGapConfig | | |
| } | | | |

Table 8.2.3.2.1.3.3-3: *QuantityConfig-DEFAULT* (Table 8.2.3.2.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-3A | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| QuantityConfig-DEFAULT SEQUENCE { | | | |
| quantityConfigNRLList-r15 SEQUENCE ((SIZE (1..maxQuantSetsNR-r15)) OF SEQUENCE { | | | |
| measQuantityCellNR-r15 SEQUENCE { | | | |
| filterCoeff-RSRP-r15 | fc0 | | |
| filterCoeff-RSRQ-r15 | fc0 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.2.1.3.3-4: *MeasObjectNR-GENERIC (NRf1)* (Table 8.2.3.2.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-2B | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR-GENERIC(Freq) ::= SEQUENCE { | | | |
| carrierFreq-r15 | Downlink carrier frequency of NR cell 1 | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.2.3.2.1.3.3-5: ReportConfig-B1-NR-r15 (Table 8.2.3.2.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-7AA | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfig-B1-NR ::= SEQUENCE { | | | |
| triggerType CHOICE { | | | |
| event SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventB1-NR-r15 SEQUENCE{ | | | |
| b1-ThresholdNR-r15 CHOICE{ | | | |
| nr-RSRQ-r15 | 57 | For FR1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| reportAmount | infinity | | |
| } | | | |

Table 8.2.3.2.1.3.3-6: *MeasurementReport* (step 5, Table 8.2.3.2.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-5 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| measurementReport-r8 SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultPCell SEQUENCE { | | | |
| rsrpResult | (0..97) | | |
| rsrqResult | (0..34) | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |

| | | | |
|--|--------------------------------------|---------|--|
| measResultNeighCellListNR-r15
SEQUENCE (SIZE (1..maxCellReport)) OF
SEQUENCE { | 1 entry | | |
| pci-r15 [1] | PhysicalCellIdentity of
NR Cell 1 | | |
| measResultCell-r15 [1] SEQUENCE { | | | |
| rsrqResult-r15 | (0..127) | For FR1 | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.2.1.3.3-7: MeasGapConfig(Table 8.2.3.2.1.3.3-2)

| Derivation Path: 36.331, clause 6.3.5 | | | |
|---------------------------------------|--------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig-GP2 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp1 | 19 | TGRP = 80 ms | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.3 Measurement configuration control and reporting / Inter-RAT measurements / Periodic reporting / Measurement of NR cells

8.2.3.3.1 Measurement configuration control and reporting / Inter-RAT measurements / Periodic reporting / Measurement of NR cells / EN-DC

8.2.3.3.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell }

ensure that {

when { The UE receives reference signal power for cells on the NR frequencies where measurements are configured }

then { UE sends MeasurementReport message at regular intervals for these NR cells }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only and a MeasurementReport message for a configured periodic measurement reporting of NR cells on a configured frequency were sent }

ensure that {

when { A previously reported cell become unavailable and the UE receives reference signal power on a reported NR frequency for a cell which was previously not reported }

then { UE sends MeasurementReport message at regular intervals for the available NR cells }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only and periodic measurement reporting of NR cells ongoing }

ensure that {

when { The UE receives a RRCConnectionReconfiguration message removing the measId of periodic reporting of NR cells }

then { UE stops sending MeasurementReport message for NR cells }

}

8.2.3.3.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.5.1, 5.5.4.1, 5.5.4.7 and 5.5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.5.1]

The UE reports measurement information in accordance with the measurement configuration as provided by E-UTRAN. E-UTRAN provides the measurement configuration applicable for a UE in RRC_CONNECTED by means of dedicated signalling, i.e. using the *RRCConnectionReconfiguration* or *RRCConnectionResume* message.

The UE can be requested to perform the following types of measurements:

- Intra-frequency measurements: measurements at the downlink carrier frequency(ies) of the serving cell(s).
- Inter-frequency measurements: measurements at frequencies that differ from any of the downlink carrier frequency(ies) of the serving cell(s).
- Inter-RAT measurements of NR frequencies.

...

The measurement configuration includes the following parameters:

1. **Measurement objects:** The objects on which the UE shall perform the measurements.

- For intra-frequency and inter-frequency measurements a measurement object is a single E-UTRA carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.
- For inter-RAT NR measurements a measurement object is a single NR carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of 'blacklisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.

...

NOTE 1: Some measurements using the above mentioned measurement objects, only concern a single cell, e.g. measurements used to report neighbouring cell system information, PCell UE Rx-Tx time difference, or a pair of cells, e.g. SSTD measurements between the PCell and the PSCell.

2. **Reporting configurations:** A list of reporting configurations where each reporting configuration consists of the following:

- Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.
- Reporting format: The quantities that the UE includes in the measurement report and associated information (e.g. number of cells to report).

3. **Measurement identities:** A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is used as a reference number in the measurement report.

4. **Quantity configurations:** One quantity configuration is configured per RAT type. The quantity configuration defines the measurement quantities and associated filtering used for all event evaluation and related reporting of that measurement type. One filter can be configured per measurement quantity, except for NR where the network may configure up to 2 sets of quantity configurations each comprising per measurement quantity separate filters for cell and RS index measurement results. The quantity configuration set that applies for a given measurement is indicated within the NR measurement object.

5. **Measurement gaps:** Periods that the UE may use to perform measurements, i.e. no (UL, DL) transmissions are scheduled.

E-UTRAN only configures a single measurement object for a given frequency (except for WLAN and except for CBR measurements), i.e. it is not possible to configure two or more measurement objects for the same frequency with different associated parameters, e.g. different offsets and/ or blacklists. E-UTRAN may configure multiple instances of the same event e.g. by configuring two reporting configurations with different thresholds.

The UE maintains a single measurement object list, a single reporting configuration list, and a single measurement identities list. The measurement object list includes measurement objects, that are specified per RAT type, possibly including intra-frequency object(s) (i.e. the object(s) corresponding to the serving frequency(ies)), inter-frequency object(s) and inter-RAT objects. Similarly, the reporting configuration list includes E-UTRA and inter-RAT reporting configurations. Any measurement object can be linked to any reporting configuration of the same RAT type. Some reporting configurations may not be linked to a measurement object. Likewise, some measurement objects may not be linked to a reporting configuration.

[TS 36.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

...

2> else:

...

3> else if the corresponding *measObject* concerns NR:

4> if the *reportSFTD-Meas* is set to *pSCell* in the corresponding *reportConfigInterRAT*:

5> consider the PSCell to be applicable;

4> else if the *reportSFTD-Meas* is set to *neighborCells* in the corresponding *reportConfigInterRAT*:

5> if *cellsForWhichToReportSFTD* is configured in the corresponding *measObjectNR*:

6> consider any neighbouring NR cell on the associated frequency that is included in *cellsForWhichToReportSFTD* to be applicable;

5> else:

6> consider up to 3 strongest neighbouring NR cells detected on the associated frequency to be applicable when the concerned cells are not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

4> else:

5> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

...

2> else if the *purpose* is included and set to *reportStrongestCells*, *reportStrongestCellsForSON*, *reportLocation* or *sidelink* and if a (first) measurement result is available:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> if the *purpose* is set to *reportStrongestCells* and *reportStrongestCSI-RSs* is not included:

4> if the *triggerType* is set to *periodical* and the corresponding *reportConfig* includes the *ul-DelayConfig*:

5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after a first measurement result is provided by lower layers;

...

4> else if the *reportAmount* exceeds 1:

5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the PCell;

4> else (i.e. the *reportAmount* is equal to 1):

5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the PCell and for the strongest cell among the applicable cells, or becomes available for the pair of PCell and the PSCell in case of SSTD measurements, or becomes available for each requested pair of PCell and NR cell or the maximal measurement reporting delay as specified in TS 38.133 [X, 8.17.2.3] in case of SFTD measurements;

...

3> else:

4> initiate the measurement reporting procedure, as specified in 5.5.5, when it has determined the strongest cells on the associated frequency;

2> upon expiry of the periodical reporting timer for this *measId*:

3> initiate the measurement reporting procedure, as specified in 5.5.5;

...

2> upon expiry of the T321 for this *measId*:

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

NOTE 2: The UE does not stop the periodical reporting with *triggerType* set to *event* or to *periodical* while the corresponding measurement is not performed due to the PCell RSRP being equal to or better than *s-Measure* or due to the measurement gap not being setup.

NOTE 3: If the UE is configured with DRX, the UE may delay the measurement reporting for event triggered and periodical triggered measurements until the Active Time, which is defined in TS 36.321 [6].

[TS 36.331, clause 5.5.5.1]

The purpose of this procedure is to transfer measurement results from the UE to E-UTRAN. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultPCell* to include the quantities of the PCell;
- 1> set the *measResultServFreqList* to include for each E-UTRA SCell that is configured, if any, within *measResultSCell* the quantities of the concerned SCell, if available according to performance requirements in [16], except if *purpose* for the *reportConfig* associated with the *measId* that triggered the measurement reporting is set to *reportLocation*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
 - 2> for each E-UTRA serving frequency for which *measObjectId* is referenced in the *measIdList*, other than the frequency corresponding with the *measId* that triggered the measurement reporting:
 - 3> set the *measResultServFreqList* to include within *measResultBestNeighCell* the *physCellId* and the quantities of the best non-serving cell, based on RSRP, on the concerned serving frequency;
 - ...
 - 1> if there is at least one applicable neighbouring cell to report:
 - 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *triggerType* is set to *event*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;...3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

NOTE 1: The reliability of the report (i.e. the certainty it contains the strongest cells on the concerned frequency) depends on the measurement configuration i.e. the *reportInterval*. The related performance requirements are specified in TS 36.133 [16].

- 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
- 3> if the *triggerType* is set to *event*; or the *purpose* is set to *reportStrongestCells* or to *reportStrongestCellsForSON*:
- 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 5> if the *measObject* associated with this *measId* concerns E-UTRA:
 - 6> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfig* in order of decreasing *triggerQuantity*, i.e. the best cell is included first;
- 5> if the *measObject* associated with this *measId* concerns NR:
 - 6> set the *measResultCell* to include the quantity(ies) indicated in the *reportQuantityCellNR* within the concerned *reportConfig* in order of decreasing quantity according to *bN-ThresholdYNR*, i.e. the best cell is included first;

6> if *maxReportRS-Index* and *reportQuantityRS-IndexNR* are configured, set *measResultCellRS-Index* to include results of the best beam and the beams whose quantity is above *threshRS-Index* defined in the *VarMeasConfig* for the corresponding *measObject*, up to *maxReportRS-Index* beams in total, and in order of decreasing quantity, same as used for cell reporting, and as follows:

7> order beams based on the reporting quantity determined as specified in 5.5.5.2;

7> include *ssbIndex*;

7> if *reportQuantityRS-IndexNR* and *reportRS-IndexResultsNR* are configured, for each quantity indicated, include the corresponding measurement result;

5> if the *measObject* associated with this *measId* concerns UTRA FDD and if *ReportConfigInterRAT* includes the *reportQuantityUTRA-FDD*:

6> set the *measResult* to include the quantities indicated by the *reportQuantityUTRA-FDD* in order of decreasing *measQuantityUTRA-FDD* within the *quantityConfig*, i.e. the best cell is included first;

5> if the *measObject* associated with this *measId* concerns UTRA FDD and if *ReportConfigInterRAT* does not include the *reportQuantityUTRA-FDD*; or

5> if the *measObject* associated with this *measId* concerns UTRA TDD, GERAN or CDMA2000:

6> set the *measResult* to the quantity as configured for the concerned RAT within the *quantityConfig* in order of either decreasing quantity for UTRA and GERAN or increasing quantity for CDMA2000 *pilotStrength*, i.e. the best cell is included first;

1> for the cells included according to the previous (i.e. covering the PCell, the SCells, the best non-serving cells on serving frequencies as well as neighbouring EUTRA cells) include results according to the extended RSRQ if corresponding results are available according to the associated performance requirements defined in 36.133 [16];

1> if there is at least one applicable CSI-RS resource to report:

2> set the *measResultCSI-RS-List* to include the best CSI-RS resources up to *maxReportCells* in accordance with the following:

3> if the *triggerType* is set to *event*:

4> include the CSI-RS resources included in the *csi-RS-TriggeredList* as defined within the *VarMeasReportList* for this *measId*;

3> else:

4> include the applicable CSI-RS resources for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;

NOTE 2: The reliability of the report (i.e. the certainty it contains the strongest CSI-RS resources on the concerned frequency) depends on the measurement configuration i.e. the *reportInterval*. The related performance requirements are specified in TS 36.133 [16].

...

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

1> else:

2> if the *triggerType* is set to *periodical*:

3> remove the entry within the *VarMeasReportList* for this *measId*;

3> remove this *measId* from the *measIdList* within *VarMeasConfig*;

...

1> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends;

8.2.3.3.1.3 Test description

8.2.3.3.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1, NR Cell 1 and NR Cell 2.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) only*) established according to TS 38.508-1 [4], clause 4.5.4.

8.2.3.3.1.3.2 Test procedure sequence

Table 8.2.3.3.1.3.2-1 and Table 8.2.3.3.1.3.2-1A illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1", "T2" and "T3" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.3.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------------------|------------|---------------|-----------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | - | The power level values are such that camping on E-UTRA Cell 1 is guarantee. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | Off | Off | |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | - | The power level values are such that NR Cell 1 is satisfied for periodic reporting. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -91 | Off | |
| T2 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | - | The power level values are such that NR Cell 2 is satisfied for periodic reporting and NR Cell 1 become unavailable. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | Off | -91 | |
| T3 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | - | The power level values are such that NR Cell 1 and NR Cell 2 are satisfied for periodic reporting. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -91 | -91 | |

Table 8.2.3.3.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------------------|------------|---------------|-----------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | - | The power level values are such that camping on E-UTRA Cell 1 is guaranteed. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | Off | Off | |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | - | The power level values are such that NR Cell 1 is satisfied for periodic reporting. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -82 | Off | |
| T2 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | - | The power level values are such that NR Cell 2 is satisfied for periodic reporting and NR Cell 1 become unavailable. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | Off | -82 | |
| T3 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | - | The power level values are such that NR Cell 1 and NR Cell 2 are satisfied for periodic reporting. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -82 | -82 | |

Table 8.2.3.3.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> including measConfig to setup inter RAT measurements and reporting for NR Cell. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 2 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message to confirm the setup of inter RAT measurements for NR Cell. | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | - | - |
| 3 | The SS changes NR Cell y parameters according to the row "T1". | - | - | - | - |
| 4 | Wait and ignore <i>MEASUREMENTREPORT</i> messages for 15s to allow change of power levels and UE measurements for NR Cell 1. | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message on E-UTRA Cell 1 to perform periodical reporting for NR Cell 1? | --> | <i>MEASUREMENTREPORT</i> | 1 | P |

| | | | | | |
|----|--|-----|---|---|---|
| 6 | The SS changes NR Cell y parameters according to the row "T2". | - | - | - | - |
| 7 | Wait and ignore <i>MeasurementReport</i> messages for 15s to allow change of power levels and UE measurements for NR Cell 2. | - | - | - | - |
| 8 | Check: Does the UE transmit a <i>MeasurementReport</i> message on E-UTRA Cell 1 to perform periodical reporting for NR Cell 2? | --> | <i>MeasurementReport</i> | 2 | P |
| 9 | The SS changes NR Cell y parameters according to the row "T3". | - | - | - | - |
| 10 | Wait and ignore <i>MeasurementReport</i> messages for 15s to allow change of power levels and UE measurements for NR Cell 1 and NR Cell 2. | - | - | - | - |
| 11 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> including measConfig to remove inter RAT measurements and reporting for NR Cell. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 12 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message to confirm the remove of inter RAT measurements for NR Cell. | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | - | - |
| 13 | Check: Does the UE transmit a <i>MeasurementReport</i> message on E-UTRA Cell 1 to perform periodical reporting for NR Cell 1 and NR Cell 2 during the next 10s? | --> | <i>MeasurementReport</i> | 3 | F |

8.2.3.3.1.3.3 Specific message contents

Table 8.2.3.3.1.3.3-1: *RRCCONNECTIONRECONFIGURATION* (step 1, Table 8.2.3.3.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-8, condition MEAS

Table 8.2.3.3.1.3.3-2: *MeasConfig* (Table 8.2.3.3.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|---|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | IdMeasObject-NRf1 | | |
| measObject[1] | MeasObjectNR-GENERIC (NRf1) | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | IdReportConfig-NR | | |
| reportConfig[1] | ReportConfigInterRAT-PERIODICAL-NR | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | IdMeasObject-NRf1 | | |
| reportConfigId[1] | IdReportConfig-NR | | |
| } | | | |
| quantityConfig | QuantityConfig-DEFAULT | | |
| measGapConfig | MeasGapConfig | | |
| } | | | |

Table 8.2.3.3.1.3.3-3: *QuantityConfig-DEFAULT* (Table 8.2.3.3.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-3A | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| QuantityConfig-DEFAULT SEQUENCE { | | | |
| quantityConfigNRList-r15 SEQUENCE ((SIZE (1..maxQuantSetsNR-r15)) OF SEQUENCE { | | | |
| measQuantityCellNR-r15 SEQUENCE { | | | |
| filterCoeff-RSRP-r15 | fc0 | | |
| filterCoeff-RSRQ-r15 | fc0 | | |
| filterCoefficient-SINR-r13 | fc0 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.3.1.3.3-4: *MeasObjectNR-GENERIC (NRf1)* (Table 8.2.3.3.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-2B | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR-GENERIC(Freq) ::= SEQUENCE { | | | |
| carrierFreq-r15 | Downlink carrier frequency of NR cell 1 | | |
| } | | | |

Table 8.2.3.3.1.3.3-5: *ReportConfigInterRAT-PERIODICAL-NR* (Table 8.2.3.3.1.3.3-2)

| Derivation path: 36.508 [7], Table 4.6.6-7 | | | |
|--|--------------|---------|-----------------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigInterRAT ReportConfigInterRAT-PERIODICAL-NR ::= SEQUENCE { | | | |
| maxReportCells | 2 | | |
| reportAmount | Infinity | | |
| reportQuantityCellNR-r15 ::= SEQUENCE { | | | |
| ss-rsrp | true | | |
| ss-rsrq | true | | |
| ss-sinr | true | | pc_ss_SINR_Meas |
| | false | | |
| } | | | |
| } | | | |

Table 8.2.3.3.1.3.3-6: *MeasurementReport* (step 5, Table 8.2.3.3.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-5 | | | |
|--|-----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| measurementReport-r8 SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultPCell SEQUENCE { | | | |
| rsrpResult | (0..97) | | |
| rsrqResult | (0..34) | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultNeighCellListNR-r15 SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | 1 entry | | |
| pci-r15 [1] | PhysicalCellIdentity of NR Cell 1 | | |
| measResultCell-r15 [1] SEQUENCE { | | | |

| | | | |
|--------------------|-------------|--|-----------------|
| rsrpResult-r15 | (0..127) | | |
| rsrqResult-r15 | (0..127) | | |
| rs-sinr-Result-r15 | (0..127) | | pc_ss_SINR_Meas |
| | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.3.1.3.3-7: *MeasurementReport* (step 8, Table 8.2.3.3.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-5 | | | |
|--|-----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| measurementReport-r8 SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultPCell SEQUENCE { | | | |
| rsrpResult | (0..97) | | |
| rsrqResult | (0..34) | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultNeighCellListNR-r15 SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | 1 entry | | |
| pci-r15 [1] | PhysicalCellIdentity of NR Cell 2 | | |
| measResultCell-r15 [1] SEQUENCE { | | | |
| rsrpResult-r15 | (0..127) | | |

| | | | |
|--------------------|-------------|--|-----------------|
| rsrqResult-r15 | (0..127) | | |
| rs-sinr-Result-r15 | (0..127) | | pc_ss_SINR_Meas |
| | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.3.1.3.3-8: *MeasConfig* (step 11, Table 8.2.3.3.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measIdToRemoveList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.3.3.1.3.3-9: *MeasGapConfig* (Table 8.2.3.3.1.3.3-2)

| Derivation Path: 36.508, clause 6.5.1-2 | | | |
|---|--------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig-GP2 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp1 | 19 | TGRP = 80 ms | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.4 Measurement configuration control and reporting / Event A1 / Measurement of NR PSCell

8.2.3.4.1 Measurement configuration control and reporting / Event A1 / Measurement of NR PSCell / EN-DC

8.2.3.4.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state in EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and measurement configured for event A1 with event based periodical reporting }

ensure that {

when { Serving NR cell becomes better than absolute threshold plus hysteresis }

then {UE sends MeasurementReport message at regular intervals while entering condition for event A1 is satisfied }

}

(2)

with { UE in RRC_CONNECTED state in EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and periodical measurement reporting triggered by event A1 ongoing }

ensure that {

when { Serving NR cell becomes worse than absolute threshold minus hysteresis }

then {UE stops sending MeasurementReport message }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and measurements are re-configured for event A1 with event based reporting to report on leaving condition }

ensure that {

when { Serving NR cell becomes worse than absolute threshold minus hysteresis }

then { UE sends MeasurementReport message when leaving condition for event A1 is satisfied }

}

8.2.3.4.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331:5.3.5.3; TS 38.331:5.3.5.3, 5.5.2, 5.5.4.1, 5.5.4.2 and 5.5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82, 5.3.5.3];

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2.

1> set the content of *RRCReconfigurationComplete* message as follows:

2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;

2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:

3> include the *uplinkTxDirectCurrentList*;

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1 > else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

[TS 38.331, clause 5.5.2.3]

The network applies the procedure as follows:

- configure a *measId* only if the corresponding measurement object, the corresponding reporting configuration and the corresponding quantity configuration, are configured;

The UE shall:

1> for each *measId* included in the received *measIdToAddModList*:

- 2> if an entry with the matching *measId* exists in the *measIdList* within the *VarMeasConfig*:
 - 3> replace the entry with the value received for this *measId*;
 - 2> else:
 - 3> add a new entry for this *measId* within the *VarMeasConfig*;
 - 2> remove the measurement reporting entry for this *measId* from the *VarMeasReportList*, if included;
 - 2> stop the periodical reporting timer and reset the associated information (e.g. *timeToTrigger*) for this *measId*;
- [TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;
- 3> if the corresponding *measObject* concerns NR;
- 4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*;
- 5> consider only the serving cell to be applicable;
- ...
- 2> if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:
- 3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:
- 4> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> upon expiry of the periodical reporting timer for this *measId*;
- ...
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;

[TS 38.331, clause 5.5.4.2]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when condition A1-1, as specified below, is fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition A1-2, as specified below, is fulfilled;
- 1> for this measurement, consider the NR serving cell corresponding to the associated *measObjectNR* associated with this event.

Inequality A1-1 (Entering condition)

$$Ms - Hys > Thresh$$

Inequality A1-2 (Leaving condition)

$$Ms + Hys < Thresh$$

The variables in the formula are defined as follows:

Ms is the measurement result of the serving cell, not taking into account any offsets.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh is the threshold parameter for this event (i.e. *a1-Threshold* as defined within *reportConfigNR* for this event).

Ms is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Hys is expressed in dB.

Thresh is expressed in the same unit as **Ms**.

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured, if any, the *servFreqId*;
- ...
- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
 - 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*.
- 1> else:
 - 2> if the *reportType* is set to *periodical*:
 - 3> remove the entry within the *VarMeasReportList* for this *measId*;
 - 3> remove this *measId* from the *measIdList* within *VarMeasConfig*.
 - 1> if the UE is configured with EN-DC:
 - 2> if SRB3 is configured:
 - 3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;
 - 2>else:
 - 3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

1> else:

2>submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.2.3.4.1.3 Test description

System Simulator:

- EUTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) and Bearers (*MCG(s) and SCG*) on E-UTRA Cell 1 according to TS 38.508-1 [4], clause 4.5.4.

8.2.3.4.1.3.2 Test procedure sequence

Table 8.2.3.4.1.3.2-1 and Table 8.2.3.4.1.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while row marked "T1" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.4.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|---------------|-----------|---|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | Power level is such that exit condition for event A1 is satisfied
$Ms < Thresh + Hys$ |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -91 | |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | Power level is such that entry condition for event A1 is satisfied
$Ms - Hys > Thresh$ |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -79 | |

Table 8.2.3.4.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|---------------|-----------|---|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | Power level is such that $Ms < Thresh + Hys$ |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -100 | |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | Power level is such that entry condition for event A1 is satisfied
$Ms - Hys > Thresh$ |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -82 | |

Table 8.2.3.4.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message including nr Config to setup intra NR measurement for NR Cell 1 and reporting for event A1 | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 2 | The UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MeasurementReport</i> encapsulated in <i>ULINFORMATIONTRANSFERMRDC</i> message to report event A1 with the measured [Results] for NR Cell 1? | --> | <i>ULINFORMATIONTRANSFERMRDC</i>
<i>(MeasurementReport)</i> | 1 | P |
| - | EXCEPTION: Step 5 below is repeated until 3 <i>MeasurementReport</i> messages are received from the UE | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MeasurementReport</i> encapsulated in <i>ULINFORMATIONTRANSFERMRDC</i> message, with the measured [Results] value for NR Cell 1? | --> | <i>ULINFORMATIONTRANSFERMRDC</i>
<i>(MeasurementReport)</i> | 1 | P |
| 6 | SS re-adjusts the cell-specific reference signal level according to row "T0". | - | - | - | - |
| 7 | Wait and ignore <i>MeasurementReport</i> messages for 15 s to allow change of power levels for NR Cell 1 and UE measurement. | - | - | - | - |
| 8 | Check: Does the UE transmit a <i>MeasurementReport</i> encapsulated in <i>ULINFORMATIONTRANSFERMRDC</i> message, with the measured [Results] value for NR Cell 1 within the next 10s? | --> | <i>ULINFORMATIONTRANSFERMRDC</i>
<i>(MeasurementReport)</i> | 2 | F |
| 9 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message including nr Config to setup intra NR measurement for NR Cell 1 and reporting for event A1 on leaving condition. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 10 | The UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | - | - |
| 11 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.2.3.4.1.3.2-1. | - | - | - | - |
| 12 | The UE transmit a <i>MeasurementReport</i> encapsulated in <i>ULINFORMATIONTRANSFERMRDC</i> message to report event A1 for NR Cell 1. | --> | <i>ULINFORMATIONTRANSFERMRDC</i>
<i>(MeasurementReport)</i> | - | - |
| 13 | SS re-adjusts the cell-specific reference signal level according to row "T0" in table 8.2.3.4.1.3.2-1. | - | - | - | - |
| 14 | Check: Does the UE transmit a <i>MeasurementReport</i> encapsulated in <i>ULINFORMATIONTRANSFERMRDC</i> message, with the measured [Results] value for NR | --> | <i>ULINFORMATIONTRANSFERMRDC</i>
<i>(MeasurementReport)</i> | 3 | P |

| | | | | |
|---------|--|--|--|--|
| Cell 1? | | | | |
|---------|--|--|--|--|

8.2.3.4.1.3.3 Specific message contents

Table 8.2.3.4.1.3.3-1: RRCConnectionReconfiguration (step 1, 9, Table 8.2.3.4.1.3.2-2)

| |
|--|
| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon |
|--|

Table 8.2.3.4.1.3.3-2: RRCReconfiguration (Table 8.2.3.4.1.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table [4.6.1-13] | | | |
|--|---------------------------|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | TS 38.508-1 [4], Table [4.6.5-12]. | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.4.1.3.3-3: MeasConfig (Table 8.2.3.4.1.3.3-2)

| Derivation path: 38.508-1[4] Table 4.6.3-69 | | | |
|--|--------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1.. maxNrofObjectId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | MeasObjectId | | |
| measObject CHOICE { | | | |
| measObjectNR[1] | MeasObjectNR-GENERIC(72) | | |

| | | | |
|---|------------------|--|-----|
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] | ReportConfig1-A1 | | FR1 |
| reportConfig[1] | ReportConfig2-A1 | | FR2 |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | MeasId | | |
| measObjectId[1] | MeasObjectId | | |
| reportConfigId[1] | ReportConfigId | | |
| } | | | |
| } | | | |

Table 8.2.3.4.1.3.3-4: MeasObjectNR-GENERIC(72) (Table 8.2.3.4.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR-GENERIC(Freq) ::= SEQUENCE { | | | |
| ssbFrequency | Downlink carrier frequency of NR cell 1 | | |
| } | | | |

Table 8.2.3.4.1.3.3-5: ReportConfig1-A1 (Step 1, Table 8.2.3.4.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A1 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA1 SEQUENCE { | | | |
| a1-Threshold CHOICE { | | | |
| rsrp | 72 | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|--------------|----------|-----|--|
| Hysteresis | 6 | 3dB | |
| } | | | |
| reportAmount | Infinity | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.4.1.3.3-6: RRCConnectionReconfigurationComplete (step 2, 10 Table 8.2.3.4.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-9 with condition MCG_and_SCG

Table 8.2.3.4.1.3.3-7: MeasurementReport (steps 4, 5, 12, 14, Table 8.2.3.4.1.3.2-2)

| Derivation Path: 38.508-1 [4], Table 4.6.1-5A | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.4.1.3.3-8: MeasResults (Table 8.2.3.4.1.3.3-7)

| Derivation Path: 38.508-1 [4], clause 4.6.3-79 with condition A1 | | | |
|---|---------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { | | | |
| measResultServingMOList ::= SEQUENCE (SIZE (1.. maxNrofServingCells)) OF SEQUENCE { | 1 entry | | |
| servCellId | Cell index corresponding to NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| measResult SEQUENCE { | | | |

Table 8.2.3.4.1.3.3-10: ReportConfig2-A1 (Step 1, Table 8.2.3.4.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A1 | | | |
|--|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA1 SEQUENCE { | | | |
| a1-Threshold CHOICE { | | | |
| rsrp | 69+delta(NRfs)) | | |
| } | | | |
| Hysteresis | 6 | 3dB | |
| } | | | |
| reportAmount | Infinity | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| NOTE 1: delta(NRfs) is derived based on calibration procedure defined in the TS 38.508-1 [4], clause 6.1.3.3 | | | |

Table 8.2.3.4.1.3.3-11: ReportConfig2-A1 (Step 9, Table 8.2.3.4.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A1 | | | |
|---|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA1 SEQUENCE { | | | |
| a1-Threshold CHOICE { | | | |
| rsrp | 69+delta(NRfs)) | | |
| } | | | |
| reportOnLeave | True | | |
| Hysteresis | 6 | 3dB | |

| | | | |
|--|---|--|--|
| } | | | |
| reportAmount | 1 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| NOTE 1: delta(NRfs) is derived based on calibration procedure defined in the TS 38.508-1 [4], clause 6.1.3.3 | | | |

8.2.3.5 Measurement configuration control and reporting / Event A2 / Measurement of NR PSCell

8.2.3.5.1 Measurement configuration control and reporting / Event A2 / Measurement of NR PSCell / EN-DC

8.2.3.5.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state in EN-DC mode and measurement configured for event A2 with event based periodical reporting }

ensure that {

when { Serving NR cell becomes worse than absolute threshold minus hysteresis }

then { UE sends MeasurementReport message at regular intervals while entering condition for event A2 is satisfied }

}

(2)

with { UE in RRC_CONNECTED state in EN-DC mode and periodical measurement reporting triggered by event A2 ongoing }

ensure that {

when { Serving NR cell becomes better than absolute threshold plus hysteresis }

then { UE stops sending MeasurementReport message }

}

8.2.3.5.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.5.4.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

1> else:

2> if the *RRCCONNECTIONRECONFIGURATION* message includes the *RADIORESOURCECONFIGDEDICATED*:

3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 3: If the *RRCCConnectionReconfiguration* message includes the establishment of radio bearers other than SRB1, the UE may start using these radio bearers immediately, i.e. there is no need to wait for an outstanding acknowledgment of the *SecurityModeComplete* message.

1> if the received *RRCCConnectionReconfiguration* includes the *sCellToReleaseList*:

2> perform SCell release as specified in 5.3.10.3a;

1> if the received *RRCCConnectionReconfiguration* includes the *sCellToAddModList*:

2> perform SCell addition or modification as specified in 5.3.10.3b;

1> if the received *RRCCConnectionReconfiguration* includes the *scg-Configuration*; or

1> if the current UE configuration includes one or more split DRBs and the received *RRCCConnectionReconfiguration* includes *radioResourceConfigDedicated* including *drb-ToAddModList*:

2> perform SCG reconfiguration as specified in 5.3.10.10;

1> if the received *RRCCConnectionReconfiguration* includes the *systemInformationBlockType1Dedicated*:

2> perform the actions upon reception of the *SystemInformationBlockType1* message as specified in 5.2.2.7;

1> if the *RRCCConnectionReconfiguration* message includes the *dedicatedInfoNASList*:

2> forward each element of the *dedicatedInfoNASList* to upper layers in the same order as listed;

1> if the *RRCCConnectionReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

[TS 38.331, clause 5.3.5.3]

1> if the *RRCReconfiguration* includes the *fullConfig*:

2> perform the radio configuration procedure as specified in 5.3.5.11;

1> if the *RRCReconfiguration* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

1> if the *RRCReconfiguration* includes the *masterKeyUpdate*:

2> perform security key update procedure as specified in 5.3.5.7;

1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> if the *RRCReconfiguration* message includes the *dedicatedSIB1-Delivery*:

2> perform the action upon reception of *SIB1* as specified in 5.2.2.4.2;

1> if the *RRCReconfiguration* message includes the *dedicatedSystemInformationDelivery*:

2> perform the action upon reception of System Information as specified in 5.2.2.4;

1> set the content of *RRCReconfigurationComplete* message as follows:

2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;

2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:

3> include the *uplinkTxDirectCurrentList*;

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1 > else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured:

4> acquire the *SIB1* of the target SpCell of the MCG, as specified in 5.2.2.3.1;

2> the procedure ends.

1> if the *RRCReconfiguration* includes the *fullConfig*:

2> perform the radio configuration procedure as specified in 5.3.5.11;

1> if the *RRCReconfiguration* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

1> if the *RRCReconfiguration* includes the *masterKeyUpdate*:

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured:

4> acquire the *SIB1* of the target SpCell of the MCG, as specified in 5.2.2.3.1;

2> the procedure ends.

[TS 38.331, clause 5.5.4.3]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A2-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A2-2, as specified below, is fulfilled;

1> for this measurement, consider the primary or secondary cell that is configured on the frequency indicated in the associated *measObjectNR* to be the serving cell;

Inequality A2-1 (Entering condition)

$$Ms + Hys < Thresh$$

Inequality A2-2 (Leaving condition)

$$Ms - Hys > Thresh$$

The variables in the formula are defined as follows:

Ms is the measurement result of the serving cell, not taking into account any offsets.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigEUTRA* for this event).

Thresh is the threshold parameter for this event (i.e. *a2-Threshold* as defined within *reportConfigEUTRA* for this event).

Ms is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Hys is expressed in dB.

Thresh is expressed in the same unit as ***Ms***.

8.2.3.5.1.3 Test description

8.2.3.5.1.3.1 Pre-test conditions

System Simulator:

- EUTRA Cell 1 is the PCell and NR Cell 1 is the PS Cell.

UE:

- None

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC) and DC Bearers (MCG(s) and SCG) on E-UTRA Cell 1 according to TS 38.508-1, clause 4.5.4 [4].

8.2.3.5.1.3.2 Test procedure sequence

Table 8.2.3.5.1.3.2-1 and Table 8.2.3.5.1.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.5.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | EUTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|--------------|-----------|---|
| T0 | Cell-specific RS EPRE | dBm/1 5kHz | -85 | - | |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -79 | Power level is such that $M_s > Thresh + Hys$ |
| T1 | Cell-specific RS EPRE | dBm/1 5kHz | -85 | - | |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -95 | Power level is such that entry condition for event A2 is satisfied $M_s + Hys < Thresh$ |
| T2 | Cell-specific RS EPRE | dBm/1 5kHz | -85 | - | |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -79 | Power level is such that exit condition for event A2 is satisfied $M_s > Thresh + Hys$ |

Table 8.2.3.5.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | EUTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|--------------|-----------|---|
| T0 | Cell-specific RS EPRE | dBm/1 5kHz | -96 | - | |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -82 | Power level is such that $M_s > Thresh + Hys$ |
| T1 | Cell-specific RS EPRE | dBm/1 5kHz | -96 | - | |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -100 | Power level is such that entry condition for event A2 is satisfied $M_s + Hys < Thresh$ |
| T2 | Cell-specific RS EPRE | dBm/1 5kHz | -96 | - | |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -82 | Power level is such that exit condition for event A2 is satisfied $M_s > Thresh + Hys$ |

Table 8.2.3.5.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message including <i>measConfig</i> to setup intra NR measurement for PSCell and reporting for event A2 | <-- | <i>RRCConnectionReconfiguration</i> | - | - |
| 2 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message | --> | <i>RRCConnectionReconfigurationComplete</i> | - | - |
| 3 | SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 4 | Check: Does the UE transmit <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message to report event A2 with the measured results for NR Cell 1? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 1 | P |
| - | EXCEPTION: Step 5 below is repeated until 3 <i>MeasurementReport</i> messages are received from the UE | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message to report event A2 with the measured results for NR Cell 1? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 1 | P |
| 6 | SS re-adjusts the cell-specific reference signal level according to row "T2". | - | - | - | - |
| 7 | Wait and ignore <i>MeasurementReport</i> messages for 15 s to allow change of power levels for NR Cell 1 and UE measurement. | - | - | - | - |
| 8 | Check: Does the UE attempt to transmit an uplink message within the next 10s? | - | - | 2 | F |

8.2.3.5.1.3.3 Specific message contents

Table 8.2.3.5.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.5.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition MCG and SCG | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCConnectionReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| <i>rrcConnectionReconfiguration-r8</i> ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|---|--------------------------------|---|-----|
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR[1] | Downlink ARFCN of NR Cell2(68) | ssbFrequency IE equals to ARFCN of NR Cell1 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] | ReportConfigNR1-A2 | | FR1 |
| reportConfig[1] | ReportConfigNR2-A2 | | FR2 |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.3.5.1.3.3-4: RRCConnectionReconfigurationComplete (step 2, Table 8.2.3.5.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-9 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfigurationComplete ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcConnectionReconfigurationComplete-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|---------------------------------|---------|--|--|
| nonCriticalExtension SEQUENCE { | | | |
| scg-ConfigResponseNR-r15 | Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.5.1.3.3-5: MeasurementReport (steps 4, 5, Table 8.2.3.5.1.3.2-2)

| Derivation Path: TS 38.331 [6], clause 6.2.2 | | | |
|--|---------------------------------------|---------|-----------------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| measurementReport ::= SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |
| servCellId | Cell index corresponding to NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| cgi-Info | Not present | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |

| | | | |
|-------------------------|-------------|--|--|
| | Not present | | |
| } | | | |
| } | | | |
| rsIndexResults | Not checked | | |
| } | | | |
| } | | | |
| measResultBestNeighCell | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.5.1.3.3-6: ReportConfigNR-A2(68) (Table 8.2.3.5.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A2 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| reportAmount | infinity | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.5.1.3.3-7: ReportConfigNR-A2(66 + $\Delta(\text{NRf1})$) (Table 8.2.3.5.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A2 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |

| | | | |
|--|----------|--|--|
| eventId CHOICE { | | | |
| reportAmount | infinity | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| NOTE 1: $\Delta(\text{NRf1})$ is derived based on calibration procedure defined in the TS 38.508-1 [4], clause 6.1.3.3 | | | |

8.2.3.6 Measurement configuration control and reporting / Event A3 / Measurement of Neighbour NR cells

8.2.3.6.1 Measurement configuration control and reporting / Event A3 / Measurement of Neighbour NR cells / Intra-frequency measurements / EN-DC

8.2.3.6.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and measurements configured for event A3 }

ensure that {

when { Entry condition for event A3 is not met for neighbour NR cell }

then { UE does not send MeasurementReport }

 }

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and measurements configured for event A3 }

ensure that {

when { Neighbour NR cell becomes offset better than serving NR PSCell }

then { UE sends MeasurementReport with correct measId for event A3 }

 }

8.2.3.6.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.5.2, 5.5.4.1, 5.5.4.4 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

- 1> if the *RRCConnectionReconfiguration* message includes the *measConfig*:
- 2> perform the measurement configuration procedure as specified in 5.5.2;
- 1> set the content of *RRCConnectionReconfigurationComplete* message as follows:
- 2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:
- 3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;
 - 1> set the content of *RRCConnectionReconfigurationComplete* message as follows:
- 2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:
- 3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3]; 1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

- 1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:
- 2> perform the cell group configuration for the SCG according to 5.3.5.5;
- 1> if the *RRCReconfiguration* message includes the *measConfig*:
- 2> perform the measurement configuration procedure as specified in 5.5.2;
- 1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):
- 2> if *RRCReconfiguration* was received via SRB1:
- 3> construct *RRCReconfigurationComplete* message and submit it via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10];

[TS 38.331, clause 5.5.2]

The UE shall:

- 1> if the received *measConfig* includes the *measObjectToAddModList*:
- 2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;
- 1> if the received *measConfig* includes the *reportConfigToAddModList*:
- 2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;
- 1> if the received *measConfig* includes the *measIdToAddModList*:
- 2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;
- 3> if the corresponding *measObject* concerns NR;
- 4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*;
- 5> consider only the serving cell to be applicable;
- 4> else:

5> for events involving a serving cell associated with a *measObjectNR* and neighbours associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):

3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;

3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

3> initiate the measurement reporting procedure, as specified in 5.5.5;

[TS 38.331, clause 5.5.4.4]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

1> use the SpCell for *Mp*, *Ofp* and *Ocp*.

NOTE The cell(s) that triggers the event is on the frequency indicated in the associated *measObjectNR* which may be different from the frequency used by the NR SpCell.

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$$

Inequality A3-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the neighbour cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the frequency of the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Mp is the measurement result of the SpCell, not taking into account any offsets.

Ofp is the measurement object specific offset of the frequency of the SpCell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the frequency of the SpCell).

Ocp is the cell specific offset of the SpCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the frequency of the SpCell), and is set to zero if not configured for the SpCell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigNR* for this event).

Mn, Mp are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, Ocn, Ofp, Ocp, Hys, Off are expressed in dB.

[TS 38.331, clause 5.5.5]

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
 - 2> for each serving cell *measObjectId* referenced in the *measIdList*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:
 - 3> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells on this frequency, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells on this frequency, otherwise with the highest measured SINR;
 - 3> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 4> for each best non-serving cell included in the measurement report:
 - 5> include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if there is at least one applicable neighbouring cell to report:
 - 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
 - 4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
 - 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 3> if the *reportType* is set to *eventTriggered*:

- 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 5> if the *measObject* associated with this *measId* concerns NR:
- 6> if *rsType* in the associated *reportConfig* is set to *ssb*:
- 7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first:
- 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
- 6> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:
- 7> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first:
- 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are, include beam measurement information as described in 5.5.5.2;
- 1> if the UE is configured with EN-DC:
- 2> if SRB3 is configured:
- 3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;
- 2>else:
- 3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].
- 1> else:
- 2>submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.2.3.6.1.3 Test description

8.2.3.6.1.3.1 Pre-test conditions

System Simulator:

- EUTRA Cell 1 is the PCell and NR Cell 1 is the PS Cell.
- NR Cell 2 is the intra-frequency neighbour cell.

UE:

- None

Preamble:

- The UE is in state RRC_CONNECTED in EN-DC mode and DC Bearers (MCG and SCG) on E-UTRA Cell 1 according to TS 38.508-1 [4].

8.2.3.6.1.3.2 Test procedure sequence

Table 8.2.3.6.1.3.2-1 and Table 8.2.3.6.1.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.6.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | EUTR
A Cell
1 | NR
Cell 1 | NR
Cell 2 | | | Remark |
|----|-----------------------|---------------|---------------------|--------------|--------------|--|--|---|
| T0 | Cell-specific RS EPRE | dBm/1
5kHz | -85 | - | - | | | Power levels are such that entry condition for event A3 is not satisfied for any of the neighbour NR cells:
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |
| | SS/PBCH SSS EPRE | dBm/S
CS | - | -85 | -91 | | | |
| T1 | Cell-specific RS EPRE | dBm/1
5kHz | -85 | - | - | | | Power levels are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell (<i>measId 1</i>):
$Mn + Ofn + Ocn - Hys > Ms + Of_s + Ocs + Off$ |
| | SS/PBCH SSS EPRE | dBm/S
CS | - | -85 | -79 | | | |
| | | | | | | | | |
| | | | | | | | | |

Table 8.2.3.6.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | EUTR
A Cell
1 | NR
Cell 1 | NR
Cell 2 | | | Remark |
|----|-----------------------|---------------|---------------------|--------------|--------------|--|--|---|
| T0 | Cell-specific RS EPRE | dBm/1
5kHz | -96 | - | - | | | Power levels are such that entry condition for event A3 is not satisfied for any of the neighbour NR cells:
$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$ |
| | SS/PBCH SSS EPRE | dBm/S
CS | - | -91 | -100 | | | |
| T1 | Cell-specific RS EPRE | dBm/1
5kHz | -96 | - | - | | | Power levels are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell (<i>measId 1</i>):
$Mn + Ofn + Ocn - Hys > Ms + Of_s + Ocs + Off$ |
| | SS/PBCH SSS EPRE | dBm/S
CS | - | -91 | -82 | | | |
| | | | | | | | | |
| | | | | | | | | |

Table 8.2.3.6.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCReconfiguration</i> to setup measurements for neighbour NR Cells and | <-- | <i>RRCCONNECTIONRECONFIGURATION (RRCReconfiguration)</i> | - | - |

| | | | | | |
|---|--|-----|---|---|---|
| | reporting for event A3 | | | | |
| 2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete</i> (<i>RRCReconfigurationComplete</i>) | - | - |
| 3 | Check: Does the UE transmit an <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message within the next 10s to report event A3? | --> | <i>ULInformationTransferMRDC</i> (<i>MeasurementReport</i>) | 1 | F |
| 4 | The SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 5 | Check: Does the UE transmit an <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message to report event A3 (<i>measId 1</i>) with the measured value for NR Cell 2? | --> | <i>ULInformationTransferMRDC</i> (<i>MeasurementReport</i>) | 2 | P |

8.2.3.6.1.3.3 Specific message contents

Table 8.2.3.6.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.6.1.3.2-2)

| |
|--|
| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon |
|--|

Table 8.2.3.6.1.3.3-2: *RRCReconfiguration* (Table 8.2.3.6.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| <i>rrcReconfiguration</i> SEQUENCE { | | | |
| <i>radioBearerConfig</i> | Not Present | | |
| <i>secondaryCellGroup</i> | Not Present | | |
| <i>measConfig</i> | MeasConfig-A3 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.6.1.3.3-3: *MeasConfig-A3* (Table 8.2.3.6.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>MeasConfig</i> ::= SEQUENCE { | | | |

| | | | |
|--|--|--|----------|
| measObjectToAddModList | MeasObjectNRAddMod | | |
| ReportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(2)
Same as TS 38.508-1 [4],
Table 4.6.3-142 except
for reportAmount set to
'r1' | a3-Offset value
set to 1 dB (2*0.5
dB) | EVENT_A3 |
| } | | | |
| } | | | |
| MeasIdToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.3.6.1.3.3-4: *MeasObjectNRAddMod* (Table 8.2.3.6.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| measObjectToAddModList ::= SEQUENCE (SIZE (1.. maxNrofObjectId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR(59) | ssbFrequency IE
equals the
ARFCN for NR
Cell 2

Thresh value set
to -97dBm | |
| } | | | |
| } | | | |

Table 8.2.3.6.1.3.3-5: *RRCCONNECTIONRECONFIGURATIONCOMPLETE* (step 2, Table 8.2.3.6.1.3.2-2)

Derivation Path: 36.508 [7] , Table 4.6.1-9 with condition MCG_and_SCG

Table 8.2.3.6.1.3.3-6: ULInformationTransferMRDC (step 5, Table 8.2.3.6.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-27 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ULInformationTransferMRDC ::= SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING
including the
MeasurementReport
message according to
Table 8.2.3.6.1.3.3-7 | | |
| } | | | |

Table 8.2.3.6.1.3.3-7: *MeasurementReport* (Table 8.2.3.6.1.3.3-6)

| Derivation Path: 38.508-1 [4], Table 4.6.1-5A | | | |
|--|---|------------------|---------------------|
| Information Element | Value/remark | Comment | Condition |
| measurementReport ::= SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList ::= SEQUENCE (SIZE (1..maxNrofServingCells)) { | | Report NR Cell 1 | |
| servCellId | Cell index corresponding
to NR Cell 1 | | |
| measResultServingCell ::= SEQUENCE { | | | |
| physCellId | Phy cell id corresponding
to NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR
_Meas |
| Not present | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|------------------|-----------------|
| } | | | |
| } | | | |
| measResultNeighCells ::= SEQUENCE (SIZE (1..maxCellReport)) { | 1 entry | Report NR Cell 2 | |
| measResultListNR ::= SEQUENCE { | | | |
| physCellId | Phy cell id corresponding to NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.6.1a Measurement configuration control and reporting / Event A3 / Measurement of Neighbor NR cell / Inter-frequency measurements / EN-DC

8.2.3.6.1a.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and inter-frequency measurements configured for event A3 }

ensure that {

when { Entry condition for event A3 is not met for neighbour NR cell }

then { UE does not send MeasurementReport }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and inter-frequency measurements configured for event A3 }

ensure that {

when { Neighbour NR cell becomes offset better than serving NR PSCell }

then { UE sends MeasurementReport with correct measId for event A3 }

}

8.2.3.6.1a.2 Conformance requirements

Same as test case 8.2.3.6.1 with the following difference:

[TS 36.331, clause 5.5.2.9]

The UE shall:

1> if *measGapConfig* is set to *setup*:

...

2> if EN-DC is configured:

3> if the UE is configured with *fr1-Gap* set to *TRUE*:

4> apply the gap configuration for LTE serving cells and for NR serving cells on FR1;

3> else:

4> apply the gap configuration for all LTE and NR serving cells;

Test description

8.2.3.6.1a.3.1 Pre-test conditions

Same as test case 8.2.3.6.1 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

8.2.3.6.1a.3.2 Test procedure sequence

Same as test case 8.2.3.6.1 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

8.2.3.6.1a.3.3 Specific message contents

Same as test case 8.2.3.6.1 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

Table 8.2.3.6.1a.3.3-0: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.6.1.3.2-2)

| |
|--|
| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon |
|--|

| Information Element | Value/remark | Comment | Condition |
|--|-------------------------|---------|-----------|
| RRConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| measConfig | Table 8.2.3.6.1a.3.3-0a | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.6.1a.3.3-0a: measConfig (Table 8.2.3.6.1a.3.3-0)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| measConfig SEQUENCE { | | | |
| measGapConfig CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 9 | MGRP = 40 ms,
MGL = 6 ms | |
| } | | | |
| } | | | |
| fr1-gap-r15 | False | | |
| mgta-r15 | False | | |
| } | | | |

Table 8.2.3.6.1a.3.3-1: MeasConfig-A3 (Table 8.2.3.6.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|-----------------|---------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table
8.2.3.6.1a.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table
8.2.3.6.1a.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |

| | | | |
|--|--|--|------------------|
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(2)
Same as TS 38.508-1 Table 4.6.3-142 except for reportAmount set to 'r1' | a3-Offset Thresh value set to -1 dB (2*0.5 dB) | EVENT_A3 AND FR1 |
| | ReportConfigNR(2+ Delta(NRf ₂) - Delta(NRf ₁))
Same as TS 38.508-1 [4], Table 4.6.3-142 except for reportAmount set to 'r1' | a3-Offset value set to (2+ Delta(NRf ₂) - Delta(NRf ₁)).
(Note 1) | EVENT_A3 AND FR2 |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |
| Note 1: Delta(NRf ₂) and Delta(NRf ₁) are derived based on calibration procedure defined in the TS 38.508-1 [4], clause 6.1.3.3. | | | |

Table 8.2.3.6.1a.3.3-2: *MeasObjectNR-f1* (Table 8.2.3.6.1a.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.2.3.6.1a.3.3-3: *MeasObjectNR-f2* (Table 8.2.3.6.1a.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|---------------------------------|------------------------------------|--|--|
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.2.3.6.1b Measurement configuration control and reporting / Event A3 / Measurement of Neighbor NR cell / Inter-band measurements / EN-DC

8.2.3.6.1b.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and inter-band measurements configured for event A3 }

ensure that {

 when { Entry condition for event A3 is not met for neighbour NR cell }

 then { UE does not send MeasurementReport }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and inter-band measurements configured for event A3 }

ensure that {

 when { Neighbour NR cell becomes offset better than serving NR PSCell }

 then { UE sends MeasurementReport with correct measId for event A3 }

}

8.2.3.6.1b.2 Conformance requirements

Same as test case 8.2.3.6.1 with the following difference:

[TS 36.331, clause 5.5.2.9]

The UE shall:

1> if *measGapConfig* is set to *setup*:

...

2> if EN-DC is configured:

3> if the UE is configured with *fr1-Gap* set to *TRUE*:

4> apply the gap configuration for LTE serving cells and for NR serving cells on FR1;

3> else:

4> apply the gap configuration for all LTE and NR serving cells;

...

8.2.3.6.1b.3 Test description

8.2.3.6.1b.3.1 Pre-test conditions

Same as test case 8.2.3.6.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

8.2.3.6.1b.3.2 Test procedure sequence

Same as test case 8.2.3.6.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

8.2.3.6.1b.3.3 Specific message contents

Same as test case 8.2.3.6.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

Table 8.2.3.6.1b.3.3-0: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.6.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon | | | |
|--|-------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| measConfig | Table 8.2.3.6.1b.3.3-0a | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.6.1b.3.3-0a: measConfig (Table 8.2.3.6.1b.3.3-0)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| measConfig SEQUENCE { | | | |
| measGapConfig CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 9 | MGRP = 40 ms,
MGL = 6 ms | |
| } | | | |
| } | | | |
| } | | | |
| fr1-gap-r15 | False | | |
| mgta-r15 | False | | |
| } | | | |

Table 8.2.3.6.1b.3.3-1: *MeasConfig-A3* (Table 8.2.3.6.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|--|--|--|----------|
| | | | |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.2.3.6.1b.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.2.3.6.1b.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(2)
Same as TS 38.508-1 Table 4.6.3-107 except for reportAmount set to 'r1' | a3-Offset Thresh value set to -1 dB (2*0.5 dB) | EVENT_A3 |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.3.6.1b.3.3-2: *MeasObjectNR-f1* (Table 8.2.3.6.1b.3.3-1)

| | | | |
|---|--------------|---------|-----------|
| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
| Information Element | Value/remark | Comment | Condition |

| | | | |
|---------------------------------|------------------------------------|--|--|
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.2.3.6.1b.3.3-3: *MeasObjectNR-f2* (Table 8.2.3.6.1b.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|-------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 10 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.2.3.7 Measurement configuration control and reporting / Event A4 (intra-frequency, inter-frequency and inter-band measurements) / Measurement of Neighbour NR cell

8.2.3.7.1 Measurement configuration control and reporting / Event A4 / Measurement of Neighbour NR cell / Intra-frequency measurements / EN-DC

8.2.3.7.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and measurement configured for event A4 with event based periodical reporting }

ensure that {

when { Neighbour NR cell becomes better than absolute threshold }

then { UE sends MeasurementReport message at regular intervals while entering condition for event A4 is satisfied }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and periodical measurement reporting triggered by event A4 ongoing }

ensure that {

when { Neighbour NR cell becomes worse than absolute threshold }

```
then { UE stops sending MeasurementReport message }  
}
```

8.2.3.7.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 36.331, clause 5.3.5.3, and TS 38.331, clause 5.3.5.3, 5.5.2.1, 5.5.4.1, 5.5.4.5 and 5.5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCCONNECTIONRECONFIGURATION* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82, 5.3.5.3];

...

1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:

...

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];

1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

...

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];

[TS 38.331, clause 5.5.2.1]

The network applies the procedure as follows:

- to ensure that, whenever the UE has a *measConfig*, it includes a *measObject* for the SpCell and for each NR SCell to be measured;
- to configure at most one measurement identity using a reporting configuration with the *reportType* set to *reportCGI*;

- to ensure that, for all SSB based reporting configurations have at most one measurement object with the same *ssbFrequency* and *ssbSubcarrierSpacing*;

The UE shall:

...

- 1> if the received *measConfig* includes the *measObjectToAddModList*:
- 2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

- 1> if the received *measConfig* includes the *reportConfigToAddModList*:
- 2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

- 1> if the received *measConfig* includes the *measIdToAddModList*:
- 2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

- 1> if the received *measConfig* includes the *measGapConfig*:
- 2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;
- 3> if the corresponding *measObject* concerns NR;
- 4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*;
- 5> consider only the serving cell to be applicable;
- 4> else:
 - 5> for events involving a serving cell associated with a *measObjectNR* and neighbours associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;
 - 5> if *useWhiteCellList* is set to TRUE:
 - 6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is included in the *whiteCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;
 - 5> else:
 - 6> consider any neighbouring cell detected based on parameters in the associated *measObjectNR* to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;
 - 3> else if the corresponding *measObject* concerns E-UTRA;
 - 4> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModListEUTRAN* defined within the *VarMeasConfig* for this *measId*;
 - 2> if the corresponding *reportConfig* includes a *reportType* set to *reportCGI*:
 - 3> consider the cell detected on the associated *measObject* which has a physical cell identity matching the value of the *cellForWhichToReportCGI* included in the corresponding *reportConfig* within the *VarMeasConfig* to be applicable;
 - 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more

applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):

- 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5;
 - 2> if the *reportType* is set to *eventTriggered* and if the leaving condition applicable for this event is fulfilled for one or more of the cells included in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* for all measurements after layer 3 filtering taken during *timeToTrigger* defined within the *VarMeasConfig* for this event:
 - 3> remove the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> if *reportOnLeave* is set to *TRUE* for the corresponding reporting configuration:
 - 4> initiate the measurement reporting procedure, as specified in 5.5.5;
 - 3> if the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId* is empty:
 - 4> remove the measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 4> stop the periodical reporting timer for this *measId*, if running;
 - 2> if *reportType* is set to *periodical* and if a (first) measurement result is available:
 - 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 4> if the *reportAmount* exceeds 1:
 - 5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell;
 - 4> else (i.e. the *reportAmount* is equal to 1):
 - 5> initiate the measurement reporting procedure, as specified in 5.5.5, immediately after the quantity to be reported becomes available for the NR SpCell and for the strongest cell among the applicable cells;
 - 2> upon expiry of the periodical reporting timer for this *measId*:
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5.

[TS 38.331, clause 5.5.4.5]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when condition A4-1, as specified below, is fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition A4-2, as specified below, is fulfilled.

Inequality A4-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Thresh$$

Inequality A4-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Thresh$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the neighbour cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell).

Ocn is the measurement object specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the neighbour cell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh is the threshold parameter for this event (i.e. *a4-Threshold* as defined within *reportConfigNR* for this event).

Mn is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, Ocn, Hys are expressed in dB.

Thresh is expressed in the same unit as **Mn**.

[TS 38.331, clause 5.5.5.1]

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
 - 2>for each serving cell *measObjectId* referenced in the *measIdList*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:
 - 3> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured SINR;
 - 3> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 4> for each best non-serving cell included in the measurement report:
 - 5>include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;

- 1> if there is at least one applicable neighbouring cell to report:
- 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
 - 4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
 - 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
 - 5> if the *measObject* associated with this *measId* concerns NR:
 - 6> if *rsType* in the associated *reportConfig* is set to *ssb*:
 - 7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
 - 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
 - 6> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:
 - 7> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
 - 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are, include beam measurement information as described in 5.5.5.2;
 - 5> if the *measObject* associated with this *measId* concerns E-UTRA:
 - 6> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfigInterRAT* in order of decreasing E-UTRA trigger quantity, i.e. the best cell is included first;
 - 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
 - 1> stop the periodical reporting timer, if running;
 - 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
 - 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
 - 1> else:
 - 2> if the *reportType* is set to *periodical*:
 - 3> remove the entry within the *VarMeasReportList* for this *measId*;

3> remove this *measId* from the *measIdList* within *VarMeasConfig*;

1> if the UE is configured with EN-DC:

2> if SRB3 is configured:

3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;

2>else:

3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.2.3.7.1.3 Test description

8.2.3.7.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell
- NR Cell 2 is the intra-frequency neighbour cell of NR Cell 1.

UE:

- None

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC) and DC Bearers (MCG(s) and SCG) on E-UTRA Cell 1 according to TS 38.508-1 [4], clause 4.5.4.

8.2.3.7.1.3.2 Test procedure sequence

Table 8.2.3.7.1.3.2-1 and Table 8.2.3.7.1.3.2-1A illustrates the downlink power levels to be applied for E-UTRA Cell 1, NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.7.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------------------|------------|---------------|-----------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | The power level values are such that entry condition for event A4 is not satisfied |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -88 | Off | |
| T1 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | The power level values are such that entry condition for event A4 is satisfied for intra-frequency neighbour NR Cell 2 |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -88 | -79 | |

| | | | | | | |
|----|-----------------------|------------|-----|-----|-----|---|
| T2 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | The power level values are such that entry conditions for event A4 is not satisfied for intra-frequency neighbour NR Cell 2 |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -88 | -91 | |

Table 8.2.3.7.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------------------|------------|---------------|-----------|-----------|---|
| T0 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | The power level values are such that entry condition for event A4 is not satisfied |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -91 | Off | |
| T1 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | The power level values are such that entry condition for event A4 is satisfied for intra-frequency neighbour NR Cell 2 |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -91 | -82 | |
| T2 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | The power level values are such that entry conditions for event A4 is not satisfied for intra-frequency neighbour NR Cell 2 |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -91 | -100 | |

Table 8.2.3.7.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCReconfiguration</i> message to setup NR measurement and reporting of event A4. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> (<i>RRCReconfiguration</i>) | - | - |
| 2 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> (<i>RRCReconfigurationComplete</i>) | - | - |
| 3 | The SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 4 | Check: Does the UE transmit <i>ULINFORMATIONTRANSFERMRDC</i> message containing NR <i>MeasurementReport</i> message to report event A4 with the measured Results for NR Cell 2? | --> | <i>ULINFORMATIONTRANSFERMRDC</i> (<i>MeasurementReport</i>) | 1 | P |
| - | EXCEPTION: Step 5 below is repeated until | - | - | - | - |

| | | | | | |
|---|---|-----|--|---|---|
| | 3 <i>MeasurementReport</i> messages are received from the UE | | | | |
| 5 | Check: Does the UE transmit <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message to report event A4 with the measured Results for NR Cell 2? | --> | <i>ULInformationTransferMRDC</i>
(<i>MeasurementReport</i>) | 1 | P |
| 6 | The SS re-adjusts the cell-specific reference signal level according to row "T2". | - | - | - | - |
| 7 | Wait and ignore <i>MeasurementReport</i> messages for 15 s to allow change of power levels for NR Cell 2 and UE measurement. | - | - | - | - |
| 8 | Check: Does the UE attempt to transmit an uplink message within the next 10s? | - | - | 2 | F |

8.2.3.7.1.3.3 Specific message contents

Table 8.2.3.7.1.3.3-1: RRCConnectionReconfiguration (step 1, Table 8.2.3.7.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EMBEDNR_RRCRecon

Table 8.2.3.7.1.3.3-2: RRCReconfiguration (Table 8.2.3.7.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not Present | | |
| secondaryCellGroup | Not Present | | |
| measConfig | MeasConfig-A4 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.7.1.3.3-3: MeasConfig-A4 (Table 8.2.3.7.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|---|--------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | MeasObjectNR-A4 | | |
| reportConfigToAddModList | ReportConfigNR1-A4 | | FR1 |

| | | | |
|---|--------------------|--|-----|
| reportConfigToAddModList | ReportConfigNR2-A4 | | FR2 |
| MeasIdToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |

Table 8.2.3.7.1.3.3-4: *MeasObjectNR-A4* (Table 8.2.3.7.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| measObjectToAddModList ::= SEQUENCE (SIZE (1.. maxNrofObjectId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR SEQUENCE { | | | |
| ssbFrequency | ssbFrequency IE equals the ARFCN for NR Cell 2 | | |
| absThreshSS-BlocksConsolidation | Not Present | | |
| absThreshCSI-RS-Consolidation | Not Present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.7.1.3.3-5: *ReportConfigNR1-A4* (Table 8.2.3.7.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-143 with condition EVENT_A4 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |

| | | | |
|-----------------------|----------|---------------------------------------|--|
| eventA4 SEQUENCE { | | | |
| a4-Threshold CHOICE { | | | |
| rsrp | 71 | SS RSRP
corresponding to
-86dBm | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| reportInterval[1] | ms1024 | | |
| reportAmount[1] | Infinity | | |
| } | | | |

Table 8.2.3.7.1.3.3-6: RRCConnectionReconfigurationComplete (step 2, Table 8.2.3.7.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-9 with condition MCG_and_SCG

Table 8.2.3.7.1.3.3-7: ULInformationTransferMRDC (steps 4, 5, Table 8.2.3.7.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-27

| Information Element | Value/remark | Comment | Condition |
|--|---|---------|-----------|
| ULInformationTransferMRDC ::= SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING
including the
MeasurementReport
message according to
Table 8.2.3.7.1.3.3-8 | | |
| } | | | |

Table 8.2.3.7.1.3.3-8: *MeasurementReport* (steps 4, 5, Table 8.2.3.7.1.3.2-2)

Derivation Path: 38.508-1 [4], Table 4.6.1-5A

| Information Element | Value/remark | Comment | Condition |
|----------------------------------|--------------|---------|-----------|
| measurementReport ::= SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 1 | | |

| | | | |
|--|--|------------------|-----------------|
| measResultServingMOList ::= SEQUENCE (SIZE (1..maxNrofServingCells)) { | | Report NR Cell 1 | |
| servCellId | Cell index corresponding to NR Cell 1 | | |
| measResultServingCell ::= SEQUENCE { | | | |
| physCellId | Phy cell id corresponding to NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells ::= SEQUENCE (SIZE (1..maxCellReport)) { | 1 entry | Report NR Cell 2 | |
| measResultListNR ::= SEQUENCE { | | | |
| physCellId | Phy cell id corresponding to NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.7.1.3.3-9: ReportConfigNR2-A4 (Table 8.2.3.7.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-143 with condition EVENT_A4 | | | |
|--|------------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA4 SEQUENCE { | | | |
| a4-Threshold CHOICE { | | | |
| rsrp | 66 + delta(NRfs) | SS RSRP corresponding to -91dBm | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| reportInterval[1] | ms1024 | | |
| reportAmount[1] | Infinity | | |
| } | | | |
| NOTE 1: delta(NRfs) is derived based on calibration procedure defined in the TS 38.508-1 [4], clause 6.1.3.3 | | | |

8.2.3.7.1a Measurement configuration control and reporting / Event A4 / Measurement of Neighbor NR cell / Inter-frequency measurements / EN-DC

8.2.3.7.1a.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and inter-frequency measurements configured for event A4 with event based periodical reporting }

ensure that {

when { Neighbour NR cell becomes better than absolute threshold }

then { UE sends MeasurementReport message at regular intervals while entering condition for event A4 is satisfied }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and periodical measurement reporting triggered by event A4 ongoing }

ensure that {

when { Neighbour NR cell becomes worse than absolute threshold }

then { UE stops sending MeasurementReport message }

}

8.2.3.7.1a.2 Conformance requirements

Same as test case 8.2.3.7.1 with the following difference:

[TS 36.331, clause 5.5.2.9]

The UE shall:

1> if *measGapConfig* is set to *setup*:

...

2> if EN-DC is configured:

3> if the UE is configured with *fr1-Gap* set to *TRUE*:

4> apply the gap configuration for LTE serving cells and for NR serving cells on FR1;

3> else:

4> apply the gap configuration for all LTE and NR serving cells;

8.2.3.7.1a.3 Test description

8.2.3.7.1a.3.1 Pre-test conditions

Same as test case 8.2.3.7.1 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

8.2.3.7.1a.3.2 Test procedure sequence

Same as test case 8.2.3.7.1 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

8.2.3.7.1a.3.3 Specific message contents

Same as test case 8.2.3.7.1 with the following differences:

Cells configuration: NR Cell 3 replaces NR Cell 2.

Table 8.2.3.7.1a.3.3-0: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.7.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon | | | |
|--|-------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| measConfig | Table 8.2.3.7.1a.3.3-0a | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.7.1a.3.3-0a: measConfig (Table 8.2.3.7.1a.3.3-0)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| measConfig SEQUENCE { | | | |
| measGapConfig CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 9 | MGRP = 40 ms,
MGL = 6 ms | |
| } | | | |
| } | | | |
| } | | | |
| fr1-gap-r15 | False | | |
| mgta-r15 | False | | |
| } | | | |

Table 8.2.3.7.1a.3.3-1: *MeasConfig-A4* (Table 8.2.3.7.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|-----------------|---------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table
8.2.3.7.1a.3.3-2 | |
| } | | | |

| | | | |
|--|---|-------------------------------|----------|
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.2.3.7.1a.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(71)
Same as TS 38.508-1 [4],
Table 4.6.3-142 except
for reportAmount set to
'infinity'. ReportInterval
value is set to 'ms1024' | Thresh value set
to -85dBm | EVENT_A4 |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.3.7.1a.3.3-2: *MeasObjectNR-f1* (Table 8.2.3.7.1a.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for
SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.2.3.7.1a.3.3-3: *MeasObjectNR-f2* (Table 8.2.3.7.1a.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 |
|---|
|---|

| Information Element | Value/remark | Comment | Condition |
|---------------------------------|------------------------------------|---------|-----------|
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.2.3.7.1b Measurement configuration control and reporting / Event A4 / Measurement of Neighbor NR cell / Inter-band measurements / EN-DC

8.2.3.7.1b.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and inter-band measurements configured for event A4 with event based periodical reporting }

ensure that {

when { Neighbour NR cell becomes better than absolute threshold }

then { UE sends MeasurementReport message at regular intervals while entering condition for event A4 is satisfied }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and periodical measurement reporting triggered by event A4 ongoing }

ensure that {

when { Neighbour NR cell becomes worse than absolute threshold }

then { UE stops sending MeasurementReport message }

}

8.2.3.7.1b.2 Conformance requirements

Same as test case 8.2.3.7.1 with the following difference:

[TS 36.331, clause 5.5.2.9]

The UE shall:

1> if *measGapConfig* is set to *setup*:

...

- 2> if EN-DC is configured:
- 3> if the UE is configured with *fr1-Gap* set to *TRUE*:
- 4> apply the gap configuration for LTE serving cells and for NR serving cells on FR1;
- 3> else:
- 4> apply the gap configuration for all LTE and NR serving cells;
- ...

8.2.3.7.1b.3 Test description

8.2.3.7.1b.3.1 Pre-test conditions

Same as test case 8.2.3.7.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

8.2.3.7.1b.3.2 Test procedure sequence

Same as test case 8.2.3.7.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

8.2.3.7.1b.3.3 Specific message contents

Same as test case 8.2.3.7.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

Table 8.2.3.7.1b.3.3-0: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.7.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon | | | |
|--|-------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| measConfig | Table 8.2.3.7.1b.3.3-0a | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.7.1b.3.3-0a: measConfig (Table 8.2.3.7.1b.3.3-0)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| measConfig SEQUENCE { | | | |
| measGapConfig CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 9 | MGRP = 40 ms,
MGL = 6 ms | |
| } | | | |
| } | | | |
| } | | | |
| fr1-gap-r15 | False | | |
| mgta-r15 | False | | |
| } | | | |

Table 8.2.3.7.1b.3.3-1: MeasConfig-A4 (Table 8.2.3.7.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|---|----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table 8.2.3.7.1b.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table 8.2.3.7.1b.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(71)

Same as TS 38.508-1 [4], Table 4.6.3-142 except for reportAmount set to 'infinity'. ReportInterval value is set to 'ms1024' | Thresh value set to -85dBm | EVENT_A4 |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.3.7.1b.3.3-2: MeasObjectNR-f1 (Table 8.2.3.7.1b.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.2.3.7.1b.3.3-3: *MeasObjectNR-f2* (Table 8.2.3.7.1b.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|-------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 10 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.2.3.8 Measurement configuration control and reporting / Event A5 / Measurement of Neighbour NR cell

8.2.3.8.1 Measurement configuration control and reporting / Event A5 / Measurement of Neighbour NR cell / Intra-frequency measurements / EN-DC

8.2.3.8.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and measurement configured for event A5 with event based periodical reporting }

ensure that {

when { Serving NR PSCell becomes worse than absolute threshold1 and neighbour NR cell becomes better than absolute threshold2 }

then { UE sends MeasurementReport message at regular intervals while entering conditions for event A5 are satisfied }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and periodical measurement reporting triggered by event A5 ongoing }

ensure that {

when { Serving NR PSCell becomes better than absolute threshold1 or neighbour NR cell becomes worse than absolute threshold2 }

then { UE stops sending MeasurementReport message }

}

8.2.3.8.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.5.2, 5.5.4.1 and 5.5.4.6. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

1> if the *RRCConnectionReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> set the content of *RRCConnectionReconfigurationComplete* message as follows:

2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;

2> set the content of *RRCConnectionReconfigurationComplete* message as follows:

2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

1> if the *RRCReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> construct *RRCReconfigurationComplete* message and submit it via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10];

[TS 38.331, clause 5.5.2]

The UE shall:

- 1> if the received *measConfig* includes the *measObjectToAddModList*:
 - 2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;
 - 1> if the received *measConfig* includes the *reportConfigToAddModList*:
 - 2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;
 - 1> if the received *measConfig* includes the *measIdToAddModList*:
 - 2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;
- [TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;
- 3> if the corresponding *measObject* concerns NR;
- 4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*;
- 5> consider only the serving cell to be applicable;
- 4> else:
- 5> for events involving a serving cell associated with a *measObjectNR* and neighbours associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;
- 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):
- 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
- 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;
- 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):
- 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
- 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
- 3> initiate the measurement reporting procedure, as specified in 5.5.5;

[TS 38.331, clause 5.5.4.6]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when both condition A5-1 and condition A5-2, as specified below, are fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition A5-3 or condition A5-4, i.e. at least one of the two, as specified below, is fulfilled;
- 1> use the SpCell for *Mp*.

NOTE: The cell(s) that triggers the event is on the frequency indicated in the associated *measObjectNR* which may be different from the frequency used by the NR SpCell.

Inequality A5-1 (Entering condition 1)

$$Mp + Hys < Thresh1$$

Inequality A5-2 (Entering condition 2)

$$Mn + Ofn + Ocn - Hys > Thresh2$$

Inequality A5-3 (Leaving condition 1)

$$Mp - Hys > Thresh1$$

Inequality A5-4 (Leaving condition 2)

$$Mn + Ofn + Ocn + Hys < Thresh2$$

The variables in the formula are defined as follows:

Mp is the measurement result of the NR SpCell, not taking into account any offsets.

Mn is the measurement result of the neighbouring cell/SCell, not taking into account any offsets.

Ofn is the measurement object specific offset of the neighbour/SCell cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the frequency of the neighbour cell/SCell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the neighbour cell/SCell), and set to zero if not configured for the neighbour cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh1 is the threshold parameter for this event (i.e. *a5-Threshold1* as defined within *reportConfigNR* for this event).

Thresh2 is the threshold parameter for this event (i.e. *a5-Threshold2* as defined within *reportConfigNR* for this event).

Mn, ***Mp*** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn, ***Ocn***, ***Hys*** are expressed in dB.

Thresh1 is expressed in the same unit as ***Mp***.

Thresh2 is expressed in the same unit as ***Mn***.

[TS 38.331, clause 5.5.5]

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;

1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:

2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;

1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:

- 2> for each serving cell *measObjectId* referenced in the *measIdList*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:
- 3> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells on this frequency, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells on this frequency, otherwise with the highest measured SINR;
- 3> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
- 4> for each best non-serving cell included in the measurement report:
- 5> include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
- 1> if there is at least one applicable neighbouring cell to report:
- 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
- 3> if the *reportType* is set to *eventTriggered*:
- 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
- 3> else:
- 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
- 4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
- 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
- 3> if the *reportType* is set to *eventTriggered*:
- 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 5> if the *measObject* associated with this *measId* concerns NR:
- 6> if *rsType* in the associated *reportConfig* is set to *ssb*:
- 7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
- 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
- 6> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:
- 7> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
- 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are, include beam measurement information as described in 5.5.5.2;
- 1> if the UE is configured with EN-DC:
- 2> if SRB3 is configured:
- 3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;
- 2> else:

3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

1> else:

2>submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.2.3.8.1.3 Test description

8.2.3.8.1.3.1 Pre-test conditions

System Simulator:

- EUTRA Cell 1 is the PCell and NR Cell 1 is the Serving PS Cell.
- NR Cell 2 is the intra-frequency neighbour cell.

UE:

- None

Preamble:

- The UE is in state RRC_CONNECTED in EN-DC mode and DC Bearers (MCG and SCG) on E-UTRA Cell 1 according to TS 38.508-1 [4].

8.2.3.8.1.3.2 Test procedure sequence

Table 8.2.3.8.1.3.2-1 and Table 8.2.3.8.1.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1", "T2", "T3", "T4" and "T5" and "T11" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.8.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | EUTR
A Cell
1 | NR
Cell 1 | NR
Cell 2 | Remark |
|----|--------------------------|-----------|---------------------|--------------|--------------|---|
| T0 | Cell-specific RS
EPRE | dBm/15kHz | -85 | - | - | Power levels are such that entry condition for event A5 is not satisfied, i.e. condition A5-1 ($Mp + Hys < Thresh1$) is fulfilled but condition A5-2 ($Mn + Ofn + Ocn - Hys > Thresh2$) is not fulfilled for intra-frequency neighbour NR Cell 2. |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -79 | -91 | |
| T1 | Cell-specific RS
EPRE | dBm/15kHz | -85 | - | - | Power levels are such that entry condition for event A5 is not satisfied, i.e. condition A5-1 ($Mp + Hys < Thresh1$) is not fulfilled but condition A5-2 ($Mn + Ofn + Ocn - Hys > Thresh2$) is fulfilled for intra-frequency neighbour NR Cell 2. |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -73 | -85 | |
| T2 | Cell-specific RS
EPRE | dBm/15kHz | -85 | - | - | Power levels are such that entry condition for event A5 is satisfied, i.e. condition A5-1 (|

| | | | | | | |
|----|--------------------------|-----------|-----|-----|-----|--|
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -79 | -85 | $Mp + Hys < Thresh1$) and condition A5-2 ($Mn + Ofn + Ocn - Hys > Thresh2$) are fulfilled for intra-frequency neighbour NR Cell 2 (i.e. periodical reporting for event A5 starts). |
| T3 | Cell-specific RS
EPRE | dBm/15kHz | -85 | - | - | Power levels are such that leaving condition for event A5 is satisfied, i.e. condition A5-3 ($Mp - Hys > Thresh1$) is satisfied but condition A5-4 ($Mn + Ofn + Ocn + Hys < Thresh2$) is not satisfied for intra-frequency neighbour NR Cell 2 (i.e. periodical reporting for event A5 stops). |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -73 | -85 | |
| T4 | Cell-specific RS
EPRE | dBm/15kHz | -85 | - | - | Power levels are such that entry condition for event A5 is satisfied, i.e. condition A5-1 ($Mp + Hys < Thresh1$) and condition A5-2 ($Mn + Ofn + Ocn - Hys > Thresh2$) are fulfilled for intra-frequency neighbour NR Cell 2 (i.e. periodical reporting for event A5 starts). |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -79 | -85 | |
| T5 | Cell-specific RS
EPRE | dBm/15kHz | -85 | - | - | Power levels are such that leaving condition for event A5 is satisfied, i.e. condition A5-3 ($Mp - Hys > Thresh1$) is not satisfied but condition A5-4 ($Mn + Ofn + Ocn + Hys < Thresh2$) is satisfied for intra-frequency neighbour NR Cell 2 (i.e. periodical reporting for event A5 stops). |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -79 | -91 | |

Table 8.2.3.8.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | EUTR
A Cell
1 | NR
Cell 1 | NR
Cell 2 | Remark |
|----|--------------------------|-----------|---------------------|--------------|--------------|---|
| T0 | Cell-specific RS
EPRE | dBm/15kHz | -96 | - | - | Power levels are such that entry condition for event A5 is not satisfied, i.e. condition A5-1 ($Mp + Hys < Thresh1$) is fulfilled but condition A5-2 ($Mn + Ofn + Ocn - Hys > Thresh2$) is not fulfilled for intra-frequency neighbour NR Cell 2. |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -100 | -100 | |
| T1 | Cell-specific RS
EPRE | dBm/15kHz | -96 | - | - | Power levels are such that entry condition for event A5 is not satisfied, i.e. condition A5-1 ($Mp + Hys < Thresh1$) is not fulfilled but condition A5-2 ($Mn + Ofn + Ocn - Hys > Thresh2$) is fulfilled for intra-frequency neighbour NR Cell 2. |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -82 | -91 | |
| T2 | Cell-specific RS
EPRE | dBm/15kHz | -96 | - | - | Power levels are such that entry condition for event A5 is satisfied, i.e. condition A5-1 ($Mp + Hys < Thresh1$) is fulfilled for intra-frequency neighbour NR Cell 2. |

| | | | | | | |
|----|--------------------------|-----------|-----|------|------|--|
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -100 | -82 | $Mp + Hys < Thresh1$) and condition A5-2 ($Mn + Ofn + Ocn - Hys > Thresh2$) are fulfilled for intra-frequency neighbour NR Cell 2 (i.e. periodical reporting for event A5 starts). |
| T3 | Cell-specific RS
EPRE | dBm/15kHz | -96 | - | - | Power levels are such that leaving condition for event A5 is satisfied, i.e. condition A5-3 ($Mp - Hys > Thresh1$) is satisfied but condition A5-4 ($Mn + Ofn + Ocn + Hys < Thresh2$) is not satisfied for intra-frequency neighbour NR Cell 2 (i.e. periodical reporting for event A5 stops). |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -82 | -100 | |
| T4 | Cell-specific RS
EPRE | dBm/15kHz | -96 | - | - | Power levels are such that entry condition for event A5 is satisfied, i.e. condition A5-1 ($Mp + Hys < Thresh1$) and condition A5-2 ($Mn + Ofn + Ocn - Hys > Thresh2$) are fulfilled for intra-frequency neighbour NR Cell 2 (i.e. periodical reporting for event A5 starts). |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -100 | -82 | |
| T5 | Cell-specific RS
EPRE | dBm/15kHz | -96 | - | - | Power levels are such that leaving condition for event A5 is satisfied, i.e. condition A5-3 ($Mp - Hys > Thresh1$) is not satisfied but condition A5-4 ($Mn + Ofn + Ocn + Hys < Thresh2$) is satisfied for intra-frequency neighbour NR Cell 2 (i.e. periodical reporting for event A5 stops). |
| | SS/PBCH
SSS EPRE | dBm/SCS | - | -100 | -100 | |

Table 8.2.3.8.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCCONNECTIONRECONFIGURATION</i> message to setup measurements for neighbour NR Cells and reporting for event A5. | <-- | <i>RRCCONNECTIONRECONFIGURATION (RRCReconfiguration)</i> | - | - |
| 2 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE (RRCReconfigurationComplete)</i> | - | - |
| 3 | Check: Does the UE transmit an <i>ULINFORMATIONTRANSFERMRDC</i> message containing NR <i>MEASUREMENTREPORT</i> message within the next 10s? | --> | <i>ULINFORMATIONTRANSFERMRDC (MeasurementReport)</i> | 1 | F |
| 4 | The SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 5 | Check: Does the UE transmit an <i>ULINFORMATIONTRANSFERMRDC</i> message containing NR <i>MEASUREMENTREPORT</i> message to report event A5 with the measured value for NR Cell 2? | --> | <i>ULINFORMATIONTRANSFERMRDC (MeasurementReport)</i> | 1 | F |

| | | | | | |
|-----|--|-----|--|---|---|
| - | EXCEPTION: Steps 5a1-5a2 are executed in case of FR2 | - | - | - | - |
| 5a1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to setup measurements for neighbour NR Cells and reporting for event A5. | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 5a2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | - | - |
| 6 | The SS re-adjusts the cell-specific reference signal level according to row "T2". | - | - | - | - |
| 7 | Check: Does the UE transmit an <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message to report event A5 with the measured value for NR Cell 2? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 1 | P |
| - | EXCEPTION: Step 8 below is repeated until 3 <i>MeasurementReport</i> messages are received from the UE. | - | - | - | - |
| 8 | Check: Does the UE transmit an <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message, with the measured value for NR Cell 2? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 1 | P |
| 9 | The SS re-adjusts the cell-specific reference signal level according to row "T3". | - | - | - | - |
| 10 | Wait and ignore NR <i>MeasurementReport</i> messages for 15 s to allow change of power levels for NR Cell 2 and UE measurements. | - | - | - | - |
| 11 | Check: Does the UE attempt to transmit an uplink message within the next 10s? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 2 | F |
| 12 | The SS re-adjusts the cell-specific reference signal level according to row "T4". | - | - | - | - |
| 13 | Check: Does the UE transmit an <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message to report event A5 with the measured value for NR Cell 2? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 1 | P |
| 14 | The SS re-adjusts the cell-specific reference signal level according to row "T5". | - | - | - | - |
| 15 | Wait and ignore NR <i>MeasurementReport</i> messages for 15 s to allow change of power levels for NR Cell 2 and UE measurements. | - | - | - | - |
| 16 | Check: Does the UE attempt to transmit an uplink message within the next 10s? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 2 | F |

8.2.3.8.1.3.3 Specific message contents

Table 8.2.3.8.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Step 5a1 Table 8.2.3.8.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon

Table 8.2.3.8.1.3.3-2: RRCReconfiguration (Table 8.2.3.8.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|---------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not Present | | |
| secondaryCellGroup | Not Present | | |
| measConfig | MeasConfig-A5 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.8.1.3.3-3: MeasConfig-A5 (Table 8.2.3.8.1.3.3-2, Step 1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|--|---|--------------------------------------|------------------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | MeasObjectNR | | |
| ReportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(81,69). Same as TS 38.508-1 Table 4.6.3-107 except for hysteresis value in eventA5 set to '0', reportAmount set to 'infinity', and reportInterval value set to 'ms1024'. | Thresh values set to -76dBm, -88 dBm | EVENT_A5 AND FR1 |

| | | | |
|--|---|---------------------------------------|------------------|
| | ReportConfigNR(66+Delta(NRf1),57+Delta(NRf1)). Same as TS 38.508-1 Table 4.6.3-107 except for hysteresis value in eventA5 set to '0', reportAmount set to 'infinity', and reportInterval value set to 'ms1024'. | Thresh values set to -91dBm, -100 dBm | EVENT_A5 AND FR2 |
| } | | | |
| } | | | |
| MeasIdToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |
| NOTE 1: Delta(NRf1) is derived based on calibration procedure defined in the TS 38.508-1 [4], clause 6.1.3.3 | | | |

Table 8.2.3.8.1.3.3-3A: MeasConfig-A5 (Table 8.2.3.8.1.3.3-2, Step 5a1)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|--|---|--------------------------------------|------------------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | MeasObjectNR | | |
| ReportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | | | |
| reportConfigId[1] | ReportConfigId | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(66+Delta(NRf1),66+Delta(NRf1)). Same as TS 38.508-1 Table 4.6.3-107 except for hysteresis value in eventA5 set to '0', reportAmount set to 'infinity', and reportInterval value set to 'ms1024'. | Thresh values set to -91dBm, -91 dBm | EVENT_A5 AND FR2 |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|---------|--|--|
| MeasIdToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.3.8.1.3.3-4: *MeasObjectNR* (Table 8.2.3.8.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| measObjectToAddModList ::= SEQUENCE (SIZE (1.. maxNrofObjectId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | MeasObjectNR(60) | ssbFrequency IE equals the ARFCN for NR Cell 2

Thresh value set to -97dBm | |
| } | | | |
| } | | | |

Table 8.2.3.8.1.3.3-5: *RRCCONNECTIONRECONFIGURATIONCOMPLETE* (step 2, Table 8.2.3.8.1.3.2-2)

| |
|---|
| Derivation Path: 36.508 [7], Table 4.6.1-9 with condition MCG_and_SCG |
|---|

Table 8.2.3.8.1.3.3-6: *ULINFORMATIONTRANSFERMRDC* (steps 7, 8, 13 Table 8.2.3.8.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-27 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ULInformationTransferMRDC ::= SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING including the MeasurementReport message according to Table 8.2.3.8.1.3.3-7 | | |
| } | | | |

Table 8.2.3.8.1.3.3-7: *MeasurementReport* (Table 8.2.3.8.1.3.3-6)

| Derivation Path: 38.508-1 [4], Table 4.6.1-5A | | | |
|--|--|------------------|-----------------|
| Information Element | Value/remark | Comment | Condition |
| measurementReport ::= SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList ::= SEQUENCE (SIZE (1..maxNrofServingCells)) { | | Report NR Cell 1 | |
| servCellId | Cell index corresponding to NR Cell 1 | | |
| measResultServingCell ::= SEQUENCE { | | | |
| physCellId | Phy cell id corresponding to NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |
| Not present | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells ::= SEQUENCE (SIZE (1..maxCellReport)) { | 1 entry | Report NR Cell 2 | |
| measResultListNR ::= SEQUENCE { | | | |
| physCellId | Phy cell id corresponding to NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | (0..127) | | pc_ss_SINR_Meas |

| | | | |
|---|-------------|--|--|
| | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.8.1a Measurement configuration control and reporting / Event A5 / Measurement of Neighbor NR cell / Inter-frequency measurements / EN-DC

8.2.3.8.1a.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and inter-frequency measurements configured for event A5 with event based periodical reporting }

ensure that {

when { Serving NR PSCell becomes worse than absolute threshold1 and neighbour NR cell becomes better than absolute threshold2 }

then { UE sends MeasurementReport message at regular intervals while entering conditions for event A5 are satisfied }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and periodical measurement reporting triggered by event A5 ongoing }

ensure that {

when { Serving NR PSCell becomes better than absolute threshold1 or neighbour NR cell becomes worse than absolute threshold2 }

then { UE stops sending MeasurementReport message }

}

8.2.3.8.1a.2 Conformance requirements

Same as test case 8.2.3.8.1 with the following difference:

[TS 36.331, clause 5.5.2.9]

The UE shall:

1> if *measGapConfig* is set to *setup*:

...

2> if EN-DC is configured:

3> if the UE is configured with *fr1-Gap* set to *TRUE*:

4> apply the gap configuration for LTE serving cells and for NR serving cells on FR1;

3> else:

4> apply the gap configuration for all LTE and NR serving cells;

...

8.2.3.8.1a.3 Test description

8.2.3.8.1a.3.1 Pre-test conditions

Same as test case 8.2.3.8.1 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

8.2.3.8.1a.3.2 Test procedure sequence

Same as test case 8.2.3.8.1 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

8.2.3.8.1a.3.3 Specific message contents

Same as test case 8.2.3.8.1 with the following differences:

- Cells configuration: NR Cell 3 replaces NR Cell 2.

Table 8.2.3.8.1a.3.3-0: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.8.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon | | | |
|--|-------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCConnectionReconfiguration</i> ::= SEQUENCE { | | | |
| <i>criticalExtensions</i> CHOICE { | | | |
| c1 CHOICE{ | | | |
| <i>rrcConnectionReconfiguration-r8</i> SEQUENCE { | | | |
| <i>measConfig</i> | Table 8.2.3.8.1a.3.3-0a | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.8.1a.3.3-0a: *measConfig* (Table 8.2.3.8.1a.3.3-0)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| measConfig SEQUENCE { | | | |
| measGapConfig CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 9 | MGRP = 40 ms,
MGL = 6 ms | |
| } | | | |
| } | | | |
| } | | | |
| fr1-gap-r15 | False | | |
| mgta-r15 | False | | |
| } | | | |

Table 8.2.3.8.1a.3.3-1: MeasConfig-A5 (Table 8.2.3.8.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|--|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table
8.2.3.8.1a.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table
8.2.3.8.1a.3.3-3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(66,60)

Same as TS 38.508-1 [4],
Table 4.6.3-142 except
for reportAmount set to
'infinity'. ReportInterval
value is set to 'ms1024' | Thresh values
set to -91dBm,
-97dBm | EVENT_A5 |
| } | | | |
| } | | | |

| | | | |
|---|---------|--|--|
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.3.8.1a.3.3-2: *MeasObjectNR-f1* (Table 8.2.3.8.1a.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.2.3.8.1a.3.3-3: *MeasObjectNR-f2* (Table 8.2.3.8.1a.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|---|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 3 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.2.3.8.1b Measurement configuration control and reporting / Event A5 / Measurement of Neighbor NR cell / Inter-band measurements / EN-DC

8.2.3.8.1b.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and inter-band measurements configured for event A5 with event based periodical reporting }

ensure that {

when { Serving NR PSCell becomes worse than absolute threshold1 and neighbour NR cell becomes better than absolute threshold2 }

then { UE sends MeasurementReport message at regular intervals while entering conditions for event A5 are satisfied }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and periodical measurement reporting triggered by event A5 ongoing }

ensure that {

when { Serving NR PSCell becomes better than absolute threshold1 or neighbour NR cell becomes worse than absolute threshold2 }

then { UE stops sending MeasurementReport message }

}

8.2.3.8.1b.2 Conformance requirements

Same as test case 8.2.3.8.1 with the following difference:

[TS 36.331, clause 5.5.2.9]

The UE shall:

1> if *measGapConfig* is set to *setup*:

...

2> if EN-DC is configured:

3> if the UE is configured with *fr1-Gap* set to *TRUE*:

4> apply the gap configuration for LTE serving cells and for NR serving cells on FR1;

3> else:

4> apply the gap configuration for all LTE and NR serving cells;

...

8.2.3.8.1b.3 Test description

8.2.3.8.1b.3.1 Pre-test conditions

Same as test case 8.2.3.8.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

8.2.3.8.1b.3.2 Test procedure sequence

Same as test case 8.2.3.8.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

8.2.3.8.1b.3.3 Specific message contents

Same as test case 8.2.3.8.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 2.

Table 8.2.3.8.1b.3.3-0: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.8.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon | | | |
|--|-------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| measConfig | Table 8.2.3.8.1b.3.3-0a | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.8.1b.3.3-0a: measConfig (Table 8.2.3.8.1b.3.3-0)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| measConfig SEQUENCE { | | | |
| measGapConfig CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 9 | MGRP = 40 ms,
MGL = 6 ms | |
| } | | | |
| } | | | |
| } | | | |
| fr1-gap-r15 | False | | |
| mgta-r15 | False | | |
| } | | | |

Table 8.2.3.8.1b.3.3-1: *MeasConfig-A5* (Table 8.2.3.8.1.3.3-2)

| Derivation Path: 38.508-1 [4] Table 4.6.3-69 | | | |
|---|-----------------|---------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f1 | Table
8.2.3.8.1b.3.3-2 | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-f2 | Table
8.2.3.8.1b.3.3-3 | |

| | | | |
|--|--|-------------------------------------|----------|
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(66,60)

Same as TS 38.508-1 [4], Table 4.6.3-142 except for reportAmount set to 'infinity'. ReportInterval value is set to 'ms1024' | Thresh values set to -91dBm, -97dBm | EVENT_A5 |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.3.8.1b.3.3-2: *MeasObjectNR-f1* (Table 8.2.3.8.1b.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for SSB of NR Cell 1 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

Table 8.2.3.8.1b.3.3-3: *MeasObjectNR-f2* (Table 8.2.3.8.1b.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-76 | | | |
|--|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | ARFCN-ValueNR for | | |

| | | | |
|---------------------------------|-------------------|--|--|
| | SSB of NR Cell 10 | | |
| absThreshSS-BlocksConsolidation | Not present | | |
| nrofSS-BlocksToAverage | Not present | | |
| } | | | |

8.2.3.9 Measurement configuration control and reporting / SS/PBCH block based / CSI-RS based intra-frequency measurements / Measurement of Neighbour NR cell

8.2.3.9.1 Measurement configuration control and reporting / SS/PBCH block based / CSI-RS based Intra-frequency measurements / Measurement of Neighbour NR Cell / EN-DC

8.2.3.9.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state in EN-DC mode and measurement configured for SS/PBCH measurement reporting of intra-frequency on specified frequency }

ensure that {

when { SS/PBCH block sorting quantity is above *absThreshSS-BlocksConsolidation* for each beam of NR Neighbour Cell }

then { UE sends MeasurementReport message containing rsIndexResults with *resultsSSB-Indexes* }

}

(2)

with { UE in RRC_CONNECTED state in EN-DC mode and measurement configured for SS/PBCH measurement reporting of intra-frequency on specified frequency }

ensure that {

when { SS/PBCH block sorting quantity is below *absThreshSS-BlocksConsolidation* for one beam of NR Neighbour Cell and another beam(s) is above *absThreshSS-BlocksConsolidation* }

then { UE sends MeasurementReport message containing rsIndexResults with *resultsSSB-Indexes* includes RsIndex above *absThreshSS-BlocksConsolidation* and excludes RsIndex below *absThreshSS-BlocksConsolidation* }

}

(3)

with { UE in RRC_CONNECTED state in EN-DC mode and measurement configured for CSI-RS measurement reporting of intra frequency on specified frequency }

ensure that {

when { CSI-RS sorting quantity is above *absThreshCSI-RS-Consolidation* for each beam of NR Neighbour Cell }

then { UE sends MeasurementReport message containing rsIndexResults with *resultsCSI-RS-Indexes* }

}

(4)

with { UE in RRC_CONNECTED state in EN-DC mode and measurement configured for CSI-RS measurement reporting of intra frequency on specified frequency }

ensure that {

when { CSI-RS sorting quantity is below absThreshCSI-RS-Consolidation for one beam of NR Neighbour Cell and another beam(s) is above absThreshCSI-RS-Consolidation }

then { UE sends MeasurementReport message containing rsIndexResults with resultsCSI-RS-Indexes includes RsIndex above absThreshCSI-RS-Consolidation and excludes RsIndex below absThreshCSI-RS-Consolidation }

}

8.2.3.9.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331 clauses 5.5.5.1 and 5.5.5.2. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.5.5.1]

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> for each serving cell configured with *servingCellMO*:
- 2> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *rsType*:
- 3> if the serving cell measurements based on the *rsType* included in the *reportConfig* that triggered the measurement report are available:
- 4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on the *rsType* included in the *reportConfig* that triggered the measurement report;
- 2> else:
- 3> if SSB based serving cell measurements are available:
- 4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on SSB;
- 3> else if CSI-RS based serving cell measurements are available:
- 4> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR of the serving cell, derived based on CSI-RS;
- 1> set the *servingCellId* within *measResultServingMOList* to include for each NR serving cell that is configured, if any;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport*:
- 2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;

- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
- 2> for each *measObjectId* referenced in the *measIdList* which is also referenced with *servingCellMO*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:
- 3> if the *measObjectNR* indicated by the *servingCellMO* includes the RS resource configuration corresponding to the *rsType* indicated in the *reportConfig*:
- 4> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured SINR;
- 4> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport*:
- 5> for each best non-serving cell included in the measurement report:
- 6> include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
- 1> if there is at least one applicable neighbouring cell to report:
- 2> if the *reportType* is set to *eventTriggered* or *periodical*:
- 3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
- 4> if the *reportType* is set to *eventTriggered*:
- 5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
- 4> else:
- 5> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
- 4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
- 4> if the *reportType* is set to *eventTriggered*:
- 5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 6> if the *measObject* associated with this *measId* concerns NR:
- 7> if *rsType* in the associated *reportConfig* is set to *ssb*:
- 8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;
- 8> if *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
- 7> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:
- 8> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;
- 8> if *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;

[TS 38.331, clause 5.5.5.1]

- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
 - 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
 - 1> else:
 - 2> if the *reportType* is set to *periodical*:
 - 3> remove the entry within the *VarMeasReportList* for this *measId*;
 - 3> remove this *measId* from the *measIdList* within *VarMeasConfig*;
 - 1> if the UE is in (NG)EN-DC:
 - 2> if SRB3 is configured:
 - 3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;
 - 2>else:
 - 3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

[TS 38.331, clause 5.5.5.2]

For beam measurement information to be included in a measurement report the UE shall:

- 1> if *reportType* is set to *eventTriggered*:
 - 2> consider the trigger quantity as the sorting quantity if available, otherwise RSRP as sorting quantity if available, otherwise RSRQ as sorting quantity if available, otherwise SINR as sorting quantity;
 - 1> set *rsIndexResults* to include up to *maxNrofRS-IndexesToReportSS/PBCH* block indexes or CSI-RS indexes in order of decreasing sorting quantity as follows:
 - 2> if the measurement information to be included is based on SS/PBCH block:
 - 3> include within *resultsSSB-Indexes* the index associated to the best beam for that SS/PBCH block sorting quantity and if *absThreshSS-BlocksConsolidation* is included in the *VarMeasConfig* for the *measObject* associated to the cell for which beams are to be reported, the remaining beams whose sorting quantity is above *absThreshSS-BlocksConsolidation*;
 - 3> if *includeBeamMeasurements* is configured, include the SS/PBCH based measurement results for the quantities in *reportQuantityRS-Indexes* set to *true* for each SS/PBCH block index;
 - 2> else if the beam measurement information to be included is based on CSI-RS:
 - 3> include within *resultsCSI-RS-Indexes* the index associated to the best beam for that CSI-RS sorting quantity and, if *absThreshCSI-RS-Consolidation* is included in the *VarMeasConfig* for the *measObject* associated to the cell for which beams are to be reported, the remaining beams whose sorting quantity is above *absThreshCSI-RS-Consolidation*;
 - 3> if *includeBeamMeasurements* is configured, include the CSI-RS based measurement results for the quantities in *reportQuantityRS-Indexes* set to *true* for each CSI-RS index.

8.2.3.9.1.3 Test description

8.2.3.9.1.3.1 Pre-test conditions

System Simulator:

- EUTRA Cell 1 is the PCell and NR Cell 1 is the PS Cell and NR Cell 2 is the intra-frequency neighbour cell of NR Cell 1. NR Cell2 has two beams: SSB/CSI-RS index#0 and SSB/CSI-RS index#1.

UE:

- None

Preamble:

- The UE is in state RRC_CONNECTED in EN-DC using generic procedure parameter Connectivity (EN-DC) and DC Bearers (MCG(s) and SCG) on E-UTRA Cell 1 according to TS 38.508-1 [4].

8.2.3.9.1.3.2 Test procedure sequence

Table 8.2.3.9.1.3.2-1 and Table 8.2.3.9.1.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.9.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 2 | NR Cell 2 Beam 0 (NOTE) | NR Cell 2 Beam 1 (NOTE) | Remark |
|---|-------------------------------|------------|---------------|-----------|-----------|-------------------------|-------------------------|---|
| T0 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | - | - | |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -94 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -4 | -4 | |
| T1 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | - | - | $Mn + Ofn + Ocn - Hys > Mp + Ofp + C$

Power level is such that SS/PBCH quality and CSI-RS quality for both beams of NR Cell 2 are above <i>absThreshSS-BlocksConsolidation</i> . |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -106 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -4 | -4 | |
| T2 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | - | - | $Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$

Power level is such that SS/PBCH quality and CSI-RS quality for both beams of NR Cell 2 are below <i>absThreshSS-BlocksConsolidation</i> |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -106 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -12 | -12 | |
| T3 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | - | - | Power level is such that SS/PBCH quality and CSI-RS quality for beam 0 of NR Cell 2 is above <i>absThreshSS-BlocksConsolidation</i> and for beam 1 of NR Cell 2 is below <i>absThreshSS-BlocksConsolidation</i> . |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -106 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -4 | -12 | |
| NOTE: "Beam 0" refers to transmission of the SS/PBCH block with SSB index #0 (according to the <i>ssb-PositionsInBurst</i>) and CSI-RS with index #0 (according to the <i>csi-rs-ResourceList-Mobility</i> being signalled to the UE at step 9); "Beam 1" refers to transmission of the SS/PBCH block with SSB index #1 (according to the <i>ssb-PositionsInBurst</i>) and CSI-RS with index #1 (according to the <i>csi-rs-ResourceList-Mobility</i> being signalled to the UE at step 9). For each beam SSS and CSI-RS have the same power levels at any given time instance. | | | | | | | | |

Table 8.2.3.9.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 2 | NR Cell 2 Beam 0 (NOTE) | NR Cell 2 Beam 1 (NOTE) | Remark |
|---|-------------------------------|------------|---------------|-----------|-----------|-------------------------|-------------------------|---|
| T0 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | - | - | |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -82 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -1 | -1 | |
| T1 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | - | - | $Mn + Ofn + Ocn - Hys > Mp + Ofp + C$

Power level is such that SS/PBCH quality and CSI-RS quality for both beams of NR Cell 2 are above <i>absThreshSS-BlocksConsolidation</i> . |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -100 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -1 | -1 | |
| T2 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | - | - | $Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$

Power level is such that SS/PBCH quality and CSI-RS quality for both beams of NR Cell 2 are below <i>absThreshSS-BlocksConsolidation</i> |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -82 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -10 | -10 | |
| T3 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | - | - | Power level is such that SS/PBCH quality and CSI-RS quality for beam 0 of NR Cell 2 is above <i>absThreshSS-BlocksConsolidation</i> and for beam 1 of NR Cell 2 is below <i>absThreshSS-BlocksConsolidation</i> . |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -100 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -1 | -10 | |
| NOTE: "Beam 0" refers to transmission of the SS/PBCH block with SSB index #0 (according to the <i>ssb-PositionsInBurst</i>) and CSI-RS with index #0 (according to the <i>csi-rs-ResourceList-Mobility</i> being signalled to the UE at step 9); "Beam 1" refers to transmission of the SS/PBCH block with SSB index #1 (according to the <i>ssb-PositionsInBurst</i>) and CSI-RS with index #1 (according to the <i>csi-rs-ResourceList-Mobility</i> being signalled to the UE at step 9). For each beam SSS and CSI-RS have the same power levels at any given time instance. | | | | | | | | |

Table 8.2.3.9.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | TP | Verdict |
|----|-----------|------------------|----|---------|
|----|-----------|------------------|----|---------|

| | | U - S | Message | | |
|----|---|-------|---|---|---|
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCReconfiguration</i> including <i>measConfig</i> to setup SS/PBCH block based intra-frequency NR measurement for PSCell (NR Cell 1) and reporting for event A3. | <-- | <i>RRCCONNECTIONRECONFIGURATION(RRCReconfiguration)</i> | - | - |
| 2 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCReconfigurationComplete</i> . | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE(RRCReconfigurationComplete)</i> | - | - |
| 3 | The SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message to report event A3 with the measured results for NR Cell 2 with beam information containing <i>RsIndex[0]</i> and <i>RsIndex[1]</i> ? | --> | <i>ULINFORMATIONTRANSFERMRDC(MEASUREMENTREPORT)</i> | 1 | P |
| 4A | The SS re-adjusts the cell-specific reference signal level according to the row "T2". | - | - | - | - |
| 4B | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message on E-UTRA Cell 1 to report the event A3 during the next 10s? | - | - | 1 | F |
| 5 | The SS re-adjusts the cell-specific reference signal level according to row "T3". | - | - | - | - |
| 6 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message to report event A3 with the measured results for NR Cell 2 with beam information containing <i>RsIndex[0]</i> and excludes <i>RsIndex[1]</i> ? | --> | <i>ULINFORMATIONTRANSFERMRDC(MEASUREMENTREPORT)</i> | 2 | P |
| 7 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCReconfiguration</i> including <i>measConfig</i> to remove SS/PBCH block based intra-frequency NR measurement for PSCell (NR Cell 1) and reporting for event A3. | <-- | <i>RRCCONNECTIONRECONFIGURATION(RRCReconfiguration)</i> | - | - |
| 8 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCReconfigurationComplete</i> . | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE(RRCReconfigurationComplete)</i> | - | - |
| 9 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCReconfiguration</i> including <i>measConfig</i> to setup CSI-RS based intra-frequency NR measurement for PSCell (NR Cell 1) and reporting for event A3. | <-- | <i>RRCCONNECTIONRECONFIGURATION(RRCReconfiguration)</i> | - | - |
| 10 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCReconfigurationComplete</i> . | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE(RRCReconfigurationComplete)</i> | - | - |
| 11 | SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 12 | Check: Does the UE transmit a | --> | <i>ULINFORMATIONTRANSFERMR</i> | 3 | P |

| | | | | | |
|-----|--|-----|--|---|---|
| | <i>MeasurementReport</i> message to report event A3 with the measured results for NR Cell 2 with beam information containing RsIndex[0] and RsIndex[1]? | | <i>DC(MeasurementReport)</i> | | |
| 12A | The SS re-adjusts the cell-specific reference signal level according to the row "T2". | - | - | - | - |
| 12B | Check: Does the UE transmit a <i>MeasurementReport</i> message on E-UTRA Cell 1 to report the event A3 during the next 10s? | - | - | 3 | F |
| 13 | The SS re-adjusts the cell-specific reference signal level according to row "T3". | - | - | - | - |
| 14 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured results for NR Cell 2 with beam information containing RsIndex[0] and excludes RsIndex[1]? | --> | <i>ULInformationTransferMR
DC(MeasurementReport)</i> | 4 | P |

8.2.3.9.1.3.3 Specific message contents

Table 8.2.3.9.1.3.3-1: *RRCConnectionReconfiguration* (steps 1, 7, 9 Table 8.2.3.9.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon

Table 8.2.3.9.1.3.3-2: *RRCReconfiguration* (Table 8.2.3.9.1.3.3-1)

Derivation Path: 38.508-1 [4], Table 4.6.1-13

Table 8.2.3.9.1.3.3-3: *MeasConfig* (Table 8.2.3.9.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|---|---------------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | IdMeasObjectToAdd | | |
| reportConfigToAddModList | IdReportConfigToAdd | | |
| measIdToAddModList | IdMeasIdToAdd | | |
| s-MeasureConfig CHOICE { | | | |
| ssb-rsrp | 57 | corresponding to -99dBm | FR1 |
| | 66 | corresponding to -90dBm | FR2 |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-4: *IdMeasObjectToAdd* (Table 8.2.3.9.1.3.3-3)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | Id-MeasObjectNR | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-5: Id-MeasObjectNR (Table 8.2.3.9.1.3.3-4)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|--|--|---------|--|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR Cell2 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure CHOICE { | | | |
| setup CHOICE { | | | |
| shortBitmap | 1100 | | (FREQ<=3 GHz AND (FR1_FDD OR NOT CASE_C)) OR (FREQ<=2.4 GHz AND FR1_TDD) |
| mediumBitmap | 11000000 | | (FREQ>3 GHz AND FR1) OR (FREQ>2.4 GHz AND FR1_TDD AND CASE_C) |
| longBitmap | 11000000 00000000
00000000 00000000
00000000 00000000
00000000 00000000 | | FR2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|--|----|----------------------------|-----|
| } | | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation SEQUENCE { | | | |
| thresholdRSRP | 57 | corresponding to
-99dBm | FR1 |
| | 66 | corresponding to
-90dBm | FR2 |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-6: IdReportConfigToAdd (Table 8.2.3.9.1.3.3-3)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|--|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigToAddModList ::= SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | IdReportConfig-A3 | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-7: IdReportConfig-A3 (Table 8.2.3.9.1.3.3-6)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A3 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | 2 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|-------------------------------------|-------|--|--|
| rsType | ssb | | |
| reportAmount | r1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 2 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-8: IdMeasIdToAdd (Table 8.2.3.9.1.3.3-3, Table 8.2.3.9.1.3.3-14)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasIdToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| } | | | |

Table 8.2.3.9.1.3.3-9: RRCConnectionReconfigurationComplete (steps 2, 8, 10, Table 8.2.3.9.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-9 with condition MCG_and_SCG

Table 8.2.3.9.1.3.3-10: ULInformationTransferMRDC (steps 4, 6,12,14 Table 8.2.3.9.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-27 | | | |
|--|--------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ULInformationTransferMRDC-r15 ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| ulInformationTransferMRDC-r15 SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING containing NR RRC | | |

| | | | |
|---|-------------------|--|--|
| | MeasurementReport | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-11: MeasurementReport (step 4, Table 8.2.3.9.1.3.2-2)

| Derivation Path: 38.508-1 [4], Table 4.6.1-7 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-11A: MeasResults (Table 8.2.3.9.1.3.3-11)

| Derivation Path: 38.508-1 [4], Table 4.6.3-79 | | | |
|---|----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|------------------------------------|----------------------------------|--|--|
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE { | 1 entry | | |
| physCellId | Physical CellID of the NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| rsIndexResults SEQUENCE { | | | |
| resultsSSB-Indexes SEQUENCE { | 2 entries | | |
| ResultsPerSSB-Index [1] SEQUENCE { | | | |
| ssb-Index | SSB index 0 | | |
| ssb-Results SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| ResultsPerSSB-Index [1] SEQUENCE { | | | |
| ssb-Index | SSB index 1 | | |
| ssb-Results SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| resultsCSI-RS-Indexes | Not present | | |
| } | | | |
| } | | | |

| | | | |
|----------|-------------|--|--|
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-12: MeasurementReport (step 6, Table 8.2.3.9.1.3.2-2)

| Derivation Path: 38.508-1 [4], Table 4.6.1-7 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-12A: MeasResults (Table 8.2.3.9.1.3.3-12)

| Derivation Path: 38.508-1 [4], Table 4.6.3-79 | | | |
|---|----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|-------------------------------|---------------------------------|--|--|
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE { | 1 entry | | |
| physCellId | Physical CellID of the NR Cell2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| rsIndexResults SEQUENCE { | | | |
| resultsSSB-Indexes SEQUENCE { | 1 entry | | |
| ssb-Index | SSB index 0 | | |
| ssb-Results SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| resultsCSI-RS-Indexes | Not present | | |
| } | | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-13: *MeasConfig* (step 7, Table 8.2.3.9.1.3.2-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig::= SEQUENCE { | | | |

| | | | |
|---|-------------|--|--|
| measObjectToRemoveList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | One entry | | |
| MeasObjectId[1] | 1 | | |
| } | | | |
| measObjectToAddModList | Not Present | | |
| reportConfigToAddModList | Not Present | | |
| measIdToAddModList | Not Present | | |
| quantityConfig | Not Present | | |
| } | | | |

Table 8.2.3.9.1.3.3-14: *MeasConfig* (step 9, Table 8.2.3.9.1.3.2-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|--|---------------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig::= SEQUENCE { | | | |
| measObjectToAddModList | IdMeasObjectToAdd | | |
| reportConfigToAddModList | IdReportConfigToAdd | | |
| measIdToAddModList | IdMeasIdToAdd | | |
| s-MeasureConfig CHOICE { | | | |
| csi-rsrp | 57 | corresponding to -99dBm | FR1 |
| | 66 | corresponding to -90dBm | FR2 |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-14A: *IdMeasObjectToAdd* (Table 8.2.3.9.1.3.3-14)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|--|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectToAddModList::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | Id-MeasObjectNR | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-14B: Id-MeasObjectNR (Table 8.2.3.9.1.3.3-14A)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---|---|------------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| refFreqCSI-RS | Downlink ARFCN of NR Cell2 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility | Not Present | | |
| csi-rs-ResourceConfigMobility SEQUENCE { | | | |
| setup SEQUENCE { | | | |
| subcarrierSpacing | kHz15 | | SCS_15kHz |
| | kHz30 | | SCS_30kHz |
| | kHz120 | | SCS_120kHz |
| csi-RS-CellList-Mobility SEQUENCE (SIZE (1..maxNrofCSI-RS-CellsRRM)) OF SEQUENCE { | 1 entry | | |
| CSI-RS-CellMobility [1] SEQUENCE { | | | |
| cellId | Physical CellID of the NR Cell 2 | | |
| csi-rs-MeasurementBW SEQUENCE { | | | |
| nrofPRBs | size24 | | |
| startPRB | same value as 'offsetToCarrier' as defined for the DL frequency of the cell | | |
| } | | | |
| density | D3 | | |
| csi-rs-ResourceList-Mobility ::= SEQUENCE (SIZE (1.. maxNrofCSI-RS-ResourcesRRM)) OF SEQUENCE { | 2 entries | | |
| CSI-RS-Resource-Mobility [1] SEQUENCE { | | | |
| csi-RS-Index | 0 | CSI-RS with Index 0 | |
| slotConfig CHOICE { | | | |
| ms20 | 10 * μ | μ : numerology (SCS=15kHz: 1, SCS=30kHz: 2, etc.) | |

| | | | |
|--|-------------|----------------------------|-----|
| } | | | |
| absThreshSS-BlocksConsolidation | Not Present | | |
| absThreshCSI-RS-Consolidation SEQUENCE { | | | |
| thresholdRSRP | 57 | corresponding to
-99dBm | FR1 |
| | 66 | corresponding to
-90dBm | FR2 |
| thresholdRSRQ | Not Present | | |
| thresholdSINR | Not Present | | |
| } | | | |
| nrofSS-BlocksToAverage | Not Present | | |
| nrofCSI-RS-ResourcesToAverage | 2 | | |
| } | | | |

Table 8.2.3.9.1.3.3-14C: IdReportConfigToAdd (Table 8.2.3.9.1.3.3-14)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|--|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigToAddModList ::= SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | IdReportConfig-A3 | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-14D: IdReportConfig-A3 (Table 8.2.3.9.1.3.3-14C)

| Derivation Path: Table 8.2.3.9.1.3.3-7 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| rsType | csi-rs | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-15: MeasurementReport (step 12, Table 8.2.3.9.1.3.2-2)

| Derivation Path: 38.508-1 [4], Table 4.6.1-7 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-15A: MeasResults (Table 8.2.3.9.1.3.3-15)

| Derivation Path: 38.508-1 [4], Table 4.6.3-79 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|---------------------------------------|----------------------------------|--|--|
| MeasResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE { | 1 entry | | |
| physCellId | Physical CellID of the NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsCSI-RS-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsCSI-RS-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | | | |
| rsIndexResults SEQUENCE { | | | |
| resultsSSB-Indexes | Not Present | | |
| resultsCSI-RS-Indexes SEQUENCE { | 2 entries | | |
| ResultsPerCSI-RS-Index [1] SEQUENCE { | | | |
| csi-RS-Index | CSI-RS-index 0 | | |
| csi-RS--Results SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| ResultsPerCSI-RS-Index [2] SEQUENCE { | | | |
| csi-RS-Index | CSI-RS-index 1 | | |
| csi-RS--Results SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-16: MeasurementReport (step 14, Table 8.2.3.9.1.3.2-2)

| Derivation Path: 38.508-1 [4], Table 4.6.1-7 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|----------------------------------|-------------|--|--|
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.9.1.3.3-16A: MeasResults (Table 8.2.3.9.1.3.3-16)

| Derivation Path: 38.508-1 [4], Table 4.6.3-79 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

ensure that {

when { SS/PBCH block sorting quantity is above *absThreshSS-BlocksConsolidation* for each beam of NR Neighbour Cell }

then { UE sends MeasurementReport message containing rsIndexResults with *resultsSSB-Indexes* }

(2)

with { UE in RRC_CONNECTED state in EN-DC mode and measurement configured for SS/PBCH measurement reporting of inter frequency on specified frequency }

ensure that {

when { SS/PBCH block sorting quantity is below *absThreshSS-BlocksConsolidation* for one beam of NR Neighbour Cell and another beam(s) is above *absThreshSS-BlocksConsolidation* }

then { UE sends MeasurementReport message containing rsIndexResults with *resultsSSB-Indexes* includes RsIndex above *absThreshSS-BlocksConsolidation* and excludes RsIndex below *absThreshSS-BlocksConsolidation* }

(3)

with { UE in RRC_CONNECTED state in EN-DC mode and measurement configured for CSI-RS measurement reporting of inter frequency on specified frequency }

ensure that {

when { CSI-RS sorting quantity is above *absThreshCSI-RS-Consolidation* for each beam of NR Neighbour Cell }

then { UE sends MeasurementReport message containing rsIndexResults with *resultsCSI-RS-Indexes* }

(4)

with { UE in RRC_CONNECTED state in EN-DC mode and measurement configured for CSI-RS measurement reporting of inter frequency on specified frequency }

ensure that {

when { CSI-RS sorting quantity is below *absThreshCSI-RS-Consolidation* for one beam of NR Neighbour Cell and another beam(s) is above *absThreshCSI-RS-Consolidation* }

then { UE sends MeasurementReport message containing rsIndexResults with *resultsCSI-RS-Indexes* includes RsIndex above *absThreshCSI-RS-Consolidation* and excludes RsIndex below *absThreshCSI-RS-Consolidation* }

8.2.3.10.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331 clauses 5.5.5.1 and 5.5.5.2. Unless otherwise stated these are Rel-15 requirements.

- 3> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
- 4> if the *reportType* is set to *eventTriggered*:
- 5> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
- 4> else:
- 5> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
- 4> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
- 4> if the *reportType* is set to *eventTriggered* or *periodical*:
- 5> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
- 6> if the *measObject* associated with this *measId* concerns NR:
- 7> if *rsType* in the associated *reportConfig* is set to *ssb*:
- 8> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;
- 8> if *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
- 7> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:
- 8> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in decreasing order of the sorting quantity, determined as specified in 5.5.5.3, i.e. the best cell is included first;
- 8> if *reportQuantityRS-Indexes* and *maxNrofRS-IndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
- [TS 38.331, clause 5.5.5.1]
- 1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;
- 1> stop the periodical reporting timer, if running;
- 1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:
- 2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;
- 1> else:
- 2> if the *reportType* is set to *periodical*:
- 3> remove the entry within the *VarMeasReportList* for this *measId*;
- 3> remove this *measId* from the *measIdList* within *VarMeasConfig*;
- 1> if the UE is in (NG)EN-DC:
- 2> if SRB3 is configured:
- 3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;
- 2>else:

3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

[TS 38.331, clause 5.5.5.2]

For beam measurement information to be included in a measurement report the UE shall:

1> if *reportType* is set to *eventTriggered*:

2> consider the trigger quantity as the sorting quantity if available, otherwise RSRP as sorting quantity if available, otherwise RSRQ as sorting quantity if available, otherwise SINR as sorting quantity;

1> set *rsIndexResults* to include up to *maxNrofRS-IndexesToReport* SS/PBCH block indexes or CSI-RS indexes in order of decreasing sorting quantity as follows:

2> if the measurement information to be included is based on SS/PBCH block:

3> include within *resultsSSB-Indexes* the index associated to the best beam for that SS/PBCH block sorting quantity and if *absThreshSS-BlocksConsolidation* is included in the *VarMeasConfig* for the *measObject* associated to the cell for which beams are to be reported, the remaining beams whose sorting quantity is above *absThreshSS-BlocksConsolidation*;

3> if *includeBeamMeasurements* is configured, include the SS/PBCH based measurement results for the quantities in *reportQuantityRS-Indexes* set to *true* for each SS/PBCH block index;

2> else if the beam measurement information to be included is based on CSI-RS:

3> include within *resultsCSI-RS-Indexes* the index associated to the best beam for that CSI-RS sorting quantity and, if *absThreshCSI-RS-Consolidation* is included in the *VarMeasConfig* for the *measObject* associated to the cell for which beams are to be reported, the remaining beams whose sorting quantity is above *absThreshCSI-RS-Consolidation*;

3> if *includeBeamMeasurements* is configured, include the CSI-RS based measurement results for the quantities in *reportQuantityRS-Indexes* set to *true* for each CSI-RS index.

8.2.3.10.1.3 Test description

8.2.3.10.1.3.1 Pre-test conditions

System Simulator:

- EUTRA Cell 1 is the PCell and NR Cell 1 is the PS Cell and NR Cell 3 is the inter-frequency neighbour cell of NR Cell 1. NR Cell 3 has two beams: SSB/CSI-RS index#0 and SSB/CSI-RS index#1.

UE:

- None

Preamble:

- The UE is in state RRC_CONNECTED in EN-DC using generic procedure parameter Connectivity (EN-DC) and DC Bearers (MCG(s) and SCG) on E-UTRA Cell 1 according to TS 38.508-1 [4].

8.2.3.10.1.3.2 Test procedure sequence

Table 8.2.3.10.1.3.2-1 and Table 8.2.3.10.1.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 3 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.10.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA
Cell 1 | NR
Cell 1 | NR
Cell 3 | NR
Cell 3
Beam 0
(NOTE
) | NR
Cell 3
Beam 1
(NOTE
) | Remark |
|----|-------------------------------|------------|------------------|--------------|--------------|--------------------------------------|--------------------------------------|---|
| T0 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | - | - | |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -94 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -4 | -4 | |
| T1 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | - | - | $Mn + Ofn + Ocn - Hys > Mp + Ofp + C$

Power level is such that SS/PBCH quality and CSI-RS quality for both beams of NR Cell 3 are above <i>absThreshSS-BlocksConsolidation</i> . |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -106 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -4 | -4 | |
| T2 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | - | - | $Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$

Power level is such that SS/PBCH quality and CSI-RS quality for both beams of NR Cell 3 are below <i>absThreshSS-BlocksConsolidation</i> |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -106 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -12 | -12 | |

| | | | | | | | | |
|--|-------------------------------|------------|-----|------|-----|----|-----|---|
| T3 | Cell-specific RS EPRE | dBm/15k Hz | -85 | - | - | - | - | Power level is such that SS/PBCH quality and CSI-RS quality for beam 0 of NR Cell 3 is above <i>absThreshSS-BlocksConsolidation</i> and for beam 1 of NR Cell 3 is below <i>absThreshSS-BlocksConsolidation</i> . |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -106 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -90 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -4 | -12 | |
| <p>NOTE: "Beam 0" refers to transmission of the SS/PBCH block with SSB index #0 (according to the <i>ssb-PositionsInBurst</i>) and CSI-RS with index #0 (according to the <i>csi-rs-ResourceList-Mobility</i> being signalled to the UE at step 9); "Beam 1" refers to transmission of the SS/PBCH block with SSB index #1 (according to the <i>ssb-PositionsInBurst</i>) and CSI-RS with index #1 (according to the <i>csi-rs-ResourceList-Mobility</i> being signalled to the UE at step 9). For each beam SSS and CSI-RS have the same power levels at any given time instance.</p> | | | | | | | | |

Table 8.2.3.10.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 3 | NR Cell 3 Beam 0 (NOTE) | NR Cell 3 Beam 1 (NOTE) | Remark |
|----|-------------------------------|------------|---------------|-----------|-----------|-------------------------|-------------------------|--|
| T0 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | - | - | |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -82 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -81 | - | - | |
| | SS/PBCH SSS EPRE, CSI-RS EPRE | dB | - | - | - | -1 | -1 | |
| T1 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | - | - | $Mn + Ofn + Ocn - Hys > Mp + Ofp + C$ |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -100 | - | - | - | Power level is such that SS/PBCH quality and CSI-RS quality for both beams of NR Cell 3 are above <i>absThreshSS-BlocksConsolidation</i> . |
| | Reference Power | dBm/SC S | - | - | -81 | - | - | |

| | | | | | | | | |
|--|-------------------------------------|------------|-----|------|-----|-----|-----|--|
| | SS/PBCH
SSS EPRE,
CSI-RS EPRE | dB | - | - | - | -1 | -1 | |
| T2 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | - | - | $M_n + O_{fn} + O_{cn} + H_{ys} < M_p + O_{fp} + O_{cp} + O_{ff}$ |
| | SS/PBCH
SSS EPRE | dBm/SC S | - | -100 | - | - | - | Power level is such that SS/PBCH quality and CSI-RS quality for both beams of NR Cell 3 are below <i>absThreshSS-BlocksConsolidation</i> |
| | Reference Power | dBm/SC S | - | - | -81 | - | - | |
| | SS/PBCH
SSS EPRE,
CSI-RS EPRE | dB | - | - | - | -19 | -19 | |
| T3 | Cell-specific RS EPRE | dBm/15k Hz | -96 | - | - | - | - | |
| | SS/PBCH
SSS EPRE | dBm/SC S | - | -100 | - | - | - | |
| | Reference Power | dBm/SC S | - | - | -81 | - | - | |
| | SS/PBCH
SSS EPRE,
CSI-RS EPRE | dB | - | - | - | -1 | -19 | |
| <p>NOTE: "Beam 0" refers to transmission of the SS/PBCH block with SSB index #0 (according to the <i>ssb-PositionsInBurst</i>) and CSI-RS with index #0 (according to the <i>csi-rs-ResourceList-Mobility</i> being signalled to the UE at step 9); "Beam 1" refers to transmission of the SS/PBCH block with SSB index #1 (according to the <i>ssb-PositionsInBurst</i>) and CSI-RS with index #1 (according to the <i>csi-rs-ResourceList-Mobility</i> being signalled to the UE at step 9). For each beam SSS and CSI-RS have the same power levels at any given time instance.</p> | | | | | | | | |

Table 8.2.3.10.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> including <i>measConfig</i> to setup SS/PBCH block based inter-frequency NR measurement for PSCell (NR Cell 1) and reporting for A3. | <-- | <i>RRCConnectionReconfiguration(RRCReconfiguration)</i> | - | - |
| 2 | The UE transmits an | --> | <i>RRCConnectionReconfigur</i> | - | - |

| | | | | | |
|-----|---|-----|---|---|---|
| | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> . | | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE(RRCCONNECTIONRECONFIGURATIONCOMPLETE)</i> | | |
| 3 | The SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 4 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message to report event A3 with the measured results for NR Cell 3 with beam information containing <i>RSINDEX[0]</i> and <i>RSINDEX[1]</i> ? | --> | <i>ULINFORMATIONTRANSFERMRDC(MEASUREMENTREPORT)</i> | 1 | P |
| 4A | The SS re-adjusts the cell-specific reference signal level according to the row "T2". | - | - | - | - |
| 4B | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message on E-UTRA Cell 1 to report the event A3 during the next 10s? | - | - | 1 | F |
| 5 | The SS re-adjusts the cell-specific reference signal level according to row "T3". | - | - | - | - |
| 6 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message to report event A3 with the measured results for NR Cell 3 with beam information containing <i>RSINDEX[0]</i> and excludes <i>RSINDEX[1]</i> ? | --> | <i>ULINFORMATIONTRANSFERMRDC(MEASUREMENTREPORT)</i> | 2 | P |
| 7 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCCONNECTIONRECONFIGURATION</i> including <i>MEASCONFIG</i> to remove SS/PBCH block based inter-frequency NR measurement for PSCell (NR Cell 1) and reporting for event A3. | <-- | <i>RRCCONNECTIONRECONFIGURATION(RRCCONNECTIONRECONFIGURATION)</i> | - | - |
| 8 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> . | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE(RRCCONNECTIONRECONFIGURATIONCOMPLETE)</i> | - | - |
| 9 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message containing NR <i>RRCCONNECTIONRECONFIGURATION</i> including <i>MEASCONFIG</i> to setup CSI-RS based inter-frequency NR measurement for PSCell (NR Cell 1) and event A3. | <-- | <i>RRCCONNECTIONRECONFIGURATION(RRCCONNECTIONRECONFIGURATION)</i> | - | - |
| 10 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message containing NR <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> . | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE(RRCCONNECTIONRECONFIGURATIONCOMPLETE)</i> | - | - |
| 11 | The SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 12 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message to report event A3 with the measured results for NR Cell 3 with beam information containing <i>RSINDEX[0]</i> and <i>RSINDEX[1]</i> ? | --> | <i>ULINFORMATIONTRANSFERMRDC(MEASUREMENTREPORT)</i> | 3 | P |
| 12A | The SS re-adjusts the cell-specific reference signal level according to the row "T2". | - | - | - | - |
| 12B | Check: Does the UE transmit a | - | - | 3 | F |

| | | | | | |
|----|---|-----|--|---|---|
| | <i>MeasurementReport</i> message on E-UTRA Cell 1 to report the event A3 during the next 10s? | | | | |
| 13 | The SS re-adjusts the cell-specific reference signal level according to row "T3". | - | - | - | - |
| 14 | Check: Does the UE transmit a <i>MeasurementReport</i> message to report event A3 with the measured results for NR Cell 3 with beam information containing <i>RsIndex[0]</i> and excludes <i>RsIndex[1]</i> ? | --> | <i>ULInformationTransferMR DC(MeasurementReport)</i> | 4 | P |

8.2.3.10.1.3.3 Specific message contents

Table 8.2.3.10.1.3.3-1: *RRCConnectionReconfiguration* (steps 1, 7, 9. Table 8.2.3.10.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC EmbedNR RRCRecon

Table 8.2.3.10.1.3.3-2: *RRCReconfiguration* (Table 8.2.3.10.1.3.3-1)

Derivation Path: 38.508-1 [4], Table 4.6.1-13

Table 8.2.3.10.1.3.3-3: *MeasConfig* (Table 8.2.3.10.1.3.3-2,)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|---|----------------------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>MeasConfig</i> ::= SEQUENCE { | | | |
| <i>measObjectToAddModList</i> | <i>IdMeasObjectToAdd</i> | | |
| <i>reportConfigToAddModList</i> | <i>IdReportConfigToAdd</i> | | |
| <i>measIdToAddModList</i> | <i>IdMeasIdToAdd</i> | | |
| s- <i>MeasureConfig</i> CHOICE { | | | |
| <i>ssb-rsrp</i> | 57 | corresponding to -99dBm | FR1 |
| | 66 | corresponding to -90dBm | FR2 |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-4: *IdMeasObjectToAdd* (Table 8.2.3.10.1.3.3-3)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>MeasObjectToAddModList</i> ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| <i>measObjectId[1]</i> | 1 | | |

| | | | |
|------------------------|--------------------|--|--|
| measObject[1] CHOICE { | | | |
| measObjectNR | Id-MeasObjectNR-f1 | | |
| } | | | |
| measObjectId[2] | 2 | | |
| measObject[2] CHOICE { | | | |
| measObjectNR | Id-MeasObjectNR-f2 | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-5: Id-MeasObjectNR-f1 (Table 8.2.3.10.1.3.3-4)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---------------------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NCell 1 | | |
| absThreshSS-BlocksConsolidation SEQUENCE { | | | |
| thresholdRSRP | 57 | corresponding to -99dBm | FR1 |
| | 66 | corresponding to -90dBm | FR2 |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-5A: Id-MeasObjectNR-f2 (Table 8.2.3.10.1.3.3-4)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---------------------------|---------|---|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NCell 3 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility SEQUENCE { | | | |
| ssb-ToMeasure CHOICE { | | | |
| setup CHOICE { | | | |
| shortBitmap | 1100 | | (FREQ<=3 GHz AND (FR1_FDD OR NOT CASE_C)) |

| | | | |
|--|--|-------------------------|--|
| | | | OR
(FREQ<=2.4GHz AND FR1_TDD) |
| mediumBitmap | 11000000 | | (FREQ>3GHz AND FR1) OR
(FREQ>2.4GHz AND FR1_TDD AND CASE_C) |
| longBitmap | 11000000 00000000
00000000 00000000
00000000 00000000
00000000 00000000 | | FR2 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation SEQUENCE { | | | |
| thresholdRSRP | 57 | corresponding to -99dBm | FR1 |
| | 66 | corresponding to -90dBm | FR2 |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-6: IdReportConfigToAdd (Table 8.2.3.10.1.3.3-3)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|--|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigToAddModList ::= SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | IdReportConfig-A3 | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-7: IdReportConfig-A3 (Table 8.2.3.10.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition EVENT_A3 |
|--|
|--|

| Information Element | Value/remark | Comment | Condition |
|-------------------------------------|--------------|---------|-----------|
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| eventId CHOICE { | | | |
| eventA3 SEQUENCE { | | | |
| a3-Offset CHOICE { | | | |
| rsrp | 2 | | |
| } | | | |
| } | | | |
| } | | | |
| rsType | ssb | | |
| reportAmount | r1 | | |
| reportQuantityRS-Indexes SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | false | | |
| sinr | false | | |
| } | | | |
| maxNrofRS-IndexesToReport | 2 | | |
| includeBeamMeasurements | true | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-8: IdMeasIdToAdd (Table 8.2.3.10.1.3.3-3, Table 8.2.3.10.1.3.3-14)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasIdToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | | |
| reportConfigId[1] | 1 | | |
| } | | | |

Table 8.2.3.10.1.3.3-9: RRCConnectionReconfigurationComplete (steps 2, 8, 10, Table 8.2.3.10.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-9 with condition MCG_and_SCG

Table 8.2.3.10.1.3.3-10: ULInformationTransferMRDC (steps 4, 6,12,14 Table 8.2.3.10.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-27

| Information Element | Value/remark | Comment | Condition |
|--|--|---------|-----------|
| ULInformationTransferMRDC-r15 ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| ulInformationTransferMRDC-r15 SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING
containing NR RRC
MeasurementReport | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-11: MeasurementReport (step 4, Table 8.2.3.10.1.3.2-2)

Derivation Path: 38.508-1 [4], Table 4.6.1-7

| Information Element | Value/remark | Comment | Condition |
|----------------------------------|--------------|---------|-----------|
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-11A: MeasResults (Table 8.2.3.10.1.3.3-11)

Derivation Path: 38.508-1 [4], Table 4.6.3-79

| Information Element | Value/remark | Comment | Condition |
|---------------------|--------------|---------|-----------|
| | | | |

| | | | |
|------------------------------------|-------------------------------------|--|--|
| MeasResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex of NR Cell
1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical CellID of the NR
Cell 1 | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE { | 1 entry | | |
| physCellId | Physical CellID of the NR
Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|------------------------------------|-------------|--|--|
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| rsIndexResults SEQUENCE { | | | |
| resultsSSB-Indexes SEQUENCE { | | | |
| ResultsPerSSB-Index [1] SEQUENCE { | | | |
| ssb-Index | SSB index 0 | | |
| ssb-Results SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| ResultsPerSSB-Index [1] SEQUENCE { | | | |
| ssb-Index | SSB index 1 | | |
| ssb-Results SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| resultsCSI-RS-Indexes | Not present | | |
| } | | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-12: MeasurementReport (step 6, Table 8.2.3.10.1.3.2-2)

| Derivation Path: 38.508-1 [4], Table 4.6.1-7 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-12A: MeasResults (Table 8.2.3.10.1.3.3-12)

| Derivation Path: 38.508-1 [4], Table 4.6.3-79 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |

| | | | |
|---|-------------|--|--|
| measObjectToRemoveList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| MeasObjectId [1] | 2 | | |
| } | | | |
| measObjectToAddModList | Not Present | | |
| reportConfigToAddModList | Not Present | | |
| measIdToAddModList | Not Present | | |
| quantityConfig | Not Present | | |
| } | | | |

Table 8.2.3.10.1.3.3-14: *MeasConfig* (step 9, Table 8.2.3.10.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|--|---------------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig::= SEQUENCE { | | | |
| measObjectToAddModList | IdMeasObjectToAdd | | |
| reportConfigToAddModList | IdReportConfigToAdd | | |
| measIdToAddModList | IdMeasIdToAdd | | |
| s-MeasureConfig CHOICE { | | | |
| csi-rsrp | 57 | corresponding to -99dBm | FR1 |
| | 66 | corresponding to -90dBm | FR2 |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-14A: *IdMeasObjectToAdd* (Table 8.2.3.10.1.3.3-14)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|--|--------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectToAddModList::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject CHOICE { | | | |
| measObjectNR | Id-MeasObjectNR-f1 | | |
| } | | | |
| measObjectId[2] | 2 | | |

| | | | |
|------------------------|--------------------|--|--|
| measObject[2] CHOICE { | | | |
| measObjectNR | Id-MeasObjectNR-f2 | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-14B: Id-MeasObjectNR-f1 (Table 8.2.3.10.1.3.3-14A)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---------------------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NCell 1 | | |
| absThreshSS-BlocksConsolidation SEQUENCE { | | | |
| thresholdRSRP | 57 | corresponding to -99dBm | FR1 |
| | 66 | corresponding to -90dBm | FR2 |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-14C: Id-MeasObjectNR-f2 (Table 8.2.3.10.1.3.3-14A)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|--|----------------------------|---------|------------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| refFreqCSI-RS | Downlink ARFCN of NR Cell3 | | |
| referenceSignalConfig SEQUENCE { | | | |
| ssb-ConfigMobility | Not Present | | |
| csi-rs-ResourceConfigMobility SEQUENCE { | | | |
| setup SEQUENCE { | | | |
| subcarrierSpacing | kHz15 | | SCS_15kHz |
| | kHz30 | | SCS_30kHz |
| | kHz120 | | SCS_120kHz |
| csi-RS-CellList-Mobility SEQUENCE (SIZE (1..maxNrofCSI-RS-CellsRRM)) OF SEQUENCE { | 1 entry | | |
| CSI-RS-CellMobility [1] SEQUENCE { | | | |

| | | | |
|--|---|---|--|
| cellId | Physical CellID of the NR Cell 3 | | |
| csi-rs-MeasurementBW SEQUENCE { | | | |
| nrofPRBs | size24 | | |
| startPRB | same value as 'offsetToCarrier' as defined for the DL frequency of the cell | | |
| } | | | |
| density | D3 | | |
| csi-rs-ResourceList-Mobility::= SEQUENCE (SIZE (1.. maxNrofCSI-RS-ResourcesRRM)) OF SEQUENCE { | 2 entries | | |
| CSI-RS-Resource-Mobility [1] SEQUENCE { | | | |
| csi-RS-Index | 0 | CSI-RS with Index 0 | |
| slotConfig CHOICE { | | | |
| ms20 | 10 * μ | μ : numerology (SCS=15kHz: 1, SCS=30kHz: 2, etc.) | |
| } | | | |
| associatedSSB SEQUENCE { | | | |
| ssb-Index | 0 | | |
| isQuasiColocated | false | | |
| } | | | |
| frequencyDomainAllocation CHOICE { | | | |
| row1 | 1000 | | |
| } | | | |
| firstOFDMSymbolInTimeDomain | 4 | | |
| sequenceGenerationConfig | 24 | | |
| } | | | |
| CSI-RS-Resource-Mobility [2] SEQUENCE { | | | |
| csi-RS-Index | 1 | CSI-RS with Index 1 | |
| slotConfig CHOICE { | | | |
| ms20 | 10 * μ | μ : numerology (SCS=15kHz: 1, SCS=30kHz: 2, etc.) | |

| | | | |
|--|-------------|----------------------------|-----|
| } | | | |
| associatedSSB SEQUENCE { | | | |
| ssb-Index | 1 | | |
| isQuasiColocated | false | | |
| } | | | |
| frequencyDomainAllocation CHOICE { | | | |
| row1 | 0001 | | |
| } | | | |
| firstOFDMSymbolInTimeDomain | 0 | | |
| sequenceGenerationConfig | 24 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| absThreshSS-BlocksConsolidation | Not Present | | |
| absThreshCSI-RS-Consolidation SEQUENCE { | | | |
| thresholdRSRP | 57 | corresponding to
-99dBm | FR1 |
| | 66 | corresponding to
-90dBm | FR2 |
| thresholdRSRQ | Not Present | | |
| thresholdSINR | Not Present | | |
| } | | | |
| nrofSS-BlocksToAverage | Not Present | | |
| nrofCSI-RS-ResourcesToAverage | 2 | | |
| } | | | |

Table 8.2.3.10.1.3.3-14D: IdReportConfigToAdd (Table 8.2.3.10.1.3.3-14)

| Derivation Path: TS 38.331 [6], clause 6.3.2 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigToAddModList ::= SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |

| | | | |
|----------------|-------------------|--|--|
| reportConfigNR | IdReportConfig-A3 | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-14E: IdReportConfig-A3 (Table 8.2.3.10.1.3.3-16)

| Derivation Path: Table 8.2.3.10.1.3.3-7 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| rsType | csi-rs | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-14F: MeasurementReport (step 12, Table 8.2.3.10.1.3.2-2)

| Derivation Path: 38.508-1 [4], Table 4.6.1-7 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-15: MeasResults

| Derivation Path: 38.508-1 [4], Table 4.6.3-79 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |
| measResultServingCell SEQUENCE { | | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |

| | | | |
|---------------------------------------|----------------------------------|--|--|
| resultsCSI-RS-Cell::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE { | 1 entry | | |
| physCellId | Physical CellID of the NR Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsCSI-RS-Cell::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| rsIndexResults SEQUENCE { | | | |
| resultsSSB-Indexes | Not present | | |
| resultsCSI-RS-Indexes SEQUENCE { | 2 entries | | |
| ResultsPerCSI-RS-Index [1] SEQUENCE { | | | |
| csi-RS-Index | CSI-RS-Index #0 | | |
| csi-RS--Results SEQUENCE { | | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| ResultsPerCSI-RS-Index [2] SEQUENCE { | | | |
| csi-RS-Index | CSI-RS-Index#1 | | |
| csi-RS--Results SEQUENCE { | 0 | | |
| rsrp | Not checked | | |
| rsrq | Not checked | | |
| sinr | Not checked | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| cgi-Info | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-15A: MeasurementReport (step 14, Table 8.2.3.10.1.3.2-2)

Derivation Path: 38.508-1 [4], Table 4.6.1-7

| Information Element | Value/remark | Comment | Condition |
|----------------------------------|--------------|---------|-----------|
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults | MeasResults | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.10.1.3.3-16: MeasurementReport (step 14, Table 8.2.3.10.1.3.2-2)

| Derivation Path: TS 38.331 [6], clause 6.2.2 | | | |
|--|----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsCSI-RS-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultListNR SEQUENCE { | 1 entry | | |
| physCellId | Physical CellID of the NR Cell 3 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsCSI-RS-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |

8.2.3.11.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 36.331, clause 5.3.5.3 and 5.5.2.9, and TS 38.331, clause 5.5.2.1 and 5.5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCCONNECTIONRECONFIGURATION* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

...

1> if the *RRCCONNECTIONRECONFIGURATION* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:

...

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];

1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 36.331, clause 5.5.2.9]

The UE shall:

1> if *measGapConfig* is set to *setup*:

2> if a measurement gap configuration *measGapConfig* or *measGapConfigPerCC-List* is already setup, release the measurement gap configuration;

2> if the *gapOffset* in *measGapConfig* indicates a non-uniform gap pattern:

...

2> else:

3> setup the measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition (SFN and subframe of MCG cells):

$SFN \bmod T = \text{FLOOR}(\text{gapOffset}/10)$;

subframe = $\text{gapOffset} \bmod 10$;

with $T = \text{MGRP}/10$ as defined in TS 36.133 [16];

2> if EN-DC is configured:

3> if the UE is configured with *fr1-Gap* set to *TRUE*:

4> apply the gap configuration for LTE serving cells and for NR serving cells on FR1;

3> else:

4> apply the gap configuration for all LTE and NR serving cells;

2> if *mgta* is set to *TRUE*, apply a timing advance value of 0.5ms to the gap occurrences calculated above according to TS 38.133 [16];

NOTE 1: The UE applies a single gap, which timing is relative to the MCG cells, even when configured with DC. In case of EN-DC, the UE may either be configured with a single (common) gap or with two separate gaps i.e. a first one for FR1 (configured by E-UTRA RRC) and a second one for FR2 (configured by NR RRC).

1> else if *measGapConfig* is set to *release*:

2> release the measurement gap configuration *measGapConfig*;

...

[TS 38.331, clause 5.5.2.1]

The network applies the procedure as follows:

- to ensure that, whenever the UE has a *measConfig*, it includes a *measObject* for the SpCell and for each NR SCell to be measured;
- to configure at most one measurement identity using a reporting configuration with the *reportType* set to *reportCGI*;
- to ensure that, for all SSB based reporting configurations have at most one measurement object with the same *ssbFrequency* and *ssbSubcarrierSpacing*;

The UE shall:

1> if the received *measConfig* includes the *measObjectToRemoveList*:

2> perform the measurement object removal procedure as specified in 5.5.2.4;

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

1> if the received *measConfig* includes the *reportConfigToRemoveList*:

2> perform the reporting configuration removal procedure as specified in 5.5.2.6;

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

1> if the received *measConfig* includes the *quantityConfig*:

2> perform the quantity configuration procedure as specified in 5.5.2.8;

1> if the received *measConfig* includes the *measIdToRemoveList*:

2> perform the measurement identity removal procedure as specified in 5.5.2.2;

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

1> if the received *measConfig* includes the *measGapConfig*:

2> perform the measurement gap configuration procedure as specified in 5.5.2.9;

...

[TS 38.331, clause 5.5.5.1]



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;
- 1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
 - ...
 - 1> if there is at least one applicable neighbouring cell to report:
 - 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
 - 4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
 - 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - ...
 - 3> if the *reportType* is set to *periodical*:
 - 4> if a single reporting quantity is set to *TRUE* in *reportQuantityRsIndexes*;
 - 5> consider the configured single quantity as the sorting quantity;
 - 4> else:
 - 5> if *rsrp* is set to *TRUE*;
 - 6> consider RSRP as the sorting quantity;

5> else:

6> consider RSRQ as the sorting quantity;

...

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

1> else:

2> if the *reportType* is set to *periodical*:

3> remove the entry within the *VarMeasReportList* for this *measId*;

3> remove this *measId* from the *measIdList* within *VarMeasConfig*;

1> if the UE is configured with EN-DC:

2> if SRB3 is configured:

3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;

2> else:

3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

...

8.2.3.11.1.3 Test description

8.2.3.11.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is PCell , NR Cell 1 is PSCell on FR1 and NR Cell 3 is inter-frequency neighbour Cell on FR1.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) and Bearers (*MCG and SCG*) established according to TS 38.508-1 [4].

8.2.3.11.1.3.2 Test procedure sequence

Table 8.2.3.11.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.11.1.3.2-1: Time instances of cell power level and parameter changes

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 3 | Remark |
|----|-----------------------|------------|---------------|-----------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | - | Switch on NR neighbour Cell and UE start to perform E-UTRA interRAT measurement. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -88 | -88 | |

Table 8.2.3.11.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message to setup fr1-Gap to report periodical measurements for E-UTRA serving Cell 1 and NR neighbor cell 3 on FR1 frequency. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 2 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message to confirm the setup of fr1-Gap and report periodical measurements for E-UTRA serving cell1 and NR neighbor cell 3 on FR1 frequency. | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | - | - |
| 3 | Wait and ignore <i>MEASUREMENTREPORT</i> messages for 8 s to allow UE to measure the neighbouring cells. | - | - | - | - |
| - | EXCEPTION: In parallel to events described in step 4 the steps specified in table 8.2.3.11.1.3.2-3 shall take place. | - | - | - | - |
| 4 | Wait for 30 s to ensure that the UE performs a periodical inter frequency reporting. | - | - | - | - |
| - | EXCEPTION: Steps 5 to 7 shall be repeated for k=1 to 11 (increment=1).

Note: skip the gap pattern among #2 - #11 not supported by the UE according to the PICS setting given in TS 38.508-2[5] table A.4.3.6-1 | - | - | - | - |
| 5 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> including measConfig to change fr1-Gap. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 6 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message to confirm the change of fr1-Gap. | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | - | - |
| - | EXCEPTION: In parallel to events described in step 7 the steps specified in table 8.2.3.11.1.3.2-3 shall take place. | - | - | - | - |
| 7 | Wait for 30 s to ensure that the UE performs a periodical inter frequency reporting. | - | - | - | - |

| | | | | | |
|----|--|-----|--|---|---|
| 8 | SS transmits an <i>RRCCConnectionReconfiguration</i> message including measConfig to release fr1-Gap and measid of periodical measurements. | <-- | <i>RRCCConnectionReconfiguration</i> | - | - |
| 9 | The UE transmits an <i>RCCConnectionReconfigurationComplete</i> message. | --> | <i>RRCCConnectionReconfiguration Complete</i> | - | - |
| 10 | Wait 10s | - | - | - | - |
| 11 | The SS transmits an <i>RRCCConnectionReconfiguration</i> including measConfig to setup fr1-Gap and nr-Config IE containing measConfig to report periodical measurements for NR serving Cell 1 and NR neighbor cell 3 on FR1 frequency. | <-- | <i>RRCCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 12 | The UE transmits an <i>RRCCConnectionReconfigurationComplete</i> message to confirm the setup of fr1-Gap and report periodical measurements for NR serving Cell 1 and NR neighbor cell 3 on FR1 frequency. | --> | <i>RRCCConnectionReconfiguration Complete (RRCReconfigurationComplete)</i> | - | - |
| 13 | Wait and ignore <i>MeasurementReport</i> messages for 8 s to allow for UE to measure the neighbouring cells. | - | - | - | - |
| - | EXCEPTION: In parallel to events described in step 14 the steps specified in table 8.2.3.11.1.3.2-4 shall take place. | - | - | - | - |
| 14 | Wait for 30 s to ensure that the UE performs a periodical inter frequency reporting. | - | - | - | - |
| - | EXCEPTION: Steps 15 to 17 shall be repeated for k=1 to 11 (increment=1).

Note: skip the gap pattern among #2 - #11 not supported by the UE according to the PICS setting given in TS 38.508-2[5] table A.4.3.6-1. | - | - | - | - |
| 15 | The SS transmits an <i>RRCCConnectionReconfiguration</i> including measConfig to change fr1-Gap. | <-- | <i>RRCCConnectionReconfiguration</i> | - | - |
| 16 | The UE transmits an <i>RRCCConnectionReconfigurationComplete</i> message to confirm the change of fr1-Gap. | --> | <i>RRCCConnectionReconfiguration Complete</i> | - | - |
| - | EXCEPTION: In parallel to events described in step 17 the steps specified in table 8.2.3.11.1.3.2-4 shall take place. | - | - | - | - |
| 17 | Wait for 30 s to ensure that the UE performs a periodical inter frequency reporting. | - | - | - | - |
| 18 | SS transmits an <i>RRCCConnectionReconfiguration</i> message including measConfig to release fr1-Gap and measid of periodical measurements. | <-- | <i>RRCCConnectionReconfiguration</i> | - | - |
| 19 | The UE transmits an | --> | <i>RRCCConnectionReconfiguration</i> | - | - |

| | | | | | |
|--|---|--|-----------------|--|--|
| | <i>RCConnectionReconfigurationComplete</i> message. | | <i>Complete</i> | | |
|--|---|--|-----------------|--|--|

Table 8.2.3.11.1.3.2-3: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--------------------------|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: After the 1st message is received, step 1 below shall be repeated every time the duration indicated in the IE <i>reportInterval</i> has elapsed. | - | - | - | - |
| 1 | Check: Does the UE transmit a <i>MeasurementReport</i> message to perform periodical interRAT reporting for E-UTRA serving Cell 1 and NR Cell 3? | --> | <i>MeasurementReport</i> | 1 | P |

Table 8.2.3.11.1.3.2-4: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: After the 1st message is received, step 1 below shall be repeated every time the duration indicated in the IE <i>reportInterval</i> has elapsed. | - | - | - | - |
| 1 | Check: Does the UE transmit a <i>MeasurementReport</i> encapsulated in <i>ULInformationTransferMRDC</i> message to perform periodical inter frequency reporting for NR serving Cell 1 and NR Cell 3? | --> | <i>ULInformationTransferMRDC</i>

(<i>MeasurementReport</i>) | 2 | P |

8.2.3.11.1.3.3 Specific message contents

Table 8.2.3.11.1.3.3-0: Conditions for specific message contents in Table 8.2.3.11.1.3.3-1

| Condition | Explanation |
|-----------|--------------------------|
| Band > 64 | If band > 64 is selected |

Table 8.2.3.11.1.3.3-1: *RRCCConnectionReconfiguration* (step 1, Table 8.2.3.11.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCCConnectionReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |

| | | | |
|--|--|-----------------------------|-----------|
| measConfig SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE
(SIZE (1.. maxNrofObjectId)) OF SEQUENCE { | 2 entry | | |
| measObjectId[1] | 1 | MeasObjectIdEutra-f1 | |
| measObject[1] CHOICE { | | | |
| measObjectEUTRA | MeasObjectEUTRA-
GENERIC(f1) | | |
| measObjectEUTRA | MeasObjectEUTRA-
GENERIC(maxEARFC
N) | | Band > 64 |
| } | | | |
| measObjectId[2] | 2 | MeasObjectIdNR-f2 | |
| measObject[2] CHOICE { | | | |
| measObjectNR-r15 | MeasObjectNR-
GENERIC(NRf2) | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE
(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] | ReportConfigInterRAT-
PERIODICAL | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..
maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | MeasObjectIdNR-f2 | |
| reportConfigId[1] | 1 | | |
| } | | | |
| quantityConfig | QuantityConfig-
DEFAULT | | |
| measGapConfig CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 0 | MGRP = 40 ms,
MGL = 6 ms | |

| | | | |
|--|-------------------------------------|------------|-----------|
| } | | | |
| } | | | |
| } | | | |
| measObjectToAddModList-v9e0 ::= SEQUENCE (SIZE (1..maxObjectId)) OF SEQUENCE { | 1 entry | | Band > 64 |
| measObjectEUTRA-v9e0[1] SEQUENCE { | | | |
| carrierFreq-v9e0 | Same downlink EARFCN as used for f1 | | |
| } | | | |
| fr1-gap-r15 | True | | |
| mgta-r15 | True | Mgta=0.5ms | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.1.3.3-2: MeasObjectNR-GENERIC(NRf2) (Table 8.2.3.11.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.6-2B | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR-r15 ::= SEQUENCE { | | | |
| carrierFreq-r15 | Downlink carrier frequency of NR cell 3 | | |
| } | | | |

Table 8.2.3.11.1.3.3-3: ReportConfigInterRAT-PERIODICAL (Table 8.2.3.11.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.6-9 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigInterRAT-PERIODICAL ::= SEQUENCE { | | | |
| reportQuantityCellNR-r15 SEQUENCE { | | | |
| ss-rsrp | true | | |
| ss-rsrq | true | | |
| ss-sinr | false | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.2.3.11.1.3.3-4: QuantityConfig-DEFAULT (Table 8.2.3.11.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.6-3A | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| QuantityConfig-DEFAULT ::= SEQUENCE { | | | |
| quantityConfigNRLList-r15 SEQUENCE ((SIZE (1..maxQuantSetsNR-r15)) OF SEQUENCE { | | | |
| measQuantityCellNR-r15 SEQUENCE { | | | |
| filterCoeff-RSRP-r15 | fc4 | | |
| filterCoeff-RSRQ-r15 | fc4 | | |
| filterCoefficient-SINR-r13 | fc4 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.1.3.3-5: MeasurementReport (step 1, Table 8.2.3.11.1.3.2-3)

| Derivation Path: 36.508 [7], Table 4.6.1-5 | | | |
|--|-----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| measurementReport-r8 SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultPCell SEQUENCE { | | | |
| rsrpResult | (0..97) | | |
| rsrqResult | (0..34) | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultNeighCellListNR-r15 SEQUENCE (SIZE (1..maxCellReport)) OF SEQUENCE { | 1 entry | | |
| pci-r15 [1] | PhysicalCellIdentity of NR Cell 3 | | |

| | | | |
|-------------|-------|--|--------------------------------|
| | | | _dc=True |
| gp5-r15 | 0 | Gap Pattern #5, MGRP = 160 ms, MGL = 6 ms | k=5
pc_gp5_en
_dc=True |
| gp6-r15 | 0 | Gap Pattern #6, MGRP = 20 ms, MGL = 4 ms | k=6
pc_gp6_en
_dc=True |
| gp7-r15 | 0 | Gap Pattern #7, MGRP = 40 ms, MGL = 4 ms | k=7
pc_gp7_en
_dc=True |
| gp8-r15 | 0 | Gap Pattern #8, MGRP = 80 ms, MGL = 4 ms | k=8
pc_gp8_en
_dc=True |
| gp9-r15 | 0 | Gap Pattern #9, MGRP = 160 ms, MGL = 4 ms | k=9
pc_gp9_en
_dc=True |
| gp10-r15 | 0 | Gap Pattern #10, MGRP = 20 ms, MGL = 3 ms | k=10
pc_gp10_e
n_dc=True |
| gp11-r15 | 0 | Gap Pattern #11, MGRP = 160 ms, MGL = 3 ms | k=11
pc_gp11_e
n_dc=True |
| } | | | |
| } | | | |
| } | | | |
| fr1-gap-r15 | True | | |
| mgta-r15 | False | Mgta=0ms | k=6-11 |
| | True | Mgta=0.5ms | k=1-5 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.1.3.3-7: RRCConnectionReconfiguration (step 8 Table 8.2.3.11.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|---|-------------|--|--|
| RRConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| measConfig SEQUENCE { | | | |
| measIdToRemoveList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| MeasId[1] | 1 | | |
| } | | | |
| quantityConfig | Not present | | |
| measConfig SEQUENCE { | | | |
| measGapConfig CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.1.3.3-8: RRConnectionReconfiguration (step 11, Table 8.2.3.11.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| measConfig SEQUENCE { | | | |
| quantityConfig | Not present | | |
| measGapConfig CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp0 | 0 | MGRP = 40 ms,
MGL = 6 ms | |

Table 8.2.3.11.1.3.3-9: RRCReconfiguration (Table 8.2.3.11.1.3.3-8)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13 | | | |
|--|---------------------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | 38.508-1 [4]
Table 4.6.5-12. | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.1.3.3-10: MeasConfig (Table 8.2.3.11.1.3.3-9)

| Derivation path: 38.508-1[4] Table 4.6.3-69 | | | |
|---|-------------------------|-------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF SEQUENCE { | 2 entry | | |
| measObjectId[1] | 1 | MeasObjectIdNR-f1 | |
| measObject CHOICE { | | | |
| measObjectNR[1] | MeasObjectNR-GENERIC(0) | NR Cell 1 | |
| } | | | |
| measObjectId[2] | 2 | MeasObjectIdNR-f2 | |
| measObject CHOICE { | | | |
| measObjectNR[2] | MeasObjectNR-GENERIC(0) | NR Cell 3 | |

| | | | |
|---|-------------------------|-------------------|--|
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | ReportConfigId | |
| reportConfig[1] | ReportConfig-Periodical | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 2 | | |
| measObjectId[1] | 2 | MeasObjectIdNR-f2 | |
| reportConfigId[1] | 1 | ReportConfigId | |
| } | | | |
| quantityConfig | QuantityConfig | | |
| } | | | |

Table 8.2.3.11.1.3.3-11: MeasObjectNR-GENERIC(0) (Table 8.2.3.11.1.3.3-10)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR cell 3 SSB | | |
| } | | | |

Table 8.2.3.11.1.3.3-12: MeasObjectNR-GENERIC(0) (Table 8.2.3.11.1.3.3-10)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR cell 1 SSB | | |
| } | | | |

Table 8.2.3.11.1.3.3-13: ReportConfig-Periodical (Table 8.2.3.11.1.3.3-10)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition Periodical | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|-------------------------------|----------------|---------------------------------|--|
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| Periodical SEQUENCE { | | | |
| rsType | ssb | | |
| reportInterval | ReportInterval | 38.508-1 [4]
Table 4.6.3-144 | |
| reportAmount | infinity | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | true | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRsIndexes | Not present | | |
| maxNrofRSIndexesToReport | Not present | | |
| includeBeamMeasurements | false | | |
| useWhiteCellList | false | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.1.3.3-14: QuantityConfig (Table 8.2.3.11.1.3.3-10)

| Derivation Path: 38.508-1 [4], Table 4.6.3-127 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| QuantityConfig ::= SEQUENCE { | | | |
| quantityConfigNR-List SEQUENCE (SIZE (1..maxNrofQuantityConfig)) OF SEQUENCE { | 1 entry | | |
| quantityConfigCell[1] SEQUENCE { | | | |
| ssb-FilterConfig SEQUENCE { | | | |
| filterCoefficientRSRP | fc4 | | |
| filterCoefficientRSRQ | fc4 | | |
| filterCoefficientRS-SINR | fc4 | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 8.2.3.11.1.3.3-15: ULInformationTransferMRDC (step1, Table 8.2.3.11.1.3.2-4)

| Derivation Path: 36.508 [7], Table 4.6.1-27 | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ULInformationTransferMRDC ::= SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING including the MeasurementReport message according to Table 8.2.3.11.1.3.3-16 | | |
| } | | | |

Table 8.2.3.11.1.3.3-16: MeasurementReport (Table 8.2.3.11.1.3.3-15)

| Derivation Path: TS 38.508-1 [4], clause 4.6.1-5A | | | |
|---|----------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| measurementReport ::= SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 2 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |
| servCellId | ServCellIndex of NR Cell 1 | | |
| measResultServingCell SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE { | | | |
| resultsSSB-Cell SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|-------------|--|--|
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig SEQUENCE { | | | |
| measObjectToAddModList | Not present | | |
| reportConfigToAddModList | Not present | | |
| measIdToRemoveList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| MeasId[1] | 2 | | |
| } | | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| } | | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.11.2 Measurement configuration control and reporting / Measurement Gaps / NR FR2 / EN-DC

8.2.3.11.2.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG (E-UTRA PDCP) and SCG }

ensure that {

when { UE receives RRCConnectionReconfiguration message with nr-Config IE containing MeasConfig to setup gapFR2 and report periodical measurements for NR neighbor cell on FR2 frequency }

then { UE applies gapFR2 and sends periodical measurements for NR neighbor cell on FR2 frequency }

 }

8.2.3.11.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 36.331, clause 5.3.5.3, and TS 38.331, clause 5.5.2.9. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> set the content of *RRConnectionReconfigurationComplete* message as follows:

...

2> if the received *RRConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];

1> submit the *RRConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.5.2.9]

The UE shall:

...

1> if *gapFR2* is set to setup:

2> if an FR2 measurement gap configuration is already setup, release the FR2 measurement gap configuration;

2> setup the FR2 measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$$\text{SFN mod } T = \text{FLOOR}(\text{gapOffset}/10);$$
$$\text{subframe} = \text{gapOffset mod } 10;$$

with $T = \text{MGRP}/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapFR2* is set to release:

2> release the FR2 measurement gap configuration;

1> if *gapUE* is set to setup:

2> if a per UE measurement gap configuration is already setup, release the per UE measurement gap configuration;

2> setup the per UE measurement gap configuration indicated by the *measGapConfig* in accordance with the received *gapOffset*, i.e., the first subframe of each gap occurs at an SFN and subframe meeting the following condition:

$$\text{SFN mod } T = \text{FLOOR}(\text{gapOffset}/10);$$
$$\text{subframe} = \text{gapOffset mod } 10;$$

with $T = \text{MGRP}/10$ as defined in TS 38.133 [14];

2> if *mgta* is configured, apply the specified timing advance to the gap occurrences calculated above (i.e. the UE starts the measurement *mgta* ms before the gap subframe occurrences);

1> else if *gapUE* is set to release:

2> release the per UE measurement gap configuration.

...

NOTE 1: For gapFR2 configuration, the SFN and subframe of a serving cell on FR2 frequency is used in the gap calculation

8.2.3.11.2.3 Test description

8.2.3.11.2.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is PCell , NR Cell 1 is PSCell on FR2 and NR Cell 3 is inter-frequency neighbour Cell on FR2.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) and Bearers (*MCG and SCG*) established according to TS 38.508-1 [4].

8.2.3.11.2.3.2 Test procedure sequence

Table 8.2.3.11.3.2-1 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.11.2.3.2-1: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 3 | Remark |
|----|-----------------------|------------|---------------|-----------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -96 | - | - | Switch on NR neighbour Cell and UE start to perform E-UTRA interRAT measurement. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -91 | -91 | |

Table 8.2.3.11.2.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> including nr-Config IE containing measConfig to setup gapFR2 and report periodical measurements for NR neighbor cell 3 on FR2 frequency. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 2 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message to confirm the setup gapFR2 and report periodical measurements for NR neighbor cell 3 on FR2 frequency. | --> | <i>RRCConnectionReconfigurationComplete</i>
(<i>RRCReconfigurationComplete</i>) | - | - |
| 3 | Wait and ignore <i>MeasurementReport</i> messages for 8 s to allow for UE to measure the | - | - | - | - |

| | | | | | |
|---|--|-----|--|---|---|
| | neighbouring cells. | | | | |
| - | EXCEPTION: In parallel to events described in step 4 the steps specified in table 8.2.3.11.2.3.2-3 shall take place | - | - | - | - |
| 4 | Wait for 30 s to ensure that the UE performs a periodical inter frequency reporting. | - | - | - | - |
| - | EXCEPTION: Steps 5 to 7 shall be repeated for k=13 to 23 (increment=1).

Note: skip the gap pattern among #12 and #15 - #23 not supported by the UE according to the PICS setting. | - | - | - | - |
| 5 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> including nr-Config IE containing measConfig to change gapFR2 | <-- | <i>RRCCONNECTIONRECONFIGURATION</i>
<i>(RRCCONNECTIONRECONFIGURATION)</i> | - | - |
| 6 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message to confirm the change of gapFR2 | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i>
<i>(RRCCONNECTIONRECONFIGURATIONCOMPLETE)</i> | - | - |
| - | EXCEPTION: In parallel to events described in step 7 the steps specified in table 8.2.3.11.1.3.2-3 shall take place | - | - | - | - |
| 7 | Wait for 30 s to ensure that the UE performs a periodical inter frequency reporting. | - | - | - | - |
| 8 | SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message including measConfig to release gapFR2 and measid of periodical measurements. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i>
<i>(RRCCONNECTIONRECONFIGURATION)</i> | - | - |
| 9 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i>
<i>(RRCCONNECTIONRECONFIGURATIONCOMPLETE)</i> | - | - |

Table 8.2.3.11.2.3.2-3: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: After the 1st message is received, step 1 below shall be repeated every time the duration indicated in the IE <i>reportInterval</i> has elapsed | - | - | - | - |
| 1 | Check: Does the UE transmit a <i>MeasurementReport</i> encapsulated in <i>ULInformationTransferMRDC</i> message to perform periodical inter frequency reporting for NR serving Cell 1 and NR Cell 3? | --> | <i>ULInformationTransferMRDC</i>
<i>(MeasurementReport)</i> | 1 | P |

8.2.3.11.2.3.3 Specific message contents

Table 8.2.3.11.2.3.3-1: RRCConnectionReconfiguration (step 1, Table 8.2.3.11.2.3.2-2)

| |
|--|
| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon |
|--|

Table 8.2.3.11.2.3.3-2: RRCReconfiguration (Table 8.2.3.11.2.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13 | | | |
|--|---------------------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | 38.508-1 [4]
Table 4.6.5-12. | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.2.3.3-3: MeasConfig (Table 8.2.3.11.2.3.3-2)

| Derivation path: 38.508-1[4] Table 4.6.3-69 | | | |
|--|-------------------------|-------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1.. maxNrofObjectId)) OF SEQUENCE { | 2 entry | | |
| measObjectId[1] | 1 | MeasObjectIdNR-f1 | |
| measObject CHOICE { | | | |
| measObjectNR[1] | MeasObjectNR-GENERIC(0) | NR Cell 1 | |
| } | | | |

| | | | |
|---|-------------------------|-------------------|-----------------|
| measObjectId[2] | 2 | MeasObjectIdNR-f2 | |
| measObject CHOICE { | | | |
| measObjectNR[2] | MeasObjectNR-GENERIC(0) | NR Cell 3 | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | 1 | ReportConfigId | |
| reportConfig[1] | ReportConfig-Periodical | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | 2 | MeasObjectIdNR-f2 | |
| reportConfigId[1] | 1 | ReportConfigId | |
| } | | | |
| quantityConfig | QuantityConfig | | |
| measGapConfig SEQUENCE { | MeasGapConfig | | |
| gapFR2 SteupRelease { | | | |
| gapOffset | 0 | | |
| mgl | ms5dot5 | 5.5ms | Gap pattern #13 |
| mgrp | ms40 | 40ms | |
| mgta | ms0dot25 | 0.25ms | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.2.3.3-4: MeasObjectNR-GENERIC(0) (Table 8.2.3.11.2.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR cell 1 SSB | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.2.3.11.2.3.3-5: MeasObjectNR-GENERIC(0) (Table 8.2.3.11.2.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-76 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR ::= SEQUENCE { | | | |
| ssbFrequency | Downlink ARFCN of NR cell 3 SSB | | |
| } | | | |

Table 8.2.3.11.2.3.3-6: ReportConfig-Periodical (Table 8.2.3.11.2.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 with condition Periodical | | | |
|--|----------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| Periodical SEQUENCE { | | | |
| rsType | ssb | | |
| reportInterval | ReportInterval | 38.508-1 [4]Table 4.6.3-144 | |
| reportAmount | infinity | | |
| reportQuantityCell SEQUENCE { | | | |
| rsrp | true | | |
| rsrq | true | | |
| sinr | false | | |
| } | | | |
| maxReportCells | 1 | | |
| reportQuantityRsIndexes | Not present | | |
| maxNrofRSIndexesToReport | Not present | | |
| includeBeamMeasurements | false | | |
| useWhiteCellList | false | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.2.3.3-7: QuantityConfig (Table 8.2.3.11.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-127 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| QuantityConfig ::= SEQUENCE { | | | |
| quantityConfigNR-List SEQUENCE (SIZE (1..maxNrofQuantityConfig)) OF SEQUENCE { | 1 entry | | |
| quantityConfigCell[1] SEQUENCE { | | | |
| ssb-FilterConfig SEQUENCE { | | | |
| filterCoefficientRSRP | fc4 | | |
| filterCoefficientRSRQ | fc4 | | |
| filterCoefficientRS-SINR | fc4 | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.2.3.3-8: ULInformationTransferMRDC (step1, Table 8.2.3.11.2.3.2-3)

| Derivation Path: 36.508 [7], Table 4.6.1-27 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ULInformationTransferMRDC ::= SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING including the MeasurementReport message according to Table 8.2.3.11.2.3.3-9 | | |
| } | | | |

Table 8.2.3.11.2.3.3-9: MeasurementReport (Table 8.2.3.11.2.3.3-8)

| Derivation Path: TS 38.508-1 [4], clause 4.6.1-5A | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| measurementReport ::= SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList SEQUENCE { | 1 entry | | |

| |
|--|
| |
|--|

Table 8.2.3.11.2.3.3-11: RRCReconfiguration (Table 8.2.3.11.2.3.3-10)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13 | | | |
|--|---------------------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | 38.508-1 [4]
Table 4.6.5-12. | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.2.3.3-12: MeasConfig (Table 8.2.3.11.2.3.3-11)

| Derivation path: 38.508-1[4] Table 4.6.3-69 | | | |
|---|---------------|------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | Not present | | |
| reportConfigToAddModList | Not present | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| measGapConfig SEQUENCE { | MeasGapConfig | | |
| gapFR2 CHOICE { | | | |
| Setup SEQUENCE{ | | | |
| gapOffset | 0 | | k=13-23 |
| mgl | ms5dot5 | Gap Pattern #12, | k=13 |

| | | | |
|------|---------|----------------------------|-----------------------------|
| | | 5.5ms | pc_gp12_n
r=True |
| mgl | ms5dot5 | Gap Pattern #14,
5.5ms | k=14 |
| mgl | ms5dot5 | Gap Pattern #15,
5.5ms | k=15
pc_gp15_n
r=True |
| mgl | ms3dot5 | Gap Pattern #16,
3.5ms | k=16
pc_gp16_n
r=True |
| mgl | ms3dot5 | Gap Pattern #17,
3.5ms | k=17
pc_gp17_n
r=True |
| mgl | ms3dot5 | Gap Pattern #18,
3.5ms | k=18
pc_gp18_n
r=True |
| mgl | ms3dot5 | Gap Pattern #19,
3.5ms | k=19
pc_gp19_n
r=True |
| mgl | ms1dot5 | Gap Pattern #20,
1.5ms | k=20
pc_gp20_n
r=True |
| mgl | ms1dot5 | Gap Pattern #21,
1.5ms | k=21
pc_gp21_n
r=True |
| mgl | ms1dot5 | Gap Pattern #22,
1.5ms | k=22
pc_gp22_n
r=True |
| mgl | ms1dot5 | Gap Pattern #23,
1.5ms | k=23
pc_gp23_n
r=True |
| mgrp | Ms20 | Gap Pattern #12,
20ms | k=13
pc_gp12_n
r=True |
| mgrp | ms80 | Gap Pattern #14,
80ms | k=14 |
| mgrp | ms160 | Gap Pattern #15,
160ms, | k=15
pc_gp15_n
r=True |
| mgrp | ms20 | Gap Pattern #16, | k=16 |

| | | | |
|------|----------|---------------------------|-----------------------------|
| | | 20ms | pc_gp16_n
r=True |
| mgrp | ms40 | Gap Pattern #17,
40ms | k=17
pc_gp17_n
r=True |
| mgrp | ms80 | Gap Pattern #18,
80ms | k=18
pc_gp18_n
r=True |
| mgrp | ms160 | Gap Pattern #19,
160ms | k=19
pc_gp19_n
r=True |
| mgrp | ms20 | Gap Pattern #20,
20ms | k=20
pc_gp20_n
r=True |
| mgrp | ms40 | Gap Pattern #21,
40ms | k=21
pc_gp21_n
r=True |
| mgrp | ms80 | Gap Pattern #22,
80ms | k=22
pc_gp22_n
r=True |
| mgrp | ms160 | Gap Pattern #23,
160ms | k=23
pc_gp23_n
r=True |
| mgta | ms0dot25 | 0.25ms | k=18-23 |
| mgta | ms0 | 0 ms | k=13-17 |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.2.3.3-13: RRCConnectionReconfiguration (step 8, Table 8.2.3.11.2.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon

Table 8.2.3.11.2.3.3-14: RRCReconfiguration (Table 8.2.3.11.2.3.3-13)

Derivation Path: TS 38.508-1 [4], Table 4.6.1-13

| Information Element | Value/remark | Comment | Condition |
|-----------------------------------|--------------|---------|-----------|
| RRCReconfiguration ::= SEQUENCE { | | | |

| | | | |
|-----------------------------------|---------------------------|------------------------------------|--|
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | TS 38.508-1 [4],
Table 4.6.5-12 | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | Not present | | |
| secondaryCellGroup | Not present | | |
| measConfig | MeasConfig | | |
| lateNonCriticalExtension | Not present | | |
| nonCriticalExtension | Not present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.11.2.3.3-15: MeasConfig (Table 8.2.3.11.2.3.3-14)

| Derivation path: 38.508-1[4] Table 4.6.3-69 | | | |
|---|---------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList | Not present | | |
| reportConfigToAddModList | Not present | | |
| MeasIdToRemoveList SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | | | |
| measId[1] | 1 | | |
| } | | | |
| measIdToAddModList | Not present | | |
| quantityConfig | Not present | | |
| measGapConfig SEQUENCE { | MeasGapConfig | | |
| gapFR2 CHOICE { | | | |
| release | NULL | | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.12 Measurement configuration control and reporting / Inter-RAT measurements / Event B2 / Measurement of NR cells

8.2.3.12.1 Measurement configuration control and reporting / Inter-RAT measurements / Event B2 / Measurement of NR cells / EN-DC

8.2.3.12.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell and not detected entering condition for the event B2 is met }

ensure that {

when { UE detects entering condition for the event B2 is not met }

then { UE does not transmit any MeasurementReport }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell and not detected entering condition for the event B2 is met }

ensure that {

when { UE detects entering condition for the event B2 is met }

then { UE transmits a MeasurementReport }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only having completed the radio bearer establishment and performed the inter RAT measurement for NR cell and detected entering condition for the event B2 is met }

ensure that {

when { UE detects leaving condition for the event B2 is met }

then { UE does not transmit any MeasurementReport }

}

8.2.3.12.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.5.1, 5.5.4.1, 5.5.4.8, 5.5.5 and 5.5.5.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.5.1]

The UE reports measurement information in accordance with the measurement configuration as provided by E-UTRAN. E-UTRAN provides the measurement configuration applicable for a UE in RRC_CONNECTED by means of dedicated signalling, i.e. using the *RRCConnectionReconfiguration* or *RRCConnectionResume* message.

The UE can be requested to perform the following types of measurements:

- Intra-frequency measurements: measurements at the downlink carrier frequency(ies) of the serving cell(s).
- Inter-frequency measurements: measurements at frequencies that differ from any of the downlink carrier frequency(ies) of the serving cell(s).
- Inter-RAT measurements of NR frequencies.

...

The measurement configuration includes the following parameters:

1. **Measurement objects:** The objects on which the UE shall perform the measurements.

- For intra-frequency and inter-frequency measurements a measurement object is a single E-UTRA carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of cell specific offsets, a list of 'blacklisted' cells and a list of 'whitelisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.
- For inter-RAT NR measurements a measurement object is a single NR carrier frequency. Associated with this carrier frequency, E-UTRAN can configure a list of 'blacklisted' cells. Blacklisted cells are not considered in event evaluation or measurement reporting.

...

NOTE 1: Some measurements using the above mentioned measurement objects, only concern a single cell, e.g. measurements used to report neighbouring cell system information, PCell UE Rx-Tx time difference, or a pair of cells, e.g. SSTD measurements between the PCell and the PSCell.

2. **Reporting configurations:** A list of reporting configurations where each reporting configuration consists of the following:

- Reporting criterion: The criterion that triggers the UE to send a measurement report. This can either be periodical or a single event description.
- Reporting format: The quantities that the UE includes in the measurement report and associated information (e.g. number of cells to report).

3. **Measurement identities:** A list of measurement identities where each measurement identity links one measurement object with one reporting configuration. By configuring multiple measurement identities it is possible to link more than one measurement object to the same reporting configuration, as well as to link more than one reporting configuration to the same measurement object. The measurement identity is used as a reference number in the measurement report.

4. **Quantity configurations:** One quantity configuration is configured per RAT type. The quantity configuration defines the measurement quantities and associated filtering used for all event evaluation and related reporting of that measurement type. One filter can be configured per measurement quantity, except for NR where the network may configure up to 2 sets of quantity configurations each comprising per measurement quantity separate filters for cell and RS index measurement results. The quantity configuration set that applies for a given measurement is indicated within the NR measurement object.

[TS 36.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

1> for each *measId* included in the *measIdList* within *VarMeasConfig*:

...

2> else:

...

- 3> else if the corresponding measObject concerns NR:
- 4> if the *reportSFTD-Meas* is set to *pSCell* in the corresponding *reportConfigInterRAT*:
- 5> consider the PSCell to be applicable;
- 4> else if the *reportSFTD-Meas* is set to *neighborCells* in the corresponding *reportConfigInterRAT*;
- 5> if *cellsForWhichToReportSFTD* is configured in the corresponding *measObjectNR*:
- 6> consider any neighbouring NR cell on the associated frequency that is included in *cellsForWhichToReportSFTD* to be applicable;
- 5> else:
- 6> consider up to 3 strongest neighbouring NR cells detected on the associated frequency to be applicable when the concerned cells are not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this measId;
- 4> else:
- 5> if the *eventB1* or *eventB2* is configured in the corresponding *reportConfig*:
- 6> consider a serving cell, if any, on the associated NR frequency as neighbouring cell;
- 5> consider any neighbouring cell detected on the associated frequency to be applicable when the concerned cell is not included in the *blackCellsToAddModList* defined within the *VarMeasConfig* for this *measId*;

[TS 36.331, clause 5.5.4.8]

The UE shall:

- 1> for UTRA and CDMA2000, only trigger the event for cells included in the corresponding measurement object;
- 1> consider the entering condition for this event to be satisfied when both condition B2-1 and condition B2-2, as specified below, are fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition B2-3 or condition B2-4, i.e. at least one of the two, as specified below, is fulfilled;

Inequality B2-1 (Entering condition 1)

$$Mp + Hys < Thresh1$$

Inequality B2-2 (Entering condition 2)

$$Mn + Ofn - Hys > Thresh2$$

Inequality B2-3 (Leaving condition 1)

$$Mp - Hys > Thresh1$$

Inequality B2-4 (Leaving condition 2)

$$Mn + Ofn + Hys < Thresh2$$

The variables in the formula are defined as follows:

Mp is the measurement result of the PCell, not taking into account any offsets.

Mn is the measurement result of the inter-RAT neighbour cell, not taking into account any offsets. For CDMA2000 measurement result, *pilotStrength* is divided by -2.

Ofn is the frequency specific offset of the frequency of the inter-RAT neighbour cell (i.e. *offsetFreq* as defined within the *measObject* corresponding to the frequency of the inter-RAT neighbour cell).

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigInterRAT* for this event).

Thresh1 is the threshold parameter for this event (i.e. *b2-Threshold1* as defined within *reportConfigInterRAT* for this event).

Thresh2 is the threshold parameter for this event (i.e. *b2-Threshold2* as defined within *reportConfigInterRAT* for this event). For CDMA2000, *b2-Threshold2* is divided by -2.

Mp is expressed in dBm in case of RSRP, or in dB in case of RSRQ.

Mn is expressed in dBm or dB, depending on the measurement quantity of the inter-RAT neighbour cell.

Ofn, Hys are expressed in dB.

Thresh1 is expressed in the same unit as **Mp**.

Thresh2 is expressed in the same unit as **Mn**.

[TS 36.331, clause 5.5.5]

The purpose of this procedure is to transfer measurement results from the UE to E-UTRAN. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

- 1> set the *measId* to the measurement identity that triggered the measurement reporting;
- 1> set the *measResultPCell* to include the quantities of the PCell;
- 1> set the *measResultServFreqList* to include for each E-UTRA SCell that is configured, if any, within *measResultSCell* the quantities of the concerned SCell, if available according to performance requirements in TS 36.133 [16], except if *purpose* for the *reportConfig* associated with the *measId* that triggered the measurement reporting is set to *reportLocation*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
- 2> for each E-UTRA serving frequency for which *measObjectId* is referenced in the *measIdList*, other than the frequency corresponding with the *measId* that triggered the measurement reporting:
- 3> set the *measResultServFreqList* to include within *measResultBestNeighCell* the *physCellId* and the quantities of the best non-serving cell, based on RSRP, on the concerned serving frequency;
- 1> if the *triggerType* is set to *event*; and if the corresponding *measObject* concerns NR; and if *eventId* is set to *eventB1-NR* or *eventB2-NR*; or
- ...
- 2> if *purpose* for the *reportConfig* or *reportConfigInterRAT* associated with the *measId* that triggered the measurement reporting is set to a value other than *reportLocation*:
- 3> set the *measResultServFreqListNR* to include for each NR serving frequency that the UE is configured to measure according to TS 38.331 [82], if any, the following:
- 4> set *measResultSCell* to include the available results of the NR serving cell, as specified in 5.5.5.2;
- 4> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
- 5> set *measResultBestNeighCell* to include the available results, as specified in 5.5.5.2, of the non-serving cell with the highest sorting quantity determined as specified in 5.5.5.3;
- 3> for each (serving or neighbouring) cell for which the UE reports results according to the previous, additionally include available beam results according to the following:
- 4> if *maxReportRS-Index* is configured, set *measResultCellRS-Index* to include available results, as specified in 5.5.5.2, of up to *maxReportRS-Index* beams, ordered based on the quantity determined as specified in 5.5.5.3;

- 1> if there is at least one applicable neighbouring cell to report:
 - 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *triggerType* is set to *event*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
- NOTE 1: The reliability of the report (i.e. the certainty it contains the strongest cells on the concerned frequency) depends on the measurement configuration i.e. the *reportInterval*. The related performance requirements are specified in TS 36.133 [16].
- 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 3> if the *triggerType* is set to *event*; or the *purpose* is set to *reportStrongestCells* or to *reportStrongestCellsForSON*:
 - 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
 - 5> if the *measObject* associated with this *measId* concerns E-UTRA:
 - 6> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfig*;
 - 6> sort the included cells in order of decreasing *triggerQuantity*, i.e. the best cell is included first;
 - 5> if the *measObject* associated with this *measId* concerns NR:
 - 6> set the *measResultCell* to include the quantity(ies) indicated in the *reportQuantityCellNR* within the concerned *reportConfig*;
 - 6> if *maxReportRS-Index* and *reportQuantityRS-IndexNR* are configured, set *measResultRS-IndexList* to include the result of the best beam if *threshRS-Index* is included in the *VarMeasConfig* for the corresponding *measObject*, and the remaining beams whose quantity is above *threshRS-Index*, up to *maxReportRS-Index* beams in total:
 - 7> order beams based on the sorting quantity determined as specified in 5.5.5.3;
 - 7> for each included beam:
 - 8> include *ssbIndex*;
 - 8> if *reportRS-IndexResultsNR* is set to TRUE, for each quantity indicated, include the corresponding measurement result in *measResultSSB-Index* for each *ssb-Index*;

[TS 36.331, clause 5.5.5.3]

When configured to report the best cells or beams, the UE shall determine the quantity that is used to order and select as follows:

- 1> for cells on the frequency associated with the *measId* that triggered the measurement reporting, if the *reportTrigger* is set to *event*, consider the quantity used in *bN-ThresholdYNR* to be the sorting quantity;
- 1> for other cases, determine the sorting quantity as follows:
 - 1> consider the quantities the UE reports as candidate sorting quantities i.e. as follows:
 - 2> consider the following quantities as candidate sorting quantities:
 - 3> for cells on the frequency associated with the *measId* that triggered the measurement reporting (for a *triggerType* set to *periodical*):
 - 4> the quantities defined by *reportQuantityCellNR*, when used for sorting cells;

- 4> the quantities defined by *reportQuantityRS-IndexNR*, when used for sorting beams;
- 3> for cells, serving or non-serving (i.e. within *reportAddNeighMeas*), on NR serving frequencies other than the one associated with the *measId* triggering reporting;
- 4> the available quantities of available NR measurement results as specified in 5.5.5.2;
- 2> if there is a single candidate sorting quantity;
- 3> consider the concerned quantity to be the sorting quantity;
- 2> else:
- 3> if RSRP is one of the candidate sorting quantities;
- 4> consider RSRP to be the sorting quantity;
- 3> else:
- 4> consider RSRQ to be the sorting quantity;

8.2.3.12.1.3 Test description

8.2.3.12.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 and NR Cell 1.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) with MCG(s) only established according to [4].

8.2.3.12.1.3.2 Test procedure sequence

Table 8.2.3.12.1.3.2-1 and Table 8.2.3.12.1.3.2-1A illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1", "T2", "T3", "T4" and "T5" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.12.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|---------------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -84 | - | The power level values are such that entering conditions for event B2 are not satisfied, i.e. condition B2-1(
$Mp + Hys < Thresh1$) is fulfilled but condition B2-2(
$Mn + Ofn - Hys > Thresh2$) is not fulfilled. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -91 | |

| | | | | | |
|----|-----------------------|------------|-----|-----|--|
| T1 | Cell-specific RS EPRE | dBm/15 kHz | -60 | | The power level values are such that entering conditions for event B2 are not satisfied,
i.e condition B2-1(
$Mp + Hys < Thresh1$) is not fulfilled but condition B2-2(
$Mn + Ofn - Hys > Thresh2$) is fulfilled. |
| | SS/PBCH SSS EPRE | dBm/SC S | | -79 | |
| T2 | Cell-specific RS EPRE | dBm/15 kHz | -84 | - | The power level values are such that entering conditions for event B2 are satisfied,
i.e. condition B2-1(
$Mp + Hys < Thresh1$) and B2-2(
$Mn + Ofn - Hys > Thresh2$) are fulfilled. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -79 | |
| T3 | Cell-specific RS EPRE | dBm/15 kHz | -60 | - | The power level values are such that leaving conditions for event B2 are satisfied,
i.e. condition B2-3(
$Mp - Hys > Thresh1$) is fulfilled but condition B2-4(
$Mn + Ofn + Hys < Thresh2$) is not fulfilled. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -79 | |
| T4 | Cell-specific RS EPRE | dBm/15 kHz | -84 | - | The power level values are such that entering conditions for event B2 are satisfied,
i.e. condition B2-1(
$Mp + Hys < Thresh1$) and B2-2(
$Mn + Ofn - Hys > Thresh2$) are fulfilled. |
| | SS/PBCH SSS EPRE | dBm/SC S | - | -79 | |
| T5 | Cell-specific RS EPRE | dBm/15 kHz | -84 | - | The power level values are such that leaving conditions for event B2 are satisfied,
i.e. condition B2-3(
$Mp - Hys > Thresh1$) is not fulfilled but condition B2-4(
$Mn + Ofn + Hys < Thresh2$) is fulfilled. |
| | SS/PBCH SSS EPRE | dBm/SS C | - | -91 | |

Table 8.2.3.12.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | Remark |
|----|-----------------------|------------|---------------|-----------|--------|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | FFS | - | |

| | | | | | |
|----|--------------------------|---------------|-----|-----|---|
| | SS/PBCH
SSS EPRE | dBm/SC
S | - | FFS | The power level values are such that entering conditions for event B2 are not satisfied,

i.e. condition B2-1(
$Mp + Hys < Thresh1$) is fulfilled but condition B2-2(
$Mn + Ofn - Hys > Thresh2$) is not fulfilled. |
| T1 | Cell-specific
RS EPRE | dBm/15
kHz | FFS | - | The power level values are such that entering conditions for event B2 are not satisfied,

i.e condition B2-1(
$Mp + Hys < Thresh1$) is not fulfilled but condition B2-2(
$Mn + Ofn - Hys > Thresh2$) is fulfilled. |
| | SS/PBCH
SSS EPRE | dBm/SC
S | - | FFS | |
| T2 | Cell-specific
RS EPRE | dBm/15
kHz | FFS | - | The power level values are such that entering conditions for event B2 are satisfied,

i.e. condition B2-1(
$Mp + Hys < Thresh1$) and B2-2(
$Mn + Ofn - Hys > Thresh2$) are fulfilled. |
| | SS/PBCH
SSS EPRE | dBm/SC
S | - | FFS | |
| T3 | Cell-specific
RS EPRE | dBm/15
kHz | FFS | - | The power level values are such that leaving conditions for event B2 are satisfied,

i.e. condition B2-3(
$Mp - Hys > Thresh1$) is fulfilled but condition B2-4(
$Mn + Ofn + Hys < Thresh2$) is not fulfilled. |
| | SS/PBCH
SSS EPRE | dBm/SC
S | - | FFS | |
| T4 | Cell-specific
RS EPRE | dBm/15
kHz | FFS | - | The power level values are such that entering conditions for event B2 are satisfied,

i.e. condition B2-1(
$Mp + Hys < Thresh1$) and B2-2(
$Mn + Ofn - Hys > Thresh2$) are fulfilled. |
| | SS/PBCH
SSS EPRE | dBm/SC
S | - | FFS | |
| T5 | Cell-specific
RS EPRE | dBm/15
kHz | FFS | - | The power level values are such that leaving conditions for event B2 are satisfied,

i.e. condition B2-3(
$Mp - Hys > Thresh1$) is not fulfilled but condition B2-4(
$Mn + Ofn + Hys < Thresh2$) is fulfilled. |
| | SS/PBCH
SSS EPRE | dBm/SC
S | - | FFS | |

Table 8.2.3.12.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U – S | Message | | |
| 1 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> including measConfig to setup inter RAT measurements and reporting for NR Cell 1. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 2 | The UE transmits an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message to confirm the setup of inter RAT measurements for NR Cell 1. | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | - | - |
| 3 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message on E-UTRA Cell 1 to report the event B2 during the next 10s? | --> | <i>MEASUREMENTREPORT</i> | 1 | F |
| 4 | The SS changes NR Cell 1 and E-UTRA Cell 1 parameters according to the row "T1". | - | - | - | - |
| 5 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message on E-UTRA Cell 1 to report the event B2 during the next 10s? | --> | <i>MEASUREMENTREPORT</i> | 1 | F |
| 6 | The SS changes NR Cell 1 and E-UTRA Cell 1 parameters according to the row "T2". | - | - | - | - |
| 7 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message to report the event B2 for NR Cell 1? | --> | <i>MEASUREMENTREPORT</i> | 2 | P |
| 8 | The SS changes NR Cell 1 and E-UTRA Cell 1 parameters according to the row "T3". | - | - | - | - |
| 9 | Wait and ignore <i>MEASUREMENTREPORT</i> messages for 15s to allow change of power levels and UE measurements for NR Cell 1 and E-UTRA Cell 1. | - | - | - | - |
| 10 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message on E-UTRA Cell 1 to report the event B2 during the next 10s? | --> | <i>MEASUREMENTREPORT</i> | 3 | F |
| 11 | The SS changes NR Cell 1 and E-UTRA Cell 1 parameters according to the row "T4" in table 8.2.3.12.1.3.2-1. | - | - | - | - |
| 12 | Void | | | | |
| 13 | Check: Does the UE transmit a <i>MEASUREMENTREPORT</i> message to report the event B2 for NR Cell 1? | --> | <i>MEASUREMENTREPORT</i> | 2 | P |
| 14 | The SS changes NR Cell 1 and E-UTRA Cell 1 parameters according to the row "T5" in table 8.2.3.12.1.3.2-1. | - | - | - | - |
| 15 | Wait and ignore <i>MEASUREMENTREPORT</i> messages for 15s to allow change of power levels and UE measurements for NR Cell 1 and E-UTRA Cell 1. | - | - | - | - |

| | | | | | |
|----|---|-----|--------------------------|---|---|
| 16 | Check: Does the UE transmit a <i>MeasurementReport</i> message on E-UTRA Cell 1 to report the event B2 during the next 10s? | --> | <i>MeasurementReport</i> | 3 | F |
|----|---|-----|--------------------------|---|---|

8.2.3.12.1.3.3 Specific message contents

Table 8.2.3.12.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.12.1.3.2-2)

| |
|--|
| Derivation Path: 36.508 [7], Table 4.6.1-8, condition MEAS |
|--|

Table 8.2.3.12.1.3.3-2: *MeasConfig* (Table 8.2.3.12.1.3.3-1)

| Derivation Path: 36.508 [7], Table 4.6.6-1 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>MeasConfig</i> ::= SEQUENCE { | | | |
| <i>measObjectToAddModList</i> SEQUENCE (SIZE (1.. <i>maxObjectId</i>)) OF SEQUENCE { | 1 entries | | |
| <i>measObjectId</i> [1] | IdMeasObject-NRf1 | | |
| <i>measObject</i> [1] | MeasObjectNR-GENERIC (NRf1) | | |
| } | | | |
| <i>reportConfigToAddModList</i> SEQUENCE (SIZE (1.. <i>maxReportConfigId</i>)) OF SEQUENCE { | 1 entry | | |
| <i>reportConfigId</i> [1] | IdReportConfig-B2-NR | | |
| <i>reportConfig</i> [1] | ReportConfigInterRAT-B2-NR-r15(-72, -85) | | |
| } | | | |
| <i>measIdToAddModList</i> SEQUENCE (SIZE (1.. <i>maxMeasId</i>)) OF SEQUENCE { | 1 entry | | |
| <i>measId</i> [1] | 1 | | |
| <i>measObjectId</i> [1] | IdMeasObject-NRf1 | | |
| <i>reportConfigId</i> [1] | IdReportConfig-B2-NR | | |
| } | | | |
| <i>quantityConfig</i> | QuantityConfig-DEFAULT | | |
| <i>measGapConfig</i> | MeasGapConfig | | |
| } | | | |

Table 8.2.3.12.1.3.3-3: *QuantityConfig-DEFAULT* (Table 8.2.3.12.1.3.3-2)

| |
|---|
| Derivation Path: 36.508 [7], Table 4.6.6-3A |
|---|

| Information Element | Value/remark | Comment | Condition |
|--|--------------|---------|-----------|
| QuantityConfig-DEFAULT ::= SEQUENCE { | | | |
| quantityConfigNRLList-r15 SEQUENCE ((SIZE (1..maxQuantSetsNR-r15)) OF SEQUENCE { | | | |
| measQuantityCellNR-r15 SEQUENCE { | | | |
| filterCoeff-RSRP-r15 | fc0 | | |
| filterCoeff-RSRQ-r15 | fc0 | | |
| filterCoefficient-SINR-r13 | fc0 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.12.1.3.3-4: *MeasObjectNR-GENERIC (NRf1)* (Table 8.2.3.12.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-2B | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasObjectNR-GENERIC(Freq) ::= SEQUENCE { | | | |
| carrierFreq-r15 | Downlink carrier frequency of NR cell 1 | | |
| } | | | |

Table 8.2.3.12.1.3.3-5: *ReportConfigInterRAT-B2-NR-r15* (-72, -85) (Table 8.2.3.12.1.3.3-2)

| Derivation Path: 36.508 [7], Table 4.6.6-8A | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfig-B2-NR ::= SEQUENCE { | | | |
| reportQuantityCellNR-r15 ::= SEQUENCE { | | | |
| ss-rsrp | true | | |
| ss-rsrq | true | | |
| ss-sinr | true | | |
| } | | | |
| } | | | |

Table 8.2.3.12.1.3.3-6: *MeasurementReport* (step 3, 5, 7, 10, 13, 16, Table 8.2.3.12.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-5 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|--|--------------------------------------|--|--|
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |
| measurementReport-r8 SEQUENCE { | | | |
| measResults SEQUENCE { | | | |
| measId | 1 | | |
| measResultPCell SEQUENCE { | | | |
| rsrpResult | (0..97) | | |
| rsrqResult | (0..34) | | |
| } | | | |
| measResultNeighCells CHOICE { | | | |
| measResultNeighCellListNR-r15
SEQUENCE (SIZE (1..maxCellReport)) OF
SEQUENCE { | 1 entry | | |
| pci-r15 [1] | PhysicalCellIdentity of
NR Cell 1 | | |
| measResultCell-r15 [1] SEQUENCE { | | | |
| rsrpResult-r15 | (0..127) | | |
| rsrqResult-r15 | (0..127) | | |
| rs-sinr-Result-r15 | (0..127) | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.12.1.3.3-7: MeasGapConfig(Table 8.2.3.12.1.3.3-2)

| Derivation Path: 36.331, clause 6.3.5 | | | |
|---------------------------------------|--------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasGapConfig-GP2 ::= CHOICE { | | | |
| setup SEQUENCE { | | | |
| gapOffset CHOICE { | | | |
| gp1 | 19 | TGRP = 80 ms | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.13 PCell Handover with SCG change / Reconfiguration with sync / SCG DRB

8.2.3.13.1 PCell Handover with SCG change / Reconfiguration with sync / SCG DRB / EN-DC

8.2.3.13.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state in EN-DC mode, and, MCG(s) (E-UTRA PDCP) and SCG DRB established }

ensure that {

when { UE receives an *RRCConnectionReconfiguration* message containing *mobilityControlInfo* to handover to target E-UTRAN PCell involving SCG change with *reconfigurationWithSync* on the same PSCell }

then { UE sends an *RRCConnectionReconfigurationComplete* message }

}

8.2.3.13.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.4, TS 38.331, clauses 5.3.5.3, 5.3.5.5.1 and 5.3.5.5.2. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.4]

If the *RRCConnectionReconfiguration* message includes the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

1> stop timer T310, if running;

1> stop timer T312, if running;

1> start timer T304 with the timer value set to *t304*, as included in the *mobilityControlInfo*;

1> stop timer T370, if running;

1> if the *carrierFreq* is included:

2> consider the target PCell to be one on the frequency indicated by the *carrierFreq* with a physical cell identity indicated by the *targetPhysCellId*;

1> else:

2> consider the target PCell to be one on the frequency of the source PCell with a physical cell identity indicated by the *targetPhysCellId*;

1> stop timer T309, if running, for all access categories;

1> start synchronising to the DL of the target PCell;

NOTE 1: The UE should perform the handover as soon as possible following the reception of the RRC message triggering the handover, which could be before confirming successful reception (HARQ and ARQ) of this message.

...

1> if the received *RRCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3.

...

1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:

...

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCRECONFIGURATION*:

...

1> if the *RRCRECONFIGURATION* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

...

1> set the content of *RRCRECONFIGURATIONCOMPLETE* message as follows:

2> if the *RRCRECONFIGURATION* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;

2> if the *RRCRECONFIGURATION* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:

3> include the *uplinkTxDirectCurrentList*;

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCRECONFIGURATION* was received via SRB1:

3> submit the *RRCRECONFIGURATIONCOMPLETE* via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCRECONFIGURATION* was received via SRB3):

3> submit the *RRCRECONFIGURATIONCOMPLETE* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCRECONFIGURATIONCOMPLETE*.

1> else:

2> submit the *RRCRECONFIGURATIONCOMPLETE* message via SRB1 to lower layers for transmission using the new configuration;

...

1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if T390 is running:

4> stop timer T390 for all access categories;

4> perform the actions as specified in 5.3.14.4.

...

[TS 38.331, clause 5.3.5.5.1]

The network configures the UE with Master Cell Group (MCG), and zero or one Secondary Cell Group (SCG). For EN-DC, the MCG is configured as specified in TS 36.331 [10]. The network provides the configuration parameters for a cell group in the *CellGroupConfig* IE.

The UE performs the following actions based on a received *CellGroupConfig* IE:

1> if the *CellGroupConfig* contains the *spCellConfig* with *reconfigurationWithSync*:

2> perform Reconfiguration with sync according to 5.3.5.5.2;

2> resume all suspended radio bearers and resume SCG transmission for all radio bearers, if suspended;

1> if the *CellGroupConfig* contains the *rlc-BearerToReleaseList*:

2> perform RLC bearer release as specified in 5.3.5.5.3;

1> if the *CellGroupConfig* contains the *rlc-BearerToAddModList*:

2> perform the RLC bearer addition/modification as specified in 5.3.5.5.4;

1> if the *CellGroupConfig* contains the *mac-CellGroupConfig*:

2> configure the MAC entity of this cell group as specified in 5.3.5.5.5;

1> if the *CellGroupConfig* contains the *sCellToReleaseList*:

2> perform SCell release as specified in 5.3.5.5.8;

1> if the *CellGroupConfig* contains the *spCellConfig*:

2> configure the SpCell as specified in 5.3.5.5.7;

1> if the *CellGroupConfig* contains the *sCellToAddModList*:

2> perform SCell addition/modification as specified in 5.3.5.5.9.

[TS 38.331, clause 5.3.5.5.2]

The UE shall perform the following actions to execute a reconfiguration with sync.

1> if the security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

1> stop timer T310 for the corresponding SpCell, if running;

1> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;

1> if the *frequencyInfoDL* is included:

2> consider the target SpCell to be one on the frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;

1> else:

2> consider the target SpCell to be one on the SSB frequency of the source SpCell with a physical cell identity indicated by the *physCellId*;

1> start synchronising to the DL of the target SpCell;

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

1> perform the actions specified in clause 5.2.2.4.1;

NOTE 1: The UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message.

NOTE 2: The UE may omit reading the MIB if the UE already has the required timing information, or the timing information is not needed for random access.

1> reset the MAC entity of this cell group;

1> consider the SCell(s) of this cell group, if configured, to be in deactivated state;

1> apply the value of the *newUE-Identity* as the C-RNTI for this cell group;

Editor's Note: Verify that this does not configure some common parameters which are later discarded due to e.g. SCell release or due to LCH release.

1> configure lower layers in accordance with the received *spCellConfigCommon*;

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *reconfigurationWithSync*.

8.2.3.13.1.3 Test description

8.2.3.13.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell, E-UTRA Cell 2 is the target PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- If *pc_IP_Ping* is set to TRUE then, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC), Bearers (MCG(s) and SCG) established according to TS 38.508-1 [4], clause 4.5.4.2-1.
- Else, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC), Bearers (MCG(s) and SCG) and Test Loop Function (On) with UE test loop mode B activated according to TS 38.508-1 [4], table 4.5.4.2-1.

8.2.3.13.1.3.2 Test procedure sequence

Tables 8.2.3.13.1.3.2-1 and 8.2.3.13.1.3.2-2 and Table 8.2.3.13.1.3.2-1A illustrate the downlink power levels and other changing parameters to be applied for the cells, with NR cells configured with FR1 and FR2 bands respectively, at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while

columns marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.13.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA Cell 1 | E-UTRA Cell 2 | NR Cell 1 | Remark |
|----|-----------------------|-----------|---------------|---------------|-----------|--------|
| T0 | Cell-specific RS EPRE | dBm/15kHz | -85 | -91 | - | |
| | SS/PBCH SSS EPRE | dBm/SCS | - | - | -88 | |
| T1 | Cell-specific RS EPRE | dBm/15kHz | -85 | -79 | - | |
| | SS/PBCH SSS EPRE | dBm/SCS | - | - | -88 | |

Table 8.2.3.13.1.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | E-UTRA Cell 2 | NR Cell 1 | Remark |
|----|-----------------------|-----------|---------------|---------------|-----------|--------|
| T0 | Cell-specific RS EPRE | dBm/15kHz | FFS | FFS | - | |
| | SS/PBCH SSS EPRE | [dBm/SCS] | - | - | FFS | |
| T1 | Cell-specific RS EPRE | dBm/15kHz | FFS | FFS | - | |
| | SS/PBCH SSS EPRE | [dBm/SCS] | - | - | FFS | |

Table 8.2.3.13.1.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | SS re-adjusts the cell-specific reference signal level according to row "T1" 8.2.3.13.1.3.2-1 or 8.2.3.13.1.3.2-1A depending upon whether NR cell is configured on FR1 or FR2 band respectively. | - | - | - | - |
| 2 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing <i>mobilityControlInfo</i> to handover to E-UTRA Cell 2 and NR <i>RRCReconfiguration</i> message to perform SCG change with <i>reconfigurationWithSync</i> with the same PSCell. | <-- | <i>RRCConnectionReconfiguration</i>
(<i>RRCReconfiguration</i>) | - | - |
| 3 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message on E- | --> | <i>RRCConnectionReconfigurationComplete</i>
(<i>RRCReconfigurationComplete</i>) | 1 | P |

| | | | | | |
|---|--|---|---|---|---|
| | UTRA Cell 2? | | | | |
| 4 | Void | - | - | - | - |
| 5 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on SCG DRB using NR radio path? | - | - | 1 | P |

8.2.3.13.1.3.3 Specific message contents

Table 8.2.3.13.1.3.3-1: *RRCConnectionReconfiguration* (step 2, Table 8.2.3.13.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon and EN-DC_PSCell_HO AND RBConfig_KeyChange | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| mobilityControlInfo SEQUENCE { | MobilityControlInfo-HO | | |
| targetPhysCellId | PhysicalCellIdentity of E-UTRA Cell 2 | | |
| carrierFreq SEQUENCE { | | | |
| dl-CarrierFreq | Same downlink EARFCN as used for E-UTRA Cell 2 | | |
| } | | | |
| carrierFreq SEQUENCE { } | Not present | | Band > 64 |
| carrierFreq-v9e0 SEQUENCE { | | | Band > 64 |
| dl-CarrierFreq-v9e0 | Same downlink EARFCN as used for E-UTRA Cell 2 | | |
| } | | | |
| } | | | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|---------------------------------|---|--|--|
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| sk-Counter-r15 | Different counter value used before Handover than what was used for initial Split bearer configuration. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|-----------|--------------------------|
| Band > 64 | If band > 64 is selected |

Table 8.2.3.13.1.3.3-2: *MobilityControlInfo-HO* (Table 8.2.3.13.1.3.3-1)

| |
|--|
| Derivation Path: 36.508 [7], Table 4.6.5-1 |
|--|

8.2.3.14 SCG change / Reconfiguration with sync / Split DRB

8.2.3.14.1 SCG change / Reconfiguration with sync / Split DRB / EN-DC

8.2.3.14.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and Split }

ensure that {

when { UE receives an *RRCCONNECTIONRECONFIGURATION* message to handover from NR PSCell involving SCG change with *reconfigurationWithSync* to the target NR cell with Split DRB }

then { UE sends an *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message }

}

8.2.3.14.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.3.5.5.1 and 5.3.5.5.2. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCCONNECTIONRECONFIGURATION* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *sk-Counter*:

2> perform key update procedure as specified in TS 38.331 [82], clause 5.3.5.7;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

...

1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:

...

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;

1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

...

1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

...

1> set the content of *RRCReconfigurationComplete* message as follows:

2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;

2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:

3> include the *uplinkTxDirectCurrentList*;

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1> else:

...

1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if T390 is running:

4> stop timer T390 for all access categories;

4> perform the actions as specified in 5.3.14.4.

[TS 38.331, clause 5.3.5.5.1]

The network configures the UE with Master Cell Group (MCG), and zero or one Secondary Cell Group (SCG). For EN-DC, the MCG is configured as specified in TS 36.331 [10]. The network provides the configuration parameters for a cell group in the *CellGroupConfig* IE.

The UE performs the following actions based on a received *CellGroupConfig* IE:

1> if the *CellGroupConfig* contains the *spCellConfig* with *reconfigurationWithSync*:

2> perform Reconfiguration with sync according to 5.3.5.5.2;

2> resume all suspended radio bearers and resume SCG transmission for all radio bearers, if suspended;

1> if the *CellGroupConfig* contains the *rlc-BearerToReleaseList*:

2> perform RLC bearer release as specified in 5.3.5.5.3;

1> if the *CellGroupConfig* contains the *rlc-BearerToAddModList*:

2> perform the RLC bearer addition/modification as specified in 5.3.5.5.4;

1> if the *CellGroupConfig* contains the *mac-CellGroupConfig*:

2> configure the MAC entity of this cell group as specified in 5.3.5.5.5;

1> if the *CellGroupConfig* contains the *sCellToReleaseList*:

2> perform SCell release as specified in 5.3.5.5.8;

1> if the *CellGroupConfig* contains the *spCellConfig*:

2> configure the SpCell as specified in 5.3.5.5.7;

1> if the *CellGroupConfig* contains the *sCellToAddModList*:

2> perform SCell addition/modification as specified in 5.3.5.5.9.

[TS 38.331, clause 5.3.5.5.2]

The UE shall perform the following actions to execute a reconfiguration with sync.

1> if the security is not activated, perform the actions upon going to RRC_IDLE as specified in 5.3.11 with the release cause 'other' upon which the procedure ends;

1> stop timer T310 for the corresponding SpCell, if running;

1> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;

1> if the *frequencyInfoDL* is included:

2> consider the target SpCell to be one on the frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;

1> else:

2> consider the target SpCell to be one on the SSB frequency of the source SpCell with a physical cell identity indicated by the *physCellId*;

1> start synchronising to the DL of the target SpCell;

1> apply the specified BCCH configuration defined in 9.1.1.1;

1> acquire the *MIB*, which is scheduled as specified in TS 38.213 [13];

1> perform the actions specified in clause 5.2.2.4.1;

NOTE 1: The UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message.

NOTE 2: The UE may omit reading the MIB if the UE already has the required timing information, or the timing information is not needed for random access.

1> reset the MAC entity of this cell group;

1> consider the SCell(s) of this cell group, if configured, to be in deactivated state;

1> apply the value of the *newUE-Identity* as the C-RNTI for this cell group;

Editor's Note: Verify that this does not configure some common parameters which are later discarded due to e.g. SCell release or due to LCH release.

1> configure lower layers in accordance with the received *spCellConfigCommon*;

1> configure lower layers in accordance with any additional fields, not covered in the previous, if included in the received *reconfigurationWithSync*.

8.2.3.14.1.3 Test description

8.2.3.14.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell, NR Cell 1 is the source PSCell and NR Cell 2 is the target PSCell.

UE:

- None.

Preamble:

- If `pc_IP_Ping` is set to TRUE then, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) and Split*) established according to TS 38.508-1 [4], clause 4.5.4.2-1.
- Else, the UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) and Split*) and Test Loop Function (On) with UE test loop mode B activated according to TS 38.508-1 [4], table 4.5.4.2-1.

8.2.3.14.1.3.2 Test procedure sequence

Table 8.2.3.14.1.3.2-1 and 8.2.3.14.1.3.2-2 illustrate the downlink power levels and other changing parameters to be applied for the cells, with NR cell configured with FR1 and FR2 band respectively, at various time instants of the test execution. Row marked "T0" denotes the initial conditions after preamble, while columns marked "T1" is to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.14.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------------------|-----------|---------------|-----------|-----------|--------|
| T0 | Cell-specific RS EPRE | dBm/15kHz | -85 | - | - | |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -88 | "Off" | |
| T1 | Cell-specific RS EPRE | dBm/15kHz | -85 | - | - | |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -88 | -82 | |

Table 8.2.3.14.1.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------------------|-----------|---------------|-----------|-----------|--------|
| T0 | Cell-specific RS EPRE | dBm/15kHz | -96 | - | - | |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -91 | "Off" | |
| T1 | Cell-specific RS EPRE | dBm/15kHz | -96 | - | - | |

| | | | | | | |
|--|---------------------|---------|---|-----|-----|--|
| | SS/PBCH SSS
EPRE | dBm/SCS | - | -91 | -82 | |
|--|---------------------|---------|---|-----|-----|--|

Table 8.2.3.14.1.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.2.3.14.1.3.2-1 or 8.2.3.14.1.3.2-2 depending upon whether NR cells are configured on FR1 or FR2 bands respectively. | - | - | - | - |
| 2 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message including <i>reconfigurewithsync</i> to handover source PSCell NR Cell 1 to target NR Cell 2 with Split DRB | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 3 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 1 | P |
| 4 | Void. | - | - | - | - |
| 5 | Check: Does the test result of generic test procedure in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on Split DRB using NR radio path on NR Cell 2? | - | - | 1 | P |

8.2.3.14.1.3.3 Specific message contents

Table 8.2.3.14.1.3.3-1: *RRCConnectionReconfiguration* (step 2, Table 8.2.3.14.1.3.2-3)

| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_PSCell_HO AND RBConfig_KeyChange | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCConnectionReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|---------------------------------|---|--|--|
| nonCriticalExtension SEQUENCE { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | OCTET STRING including the <i>RRCReconfiguration</i> message containing the IE secondaryCellGroup | reconfigurewithsync is present in spCellConfig IE in the secondaryCellGroup IE | |
| } | | | |
| } | | | |
| sk-Counter-r15 | Different counter value used before Handover than what was used for initial Split bearer configuration. | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.14.1.3.3-2: *RRCReconfiguration* (Table 8.2.3.14.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|-----------------------------------|-----------------|--|--|
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.14.1.3.3-3 *CellGroupConfig* (Table 8.2.3.14.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 with condition PSCell_change | | | |
|--|-------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| reconfigurationWithSync SEQUENCE { | | | |
| spCellConfigCommon SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR Cell 2 | | |
| } | | | |
| newUE-Identity | '4148'H | | |
| } | | | |
| } | | | |
| } | | | |

8.2.3.15 Measurement configuration control and reporting / Two simultaneous events A2 and A3 (intra-frequency measurements) / Measurement of Neighbour NR cells

8.2.3.15.1 Measurement configuration control and reporting / Two simultaneous events A2 and A3 (intra-frequency measurements) / Measurement of Neighbour NR cells / EN-DC

8.2.3.15.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and measurements configured for event A2 and event A3 }

ensure that {

when { Serving NR cell becomes worse than absolute threshold minus hysteresis }

then { UE sends MeasurementReport for event A2 }

 }

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG and measurements configured for event A2 and event A3 }

ensure that {

when { Neighbour NR cell becomes offset better than serving NR PSCell }

then { UE sends MeasurementReport for event A3 }

}

8.2.3.15.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.5.2, 5.5.4.1, 5.5.4.3, 5.5.4.4 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCCONNECTIONRECONFIGURATION* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> else:

2> if the *RRCCONNECTIONRECONFIGURATION* message includes the *radioResourceConfigDedicated*:

3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 3: If the *RRCCONNECTIONRECONFIGURATION* message includes the establishment of radio bearers other than SRB1, the UE may start using these radio bearers immediately, i.e. there is no need to wait for an outstanding acknowledgment of the *SecurityModeComplete* message.

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *sCellToReleaseList*:

2> perform SCell release as specified in 5.3.10.3a;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *sCellToAddModList*:

2> perform SCell addition or modification as specified in 5.3.10.3b;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *scg-Configuration*; or

1> if the current UE configuration includes one or more split DRBs configured with *pdcp-Config* and the received *RRCCONNECTIONRECONFIGURATION* includes *radioResourceConfigDedicated* including *drb-ToAddModList*:

2> perform SCG reconfiguration as specified in 5.3.10.10;

...

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *systemInformationBlockType1Dedicated*:

2> perform the actions upon reception of the *SystemInformationBlockType1* message as specified in 5.2.2.7;

1> if the *RRCCONNECTIONRECONFIGURATION* message includes the *dedicatedInfoNASList*:

2> forward each element of the *dedicatedInfoNASList* to upper layers in the same order as listed;

1> if the *RRCCONNECTIONRECONFIGURATION* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

...

1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:

...

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;

1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCRECONFIGURATION*:

1> if the *RRCRECONFIGURATION* includes the *fullConfig*:

2> perform the radio configuration procedure as specified in 5.3.5.11;

1> if the *RRCRECONFIGURATION* includes the *masterCellGroup*:

2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;

1> if the *RRCRECONFIGURATION* includes the *masterKeyUpdate*:

2> perform security key update procedure as specified in 5.3.5.7;

1> if the *RRCRECONFIGURATION* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

1> if the *RRCRECONFIGURATION* message contains the *radioBearerConfig*:

2> perform the radio bearer configuration according to 5.3.5.6;

1> if the *RRCRECONFIGURATION* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> if the *RRCRECONFIGURATION* message includes the *dedicatedSIB1-Delivery*:

2> perform the action upon reception of *SIB1* as specified in 5.2.2.4.2;

1> if the *RRCRECONFIGURATION* message includes the *dedicatedSystemInformationDelivery*:

2> perform the action upon reception of System Information as specified in 5.2.2.4;

1> set the content of *RRCRECONFIGURATIONCOMPLETE* message as follows:

2> if the *RRCRECONFIGURATION* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;

2> if the *RRCRECONFIGURATION* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:

3> include the *uplinkTxDirectCurrentList*;

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCRECONFIGURATION* was received via SRB1:

3> submit the *RRCRECONFIGURATIONCOMPLETE* via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured:

4> acquire the *SIB1* of the target SpCell of the MCG, as specified in 5.2.2.3.1;

2> the procedure ends.

NOTE: The UE is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.5.2]

The UE shall:

...

1> if the received *measConfig* includes the *measObjectToAddModList*:

2> perform the measurement object addition/modification procedure as specified in 5.5.2.5;

...

1> if the received *measConfig* includes the *reportConfigToAddModList*:

2> perform the reporting configuration addition/modification procedure as specified in 5.5.2.7;

...

1> if the received *measConfig* includes the *measIdToAddModList*:

2> perform the measurement identity addition/modification procedure as specified in 5.5.2.3;

[TS 38.331, clause 5.5.4.1]

If security has been activated successfully, the UE shall:

- 1> for each *measId* included in the *measIdList* within *VarMeasConfig*:
 - 2> if the corresponding *reportConfig* includes a *reportType* set to *eventTriggered* or *periodical*;
 - 3> if the corresponding *measObject* concerns NR;
 - 4> if the *eventA1* or *eventA2* is configured in the corresponding *reportConfig*:
 - 5> consider only the serving cell to be applicable;
 - 4> else:
 - 5> for events involving a serving cell associated with a *measObjectNR* and neighbours associated with another *measObjectNR*, consider any serving cell associated with the other *measObjectNR* to be a neighbouring cell as well;

...

- 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig*, while the *VarMeasReportList* does not include a measurement reporting entry for this *measId* (a first cell triggers the event):
 - 3> include a measurement reporting entry within the *VarMeasReportList* for this *measId*;
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5;

...

- 2> if the *reportType* is set to *eventTriggered* and if the entry condition applicable for this event, i.e. the event corresponding with the *eventId* of the corresponding *reportConfig* within *VarMeasConfig*, is fulfilled for one or more applicable cells not included in the *cellsTriggeredList* for all measurements after layer 3 filtering taken during *timeToTrigger* defined for this event within the *VarMeasConfig* (a subsequent cell triggers the event):
 - 3> set the *numberOfReportsSent* defined within the *VarMeasReportList* for this *measId* to 0;
 - 3> include the concerned cell(s) in the *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;
 - 3> initiate the measurement reporting procedure, as specified in 5.5.5;

[TS 38.331, clause 5.5.4.3]

The UE shall:

- 1> consider the entering condition for this event to be satisfied when condition A2-1, as specified below, is fulfilled;
- 1> consider the leaving condition for this event to be satisfied when condition A2-2, as specified below, is fulfilled;
- 1> for this measurement, consider the serving cell indicated by the *measObjectNR* associated to this event.

Inequality A2-1 (Entering condition)

$$Ms + Hys < Thresh$$

Inequality A2-2 (Leaving condition)

$$Ms - Hys > Thresh$$

The variables in the formula are defined as follows:

Ms is the measurement result of the serving cell, not taking into account any offsets.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Thresh is the threshold parameter for this event (i.e. *a2-Threshold* as defined within *reportConfigNR* for this event).

Ms is expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Hys is expressed in dB.

Thresh is expressed in the same unit as ***Ms***.

[TS 38.331, clause 5.5.4.4]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A3-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A3-2, as specified below, is fulfilled;

1> use the SpCell for *Mp*, *Ofp* and *Ocp*.

NOTE The cell(s) that triggers the event has reference signals indicated in the *measObjectNR* associated to this event which may be different from the NR SpCell*measObjectNR*.

Inequality A3-1 (Entering condition)

$$Mn + Ofn + Ocn - Hys > Mp + Ofp + Ocp + Off$$

Inequality A3-2 (Leaving condition)

$$Mn + Ofn + Ocn + Hys < Mp + Ofp + Ocp + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ofn is the measurement object specific offset of the reference signal of the neighbour cell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the neighbour cell).

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the frequency of the neighbour cell), and set to zero if not configured for the neighbour cell.

Mp is the measurement result of the SpCell, not taking into account any offsets.

Ofp is the measurement object specific offset of the SpCell (i.e. *offsetMO* as defined within *measObjectNR* corresponding to the SpCell).

Ocp is the cell specific offset of the SpCell (i.e. *cellIndividualOffset* as defined within *measObjectNR* corresponding to the SpCell), and is set to zero if not configured for the SpCell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a3-Offset* as defined within *reportConfigNR* for this event).

Mn*, *Mp are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ofn*, *Ocn*, *Ofp*, *Ocp*, *Hys*, *Off are expressed in dB.

[TS 38.331, clause 5.5.5]

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;

- 1> set the *measResultServingCell* within *measResultServingMOList* to include for each NR serving cell that is configured with *servingCellMO*, if any, the *servCellId*;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 2> for each serving cell configured with *servingCellMO*, include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
- 1> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportAddNeighMeas*:
 - 2> for each serving cell *measObjectId* referenced in the *measIdList*, other than the *measObjectId* corresponding with the *measId* that triggered the measurement reporting:
 - 3> set the *measResultBestNeighCell* within *measResultServingMOList* to include the *physCellId* and the available measurement quantities based on the *reportQuantityCell* and *rsType* indicated in *reportConfig* of the non-serving cell corresponding to the concerned *measObjectNR* with the highest measured RSRP if RSRP measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured RSRQ if RSRQ measurement results are available for cells corresponding to this *measObjectNR*, otherwise with the highest measured SINR;
 - 3> if the *reportConfig* associated with the *measId* that triggered the measurement reporting includes *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport*:
 - 4> for each best non-serving cell included in the measurement report:
 - 5> include beam measurement information according to the associated *reportConfig* as described in 5.5.5.2;
- 1> if there is at least one applicable neighbouring cell to report:
 - 2> set the *measResultNeighCells* to include the best neighbouring cells up to *maxReportCells* in accordance with the following:
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> include the cells included in the *cellsTriggeredList* as defined within the *VarMeasReportList* for this *measId*;
 - 3> else:
 - 4> include the applicable cells for which the new measurement results became available since the last periodical reporting or since the measurement was initiated or reset;
 - 4> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;
 - 3> for each cell that is included in the *measResultNeighCells*, include the *physCellId*;
 - 3> if the *reportType* is set to *eventTriggered*:
 - 4> for each included cell, include the layer 3 filtered measured results in accordance with the *reportConfig* for this *measId*, ordered as follows:
 - 5> if the *measObject* associated with this *measId* concerns NR:
 - 6> if *rsType* in the associated *reportConfig* is set to *ssb*:
 - 7> set *resultsSSB-Cell* within the *measResult* to include the SS/PBCH block based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;
 - 8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are configured, include beam measurement information as described in 5.5.5.2;

6> else if *rsType* in the associated *reportConfig* is set to *csi-rs*:

7> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first:

8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are, include beam measurement information as described in 5.5.5.2;

...

1> if the UE is configured with EN-DC:

2> if SRB3 is configured:

3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;

2> else:

3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.2.3.15.1.3 Test description

8.2.3.15.1.3.1 Pre-test conditions

System Simulator:

- EUTRA Cell 1 is the PCell and NR Cell 1 is the PS Cell.
- NR Cell 2 is the intra-frequency neighbour cell.

UE:

- None

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC) and DC Bearers (MCG(s) and SCG) on E-UTRA Cell 1 according to TS 38.508-1, clause 4.5.4 [4].

8.2.3.15.1.3.2 Test procedure sequence

Table 8.2.3.15.1.3.2-1 and Table 8.2.3.15.1.3.2-1A illustrates the downlink power levels to be applied for NR Cell 1 and NR Cell 2 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while rows marked "T1" and "T2" are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.3.15.1.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | EUTRA Cell 1 | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------------------|------------|--------------|-----------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | - | Power levels are such that entry condition for event A2 and event A3 is not satisfied:
$Ms - Hys > Thresh$ |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -79 | -103 | AND
$Mn + Ofn + Ocn + Hys < Ms + Ofn + Ocs + Off$ |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | - | Power level of Cell 1 is such that entry condition for event A2 is satisfied for the serving cell:
$Ms + Hys < Thresh$ |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -103 | -113 | AND
Power levels of Cell 1 and Cell 2 are such that entry condition for event A3 is not satisfied for any of the neighbour NR cells:
$Mn + Ofn + Ocn + Hys < Ms + Ofn + Ocs + Off$ |
| T2 | Cell-specific RS EPRE | dBm/15 kHz | -85 | - | - | Power levels are such that entry condition for event A2 is not satisfied:
$Ms - Hys > Thresh$ |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -79 | -69 | Power levels of Cell 1 and Cell 2 are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell:
$Mn + Ofn + Ocn - Hys > Ms + Ofn + Ocs + Off$ |

Table 8.2.3.15.1.3.2-1A: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | EUTRA Cell 1 | NR Cell 1 | NR Cell 2 | Remark |
|----|-----------------------|------------|--------------|-----------|-----------|--|
| T0 | Cell-specific RS EPRE | dBm/15 kHz | FFS | - | - | Power levels are such that entry condition for event A2 and event A3 is not satisfied:
$Ms - Hys > Thresh$ |
| | SS/PBCH SSS EPRE | dBm/S CS | - | FFS | FFS | AND
$Mn + Ofn + Ocn + Hys < Ms + Ofn + Ocs + Off$ |
| T1 | Cell-specific RS EPRE | dBm/15 kHz | FFS | - | - | Power level of Cell 1 is such that entry condition for event A2 is satisfied for the serving cell:
$Ms + Hys < Thresh$ |
| | SS/PBCH SSS EPRE | dBm/S CS | - | FFS | FFS | AND
Power levels of Cell 1 and Cell 2 are such that entry condition for event A3 is not satisfied for any of the neighbour NR cells:
$Mn + Ofn + Ocn + Hys < Ms + Ofn + Ocs + Off$ |
| T2 | Cell-specific RS EPRE | dBm/15 kHz | FFS | - | - | Power levels are such that entry condition for event A2 is not satisfied:
$Ms - Hys > Thresh$ |
| | SS/PBCH SSS EPRE | dBm/S CS | - | FFS | FFS | Power levels of Cell 1 and Cell 2 are such that entry condition for event A3 is satisfied for intra-frequency neighbour NR cell:
$Mn + Ofn + Ocn - Hys > Ms + Ofn + Ocs + Off$ |

Table 8.2.3.15.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> to setup measurement for PSCell and reporting for event A2, and measurement for neighbour NR Cell and reporting for event A3 (intra-frequency measurement) | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | - | - |
| 3 | Check: Does the UE transmit an <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message within the next 10s to report event A2 or A3? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 1 | F |
| 4 | The SS re-adjusts the cell-specific reference signal level according to row "T1". | - | - | - | - |
| 5 | Check: Does the UE transmit an <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message to report event A2 (<i>measId 1</i>) with the measured value for NR Cell 1? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 1 | P |
| 6 | The SS re-adjusts the cell-specific reference signal level according to row "T2". | - | - | - | - |
| 7 | Check: Does the UE transmit an <i>ULInformationTransferMRDC</i> message containing NR <i>MeasurementReport</i> message to report event A3 (<i>measId 2</i>) with the measured value for NR Cell 2? | --> | <i>ULInformationTransferMRDC (MeasurementReport)</i> | 2 | P |

8.2.3.15.1.3.3 Specific message contents

Table 8.2.3.15.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.3.15.1.3.2-2)

| |
|--|
| Derivation Path: 36.508 [7], Table 4.6.1-8 with condition EN-DC_EmbedNR_RRCRecon |
|--|

Table 8.2.3.15.1.3.3-2: *RRCReconfiguration* (Table 8.2.3.15.1.3.3-1)

| |
|---|
| Derivation Path: 38.508-1 [4], Table 4.6.1-13 with condition MEAS |
|---|

Table 8.2.3.15.1.3.3-3: *MeasConfig* (Table 8.2.3.15.1.3.3-2)

| Derivation Path: 38.508-1 [4], Table 4.6.3-69 | | | |
|--|--------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1..maxNrofObjectId)) OF SEQUENCE { | 1 entry | | |
| measObjectId[1] | 1 | | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR(54) | ssbFrequency IE equals the ARFCN for NR Cell 1
Thresh value set to -103dBm | |
| } | | | |
| } | | | |
| ReportConfigToAddModList SEQUENCE(SIZE (1..maxReportConfigId)) OF SEQUENCE { | 2 entries | | |
| reportConfigId[1] | 1 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(66) | Thresh value set to -91dBm | EVENT_A2 |
| } | | | |
| reportConfigId[2] | 2 | | |
| reportConfig[2] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(0) | Offset value set to 0dBm | EVENT_A3 |
| } | | | |
| } | | | |
| MeasIdToAddModList ::= SEQUENCE (SIZE (1..maxNrofMeasId)) OF SEQUENCE { | 2 entries | | |
| measId[1] | 1 | | |
| measObjectId[1] | 1 | | |
| reportConfigId[1] | 1 | | |
| measId[2] | 2 | | |
| measObjectId[2] | 1 | | |
| reportConfigId[2] | 2 | | |
| } | | | |
| } | | | |

Table 8.2.3.15.1.3.3-3a: ReportConfigNR(Thres) (Table 8.2.3.15.1.3.3-3)

| Derivation Path: 38.508-1 [4], Table 4.6.3-142 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ReportConfigNR ::= SEQUENCE { | | | |
| reportType CHOICE { | | | |
| eventTriggered SEQUENCE { | | | |
| reportAmount | r1 | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.15.1.3.3-4: RRCConnectionReconfigurationComplete (step 2, Table 8.2.3.15.1.3.2-2)

Derivation Path: 36.508 [7], Table 4.6.1-9 with condition MCG_and_SCG

Table 8.2.3.15.1.3.3-5: ULInformationTransferMRDC (step 5, Table 8.2.3.15.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-27 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ULInformationTransferMRDC ::= SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING including the MeasurementReport message according to Table 8.2.3.15.1.3.3-6 | | |
| } | | | |

Table 8.2.3.15.1.3.3-6: MeasurementReport (Table 8.2.3.15.1.3.3-5)

| Derivation Path: 38.508-1 [4], Table 4.6.1-5A | | | |
|--|---------------------------------------|---------|---------------------|
| Information Element | Value/remark | Comment | Condition |
| measurementReport ::= SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList ::= SEQUENCE (SIZE (1..maxNrofServingCells)) { | 1 entry | | |
| servCellId | Cell index corresponding to NR Cell 1 | | |
| measResultServingCell ::= SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| } | (0..127) | | pc_ss_SINR
_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.3.15.1.3.3-7: ULInformationTransferMRDC (step 7, Table 8.2.3.15.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-27 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ULInformationTransferMRDC ::= SEQUENCE { | | | |
| ul-DCCH-MessageNR-r15 | OCTET STRING including the MeasurementReport message according to Table 8.2.3.15.1.3.3-8 | | |
| } | | | |

Table 8.2.3.15.1.3.3-8: MeasurementReport (Table 8.2.3.15.1.3.3-7)

| Derivation Path: 38.508-1 [4], Table 4.6.1-5A | | | |
|--|--|------------------|---------------------|
| Information Element | Value/remark | Comment | Condition |
| measurementReport ::= SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 2 | | |
| measResultServingMOList ::= SEQUENCE (SIZE (1..maxNrofServingCells)) { | 1 entry | Report NR Cell 1 | |
| servCellId | Cell index corresponding to NR Cell 1 | | |
| measResultServingCell ::= SEQUENCE { | | | |
| physCellId | Physical CellID of the NR Cell 1 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| | (0..127) | | pc_ss_SINR
_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| measResultNeighCells ::= SEQUENCE (SIZE (1..maxCellReport)) { | 1 entry | Report NR Cell 2 | |
| measResultListNR ::= SEQUENCE { | | | |
| physCellId | Phy cell id corresponding to NR Cell 2 | | |
| measResult SEQUENCE { | | | |
| cellResults SEQUENCE{ | | | |
| resultsSSB-Cell ::= SEQUENCE { | | | |
| rsrp | (0..127) | | |
| rsrq | (0..127) | | |
| sinr | Not present | | |
| | (0..127) | | pc_ss_SINR
_Meas |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.4 Carrier Aggregation

8.2.4.1 NR CA / NR SCell addition / modification / release / Success

8.2.4.1.1 NR CA / NR SCell addition / modification / release / Success / EN-DC

8.2.4.1.1.1 NR CA / NR SCell addition / modification / release / Success / EN-DC / Intra-band Contiguous CA

8.2.4.1.1.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG with initial AS security activated }

ensure that {

when { UE receives an **RRCCONNECTIONRECONFIGURATION** message with **nr-Config IE** including **NR RRCReconfiguration** message containing **sCellToAddModList** with an **sCellIndex** set to the configured **SCell** }

then { UE adds the new **SCell**, configures lower layers to consider the **SCell** to be in deactivated state and sends an **RRCCONNECTIONRECONFIGURATIONCOMPLETE** message }

}

(2)

with { UE in **RRC_CONNECTED** state with **EN-DC**, and, **MCG(s)** (**E-UTRA PDCP**) and **SCG** with **SCell(s)** configured }

ensure that {

when { UE receives an **RRCCONNECTIONRECONFIGURATION** message with **nr-Config IE** including **NR RRCReconfiguration** message containing **sCellToAddModList** with an **sCellIndex** matching one of the current UE **SCell** configuration }

then { UE modifies the affected **SCell** dedicated configurations and sends an **RRCCONNECTIONRECONFIGURATIONCOMPLETE** message }

}

(3)

with { UE in **RRC_CONNECTED** state with **EN-DC**, and, **MCG(s)** (**E-UTRA PDCP**) and **SCG** with **SCell(s)** configured }

ensure that {

when { UE receives an **RRCCONNECTIONRECONFIGURATION** message with **nr-Config IE** including **NR RRCReconfiguration** message containing **sCellToReleaseList** with an **sCellIndex** matching one of the current UE **SCell** configuration }

then { UE releases the **SCell** and sends an **RRCCONNECTIONRECONFIGURATIONCOMPLETE** message }

}

8.2.4.1.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331: 5.3.5.3; TS 38.331: 5.3.5.3, 5.3.5.5.8, 5.3.5.5.9. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCCONNECTIONRECONFIGURATION* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

1> if this is the first *RRCCONNECTIONRECONFIGURATION* message after successful completion of the RRC connection re-establishment procedure:

2> re-establish PDCP for SRB2 configured with E-UTRA PDCP entity and for all DRBs that are established and configured with E-UTRA PDCP, if any;

2> re-establish RLC for SRB2 and for all DRBs that are established and configured with E-UTRA RLC, if any;

2> if the *RRCCONNECTIONRECONFIGURATION* message includes the *fullConfig*:

- 3> perform the radio configuration procedure as specified in 5.3.5.8;
- 2> if the *RRCCConnectionReconfiguration* message includes the *radioResourceConfigDedicated*:
- 3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 1: Void

NOTE 2: Void

- 1> else:
- 2> if the *RRCCConnectionReconfiguration* message includes the *radioResourceConfigDedicated*:
- 3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 3: If the *RRCCConnectionReconfiguration* message includes the establishment of radio bearers other than SRB1, the UE may start using these radio bearers immediately, i.e. there is no need to wait for an outstanding acknowledgment of the *SecurityModeComplete* message.

- 1> if the received *RRCCConnectionReconfiguration* includes the *sCellToReleaseList*:
- 2> perform SCell release as specified in 5.3.10.3a;
- 1> if the received *RRCCConnectionReconfiguration* includes the *sCellToAddModList*:
- 2> perform SCell addition or modification as specified in 5.3.10.3b;
- 1> if the received *RRCCConnectionReconfiguration* includes the *scg-Configuration*; or
- 1> if the current UE configuration includes one or more split DRBs configured with *pdcp-Config* and the received *RRCCConnectionReconfiguration* includes *radioResourceConfigDedicated* including *drb-ToAddModList*:
- 2> perform SCG reconfiguration as specified in 5.3.10.10;
- 1> if the received *RRCCConnectionReconfiguration* includes the *nr-Config* and it is set to *release*: or
- 1> if the received *RRCCConnectionReconfiguration* includes *endc-ReleaseAndAdd* and it is set to *TRUE*:
- 2> perform EN-DC release as specified in TS 38.331 [82], clause 5.3.5.10;
- 1> if the received *RRCCConnectionReconfiguration* includes the *sk-Counter*:
- 2> perform key update procedure as specified in TS 38.331 [82], clause 5.3.5.7;
- 1> if the received *RRCCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:
- 2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;
- 1> if the received *RRCCConnectionReconfiguration* includes the *nr-RadioBearerConfig1*:
- 2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;
- 1> if the received *RRCCConnectionReconfiguration* includes the *nr-RadioBearerConfig2*:
- 2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;
- 1> if this is the first *RRCCConnectionReconfiguration* message after successful completion of the RRC connection re-establishment procedure:
- 2> resume SRB2 and all DRBs that are suspended, if any, including RBs configured with NR PDCP;

NOTE 4: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].

NOTE 5: The UE may discard SRB2 messages and data that it receives prior to completing the reconfiguration used to resume these bearers.

- 1> if the received *RRCConnectionReconfiguration* includes the *systemInformationBlockType1Dedicated*:
- 2> perform the actions upon reception of the *SystemInformationBlockType1* message as specified in 5.2.2.7;
- 1> if the *RRCConnectionReconfiguration* message includes the *dedicatedInfoNASList*:
- 2> forward each element of the *dedicatedInfoNASList* to upper layers in the same order as listed;
- 1> if the *RRCConnectionReconfiguration* message includes the *measConfig*:
- 2> perform the measurement configuration procedure as specified in 5.5.2;
- 1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;
- 1> if the *RRCConnectionReconfiguration* message includes the *otherConfig*:
- 2> perform the other configuration procedure as specified in 5.3.10.9;
- 1> upon RRC connection establishment, if UE does not need UL gaps during continuous uplink transmission:
- 2> configure lower layers to stop using UL gaps during continuous uplink transmission in FDD for *RRCConnectionReconfigurationComplete* message and subsequent uplink transmission in RRC_CONNECTED except for UL transmissions as specified in TS36.211 [21];
- 1> set the content of *RRCConnectionReconfigurationComplete* message as follows:
- 2> if the *RRCConnectionReconfiguration* message includes *perCC-GapIndicationRequest*:
- 3> include *perCC-GapIndicationList* and *numFreqEffective*;
- 2> if the frequencies are configured for reduced measurement performance:
- 3> include *numFreqEffectiveReduced*;
- 2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:
- 3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];
 - 1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

- 1> if the *RRCReconfiguration* includes the *fullConfig*:
- 2> perform the radio configuration procedure as specified in 5.3.5.11;
- 1> if the *RRCReconfiguration* includes the *masterCellGroup*:
- 2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;
- 1> if the *RRCReconfiguration* includes the *masterKeyUpdate*:
- 2> perform security key update procedure as specified in 5.3.5.7;
- 1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:
- 2> perform the cell group configuration for the SCG according to 5.3.5.5;
- 1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:
- 2> perform the radio bearer configuration according to 5.3.5.6;
- 1> if the *RRCReconfiguration* message includes the *measConfig*:
- 2> perform the measurement configuration procedure as specified in 5.5.2;

- 1> if the *RRCReconfiguration* message includes the *dedicatedNAS-MessageList*:
- 2> forward each element of the *dedicatedNAS-MessageList* to upper layers in the same order as listed;
- 1> if the *RRCReconfiguration* message includes the *dedicatedSIB1-Delivery*:
- 2> perform the action upon reception of *SIB1* as specified in 5.2.2.4.2;
- 1> if the *RRCReconfiguration* message includes the *dedicatedSystemInformationDelivery*:
- 2> perform the action upon reception of System Information as specified in 5.2.2.4;
- 1> set the content of *RRCReconfigurationComplete* message as follows:
- 2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;
- 2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:
- 3> include the *uplinkTxDirectCurrentList*;
- 1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):
- 2> if *RRCReconfiguration* was received via SRB1:
- 3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10];
- 3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCConnectionReconfigurationComplete* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case *RRCReconfiguration* is received via SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case *RRCReconfiguration* is received via SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1 > else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

2> if this is the first *RRCReconfiguration* message after successful completion of the RRC re-establishment procedure:

3> resume SRB2 and DRBs that are suspended;

1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if T390 is running:

4> stop timer T390 for all access categories;

4> perform the actions as specified in 5.3.14.4.

3> if *RRCReconfiguration* does not include *dedicatedSIB1-Delivery* and

3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured by *searchSpaceSIB1*:

4> acquire the *SIB1*, which is scheduled as specified in TS 38.213 [13], of the target SpCell of the MCG;

4> upon acquiring *SIB1*, perform the actions specified in clause 5.2.2.4.2;

2> the procedure ends.

NOTE: The UE is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.3.5.5.8]

The UE shall:

1> if the release is triggered by reception of the *sCellToReleaseList*:

2> for each *sCellIndex* value included in the *sCellToReleaseList*:

3> if the current UE configuration includes an SCell with value *sCellIndex*:

4> release the SCell.

[TS 38.331, clause 5.3.5.5.9]

The UE shall:

1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (SCell addition):

2> add the SCell, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;

2> configure lower layers to consider the SCell to be in deactivated state;

Editor's Note: FFS Check automatic measurement handling for SCells.

2> for each *measId* included in the *measIdList* within *VarMeasConfig*:

3> if SCells are not applicable for the associated measurement; and

3> if the concerned SCell is included in *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*:

4> remove the concerned SCell from *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (SCell modification):

2> modify the SCell configuration in accordance with the *sCellConfigDedicated*.

8.2.4.1.1.1.3 Test description

8.2.4.1.1.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell. NR Cell 1 is the PSCell and NR Cell 3 is the SCell.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) and SCG*) established according to TS 38.508-1 [4].

8.2.4.1.1.1.3.2 Test procedure sequence

Table 8.2.4.1.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a <i>RRCConnectionReconfiguration</i> message including NR <i>RRCReconfiguration</i> message to configure the NR SCell | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 2 | Check: Does the UE transmit a <i>RRCConnectionReconfigurationComplete</i> message containing <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 1 | P |
| 3 | The SS transmits a <i>RRCConnectionReconfiguration</i> message including NR <i>RRCReconfiguration</i> message to modify the <i>startingBitOfFormat2-3</i> of the NR SCell | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 4 | Check: Does the UE transmit a <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 2 | P |
| 5 | The SS transmits a <i>RRCConnectionReconfiguration</i> message including NR <i>RRCReconfiguration</i> message to release the NR SCell | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| 6 | Check: Does the UE release SCell and sends a <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message? | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | 3 | P |

8.2.4.1.1.1.3.3 Specific message contents

Table 8.2.4.1.1.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.4.1.1.1.3.2-1)

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.2.4.1.1.1.3.3-2: RRCReconfiguration (Table 8.2.4.1.1.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.1.1.1.3.3-3: CellGroupConfig (Table 8.2.4.1.1.1.3.3-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-19. | | | |
|--|-------------------------|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | | | |
| sCellIndex[1] | 1 | | |
| sCellConfigCommon[1] | ServingCellConfigCommon | | |
| sCellConfigDedicated[1] | ServingCellConfig | TS 38.508-1 [4]
table 4.6.3-167 | |
| } | | | |
| } | | | |

Table 8.2.4.1.1.1.3.3-4: ServingCellConfigCommon (Table 8.2.4.1.1.1.3.3-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-168. | | | |
|---|-------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| PhysCellId | Physical Cell Identity of NR Cell 3 | | |
| } | | | |

Table 8.2.4.1.1.1.3.3-5: RRCConnectionReconfiguration (step 3, Table 8.2.4.1.1.1.3.2-1)

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.2.4.1.1.1.3.3-6: RRCReconfiguration (Table 8.2.4.1.1.1.3.3-5)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.1.1.1.3.3-7: CellGroupConfig (Table 8.2.4.1.1.1.3.3-6)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|--|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToAddModList SEQUENCE
(SIZE(1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellConfigDedicated | ServingCellConfig | | |
| } | | | |
| } | | | |

Table 8.2.4.1.1.1.3.3-8: ServingCellConfig (Table 8.2.4.1.1.1.3.3-7)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-167 | | | |
|--|---------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfig ::= SEQUENCE { | | | |
| initialDownlinkBWP | BWP-
DownlinkDedicated | | |
| } | | | |

Table 8.2.4.1.1.1.3.3-9: BWP-DownlinkDedicated (Table 8.2.4.1.1.1.3.3-8)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-10 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|--------------------------------------|--------------|--|--|
| BWP-DownlinkDedicated ::= SEQUENCE { | | | |
| pdccch-Config CHOICE { | | | |
| setup | PDCCH-Config | | |
| } | | | |
| } | | | |

Table 8.2.4.1.1.1.3.3-10: PDCCH-Config (Table 8.2.4.1.1.1.3.3-9)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-100 | | | |
|---|-----------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDCCH-Config ::= SEQUENCE { | | | |
| tpc-SRS SetupRelease { | | | |
| setup | SRS-TPC-CommandConfig | | |
| } | | | |
| } | | | |

Table 8.2.4.1.1.1.3.3-11: SRS-TPC-CommandConfig (Table 8.2.4.1.1.1.3.3-10)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-183 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SRS-TPC-CommandConfig ::= SEQUENCE { | | | |
| <i>startingBitOfFormat2-3</i> | 1 | | |
| } | | | |

Table 8.2.4.1.1.1.3.3-12: RRCConnectionReconfiguration (step 5, Table 8.2.4.1.1.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |
| nonCriticalExtension ::= SEQUENCE { | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.1.1.3.3-14: CellGroupConfig (Table 8.2.4.1.1.3.3-13)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToReleaseList SEQUENCE
(SIZE(1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex | 1 | | |
| } | | | |
| } | | | |

8.2.4.1.1.2 NR CA / NR SCell addition / modification / release / Success / EN-DC / Intra-band non-Contiguous CA

8.2.4.1.1.2.1 Test Purpose (TP)

Same as TC 8.2.4.1.1.1 but applied to Intra-band non-Contiguous CA.

8.2.4.1.1.2.2 Conformance requirements

Same as TC 8.2.4.1.1.1 but applied to Intra-band non-Contiguous CA.

8.2.4.1.1.2.3 Test description

8.2.4.1.1.2.3.1 Pre-test conditions

Same as TC 8.2.4.1.1.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA

8.2.4.1.1.2.3.2 Test procedure sequence

Same as TC 8.2.4.1.1.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA

8.2.4.1.1.3 NR CA / NR SCell addition / modification / release / Success / EN-DC / Inter-band CA

8.2.4.1.1.3.1 Test Purpose (TP)

Same as TC 8.2.4.1.1.1 but applied to Inter-band CA

8.2.4.1.1.3.2 Conformance requirements

Same as TC 8.2.4.1.1.1 but applied to Inter-band CA

8.2.4.1.1.3.3 Test description

8.2.4.1.1.3.3.1 Pre-test conditions

Same as TC 8.2.4.1.1.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA
- Cells configuration: NR Cell 10 replaces NR Cell 3

8.2.4.1.1.3.3.2 Test procedure sequence

Same as TC 8.2.4.1.1.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA
- Cells configuration: NR Cell 10 replaces NR Cell 3

8.2.4.2 NR CA / Simultaneous PSCell and SCell addition / PSCell and SCell change / CA Release

8.2.4.2.1 NR CA / Simultaneous PSCell and SCell addition / PSCell and SCell change / CA Release / EN-DC

8.2.4.2.1.1 NR CA / Simultaneous PSCell and SCell addition / PSCell and SCell change / CA Release / EN-DC / Intra-band Contiguous CA

8.2.4.2.1.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with E-UTRA }

ensure that {

when { UE receives an RRCConnectionReconfiguration message with nr-Config IE including NR RRCReconfiguration message to configure NR PSCell and sCellToAddModList with an sCellIndex set to the configured SCell }

then { UE sends an RRCConnectionReconfigurationComplete message indicating the addition of PSCell and configures lower layers to consider the SCell to be in deactivated state }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG with SCell(s) configured }

ensure that {

when { UE receives an RRCConnectionReconfiguration message with nr-Config IE including NR RRCReconfiguration message to perform both PSCell and SCell change to the configured target PSCell and SCell }

then { UE sends an RRCConnectionReconfigurationComplete message and configures new PSCell and configures lower layers to consider the SCell to be in deactivated state }

}

(3)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG with SCell(s) configured }

ensure that {

when { UE receives an RRCConnectionReconfiguration message with nr-Config IE including NR RRCReconfiguration message to perform PSCell change to one of the SCell equaling to one of the current UE SCell configuration }

then { UE sends an RRCConnectionReconfigurationComplete message and reconfigures the current NR Scell to PSCell }

}

8.2.4.2.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331: 5.3.5.3; TS 38.331: 5.3.5.3, 5.3.5.5.7, 5.3.5.5.8, 5.3.5.5.9, 5.3.5.6.4 and 5.3.5.6.5. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

1> if this is the first *RRCConnectionReconfiguration* message after successful completion of the RRC connection re-establishment procedure:

2> re-establish PDCP for SRB2 configured with E-UTRA PDCP entity and for all DRBs that are established and configured with E-UTRA PDCP, if any;

2> re-establish RLC for SRB2 and for all DRBs that are established and configured with E-UTRA RLC, if any;

2> if the *RRCConnectionReconfiguration* message includes the *fullConfig*:

3> perform the radio configuration procedure as specified in 5.3.5.8;

2> if the *RRCConnectionReconfiguration* message includes the *radioResourceConfigDedicated*:

3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 1: Void

NOTE 2: Void

1> else:

2> if the *RRCConnectionReconfiguration* message includes the *radioResourceConfigDedicated*:

3> perform the radio resource configuration procedure as specified in 5.3.10;

NOTE 3: If the *RRCConnectionReconfiguration* message includes the establishment of radio bearers other than SRB1, the UE may start using these radio bearers immediately, i.e. there is no need to wait for an outstanding acknowledgment of the *SecurityModeComplete* message.

1> if the received *RRCConnectionReconfiguration* includes the *sCellToReleaseList*:

2> perform SCell release as specified in 5.3.10.3a;

1> if the received *RRCConnectionReconfiguration* includes the *sCellToAddModList*:

2> perform SCell addition or modification as specified in 5.3.10.3b;

1> if the received *RRCConnectionReconfiguration* includes the *scg-Configuration*; or

1> if the current UE configuration includes one or more split DRBs configured with *pdcp-Config* and the received *RRCCConnectionReconfiguration* includes *radioResourceConfigDedicated* including *drb-ToAddModList*:

2> perform SCG reconfiguration as specified in 5.3.10.10;

1> if the received *RRCCConnectionReconfiguration* includes the *nr-Config* and it is set to *release*: or

1> if the received *RRCCConnectionReconfiguration* includes *endc-ReleaseAndAdd* and it is set to *TRUE*:

2> perform EN-DC release as specified in TS 38.331 [82], clause 5.3.5.10;

1> if the received *RRCCConnectionReconfiguration* includes the *sk-Counter*:

2> perform key update procedure as specified in TS 38.331 [82], clause 5.3.5.7;

1> if the received *RRCCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received *RRCCConnectionReconfiguration* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if the received *RRCCConnectionReconfiguration* includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if this is the first *RRCCConnectionReconfiguration* message after successful completion of the RRC connection re-establishment procedure:

2> resume SRB2 and all DRBs that are suspended, if any, including RBs configured with NR PDCP;

NOTE 4: The handling of the radio bearers after the successful completion of the PDCP re-establishment, e.g. the re-transmission of unacknowledged PDCP SDUs (as well as the associated status reporting), the handling of the SN and the HFN, is specified in TS 36.323 [8].

NOTE 5: The UE may discard SRB2 messages and data that it receives prior to completing the reconfiguration used to resume these bearers.

1> if the received *RRCCConnectionReconfiguration* includes the *systemInformationBlockType1Dedicated*:

2> perform the actions upon reception of the *SystemInformationBlockType1* message as specified in 5.2.2.7;

1> if the *RRCCConnectionReconfiguration* message includes the *dedicatedInfoNASList*:

2> forward each element of the *dedicatedInfoNASList* to upper layers in the same order as listed;

1> if the *RRCCConnectionReconfiguration* message includes the *measConfig*:

2> perform the measurement configuration procedure as specified in 5.5.2;

1> perform the measurement identity autonomous removal as specified in 5.5.2.2a;

1> if the *RRCCConnectionReconfiguration* message includes the *otherConfig*:

2> perform the other configuration procedure as specified in 5.3.10.9;

1> if the *RRCCConnectionReconfiguration* message includes the *sl-DiscConfig* or *sl-CommConfig*:

2> perform the sidelink dedicated configuration procedure as specified in 5.3.10.15;

1> if the *RRCCConnectionReconfiguration* message includes the *sl-V2X-ConfigDedicated*:

2> perform the V2X sidelink communication dedicated configuration procedure as specified in 5.3.10.15a;

1> if the *RRCCConnectionReconfiguration* message includes *wlan-OffloadInfo*:

2> perform the dedicated WLAN offload configuration procedure as specified in 5.6.12.2;

- 1> if the *RRCCONNECTIONRECONFIGURATION* message includes *rclwi-Configuration*:
- 2> perform the WLAN traffic steering command procedure as specified in 5.6.16.2;
- 1> if the *RRCCONNECTIONRECONFIGURATION* message includes *lwa-Configuration*:
- 2> perform the LWA configuration procedure as specified in 5.6.14.2;
- 1> if the *RRCCONNECTIONRECONFIGURATION* message includes *lwip-Configuration*:
- 2> perform the LWIP reconfiguration procedure as specified in 5.6.17.2;
- 1> upon RRC connection establishment, if UE does not need UL gaps during continuous uplink transmission:
- 2> configure lower layers to stop using UL gaps during continuous uplink transmission in FDD for *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message and subsequent uplink transmission in RRC_CONNECTED except for UL transmissions as specified in TS36.211 [21];
- 1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:
- 2> if the *RRCCONNECTIONRECONFIGURATION* message includes *perCC-GapIndicationRequest*:
- 3> include *perCC-GapIndicationList* and *numFreqEffective*;
- 2> if the frequencies are configured for reduced measurement performance:
- 3> include *numFreqEffectiveReduced*;
- 2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:
- 3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];
- 1> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

- 1> if the *RRCReconfiguration* includes the *fullConfig*:
- 2> perform the radio configuration procedure as specified in 5.3.5.11;
- 1> if the *RRCReconfiguration* includes the *masterCellGroup*:
- 2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;
- 1> if the *RRCReconfiguration* includes the *masterKeyUpdate*:
- 2> perform security key update procedure as specified in 5.3.5.7;
- 1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:
- 2> perform the cell group configuration for the SCG according to 5.3.5.5;
- 1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:
- 2> perform the radio bearer configuration according to 5.3.5.6;
- 1> if the *RRCReconfiguration* message includes the *measConfig*:
- 2> perform the measurement configuration procedure as specified in 5.5.2;
- 1> if the *RRCReconfiguration* message includes the *dedicatedSIB1-Delivery*:
- 2> perform the action upon reception of *SIB1* as specified in 5.2.2.4.2;
- 1> if the *RRCReconfiguration* message includes the *dedicatedSystemInformationDelivery*:

2> perform the action upon reception of System Information as specified in 5.2.2.4;

1> set the content of *RRCReconfigurationComplete* message as follows:

2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;

2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:

3> include the *uplinkTxDirectCurrentList*;

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> submit the *RRCReconfigurationComplete* via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

3> else:

4> the procedure ends;

NOTE: The order the UE sends the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message and performs the Random Access procedure towards the SCG is left to UE implementation.

2> else (*RRCReconfiguration* was received via SRB3):

3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

1> 1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured:

4> acquire the *SIB1* of the target SpCell of the MCG, as specified in 5.2.2.3.1;

2> the procedure ends.

NOTE: The UE is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.3.5.5.7]

The UE shall:

- 1> if the *SpCellConfig* contains the *rlf-TimersAndConstants*:
- 2> configure the RLF timers and constants for this cell group as specified in 5.3.5.5.6.
- 1> else if *rlf-TimersAndConstants* is not configured for this cell group:
- 2> use values for timers T301, T310, T311 and constants N310, N311, as included in *ue-TimersAndConstants* received in *SIB1*;
 - 1> 1> if the *SpCellConfig* contains *spCellConfigDedicated*:
 - 2> configure the *SpCell* in accordance with the *spCellConfigDedicated*;
 - 2> consider the bandwidth part indicated in *firstActiveUplinkBWP-Id* if configured to be the active uplink bandwidth part;
 - 2> consider the bandwidth part indicated in *firstActiveDownlinkBWP-Id* if configured to be the active downlink bandwidth part;
 - 2> if the any of the reference signal(s) that are used for radio link monitoring are reconfigured by the received *spCellConfigDedicated*:
 - 3> stop timer T310 for the corresponding *SpCell*, if running;
 - 3> reset the counters N310 and N311.

[TS 38.331, clause 5.3.5.5.8]

The UE shall:

- 1> if the release is triggered by reception of the *sCellToReleaseList*:
- 2> for each *sCellIndex* value included in the *sCellToReleaseList*:
- 3> if the current UE configuration includes an *SCell* with value *sCellIndex*:
- 4> release the *SCell*.

[TS 38.331, clause 5.3.5.5.9]

The UE shall:

- 1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (*SCell* addition):
- 2> add the *SCell*, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;
- 2> configure lower layers to consider the *SCell* to be in deactivated state;

Editor's Note: FFS Check automatic measurement handling for *SCells*.

- 2> for each *measId* included in the *measIdList* within *VarMeasConfig*:
- 3> if *SCells* are not applicable for the associated measurement; and
- 3> if the concerned *SCell* is included in *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*:
- 4> remove the concerned *SCell* from *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (*SCell* modification):

- 2> modify the *SCell* configuration in accordance with the *sCellConfigDedicated*.

[TS 38.331, clause 5.3.5.6.4]

Editor's Note: FFS / TODO: Add handling for the new QoS concept (mapping of flows; configuration of QFI-to-DRB mapping; reflective QoS...) but keep also EPS-Bearer handling for the EN-DC case

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToReleaseList* that is part of the current UE configuration (DRB release):

2> release the PDCP entity;

2> if SDAP entity associated with this DRB is configured:

3> indicate the release of the DRB to SDAP entity associated with this DRB (TS 37.324 [xx] section 5.3.3);

2> if the UE is operating in EN-DC:

3> if a new bearer is not added either with NR or E-UTRA with same *eps-BearerIdentity*:

4> indicate the release of the DRB and the *eps-BearerIdentity* of the released DRB to upper layers.

NOTE 1: The UE does not consider the message as erroneous if the *drb-ToReleaseList* includes any *drb-Identity* value that is not part of the current UE configuration.

NOTE 2: Whether or not the RLC and MAC entities associated with this PDCP entity are reset or released is determined by the *CellGroupConfig*.

[TS 38.331, clause 5.3.5.6.5]

The UE shall:

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is not part of the current UE configuration (DRB establishment including the case when full configuration option is used):

2> if an *sdap-Config* is included:

3> if an SDAP entity with the received *pdu-Session* does not exist:

4> establish an SDAP entity as specified in TS 37.324 [xx] section 5.1.1;

3> configure the SDAP entity in accordance with the received *sdap-Config* as specified in TS 37.324 [xx] and associate the DRB with the SDAP entity;

2> establish a PDCP entity and configure it in accordance with the received *pdcp-Config*;

2> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:

3> configure the PDCP entity with the ciphering algorithms according to *securityConfig* and apply the K_{UPenc} key associated with the master key (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;

2> if the PDCP entity of this DRB is configured with *integrityProtection*:

3> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;

2> if the UE is operating in EN-DC:

3> if the DRB was configured with the same *eps-BearerIdentity* either by NR or E-UTRA prior to receiving this reconfiguration:

4> associate the established DRB with the corresponding *eps-BearerIdentity*;

3> else:

4> indicate the establishment of the DRB(s) and the *eps-BearerIdentity* of the established DRB(s) to upper layers;

1> for each *drb-Identity* value included in the *drb-ToAddModList* that is part of the current UE configuration:

2> if an *sdap-Config* is included, reconfigure the SDAP entity in accordance with the received *sdap-Config* as specified in TS 37.324 [xx];

2> if the *reestablishPDCP* is set:

3> if target RAT is E-UTRA/5GC:

4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:

5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key configured/derived as specified in TS 36.331 [10, 5.4.2.3], i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;

3> else:

4> if the PDCP entity of this DRB is not configured with *cipheringDisabled*:

5> configure the PDCP entity with the ciphering algorithm and K_{UPenc} key associated with the master or secondary key ($K_{eNB}/S-K_{gNB}/K_{gNB}$) as indicated in *keyToUse*, i.e. the ciphering configuration shall be applied to all subsequent PDCP PDUs received and sent by the UE;

4> if the PDCP entity of this DRB is configured with *integrityProtection*:

5> configure the PDCP entity with the integrity algorithms according to *securityConfig* and apply the K_{UPint} key associated with the master (K_{eNB}/K_{gNB}) or the secondary key ($S-K_{gNB}$) as indicated in *keyToUse*;

3> re-establish the PDCP entity of this DRB as specified in 38.323 [5], section 5.1.2;

2> else, if the *recoverPDCP* is set:

3> trigger the PDCP entity of this DRB to perform data recovery as specified in 38.323;

2> if the *pdcp-Config* is included:

3> reconfigure the PDCP entity in accordance with the received *pdcp-Config*.

NOTE 1: Removal and addition of the same *drb-Identity* in a single *radioResourceConfig* is not supported. In case *drb-Identity* is removed and added due to reconfiguration with sync or re-establishment with the full configuration option, the network can use the same value of *drb-Identity*.

NOTE 2: When determining whether a *drb-Identity* value is part of the current UE configuration, the UE does not distinguish which *RadioBearerConfig* and *DRB-ToAddModList* that DRB was originally configured in. To re-associate a DRB with a different key (K_{eNB} to $S-K_{eNB}$ or vice versa), the network provides the *drb-Identity* value in the (target) *drb-ToAddModList* and sets the *reestablishPDCP* flag. The network does not list the *drb-Identity* in the (source) *drb-ToReleaseList*.

NOTE 3: When setting the *reestablishPDCP* flag for a radio bearer, the network ensures that the RLC receiver entities do not deliver old PDCP PDUs to the re-established PDCP entity. It does that e.g. by triggering a reconfiguration with sync of the cell group hosting the old RLC entity or by releasing the old RLC entity.

NOTE 4: In this specification, UE configuration refers to the parameters configured by NR RRC unless otherwise stated.

NOTE 5: Ciphering and integrity protection can be enabled or disabled for a DRB. The enabling/disabling of ciphering or integrity protection can be changed only by releasing and adding the DRB.

8.2.4.2.1.1.3 Test description

8.2.4.2.1.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell, NR Cell 1 is the PSCell to be added, and NR Cell 3 is Scell to be added. NR Cell 2 and NR Cell 12 are the target PSCell and SCell.

- NR Cell 1 and NR Cell 3 are Intra-band Contiguous. NR Cell 2 and NR Cell 12 are Intra-band Contiguous.

UE:

None

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) according to TS 38.508-1 [4].

8.2.4.2.1.1.3.2 Test procedure sequence

Table 8.2.4.2.1.1.3.2-1 illustrates the downlink power levels to be applied for EUTRA Cell 1, NR Cell 1, NR Cell 3, NR Cell 2 and NR Cell 12 at various time instants of the test execution. Row marked “T0” denotes the conditions after the preamble, while rows marked “T1” are to be applied subsequently. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 8.2.4.2.1.1.3.2-1: Power levels for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 3 | NR Cell 2 | NR Cell 12 | Remark |
|----|-----------------------|-----------|---------------|-----------|-----------|-----------|------------|--|
| T0 | Cell-specific RS EPRE | dBm/15kHz | -85 | - | - | - | - | EUTRA Cell 1, NR Cell 1 and NR Cell 3 are available. NR Cell 2 and NR Cell 12 are not available. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -88 | -88 | off | off | |
| T1 | Cell-specific RS EPRE | dBm/15kHz | -85 | - | - | - | - | EUTRA Cell 1, NR Cell 1, NR Cell 3, NR Cell 2 and NR Cell 12 are available. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -88 | -88 | -88 | -88 | |

Table 8.2.4.2.1.1.3.2-1A: Power levels for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 3 | NR Cell 2 | NR Cell 12 | Remark |
|----|-----------------------|-----------|---------------|-----------|-----------|-----------|------------|--|
| T0 | Cell-specific RS EPRE | dBm/15kHz | -96 | - | - | - | - | EUTRA Cell 1, NR Cell 1 and NR Cell 3 are available. NR Cell 2 and NR Cell 12 are not available. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -91 | -91 | off | off | |
| T1 | Cell-specific RS EPRE | dBm/15kHz | -96 | - | - | - | - | EUTRA Cell 1, NR Cell 1, NR Cell 3, NR Cell 2 and NR Cell 12 are available. |
| | SS/PBCH SSS EPRE | dBm/SCS | - | -91 | -91 | -91 | -91 | |

Table 8.2.4.2.1.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U – S | Message | | |
| 1 | The SS changes Cell parameters according to the row “T0” in table 8.2.4.2.1.1.3.2-1. | - | - | - | - |
| 2 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message with nr-Config IE including NR RRCReconfiguration message to configure NR Cell 1 as the NR PSCell and sCellToAddModList with an sCellIndex set to NR Cell 3 as the configured Scell. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 3 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | 1 | P |
| 4 | The SS changes NR Cell 2 and NR Cell 12 parameters according to the row “T1” in table 8.2.4.2.1.1.3.2-1. | - | - | - | - |
| 5 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message with nr-Config IE including NR RRCReconfiguration message to perform both NR Cell 1 and NR Cell 3 changed to the configured target NR Cell 2 and NR Cell 12. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 6 | Check: Does the UE transmit an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message configuring the new PSCell and SCell and configure lower layers to consider the SCell to be in deactivated state? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | 2 | P |
| 7 | The SS transmits an <i>RRCCONNECTIONRECONFIGURATION</i> message with nr-Config IE including NR RRCReconfiguration message to change the current PSCell (NR Cell 2) to NR Cell 12 equaling to one of the current UE SCell configuration. | <-- | <i>RRCCONNECTIONRECONFIGURATION</i> | - | - |
| 8 | Check: Does the UE send an <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> message and reconfigure the current NR Scell to PSCell? | --> | <i>RRCCONNECTIONRECONFIGURATIONCOMPLETE</i> | 3 | P |

8.2.4.2.1.1.3.3 Specific message contents

Table 8.2.4.2.1.1.3.3-1: *RRCCONNECTIONRECONFIGURATION* (step 2, Table 8.2.4.2.1.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCCONNECTIONRECONFIGURATION</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE{ | | | |

| | | | |
|--|---------------------------|--|--|
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nr-Config-r15 CHOICE { | | | |
| setup SEQUENCE { | | | |
| nr-SecondaryCellGroupConfig-r15 | <i>RRCReconfiguration</i> | OCTET STRING including the <i>RRCReconfiguration</i> | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.2.1.1.3.3-2: *RRCReconfiguration* (Table 8.2.4.2.1.1.3.3-1: *RRCConnectionReconfiguration*)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|-------------------------------|-----------------|---|-------|
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | OCTET STRING
(CONTAINING
CellGroupConfig) | EN-DC |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.2.1.1.3.3-3: *CellGroupConfig* (Table 8.2.4.2.1.1.3.3-2: *RRCReconfiguration*)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | 1 | | |
| reconfigurationWithSync SEQUENCE { | | | EN-DC |
| spCellConfigCommon ::= SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR
Cell 1 | | |
| } | | | |
| } | | | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE
(1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex[1] | 1 | | |
| sCellConfigCommon[1] SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR
Cell 3 | | |
| } | | | |
| } | | | |
| sCellToReleaseList | Not present | | |
| } | | | |

Table 8.2.4.2.1.1.3.3-4: *RRCConnectionReconfigurationComplete* (step 3, step 6 and step 8, Table 8.2.4.2.1.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-9 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|--|---------|--|--|
| RRConnectionReconfigurationComplete ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcConnectionReconfigurationComplete-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| scg-ConfigResponseNR-r15 | Present | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.2.1.1.3.3-5: *RRConnectionReconfiguration* (step 5, Table 8.2.4.2.1.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 8.2.4.2.1.1.3.3-7: *CellGroupConfig* (Table 8.2.4.2.1.1.3.3-6: *RRCReconfiguration*)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|--|--------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | 1 | | |
| reconfigurationWithSync SEQUENCE { | | | EN-DC |
| spCellConfigCommon ::= SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR Cell 2 | | |
| } | | | |
| } | | | |
| } | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | 1 entry | | |
| sCellIndex[1] | 1 | | |
| sCellConfigCommon[1] SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR Cell 12 | | |
| } | | | |
| } | | | |
| sCellToReleaseList | Not present | | |
| } | | | |

Table 8.2.4.2.1.1.3.3-8: *RRCConnectionReconfiguration* (step 7, Table 8.2.4.2.1.1.3.2-2)

| Derivation Path: 36.508 [7], Table 4.6.1-8 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionReconfiguration-r8 SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |
| nonCriticalExtension SEQUENCE { | | | |

| | | | |
|---|--|------------------|--|
| | | CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.2.1.1.3.3-10: *CellGroupConfig* (Table 8.2.4.2.1.1.3.3-10: *RRCReconfiguration*)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19 | | | |
|---|--------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| servCellIndex | 1 | | |
| reconfigurationWithSync SEQUENCE { | | | EN-DC |
| spCellConfigCommon ::= SEQUENCE { | | | |
| physCellId | Physical Cell Identity of NR Cell 12 | | |
| } | | | |
| } | | | |
| } | | | |
| sCellToAddModList | Not present | | |
| sCellToReleaseList | Not present | | |
| } | | | |

8.2.4.2.1.2 NR CA / Simultaneous PSCell and SCell addition / PSCell and SCell change / CA Release / EN-DC / Intra-band non-Contiguous CA

8.2.4.2.1.2.1 Test Purpose (TP)

Same as TC 8.2.4.2.1.1 but applied to Intra-band non-Contiguous CA.

8.2.4.2.1.2.2 Conformance requirements

Same as TC 8.2.4.2.1.1 but applied to Intra-band non-Contiguous CA.

8.2.4.2.1.2.3 Test description

8.2.4.2.1.2.3.1 Pre-test conditions

Same as TC 8.2.4.2.1.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA

8.2.4.2.1.2.3.2 Test procedure sequence

Same as TC 8.2.4.2.1.1 with the following differences:

- CA configuration: Intra-band non-Contiguous CA replaces Intra-band Contiguous CA

8.2.4.2.1.3 NR CA / Simultaneous PSCell and SCell addition / PSCell and SCell change / CA Release / EN-DC / Inter-band CA

8.2.4.2.1.3.1 Test Purpose (TP)

Same as TC 8.2.4.2.1.1 but applied to Inter-band CA.

8.2.4.2.1.3.2 Conformance requirements

Same as TC 8.2.4.2.1.1 but applied to Inter-band CA.

8.2.4.2.1.3.3 Test description

8.2.4.2.1.3.3.1 Pre-test conditions

Same as TC 8.2.4.2.1.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA

8.2.4.2.1.3.3.2 Test procedure sequence

Same as TC 8.2.4.2.1.1 with the following differences:

- CA configuration: Inter-band CA replaces Intra-band Contiguous CA
- Cells configuration: NR Cell 10 replaces NR Cell 3, NR Cell 30 replaces NR Cell 10

8.2.4.3 NR CA / SCell change / Intra-NR measurement event A6 / SRB3

8.2.4.3.1 NR CA / SCell change / Intra-NR measurement event A6 / SRB3 / EN-DC

8.2.4.3.1.1 NR CA / SCell change / Intra-NR measurement event A6 / SRB3 / EN-DC / Intra-band Contiguous CA

8.2.4.3.1.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and MCG(s) (E-UTRA PDCP) and SCG with SCell(s) configured and SRB3 configured and Intra-NR measurement configured for event A6 }

ensure that {

when { Neighbour becomes offset better than NR SCell }

then { UE sends a Measurement Report message on SRB3 While entering condition for event A6 is satisfied }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and MCG(s) (E-UTRA PDCP) and SCG with SCell(s) configured and received event A6 triggered measurement report }

ensure that {

when { UE receives an RRCReconfiguration message containing sCellToReleaseList with an sCellIndex equalling to one of the current UE SCell configuration and sCellToAddModList with an sCellIndex set to the configured target SCell }

then { UE sends an RRCReconfigurationComplete message and changes the SCell }

}

8.2.4.3.1.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 36.331, clause 5.3.5.3, TS 38.331, clauses 5.3.5.3, 5.3.5.5.8, 5.3.5.5.9, 5.5.4.7 and 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCConnectionReconfiguration* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCConnectionReconfiguration* includes the *nr-Config* and it is set to *release*: or

1> if the received *RRCConnectionReconfiguration* includes *endc-ReleaseAndAdd* and it is set to *TRUE*:

2> perform ENDC release as specified in TS38.331 [82], clause 5.3.5.10;

1> if the received *RRCConnectionReconfiguration* includes the *sk-Counter*:

2> perform key update procedure as specified in TS 38.331 [82], clause 5.3.5.7;

1> if the received *RRCConnectionReconfiguration* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.5;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

1> if the received *RRCConnectionReconfiguration* includes the *nr-RadioBearerConfig2*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

...

1> set the content of *RRCConnectionReconfigurationComplete* message as follows:

2> if the *RRCConnectionReconfiguration* message includes *perCC-GapIndicationRequest*:

3> include *perCC-GapIndicationList* and *numFreqEffective*;

2> if the frequencies are configured for reduced measurement performance:

3> include *numFreqEffectiveReduced*;

2> if the received *RRCConnectionReconfiguration* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82, 5.3.5.3];

1> submit the *RRCConnectionReconfigurationComplete* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

- 1> if the *RRCReconfiguration* includes the *fullConfig*:
 - 2> perform the radio configuration procedure as specified in 5.3.5.11;
- 1> if the *RRCReconfiguration* includes the *masterCellGroup*:
 - 2> perform the cell group configuration for the received *masterCellGroup* according to 5.3.5.5;
- 1> if the *RRCReconfiguration* includes the *masterKeyUpdate*:
 - 2> perform security key update procedure as specified in 5.3.5.7;
- 1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:
 - 2> perform the cell group configuration for the SCG according to 5.3.5.5;
- 1> if the *RRCReconfiguration* message contains the *radioBearerConfig*:
 - 2> perform the radio bearer configuration according to 5.3.5.6;
- 1> if the *RRCReconfiguration* message includes the *measConfig*:
 - 2> perform the measurement configuration procedure as specified in 5.5.2;
- 1> if the *RRCReconfiguration* message includes the *dedicatedSIB1-Delivery*:
 - 2> perform the action upon reception of *SIB1* as specified in 5.2.2.4.2;
- 1> if the *RRCReconfiguration* message includes the *dedicatedSystemInformationDelivery*:
 - 2> perform the action upon reception of System Information as specified in 5.2.2.4;
- 1> set the content of *RRCReconfigurationComplete* message as follows:
 - 2> if the *RRCReconfiguration* includes the *masterCellGroup* containing the *reportUplinkTxDirectCurrent*, or;
 - 2> if the *RRCReconfiguration* includes the *secondaryCellGroup* containing the *reportUplinkTxDirectCurrent*:
 - 3> include the *uplinkTxDirectCurrentList*;
 - 1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):
 - 2> if *RRCReconfiguration* was received via SRB1:
 - 3> submit the *RRCReconfigurationComplete* message via the EUTRA MCG embedded in E-UTRA RRC message *RRCCONNECTIONRECONFIGURATIONCOMPLETE* as specified in TS 36.331 [10].
 - 3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:
 - 4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];
 - 3> else:
 - 4> the procedure ends;

NOTE: The order the UE sends the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message and performs the Random Access procedure towards the SCG is left to UE implementation.

- 2> else (*RRCReconfiguration* was received via SRB3):
 - 3> submit the *RRCReconfigurationComplete* message via SRB3 to lower layers for transmission using the new configuration;

NOTE: For EN-DC, in the case of SRB1, the random access is triggered by RRC layer itself as there is not necessarily other UL transmission. In the case of SRB3, the random access is triggered by the MAC layer due to arrival of *RRCReconfigurationComplete*.

- 1> else:

2> submit the *RRCReconfigurationComplete* message via SRB1 to lower layers for transmission using the new configuration;

1> if *reconfigurationWithSync* was included in *spCellConfig* of an MCG or SCG, and when MAC of an NR cell group successfully completes a random access procedure triggered above;

2> stop timer T304 for that cell group;

2> apply the parts of the CQI reporting configuration, the scheduling request configuration and the sounding RS configuration that do not require the UE to know the SFN of the respective target SpCell, if any;

2> apply the parts of the measurement and the radio resource configuration that require the UE to know the SFN of the respective target SpCell (e.g. measurement gaps, periodic CQI reporting, scheduling request configuration, sounding RS configuration), if any, upon acquiring the SFN of that target SpCell;

2> if the *reconfigurationWithSync* was included in *spCellConfig* of an MCG:

3> if the active downlink BWP, which is indicated by the *firstActiveDownlinkBWP-Id* for the target SpCell of the MCG, has a common search space configured:

4> acquire the *SIB1* of the target SpCell of the MCG, as specified in 5.2.2.3.1;

2> the procedure ends;

NOTE: The UE is only required to acquire broadcasted *SIB1* if the UE can acquire it without disrupting unicast data reception, i.e. the broadcast and unicast beams are quasi co-located.

[TS 38.331, clause 5.3.5.5.8]

The UE shall:

1> if the release is triggered by reception of the *sCellToReleaseList*:

2> for each *sCellIndex* value included in the *sCellToReleaseList*:

3> if the current UE configuration includes an SCell with value *sCellIndex*:

4> release the SCell;

[TS 38.331, clause 5.3.5.5.9]

The UE shall:

1> for each *sCellIndex* value included in the *sCellToAddModList* that is not part of the current UE configuration (SCell addition):

2> add the SCell, corresponding to the *sCellIndex*, in accordance with the *sCellConfigCommon* and *sCellConfigDedicated*;

2> configure lower layers to consider the SCell to be in deactivated state;

2> for each *measId* included in the *measIdList* within *VarMeasConfig*:

3> if SCells are not applicable for the associated measurement; and

3> if the concerned SCell is included in *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*:

4> remove the concerned SCell from *cellsTriggeredList* defined within the *VarMeasReportList* for this *measId*;

1> for each *sCellIndex* value included in the *sCellToAddModList* that is part of the current UE configuration (SCell modification):

2> modify the SCell configuration in accordance with the *sCellConfigDedicated*;

[TS 38.331, clause 5.5.4.7]

The UE shall:

1> consider the entering condition for this event to be satisfied when condition A6-1, as specified below, is fulfilled;

1> consider the leaving condition for this event to be satisfied when condition A6-2, as specified below, is fulfilled;

1> for this measurement, consider the (secondary) cell corresponding to the *measObjectNR* associated to this event to be the serving cell.

NOTE: The reference signal(s) of the neighbour(s) and the reference signal(s) of the SCell are both indicated in the associated *measObjectNR*.

Inequality A6-1 (Entering condition)

$$Mn + Ocn - Hys > Ms + Ocs + Off$$

Inequality A6-2 (Leaving condition)

$$Mn + Ocn + Hys < Ms + Ocs + Off$$

The variables in the formula are defined as follows:

Mn is the measurement result of the neighbouring cell, not taking into account any offsets.

Ocn is the cell specific offset of the neighbour cell (i.e. *cellIndividualOffset* as defined within the associated *measObjectNR*), and set to zero if not configured for the neighbour cell.

Ms is the measurement result of the serving cell, not taking into account any offsets.

Ocs is the cell specific offset of the serving cell (i.e. *cellIndividualOffset* as defined within the associated *measObjectNR*), and is set to zero if not configured for the serving cell.

Hys is the hysteresis parameter for this event (i.e. *hysteresis* as defined within *reportConfigNR* for this event).

Off is the offset parameter for this event (i.e. *a6-Offset* as defined within *reportConfigNR* for this event).

Mn, **Ms** are expressed in dBm in case of RSRP, or in dB in case of RSRQ and RS-SINR.

Ocn, **Ocs**, **Hys**, **Off** are expressed in dB.

[TS 38.331, clause 5.5.5]

UE

Network



Figure 5.5.5.1-1: Measurement reporting

The purpose of this procedure is to transfer measurement results from the UE to the network. The UE shall initiate this procedure only after successful security activation.

For the *measId* for which the measurement reporting procedure was triggered, the UE shall set the *measResults* within the *MeasurementReport* message as follows:

1> set the *measId* to the measurement identity that triggered the measurement reporting;

1> set the *measResultServingCell* within *measResultServingMOList* to include RSRP, RSRQ and the available SINR for each configured serving cell derived based on the *rsType* indicated in the associated *reportConfig*;

7> set *resultsCSI-RS-Cell* within the *measResult* to include the CSI-RS based quantity(ies) indicated in the *reportQuantityCell* within the concerned *reportConfig*, in order of decreasing trigger quantity, i.e. the best cell is included first;

8> if *reportQuantityRsIndexes* and *maxNrofRSIndexesToReport* are, include beam measurement information as described in 5.5.5.2;

5> if the *measObject* associated with this *measId* concerns E-UTRA:

6> set the *measResult* to include the quantity(ies) indicated in the *reportQuantity* within the concerned *reportConfigInterRAT* in order of decreasing E-UTRA trigger quantity, i.e. the best cell is included first;

3> if the *reportType* is set to *periodical*:

4> if a single reporting quantity is set to *TRUE* in *reportQuantityRsIndexes*;

5> consider the configured single quantity as the sorting quantity;

4> else:

5> if *rsrp* is set to *TRUE*;

6> consider RSRP as the sorting quantity;

5> else:

6> consider RSRQ as the sorting quantity;

3> if the *reportType* is set to *reportCGI*:

4> if the cell indicated by *cellForWhichToReportCGI* is an NR cell:

5> if all mandatory fields of the *cgi-Info* for the concerned cell have been obtained:

6> include the *plmn-IdentityInfoList* including *plmn-IdentityList*, *trackingAreaCode* (if available), *ranac* (if available) and *cellIdentity* for each entry of the *plmn-IdentityInfoList*;

6> include *frequencyBandList* if available;

5> else if MIB indicates the SIB1 is not broadcast:

6> include the *noSIB1* including the *ssb-SubcarrierOffset* and *pdcc-ConfigSIB1* obtained from MIB of the concerned cell;

4> if the cell indicated by *cellForWhichToReportCGI* is an EUTRA cell:

5> if all mandatory fields of the *cgi-Info-EPC* for the concerned cell have been obtained:

6> include in the *cgi-Info-EPC* the fields broadcasted in EUTRA *SystemInformationBlockType1* associated to EPC;

5> if UE is E-UTRA/5GC capable and all mandatory fields of the *cgi-Info-5GC* for the concerned cell have been obtained:

6> include in the *cgi-Info-5GC* the fields broadcasted in EUTRA *SystemInformationBlockType1* associated to 5GC;

5> include the *freqBandIndicator*;

5> if the cell broadcasts the *multiBandInfoList*, include the *multiBandInfoList*;

5> if the cell broadcasts the *freqBandIndicatorPriority*, include the *freqBandIndicatorPriority*;

1> increment the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* by 1;

1> stop the periodical reporting timer, if running;

1> if the *numberOfReportsSent* as defined within the *VarMeasReportList* for this *measId* is less than the *reportAmount* as defined within the corresponding *reportConfig* for this *measId*:

2> start the periodical reporting timer with the value of *reportInterval* as defined within the corresponding *reportConfig* for this *measId*;

1> else:

2> if the *reportType* is set to *periodical*:

3> remove the entry within the *VarMeasReportList* for this *measId*;

3> remove this *measId* from the *measIdList* within *VarMeasConfig*;

1> if the UE is configured with EN-DC:

2> if SRB3 is configured:

3> submit the *MeasurementReport* message via SRB3 to lower layers for transmission, upon which the procedure ends;

2> else:

3> submit the *MeasurementReport* message via the EUTRA MCG embedded in E-UTRA RRC message *ULInformationTransferMRDC* as specified in TS 36.331 [10].

1> else:

2> submit the *MeasurementReport* message to lower layers for transmission, upon which the procedure ends.

8.2.4.3.1.1.3 Test description

8.2.4.3.1.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell. NR Cell 1 is the PSCell and NR Cell 3 is the SCell to be added, NR Cell 12 is the intra-frequency neighbour cell of NR Cell 3.

UE:

None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) and DC bearers (*MCG(s)* and *SCG*) according to TS 38.508-1 [4], table 4.5.4.

8.2.4.3.1.1.3.2 Test procedure sequence

Table 8.2.4.3.1.1.3.2-1 and table 8.2.4.3.1.1.3.2-1A illustrates the downlink power levels to be applied for E-UTRA Cell 1, NR Cell 1, NR Cell 3 and NR Cell 12 at various time instants of the test execution. Row marked "T0" denotes the conditions after the preamble, while the configuration marked "T1" is applied at the point indicated in the Main behaviour description in Table 8.2.4.3.1.1.3.2-2.

Table 8.2.4.3.1.1.3.2-1: Power levels for FR1

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 3 | NR Cell 12 | Remark |
|----|-----------------------|-----------|---------------|-----------|-----------|------------|--|
| T0 | Cell-specific RS EPRE | dBm/15kHz | -79 | - | - | - | Power levels are such that entry condition for event A6 is not satisfied:
$Mn + Ocn + Hys < Ms + Ocs + Off$ |
| | SS/PBCH SSS EPRE | dBm/S CS | - | -79 | -85 | -97 | |

| | | | | | | | |
|----|-----------------------|-----------|-----|-----|-----|-----|--|
| T1 | Cell-specific RS EPRE | dBm/15kHz | -79 | - | - | - | Power levels are such that entry condition for event A6 is satisfied:

$Mn + Ocn - Hys > Ms + Ocs + Off$ |
| | SS/PBCH SSS EPRE | dBm/5CS | - | -79 | -97 | -85 | |

Table 8.2.4.3.1.1.3.2-1A: Power levels for FR2

| | Parameter | Unit | E-UTRA Cell 1 | NR Cell 1 | NR Cell 3 | NR Cell 12 | Remark |
|----|-----------------------|-----------|---------------|-----------|-----------|------------|--|
| T0 | Cell-specific RS EPRE | dBm/15kHz | -96 | - | - | - | Power levels are such that entry condition for event A6 is not satisfied:

$Mn + Ocn + Hys < Ms + Ocs + Off$ |
| | SS/PBCH SSS EPRE | dBm/5CS | - | -91 | -91 | -100 | |
| T1 | Cell-specific RS EPRE | dBm/15kHz | -96 | - | - | - | Power levels are such that entry condition for event A6 is satisfied:

$Mn + Ocn - Hys > Ms + Ocs + Off$ |
| | SS/PBCH SSS EPRE | dBm/5CS | - | -91 | -100 | -91 | |

Table 8.2.4.3.1.1.3.2-2: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U – S | Message | | |
| 1 | SS transmits an <i>RRCConnectionReconfiguration</i> message containing <i>RRCReconfiguration</i> message to configure SCell (NR Cell 3) and SRB3. | <-- | <i>RRCConnectionReconfiguration(RRCReconfiguration)</i> | - | - |
| 2 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message containing <i>RRCReconfigurationComplete</i> message. | --> | <i>RRCConnectionReconfigurationComplete(RRCReconfigurationComplete)</i> | - | - |
| 3 | SS transmits an <i>RRCConnectionReconfiguration</i> message containing <i>RRCReconfiguration</i> message including <i>measConfig</i> to setup intra NR measurement and reporting for event A6 | <-- | <i>RRCConnectionReconfiguration(RRCReconfiguration)</i> | - | - |
| 4 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message containing <i>RRCReconfigurationComplete</i> message. | --> | <i>RRCConnectionReconfigurationComplete(RRCReconfigurationComplete)</i> | - | - |
| 5 | SS re-adjusts the cell-specific reference signal level according to row "T1" in table 8.2.4.3.1.1.3.2-1/1A. | - | - | - | - |
| 6 | Check: Does the UE transmit a <i>MeasurementReport</i> message via SRB3 to report event A6 with the measured RSRP and | --> | <i>MeasurementReport</i> | 1 | P |

| | | | | | |
|---|--|-----|-----------------------------------|---|---|
| | RSRQ value for NR Cell 12? | | | | |
| 7 | The SS transmits an <i>RRCReconfiguration</i> message including <i>sCellToReleaseList</i> with NR Cell 3 as SCell release and <i>sCellToAddModList</i> with NR Cell 12 as SCell addition via SRB3. | <-- | <i>RRCReconfiguration</i> | - | - |
| 8 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message on NR Cell 1? | --> | <i>RRCReconfigurationComplete</i> | 2 | P |

8.2.4.3.1.1.3.3 Specific message contents

Table 8.2.4.3.1.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.4.3.1.1.3.2-2)

Derivation Path: TS 36.508 [7], Table 4.6.1-8 condition MCG_and_SCG.

Table 8.2.4.3.1.1.3.3-2: *RRCReconfiguration* (step 1, Table 8.2.4.3.1.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13. | | | |
|---|-------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCReconfiguration</i> ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| <i>rrcReconfiguration</i> ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig | TS 38.508-1 [4]
table 4.6.3-132
condition SRB3 | |
| secondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.3.1.1.3.3-3: CellGroupConfig (Table 8.2.4.3.1.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-19. | | | |
|---|-------------------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>CellGroupConfig</i> ::= SEQUENCE { | | | |
| <i>sCellToAddModList</i> SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | | | |
| <i>sCellIndex</i> [1] | 1 | | |
| <i>sCellConfigCommon</i> [1] | ServingCellConfigCommon | | |
| <i>sCellConfigDedicated</i> [1] | ServingCellConfig | TS 38.508-1 [4] | |

| | | | |
|---|--|-----------------|--|
| | | table 4.6.3-167 | |
| } | | | |
| } | | | |

Table 8.2.4.3.1.1.3.3-4: ServingCellConfigCommon (Table 8.2.4.3.1.1.3.3-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-168. | | | |
|---|-------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| PhysCellId | Physical Cell Identity of NR Cell 3 | | |
| } | | | |

Table 8.2.4.3.1.1.3.3-5: RRCReconfiguration (step 3, Table 8.2.4.3.1.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13. | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| measConfig | MeasConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.3.1.1.3.3-6: MeasConfig (Table 8.2.4.3.1.1.3.3-5)

| Derivation path: TS 38.508-1 [4], Table 4.6.3-69. | | | |
|--|----------------------------|-----------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1.. maxNrofObjectId)) OF SEQUENCE { | 2 entry | | |
| measObjectId[1] | IdMeasObject-NRf1 | NR Cell 1 | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-GENERIC(NRf1) | | |
| } | | | |
| measObjectId[2] | IdMeasObject-NRf2 | NR Cell 3 | |

| | | | |
|--|---|---|--|
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-
GENERIC(NRf2) | | |
| } | | | |
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | IdReportConfig-A6 | | |
| reportConfig[1] CHOICE { | | | |
| reportConfigNR | ReportConfigNR(Delta(
NRf2) – Delta(NRf1)) | TS 38.508-1 [4]
table 4.6.3-142
condition
EVENT_A6 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | IdMeasObject-NRf2 | | |
| reportConfigId[1] | IdReportConfig-A6 | | |
| } | | | |
| } | | | |
| NOTE 1: Delta(NRf1) and Delta(NRf2) is derived based on calibration procedure defined in the TS 38.508-1 [4], clause 6.1.3.3 | | | |

Table 8.2.4.3.1.1.3.3-7: *MeasurementReport* (step 6, Table 8.2.4.3.1.1.3.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-5A. | | | |
|--|--------------|------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MeasurementReport ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| measurementReport SEQUENCE { | | | |
| measResults ::= SEQUENCE { | | | |
| measId | 1 | | |
| measResultServingMOList
::=SEQUENCE(SIZE (1..maxNrofServingCells)) OF
SEQUENCE { | | | |
| servCellId[1] | 1 | | |
| measResultServingCell[1] SEQUENCE { | | Report NR Cell 3 | |

| | | | |
|-----------------------------------|-----------------|--|--|
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| SecondaryCellGroup | CellGroupConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.4.3.1.1.3.3-9: CellGroupConfig (Table 8.2.4.3.1.1.3.3-8)

| Derivation Path: 38.508-1 [4], Table 4.6.3-19. | | | |
|--|-------------------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| sCellToAddModList SEQUENCE (SIZE (1..maxNrofSCells)) OF SEQUENCE { | | | |
| sCellIndex[1] | 2 | | |
| sCellConfigCommon[1] | ServingCellConfigCommon | | |
| sCellConfigDedicated[1] | ServingCellConfig | TS 38.508-1 [4] table 4.6.3-167 | |
| } | | | |
| sCellToReleaseList SEQUENCE (SIZE (1..maxNrofSCells)) OF { | 1 entry | | |
| sCellIndex[1] | 1 | | |
| } | | | |
| } | | | |

Table 8.2.4.3.1.1.3.3-10: ServingCellConfigCommon (Table 8.2.4.3.1.1.3.3-9)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-168. | | | |
|---|--------------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ServingCellConfigCommon ::= SEQUENCE { | | | |
| PhysCellId | Physical Cell Identity of NR Cell 12 | | |
| } | | | |

8.2.4.3.1.2 NR CA / SCell change / Intra-NR measurement event A6 / SRB3 / EN-DC / Intra-band non-Contiguous CA

The scope and description of the present TC is the same as test case 8.2.4.3.1.1 with the following differences:

- CA configuration: Intra-band non-contiguous CA replaces Intra-band Contiguous CA

8.2.4.3.1.3 NR CA / SCell change / Intra-NR measurement event A6 / SRB3 / EN-DC / Inter-band CA

8.2.4.3.1.3.1 Test Purpose (TP)

Same as TC 8.2.4.3.1.1 but applied to Inter-band CA case.

8.2.4.3.1.3.2 Conformance requirements

Same as TC 8.2.4.3.1.1.

8.2.4.3.1.3.3 Test description

8.2.4.3.1.3.3.1 Pre-test conditions

Same as test case 8.2.4.3.1.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 3, NR Cell 30 replaces NR Cell 12

8.2.4.3.1.3.3.2 Test procedure sequence

Same as test case 8.2.4.3.1.1 with the following differences:

- Cells configuration: NR Cell 10 replaces NR Cell 3, NR Cell 30 replaces NR Cell 12

8.2.4.3.1.3.3.3 Specific message contents

Table 8.2.4.3.1.3.3.3-1: *MeasConfig* (Table 8.2.4.3.1.1.3.3-6)

| Derivation path: TS 38.508-1 [4], Table 4.6.3-69. | | | |
|--|----------------------------|------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| measConfig ::= SEQUENCE { | | | |
| measObjectToAddModList SEQUENCE (SIZE (1.. maxNrofObjectId)) OF SEQUENCE { | 2 entry | | |
| measObjectId[1] | IdMeasObject-NRf1 | NR Cell 1 | |
| measObject[1] CHOICE { | | | |
| measObjectNR | MeasObjectNR-GENERIC(NRf1) | | |
| } | | | |
| measObjectId[2] | IdMeasObject-NRf5 | NR Cell 10 | |
| measObject[2] CHOICE { | | | |
| measObjectNR | MeasObjectNR-GENERIC(NRf5) | | |
| } | | | |

| | | | |
|---|-------------------|---|--|
| } | | | |
| reportConfigToAddModList SEQUENCE (SIZE (1..maxReportConfigId)) OF SEQUENCE { | 1 entry | | |
| reportConfigId[1] | IdReportConfig-A6 | | |
| reportConfig[1] CHOICE { | | | |
| ReportConfigNR | ReportConfigNR | TS 38.508-1 [4]
table 4.6.3-142
condition
EVENT_A6 | |
| } | | | |
| } | | | |
| measIdToAddModList SEQUENCE (SIZE (1..maxMeasId)) OF SEQUENCE { | 1 entry | | |
| measId[1] | 1 | | |
| measObjectId[1] | IdMeasObject-NRf5 | | |
| reportConfigId[1] | IdReportConfig-A6 | | |
| } | | | |
| } | | | |

8.2.5 Reconfiguration Failure / Radio link failure

8.2.5.1 Radio link failure / PSCell addition failure

8.2.5.1.1 Radio link failure / Random access problem / EN-DC

8.2.5.1.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG }

ensure that {

when { UE receives an IP Packet to loopback on SCG DRB and the SS does not respond to the Scheduling Requests from UE }

then { UE encounters random access problem and initiates the NR SCG failure information procedure to report SCGFailureInformationNR with failure type randomAccessProblem }

}

8.2.5.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.6.13a.3, TS 38.331, clauses 5.3.10.3, 5.7.3.2, 5.7.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.6.13a.3]

The UE shall set the contents of the *SCGFailureInformationNR* message as follows:

1> include *failureType* within *failureReportSCG-NR* and set it to indicate the SCG failure in accordance with TS 38.331 [82], clause 5.7.3.3;

...

The UE shall submit the *SCGFailureInformationNR* message to lower layers for transmission.

[TS 38.331, clause 5.3.10.3]

The UE shall:

...

1> upon random access problem indication from SCG MAC; or

...

3> consider radio link failure to be detected for the SCG i.e. SCG-RLF;

3> initiate the SCG failure information procedure as specified in 5.7.3 to report SCG radio link failure.

[TS 38.331, clause 5.7.3.2]

A UE initiates the procedure to report SCG failures when SCG transmission is not suspended and when one of the following conditions is met:

...

1> upon SCG configuration failure, in accordance with subclause 5.3.5.8.2;

...

Upon initiating the procedure, the UE shall:

1> suspend SCG transmission for all SRBs and DRBs;

1> reset SCG-MAC;

1> stop T304, if running;

1> if the UE is operating in EN-DC:

2> initiate transmission of the *SCGFailureInformationNR* message as specified in TS 36.331 [10], clause 5.6.13a.

[TS 38.331, clause 5.7.3.3]

The UE shall set the SCG failure type as follows:

...

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide random access problem indication from SCG MAC:

2> set the *failureType* as *randomAccessProblem*;

8.2.5.1.1.3 Test description

8.2.5.1.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) and Bearers (*MCG(s) and SCG*) established and Test Loop Function (On) with UE test loop mode B according to TS 38.508-1 [4], clause 4.5.4.

8.2.5.1.1.3.2 Test procedure sequence

Table 8.2.5.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS shall not respond to the Scheduling Requests for the IP Packet transmitted at next step (Note) | - | - | - | - |
| 2 | The SS transmits one IP Packet on SCG DRB | - | - | - | - |
| 3 | The SS shall not respond to the PRACH Preambles thereby simulating a random access problem. | - | - | - | - |
| 4 | Check: Does the UE transmit in the next 5 sec (arbitrary value) a <i>SCGFailureInformationNR</i> message with <i>failureType</i> set to ' <i>randomAccessProblem</i> '? | --> | <i>SCGFailureInformationNR</i> | 1 | P |

Note: The UE initiates random access procedure once SR number of attempts reach sr-transMax.

Table 8.2.5.1.1.3.2-2: Void

Table 8.2.5.1.1.3.2-3: Void

8.2.5.1.1.3.3 Specific message contents

Table 8.2.5.1.1.3.3-1: Void

Table 8.2.5.1.1.3.3-2: Void

Table 8.2.5.1.1.3.3-3: Void

Table 8.2.5.1.1.3.3-4: Void

Table 8.2.5.1.1.3.3-5: *SCGFailureInformationNR* (step 4, Table 8.2.5.1.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-18AA | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SCGFailureInformationNR-r15 ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |

| | | | |
|--|---------------------|--|--|
| c1 CHOICE { | | | |
| scgFailureInformationNR-r15 SEQUENCE { | | | |
| failureReportSCG-NR-r15 SEQUENCE { | | | |
| failureType-r15 | randomAccessProblem | | |
| measResultFreqListNR-r15 | Not checked | | |
| measResultSCG-r15 | Not checked | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.5.2 Radio link failure / PSCell out of sync indication

8.2.5.2.1 Radio link failure / PSCell out of sync indication / EN-DC

8.2.5.2.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG DRB established }

ensure that {

when { UE receives N310 consecutive "out-of-sync" indications for the SpCell from lower layers due to radio link failure }

then { UE starts timer T310 for the corresponding SpCell, **and**, upon timer expiry initiates the NR SCG failure information procedure to report SCGFailureInformationNR with failure type set to 't310-Expiry' }

}

8.2.5.2.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 36.331, clause 5.6.13a.3, TS 38.331, clauses 5.3.10.1, 5.3.10.3, 5.7.3.2, 5.7.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.6.13a.3]

The UE shall set the contents of the *SCGFailureInformationNR* message as follows:

1> include *failureType* within *failureReportSCG-NR* and set it to indicate the SCG failure in accordance with TS 38.331 [82, 5.7.3.3];

...

The UE shall submit the *SCGFailureInformationNR* message to lower layers for transmission.

[TS 38.331, clause 5.3.10.1]

The UE shall:

1> upon receiving N310 consecutive "out-of-sync" indications for the SpCell from lower layers while T311 is not running;

2> start timer T310 for the corresponding SpCell.

[TS 38.331, clause 5.3.10.3]

The UE shall:

1> upon T310 expiry in PSCell; or

...

2> initiate the SCG failure information procedure as specified in 5.7.3 to report SCG radio link failure.

[TS 38.331, clause 5.7.3.2]

A UE initiates the procedure to report SCG failures when SCG transmission is not suspended and when one of the following conditions is met:

1> upon detecting radio link failure for the SCG, in accordance with subclause 5.3.10.3;

...

Upon initiating the procedure, the UE shall:

1> suspend SCG transmission for all SRBs and DRBs;

1> reset SCG-MAC;

1> stop T304, if running;

1> if the UE is operating in EN-DC:

2> initiate transmission of the *SCGFailureInformationNR* message as specified in TS 36.331 [10, 5.6.13a].

[TS 38.331, clause 5.7.3.3]

The UE shall set the SCG failure type as follows:

1> if the UE initiates transmission of the *SCGFailureInformationNR* message due to T310 expiry:

2> set the failureType as t310-Expiry;

8.2.5.2.1.3 Test description

8.2.5.2.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC) and DC Bearers (MCG(s) and SCG) on E-UTRA Cell 1 according to TS 38.508-1 [4], clause 4.5.4.

8.2.5.2.1.3.2 Test procedure sequence

Table 8.2.5.2.1.3.3-0A: *RRCReconfiguration* (Preamble)

| Derivation path: 38.508-1 [4], Table 4.6.1-13 | | | |
|---|-----------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | OCTET STRING | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.5.2.1.3.3-0B: *CellGroupConfig* (Table 8.2.5.2.1.3.3-0A: *RRCReconfiguration*)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-19 | | | |
|---|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| CellGroupConfig ::= SEQUENCE { | | | |
| spCellConfig SEQUENCE { | | | |
| spCellConfigDedicated | ServingCellConfig | | |
| } | | | |
| } | | | |

Table 8.2.5.2.1.3.3-0E: *RadioLinkMonitoringConfig* (Table 8.2.5.2.1.3.3-0D: *BWP-DownlinkDedicated*)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-133 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioLinkMonitoringConfig ::= SEQUENCE { | | | |
| failureDetectionResourcesToAddModList
SEQUENCE
(SIZE(1..maxNrofFailureDetectionResources)) OF
SEQUENCE { | 1 entry | | |
| radioLinkMonitoringRS-Id[1] | 0 | | |
| purpose[1] | rlf | | |
| detectionResource[1] CHOICE { | | | |
| ssb-Index | 1 | | |
| } | | | |
| } | | | |

| | | | |
|--|-------------|--|--|
| failureDetectionResourcesToReleaseList | Not present | | |
| beamFailureInstanceMaxCount | Not present | | |
| beamFailureDetectionTimer | Not present | | |
| } | | | |

Table 8.2.5.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS changes NR Cell 1 parameter to non-suitable "Off" in order to simulate radio link failure. | - | - | - | - |
| 2 | Void. | - | - | - | - |
| 3 | Check: Does the UE transmit in the next 5 sec (NOTE 1) a <i>SCGFailureInformationNR</i> message with <i>failureType</i> set to 't310-Expiry'? | --> | <i>SCGFailureInformationNR</i> | 1 | P |

NOTE 1: The time of 5 sec is chosen arbitrary. When the UE will send the Failure report depends on (1) the values pre-set for N310 and T310 (see TS 38.508-1 [4], *RLF-TimersAndConstants* - set at the moment to 'n1' and 'ms1000' respectively), and, (2) the time it will take for the SS to complete step 1 and the UE to notice the change and perform internally all relevant to it actions. Because of the uncertainties associated with (2), and, the lower values used in typical network setting for (1), testing if the UE obeys the exact values of (1) is unreliable.

Table 8.2.5.2.1.3.3-3: *ServingCellConfig* (Table 8.2.5.2.1.3.3-0B: *CellGroupConfig*)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-167 | | | |
|---|-----------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>ServingCellConfig</i> ::= SEQUENCE { | | | |
| initialDownlinkBWP | BWP-DownlinkDedicated | | |
| } | | | |

Table 8.2.5.2.1.3.3-4: *BWP-DownlinkDedicated* (Table 8.2.5.2.1.3.3-0C: *ServingCellConfig*)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-11 | | | |
|--|---------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>BWP-DownlinkDedicated</i> ::= SEQUENCE { | | | |
| radioLinkMonitoringConfig | RadioLinkMonitoringConfig | | |
| } | | | |

8.2.5.2.1.3.3 Specific message contents

Table 8.2.5.2.1.3.3-1: *SCGFailureInformationNR* (step 3, Table 8.2.5.2.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-18AA | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SCGFailureInformationNR-r15 ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| scgFailureInformationNR-r15 SEQUENCE { | | | |
| failureReportSCG-NR-r15 SEQUENCE { | | | |
| failureType-r15 | t310-Expiry | | |
| measResultFreqListNR-r15 | Not checked | | |
| measResultSCG-r15 | Not present | | |
| } | | | |
| nonCriticalExtension SEQUENCE { } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.5.3 Radio link failure / rlc-MaxNumRetx failure

8.2.5.3.1 Radio link failure / rlc-MaxNumRetx failure / EN-DC

8.2.5.3.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC MCG(s) (E-UTRA PDCP) and SCG DRB established }

ensure that {

when { the transmitting side of the UE's AM RLC entity for the SCG DRB has retransmitted an RLC SDU until RETX_COUNT = *maxRetxThreshold* }

then { the UE shall transmit a *SCGFailureInformationNR* message with failureType set to 'rlc-MaxNumRetx' }

 }

8.2.5.3.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 38.322, clause 5.3.2, TS 36.331, clause 5.6.13a.3, TS 38.331, clauses 5.3.10.3, 5.7.3.2, 5.7.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 38.322, clause 5.3.2]

When an RLC SDU or an RLC SDU segment is considered for retransmission, the transmitting side of the AM RLC entity shall:

- if the RLC SDU or RLC SDU segment is considered for retransmission for the first time:
- set the RETX_COUNT associated with the RLC SDU to zero.
- else, if it (the RLC SDU or the RLC SDU segment that is considered for retransmission) is not pending for retransmission already and the RETX_COUNT associated with the RLC SDU has not been incremented due to another negative acknowledgment in the same STATUS PDU:
- increment the RETX_COUNT.
 - if RETX_COUNT = *maxRetxThreshold*:
 - indicate to upper layers that max retransmission has been reached.

...

[TS 36.331, clause 5.6.13a.3]

The UE shall set the contents of the *SCGFailureInformationNR* message as follows:

1> include *failureType* within *failureReportSCG-NR* and set it to indicate the SCG failure in accordance with TS 38.331 [82] clause 5.7.3.3;

...

The UE shall submit the *SCGFailureInformationNR* message to lower layers for transmission.

[TS 38.331, clause 5.3.10.3]

The UE shall:

...

- 1> upon indication from SCG RLC that the maximum number of retransmissions has been reached;
- 2> if CA duplication is configured and activated; and for the corresponding logical channel *allowedServingCells* only includes SCell(s):
 - 3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.
- 2> else:
 - 3> consider radio link failure to be detected for the SCG i.e. SCG-RLF;
 - 3> initiate the SCG failure information procedure as specified in 5.7.3 to report SCG radio link failure.

...

else3> consider radio link failure to be detected for the SCG i.e. SCG-RLF;

3[TS 38.331, clause 5.7.3.2]

A UE initiates the procedure to report SCG failures when SCG transmission is not suspended and when one of the following conditions is met:

- 1> upon detecting radio link failure for the SCG, in accordance with subclause 5.3.10.3;

...

Upon initiating the procedure, the UE shall:

- 1> suspend SCG transmission for all SRBs and DRBs;

1> reset SCG-MAC;

1> stop T304, if running;

1> if the UE is operating in EN-DC:

2> initiate transmission of the *SCGFailureInformationNR* message as specified in TS 36.331 [10], clause 5.6.13a.

Editor's Note: The section for transmission of *SCGFailureInformation* in NR RRC entity for SA is FFS_Standalone.

[TS 38.331, clause 5.7.3.3]

Editor's Note: FFS / TODO: Either use this section also for NR-DC or change section title (add "for EN-DC").

The UE shall set the SCG failure type as follows:

...

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide indication from SCG RLC that the maximum number of retransmissions has been reached:

2> set the failureType as rlc-MaxNumRetx;

8.2.5.3.1.3 Test description

8.2.5.3.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*), Bearers (*MCG(s) and SCG*) established and Test Loop Function (*On*) with UE test loop mode A (message condition UE TEST LOOP MODE A to return one UL PDCP SDU per DL PDCP SDU) according to TS 38.508-1 [4] the exception that ciphering algorithm 'nea0 (NULL)' is configured.

- The RLC Acknowledged Mode is enabled

8.2.5.3.1.3.2 Test procedure sequence

Table 8.2.5.3.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits AMD PDU#1 containing a complete RLC SDU#1 (on the SCG bearer). | <-- | AMD PDU#1 | - | - |
| 1A | Void | - | - | - | - |
| 1B | The UE transmits one AMD PDU#1 containing a complete RLC SDU#1 (on the SCG bearer). | --> | AMD PDU#1 (SN=0) | - | - |
| - | EXCEPTION: Steps 1C-3 are repeated maxRetxThreshold times | - | - | - | - |

| | | | | | |
|----|---|-----|--------------------------------|---|---|
| | NOTE: maxRetxThreshold is configured by RLC-Config. | | | | |
| 1C | The SS transmits an RLC STATUS PDU. ACK_SN =1 and NACK_SN =0. | <-- | STATUS PDU | - | - |
| 2 | Void | - | - | - | - |
| 3 | The UE transmits one AMD PDU#1 containing a complete RLC SDU#1 (on the SCG bearer). | --> | AMD PDU#1 (SN=0) | - | - |
| 3A | The SS transmits an RLC STATUS PDU. ACK_SN =1 and NACK_SN =0. | <-- | STATUS PDU | - | - |
| 4 | Check: Does the UE transmit in the next 5 sec (arbitrary value) a <i>SCGFailureInformationNR</i> message with <i>failureType</i> set to 'rlc-MaxNumRetx'? | --> | <i>SCGFailureInformationNR</i> | 1 | P |

8.2.5.3.1.3.3 Specific message contents

Table 8.2.5.3.1.3.3-1: *SCGFailureInformationNR* (step 4, Table 8.2.5.3.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-18AA | | | |
|---|----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SCGFailureInformationNR-r15 ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| scgFailureInformationNR-r15 SEQUENCE { | | | |
| failureReportSCG-NR-r15 SEQUENCE { | | | |
| failureType-r15 | rlc-MaxNumRetx | | |
| measResultFreqListNR-r15 | Not checked | | |
| measResultSCG-r15 | Not checked | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.5.4 Reconfiguration failure / SCG change failure

8.2.5.4.1 Reconfiguration failure / SCG change failure / EN-DC

8.2.5.4.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) and SCG DRB established }

ensure that {

when { UE receives an RRCConnectionReconfiguration message with nr-Config IE containing NR RRCReconfiguration message with reconfigurationWithSync for configured PSCell and if T304 of a secondary cell group expires }

then { UE initiates the NR SCG failure information procedure to report SCGFailureInformationNR with failure type set to 'synchReconfigFailure-SCG' }

}

8.2.5.4.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 36.331, clause 5.6.13a.3, TS 38.331, clauses 5.3.5.3, 5.3.5.5.1, 5.3.5.5.2, 5.3.5.8.3, 5.7.3.2 and 5.7.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.6.13a.3]

The UE shall set the contents of the *SCGFailureInformationNR* message as follows:

1> include *failureType* within *failureReportSCG-NR* and set it to indicate the SCG failure in accordance with TS 38.331 [82, 5.7.3.3];

...

The UE shall submit the *SCGFailureInformationNR* message to lower layers for transmission.

[TS 38.331, clause 5.3.5.3]

The UE shall perform the following actions upon reception of the *RRCReconfiguration*:

1> if the *RRCReconfiguration* includes the *secondaryCellGroup*:

2> perform the cell group configuration for the SCG according to 5.3.5.5;

...

1> if the UE is configured with E-UTRA *nr-SecondaryCellGroupConfig* (MCG is E-UTRA):

2> if *RRCReconfiguration* was received via SRB1:

3> construct *RRCReconfigurationComplete* message and submit it via the EUTRA MCG embedded in E-UTRA RRC message *RRCConnectionReconfigurationComplete* as specified in TS 36.331 [10];

3> if *reconfigurationWithSync* was included in *spCellConfig* of an SCG:

4> initiate the random access procedure on the SpCell, as specified in TS 38.321 [3];

...

[TS 38.331, clause 5.3.5.5.1]

The network configures the UE with Master Cell Group (MCG), and zero or one Secondary Cell Group (SCG). For EN-DC, the MCG is configured as specified in TS 36.331 [10]. The network provides the configuration parameters for a cell group in the *CellGroupConfig* IE.

The UE performs the following actions based on a received *CellGroupConfig* IE:

1> if the *CellGroupConfig* contains the *spCellConfig* with *reconfigurationWithSync*:

2> perform Reconfiguration with sync according to 5.3.5.5.2;

[TS 38.331, clause 5.3.5.5.2]

The UE shall perform the following actions to execute a reconfiguration with sync.

1> stop timer T310 for the corresponding SpCell, if running;

1> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;

[TS 38.331, clause 5.3.5.8.3]

The UE shall:

1> else if T304 of a secondary cell group expires:

2> release dedicated preambles provided in *rach-ConfigDedicated*, if configured;

2> initiate the SCG failure information procedure as specified in subclause 5.7.3 to report SCG reconfiguration with sync failure, upon which the RRC reconfiguration procedure ends.

[TS 38.331, clause 5.7.3.2]

A UE initiates the procedure to report SCG failures when SCG transmission is not suspended and when one of the following conditions is met:

...

1> upon reconfiguration with sync failure of the SCG, in accordance with subclause 5.3.5.8.3;

...

Upon initiating the procedure, the UE shall:

1> suspend SCG transmission for all SRBs and DRBs;

1> reset SCG-MAC;

1> stop T304, if running;

1> if the UE is operating in EN-DC:

2> initiate transmission of the *SCGFailureInformationNR* message as specified in TS 36.331 [10], clause 5.6.13a.

[TS 38.331, clause 5.7.3.3]

The UE shall set the SCG failure type as follows:

...

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide reconfiguration with sync failure information for an SCG:

2> set the failureType as *synchReconfigFailure-SCG*;

8.2.5.4.1.3 Test description

8.2.5.4.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (EN-DC) and DC Bearers (MCG(s) and SCG) on E-UTRA Cell 1 according to TS 38.508-1 [4], clause 4.5.4.

8.2.5.4.1.3.2 Test procedure sequence

Table 8.2.5.4.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U – S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to perform SCG change with <i>reconfigurationWithSync</i> with the same PSCell. | <-- | <i>RRCConnectionReconfiguration (RRCReconfiguration)</i> | - | - |
| - | EXCEPTION: In parallel to the event described in step 2 the event described in Table 8.2.5.4.1.3.2-2 takes place. | - | - | - | - |
| 2 | Wait for <i>t304</i> ms to ensure that <i>T304</i> expires (the value is defined in <i>CellGroupConfig</i>).

NOTE: SS does not respond to the UE transmitted RACH preambles on NR Cell 1 | - | - | - | - |
| 3 | Check: Does the UE transmit on PCell (E-UTRA Cell 1) in the next 5 sec (arbitrary value) a <i>SCGFailureInformationNR</i> message with <i>failureType</i> set to ' <i>synchReconfigFailure-SCG</i> '? | --> | <i>SCGFailureInformationNR</i> | 1 | P |

Table 8.2.5.4.1.3.2-2: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message containing NR <i>RRCReconfigurationComplete</i> message on E-UTRA Cell 1. | --> | <i>RRCConnectionReconfigurationComplete (RRCReconfigurationComplete)</i> | - | - |

8.2.5.4.1.3.3 Specific message contents

Table 8.2.5.4.1.3.3-1: *RRCCONNECTIONRECONFIGURATION* (step 1, Table 8.2.5.4.1.3.2-1)

| |
|---|
| Derivation Path: 36.508 [7], Table 4.6.1-8, with condition EN-DC_EmbedNR_RRCRecon |
|---|

Table 8.2.5.4.1.3.3-1A: *RRCRECONFIGURATION* (Table 8.2.5.4.1.3.3-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-13 with condition EN-DC | | | |
|--|-----------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>RRCCONNECTIONRECONFIGURATION</i> ::= SEQUENCE { | | | |
| <i>rrc-TransactionIdentifier</i> | | | |
| criticalExtensions CHOICE { | | | |
| <i>rrcReconfiguration</i> ::= SEQUENCE { | | | |
| secondaryCellGroup | CellGroupConfig | | EN-DC |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.5.4.1.3.3-1B: *CELLGROUPCONFIG* (Table 8.2.5.4.1.3.3-1A)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-19 with condition EN-DC | | | |
|---|-------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>CELLGROUPCONFIG</i> ::= SEQUENCE { | | | |
| <i>spCellConfig</i> ::= SEQUENCE { | | | |
| reconfigurationWithSync ::= SEQUENCE { | | | |
| <i>spCellConfigCommon</i> | ServingCellConfigCommon | | |
| } | | | |
| } | | | |
| } | | | |

Table 8.2.5.4.1.3.3-1C: *SERVINGCELLCONFIGCOMMON* (Table 8.2.5.4.1.3.3-1B)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-168 | | | |
|--|------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| <i>SERVINGCELLCONFIGCOMMON</i> ::= SEQUENCE { | | | |
| uplinkConfigCommon SEQUENCE { | | | |
| initialUplinkBWP | BWP-UplinkCommon | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 8.2.5.4.1.3.3-1D: BWP-UplinkCommon (Table 8.2.5.4.1.3.3-1C)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-14 | | | |
|--|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| BWP-UplinkCommon ::= SEQUENCE { | | | |
| rach-ConfigCommon CHOICE { | | | |
| setup | RACH-ConfigCommon | | |
| } | | | |
| } | | | |

Table 8.2.5.4.1.3.3-1E: RACH-ConfigCommon (Table 8.2.5.4.1.3.3-1D)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-128 | | | |
|--|--------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigCommon ::= SEQUENCE { | | | |
| rach-ConfigGeneric | RACH-ConfigGeneric | | |
| } | | | |

Table 8.2.5.4.1.3.3-1F: RACH-ConfigGeneric (Table 8.2.5.4.1.3.3-1E)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-130 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RACH-ConfigGeneric ::= SEQUENCE { | | | |
| preambleTransMax | n200 | | |
| } | | | |

Table 8.2.5.4.1.3.3-2: SCGFailureInformationNR (step 3, Table 8.2.5.4.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.6.1-18AA | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SCGFailureInformationNR-r15 ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| scgFailureInformationNR-r15 SEQUENCE { | | | |
| failureReportSCG-NR-r15 SEQUENCE { | | | |

| | | | |
|----------------------------------|--------------------------|--|--|
| failureType-r15 | synchReconfigFailure-SCG | | |
| measResultFreqListNR-r15 | Not checked | | |
| measResultSCG-r15 | Not checked | | |
| } | | | |
| nonCriticalExtension SEQUENCE {} | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

8.2.5.5 Reconfiguration failure / SCG Reconfiguration failure / SRB3

Note: Core specs requirements cannot be simulated and verified as conformance test.

8.2.5.5.1 Void

8.2.5.6 Reconfiguration failure / SCG Reconfiguration failure / SRB1

Note: Core specs requirements cannot be simulated and verified as conformance test.

8.2.5.6.1 Void

8.2.6

8.2.6.1

8.2.6.2 Processing delay

8.2.6.2.1 Processing delay / PSCell addition / SCG DRB / Success / Latency check / EN-DC

8.2.6.2.1.1 Test Purpose (TP)

(1)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only }

ensure that {

when { UE receives an RRCConnectionReconfiguration message to add PSCell with SCG DRB and after 20 subframes receives an UL grant }

then { UE successfully configures the PSCell with SCG DRB and sends an RRCConnectionReconfigurationComplete message }

}

(2)

with { UE in RRC_CONNECTED state with EN-DC, and, MCG(s) (E-UTRA PDCP) only }

ensure that {

when { UE receives an UECapabilityEnquiry message requesting eutra-nr capabilities and after 80 subframes receives an UL grant }

then { UE successfully transmits an UECapabilityInformation message }

 }

8.2.6.2.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 36.331, clauses 5.3.5.3, , TS 38.331, clauses 5.3.10.3, 5.7.3.2, 5.7.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, clause 5.3.5.3]

If the *RRCCONNECTIONRECONFIGURATION* message does not include the *mobilityControlInfo* and the UE is able to comply with the configuration included in this message, the UE shall:

...

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-SecondaryCellGroupConfig*:

2> perform NR RRC Reconfiguration as specified in TS 38.331 [82], clause 5.3.5.3;

1> if the received *RRCCONNECTIONRECONFIGURATION* includes the *nr-RadioBearerConfig1*:

2> perform radio bearer configuration as specified in TS 38.331 [82], clause 5.3.5.6;

...

1> set the content of *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message as follows:

...

2> if the received *RRCCONNECTIONRECONFIGURATION* message included *nr-SecondaryCellGroupConfig*:

3> include *scg-ConfigResponseNR* in accordance with TS 38.331 [82], clause 5.3.5.3;

...

1> else:

2> submit the *RRCCONNECTIONRECONFIGURATIONCOMPLETE* message to lower layers for transmission using the new configuration, upon which the procedure ends;

[TS 36.331, clause 5.6.3.3]

The UE shall:

...

1> else, set the contents of *UECAPABILITYINFORMATION* message as follows:

...

2> if the *ue-CapabilityRequest* includes *eutra-nr* and if the UE supports (NG)EN-DC or NE-DC:

3> include the UE radio access capabilities for EUTRA-NR within a *ue-CapabilityRAT-Container*, with the *rat-Type* set to *eutra-nr*;

3> include band combinations as specified in TS 38.331 [82], clause 5.6.1.4, considering the included *requestedFreqBandsNR-MRDC*, *requestedCapabilityNR* (if present) and *requestedCapabilityCommon* (if included);

1> submit the *UECapabilityInformation* message to lower layers for transmission, upon which the procedure ends;

[TS 36.331, clause 11.2]

The UE performance requirements for RRC procedures are specified in the following tables, by means of a value N:

N = the number of 1ms subframes from the end of reception of the E-UTRAN -> UE message on the UE physical layer up to when the UE shall be ready for the reception of uplink grant for the UE -> E-UTRAN response message with no access delay other than the TTI-alignment (e.g. excluding delays caused by scheduling, the random access procedure or physical layer synchronisation).

NOTE: No processing delay requirements are specified for RN-specific procedures.

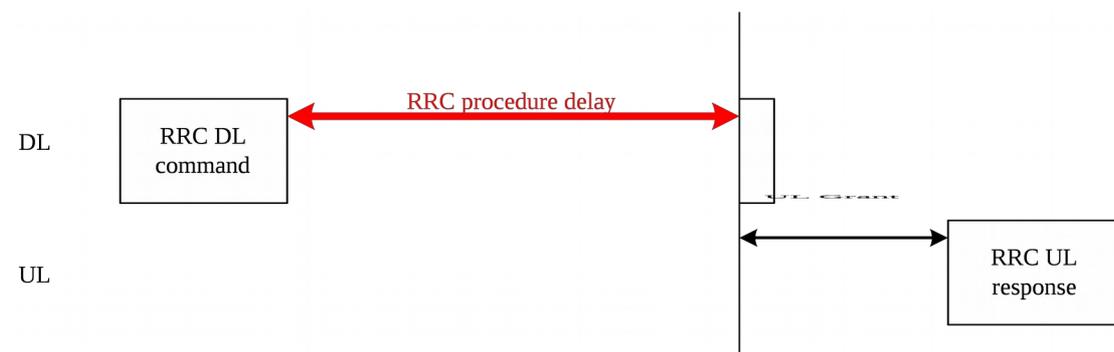


Figure 11.2-1: Illustration of RRC procedure delay

Table 11.2-1: UE performance requirements for RRC procedures for UEs other than NB-IoT UEs

| Procedure title: | E-UTRAN -> UE | UE -> E-UTRAN | N | Notes |
|---|-------------------------------------|---|--------|---|
| RRC Connection Control Procedures | | | | |
| RRC connection reconfiguration (NR SCG establishment/ modification/release) | <i>RRCConnectionReconfiguration</i> | <i>RRCConnectionReconfigurationComplete</i> | 20 | |
| Other procedures | | | | |
| UE capability transfer | <i>UECapabilityEnquiry</i> | <i>UECapabilityInformation</i> | 10/ 80 | N = 80 applies in case the UE has to report at least one of the following UE capabilities. <ul style="list-style-type: none"> - MR-DC band combinations. - NR band combinations - EUTRA feature sets |

8.2.6.2.1.3 Test description

8.2.6.2.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- The UE is in state RRC_CONNECTED using generic procedure parameter Connectivity (*EN-DC*) and Bearers (*MCG(s) only*) established and Test Loop Function (On) with UE test loop mode B according to TS 38.508-1 [4], clause 4.5.4.

8.2.6.2.1.3.2 Test procedure sequence

Table 8.2.6.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits an <i>RRCConnectionReconfiguration</i> message to add PSCell with SCG DRB | <-- | E-UTRA RRC:
<i>RRCConnectionReconfiguration</i> | - | - |
| 2 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message within 25 (FDD)/28 (TDD) subframes after successful completion of step 1? (Note 2) | --> | E-UTRA RRC:
<i>RRCConnectionReconfigurationComplete</i> | 1 | P |
| 3 | The SS sends E-UTRA RRC <i>UECapabilityEnquiry</i> message including <i>RAT-Type eutra-nr</i> . | <-- | E-UTRA RRC:
<i>UECapabilityEnquiry</i> | | |
| 4 | Check: Does the UE transmit an E-UTRA RRC <i>UECapabilityInformation</i> message within 85 (FDD)/88 (TDD) subframes after successful completion of step 3? (Note 2) | --> | E-UTRA RRC:
<i>UECapabilityInformation</i> | 2 | P |

Note 1: The SS is configured for RRC procedure delay testing according to TS 36.523-3 clause 7.12.1.

Note 2: 5 (FDD) / 8 (TDD) subframes is added on top of RRC processing delay requirement, because UL grant is allocated for the next subframe after RRC procedure delay and because of transmission delay after UL grant. For TDD, consider the max 7 TTI transmission delay after UL grant.

8.2.6.2.1.3.3 Specific message contents

Table 8.2.6.2.1.3.3-1: *RRCConnectionReconfiguration* (step 1, Table 8.2.6.2.1.3.2-1)

Derivation Path: TS 36.508 [7], Table 4.6.1-8 with Condition SCG-DRB(1,1)

Table 8.2.6.2.1.3.3-2: *UECapabilityEnquiry* (step 3, Table 8.2.6.2.1.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.6.1-22 with Condition EN-DC | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| UECapabilityEnquiry ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| ueCapabilityEnquiry-r8 SEQUENCE { | | | |
| ue-CapabilityRequest SEQUENCE (SIZE (1..maxRAT-Capabilities)) OF RAT-Type { | 1 entry | | |
| RAT-Type[1] | eutra-nr | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

9 Mobility management

Editor's note: Intended to capture tests of 5G Core Network behaviour defined in TS 24.301, TS 24.501 et.al.

Multi-RAT Dual Connectivity behaviour defined in TS 37.340.

Possible configurations may be handled in the following sub-structure:

- a) E-UTRA–NR DC via EPC with E-UTRA as master (also referred to EN-DC, option 3, 3a, 3x)
- b) E-UTRA–NR DC via 5GC
 - with E-UTRA as master (also referred to NGEN-DC, option 7, 7a, 7x)
 - with NR as master (also referred to NE-DC, option 4, 4A)

9.1 5GS Mobility Management

9.1.1 Primary authentication and key agreement

9.1.1.1 EAP based primary authentication and key agreement / EAP-AKA' related procedures

9.1.1.1.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends an EAP-Request/AKA'-Identity message within AUTHENTICATION REQUEST }

then { the UE sends an EAP-Response/AKA'-Identity message within AUTHENTICATION RESPONSE }

}

(2)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends the EAP-request/AKA'-challenge message within AUTHENTICATION REQUEST with the sequence number in AUTN is not correct }

then { the UE sends an EAP-response/AKA'-synchronization-failure message within AUTHENTICATION RESPONSE }

}

(3)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends an EAP-request/AKA'-challenge message within AUTHENTICATION REQUEST }

then { the UE sends an EAP-response/AKA'-challenge message within AUTHENTICATION RESPONSE }

}

(4)

with { the UE in 5GMM-REGISTERED-INITIATED state and SS initiates an EAP based primary authentication and key agreement procedure }

ensure that {

when { the SS sends an EAP-success message within AUTHENTICATION RESULT }

then { the UE considers the procedure complete and authentication procedure succeed }

}

9.1.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 clauses 5.4.1.2.2.3, 5.4.1.2.2.4, 5.4.1.2.2.6B, 5.4.1.2.2.8.

[TS 24.501, clause 5.4.1.2.2.6B (TP1)]

Upon receipt of the AUTHENTICATION REQUEST message with EAP-Request/Identity message the UE shall send an AUTHENTICATION RESPONSE message with EAP-Response/Identity to the network. In the EAP-Response/Identity message, the UE shall provide the requested identity according to 3GPP TS 33.501 [24] annex F.2, in the UE identity in the EAP-Response/Identity message as specified in IETF RFC 5448 [40].

Upon receipt of the AUTHENTICATION REQUEST message with EAP-Request/AKA'-Identity message the UE shall send an AUTHENTICATION RESPONSE message with EAP-Response/AKA'-Identity to the network. Based on the attribute received in the EAP-Request/AKA'-Identity, the UE shall provide the requested identity according to 3GPP TS 33.501 [24] annex F.2, in the EAP-Response/AKA'-Identity message, as specified in IETF RFC 5448 [40].

If the EAP-Request/AKA'-Identity carries the AT_PERMANENT_REQ, the UE shall respond with EAP-Response/AKA'-Client-Error with the error code "unable to process packet".

[TS 24.501, clause 5.4.1.2.2.4 (TP2)]

If a USIM is present, the SNN check fails or the UE does not accept AUTN during handling of the EAP-request/AKA'-challenge message as specified in IETF RFC 5448 [40], the UE shall send an EAP-response/AKA'-authentication-reject message as specified in IETF RFC 5448 [40].

If a USIM is present, the SNN check is successful but the UE detects that the sequence number in AUTN is not correct during handling of the EAP-request/AKA'-challenge message as specified in IETF RFC 5448 [40], the UE shall send an EAP-response/AKA'-synchronization-failure message as specified in IETF RFC 5448 [40].

If a USIM is present, the SNN check is successful, the sequence number in AUTN is correct and the UE detects another error during handling of the EAP-request/AKA'-challenge message as specified in IETF RFC 5448 [40], the UE shall send an EAP-response/AKA'-client-error message as specified in IETF RFC 5448 [40].

If a USIM is not present, the UE shall send an EAP-response/AKA'-client-error message as specified in IETF RFC 5448 [40].

For any of the above, the UE shall start timer T3520 when the AUTHENTICATION RESPONSE message containing the EAP-response message is sent. Furthermore, the UE shall stop any of the retransmission timers that are running (e.g. T3510, T3517 or T3521). Upon receiving an AUTHENTICATION REQUEST message with the EAP message IE containing an EAP-request/AKA'-challenge from the network, the UE shall stop timer T3520, if running, and then process the EAP-request/AKA'-challenge information as normal.

[TS 24.501, clause 5.4.1.2.2.3 (TP3)]

If a USIM is present and the SNN check is successful, the UE shall handle the EAP-request/AKA'-challenge message as specified in IETF RFC 5448 [40]. The USIM shall derive CK and IK and compute the authentication response (RES) using the 5G authentication challenge data received from the ME, and pass RES to the ME. The ME shall derive CK' and IK' from CK and IK, and EMSK from CK' and IK'. Furthermore, the ME may generate K_{AUSF} from the EMSK, the K_{SEAF} from the K_{AUSF} , and the K_{AMF} from the ABBA received together with the EAP-request/AKA'-challenge message, and the K_{SEAF} as described in 3GPP TS 33.501 [24], and create a partial native 5G NAS security context identified by the ngKSI value received together with the EAP-request/AKA'-challenge message in subclause 5.4.1.2.4.2 in the volatile memory of the ME. If the K_{AMF} and the partial native 5G NAS security context are created, the ME shall store the K_{AMF} in the created partial native 5G NAS security context, and shall send an EAP-response/AKA'-challenge message as specified in IETF RFC 5448 [40].

If the EAP-request/AKA'-challenge message contains AT_RESULT_IND attribute, the UE may include AT_RESULT_IND attribute in the EAP-response/AKA'-challenge message as specified in IETF RFC 5448 [40].

[TS 24.501, clause 5.4.1.2.2.8 (TP4)]

Upon receiving an EAP-success message, if the ME has not generated a partial native 5G NAS security context as described in subclause 5.4.1.2.2.3, the ME shall:

- a) generate the K_{AUSF} from the EMSK, the K_{SEAF} from the K_{AUSF} , and the K_{AMF} from the ABBA that was received with the EAP-success message, and the K_{SEAF} as described in 3GPP TS 33.501 [24];
- b) create a partial native 5G NAS security context identified by the ngKSI value in the volatile memory of the ME; and
- c) store the K_{AMF} in the created partial native 5G NAS security context.

The UE shall consider the procedure complete.

9.1.1.1.3 Test description

9.1.1.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A is configured according to table 6.3.2.2-1 in TS 38.508-1 [4].

UE:

- None

Preamble:

- The UE is in state Switched OFF Mode (state 0N-B) according to TS 38.508-1 [4].

9.1.1.1.3.2 Test procedure sequence

Table 9.1.1.1.3.2-1: Main behaviour

| | Procedure | Message Sequence | | TP | Verdict |
|-------|---|------------------|-------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-4 | The UE establishes RRC connection and initiates registration procedure by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 [4]. | - | - | - | - |
| 5 | SS transmits an AUTHENTICATION REQUEST message with an EAP-Request/AKA'-Identity message. | <-- | 5GMM: AUTHENTICATION REQUEST | | |
| 6 | Check: Does the UE respond with an AUTHENTICATION RESPONSE message, with an EAP-Response/AKA'-Identity message? | --> | 5GMM: AUTHENTICATION RESPONSE | 1 | P |
| 7 | SS transmits an AUTHENTICATION REQUEST message with an EAP-Request/AKA'-challenge message which contains a not correct sequence number. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 8 | Check: Does the UE respond with an AUTHENTICATION RESPONSE message, with an EAP-Response/AKA'-synchronization-failure? | --> | 5GMM: AUTHENTICATION RESPONSE | 2 | P |
| 9 | SS transmits a correct AUTHENTICATION REQUEST message with an EAP-Request/AKA'-challenge message. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 10 | Check: Does the UE respond with a correct AUTHENTICATION RESPONSE message, with an EAP-Response/AKA'-challenge message? | --> | 5GMM: AUTHENTICATION RESPONSE | 3 | P |
| 11 | SS transmits an AUTHENTICATION RESULT message with an EAP-success message. | <-- | 5GMM: AUTHENTICATION RESULT | - | - |
| 12-18 | The registration procedure is performed by executing steps 8-14 of Table 4.5.2.2-2 in TS 38.508-1 [4]. | - | - | - | - |
| 19 | Check: Does the UE transmits a REGISTRATION COMPLETE message? | --> | 5GMM: REGISTRATION COMPLETE | 4 | P |

9.1.1.1.3.3 Specific message contents

Table 9.1.1.1.3.3-1: Message AUTHENTICATION REQUEST (step 5, Table 9.1.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-1 | | | |
|---|---------------------------|-------------------------|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-request/AKA'-Identity | See Table 9.1.1.1.3.3-7 | EAP-AKA |

Table 9.1.1.1.3.3-2: Message AUTHENTICATION RESPONSE (step 6, Table 9.1.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-2 | | | |
|---|----------------------------|-------------------------|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-response/AKA'-Identity | See Table 9.1.1.1.3.3-8 | EAP-AKA |

Table 9.1.1.1.3.3-3: Message AUTHENTICATION REQUEST (step 7, Table 9.1.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-1 | | | |
|---|----------------------------|--|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-request/AKA'-challenge | The sequence number in AUTN is not correct | EAP-AKA |

Table 9.1.1.1.3.3-4: Message AUTHENTICATION RESPONSE (step 8, Table 9.1.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-2 | | | |
|---|---|---------|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-response/AKA'-synchronization-failure | | EAP-AKA |

Table 9.1.1.1.3.3-5: Message AUTHENTICATION RESPONSE (step 10, Table 9.1.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-2 | | | |
|---|-----------------------------|---|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-Response/AKA'-Challenge | RES* equal to the XRES* calculated in the SS with the parameters provided/indicated in the AUTHENTICATION REQUEST | EAP-AKA |

Table 9.1.1.1.3.3-6: Message AUTHENTICATION RESULT (step 11, Table 9.1.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-3 | | | |
|---|--------------|---------|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-Success | | EAP-AKA |

Table 9.1.1.1.3.3-7: Message EAP-Request/AKA'-Identity (Table 9.1.1.1.3.3-1)

| Derivation Path: IETF RFC 4187 [30] clause 9.1, RFC 3748 [32] clause 4 | | | |
|--|-----------------------------|-------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Code | 1 | Request | |
| Length | Set to length of EAP packet | | |
| Data | | | |
| AT_ANY_ID_REQ | AT_ANY_ID_REQ_Def | See Table 9.1.1.1.3.3-9 | |

Table 9.1.1.1.3.3-8: Message EAP-Response/AKA'-Identity (Table 9.1.1.1.3.3-2)

| Derivation Path: IETF RFC 4187 [30] clause 9.2, RFC 3748 [32] clause 4 | | | |
|--|-----------------------------|--------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Code | 2 | Response | |
| Length | Set to length of EAP packet | | |
| Data | | | |
| AT_IDENTITY | AT_IDENTITY_Def | See Table 9.1.1.1.3.3-10 | |

Table 9.1.1.1.3.3-9: AT_ANY_ID_REQ_Def (Table 9.1.1.1.3.3-7)

| Derivation Path: IETF RFC 4187 [30] clause 10.3 | | | |
|---|------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| AT_ANY_ID_REQ | '0000 1101'B | 13 | |
| Length | '0000 0001'B | 1 | |
| Reserved | '0000 0000 0000 0000'B | | |

Table 9.1.1.1.3.3-10: AT_IDENTITY_Def (Table 9.1.1.1.3.3-8)

| Derivation Path: IETF RFC 4187 [30] clause 10.5 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| AT_IDENTITY | '0000 1110'B | 14 | |

| | | | |
|------------------------|---|----------------|--|
| Length | Set to the Length of AT_IDENTITY attribute in 4 bytes | | |
| Actual Identity Length | Set to the actual length of 'identity' in bytes excluding any appended all zero bytes at end | | |
| Identity | Value generated according to TS 24.501 [28] clause 9.11.3.4 and shall be a multiple of 4 bytes (appended with 1,2 or 3 bytes of all zero bits when necessary) | SUCI of the UE | |

9.1.1.2 EAP based primary authentication and key agreement / Reject

9.1.1.2.1 Test Purpose (TP)

(1)

with {the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends the EAP-request/AKA'-challenge message within AUTHENTICATION REQUEST with incorrect SNN }

then { the UE sends an EAP-response/AKA'-authentication-reject message within AUTHENTICATION RESPONSE }

}

(2)

with {the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends an EAP-Request/AKA'-notification message within AUTHENTICATION REQUEST }

then { the UE sends an EAP-Response/AKA'-notification message within AUTHENTICATION RESPONSE }

}

(3)

with {the UE in 5GMM-REGISTERED-INITIATED state and SS initiates an EAP based primary authentication and key agreement procedure }

ensure that {

when { the SS sends an an EAP-failure message within AUTHENTICATION REJECT }

then { the UE deletes the stored 5G-GUTI, TAI list, last visited registered TAI and ngKSI and enter state 5GMM-DEREGISTERED, the USIM is considered invalid until switching off the UE }

}

9.1.1.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501, clauses 5.4.1.2.2.11.

[TS 24.501, clause 5.4.1.2.2.4]

If a USIM is present, the SNN check fails or the UE does not accept AUTN during handling of the EAP-request/AKA'-challenge message as specified in IETF RFC 5448 [40], the UE shall send an EAP-response/AKA'-authentication-reject message as specified in IETF RFC 5448 [40].

If a USIM is present, the SNN check is successful but the UE detects that the sequence number in AUTN is not correct during handling of the EAP-request/AKA'-challenge message as specified in IETF RFC 5448 [40], the UE shall send an EAP-response/AKA'-synchronization-failure message as specified in IETF RFC 5448 [40].

If a USIM is present, the SNN check is successful, the sequence number in AUTN is correct and the UE detects another error during handling of the EAP-request/AKA'-challenge message as specified in IETF RFC 5448 [40], the UE shall send an EAP-response/AKA'-client-error message as specified in IETF RFC 5448 [40].

If a USIM is not present, the UE shall send an EAP-response/AKA'-client-error message as specified in IETF RFC 5448 [40].

For any of the above, the UE shall start timer T3520 when the AUTHENTICATION RESPONSE message containing the EAP-response message is sent. Furthermore, the UE shall stop any of the retransmission timers that are running (e.g. T3510, T3517 or T3521). Upon receiving an AUTHENTICATION REQUEST message with the EAP message IE containing an EAP-request/AKA'-challenge from the network, the UE shall stop timer T3520, if running, and then process the EAP-request/AKA'-challenge information as normal.

[TS 24.501, clause 5.4.1.2.2.6]

Upon receiving an EAP-request/AKA'-notification message, the UE shall send an EAP-response/AKA'-notification message as specified in IETF RFC 5448 [40].

[TS 24.501, clause 5.4.1.2.2.11]

Upon receiving an EAP-failure message, the UE shall delete the partial native 5G NAS security context if any was created as described in subclause 5.4.1.2.2.3.

The UE shall consider the procedure complete.

If the EAP-failure message is received in an AUTHENTICATION REJECT message:

- the UE shall set the update status to 5U3 ROAMING NOT ALLOWED, delete the stored 5G-GUTI, TAI list, last visited registered TAI and ngKSI. The USIM shall be considered invalid until switching off the UE or the UICC containing the USIM is removed; and
- if the UE is operating in single-registration mode, the UE shall handle 4G-GUTI, last visited registered TAI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when the authentication procedure is not accepted by the network. The USIM shall be considered as invalid also for non-EPS services until switching off or the UICC containing the USIM is removed.

If the AUTHENTICATION REJECT message is received by the UE, the UE shall abort any 5GMM signalling procedure, stop any of the timers T3510, T3517 or T3521 (if they were running) and enter state 5GMM-DEREGISTERED.

9.1.1.2.3 Test description

9.1.1.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A "Serving cell" TS 38.508-1 [4] Table 6.2.2.1-3

UE:

- None

Preamble:

- The UE is in state Switched OFF (state ON-B) according to TS 38.508-1 [4].

9.1.1.2.3.2 Test procedure sequence

Table 9.1.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|--------------------------------|----|---------|
| | | U – S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-4 | The UE executes steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | - | - | - |
| 5 | The SS transmits “EAP-request/AKA'-challenge” message in AUTHENTICATION REQUEST with incorrect SNN. | | 5GMM: AUTHENTICATION REQUEST | - | - |
| 6 | Check: Does the UE transmit an “EAP-response/AKA'-authentication-reject” message in AUTHENTICATION RESPONSE? | | 5GMM: AUTHENTICATION RESPONSE | 1 | P |
| 7 | The SS transmits “EAP-request/AKA'-challenge” message in AUTHENTICATION REQUEST. | | 5GMM: AUTHENTICATION REQUEST | - | - |
| 8 | The UE transmit an “EAP-response/AKA'-challenge” message in AUTHENTICATION RESPONSE. | | 5GMM: AUTHENTICATION RESPONSE | - | - |
| 9 | The SS transmits “EAP- request /AKA'-notification“message in AUTHENTICATION REQUEST. | | 5GMM: AUTHENTICATION REQUEST | - | - |
| 10 | Check: Does the UE transmit an “EAP-response/AKA'-notification” message in AUTHENTICATION RESPONSE? | | 5GMM: AUTHENTICATION RESPONSE | 2 | P |
| 11 | The SS transmits an “EAP-failure” message within AUTHENTICATION REJECT | <-- | 5GMM: AUTHENTICATION REJECT | - | - |
| 12 | SS releases the RRC connection | - | - | - | - |
| 13 | Check: Does the UE transmit an RRCSetupRequest message for initial registration procedure within the next 30 seconds? | --> | NR RRC: <i>RRCSetupRequest</i> | 3 | F |

| | | | | | |
|----|--|-----|----------------------------|---|---|
| 14 | The UE is switched off by executing generic procedure in Table 4.9.6.4-1 in TS 38.508-1 [4]. | - | - | - | - |
| 15 | The UE is switched on. | - | - | - | - |
| 16 | Check: Does the UE transmit a REGISTRATION REQUEST message? | --> | 5GMM: REGISTRATION REQUEST | 1 | P |
| 17 | The UE executes steps 5-20a1 of Table 4.5.2.2-2 in TS38.508-1 [4] complete registration procedure. | - | - | - | - |

9.1.1.2.3.3 Specific message contents

Table 9.1.1.2.3.3-1: Message AUTHENTICATION REQUEST (step 5, Table 9.1.1.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-1 | | | |
|---|------------------------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Extended protocol discriminator | 5GMM | | |
| Security header type | '0000'B | Plain 5GS NAS message, not security protected | |
| Spare half octet | '0000'B | | |
| EAP message | "EAP-request/AKA'-challenge" | SNN in EAP message is incorrect or does not match with the PLMN identity saved in the UE. | |

Table 9.1.1.2.3.3-2: Message AUTHENTICATION RESPONSES (step 6, Table 9.1.1.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-2 | | | |
|---|--|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Extended protocol discriminator | 5GMM | | |
| Security header type | '0000'B | Plain 5GS NAS message, not security protected | |
| Spare half octet | '0000'B | | |
| EAP message | "EAP-response/AKA'-authentication-reject " | | |

Table 9.1.1.2.3.3-3: Message AUTHENTICATION RESPONSES (step 8, Table 9.1.1.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-2 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Extended protocol discriminator | 5GMM | | |

| | | | |
|----------------------|------------------------------|--|--|
| Security header type | '0000'B | Plain 5GS NAS message, not security protected | |
| Spare half octet | '0000'B | | |
| EAP message | "EAP-request/AKA'-challenge" | the AT_RESULT_IND attribute is included in the EAP-response/AKA'-challenge message | |

Table 9.1.1.2.3.3-4: Message AUTHENTICATION REQUEST (step 9, Table 9.1.1.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-1 | | | |
|---|----------------------------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Extended protocol discriminator | 5GMM | | |
| Security header type | '0000'B | Plain 5GS NAS message, not security protected | |
| Spare half octet | '0000'B | | |
| EAP message | "EAP-request /AKA'-notification" | See Table 9.1.1.2.3.3-8 | |

Table 9.1.1.2.3.3-5: Message AUTHENTICATION RESPONSE (step 10, Table 9.1.1.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-2 | | | |
|---|----------------------------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Extended protocol discriminator | 5GMM | | |
| Security header type | '0000'B | Plain 5GS NAS message, not security protected | |
| Spare half octet | '0000'B | | |
| EAP message | "EAP-response/AKA'-notification" | See Table 9.1.1.2.3.3-9 | |

Table 9.1.1.2.3.3-6: Message AUTHENTICATION REJECT (step 11, Table 9.1.1.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-5 | | | |
|---|--------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Extended protocol discriminator | 5GMM | | |
| Security header type | '0000'B | Plain 5GS NAS message, not security protected | |
| Spare half octet | '0000'B | | |

| | | | |
|-------------|-------------|-------------|--|
| EAP message | EAP-failure | EAP-failure | |
|-------------|-------------|-------------|--|

Table 9.1.1.2.3.3-7: Message REGISTRATION REQUEST (step13, Table 9.1.1.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|----------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | '0000 0010'B | Initial registration | |
| Last visited registered TAI | Not present | | |
| 5GS mobile identity | SUCI of the UE | | |

Table 9.1.1.2.3.3-8: Message EAP-Request/AKA'-Notification (Table 9.1.1.2.3.3-4)

| Derivation Path: IETF RFC 4187 [30] clause 9.10, RFC 3748 [32] clause 4 | | | |
|---|-----------------------------|--------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Code | 1 | Request | |
| Length | Set to length of EAP packet | | |
| Data | | | |
| AT_NOTIFICATION | AT_NOTIFICATION_Def | See Table 9.1.1.2.3.3-10 | |

Table 9.1.1.2.3.3-9: Message EAP-Response/AKA'-Notification (Table 9.1.1.2.3.2-5)

| Derivation Path: IETF RFC 4187 [30] clause 9.11, RFC 3748 [32] clause 4 | | | |
|---|-----------------------------|----------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Code | 2 | Response | |
| Length | Set to length of EAP packet | | |
| Data | Not present | | |

Table 9.1.1.2.3.3-10: AT_NOTIFICATION_Def (Table 9.1.1.2.3.3-8)

| Derivation Path: IETF RFC 4187 [30] clause 10.19 | | | |
|--|------------------------|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| AT_NOTIFICATION | '0000 1100'B | 12 | |
| Length | '0000 0001'B | 1 | |
| Notification Code | '0100 0000 0000 0000'B | Set to "General failure" | |

9.1.1.3 EAP based primary authentication and key agreement / EAP message transport / Abnormal

9.1.1.3.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends the EAP-request/AKA'-challenge message within AUTHENTICATION REQUEST with ngKSI is already in use }

then { the UE sends an AUTHENTICATION FAILURE message with 5GMM cause #71 "ngKSI already in use" }

}

(2)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the third time SS sends the EAP-request/AKA'-challenge message within AUTHENTICATION REQUEST with ngKSI is already in use }

then { the UE locally releases the RRC connection and treats the active cell as barred }

}

(3)

with { the UE in 5GMM-REGISTERED-INITIATED state, the SS sends the EAP-request/AKA'-challenge message within AUTHENTICATION REQUEST with ngKSI is already in use and the UE sends an AUTHENTICATION FAILURE message }

ensure that {

when { T3520 times out }

then { the UE locally releases the RRC connection and treats the active cell as barred }

}

(4)

with { the UE in 5GMM-REGISTERED state and 5GMM-IDLE mode over 3GPP access, starts SERVICE REQUEST procedure after received a paging request from the network }

ensure that {

when { the SS sends the EAP-request/AKA'-challenge message within AUTHENTICATION REQUEST and the UE fails on transmission of AUTHENTICATION RESPONSE message by entering a cell with TAI not in the TAI list }

then { the UE initiates a mobility registration update procedure }

}

(5)

with { the UE in 5GMM-REGISTERED state and initiates a mobility registration update procedure }

ensure that {

when { the SS sends the EAP-request/AKA'-challenge message within AUTHENTICATION REQUEST and the UE fails on transmission of AUTHENTICATION RESPONSE message with the indication from lower layers }

then { the UE re-initiate the mobility registration update procedure }

}

9.1.1.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 clauses 5.4.1.2.4.5.

[TS 24.501, clause 5.4.1.2.4.5 (TP1, TP2, TP3, TP4, TP5)]

The following abnormal cases can be identified:

- a) Authentication failure (5GMM cause #71 "ngKSI already in use").

The UE shall send an AUTHENTICATION FAILURE message, with 5GMM cause #71 "ngKSI already in use", to the network and start the timer T3520 (see example in figure 5.4.1.3.7.1). Furthermore, the UE shall stop any of the retransmission timers that are running (e.g. T3510, T3517 or T3521). Upon the first receipt of an AUTHENTICATION FAILURE message from the UE with 5GMM cause #71 "ngKSI already in use", the network performs necessary actions to select a new ngKSI and send the same EAP-request message to the UE.

NOTE 1: Upon receipt of an AUTHENTICATION FAILURE message from the UE with 5GMM cause #71 "ngKSI already in use", the network can also re-initiate the EAP based primary authentication and key agreement procedure (see subclause 5.4.1.2.2.2).

Upon receiving a new AUTHENTICATION REQUEST message with the EAP message IE containing an EAP-request message from the network, the UE shall stop timer T3520, if running, process the EAP-request message as normal.

If the network is validated successfully (an AUTHENTICATION REQUEST message that contains a valid ngKSI and EAP-request message is received), the UE shall send the AUTHENTICATION RESPONSE message to the network and shall start any retransmission timers (e.g. T3510, T3517 or T3521) if they were running and stopped when the UE received the first failed AUTHENTICATION REQUEST message.

- b) Transmission failure of AUTHENTICATION RESPONSE message or AUTHENTICATION FAILURE message indication from lower layers (if the EAP based primary authentication and key agreement procedure is triggered by a registration procedure for mobility and periodic registration update).

The UE shall stop the timer T3520, if running, and re-initiate the registration procedure for mobility and periodic registration update.

- c) Transmission failure of AUTHENTICATION RESPONSE message or AUTHENTICATION FAILURE message indication with TAI change from lower layers (if the EAP based primary authentication and key agreement procedure is triggered by a service request procedure).

The UE shall stop the timer T3520, if running.

If the current TAI is not in the TAI list, the EAP based primary authentication and key agreement procedure shall be aborted and a registration procedure for mobility and periodic registration update shall be initiated.

If the current TAI is still part of the TAI list, it is up to the UE implementation how to re-run the ongoing procedure that triggered the EAP based primary authentication and key agreement procedure.

...

- e) Network failing the authentication check.

If the UE deems that the network has failed the authentication check, then it shall request RRC to locally release the RRC connection and treat the active cell as barred (see 3GPP TS 38.304 [28]). The UE shall start any retransmission timers (e.g. T3510, T3517 or T3521), if they were running and stopped when the UE received the first AUTHENTICATION REQUEST message containing an ngKSI that was already in use.

For item e, whether or not the UE is registered for emergency services:

The UE shall stop timer T3520, if the timer is running and the UE enters 5GMM-IDLE mode, e.g. upon detection of a lower layer failure, release of the N1 NAS signalling connection, or as the result of an inter-system change in 5GMM-CONNECTED mode from N1 mode to S1 mode.

The UE shall deem that the network has failed the authentication check or assume that the authentication is not genuine and proceed as described in item e above if any of the following occurs:

- the timer T3520 expires;
- the UE detects any combination of the EAP-based authentication failures: transmission of AUTHENTICATION FAILURE message with 5GMM cause #71 "ngKSI already in use", transmission of AUTHENTICATION RESPONSE message with an EAP-response message after detecting an error as described in subclause 5.4.1.2.2.4 or with an EAP-response message after not accepting of the server certificate as described in subclause 5.4.1.2.3.1, during three consecutive authentication challenges. The EAP-request/AKA'-challenge challenges shall be considered as consecutive only, if the EAP-request/AKA'-challenge challenges causing the second and third EAP-based authentication failure are received by the UE, while the timer T3520 started after the previous EAP-based authentication failure is running. Not accepting of the server certificate shall be considered as consecutive only, if the EAP-request messages causing the second and third not accepting of the server certificate are received by the UE, while the timer T3520 started after the previous EAP request message causing the previous not accepting of the server certificate is running.

NOTE 2: Reception of an EAP-failure message is not considered when determining the three consecutive authentication challenges or three consecutive not accepting of the server certificate.

...

9.1.1.3.3 Test description

9.1.1.3.3.1 Pre-test conditions

System Simulator:

- NGC Cell A, NGC Cell B, NGC Cell C and NGC Cell D are configured according to table 6.3.2.2-1 in TS 38.508-1 [4].

UE:

- None

Preamble:

- The UE is in state Switched OFF Mode (state 0N-B) according to TS 38.508-1 [4].

9.1.1.3.3.2 Test procedure sequence

Table 9.1.1.3.3.2-1: Main behaviour

| | Procedure | Message Sequence | | TP | Verdict |
|---|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC Cell A as the "Serving cell".
- NGC Cell B, NGC Cell C and NGC Cell D as a "Non-suitable 'Off' cell". | - | - | - | - |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise. | - | - | - | - |
| 2 | The UE is switched on. | - | - | - | - |

| | | | | | |
|-------|---|-----|------------------------------|----------|----------|
| 3-5 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 [4] and transmits a REGISTRATION REQUEST message. | --> | 5GMM: REGISTRATION REQUEST | - | - |
| 6 | SS transmits the EAP-request/AKA'-challenge message within an AUTHENTICATION REQUEST message, with ngKSI is already in use in the UE to initiate an EAP-AKA' procedure. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 7 | Check: Does the UE respond with an AUTHENTICATION FAILURE message, with 5GMM cause "ngKSI already in use"? | --> | 5GMM: AUTHENTICATION FAILURE | 1 | P |
| 8 | SS transmits the EAP-request/AKA'-challenge message within an AUTHENTICATION REQUEST message, with ngKSI is already in use in the UE to initiate an EAP-AKA' procedure. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 9 | Check: Does the UE respond with an AUTHENTICATION FAILURE message, with 5GMM cause "ngKSI already in use"? | --> | 5GMM: AUTHENTICATION FAILURE | 1 | P |
| 10 | SS transmits the EAP-request/AKA'-challenge message within an AUTHENTICATION REQUEST message, with ngKSI is already in use in the UE to initiate an EAP-AKA' procedure. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 11 | The SS configures:
- NGC Cell B as the "Serving cell".
- NGC Cell A as a "Suitable neighbour intra-frequency cell". | - | - | - | - |
| - | The following messages are to be observed on NGC Cell B unless explicitly stated otherwise. | - | - | - | - |
| 12-14 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 [4]. | - | - | - | - |
| 15 | Check: Does the UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE setting as Initial registration? | --> | 5GMM: REGISTRATION REQUEST | 2 | P |
| 16 | SS transmits the EAP-request/AKA'-challenge message within an AUTHENTICATION REQUEST message, with ngKSI is already in use in the UE to initiate an EAP-AKA' procedure. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 17 | The UE responds with an AUTHENTICATION FAILURE message, with 5GMM cause "ngKSI already in use". | --> | 5GMM: AUTHENTICATION FAILURE | - | - |
| 18 | SS responds nothing and waits for the expiration of T3520. | - | - | - | - |
| 19 | The SS configures: | - | - | - | - |

| | | | | | |
|-------------|---|-----|-------------------------------|----------|----------|
| | <ul style="list-style-type: none"> - NGC Cell C as the "Serving cell". - NGC Cell B as a "Suitable neighbour intra-frequency cell". - NGC Cell A as the "Non-suitable 'Off' cell". | | | | |
| - | The following messages are to be observed on NGC Cell C unless explicitly stated otherwise. | - | - | - | - |
| 20-22 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 [4]. | - | - | - | - |
| 23 | Check: Does the UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE setting as Initial registration? | --> | 5GMM: REGISTRATION REQUEST | 3 | P |
| 24-39a
1 | The registration procedure is successfully completed by executing steps 5 to 20a1 of the generic procedure in TS 38.508-1 [4] Table 4.5.2.2-2. | - | - | - | - |
| - | The UE is in end state Registered, Idle Mode (1N-A) on NGC Cell C according to TS 38.508-1 [4]. | - | - | - | - |
| 40 | SS transmits a <i>Paging</i> message. | <-- | NR RRC: Paging | - | - |
| 41-43 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.4.2-3 in TS38.508-1 [4] and transmits a SERVICE REQUEST message. | --> | 5GMM: SERVICE REQUEST | - | - |
| 44 | The SS is configured not to send the RLC ACK for the message transmitted in step46. | - | - | - | - |
| 45 | SS transmits the EAP-request/AKA'-challenge message within a correct AUTHENTICATION REQUEST message to initiate an EAP-AKA' procedure. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 46 | The UE responds with a correct AUTHENTICATION RESPONSE message, with an EAP-Response/AKA'-challenge message. | --> | 5GMM: AUTHENTICATION RESPONSE | - | - |
| 47 | <p>The SS configures:</p> <ul style="list-style-type: none"> - NGC Cell D as the "Serving cell", and the tracking area of NGC Cell D is not in the list of tracking areas that the UE previously registered. - NGC Cell C as the "Suitable neighbour intra-frequency cell". - NGC Cell B as the "Non-suitable 'Off' cell". | - | - | - | - |
| - | The following messages are to be observed on Cell D unless explicitly stated otherwise. | - | - | - | - |
| 48-50 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS | - | - | - | - |

| | | | | | |
|--|---|-----|------------------------------|---|---|
| | 38.508-1 [4]. | | | | |
| 51 | Check: Does the UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE setting as Mobility registration updating? | --> | 5GMM: REGISTRATION REQUEST | 4 | P |
| 52 | The SS cuts off the UL grant and RA Response.
(Note 1) | - | - | - | - |
| 53 | SS transmits the EAP-request/AKA'-challenge message within a correct AUTHENTICATION REQUEST message to initiate an EAP-AKA' procedure. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 54 | SS starts a timer t_Delay = 10s.
(Note 2) | - | - | - | - |
| 55 | SS locally releases the RRC connection and waits for the expiration of t_Delay. | - | - | - | - |
| 56 | The SS turn on the UL grant and RA Response. | - | - | - | - |
| 57-59 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 [4]. | - | - | - | - |
| 60 | Check: Does the UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE setting as mobility registration updating? | --> | 5GMM: REGISTRATION REQUEST | 5 | P |
| 61-63a
1 | The registration procedure is successfully completed by executing steps 4 to 6a1 of the generic procedure in TS 38.508-1 [4] Table 4.9.5.2.2-1. | - | - | - | - |
| <p>Note 1: For transmission of the AUTHENTICATION RESPONSE message, the UE needs to initiate RACH to get UL grant. Since not RA Response, registration failure due to lower layer failure will occur, then timer T3511 will be started.</p> <p>Note 2: Timer t_Delay is derived from timer T3511. During timer t_Delay, UE fails on transmission of the AUTHENTICATION RESPONSE message with the indication from lower layers.</p> | | | | | |

9.1.1.3.3.3 Specific message contents

Table 9.1.1.3.3.3-1: Message AUTHENTICATION REQUEST (step 6, 8, 10 and 16, Table 9.1.1.3.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-1 | | | |
|---|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| ngKSI | ngKSI | SS shall use the ngKSI is already in use in the UE | |

Table 9.1.1.3.3.3-2: Message AUTHENTICATION FAILURE (step 7, 9 and 17, Table 9.1.1.3.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-4 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GMM cause | '0100 0111'B | ngKSI already in use | |

Table 9.1.1.3.3.3-3: Message REGISTRATION REQUEST (step 15 and step 23, Table 9.1.1.3.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | '001'B | Initial registration | |

Table 9.1.1.3.3.3-4: Message REGISTRATION REQUEST (step 51 and step 60, Table 9.1.1.3.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|--------------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | '010'B | Mobility registration updating | |

9.1.1.4 5G AKA based primary authentication and key agreement / 5G-AKA related procedures

9.1.1.4.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST with invalid MAC code }

then { the UE sends an AUTHENTICATION FAILURE message to the network, with the 5GMM cause #20 "MAC failure" }

}

(2)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST with the "separation bit" in the AMF field of AUTN supplied by the core network is set to 0 }

then { the UE sends an AUTHENTICATION FAILURE message to the network, with the 5GMM cause #26 "non-5G authentication unacceptable" }

}

(3)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST with the sequence number SQN to be out of range }

then { the UE sends an AUTHENTICATION FAILURE message to the network, with the 5GMM cause #21 "synch failure" and a re-synchronization token AUTS provided by the USIM }

}

(4)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST }

then { the UE process the 5G authentication challenge data and respond with an AUTHENTICATION RESPONSE message }

}

(5)

with { the UE in 5GMM-REGISTERED-INITIATED state and sends out an AUTHENTICATION RESPONSE message }

ensure that {

when { the SS proceeds with the registration procedure }

then { the UE consider the authentication procedure complete and succeed }

}

9.1.1.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 clauses 5.4.1.3.3, 5.4.1.3.6, 5.4.1.3.7. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.4.1.3.3]

The UE shall respond to an AUTHENTICATION REQUEST message. With the exception of the cases described in subclause 5.4.1.3.5, the UE shall process the 5G authentication challenge data and respond with an AUTHENTICATION RESPONSE message to the network.

Upon a successful 5G authentication challenge, the new K_{AMF} calculated from the 5G authentication challenge data shall be stored in a new 5G NAS security context in the volatile memory of the ME.

[TS 24.501, clause 5.4.1.3.6]

In the 5G authentication challenge, the UE shall check the 5G authentication challenge data (RAND, AUTN and ngKSI) received in the AUTHENTICATION REQUEST message to verify authenticity of the 5G core network.

The ME shall check that ngKSI received in the AUTHENTICATION REQUEST message is not already in use. The ME shall forward the RAND and AUTN to the USIM to check.

The UE may reject the core network due to an incorrect AUTN or ngKSI parameter. If the UE has to reject the 5G authentication challenge, the UE shall return AUTHENTICATION FAILURE message to the network with a cause value indicating the reason for the failure (see 3GPP TS 33.501 [24]).

Incorrect 5G authentication challenge data contains four possible causes for authentication failure:

a) MAC code failure:

If the UE finds the MAC code (supplied by the core network in the AUTN parameter) to be invalid, the UE shall send an AUTHENTICATION FAILURE message to the network, with the 5GMM cause #20 "MAC failure". The UE shall then follow the procedure described in subclause 5.4.1.3.7, item c.

b) Non-5G authentication unacceptable:

If the UE finds that the "separation bit" in the AMF field of AUTN supplied by the core network is set to 0, the UE shall send an AUTHENTICATION FAILURE message to the network, with the 5GMM cause #26 "non-5G authentication unacceptable" (see subclause 6.1.3 in 3GPP TS 33.501 [24]). The UE shall then follow the procedure described in subclause 5.4.1.3.7, item d.

...

d) SQN failure:

If the UE finds the sequence number SQN (supplied by the core network in the AUTN parameter) to be out of range, the UE shall send an AUTHENTICATION FAILURE message to the network, with the 5GMM cause #21 "synch failure" and a re-synchronization token AUTS provided by the USIM (see 3GPP TS 33.102 [23]). The UE shall then follow the procedure described in subclause 5.4.1.3.7, item f.

[TS 24.501, clause 5.4.1.3.7]

c) Authentication failure (5GMM cause #20 "MAC failure").

The UE shall send an AUTHENTICATION FAILURE message, with 5GMM cause #20 "MAC failure" according to subclause 5.4.1.3.6, to the network and start timer T3520 (see example in figure 5.4.1.3.7.1). Furthermore, the UE shall stop any of the retransmission timers that are running (e.g. T3510, T3517 or T3521). Upon the first receipt of an AUTHENTICATION FAILURE message from the UE with 5GMM cause #20 "MAC failure", the network may initiate the identification procedure described in subclause 5.4.3. This is to allow the network to obtain the SUCI from the UE. The network may then check that the 5G-GUTI originally used in the 5G authentication challenge corresponded to the correct SUPI. Upon receipt of the IDENTITY REQUEST message from the network, the UE shall proceed as specified in subclause 5.4.3.3.

NOTE 1: Upon receipt of an AUTHENTICATION FAILURE message from the UE with 5GMM cause #20 "MAC failure", the network may also terminate the 5G AKA based primary authentication and key agreement procedure (see subclause 5.4.1.3.5).

If the mapping of 5G-GUTI to SUPI in the network was incorrect, the network should respond by sending a new AUTHENTICATION REQUEST message to the UE. Upon receiving the new AUTHENTICATION REQUEST message from the network, the UE shall stop the timer T3520, if running, and then process the 5G challenge information as normal. If the mapping of 5G-GUTI to SUPI in the network was correct, the network should terminate the 5G AKA based primary authentication and key agreement procedure by sending an AUTHENTICATION REJECT message (see subclause 5.4.1.3.5).

If the network is validated successfully (an AUTHENTICATION REQUEST message that contains a valid SQN and MAC is received), the UE shall send the AUTHENTICATION RESPONSE message to the network and shall start any retransmission timers (e.g. T3510, T3517 or T3521) if they were running and stopped when the UE received the first failed AUTHENTICATION REQUEST message.

If the UE receives the second AUTHENTICATION REQUEST message, and the MAC value cannot be resolved, the UE shall follow the procedure specified in this subclause, item c, starting again from the beginning, or if the message contains a UMTS authentication challenge, the UE shall follow the procedure specified in item d. If the SQN is invalid, the UE shall proceed as specified in item f.

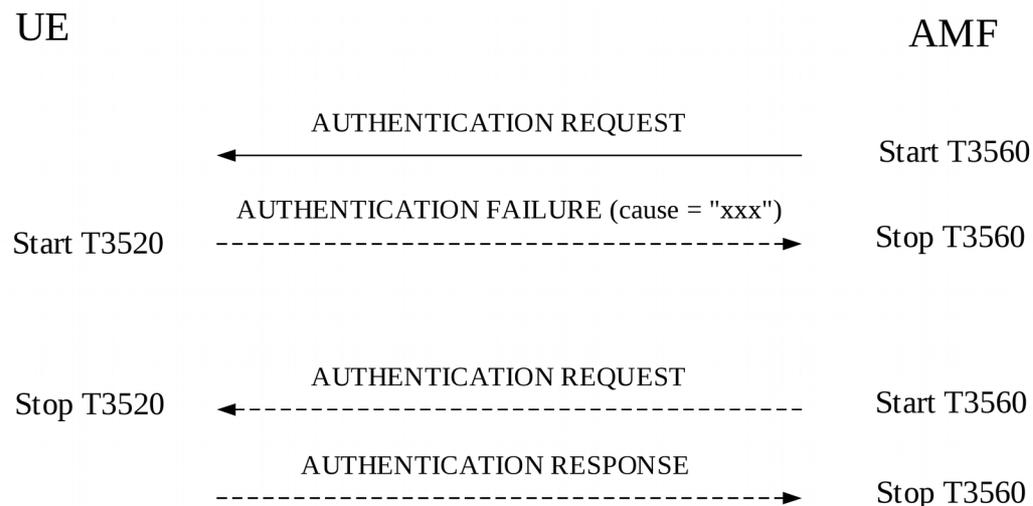


Figure 5.4.1.3.7.1: Authentication failure during 5G AKA based primary authentication and key agreement procedure

d) Authentication failure (5GMM cause #26 "non-5G authentication unacceptable").

The UE shall send an AUTHENTICATION FAILURE message, with 5GMM cause #26 "non-5G authentication unacceptable", to the network and start the timer T3520 (see example in figure 5.4.1.3.7.1). Furthermore, the UE shall stop any of the retransmission timers that are running (e.g. T3510, T3517 or T3521). Upon the first receipt of an AUTHENTICATION FAILURE message from the UE with 5GMM cause #26 "non-5G authentication unacceptable", the network may initiate the identification procedure described in subclause 5.4.3. This is to allow the network to obtain the SUCI from the UE. The network may then check that the 5G-GUTI originally used in the 5G authentication challenge corresponded to the correct SUPI. Upon receipt of the IDENTITY REQUEST message from the network, the UE shall proceed as specified in subclause 5.4.3.3.

NOTE 2: Upon receipt of an AUTHENTICATION FAILURE message from the UE with 5GMM cause #26 "non-5G authentication unacceptable", the network may also terminate the 5G AKA based primary authentication and key agreement procedure (see subclause 5.4.1.3.5).

If the mapping of 5G-GUTI to SUPI in the network was incorrect, the network should respond by sending a new AUTHENTICATION REQUEST message to the UE. Upon receiving the new AUTHENTICATION REQUEST message from the network, the UE shall stop the timer T3520, if running, and then process the 5G challenge information as normal. If the mapping of 5G-GUTI to SUPI in the network was correct, the network should terminate the 5G AKA based primary authentication and key agreement authentication procedure by sending an AUTHENTICATION REJECT message (see subclause 5.4.1.3.5).

...

f) Authentication failure (5GMM cause #21 "synch failure").

The UE shall send an AUTHENTICATION FAILURE message, with 5GMM cause #21 "synch failure", to the network and start the timer T3520 (see example in figure 5.4.1.3.7.1). Furthermore, the UE shall stop any of the retransmission timers that are running (e.g. T3510, T3517 or T3521). Upon the first receipt of an AUTHENTICATION FAILURE message from the UE with the 5GMM cause #21 "synch failure", the network shall use the returned AUTS parameter from the authentication failure parameter IE in the AUTHENTICATION FAILURE message, to re-synchronise. The re-synchronisation procedure requires the AMF to delete all unused authentication vectors for that SUPI and obtain new vectors from the UDM/AUSF. When re-synchronisation is complete, the network shall initiate the 5G AKA based primary authentication and key agreement procedure. Upon receipt of the AUTHENTICATION REQUEST message, the UE shall stop the timer T3520, if running.

NOTE 4: Upon receipt of two consecutive AUTHENTICATION FAILURE messages from the UE with 5GMM cause #21 "synch failure", the network may terminate the 5G AKA based primary authentication and key agreement procedure by sending an AUTHENTICATION REJECT message.

If the network is validated successfully (a new AUTHENTICATION REQUEST message is received which contains a valid SQN and MAC) while T3520 is running, the UE shall send the AUTHENTICATION RESPONSE message to the network and shall start any retransmission timers (e.g. T3510, T3517 or T3521), if they were running and stopped when the UE received the first failed AUTHENTICATION REQUEST message.

Upon receipt of an AUTHENTICATION REJECT message, the UE shall perform the actions as specified in subclause 5.4.1.3.5.

9.1.1.4.3 Test description

9.1.1.4.3.1 Pre-test conditions

System Simulator:

- NR cell A.

UE:

- None.

Preamble:

- the UE is in state Switched OFF (state 0N-B) according to TS 38.508-1 [4].

9.1.1.4.3.2 Test procedure sequence

Table 9.1.1.4.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|-------------------------|----|---------|
| | | U - S | Message | | |
| 1 | Switch the UE on | - | - | - | - |
| 2-4 | The UE establishes RRC connection and initiates registration procedure by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 [4]. | - | - | - | - |
| 5 | The SS transmits an AUTHENTICATION REQUEST message which contains an invalid MAC code. | <-- | AUTHENTICATION REQUEST | - | - |
| 6 | Check: Does the UE respond with an AUTHENTICATION FAILURE message with 5GMM cause "MAC failure"? | --> | AUTHENTICATION FAILURE | 1 | P |
| 7 | SS transmits a correct AUTHENTICATION REQUEST message with RAND different to the one send in Step 5 | <-- | AUTHENTICATION REQUEST | - | - |
| 8 | Check: Does the UE respond with a correct AUTHENTICATION RESPONSE message with RES* that is equal to the XRES* calculated in the SS? | --> | AUTHENTICATION RESPONSE | 4 | P |
| 9 | SS transmits a NAS SECURITY MODE COMMAND message including the ngKSI of the new 5G NAS security context (as provided in step 7), to proceed with the registration procedure. | <-- | SECURITY MODE COMMAND | - | - |

| | | | | | |
|-------------|---|-----|-------------------------|---|---|
| 10 | Check: Does the UE respond with NAS SECURITY MODE COMPLETE message integrity protected and ciphered with the new 5G NAS security context identified by the ngKSI received in the SECURITY MODE COMMAND message in step 9. | --> | SECURITY MODE COMPLETE | 5 | P |
| 11-20a
1 | Steps 10-19a1 of the generic procedure (TS 38.508-1 Table 4.5.2.2-2 [4]) are executed to successfully complete the registration procedure. | - | - | - | - |
| 21 | Switch off UE in RRC_CONNECTED as described in TS 38.508-1 [4] subclause 4.9.6.3 | - | - | - | - |
| 22-25 | Steps 1-4 above are repeated | - | - | - | - |
| 26 | SS transmits an AUTHENTICATION REQUEST message with "separation bit" in the AMF field is 0. | <-- | AUTHENTICATION REQUEST | - | - |
| 27 | Check: Does the UE respond with an AUTHENTICATION FAILURE message, with 5GMM cause " Non-5G authentication unacceptable "? | --> | AUTHENTICATION FAILURE | 2 | P |
| 28 | SS transmits a correct AUTHENTICATION REQUEST message with RAND different to the one send in Step 26 | <-- | AUTHENTICATION REQUEST | - | - |
| 29 | Check: Does the UE respond with a correct AUTHENTICATION RESPONSE message with RES* that is equal to the XRES* calculated in the SS? | --> | AUTHENTICATION RESPONSE | 4 | P |
| 30-41a
1 | Steps 8-19a1 of the generic procedure (TS 38.508-1 Table 4.5.2.2-2 [4]) are executed to successfully complete the registration procedure. | - | - | - | - |
| 42 | Switch off UE in RRC_CONNECTED as described in TS 38.508-1 [4] subclause 4.9.6.3 | - | - | - | - |
| 43-46 | Steps 1-4 above are repeated | - | - | - | - |
| 47 | SS transmits AUTHENTICATION REQUEST message with the AMF field in the IE "Authentication parameter AUTN" set to "AMF _{RESYNCH} " value to trigger SQN re-synchronisation procedure in test USIM | <-- | AUTHENTICATION REQUEST | - | - |
| 48 | Check: Does the UE respond with an AUTHENTICATION FAILURE message, with 5GMM cause "Synch failure" and Authentication failure parameter? | --> | AUTHENTICATION FAILURE | 3 | P |
| 49 | SS transmits a correct AUTHENTICATION REQUEST message with RAND different to the one send in Step 47. | <-- | AUTHENTICATION REQUEST | - | - |
| 50 | Check: Does the UE respond with a correct AUTHENTICATION RESPONSE message | --> | AUTHENTICATION | 4 | P |

| | | | | | |
|---------|---|---|----------|---|---|
| | with RES* that is equal to the XRES* calculated in the SS? | | RESPONSE | | |
| 51-62a1 | Steps 8-19a1 of the generic procedure (TS 38.508-1 Table 4.5.2.2-2 [4]) are executed to successfully complete the registration procedure. | - | - | - | - |

9.1.1.4.3.3 Specific message contents

Table 9.1.1.4.3.3-1: AUTHENTICATION RESPONSE (step 8, step 29 and step 50 , Table 9.1.1.4.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Authentication response parameter | RES* equal to the XRES* calculated in the SS with the parameters provided/indicated in the AUTHENTICATION REQUEST | | |

Table 9.1.1.4.3.3-2: AUTHENTICATION REQUEST (step 5, Table 9.1.1.4.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-1 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Authentication parameter AUTN | Invalid MAC | SS shall calculate the correct MAC value as specified in TS 33.102 and use any different value, e.g. correct_MAC+5. | |

Table 9.1.1.4.3.3-3: AUTHENTICATION FAILURE (step 6, Table 9.1.1.4.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-4 | | | |
|--|--------------|-------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0001 0100'B | MAC failure | |

Table 9.1.1.4.3.3-4: AUTHENTICATION REQUEST (step 26, Table 9.1.1.4.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-1 | | | |
|--|--------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| Authentication parameter AUTN | "separation bit"=0 | The "separation bit" in the AMF field of AUTN supplied by the core network is | |

| | | | |
|--|--|----|--|
| | | 0. | |
|--|--|----|--|

Table 9.1.1.4.3.3-5: AUTHENTICATION FAILURE (step 27, Table 9.1.1.4.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-4 | | | |
|--|--------------|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0001 1010'B | Non-5G authentication unacceptable | |

Table 9.1.1.4.3.3-6: AUTHENTICATION REQUEST (step 47, Table 9.1.1.4.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-1 | | | |
|--|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Authentication parameter AUTN | AMF field set to "AMF _{RESYNCH} ",
AMF _{RESYNCH} = '1111 1111 1111 1111'B | AMF _{RESYNCH} see TS 34.108, 8.1.2.2 | |

Table 9.1.1.4.3.3-7: AUTHENTICATION FAILURE (step 48, Table 9.1.1.4.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-4 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0001 0101'B | Synch failure | |
| Authentication failure parameter | AUTS | AUTS see TS 34.108, 8.1.2.2 | |

9.1.1.5 5G AKA based primary authentication and key agreement / Reject

9.1.1.5 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state and SS initiates a 5G AKA based primary authentication and key agreement procedure }

ensure that {

when { the SS sends an a AUTHENTICATION REJECT message }

then { the UE deletes the stored 5G-GUTI, last visited registered TAI and ngKSI and enter state 5GMM-DEREGISTERED, the USIM is considered invalid until switching off the UE. }

}

9.1.1.5.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clauses 5.4.1.3.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.4.1.3.5]

If the authentication response (RES) returned by the UE is not valid, the network response depends upon the type of identity used by the UE in the initial NAS message, that is:

- if the 5G-GUTI was used; or
- if the SUCI was used.

If the 5G-GUTI was used, the network should initiate an identification procedure to retrieve SUCI from the UE and restart the 5G AKA based primary authentication and key agreement procedure with the received SUCI.

If the SUCI was used for identification in the initial NAS message or in a restarted 5G AKA based primary authentication and key agreement procedure, or the network decides not to initiate the identification procedure to retrieve SUCI from the UE after an unsuccessful 5G AKA based primary authentication and key agreement procedure, the network should send an AUTHENTICATION REJECT message to the UE.

Upon receipt of an AUTHENTICATION REJECT message,

1) if the message has been successfully integrity checked by the NAS, the UE shall set the update status to 5U3 ROAMING NOT ALLOWED, delete the stored 5G-GUTI, TAI list, last visited registered TAI and ngKSI.

In case of PLMN, the USIM shall be considered invalid until switching off the UE or the UICC containing the USIM is removed. In case of SNPN, the entry of the "list of subscriber data" with the SNPN identity of the current SNPN shall be considered invalid until the UE is switched off or the entry is updated.

- The UE shall set:

- i) the counter for "SIM/USIM considered invalid for GPRS services" events and the counter for "SIM/USIM considered invalid for 5GS services over non-3GPP access" events in case of PLMN; or
- ii) the counter for "the entry for the current SNPN considered invalid for 3GPP access" events in case of SNPN;

to UE implementation-specific maximum value. If the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services", then the UE shall set this counter to UE implementation-specific maximum value; and

- if the UE is operating in single-registration mode, the UE shall handle 4G-GUTI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when the authentication procedure is not accepted by the network. The USIM shall be considered as invalid also for non-EPS services until switching off or the UICC containing the USIM is removed.

2) if the message is received without integrity protection, the UE shall start timer T3247 with a random value uniformly drawn from the range between 30 minutes and 60 minutes, if the timer is not running (see subclause 5.3.20). Additionally, the UE shall:

- a) if the message is received over 3GPP access, and the counter for "SIM/USIM considered invalid for GPRS services" events or the counter for "the entry for the current SNPN considered invalid for 3GPP access" events has a value less than a UE implementation-specific maximum value, proceed as specified in subclause 5.3.20, list item 1)-a) of clause 5.3.20.2 (if the UE is not SNPN enabled or is not operating in SNPN access mode) or list item a) of clause 5.30.20.3 (if the UE is operating in SNPN access mode) for the case that the 5GMM cause value received is #3;
- b) if the message is received over non-3GPP access, and the counter for "SIM/USIM considered invalid for 5GS services over non-3GPP access" events has a value less than a UE implementation-specific maximum value, proceed as specified in subclause 5.3.20, list item 1)-b) of clause 5.3.20.2 for the case that the 5GMM cause value received is #3.
- c) otherwise
- i) if the 5GMM cause value is received over 3GPP access, the UE shall:

- set the update status for 3GPP access to 5U3 ROAMING NOT ALLOWED, delete for 3GPP access only the stored 5G-GUTI, TAI list, last visited registered TAI and ngKSI. The USIM shall be considered invalid for 5GS services via 3GPP access and non-EPS service until switching off the UE or the UICC containing the USIM is removed or the entry

of the "list of subscriber data" with the SNPN identity of the current SNPN shall be considered invalid for 3GPP access until the UE is switched off or the entry is updated.

- The UE shall set the counter for "SIM/USIM considered invalid for GPRS services" events or the counter for "the entry for the current SNPN considered invalid for 3GPP access" events to UE implementation-specific maximum value. If the UE maintains a counter for "SIM/USIM considered invalid for non-GPRS services", then the UE shall set this counter to UE implementation-specific maximum value.

- If the UE is operating in single-registration mode, the UE shall handle 4G-GUTI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when the authentication procedure is not accepted by the network. The USIM shall be considered as invalid also for non-EPS services until switching off or the UICC containing the USIM is removed; and

ii) if the 5GMM cause value is received over non-3GPP access, the UE shall:

- set the update status for non-3GPP access to 5U3 ROAMING NOT ALLOWED, delete for non-3GPP access only the stored 5G-GUTI, TAI list, last visited registered TAI and ngKSI. The USIM shall be considered invalid for 5GS services via non-3GPP access until switching off the UE or the UICC containing the USIM is removed.

The UE shall set the counter for "SIM/USIM considered invalid for 5GS services over non-3GPP access" events to UE implementation-specific maximum value.

If the AUTHENTICATION REJECT message is received by the UE, the UE shall abort any 5GMM signalling procedure, stop any of the timers T3510, T3516, T3517, T3519 or T3521 (if they were running), enter state 5GMM-DEREGISTERED and delete any stored SUCI.

Depending on local requirements or operator preference for emergency services, if the UE initiates a registration procedure with 5GS registration type IE set to "emergency registration" and the AMF is configured to allow emergency registration without user identity, the AMF needs not follow the procedures specified for the authentication failure in the present subclause. The AMF may continue a current 5GMM specific procedure.

9.1.1.5.3 Test description

9.1.1.5.3.1 Pre-test conditions

System Simulator:

- NGC Cell A "Serving cell" TS 38.508-1 [4] Table 6.2.2.1-3

UE:

- None

Preamble:

- The UE is in state Switched OFF (state 0N-B) according to TS 38.508-1 [4].

9.1.1.5.3.2 Test procedure sequence

Table 9.1.1.5.3.2-1: Main behaviour

| | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-4 | The UE executes steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | - | - | - |
| 5 | The SS transmits an AUTHENTICATION REQUEST message | | 5GMM: AUTHENTICATION REQUEST | - | - |

| | | | | | |
|---------|---|-----|--------------------------------|---|---|
| 6 | The UE transmits an AUTHENTICATION RESPONSE | | 5GMM: AUTHENTICATION RESPONSE | - | - |
| 7 | The SS transmits an AUTHENTICATION REJECT message | <-- | 5GMM: AUTHENTICATION REJECT | - | - |
| 8 | SS releases the RRC connection | - | - | - | - |
| 9 | Check: Does the UE transmit an RRCSetupRequest message for initial registration procedure within the next 30 seconds? | --> | NR RRC: <i>RRCSetupRequest</i> | 1 | F |
| 10 | The UE is switched off by executing generic procedure in Table 4.9.6.4-1 in TS 38.508-1 [4]. | - | - | - | - |
| 11 | The UE is switched on. | - | - | - | - |
| 12 | Check: Does the UE transmit a REGISTRATION REQUEST message? | --> | 5GMM: REGISTRATION REQUEST | 1 | P |
| 13-28a1 | The UE executes steps 5-20a1 of Table 4.5.2.2-2 in TS 38.508-1 [4] complete registration procedure. | - | - | - | - |

9.1.1.5.3.3 Specific message contents

Table 9.1.1.5.3.3-1: Message REGISTRATION REQUEST (step 4, Table 9.1.1.5.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '001'B | initial registration | |

Table 9.1.1.5.3.3-2: Message REGISTRATION REQUEST (step 12, Table 9.1.1.5.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|----------------|--------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '001'B | initial registration | |
| ngKSI | '111' | no key is available | |
| 5GS mobile identity | SUCI of the UE | a freshly generated SUCI | |
| Last visited registered TAI | Not present | | |

9.1.1.6 5G AKA based primary authentication and key agreement / Abnormal

9.1.1.6 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state }**ensure that** {**when** { the SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST with ngKSI is already in use }**then** { the UE sends an AUTHENTICATION FAILURE message to the network, with the 5GMM cause #71 "ngKSI already in use". }

}

(2)

with { the UE in 5GMM-REGISTERED-INITIATED state }**ensure that** {**when** { the third time SS initiates 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST with ngKSI is already in use }**then** { the UE locally releases the RRC connection and treats the active cell as barred }

}

(3)

with { the UE in 5GMM-REGISTERED-INITIATED state, the SS sends an AUTHENTICATION REQUEST with ngKSI is already in use and the UE sends an AUTHENTICATION FAILURE message }**ensure that** {**when** { T3520 times out }**then** { the UE locally releases the RRC connection and treats the active cell as barred }

}

(4)

with { the UE in 5GMM-REGISTERED state and 5GMM-IDLE mode over 3GPP access, starts SERVICE REQUEST procedure after received a paging request from the network }**ensure that** {**when** { the SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST and the UE fails on transmission of AUTHENTICATION RESPONSE message by entering a cell with TAI not in the TAI list }**then** { the UE initiates a mobility registration update procedure }

}

(5)

with { the UE in 5GMM-REGISTERED state and initiates a mobility registration update procedure }

ensure that {

when { the SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST and the UE fails on transmission of AUTHENTICATION RESPONSE message with the indication from lower layers }

then { the UE re-initiate the mobility registration update procedure }

}

9.1.1.6.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clauses 5.4.1.3.7. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.4.1.3.7]

e) Authentication failure (5GMM cause #71 "ngKSI already in use").

The UE shall send an AUTHENTICATION FAILURE message, with 5GMM cause #71 "ngKSI already in use", to the network and start the timer T3520 (see example in figure 5.4.1.3.7.1). Furthermore, the UE shall stop any of the retransmission timers that are running (e.g. T3510, T3517 or T3521). Upon the first receipt of an AUTHENTICATION FAILURE message from the UE with 5GMM cause #71 "ngKSI already in use", the network performs necessary actions to select a new ngKSI and send the same 5G authentication challenge to the UE.

...

g) Network failing the authentication check.

If the UE deems that the network has failed the authentication check, then it shall request RRC to locally release the RRC connection and treat the active cell as barred (see 3GPP TS 38.304 [28]). The UE shall start any retransmission timers (e.g. T3510, T3517 or T3521), if they were running and stopped when the UE received the first AUTHENTICATION REQUEST message containing an incorrect authentication challenge data causing authentication failure.

h) Transmission failure of AUTHENTICATION RESPONSE message or AUTHENTICATION FAILURE message indication from lower layers (if the 5G AKA based primary authentication and key agreement procedure is triggered by a registration procedure for mobility and periodic registration update).

The UE shall stop the timer T3520, if running, and re-initiate the registration procedure for mobility and periodic registration update.

...

i) Transmission failure of AUTHENTICATION RESPONSE message or AUTHENTICATION FAILURE message indication with TAI change from lower layers (if the 5G AKA based primary authentication and key agreement procedure is triggered by a service request procedure).

The UE shall stop the timer T3520, if running.

If the current TAI is not in the TAI list, the 5G AKA based primary authentication and key agreement procedure shall be aborted and a registration procedure for mobility and periodic registration update shall be initiated.

If the current TAI is still part of the TAI list, it is up to the UE implementation how to re-run the ongoing procedure that triggered the 5G AKA based primary authentication and key agreement procedure.

...

For items c, d, e, and f whether or not the UE is registered for emergency services:

...

The UE shall deem that the network has failed the authentication check or assume that the authentication is not genuine and proceed as described in item g above if any of the following occurs:

- the timer T3520 expires;
- the UE detects any combination of the 5G authentication failures: 5GMM causes #20 "MAC failure", #21 "synch failure", #26 "non-5G authentication unacceptable" or #71 "ngKSI already in use", during three consecutive authentication challenges. The 5G authentication challenges shall be considered as consecutive only, if the 5G authentication challenges causing the second and third 5G authentication failure are received by the UE, while the timer T3520 started after the previous 5G authentication failure is running.

9.1.1.6.3 Test description

9.1.1.6.3.1 Pre-test conditions

System Simulator:

- NGC Cell A, NGC Cell B, NGC Cell C and NGC Cell D are configured according to table 6.3.2.2-1 in TS 38.508-1 [4].
- The SS configures the NGC Cell A as the "Serving cell" and other NGC Cells as "Non-suitable "Off" cell".
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used.

UE:

- None.

Preamble:

- The UE is in test state 0N-B on NGC Cell A according to TS 38.508-1 [4]. The ngKSI-1 has been assigned and security context has been established.

9.1.1.6.3.2 Test procedure sequence

Table 9.1.1.6.3.2-1: Main behaviour

| | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|------------------------------|----|---------|
| | | U - S | Message | | |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise. | - | - | - | - |
| 0 | The UE is switched on. | - | - | - | - |
| 0A | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 [4] and transmits a REGISTRATION REQUEST message. | - | 5GMM: REGISTRATION REQUEST | - | - |
| 1 | The SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST with ngKSI is already in use (ngKSI-1). | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 2 | Check: Does the UE send an AUTHENTICATION FAILURE message to the | --> | 5GMM: AUTHENTICATION FAILURE | 1 | P |

| | | | | | |
|-------|--|-----|------------------------------|---|---|
| | network, with the 5GMM cause #71 "ngKSI already in use"? | | | | |
| 3 | The SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST with ngKSI is already in use (ngKSI-1). | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 4 | Check: Does the UE send an AUTHENTICATION FAILURE message to the network, with the 5GMM cause #71 "ngKSI already in use"? | --> | 5GMM: AUTHENTICATION FAILURE | 1 | P |
| 5 | The SS configures:
-NGC Cell B as the "Serving cell".
-NGC Cell A as a "Suitable neighbour intra-frequency cell". | - | - | - | - |
| 6 | The SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST with ngKSI is already in use (ngKSI-1). | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| - | The following messages are to be observed on NGC Cell B unless explicitly stated otherwise. | - | - | - | - |
| 7-9 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | - | - | - |
| 10 | Check: Does the UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE setting as initial registration? | --> | 5GMM: REGISTRATION REQUEST | 2 | P |
| 11 | The SS initiates a 5G AKA based primary authentication and key agreement procedure by sending AUTHENTICATION REQUEST with ngKSI is already in use (ngKSI-1). | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 12 | The UE sends an AUTHENTICATION FAILURE message to the network, with the 5GMM cause #71 "ngKSI already in use" | --> | 5GMM: AUTHENTICATION FAILURE | - | - |
| 13 | The SS configures:
-NGC Cell C as the "Serving cell".
-NGC Cell B as a "Suitable neighbour intra-frequency cell".
-NGC Cell A as a "Non-suitable "Off" cell". | - | - | - | - |
| 14 | SS responds nothing and waits for the expiration of T3520. | - | - | - | - |
| - | The following messages are to be observed on NGC Cell C unless explicitly stated otherwise. | - | - | - | - |
| 15-17 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | - | - | - |

| | | | | | |
|---------|---|-----|-------------------------------|---|---|
| 18 | Check: Does the UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE setting as initial registration? | --> | 5GMM: REGISTRATION REQUEST | 3 | P |
| 19-34a1 | Steps 5-20a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 35-38 | Steps 1-4 of Table 4.5.4.2-3 of the generic procedure in TS 38.508-1 [4] are performed. | | | | |
| 39 | The SS is configured not send RLC ACK for the message sent in step 41. | - | - | - | - |
| 40 | The SS configures:
- NGC Cell D as the "Serving cell".
- NGC Cell C as a "Suitable neighbour intra-frequency cell".
- NGC Cell B as a "Non-suitable "Off" cell". | - | - | - | - |
| 41 | SS transmits an AUTHENTICATION REQUEST message with ngKSI-2 to initiate the 5G-AKA procedure. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 42 | The UE sends an AUTHENTICATION RESPONSE message to the network. | --> | 5GMM: AUTHENTICATION RESPONSE | - | - |
| - | The following messages are to be observed on NGC Cell D unless explicitly stated otherwise. | - | - | - | - |
| 43-45 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 [4]. | - | - | - | - |
| 46 | Check: Does the UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE setting as Mobility registration updating? | --> | 5GMM: REGISTRATION REQUEST | 4 | P |
| 47 | The SS cuts off the UL grant and RA Response, so that the UE cannot send the AUTHENTICATION RESPONSE to SS. | - | - | - | - |
| 48 | SS transmits an AUTHENTICATION REQUEST message with ngKSI-2 to initiate the 5G-AKA procedure. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 49 | SS starts timer of t_Delay =10s. (Note 1). | - | - | - | - |
| 50 | SS performs local release. | - | - | - | - |
| 51 | Check whether t_Delay is still running, if it's running, then waiting for timeout. | - | - | - | - |
| 52 | SS configures the RA Response. | - | - | - | - |
| 53 | Check: Does the test result of generic test procedure in TS 38.508-1 [4] subclause 4.9.5 indicate that the UE is camped on NGC Cell D, with 'connected without release'? | - | - | 5 | P |

Note 1: To send the AUTHENTICATION RESPONSE, the UE will initiate RACH to get UL grant. Since there is

no RA Response, registration failure due to lower layer failure will occur, then T3511 will start. Timer t_Delay is derived from T3511. During timer t_Delay, UE fails on transmission of AUTHENTICATION RESPONSE message with the indication from lower layers.

9.1.1.6.3.3 Specific message contents

Table 9.1.1.6.3.3-1: Message AUTHENTICATION REQUEST (step 1, step 3, step 5 and step 11, Table 9.1.1.6.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-1 | | | |
|---|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| ngKSI | ngKSI-1 | The same with the ng-KSI assigned in Preamble. | |

Table 9.1.1.6.3.3-2: Message AUTHENTICATION FAILURE (step 2, step 4 and step 12, Table 9.1.1.6.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-4 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GMM cause | '0100 0111'B | ngKSI already in use | |

Table 9.1.1.6.3.3-3: Message AUTHENTICATION REQUEST (step 40 and step 48, Table 9.1.1.6.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-1 | | | |
|---|--------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| ngKSI | ngKSI-2 | Different from the ng-KSI assigned in Preamble. | |

Table 9.1.1.6.3.3-4: Message REGISTRATION REQUEST (step 10 and step 18, Table 9.1.1.6.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '001'B | initial registration | |

Table 9.1.1.6.3.3-5: Message REGISTRATION REQUEST (step 46, Table 9.1.1.6.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|-----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '010'B | mobility registration | |

| | | | |
|--|--|----------|--|
| | | updating | |
|--|--|----------|--|

9.1.2 Security mode control

9.1.2.1 NAS security mode command

9.1.2.1.1 Test Purpose (TP)

(1)

with { the UE is in 5GMM-REGISTERED-INITIATED state and the SS initiates the NAS security mode control procedure by sending a SECURITY MODE COMMAND message during initial registration procedure }

ensure that {

when { the UE receives an integrity protected SECURITY MODE COMMAND message including not matching replayed security capabilities }

then { the UE send a SECURITY MODE REJECT message and does not start applying the NAS security in both UL and DL }

}

(2)

with { the UE is in 5GMM-REGISTERED-INITIATED state and the SS initiates the NAS security mode control procedure by sending a SECURITY MODE COMMAND message during initial registration procedure }

ensure that {

when { the UE receives an integrity protected SECURITY MODE COMMAND message including IMEISV request }

then { the UE send an integrity protected and ciphered SECURITY MODE COMPLETE message including IMEISV and starts applying the NAS Security in both UL and DL }

}

9.1.2.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 24.501, clauses 5.4.2.1, 5.4.2.3 and 5.4.2.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.4.2.1]

The purpose of the NAS security mode control procedure is to take a 5G NAS security context into use, and initialise and start NAS signalling security between the UE and the AMF with the corresponding 5G NAS keys and 5G NAS security algorithms.

Furthermore, the network may also initiate the security mode control procedure in the following cases:

- a) in order to change the 5G NAS security algorithms for a current 5G NAS security context already in use;
- b) in order to change the value of uplink NAS COUNT used in the latest SECURITY MODE COMPLETE message as described in 3GPP TS 33.501 [24], subclause 6.9.4.4.
- c) in order to provide the Selected EPS NAS security algorithms to the UE.

For restrictions concerning the concurrent running of a security mode control procedure with other security related procedures in the AS or inside the core network see 3GPP TS 33.501 [24], subclause 6.9.5.

[TS 24.501, clause 5.4.2.3]

Upon receipt of the SECURITY MODE COMMAND message, the UE shall check whether the security mode command can be accepted or not. This is done by performing the integrity check of the message, and by checking that the received Replayed UE security capabilities IE has not been altered compared to the latest values that the UE sent to the network.

When the SECURITY MODE COMMAND message includes an EAP-success message the UE handles the EAP-success message and the ABBA as described in subclause 5.4.1.2.2.8 and 5.4.1.2.3.1.

If:

- a) the UE is registered for emergency services, performing initial registration for emergency services or establishing an emergency PDU session; or
- b) the W-AGF acts on behalf of the FN-RG;

and the SECURITY MODE COMMAND message is received with ngKSI value "000" and 5G-IA0 and 5G-EA0 as selected 5G NAS security algorithms, the UE shall locally derive and take in use 5G NAS security context. The UE shall delete existing current 5G NAS security context.

The UE shall accept a SECURITY MODE COMMAND message indicating the "null integrity protection algorithm" 5G-IA0 as the selected 5G NAS integrity algorithm only if the message is received when the UE is registered for emergency services, performing initial registration for emergency services or establishing an emergency PDU session or when the W-AGF acts on behalf of the FN-RG.

If the type of security context flag included in the SECURITY MODE COMMAND message is set to "native security context" and if the ngKSI matches a valid non-current native 5G NAS security context held in the UE while the UE has a mapped 5G NAS security context as the current 5G NAS security context, the UE shall take the non-current native 5G NAS security context into use which then becomes the current native 5G NAS security context and delete the mapped 5G NAS security context.

The UE shall ignore the Replayed S1 UE security capabilities IE if this IE is included in the SECURITY MODE COMMAND message.

If the SECURITY MODE COMMAND message can be accepted, the UE shall take the 5G NAS security context indicated in the message into use. The UE shall in addition reset the uplink NAS COUNT counter if:

- a) the SECURITY MODE COMMAND message is received in order to take a 5G NAS security context into use created after a successful execution of the 5G AKA based primary authentication and key agreement procedure or the EAP based primary authentication and key agreement procedure; or
- b) the SECURITY MODE COMMAND message received includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE the ngKSI does not match the current 5G NAS security context, if it is a mapped 5G NAS security context.

If the SECURITY MODE COMMAND message can be accepted and a new 5G NAS security context is taken into use and SECURITY MODE COMMAND message does not indicate the "null integrity protection algorithm" 5G-IA0 as the selected NAS integrity algorithm, the UE shall:

- if the SECURITY MODE COMMAND message has been successfully integrity checked using an estimated downlink NAS COUNT equal to 0, then the UE shall set the downlink NAS COUNT of this new 5G NAS security context to 0;
- otherwise the UE shall set the downlink NAS COUNT of this new 5G NAS security context to the downlink NAS COUNT that has been used for the successful integrity checking of the SECURITY MODE COMMAND message.

If the SECURITY MODE COMMAND message includes the horizontal derivation parameter indicating "K_{AMF} derivation is required", the UE shall derive a new K'_{AMF}, as specified in 3GPP TS 33.501 [24] for K_{AMF} to K'_{AMF} derivation in mobility, and set both uplink and downlink NAS COUNTs to zero. When the new 5G NAS security context is taken into use for current access and the UE is registered with the same PLMN over the 3GPP access and the non-3GPP access:

- a) the UE is in 5GMM-IDLE mode over the non-current access, the AMF and the UE shall activate the new 5G NAS security context over the non-current access as described in 3GPP TS 33.501 [24]. The AMF and the UE shall set the downlink NAS COUNT and uplink NAS COUNT to zero for the non-current access; or
- b) the UE is in 5GMM-CONNECTED mode over the non-current access, the AMF shall send the SECURITY MODE COMMAND message over the non-current access to activate the new 5G NAS security context that was activated over the current access as described in 3GPP TS 33.501 [24]. The AMF shall include the same ngKSI in the SECURITY MODE COMMAND message to identify the new 5G NAS security context.

If the SECURITY MODE COMMAND message includes the horizontal derivation parameter indicating "K_{AMF} derivation is not required" or the Additional 5G security parameters IE is not included in the message, the UE is registered with the same PLMN over the 3GPP access and non-3GPP access, then after the completion of a security mode control procedure over the current access:

- a) the UE is in 5GMM-IDLE mode over the non-current access, the AMF and the UE shall activate the new 5G NAS security context for the non-current access. If a primary authentication and key agreement procedure was completed before the security mode control procedure, the AMF and the UE shall set the downlink NAS COUNT and uplink NAS COUNT to zero for the non-current access, otherwise the downlink NAS COUNT and uplink NAS COUNT for the non-3GPP access are not changed; or
- b) the UE is in 5GMM-CONNECTED mode over the non-current access, the AMF shall send the SECURITY MODE COMMAND message over the non-current access to activate the new 5G NAS security context that was activated over the current access as described in 3GPP TS 33.501 [24]. The AMF shall include the same ngKSI in the SECURITY MODE COMMAND message to identify the new 5G NAS security context.

If the SECURITY MODE COMMAND message can be accepted, the UE shall send a SECURITY MODE COMPLETE message integrity protected with the selected 5GS integrity algorithm and the 5G NAS integrity key based on the K_{AMF} or mapped K'_{AMF} if the type of security context flag is set to "mapped security context" indicated by the ngKSI. When the SECURITY MODE COMMAND message includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE, then the UE shall check whether the SECURITY MODE COMMAND message indicates the ngKSI of the current 5GS security context, if it is a mapped 5G NAS security context, in order not to re-generate the K'_{AMF}.

Furthermore, if the SECURITY MODE COMMAND message can be accepted, the UE shall cipher the SECURITY MODE COMPLETE message with the selected 5GS ciphering algorithm and the 5GS NAS ciphering key based on the K_{AMF} or mapped K'_{AMF} indicated by the ngKSI. The UE shall set the security header type of the message to "integrity protected and ciphered with new 5G NAS security context".

From this time onward the UE shall cipher and integrity protect all NAS signalling messages with the selected 5GS integrity and ciphering algorithms.

If the AMF indicated in the SECURITY MODE COMMAND message that the IMEISV is requested:

- 1) if the UE has an IMEISV, the UE shall include its IMEISV in the SECURITY MODE COMPLETE message; or
- 2) if the 5G-CRG or the W-AGF acting on behalf of the FN-CRG do not have an IMEISV, the 5G-CRG or the W-AGF acting on behalf of the FN-CRG shall include the 5G-CRG's cable modem MAC address or the FN-CRG's cable modem MAC address in the SECURITY MODE COMPLETE message.

If, during an ongoing registration procedure or service request procedure, the SECURITY MODE COMMAND message includes the Additional 5G security information IE with the RINMR bit set to "Retransmission of the initial NAS message requested", the UE shall include the entire unciphered REGISTRATION REQUEST message or SERVICE REQUEST message, which the UE had previously included in the NAS message container IE of the initial NAS message (i.e. REGISTRATION REQUEST message or SERVICE REQUEST message, respectively), in the NAS message container IE of the SECURITY MODE COMPLETE message.

If, prior to receiving the SECURITY MODE COMMAND message, the UE without a valid 5G NAS security context had sent a REGISTRATION REQUEST message the UE shall include the entire REGISTRATION REQUEST message in the NAS message container IE of the SECURITY MODE COMPLETE message as described in subclause 4.4.6.

If the UE operating in the single-registration mode receives the Selected EPS NAS security algorithms IE, the UE shall use the IE according to 3GPP TS 33.501 [24].

For a UE operating in single-registration mode with N26 interface supported in the network, after an inter-system change from S1 mode to N1 mode in 5GMM-CONNECTED mode, the UE shall set the value of the Selected EPS NAS security algorithms IE in the 5G NAS security context to the NAS security algorithms that were received from the source MME when the UE was in S1 mode.

[TS 24.501, clause 5.4.2.5]

If the security mode command cannot be accepted, the UE shall send a SECURITY MODE REJECT message. The SECURITY MODE REJECT message contains a 5GMM cause that typically indicates one of the following cause values:

- #23 UE security capabilities mismatch.
- #24 security mode rejected, unspecified.

If the UE detects that the received Replayed UE security capabilities IE has been altered compared to the latest values that the UE sent to the network, the UE shall set the cause value to #23 "UE security capabilities mismatch".

Upon receipt of the SECURITY MODE REJECT message, the AMF shall stop timer T3560. The AMF shall also abort the ongoing procedure that triggered the initiation of the NAS security mode control procedure.

Both the UE and the AMF shall apply the 5G NAS security context in use before the initiation of the security mode control procedure, if any, to protect the SECURITY MODE REJECT message and any other subsequent messages according to the rules in subclause 4.4.4 and 4.4.5.

9.1.2.1.3 Test description

9.1.2.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state 0N-B on NGC Cell A according to TS 38.508-1 [4].

9.1.2.1.3.2 Test procedure sequence

Table 9.1.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|-----------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2 | Steps 1-6 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-2 are performed. | - | - | - | - |
| 3 | The SS transmits a SECURITY MODE COMMAND message to activate NAS security. It is integrity protected and includes unmatched replayed security capabilities. | <-- | SECURITY MODE COMMAND | - | - |
| 4 | Check: Does the UE transmit a SECURITY MODE REJECT message with cause'#23: UE | --> | SECURITY MODE REJECT | 1 | P |

| | | | | | |
|----|---|-----|------------------------|---|---|
| | security capabilities mismatch'? | | | | |
| 5 | The SS transmits an IDENTITY REQUEST message (Security not applied). | <-- | IDENTITY REQUEST | - | - |
| 6 | Check: Does the UE transmit a non security protected IDENTITY RESPONSE message? | --> | IDENTITY RESPONSE | 1 | P |
| 7 | The SS transmits a SECURITY MODE COMMAND message to activate NAS security. It is integrity protected and includes IMEISV. | <-- | SECURITY MODE COMMAND | - | - |
| 8 | Check: Does the UE transmit a SECURITY MODE COMPLETE message and does it establish the initial security configuration? | --> | SECURITY MODE COMPLETE | 2 | P |
| 9 | Steps 9a1-19a1 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-2 are performed. | - | - | - | - |
| 10 | The SS transmits an IDENTITY REQUEST message (Security protected as per the algorithms specified in step 7). | <- | IDENTITY REQUEST | - | - |
| 11 | Check: Does the UE transmit an IDENTITY RESPONSE message (Security Protected as per the algorithms specified in step 7)? | -> | IDENTITY RESPONSE | 2 | P |

9.1.2.1.3.3 Specific message contents

Table 9.1.2.1.3.3-1: SECURITY MODE COMMAND (Step 3, Table 9.1.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-25 | | | |
|--|--|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Replayed UE security capabilities | Set to mismatch the security capability of UE under test | | |

Table 9.1.2.1.3.3-2: SECURITY MODE REJECT (Step 4, Table 9.1.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-27 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GMM cause | #23 | | |

Table 9.1.2.1.3.3-3: IDENTITY REQUEST (Step 5, Table 9.1.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-21 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Identity type | '0001'B | SUCI | |

Table 9.1.2.1.3.3-4: IDENTITY RESPONSE (Step 6, Table 9.1.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-22 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Mobile identity | | | |
| Type of identity | '001'B | SUCI | |

Table 9.1.2.1.3.3-5: SECURITY MODE COMMAND (Step 7, Table 9.1.2.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-25 | | | |
|---|--|------------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Selected NAS security algorithms | | | |
| Type of ciphering algorithm | Set according to PIXIT parameter for default ciphering algorithm if it is set to a value different to 5G-EA0, or, set to any value different to 5G-EA0 otherwise | Non-zero ciphering algorithm | |
| IMEISV request | Present | | |

Table 9.1.2.1.3.3-6: SECURITY MODE COMPLETE (Step 8, Table 9.1.2.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-26 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| IMEISV | Present | | |

Table 9.1.2.1.3.3-7: IDENTITY REQUEST (Step 10, Table 9.1.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-21 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Identity type | '0011'B | IMEI | |

Table 9.1.2.1.3.3-8: IDENTITY RESPONSE (Step 11, Table 9.1.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-22 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Mobile identity | | | |
| Type of identity | '011'B | IMEI | |

9.1.2.2 Protection of initial NAS signalling messages

9.1.2.2.1 Test Purpose (TP)

(1)

with { the UE is switched-off with no valid 5G NAS security context }

ensure that {

when { the UE is switched on }

then {the UE sends a REGISTRATION REQUEST message including cleartext IEs only }

}

(2)

with { the UE is in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the UE is activating a 5G NAS security context resulting from a security mode control procedure }

then {the UE sends SECURITY MODE COMPLETE message with the entire REGISTRATION REQUEST message }

}

9.1.2.2.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 24.501, clauses 4.4.6 and 5.5.1. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 4.4.6]

The 5GS supports protection of initial NAS messages as specified in 3GPP TS 33.501 [24]. The protection of initial NAS messages applies to the REGISTRATION REQUEST and SERVICE REQUEST message, and is achieved as follows:

a) If the UE does not have a valid 5G NAS security context, the UE sends a REGISTRATION REQUEST message including cleartext IEs only. After activating a 5G NAS security context resulting from a security mode control procedure:

1) if the UE needs to send non-cleartext IEs, the UE shall include the entire REGISTRATION REQUEST message (i.e. containing both cleartext IEs and non-cleartext IEs) in the NAS message container IE and shall include the NAS message container IE in the SECURITY MODE COMPLETE message;

2) if the UE does not need to send non-cleartext IEs, the UE shall include the entire REGISTRATION REQUEST message (i.e. containing cleartext IEs only) in the NAS message container IE and shall include the NAS message container IE in the SECURITY MODE COMPLETE message.

b) If the UE has a valid 5G NAS security context and the UE needs to send non-cleartext IEs in a REGISTRATION REQUEST or SERVICE REQUEST message, the UE includes the entire REGISTRATION REQUEST or SERVICE REQUEST message (i.e. containing both cleartext IEs and non-cleartext IEs) in the NAS message container IE and shall cipher the value part of the NAS message container IE. The UE shall then send a REGISTRATION REQUEST or SERVICE REQUEST message containing the cleartext IEs and the NAS message container IE.

When the initial NAS message is a REGISTRATION REQUEST message, the cleartext IEs are:

- Extended protocol discriminator;
- Security header type;
- Spare half octet;
- Registration request message identity;
- 5GS registration type;
- ngKSI;
- 5GS mobile identity;
- UE security capability;
- Additional GUTI;
- UE status; and
- EPS NAS message container.

...

When the UE sends a REGISTRATION REQUEST or SERVICE REQUEST message that includes a NAS message container IE, the UE shall set the security header type of the initial NAS message to "integrity protected".

If the UE does not need to send non-plaintext IEs in the initial NAS message, the UE shall send the initial NAS message i.e. REGISTRATION REQUEST or SERVICE REQUEST message with plaintext IEs only i.e. without including the NAS message container IE in the initial NAS message.

[TS 24.501, clause 5.5.1]

...

If the UE does not have a valid 5G NAS security context, the UE shall send the REGISTRATION REQUEST message without including the NAS message container IE. The UE shall include the entire REGISTRATION REQUEST message (i.e. containing plaintext IEs and non-plaintext IEs) in the NAS message container IE that is sent as part of the SECURITY MODE COMPLETE message as described in subclauses 4.4.6 and 5.2.4.

9.1.2.2.3 Test description

9.1.2.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state 0-A on NGC Cell A according to TS 38.508-1 [4].
- The procedure defined in subclause 4.9.8 in TS 38.508-1 [4] has been performed to ensure that the UE does not have a valid 5G NAS security context.

9.1.2.2.3.2 Test procedure sequence

Table 9.1.2.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | TP | Verdict |
|----|-----------|------------------|----|---------|
|----|-----------|------------------|----|---------|

| | | U - S | | | |
|-------|--|-------|-------------------------|---|---|
| | | | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-4 | Steps 1-3 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-2 are performed. | - | - | - | - |
| 5 | Check: Does the UE transmit an <i>RRCSetupComplete</i> message and a REGISTRATION REQUEST message? | --> | REGISTRATION REQUEST | 1 | P |
| 6 | The SS transmits a <i>DLInformationTransfer</i> message and an AUTHENTICATION REQUEST message. | <-- | AUTHENTICATION REQUEST | | |
| 7 | The UE transmits an <i>ULInformationTransfer</i> message and an AUTHENTICATION RESPONSE message. | --> | AUTHENTICATION RESPONSE | | |
| 8 | The SS transmits a <i>DLInformationTransfer</i> message and a SECURITY MODE COMMAND message. | <-- | SECURITY MODE COMMAND | | |
| 9 | Check: Does the UE transmit an <i>ULInformationTransfer</i> message and a SECURITY MODE COMPLETE message? | --> | SECURITY MODE COMPLETE | 2 | P |
| 10-20 | Steps 10-20a1 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-2 are performed. | - | - | - | - |

9.1.2.2.3.3 Specific message contents

Table 9.1.2.2.3.3-1: REGISTRATION REQUEST (Step 5, Table 9.1.2.2.3.2-1)

Derivation path: TS 38.508-1 [4], table 4.7.1-6 using condition NON_CLEARTEXT_IE

Table 9.1.2.2.3.3-2: REGISTRATION REQUEST (Step 9, Table 9.1.2.2.3.2-1)

Derivation path: TS 38.508-1 [4], table 4.7.1-6 using condition CIPHERED_MESSAGE

Table 9.1.2.2.3.3-3: SECURITY MODE COMPLETE (Step 9, Table 9.1.2.2.3.2-1)

Derivation path: TS 38.508-1 [4], table 4.7.1-26

| Information Element | Value/Remark | Comment | Condition |
|-----------------------|---------------------------------|--|-----------|
| NAS message container | Contents of Table 9.1.2.2.3.3-2 | The entire REGISTRATION REQUEST message. | |

9.1.2.3 Integrity protection / Correct functionality of 5G NAS integrity algorithm / SNOW3G

9.1.2.3.1 Test Purpose (TP)

(1)

with { successful completion of 5G authentication and key agreement (AKA) procedure }

ensure that {

when { UE receives a an integrity protected SECURITY MODE COMMAND message instructing to start integrity protection using algorithm SNOW3G }

then { UE transmits an integrity protected SECURITY MODE COMPLETE using SNOW3G and starts applying the NAS Integrity protection in both UL and DL }

}

(2)

with { Integrity protection successful started by executing Security Mode Procedure }

ensure that {

when { UE receives an IDENTITY REQUEST message (requested identification parameter is not SUCI), without integrity protected }

then { UE does not transmit IDENTITY Response }

}

9.1.2.3.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clause 4.4.4.1, 4.4.4.2, 5.4.2.1, 5.4.2.2 and 5.4.2.3. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 4.4.4.1]

For the UE, integrity protected signalling is mandatory for the 5GMM NAS messages once a valid 5G NAS security context exists and has been taken into use. For the network, integrity protected signalling is mandatory for the 5GMM NAS messages once a secure exchange of 5GS NAS messages has been established for the NAS signalling connection. Integrity protection of all NAS signalling messages is the responsibility of the NAS. It is the network which activates integrity protection.

[TS 24.501, clause 4.4.4.2]

Once the secure exchange of NAS messages has been established, the receiving 5GMM entity in the UE shall not process any NAS signalling messages unless they have been successfully integrity checked by the NAS. If NAS signalling messages, having not successfully passed the integrity check, are received, then the NAS in the UE shall discard that message. The processing of the SECURITY MODE COMMAND message that has not successfully passed the integrity check is specified in subclause 5.4.2.5. If any NAS signalling message is received as not integrity protected even though the secure exchange of NAS messages has been established by the network, then the NAS shall discard this message.

[TS 24.501, clause 5.4.2.1]

The purpose of the NAS security mode control procedure is to take a 5G NAS security context into use, and initialise and start NAS signalling security between the UE and the AMF with the corresponding 5G NAS keys and 5G NAS security algorithms.

[TS 24.501, clause 5.4.2.2]

The AMF initiates the NAS security mode control procedure by sending a SECURITY MODE COMMAND message to the UE and starting timer T3560 (see example in figure 5.4.2.2).

The AMF shall reset the downlink NAS COUNT counter and use it to integrity protect the initial SECURITY MODE COMMAND message if the security mode control procedure is initiated:

- a) to take into use the security context created after a successful execution of the 5G AKA based primary authentication and key agreement procedure or the EAP based primary authentication and key agreement procedure; or

...

The AMF shall send the SECURITY MODE COMMAND message uncyphered, but shall integrity protect the message with the 5G NAS integrity key based on K_{AMF} or mapped K'_{AMF} indicated by the ngKSI included in the message. The AMF shall set the security header type of the message to "integrity protected with new 5G NAS security context".

...

The AMF shall include the replayed security capabilities of the UE (including the security capabilities with regard to NAS, RRC and UP (user plane) ciphering as well as NAS and RRC integrity, and other possible target network security capabilities, i.e. E-UTRAN if the UE included them in the message to network), the selected 5GS ciphering and integrity algorithms and the ngKSI.

[TS 24.501, clause 5.4.2.3]

Upon receipt of the SECURITY MODE COMMAND message, the UE shall check whether the security mode command can be accepted or not. This is done by performing the integrity check of the message, and by checking that the received Replayed UE security capabilities IE has not been altered compared to the latest values that the UE sent to the network.

...

If the type of security context flag included in the SECURITY MODE COMMAND message is set to "native security context" and if the ngKSI matches a valid non-current native 5G NAS security context held in the UE while the UE has a mapped 5G NAS security context as the current 5G NAS security context, the UE shall take the non-current native 5G NAS security context into use which then becomes the current native 5G NAS security context and delete the mapped 5G NAS security context.

...

If the SECURITY MODE COMMAND message can be accepted, the UE shall take the 5G NAS security context indicated in the message into use. The UE shall in addition reset the uplink NAS COUNT counter if:

- a) the SECURITY MODE COMMAND message is received in order to take a 5G NAS security context into use created after a successful execution of the 5G AKA based primary authentication and key agreement procedure or the EAP based primary authentication and key agreement procedure; or
- b) the SECURITY MODE COMMAND message received includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE the ngKSI does not match the current 5G NAS security context, if it is a mapped 5G NAS security context.

...

If the SECURITY MODE COMMAND message can be accepted, the UE shall send a SECURITY MODE COMPLETE message integrity protected with the selected 5GS integrity algorithm and the 5G NAS integrity key based on the K_{AMF} or mapped K'_{AMF} if the type of security context flag is set to "mapped security context" indicated by the ngKSI. When the SECURITY MODE COMMAND message includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE, then the UE shall check whether the SECURITY MODE COMMAND message indicates the ngKSI of the current 5GS security context, if it is a mapped 5G NAS security context, in order not to re-generate the K'_{AMF} .

...

From this time onward the UE shall cipher and integrity protect all NAS signalling messages with the selected 5GS integrity and ciphering algorithms.

9.1.2.3.3 Test description

9.1.2.3.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state Switched OFF (state 0N-B) according to TS 38.508-1 [4].

9.1.2.3.3.2 Test procedure sequence

Table 9.1.2.3.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------------|--|------------------|------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-6 | Steps 2-6 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-2 are performed. | - | - | - | - |
| 7 | The SS transmits a SECURITY MODE COMMAND message to activate NAS security. It is integrity protected. | <-- | SECURITY MODE COMMAND | - | - |
| 8 | Check: Does the UE transmit a SECURITY MODE COMPLETE message and starts applying the NAS Integrity protection in both UL and DL? | --> | SECURITY MODE COMPLETE | 1 | P |
| 9-18a
1 | Steps 10-19a1 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-2 are performed. | - | - | - | - |
| 19 | The SS transmits an IDENTITY REQUEST message with Integrity protected and with default ciphering | <-- | IDENTITY REQUEST | - | - |
| 20 | Check: Does the UE transmit an IDENTITY RESPONSE message with Integrity Protected and with default ciphering? | --> | IDENTITY RESPONSE | 1 | P |
| 21 | The SS transmits an IDENTITY REQUEST message (not Integrity protected) | <-- | IDENTITY REQUEST | - | - |
| 22 | Check: Does the UE transmit an IDENTITY RESPONSE message within the next 5 seconds? | --> | IDENTITY RESPONSE | 2 | F |

9.1.2.3.3.3 Specific message contents

Table 9.1.2.3.3.3-1: SECURITY MODE COMMAND (Step 7, Table 9.1.2.3.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-25 | | | |
|--|--------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Selected NAS security algorithms | | | |
| Type of integrity protection algorithm | '0001'B | 5G integrity algorithm 128-5G-IA1[SNOW3G] | |

9.1.2.4 Integrity protection / Correct functionality of 5G NAS integrity algorithm / AES

9.1.2.4.1 Test Purpose (TP)

(1)

with { successful completion of 5G authentication and key agreement (AKA) procedure }**ensure that** {

when { UE receives a an integrity protected SECURITY MODE COMMAND message instructing to start integrity protection using algorithm AES }

then { UE transmits an integrity protected SECURITY MODE COMPLETE using AES and starts applying the NAS Integrity protection in both UL and DL }

}

(2)

with { Integrity protection successful started by executing Security Mode Procedure }**ensure that** {

when { UE receives an IDENTITY REQUEST message (requested identification parameter is not SUCI), without integrity protected }

then { UE does not transmit IDENTITY Response }

}

9.1.2.4.2 Conformance requirements

Same Conformance requirements as in clause 9.1.2.3.2.

9.1.2.4.3 Test description

9.1.2.4.3.1 Pre-test conditions

Same Pre-test conditions as in clause 9.1.2.3.1.

9.1.2.4.3.2 Test procedure sequence

Same Test procedure sequence as in table 9.1.2.3.3.2-1, except the integrity protection algorithm is AES.

9.1.2.4.3.3 Specific message contents

Table 9.1.2.4.3.3-1: SECURITY MODE COMMAND (Step 7)

| Derivation path: 38.508-1 [4],table 4.7.1-25 | | | |
|--|--------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Selected NAS security algorithms | | | |
| Type of integrity protection algorithm | '0010'B | 5G integrity algorithm 128-5G-IA2 [AES] | |

9.1.2.5 Integrity protection / Correct functionality of 5G NAS integrity algorithm / ZUC

9.1.2.5.1 Test Purpose (TP)

(1)

with { successful completion of 5G authentication and key agreement (AKA) procedure }

ensure that {

when { UE receives a an integrity protected SECURITY MODE COMMAND message instructing to start integrity protection using algorithm ZUC }

then { UE transmits an integrity protected SECURITY MODE COMPLETE using ZUC and starts applying the NAS Integrity protection in both UL and DL }

}

(2)

with { Integrity protection successful started by executing Security Mode Procedure }

ensure that {

when { UE receives an IDENTITY REQUEST message (requested identification parameter is not SUCI), without integrity protected }

then { UE does not transmit IDENTITY Response }

}

9.1.2.5.2 Conformance requirements

Same Conformance requirements as in clause 9.1.2.3.2.

9.1.2.5.3 Test description

9.1.2.5.3.1 Pre-test conditions

Same Pre-test conditions as in clause 9.1.2.3.3.1.

9.1.2.5.3.2 Test procedure sequence

Same Test procedure sequence as in table 9.1.2.3.3.2-1, except the integrity protection algorithm is ZUC.

9.1.2.5.3.3 Specific message contents

Table 9.1.2.5.3.3-1: SECURITY MODE COMMAND (Step 7)

| Derivation path: 38.508-1 [4],table 4.7.1-25 | | | |
|--|--------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Selected NAS security algorithms | | | |
| Type of integrity protection algorithm | '0011'B | 5G integrity algorithm 128-5G-IA3 [ZUC] | |

9.1.2.6 Ciphering and deciphering / Correct functionality of 5G NAS encryption algorithm / SNOW3G

9.1.2.6.1 Test Purpose (TP)

(1)

with { successful completion of 5G authentication and key agreement (AKA) procedure }

ensure that {

when { UE receives a SECURITY MODE COMMAND instructing to start ciphering using algorithm SNOW3G }

then { UE sends a SECURITY MODE COMPLETE message ciphered with SNOW3G and starts applying the NAS ciphering in both UL and DL }

}

9.1.2.6.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clause 5.4.3.1, 5.4.3.2 and 5.4.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.4.2.1]

The purpose of the NAS security mode control procedure is to take a 5G NAS security context into use, and initialise and start NAS signalling security between the UE and the AMF with the corresponding 5G NAS keys and 5G NAS security algorithms.

[TS 24.501, clause 5.4.2.2]

The AMF initiates the NAS security mode control procedure by sending a SECURITY MODE COMMAND message to the UE and starting timer T3560 (see example in figure 5.4.2.2).

The AMF shall reset the downlink NAS COUNT counter and use it to integrity protect the initial SECURITY MODE COMMAND message if the security mode control procedure is initiated:

a) to take into use the security context created after a successful execution of the 5G AKA based primary authentication and key agreement procedure or the EAP based primary authentication and key agreement procedure; or

...

The AMF shall send the SECURITY MODE COMMAND message uncyphered, but shall integrity protect the message with the 5G NAS integrity key based on K_{AMF} or mapped K'_{AMF} indicated by the ngKSI included in the message. The AMF shall set the security header type of the message to "integrity protected with new 5G NAS security context".

...

The AMF shall include the replayed security capabilities of the UE (including the security capabilities with regard to NAS, RRC and UP (user plane) ciphering as well as NAS and RRC integrity, and other possible target network security capabilities, i.e. E-UTRAN if the UE included them in the message to network), the selected 5GS ciphering and integrity algorithms and the ngKSI.

[TS 24.501, clause 5.4.2.3]

Upon receipt of the SECURITY MODE COMMAND message, the UE shall check whether the security mode command can be accepted or not. This is done by performing the integrity check of the message, and by checking that the received Replayed UE security capabilities IE has not been altered compared to the latest values that the UE sent to the network.

...

If the type of security context flag included in the SECURITY MODE COMMAND message is set to "native security context" and if the ngKSI matches a valid non-current native 5G NAS security context held in the UE while the UE has a mapped 5G NAS security context as the current 5G NAS security context, the UE shall take the non-current native 5G NAS security context into use which then becomes the current native 5G NAS security context and delete the mapped 5G NAS security context.

...

If the SECURITY MODE COMMAND message can be accepted, the UE shall take the 5G NAS security context indicated in the message into use. The UE shall in addition reset the uplink NAS COUNT counter if:

a) the SECURITY MODE COMMAND message is received in order to take a 5G NAS security context into use created after a successful execution of the 5G AKA based primary authentication and key agreement procedure or the EAP based primary authentication and key agreement procedure; or

b) the SECURITY MODE COMMAND message received includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE the ngKSI does not match the current 5G NAS security context, if it is a mapped 5G NAS security context.

...

If the SECURITY MODE COMMAND message can be accepted, the UE shall send a SECURITY MODE COMPLETE message integrity protected with the selected 5GS integrity algorithm and the 5G NAS integrity key based on the K_{AMF} or mapped K'_{AMF} if the type of security context flag is set to "mapped security context" indicated by the ngKSI. When the SECURITY MODE COMMAND message includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE, then the UE shall check whether the SECURITY MODE COMMAND message indicates the ngKSI of the current 5GS security context, if it is a mapped 5G NAS security context, in order not to re-generate the K'_{AMF} .

Furthermore, if the SECURITY MODE COMMAND message can be accepted, the UE shall cipher the SECURITY MODE COMPLETE message with the selected 5GS ciphering algorithm and the 5GS NAS ciphering key based on the K_{AMF} or mapped K'_{AMF} indicated by the ngKSI. The UE shall set the security header type of the message to "integrity protected and ciphered with new 5G NAS security context".

From this time onward the UE shall cipher and integrity protect all NAS signalling messages with the selected 5GS integrity and ciphering algorithms

9.1.2.6.3 Test description

9.1.2.6.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state Switched OFF (state ON-B) according to TS 38.508-1 [4].

9.1.2.6.3.2 Test procedure sequence

Table 9.1.2.6.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------------|--|------------------|------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-6 | Steps 2-6 of the generic procedure for UE registration specified in TS 38.508-1 [4] subclause 4.5.2.3 are performed. | - | - | - | - |
| 7 | The SS transmits a SECURITY MODE COMMAND message to activate NAS security. | <-- | SECURITY MODE COMMAND | - | - |
| 8 | Check: Does the UE transmit a SECURITY MODE COMPLETE message ciphered and starts applying the NAS ciphering in both UL and DL? | --> | SECURITY MODE COMPLETE | 1 | P |
| 9-18a
1 | Steps 10-19a1 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-2 are performed. | - | - | - | - |
| 19 | The SS transmits an IDENTITY REQUEST message Ciphered | <-- | IDENTITY REQUEST | - | - |
| 20 | Check: Does the UE transmit an IDENTITY RESPONSE message Ciphered? | --> | IDENTITY RESPONSE | 1 | P |

9.1.2.6.3.3 Specific message contents

Table 9.1.2.6.3.3-1: SECURITY MODE COMMAND (Step 7, Table 9.1.2.6.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-25 | | | |
|--|--------------|------------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Selected NAS security algorithms | | | |
| Type of ciphering algorithm | '0001'B | 5G encryption algorithm 128- | |

| | | | |
|--|--|--------------------|--|
| | | 5G-EA1
[SNOW3G] | |
|--|--|--------------------|--|

9.1.2.7 Cipherring and decipherring / Correct functionality of 5G NAS encryption algorithm / AES

9.1.2.7.1 Test Purpose (TP)

(1)

with { successful completion of 5G authentication and key agreement (AKA) procedure }

ensure that {

when { UE receives a SECURITY MODE COMMAND instructing to start cipherring using algorithm AES }

then { UE sends a SECURITY MODE COMPLETE message cipherring with AES and starts applying the NAS cipherring in both UL and DL }

}

9.1.2.7.2 Conformance requirements

Same conformance requirement as in clause 9.1.2.6.2.

9.1.2.7.3 Test description

9.1.2.7.3.1 Pre-test conditions

Same Pre-test conditions as in clause 9.1.2.6.3.1.

9.1.2.7.3.2 Test procedure sequence

Same Test procedure sequence as in Table 9.1.2.6.3.2-1, except the cipherring algorithm is AES.

9.1.2.7.3.3 Specific message contents

Table 9.1.2.7.3.3-1: SECURITY MODE COMMAND (Step 7)

| Derivation path: 38.508-1 [4],table 4.7.1-25 | | | |
|--|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Selected NAS security algorithms | | | |
| Type of cipherring algorithm | '0010'B | 5G encryption algorithm 128-5G-EA2 [AES] | |

9.1.2.8 Cipherng and deciphering / Correct functionality of 5G NAS encryption algorithm / ZUC

9.1.2.8.1 Test Purpose (TP)

(1)

with { successful completion of 5G authentication and key agreement (AKA) procedure }

ensure that {

when { UE receives a SECURITY MODE COMMAND instructing to start cipherng using algorithm ZUC }

then { UE sends a SECURITY MODE COMPLETE message cipherng with ZUC and starts applying the NAS cipherng in both UL and DL }

}

9.1.2.8.2 Conformance requirements

Same conformance requirement as in clause 9.1.2.6.2.

9.1.2.8.3 Test description

9.1.2.8.3.1 Pre-test conditions

Same Pre-test conditions as in clause 9.1.2.6.3.1.

9.1.2.8.3.2 Test procedure sequence

Same Test procedure sequence as in Table 9.1.2.6.3.2-1, except the cipherng algorithm is ZUC.

9.1.2.8.3.3 Specific message contents

Table 9.1.2.8.3.3-1: SECURITY MODE COMMAND (Step 7)

| Derivation path: 38.508-1 [4],table 4.7.1-25 | | | |
|--|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Selected NAS security algorithms | | | |
| Type of cipherng algorithm | '0011'B | 5G encryption algorithm 128-5G-EA3 [ZUC] | |

9.1.3 Identification

9.1.3.1 Identification procedure

9.1.3.1.1 Test Purpose (TP)

(1)

with { The UE is in 5GMM-REGISTERED-INITIATED state and the SS sends an IDENTITY REQUEST message }

ensure that {

when { UE detects transmission failure of IDENTITY RESPONSE message }
then { The UE re-initiates the Initial registration procedure }
}

(2)

with { The UE is in 5GMM-CONNECTED mode and the SS sends an IDENTITY REQUEST message }
ensure that {
when { The UE receives the unprotected IDENTITY REQUEST message with identity type as SUCI }
then { UE transmits the IDENTITY RESPONSE message with identity type set to SUCI }
}

(3)

with { The UE is in 5GMM-CONNECTED mode and the SS sends an IDENTITY REQUEST message }
ensure that {
when { the UE receives an IDENTITY REQUEST with identity type set as IMEISV }
then { UE transmits an IDENTITY RESPONSE with identity type set as IMEISV }
}

(4)

with { The UE is in 5GMM-CONNECTED mode and the SS sends an IDENTITY REQUEST message }
ensure that {
when { the UE receives an IDENTITY REQUEST with identity type set as “IMEI” }
then { UE transmits an IDENTITY RESPONSE with identity type set as “IMEI” }
}

(5)

with { The UE is in 5GMM-CONNECTED mode and the SS sends an IDENTITY REQUEST message }
ensure that {
when { the UE receives an IDENTITY REQUEST with identity type set as “5G-GUTI” and has no valid 5G-GUTI available }
then { UE transmits an IDENTITY RESPONSE with identity type set as “No identity” }
}

9.1.3.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.4.3.3, 4.4.4.3 and 5.4.3.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.4.3.3]

A UE shall be ready to respond to an IDENTITY REQUEST message at any time whilst in 5GMM-CONNECTED mode.

Upon receipt of the IDENTITY REQUEST message:

- a) if the Identity type IE in the IDENTITY REQUEST message is not set to "SUCI", the UE shall send an IDENTITY RESPONSE message to the network. The IDENTITY RESPONSE message shall contain the identification parameters as requested by the network; and
- b) if the Identity type IE in the IDENTITY REQUEST message is set to "SUCI", the UE shall:
 - 1) if timer T3519 is not running, generate a fresh SUCI as specified in 3GPP TS 33.501 [24], send an IDENTITY RESPONSE message with the SUCI, start timer T3519 and store the value of the SUCI sent in the IDENTITY RESPONSE message; and
 - 2) if timer T3519 is running, send an IDENTITY RESPONSE message with the stored SUCI.

[TS 24.501, clause 4.4.4.3]

Except the messages listed below, no NAS signalling messages shall be processed by the receiving 5GMM entity in the AMF or forwarded to the 5GSM entity, unless the secure exchange of NAS messages has been established for the NAS signalling connection:

- a) REGISTRATION REQUEST;
- b) IDENTITY RESPONSE (if requested identification parameter is SUCI);
- c) AUTHENTICATION RESPONSE;
- d) AUTHENTICATION FAILURE;
- e) SECURITY MODE REJECT;
- f) DEREGISTRATION REQUEST; and
- g) DEREGISTRATION ACCEPT;

NOTE 1: The REGISTRATION REQUEST message is sent by the UE without integrity protection, if the registration procedure is initiated due to an inter-system change in 5GMM-IDLE mode and no current 5G NAS security context is available in the UE. The other messages are accepted by the AMF without integrity protection, as in certain situations they are sent by the UE before security can be activated.

NOTE 2: The DEREGISTRATION REQUEST message can be sent by the UE without integrity protection, e.g. if the UE is registered for emergency services and there is no shared 5G NAS security context available, or if due to user interaction a registration procedure is cancelled before the secure exchange of NAS messages has been established. For these cases the network can attempt to use additional criteria (e.g. whether the UE is subsequently still performing periodic registration update or still responding to paging) before marking the UE as 5GMM-DEREGISTERED.

Integrity protection is never applied directly to 5GSM messages, but to the 5GMM message in which the 5GSM message is included.

Once a current 5G NAS security context exists, until the secure exchange of NAS messages has been established for the NAS signalling connection, the receiving 5GMM entity in the AMF shall process the following NAS signalling messages, even if the MAC included in the message fails the integrity check or cannot be verified, as the 5G NAS security context is not available in the network:

- a) REGISTRATION REQUEST;
- b) IDENTITY RESPONSE (if requested identification parameter is SUCI);

- c) AUTHENTICATION RESPONSE;
- d) AUTHENTICATION FAILURE;
- e) SECURITY MODE REJECT;
- f) DEREGISTRATION REQUEST;
- g) DEREGISTRATION ACCEPT; and
- h) SERVICE REQUEST;

...

[TS 24.501, clause 5.4.3.5]

The following abnormal cases can be identified:

- a) Transmission failure of the IDENTITY RESPONSE message (if the identification procedure is triggered by a registration procedure).

The UE shall re-initiate the registration procedure.

- b) Requested identity is not available

If the UE cannot encode the requested identity in the IDENTITY RESPONSE message, e.g. because no valid USIM is available, then it shall encode the identity type as "No identity".

9.1.3.1.3 Test description

9.1.3.1.3.1 Pre test conditions

System Simulator:

- NGC Cell A "Serving cell" [TS 38.508 Table 6.3.2.2-1], PLMN1, TAI-1
- System information combination NR-1 as defined in TS 38.508[4] clause 4.4.3.1.2 is used.

UE:

None.

Preamble:

- The UE is in state Switched OFF [State 0N-B as per TS 38.508-1 Table 4.4A.2-0].

9.1.3.1.3.2 Test procedure sequence

Table 9.1.3.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| | The SS configures NGC Cell A as the serving cell | - | - | - | - |
| 1 | The UE is switched on | - | - | - | - |
| 2-4 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | | - | - |
| 5 | SS is configured to not allocate any UL grant | | | - | - |

| | | | | | |
|------------|---|-----|---------------------|---|---|
| | and RA Response, so that the UE cannot send the IDENTITY RESPONSE to SS. | | | | |
| 6 | The SS transmits an IDENTITY REQUEST requesting SUCI in the IE identity type | <-- | IDENTITY REQUEST | - | - |
| 6A | SS starts timer of T3511 (Note 1). | - | - | - | - |
| 6B | SS locally releases the RRC connection. | - | - | - | - |
| 6C | Wait for T3511 to time out. | - | - | - | - |
| 6D | SS configures the RA Response. | - | - | - | - |
| 7-9 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. (Note 2) | --> | | 1 | P |
| 10 | The SS transmits an unprotected IDENTITY REQUEST requesting SUCI in the IE identity type | <-- | IDENTITY REQUEST | - | - |
| 11 | Check : Does the UE respond with an IDENTITY RESPONSE message with IE identity type set to "SUCI" ? | --> | IDENTITY RESPONSE | 2 | P |
| 11 A | The SS transmits a REGISTRATION REJECT (Cause #3, illegal UE) | <-- | REGISTRATION REJECT | - | - |
| 11 B | The SS releases the RRC | - | - | - | - |
| 11 C | The UE is Switched OFF | - | - | - | - |
| 11 D | The UE is Switched ON | - | - | - | - |
| 12-24 | Steps 1–13 of Table 4.5.2.2-2 in TS38.508-1 [4] are performed | - | | | |
| 25 | The SS transmits an IDENTITY REQUEST requesting 5G-GUTI in the IE identity type | <-- | IDENTITY REQUEST | - | - |
| 26 | Check: Does the UE respond with an IDENTITY RESPONSE message with IE identity type set to "No identity" ? | --> | IDENTITY RESPONSE | 5 | P |
| 27-29 Ba 1 | Steps 14-19a1 of Table 4.5.2.2-2 in TS 38.508-1 [4] are performed | - | - | - | - |
| 30 | The SS transmits an IDENTITY REQUEST requesting IMEISV in the IE identity type | <-- | IDENTITY REQUEST | - | - |
| 31 | Check : Does the UE respond with an IDENTITY RESPONSE message with IE identity type set to IMEISV ? | --> | IDENTITY RESPONSE | 3 | P |
| 32 | The SS transmits an IDENTITY REQUEST requesting IMEI in the IE identity type | <-- | IDENTITY REQUEST | - | - |
| 33 | Check : Does the UE respond with an IDENTITY RESPONSE message with IE identity type set to IMEI ? | --> | IDENTITY RESPONSE | 4 | P |

| | | | | | |
|-------|------|--|--|--|--|
| 34-35 | Void | | | | |
|-------|------|--|--|--|--|

Note 1: To send the IDENTITY RESPONSE, the UE will initiate RACH to get UL grant. Since there is no RA Response, registration failure due to lower layer failure will occur, then T3511 will start. During timer T3511, UE fails on transmission of AUTHENTICATION RESPONSE message with the indication from lower layers. T3511 at the SS includes the timer tolerance.

Note 2: The UL grant is restarted in step 8.

9.1.3.1.3.3 Specific message contents

Table 9.1.3.1.3.3-1: IDENTITY REQUEST (step 6, 10 Table 9.1.3.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-21 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '001'B | SUCI | |

Table 9.1.3.1.3.3-2: IDENTITY RESPONSE (step 11 Table 9.1.3.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-22 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '001'B | SUCI | |

Table 9.1.3.1.3.3-3: IDENTITY REQUEST (step 30 Table 9.1.3.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-21 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '101'B | IMEISV | |

Table 9.1.3.1.3.3-4: IDENTITY RESPONSE (step 31 Table 9.1.3.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-22 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '101'B | IMEISV | |

Table 9.1.3.1.3.3-5: IDENTITY REQUEST (step 32 Table 9.1.3.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-21 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '011'B | IMEI | |

Table 9.1.3.1.3.3-6: IDENTITY RESPONSE (step 33 Table 9.1.3.1.3.2-1)

| | | | |
|---|--|--|--|
| Derivation Path: 38.508-1 [4], Table 4.7.1-22 | | | |
|---|--|--|--|

| Information Element | Value/remark | Comment | Condition |
|---------------------|--------------|---------|-----------|
| Identity type | '011'B | IMEI | |

Table 9.1.3.1.3.3-7: IDENTITY REQUEST (step 25 Table 9.1.3.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-21 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '010'B | 5G-GUTI | |

Table 9.1.3.1.3.3-8: IDENTITY RESPONSE (step 26 Table 9.1.3.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-22 | | | |
|--|--------------|-------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '000'B | No Identity | |

Table 9.1.3.1.3.3-9: Void

Table 9.1.3.1.3.3-10: REGISTRATION REJECT (step 11A Table 9.1.3.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9 | | | |
|---|--------------|------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '00000011'B | Illegal UE | |

9.1.4 Generic UE configuration update

9.1.4.1 Generic UE configuration update / New 5G-GUTI, NITZ, registration requested, Network slicing indication, New Allowed NSSAI / acknowledgement from the UE

9.1.4.1.1 Test Purpose (TP)

(1)

with { UE in 5GMM-REGISTERED state }

ensure that {

when { UE receives a new 5G-GUTI in the CONFIGURATION UPDATE COMMAND message and acknowledgement from the UE is requested }

then { UE sends a CONFIGURATION UPDATE COMPLETE message and UE shall consider new 5G-GUTI as valid }

}

(2)

with { UE in 5GMM-REGISTERED state }

ensure that {

when { UE receives a NITZ information in the CONFIGURATION UPDATE COMMAND message and acknowledgement from the UE is not requested }

then { UE updates NITZ information }

}

(3)

with { UE in 5GMM-REGISTERED state }

ensure that {

when { UE receives CONFIGURATION UPDATE COMMAND message indicating “registration requested” and contains no other parameters }

then { UE deletes any stored allowed NSSAI for this PLMN and then release the existing N1 NAS signalling connection, starts a mobility registration procedure }

}

(4)

with { UE in 5GMM-REGISTERED state }

ensure that {

when { UE receives a new allowed NSSAI in the CONFIGURATION UPDATE COMMAND message and registration is not requested }

then { UE replaces any stored allowed NSSAI for this PLMN with new allowed NSSAI }

}

(5)

with { UE in 5GMM-REGISTERED state }

ensure that {

when { UE receives a Network Slicing subscription change indication set to "Network slicing subscription changed" in the CONFIGURATION UPDATE COMMAND message and registration is not requested }

then { UE deletes the network slicing information for each and every PLMN except for the current PLMN and default configured NSSAI }

}

9.1.4.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 4.6.2.2, 5.4.4.1, 5.4.4.2 and 5.4.4.3. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 4.6.2.2]

If available, the configured NSSAI(s) shall be stored in a non-volatile memory in the ME as specified in annex C.

...

If the UE receives the CONFIGURATION UPDATE COMMAND message indicating "registration requested" and contains no other parameters (see subclauses 5.4.4.2 and 5.4.4.3), the UE shall delete any stored allowed NSSAI for this PLMN, and delete any stored mapping of each S-NSSAI of the allowed NSSAI to the S-NSSAI(s) of the HPLMN, if available;

...

- d) When the UE receives the Network slicing indication IE with the Network slicing subscription change indication set to "Network slicing subscription changed" in the REGISTRATION ACCEPT message or in the CONFIGURATION UPDATE COMMAND message, the UE shall delete the network slicing information for each of the PLMNs that the UE has slicing information stored for (excluding the current PLMN). The UE shall not delete the default configured NSSAI. Additionally, the UE shall update the network slicing information for the current PLMN (if received) as specified above in bullets a), b) and c):

[TS 24.501 clause 5.4.4.1]

The purpose of this procedure is to:

- a) allow the AMF to update the UE configuration for access and mobility management-related parameters decided and provided by the AMF by providing new parameter information within the command; or
- b) request the UE to perform a registration procedure for mobility and periodic registration update towards the network to update access and mobility management-related parameters decided and provided by the AMF (see subclause 5.5.1.3).

This procedure is initiated by the network and can only be used when the UE has an established 5GMM context, and the UE is in 5GMM-CONNECTED mode. When the UE is in 5GMM-IDLE mode, the AMF may use the paging or notification procedure to initiate the generic UE configuration update procedure. The AMF can request a confirmation response in order to ensure that the parameter has been updated by the UE.

This procedure shall be initiated by the network to assign a new 5G-GUTI to the UE after a successful service request procedure invoked as a response to a paging request from the network and before the release of the N1 NAS signalling connection. If the service request procedure was triggered due to 5GSM downlink signalling pending, the procedure for assigning a new 5G-GUTI can be initiated by the network after the transport of the 5GSM downlink signalling.

The following parameters are supported by the generic UE configuration update procedure without the need to request the UE to perform the registration procedure for mobility and periodic registration update:

- a) 5G-GUTI;
- b) TAI list;
- c) Service area list;
- d) Network identity and time zone information (Full name for network, short name for network, local time zone, universal time and local time zone, network daylight saving time);
- e) LADN information;
- f) Rejected NSSAI;
- g) Network slicing indication;
- h) Operator-defined access category definitions; and

i) SMS indication.

The following parameters can be sent to the UE with or without a request to perform the registration procedure for mobility and periodic registration update:

- a) Allowed NSSAI; or
- b) Configured NSSAI.

The following parameter is sent to the UE with a request to perform the registration procedure for mobility and periodic registration update:

- a) MICO indication.

The following parameters are sent over 3GPP access only:

- a) LADN information;
- b) MICO indication;
- c) TAI list; and
- d) Service area list.

The following parameters are managed and sent per access type i.e., independently over 3GPP access or non 3GPP access:

- a) Allowed NSSAI; and
- b) Rejected NSSAI (when the NSSAI is rejected for the current registration area).

The following parameters are managed commonly and sent over 3GPP access or non 3GPP access:

- a) 5G-GUTI;
- b) Network identity and time zone information;
- c) Rejected NSSAI (when the NSSAI is rejected for the current PLMN);
- d) Configured NSSAI; and
- e) SMS indication.

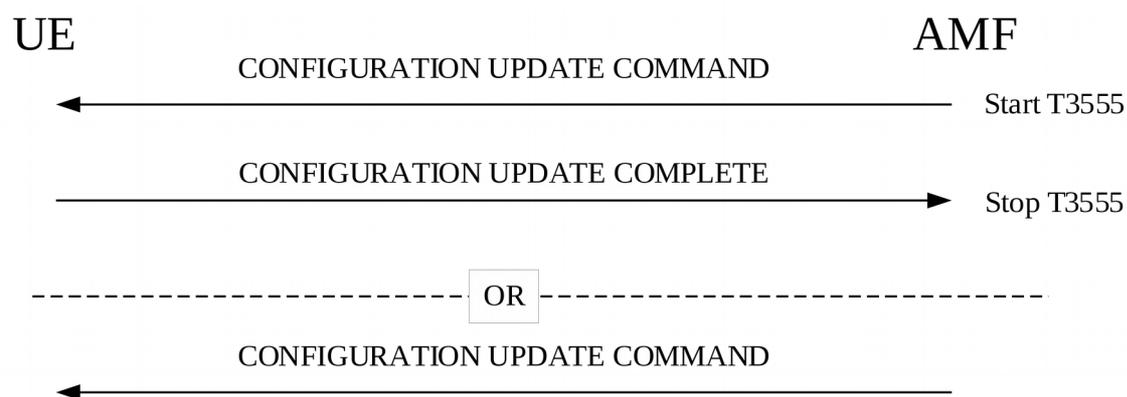


Figure 5.4.4.1.1: Generic UE configuration update procedure

[TS 24.501 clause 5.4.4.2]

The AMF shall initiate the generic UE configuration update procedure by sending the CONFIGURATION UPDATE COMMAND message to the UE.

The AMF shall in the CONFIGURATION UPDATE COMMAND message either:

- a) include one or more of the following parameters: 5G-GUTI, TAI list, allowed NSSAI that may include the mapped S-NSSAI(s), LADN information, service area list, MICO indication NITZ information, configured NSSAI that may include the mapped S-NSSAI(s), rejected NSSAI, network slicing indication, operator-defined access category definitions or SMS indication;
- b) include the Configuration update indication IE with the Registration requested bit set to "registration requested"; or
- c) include a combination of both a) and b).

If an acknowledgement from the UE is requested, the AMF shall indicate "acknowledgement requested" in the Acknowledgement bit of the Configuration update indication IE in the CONFIGURATION UPDATE COMMAND message and shall start timer T3555. Acknowledgement shall be requested for all parameters except when only NITZ is included.

To initiate parameter re-negotiation between the UE and network, the AMF shall indicate "registration requested" in the Registration requested bit of the Configuration update indication IE in the CONFIGURATION UPDATE COMMAND message.

If a new allowed NSSAI information or AMF re-configuration of supported S-NSSAIs requires an AMF relocation, the AMF shall indicate "registration requested" in the Registration requested bit of the Configuration update indication IE and include the Allowed NSSAI IE in the CONFIGURATION UPDATE COMMAND message.

If the AMF includes a new configured NSSAI in the CONFIGURATION UPDATE COMMAND message and the new configured NSSAI requires an AMF relocation as specified in 3GPP TS 23.501 [8], the AMF shall indicate "registration requested" in the Registration requested bit of the Configuration update indication IE in the message.

If the AMF indicates "registration requested" in the Registration requested bit of the Configuration update indication IE, acknowledgement shall be requested.

If changes to the allowed NSSAI require the UE to initiate a registration procedure, but the AMF is unable to determine an allowed NSSAI for the UE as specified in 3GPP TS 23.501 [8], the CONFIGURATION UPDATE COMMAND message shall indicate "registration requested" in the Registration requested bit of the Configuration update indication IE, and shall not contain any other parameters.

If the AMF needs to update the LADN information, the AMF shall include the LADN information in the LADN information IE of the CONFIGURATION UPDATE COMMAND message.

During an established 5GMM context, the network may send none, one, or more CONFIGURATION UPDATE COMMAND messages to the UE. If more than one CONFIGURATION UPDATE COMMAND message is sent, the messages need not have the same content.

[TS 24.501 clause 5.4.4.3]

Upon receiving the CONFIGURATION UPDATE COMMAND message, the UE shall stop timer T3346 if running and use the contents to update appropriate information stored within the UE.

If "acknowledgement requested" is indicated in the Acknowledgement bit of the Configuration update indication IE in the CONFIGURATION UPDATE COMMAND message, the UE shall send a CONFIGURATION UPDATE COMPLETE message.

If the UE receives a new 5G-GUTI in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new 5G-GUTI as valid, the old 5G-GUTI as invalid, stop timer T3519 if running, and delete any stored SUCI; otherwise, the UE shall consider the old 5G-GUTI as valid. The UE shall provide the 5G-GUTI to the lower layer of 3GPP access if the CONFIGURATION UPDATE COMMAND message is sent over the non-3GPP access, and the UE is in 5GMM-REGISTERED in both 3GPP access and non-3GPP access in the same PLMN.

If the UE receives a new TAI list in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new TAI list as valid and the old TAI list as invalid; otherwise, the UE shall consider the old TAI list as valid.

If the UE receives a new service area list in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new service area list as valid and the old service area list as invalid; otherwise, the UE shall consider the old service area list, if any, as valid.

If the UE receives new NITZ information in the CONFIGURATION UPDATE COMMAND message, the UE considers the new NITZ information as valid and the old NITZ information as invalid; otherwise, the UE shall consider the old NITZ information as valid.

If the UE receives a LADN information IE in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the old LADN information as invalid and the new LADN information as valid, if any; otherwise, the UE shall consider the old LADN information as valid.

If the UE receives a new allowed NSSAI for the associated access type in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new allowed NSSAI as valid for the associated access type, store the allowed NSSAI for the associated access type as specified in subclause 4.6.2.2 and consider the old allowed NSSAI for the associated access type as invalid; otherwise, the UE shall consider the old Allowed NSSAI as valid for the associated access type.

If the UE receives a new configured NSSAI in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new configured NSSAI for the registered PLMN as valid and the old configured NSSAI for the registered PLMN as invalid; otherwise, the UE shall consider the old configured NSSAI for the registered PLMN as valid. The UE shall store the new configured NSSAI as specified in subclause 4.6.2.2.

If the UE receives the Network slicing indication IE in the CONFIGURATION UPDATE COMMAND message with the Network slicing subscription change indication set to "Network slicing subscription changed", the UE shall delete the network slicing information for each and every PLMN except for the current PLMN as specified in subclause 4.6.2.2.

If the UE receives Operator-defined access category definitions IE in the CONFIGURATION UPDATE COMMAND message and the Operator-defined access category definitions IE contains one or more operator-defined access category definitions, the UE shall delete any operator-defined access category definitions stored for the RPLMN and shall store the received operator-defined access category definitions for the RPLMN. If the UE receives the Operator-defined access category definitions IE in the CONFIGURATION UPDATE COMMAND message and the Operator-defined access category definitions IE contains no operator-defined access category definitions, the UE shall delete any operator-defined access category definitions stored for the RPLMN. If the CONFIGURATION UPDATE COMMAND message does not contain the Operator-defined access category definitions IE, the UE shall not delete the operator-defined access category definitions stored for the RPLMN.

If the UE receives the SMS indication IE in the CONFIGURATION UPDATE COMMAND message with the SMS availability indication set to:

- a) "SMS over NAS not available", the UE shall consider that SMS over NAS transport is not allowed by the network; and
- b) "SMS over NAS available", the UE may request the use of SMS over NAS transport by performing a registration procedure for mobility and periodic registration update as specified in subclause 5.5.1.3, after the completion of the generic UE configuration update procedure.

If the CONFIGURATION UPDATE COMMAND message indicates "registration requested" in the Registration requested bit of the Configuration update indication IE and:

- a) contains no other parameters or contains at least one of the following parameters: a new allowed NSSAI, a new configured NSSAI or the Network slicing subscription change indication, and:
 - 1) an emergency PDU session exists, the UE shall, after the completion of the generic UE configuration update procedure and the release of the emergency PDU session, release the existing N1 NAS signalling connection, and start a registration procedure for mobility and periodic registration update as specified in subclause 5.5.1.3; or
 - 2) no emergency PDU Session exists, the UE shall, after the completion of the generic UE configuration update procedure and the release of the existing N1 NAS signalling connection, start a registration procedure for mobility and periodic registration update as specified in subclause 5.5.1.3; or
- b) an MICO indication is included without a new allowed NSSAI or a new configured NSSAI, the UE shall, after the completion of the generic UE configuration update procedure, start a registration procedure for mobility and registration update as specified in subclause 5.5.1.3 to re-negotiate MICO mode with the network.

The UE receiving the rejected NSSAI in the CONFIGURATION UPDATE COMMAND message takes the following actions based on the rejection cause in the rejected NSSAI:

"S-NSSAI not available in the current PLMN"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current PLMN until switching off the UE or the UICC containing the USIM is removed.

"S-NSSAI not available in the current registration area"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current registration area as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current registration area until switching off the UE, the UE moving out of the current registration area or the UICC containing the USIM is removed.

9.1.4.1.3 Test description

9.1.4.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A configured according to Table 6.3.2.2-1 and Table 6.3.2.2-3 in 38.508-1 [4] belongs to Home PLMN and set as serving cell;
- NGC Cell G configured according to Table 6.3.2.2-1 and Table 6.3.2.2-3 in 38.508-1 [4] and set as Non-Suitable "Off" cell.

UE:

- UE is configured with NSSAI associated with HPLMN and with 5G-GUTI assigned.

Preamble:

- The UE is in state 3N-A on NGC cell A according to TS 38.508-1 [4].

9.1.4.1.3.2 Test procedure sequence

Table 9.1.4.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|--|------------------|-------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a CONFIGURATION UPDATE COMMAND message including a new 5G-GUTI. | <-- | CONFIGURATION UPDATE COMMAND | - | - |
| 2 | Check: Does UE transmit a CONFIGURATION UPDATE COMPLETE message? | --> | CONFIGURATION UPDATE COMPLETE | 1 | P |
| 3 | The SS transmits an <i>RRRelease</i> message. | - | - | - | - |
| 4 | The SS transmits a <i>Paging</i> message with the new 5G-GUTI. | - | - | - | - |
| 5-11 | Steps 2 to 8 of the generic procedure for NR_RRC_CONNECTED specified in TS 38.508-1 [4] subclause 4.5.4.2-3 are performed. | - | - | 1 | P |
| 12 | The SS transmits a CONFIGURATION UPDATE COMMAND message including NITZ information. | <-- | CONFIGURATION UPDATE COMMAND | - | - |
| 13 | Check: Does the UE transmit a | --> | CONFIGURATION UPDATE | 2 | F |

| | | | | | |
|-----------|--|-----|-------------------------------|---|---|
| | CONFIGURATION UPDATE COMPLETE message within the expiry of T3555? | | COMPLETE | | |
| 14 | Check: Using MMI/AT command verify the NITZ update on the UE. | - | - | 2 | P |
| 15 | Switch off procedure in RRC_Connected specified in TS 38.508-1 [4] subclause 4.9.6.3 is performed. | - | - | - | - |
| 16 | The UE is switched On. | - | - | - | - |
| 17-30 | Steps 1 to13 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 [4] subclause 4.5.2 are performed. | - | - | - | - |
| 31 | The SS transmits a REGISTRATION ACCEPT message including Configured NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 31A – 31E | Steps 15 to 19a1 of the generic procedure for NR RRC_IDLE as specified in TS 38.508-1 [4] subclause 4.5.2.2-2 with ' <i>connected without release</i> ' are performed. | - | - | - | - |
| 32 | The SS transmits a CONFIGURATION UPDATE COMMAND message including registration requested IE. | <-- | CONFIGURATION UPDATE COMMAND | - | - |
| 32A | The UE transmits a CONFIGURATION UPDATE COMPLETE message. | --> | CONFIGURATION UPDATE COMPLETE | - | - |
| 33 | Check: Does UE transmit a REGISTRATION REQUEST message with registration type value set to “Mobility” and including the Requested NSSAI? | --> | REGISTRATION REQUEST | 3 | P |
| 34-42 | Void. | - | - | - | - |
| 43 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 44 | The UE transmits an <i>ULInformationTransfer</i> message and a REGISTRATION COMPLETE message. | --> | REGISTRATION COMPLETE | - | - |
| 44A | The SS transmits an <i>RRCRelease</i> message. | - | - | - | - |
| 45 | Check: Using MMI/AT command (+C5GNSSAIRDP) verify the update of allowed NSSAI. | - | - | 3 | P |
| 45A – 45H | Steps 1 to 8 of the generic procedure for NR RRC_CONNECTED specified in TS 38.508-1 [4] subclause 4.5.4.2-3 are performed. | - | - | - | - |
| 46 | The SS transmits a CONFIGURATION UPDATE COMMAND message including a new allowed NSSAI list. | <-- | CONFIGURATION UPDATE COMMAND | - | - |
| 47 | The UE transmits a CONFIGURATION UPDATE COMPLETE message. | --> | CONFIGURATION UPDATE COMPLETE | - | - |

| | | | | | |
|-------|--|-----|-------------------------------|---|---|
| 48 | Check: Using MMI/AT command (+C5GNSSAIRDP) verify the update of allowed NSSAI. | - | - | 4 | P |
| 49 | The SS configures NGC Cell A as the "Non-suitable cell" and NGC Cell G as the "Serving cell". | - | - | - | - |
| 50-53 | Steps 1 to 3 of the test procedure sequence mobility registration updating specified in TS 38.508-1 [4] subclause 4.9.5.2.2-1 are performed on NGC Cell G. | - | - | - | - |
| 53-63 | Void. | - | - | - | - |
| 64 | The SS transmits a REGISTRATION ACCEPT message including Allowed and Configured NSSAIs. | <-- | REGISTRATION ACCEPT | - | - |
| 65 | The UE transmits an <i>ULInformationTransfer</i> message and a REGISTRATION COMPLETE message. | --> | REGISTRATION COMPLETE | - | - |
| 66 | The SS transmits a CONFIGURATION UPDATE COMMAND message with Network slicing subscription changed. | <-- | CONFIGURATION UPDATE COMMAND | - | - |
| 67 | The UE transmits a CONFIGURATION UPDATE COMPLETE message. | --> | CONFIGURATION UPDATE COMPLETE | - | - |
| 67A | The SS transmits an <i>RRRelease</i> message. | - | - | - | - |
| 68 | Check: Using MMI/AT command (+C5GNSSAIRDP) verify the update of allowed NSSAI. | - | - | 5 | P |

9.1.4.1.3.3 Specific message contents

Table 9.1.4.1.3.3-1: CONFIGURATION UPDATE COMMAND (step 1, Table 9.1.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|------------------------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Configuration update indication | 0001 | Acknowledgement (ACK) requested | |
| 5G-GUTI | Other than the default value | | |

Table 9.1.4.1.3.3-2: CONFIGURATION UPDATE COMMAND (step 12, Table 9.1.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|----------------------------------|----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Full name for network | "C63A9BED0CB7CB31D98C56B3DD70" O | "FullName12345678", Note 1 | |

| | | | |
|---|--------------------|--|--|
| Short name for network | "5367B85D8EC966" O | "SName123",
Note 1 | |
| Local time zone | "40" O | "GMT+1", Note
1, Note 2 | |
| Universal time and local time zone | "01402131832540" O | "2010 12 April
13:38 52s
GMT+1", Note 1,
Note 2 | |
| Network daylight saving time | "01" O | "+1 hour
adjustment for
Daylight Saving
Time", Note 1 | |
| Note 1: Hard coded values have been chosen to allow for consistent/comparable SS behaviour. | | | |
| Note 2: Daylight Saving Time is included in the Local Time Zone. | | | |

Table 9.1.4.1.3.3-3: REGISTRATION ACCEPT (step 31, Table 9.1.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Configured NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '0000001'B | SST | |
| SST | '0000001'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 3 | |
| Length of S-NSSAI contents | '0000001'B | SST | |
| SST | '0000010'B | 3 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.1.4.1.3.3-4: CONFIGURATION UPDATE COMMAND (step 32, Table 9.1.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|--------------|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Configuration update indication | 001 | Registration and
Acknowledgemen | |

| | | | |
|--|--|-------------------|--|
| | | t (ACK) requested | |
|--|--|-------------------|--|

Table 9.1.4.1.3.3-5: REGISTRATION REQUEST (step 33, Table 9.1.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '010'B | | MOBILITY |
| Requested NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 3 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000011'B | 3 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.1.4.1.3.3-6: REGISTRATION ACCEPT (step 43, Table 9.1.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |

| | | | |
|----------------------------|-------------|-----------------|--|
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 3 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000011'B | 3 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.1.4.1.3.3-7: CONFIGURATION UPDATE COMMAND (step 46, Table 9.1.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|--------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Configuration update indication | 0001 | Acknowledgement (ACK) requested | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.1.4.1.3.3-8: REGISTRATION ACCEPT (step 64, Table 9.1.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------|-------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |

| | | | |
|----------------------------|-------------|-----------------|--|
| Configured NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 3 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 3 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.1.4.1.3.3-9: CONFIGURATION UPDATE COMMAND (step 66, Table 9.1.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|--------------|--------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Configuration update indication | 0001 | Acknowledgement (ACK) requested | |
| Network slicing indication | 0001 | Network slicing subscription changed | |

9.1.5 Registration

9.1.5.1 Initial Registration

9.1.5.1.1 Initial registration / Success / 5G-GUTI reallocation, Last visited TAI

9.1.5.1.1.1 Test Purpose (TP)

(1)

with { the UE is 5GMM-REGISTERED state with no valid 5G-GUTI but available SUCI }

ensure that {

when { the UE is switched off and switched on }

then { the UE sends a REGISTRATION REQUEST message including the SUCI in the 5GS mobile identity IE }

}

(2)

with { the UE is 5GMM-REGISTERED state with a cell belong to a non-equivalent PLMN with assigned 5G-GUTI and last visited registered TAI }

ensure that {

when { the UE is switched off and switched on with a cell belong to another PLMN }

then { the UE sends a REGISTRATION REQUEST message including the 5G-GUTI assigned by the last PLMN in the 5GS mobile identity IE and the last visited registered TAI }

}

(3)

with { the UE is 5GMM-REGISTERED state with a cell belong to an equivalent PLMN with assigned 5G-GUTI }

ensure that {

when { the UE is switched off and switched on with a cell belong to another PLMN }

then { the UE sends a REGISTRATION REQUEST message including the 5G-GUTI assigned by the equivalent PLMN in the 5GS mobile identity IE }

}

(4)

with { the UE is 5GMM-REGISTERED state with an assigned 5G-GUTI }

ensure that {

when { the UE is switched off **and** switched on with a cell belong to the same PLMN }

then { the UE sends a REGISTRATION REQUEST message including the 5G-GUTI assigned by the last registered PLMN in the 5GS mobile identity IE }

}

9.1.5.1.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clauses 5.5.1.2.2 and 5.5.1.2.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.2.2]

The UE initiates the registration procedure for initial registration by sending a REGISTRATION REQUEST message to the AMF, starting timer T3510. If timer T3502 is currently running, the UE shall stop timer T3502. If timer T3511 is currently running, the UE shall stop timer T3511.

During initial registration the UE handles the 5GS mobile identity IE in the following order:

- b) if the UE holds a valid 5G-GUTI that was previously assigned, over 3GPP access or non-3GPP access, by the same PLMN with which the UE is performing the registration, the UE shall indicate the 5G-GUTI in the 5GS mobile identity IE;
- c) if the UE holds a valid 5G-GUTI that was previously assigned, over 3GPP access or non-3GPP access, by an equivalent PLMN, the UE shall indicate the 5G-GUTI in the 5GS mobile identity IE;
- d) if the UE holds a valid 5G-GUTI that was previously assigned, over 3GPP access or non-3GPP, by any other PLMN, the UE shall indicate the 5G-GUTI in the 5GS mobile identity IE;
- e) if a SUCI is available the UE shall include the SUCI in the 5GS mobile identity IE; and

...

If the SUCI is included in the 5GS mobile identity IE and the timer T3519 is not running, the UE shall start timer T3519 and store the value of the SUCI sent in the REGISTRATION REQUEST message. The UE shall include the stored SUCI in the REGISTRATION REQUEST message while timer T3519 is running.

...

If the last visited registered TAI is available, the UE shall include the last visited registered TAI in the REGISTRATION REQUEST message.

9.1.5.1.1.3 Test description

9.1.5.1.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A, NGC Cell C and NGC Cell H are configured according to Table 6.3.2.2-1 in 38.508-1 [4].

UE:

- None.

Preamble:

- The UE is in test state 0N-B according to TS 38.508-1 [4].

9.1.5.1.1.3.2 Test procedure sequence

Table 9.1.5.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|---------------------|----|---------|
| | | U – S | Message | | |
| 1 | The SS configures:
- NGC Cell A as the "Serving cell".
- NGC Cell H and NGC Cell C as the "Non-Suitable "off" cell". | - | - | - | - |
| 2 | The UE is switched on. | - | - | - | - |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise. | - | - | - | - |
| 3-5 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | - | - | - |
| 6 | SS transmits an REGISTRATION REJECT message with the 5GMM cause IE setting as "Illegal UE".

NOTE1: 5G-GUTI-1 should be deleted, then UE has no valid 5G-GUTI but available SUCI now. | <-- | REGISTRATION REJECT | - | - |
| 7 | The generic test procedure in TS 38.508-1 Table 4.9.6.4-1 of Switch off procedure in State Deregistered are performed. | | | | |

| | | | | | |
|-------------|--|-----|----------------------|---|---|
| 8 | The UE is brought back to operation or the USIM is inserted. | | | | |
| 9-11 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | - | - | - |
| 12 | Check: Does the UE transmit an REGISTRATION REQUEST message including the SUCI in the 5GS mobile identity IE? | --> | REGISTRATION REQUEST | 1 | P |
| 13-21 | Steps 5-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 22 | SS transmits an REGISTRATION ACCEPT message with a new assigned 5G-GUTI-2. | <-- | REGISTRATION ACCEPT | - | - |
| 23-27a
1 | Steps 15-19a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 28 | The generic test procedure in TS 38.508-1 Table 4.9.6.3-1 of Switch off procedure in RRC_CONNECTED are performed. | - | - | - | - |
| 29 | The SS configures:
- NGC Cell H as the "Serving cell".
- NGC Cell A and NGC Cell C as a "Non-Suitable "off" cell". | - | - | - | - |
| 30 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| - | The following messages are to be observed on NGC Cell H unless explicitly stated otherwise. | - | - | - | - |
| 31-33 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | - | - | - |

| | | | | | |
|---------|--|-----|----------------------|---|---|
| 34 | Check: Does the UE transmit an REGISTRATION REQUEST message including the 5G-GUTI-2 assigned by the last PLMN in the 5GS mobile identity IE and the last visited registered TAI? | --> | REGISTRATION REQUEST | 2 | P |
| 35-43 | Steps 5-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 44 | SS transmits an REGISTRATION ACCEPT message with a new assigned 5G-GUTI-3 and the PLMN of NGC Cell A as Equivalent PLMNs. | <-- | REGISTRATION ACCEPT | - | - |
| 45-49a1 | Steps 15-19a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 50 | The generic test procedure in TS 38.508-1 Table 4.9.6.3-1 of Switch off procedure in RRC_CONNECTED is performed. | - | - | - | - |
| 51 | The SS configures:
- NGC Cell A as the "Serving cell".
- NGC Cell H and NGC Cell C as a "Non-Suitable "off" cell". | - | - | - | - |
| 52 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise. | - | - | - | - |
| 53-55 | The UE establishes an RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | - | - | - |
| 56 | Check: Does the UE transmit an REGISTRATION REQUEST message including the 5G-GUTI-3 assigned by the equivalent PLMN in the 5GS mobile identity IE? | --> | REGISTRATION REQUEST | 3 | P |
| 57-65 | Steps 5-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 66 | SS transmits an REGISTRATION ACCEPT message with a new assigned 5G-GUTI-4. | <-- | REGISTRATION ACCEPT | - | - |
| 67-71a1 | Steps 15-19a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 72 | The generic test procedure in TS 38.508-1 Table 4.9.6.3-1 of Switch off procedure in RRC_CONNECTED is performed. | - | - | - | - |
| 73 | The SS configures:
- NGC Cell C as the "Serving cell".
- NGC Cell A and NGC Cell H as a "Non-Suitable off cell". | - | - | - | - |
| 74 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| - | The following messages are to be observed on NGC Cell C unless explicitly stated otherwise. | - | - | - | - |
| 75-77 | The UE establishes an RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in | - | - | - | - |

| | | | | | |
|-------|---|-----|----------------------|---|---|
| | TS38.508-1 [4]. | | | | |
| 78 | Check: Does the UE transmit an REGISTRATION REQUEST message including the 5G-GUTI-4 assigned by last registered PLMN in the 5GS mobile identity IE? | --> | REGISTRATION REQUEST | 4 | P |
| 79-94 | Steps 5-20 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |

9.1.5.1.1.3.3 Specific message contents

Table 9.1.5.1.1.3.3-1: Message REGISTRATION REJECT (step 6, Table 9.1.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-9 | | | |
|---|--------------|------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GMM cause | '0000 0011'B | Illegal UE | |

Table 9.1.5.1.1.3.3-2: Message REGISTRATION REQUEST (step 12, Table 9.1.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | '0000 0001'B | Initial registration | |
| 5GS mobile identity | SUCI | The SUCI of UE | |

Table 9.1.5.1.1.3.3-3: Message REGISTRATION ACCEPT (step 22, Table 9.1.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-7 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5G-GUTI | 5G-GUTI-2 | | |

Table 9.1.5.1.1.3.3-4: Message REGISTRATION REQUEST (step 34, Table 9.1.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | '0000 0001'B | Initial registration | |
| 5GS mobile identity | 5G-GUTI | | |
| Last visited registered TAI | TAI-1 | TAI of NGC Cell A | |

Table 9.1.5.1.1.3.3-5: Message REGISTRATION ACCEPT (step 44, Table 9.1.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-7 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| | | | |

| | | | |
|------------------|---------------------------|--|--|
| 5G-GUTI | 5G-GUTI-3 | | |
| Equivalent PLMNs | The PLMN ID of NGC Cell A | | |

Table 9.1.5.1.1.3.3-6: Message REGISTRATION REQUEST (step 56, Table 9.1.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | '0000 0001'B | Initial registration | |
| 5GS mobile identity | 5G-GUTI-3 | | |
| Last visited registered TAI | TAI-8 | TAI of NGC Cell H | |

Table 9.1.5.1.1.3.3-7: Message REGISTRATION ACCEPT (step 66, Table 9.1.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-7 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5G-GUTI | 5G-GUTI-4 | | |

Table 9.1.5.1.1.3.3-8: Message REGISTRATION REQUEST (step 78, Table 9.1.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | '0000 0001'B | Initial registration | |
| 5GS mobile identity | 5G-GUTI-4 | | |
| Last visited registered TAI | TAI-1 | TAI of NGC Cell A | |

9.1.5.1.2 Initial registration / 5GS services / Equivalent PLMN list handling

9.1.5.1.2.1 Test Purpose (TP)

(1)

with { The UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { UE receives a REGISTRATION ACCEPT with a new set of Equivalent PLMNs, then after Switch OFF and Switch ON }

then { The UE deletes the old equivalent PLMN list and uses the new equivalent PLMN list }

}

(2)

with { The UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { UE receives a REGISTRATION ACCEPT that does not include Equivalent PLMNs, then after Switch OFF and Switch ON }

then { UE deletes the old equivalent PLMN list }

}

(3)

with { The UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the UE receives a REGISTRATION ACCEPT that includes equivalent PLMN list, and the UE detects that an entry in the equivalent PLMN list is also present in forbidden PLMN list }

then { UE deletes the entry in equivalent PLMN list that is also present in forbidden PLMN list }

}

9.1.5.1.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.1.2.4 and 5.5.1.3.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.2.4]

...

The AMF may also include a list of equivalent PLMNs in the REGISTRATION ACCEPT message. Each entry in the list contains a PLMN code (MCC+MNC). The UE shall store the list as provided by the network, and if the initial registration procedure is not for emergency services, the UE shall remove from the list any PLMN code that is already in the list of "forbidden PLMNs". In addition, the UE shall add to the stored list the PLMN code of the registered PLMN that sent the list. The UE shall replace the stored list on each receipt of the REGISTRATION ACCEPT message. If the REGISTRATION ACCEPT message does not contain a list, then the UE shall delete the stored list.

...

[TS 24.501, clause 5.5.1.3.4]

...

The AMF may also include a list of equivalent PLMNs in the REGISTRATION ACCEPT message. Each entry in the list contains a PLMN code (MCC+MNC). The UE shall store the list as provided by the network, and if there is no emergency PDU session established, the UE shall remove from the list any PLMN code that is already in the list of "forbidden PLMNs". If the UE is not registered for emergency services and there is an emergency PDU session established, the UE shall remove from the list of equivalent PLMNs any PLMN code present in the "forbidden PLMNs list" when the emergency PDU session is released. In addition, the UE shall add to the stored list the PLMN code of the registered PLMN that sent the list. The UE shall replace the stored list on each receipt of the REGISTRATION ACCEPT message. If the REGISTRATION ACCEPT message does not contain a list, then the UE shall delete the stored list.

...

9.1.5.1.2.3 Test description

9.1.5.1.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A and NGC Cell E and NGC Cell F are configured according to Table 6.3.2.2-1 and Table 6.3.2.2-3 in TS 38.508-1[4].
- NGC Cell F is configured with NR frequency NRf3.
- System information combination NR-4 as defined in TS 38.508[4] clause 4.4.3.1.2 is used.

UE:

None.

Preamble:

- The UE is in state Switched OFF [State 0-A as per TS 38.508-1 [4] Table 4.4A.2-0].

9.1.5.1.2.3.2 Test procedure sequence

Table 9.1.5.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|---------|---|------------------|---------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC Cell A as the "Serving cell".
- NGC Cell E as the "Non-Suitable "off" cell".
- NGC Cell F as the "Non-Suitable "off" cell". | - | - | - | - |
| 2 | The UE is Switched ON | | - | | |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise | | - | | |
| 3-14 | Steps 2-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 15 | SS transmits a REGISTRATION ACCEPT message with PLMN ID of NGC Cell F included in the Equivalent PLMNs IE | <-- | REGISTRATION ACCEPT | - | - |
| 16-20a1 | Steps 15-19a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 21 | The UE is switched off by executing generic procedure in Table 4.9.6.3-1 in TS 38.508-1 [4] | - | - | - | - |
| 22 | The UE is Switched ON | - | - | - | - |
| 23-34 | Steps 2-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 35 | SS transmits a REGISTRATION ACCEPT message with PLMN ID of NGC Cell E | <-- | REGISTRATION ACCEPT | - | - |

| | | | | | |
|---------|---|-----|---------------------|---|---|
| | included in the Equivalent PLMNs IE | | | | |
| 36-40a1 | Steps 15-19a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 41 | The UE is switched off by executing generic procedure in Table 4.9.6.3-1 in TS 38.508-1 [4]. | - | - | - | - |
| 42 | The SS configures:
- NGC Cell A as the "Non-Suitable "off" cell".
- NGC Cell E as the "Suitable neighbour cell".
- NGC Cell F as the "Serving cell". | - | - | - | - |
| 43 | The UE is Switched ON | - | - | - | - |
| - | The following messages are to be observed on NGC Cell E unless explicitly stated otherwise | - | - | - | - |
| 44-62a1 | Steps 2-20a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | 1 | P |
| 63 | The UE is switched off by executing generic procedure in Table 4.9.6.1-1 in TS 38.508-1 [4]. | - | - | - | - |
| 64 | The UE is Switched ON | - | - | - | - |
| - | The following messages are to be observed on NGC Cell F unless explicitly stated otherwise | - | - | - | - |
| 65-76 | Steps 2-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | 2 | P |
| 76A | The SS configures:
- NGC Cell E as the "Non-Suitable "off" cell". | - | - | - | - |
| 77 | SS transmits a REGISTRATION REJECT with cause #11 (PLMN not allowed) | <-- | REGISTRATION REJECT | - | - |
| 78 | The SS releases the RRC connection | - | - | | |
| 79 | The SS configures:
- NGC Cell A as the "Serving cell".
- NGC Cell E as the "Non-Suitable "off" cell".
- NGC Cell F as the "Non-Suitable "off" cell". | - | - | - | - |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise | - | - | - | - |
| 80-93 | Steps 2-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 94 | SS transmits a REGISTRATION ACCEPT message with PLMN ID of NGC Cell E and | <-- | REGISTRATION ACCEPT | - | - |

| | | | | | |
|-----------|---|---|---|---|---|
| | NGC Cell F included in the Equivalent PLMNs IE | | | | |
| 95-99a1 | Steps 15-19a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 100 | The UE is switched off by executing generic procedure in Table 4.9.6.3-1 in TS 38.508-1 [4]. | - | - | - | - |
| 101 | The SS configures:
- NGC Cell A as the "Non-Suitable "off" cell".
- NGC Cell E as the "Suitable neighbour cell".
- NGC Cell F as the "Serving cell". | - | - | - | - |
| - | The following messages are to be observed on NGC Cell E unless explicitly stated otherwise | - | - | - | - |
| 102 | The UE is Switched ON | - | - | - | - |
| 103-121a1 | Steps 2-20a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | 3 | P |
| 122 | The UE is switched off by executing generic procedure in Table 4.9.6.1-1 in TS 38.508-1 [4]. | - | - | - | - |
| 123 | The SS configures:
- NGC Cell A as the "Non-Suitable "off" cell".
- NGC Cell E as the "Non-Suitable "off" cell".
- NGC Cell F as the "Serving cell". | - | - | - | - |
| 124 | The UE is Switched ON | - | - | - | - |
| - | The user is prompted to manually select PLMN of NGC Cell F | - | - | - | - |
| - | The following messages are to be observed on NGC Cell F unless explicitly stated otherwise | - | - | - | - |
| 125-143a1 | Steps 2-20a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |

9.1.5.1.2.3.3 Specific message contents

Table 9.1.5.1.2.3.3-1: REGISTRATION ACCEPT (step 15 Table 9.1.5.1.2.3.2-1)

Derivation Path: TS 38.508-1 [4], Table 4.7.1-7

| Information Element | Value/remark | Comment | Condition |
|---------------------|------------------|-----------------------|-----------|
| Equivalent PLMNs | MCC=003, MNC=101 | PLMN ID of NGC Cell F | |

Table 9.1.5.1.2.3.3-2: REGISTRATION ACCEPT (step 35 Table 9.1.5.1.2.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-7 | | | |
|---|------------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Equivalent PLMNs | MCC=002, MNC=101 | PLMN ID of NGC Cell E | |

Table 9.1.5.1.2.3.3-3: REGISTRATION ACCEPT (step 94 Table 9.1.5.1.2.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-7 | | | |
|---|---------------------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Equivalent PLMNs | MCC=003, MNC=101 and MCC=002, MNC=101 | PLMN ID of NGC Cell F and PLMN ID of NGC Cell E | |

Table 9.1.5.1.2.3.3-4: REGISTRATION REJECT (step 77 Table 9.1.5.1.2.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9 | | | |
|---|--------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM Cause | '0000 1011'B | PLMN not allowed | |

9.1.5.1.3 Initial registration / 5GS services / NSSAI handling

9.1.5.1.3.1 Test Purpose (TP)

(1)

with { UE has sent a REGISTRATION REQUEST message including requested NSSAI }

ensure that {

when { UE receives REGISTRATION ACCEPT message with allowed NSSAI }

then { UE shall replace any stored allowed NSSAI for the current PLMN with new allowed NSSAI for the current PLMN }

}

(2)

with { UE has sent a REGISTRATION REQUEST message including Requested NSSAI }

ensure that {

when { UE receives REGISTRATION ACCEPT message with Rejected NSSAI with reject cause “S-NSSAI not available in the current PLMN” }

then { UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN and not attempt to use the Rejected NSSAI in the current PLMN until switching off the UE or the UICC containing the USIM is removed }

}

(3)

with { UE receives REGISTRATION ACCEPT message with Rejected NSSAI with reject cause “S-NSSAI not available in the current PLMN” }

ensure that {

when { UE has been switched off, then switched on }

then { UE shall delete the stored Rejected NSAAI and shall send the NSSAI in Requested NSSAI IE of the REGISTRATION REQUEST message as per the configured and Allowed NSSAI for current PLMN }

}

(4)

with { UE has sent a REGISTRATION REQUEST message including Requested NSSAI }

ensure that {

when { UE receives REGISTRATION ACCEPT message with Rejected NSSAI with reject cause “S-NSSAI not available in the current registration area” }

then { UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN and registration area combination and not attempt to use the Rejected NSSAI in the current registration area until switching off the UE, the UE moving out of the current registration area or the UICC containing the USIM is removed }

}

(5)

with { UE receives REGISTRATION ACCEPT message with Rejected NSSAI with reject cause “S-NSSAI not available in the current registration area” }

ensure that {

when { UE has been moved out of the current registration area }

then { UE shall delete the stored Rejected NSAAI for the current PLMN as well as registration area combination and shall send the NSSAI in Requested NSSAI IE of the REGISTRATION REQUEST message as per the configured and Allowed NSSAI for current PLMN }

}

9.1.5.1.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], clause 5.5.1.2.2 and 5.5.1.2.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 5.5.1.2.2]

The UE shall include the requested NSSAI containing the S-NSSAI(s) corresponding to the slice(s) to which the UE wants to register and shall include the mapping of the requested NSSAI which is the mapping of each S-NSSAI of the requested NSSAI to the S-NSSAI(s) of the HPLMN, if available, in the REGISTRATION REQUEST message. If the UE has allowed NSSAI or configured NSSAI for the current PLMN, the requested NSSAI shall be either:

- a) the configured NSSAI for the current PLMN, or a subset thereof as described below, if the UE has no allowed NSSAI for the current PLMN;
- b) the allowed NSSAI for the current PLMN, or a subset thereof as described below, if the UE has an allowed NSSAI for the current PLMN; or
- c) the allowed NSSAI for the current PLMN, or a subset thereof as described below, plus one or more S-NSSAIs from the configured NSSAI for which no corresponding S-NSSAI is present in the allowed NSSAI and those are neither in the rejected NSSAI for the current PLMN nor in the rejected NSSAI for the current PLMN and registration area combination.

If the UE has neither allowed NSSAI for the current PLMN nor configured NSSAI for the current PLMN and has a default configured NSSAI, the UE shall:

- a) include the S-NSSAI(s) in the Requested NSSAI IE of the REGISTRATION REQUEST message using the default configured NSSAI; and
- b) include the Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI" in the REGISTRATION REQUEST message.

If the UE has no allowed NSSAI for the current PLMN, no configured NSSAI for the current PLMN, and no default configured NSSAI, the UE shall not include a requested NSSAI in the REGISTRATION message.

The subset of configured NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the configured NSSAI applicable to the current PLMN, if the S-NSSAI is neither in the rejected NSSAI for the current PLMN nor in the rejected NSSAI for the current PLMN and registration area combination.

The subset of allowed NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the allowed NSSAI for the current PLMN.

NOTE 3: How the UE selects the subset of configured NSSAI or allowed NSSAI to be provided in the requested NSSAI is implementation.

NOTE 4: The number of S-NSSAI(s) included in the requested NSSAI cannot exceed eight.

[TS 24.501 clause 5.5.1.2.4]

The AMF shall include the allowed NSSAI for the current PLMN and shall include the mapping of each S-NSSAI of the allowed NSSAI to the S-NSSAI(s) of the HPLMN contained in the requested NSSAI from the UE if available, in the REGISTRATION ACCEPT message if the UE included the requested NSSAI in the REGISTRATION REQUEST message and the AMF allows one or more S-NSSAIs in the requested NSSAI. The AMF may also include rejected NSSAI in the REGISTRATION ACCEPT message. Rejected NSSAI contains S-NSSAI(s) which was included in the requested NSSAI but rejected by the network associated with rejection cause(s).

The AMF may include a new configured NSSAI for the current PLMN in the REGISTRATION ACCEPT message if:

- a) the REGISTRATION REQUEST message did not include the requested NSSAI;
- b) the REGISTRATION REQUEST message included the requested NSSAI containing an S-NSSAI that is not valid in the serving PLMN; or
- c) the REGISTRATION REQUEST message included the Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI".

If a new configured NSSAI for the current PLMN is included in the REGISTRATION ACCEPT message, the AMF shall also include the mapping of the configured NSSAI for the current PLMN the S-NSSAI(s) of the to HPLMN if available in the REGISTRATION ACCEPT message. In this case the AMF shall start timer T3550 and enter state 5GMM-COMMON-PROCEDURE-INITIATED as described in subclause 5.1.3.2.3.3.

The AMF shall include the Network slicing indication IE with the Network slicing subscription change indication set to "Network slicing subscription changed" in the REGISTRATION ACCEPT message if the UDM has indicated that the subscription data for network slicing has changed. In this case the AMF shall start timer T3550 and enter state 5GMM-COMMON-PROCEDURE-INITIATED as described in subclause 5.1.3.2.3.3.

The UE receiving the rejected NSSAI in the REGISTRATION ACCEPT message takes the following actions based on the rejection cause in the rejected NSSAI:

"S-NSSAI not available in the current PLMN"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current PLMN until switching off the UE or the UICC containing the USIM is removed.

"S-NSSAI not available in the current registration area"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN and registration area combination as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current registration area until switching off the UE, the UE moving out of the current registration area or the UICC containing the USIM is removed.

If the UE did not include the requested NSSAI in the REGISTRATION REQUEST message or none of the requested NSSAI are present in the subscribed S-NSSAIs, and one or more subscribed S-NSSAIs (containing one or more S-NSSAIs each of which may be associated with a new S-NSSAI) marked as default are available, the AMF shall put the subscribed S-NSSAIs marked as default in the allowed NSSAI of the REGISTRATION ACCEPT message. The AMF shall determine a registration area such that all S-NSSAIs of the allowed NSSAI are available in the registration area.

9.1.5.1.3.3 Test description

9.1.5.1.3.3.1 Pre-test conditions

System Simulator:

- NGC Cell A belongs to Home PLMN and TAI-1 and set as serving cell;
- NGC Cell B belongs to Home PLMN and TAI-2 and set as Non-Suitable "Off" cell.
- NGC Cell C belongs to Home PLMN and TAI-3 and set as Non-Suitable "Off" cell.

UE:

- UE is previously registered on NGC Cell A using default message contents according to TS 38.508-1 [4];
- Empty URSP Configuration.

Preamble:

- The UE is in state Switched OFF (state 0N-B) according to TS 38.508-1 [4].

9.1.5.1.3.3.2 Test procedure sequence

Table 9.1.5.1.3.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|--|------------------|----------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2 | Check: Does UE transmit a REGISTRATION REQUEST message? | --> | REGISTRATION REQUEST | - | - |
| 3-11 | Steps 5 to13 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 | - | - | - | - |

| | | | | | |
|-------|--|-----|-----------------------|---|---|
| | subclause 4.5.2 are performed. | | | | |
| 12 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI and Configured NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 13-18 | Steps 15 to 20 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 19 | Switch off procedure in RRC_Idle specified in TS 38.508-1 subclause 4.9.6.1 is performed. | - | - | - | - |
| 20 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| 21 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 1 | P |
| 22-30 | Steps 5 to13 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 31 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI and Rejected NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 32-37 | Steps 15 to 20 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 38 | The SS configures NGC Cell A as a “Non-suitable cell” and NGC Cell C as the “Serving cell”. | - | - | - | - |
| 39 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 2 | P |
| 40-48 | Void. | - | - | - | - |
| 49 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 50 | The UE transmits a REGISTRATION COMPLETE message. | --> | REGISTRATION COMPLETE | - | - |
| 51 | The SS transmits an <i>RRCRelease</i> message.. | - | - | - | - |
| 52 | Check: Is S-NSSAI=2 in the Rejected NSSAI list with cause “S-NSSAI not available in the current PLMN” associated with current PLMN using AT/MMI? | - | - | 2 | P |
| 53 | Switch off procedure in RRC_Idle specified in TS 38.508-1 subclause 4.9.6.1 is performed. | - | - | - | - |
| 54 | The UE is brought back to operation or the USIM is inserted | - | - | - | - |

| | | | | | |
|-------|---|-----|----------------------|---|---|
| 55 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 3 | P |
| 56-64 | Steps 5 to 13 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 65 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI and Rejected NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 66-71 | Steps 15 to 20 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 72 | Check: Is S-NSSAI=2 removed from the Rejected NSSAI list associated with current PLMN? | - | - | 3 | P |
| 72A | Check: Is S-NSSAI=1 in the Rejected NSSAI list with cause "S-NSSAI not available in the current registration area" associated with current PLMN and registration area combination using AT/MMI? | - | - | 3 | P |
| 73 | The SS configures NGC Cell C as the "Non-suitable cell" and NGC Cell B as the "Serving cell". | - | - | - | - |
| 74 | Wait 70 seconds for UE to camp on Cell B.
Editor's note: this has probably to be deleted:
Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | - | - | - | - |
| 75-83 | Void | - | - | - | - |
| 84 | Void | - | - | - | - |
| 85 | Void | - | - | - | - |
| 86 | Void | - | - | - | - |
| 87 | Check: Is S-NSSAI=1 in the Rejected NSSAI list with cause "S-NSSAI not available in the current registration area" associated with current PLMN and registration area combination using AT/MMI? | - | - | 4 | P |
| 88 | The SS configures NGC Cell B as the "Non-suitable cell" and NGC Cell A as the "Serving cell". | - | - | - | - |
| 89 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 5 | P |
| 90-98 | Void | - | - | - | - |
| 99 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI. | <-- | REGISTRATION ACCEPT | - | - |

| | | | | | |
|-----|--|-----|-----------------------|---|---|
| 100 | The UE transmits a REGISTRATION COMPLETE message. | --> | REGISTRATION COMPLETE | - | - |
| 101 | The SS transmits an <i>RRCRelease</i> message. | - | - | - | - |
| 102 | Check: Is S-NSSAI=1 removed from the Rejected NSSAI list associated with current PLMN and registration area combination? | - | - | 5 | P |

9.1.5.1.3.3.3 Specific message contents

Table 9.1.5.1.3.3.3-1: REGISTRATION REQUEST (step 2, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | Note |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Note: S-NSSAI =1 will be always included from the allowed NSSAI list associated with PLMN of NCG Cell A by the UE but may include other S-NSSAI from Configured NSSAI list associated with PLMN of NCG Cell A if configured in the UE. See TS 24.501 sub-clause 5.5.1.2.1 | | | |

Table 9.1.5.1.3.3.3-2: REGISTRATION ACCEPT (step 12, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Configured NSSAI | | | |

| | | | |
|----------------------------|-------------|-----------------|--|
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.1.5.1.3.3.3-3: PDU SESSION ESTABLISHMENT ACCEPT (step 15 , Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 clause 4.7.2-2 | | | |
|--|--------------|-------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| S-NSSAI | | | |
| Length of S-NSSAI contents | '0000 0001'B | SST | |
| SST | '0000 0010'B | SST value 2 | |

Table 9.1.5.1.3.3.3-4: REGISTRATION REQUEST (step 21, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | Note |
| Length of S-NSSAI contents | '00000001'B | SST | |

| | | | |
|--|-------------|---|--|
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Note: S-NSSAI =2 will be always included by the UE from the allowed NSSAI list associated with PLMN of NCG Cell A but may include S-NSSAI =1 from Configured NSSAI list associated with PLMN of NCG Cell A. See TS 24.501 sub-clause 5.5.1.2.1 | | | |

Table 9.1.5.1.3.3.3-5: REGISTRATION ACCEPT (step 31, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Allowed NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | Note |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Rejected NSSAI | | | |
| Rejected S-NSSAI-1 | | Rejected S-NSSAI value 1 | |
| Cause value | '0000'B | S-NSSAI not available in the current PLMN | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Note: If UE has requested only S-NSSAI =2 in step 22 and S-NSSAI =2 is added in the Rejected NSSAI list by the SS then AMF/SS can include default subscribed S-NSSAIs in the allowed NSSAI of REGISTRATION ACCEPT message, see TS 24.501 sub-clause 5.5.1.2.4. | | | |

Table 9.1.5.1.3.3.3-6: REGISTRATION REQUEST (step 39, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|--------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '011'B | mobility registration updating | |
| Requested NSSAI | | | |

| | | | |
|----------------------------|-----------------|---|--|
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| PDU session status | PDU session IDs | PDU session IDs of the ACTIVE PDU sessions to be transferred to a new cell. | |

Table 9.1.5.1.3.3.3-7: REGISTRATION ACCEPT (step 49, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|-----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| PDU session status | PDU session IDs | PDU session IDs of the ACTIVE PDU sessions to be transferred to a new cell. Same value as sent by the UE in step 40. | |

Table 9.1.5.1.3.3.3-8: REGISTRATION REQUEST (step 55, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | Note |
| Length of S-NSSAI contents | '00000001'B | SST | |

| | | | |
|--|-------------|-----------------|--|
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Note: S-NSSAI =1 will be always included by the UE from the allowed NSSAI list associated with PLMN of NCG Cell C but may include S-NSSAI =2 from Configured NSSAI list associated with PLMN of NCG Cell C. See TS 24.501 sub-clause 5.5.1.2.1 | | | |

Table 9.1.5.1.3.3.3-9: REGISTRATION ACCEPT (step 65, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| TAI list | | | |
| Type of list | '01'B | list of TACs belonging to one PLMN, with consecutive TAC values | |
| Number of elements | '00001'B | 2 Elements | |
| TAC | PLMN =MCC/MNC
stored in EF _{IMSI}
TAC 1 = 2 | TAI2, TAI 3 | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Rejected NSSAI | | | |

| | | | |
|--|-------------|--|--|
| Rejected S-NSSAI-1 | | Rejected S-NSSAI value 1 | |
| Cause value | '0001'B | S-NSSAI not available in the current registration area | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Note: If UE has requested only S-NSSAI =1 in step 57 and S-NSSAI =1 is added in the Rejected NSSAI list by the SS then AMF/SS can include default subscribed S-NSSAIs in the allowed NSSAI of REGISTRATION ACCEPT message, see TS 24.501 sub-clause 5.5.1.2.4. | | | |

Table 9.1.5.1.3.3.3-10: PDU SESSION ESTABLISHMENT ACCEPT (step 68 , Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 clause 4.7.2-2 | | | |
|--|--------------|-------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| S-NSSAI | | | |
| Length of S-NSSAI contents | '0000 0001'B | SST | |
| SST | '0000 0010'B | SST value 2 | |

Table 9.1.5.1.3.3.3-11: Void

Table 9.1.5.1.3.3.3-12: Void

Table 9.1.5.1.3.3.3-13: REGISTRATION REQUEST (step 89, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|--------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '010'B | mobility registration updating | |
| Requested NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |

| | | | |
|--|-----------------|---|--|
| SST | '00000010'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| PDU session status | PDU session IDs | PDU session IDs of the ACTIVE PDU sessions to be transferred to a new cell. | |
| Note: S-NSSAI =2 will be always included by the UE from the allowed NSSAI list associated with PLMN of NCG Cell A but may include S-NSSAI =1 from Configured NSSAI list associated with PLMN of NCG Cell A. See TS 24.501 sub-clause 5.5.1.2.1 | | | |

Table 9.1.5.1.3.3.3-14: REGISTRATION ACCEPT (step 99, Table 9.1.5.1.3.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|--|-----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000010'B | SST | |
| SST | '00000001'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | Note |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| PDU session status | PDU session IDs | PDU session IDs of the ACTIVE PDU sessions to be transferred to a new cell. Same value as sent by the UE in step 77. | |
| Note: SS will send allowed NSSAIs based on the Requested NSSAIs sent by UE in step 89. | | | |

9.1.5.1.3a Initial registration / 5GS services / NSSAI handling / NSSAI Storage

9.1.5.1.3a.1 Test Purpose (TP)

(1)

with { UE is switched off with a valid USIM inserted }

ensure that {

when { UE has configured NSSAI associated with HPLMN, configured NSSAI associated with a current PLMN with mapping to the Configured NSSAI for the HPLMN and UE is powered up or switched on }

then { UE transmits REGISTRATION REQUEST message with Requested NSSAI using the configured NSSAI associated with current PLMN and mapping of each S-NSSAI of the requested NSSAI to the S-NSSAIs of the configured NSSAI for the HPLMN }

}

(2)

with { UE is switched off with a valid USIM inserted }

ensure that {

when { UE has neither allowed NSSAI for the current PLMN nor configured NSSAI for the current PLMN and has a default configured NSSAI and UE is powered up or switched on }

then { UE transmits REGISTRATION REQUEST message with Requested NSSAI using the default configured NSSAI and also includes Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI" }

}

(3)

with { UE is switched off with a valid USIM inserted }

ensure that {

when { UE has no allowed NSSAI for the current PLMN, no configured NSSAI for the current PLMN, and no configured NSSAI not associated with a PLMN and UE is powered up or switched on }

then { UE transmits REGISTRATION REQUEST message and does not include a Requested NSSAI }

}

9.1.5.1.3a.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 5.5.1.2.2 and 5.5.1.2.4.

[TS 24.501 clause 5.5.1.2.2]

5.5.1.2.1 General

This procedure can be used by a UE for initial registration for 5GS services.

...

The UE shall include the requested NSSAI containing the S-NSSAI(s) corresponding to the slice(s) to which the UE wants to register and shall include the mapping of the requested NSSAI which is the mapping of each S-NSSAI of the requested NSSAI to the S-NSSAI(s) of the HPLMN, if available, in the REGISTRATION REQUEST message. If the UE has allowed NSSAI or configured NSSAI for the current PLMN, the requested NSSAI shall be either:

- a) the configured NSSAI for the current PLMN, or a subset thereof as described below, if the UE has no allowed NSSAI for the current PLMN;
- b) the allowed NSSAI for the current PLMN, or a subset thereof as described below, if the UE has an allowed NSSAI for the current PLMN; or
- c) the allowed NSSAI for the current PLMN, or a subset thereof as described below, plus one or more S-NSSAIs from the configured NSSAI for which no corresponding S-NSSAI is present in the allowed NSSAI and those are neither in the rejected NSSAI for the current PLMN nor in the rejected NSSAI for the current PLMN and registration area combination.

If the UE has neither allowed NSSAI for the current PLMN nor configured NSSAI for the current PLMN and has a default configured NSSAI, the UE shall:

- a) include the S-NSSAI(s) in the Requested NSSAI IE of the REGISTRATION REQUEST message using the default configured NSSAI; and
- b) include the Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI" in the REGISTRATION REQUEST message.

If the UE has no allowed NSSAI for the current PLMN, no configured NSSAI for the current PLMN, and no default configured NSSAI, the UE shall not include a requested NSSAI in the REGISTRATION message.

The subset of configured NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the configured NSSAI applicable to the current PLMN, if the S-NSSAI is neither in the rejected NSSAI for the current PLMN nor in the rejected NSSAI for the current PLMN and registration area combination.

The subset of allowed NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the allowed NSSAI for the current PLMN.

NOTE 3: How the UE selects the subset of configured NSSAI or allowed NSSAI to be provided in the requested NSSAI is implementation.

NOTE 4: The number of S-NSSAI(s) included in the requested NSSAI cannot exceed eight.

[TS 24.501 clause 5.5.1.2.4]

The AMF shall include the allowed NSSAI for the current PLMN and shall include the mapping of each S-NSSAI of the allowed NSSAI to the S-NSSAI(s) of the HPLMN contained in the requested NSSAI from the UE if available, in the REGISTRATION ACCEPT message if the UE included the requested NSSAI in the REGISTRATION REQUEST message and the AMF allows one or more S-NSSAIs in the requested NSSAI. The AMF may also include rejected NSSAI in the REGISTRATION ACCEPT message. Rejected NSSAI contains S-NSSAI(s) which was included in the requested NSSAI but rejected by the network associated with rejection cause(s).

The AMF may include a new configured NSSAI for the current PLMN in the REGISTRATION ACCEPT message if:

- a) the REGISTRATION REQUEST message did not include the requested NSSAI;
- b) the REGISTRATION REQUEST message included the requested NSSAI containing an S-NSSAI that is not valid in the serving PLMN; or
- c) the REGISTRATION REQUEST message included the Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI".

If a new configured NSSAI for the current PLMN is included in the REGISTRATION ACCEPT message, the AMF shall also include the mapping of the configured NSSAI for the current PLMN the S-NSSAI(s) of the to HPLMN if available in the REGISTRATION ACCEPT message. In this case the AMF shall start timer T3550 and enter state 5GMM-COMMON-PROCEDURE-INITIATED as described in subclause 5.1.3.2.3.3.

The AMF shall include the Network slicing indication IE with the Network slicing subscription change indication set to "Network slicing subscription changed" in the REGISTRATION ACCEPT message if the UDM has indicated that the

subscription data for network slicing has changed. In this case the AMF shall start timer T3550 and enter state 5GMM-COMMON-PROCEDURE-INITIATED as described in subclause 5.1.3.2.3.3.

The UE receiving the rejected NSSAI in the REGISTRATION ACCEPT message takes the following actions based on the rejection cause in the rejected NSSAI:

"S-NSSAI not available in the current PLMN"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current PLMN until switching off the UE or the UICC containing the USIM is removed.

"S-NSSAI not available in the current registration area"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN and registration area combination as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current registration area until switching off the UE, the UE moving out of the current registration area or the UICC containing the USIM is removed.

If the UE did not include the requested NSSAI in the REGISTRATION REQUEST message or none of the requested NSSAI are present in the subscribed S-NSSAIs, and one or more subscribed S-NSSAIs (containing one or more S-NSSAIs each of which may be associated with a new S-NSSAI) marked as default are available, the AMF shall put the subscribed S-NSSAIs marked as default in the allowed NSSAI of the REGISTRATION ACCEPT message. The AMF shall determine a registration area such that all S-NSSAIs of the allowed NSSAI are available in the registration area.

9.1.5.1.3a.3 Test description

9.1.5.1.3a.3.1 Pre-test conditions

System Simulator:

- NGC Cell G is configured according to Table 6.3.2.2-1 and Table 6.3.2.2-3 in 38.508-1 [4] except that frequency NRf1 replaces NRf2.
- NGC Cell G belongs to VPLMN, TAI-7 and set as serving cell.

UE:

- None

Preamble:

- The UE is in state Switched OFF (state 0N-B) according to TS 38.508-1 [4] and camped on NGC Cell A HPLMN.

9.1.5.1.3a.3.2 Test procedure sequence

Table 9.1.5.1.3a.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|--|------------------|----------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | | | - | - |
| 2 | The UE transmits REGISTRATION REQUEST message on NGC Cell G. | --> | REGISTRATION REQUEST | - | - |
| 3-11 | Steps 5 to 13 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2.2-2 are performed. | - | - | - | - |
| 12 | The SS transmits REGISTRATION ACCEPT message including Configured and Allowed | <-- | REGISTRATION ACCEPT | - | - |

| | | | | | |
|-------|--|-----|-----------------------|---|---|
| | NSSAI lists. | | | | |
| 13-18 | Steps 15 to 20a1 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2.2-2 are performed with ' <i>connected without release</i> '. | - | - | - | - |
| 19 | The SS transmits NSSAI DELETE REQUEST message to delete the Allowed NSSAI list for all PLMNs (MCC-MNC =000-000) and for 3GPP access so UE has only configured NSSAI. | <-- | NSSAI DELETE REQUEST | - | - |
| 20 | UE transmits NSSAI DELETE RESPONSE message. | --> | NSSAI DELETE RESPONSE | - | - |
| 21 | The SS transmits an <i>RRCRelease</i> message. | - | - | - | - |
| 22 | Switch off procedure in RRC_Idle specified in TS 38.508-1 subclause 4.9.6.1 is performed. | - | - | - | - |
| 23 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| 24 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 1 | P |
| 25-33 | Steps 5 to13 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2.2-2 are performed. | - | - | - | - |
| 34 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 35-40 | Steps 15 to 20a1 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2.2-2 are performed with ' <i>connected without release</i> '. | - | - | - | - |
| 41 | The SS transmits NSSAI DELETE REQUEST message to delete the Default Configured NSSAI list. | <-- | NSSAI DELETE REQUEST | - | - |
| 42 | UE transmits NSSAI DELETE RESPONSE message. | --> | NSSAI DELETE RESPONSE | - | - |
| 43 | Use AT command and set Default Configured NSSAI to 1 & 2. | - | - | - | - |
| 44 | The SS transmits NSSAI DELETE REQUEST message to delete the Configured NSSAI list for all PLMNs (MCC-MNC =000-000). | <-- | NSSAI DELETE REQUEST | - | - |
| 45 | UE transmits NSSAI DELETE RESPONSE message. | --> | NSSAI DELETE RESPONSE | - | - |
| 46 | The SS transmits NSSAI DELETE REQUEST message to delete the Allowed NSSAI list for all PLMNs (MCC-MNC =000-000). | <-- | NSSAI DELETE REQUEST | - | - |
| 47 | UE transmits NSSAI DELETE RESPONSE message. | --> | NSSAI DELETE RESPONSE | - | - |

| | | | | | |
|-------|--|-----|-----------------------|---|---|
| 48 | The SS transmits an <i>RRCRelease</i> message. | - | - | - | - |
| 49 | Switch off procedure in <i>RRC_Idle</i> specified in TS 38.508-1 subclause 4.9.6.1 is performed | - | - | - | - |
| 50 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| 51 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 2 | P |
| 52-60 | Steps 5 to 13 of the generic procedure for NR <i>RRC_IDLE</i> specified in TS 38.508-1 subclause 4.5.2.2-2 are performed. | - | - | - | - |
| 61 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 62-67 | Steps 15 to 20a1 of the generic procedure for NR <i>RRC_IDLE</i> specified in TS 38.508-1 subclause 4.5.2.2-2 are performed with ' <i>connected without release</i> '. | - | - | - | - |
| 68 | The SS transmits NSSAI DELETE REQUEST message to delete the Default Configured NSSAI list. | <-- | NSSAI DELETE REQUEST | - | - |
| 69 | UE transmits NSSAI DELETE RESPONSE message. | --> | NSSAI DELETE RESPONSE | - | - |
| 70 | The SS transmits NSSAI DELETE REQUEST message to delete the Configured NSSAI list for all PLMNs (MCC-MNC =000-000). | <-- | NSSAI DELETE REQUEST | - | - |
| 71 | UE transmits NSSAI DELETE RESPONSE message. | --> | NSSAI DELETE RESPONSE | - | - |
| 72 | The SS transmits NSSAI DELETE REQUEST message to delete the Allowed NSSAI list for all PLMNs (MCC-MNC =000-000). | <-- | NSSAI DELETE REQUEST | - | - |
| 73 | UE transmits NSSAI DELETE RESPONSE message. | --> | NSSAI DELETE RESPONSE | - | - |
| 74 | The SS transmits an <i>RRCRelease</i> message. | - | - | - | - |
| 75 | Switch off procedure in <i>RRC_Idle</i> specified in TS 38.508-1 subclause 4.9.6.1 is performed. | - | - | - | - |
| 76 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| 77 | Check: Does UE transmit a REGISTRATION REQUEST message not including Requested NSSAI? | --> | REGISTRATION REQUEST | 3 | P |
| 78-93 | Steps 5 to 20a1of the generic procedure for NR <i>RRC_IDLE</i> specified in TS 38.508-1 subclause 4.5.2.2-2 are performed. | - | - | - | - |

9.1.5.1.3a.3.3 Specific message contents

Table 9.1.5.1.3a.3.3-1: REGISTRATION ACCEPT (Preamble)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Configured NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.1.5.1.3a.3.3-2: REGISTRATION ACCEPT (step 12, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |

| | | | |
|----------------------------|-------------|-------------------------------|--|
| SST | '00000100'B | 4 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Configured NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000010'B | SST and mapped configured SST | |
| SST | '00000100'B | 4 | |
| SD | Not Present | | |
| Mapped configured SST | '00000001'B | 1 | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000010'B | SST and mapped configured SST | |
| SST | '00000101'B | 5 | |
| SD | Not Present | | |
| Mapped configured SST | '00000010'B | 2 | |
| Mapped configured SD | Not Present | | |

Table 9.1.5.1.3a.3.3-3: NSSAI DELETE REQUEST (step 19, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|-------------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10000110' | | |
| Delete NSSAI type | '00000010' | Delete Allowed NSSAI | |
| Allowed NSSAI | 000000 | All PLMNs (3 Octets) | |
| | 00 | 3GPP access | |

Table 9.1.5.1.3a.3.3-4: NSSAI DELETE RESPONSE (step 20, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|------------------------|------------|--|--|
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10100111' | | |

Table 9.1.5.1.3a.3.3-5: REGISTRATION REQUEST (step 24, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|--|--------------|-------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000010'B | SST and mapped configured SST | |
| SST | '00000100'B | 4 | |
| SD | Not Present | | |
| Mapped configured SST | '00000001'B | 1 | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000010'B | SST and mapped configured SST | |
| SST | '00000101'B | 5 | |
| SD | Not Present | | |
| Mapped configured SST | '00000010'B | 2 | |
| Mapped configured SD | Not Present | | |
| Note: UE may include S-NSSAI 4 or 5 or both 4 and 5 from the configured NSSAI list associated with NGC cell G. | | | |

Table 9.1.5.1.3a.3.3-6: REGISTRATION ACCEPT (step 34, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------|-------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Allowed NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000010'B | SST and mapped configured SST | |
| SST | '00000100'B | 4 | |
| SD | Not Present | | |

| | | | |
|---|-------------|-------------------------------|--|
| Mapped configured SST | '00000001'B | 1 | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000010'B | SST and mapped configured SST | |
| SST | '00000101'B | 5 | |
| SD | Not Present | | |
| Mapped configured SST | '00000010'B | 2 | |
| Mapped configured SD | Not Present | | |
| Note: SS will send Allowed NSSAIs based on the Requested NSSAI sent by UE in step 24. | | | |

Table 9.1.5.1.3a.3.3-7: NSSAI DELETE REQUEST (step 41, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|-------------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10000110' | | |
| Delete NSSAI type | '00000000' | Delete Default Configured NSSAI | |

Table 9.1.5.1.3a.3.3-8: NSSAI DELETE RESPONSE (step 42, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10100111' | | |

Table 9.1.5.1.3a.3.3-9: NSSAI DELETE REQUEST (step 44, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|-------------------|-------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | | | |
| Message type | '10000110' | | |
| Delete NSSAI type | '00000001' | Delete Configured | |

| | | | |
|------------------|----------|-----------|--|
| | | NSSAI | |
| Configured NSSAI | 00000000 | All PLMNs | |

Table 9.1.5.1.3a.3.3-10: NSSAI DELETE RESPONSE (step 45, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10100111' | | |

Table 9.1.5.1.3a.3.3-11: NSSAI DELETE REQUEST (step 46, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|-------------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10000110' | | |
| Delete NSSAI type | '00000010' | Delete Allowed NSSAI | |
| Allowed NSSAI | 000000 | All PLMNs (3 Octets) | |
| | 00 | 3GPP access | |

Table 9.1.5.1.3a.3.3-12: NSSAI DELETE RESPONSE (step 47, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10100111' | | |

Table 9.1.5.1.3a.3.3-13: REGISTRATION REQUEST (step 51, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | | Note | |

| | | | |
|--|-------------|---|--|
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Network slicing indication | | | |
| Default configured NSSAI indication | 1 | Requested NSSAI created from default configured NSSAI | |
| Note: UE may include either 1 or 2 or both 1 and 2 NSSAIs. | | | |

Table 9.1.5.1.3a.3.3-14: REGISTRATION ACCEPT (step 61, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------|-------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '001'B | 3GPP access | |
| Allowed NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000010'B | SST and mapped configured SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | '00000001'B | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000010'B | SST and mapped configured SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |

| | | | |
|--|-------------|--|--|
| Mapped configured SST | '0000010'B | | |
| Mapped configured SD | Not Present | | |
| Note: SS will send Allowed NSSAIs based on the Requested NSSAI sent by UE in Step 51 | | | |

Table 9.1.5.1.3a.3.3-15: NSSAI DELETE REQUEST (step 68, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|---------------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | ' 10000110 ' | | |
| Delete NSSAI type | '00000000' | Delete Default Configured NSSAI | |

Table 9.1.5.1.3a.3.3-16: NSSAI DELETE RESPONSE (step 69, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|---------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | ' 10100111 ' | | |

Table 9.1.5.1.3a.3.3-17: NSSAI DELETE REQUEST (step 70, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|---------------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | ' 10000110 ' | | |
| Delete NSSAI type | '00000001' | Delete Configured NSSAI | |
| Configured NSSAI | 000000 | All PLMNs (3 Octets) | |

Table 9.1.5.1.3a.3.3-18: NSSAI DELETE RESPONSE (step 71, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|------------------------|------------|--|--|
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10100111' | | |

Table 9.1.5.1.3a.3.3-19: NSSAI DELETE REQUEST (step 72, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10000110' | | |
| Delete NSSAI type | '00000010' | Delete Allowed NSSAI | |
| Allowed NSSAI | 000000 | All PLMNs (3 Octets) | |
| | 00 | 3GPP access | |

Table 9.1.5.1.3a.3.3-20: NSSAI DELETE RESPONSE (step 73, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.509 Table 6.7.1 | | | |
|-------------------------------------|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1111 | | |
| Skip indicator | 0000 | | |
| Message type | '10100111' | | |

Table 9.1.5.1.3a.3.3-21: REGISTRATION REQUEST (step 77, Table 9.1.5.1.3a.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | Not Present | | |

9.1.5.1.4 Initial registration / 5GS services / MICO mode / TAI list handling

9.1.5.1.4.1 Test Purpose (TP)

(1)

with { The UE is in 5GMM-DEREGISTERED state and is switched off }

ensure that {

when { the UE supports MICO mode and requests the use of MICO mode}
then { the UE includes the MICO indication IE in the REGISTRATION REQUEST message }
}

(2)

with { The UE has received REGISTRATION ACCEPT message }
ensure that {
when { the REGISTRATION ACCEPT message included MICO indication IE indicating “all PLMN registration area allocated” }
then { the UE treats all TAIs in the current PLMN as a registration area and deletes its old TAI list }
}

(3)

with { The UE detecting a better NG cell in same PLMN }
ensure that {
when { the UE treats all TAIs in the current PLMN as a registration area and has deleted its old TAI list as a result of REGISTRATION ACCEPT message included MICO indication IE indicating “all PLMN registration area allocated” }
then { the UE does not perform the REGISTRATION procedure for mobility }
}

(4)

with { The UE detecting a better NG cell in a different PLMN }
ensure that {
when { the UE transmits the REGISTRATION REQUEST }
then { the UE sets the IE 5GS registration type to “mobility registration updating” and performs a REGISTRATION procedure for Mobility }
}

9.1.5.1.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 5.5.1.2.2 and 5.5.1.2.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.2.2]

...

If the UE supports MICO mode and requests the use of MICO mode, then the UE shall include the MICO indication IE in the REGISTRATION REQUEST message.

...

[TS 24.501, clause 5.5.1.2.4]

...

The AMF shall include the MICO indication IE in the REGISTRATION ACCEPT message only if the MICO indication IE was included in the REGISTRATION REQUEST message, the AMF supports and accepts the use of MICO mode. If the AMF supports and accepts the use of MICO mode, the AMF may indicate "all PLMN registration area allocated" in the MICO indication IE in the REGISTRATION ACCEPT message. If "all PLMN registration area allocated" is indicated in the MICO indication IE, the AMF shall not assign and include the TAI list in the REGISTRATION ACCEPT message. If the REGISTRATION ACCEPT message included an MICO indication IE indicating "all PLMN registration area allocated", the UE shall treat all TAIs in the current PLMN as a registration area and delete its old TAI list.

...

9.1.5.1.4.3 Test description

9.1.5.1.4.3.1 Pre-test conditions

System Simulator:

- NGC Cell A, NGC Cell C and NGC Cell E are configured according to Table 6.3.2.2-1 and Table 6.3.2.2-3 in TS 38.508-1[4].

UE:

None.

Preamble:

- The UE is in state Switched OFF [State 0-A as per TS 38.508-1 Table 4.4A.2-0].

9.1.5.1.4.3.2 Test procedure sequence

Table 9.1.5.1.4.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| 0 | The SS configures:
- NGC Cell A as the "Non-Suitable "off" cell."
- NGC Cell C as the "Non-Suitable "off" cell".
- NGC Cell E as the "Non-Suitable "off" cell". | | | | |
| 1 | The UE is switched ON | | | | |
| 2 | The user requests enabling of MICO mode by MMI or AT command | - | | - | - |
| 3 | The SS configures:
- NGC Cell A as the "Serving cell".
- NGC Cell C as the "Non-Suitable "off" cell".
- NGC Cell E as the "Non-Suitable "off" cell". | - | | - | - |
| 4-6 | The UE establishes an RRC connection by executing steps 2–4 of Table 4.5.2.2-2 in | - | | - | - |

| | | | | | |
|-------|---|-----|--------------------------------|-----|---|
| | TS38.508-1 [4]. | | | | |
| 7 | Check : Does the UE transmit a REGISTRATION REQUEST message including IE MICO indication | --> | REGISTRATION REQUEST | 1 | P |
| 8-16 | Steps 5-13 of Table 4.5.2.2-2 of the generic procedure in TS 38508-1 [4] are performed | - | | - | - |
| 17 | SS transmits a REGISTRATION ACCEPT message that includes IE MICO indication | <-- | REGISTRATION ACCEPT | - | - |
| 18 | The SS releases the RRC Connection | - | | - | - |
| 19 | The SS configures:
- NGC Cell A as the "Non-suitable cell".
- NGC Cell C as the "Serving cell".
- NGC Cell E as the "Non-suitable cell". | - | | | |
| 20 | Check : Does the UE transmit a RRCSetupRequest on NGC Cell C ?

This is checked for 60s | --> | NR RRC: <i>RRCSetupRequest</i> | 2,3 | F |
| 21 | The SS configures:
- NGC Cell A as the "Non-suitable cell".
- NGC Cell C as the "Non-suitable cell".
- NGC Cell E as the "Serving cell". | - | | - | - |
| | The following messages are to be observed on NGC Cell E unless explicitly stated otherwise | | | | |
| 22-24 | The UE establishes an RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 [4]. | - | | - | - |
| 25 | Check : Does the UE transmit a REGISTRATION REQUEST message with IE 5GS registration type set to "mobility registration updating" | --> | REGISTRATION REQUEST | 4 | P |
| 26-27 | Steps 4-5 of Table 4.9.5.2.2-1 in TS38.508-1 [4] are performed | | | | |

9.1.5.1.4.3.3 Specific message contents

Table 9.1.5.1.4.3.3-1: REGISTRATION REQUEST (step 6 Table 9.1.5.1.4.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '001'B | Initial registration | INITIAL |
| MICO indication | '0000'B | | |

Table 9.1.5.1.4.3.3-2: REGISTRATION ACCEPT (step 16 Table 9.1.5.1.4.3.2-1)

| Derivation Path: TS 38.508 [4], Table 4.7.1-7 | | | |
|---|--------------|--------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MICO Indication | '0001'B | All PLMN registration area allocated | |
| TAI list | Not present | | |

Table 9.1.5.1.4.3.3-3: REGISTRATION REQUEST (step 23 Table 9.1.5.1.4.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6 | | | |
|---|--------------|--------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '010'B | Mobility registration updating | MOBILITY |

9.1.5.1.5 Initial registration / Abnormal / Failure after 5 attempts

9.1.5.1.5.1 Test Purpose (TP)

(1)

with { The UE in 5GMM-REGISTERED-INITIATED state and T3510 timer expired }

ensure that {

when { T3511 timer expires and registration attempt counter is less than 5 }

then { UE restarts the initial registration procedure }

}

(2)

with { The UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { The NAS signalling connection is released before the REGISTRATION ACCEPT or REGISTRATION REJECT message is received }

then { UE restarts the initial registration procedure }

}

(3)

with { The UE has sent initial REGISTRAION REQUEST message }

ensure that {

when { UE receives a REGISTRATION REJECT message including 5GMM cause value #95 and the UE updates the registration counter to 5 }

then { UE deletes 5G-GUTI, last visited TAI and ngKSI, performs a PLMN selection after timer T3502 timeout }

}

9.1.5.1.5.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.1.1 5.5.1.2.7, and 10.2. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.1]

Additionally, the registration attempt counter shall be reset when the UE is in sub state 5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION or 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE, and:

- a new tracking area is entered;
- timer T3502 expires; or
- timer T3346 is started.

[TS 24.501, clause 5.5.1.2.7]

The following abnormal cases can be identified:

...

c) T3510 timeout.

The UE shall abort the registration procedure for initial registration and the NAS signalling connection, if any, shall be released locally if the initial registration request is not for emergency services. The UE shall proceed as described below.

d) REGISTRATION REJECT message, other 5GMM cause values than those treated in subclause 5.5.1.2.5, and cases of 5GMM cause value #22, if considered as abnormal cases according to subclause 5.5.1.2.5.

If the registration request is not an initial registration request for emergency services, upon reception of the 5GMM causes #95, #96, #97, #99 and #111 the UE should set the registration attempt counter to 5.

The UE shall proceed as described below.

e) Lower layer failure or release of the NAS signalling connection received from lower layers before the REGISTRATION ACCEPT or REGISTRATION REJECT message is received.

The UE shall abort the registration procedure for initial registration and proceed as described below.

...

For the cases c, d and e, the UE shall proceed as follows:

Timer T3510 shall be stopped if still running.

If the registration procedure is neither an initial registration for emergency services nor for establishing an emergency PDU session with registration type not set to "emergency registration", the registration attempt counter shall be incremented, unless it was already set to 5.

If the registration attempt counter is less than 5:

- if the initial registration request is not for emergency services, timer T3511 is started and the state is changed to 5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION. When timer T3511 expires the registration procedure for initial registration shall be restarted, if still required.

If the registration attempt counter is equal to 5

- the UE shall delete 5G-GUTI, TAI list, last visited TAI, list of equivalent PLMNs and ngKSI, start timer T3502 and shall set the 5GS update status to 5U2 NOT UPDATED. The state is changed to 5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION or optionally to 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5].

[TS 24.501, clause 10.2]

Table 10.2.1: Timers of 5GS mobility management – UE side

| TIMER NUM. | TIMER VALUE | STATE | CAUSE OF START | NORMAL STOP | ON EXPIRY |
|------------|---------------------------|---|--|--|--|
| T3510 | 15s | 5GMM-REGISTERED-INITIATED | Transmission of REGISTRATION REQUEST message | REGISTRATION ACCEPT message received or REGISTRATION REJECT message received | Start T3511 or T3502 as specified in subclause 5.5.1.2.7 if T3510 expired during registration procedure for initial registration.

Start T3511 or T3502 as specified in subclause 5.5.1.3.7 if T3510 expired during the registration procedure for mobility and periodic registration update |
| T3502 | Default 12 min.
NOTE 1 | 5GMM-REGISTERED | At registration failure and the attempt counter is equal to 5 | Transmission of REGISTRATION REQUEST message | Initiation of the registration procedure, if still required |
| T3511 | 10s | 5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION

5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE

5GMM-REGISTERED.NORMAL-SERVICE | At registration failure due to lower layer failure, T3510 timeout or registration rejected with other 5GMM cause values than those treated in subclause 5.5.1.2.5 for initial registration or subclause 5.5.1.3.5 for mobility and periodic registration | Transmission of REGISTRATION REQUEST message

5GMM-CONNECTED mode entered (NOTE 5) | Retransmission of the REGISTRATION REQUEST, if still required |

9.1.5.1.5.3 Test description

9.1.5.1.5.3.1 Pre-test conditions

System Simulator:

- NGC Cell A is configured according to Table 6.3.2.2-1 in TS 38.508-1 [4].

UE:

None.

Preamble:

- The UE is in state 0-A according to TS 38.508-1 [4] Table 4.4A.2-0.

9.1.5.1.5.3.2 Test procedure sequence

Table 9.1.5.1.5.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-------|--|------------------|----------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC Cell A as the "Serving cell". | - | - | - | - |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise. | - | - | - | - |
| 2 | The UE is switched on. | - | - | - | - |
| 3-5 | Steps 2-4 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed and the UE transmits a REGISTRATION REQUEST with IE 5GS registration type set to "initial registration". | --> | REGISTRATION REQUEST | - | - |
| 6 | The SS waits 25 seconds (15 seconds T3510 and 10 seconds T3511). (UE's registration attempt counter = 1) | - | - | - | - |
| 7 | Check: Does the UE transmit a REGISTRATION REQUEST message with IE 5GS registration type set to "initial registration"? | --> | REGISTRATION REQUEST | 1 | P |
| 8 | The SS releases the RRC connection. | - | - | - | - |
| 8A | The SS waits 10 seconds (T3511). (UE's registration attempt counter = 2) | | | | |
| 9-11 | Steps 2-4 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. Check: Does the UE transmit a REGISTRATION REQUEST message with IE 5GS registration type set to "initial registration"? | --> | REGISTRATION REQUEST | 2 | P |
| 12-16 | Steps 5-9 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 17 | The SS transmits a REGISTRATION REJECT with cause #95 (Semantically incorrect message). (UE's registration attempt counter = 5) | <-- | REGISTRATION REJECT | - | - |
| 17A | The SS releases the RRC connection. | - | - | - | - |
| | EXCEPTION: Steps 17Aa1 and 17Ab1 describes behaviour that depends on the UE capability; the "lower case letter" identifies a step sequence that take place if a capability is supported | | | | |
| 17Aa1 | IF the UE transmits a REGISTRATION REQUEST message with IE 5GS registration type set to "initial registration" 10s after step 17A. | --> | REGISTRATION REQUEST | - | - |
| 17Ab1 | ELSE Check: Does the UE transmit a REGISTRATION REQUEST message with IE 5GS registration type set to "initial registration" after 12 minutes after step 17A? (UE's registration attempt counter has been reset to 0 after expiry of T3502) | --> | REGISTRATION REQUEST | 3 | P |
| 18 | Void | - | - | - | - |
| 19-34 | Steps 5-20a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |

9.1.5.1.5.3.3 Specific message contents

Table 9.1.5.1.5.3.3-1: REGISTRATION REJECT (step 17, Table 9.1.5.1.5.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-9 | | | |
|--|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '01011111'B | Cause #95 (Semantically incorrect message) | |

Table 9.1.5.1.5.3.3-2: REGISTRATION REQUEST (step 18, Table 9.1.5.1.5.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|-------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| ngKSI | | | |
| NAS key set identifier | '111'B | no key is available | |
| TSC | Any allowed value | TSC does not apply for NAS key set identifier value "111" | |
| 5GS mobile identity | SUCI | | |
| Last visited registered TAI | Not present | | |

Table 9.1.5.1.5.3.3-3: Void

9.1.5.1.6 Initial registration / Rejected / Illegal UE

9.1.5.1.6.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value #3 (Illegal UE) }

then { the UE deletes the stored 5G-GUTI, last visited registered TAI and ngKSI, deletes the list of equivalent PLMNs and enter state 5GMM-DEREGISTERED, the USIM is considered invalid until switching off the UE }

}

9.1.5.1.6.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 clause 5.5.1.2.5.

[TS 24.501, clause 5.5.1.2.5]

If the initial registration request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

If the initial registration request is rejected due to general NAS level mobility management congestion control, the network shall set the 5GMM cause value to #22 "congestion" and assign a back-off timer T3346.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

#3 (Illegal UE); or

#6 (Illegal ME).

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall consider the USIM as invalid for 5GS services until switching off or the UICC containing the USIM is removed. The UE shall delete the list of equivalent PLMNs and enter the state 5GMM-DEREGISTERED.

If the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status, 4G-GUTI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when the EPS attach

request procedure is rejected with the EMM cause with the same value. The USIM shall be considered as invalid also for non-EPS services until switching off or the UICC containing the USIM is removed.

If the UE also supports the registration procedure over the other access, the UE shall in addition handle 5GMM parameters and 5GMM state for this access, as described for this 5GMM cause value.

9.1.5.1.6.3 Test description

9.1.5.1.6.3.1 Pre-test conditions

System Simulator:

- NGC Cell A is configured according to table 6.3.2.2-1 in TS 38.508-1 [4].

UE:

None.

Preamble:

- The UE is in state Switched OFF (state 0N-B) according to TS 38.508-1 [4].

9.1.5.1.6.3.2 Test procedure sequence

Table 9.1.5.1.6.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|--|------------------|----------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC cell A as the "Serving cell". | - | - | - | - |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise. | - | - | - | - |
| 2 | The UE is switched on. | - | - | - | - |
| 3-14 | Steps 2-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 15 | The SS transmits a REGISTRATION REJECT message with the 5GMM cause set to 'Illegal UE' as specified. | <-- | 5GMM: REGISTRATION REJECT | - | - |
| 16 | The SS releases the RRC connection. | - | - | - | - |
| 17 | Check: Does the UE transmit an REGISTRATION REQUEST message on NGC cell A in the next 30 seconds? | --> | 5GMM: REGISTRATION REQUEST | 1 | F |
| 18 | The user initiates Registration Request by MMI or by AT command. | - | - | - | - |
| 19 | Check: Does the UE transmit the REGISTRATION REQUEST message in the next 30 seconds? | --> | 5GMM: REGISTRATION REQUEST | 1 | F |
| 20 | If possible (see ICS) switch off is performed or the USIM is removed. | - | - | - | - |

| | | | | | |
|-------|--|-----|----------------------------|---|---|
| | Otherwise the power is removed. | | | | |
| 21 | The UE is brought back to operation or the USIM is inserted. The UE is powered on or switched on. | - | - | - | - |
| 22 | Check: Does the UE transmit an REGISTRATION REQUEST message on NGC Cell A? | --> | 5GMM: REGISTRATION REQUEST | 1 | P |
| 23-38 | Steps 5-20 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed on NGC Cell A. | - | - | - | - |

9.1.5.1.6.3.3 Specific message contents

Table 9.1.5.1.6.3.3-1: REGISTRATION REJECT (step 15, Table 9.1.5.1.6.3.2-1)

| Derivation Path: TS 38.508-1 Table 4.7.1-9 | | | |
|--|--------------|------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0000 0011'B | Illegal UE | |

Table 9.1.5.1.6.3.3-2: REGISTRATION REQUEST (step 22, Table 9.1.5.1.6.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-6 | | | |
|--|-------------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| ngKSI | | | |
| NAS key set identifier | '111'B | no key is available (UE to network) | |
| TSC | Any allowed value | TSC does not apply for NAS key set identifier value "111" | |
| 5GS mobile identity | The valid SUCI | . | |
| Last visited registered TAI | Not present | | |

9.1.5.1.7 Void

9.1.5.1.8 Initial registration / Rejected / Serving network not authorized

9.1.5.1.8.1 Test Purpose (TP)

(1)

with { The UE has sent initial REGISTRAION REQUEST message }

ensure that {

when { the UE receives a REGISTRATION REJECT with cause #73 (Serving network not authorized) }

then { the UE stores the PLMN identity in the "forbidden PLMN list" and does not attempt to register on a cell belong to that PLMN }

}

9.1.5.1.8.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.1.2.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.2.5]

If the initial registration request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

If the initial registration request is rejected due to general NAS level mobility management congestion control, the network shall set the 5GMM cause value to #22 "congestion" and assign a back-off timer T3346.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

#3 (Illegal UE); or

#6 (Illegal ME).

....

#73 (Serving network not authorized).

The UE shall set the 5GS update status to 5U2 NOT UPDATED, reset the registration attempt counter, store the PLMN identity in the "forbidden PLMN list" and enter state 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5].

9.1.5.1.8.3 Test description

9.1.5.1.8.3.1 Pre-test conditions

System Simulator:

- 3 NGC Cells NGC Cell E, NGC Cell I and NGC Cell A are configured as specified in TS 38.508-1[4] table 6.3.2.2-1 and table 6.3.2.2-3.

UE:

- The UE is in Automatic PLMN selection mode.

Preamble:

- NGC Cell E is set to "Serving Cell".

- NGC Cell I is set to "Suitable neighbour cell".

- NGC Cell A is set to "Non-Suitable cell".

- The UE is in state 0N-B with a successful registration on NGC Cell E according to 38.508-1[4].

9.1.5.1.8.3.2 Test procedure sequence

Table 9.1.5.1.8.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on | - | - | - | - |
| 2-9 | Steps 2-9 of Table 4.5.2.2-2 in TS38.508-1 [4] are performed on NGC Cell E. | - | - | - | - |
| 10 | The SS transmits a REGISTRATION REJECT with cause #73 (Serving network not authorized). | <-- | REGISTRATION REJECT | - | - |
| 11 | The SS releases the RRC connection | - | - | - | - |
| 12 | Check: Does the UE send in the next 30 sec a request for RRC connection establishment on Cell E or Cell I. | --> | NR RRC: <i>RRCSetupRequest</i> | 1 | F |
| 13 | The SS configures
- NGC Cell A as "Serving Cell" | - | - | - | - |
| 14 | Check: Does the UE perform Registration procedure on NGC Cell A as specified in TS 38.508-1 [4] subclause 4.5.2? | - | - | 1 | P |
| 15 | The SS configures
- NGC Cell A as "Non-Suitable cell" | - | - | - | - |
| 16 | Set the UE in manual PLMN selection mode or request a PLMN search. | - | - | - | - |
| 17 | The user selects the PLMN of NGC Cell E. | - | - | - | - |
| 18 | The UE performs Registration procedure on NGC Cell E as specified in TS 38.508-1 [4] subclause 4.5.2 with ' <i>connected without release</i> '. | - | - | - | - |
| 19 | Set the UE in Automatic PLMN selection mode. | - | - | - | - |

9.1.5.1.8.3.3 Specific message contents

Table 9.1.5.1.8.3.3-1: REGISTRATION REJECT (step 10 Table 9.1.5.1.8.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9 | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '01001001'B | Cause #73
(Serving network not authorized) | |

9.1.5.1.9 Initial registration / Abnormal / Change of cell into a new tracking area

9.1.5.1.9.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the UE receives transmission failure of REGISTRATION COMPLETE message indication with TAI change from lower layers }

then { the UE restarts the registration procedure with 5G-GUTI allocated during the last registration procedure }

}

9.1.5.1.9.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 5.5.1.2.7.

[TS 24.501, clause 5.5.1.2.7]

The following abnormal cases can be identified:

...

h) Change of cell into a new tracking area.

If a cell change into a new tracking area occurs before the registration procedure for initial registration is completed, the registration procedure for initial registration shall be aborted and re-initiated immediately. If a tracking area border is crossed when the REGISTRATION ACCEPT message has been received but before a REGISTRATION COMPLETE message is sent, the registration procedure for initial registration shall be re-initiated. If a 5G-GUTI was allocated during the registration procedure, this 5G-GUTI shall be used in the registration procedure.

9.1.5.1.9.3 Test description

9.1.5.1.9.3.1 Pre-test conditions

System Simulator:

- NGC Cell A and NGC Cell B are configured according to Table 6.3.2.2-1 in TS 38.508-1 [4].

UE:

- the UE is previously registered on NGC, and when on NGC, the UE is last authenticated and registered on NGC cell A using default message contents according to TS 38.508-1 [4].

Preamble:

- The UE is in state Switched OFF (state 0N-B) according to TS 38.508-1 [4].

9.1.5.1.9.3.2 Test procedure sequence

Table 9.1.5.1.9.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|---|------------------|---------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC cell A as the "Serving cell".
- NGC cell B as the "Non-suitable cell". | - | - | - | - |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise. | - | - | - | - |
| 2 | The UE is switched on. | - | - | - | - |
| 3-14 | Steps 2–13 of Table 4.5.2.2-2 in TS38.508-1 [4] are performed. | - | - | - | - |
| 15 | SS stops sending RLC acknowledgments on NGC Cell A | - | - | - | - |
| 16 | The SS transmits an REGISTRATION ACCEPT message with 5G-GUTI-1 assigned to UE. | <-- | 5GMM: REGISTRATION ACCEPT | - | - |
| 16A | The UE transmits an <i>ULInformationTransfer</i> message and a | --> | 5GMM: REGISTRATION | - | - |

| | | | | | |
|-------|--|-----|----------------------------|---|---|
| | REGISTRATION COMPLETE message. | | COMPLETE | | |
| 17 | The SS configures:
- NGC cell B as the "Serving cell".
- NGC cell A as the "Non-suitable cell". | - | - | - | - |
| 17A | SS resumes sending RLC acknowledgments on NGC Cell A | - | - | - | - |
| - | The following messages are to be observed on NGC Cell B unless explicitly stated otherwise. | - | - | - | - |
| 18 | Check: Does the UE transmit an REGISTRATION REQUEST message including the 5G-GUTI-1 assigned by the last registration procedure in step15? | --> | 5GMM: REGISTRATION REQUEST | 1 | P |
| 19-34 | Steps 5–20 of Table 4.5.2.2-2 in TS38.508-1 [4] are performed | - | - | - | - |

9.1.5.1.9.3.3 Specific message contents

Table 9.1.5.1.9.3.3-1: Message REGISTRATION ACCEPT (step 16, Table 9.1.5.1.9.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-7 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5G-GUTI | 5G-GUTI-1 | | |

Table 9.1.5.1.9.3.3-2: REGISTRATION REQUEST (step 18, Table 9.1.5.1.9.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-6 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS mobile identity | 5G-GUTI-1 | . | |

9.1.5.1.10 Initial registration / Rejected / PLMN not allowed

9.1.5.1.10.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value #11 (PLMN not allowed) }

then { the UE deletes any 5G-GUTI, last visited registered TAI and ngKSI, deletes the list of equivalent PLMNs, stores the PLMN identity in the "forbidden PLMN list" and performs a PLMN selection }

9.1.5.1.10.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clauses 5.5.1.2.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.2.5]

If the initial registration request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

...

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

...

#11 (PLMN not allowed).

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall delete the list of equivalent PLMNs and reset the registration attempt counter and store the PLMN identity in the "forbidden PLMN list". The UE shall enter state 5GMM-DEREGISTERED.PLMN-SEARCH and perform a PLMN selection according to 3GPP TS 23.122 [5]. If the message has been successfully integrity checked by the NAS, the UE shall set the PLMN-specific attempt counter and the PLMN-specific attempt counter for non-3GPP access for that PLMN to the UE implementation-specific maximum value.

9.1.5.1.10.3 Test description

9.1.5.1.10.3.1 Pre-test conditions

System Simulator:

- NGC cell G and NGC cell I.
- The NGC cells are configured according to Table 6.3.2.2-1 and Table 6.3.2.2-3 in 38.508-1 [4], except replacing Nrf3 with Nrf1;

UE:

- the UE is previously registered on NGC, and when on NGC, the UE is last authenticated and registered on NGC cell G using default message contents according to TS 38.508-1 [4];

Preamble:

- The UE is in state 0N-B according to TS 38.508-1 [4].

9.1.5.1.10.3.2 Test procedure sequence

Table 9.1.5.1.10.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U – S | Message | | |
| 1 | The SS configures: <ul style="list-style-type: none"> - NGC Cell G as the "Serving cell". - NGC Cell I as a "Non-Suitable Off cell". | - | - | - | - |

| | | | | | |
|---------|--|-----|----------------------------|---|---|
| 2 | Void | | | | |
| | The following messages are to be observed on Cell G unless explicitly stated otherwise. | - | - | - | - |
| 3 | The UE is switched on. | - | - | - | - |
| 4-11 | Steps 2-9 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 12 | The SS transmits an REGISTRATION REJECT message including an appropriate 5GMM cause value #11 (PLMN not allowed). | <-- | 5GMM: REGISTRATION REJECT | - | - |
| 13 | The SS releases the RRC connection. | - | - | - | - |
| 14 | Check: Does the UE transmit an REGISTRATION REQUEST message on NGC cell G in the next 90 seconds? | --> | 5GMM: REGISTRATION REQUEST | 1 | F |
| 15 | The generic test procedure in TS 38.508-1 Table 4.9.6.4-1 of Switch off procedure in State DEREGISTERED are performed. | - | - | - | - |
| 16 | The UE is brought back to operation or the USIM is inserted. The UE is powered on or switched on. | - | - | - | - |
| 17 | Check: Does the UE transmit an REGISTRATION REQUEST message in the next 30 seconds? | --> | 5GMM: REGISTRATION REQUEST | 1 | F |
| 18 | The SS configures:
-NGC Cell G as the "Serving cell"
-NGC Cell I as a "Suitable neighbour cell". | - | - | - | - |
| 19 | Void | | | | |
| - | The following messages are to be observed on NGC Cell I unless explicitly stated otherwise. | - | - | - | - |
| 20-22 | The UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 [4]. | - | - | - | - |
| 23 | Check: Does the UE transmit an REGISTRATION REQUEST message as specified? | --> | 5GMM: REGISTRATION REQUEST | 1 | P |
| 24-39a1 | Steps 5-19a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 40 | The generic test procedure in TS 38.508-1 Table 4.9.6.3-1 of Switch off procedure in RRC_CONNECTED are performed. | - | - | - | - |
| 40A | The SS configures:
-NGC Cell G as the "Serving cell"
-NGC Cell I as a "Non-Suitable "off" cell ". | | | | |
| 40 | The UE is brought back to operation or the | - | - | - | - |

| | | | | | |
|-----------------|---|---|---|---|---|
| B | USIM is inserted. The UE is powered on or switched on. | | | | |
| 40
C | The user sets the UE in manual PLMN selection mode or requests a PLMN search. | - | - | - | - |
| 41 | The user selects PLMN of NGC Cell I. | - | - | - | - |
| 42-
60a
1 | Steps 2 to 20a1 of the registration procedure described in TS 38.508-1 [4] subclause 4.5.2 are performed on NGC Cell G. | - | - | - | - |
| 61 | The user sets the UE in Automatic PLMN selection mode. | - | - | - | - |

9.1.5.1.10.3.3 Specific message contents

Table 9.1.5.1.10.3.3-1: Message REGISTRATION REJECT (step 12, Table 9.1.5.1.10.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-9 | | | |
|---|--------------|------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GMM cause | '00001011'B | #11 "PLMN not allowed" | |

Table 9.1.5.1.10.3.3-2: Message REGISTRATION REQUEST (step 23, Table 9.1.5.1.10.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-6 | | | |
|--|-------------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| ngKSI | | | |
| NAS key set identifier | '111'B | no key is available (UE to network) | |
| TSC | Any allowed value | TSC does not apply for NAS key set identifier value "111" | |
| 5GS mobile identity | The valid SUCI | . | |
| Last visited registered TAI | Not present | | |

9.1.5.1.11 Initial registration / Rejected / Tracking area not allowed

9.1.5.1.11.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value #12 (Tracking area not allowed)}

then { the UE deletes any 5G-GUTI, last visited registered TAI and ngKSI, stores the current TAI in the list of "5GS forbidden tracking areas for regional provision of service". }

}

(2)

with { the UE is in 5GMM-DEREGISTERED.LIMITED-SERVICE state and the TAI of the current cell belongs to the list of "forbidden tracking areas for regional provision of service" }

ensure that {

when { the UE enters a cell belonging to a tracking area not in the list of "forbidden tracking areas for regional provision of service" }

then { the UE attempts to registration }

}

(3)

with { the UE is in 5GMM-DEREGISTERED.LIMITED-SERVICE state and the list of "forbidden tracking areas for regional provision of service" contains more than one TAI }

ensure that {

when { the UE selects a cell belonging to one of the TAIs in the list of "forbidden tracking areas for regional provision of service" }

then { the UE does not attempt to registration }

}

(4)

with { the UE is switched off or the UICC containing the USIM is removed }

ensure that {

when { UE is powered on in the cell belonging to the TAI which was in the list of "forbidden tracking areas for regional provision of service" before the UE was switched off or the USIM is inserted again on that cell }

then { UE performs registration on that cell }

}

9.1.5.1.11.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501, clauses 5.5.1.2.5, 5.1.3.2.2.

[TS 24.501, clause 5.5.1.2.5]

If the initial registration request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

If the initial registration request is rejected due to general NAS level mobility management congestion control, the network shall set the 5GMM cause value to #22 "congestion" and assign a back-off timer T3346.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

...

#12 (Tracking area not allowed).

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete 5G-GUTI, last visited registered TAI, TAI list and ngKSI. Additionally, the UE shall reset the registration attempt counter.

The UE shall store the current TAI in the list of "5GS forbidden tracking areas for regional provision of service" and enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE.

[TS 24.501, clause 5.1.3.2.2]

In order to describe the detailed UE behaviour, the 5GS update (5U) status pertaining to a specific subscriber is defined.

If the UE is not SNPN enabled or the UE is not operating in SNPN access mode (see 3GPP TS 23.501 [8]), the 5GS update status is stored in a non-volatile memory in the USIM if the corresponding file is present in the USIM, else in the non-volatile memory in the ME, as described in annex C.

If the UE is operating in SNPN access mode, the 5GS update status for each SNPN whose SNPN identity is included in the "list of subscriber data" configured in the ME (see 3GPP TS 23.122 [5]) is stored in the non-volatile memory in the ME as described in annex C.

The 5GS update status value is changed only after the execution of a registration, network-initiated de-registration, 5GS based primary authentication and key agreement, service request or paging procedure.

5U1: UPDATED

The last registration attempt was successful.

5U2: NOT UPDATED

The last registration attempt failed procedurally, e.g. no response or reject message was received from the AMF.

5U3: ROAMING NOT ALLOWED

The last registration, service request, or registration for mobility or periodic registration update attempt was correctly performed, but the answer from the AMF was negative (because of roaming or subscription restrictions).

[TS 24.501, clause 5.3.13]

The UE shall store a list of "5GS forbidden tracking areas for roaming", as well as a list of "5GS forbidden tracking areas for regional provision of service". Within the 5GS, these lists are managed independently per access type, i.e., 3GPP access or non-3GPP access. These lists shall be erased when

- a) the UE is switched off or the UICC containing the USIM is removed or an entry of the "list of subscriber data" with the SNPN identity of the current SNPN is updated; and
- b) periodically (with a period in the range 12 to 24 hours).

Over 3GPP access, when the lists are erased, the UE performs cell selection according to 3GPP TS 38.304 [28]. A tracking area shall be removed from the list of "5GS forbidden tracking areas for roaming", as well as the list of "5GS forbidden tracking areas for regional provision of service", if the UE receives the tracking area in the TAI list or the Service area list of "allowed tracking areas" in REGISTRATION ACCEPT message or a CONFIGURATION UPDATE COMMAND message. The UE shall not remove the tracking area from "5GS forbidden tracking areas for roaming" or "5GS forbidden tracking areas for regional provision of service" if the UE is registered for emergency services.

In N1 mode, the UE shall update the suitable list whenever a REGISTRATION REJECT, SERVICE REJECT or DEREGISTRATION REQUEST message is received with the 5GMM cause #12 "tracking area not allowed", #13 "roaming not allowed in this tracking area", or #15 "no suitable cells in tracking area".

Each list shall accommodate 40 or more TAIs. When the list is full and a new entry has to be inserted, the oldest entry shall be deleted.

9.1.5.1.11.3 Test description

9.1.5.1.11.3.1 Pre-test conditions

System Simulator:

- NGC Cell A (home PLMN) and NGC Cell B (home PLMN, another TA) are configured according to Table 6.3.2.2-1 in TS 38.508-1 [4].
- System information combination NR-2 in accordance with TS 38.508-1[4] sub-clause 4.4.3.1.2 is used in NGC Cell A and NGC Cell B.
- The UE is last authenticated and registered on NGC Cell A.

Preamble:

- The UE is in state Switched OFF (state 0N-B) according to TS 38.508-1 [4].

9.1.5.1.11.3.2 Test procedure sequence

Table 9.1.5.1.11.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|--|------------------|----------------------|------------|----------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC Cell A as the "Serving cell".
- NGC Cell B as "Non-suitable cell". | - | - | - | - |
| 2 | The UE is switched on. | - | - | - | - |
| 3-14 | Steps 2-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 15 | The SS transmits a REGISTRATION REJECT message, 5GMM cause value = #12 "Tracking area not allowed". | <-- | REGISTRATION REJECT | - | - |
| 16 | The SS releases the RRC connection. | - | - | - | - |
| 17 | Check: Does the UE transmit the REGISTRATION REQUEST message on NGC Cell A in the next 30 seconds? | --> | REGISTRATION REQUEST | 1 | F |
| 18 | The SS reconfigures:
- NGC cell B as the "Serving cell".
- NGC cell A as a " Non-Suitable cell". | - | - | - | - |
| 19 | Check: Does the UE transmit the REGISTRATION REQUEST message on NGC Cell B? | --> | REGISTRATION REQUEST | 1,2 | P |

| | | | | | |
|---------|--|-----|----------------------|------------|----------|
| 20-26 | Steps 5 to 11 from procedure in TS 38.508-1 [4] Table 4.5.2.2-2 are performed. | - | - | - | - |
| 27 | The SS transmits a REGISTRATION REJECT message, 5GMM cause value = #12 "Tracking area not allowed". | <-- | REGISTRATION REJECT | - | - |
| 28 | The SS releases the RRC connection. | - | - | - | - |
| 28 A | The SS reconfigures:
- NGC cell A as a "Suitable neighbour intra-frequency cell". | - | - | - | - |
| 29 | Check: Does the UE transmit the REGISTRATION REQUEST message in the next 30 seconds on NGC Cell A or NGC Cell B? | --> | REGISTRATION REQUEST | 1,3 | F |
| 30 | Switch off UE in State Deregistered as described in TS38.508-1 [4] subclause 4.9.6.4. | - | - | - | - |
| 31 | The SS reconfigures:
- NGC cell A as the "Serving cell".
- NGC cell B as "Non-suitable cell". | - | - | - | - |
| 32 | Switch on UE. | - | - | - | - |
| 33 | Check: Does the UE transmit a REGISTRATION REQUEST message on NGC Cell A? | --> | REGISTRATION REQUEST | 4 | P |
| 34-49a1 | Steps 5-20a1 of Table 4.5.2.2-2 in TS38.508-1 [4] are performed. | - | - | - | - |

9.1.5.1.11.3.3 Specific message contents

Table 9.1.5.1.11.3.3-1: REGISTRATION REJECT (step 15, step 27, Table 9.1.5.1.11.3.2-1)

| Derivation path: 38.508-1 [4] table 4.7.1-9 | | | |
|---|--------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '00001100'B | #12 "Tracking area not allowed" | |

Table 9.1.5.1.11.3.3-2: REGISTRATION REQUEST (step 19, step33, Table 9.1.5.1.11.3.2-1)

| Derivation path: 38.508-1 [4] table 4.7.1-6 | | | |
|---|-------------------|---------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| ngKSI | | | |
| NAS key set identifier | '111'B | no key is available | |
| TSC | Any allowed value | TSC does not | |

| | | | |
|-----------------------------|----------------|--|--|
| | | apply for NAS key set identifier value "111" | |
| 5GS mobile identity | The valid SUCI | Only SUCI is available. | |
| Last visited registered TAI | Not present | | |

9.1.5.1.12 Initial registration / Rejected / Roaming not allowed in this tracking area

9.1.5.1.12.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the SS sends a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value #13 (Roaming not allowed in this tracking area)

then { the UE deletes any 5G-GUTI, last visited registered TAI and ngKSI, deletes the list of equivalent PLMNs, stores the current TAI in the list of "5GS forbidden tracking areas for roaming" }

}

(2)

with { the initial registration request cannot be accepted by the network }

ensure that {

when { the SS sends a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value #13 (Roaming not allowed in this tracking area)}

then { The UE performs a PLMN selection }

}

(3)

with { the UE is in 5GMM-DEREGISTERED.LIMITED-SERVICE or 5GMM-DEREGISTERED.PLMN-SEARCH state and the TAI of the current cell belongs to the list of "forbidden tracking areas for roaming" }

ensure that {

when { the UE enters a cell belonging to a tracking area not in the list of "forbidden tracking areas for roaming" }

then { the UE attempts to registration }

}

(4)

with { the UE is in 5GMM-DEREGISTERED.LIMITED-SERVICE or 5GMM-DEREGISTERED.PLMN-SEARCH state and the list of "forbidden tracking areas for roaming" contains more than one TAI }

ensure that {

when { the UE selects a cell belonging to one of the TAIs in the list of "forbidden tracking areas for roaming" }

then { the UE does not attempt to registration }

}

(5)

with { the UE is switched off or the UICC containing the USIM is removed }

ensure that {

when { UE is powered on in the cell belonging to the TAI which was in the list of "forbidden tracking areas for roaming" before the UE was switched off or the USIM is inserted again on that cell }

then { UE performs registration on that cell }

}

9.1.5.1.12.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clauses 5.5.1.2.5, 5.1.3.2.1, 5.1.3.2.2, TS 23.122 clauses 3.1.

[TS 24.501, clause 5.5.1.2.5]

If the initial registration request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

If the initial registration request is rejected due to general NAS level mobility management congestion control, the network shall set the 5GMM cause value to #22 "congestion" and assign a back-off timer T3346.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

...

#13 (Roaming not allowed in this tracking area).

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete 5G-GUTI, last visited registered TAI, TAI list and ngKSI. Additionally, the UE shall delete the list of equivalent PLMNs and reset the registration attempt counter.

The UE shall store the current TAI in the list of "5GS forbidden tracking areas for roaming" and enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE or optionally 5GMM-DEREGISTERED.PLMN-SEARCH. The UE shall perform a PLMN selection according to 3GPP TS 23.122 [5].

...

[TS 24.501, clause 5.1.3.2.1.3.3]

The sub state 5GMM-DEREGISTERED.LIMITED-SERVICE is chosen in the UE, when it is known that a selected cell for 3GPP access or TA for non-3GPP access is unable to provide normal service (e.g. the selected cell over 3GPP access is in a forbidden PLMN or is in a forbidden tracking area or TA for non-3GPP access is forbidden).

[TS 24.501, clause 5.1.3.2.1.3.5]

The sub state 5GMM-DEREGISTERED.PLMN-SEARCH is chosen in the UE, if the UE is searching for PLMNs. This sub state is left either when a cell has been selected (the new sub state is NORMAL-SERVICE or LIMITED-SERVICE) or when it has been concluded that no cell is available at the moment (the new sub state is NO-CELL-AVAILABLE).

This sub state is not applicable to non-3GPP access.

[TS 24.501, clause 5.1.3.2.2]

In order to describe the detailed UE behaviour, the 5GS update (5U) status pertaining to a specific subscriber is defined.

If the UE is not SNPN enabled or the UE is not operating in SNPN access mode (see 3GPP TS 23.501 [8]), the 5GS update status is stored in a non-volatile memory in the USIM if the corresponding file is present in the USIM, else in the non-volatile memory in the ME, as described in annex C.

If the UE is operating in SNPN access mode, the 5GS update status for each SNPN whose SNPN identity is included in the "list of subscriber data" configured in the ME (see 3GPP TS 23.122 [5]) is stored in the non-volatile memory in the ME as described in annex C.

The 5GS update status value is changed only after the execution of a registration, network-initiated de-registration, 5GS based primary authentication and key agreement, service request or paging procedure.

5U1: UPDATED

The last registration attempt was successful.

5U2: NOT UPDATED

The last registration attempt failed procedurally, e.g. no response or reject message was received from the AMF.

5U3: ROAMING NOT ALLOWED

The last registration, service request, or registration for mobility or periodic registration update attempt was correctly performed, but the answer from the AMF was negative (because of roaming or subscription restrictions).

[TS 23.122, clause 3.1]

The tracking area is added to the list of "5GS forbidden tracking areas for roaming" which is stored in the MS. The MS shall then search for a suitable cell in the same PLMN but belonging to a tracking area which is not in the "5GS forbidden tracking areas for roaming" list.

9.1.5.1.12.3 Test description

9.1.5.1.12.3.1 Pre-test conditions

System Simulator:

- NGC cell C (MCC/MNC=MCC/MNC in USIM), NGC cell E (visited PLMN, mcc=002, mnc=101) and NGC cell I (visited PLMN, mcc=002, mnc=101, another TA) are configured according to Table 6.3.2.2-1 and Table 6.3.2.2-3 in TS 38.508-1 [4], except replacing NRf3 with NRf2.

UE:

- The UE is last authenticated and registered on NGC Cell E.

Preamble:

- The UE is in state Switched OFF (state 0N-B) according to TS 38.508-1 [4] Table 4.4A.2-0.

9.1.5.1.12.3.2 Test procedure sequence

Table 9.1.5.1.12.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-------|---|------------------|----------------------|-----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGCCell E as the "Serving cell".
- Other NGC cells as "Non-suitable cell". | - | - | - | - |
| 2 | The UE is switched on. | - | - | - | - |
| 3-14 | Steps 2-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 15 | The SS transmits a REGISTRATION REJECT message, 5GMM cause value = #13 " roaming not allowed in this tracking area " . | <-- | REGISTRATION REJECT | - | - |
| 16 | The SS releases the RRC connection. | - | - | - | - |
| 17 | Check: Does the UE transmit the REGISTRATION REQUEST message on NGC Cell E in the next 30 seconds? | --> | REGISTRATION REQUEST | 1 | F |
| 18 | The SS reconfigures:
- NGC cell I as the "Serving cell".
- NGC cell E as a "Suitable Neighbour cell",
- NGC cell C as "Non-suitable cell". | - | - | - | - |
| 19 | Check: Does the UE transmit the REGISTRATION REQUEST message on NGC Cell I? | --> | REGISTRATION REQUEST | 1,3 | P |
| 20-26 | Steps 5 to 11 from procedure in TS 38.508-1 [4] Table 4.5.2.2-2 are performed. | - | - | - | - |
| 27 | The SS transmits a REGISTRATION REJECT message, 5GMM cause value = #13 " roaming not allowed in this tracking area " . | <-- | REGISTRATION REJECT | - | - |
| 28 | The SS releases the RRC connection. | - | - | - | - |
| 29 | Check: Does the UE transmit the REGISTRATION REQUEST message in the next 30 seconds on NGC cell I or NGC cell E? | --> | REGISTRATION REQUEST | 1,4 | F |
| 30 | Switch off UE in State Deregistered as described in TS38.508-1 [4] subclause 4.9.6.4. | - | - | - | - |
| 31 | The SS reconfigures:
- NGC cell E as the "Serving cell".
- Other NGC cells as "Non-suitable cell". | - | - | - | - |
| 32 | Switch on UE. | - | - | - | - |
| 33 | Check: Does the UE transmit the REGISTRATION REQUEST message on NGC Cell E? | --> | REGISTRATION REQUEST | 5 | P |
| 34- | Steps 5 to 13 from procedure in TS 38.508-1 | - | - | - | - |

| | | | | | |
|-------------|---|-----|----------------------|---|---|
| 42 | [4] Table 4.5.2.2-2 are performed. | | | | |
| 43 | The SS transmits a REGISTRATION REJECT message, 5GMM cause value = #13 "roaming not allowed in this tracking area". | <-- | REGISTRATION REJECT | - | - |
| 44 | The SS releases the RRC connection. | - | - | - | - |
| 45 | The SS reconfigures:
- NGC Cell E as the "Serving cell",
- NGC Cell C as a "Suitable neighbour cell".
- NGC Cell I as "Non-suitable cell". | - | - | - | - |
| 46 | Check: Does the UE transmit the REGISTRATION REQUEST message on NGC Cell C? | --> | REGISTRATION REQUEST | 2 | P |
| 47-62a
1 | Steps 5–20a1 of Table 4.5.2.2-2 in TS38.508-1 [4] are performed. | - | - | - | - |

9.1.5.1.12.3.3 Specific message contents

Table 9.1.5.1.12.3.3-1: REGISTRATION REJECT (step 15, step 27, step 43, Table 9.1.5.1.12.3.2-1)

| Derivation path: 38.508-1 [4] table 4.7.1-9 | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '00001101'B | #13 "roaming not allowed in this tracking area" | |

Table 9.1.5.1.12.3.3-2: REGISTRATION REQUEST (step 19, step 33, step 46, Table 9.1.5.1.12.3.2-1)

| Derivation path: 38.508-1 [4] table 4.7.1-6 | | | |
|---|-------------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| ngKSI | | | |
| NAS key set identifier | '111'B | no key is available | |
| TSC | Any allowed value | TSC does not apply for NAS key set identifier value "111" | |
| 5GS mobile identity | The valid SUCI | Only SUCI is available. | |
| Last visited registered TAI | Not present | | |

9.1.5.1.13 Initial registration / Rejected / No suitable cells in tracking area

9.1.5.1.13.1 Test Purpose (TP)

(1)

with { the UE has sent initial REGISTRAION REQUEST message }

ensure that {

when { the UE receives a REGISTRATION REJECT with cause #15 (No suitable cells in tracking area)}

then { the UE sets the 5GS update status to 5U3 ROAMING NOT ALLOWED and delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI }

}

(2)

with { the UE is in 5GMM-DEREGISTERED.LIMITED-SERVICE state and the current TAI in the list of "forbidden tracking areas for roaming"}

ensure that {

when { the UE re-selects a cell that belongs to the TAI where UE was rejected }

then { the UE does not attempt to perform registration }

}

(3)

with { the UE has sent initial REGISTRAION REQUEST message }

ensure that {

when { the UE receives a REGISTRATION REJECT with cause #15 (No suitable cells in tracking area)}

then { the UE searches for a suitable cell in another tracking area }

}

9.1.5.1.13.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.1.2.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.2.5]

If the initial registration request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

If the initial registration request is rejected due to general NAS level mobility management congestion control, the network shall set the 5GMM cause value to #22 "congestion" and assign a back-off timer T3346.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

#3 (Illegal UE); or

#6 (Illegal ME).

....

#15 (No suitable cells in tracking area);

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, TAI list and ngKSI. Additionally, the UE shall reset the registration attempt counter.

The UE shall store the current TAI in the list of "5GS forbidden tracking areas for roaming" and enter the state 5GMM-DEREGISTERED.LIMITED-SERVICE. The UE shall search for a suitable cell in another tracking area according to 3GPP TS 38.304 [15].

9.1.5.1.13.3 Test description

9.1.5.1.13.3.1 Pre-test conditions

System Simulator:

- 3 cells, NGC Cell A and NGC Cell B belonging to TAI-1, NGC Cell C is in TAI-2. All Cells in the same PLMN.

UE:

- None.

Preamble:

- The UE is switched OFF.
- NGC Cell A is set to "Serving Cell".
- NGC Cell B is set to "Suitable neighbour cell".
- NGC Cell C is set to "Non-Suitable cell".

9.1.5.1.13.3.2 Test procedure sequence

Table 9.1.5.1.13.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|----------------------|-----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on | - | - | - | - |
| 2-9 | Steps 2-9 of Table 4.5.2.2-2 in TS38.508-1 [4] are performed on NGC Cell A. | - | - | - | - |
| 10 | The SS transmits a REGISTRATION REJECT with cause #15 (No suitable cells in tracking area). | <-- | REGISTRATION REJECT | - | - |
| 11 | The SS releases the RRC connection | - | - | - | - |
| 12 | Check: Does the UE transmit a REGISTRATION REQUEST message on NGC Cell A or NGC Cell B in the next 30 seconds? | --> | REGISTRATION REQUEST | 1,2 | F |
| 13 | The SS configures
- NGC Cell C as "Serving Cell" | - | - | - | - |

| | | | | | |
|-------|---|-----|----------------------|---|---|
| 14 | Check: Does the UE transmit a REGISTRATION REQUEST message on NGC Cell C? | --> | REGISTRATION REQUEST | 3 | P |
| 15-29 | Steps 5-19a1 of Table 4.5.2.2-2 in TS38.508-1 [4] are performed. | - | - | - | - |

9.1.5.1.13.3.3 Specific message contents

Table 9.1.5.1.13.3.3-1: REGISTRATION REJECT (step 10 Table 9.1.5.1.13.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9 | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '00001111'B | Cause #15(No suitable cells in tracking area) | |

Table 9.1.5.1.13.3.3-2: REGISTRATION REQUEST (step 14 Table 9.1.5.1.13.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6 | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| ngKSI | | | |
| NAS key set identifier | '111'B | "No key is available" | |
| 5GS mobile identity | | | |
| Type of identity | '001'B | 5GS mobile identity is SUCI, 5G-GUTI has been deleted after receiving REGISTRATION REJECT at step 10. | |
| Last visited registered TAI | Not present | TAI has been deleted after receiving REGISTRATION REJECT at step 10. | |

Table 9.1.5.1.13.3.3-3: Void

9.1.5.1.14 Initial registration / Rejected / Congestion / Abnormal cases / T3346

9.1.5.1.14.1 Test Purpose (TP)

(1)

with { The UE has sent initial REGISTRAION REQUEST message }**ensure that** {**when** { UE receives a REGISTRATION REJECT with cause #22 (Congestion) with T3346 included and the UE is NOT configured for High Priority Access in the selected PLMN }**then** { UE does not start the Initial registration until T3346 expires }

}

(2)

with { The UE has received initial REGISTRATION REJECT with T3346 included }**ensure that** {**when** { upon expiry of T3346 }**then** { UE starts the Initial registration procedure }

}

(3)

with { The UE has received initial REGISTRATION REJECT with T3346 included }**ensure that** {**when** { the timer T3346 is running and the UE needs to perform initial registration for emergency services }**then** { UE starts the Initial registration procedure }

}

(4)

with { The UE has received initial REGISTRATION REJECT with T3346 included }**ensure that** {**when** { the timer T3346 is running and the UE detects a cell better than serving cell on a PLMN other than serving cells PLMN (S criterion for detected cell > S criterion for serving cell)**then** { UE starts the Initial registration procedure on the detected cell }

}

(5)

with { The UE has received initial REGISTRATION REJECT with T3346 included }

ensure that {

when { the timer T3346 is running and the UE detects a cell better than serving cell on same PLMN as serving cell (S criterion for detected cell > S criterion for serving cell)}

then { UE starts the Initial registration procedure on the detected cell after T3346 expiry }

}

9.1.5.1.14.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.2.2.3.3, 5.5.1.2.5 and 5.5.1.2.7. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.2.5]

If the initial registration request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

If the initial registration request is rejected due to general NAS level mobility management congestion control, the network shall set the 5GMM cause value to #22 "congestion" and assign a back-off timer T3346.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

#3 (Illegal UE);

#6 (Illegal ME); or

....

#22 (Congestion).

If the T3346 value IE is present in the REGISTRATION REJECT message and the value indicates that this timer is neither zero nor deactivated, the UE shall proceed as described below; otherwise it shall be considered as an abnormal case and the behaviour of the UE for this case is specified in subclause 5.5.1.2.7.

The UE shall abort the initial registration procedure, set the 5GS update status to 5U2 NOT UPDATED and enter state 5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION.

The UE shall stop timer T3346 if it is running.

If the REGISTRATION REJECT message is integrity protected, the UE shall start timer T3346 with the value provided in the T3346 value IE.

If the REGISTRATION REJECT message is not integrity protected, the UE shall start timer T3346 with a random value from the default range specified in 3GPP TS 24.008 [12].

The UE stays in the current serving cell and applies the normal cell reselection process. The initial registration procedure is started if still needed when timer T3346 expires or is stopped.

#27 (N1 mode not allowed).

The UE capable of S1 mode shall disable the N1 mode capability for both 3GPP access and non-3GPP access (see subclause 4.9).

Other values are considered as abnormal cases. The behaviour of the UE in those cases is specified in subclause 5.5.1.2.7.

[TS 24.501, clause 5.5.1.2.7]

The following abnormal cases can be identified:

a) Timer T3346 is running.

The UE shall not start the registration procedure for initial registration unless:

- 1) the UE is a UE configured for high priority access in selected PLMN; or
- 2) the UE needs to perform the registration procedure for initial registration for emergency services.

The UE stays in the current serving cell and applies the normal cell reselection process.

NOTE 1: It is considered an abnormal case if the UE needs to initiate a registration procedure for initial registration while timer T3346 is running independent on whether timer T3346 was started due to an abnormal case or a non-successful case.

[TS 24.501, clause 5.2.2.3.3]

The UE in 3GPP access:

- a) ...
- b) ...
- c) shall initiate an initial registration procedure when entering a new PLMN, if timer T3346 is running and the new PLMN is not equivalent to the PLMN where the UE started timer T3346, the PLMN identity of the new cell is not in the forbidden PLMN lists and the tracking area is not in one of the lists of 5GS forbidden tracking areas;

9.1.5.1.14.3 Test description

9.1.5.1.14.3.1 Pre-test conditions

System Simulator:

- NGC Cell A , NGC Cell B and NGC Cell E are configured according to Table 6.3.2.2-1 and Table 6.3.2.2-3 in TS 38.508-1[4].
- System information combination NR-2 as defined in TS 38.508[4] clause 4.4.3.1.2 is used.

UE:

None.

Preamble:

- The UE is in state Switched OFF [State 0-A as per TS 38.508-1 [4] Table 4.4A.2-0].

9.1.5.1.14.3.2 Test procedure sequence

Table 9.1.5.1.14.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-------|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 0 | The SS configures:
- NGC Cell A as the "Non-Suitable "off" cell".
- NGC Cell B as the "Non-Suitable "off" cell".
- NGC Cell E as the "Serving cell". | - | | - | |
| 0A | The UE is Switched/Powerd ON | - | - | - | - |
| 1-12 | Steps 2-13 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | | - | - |
| 13 | SS transmits a REGISTRATION REJECT message with cause #22 (Congestion) and T3346 set to 3 minutes.
(Note 1) | <-- | REGISTRATION REJECT | - | - |
| 14 | The SS releases the RRC connection | - | | - | - |
| 15 | Check : Does the UE transmit a RRCSetupRequest on NGC Cell E
(Note 1) | --> | NR RRC: <i>RRCSetupRequest</i> | 1 | F |
| 16 | Check : Does the UE transmit a RRCSetupRequest on NGC Cell E | --> | NR RRC: <i>RRCSetupRequest</i> | 2 | P |
| 17-25 | Steps 3-11 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | | | | |
| 26 | SS transmits a REGISTRATION REJECT message with cause #22 (Congestion) and T3346 set to 3 minutes.
(Note 1) | <-- | REGISTRATION REJECT | - | - |
| 27 | The SS releases the RRC connection | - | | | |
| 28 | The SS configures:
- NGC Cell A as the "Non-suitable cell".
- NGC Cell B as the "Serving cell".
- NGC Cell E as the "Non-suitable cell". | | | | |
| 29 | Check : Does the UE transmit a RRCSetupRequest on NGC Cell B within 3 minutes of Step 18
(Note 1) | --> | NR RRC: <i>RRCSetupRequest</i> | 4 | P |
| 30-38 | Steps 3-11 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | | | | |
| 39 | SS transmits a REGISTRATION REJECT message with cause #22 (Congestion) and T3346 set to 3 minutes.
(Note 1) | <-- | REGISTRATION REJECT | - | - |
| 40 | The SS releases the RRC connection | - | | - | - |
| 41 | The SS configures:
- NGC Cell A as the "Serving cell".
- NGC Cell B as the "Non-suitable cell".
- NGC Cell E as the "Non-suitable cell". | | | | |
| 42 | Check : Does the UE transmit a RRCSetupRequest on NGC Cell A within 3 minutes of Step 18
(Note 1) | --> | NR RRC: <i>RRCSetupRequest</i> | 5 | F |
| 43 | Check : Does the UE transmit a RRCSetupRequest on NGC Cell A | --> | NR RRC: <i>RRCSetupRequest</i> | 5 | P |
| 44-52 | Steps 3-11 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | | | | |
| 53 | SS transmits a REGISTRATION REJECT message with cause #22 (Congestion) and T3346 set to 3 minutes.
(Note 1) | <-- | REGISTRATION REJECT | - | - |
| 54 | The SS releases the RRC connection | - | | - | - |
| 55 | The UE is made to establish an emergence PDU session. This can be done by an AT/MMI command | | | | |
| 56 | Check : Does the UE transmit a RRCSetupRequest on NGC Cell B within 3 minutes of Step 39 indicating "emergency registration"
(Note 1) | --> | NR RRC: <i>RRCSetupRequest</i> | 3 | P |
| 57 | Steps 3-4 of Table 4.5.2.2-2 in TS38.508-1 [4] | | | | |

| | | | | | |
|---|---|-----|----------------------|---|---|
| -58 | are performed | | | | |
| 59 | Check : Does the UE transmit a REGISTRATION REQUEST message with IE 5GS registration type set to "emergency registration" | --> | REGISTRATION REQUEST | 3 | P |
| 60-74b
1 | Steps 5–19b1 of Table 4.5.2.2-2 in TS38.508-1 [4] are performed | | | - | - |
| Note 1: This is checked for 3 minutes less tolerance. | | | | | |

9.1.5.1.14.3.3 Specific message contents

Table 9.1.5.1.14.3.3-1: REGISTRATION REJECT (steps 13, 26, 39, 53 Table 9.1.5.1.14.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9 | | | |
|---|--------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '00010110'B | Cause #22 (Congestion) | |
| T3346 Value | '00100011'B | 3 minutes | |

Table 9.1.5.1.14.3.3-2: REGISTRATION REQUEST (step 58 Table 9.1.5.1.14.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6 | | | |
|---|--------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '100'B | Emergency registration | EMERGENCY |

9.1.5.2 Mobility and periodic registration update

9.1.5.2.1 Mobility registration update / TAI list handling

9.1.5.2.1.1 Test Purpose (TP)

(1)

with { UE in state 5GMM-REGISTERED, and 5GMM-IDLE mode over 3GPP access }

ensure that {

when { UE detects entering a tracking area which is not in the list of forbidden TAs and is not in the list of tracking areas that the UE previously registered in the AMF }

then { UE initiates **and** successfully completes the registration procedure for mobility registration update }

}

(2)

with { UE in state 5GMM-REGISTERED, and 5GMM-IDLE mode over 3GPP access }

ensure that {

when { UE detects entering a tracking area which is not in the list of forbidden TAs and is in the list of tracking areas that the UE previously registered in the AMF }

then { UE does not initiate the registration procedure for mobility registration update }
}

(3)

with { UE in state 5GMM-REGISTERED, and 5GMM-IDLE mode over 3GPP access }

ensure that {

when { UE receives a new TAI list during a mobility registration update procedure }

then { UE shall delete its old TAI list and store the received TAI list }
}

9.1.5.2.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.1.3.2, 5.5.1.3.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.3.2]

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic registration update by sending a REGISTRATION REQUEST message to the AMF,

a) when the UE detects entering a tracking area that is not in the list of tracking areas that the UE previously registered in the AMF;

...

If case b) is the only reason for initiating the registration procedure for mobility and periodic registration update, the UE shall indicate "periodic registration updating" in the 5GS registration type IE; otherwise the UE shall indicate "mobility registration updating".

...

After sending the REGISTRATION REQUEST message to the AMF the UE shall start timer T3510. If timer T3502 is currently running, the UE shall stop timer T3502. If timer T3511 is currently running, the UE shall stop timer T3511.

If the last visited registered TAI is available, the UE shall include the last visited registered TAI in the REGISTRATION REQUEST message.

The UE shall handle the 5GS mobility identity IE in the REGISTRATION REQUEST message as follows:

...

b) for all other cases, if the UE holds a valid 5G-GUTI, the UE shall indicate the 5G-GUTI in the 5GS mobile identity IE.

...

When the registration procedure for mobility and periodic registration update is initiated in 5GMM-IDLE mode, the UE may include a PDU session status IE in the REGISTRATION REQUEST message, indicating which PDU sessions associated with the access type the REGISTRATION REQUEST message is sent over are active in the UE.

...

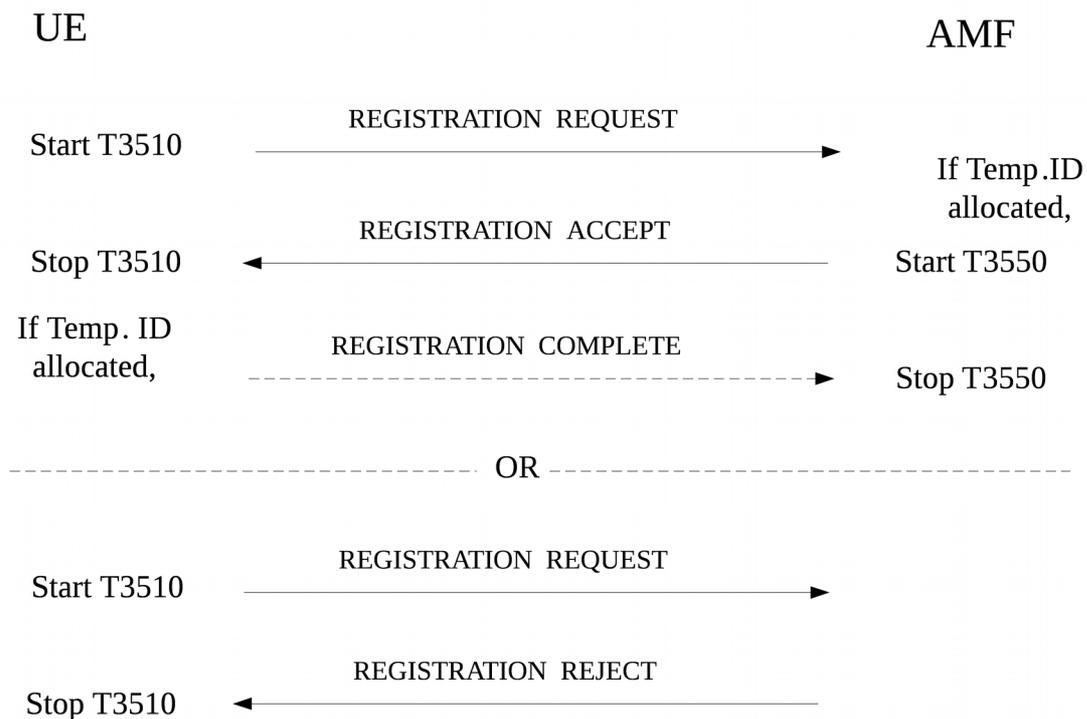


Figure 5.5.1.3.2.1: Registration procedure for mobility and periodic registration update

[TS 24.501, clause 5.5.1.3.4]

The AMF shall assign and include a TAI list as a registration area the UE is registered to in the REGISTRATION ACCEPT message. The UE, upon receiving a REGISTRATION ACCEPT message, shall delete its old TAI list and store the received TAI list. If the REGISTRATION REQUEST message was received over non-3GPP access, the AMF shall include only the N3GPP TAI in the TAI list.

...

Upon receipt of the REGISTRATION ACCEPT message, the UE shall reset the registration attempt counter, enter state 5GMM-REGISTERED and set the 5GS update status to 5U1 UPDATED.

...

If the REGISTRATION ACCEPT message contains a 5G-GUTI, the UE shall return a REGISTRATION COMPLETE message to the AMF to acknowledge the received 5G-GUTI, stop timer T3519 if running, and delete any stored SUCI.

9.1.5.2.1.3 Test description

9.1.5.2.1.3.1 Pre-test conditions

System Simulator:

- 3 cells, NGC Cell A, and NGC Cell B and NGC Cell D belonging to the same PLMN and different TA in accordance with TS 38.508-1 [4] Table 6.3.2.2-1

- Default system information combination as defined in TS 38.508-1 [4], sub-clause 4.4.3.1.2 is used in all cells when active.

UE:

None.

Preamble:

- Cell configuration " in accordance with TS 38.508-1 [4] Table 6.3.2.2-1:
- NGC Cell A "Serving cell"
- NGC Cell B "Non-Suitable cell"
- NGC Cell D "Non-Suitable cell"
- The UE is in test state [1N-A as defined in 38.508-1 \[4\], subclause 4.4A](#) on NGC Cell A.
- During the initial registration:
- In the list of tracking areas provided by the AMF (IE 'TAI list') contains only the TAI of NGC Cell A.

9.1.5.2.1.3.2 Test procedure sequence

Table 9.1.5.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC Cell B as "Serving cell"
- NGC Cell A as "Non-Suitable cell". | - | - | - | - |
| 2 | Check: Does the UE perform on NGC Cell B the Registration procedure for mobility registration update by executing the Test procedure to check that UE is camped on a new cell belonging to a new TA as specified in TS 38.508-1 [4] subclause 4.9.5?

NOTE: During the procedure the SS assigns a TAI list containing the TAI of NGC Cell B and NGC Cell D. | - | - | 1 | - |
| 3 | The SS configures:
- NGC Cell D as "Serving cell"
- NGC Cell B as "Non-Suitable cell". | - | - | - | - |
| 4 | Check: Does the UE send in the next 30 sec a request for RRC connection establishment. | --> | NR RRC: <i>RRCSetupRequest</i> | 2 | F |
| 5 | Check: Does the result of generic test procedure in TS 38.508-1 [4] subclause 4.9.4 indicate that the UE is in 5GC RRC_IDLE state on the NGC Cell D? | - | - | 2 | - |
| 6 | The SS configures:
- NGC Cell A as "Serving cell"
- NGC Cell D as "Non-Suitable cell". | - | - | - | - |
| 7 | Check: Does the UE perform on NGC Cell A the Registration procedure for mobility registration update as specified in TS 38.508-1 | - | - | 3 | - |

| | | | | |
|---|--|--|--|--|
| [4] subclause 4.9.5, 'connected without release'? | | | | |
|---|--|--|--|--|

9.1.5.2.1.3.3 Specific message contents

Table 9.1.5.2.1.3.3-1: REGISTRATION REQUEST (step 2, Table 9.1.5.2.1.3.2-1; step 3, TS 38.508-1 [4] Table 4.9.5.2.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6. | | | |
|---|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | '00xxx010' | mobility registration updating

x - not checked | |
| 5GS mobile identity | Active 5G-GUTI assigned in the preamble | | |
| 5GMM capability | Any value | | |
| Last visited registered TAI | The TAI of the NGC Cell A, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| S1 UE network capability | If included then Any value | Shall be included if S1 mode indicated as supported in the IE '5GMM capability' | |

Table 9.1.5.2.1.3.3-2: REGISTRATION ACCEPT (step 2, Table 9.1.5.2.1.3.2-1; step 4, TS 38.508-1 [4] Table 4.9.5.2.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7. | | | |
|---|---|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result | | | |
| 5GS registration result value | '001' | 3GPP access | |
| SMS allowed | '0' | SMS over NAS not allowed | |
| 5G-GUTI | A 5G-GUTI different to the one provided by the UE in the REGISTRATION REQUEST | | |

| | | | |
|--------------------|---|---|--|
| TAI list | | | |
| Type of list | "00" | list of TACs belonging to one PLMN, with non-consecutive TAC values | |
| MCC | The MCC of the PLMN to which the NGC Cell A, NGC Cell B and NGC Cell D belong to, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| MNC | The MNC of the PLMN to which the NGC Cell A, NGC Cell B and NGC Cell D belong to, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| TAC 1 | The TAI of the NGC Cell B, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| TAC 2 | The TAI of the NGC Cell D, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| PDU session status | If PDU session status was included in the REGISTRATION REQUEST, the indicated as active PDN sessions shall be confirmed as active | | |

Table 9.1.5.2.1.3.3-3: REGISTRATION REQUEST (step 7, Table 9.1.5.2.1.3.2-1; step 3, TS 38.508-1 [4] Table 4.9.5.2.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6. | | | |
|---|---|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | '00xxx010' | mobility registration updating

x - not checked | |
| 5GS mobile identity | Active 5G-GUTI assigned in Table 9.1.5.2.1.3.3-2: REGISTRATION ACCEPT | | |
| 5GMM capability | Any value | | |

| | | | |
|-----------------------------|--|---|--|
| Last visited registered TAI | The TAI of the NGC Cell D, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| S1 UE network capability | If included then Any value | Shall be included if S1 mode indicated as supported in the IE '5GMM capability' | |

Table 9.1.5.2.1.3.3-4: REGISTRATION ACCEPT (step 7, Table 9.1.5.2.1.3.2-1; step 4, TS 38.508-1 [4] Table 4.9.5.2.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7. | | | |
|---|---|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result | | | |
| 5GS registration result value | '001' | 3GPP access | |
| SMS allowed | '0' | SMS over NAS not allowed | |
| 5G-GUTI | Active 5G-GUTI assigned in the preamble | | |
| TAI list | | | |
| Type of list | "00" | list of TACs belonging to one PLMN, with non-consecutive TAC values | |
| MCC | The MCC of the PLMN to which the NGC Cell A, NGC Cell B and NGC Cell D belong to, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| MNC | The MNC of the PLMN to which the NGC Cell A, NGC Cell B and NGC Cell D belong to, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| TAC 1 | The TAI of the NGC Cell A, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| PDU session status | If PDU session status was included in the REGISTRATION REQUEST, the indicated as active PDU sessions shall be confirmed as active | | |

9.1.5.2.2 Periodic registration update / Accepted

9.1.5.2.2.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state and 5GMM-IDLE mode over 3GPP access }

ensure that {

when { the periodic registration updating timer T3512 expires }

then { the UE initiates the registration procedure for mobility and periodic registration update and indicates "periodic registration updating" in the 5GS registration type IE }

}

(2)

with { the UE in 5GMM-REGISTERED-INITIATED state }

ensure that {

when { the UE receives an REGISTRATION ACCEPT message included a new T3512 value IE }

then { the UE uses the new value in T3512 value IE as periodic registration update timer (T3512) }

}

9.1.5.2.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.1.3.1, 5.5.1.3.2 and 5.5.1.3.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.3.1]

This procedure is used by a UE for both mobility and periodic registration update of 5GS services. This procedure, when used for periodic registration update of 5GS services, is performed only in 3GPP access.

This procedure used for periodic registration update of 5GS services is controlled in the UE by timer T3512. When timer T3512 expires, the registration procedure for mobility and periodic registration area updating is started. Start and reset of timer T3512 is described in subclause 10.2.

[TS 24.501, clause 5.5.1.3.2]

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic registration update by sending a REGISTRATION REQUEST message to the AMF,

a) when the UE detects entering a tracking area that is not in the list of tracking areas that the UE previously registered in the AMF;

b) when the periodic registration updating timer T3512 expires;

...

If item b) is the only reason for initiating the registration procedure for mobility and periodic registration update, the UE shall indicate "periodic registration updating" in the 5GS registration type IE; otherwise the UE shall indicate "mobility registration updating".

...

[TS 24.501, clause 5.5.1.3.4]

...

If the REGISTRATION ACCEPT message included a T3512 value IE, the UE shall use the value in T3512 value IE as periodic registration update timer (T3512). If the T3512 value IE is not included, the UE shall use the value currently stored, e.g. from a prior REGISTRATION ACCEPT message.

...

9.1.5.2.2.3 Test description

9.1.5.2.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state 0N-B on NGC Cell A according to TS 38.508-1[4].

9.1.5.2.2.3.2 Test procedure sequence

Table 9.1.5.2.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-------|---|------------------|----------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-14 | Steps 1-13 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-2 are performed. | - | - | - | - |
| 15 | The SS transmits a REGISTRATION ACCEPT message. | <-- | REGISTRATION ACCEPT | - | - |
| 16-21 | Steps 15-20 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-2 are performed. | - | - | - | - |
| 22 | The SS waits 3 minutes. (Expire of T3512) | - | - | - | - |
| 23 | Check: Does the UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE indicating "periodic registration updating"? | --> | REGISTRATION REQUEST | 1 | P |
| 24 | The SS transmits a REGISTRATION ACCEPT message. | <-- | REGISTRATION ACCEPT | 2 | - |
| 25 | The SS releases the RRC connection. | - | - | - | - |
| 26 | The SS waits 1 minute. (Expire of T3512) | - | - | - | - |

| | | | | | |
|----|---|-----|----------------------|---|---|
| 27 | Check: Does the UE transmit a REGISTRATION REQUEST message? | --> | REGISTRATION REQUEST | 2 | P |
| 28 | The SS transmits a REGISTRATION ACCEPT message. | <-- | REGISTRATION ACCEPT | - | - |

9.1.5.2.2.3.3 Specific message contents

Table 9.1.5.2.2.3.3-1: REGISTRATION ACCEPT (Step 3, Table 9.1.5.2.2.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-7 | | | |
|--|--------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| T3512 value | | | |
| Unit | '101'B | value is incremented in multiples of 1 minute | |
| Timer value | '0 0011'B | 3 minutes | |

Table 9.1.5.2.2.3.3-2: REGISTRATION REQUEST (Step 6 & 11, Table 9.1.5.2.2.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-6 | | | |
|--|--------------|--------------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '011'B | periodic registration updating | |

Table 9.1.5.2.2.3.3-3: REGISTRATION ACCEPT (Step 7, Table 9.1.5.2.2.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-7 | | | |
|--|--------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| T3512 value | | | |
| Unit | '101'B | value is incremented in multiples of 1 minute | |
| Timer value | '0 0001'B | 1 minute | |

9.1.5.2.3

9.1.5.2.4 Mobility registration update / The lower layer requests NAS signalling connection recovery

9.1.5.2.4.1 Test Purpose (TP)

(1)

with { UE in state 5GMM-REGISTERED, and 5GMM-CONNECTED mode over 3GPP access and does not have signalling or user uplink data pending }

ensure that {

when { UE receives an indication of "RRC Connection failure" from the lower layers }

then { UE initiates **and** successfully completes the registration procedure for mobility registration update }

}

9.1.5.2.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.1.3.2, 5.5.1.3.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.3.2]

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic registration update by sending a REGISTRATION REQUEST message to the AMF,

...

- f) when the UE receives an indication of "RRC Connection failure" from the lower layers and does not have signalling or user uplink data pending (i.e. when the lower layer requests NAS signalling connection recovery);

...

If case b) is the only reason for initiating the registration procedure for mobility and periodic registration update, the UE shall indicate "periodic registration updating" in the 5GS registration type IE; otherwise the UE shall indicate "mobility registration updating".

...

After sending the REGISTRATION REQUEST message to the AMF the UE shall start timer T3510. If timer T3502 is currently running, the UE shall stop timer T3502. If timer T3511 is currently running, the UE shall stop timer T3511.

If the last visited registered TAI is available, the UE shall include the last visited registered TAI in the REGISTRATION REQUEST message.

The UE shall handle the 5GS mobility identity IE in the REGISTRATION REQUEST message as follows:

...

- b) for all other cases, if the UE holds a valid 5G-GUTI, the UE shall indicate the 5G-GUTI in the 5GS mobile identity IE.

...

When the registration procedure for mobility and periodic registration update is initiated in 5GMM-IDLE mode, the UE may include a PDU session status IE in the REGISTRATION REQUEST message, indicating which PDU sessions associated with the access type the REGISTRATION REQUEST message is sent over are active in the UE.

...

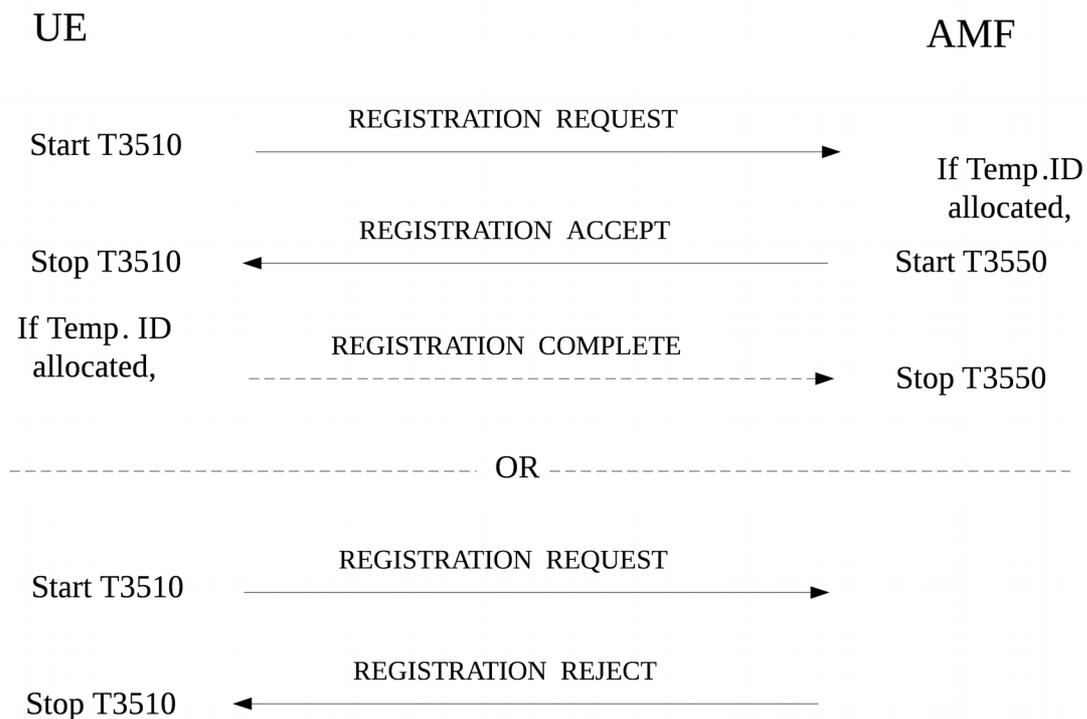


Figure 5.5.1.3.2.1: Registration procedure for mobility and periodic registration update

[TS 24.501, clause 5.5.1.3.4]

Upon receipt of the REGISTRATION ACCEPT message, the UE shall reset the registration attempt counter, enter state 5GMM-REGISTERED and set the 5GS update status to 5U1 UPDATED.

...

If the REGISTRATION ACCEPT message contains a 5G-GUTI, the UE shall return a REGISTRATION COMPLETE message to the AMF to acknowledge the received 5G-GUTI, stop timer T3519 if running, and delete any stored SUCI.

9.1.5.2.4.3 Test description

9.1.5.2.4.3.1 Pre-test conditions

System Simulator:

- NGC Cell A, default system information in accordance with TS 38.508-1 [4] sub-clause 4.4.3.1.2.

UE:

- None.

Preamble:

- Cell configuration in accordance with TS 38.508-1 [4] Table 6.3.2.2-1:
- NGC Cell A "Serving cell"
- The UE is in test state 3N-A as defined in TS 38.508-1 [4], subclause 4.4A.2 on NGC Cell A.

9.1.5.2.4.3.2 Test procedure sequence

Table 9.1.5.2.4.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC Cell A as "Non-suitable "off" cell" in order to simulate radio link failure.

(NOTE 1) | - | - | - | - |
| 2 | Wait for T=T310+T311+1.2 sec.

(NOTE 1) | - | - | - | - |
| 3 | The SS configures:
- NGC Cell A as "Serving cell". | - | - | - | - |
| 4 | Check: Does the UE perform on NGC Cell A the Registration procedure for mobility registration update by executing the Test procedure to check that UE is camped on a new cell belonging to a new TA as specified in TS 38.508-1 [4] subclause 4.9.5.2.2-1, 'connected without release'? | - | - | 1 | - |

NOTE 1: Steps 1-2 simulate the RRC connection failure needed in order for the UE "NAS layer" to receive an indication of "RRC Connection failure" from the lower layers. This is based on requirements specified in TS 38.331 [12], subclauses 5.3.10.1, 5.3.10.3, 5.3.11.
A 1s delay is added to allow for N310 consecutive "out-of-sync" indications and 0.2s is added for timer tolerance. Note that N310, T310, N311, T311 values are set in TS 38.508-1 [4], Table 4.6.3-150, *RLF-TimersAndConstants*.

9.1.5.2.4.3.3 Specific message contents

Table 9.1.5.2.4.3.3-1: REGISTRATION REQUEST (step 4, Table 9.1.5.2.4.3.2-1; step 3, TS 38.508-1 [4] Table 4.9.5.2.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6. | | | |
|--|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | '00xxx010' | mobility registration updating

x - not checked | |
| 5GS mobile identity | Active 5G-GUTI assigned in the preamble | | |
| 5GMM capability | Any value | | |
| Last visited registered TAI | The TAI of the NGC Cell A, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |

| | | | |
|--------------------------|----------------------------|---|--|
| S1 UE network capability | If included then Any value | Shall be included if S1 mode indicated as supported in the IE '5GMM capability' | |
|--------------------------|----------------------------|---|--|

Table 9.1.5.2.4.3.3-2: REGISTRATION ACCEPT (step 4, Table 9.1.5.2.4.3.2-1; step 4, TS 38.508-1 [4] Table 4.9.5.2.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-7. | | | |
|--|---|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result | | | |
| 5GS registration result value | '001' | 3GPP access | |
| SMS allowed | '0' | SMS over NAS not allowed | |
| 5G-GUTI | Active 5G-GUTI assigned in the preamble | | |
| TAI list | | | |
| Type of list | "00" | list of TACs belonging to one PLMN, with non-consecutive TAC values | |
| MCC | The MCC of the PLMN to which the NGC Cell A, NGC Cell B and NGC Cell D belong to, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| MNC | The MNC of the PLMN to which the NGC Cell A, NGC Cell B and NGC Cell D belong to, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| TAC 1 | The TAI of the NGC Cell A, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |
| PDU session status | If PDU session status was included in the REGISTRATION REQUEST, the indicated as active PDN sessions shall be confirmed as active | | |

9.1.5.2.6 Mobility registration update / Registered slice(s) change

9.1.5.2.6.1 Test Purpose (TP)

(1)

with { UE in state 5GMM-REGISTERED, and 5GMM-IDLE mode over 3GPP access }

ensure that {

when { UE needs to change the slice(s) currently registered to }

then { UE initiates **and** successfully completes the registration procedure for mobility registration update }

}

9.1.5.2.6.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], subclause 5.5.1.3.2. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.3.2]

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic registration update by sending a REGISTRATION REQUEST message to the AMF,

...

i) when the UE needs to change the slice(s) it is currently registered to;

...

For a REGISTRATION REQUEST message with a 5GS registration type IE indicating "mobility registration updating", UE shall include the requested NSSAI containing the S-NSSAI(s) corresponding to the slices to which the UE intends to register with and shall include the mapped S-NSSAI(s) for the requested NSSAI, if available, in the REGISTRATION REQUEST message. If the UE has allowed NSSAI or configured NSSAI for the current PLMN, the requested NSSAI shall be either:

a) the configured NSSAI for the current PLMN, or a subset thereof as described below, if the UE has no allowed NSSAI for the current PLMN;

b) the allowed NSSAI for the current PLMN, or a subset thereof as described below, if the UE has an allowed NSSAI for the current PLMN; or

c) the allowed NSSAI for the current PLMN, or a subset thereof as described below, plus one or more S-NSSAIs from the configured NSSAI for which no corresponding S-NSSAI is present in the allowed NSSAI and those are neither in the rejected NSSAI for the current PLMN nor in the rejected NSSAI for the current registration area.

If the UE has neither allowed NSSAI for the current PLMN nor configured NSSAI for the current PLMN and has a default configured NSSAI, the UE shall:

a) include the S-NSSAI(s) in the Requested NSSAI IE of the REGISTRATION REQUEST message using the default configured NSSAI; and

b) include the Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI" in the REGISTRATION REQUEST message.

If the UE has no allowed NSSAI for the current PLMN, no configured NSSAI for the current PLMN, and no default configured NSSAI, the UE shall not include a requested NSSAI in the REGISTRATION REQUEST message.

The subset of configured NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the configured NSSAI applicable to this PLMN, if the S-NSSAI is neither in the rejected NSSAIs for the current PLMN nor in the rejected NSSAI for the current registration area.

The subset of allowed NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the allowed NSSAI for this PLMN.

NOTE 3: How the UE selects the subset of configured NSSAI or allowed NSSAI to be provided in the requested NSSAI is implementation specific. The UE can take preferences indicated by the upper layers (e.g. policies, applications) into account.

9.1.5.2.6.3 Test description

9.1.5.2.6.3.1 Pre-test conditions

System Simulator:

- NGC Cell A configured according to Table 6.3.2.2-1 in 38.508-1 [4].

UE:

- UE is previously registered on NGC Cell A using default message contents according to TS 38.508-1 [4]

Preamble:

- The UE is in test state 1N-A as defined in 38.508-1 [4], subclause 4.4A on NGC Cell A.

9.1.5.2.6.3.2 Test procedure sequence

Table 9.1.5.2.6.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | Make the UE change the slice(s) the UE is currently registered to.

(NOTE 1) | - | - | - | - |
| 2 | Check: Does the UE perform on NGC Cell A the Registration procedure for mobility registration update as specified in TS 38.508-1 [4] subclause 4.9.5, ' <i>connected without release</i> '? | - | - | 1 | - |

NOTE 1: This can be done by MMI or AT command

- If the AT command +C5GNSSAI is to be used then in accordance with its definition (TS 27.007 [40], clause 10.1.62) it would need to be run 2 times: once to delete the stored in the UE default NSSAI, and, second time to allocate a new one
- In the Preamble SS has sent one allowed S-NSSAI which the UE has accepted as the S-NSSAI it is registered to (see 38.508-1 [4], Table 4.7.1-7). A S-NSSAI different to that one needs to be selected.

9.1.5.2.6.3.3 Specific message contents

None.

NOTE: The UE is expected to request a new S-NSSAI in the REGISTRATION REQUEST message sent as part of step 2. However, due to this S-NSSAI being implementation dependent, there is no verification of the content of the REGISTRATION REQUEST message foreseen.

9.1.5.2.7 Mobility and periodic registration update / Rejected / UE identity cannot be derived by the network

9.1.5.2.7.1 Test Purpose (TP)

(1)

with { UE in state 5GMM-REGISTERED on an NGC cell }

ensure that {

when { UE initiates a Mobility and periodic registration procedure on an NGC cell and receives a REGISTRATION REJECT message including 5GMM cause value #9 (UE identity cannot be derived by the network) }

then { UE deletes any 5G-GUTI, last visited registered TAI and ngKSI, enters the state 5GMM-DEREGISTERED 5U2 NOT UPDATED, **and**, subsequently automatically initiates the initial registration procedure }

}

9.1.5.2.7.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 5.5.1.3.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.3.5]

If the mobility and periodic registration update request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

...

#9 (UE identity cannot be derived by the network).

The UE shall set the 5GS update status to 5U2 NOT UPDATED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall enter the state 5GMM-DEREGISTERED.

If the rejected request was not for initiating an emergency PDU session, the UE shall subsequently, automatically initiate the initial registration procedure.

9.1.5.2.7.3 Test description

9.1.5.2.7.3.1 Pre test conditions

System Simulator:

- 1 cell

- NGC Cell A as defined in TS 38.508-1 [4] Table 6.3.2.2-1. Default system information combination as defined in TS 38.508-1 [4], sub-clause 4.4.3.1.2.

UE:

None.

Preamble:

- The UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.

9.1.5.2.7.2 Test procedure sequence

Table 9.1.5.2.7.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|----------------------|----|---------|
| | | U - S | Message | | |
| 1 | Wait for 25 seconds (expiry of T3512 periodic registration update timer, the value of 30 sec is provided during the initial registration in the Preamble). | - | - | - | - |
| 2 | The UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE indicating "periodic registration updating". | --> | REGISTRATION REQUEST | - | - |
| 3 | The SS transmits a REGISTRATION REJECT message including 5GMM cause value #9 (UE identity cannot be derived by the network). | <-- | REGISTRATION REJECT | - | - |
| 4 | SS releases the RRC connection. | - | - | - | - |
| 5 | Check: Does the UE perform initial registration on NGC Cell A as specified in TS 38.508-1 [4], Table 4.5.2.2-2? The UE does not provide 5G-GUTI, last visited registered TAI or ngKSI. | - | - | 1 | P |

9.1.5.2.7.3.3 Specific message contents

Table 9.1.5.2.7.3.3-1: REGISTRATION ACCEPT (Preamble; TS 38.508-1 [4] Table 4.5.2.2-2)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7. | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| T3512 value | | | |
| Unit | '100'B | value is incremented in multiples of 30 seconds | |
| Timer value | '0 0001'B | 30 seconds | |

Table 9.1.5.2.7.3.3-2: REGISTRATION REQUEST (step 2, Table 9.1.5.2.7.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6. | | | |
|--|--------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | '00xxx011' | periodic registration | |

| | | | |
|-----------------------------|--|-----------------|--|
| | | updating | |
| | | x - not checked | |
| ngKSI | Active ngKSI assigned in the Preamble | | |
| 5GS mobile identity | Active 5G-GUTI assigned in the Preamble | | |
| Last visited registered TAI | The TAI of the NGC Cell A, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |

Table 9.1.5.2.7.3.3-3: REGISTRATION REJECT (step 3, Table 9.1.5.2.7.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9. | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0000 1001'B | #9 - UE identity cannot be derived by the network | |

Table 9.1.5.2.7.3.3-4: REGISTRATION REQUEST (step 5, Table 9.1.5.2.7.3.2-1; step 4, TS 38.508-1 [4] Table 4.5.2.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6, condition NON_CLEARTEXT_IE | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | '00xxx001' | Initial registration | |
| | | x - not checked | |
| ngKSI | '111' | no key is available | |
| 5GS mobile identity | SUCI | | |
| Non-current native NAS key set identifier | Not present | | |
| Last visited registered TAI | Not present | | |
| Additional GUTI | Not present | | |
| NAS message container | Not included | | |

Table 9.1.5.2.7.3.3-5: SECURITY MODE COMPLETE (step 5, Table 9.1.5.2.7.3.2-1; step 9, TS 38.508-1 [4] Table 4.5.2.2-2)

| | | | |
|--|--|--|--|
| Derivation Path: TS 38.508-1 [4], Table 4.7.1-26, condition RINMR_INDICATED. | | | |
|--|--|--|--|

9.1.5.2.8 Mobility and periodic registration update / Rejected / Implicitly de-registered

9.1.5.2.8.1 Test Purpose (TP)

(1)

with { UE in state 5GMM-REGISTERED on an NGC cell }

ensure that {

when { UE initiates a Mobility and periodic registration procedure on an NGC cell and receives a REGISTRATION REJECT message including 5GMM cause value #10 (implicitly de-registered) }

then { UE deletes any partial native 5G security context, enters the state 5GMM-DEREGISTERED.NORMAL-SERVICE, **and**, initiates a new registration procedure for initial registration }

}

9.1.5.2.8.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 5.5.1.3.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.3.5]

If the mobility and periodic registration update request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

...

#10 (implicitly de-registered).

The UE shall enter the state 5GMM-DEREGISTERED.NORMAL-SERVICE. The UE shall delete any mapped 5G security context or partial native 5G security context.

If the registration rejected request was not for initiating an emergency PDU session, the UE shall perform a new registration procedure for initial registration.

9.1.5.2.8.3 Test description

9.1.5.2.8.3.1 Pre test conditions

System Simulator:

- 2 cells, NGC Cell A, and NGC Cell B belonging to the same PLMN and different TA in accordance with TS 38.508-1 [4] Table 6.3.2.2-1. Default system information combination as defined in TS 38.508-1 [4], sub-clause 4.4.3.1.2 is used in all cells when active.

UE:

None.

Preamble:

- Cell configuration in accordance with TS 38.508-1 [4] Table 6.2.2.1-3:
- NGC Cell A "Serving cell"

- NGC Cell B "Non-suitable "Off" cell"
- The UE is in test state 1N-A as defined in 38.508-1 [4], subclause 4.4A.2 on NGC Cell A.
- During the initial registration:
- In the list of tracking areas provided by the AMF (IE 'TAI list') contains only the TAI of NGC Cell A.

9.1.5.2.8.2 Test procedure sequence

Table 9.1.5.2.8.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|-------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC Cell B as "Serving cell"
- NGC Cell A as "Non-Suitable "Off" cell". | - | - | - | - |
| - | EXCEPTION: Unless otherwise stated the following messages are exchange on NGC Cell B. | - | - | - | - |
| 2 | The UE transmits an REGISTRATION REQUEST message indicating "mobility registration updating". | --> | 5GMM: REGISTRATION REQUEST | - | - |
| 3 | The SS transmits an AUTHENTICATION REQUEST message to establish a new security context. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 4 | The UE transmits an AUTHENTICATION RESPONSE message. | --> | 5GMM: AUTHENTICATION RESPONSE | - | - |
| 5 | The SS transmits a REGISTRATION REJECT message including 5GMM cause value #10 (implicitly de-registered) prior to imitating a SMC to take into account the created during the steps 3-4 partial native 5G security context. (NOTE 1) | <-- | REGISTRATION REJECT | - | - |
| 6 | SS releases the RRC connection. | - | - | - | - |
| 7-9 | Steps 1-3 from the generic procedure for UE initial Registration as specified in TS 38.508-1 [4], subclause 4.5.2, Table 4.5.2.2-2 (connectivity <i>NR</i>) take place. | - | - | - | - |
| 10 | Check: Does the UE send a REGISTRATION REQUEST message, 5GS registration type IE set to Initial registration? | --> | 5GMM: REGISTRATION REQUEST | 1 | P |
| 11 | The SS transmits a SECURITY MODE COMMAND message indicating the ngKSI of the partial native 5G security context assigned in the AUTHENTICATION REQUEST message sent in step 3. | <-- | 5GMM: SECURITY MODE COMMAND | - | - |
| 12 | The UE transmits a SECURITY MODE REJECT message. | --> | 5GMM: SECURITY MODE REJECT | 1 | P |
| 13- | Steps 5-19a1 from the generic procedure for | - | - | - | - |

| | | | | | |
|---|---|--|--|--|--|
| 27a
1 | UE initial Registration as specified in TS 38.508-1 [4], subclause 4.5.2, Table 4.5.2.2-2 (connectivity <i>NR</i>) take place. | | | | |
| NOTE 1: This 5GMM cause is sent to the UE either if the network has implicitly de-registered the UE, e.g. after the implicit de-registration timer has expired, or if the 5GMM context data related to the subscription does not exist in the AMF e.g. because of a AMF restart, or because of a registration request for mobility or registration update is routed to a new AMF (see TS 24.301 [22], subclause A.1). The latter is an example when the serving AMF will not initiate a security mode control procedure after the primary authentication and key agreement procedure. | | | | | |

9.1.5.2.8.3.3 Specific message contents

Table 9.1.5.2.8.3.3-1: REGISTRATION REQUEST (step 2, Table 9.1.5.2.8.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6. | | | |
|--|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | '00xxx011' | periodic registration updating

x - not checked | |
| ngKSI | Active ngKSI assigned in the Preamble | | |
| 5GS mobile identity | Active 5G-GUTI assigned in the Preamble | | |
| Last visited registered TAI | The TAI of the NGC Cell A, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |

Table 9.1.5.2.8.3.3-2: REGISTRATION REJECT (step 5, Table 9.1.5.2.8.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9. | | | |
|--|--------------|--------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0000 1010'B | #10 - implicitly de-registered | |

Table 9.1.5.2.8.3.3-3: REGISTRATION REQUEST (step 10, Table 9.1.5.2.8.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6. | | | |
|---|--------------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | '00xxx001' | Initial registration

x - not checked | |
| ngKSI | ngKSI assigned in the preamble | Native current security context is | |

| | | | |
|---|--|---|--|
| | | still present | |
| 5GS mobile identity | Active 5G-GUTI assigned in the preamble | | |
| Non-current native NAS key set identifier | Not present | partial native 5G security context has been deleted | |
| Last visited registered TAI | The TAI of the NGC Cell A, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |

Table 9.1.5.2.8.3.3-4: SECURITY MODE COMMAND (step 11, Table 9.1.5.2.8.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-25. | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| ngKSI | The ngKSI of the partial native 5G security context assigned in the AUTHENTICATION REQUEST message sent in step 4 | | |

Table 9.1.5.2.8.3.3-5: SECURITY MODE REJECT (step 12, Table 9.1.5.2.8.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-25. | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0001 1000' | #24 - Security mode rejected, unspecified | |

9.1.5.2.9 Mobility and periodic registration update / Abnormal / Change of cell into a new tracking area, collision with generic UE configuration update procedure

9.1.5.2.9.1 Test Purpose (TP)

(1)

with { UE initiates a Mobility and periodic registration procedure in 5GMM-REGISTERED state }

ensure that {

when { UE changes the cell into a new tracking area before the registration procedure for mobility and periodic registration update has been completed }

then { UE shall abort registration procedure for mobility and periodic registration update and re-initiate immediately }

}

(2)

with { UE initiates a Mobility and periodic registration procedure in 5GMM-REGISTERED state }

ensure that {

when { UE receives a CONFIGURATION UPDATE COMMAND message before the registration procedure for mobility and periodic registration update has been completed }

then { UE shall ignore the message and proceed with the mobility and periodic registration update procedure }

}

9.1.5.2.9.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.1.3.7 and 5.4.4.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.3.7]

The following abnormal cases can be identified:

...

f) Change of cell into a new tracking area.

If a cell change into a new tracking area occurs before the registration procedure for mobility and periodic registration update is completed, the registration procedure for mobility and periodic registration update shall be aborted and re-initiated immediately. The UE shall set the 5GS update status to 5U2 NOT UPDATED.

...

h) Registration procedure for mobility and periodic registration update and generic UE configuration update procedure collision.

If the UE receives a CONFIGURATION UPDATE COMMAND message before the registration procedure for mobility and periodic registration update has been completed, UE shall behave as specified in subclause 5.4.4.5.

[TS 24.501, clause 5.4.4.5]

The following abnormal cases can be identified:

...

d) Generic UE configuration update and registration procedure for mobility and periodic registration update collision

If the UE receives a CONFIGURATION UPDATE COMMAND message before the ongoing registration procedure for mobility and periodic registration update has been completed, and the Configuration update indication IE in the CONFIGURATION UPDATE COMMAND message indicates that the acknowledgement is requested, then the UE shall ignore the CONFIGURATION UPDATE COMMAND message and proceed with registration procedure for mobility and periodic update procedure. Otherwise the UE shall proceed with both the procedures.

9.1.5.2.9.3 Test description

9.1.5.2.9.3.1 Pre-test conditions

System Simulator:

- 2 NGC cells with system information combination NR-2 in accordance with TS 38.508-1[4] sub-clause 4.4.3.1.2.
- NGC cell A configured as "Serving cell" according to TS 38.508-1 [4] Table 6.2.2.1-3 for FR1 or Table 6.2.2.2-2 for FR2, HPLMN, TAI-1

- NGC cell B configured as "Non-Suitable cell" according to TS 38.508-1 [4] Table 6.2.2.1-3 for FR1 or Table 6.2.2.2-2 for FR2, HPLMN, TAI-2

UE:

None.

Preamble:

- The UE is in state 1N-A on NGC cell A according to TS 38.508-1 [4] Table 4.4A.2-1.

9.1.5.2.9.3.2 Test procedure sequence

Table 9.1.5.2.9.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-------|--|------------------|-------------------------------|----|---------|
| | | U - S | Message | | |
| - | The following messages are to be observed on NGC cell B unless explicitly stated otherwise. | - | - | - | - |
| 1 | Change NGC cell A to "Non-Suitable "Off" cell".

Change NGC cell B to "Serving cell". | - | - | - | - |
| 2-4 | Steps 1-3 in TS 38.508-1 [4] Table 4.9.5.2.2-1 are performed. | - | - | - | - |
| 5 | The SS transmits a CONFIGURATION UPDATE COMMAND message with the Configuration update indication IE indicating that the acknowledgement is requested. | <-- | CONFIGURATION UPDATE COMMAND | - | - |
| 6 | Check: Does the UE transmit a CONFIGURATION UPDATE COMPLETE message within the expiry of T3555? | --> | CONFIGURATION UPDATE COMPLETE | 2 | F |
| 7 | Step 4 in TS 38.508-1 [4] Table 4.9.5.2.2-1 are performed with a new assigned 5G-GUTI in the REGISTRATION ACCEPT message. | - | - | - | - |
| 8 | Check: Does the UE transmit a REGISTRATION COMPLETE message? | --> | REGISTRATION COMPLETE | 2 | P |
| 9 | The SS releases the RRC connection. | - | - | - | - |
| 10 | Waits for 2 minutes until T3512 expiry. | - | - | - | - |
| 11-13 | Steps 2-4 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. The UE transmits a REGISTRATION REQUEST message with IE 5GS registration type set to "periodic registration updating". | --> | REGISTRATION REQUEST | - | - |
| - | The following messages are to be observed on NGC cell A unless explicitly stated otherwise. | - | - | - | - |
| 14 | Change NGC cell B to "Non-Suitable "Off" cell".

Change NGC cell A to "Serving cell". | - | - | - | - |

| | | | | | |
|----|--|---|--|---|---|
| | Note: T3510 value is specified as 15s in TS 24.501 and it is assumed that SS can configure cells within this time. | | | | |
| 15 | Check: Does the UE perform mobility registration updating on NGC Cell A as specified in TS 38.508-1 [4] Table 4.9.5.2.2-1? | - | | 1 | - |

9.1.5.2.9.3.3 Specific message contents

Table 9.1.5.2.9.3.3-1: REGISTRATION REQUEST (steps 4 and 15 Table 9.1.5.2.9.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|--------------|--------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '010'B | Mobility registration updating | |

Table 9.1.5.2.9.3.3-2: CONFIGURATION UPDATE COMMAND (step 5 Table 9.1.5.2.9.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|--------------|---------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Configuration update indication | Not Present | | |
| ACK | '1'B | acknowledgement requested | |

Table 9.1.5.2.9.3.3-3: REGISTRATION ACCEPT (step 7 Table 9.1.5.2.9.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| T3512 value | | | |
| Timer value | '0 0010'B | 2 minutes | |
| Unit | '101'B | value is incremented in multiples of 1 minute | |

Table 9.1.5.2.9.3.3-4: REGISTRATION REQUEST (step 13 Table 9.1.5.2.9.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |

| | | | |
|-----------------------------|--------|--------------------------------|--|
| 5GS registration type value | '011'B | Periodic registration updating | |
|-----------------------------|--------|--------------------------------|--|

9.1.6 De-registration

9.1.6.1 UE-initiated de-registration

9.1.6.1.1 UE-initiated de-registration / Switch off / Abnormal / De-registration and 5GMM common procedure collision

9.1.6.1.1.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the UE is switched off }

then { the UE shall send DEREGISTRATION REQUEST message with De-registration type IE indicated to "Switch off" }

}

(2)

with { the UE in 5GMM-DEREGISTERED-INITIATED state }

ensure that {

when { the UE receives a DEREGISTRATION REQUEST message before the UE-initiated de-registration procedure has been completed }

then { the UE ignores the message and shall continue de-registration procedure }

}

(3)

with { the UE in 5GMM-DEREGISTERED-INITIATED state }

ensure that {

when { the UE receives a 5GMM common procedure before the UE-initiated de-registration procedure has been completed }

then { the UE ignores the message and shall continue de-registration procedure }

}

(4)

with { the UE supports remove USIM without power down and in 5GMM-REGISTERED state }

ensure that {

when { the USIM is removed from the UE }

then { the UE shall send DEREGISTRATION REQUEST message with De-registration type IE indicated to "Switch off" }

}

9.1.6.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.2.1, 5.5.2.2.1 and 5.5.2.2.6. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.2.1]

The de-registration procedure is used:

- a) by the UE to de-register for 5GS services over 3GPP access when the UE is registered over 3GPP access;;
- b) by the UE to de-register for 5GS services over 3GPP access, non-3GPP access, or both when the UE is registered in the same PLMN over both accesses;
- c) by the network to inform the UE that it is deregistered for 5GS services over 3GPP access when the UE is registered over 3GPP access;
- d) by the network to inform the UE that it is deregistered for 5GS services over 3GPP access, non-3GPP access, or both when the UE is registered in the same PLMN over both accesses; and
- e) by the network to inform the UE to re-register to the network.

The de-registration procedure with appropriate de-registration type shall be invoked by the UE:

- a) if the UE is switched off; and
- b) as part of the eCall inactivity procedure defined in subclause 5.5.3.

The de-registration procedure with appropriate de-registration type shall be invoked by the network:

- a) if the network informs whether the UE should re-register to the network.

The de-registration procedure with appropriate access type shall be invoked by the UE:

- a) if the UE wants to de-register for 5GS services over 3GPP access when the UE is registered over 3GPP access; or
- b) the UE wants to de-register for 5GS services over 3GPP access, non-3GPP access, or both when the UE is registered in the same PLMN over both accesses.

If the de-registration procedure is triggered due to USIM removal, the UE shall indicate "switch off" in the de-registration type IE.

If the de-registration procedure is requested by the UDM for a UE that has an emergency PDU session, the AMF shall not send a DEREGISTRATION REQUEST message to the UE.

If the de-registration procedure for 5GS services is performed, the PDU sessions, if any, for this particular UE are released locally without peer-to-peer signalling between the UE and the network.

The UE is allowed to initiate the de-registration procedure even if the timer T3346 is running.

NOTE: When the UE has no PDU sessions over non-3GPP access, or the UE moves all the PDU sessions over a non-3GPP access to a 3GPP access, the UE and the AMF need not initiate de-registration over the non-3GPP access.

The AMF shall provide the UE with a non-3GPP de-registration timer.

[TS 24.501, clause 5.5.2.2.1]

The de-registration procedure is initiated by the UE by sending a DEREGISTRATION REQUEST message (see example in figure 5.5.2.2.1). The De-registration type IE included in the message indicates whether the de-registration procedure is due to a "switch off" or not. The access type included in the message indicates whether the de-registration procedure is:

- a) for 5GS services over 3GPP access when the UE is registered over 3GPP access only;
- b) for 5GS services over non-3GPP access when the UE is registered over non-3GPP access only; or
- c) for 5GS services over 3GPP access, non-3GPP access or both 3GPP access and non-3GPP access when the UE is registered in the same PLMN over both accesses.

If the UE has a valid 5G-GUTI, the UE shall populate the 5GS mobile identity IE with the valid 5G-GUTI. If the UE does not have a valid 5G-GUTI, the UE shall populate the 5GS mobile identity IE with its SUCI.

If the UE does not have a valid 5G-GUTI and it does not have a valid SUCI, then the UE shall populate the 5GS mobile identity IE with its PEI.

If the de-registration request is not due to switch off and the UE is in the state 5GMM-REGISTERED or 5GMM-REGISTERED-INITIATED, timer T3521 shall be started in the UE after the DEREGISTRATION REQUEST message has been sent. The UE shall enter the state 5GMM-DEREGISTERED-INITIATED.

If the UE is to be switched off, the UE shall try for a period of 5 seconds to send the DEREGISTRATION REQUEST message. During this period, the UE may be switched off as soon as the DEREGISTRATION REQUEST message has been sent.

[TS 24.501, clause 5.5.2.2.6]

...

- d) De-registration procedure collision.

De-registration containing de-registration type "switch off":

- If the UE receives a DEREGISTRATION REQUEST message before the UE-initiated de-registration procedure has been completed, this message shall be ignored and the UE-initiated de-registration procedure shall continue.

Otherwise:

- If the UE receives a DEREGISTRATION REQUEST message before the UE-initiated de-registration procedure has been completed, it shall treat the message as specified in subclause 5.5.2.3.2 with the following modification:
- If the DEREGISTRATION REQUEST message received by the UE contains de-registration type "re-registration required", and the UE-initiated de-registration procedure is with de-registration type "normal de-registration", the UE need not initiate the registration procedure for initial registration.

- e) De-registration and 5GMM common procedure collision.

De-registration containing de-registration type "switch off":

- If the UE receives a message used in a 5GMM common procedure before the de-registration procedure has been completed, this message shall be ignored and the de-registration procedure shall continue.

Otherwise:

- If the UE receives a message used in a 5GMM common procedure before the de-registration procedure has been completed, both the 5GMM common procedure and the de-registration procedure shall continue.

9.1.6.1.1.3 Test description

9.1.6.1.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state 3N-A on NGC Cell A according to TS 38.508-1[4].

9.1.6.1.1.3.2 Test procedure sequence

Table 9.1.6.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|------------------------|----|---------|
| | | U - S | Message | | |
| 0 | SS stops sending RLC acknowledgments. | - | - | - | - |
| 1 | Cause switch off | - | - | - | - |
| 2 | Check: Does the UE transmit a DEREGISTRATION REQUEST with the De-registration type IE indicating "switch off"? | --> | DEREGISTRATION REQUEST | 1 | P |
| 3 | The SS transmits a DEREGISTRATION REQUEST message. | <-- | DEREGISTRATION REQUEST | - | - |
| 3A | SS resumes sending RLC acknowledgments | - | - | - | - |
| 4 | Check: Does the UE transmit a DEREGISTRATION ACCEPT message within 6 seconds (T3522)? | --> | DEREGISTRATION ACCEPT | 2 | F |
| 5 | The SS releases the RRC connection. | - | - | - | - |
| 6 | Switch on the UE | - | - | - | - |
| 7 | The UE performs Registration procedure as specified in TS 38.508-1 [4] subclause 4.5.2 with 'connected without release'. | - | - | - | - |
| 7A | SS stops sending RLC acknowledgments. | - | - | - | - |
| 8 | Cause switch off. | - | - | - | - |
| 9 | The UE transmits a DEREGISTRATION REQUEST with the De-registration type IE indicating "switch off". | --> | DEREGISTRATION REQUEST | - | - |
| 10 | The SS transmits an IDENTITY REQUEST message. | <-- | IDENTITY REQUEST | - | - |
| 10A | SS resumes sending RLC acknowledgments | | | | |
| 11 | Check: Does the UE transmit an IDENTITY RESPONSE message within 6 seconds (T3570)? | --> | IDENTITY RESPONSE | 3 | F |
| 12 | The SS releases the RRC connection. | - | - | - | - |
| - | EXCEPTION: Steps 13a1 to 13a4 describe behaviour that depends on the UE capability; the "lower case letter" identifies a step sequence that take place if the UE supports remove USIM without power down: | - | - | - | - |

| | | | | | |
|----------|---|-----|------------------------|---|---|
| | pc_USIM_Removal = TRUE [29] | | | | |
| 13a
1 | Switch on the UE | - | - | - | - |
| 13a
2 | The UE performs Registration procedure as specified in TS 38.508-1 [4] subclause 4.5.2 with ' <i>connected without release</i> '. | - | - | - | - |
| 13a
3 | Cause removal of USIM from the UE without powering down. | - | - | - | - |
| 13a
4 | Check: Does the UE transmit a DEREGISTRATION REQUEST with the De-registration type IE indicating "switch off"? | --> | DEREGISTRATION REQUEST | 4 | P |

9.1.6.1.1.3.3 Specific message contents

Table 9.1.6.1.1.3.3-1: DEREGISTRATION REQUEST (Steps 2, 9 and 13a4, Table 9.1.6.1.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-12 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| De-registration type | | | |
| Switch off | '1'B | | |

9.1.6.1.2 UE-initiated de-registration / Normal de-registration / Abnormal / Transmission failure without TAI change from lower layers, De-registration and 5GMM common procedure collision, T3521 timeout

9.1.6.1.2.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the UE initiates "normal de-registration" type deregistration from 5GS services over 3GPP access }

then { the UE sends DEREGISTRATION REQUEST message with De-registration type IE indicated to "Normal de-registration" and starts timer T3521 }

}

(2)

with { the UE in 5GMM-DEREGISTERED-INTIATED state }

ensure that {

when { Transmission failure of DEREGISTRATION REQUEST message indication without TAI change from lower layers }

then { the UE restarts the de-registration procedure }

}

(3)

with { the UE in 5GMM-DEREGISTERED-INTIATED state }

ensure that {

when { the UE receives a message used in a 5GMM common procedure before the de-registration procedure has been completed }

then { both the 5GMM common procedure and the de-registration procedure shall continue }

}

(4)

with { the UE in 5GMM-DEREGISTERED-INTIATED state }

ensure that {

when { the first four expiries of the timer T3521 }

then { the UE shall retransmit the DEREGISTRATION REQUEST message and shall reset and restart timer T3521 }

}

(5)

with { the UE in 5GMM-DEREGISTERED-INTIATED state }

ensure that {

when { On the fifth expiry of timer T3521 }

then { the detach procedure shall be aborted and the UE performs local detach }

}

9.1.6.1.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clause 5.5.2.2.6 and TS 38.331 clause 5.7.2.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.2.2.6]

c) T3521 timeout.

On the first four expiries of the timer, the UE shall retransmit the DEREGISTRATION REQUEST message and shall reset and restart timer T3521. On the fifth expiry of timer T3521, the de-registration procedure shall be aborted and the UE proceeds as follows:

- 1) if the de-registration procedure was performed due to disabling of 5GS services, the UE shall enter the 5GMM-NULL state; or
- 2) if the de-registration type "normal de-registration" was requested for reasons other than disabling of 5GS services, the UE shall enter the 5GMM-DEREGISTERED state.

...

e) De-registration and 5GMM common procedure collision.

De-registration containing de-registration type "switch off":

- If the UE receives a message used in a 5GMM common procedure before the de-registration procedure has been completed, this message shall be ignored and the de-registration procedure shall continue.

Otherwise:

- If the UE receives a message used in a 5GMM common procedure before the de-registration procedure has been completed, both the 5GMM common procedure and the de-registration procedure shall continue.

h) Transmission failure of DEREGISTRATION REQUEST message indication without TAI change from lower layers.

The UE shall restart the de-registration procedure.

[TS 38.331, clause 5.7.2.4]

The UE shall:

1> if AS security is not started and radio link failure occurs before the successful delivery of ULInformationTransfer messages has been confirmed by lower layers; or

1> if mobility (i.e. handover, RRC connection re-establishment) occurs before the successful delivery of ULInformationTransfer messages has been confirmed by lower layers:

2> inform upper layers about the possible failure to deliver the information contained in the concerned ULInformationTransfer messages.

9.1.6.1.2.3 Test description

9.1.6.1.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A and NGC Cell B
- Both cells are configured as per table 6.3.2.2-1 TS 38.508-1 [4] with the below exceptions

Table 9.1.6.1.2.3.1-1: Cell configuration

| NGC Cell | TAC | TAI |
|----------|-----|-------|
| B | 1 | TAI-1 |

UE:

- None.

Preamble:

- the UE is in state 3N-A on NGC Cell A according to TS 38.508-1 [4].

9.1.6.1.2.3.2 Test procedure sequence

Table 9.1.6.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|-----------|------------------|---------|----|---------|
| | | U - S | Message | | |
| | | | | | |

| | | | | | |
|---------|--|-----|---|---|---|
| 0 | The SS configures:
- NGC Cell B as "Suitable neighbour cell". | | | | |
| 1 | AT or MMI command to cause UE to initiate de-registration. | - | - | - | - |
| - | The following messages are to be observed on Cell A unless explicitly stated otherwise. | - | - | - | - |
| 1A | The SS is configured not send RLC ACK for the message sent in step 2. | - | - | - | - |
| 2 | Does the UE transmit a DEREGISTRATION REQUEST message with De-registration type IE indicating "Normal de-registration"? The UE starts timer T3521. | --> | 5GMM: DEREGISTRATION REQUEST | 1 | P |
| 3 | Void | - | - | - | - |
| 3A | The SS transmits an <i>RRCReconfiguration</i> message including reconfigurationWithSync with rach-ConfigDedicated to order the UE to perform intra-frequency handover to NGC Cell B. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| - | The following messages are to be observed on Cell B unless explicitly stated otherwise. | - | - | - | - |
| 3B | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 4 | Check: Does the UE restart the de-registration procedure by sending DEREGISTRATION REQUEST message? Timer T3521 is started. | --> | 5GMM: DEREGISTRATION REQUEST | 2 | P |
| 4A | The SS configures:
- NGC Cell A as "Non-suitable "Off" cell". | - | - | - | - |
| 5 | With T3521 still running the SS shall send AUTHENTICATION REQUEST. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 6 | Check: Does the UE transmit an AUTHENTICATION RESPONSE message? | --> | 5GMM: AUTHENTICATION RESPONSE | 3 | P |
| 7 | SS responds with DEREGISTRATION ACCEPT message. | <-- | 5GMM: DEREGISTRATION ACCEPT | - | - |
| 8 | The SS releases the RRC connection. | - | - | - | - |
| 9 | AT or MMI command to cause UE to initiate registration. | - | - | - | - |
| 10-24a4 | Steps 2-19a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed to complete the registration. | - | - | - | - |
| 25 | Cause UE to initiate de-registration. | - | - | - | - |
| 26 | Check: Does the UE transmit a DEREGISTRATION REQUEST message with De-registration type IE indicating "Normal de-registration"? The UE starts timer T3521. | --> | 5GMM: DEREGISTRATION REQUEST | 1 | P |
| 27 | SS does not respond to the DEREGISTRATION REQUEST message. | - | - | - | - |

| | | | | | |
|--|--|-----|------------------------------|---|---|
| 28 | Check: When the timer T3521 expires does the UE re-transmit DEREGISTRATION REQUEST message? Timer T3521 is re-started (1 st expiry). | --> | 5GMM: DEREGISTRATION REQUEST | 4 | P |
| 29 | The SS does not respond to the DEREGISTRATION REQUEST message. | - | - | - | - |
| 30 | Check: When the timer T3521 expires does the UE re-transmit DEREGISTRATION REQUEST message? Timer T3521 is re-started (2 nd expiry). | --> | 5GMM: DEREGISTRATION REQUEST | 4 | P |
| 31 | The SS does not respond to the DEREGISTRATION REQUEST message. | - | - | - | - |
| 32 | Check: When the timer T3521 expires does the UE re-transmit DEREGISTRATION REQUEST message? Timer T3521 is re-started (3 rd expiry). | --> | 5GMM: DEREGISTRATION REQUEST | 4 | P |
| 33 | The SS does not respond to the DEREGISTRATION REQUEST message. | - | - | - | - |
| 34 | Check: When the timer T3521 expires does the UE re-transmit DEREGISTRATION REQUEST message? Timer T3521 is re-started (4 th expiry). | --> | 5GMM: DEREGISTRATION REQUEST | 4 | P |
| 35 | The SS does not respond to the DEREGISTRATION REQUEST message. | - | - | - | - |
| 36 | Check: When the timer T3521 expires does the UE re-transmit DEREGISTRATION REQUEST message in 10s?

The UE shall abort the de-registration procedure and enter the 5GMM-DEREGISTERED (5 th expiry). | --> | 5GMM: DEREGISTRATION REQUEST | 5 | F |
| Note: T3521 value is specified as 15s in TS 24.501 [22]. | | | | | |

9.1.6.1.2.3.3 Specific message contents

Table 9.1.6.1.2.3.3-1: Message DEREGISTRATION REQUEST (steps 2, 4, 26, 28, 30, 32 and 34, Table 9.1.6.1.2.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-12 | | | |
|---|--------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| De-registration type | | | |
| Switch off | '0'B | Normal de-registration | |
| Access type | '01'B | 3GPP access | |

Table 9.1.6.1.2.3.3-2: *RRCReconfiguration-HO* (step 3A Table 9.1.6.1.2.3.2-1)

Derivation Path: 38.508-1 [4] Table 4.8.1-1A with condition RBCconfig_KeyChange

9.1.6.1.3 UE-initiated de-registration / Abnormal / Change of cell into a new tracking area

9.1.6.1.3.1 Test Purpose (TP)

(1)

with { UE in 5GMM-DEREGISTERED-INITIATED state and de-registration request is not due to switch off }

ensure that {

when { UE changes into a new tracking area that is not in the stored TAI list }

then { UE aborts the de-registration procedure and initiates a mobility registration procedure }

}

(2)

with { UE in 5GMM-REGISTERED-INITIATED state for a mobility registration procedure due to change of cell into a new tracking area list during UE-initiated de-registration procedure }

ensure that {

when { UE receives REGISTRATION ACCEPT message }

then { UE re-initiates the de-registration procedure after completing the mobility registration procedure }

}

(3)

with { UE in 5GMM-DEREGISTERED-INITIATED state and de-registration request is due to switch off }

ensure that {

when { UE changes into a new tracking area that is not in the stored TAI list }

then { UE aborts the de-registration procedure and enter the state 5GMM-DEREGISTERED }

}

9.1.6.1.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 5.2.2.6. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 5.2.2.6]

The following abnormal cases can be identified:

...

f) Change of cell into a new tracking area.

If a cell change into a new tracking area that is not in the stored TAI list occurs before the UE-initiated de-registration procedure is completed, the de-registration procedure shall be aborted and re-initiated after successfully

performing a registration procedure for mobility or periodic update used for mobility (i.e. the 5GS registration type IE set to "mobility registration updating" in the REGISTRATION REQUEST message). If the de-registration procedure was initiated due to removal of the USIM or the UE is to be switched off, the UE shall abort the de-registration procedure and enter the state 5GMM-DEREGISTERED.

9.1.6.1.3.3 Test description

9.1.6.1.3.3.1 Pre-test conditions

System Simulator:

- NGC Cell A belongs to Home PLMN and TAI-1 and set as serving cell;
- NGC Cell B belongs to Home PLMN and TAI-2 and set as Non-Suitable cell.

UE:

- None;

Preamble:

- The UE is in state 3N-A on NGC cell A according to TS 38.508-1 [4].

9.1.6.1.3.3.2 Test procedure sequence

Table 9.1.6.1.3.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|------------------------|----|---------|
| | | U - S | Message | | |
| - | The following messages are to be observed on NGC Cell A unless explicitly stated otherwise. | - | - | - | - |
| 1 | Cause UE to de-register for non Switch off reason using MMI or AT commands. | - | - | - | - |
| 2 | The UE transmits DEREGISTRATION REQUEST message. (The UE starts timer T3521) | --> | DEREGISTRATION REQUEST | | |
| 3 | The SS does not respond to DEREGISTRATION REQUEST message. | - | - | - | - |
| 4 | The SS configures NGC Cell A as the "suitable cell" and NGC Cell B as the "Serving cell".

Note: T3521 value is specified as 15s in TS 24.501 [22] and it is assumed that SS can configure cells within this time. | - | - | - | - |
| 5 | The SS transmits an <i>RRCReconfiguration</i> message on NGC Cell A to order the UE to perform intra-frequency handover to NGC Cell B. | - | - | - | - |
| 6 | The UE transmits a <i>RRCReconfigurationComplete</i> message on NGC Cell B to confirm the successful completion of the intra frequency handover. | - | - | - | - |

| | | | | | |
|---|---|-----|------------------------|---|---|
| - | The following messages are to be observed on NGC Cell B unless explicitly stated otherwise. | - | - | - | - |
| 7 | Check: Does the UE transmit a REGISTRATION REQUEST message with registration type value set to "mobility registration updating" | --> | REGISTRATION REQUEST | 1 | P |
| 8
-22 | Steps 5 to 19a1 of the generic procedure for NR RRC IDLE as specified in TS 38.508-1 [4] subclause 4.5.2.2-2 with ' <i>connected without release</i> ' are performed. | - | - | - | - |
| 23 | Check: Does the UE transmit DEREGISTRATION REQUEST message? | --> | DEREGISTRATION REQUEST | 2 | P |
| 24 | The SS transmits DEREGISTRATION ACCEPT message. | <-- | DEREGISTRATION ACCEPT | - | - |
| 25 | The SS transmits an <i>RRCRelease</i> message. | - | - | - | - |
| 26 | Check: Does the test result of the generic procedure in TS 38.508-1 [4] subclause 4.9.13 indicates that the UE doesn't responds to paging when paged with NG-5G-S-TMSI? | - | - | 2 | P |
| 27 | Cause UE to initiate registration using MMI or AT commands. | - | - | - | - |
| 28 | The UE performs Registration procedure as specified in TS 38.508-1 [4] subclause 4.5.2 with ' <i>connected without release</i> '. | - | - | - | - |
| 29 | The SS is configured on NGC Cell B not to send RLC acknowledgements (RLC ACKs) to the UE. | - | - | - | - |
| 30 | If possible (see ICS) switch off is performed or the USIM is removed.

Otherwise the power is removed. | - | - | - | - |
| 31 | The UE transmits DEREGISTRATION REQUEST message. | --> | DEREGISTRATION REQUEST | - | - |
| 32 | Void. | - | - | - | - |
| 33 | The SS transmits an <i>RRCReconfiguration</i> message on NGC Cell B to order the UE to perform intra-frequency handover to NGC Cell A. | - | - | - | - |
| 34 | UE transmit a <i>RRCReconfigurationComplete</i> message on NGC Cell A to confirm the successful completion of the intra frequency handover (Note 2). | - | - | - | - |
| 35 | Check: Does the UE transmit a REGISTRATION REQUEST message with registration type value set to "mobility registration updating" within 5 seconds? | --> | REGISTRATION REQUEST | 3 | F |
| Note 1: Void. | | | | | |
| Note 2: This will be sent by the UE as RRC doesn't know that UE has triggered switch off. RRC will complete the HO and inform NAS about the cell change. Here NAS will abort the de-registration procedure and shut off the UE. | | | | | |

9.1.6.1.3.3.3 Specific message contents

Table 9.1.6.1.3.3.3-1: DEREGISTRATION REQUEST (steps 2 and 23, Table 9.1.6.1.3.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-12 | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| De-registration type | | | |
| Switch off | '0'B | Normal de-registration | |
| Re-registration required | '0'B | Spare bit | |
| Access type | '01'B | 3GPP access | |
| 5GS mobile identity | 5G-GUTI | Same value as assigned in REGISTRATION ACCEPT | |

Table 9.1.6.1.3.3.3-2: *RRCReconfiguration-HO* (steps 5 and 33 Table 9.1.6.1.3.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.8.1-1A with condition RBConfig_KeyChange | | | |
|--|--|--|--|
|--|--|--|--|

Table 9.1.6.1.3.3.3-3: Void

Table 9.1.6.1.3.3.3-4: Void

Table 9.1.6.1.3.3.3-5: Void

Table 9.1.6.1.3.3.3-6: Void

Table 9.1.6.1.3.3.3-7: REGISTRATION REQUEST (step 7 and 35, Table 9.1.6.1.3.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|-----------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '010'B | | Mobility |
| PDU session status | PDU session IDs | PDU session IDs of the ACTIVE PDU sessions to be transferred to a new cell. | |

Table 9.1.6.1.3.3.3-8: DEREGISTRATION REQUEST (step 31, Table 9.1.6.1.3.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-12 | | | |
|---|--------------|------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| De-registration type | | | |
| Switch off | '1'B | Switch off | |

| | | | |
|--------------------------|---------|---|--|
| Re-registration required | '0'B | Spare bit | |
| Access type | '01'B | 3GPP access | |
| 5GS mobile identity | 5G-GUTI | Same value as assigned in REGISTRATION ACCEPT | |

9.1.6.1.4 UE-initiated de-registration / Abnormal / Transmission failure with TAI change from lower layers

9.1.6.1.4.1 Test Purpose (TP)

(1)

with { UE initiates de-registration procedure for 5GS services over 3GPP access with de-registration type "Normal de-registration" in 5GMM-REGISTERED state }

ensure that {

when { UE receives transmission failure of DEREGISTRATION REQUEST message indication with TAI change from lower layers and the current TAI is not in the TAI list }

then { UE shall abort the de-registration procedure and re-initiate after successfully performing a registration procedure for mobility update }

}

(2)

with { UE initiates de-registration procedure for 5GS services over 3GPP access with de-registration type "Normal de-registration" in 5GMM-REGISTERED state }

ensure that {

when { UE receives transmission failure of DEREGISTRATION REQUEST message indication with TAI change from lower layers and the current TAI is still part of the TAI list }

then { UE shall restart the de-registration procedure }

}

9.1.6.1.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.2.2.6. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.2.2.6]

The following abnormal cases can be identified:

...

g) Transmission failure of DEREGISTRATION REQUEST message indication with TAI change from lower layers.

If the current TAI is not in the TAI list, the de-registration procedure shall be aborted and re-initiated after successfully performing a registration procedure for mobility or periodic update. If the de-registration procedure was

initiated due to removal of the USIM or the UE is to be switched off, the UE shall abort the de-registration procedure and enter the state 5GMM-DEREGISTERED.

If the current TAI is still part of the TAI list, the UE shall restart the de-registration procedure.

9.1.6.1.4.3 Test description

9.1.6.1.4.3.1 Pre-test conditions

System Simulator:

- 2 NGC cells with system information combination NR-2 in accordance with TS 38.508-1[4] sub-clause 4.4.3.1.2.
- NGC cell A configured as "Serving cell" according to TS 38.508-1 [4] Table 6.2.2.1-3 for FR1 or Table 6.2.2.2-2 for FR2, HPLMN, TAI-1
- NGC cell B configured as "Suitable neighbour cell" according to TS 38.508-1 [4] Table 6.2.2.1-3 for FR1 or Table 6.2.2.2-2 for FR2, HPLMN, TAI-2

UE:

None.

Preamble:

- The UE is in state 3N-A on NGC cell A according to TS 38.508-1 [4] Table 4.4A.2-1.

9.1.6.1.4.3.2 Test procedure sequence

Table 9.1.6.1.4.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| - | The following messages are to be observed on NGC cell A unless explicitly stated otherwise. | - | - | - | - |
| 1 | The SS is configured not send RLC ACK for the message sent in step 3. | - | - | - | - |
| 2 | Cause the UE to initiate a normal de-registration for 5GS services over 3GPP access. (Note 1) | - | - | - | - |
| 3 | The UE transmits a DEREGISTRATION REQUEST message with IE de-registration type set to "Normal de-registration" for 3GPP access. | --> | DEREGISTRATION REQUEST | - | - |
| 3A | The SS transmits an <i>RRCReconfiguration</i> message including <i>reconfigurationWithSync</i> with <i>rach-ConfigDedicated</i> to order the UE to perform intra-frequency handover to NGC Cell B. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| - | The following messages are to be observed on NGC cell B unless explicitly stated otherwise. | - | - | - | - |
| 4 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC: <i>RRCReconfigurationComplete</i> | - | - |
| 4A | Configure the NGC cell A as "Non-suitable | - | - | - | - |

| | | | | | |
|---|--|-----|--|---|---|
| | "Off" cell". | | | | |
| 5 | Check: Does the UE transmit a REGISTRATION REQUEST message with IE 5GS registration type set to "mobility registration updating"? | --> | REGISTRATION REQUEST | 1 | P |
| 6-7 | Steps 4-5 of Table 4.9.5.2.2-1 of the test procedure in TS 38.508-1 [4] are performed with a new assigned 5G-GUTI and TAI list containing two consecutive TAI in the REGISTRATION ACCEPT message. | - | - | - | - |
| 8-21 | Void | - | - | - | - |
| 22 | The SS is configured not send RLC ACK for the message sent in step 23. | - | - | - | - |
| 23 | Check: Does the UE transmit a DEREGISTRATION REQUEST message with IE de-registration type set to "Normal de-registration" for 3GPP access? | --> | DEREGISTRATION REQUEST | 1 | P |
| 23 Aa | Configure the NGC cell A as "Serving cell". | - | - | - | - |
| 23 A | The SS transmits an <i>RRCReconfiguration</i> message including <i>reconfigurationWithSync</i> with <i>rach-ConfigDedicated</i> to order the UE to perform intra-frequency handover to NGC Cell A. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| - | The following messages are to be observed on NGC cell A unless explicitly stated otherwise. | - | - | - | - |
| 24 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 25 | Check: Does the UE transmit a DEREGISTRATION REQUEST message with IE de-registration type set to "Normal de-registration" for 3GPP access? | --> | DEREGISTRATION REQUEST | 2 | P |
| 26 | The SS transmits a DEREGISTRATION ACCEPT message. | <-- | DEREGISTRATION ACCEPT | - | - |
| Note 1: The request of normal deregistration for 3GPP access may be performed by MMI or AT command. | | | | | |

9.1.6.1.4.3.3 Specific message contents

Table 9.1.6.1.4.3.3-1: REGISTRATION REQUEST (step 5 Table 9.1.6.1.4.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|--------------|-----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '010'B | Mobility registration | |

| | | | |
|--|--|----------|--|
| | | updating | |
|--|--|----------|--|

Table 9.1.6.1.4.3.3-2: REGISTRATION ACCEPT (step 6 Table 9.1.6.1.4.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| TAI list | | Contains 2 consecutive partial tracking area IDs | |
| Length of tracking area identity list contents | '0000 0111'B | 7 octets | |
| Partial tracking area identity list 1 | | | |
| Number of elements | '0 0001'B | 2 elements | |
| Type of list | '01'B | list of TACs belonging to one PLMN, with consecutive TAC values | |
| MCC | See Table 4.4.2-3 in TS 38.508-1 [4] | MCC of HPLMN | |
| MNC | See Table 4.4.2-3 in TS 38.508-1 [4] | MNC of HPLMN | |
| TAC 1 | See Table 4.4.2-3 in TS 38.508-1 [4] | TAC of TAI-1 | |

Table 9.1.6.1.4.3.3-3: DEREGISTRATION REQUEST (steps 3, 23 and 25 Table 9.1.6.1.4.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-12 | | | |
|---|--------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| De-registration type | | | |
| Switch off | '0'B | Normal de-registration | |

Table 9.1.6.1.4.3.3-4: *RRCReconfiguration-HO* (steps 3A and 23A Table 9.1.6.1.4.3.2-1)

| |
|---|
| Derivation Path: 38.508-1 [4] Table 4.8.1-1A with condition RBConfig_KeyChange |
|---|

9.1.6.2 Network-initiated de-registration

9.1.6.2.1 Network-initiated de-registration / De-registration for 3GPP access / Re-registration required

9.1.6.2.1.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the SS sends a DEREGISTRATION REQUEST message indicates "re-registration required" and the de-registration request is for 3GPP access }

then { the UE sends a DEREGISTRATION ACCEPT message to the network and releases the existing NAS signalling connection, then initiates an initial registration and also re-establishes any previously established PDU sessions. }

}

9.1.6.2.1.2 Conformance requirements

References: The conformance requirement covered in the present TC is specified in: 3GPP TS 24.501 clauses 5.5.2.3.2. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 5.5.2.3.2]

...

NOTE 1: When the de-registration type indicates "re-registration required", user interaction is necessary in some cases when the UE cannot re-establish the PDU session (s), if any, automatically.

...

Upon sending a DEREGISTRATION ACCEPT message, the UE shall delete the rejected NSSAI as specified in subclause 4.6.2.2.

If the de-registration type indicates "re-registration required", then the UE shall ignore the 5GMM cause IE if received.

If the de-registration type indicates "re-registration not required", the UE shall take the actions depending on the received 5GMM cause value:

#3 (Illegal UE);

...

As an implementation option, the UE may enter the state 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5].

9.1.6.2.1.3 Test description

9.1.6.2.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- the UE is in state 3N-A on NGC Cell A according to TS 38.508-1 [4].

9.1.6.2.1.3.2 Test procedure sequence

Table 9.1.6.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|--|------------------|---|----|---------|
| | | U - S | Message/PDU/SDU | | |
| 1 | The SS transmits a DEREGISTRATION REQUEST with indicates "re-registration required". | <-- | DEREGISTRATION REQUEST | - | - |
| 2 | Check: Does the UE transmits a DEREGISTRATION ACCEPT message? | --> | DEREGISTRATION ACCEPT | 1 | P |
| 3 | The SS releases RRC connection. | - | - | - | - |
| 4 | The UE transmits an <i>RRCSetupRequest</i> message. | --> | NR RRC: <i>RRCSetupRequest</i> | - | - |
| 5 | The SS transmits an <i>RRCSetup</i> message. | <-- | NR RRC: <i>RRCSetup</i> | - | - |
| 6 | Check: Does the UE transmits an <i>RRCSetupComplete</i> message and REGISTRATION REQUEST message with registration type set to "initial registration". | --> | NR RRC: <i>RRCSetupComplete</i>
5GMM: REGISTRATION REQUEST | 1 | P |
| 7-23 | Steps 5-20 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |

9.1.6.2.1.3.3 Specific message contents

Table 9.1.6.2.1.3.3-1: DEREGISTRATION REQUEST (step 1, Table 9.1.6.2.1.3.2-1)

| Derivation path: 38.508-1 [4] Table 4.7.1-14 | | | |
|--|--------------|--------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| DEREGISTRATION type | | | |
| Switch off | '0'B | Normal de-registration | |
| Re-registration required | '1'B | re-registration required | |
| Access type | '01'B | 3GPP access | |

9.1.6.2.2 Network-initiated de-registration / De-registration for 3GPP access / Re-registration not required

9.1.6.2.2.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the SS sends a DEREGISTRATION REQUEST message indicates no 5GMM cause IE, ""re-registration not required"" and the de-registration request is for 3GPP access) }

then { the UE deletes 5G-GUTI, TAI list, last visited registered TAI, list of equivalent PLMNs, ngKSI, sends a DEREGISTRATION ACCEPT message enter the state 5GMM-DEREGISTERED for 3GPP access }

}

9.1.6.2.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clauses 5.5.2.3.2 and 5.5.2.3.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.2.3.2]

Upon receiving the DEREGISTRATION REQUEST message, if the DEREGISTRATION REQUEST message indicates "re-registration not required" and the de-registration request is for 3GPP access, the UE shall perform a local release of the PDU sessions over 3GPP access, if any. The UE shall send a DEREGISTRATION ACCEPT message to the network and enter the state 5GMM-DEREGISTERED for 3GPP access.

[TS 24.501, clause 5.5.2.3.4]

b) DEREGISTRATION REQUEST, other 5GMM cause values than those treated in subclause 5.5.2.3.2, cases of 5GMM cause value#11, #22 and #72 that are considered as abnormal cases according to subclause 5.5.2.3.2 or no 5GMM cause IE is included, and the De-registration type IE indicates "re-registration not required".

The UE shall delete 5G-GUTI, TAI list, last visited registered TAI, list of equivalent PLMNs, ngKSI, shall set the 5GS update status to 5U2 NOT UPDATED and shall start timer T3502.

A UE not supporting S1 mode may enter the state 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5]; otherwise the UE shall enter the state 5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION.

9.1.6.2.2.3 Test description

9.1.6.2.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- the UE is previously registered on 5GC, and when on 5GC, the UE is last authenticated and registered on NGC cell A using default message contents according to TS 38.508-1 [4];

Preamble:

- The UE is in state 3N-A on NGC Cell A according to TS 38.508-1 [4].

- The T3502 in UE set to 2 minutes.

9.1.6.2.2.3.2 Test procedure sequence

Table 9.1.6.2.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------------|---|------------------|------------------------------|----|---------|
| | | U – S | Message | | |
| 1 | SS sends a DEREGISTRATION REQUEST message indicates no 5GMM cause IE, "re-registration not required" and the de-registration request is for 3GPP access | <-- | 5GMM: DEREGISTRATION REQUEST | - | - |
| 2 | Check: Does the UE transmit a DEREGISTRATION ACCEPT message?

Note: Now UE should start timer T3502. | --> | 5GMM: DEREGISTRATION ACCEPT | 1 | P |
| 3 | The SS releases the RRC connection. | - | - | - | - |
| 4 | The SS waits 2 mins for T3502 to expire. | - | - | - | - |
| 5-22a
1 | Does the UE performs Steps 2-19a1 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4]? | - | - | 1 | P |

9.1.6.2.2.3.3 Specific message contents

Table 9.1.6.2.2.3.3-1: Message REGISTRATION ACCEPT (preamble)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------|---------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| T3502 Value | 2mins | | |
| Timer value | '0 0010'B | The timer value is 2mins. | |
| Unit | '001'B | | |

Table 9.1.6.2.2.3.3-2: Message DEREGISTRATION REQUEST (step 1, Table 9.1.6.2.2.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-12 | | | |
|---|--------------|------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| De-registration type | | | |
| Switch off | '0'B | Normal de-registration | |
| Re-registration required | '0'B | re-registration not required | |
| Access type | '01'B | 3GPP access | |

| | | | |
|------------|-------------|--|--|
| 5GMM cause | Not Present | | |
|------------|-------------|--|--|

Table 9.1.6.2.2.3.3-3: Message REGISTRATION REQUEST (step7, Table 9.1.6.2.2.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-6 | | | |
|--|-------------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| ngKSI | | | |
| NAS key set identifier | '111'B | no key is available (UE to network) | |
| TSC | Any allowed value | TSC does not apply for NAS key set identifier value "111" | |
| 5GS mobile identity | The valid SUCI | | |
| Last visited registered TAI | Not present | | |

9.1.7 Service request

9.1.7.1 Service request / IDLE mode uplink user data transport / Rejected / Restricted service area, Abnormal / T3517, T3525

9.1.7.1.1 Test Purpose (TP)

(1)

with { the UE is in 5GMM-REGISTERED state and 5GMM-IDLE mode over 3GPP access }

ensure that {

when { UE has uplink user data pending }

then { the UE sends a SERVICE REQUEST message }

}

(2)

with { the UE sent a SERVICE REQUEST message }

ensure that {

when { UE receives a SERVICE REJECT message including an appropriate 5GMM cause value #28(Restricted service area) }

then { the UE performs the mobility registration update procedure }

}

(3)

with { the UE is in 5GMM-REGISTERED state and the UE has triggered the SERVICE REQUEST in 5GMM-IDLE mode }

ensure that {

when { T3517 expired}

then { the UE increases the service request attempt counter, aborts the procedure and release locally any resources allocated for the service request procedure }

}

(4)

with { the UE is in 5GMM-REGISTERED state and 5GMM-IDLE mode }

ensure that {

when { the service request attempt counter is equal to 5}

then { the UE starts timer T3525 and not attempts service request until expiry of T3525}

}

9.1.7.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501, clause 5.6.1.1, 5.6.1.5 and 5.6.1.7. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.6.1.1]

The purpose of the service request procedure is to change the 5GMM mode from 5GMM-IDLE to 5GMM-CONNECTED mode, and/or to request the establishment of user-plane resources for PDU sessions which are established without user-plane resources. In latter case, the 5GMM mode can be the 5GMM-IDLE mode or the 5GMM-CONNECTED mode if the UE requires to establish user-plane resources for PDU sessions.

...

The UE shall invoke the service request procedure when:

...

d) the UE, in 5GMM-IDLE mode over 3GPP access, has uplink user data pending;

...

If one of the above criteria to invoke the service request procedure is fulfilled, then the service request procedure shall only be initiated by the UE when the following conditions are fulfilled:

- its 5GS update status is 5U1 UPDATED, and the TAI of the current serving cell is included in the TAI list; and
- no 5GMM specific procedure is ongoing.

The UE shall not invoke the service request procedure when the UE is in the state 5GMM-SERVICE-REQUEST-INITIATED.

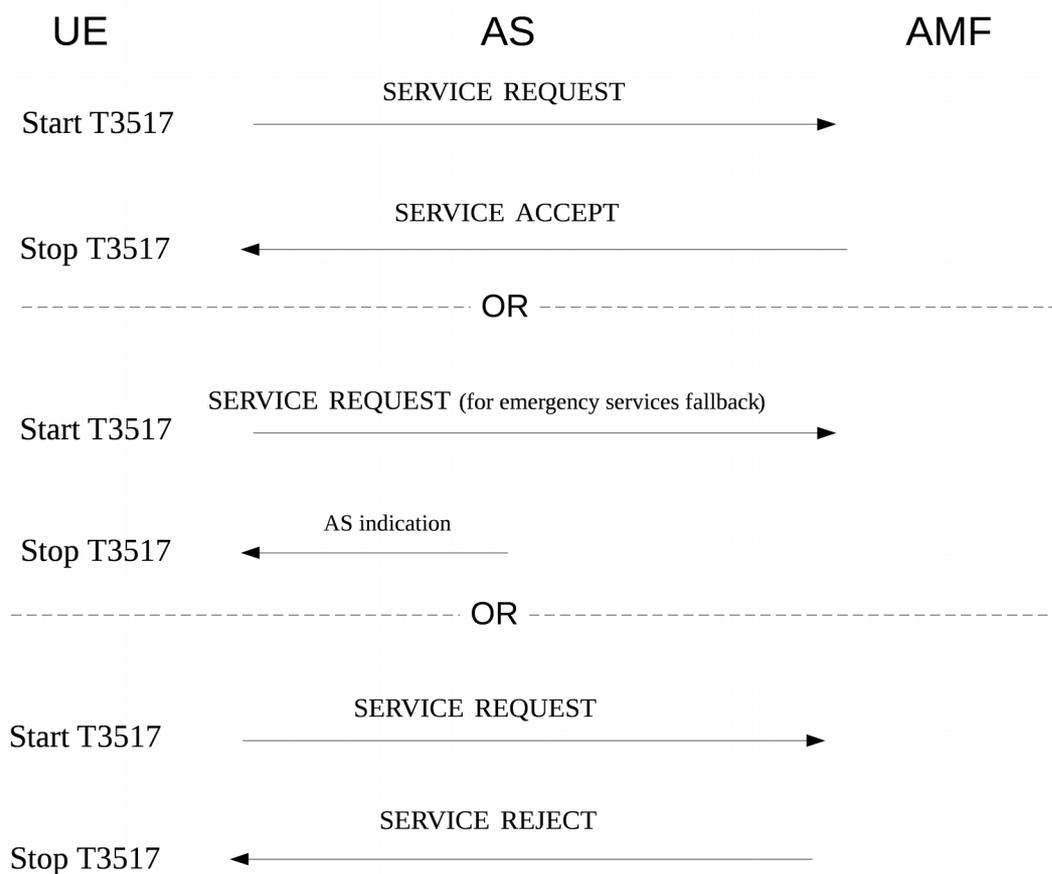


Figure 5.6.1.1.1: Service Request procedure

[TS 24.501, clause 5.6.1.5]

If the service request cannot be accepted, the network shall return a SERVICE REJECT message to the UE including an appropriate 5GMM cause value and stop timer T3517.

...

If the AMF determines that the UE is in a non-allowed area or is not in an allowed area as specified in subclause 5.3.5, then:

a) if the service type IE in the SERVICE REQUEST message is set to "signalling" or "data", the AMF shall send a SERVICE REJECT message with the 5GMM cause value set to #28 "Restricted service area";

...

The UE shall take the following actions depending on the 5GMM cause value received in the SERVICE REJECT message.

#28 (Restricted service area).

The UE shall enter the state 5GMM-REGISTERED.NON-ALLOWED-SERVICE, and perform the registration procedure for mobility and periodic registration update unless the service type IE in the SERVICE REQUEST message was set to "elevated signalling" (see subclause 5.3.5 and 5.5.1.3).

If the service type IE in the SERVICE REQUEST message was set to "elevated signalling", the UE shall not re-initiate service request procedure until the UE enters an allowed area or leaves a non-allowed area, except for emergency services, high priority access or responding to paging or notification.

[TS 24.501, clause 5.6.1.7]

The following abnormal cases can be identified:

a) T3517 expired.

The UE shall enter the state 5GMM-REGISTERED.

If the UE triggered the service request procedure in 5GMM-IDLE mode and the service type of the SERVICE REQUEST message was not set to "emergency services fallback", then the 5GMM sublayer shall increment the service request attempt counter, abort the procedure and release locally any resources allocated for the service request procedure. The service request attempt counter shall not be incremented, if:

- 1) the service request procedure is initiated to establish an emergency PDU session;
- 2) the UE has an emergency PDU session established;
- 3) the UE is a UE configured for high priority access in selected PLMN; or
- 4) the service request is initiated in response to paging or notification from the network.

If the service request attempt counter is greater than or equal to 5, the UE shall start timer T3525. Additionally, if the service request was initiated for an MO MMTEL voice call, a notification that the service request was not accepted due to the UE having started timer T3525 shall be provided to the upper layers.

NOTE 1: This can result in the upper layers requesting implementation specific mechanisms, e.g. the MMTEL voice call being attempted to another IP-CAN, or establishment of a CS voice call (if supported and not already attempted in the CS domain).

The UE shall not attempt service request until expiry of timer T3525 unless:

- 1) the service request is initiated in response to paging or notification from the network;
- 2) the UE is a UE configured for high priority access in selected PLMN;
- 3) the service request is initiated to establish an emergency PDU session;
- 4) the UE has an emergency PDU session established; or
- 5) the UE is registered in a new PLMN.

NOTE 2: The NAS signalling connection can also be released if the UE deems that the network has failed the authentication check as specified in subclause 5.4.1.3.7.

9.1.7.1.3 Test description

9.1.7.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state 3N-A with UE test loop mode B active (T_delay_modeB = 5) according to TS 38.508-1 [4].

9.1.7.1.3.2 Test procedure sequence

Table 9.1.7.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|---|--|------------------|-----------------------|-----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC Cell A as the "Serving cell". | - | - | - | - |
| 2 | The SS transmits one IP Packet to the UE. | <-- | IP packet | - | - |
| 3 | The SS waits 1 second after the IP packet has been transmitted in step 2 and then transmits an RRCRelease message. (Note 1) | - | - | - | - |
| 4 | Check: Does UE transmit a SERVICE REQUEST message with Service type IE set to 'data'? (Note 2) | --> | SERVICE REQUEST | 1 | P |
| 5 | The SS transmits a SERVICE REJECT message with 5GMM cause = "Restricted service area". | <-- | SERVICE REJECT | - | - |
| 6-7 | Void | - | - | - | - |
| 7A | The SS releases the RRC connection.
Note: A Rel-15 UE might send a REGISTRATION REQUEST which shall be ignored by the SS and the the UE will start timer T3511. | | | | |
| 7B | Check: Does the UE transmit REGISTRATION REQUEST over a new signalling connection? | --> | REGISTRATION REQUEST | 2 | P |
| 8 | The SS sends a REGISTRATION ACCEPT message | <-- | REGISTRATION ACCEPT | - | - |
| 8A | The UE sends a REGISTRATION COMPLETE | --> | REGISTRATION COMPLETE | - | - |
| 8B | The SS releases the RRC connection | - | - | - | - |
| 8C | The UE transmits a SERVICE REQUEST message over a new signalling connection. | --> | SERVICE REQUEST | - | - |
| 8D | The SS does not respond to SERVICE REQUEST message.

Note: The UE locally releases the signalling connection after T3517 expiry. | - | - | - | - |
| - | EXCEPTION: Steps 9 to 10 are repeated for 4 times. | - | - | - | - |
| 9 | Check: Does the UE transmits a SERVICE REQUEST message after T3517 expiry but before 60s over a new signalling connection? | --> | SERVICE REQUEST | 3 | P |
| 10 | The SS does not respond to SERVICE REQUEST message.

Note: The UE locally releases the signalling connection after T3517 expiry. | - | - | - | - |
| 11 | Check: Does the UE transmits a SERVICE REQUEST message within 60 seconds (minimum value of T3525) over a new signalling connection? | --> | SERVICE REQUEST | 3,4 | F |
| <p>Note 1: The 1 second delay is used to secure that the UE have received and forwarded the IP Packet transmitted by the SS in step 2 to the UE test loop function before the RRCRelease message is sent by the SS in step 3.</p> <p>Note 2: Triggered when timer T_delay_modeB (IP PDU delay time) expires and pending uplink data exist in buffered PDCP SDUs according to TS 38.509 [6] clause 5.3.4.2.3 and TS 36.509 [8] clause 5.4.4.3.</p> | | | | | |

9.1.7.1.3.3 Specific message contents

Table 9.1.7.1.3.3-1: ACTIVATE TEST MODE (preamble)

| Derivation Path: TS 38.508-1 [4] | | | |
|----------------------------------|-----------------|---------------------|---------------------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 1 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 1 | UE test loop mode B | UE TEST LOOP MODE B |

Table 9.1.7.1.3.3-2: CLOSE UE TEST LOOP (preamble)

| Derivation Path: TS 38.508-1 [4] | | | |
|----------------------------------|-----------------|---------------------|---------------------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | 1 1 1 1 | | |
| Skip indicator | 0 0 0 0 | | |
| Message type | 1 0 0 0 0 0 0 0 | | |
| UE test loop mode | 0 0 0 0 0 0 0 1 | UE test loop mode B | UE TEST LOOP MODE B |
| UE test loop mode B LB setup | | | |
| IP PDU delay | 0 0 0 0 0 1 0 1 | 5 seconds | |

Table 9.1.7.1.3.3-3: SERVICE REQUEST (steps 4, 8B and 9, Table 9.1.7.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.1-16 | | | |
|---|--------------|--|---|
| Information Element | Value/remark | Comment | Condition |
| Service type | | | |
| Service type value | '0001'B | data | |
| Uplink data status | | Indicates data present for the PDU session with the DL IP packet looped back.

The other bits are not checked. | Not allowed to be sent in cleartext and shall only be included in the complete SERVICE REQUEST message in the NAS message container IE. |

Table 9.1.7.1.3.3-4: SERVICE REJECT (step 5, Table 9.1.7.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.1-18 | | | |
|---|--------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0001 1100'B | Restricted service area | |

Table 9.1.7.1.3.3-5: REGISTRATION REQUEST (step 7B, Table 9.1.7.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.1-6 | | | |
|--|--------------|--------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | '010'B | mobility registration updating | |

9.1.7.2 Service request / CONNECTED mode user data transport / Abnormal / T3517

9.1.7.2.1 Test Purpose (TP)

(1)

with { the UE is in 5GMM-REGISTERED state and 5GMM-CONNECTED mode over 3GPP access }

ensure that {

when { the UE has user data pending due to no user-plane resources established for PDU session(s) used for user data transport }

then { the UE sends a SERVICE REQUEST message }

}

(2)

with { the UE sends a SERVICE REQUEST message in 5GMM-CONNECTED mode }

ensure that {

when { T3517 expired }

then { the UE stays in 5GMM-CONNECTED mode }

}

9.1.7.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clauses 5.6.1.1, 5.6.1.2 and 5.6.1.7. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.6.1.1]

The purpose of the service request procedure is to change the 5GMM mode from 5GMM-IDLE to 5GMM-CONNECTED mode, and/or to request the establishment of user-plane resources for PDU sessions which are established without user-plane resources. In latter case, the 5GMM mode can be the 5GMM-IDLE mode or the 5GMM-CONNECTED mode if the UE requires to establish user-plane resources for PDU sessions.

NOTE 1: The lower layer indicates when the user-plane resources for PDU sessions are successfully established or released.

This procedure is used when:

...

- the UE has user data pending over 3GPP access and the UE is in 5GMM-IDLE or 5GMM-CONNECTED mode over 3GPP access;

The UE shall invoke the service request procedure when:

...

e) the UE, in 5GMM-CONNECTED mode or in 5GMM-CONNECTED mode with RRC inactive indication, has user data pending due to no user-plane resources established for PDU session(s) used for user data transport;

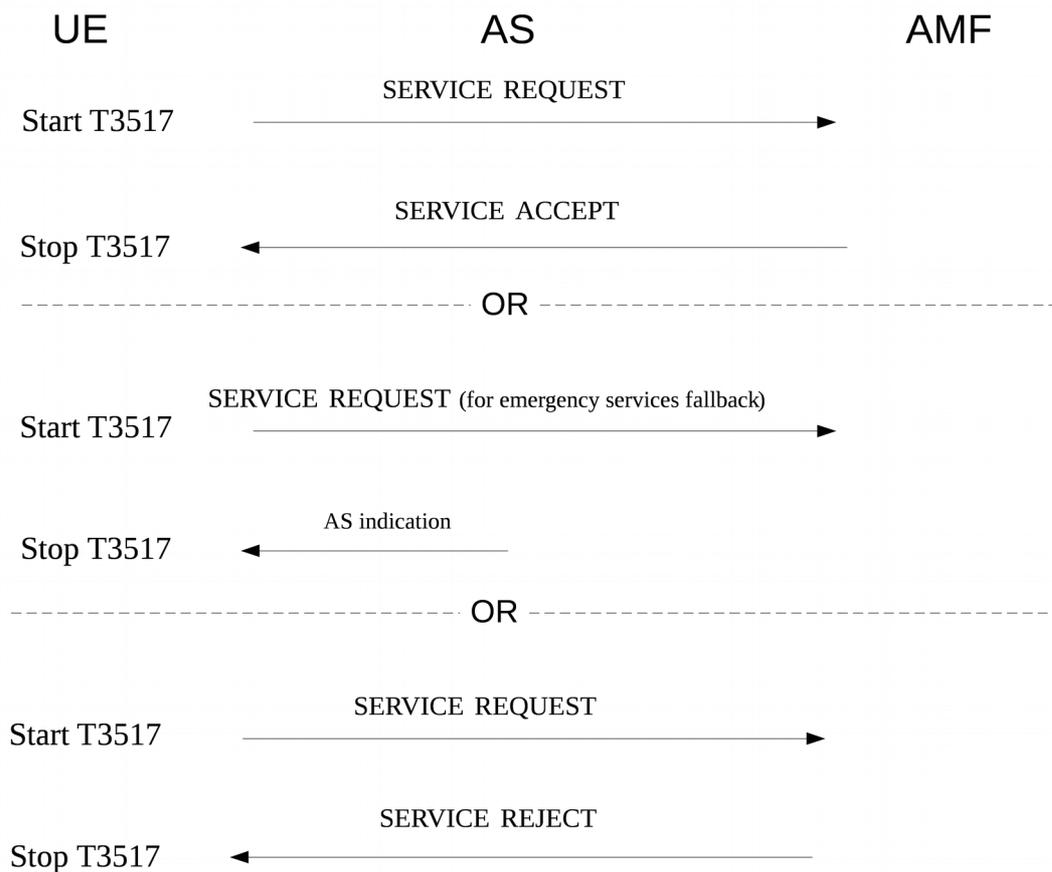


Figure 5.6.1.1.1: Service Request procedure

[TS 24.501, clause 5.6.1.2]

The UE initiates the service request procedure by sending a SERVICE REQUEST message to the AMF and starts timer T3517.

...

For cases d) and e) in subclause 5.6.1.1, the Uplink data status IE shall be included in the SERVICE REQUEST message to indicate the PDU session(s) the UE has pending user data to be sent. If the UE is not a UE configured for high priority access in selected PLMN:

- a) if there exists an emergency PDU session which is indicated in the Uplink data status IE the service type IE in the SERVICE REQUEST message shall be set to "emergency services"; or
- b) otherwise, the service type IE in the SERVICE REQUEST message shall be set to "data".

...

The Uplink data status IE may be included in the SERVICE REQUEST message to indicate which PDU session(s) associated with the access type the SERVICE REQUEST message is sent over have pending user data to be sent.

...

[TS 24.501, clause 5.6.1.7]

The following abnormal cases can be identified:

- a) T3517 expired.

The UE shall enter the state 5GMM-REGISTERED.

If the UE triggered the service request procedure in 5GMM-IDLE mode and the service type of the SERVICE REQUEST message was not set to "emergency services fallback", then the 5GMM sublayer shall increment the service request attempt counter, abort the procedure and release locally any resources allocated for the service request procedure. The service request attempt counter shall not be incremented, if:

- 1) the service request procedure is initiated to establish an emergency PDU session;
- 2) the UE has an emergency PDU session established;
- 3) the UE is a UE configured for high priority access in selected PLMN; or
- 4) the service request is initiated in response to paging or notification from the network.

If the service request attempt counter is greater than or equal to 5, the UE shall start timer T3525. Additionally, if the service request was initiated for an MO MMTEL voice call, a notification that the service request was not accepted due to the UE having started timer T3525 shall be provided to the upper layers.

NOTE 1: This can result in the upper layers requesting implementation specific mechanisms, e.g. the MMTEL voice call being attempted to another IP-CAN, or establishment of a CS voice call (if supported and not already attempted in the CS domain).

The UE shall not attempt service request until expiry of timer T3525 unless:

- 1) the service request is initiated in response to paging or notification from the network;
- 2) the UE is a UE configured for high priority access in selected PLMN;
- 3) the service request is initiated to establish an emergency PDU session;
- 4) the UE has an emergency PDU session established; or
- 5) the UE is registered in a new PLMN.

NOTE 2: The NAS signalling connection can also be released if the UE deems that the network has failed the authentication check as specified in subclause 5.4.1.3.7.

...

9.1.7.2.3 Test description

9.1.7.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A

UE:

- None.

Preamble:

- the UE is in 5GS state 3N-A with at least one PDU session active according to TS 38.508-1 [4], clause 4.4A.3 Table 4.4A.3-1. and using the message condition UE TEST LOOP MODE B active with IP PDU delay = 1 second according to TS 38.508-1 [4]. DRB 1 is defined as default DRB for the PDU session.

9.1.7.2.3.2 Test procedure sequence

Table 9.1.7.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|-----------|------------------|---------|----|---------|
| | | U – S | Message | | |
| | | | | | |

| | | | | | |
|---|---|-----|---|---|---|
| 1 | The SS transmits one IP PDU. | <-- | - | - | - |
| 2 | The SS transmits an <i>RRCReconfiguration</i> message to release User-plane resources for the PDU session. | <-- | NR RRC: <i>RRCReconfiguration</i> | - | - |
| 3 | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 4 | Check: Does the UE transmit a <i>SERVICE REQUEST</i> message? | --> | NR 5GMM: <i>SERVICE REQUEST</i> | 1 | P |
| 5 | The SS does not respond to the <i>SERVICE REQUEST</i> message. | - | - | - | - |
| 6 | Wait for T3517 seconds (Note 1). | - | - | - | - |
| 7 | The UE transmit a <i>SERVICE REQUEST</i> message. | --> | NR 5GMM: <i>SERVICE REQUEST</i> | - | - |
| 8 | The SS sends an IDENTITY REQUEST message. | <-- | NR 5GMM: IDENTITY REQUEST | - | - |
| 9 | Check: Does the UE transmit an IDENTITY RESPONSE message?. | --> | NR 5GMM: IDENTITY RESPONSE | 2 | P |
| 10 | The SS transmits an <i>RRCReconfiguration</i> message Piggybacked with <i>SERVICE ACCEPT</i> message to setup User-plane resources for the PDU session. | <-- | NR RRC: <i>RRCReconfiguration</i>
NR 5GMM: <i>SERVICE ACCEPT</i> | | |
| 11 | The UE transmits an <i>RRCReconfigurationComplete</i> message | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 12 | Void. | - | - | - | - |
| 13 | The UE loop back the IP PDU. | - | - | - | - |
| Note 1: T3517 expires after 15 seconds. | | | | | |

9.1.7.2.3.3 Specific message contents

Table 9.1.7.2.3.3-1: RRCReconfiguration (step 2, Table 9.1.7.2.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13 | | | |
|--|-------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.1.7.2.3.3-2: RadioBearerConfig (Table 9.1.7.2.3.3-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.3-132 | | | |
|---|--------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RadioBearerConfig ::= SEQUENCE { | | | |
| drb-ToReleaseList SEQUENCE { | | | |
| drb-Identity[1] | DRB configured in the preamble | | |
| } | | | |
| } | | | |

Table 9.1.7.2.3.3-3: SERVICE REQUEST (step 4, 7, Table 9.1.7.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-16 | | | |
|--|--------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Service type | '0001'B | data | |
| Uplink data status | | | |
| PSI(1) | '1'B | PSI(1) is set to 1 indicates that uplink data are pending for the corresponding PDU session identity. | |

Table 9.1.7.2.3.3-4: IDENTITY REQUEST (step 8, Table 9.1.7.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] table 4.7.1-21 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '0010'B | 5G-GUTI | |

Table 9.1.7.2.3.3-5: IDENTITY RESPONSE (step 9, Table 9.1.7.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] table 4.7.1-22 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Mobile identity | 5G-GUTI | | |

Table 9.1.7.2.3.3-6: RRCReconfiguration (step 10, Table 9.1.7.2.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-13 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCReconfiguration ::= SEQUENCE { | | | |

| | | | |
|-----------------------------------|--|---|--|
| criticalExtensions CHOICE { | | | |
| rrcReconfiguration ::= SEQUENCE { | | | |
| radioBearerConfig | RadioBearerConfig with conditions DRB configured in the preamble | | |
| nonCriticalExtension SEQUENCE { | | | |
| masterCellGroup | CellGroupConfig with condition DRB configured in the preamble | OCTET STRING (CONTAINING CellGroupConfig) | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 9.1.7.2.3.3-7: SERVICE ACCEPT (step 10, Table 9.1.7.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-17 | | | |
|--|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session reactivation result | | | |
| PSI(1) | '0'B | PSI(1) is set to 0 indicates that establishment of user-plane resource of the PDU session is successful. | |

9.1.8 SMS over NAS

9.1.8.1 SMS over NAS / MO and MT SMS over NAS - Idle mode

9.1.8.1.1 Test Purpose (TP)

(1)

with { the UE in switched off state with valid USIM inserted }

ensure that {

when { the UE requests initial registration for SMS over NAS }

then { the UE shall send REGISTRATION REQUEST message with SMS requested bit of the 5GS registration type IE "SMS over NAS supported" }

}

(2)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the UE initiates a periodic registration update and the requirements to use SMS over NAS transport have not changed in the UE }

then { the UE sets the SMS requested bit of the 5GS registration type IE in the REGISTRATION REQUEST message to the same value as indicated by the UE in the last REGISTRATION REQUEST message }

(3)

with { the UE in 5GMM_Connected state with NR RRC_IDLE mode and the UE has sent a SERVICE REQUEST message triggered by initiating MO SMS }

ensure that {

when { UE receives a SERVICE ACCEPT message from SS }

then { UE sends CP-DATA containing RP-DATA RPDU (SMS SUBMIT TPDU) encapsulated in an Uplink NAS transport message }

}

(4)

with { UE has sent CP-DATA containing an RP-DATA RPDU (SMS SUBMIT TPDU) encapsulated in an Uplink NAS transport message }

ensure that {

when { UE receives a CP-DATA containing an RP-ACK RPDU encapsulated in a Downlink NAS transport message }

then { UE sends a CP-ACK encapsulated in an Uplink NAS Transport message }

(5)

with { the UE in 5GMM-REGISTERED state with NR RRC_IDLE mode, UE has received a paging request and UE has completed a SERVICE REQUEST procedure }

ensure that {

when { UE receives a CP-DATA containing an RP-DATA RPDU (SMS DELIVER TPDU) encapsulated in a Downlink NAS transport message }

then { UE sends a CP-ACK encapsulated in an Uplink NAS transport message followed by a CP-DATA containing an RP-ACK RPDU encapsulated in an Uplink NAS transport message }

9.1.8.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 5.5.1.2.2, 5.5.1.2.4, 5.5.1.3.2, 5.5.1.3.4, 9.11.3.6 and 9.11.3.9A. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 5.5.1.2.2]

The UE in state 5GMM-DEREGISTERED shall initiate the registration procedure for initial registration by sending a REGISTRATION REQUEST message to the AMF,

- a) when the UE performs initial registration for 5GS services;
- b) when the UE performs initial registration for emergency services;
- c) when the UE performs initial registration for SMS over NAS; and
- d) when the UE moves from GERAN to NG-RAN coverage or the UE moves from a UTRAN to NG-RAN coverage.

...

The UE initiates the registration procedure for initial registration by sending a REGISTRATION REQUEST message to the AMF, starting timer T3510. If timer T3502 is currently running, the UE shall stop timer T3502. If timer T3511 is currently running, the UE shall stop timer T3511.

...

If the UE requests the use of SMS over NAS, the UE shall include the 5GS update type IE in the REGISTRATION REQUEST message with the SMS requested bit set to "SMS over NAS supported". When the 5GS update type IE is included in the REGISTRATION REQUEST for reasons other than requesting the use of SMS over NAS, and the UE does not need to register for SMS over NAS, the UE shall set the SMS requested bit of the 5GS update type IE to "SMS over NAS not supported" in the REGISTRATION REQUEST message.

[TS 24.501 clause 5.5.1.2.4]

If the initial registration request is accepted by the network, the AMF shall send a REGISTRATION ACCEPT message to the UE.

...

If the 5GS update type IE was included in the REGISTRATION REQUEST message with the SMS requested bit set to "SMS over NAS supported", and SMSF selection is successful, then the AMF shall send the REGISTRATION ACCEPT message after the SMSF has confirmed that the activation of the SMS service was successful. When sending the REGISTRATION ACCEPT message, the AMF shall:

- a) set the SMS allowed bit of the 5GS registration result IE to "SMS over NAS allowed" in the REGISTRATION ACCEPT message, if the UE has set the SMS requested bit of the 5GS registration type IE to "SMS over NAS supported" in the REGISTRATION REQUEST message and the network allows the use of SMS over NAS for the UE; and
- b) store the SMSF address and the value of the SMS allowed bit of the 5GS registration result IE in the UE 5GMM context and consider the UE available for SMS over NAS.

[TS 24.501 clause 5.5.1.3.2]

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic registration update by sending a REGISTRATION REQUEST message to the AMF,

- l) when the UE needs to register for SMS over NAS, indicate a change in the requirements to use SMS over NAS, or de-register from SMS over NAS;

...

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic update by sending a REGISTRATION REQUEST message to the AMF when the UE needs to request the use of SMS over NAS transport or the current requirements to use SMS over NAS transport change in the UE. The UE shall set the SMS requested bit of the 5GS update type IE in the REGISTRATION REQUEST message as specified in subclause 5.5.1.2.2.

When initiating a registration procedure for mobility and periodic registration update and the UE needs to send the 5GS update type IE for a reason different than indicating a change in requirement to use SMS over NAS, the UE shall set the SMS requested bit of the 5GS update type IE in the REGISTRATION REQUEST message to the same value as indicated by the UE in the last REGISTRATION REQUEST message.

If the UE no longer requires the use of SMS over NAS, then the UE shall include the 5GS update type IE in the REGISTRATION REQUEST message with the SMS requested bit set to "SMS over NAS not supported".

[TS 24.501 clause 5.5.1.3.4]

If the registration update request has been accepted by the network, the AMF shall send a REGISTRATION ACCEPT message to the UE.

...

If the 5GS update type IE was included in the REGISTRATION REQUEST message with the SMS requested bit set to "SMS over NAS not supported" and:

a) the SMSF address is stored in the UE 5GMM context and:

1) the UE is considered available for SMS over NAS; or

2) the UE is considered not available for SMS over NAS and the SMSF has confirmed that the activation of the SMS service is successful; or

b) the SMSF address is not stored in the UE 5GMM context, the SMSF selection is successful and the SMSF has confirmed that the activation of the SMS service is successful;

then the AMF shall set the SMS allowed bit of the 5GS registration result IE in the REGISTRATION ACCEPT message as specified in subclause 5.5.1.2.4. If the UE 5GMM context does not contain an SMSF address or the UE is not considered available for SMS over NAS, then the AMF shall:

a) store the SMSF address in the UE 5GMM context if not stored already; and

b) store the value of the SMS allowed bit of the 5GS registration result IE in the UE 5GMM context and consider the UE available for SMS over NAS.

If SMSF selection in the AMF or SMS activation via the SMSF is not successful, or the AMF does not allow the use of SMS over NAS, then the AMF shall set the SMS allowed bit of the 5GS registration result IE to "SMS over NAS not allowed" in the REGISTRATION ACCEPT message.

If the 5GS update type IE was included in the REGISTRATION REQUEST message with the SMS requested bit set to "SMS over NAS not supported", then the AMF shall:

a) mark the 5GMM context to indicate that the UE is not available for SMS over NAS; and

NOTE 2: The AMF can notify the SMSF that the UE is deregistered from SMS over NAS based on local configuration.

b) set the SMS allowed bit of the 5GS registration result IE to "SMS over NAS not supported" in the REGISTRATION ACCEPT message.

When the UE receives the REGISTRATION ACCEPT message, if the UE is also registered over another access to the same PLMN, the UE considers the value indicated by the SMS allowed bit of the 5GS registration result IE as applicable for both accesses over which the UE is registered.

[TS 24.501 clause 9.11.3.6]

The purpose of the 5GS registration result information element is to specify the result of a registration procedure.

The 5GS registration result information element is coded as shown in figure 9.11.3.6.1 and table 9.11.3.6.1.

The 5GS registration result is a type 4 information element with a length of 3 octets.

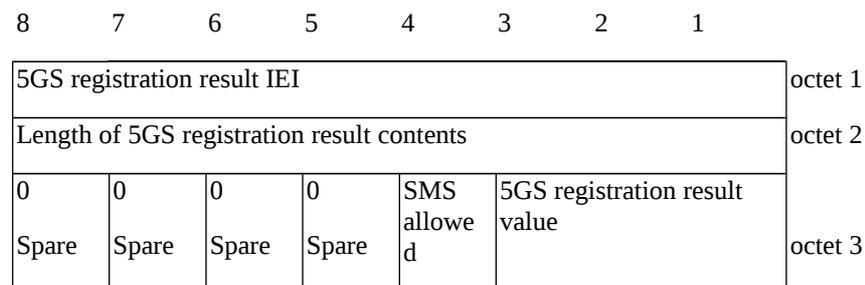


Figure 9.11.3.6.1: 5GS registration result information element

Table 9.11.3.6.1: 5GS registration result information element

| | | | |
|---|--------------------------|---|---------------------------------|
| 5GS registration result value (octet 3, bits 1 to 3) | | | |
| Bits | | | |
| 3 | 2 | 1 | |
| 0 | 0 | 1 | 3GPP access |
| 0 | 1 | 0 | Non-3GPP access |
| 0 | 1 | 1 | 3GPP access and non-3GPP access |
| 1 | 1 | 1 | reserved |
| All other values are unused and shall be treated as "3GPP access", if received by the UE. | | | |
| SMS over NAS transport allowed (SMS allowed) (octet 3, bit 4) | | | |
| Bit | | | |
| 4 | | | |
| 0 | SMS over NAS not allowed | | |
| 1 | SMS over NAS allowed | | |
| Bits 5 to 8 of octet 3 are spare and shall be coded as zero. | | | |

[TS 24.501 clause 9.11.3.9A]

The purpose of the 5GS update type IE is to allow the UE to provide additional information to the network when performing a registration procedure.

The 5GS update type information element is coded as shown in figure 9.11.3.9A.1 and table 9.11.3.9A.1.

The 5GS update type is a type 4 information element.

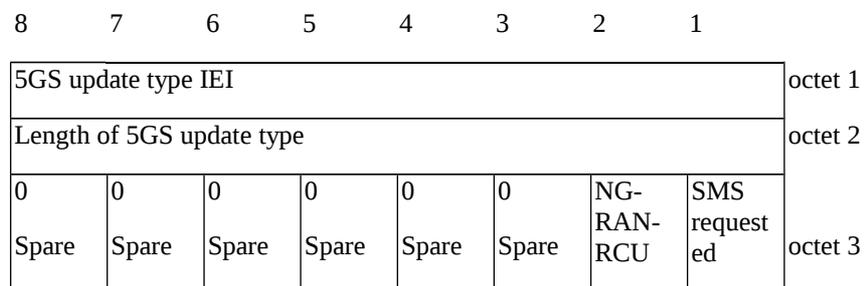


Figure 9.11.3.9A.1: 5GS update type information element

Table 9.11.3.9A.1: 5GS update type information element

| | |
|---|--|
| SMS over NAS transport requested (SMS requested) (octet 3, bit 1) | |
| Bit | |

| | |
|--|---|
| 1 | |
| 0 | SMS over NAS not supported |
| 1 | SMS over NAS supported |
| NG-RAN Radio Capability Update (NG-RAN-RCU) (octet 3, bit 2) | |
| Bits | |
| 2 | |
| 0 | NG-RAN radio capability update not needed |
| 1 | NG-RAN radio capability update needed |
| Bits 3 to 8 of octet 3 are spare and shall be coded as zero. | |

9.1.8.1.3 Test description

9.1.8.1.3.1 Pre-test conditions

System Simulator:

NGC Cell A belongs to Home PLMN and TAI1;

UE:

The UE does not have any stored SMS message.

Preamble:

The UE is in state Switched OFF (state-0A) according to TS 38.508-1 [4].

9.1.8.1.3.2 Test procedure sequence

Table 9.1.8.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|--------|--|------------------|----------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched ON | - | - | - | - |
| 2 - 4 | UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS 38.508-1 | - | - | - | - |
| 5 | Check: Does UE transmit a REGISTRATION REQUEST message including 5GS update type IE with SMS requested bit set to "SMS over NAS supported"? | --> | REGISTRATION REQUEST | 1 | P |
| 6 - 14 | Steps 5 to 13 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2, Table 4.5.2.2-2: NR RRC_IDLE are performed. | - | - | - | - |

| | | | | | |
|--------|--|-----|------------------------|---|---|
| 15 | SS transmits REGISTRATION ACCEPT message including 5GS registration result with SMS allowed bit set to "SMS over NAS allowed" and T3512 value set to 3 minutes. | <-- | REGISTRATION ACCEPT | | |
| 16 -21 | Steps 15 to 20 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2, Table 4.5.2.2-2: NR RRC_IDLE are performed. | - | - | - | - |
| 22 -24 | UE establishes RRC connection by executing steps 2-4 of Table 4.5.2.2-2 in TS38.508-1 | - | - | - | - |
| 25 | Check: Does UE perform periodic Registration (Based on T3512 value indicated in the REGISTRATION ACCEPT message with timer starting in step-15) including 5GS update type IE with SMS requested bit set to "SMS over NAS supported"? | --> | REGISTRATION REQUEST | 2 | P |
| 26 -34 | Steps 5 to 13 of the generic procedure for NR RRC_IDLE specified in TS 38.508-1 subclause 4.5.2, Table 4.5.2.2-2: NR RRC_IDLE are performed. | - | - | - | - |
| 35 | SS transmits REGISTRATION ACCEPT message including 5GS registration result with SMS allowed bit set to "SMS over NAS allowed" and T3512 value set to 3 minutes. | <-- | REGISTRATION ACCEPT | | |
| 36 | The SS transmits a <i>RRCRelease</i> message | - | - | - | - |
| 37 | Sending of a 160 character MO SMS is initiated at the UE via MMI or AT command | - | - | - | - |
| 38 | Check: Does the UE transmit a SERVICE REQUEST message? | --> | SERVICE REQUEST | | |
| 39 -42 | Steps 5 to 8 of the generic procedure for NR RRC_CONNECTED specified in TS 38.508-1 subclause 4.5.4, Table 4.5.4.2-3: NR RRC_CONNECTED are performed. | - | - | - | - |
| 43 | Check: Does the UE transmit a CP-DATA containing an RP-DATA RPDU (SMS SUBMIT TPDU) encapsulated in an Uplink NAS transport message? | --> | UPLINK NAS TRANSPORT | 3 | P |
| 44 | The SS transmits a CP-ACK encapsulated in a Downlink NAS Transport message. | <-- | DOWNLINK NAS TRANSPORT | - | - |
| 45 | The SS transmits a CP-DATA containing an RP-ACK RPDU encapsulated in a Downlink NAS transport message | <-- | DOWNLINK NAS TRANSPORT | - | - |
| 46 | Check: Does the UE transmit a CP-ACK encapsulated in an Uplink NAS Transport message? | --> | UPLINK NAS TRANSPORT | 4 | P |
| 47 | The SS transmits a <i>RRCRelease</i> message | - | - | - | - |
| 48 | The SS pages the UE using NG-5G-S-TMSI. | - | - | - | - |
| 49 | The UE transmits a SERVICE REQUEST | --> | SERVICE REQUEST | - | - |

| | | | | | |
|-------|---|-----|------------------------|---|---|
| | message. | | | | |
| 50-53 | Steps 5 to 8 of the generic procedure for NR RRC CONNECTED specified in TS 38.508-1 subclause 4.5.4, Table 4.5.4.2-3: NR RRC_CONNECTED are performed. | - | - | - | - |
| 54 | The SS transmits a CP-DATA containing a RP-DATA RPDU (SMS DELIVER TPDU) encapsulated in a Downlink NAS transport message to the UE. | <-- | DOWNLINK NAS TRANSPORT | - | - |
| 55 | Check: Does the UE transmit a CP-ACK encapsulated in an Uplink NAS transport message? | --> | UPLINK NAS TRANSPORT | 5 | P |
| 56 | Check: Does the UE transmit a CP-DATA containing a RP-ACK RPDU encapsulated in an Uplink NAS transport message? | --> | UPLINK NAS TRANSPORT | 5 | P |
| 57 | The SS transmits a CP-ACK encapsulated in a Downlink NAS transport message to the UE. | <-- | DOWNLINK NAS TRANSPORT | - | - |

9.1.8.1.3.3 Specific message contents

Table 9.1.8.1.3.3-1: REGISTRATION REQUEST (step 5, Table 9.1.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '001'B | | INITIAL |
| 5GS update type | | | |
| SMS requested | SMS over NAS supported | | |

Table 9.1.8.1.3.3-2: REGISTRATION ACCEPT (steps 15 and 35, Table 9.1.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|----------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result | | | |
| SMS allowed | SMS over NAS allowed | | |
| T3512 value | | | |
| Timer value | '00011'B | | |
| Unit | '101'B | | |

Table 9.1.8.1.3.3-3: REGISTRATION REQUEST (step 25, Table 9.1.8.1.3.2-1)

| | | | |
|--|--|--|--|
| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|--|--|--|

| Information Element | Value/remark | Comment | Condition |
|-----------------------------|------------------------|---------|-----------|
| 5GS registration type | | | |
| 5GS registration type value | '011'B | | PERIODIC |
| 5GS update type | | | |
| SMS requested | SMS over NAS supported | | |

Table 9.1.8.1.3.3-3A: SERVICE REQUEST (step 38, Table 9.1.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-16 | | | |
|---|--------------|------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Service type | | | |
| Service type value | '0000'B | signalling | |

Table 9.1.8.1.3.3-4: UL NAS TRANSPORT (step 43, Table 9.1.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-10 | | | |
|---|--------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-DATA | RP-DATA RPDU | |

Table 9.1.8.1.3.3-5: DL NAS TRANSPORT (step 44, Table 9.1.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-11 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-ACK | | |

Table 9.1.8.1.3.3-6: DL NAS TRANSPORT (step 45, Table 9.1.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-11 | | | |
|---|--------------|-------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-DATA | RP-ACK RPDU | |

Table 9.1.8.1.3.3-7: UL NAS TRANSPORT (step 46, Table 9.1.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-10 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|------------------------|---------|-----|--|
| Payload container type | '0010'B | SMS | |
| Payload container | CP-ACK | | |

Table 9.1.8.1.3.3-8: DL NAS TRANSPORT (step 54, Table 9.1.8.1.3.2-1)

| | | | |
|---|--------------|---------|-----------|
| Derivation Path: 38.508-1 [4], Table 4.7.1-11 | | | |
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-DATA | RP-DATA | |

Table 9.1.8.1.3.3-9: UL NAS TRANSPORT (step 55, Table 9.1.8.1.3.2-1)

| | | | |
|---|--------------|---------|-----------|
| Derivation Path: 38.508-1 [4], Table 4.7.1-10 | | | |
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-ACK | | |

Table 9.1.8.1.3.3-10: UL NAS TRANSPORT (step 56, Table 9.1.8.1.3.2-1)

| | | | |
|---|--------------|---------|-----------|
| Derivation Path: 38.508-1 [4], Table 4.7.1-10 | | | |
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-DATA | RP-ACK | |

Table 9.1.8.1.3.3-11: DL NAS TRANSPORT (step 57, Table 9.1.8.1.3.2-1)

| | | | |
|---|--------------|---------|-----------|
| Derivation Path: 38.508-1 [4], Table 4.7.1-11 | | | |
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-ACK | | |

9.2 5GS Non-3GPP Access Mobility Management

9.2.1 Primary authentication and key agreement procedure

9.2.1.1 EAP based primary authentication and key agreement

9.2.1.1.1 Test Purpose (TP)

Same TP's as clause 9.2.1.1.1

9.2.1.1.2 Conformance requirements

Same Conformance requirements as in clause 9.2.1.1.2.

9.2.1.1.3 Test description

9.2.1.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- None.

Preamble:

- The UE is in state Switched OFF (state 0W-B) according to TS 38.508-1 [4].

9.2.1.1.3.2 Test procedure sequence

Table 9.2.1.1.3.2-1: Main behaviour

| | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|-------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | Switch the UE on | - | - | - | - |
| 2-4 | The UE initiates establishment of an IPsec tunnel and registration procedure by executing steps 1-3 of Table 4.5.2.2-3 in TS 38.508-1 [4]. | - | - | - | - |
| 5 | SS transmits an AUTHENTICATION REQUEST message with an EAP-Request/AKA'-Identity message. | <-- | 5GMM: AUTHENTICATION REQUEST | | |
| 6 | Check: Does the UE respond with an AUTHENTICATION RESPONSE message, with an EAP-Response/AKA'-Identity message? | --> | 5GMM: AUTHENTICATION RESPONSE | 1 | P |
| 7 | SS transmits an AUTHENTICATION REQUEST message with an EAP-Request/AKA'-challenge message which contains a not correct sequence number. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 8 | Check: Does the UE respond with an AUTHENTICATION RESPONSE message, with an EAP-Response/AKA'-synchronization-failure? | --> | 5GMM: AUTHENTICATION RESPONSE | 2 | P |
| 9 | SS transmits a correct AUTHENTICATION REQUEST message with an EAP-Request/AKA'-challenge message. | <-- | 5GMM: AUTHENTICATION REQUEST | - | - |
| 10 | Check: Does the UE respond with a correct AUTHENTICATION RESPONSE message, with an EAP-Request/AKA'-challenge | --> | 5GMM: AUTHENTICATION RESPONSE | 3 | P |

| | | | | | |
|-------|--|-----|-----------------------------|---|---|
| | message? | | | | |
| 11 | SS transmits an AUTHENTICATION RESULT message with an EAP-success message. | <-- | 5GMM: AUTHENTICATION RESULT | - | - |
| 12-16 | The registration procedure is performed by executing steps 6-10 of Table 4.5.2.2-3 in TS 38.508-1 [4]. | - | - | - | - |
| 17 | Check: Does the UE transmits a REGISTRATION COMPLETE message? | --> | 5GMM: REGISTRATION COMPLETE | 4 | P |

9.2.1.1.3.3 Specific message contents

Table 9.2.1.1.3.3-1: Message AUTHENTICATION REQUEST (step 5, Table 9.2.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-1 | | | |
|---|---------------------------|---------|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-request/AKA'-Identity | | EAP-AKA |

Table 9.2.1.1.3.3-2: Message AUTHENTICATION RESPONSE (step 6, Table 9.2.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-2 | | | |
|---|----------------------------|---------|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-response/AKA'-Identity | | EAP-AKA |

Table 9.2.1.1.3.3-3: Message AUTHENTICATION REQUEST (step 7, Table 9.2.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-1 | | | |
|---|----------------------------|--|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-request/AKA'-challenge | The sequence number in AUTN is not correct | EAP-AKA |

Table 9.2.1.1.3.3-4: Message AUTHENTICATION RESPONSE (step 8, Table 9.2.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-2 | | | |
|---|---|---------|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-response/AKA'-synchronization-failure | | EAP-AKA |

Table 9.2.1.1.3.3-5: Message AUTHENTICATION RESPONSE (step 10, Table 9.2.1.1.3.2-1)

| | | | |
|---|--|--|--|
| Derivation path: TS 38.508-1 [4], table 4.7.1-2 | | | |
|---|--|--|--|

| Information Element | Value/Remark | Comment | Condition |
|---------------------|-----------------------------|---|----------------|
| EAP message | EAP-Response/AKA'-Challenge | RES* equal to the XRES* calculated in the SS with the parameters provided/indicated in the AUTHENTICATION REQUEST | EAP-AKA |

Table 9.2.1.1.3.3-6: Message AUTHENTICATION RESULT (step 11, Table 9.2.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-3 | | | |
|---|--------------|---------|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-Success | | EAP-AKA |

9.2.1.2 5G AKA based primary authentication and key agreement

9.2.1.2.1 Test Purpose (TP)

Same Test purpose as in clause 9.2.1.2.1

9.2.1.2.2 Conformance requirements

Same Conformance requirements as in clause 9.2.1.2.2

9.2.1.2.3 Test description

9.2.1.2.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- None.

Preamble:

- The UE is in state Switched OFF (state 0W-B) according to TS 38.508-1 [4].

9.2.1.2.3.2 Test procedure sequence

Table 9.2.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | Switch the UE on | - | - | - | - |
| 2-4 | The UE initiates establishment of an IPsec tunnel and registration procedure by executing steps 1-3 of Table 4.5.2.2-3 in TS | - | - | - | - |

| | | | | | |
|-------|---|-----|-------------------------|---|---|
| | 38.508-1 [4]. | | | | |
| 5 | The SS transmits an AUTHENTICATION REQUEST message which contains an invalid MAC code. | <-- | AUTHENTICATION REQUEST | - | - |
| 6 | Check: Does the UE respond with an AUTHENTICATION FAILURE message with 5GMM cause "MAC failure"? | --> | AUTHENTICATION FAILURE | 1 | P |
| 7 | SS transmits a correct AUTHENTICATION REQUEST message with RAND different to the one send in Step 5 | <-- | AUTHENTICATION REQUEST | - | - |
| 8 | Check: Does the UE respond with a correct AUTHENTICATION RESPONSE message with RES* that is equal to the XRES* calculated in the SS? | --> | AUTHENTICATION RESPONSE | 4 | P |
| 9 | SS transmits a NAS SECURITY MODE COMMAND message including the ngKSI of the new 5G NAS security context (as provided in step 7), to proceed with the registration procedure. | <-- | SECURITY MODE COMMAND | - | - |
| 10 | Check: Does the UE respond with NAS SECURITY MODE COMPLETE message integrity protected and ciphered with the new 5G NAS security context identified by the ngKSI received in the SECURITY MODE COMMAND message in step 9. | --> | SECURITY MODE COMPLETE | 5 | P |
| 11 | Steps 10 of the generic procedure (TS 38.508-1 Table 4.5.2.2-3 [4]) are executed to successfully complete the registration procedure. | - | - | - | - |
| 12 | Switch off procedure in Ipcsec_SA_Established specified in TS 38.508-1 [4] subclause 4.9.6.5 is performed. | - | - | - | - |
| 13-16 | Steps 1-4 above are repeated | - | - | - | - |
| 17 | SS transmits an AUTHENTICATION REQUEST message with "separation bit" in the AMF field is 0. | <-- | AUTHENTICATION REQUEST | - | - |
| 18 | Check: Does the UE respond with an AUTHENTICATION FAILURE message, with 5GMM cause " Non-5G authentication unacceptable "? | --> | AUTHENTICATION FAILURE | 2 | P |
| 19 | SS transmits a correct AUTHENTICATION REQUEST message with RAND different to the one send in Step 22 | <-- | AUTHENTICATION REQUEST | - | - |
| 20 | Check: Does the UE respond with a correct AUTHENTICATION RESPONSE message with RES* that is equal to the XRES* calculated in the SS? | --> | AUTHENTICATION RESPONSE | 4 | P |
| 21 | Step 10 of the generic procedure (TS 38.508-1 Table 4.5.2.2-3 [4]) are executed to successfully complete the registration procedure. | - | - | - | - |

| | | | | | |
|-------|--|-----|-------------------------|---|---|
| 22 | Switch off procedure in Ipcsec_SA_Established specified in TS 38.508-1 [4] subclause 4.9.6.5 is performed. | - | - | - | - |
| 23-26 | Steps 1-4 above are repeated | - | - | - | - |
| 27 | SS transmits AUTHENTICATION REQUEST message with the AMF field in the IE "Authentication parameter AUTN" set to "AMF _{RESYNCH} " value to trigger SQN re-synchronisation procedure in test USIM | <-- | AUTHENTICATION REQUEST | - | - |
| 28 | Check: Does the UE respond with an AUTHENTICATION FAILURE message, with 5GMM cause "Synch failure" and Authentication failure parameter? | --> | AUTHENTICATION FAILURE | 3 | P |
| 29 | SS transmits a correct AUTHENTICATION REQUEST message with RAND different to the one send in Step 32. | <-- | AUTHENTICATION REQUEST | - | - |
| 30 | Check: Does the UE respond with a correct AUTHENTICATION RESPONSE message with RES* that is equal to the XRES* calculated in the SS? | --> | AUTHENTICATION RESPONSE | 4 | P |
| 31 | Step 10 of the generic procedure (TS 38.508-1 Table 4.5.2.2-3 [4]) are executed to successfully complete the registration procedure. | - | - | - | - |

9.2.1.2.3.3 Specific message contents

Table 9.2.1.2.3.3-1: AUTHENTICATION RESPONSE (step 8, step 20 and step 30 , Table 9.2.1.2.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-2 | | | |
|--|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Authentication response parameter | RES* equal to the XRES* calculated in the SS with the parameters provided/indicated in the AUTHENTICATION REQUEST | | |

Table 9.2.1.2.3.3-2: AUTHENTICATION REQUEST (step 5, Table 9.2.1.2.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-1 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Authentication parameter AUTN | Invalid MAC | SS shall calculate the correct MAC value as specified in TS 33.102 and use any different value, e.g. correct_MAC+5. | |

Table 9.2.1.2.3.3-3: AUTHENTICATION FAILURE (step 6, Table 9.2.1.2.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-4 | | | |
|--|--------------|-------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0001 0100'B | MAC failure | |

Table 9.2.1.2.3.3-4: AUTHENTICATION REQUEST (step 17, Table 9.2.1.2.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-1 | | | |
|--|--------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Authentication parameter AUTN | "separation bit"=0 | The "separation bit" in the AMF field of AUTN supplied by the core network is 0. | |

Table 9.2.1.2.3.3-5: AUTHENTICATION FAILURE (step 18, Table 9.2.1.2.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-4 | | | |
|--|--------------|------------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0001 1010'B | Non-5G authentication unacceptable | |

Table 9.2.1.2.3.3-6: AUTHENTICATION REQUEST (step 27, Table 9.2.1.2.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-1 | | | |
|--|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Authentication parameter AUTN | AMF field set to "AMF _{RESYNCH} ",

AMF _{RESYNCH} = '1111 1111 1111 1111'B | AMF _{RESYNCH} see TS 34.108, 8.1.2.2 | |

Table 9.2.1.2.3.3-7: AUTHENTICATION FAILURE (step 28, Table 9.2.1.2.3.2-1)

| Derivation Path: 38.508, Table 4.7.1-4 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0001 0101'B | Synch failure | |
| Authentication failure parameter | AUTS | AUTS see TS 34.108, 8.1.2.2 | |

9.2.2 Security Mode Control

9.2.2.1 NAS security mode command

9.2.2.1.1 Test Purpose (TP)

(1)

with { the UE is in 5GMM-REGISTERED-INITIATED state and the SS initiates the NAS security mode control procedure by sending a SECURITY MODE COMMAND message during initial registration procedure }

ensure that {

when { the UE receives an integrity protected SECURITY MODE COMMAND message including not matching replayed security capabilities }

then { the UE send a SECURITY MODE REJECT message and does not start applying the NAS security in both UL and DL }

}

(2)

with { the UE is in 5GMM-REGISTERED-INITIATED state and the SS initiates the NAS security mode control procedure by sending a SECURITY MODE COMMAND message during initial registration procedure }

ensure that {

when { the UE receives an integrity protected SECURITY MODE COMMAND message including IMEISV request }

then { the UE send an integrity protected and ciphered SECURITY MODE COMPLETE message including IMEISV and starts applying the NAS Security in both UL and DL }

}

9.2.2.1.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 24.501, clauses 5.4.2.1, 5.4.2.3 and 5.4.2.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.4.2.1]

The purpose of the NAS security mode control procedure is to take a 5G NAS security context into use, and initialise and start NAS signalling security between the UE and the AMF with the corresponding 5G NAS keys and 5G NAS security algorithms.

Furthermore, the network may also initiate the security mode control procedure in the following cases:

- a)- in order to change the 5G NAS security algorithms for a current 5G NAS security context already in use; and
- b) in order to change the value of uplink NAS COUNT used in the latest SECURITY MODE COMPLETE message as described in 3GPP TS 33.501 [24], subclause 6.9.4.4.

For restrictions concerning the concurrent running of a security mode control procedure with other security related procedures in the AS or inside the core network see 3GPP TS 33.501 [24], subclause 6.9.5.

[TS 24.501, clause 5.4.2.3]

Upon receipt of the SECURITY MODE COMMAND message, the UE shall check whether the security mode command can be accepted or not. This is done by performing the integrity check of the message, by checking that the

Replayed S1 UE security capabilities IE is included if the Selected EPS NAS security algorithms IE is included in the message, and by checking that the received replayed UE security capabilities have not been altered compared to the latest values that the UE sent to the network.

When the SECURITY MODE COMMAND message includes an EAP-success message the UE handles the EAP-success message and the ABBA as described in subclause 5.4.1.2.2.8.

If the UE is registered for emergency services, performing initial registration for emergency services or establishing an emergency PDU session and the SECURITY MODE COMMAND message is received with ngKSI value "000" and 5G-IA0 and 5G-EA0 as selected 5G NAS security algorithms, the UE shall locally derive and take in use 5G NAS security context. The UE shall delete existing current 5G NAS security context.

The UE shall accept a SECURITY MODE COMMAND message indicating the "null integrity protection algorithm" 5G-EA0 as the selected 5G NAS integrity algorithm only if the message is received when the UE is registered for emergency services, performing initial registration for emergency services or establishing an emergency PDU session.

If the type of security context flag included in the SECURITY MODE COMMAND message is set to "native security context" and if the ngKSI matches a valid non-current native 5G NAS security context held in the UE while the UE has a mapped 5G NAS security context as the current 5G NAS security context, the UE shall take the non-current native 5G NAS security context into use which then becomes the current native 5G NAS security context and delete the mapped 5G NAS security context.

If the SECURITY MODE COMMAND message can be accepted, the UE shall take the 5G NAS security context indicated in the message into use. The UE shall in addition reset the uplink NAS COUNT counter if:

- a) the SECURITY MODE COMMAND message is received in order to take a 5G NAS security context into use created after a successful execution of the 5G AKA based primary authentication and key agreement procedure or the EAP based primary authentication and key agreement procedure; or
- b) the SECURITY MODE COMMAND message received includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE the ngKSI does not match the current 5G NAS security context, if it is a mapped 5G NAS security context.

If the SECURITY MODE COMMAND message can be accepted and a new 5G NAS security context is taken into use and SECURITY MODE COMMAND message does not indicate the "null integrity protection algorithm" 5G-IA0 as the selected NAS integrity algorithm, the UE shall:

- if the SECURITY MODE COMMAND message has been successfully integrity checked using an estimated downlink NAS COUNT equal to 0, then the UE shall set the downlink NAS COUNT of this new 5G NAS security context to 0;
- otherwise the UE shall set the downlink NAS COUNT of this new 5G NAS security context to the downlink NAS COUNT that has been used for the successful integrity checking of the SECURITY MODE COMMAND message.

If the SECURITY MODE COMMAND message includes the horizontal derivation parameter indicating "K_{AMF} derivation is required", the UE shall derive a new K'_{AMF}, as specified in 3GPP TS 33.501 [24] for K_{AMF} to K'_{AMF} derivation in mobility, and set both uplink and downlink NAS COUNTs to zero.

If the SECURITY MODE COMMAND message can be accepted, the UE shall send a SECURITY MODE COMPLETE message integrity protected with the selected 5GS integrity algorithm and the 5G NAS integrity key based on the K_{AMF} or mapped K'_{AMF} if the type of security context flag is set to "mapped security context" indicated by the ngKSI. When the SECURITY MODE COMMAND message includes the type of security context flag set to "mapped security context" in the NAS key set identifier IE, then the UE shall check whether the SECURITY MODE COMMAND message indicates the ngKSI of the current 5GS security context, if it is a mapped 5G NAS security context, in order not to re-generate the K'_{AMF}.

Furthermore, if the SECURITY MODE COMMAND message can be accepted, the UE shall cipher the SECURITY MODE COMPLETE message with the selected 5GS ciphering algorithm and the 5GS NAS ciphering key based on the K_{AMF} or mapped K'_{AMF} indicated by the ngKSI. The UE shall set the security header type of the message to "integrity protected and ciphered with new 5G NAS security context".

From this time onward the UE shall cipher and integrity protect all NAS signalling messages with the selected 5GS integrity and ciphering algorithms.

If the AMF indicated in the SECURITY MODE COMMAND message that the IMEISV is requested, the UE shall include its IMEISV in the SECURITY MODE COMPLETE message.

If, during an ongoing registration procedure or service request procedure, the SECURITY MODE COMMAND message includes the Additional 5G security information IE with the RINMR bit set to "Retransmission of the initial NAS message requested", the UE shall include the entire uncyphered REGISTRATION REQUEST message or SERVICE REQUEST message, which the UE had previously included in the NAS message container IE of the initial NAS message (i.e. REGISTRATION REQUEST message or SERVICE REQUEST message, respectively), in the NAS message container IE of the SECURITY MODE COMPLETE message.

If, prior to receiving the SECURITY MODE COMMAND message, the UE without a valid 5GS NAS security context had sent a REGISTRATION REQUEST message the UE shall include the entire REGISTRATION REQUEST message in the NAS message container IE of the SECURITY MODE COMPLETE message as described in subclause 4.4.6.

If the UE operating in the single-registration mode receives the Selected EPS NAS security algorithms IE, the UE shall use the IE according to 3GPP TS 33.501 [24].

For a UE operating in single-registration mode with N26 interface supported in the network, after an inter-system change from S1 mode to N1 mode in 5GMM-CONNECTED mode, the UE shall set the value of the Selected EPS NAS security algorithms IE in the 5G NAS security context to the NAS security algorithms that were received from the source MME when the UE was in S1 mode.

[TS 24.501, clause 5.4.2.5]

If the security mode command cannot be accepted, the UE shall send a SECURITY MODE REJECT message. The SECURITY MODE REJECT message contains a 5GMM cause that typically indicates one of the following cause values:

- #23 UE security capabilities mismatch.
- #24 security mode rejected, unspecified.

If the UE detects that the network included the Selected EPS NAS security algorithms IE in the SECURITY MODE COMMAND message without including a Replayed S1 UE security capabilities IE, or that the received replayed UE security capabilities have been altered compared to the latest values that the UE sent to the network, the UE shall set the cause value to #23 "UE security capabilities mismatch".

Upon receipt of the SECURITY MODE REJECT message, the AMF shall stop timer T3560. The AMF shall also abort the ongoing procedure that triggered the initiation of the NAS security mode control procedure.

Both the UE and the AMF shall apply the 5G NAS security context in use before the initiation of the security mode control procedure, if any, to protect the SECURITY MODE REJECT message and any other subsequent messages according to the rules in subclause 4.4.4 and 4.4.5.

9.2.2.1.3 Test description

9.2.2.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- None.

Preamble:

- The UE is in state Switched OFF (state 0W-B) according to TS 38.508-1 [4].

9.2.2.1.3.2 Test procedure sequence

Table 9.2.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|---|---|------------------|------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-6 | Steps 1-5 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-3 are performed. | - | - | - | - |
| 7 | The SS transmits a SECURITY MODE COMMAND message to activate NAS security. It is integrity protected and includes unmatched replayed security capabilities. | <-- | SECURITY MODE COMMAND | - | - |
| 8 | Check: Does the UE transmit a SECURITY MODE REJECT message with cause'#23: UE security capabilities mismatch'? | --> | SECURITY MODE REJECT | 1 | P |
| 9 | The SS transmits an IDENTITY REQUEST message (Security not applied). | <-- | IDENTITY REQUEST | - | - |
| 10 | Check: Does the UE transmit a non-security protected IDENTITY RESPONSE message? | --> | IDENTITY RESPONSE | 1 | P |
| 11 | The SS transmits a SECURITY MODE COMMAND message to activate NAS security. It is integrity protected and includes IMEISV. | <-- | SECURITY MODE COMMAND | - | - |
| 12 | Check: Does the UE transmit a SECURITY MODE COMPLETE message and does it establish the initial security configuration? | --> | SECURITY MODE COMPLETE | 2 | P |
| 13-15 | Steps 8-10 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-3 are performed. | - | - | - | - |
| 16 | The SS transmits an IDENTITY REQUEST message (Security protected as per the algorithms specified in step 11). | <- | IDENTITY REQUEST | - | - |
| 17 | Check: Does the UE transmit an IDENTITY RESPONSE message (Security Protected as per the algorithms specified in step 11)? | -> | IDENTITY RESPONSE | 2 | P |
| Note 1: The UE establishes an IPsec tunnel in parallel to 5GC registration steps 4 to 12 as per the IKEv2 protocol as defined in 3GPP TS 23.502 [31] clause 4.12.2.2 figure 4.12.2.2-1. | | | | | |

9.2.2.1.3.3 Specific message contents

Table 9.2.2.1.3.3-1: SECURITY MODE COMMAND (Step 7, Table 9.2.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-25 | | | |
|--|--|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Replayed UE security capabilities | Set to mismatch the security capability of UE under test | | |

Table 9.2.2.1.3.3-2: SECURITY MODE REJECT (Step 8, Table 9.2.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-27 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GMM cause | #23 | | |

Table 9.2.2.1.3.3-3: IDENTITY REQUEST (Step 9, Table 9.2.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-21 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Identity type | '0001'B | SUCI | |

Table 9.2.2.1.3.3-4: IDENTITY RESPONSE (Step 10, Table 9.2.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-22 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Mobile identity | | | |
| Type of identity | '001'B | SUCI | |

Table 9.2.2.1.3.3-5: SECURITY MODE COMMAND (Step 11, Table 9.2.2.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-25 | | | |
|---|--|------------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Selected NAS security algorithms | | | |
| Type of ciphering algorithm | Set according to PIXIT parameter for default ciphering algorithm if it is set to a value different to 5G-EA0, or, set to any value different to 5G-EA0 otherwise | Non-zero ciphering algorithm | |
| IMEISV request | Present | | |

Table 9.2.2.1.3.3-6: SECURITY MODE COMPLETE (Step 12, Table 9.2.2.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-26 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| IMEISV | Present | | |

Table 9.2.2.1.3.3-7: IDENTITY REQUEST (Step 16, Table 9.2.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-21 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |

| | | | |
|---------------|---------|------|--|
| | | | |
| Identity type | '0011'B | IMEI | |

Table 9.2.2.1.3.3-8: IDENTITY RESPONSE (Step 17, Table 9.2.2.1.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-22 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Mobile identity | | | |
| Type of identity | '011'B | IMEI | |

9.2.2.2 Protection of initial NAS signalling messages

9.2.2.2.1 Test Purpose (TP)

Same Test purpose as in clause 9.1.2.2.1

9.2.2.2.2 Conformance requirements

Same conformance requirements as in clause 9.1.2.2.2

9.2.2.2.3 Test description

9.2.2.2.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27.

UE:

- None.

Preamble:

- The UE is in state 0W-B on WLAN Cell 27 according to TS 38.508-1 [4].
- The UE does not have a valid 5G NAS security context.

9.2.2.2.3.2 Test procedure sequence

Table 9.2.2.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-3 | Steps 1-2 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-3 are performed. | - | - | - | - |
| - | Exception: The UE establishes an IPsec tunnel in parallel to 5GC registration steps 4 | - | - | - | - |

| | | | | | |
|------|---|-----|-------------------------|---|---|
| | to 8 as per the IKEv2 protocol as defined in 3GPP TS 23.502 [31] clause 4.12.2.2 figure 4.12.2.2-1. | | | | |
| 4 | The UE transmits a REGISTRATION REQUEST message. | --> | REGISTRATION REQUEST | 1 | P |
| 5 | The SS transmits a <i>DLInformationTransfer</i> message and a AUTHENTICATION REQUEST message. | <-- | AUTHENTICATION REQUEST | - | - |
| 6 | The UE transmits an <i>ULInformationTransfer</i> message and a AUTHENTICATION RESPONSE message. | --> | AUTHENTICATION RESPONSE | - | - |
| 7 | The SS transmits a <i>DLInformationTransfer</i> message and a SECURITY MODE COMMAND message. | <-- | SECURITY MODE COMMAND | | |
| 8 | The UE transmits an <i>ULInformationTransfer</i> message and a SECURITY MODE COMPLETE message. | --> | SECURITY MODE COMPLETE | 2 | P |
| 9-11 | Steps 8-10 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-3 are performed. | - | - | - | - |

9.2.2.2.3.3 Specific message contents

Table 9.2.2.2.3.3-1: REGISTRATION REQUEST (Step 4, Table 9.2.2.2.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-6 using condition NON_CLEARTEXT_IE | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |

Table 9.2.2.2.3.3-2: SECURITY MODE COMPLETE (Step 8, Table 9.2.2.2.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-26 | | | |
|--|---------------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| NAS message container | Contents of Table 9.2.2.2.3.3-3 | | |

Table 9.2.2.2.3.3-3: REGISTRATION REQUEST (Step 8, Table 9.2.2.2.3.2-1)

| Derivation path: 38.508-1 [4],table 4.7.1-6 using condition CIPHERED_MESSAGE | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |

9.2.3 Identification

9.2.4 Generic UE configuration

9.2.4.1 Generic UE configuration update

9.2.4.1.1 Test Purpose (TP)

(1)

with { UE in 5GMM-REGISTERED state }

ensure that {

when { UE receives a new 5G-GUTI in the CONFIGURATION UPDATE COMMAND message and acknowledgement from the UE is requested }

then { UE sends a CONFIGURATION UPDATE COMPLETE message and UE shall consider new 5G-GUTI as valid }

}

(2)

with { UE in 5GMM-REGISTERED state }

ensure that {

when { UE receives a NITZ information in the CONFIGURATION UPDATE COMMAND message and acknowledgement from the UE is not requested }

then { UE updates NITZ information }

}

(3)

with { UE in 5GMM-REGISTERED state }

ensure that {

when { UE receives CONFIGURATION UPDATE COMMAND message indicating “registration requested” and contains no other parameters }

then { UE deletes any stored allowed NSSAI for this PLMN and then release the existing N1 NAS signalling connection, starts a mobility registration procedure }

}

(4)

with { UE in 5GMM-REGISTERED state }

ensure that {

when { UE receives a new allowed NSSAI in the CONFIGURATION UPDATE COMMAND message and registration is not requested }

```
then { UE replaces any stored allowed NSSAI for this PLMN with new allowed NSSAI }  
}
```

9.2.4.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 4.6.2.2, 5.4.4.1, 5.4.4.2 and 5.4.4.3. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 4.6.2.2]

If available, the configured NSSAI(s) shall be stored in a non-volatile memory in the ME as specified in annex C.

...

If the UE receives the CONFIGURATION UPDATE COMMAND message indicating "registration requested" and contains no other parameters (see subclauses 5.4.4.2 and 5.4.4.3), the UE shall delete any stored allowed NSSAI for this PLMN, and delete any stored mapping of each S-NSSAI of the allowed NSSAI to the S-NSSAI(s) of the HPLMN, if available;

...

d) When the UE receives the Network slicing indication IE with the Network slicing subscription change indication set to "Network slicing subscription changed" in the REGISTRATION ACCEPT message or in the CONFIGURATION UPDATE COMMAND message, the UE shall delete the network slicing information for each of the PLMNs that the UE has slicing information stored for (excluding the current PLMN). The UE shall not delete the default configured NSSAI. Additionally, the UE shall update the network slicing information for the current PLMN (if received) as specified above in bullets a), b) and c):

[TS 24.501 clause 5.4.4.1]

The purpose of this procedure is to:

- a) allow the AMF to update the UE configuration for access and mobility management-related parameters decided and provided by the AMF by providing new parameter information within the command; or
- b) request the UE to perform a registration procedure for mobility and periodic registration update towards the network to update access and mobility management-related parameters decided and provided by the AMF (see subclause 5.5.1.3).

This procedure is initiated by the network and can only be used when the UE has an established 5GMM context, and the UE is in 5GMM-CONNECTED mode. When the UE is in 5GMM-IDLE mode, the AMF may use the paging or notification procedure to initiate the generic UE configuration update procedure. The AMF can request a confirmation response in order to ensure that the parameter has been updated by the UE.

This procedure shall be initiated by the network to assign a new 5G-GUTI to the UE after a successful service request procedure invoked as a response to a paging request from the network and before the release of the N1 NAS signalling connection. If the service request procedure was triggered due to 5GSM downlink signalling pending, the procedure for assigning a new 5G-GUTI can be initiated by the network after the transport of the 5GSM downlink signalling.

The following parameters are supported by the generic UE configuration update procedure without the need to request the UE to perform the registration procedure for mobility and periodic registration update:

- a) 5G-GUTI;
- b) TAI list;
- c) Service area list;
- d) Network identity and time zone information (Full name for network, short name for network, local time zone, universal time and local time zone, network daylight saving time);
- e) LADN information;

- f) Rejected NSSAI;
- g) Network slicing indication;
- h) Operator-defined access category definitions; and
- i) SMS indication.

The following parameters can be sent to the UE with or without a request to perform the registration procedure for mobility and periodic registration update:

- a) Allowed NSSAI; or
- b) Configured NSSAI.

The following parameter is sent to the UE with a request to perform the registration procedure for mobility and periodic registration update:

- a) MICO indication.

The following parameters are sent over 3GPP access only:

- a) LADN information;
- b) MICO indication;
- c) TAI list; and
- d) Service area list.

The following parameters are managed and sent per access type i.e., independently over 3GPP access or non 3GPP access:

- a) Allowed NSSAI; and
- b) Rejected NSSAI (when the NSSAI is rejected for the current registration area).

The following parameters are managed commonly and sent over 3GPP access or non 3GPP access:

- a) 5G-GUTI;
- b) Network identity and time zone information;
- c) Rejected NSSAI (when the NSSAI is rejected for the current PLMN);
- d) Configured NSSAI; and
- e) SMS indication.

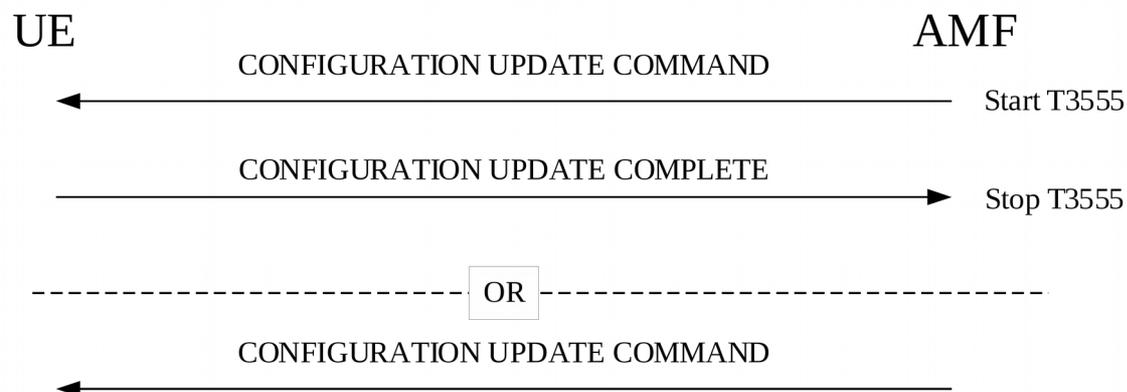


Figure 5.4.4.1.1: Generic UE configuration update procedure

[TS 24.501 clause 5.4.4.2]

The AMF shall initiate the generic UE configuration update procedure by sending the CONFIGURATION UPDATE COMMAND message to the UE.

The AMF shall in the CONFIGURATION UPDATE COMMAND message either:

- a) include one or more of the following parameters: 5G-GUTI, TAI list, allowed NSSAI that may include the mapped S-NSSAI(s), LADN information, service area list, MICO indication NITZ information, configured NSSAI that may include the mapped S-NSSAI(s), rejected NSSAI, network slicing indication, operator-defined access category definitions or SMS indication;
- b) include the Configuration update indication IE with the Registration requested bit set to "registration requested"; or
- c) include a combination of both a) and b).

If an acknowledgement from the UE is requested, the AMF shall indicate "acknowledgement requested" in the Acknowledgement bit of the Configuration update indication IE in the CONFIGURATION UPDATE COMMAND message and shall start timer T3555. Acknowledgement shall be requested for all parameters except when only NITZ is included.

To initiate parameter re-negotiation between the UE and network, the AMF shall indicate "registration requested" in the Registration requested bit of the Configuration update indication IE in the CONFIGURATION UPDATE COMMAND message.

If a new allowed NSSAI information or AMF re-configuration of supported S-NSSAIs requires an AMF relocation, the AMF shall indicate "registration requested" in the Registration requested bit of the Configuration update indication IE and include the Allowed NSSAI IE in the CONFIGURATION UPDATE COMMAND message.

If the AMF includes a new configured NSSAI in the CONFIGURATION UPDATE COMMAND message and the new configured NSSAI requires an AMF relocation as specified in 3GPP TS 23.501 [8], the AMF shall indicate "registration requested" in the Registration requested bit of the Configuration update indication IE in the message.

If the AMF indicates "registration requested" in the Registration requested bit of the Configuration update indication IE, acknowledgement shall be requested.

If changes to the allowed NSSAI require the UE to initiate a registration procedure, but the AMF is unable to determine an allowed NSSAI for the UE as specified in 3GPP TS 23.501 [8], the CONFIGURATION UPDATE COMMAND message shall indicate "registration requested" in the Registration requested bit of the Configuration update indication IE, and shall not contain any other parameters.

If the AMF needs to update the LADN information, the AMF shall include the LADN information in the LADN information IE of the CONFIGURATION UPDATE COMMAND message.

During an established 5GMM context, the network may send none, one, or more CONFIGURATION UPDATE COMMAND messages to the UE. If more than one CONFIGURATION UPDATE COMMAND message is sent, the messages need not have the same content.

[TS 24.501 clause 5.4.4.3]

Upon receiving the CONFIGURATION UPDATE COMMAND message, the UE shall stop timer T3346 if running and use the contents to update appropriate information stored within the UE.

If "acknowledgement requested" is indicated in the Acknowledgement bit of the Configuration update indication IE in the CONFIGURATION UPDATE COMMAND message, the UE shall send a CONFIGURATION UPDATE COMPLETE message.

If the UE receives a new 5G-GUTI in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new 5G-GUTI as valid, the old 5G-GUTI as invalid, stop timer T3519 if running, and delete any stored SUCI; otherwise, the UE shall consider the old 5G-GUTI as valid. The UE shall provide the 5G-GUTI to the lower layer of 3GPP access if the CONFIGURATION UPDATE COMMAND message is sent over the non-3GPP access, and the UE is in 5GMM-REGISTERED in both 3GPP access and non-3GPP access in the same PLMN.

If the UE receives a new TAI list in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new TAI list as valid and the old TAI list as invalid; otherwise, the UE shall consider the old TAI list as valid.

If the UE receives a new service area list in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new service area list as valid and the old service area list as invalid; otherwise, the UE shall consider the old service area list, if any, as valid.

If the UE receives new NITZ information in the CONFIGURATION UPDATE COMMAND message, the UE considers the new NITZ information as valid and the old NITZ information as invalid; otherwise, the UE shall consider the old NITZ information as valid.

If the UE receives a LADN information IE in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the old LADN information as invalid and the new LADN information as valid, if any; otherwise, the UE shall consider the old LADN information as valid.

If the UE receives a new allowed NSSAI for the associated access type in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new allowed NSSAI as valid for the associated access type, store the allowed NSSAI for the associated access type as specified in subclause 4.6.2.2 and consider the old allowed NSSAI for the associated access type as invalid; otherwise, the UE shall consider the old Allowed NSSAI as valid for the associated access type.

If the UE receives a new configured NSSAI in the CONFIGURATION UPDATE COMMAND message, the UE shall consider the new configured NSSAI for the registered PLMN as valid and the old configured NSSAI for the registered PLMN as invalid; otherwise, the UE shall consider the old configured NSSAI for the registered PLMN as valid. The UE shall store the new configured NSSAI as specified in subclause 4.6.2.2.

If the UE receives the Network slicing indication IE in the CONFIGURATION UPDATE COMMAND message with the Network slicing subscription change indication set to "Network slicing subscription changed", the UE shall delete the network slicing information for each and every PLMN except for the current PLMN as specified in subclause 4.6.2.2.

If the UE receives Operator-defined access category definitions IE in the CONFIGURATION UPDATE COMMAND message and the Operator-defined access category definitions IE contains one or more operator-defined access category definitions, the UE shall delete any operator-defined access category definitions stored for the RPLMN and shall store the received operator-defined access category definitions for the RPLMN. If the UE receives the Operator-defined access category definitions IE in the CONFIGURATION UPDATE COMMAND message and the Operator-defined access category definitions IE contains no operator-defined access category definitions, the UE shall delete any operator-defined access category definitions stored for the RPLMN. If the CONFIGURATION UPDATE COMMAND message does not contain the Operator-defined access category definitions IE, the UE shall not delete the operator-defined access category definitions stored for the RPLMN.

If the UE receives the SMS indication IE in the CONFIGURATION UPDATE COMMAND message with the SMS availability indication set to:

- a) "SMS over NAS not available", the UE shall consider that SMS over NAS transport is not allowed by the network; and
- b) "SMS over NAS available", the UE may request the use of SMS over NAS transport by performing a registration procedure for mobility and periodic registration update as specified in subclause 5.5.1.3, after the completion of the generic UE configuration update procedure.

If the CONFIGURATION UPDATE COMMAND message indicates "registration requested" in the Registration requested bit of the Configuration update indication IE and:

- a) contains no other parameters or contains at least one of the following parameters: a new allowed NSSAI, a new configured NSSAI or the Network slicing subscription change indication, and:
 - 1) an emergency PDU session exists, the UE shall, after the completion of the generic UE configuration update procedure and the release of the emergency PDU session, release the existing N1 NAS signalling connection, and start a registration procedure for mobility and periodic registration update as specified in subclause 5.5.1.3; or
 - 2) no emergency PDU Session exists, the UE shall, after the completion of the generic UE configuration update procedure and the release of the existing N1 NAS signalling connection, start a registration procedure for mobility and periodic registration update as specified in subclause 5.5.1.3; or

b) an MICO indication is included without a new allowed NSSAI or a new configured NSSAI, the UE shall, after the completion of the generic UE configuration update procedure, start a registration procedure for mobility and registration update as specified in subclause 5.5.1.3 to re-negotiate MICO mode with the network.

The UE receiving the rejected NSSAI in the CONFIGURATION UPDATE COMMAND message takes the following actions based on the rejection cause in the rejected NSSAI:

"S-NSSAI not available in the current PLMN"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current PLMN until switching off the UE or the UICC containing the USIM is removed.

"S-NSSAI not available in the current registration area"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current registration area as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current registration area until switching off the UE, the UE moving out of the current registration area or the UICC containing the USIM is removed.

9.2.4.1.3 Test description

9.2.4.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- None.

Preamble:

- The UE is in state 3W-A on WLAN Cell 27 according to 38.508-1[4].

9.2.4.1.3.2 Test procedure sequence

Table 9.2.4.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|-------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a CONFIGURATION UPDATE COMMAND message including a new 5G-GUTI. | <-- | CONFIGURATION UPDATE COMMAND | - | - |
| 2 | Check: Does UE transmit a CONFIGURATION UPDATE COMPLETE message? | --> | CONFIGURATION UPDATE COMPLETE | 1 | P |
| 3 | The SS transmits an IDENTITY REQUEST requesting 5G-GUTI in the IE identity type | <-- | IDENTITY REQUEST | - | - |
| 4 | Check : Does the UE respond with an IDENTITY RESPONSE message with including the new 5G-GUTI assigned in step 1 in the 5GS mobile identity IE ? | --> | IDENTITY RESPONSE | 1 | P |
| 5 | The SS transmits a CONFIGURATION UPDATE COMMAND message including NITZ information. | <-- | CONFIGURATION UPDATE COMMAND | - | - |

| | | | | | |
|-------|--|-----|-------------------------------|---|---|
| 6 | Check: Does the UE transmit a CONFIGURATION UPDATE COMPLETE message within the expiry of T3555? | --> | CONFIGURATION UPDATE COMPLETE | 2 | F |
| 7 | Check: Using MMI/AT command verify the NITZ update on the UE. | - | - | 2 | P |
| 8 | Switch off procedure in Ipsec_SA_Established specified in TS 38.508-1 [4] subclause 4.9.6.5 is performed. | - | - | - | - |
| 9 | The UE is switched On. | - | - | - | - |
| 10-16 | Steps 1 to 7 of the generic procedure for WLAN Ipsec_SA_Released specified in TS 38.508-1 [4] subclause 4.5.2 are performed. | - | - | - | - |
| 17 | The SS transmits a REGISTRATION ACCEPT message including Configured NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 18 | The SS transmits a CONFIGURATION UPDATE COMMAND message including registration requested IE. | <-- | CONFIGURATION UPDATE COMMAND | - | - |
| 19 | The UE transmits a CONFIGURATION UPDATE COMPLETE message. | --> | CONFIGURATION UPDATE COMPLETE | - | - |
| 20 | Check: Does UE transmit a REGISTRATION REQUEST message with registration type value set to "Mobility" and including the Requested NSSAI? | --> | REGISTRATION REQUEST | 3 | P |
| 21-25 | Steps 3 to 7 of the generic procedure for WLAN Ipsec_SA_Released specified in TS 38.508-1 [4] subclause 4.5.2 are performed. | - | - | - | - |
| 26 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 27 | The UE transmits a REGISTRATION COMPLETE message. | - | REGISTRATION COMPLETE | - | - |
| 28 | Check: Using MMI/AT command (+C5GNSSAIRDP) verify the update of allowed NSSAI. | - | - | 3 | P |
| 29 | The SS transmits a CONFIGURATION UPDATE COMMAND message including a new allowed NSSAI list. | <-- | CONFIGURATION UPDATE COMMAND | - | - |
| 30 | The UE transmits a CONFIGURATION UPDATE COMPLETE message. | --> | CONFIGURATION UPDATE COMPLETE | - | - |
| 31 | Check: Using MMI/AT command (+C5GNSSAIRDP) verify the update of allowed NSSAI. | - | - | 4 | P |

9.2.4.1.3.3 Specific message contents

Table 9.2.4.1.3.3-1: CONFIGURATION UPDATE COMMAND (step 1, Table 9.2.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|---------------------------------|------------------------------|---------------------------------|--|
| | | | |
| Configuration update indication | 0001 | Acknowledgement (ACK) requested | |
| 5G-GUTI | Other than the default value | | |

Table 9.2.4.1.3.3-2: IDENTITY REQUEST (step 3 Table 9.2.4.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-21 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '010'B | 5G-GUTI | |

Table 9.2.4.1.3.3-3: IDENTITY RESPONSE (step 4 Table 9.2.4.1.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-22 | | | |
|--|----------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| mobile identity IE | 5G-GUTI assigned in step 1 | 5G-GUTI | |

Table 9.2.4.1.3.3-4: CONFIGURATION UPDATE COMMAND (step 5, Table 9.2.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Full name for network | Present | | |
| Universal time and local time zone | Present | | |

Table 9.2.4.1.3.3-5: REGISTRATION ACCEPT (step 17, Table 9.2.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '010'B | Non-3GPP access | |
| Configured NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 3 | |

| | | | |
|----------------------------|-------------|-----|--|
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 3 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.2.4.1.3.3-6: CONFIGURATION UPDATE COMMAND (step 18, Table 9.2.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|--------------|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Configuration update indication | 0010 | Registration requested | |

Table 9.2.4.1.3.3-7: REGISTRATION REQUEST (step 33, Table 9.2.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '010'B | | MOBILITY |
| Requested NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 3 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000011'B | 3 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.2.4.1.3.3-8: REGISTRATION ACCEPT (step 20, Table 9.2.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '010'B | Non-3GPP access | |

| | | | |
|----------------------------|-------------|-----------------|--|
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 3 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000011'B | 3 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.2.4.1.3.3-9: CONFIGURATION UPDATE COMMAND (step 30, Table 9.2.4.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-19 | | | |
|---|--------------|---------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Configuration update indication | 0001 | Acknowledgement (ACK) requested | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '00000001'B | SST | |

| | | | |
|-----------------------|-------------|---|--|
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

9.2.5 Registration

9.2.5.1 Initial Registration

9.2.5.1.1 Initial registration / Success / 5G-GUTI reallocation, Last visited TAI

9.2.5.1.1.1 Test Purpose (TP)

(1)

with { the UE has no valid 5G-GUTI but available SUCI and switched off }

ensure that {

when { the UE is switched on }

then { the UE sends a REGISTRATION REQUEST message including the SUCI in the 5GS mobile identity IE }

}

(2)

with { the UE is 5GMM-REGISTERED state with assigned 5G-GUTI and last visited registered TAI and switched off }

ensure that {

when { the UE is switched on }

then { the UE sends a REGISTRATION REQUEST message including the 5G-GUTI assigned previously in the 5GS mobile identity IE and the last visited registered TAI }

}

9.2.5.1.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clauses 5.5.1.2.2 and 5.5.1.2.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.2.2]

The UE initiates the registration procedure for initial registration by sending a REGISTRATION REQUEST message to the AMF, starting timer T3510. If timer T3502 is currently running, the UE shall stop timer T3502. If timer T3511 is currently running, the UE shall stop timer T3511.

During initial registration the UE handles the 5GS mobile identity IE in the following order:

...

- b) if the UE holds a valid 5G-GUTI that was previously assigned, over 3GPP access or non-3GPP access, by the same PLMN with which the UE is performing the registration, the UE shall indicate the 5G-GUTI in the 5GS mobile identity IE;
- c) if the UE holds a valid 5G-GUTI that was previously assigned, over 3GPP access or non-3GPP access, by an equivalent PLMN, the UE shall indicate the 5G-GUTI in the 5GS mobile identity IE;
- d) if the UE holds a valid 5G-GUTI that was previously assigned, over 3GPP access or non-3GPP, by any other PLMN, the UE shall indicate the 5G-GUTI in the 5GS mobile identity IE;
- e) if a SUCI is available the UE shall include the SUCI in the 5GS mobile identity IE; and

If the SUCI is included in the 5GS mobile identity IE and the timer T3519 is not running, the UE shall start timer T3519 and store the value of the SUCI sent in the REGISTRATION REQUEST message. The UE shall include the stored SUCI in the REGISTRATION REQUEST message while timer T3519 is running.

...

If the last visited registered TAI is available, the UE shall include the last visited registered TAI in the REGISTRATION REQUEST message.

[TS 24.501, clause 5.5.1.2.4]

The 5G-GUTI reallocation shall be part of the initial registration procedure. During the initial registration procedure, if the AMF has not allocated a new 5G-GUTI by the generic UE configuration update procedure, the AMF shall include in the REGISTRATION ACCEPT message the new assigned 5G-GUTI together with the assigned TAI list.

9.2.5.1.1.3 Test description

9.2.5.1.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- None.

Preamble:

- The UE is in state Switched OFF (state 0W-B) according to TS 38.508-1 [4].

9.2.5.1.1.3.2 Test procedure sequence

Table 9.2.5.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|---------------------|----|---------|
| | | U – S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| 2-8 | UE establishes an IPSEC SA and trigger 5GMM Registration procedure by executing steps 1 to 7 of Table 4.5.2.2-3 in TS38.508-1 [4]. | - | - | - | - |
| 9 | SS transmits an REGISTRATION REJECT message with the 5GMM cause IE setting as “Illegal ME”.

NOTE1: 5G-GUTI-1 should be deleted, then | <-- | REGISTRATION REJECT | - | - |

| | | | | | |
|-------|---|---|---|-----|---|
| | UE has no valid 5G-GUTI but available SUCI now. | | | | |
| 10 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| 11 | If possible (see ICS) switch off is performed or the USIM is removed.

Otherwise the power is removed. | - | - | - | - |
| 12 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| 13-23 | Steps 1-11 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed | - | - | 1 | P |
| 24 | If possible (see ICS) switch off is performed or the USIM is removed.

Otherwise the power is removed. | - | - | - | - |
| 25 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| 26-35 | Steps 1-11 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed | - | - | 2,3 | P |

9.2.5.1.1.3.3 Specific message contents

Table 9.2.5.1.1.3.3-1: Message REGISTRATION REJECT (step 9, Table 9.2.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-9 | | | |
|---|--------------|------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GMM cause | '0000 0011'B | Illegal UE | |

Table 9.2.5.1.1.3.3-2: Message REGISTRATION REQUEST (step 15, Table 9.2.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | '0000 0001'B | Initial registration | |
| 5GS mobile identity | SUCI | The SUCI of UE | |

Table 9.2.5.1.1.3.3-3: Message REGISTRATION ACCEPT (step 21, Table 9.2.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-7 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5G-GUTI | 5G-GUTI-2 | | |

Table 9.2.5.1.1.3.3-4: Message REGISTRATION REQUEST (step 34, Table9.2.5.1.1.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| 5GS registration type | '0000 0001'B | Initial registration | |
| 5GS mobile identity | 5G-GUTI-2 | | |
| Last visited registered TAI | TAI-1 | N3GPP TAI | |

9.2.5.1.2 Initial registration / 5GS services / NSSAI handling

9.2.5.1.2.1 Test Purpose (TP)

(1)

with { UE has sent a REGISTRATION REQUEST message including requested NSSAI }

ensure that {

when { UE receives REGISTRATION ACCEPT message with allowed NSSAI }

then { UE shall replace any stored allowed NSSAI for the current PLMN with new allowed NSSAI for the current PLMN }

}

(2)

with { UE has sent a REGISTRATION REQUEST message including Requested NSSAI }

ensure that {

when { UE receives REGISTRATION ACCEPT message with Rejected NSSAI with reject cause “S-NSSAI not available in the current PLMN” }

then { UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN and not attempt to use the Rejected NSSAI in the current PLMN until switching off the UE or the UICC containing the USIM is removed }

}

(3)

with { UE receives REGISTRATION ACCEPT message with Rejected NSSAI with reject cause “S-NSSAI not available in the current PLMN” }

ensure that {

when { UE has been switched off, then switched on }

then { UE shall delete the stored Rejected NSAAI and shall send the NSSAI in Requested NSSAI IE of the REGISTRATION REQUEST message as per the configured and Allowed NSSAI for current PLMN }

}

(4)

with { UE has sent a REGISTRATION REQUEST message including Requested NSSAI }

ensure that {

when { UE receives REGISTRATION ACCEPT message with Rejected NSSAI with reject cause "S-NSSAI not available in the current registration area" }

then { UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN and registration area combination and not attempt to use the Rejected NSSAI in the current registration area until switching off the UE, the UE moving out of the current registration area or the UICC containing the USIM is removed }

}

9.2.5.1.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 5.5.1.2.2 and 5.5.1.2.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 5.5.1.2.2]

5.5.1.2.1 General

This procedure can be used by a UE for initial registration for 5GS services.

...

The UE shall include the requested NSSAI containing the S-NSSAI(s) corresponding to the slice(s) to which the UE wants to register and shall include the mapping of the requested NSSAI which is the mapping of each S-NSSAI of the requested NSSAI to the S-NSSAI(s) of the HPLMN, if available, in the REGISTRATION REQUEST message. If the UE has allowed NSSAI or configured NSSAI for the current PLMN, the requested NSSAI shall be either:

- a) the configured NSSAI for the current PLMN, or a subset thereof as described below, if the UE has no allowed NSSAI for the current PLMN;
- b) the allowed NSSAI for the current PLMN, or a subset thereof as described below, if the UE has an allowed NSSAI for the current PLMN; or
- c) the allowed NSSAI for the current PLMN, or a subset thereof as described below, plus one or more S-NSSAIs from the configured NSSAI for which no corresponding S-NSSAI is present in the allowed NSSAI and those are neither in the rejected NSSAI for the current PLMN nor in the rejected NSSAI for the current PLMN and registration area combination.

If the UE has neither allowed NSSAI for the current PLMN nor configured NSSAI for the current PLMN and has a default configured NSSAI, the UE shall:

- a) include the S-NSSAI(s) in the Requested NSSAI IE of the REGISTRATION REQUEST message using the default configured NSSAI; and
- b) include the Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI" in the REGISTRATION REQUEST message.

If the UE has no allowed NSSAI for the current PLMN, no configured NSSAI for the current PLMN, and no default configured NSSAI, the UE shall not include a requested NSSAI in the REGISTRATION message.

The subset of configured NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the configured NSSAI applicable to the current PLMN, if the S-NSSAI is neither in the rejected NSSAI for the current PLMN nor in the rejected NSSAI for the current PLMN and registration area combination.

The subset of allowed NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the allowed NSSAI for the current PLMN.

NOTE 3: How the UE selects the subset of configured NSSAI or allowed NSSAI to be provided in the requested NSSAI is implementation.

NOTE 4: The number of S-NSSAI(s) included in the requested NSSAI cannot exceed eight.

[TS 24.501 clause 5.5.1.2.4]

The AMF shall include the allowed NSSAI for the current PLMN and shall include the mapping of each S-NSSAI of the allowed NSSAI to the S-NSSAI(s) of the HPLMN contained in the requested NSSAI from the UE if available, in the REGISTRATION ACCEPT message if the UE included the requested NSSAI in the REGISTRATION REQUEST message and the AMF allows one or more S-NSSAIs in the requested NSSAI. The AMF may also include rejected NSSAI in the REGISTRATION ACCEPT message. Rejected NSSAI contains S-NSSAI(s) which was included in the requested NSSAI but rejected by the network associated with rejection cause(s).

The AMF may include a new configured NSSAI for the current PLMN in the REGISTRATION ACCEPT message if:

- a) the REGISTRATION REQUEST message did not include the requested NSSAI;
- b) the REGISTRATION REQUEST message included the requested NSSAI containing an S-NSSAI that is not valid in the serving PLMN; or
- c) the REGISTRATION REQUEST message included the Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI".

If a new configured NSSAI for the current PLMN is included in the REGISTRATION ACCEPT message, the AMF shall also include the mapping of the configured NSSAI for the current PLMN the S-NSSAI(s) of the HPLMN if available in the REGISTRATION ACCEPT message. In this case the AMF shall start timer T3550 and enter state 5GMM-COMMON-PROCEDURE-INITIATED as described in subclause 5.1.3.2.3.3.

The AMF shall include the Network slicing indication IE with the Network slicing subscription change indication set to "Network slicing subscription changed" in the REGISTRATION ACCEPT message if the UDM has indicated that the subscription data for network slicing has changed. In this case the AMF shall start timer T3550 and enter state 5GMM-COMMON-PROCEDURE-INITIATED as described in subclause 5.1.3.2.3.3.

The UE receiving the rejected NSSAI in the REGISTRATION ACCEPT message takes the following actions based on the rejection cause in the rejected NSSAI:

"S-NSSAI not available in the current PLMN"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current PLMN until switching off the UE or the UICC containing the USIM is removed.

"S-NSSAI not available in the current registration area"

The UE shall add the rejected S-NSSAI(s) in the rejected NSSAI for the current PLMN and registration area combination as specified in subclause 4.6.2.2 and not attempt to use this S-NSSAI in the current registration area until switching off the UE, the UE moving out of the current registration area or the UICC containing the USIM is removed.

If the UE did not include the requested NSSAI in the REGISTRATION REQUEST message or none of the requested NSSAI are present in the subscribed S-NSSAIs, and one or more subscribed S-NSSAIs (containing one or more S-NSSAIs each of which may be associated with a new S-NSSAI) marked as default are available, the AMF shall put the subscribed S-NSSAIs marked as default in the allowed NSSAI of the REGISTRATION ACCEPT message. The AMF shall determine a registration area such that all S-NSSAIs of the allowed NSSAI are available in the registration area.

9.2.5.1.2.3 Test description

9.2.5.1.2.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- UE is previously registered on WLAN Cell 27 using default message contents according to TS 38.508-1 [4];
- Empty URSP Configuration.

Preamble:

- The UE is in state Switched OFF (state 0W-B) according to TS 38.508-1 [4].

9.2.5.1.2.3.2 Test procedure sequence

Table 9.2.5.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-------|---|------------------|----------------------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched on. | - | - | - | - |
| - | Exception: The UE establishes an IPsec tunnel in parallel to 5GC registration steps 2 to 6 as per the IKEv2 protocol as defined in 3GPP TS 23.502 [33] clause 4.12.2.2 figure 4.12.2.2-1. | - | - | - | - |
| 2 | Check: Does UE transmit a REGISTRATION REQUEST message? | --> | REGISTRATION REQUEST | - | - |
| 3-6 | Steps 4 to 7 of the generic procedure for WLAN Ipsec_SA_Released specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 7 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI and Configured NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 8 | Step 10 of the generic procedure for WLAN Ipsec_SA_Released specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 9 | Switch off procedure in WLAN Ipsec_SA_Established specified in TS 38.508-1 subclause 4.9.6.5 is performed. | - | - | - | - |
| 10 | The UE is brought back to operation or the USIM is inserted. | - | - | - | - |
| - | Exception: The UE establishes an IPsec tunnel in parallel to 5GC registration steps 11 to 25 as per the IKEv2 protocol as defined in 3GPP TS 23.502 [33] clause 4.12.2.2 figure 4.12.2.2-1. | - | - | - | - |
| 11 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 1 | P |
| 12-15 | Steps 4 to 7 of the generic procedure for WLAN Ipsec_SA_Released specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 16 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI | <-- | REGISTRATION ACCEPT | - | - |

| | | | | | |
|-------|---|-----|-----------------------|---|---|
| | and Rejected NSSAI. | | | | |
| 17 | Step 10 of the generic procedure for WLAN Ipcsec_SA_Released specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 18 | Switch off procedure in WLAN Ipcsec_SA_Established specified in TS 38.508-1 subclause 4.9.6.5 is performed. | - | - | - | - |
| - | Exception: The UE establishes an IPsec tunnel in parallel to 5GC registration steps 19 to 23 as per the IKEv2 protocol as defined in 3GPP TS 23.502 [33] clause 4.12.2.2 figure 4.12.2.2-1. | - | - | - | - |
| 19 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 2 | P |
| 20-23 | Steps 4 to 7 of the generic procedure for WLAN Ipcsec_SA_Released specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 24 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 25 | The UE transmits a REGISTRATION COMPLETE message. | --> | REGISTRATION COMPLETE | - | - |
| 26 | Step 10 of the generic procedure for WLAN Ipcsec_SA_Released specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 27 | Check: Is S-NSSAI=2 in the Rejected NSSAI list with cause "S-NSSAI not available in the current PLMN" associated with current PLMN using AT/MMI? | - | - | 2 | P |
| 28 | Switch off procedure in WLAN Ipcsec_SA_Established specified in TS 38.508-1 subclause 4.9.6.5 is performed. | - | - | - | - |
| 29 | The UE is brought back to operation or the USIM is inserted | - | - | - | - |
| - | Exception: The UE establishes an IPsec tunnel in parallel to 5GC registration steps 19 to 23 as per the IKEv2 protocol as defined in 3GPP TS 23.502 [33] clause 4.12.2.2 figure 4.12.2.2-1. | - | - | - | - |
| 30 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 3 | P |
| 31-34 | Steps 4 to 7 of the generic procedure for WLAN Ipcsec_SA_Released specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 35 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI and Rejected NSSAI. | <-- | REGISTRATION ACCEPT | - | - |

| | | | | | |
|-------|---|-----|-----------------------|---|---|
| 36 | Step 10 of the generic procedure for WLAN Ipcsec_SA_Released specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 37 | Check: Is S-NSSAI=2 removed from the Rejected NSSAI list associated with current PLMN? | - | - | 3 | P |
| 38 | Switch off procedure in WLAN Ipcsec_SA_Established specified in TS 38.508-1 subclause 4.9.6.5 is performed. | - | - | - | - |
| 39 | The UE is brought back to operation or the USIM is inserted | - | - | - | - |
| - | Exception: The UE establishes an IPsec tunnel in parallel to 5GC registration steps 19 to 23 as per the IKEv2 protocol as defined in 3GPP TS 23.502 [33] clause 4.12.2.2 figure 4.12.2.2-1. | - | - | - | - |
| 40 | Check: Does UE transmit a REGISTRATION REQUEST message including Requested NSSAI? | --> | REGISTRATION REQUEST | 4 | P |
| 41-44 | Steps 4 to 7 of the generic procedure for WLAN Ipcsec_SA_Released specified in TS 38.508-1 subclause 4.5.2 are performed. | - | - | - | - |
| 45 | The SS transmits a REGISTRATION ACCEPT message including Allowed NSSAI. | <-- | REGISTRATION ACCEPT | - | - |
| 46 | The UE transmits a REGISTRATION COMPLETE message. | --> | REGISTRATION COMPLETE | - | - |
| 47 | Check: Is S-NSSAI=1 in the Rejected NSSAI list with cause "S-NSSAI not available in the current registration area" associated with current PLMN and registration area combination using AT/MMI? | - | - | 4 | P |

9.2.5.1.2.3.3 Specific message contents

Table 9.2.5.1.2.3.3-1: REGISTRATION REQUEST (step 2, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | Note |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |

| | | | |
|---|-------------|--|--|
| Mapped configured SD | Not Present | | |
| Note: S-NSSAI =1 will be always included from the allowed NSSAI list associated with PLMN of WLAN Cell 27 by the UE but may include other S-NSSAI from Configured NSSAI list associated with PLMN of NCG WLAN Cell 27 if configured in the UE. See TS 24.501 sub-clause 5.5.1.2.1 | | | |

Table 9.2.5.1.2.3.3-2: REGISTRATION ACCEPT (step 7, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '010'B | Non 3GPP access | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '0000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Configured NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '0000001'B | SST | |
| SST | '0000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | |
| Length of S-NSSAI contents | '0000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.2.5.1.2.3.3-3: PDU SESSION ESTABLISHMENT ACCEPT (step 10 , Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 clause 4.7.2-2 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| S-NSSAI | | | |

| | | | |
|----------------------------|--------------|-------------|--|
| Length of S-NSSAI contents | '0000 0001'B | SST | |
| SST | '0000 0010'B | SST value 2 | |

Table 9.2.5.1.2.3.3-4: REGISTRATION REQUEST (step 11, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|--|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 2 | Note |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Note: S-NSSAI =2 will be always included by the UE from the allowed NSSAI list associated with PLMN of NCG WLAN Cell 27 but may include S-NSSAI =1 from Configured NSSAI list associated with PLMN of NCG WLAN Cell 27. See TS 24.501 sub-clause 5.5.1.2.1 | | | |

Table 9.2.5.1.2.3.3-5: REGISTRATION ACCEPT (step 16, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '010'B | Non 3GPP access | |
| Allowed NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | Note |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |

| | | | |
|--|-------------|---|--|
| Mapped configured SD | Not Present | | |
| Rejected NSSAI | | | |
| Rejected S-NSSAI-1 | | Rejected S-NSSAI value 1 | |
| Cause value | '0000'B | S-NSSAI not available in the current PLMN | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Note: If UE has requested only S-NSSAI =2 in step 22 and S-NSSAI =2 is added in the Rejected NSSAI list by the SS then AMF/SS can include default subscribed S-NSSAIs in the allowed NSSAI of REGISTRATION ACCEPT message, see TS 24.501 sub-clause 5.5.1.2.4. | | | |

Table 9.2.5.1.2.3.3-6: REGISTRATION REQUEST (step 19, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.2.5.1.2.3.3-7: REGISTRATION ACCEPT (step 24, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '010'B | Non 3GPP access | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.2.5.1.2.3.3-8: REGISTRATION REQUEST (step 30, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|--|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | Initial registration | |
| Requested NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | Note |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Note: S-NSSAI =1 will be always included by the UE from the allowed NSSAI list associated with PLMN of NCG Cell C but may include S-NSSAI =2 from Configured NSSAI list associated with PLMN of NCG Cell C. See TS 24.501 sub-clause 5.5.1.2.1 | | | |

Table 9.2.5.1.2.3.3-9: REGISTRATION ACCEPT (step 35, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '010'B | Non 3GPP access | |
| TAI list | | | |
| Type of list | '01'B | list of TACs belonging to one PLMN, with consecutive TAC values | |
| Number of elements | '00001'B | 2 Elements | |
| TAC | PLMN =MCC/MNC
stored in EF _{IMSI}
TAC 1 = 2 | TAI2, TAI 3 | |

| | | | |
|--|-------------|--|--|
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000010'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |
| Rejected NSSAI | | | |
| Rejected S-NSSAI-1 | | Rejected S-NSSAI value 1 | |
| Cause value | '0001'B | S-NSSAI not available in the current registration area | |
| SST | '00000001'B | 1 | |
| SD | Not Present | | |
| Note: If UE has requested only S-NSSAI =1 in step 57 and S-NSSAI =1 is added in the Rejected NSSAI list by the SS then AMF/SS can include default subscribed S-NSSAIs in the allowed NSSAI of REGISTRATION ACCEPT message, see TS 24.501 sub-clause 5.5.1.2.4. | | | |

Table 9.2.5.1.2.3.3-10: PDU SESSION ESTABLISHMENT ACCEPT (step 36 , Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 clause 4.7.2-2 | | | |
|--|--------------|-------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| S-NSSAI | | | |
| Length of S-NSSAI contents | '0000 0001'B | SST | |
| SST | '0000 0010'B | SST value 2 | |

Table 9.2.5.1.2.3.3-11: REGISTRATION REQUEST (step 40, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-6 | | | |
|---|--------------|----------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type value | '001'B | initial registration | |
| Requested NSSAI | | Note | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000001'B | SST | |
| SST | '00000001'B | 2 | |
| SD | Not Present | | |

| | | | |
|-----------------------|-------------|--|--|
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

Table 9.2.5.1.2.3.3-12: REGISTRATION ACCEPT (step 45, Table 9.2.5.1.2.3.2-1)

| Derivation Path: 38.508-1 Table 4.7.1-7 | | | |
|---|--------------|-----------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result value | '010'B | Non 3GPP access | |
| Allowed NSSAI | | | |
| S-NSSAI IEI | | S-NSSAI value 1 | |
| Length of S-NSSAI contents | '00000010'B | SST | |
| SST | '00000001'B | 2 | |
| SD | Not Present | | |
| Mapped configured SST | Not Present | | |
| Mapped configured SD | Not Present | | |

9.2.5.1.3

9.2.5.1.4 Initial registration / Rejected / Congestion / Abnormal cases / T3346

9.2.5.1.4.1 Test Purpose (TP)

(1)

with { The UE has sent initial REGISTRAION REQUEST message }**ensure that** {**when** { UE receives a REGISTRATION REJECT with cause #22 (Congestion) with T3346 included and the UE is NOT configured for High Priority Access }**then** { UE does not start the Initial registration until T3346 expires }

}

(2)

with { The UE has received initial REGISTRATION REJECT with T3346 included }**ensure that** {**when** { upon expiry of T3346 }**then** { UE starts the Initial registration procedure }

}

(3)

with { The UE has received initial REGISTRATION REJECT with T3346 included }

ensure that {

when { the timer T3346 is running and the UE needs to perform initial registration for emergency services }

then { UE starts the Initial registration procedure }

}

9.2.5.1.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.1.2.5 and 5.5.1.2.7 and TS 24.301, clause 5.5.1.2.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.2.5]

If the initial registration request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

If the initial registration request is rejected due to general NAS level mobility management congestion control, the network shall set the 5GMM cause value to #22 "congestion" and assign a back-off timer T3346.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

#3 (Illegal UE);

#6 (Illegal ME); or

....

#22 (Congestion).

If the T3346 value IE is present in the REGISTRATION REJECT message and the value indicates that this timer is neither zero nor deactivated, the UE shall proceed as described below; otherwise it shall be considered as an abnormal case and the behaviour of the UE for this case is specified in subclause 5.5.1.2.7.

The UE shall abort the initial registration procedure, set the 5GS update status to 5U2 NOT UPDATED and enter state 5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION.

The UE shall stop timer T3346 if it is running.

If the REGISTRATION REJECT message is integrity protected, the UE shall start timer T3346 with the value provided in the T3346 value IE.

If the REGISTRATION REJECT message is not integrity protected, the UE shall start timer T3346 with a random value from the default range specified in 3GPP TS 24.008 [12].

The UE stays in the current serving cell and applies the normal cell reselection process. The initial registration procedure is started if still needed when timer T3346 expires or is stopped.

#27 (N1 mode not allowed).

The UE capable of S1 mode shall disable the N1 mode capability for both 3GPP access and non-3GPP access (see subclause 4.9).

Other values are considered as abnormal cases. The behaviour of the UE in those cases is specified in subclause 5.5.1.2.7.

[TS 24.501, clause 5.5.1.2.7]

The following abnormal cases can be identified:

a) Timer T3346 is running.

The UE shall not start the registration procedure for initial registration unless:

- 1) the UE is a UE configured for high priority access in selected PLMN; or
- 2) the UE needs to perform the registration procedure for initial registration for emergency services.

The UE stays in the current serving cell and applies the normal cell reselection process.

NOTE 1: It is considered an abnormal case if the UE needs to initiate a registration procedure for initial registration while timer T3346 is running independent on whether timer T3346 was started due to an abnormal case or a non-successful case.

[TS 24.301, clause 5.5.1.2.5]

...

#22 (Congestion);

If the T3346 value IE is present in the ATTACH REJECT message and the value indicates that this timer is neither zero nor deactivated, the UE shall proceed as described below; otherwise it shall be considered as an abnormal case and the behaviour of the UE for this case is specified in subclause 5.5.1.2.6.

The UE shall abort the attach procedure, reset the attach attempt counter, set the EPS update status to EU2 NOT UPDATED and enter state EMM-DEREGISTERED.ATTEMPTING-TO-ATTACH.

The UE shall stop timer T3346 if it is running.

If the ATTACH REJECT message is integrity protected, the UE shall start timer T3346 with the value provided in the T3346 value IE.

If the ATTACH REJECT message is not integrity protected, the UE shall start timer T3346 with a random value from the default range specified in 3GPP TS 24.008 [13].

The UE stays in the current serving cell and applies the normal cell reselection process. The attach procedure is started if still needed when timer T3346 expires or is stopped.

If A/Gb mode or Iu mode is supported by the UE, the UE shall in addition handle the GMM parameters GMM state, GPRS update status and GPRS attach attempt counter as specified in 3GPP TS 24.008 [13] for the case when the normal attach procedure is rejected with the GMM cause with the same value.

If the UE is operating in single-registration mode, the UE shall in addition handle the 5GMM parameters as specified in 3GPP TS 24.501 [54] for the case when the initial registration procedure is rejected with the 5GMM cause with the same value.

...

9.2.5.1.4.3 Test description

9.2.5.1.4.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

None.

Preamble:

- The UE is in state Switched OFF (State 0W-A as per TS 38.508-1 [4] Table 4.4A.2-0).

9.2.5.1.4.3.2 Test procedure sequence

Table 9.2.5.1.4.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|---|---|------------------|---------------------|----|---------|
| | | U - S | Message | | |
| 1 | UE is switched on. | - | - | - | |
| 2-8 | Steps 1-7 of Table 4.5.2.2-3 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 9 | SS transmits a REGISTRATION REJECT message with cause #22 (Congestion) and T3346 set to 3 minutes.

(Note 1) | <-- | REGISTRATION REJECT | - | - |
| 10 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| 11 | Check : Does the UE initiate IPsec secure tunnel as per 3GPP TS 24.502 [33] clause 7.3.2

(Note 1) | - | - | 1 | F |
| 12-18 | Steps 1-7 of Table 4.5.2.2-3 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | 2 | P |
| 19 | SS transmits a REGISTRATION REJECT message with cause #22 (Congestion) and T3346 set to 3 minutes.

(Note 1) | <-- | REGISTRATION REJECT | - | - |
| 20 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| 21 | The UE is made to establish an emergence PDU session. This can be done by an AT/MMI command | - | - | - | - |
| 22-32 | Steps 1-11 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed, REGISTRATION REQUEST message with IE 5GS registration type set to “emergency registration” | - | - | 3 | P |
| Note 1: This is checked for 3 minutes less tolerance. | | | | | |

9.2.5.1.4.3.3 Specific message contents

Table 9.2.5.1.4.3.3-1: REGISTRATION REJECT (steps 9, 19 Table 9.2.5.1.4.3.2-1)

| |
|---|
| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9 |
|---|

| Information Element | Value/remark | Comment | Condition |
|---------------------|--------------|---------------------------|-----------|
| 5GMM cause | '0001 0110'B | Cause #22
(Congestion) | |
| T3346 Value | '00100011'B | 3 minutes | |

Table 9.2.5.1.4.3.3-2: REGISTRATION REQUEST (step 24 Table 9.2.5.1.4.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6 | | | |
|---|--------------|---------------------------|---------------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '100'B | Emergency
registration | EMERGEN
CY |

9.2.5.2 Mobility Registration

9.2.5.2.1 Mobility registration update / registered slice(s) change

9.2.5.2.1.1 Test Purpose (TP)

with { UE in state 5GMM-REGISTERED, and 5GMM-IDLE mode over non 3GPP access }

ensure that {

when { UE needs to change the slice(s) currently registered to }

then { UE initiates **and** successfully completes the registration procedure for mobility registration update }

}

9.2.5.2.1.2 Conformance requirements

Same conformance requirements as in clause 9.1.5.2.6.2

9.2.5.2.1.3 Test description

9.2.5.2.1.3.1 Pre-test conditions

System Simulator:

WLAN Cell 27

UE:

-None

Preamble:

The UE is in state 3W-A with PDU session Active state according to TS 38.508-1 [4].

9.2.5.2.1.3.2 Test procedure sequence

Table 9.2.5.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|-----------------------------|----|---------|
| | | U - S | Message | | |
| 1 | Make the UE change the slice(s) the UE is currently registered to.

(NOTE 1) | - | - | - | - |
| 2 | The UE transmits an REGISTRATION REQUEST message indicating "mobility registration updating". | --> | 5GMM: REGISTRATION REQUEST | 1 | P |
| 3 | SS sends a REGISTRATION ACCEPT message | <-- | 5GMM: REGISTRATION ACCEPT | - | - |
| 4 | Check: Does the UE send a REGISTRATION COMPLETE? | --> | 5GMM: REGISTRATION COMPLETE | - | - |

Note 1: This can be done by MMI or AT command
- If the AT command +C5GNSSAI is to be used then in accordance with its definition (TS 27.007 [40], clause 10.1.62) it would need to be run 2 times: once to delete the stored in the UE default NSSAI, and, second time to allocate a new one
- In the Preamble SS has sent one allowed S-NSSAI which the UE has accepted as the S-NSSAI it is registered to (see 38.508-1 [4], Table 4.7.1-7). A S-NSSAI different to that one needs to be selected.

9.2.5.2.1.3.3 Specific message contents

None.

NOTE: The UE is expected to request a new S-NSSAI in the REGISTRATION REQUEST message sent as part of step 2. However, due to this S-NSSAI being implementation dependent, there is no verification of the content of the REGISTRATION REQUEST message foreseen.

9.2.5.2.2 Mobility registration update/Change of SMS over NAS capability

9.2.5.2.2.1 Test Purpose (TP)

(1)

with { UE in state 5GMM-REGISTERED, and 5GMM-IDLE mode over non 3GPP access }

ensure that {

when { UE needs to change the SMS over NAS capability }

then { UE initiates **and** successfully completes the registration procedure for mobility registration update }

}

9.2.5.2.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], subclause 5.5.1.3.2. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.1.3.2]

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic registration update by sending a REGISTRATION REQUEST message to the AMF,

...

l) when the UE needs to register for SMS over NAS, indicate a change in the requirements to use SMS over NAS, or de-register from SMS over NAS;

...

For a REGISTRATION REQUEST message with a 5GS registration type IE indicating "mobility registration updating", UE shall include the requested NSSAI containing the S-NSSAI(s) corresponding to the slices to which the UE intends to register with and shall include the mapped S-NSSAI(s) for the requested NSSAI, if available, in the REGISTRATION REQUEST message. If the UE has allowed NSSAI or configured NSSAI for the current PLMN, the requested NSSAI shall be either:

- a) the configured NSSAI for the current PLMN, or a subset thereof as described below, if the UE has no allowed NSSAI for the current PLMN;
- b) the allowed NSSAI for the current PLMN, or a subset thereof as described below, if the UE has an allowed NSSAI for the current PLMN; or
- c) the allowed NSSAI for the current PLMN, or a subset thereof as described below, plus one or more S-NSSAIs from the configured NSSAI for which no corresponding S-NSSAI is present in the allowed NSSAI and those are neither in the rejected NSSAI for the current PLMN nor in the rejected NSSAI for the current registration area.

If the UE has neither allowed NSSAI for the current PLMN nor configured NSSAI for the current PLMN and has a default configured NSSAI, the UE shall:

- a) include the S-NSSAI(s) in the Requested NSSAI IE of the REGISTRATION REQUEST message using the default configured NSSAI; and
- b) include the Network slicing indication IE with the Default configured NSSAI indication bit set to "Requested NSSAI created from default configured NSSAI" in the REGISTRATION REQUEST message.

If the UE has no allowed NSSAI for the current PLMN, no configured NSSAI for the current PLMN, and no default configured NSSAI, the UE shall not include a requested NSSAI in the REGISTRATION REQUEST message.

The subset of configured NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the configured NSSAI applicable to this PLMN, if the S-NSSAI is neither in the rejected NSSAIs for the current PLMN nor in the rejected NSSAI for the current registration area.

The subset of allowed NSSAI provided in the requested NSSAI consists of one or more S-NSSAIs in the allowed NSSAI for this PLMN.

NOTE 3: How the UE selects the subset of configured NSSAI or allowed NSSAI to be provided in the requested NSSAI is implementation specific. The UE can take preferences indicated by the upper layers (e.g. policies, applications) into account.

9.2.5.2.2.3 Test description

9.2.5.2.2.3.1 Pre-test conditions

System Simulator:

WLAN Cell 27

UE:

UE is enabled for SMS over NAS

Preamble:

The UE is in state 3W-A with PDU session Active state according to TS 38.508-1 [4]SMS over NAS allowed.

9.2.5.2.1.3.2 Test procedure sequence

Table 9.2.5.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|--|---|------------------|-----------------------------|----|---------|
| | | U - S | Message | | |
| 1 | Make the UE deregister the SMS over NAS (NOTE 1) | - | - | - | - |
| 2 | The UE transmits an REGISTRATION REQUEST message indicating "mobility registration updating". | --> | 5GMM: REGISTRATION REQUEST | 1 | P |
| 3 | SS sends a REGISTRATION ACCEPT message | <-- | 5GMM: REGISTRATION ACCEPT | - | - |
| 4 | Check: Does the UE send a REGISTRATION COMPLETE? | --> | 5GMM: REGISTRATION COMPLETE | - | - |
| Note 1: This can be done by MMI or AT command +C5GUSMS | | | | | |

9.2.5.2.1.3.3 Specific message contents

Table 9.2.5.2.1.3.3-1: REGISTRATION REQUEST (preamble)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '001'B | | INITIAL |
| 5GS update type | | | |
| SMS requested | SMS over NAS supported | | |

Table 9.2.5.2.1.3.3-2: REGISTRATION ACCEPT (preamble)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|----------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result | | | |
| SMS allowed | SMS over NAS allowed | | |
| T3512 value | | | |
| Timer value | '00011'B | | |
| Unit | '101'B | | |

Table 9.2.5.2.1.3.3-3: REGISTRATION REQUEST (Table 9.2.5.2.1.3.2-1, step 2)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|--|--|--|
| | | | |

| Information Element | Value/remark | Comment | Condition |
|-----------------------------|----------------------------|---------|-----------|
| 5GS registration type | | | |
| 5GS registration type value | '010'B | | MOBILITY |
| 5GS update type | | | |
| SMS requested | SMS over NAS not supported | | |

9.2.6 De-registration

9.2.6.1 UE-initiated de-registration

9.2.6.1.1 UE-initiated de-registration / switch off

9.2.6.1.1.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the UE is switched off }

then { the UE shall send DEREGISTRATION REQUEST message with De-registration type IE indicated to "Switch off" }

}

(2)

with { the UE supports remove USIM without power down and in 5GMM-REGISTERED state }

ensure that {

when { the USIM is removed from the UE }

then { the UE shall send DEREGISTRATION REQUEST message with De-registration type IE indicated to "Switch off" }

}

(3)

with { the UE in 5GMM-DEREGISTERED-INITIATED state }

ensure that {

when { the first four expiries of the timer T3521 }

then { the UE shall retransmit the DEREGISTRATION REQUEST message and shall reset and restart timer T3521 }

}

(4)

with { the UE in 5GMM-DEREGISTERED-INITIATED state }

ensure that {

when { On the fifth expiry of timer T3521 }

then { the deregistration procedure shall be aborted and the UE perform local detach }

}

9.2.6.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 5.5.2.1, 5.5.2.2.1 and 5.5.2.2.6. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.2.1]

The de-registration procedure is used:

- a) by the UE to de-register for 5GS services over 3GPP access when the UE is registered over 3GPP access;;
- b) by the UE to de-register for 5GS services over 3GPP access, non-3GPP access, or both when the UE is registered in the same PLMN over both accesses;
- c) by the network to inform the UE that it is deregistered for 5GS services over 3GPP access when the UE is registered over 3GPP access;
- d) by the network to inform the UE that it is deregistered for 5GS services over 3GPP access, non-3GPP access, or both when the UE is registered in the same PLMN over both accesses; and
- e) by the network to inform the UE to re-register to the network.

The de-registration procedure with appropriate de-registration type shall be invoked by the UE:

- a) if the UE is switched off; and
- b) as part of the eCall inactivity procedure defined in subclause 5.5.3.

The de-registration procedure with appropriate de-registration type shall be invoked by the network:

- a) if the network informs whether the UE should re-register to the network.

The de-registration procedure with appropriate access type shall be invoked by the UE:

- a) if the UE wants to de-register for 5GS services over 3GPP access when the UE is registered over 3GPP access; or
- b) the UE wants to de-register for 5GS services over 3GPP access, non-3GPP access, or both when the UE is registered in the same PLMN over both accesses.

If the de-registration procedure is triggered due to USIM removal, the UE shall indicate "switch off" in the de-registration type IE.

If the de-registration procedure is requested by the UDM for a UE that has an emergency PDU session, the AMF shall not send a DEREGISTRATION REQUEST message to the UE.

If the de-registration procedure for 5GS services is performed, the PDU sessions, if any, for this particular UE are released locally without peer-to-peer signalling between the UE and the network.

The UE is allowed to initiate the de-registration procedure even if the timer T3346 is running.

NOTE: When the UE has no PDU sessions over non-3GPP access, or the UE moves all the PDU sessions over a non-3GPP access to a 3GPP access, the UE and the AMF need not initiate de-registration over the non-3GPP access.

The AMF shall provide the UE with a non-3GPP de-registration timer.

[TS 24.501, clause 5.5.2.2.1]

The de-registration procedure is initiated by the UE by sending a DEREGISTRATION REQUEST message (see example in figure 5.5.2.2.1). The De-registration type IE included in the message indicates whether the de-registration procedure is due to a "switch off" or not. The access type included in the message indicates whether the de-registration procedure is:

- a) for 5GS services over 3GPP access when the UE is registered over 3GPP access only;
- b) for 5GS services over non-3GPP access when the UE is registered over non-3GPP access only; or
- c) for 5GS services over 3GPP access, non-3GPP access or both 3GPP access and non-3GPP access when the UE is registered in the same PLMN over both accesses.

If the UE has a valid 5G-GUTI, the UE shall populate the 5GS mobile identity IE with the valid 5G-GUTI. If the UE does not have a valid 5G-GUTI, the UE shall populate the 5GS mobile identity IE with its SUCI.

If the UE does not have a valid 5G-GUTI and it does not have a valid SUCI, then the UE shall populate the 5GS mobile identity IE with its PEI.

If the de-registration request is not due to switch off and the UE is in the state 5GMM-REGISTERED or 5GMM-REGISTERED-INITIATED, timer T3521 shall be started in the UE after the DEREGISTRATION REQUEST message has been sent. The UE shall enter the state 5GMM-DEREGISTERED-INITIATED.

If the UE is to be switched off, the UE shall try for a period of 5 seconds to send the DEREGISTRATION REQUEST message. During this period, the UE may be switched off as soon as the DEREGISTRATION REQUEST message has been sent.

[TS 24.501, clause 5.5.2.2.6]

...

- c) T3521 timeout.

On the first four expiries of the timer, the UE shall retransmit the DEREGISTRATION REQUEST message and shall reset and restart timer T3521. On the fifth expiry of timer T3521, the de-registration procedure shall be aborted and the UE proceeds as follows:

9.2.6.1.1.3 Test description

9.2.6.1.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27.

UE:

- None.

Preamble:

- The UE is in state 3W-A on WLAN Cell 27 according to 38.508-1[4].

9.2.6.1.1.3.2 Test procedure sequence

Table 9.2.6.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | TP | Verdict |
|----|-----------|------------------|----|---------|
|----|-----------|------------------|----|---------|

| | | U - S | | | |
|------|---|-------|------------------------|---|---|
| | | | Message | | |
| 1 | Cause switch off | - | - | - | - |
| 2 | Check: Does the UE transmit a DEREGISTRATION REQUEST with the De-registration type IE indicating "switch off"? | --> | DEREGISTRATION REQUEST | 1 | P |
| 3 | SS Transmits DEREGISTRATION ACCEPT | <-- | DEREGISTRATION ACCEPT | - | - |
| 4 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| 5 | The UE is switched on. | - | - | - | - |
| 6-15 | The registration procedure is completed by executing steps 1-10 of the UE registration procedure in TS 38.508-1 [4] table 4.5.2.2-3. | - | - | - | - |
| 16 | Cause UE to initiate deregistration. | - | - | - | - |
| 17 | The UE transmits UE transmit a DEREGISTRATION REQUEST message. The UE starts timer T3521. | --> | DEREGISTRATION REQUEST | - | - |
| 18 | The SS does not respond to the DEREGISTRATION REQUEST message. | - | - | - | - |
| 19 | Check: When the timer T3521 expires does the UE re-transmit DETACH REQUEST message. Timer T3421 is re-started (1 st expiry). | --> | DEREGISTRATION REQUEST | 3 | P |
| 20 | The SS does not respond to the DEREGISTRATION REQUEST message. | - | - | - | - |
| 21 | Check: When the timer T3521 expires does the UE re-transmit DEREGISTRATION REQUEST message. Timer T3521 is re-started (2 nd expiry). | --> | DEREGISTRATION REQUEST | 3 | P |
| 22 | The SS does not respond to the DEREGISTRATION REQUEST message. | - | - | - | - |
| 23 | Check: When the timer T3521 expires does the UE re-transmit DEREGISTRATION REQUEST message. Timer T3521 is re-started (3 rd expiry). | --> | DEREGISTRATION REQUEST | 3 | P |
| 24 | The SS does not respond to the DEREGISTRATION REQUEST message. | - | - | - | - |
| 25 | Check: When the timer T3521 expires does the UE re-transmit DEREGISTRATION REQUEST message. Timer T3521 is re-started (4 th expiry). | --> | DEREGISTRATION REQUEST | 3 | P |
| 26 | The SS does not respond to the DETACH REQUEST message. | - | - | - | - |
| 27 | When the timer T3521 expires the UE aborts the detach procedure and performs a local | - | - | 4 | P |

| | | | | | |
|-------|---|-----|-----------------------------------|---|---|
| | detach (5 th expiry). | | | | |
| 28 | SS Transmits PDU SESSION MODIFICATION COMMAND | <-- | PDU SESSION MODIFICATION COMMAND | - | - |
| 29 | Check: Does the UE transmit a PDU SESSION MODIFICATION COMPLETE? | --> | PDU SESSION MODIFICATION COMPLETE | 4 | F |
| 30 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| - | EXCEPTION: Steps 31 to 46 shall be implemented if the UE supports remove USIM without power down:
pc_USIM_Removal = TRUE [29] | - | - | - | - |
| 31 | The UE is switched off. | - | - | - | - |
| 32 | The UE is switched on. | - | - | - | - |
| 33-42 | The registration procedure is completed by executing steps 1-10 of the UE registration procedure in TS 38.508-1 [4] table 4.5.2.2-3. | - | - | - | - |
| 43 | Cause removal of USIM from the UE without powering down. | - | - | - | - |
| 44 | Check: Does the UE transmit a DEREGISTRATION REQUEST with the De-registration type IE indicating "switch off"? | --> | DEREGISTRATION REQUEST | 2 | P |
| 45 | SS Transmits DEREGISTRATION ACCEPT | <-- | DEREGISTRATION ACCEPT | - | - |
| 46 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |

9.2.6.1.1.3.3 Specific message contents

Table 9.2.6.1.1.3.3-1: DEREGISTRATION REQUEST (Step 1 and step 44, Table 9.2.6.1.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-12 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| De-registration type | | | |
| Switch off | '1'B | | |

9.2.6.2 Network-initiated de-registration

9.2.6.2.1 Network-initiated de-registration / De-registration for Non-3GPP access / Re-registration required

9.2.6.2.1.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the SS sends a DEREGISTRATION REQUEST message indicates "re-registration required" and the de-registration request is for non 3GPP access }

then { the UE sends a DEREGISTRATION ACCEPT message to the network and releases the existing NAS signalling connection, then initiates an initial registration and also re-establishes any previously established PDU sessions }

}

9.2.6.2.1.2 Conformance requirements

References: The conformance requirement covered in the present TC is specified in: 3GPP TS 24.501 clauses 5.5.2.3.2. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 5.5.2.3.2]

...

NOTE 1: When the de-registration type indicates "re-registration required", user interaction is necessary in some cases when the UE cannot re-establish the PDU session (s), if any, automatically.

...

Upon sending a DEREGISTRATION ACCEPT message, the UE shall delete the rejected NSSAI as specified in subclause 4.6.2.2.

If the de-registration type indicates "re-registration required", then the UE shall ignore the 5GMM cause IE if received.

If the de-registration type indicates "re-registration not required", the UE shall take the actions depending on the received 5GMM cause value:

#3 (Illegal UE);

#6 (Illegal ME); or

#7 (5GS services not allowed).

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall consider the USIM as invalid for 5GS services until switching off or the UICC containing the USIM is removed. The UE shall delete the list of equivalent PLMNs and shall enter the state 5GMM-DEREGISTERED.

If the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status, 4G-GUTI, last visited registered TAI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when a DETACH REQUEST is received with the EMM cause with the same value and with detach type set to "re-attach not required".

NOTE 2: The possibility to configure a UE so that the radio transceiver for a specific radio access technology is not active, although it is implemented in the UE, is out of scope of the present specification.

If the UE also supports the registration procedure over the other access, the UE shall in addition handle 5GMM parameters and 5GMM state for this access, as described for this 5GMM cause value.

...

#72 (Non-3GPP access to 5GCN not allowed).

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete 5G-GUTI, last visited registered TAI, TAI list and ngKSI. Additionally, the UE shall reset the registration attempt counter and enter the state 5GMM-DEREGISTERED.

NOTE 3: The 5GMM sublayer states, the 5GMM parameters and the registration status are managed per access type independently, i.e. 3GPP access or non-3GPP access (see subclauses 4.7.2 and 5.1.3).

The UE shall disable the N1 mode capability for non-3GPP access (see subclause 4.9.3).

As an implementation option, the UE may enter the state 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5].

9.2.6.2.1.3 Test description

9.2.6.2.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27.

UE:

- None.

Preamble:

- the UE is in state 3W-A on WLAN Cell 27 according to TS 38.508-1 [4].

9.2.6.2.1.3.2 Test procedure sequence

Table 9.2.6.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|---|------------------|------------------------|----|---------|
| | | U - S | Message/PDU/SDU | | |
| 1 | The SS transmits a DEREGISTRATION REQUEST with indicates "re-registration required". | <-- | DEREGISTRATION REQUEST | - | - |
| 2 | Check: Does the UE transmits a DEREGISTRATION ACCEPT message? | --> | DEREGISTRATION ACCEPT | 1 | P |
| 3 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| - | EXCEPTION: step 4 describes a behaviour which depends on the UE capability | - | - | - | - |
| 4 | IF NOT pc_Automatic_Re_registration, the user initiates a registration by MMI. | - | - | - | - |
| 6-15 | The registration procedure is completed by executing steps 1-10 of the UE registration | - | - | 1 | P |

| | | | | | |
|--|---|--|--|--|--|
| | procedure in TS 38.508-1 [4] table 4.5.2.2-3. | | | | |
|--|---|--|--|--|--|

9.2.6.2.1.3.3 Specific message contents

Table 9.2.6.2.1.3.3-1: DEREGISTRATION REQUEST (step 1, Table 9.2.6.2.1.3.2-1)

| Derivation path: 38.508-1 [4] Table 4.7.1-14 | | | |
|--|--------------|--------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| DEREGISTRATION type | | | |
| Switch off | '0'B | Normal de-registration | |
| Re-registration required | '1'B | re-registration required | |
| Access type | '10'B | Non 3GPP access | |
| 5GMM cause | '0000 0011'B | Cause #3 (Illegal UE) | |

Table 9.2.6.2.1.3.3-2: REGISTRATION REQUEST (step 8, Table 9.2.6.2.1.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.7.1-6 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS mobile identity | The valid 5G-GUTI that UE holds | | |

9.2.6.2.2 Network-initiated de-registration / De-registration for Non 3GPP access / Re-registration not required

9.2.6.2.2.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the SS sends a DEREGISTRATION REQUEST message indicates no 5GMM cause IE, ""re-registration not required"" and the de-registration request is for npn-3GPP access and 5GMM cause value is not included }

then { the UE deletes 5G-GUTI, TAI list, last visited registered TAI, list of equivalent PLMNs, ngKSI, sends a DEREGISTRATION ACCEPT message enter the state 5GMM-DEREGISTERED for non 3GPP access }

}

(2)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the SS sends a DEREGISTRATION REQUEST message indicates no 5GMM cause IE, "re-registration not required" and the de-registration request is for non-3GPP access and 5GMM cause value set to #7 5GS services not allowed }

then { the UE deletes 5G-GUTI, TAI list, last visited registered TAI, list of equivalent PLMNs, ngKSI, consider the USIM as invalid for 5GS services until switching off or the UICC containing the USIM is removed, sends a DEREGISTRATION ACCEPT message enter the state 5GMM-DEREGISTERED for Non 3GPP access }

}

(3)

with { the UE in 5GMM-REGISTERED state }

ensure that {

when { the SS sends a DEREGISTRATION REQUEST message indicates no 5GMM cause IE, "re-registration not required" and the de-registration request is for non-3GPP access and 5GMM cause value set to #72 Non-3GPP access to 5GCN not allowed }

then { the UE deletes 5G-GUTI, TAI list, last visited registered TAI, ngKSI, disable the N1 mode capability for non-3GPP access, sends a DEREGISTRATION ACCEPT message enter the state 5GMM-DEREGISTERED for Non 3GPP access }

}

9.2.6.2.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501 clauses 5.5.2.3.2 and 5.5.2.3.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 5.5.2.3.2]

Upon receiving the DEREGISTRATION REQUEST message, if the DEREGISTRATION REQUEST message indicates "re-registration not required" and the de-registration request is for 3GPP access, the UE shall release locally the PDU sessions over 3GPP access, if any. The UE shall send a DEREGISTRATION ACCEPT message to the network and enter the state 5GMM-DEREGISTERED for 3GPP access.

...

If the de-registration type indicates "re-registration not required", the UE shall take the actions depending on the received 5GMM cause value:

...

#7 (5GS services not allowed).

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete any 5G-GUTI, last visited registered TAI, TAI list and ngKSI. The UE shall consider the USIM as invalid for 5GS services until switching off or the UICC containing the USIM is removed. The UE shall delete the list of equivalent PLMNs and shall enter the state 5GMM-DEREGISTERED.

If the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status, 4G-GUTI, last visited registered TAI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when a DETACH REQUEST is received with the EMM cause with the same value and with detach type set to "re-attach not required".

NOTE 2: The possibility to configure a UE so that the radio transceiver for a specific radio access technology is not active, although it is implemented in the UE, is out of scope of the present specification.

If the UE also supports the registration procedure over the other access, the UE shall in addition handle 5GMM parameters and 5GMM state for this access, as described for this 5GMM cause value.

...

#72 (Non-3GPP access to 5GCN not allowed).

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2) and shall delete 5G-GUTI, last visited registered TAI, TAI list and ngKSI. Additionally, the UE shall reset the registration attempt counter and enter the state 5GMM-DEREGISTERED.

NOTE 3: The 5GMM sublayer states, the 5GMM parameters and the registration status are managed per access type independently, i.e. 3GPP access or non-3GPP access (see subclauses 4.7.2 and 5.1.3).

The UE shall disable the N1 mode capability for non-3GPP access (see subclause 4.9.3).

As an implementation option, the UE may enter the state 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5].

[TS 24.501, clause 5.5.2.3.4]

b) DEREGISTRATION REQUEST, other 5GMM cause values than those treated in subclause 5.5.2.3.2 or no 5GMM cause IE is included, and the De-registration type IE indicates "re-registration not required".

The UE shall delete 5G-GUTI, TAI list, last visited registered TAI, list of equivalent PLMNs, ngKSI, shall set the 5GS update status to 5U2 NOT UPDATED and shall start timer T3502.

A UE not supporting S1 mode may enter the state 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5]; otherwise the UE shall enter the state 5GMM-DEREGISTERED.ATTEMPTING-REGISTRATION.

A UE operating in single-registration mode shall:

- enter the state 5GMM-DEREGISTERED and attempt to select E-UTRAN radio access technology and proceed with the appropriate EMM specific procedures. In this case, the UE may disable N1 mode capability (see subclause 4.9); or
- enter the state 5GMM-DEREGISTERED.PLMN-SEARCH in order to perform a PLMN selection according to 3GPP TS 23.122 [5].

A UE operating in single-registration mode shall set the EPS update status to EU2 NOT UPDATED and shall delete the EMM parameters 4G-GUTI, last visited registered TAI, TAI list and eKSI and shall enter the state EMM-DEREGISTERED.

9.2.6.2.2.3 Test description

9.2.6.2.2.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27.

UE:

- None

Preamble:

- The UE is in state 3W-A on WLAN Cell 27 according to TS 38.508-1 [4].

9.2.6.2.2.3.2 Test procedure sequence

Table 9.2.6.2.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|-----------|------------------|---------|----|---------|
| | | U – S | Message | | |
| | | | | | |

| | | | | | |
|-------|--|-----|---------------------------------|---|---|
| 1 | SS sends a DEREGISTRATION REQUEST message indicates no 5GMM cause IE, "re-registration not required" and the de-registration request is for non 3GPP access | <-- | NR 5GMM: DEREGISTRATION REQUEST | - | - |
| 2 | Check: Does the UE transmit an DEREGISTRATION ACCEPT message? | --> | NR 5GMM: DEREGISTRATION ACCEPT | 1 | P |
| 3 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| 4 | Cause UE to initiate registration. | - | - | - | - |
| 5-15 | The registration procedure is completed by executing steps 1-10 of the UE registration procedure in TS 38.508-1 [4] table 4.5.2.2-3. | - | - | 1 | P |
| 16 | SS sends a DEREGISTRATION REQUEST message indicates no 5GMM cause IE, "re-registration not required", 5GMM Cause set to #7 (5GS services not allowed) and the de-registration request is for non 3GPP access | <-- | NR 5GMM: DEREGISTRATION REQUEST | - | - |
| 17 | Check: Does the UE transmit an DEREGISTRATION ACCEPT message? | --> | NR 5GMM: DEREGISTRATION ACCEPT | 2 | P |
| 18 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| 19 | Check for 60 seconds if UE initiates Registration procedure | - | NR 5GMM: REGISTRATION REQUEST | 2 | F |
| 20 | The UE is switched off. | - | - | - | - |
| 21 | The UE is switched on. | - | - | - | - |
| 22-31 | The registration procedure is completed by executing steps 1-10 of the UE registration procedure in TS 38.508-1 [4] table 4.5.2.2-3. | - | - | - | - |
| 32 | SS sends a DEREGISTRATION REQUEST message indicates no 5GMM cause IE, "re-registration not required", 5GMM Cause set to #72 (Non-3GPP access to 5GCN not allowed) and the de-registration request is for non 3GPP access | <-- | NR 5GMM: DEREGISTRATION REQUEST | - | - |
| 33 | Check: Does the UE transmit an DEREGISTRATION ACCEPT message? | --> | NR 5GMM: DEREGISTRATION ACCEPT | 3 | P |
| 34 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| 35 | Check for 60 seconds if UE initiates Registration procedure | - | NR 5GMM: REGISTRATION REQUEST | 3 | F |
| 36 | The UE is switched off. | - | - | - | - |

| | | | | | |
|--|--|--|--|--|--|
| | | | | | |
|--|--|--|--|--|--|

9.2.6.2.2.3.3 Specific message contents

Table 9.2.6.2.2.3.3-1: Message DEREGISTRATION REQUEST (step 1, Table 9.2.6.2.2.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-12 | | | |
|---|--------------|------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| De-registration type | | | |
| Switch off | '0'B | Normal de-registration | |
| Re-registration required | '0'B | re-registration not required | |
| Access type | '01'B | 3GPP access | |
| 5GMM cause | Not Present | | |

Table 9.2.6.2.2.3.3-2: Message REGISTRATION REQUEST (step 8, Table 9.2.6.2.2.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-6 | | | |
|--|-------------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| ngKSI | | | |
| NAS key set identifier | '111'B | no key is available (UE to network) | |
| TSC | Any allowed value | TSC does not apply for NAS key set identifier value "111" | |
| 5GS mobile identity | The valid SUCI | | |
| Last visited registered TAI | Not present | | |

Table 9.2.6.2.2.3.3-2: Message ATTACH REQUEST (step 28, Table 9.2.6.2.2.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-4 | | | |
|---|-------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| NAS key set identifier | | | |
| NAS key set identifier | '111'B | no key is available | |
| TSC | Any allowed value | TSC does not apply for NAS key set identifier value "111". | |
| Old GUTI or IMSI | IMSI1 | | |

| | | | |
|-----------------------------|-------------|--|--|
| Last visited registered TAI | Not present | | |
|-----------------------------|-------------|--|--|

9.2.7 Service request

9.2.7.1 Service request / IDLE mode uplink user data transport / Rejected / Restricted service area, Abnormal / T3517

9.2.7.1.1 Test Purpose (TP)

Same test purposes as clause 9.1.7.1.1

9.2.7.1.2 Conformance requirements

Same conformance requirements as in clause 9.1.7.1.2

9.2.7.1.3 Test description

9.2.7.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- None.

Preamble:

- The UE is in state 3W-A with PDU session Active state according to TS 38.508-1 [4]

9.2.7.1.3.2 Test procedure sequence

Table 9.1.7.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|-----------------|----|---------|
| | | U - S | Message | | |
| 1 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | - | - | - |
| 2 | Trigger UE to initiate IPsec SA, Note 1. | - | - | - | - |
| - | Exception: In parallel to steps 3, the UE initiates an IPsec security association and one child security association as defined in TS 24.502 [35] clause 7.3.2 | - | - | - | - |
| 3 | Check: Does UE transmit a SERVICE REQUEST message with Service type IE set to 'data'? (Note 2) | --> | SERVICE REQUEST | 1 | P |
| 4 | The SS transmits a SERVICE REJECT message with 5GMM cause = "Restricted service area". | <-- | SERVICE REJECT | - | - |
| 5 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified | - | - | - | - |

| | | | | | |
|---|--|-----|-----------------------|-----|---|
| | in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | | | | |
| - | Exception: In parallel to steps 6 to 7, the UE initiates an IPsec security association as defined in TS 24.502 [35] clause 7.3.2 | - | - | - | - |
| 6 | Check: Does the UE transmit REGISTRATION REQUEST for mobility registration? | --> | REGISTRATION REQUEST | 2 | P |
| 7 | SS sends a REGISTRATION ACCEPT message containing a 5G-GUTI. | <-- | REGISTRATION ACCEPT | - | - |
| 8 | Check: Does the UE send a REGISTRATION COMPLETE? | --> | REGISTRATION COMPLETE | 2 | P |
| | EXCEPTION: Steps 9 to 11 are repeated for 5 times. | - | - | - | - |
| 9 | The UE transmits a SERVICE REQUEST message. | --> | SERVICE REQUEST | - | - |
| 10 | Check: Does the UE transmit a SERVICE REQUEST message before T3517 expires? | --> | SERVICE REQUEST | 3 | F |
| 11 | Check: Does the UE transmits a SERVICE REQUEST message within 60 seconds (minimum value of T3525)? | --> | SERVICE REQUEST | 3,4 | F |
| Note 1: This could be done by e.g. MMI or by AT command +CGACT. | | | | | |

9.2.7.1.3.3 Specific message contents

Table 9.2.7.1.3.3-3: SERVICE REQUEST (steps 3 and 9, Table 9.21.7.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.1-16 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Service type | | | |
| Service type value | '0001'B | data | |

Table 9.2.7.1.3.3-4: SERVICE REJECT (step 4, Table 9.21.7.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.1-18 | | | |
|---|--------------|-------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0001 1100'B | Restricted service area | |

9.2.7.2 Service request / CMM CONNECTED mode/uplink user data transport / Abnormal / T3517

9.2.7.2.1 Test Purpose (TP)

(1)

with { the UE is in 5GMM-REGISTERED state and 5GMM-CONNECTED mode over 3GPP access }

ensure that {

when { the UE has user data pending due to no user-plane resources established for PDU session(s) used for user data transport }

then { the UE sends a SERVICE REQUEST message }

}

(2)

with { the UE sends a SERVICE REQUEST message in 5GMM-CONNECTED mode }

ensure that {

when { T3517 expired }

then { the UE stays in 5GMM-CONNECTED mode }

}

9.2.7.2.2 Conformance requirements

Same conformance requirements as in clause 9.1.7.2.2

9.2.7.2.3 Test description

9.2.7.2.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- None.

Preamble:

- The UE is in state 3W-A with PDU session Active state according to TS 38.508-1 [4]

9.2.7.2.3.2 Test procedure sequence

Table 9.2.7.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|-----------------------|----|---------|
| | | U – S | Message | | |
| 1 | The SS initiated child SA deletion procedure sec tunnel as defined in TS 24.502 [33] clause 7.7.2 | - | - | - | - |
| 2 | Trigger UE to send a ICMP ECHO REQUEST (pc_IPv4 = TRUE)_or ICMPv6 ECHO REQUEST (pc_IPv6 = TRUE), Note 2 | - | - | - | - |
| 3 | The UE transmits a SERVICE REQUEST message. | --> | 5GMM: SERVICE REQUEST | 1 | P |

| | | | | | |
|---|--|-----|-----------------------------------|---|---|
| 4 | The SS does not respond to the <i>SERVICE REQUEST</i> message. | - | - | - | - |
| 5 | Wait for T3517 seconds (Note 1). | - | - | - | - |
| 6 | The UE transmit a <i>SERVICE REQUEST</i> message. | --> | NR 5GMM: <i>SERVICE REQUEST</i> | - | - |
| 7 | The SS sends an <i>IDENTITY REQUEST</i> message. | <-- | NR 5GMM: <i>IDENTITY REQUEST</i> | - | - |
| 8 | Check: Does the UE transmit an <i>IDENTITY RESPONSE</i> message?. | --> | NR 5GMM: <i>IDENTITY RESPONSE</i> | 2 | P |
| - | Exception: In parallel to steps 9, the SS initiates one child security association as defined in TS 24.502 [33] clause 7.5 | - | - | - | - |
| 9 | The SS transmits <i>SERVICE ACCEPT</i> message to setup User-plane resources for the PDU session. | <-- | NR 5GMM: <i>SERVICE ACCEPT</i> | | |
| - | EXCEPTION: Steps 10a1 to 10b2 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation. | - | - | - | - |
| 10a1 | IF (pc_IPv4 = TRUE) THEN, check that the UE sends an ICMP Echo request to the SS? | --> | <i>ICMP ECHO REQUEST</i> | 1 | P |
| 10a2 | The SS sends an ICMP Echo reply | <-- | <i>ICMP ECHO REPLY</i> | - | |
| 10b1 | ELSE IF (pc_IPv4 = FALSE AND pc_IPv6 = TRUE) THEN, check the UE sends an ICMPv6 Echo request to the SS?. | --> | <i>ICMPv6 ECHO REQUEST</i> | 1 | P |
| 10b2 | The SS sends an ICMPv6 Echo reply | <-- | <i>ICMPv6 ECHO REPLY</i> | - | - |
| Note 1: T3517 expires after 15 seconds. | | | | | |
| Note 2: This could be done by a MMI command | | | | | |

9.2.7.2.3.3 Specific message contents

Table 9.2.7.2.3.3-1: *SERVICE REQUEST* (step 3, 6, Table 9.2.7.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-16 | | | |
|--|--------------|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Service type | '0001'B | data | |
| Uplink data status | | | |
| PSI(1) | '1'B | PSI(1) is set to 1 indicates that uplink data are pending for the corresponding PDU session identity. | |

Table 9.2.7.2.3.3-2: IDENTITY REQUEST (step 7, Table 9.2.7.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] table 4.7.1-21 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Identity type | '0010'B | 5G-GUTI | |

Table 9.2.7.2.3.3-3: IDENTITY RESPONSE (step 8, Table 9.2.7.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] table 4.7.1-22 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Mobile identity | 5G-GUTI | | |

Table 9.2.7.2.3.3-4: SERVICE ACCEPT (step 9, Table 9.2.7.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-17 | | | |
|--|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session reactivation result | | | |
| PSI(1) | '0'B | PSI(1) is set to 0 indicates that establishment of user-plane resource of the PDU session is successful. | |

9.2.8 SMS over NAS

9.2.8.1 SMS over NAS / MO SMS over NAS - 5GMM-Idle mode

9.2.8.1.1 Test Purpose (TP)

(1)

with { the UE in switched off state with valid USIM inserted }

ensure that {

when { the UE requests initial registration for SMS over NAS }

then { the UE shall send REGISTRATION REQUEST message with SMS requested bit of the 5GS registration type IE "SMS over NAS supported" }

}

(2)

with { the UE in 5GMM_Connected state with 5GMM-Idle mode and the UE has sent a SERVICE REQUEST message triggered by initiating MO SMS }

ensure that {

when { UE receives a SERVICE ACCEPT message from SS }

then { UE sends CP-DATA containing RP-DATA RPDU (SMS SUBMIT TPDU) encapsulated in an Uplink NAS transport message }

}

(3)

with { UE has sent CP-DATA containing an RP-DATA RPDU (SMS SUBMIT TPDU) encapsulated in an Uplink NAS transport message }

ensure that {

when { UE receives a CP-DATA containing an RP-ACK RPDU encapsulated in a Downlink NAS transport message }

then { UE sends a CP-ACK encapsulated in an Uplink NAS Transport message }

9.2.8.1.2 Conformance requirements

Same conformance requirements as in clause 9.2.8.1.2

9.2.8.1.3 Test description

9.2.8.1.3.1 Pre-test conditions

System Simulator:

WLAN Cell 27;

UE:

The UE does not have any stored SMS message.

Preamble:

The UE is in state Switched OFF (state-0W-B) according to TS 38.508-1 [4].

9.2.8.1.3.2 Test procedure sequence

Table 9.2.8.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | The UE is switched ON | - | - | - | - |
| 2-3 | Steps 1-2 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-3 are performed. | - | - | - | - |
| - | Exception: The UE establishes an IPsec tunnel in parallel to 5GC registration steps 4 | - | - | - | - |

| | | | | | |
|---------|---|-----|------------------------|---|---|
| | to 8 as per the IKEv2 protocol as defined in 3GPP TS 23.502 [31] clause 4.12.2.2 figure 4.12.2.2-1. | | | | |
| 4 | Check: Does UE transmit a REGISTRATION REQUEST message including 5GS update type IE with SMS requested bit set to "SMS over NAS supported"? | --> | REGISTRATION REQUEST | 1 | P |
| 5 - 8 | Steps 4-5 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-3 are performed. | - | - | - | - |
| 9 | SS transmits REGISTRATION ACCEPT message including 5GS registration result with SMS allowed bit set to "SMS over NAS allowed". | <-- | REGISTRATION ACCEPT | - | - |
| 10 - 12 | Steps 9-11 of the generic procedure for UE registration specified in TS 38.508-1 [4] table 4.5.2.2-3 are performed. | - | - | - | - |
| 13 | Sending of a 160 character MO SMS is initiated at the UE via MMI or AT command | - | - | - | - |
| 14 | UE transmits establishes a IPSEC SA and NAS signalling connection as per generic procedure in table 4.5A.4.2.2-1 of 38.508-1 [4]. | - | - | - | - |
| 15 | Check: Does the UE transmit a CP-DATA containing an RP-DATA RPDU (SMS SUBMIT TPDU) encapsulated in an Uplink NAS transport message? | --> | UPLINK NAS TRANSPORT | 2 | P |
| 16 | The SS transmits a CP-ACK encapsulated in a Downlink NAS Transport message. | <-- | DOWNLINK NAS TRANSPORT | - | - |
| 17 | The SS transmits a CP-DATA containing an RP-ACK RPDU encapsulated in a Downlink NAS transport message | <-- | DOWNLINK NAS TRANSPORT | - | - |
| 18 | Check: Does the UE transmit a CP-ACK encapsulated in an Uplink NAS Transport message? | --> | UPLINK NAS TRANSPORT | 3 | P |

9.2.8.1.3.3 Specific message contents

Table 9.2.8.1.3.3-1: REGISTRATION REQUEST (step 4, Table 9.2.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-6 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | | | |
| 5GS registration type value | '001'B | | INITIAL |
| 5GS update type | | | |
| SMS requested | SMS over NAS | | |

| | | | |
|--|-----------|--|--|
| | supported | | |
|--|-----------|--|--|

Table 9.2.8.1.3.3-2: REGISTRATION ACCEPT (step 9, Table 9.2.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|--|----------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration result | | | |
| SMS allowed | SMS over NAS allowed | | |
| T3512 value | | | |
| Timer value | '00011'B | | |
| Unit | '101'B | | |

Table 9.2.8.1.3.3-3: UL NAS TRANSPORT (step 15, Table 9.2.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-10 | | | |
|---|--------------|--------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-DATA | RP-DATA RPDU | |

Editor's note: CP-DATA, RP-DATA RPDU, CP-ACK and RP-ACK RPDU needs to be defined in TS 38.508-1 and Specific message contents will be updated accordingly.

Table 9.2.8.1.3.3-4: DL NAS TRANSPORT (step 16, Table 9.2.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-11 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-ACK | | |

Table 9.2.8.1.3.3-5: DL NAS TRANSPORT (step 17, Table 9.2.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-11 | | | |
|---|--------------|-------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0010'B | SMS | |
| Payload container | CP-DATA | RP-ACK RPDU | |

Table 9.2.8.1.3.3-6: UL NAS TRANSPORT (step 18, Table 9.2.8.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-10 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|------------------------|---------|-----|--|
| Payload container type | '0010'B | SMS | |
| Payload container | CP-ACK | | |

9.3 Inter-system mobility

9.3.1 5GS-EPC Inter-system mobility

9.3.1.1 Inter-system mobility registration update / Single-registration mode with N26 / 5GMM-IDLE / 5GC to EPC

9.3.1.1.1 Test Purpose (TP)

(1)

with { UE in state 5GMM-REGISTERED and 5GMM-IDLE on a 5GC NR cell and has been previously registered on EPC as well, UE supporting S1 and N1 and operating in single-registration mode, NWK supporting Single-registration mode with N26 interface }

ensure that {

when { UE detects a suitable EPC E-UTRA cell after the serving NGC cell becomes not suitable }

then { UE performs a Inter-system change from N1 mode to S1 mode by initiating and successfully completing a TAU procedure, mapped EPC context used }

}

9.3.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], subclause 5.1.4.2; TS 24.301 [21], subclause 4.4.2.3. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, subclause 5.1.4.2]

At Inter-system change from N1 mode to S1 mode when there is at least one active PDU session for which interworking with EPS is supported as specified in subclause 6.1.4.1, the UE shall enter sub states EMM-REGISTERED.NORMAL-SERVICE and 5GMM-REGISTERED.NO-CELL-AVAILABLE and initiate a tracking area updating procedure (see 3GPP TS 24.301 [15]).

[TS 24.301, subclause 4.4.2.3]

During Inter-system change from N1 mode to S1 mode in 5GMM-IDLE mode, if the UE is operating in the single-registration mode and:

1) if the tracking area updating procedure is initiated as specified in 3GPP TS 24.501 [54], the UE shall transmit a TRACKING AREA UPDATE REQUEST message integrity protected with the current 5G NAS security context and the UE shall derive a mapped EPS security context (see subclause 8.6.1 of 3GPP TS 33.501 [56]). The UE shall include the eKSI indicating the 5G NAS security context value in the TRACKING AREA UPDATE REQUEST message.

After receiving the TRACKING AREA UPDATE REQUEST message including the eKSI, the MME forwards the TRACKING AREA UPDATE REQUEST message to the source AMF, if possible, to obtain the mapped EPS security context from the AMF as specified in 3GPP TS 33.501 [56]. The MME re-establishes the secure exchange of NAS messages by either:

- replying with a TRACKING AREA UPDATE ACCEPT message that is integrity protected and ciphered using the mapped EPS NAS security context. From this time onward, all NAS messages exchanged between the UE and the

MME are sent integrity protected and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphared; or

9.3.1.1.3 Test description

9.3.1.1.3.1 Pre test conditions

System Simulator:

- 2 cells
- NGC Cell A as defined in TS 38.508-1 [4] Table 6.3.2.2-1. System information combination NR-6 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2.
- E-UTRA Cell A as defined in TS 38.508 [7] Table 6.3.2.2-1. System information combination 31 as defined in TS 38.508 [7], subclause 4.4.3.1.1.

UE:

None.

Preamble:

- With E-UTRA Cell A "Serving cell" and NGC Cell A "Non-suitable "Off" cell", the UE is brought to state RRC_IDLE Connectivity (*E-UTRA/EPC*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established
- the UE is switched-off
- With NGC Cell A "Serving cell" and E-UTRA Cell A "Non-suitable "Off" cell", the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.

9.3.1.1.2 Test procedure sequence

Table 9.3.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- E-UTRA Cell A as "Serving cell"
- NGC Cell A as "Non-suitable "off" cell". | - | - | - | - |
| 2 | Check: Does the UE perform on the E-UTRA Cell A the TAU procedure for Inter-system change from N1 mode to S1 mode in 5GMM/EMM-IDLE mode as described in TS 38.508-1 [4], Table 4.9.7.2.2-1, 'connected without release'? | - | - | 1 | - |

9.3.1.1.3.3 Specific message contents

None.

9.3.1.2 Inter-system mobility registration update / Single-registration mode with N26 / 5GMM-IDLE / EPC to 5GC

9.3.1.2.1 Test Purpose (TP)

(1)

with { UE in state EMM-REGISTERED and EMM-IDLE on an E-UTRA cell and has been previously registered on 5GC, UE supporting S1 and N1 and operating in single-registration mode, NWK supporting Single-registration mode with N26 interface }

ensure that {

when { UE detects a suitable NGC cell after the serving E-UTRA cell becomes not suitable }

then { UE performs a Inter-system change from S1 mode to N1 mode by initiating and successfully completing a mobility and periodic registration update procedure, mapped 5GC context used }

}

9.3.1.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], subclauses 4.4.2.5, 5.1.4.2, 5.5.1.3.2; TS 24.301 [21], subclause 5.5.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, subclause 4.4.2.5]

Secure exchange of NAS messages via a NAS signalling connection is usually established by the AMF during the registration procedure by initiating a security mode control procedure. After successful completion of the security mode control procedure, all NAS messages exchanged between the UE and the AMF are sent integrity protected using the current 5G security algorithms, and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the AMF are sent ciphered using the current 5G security algorithms.

...

During inter-system change from S1 mode to N1 mode in 5GMM-IDLE mode, if the UE is operating in single-registration mode and:

a) if the UE has a valid native 5G NAS security context, the UE shall transmit a REGISTRATION REQUEST message integrity protected with the native 5G NAS security context. The UE shall include the ngKSI indicating the native 5G NAS security context value in the REGISTRATION REQUEST message.

After receiving the REGISTRATION REQUEST message including the ngKSI indicating a native 5G NAS security context value, the AMF shall check whether the ngKSI included in the REGISTRATION REQUEST message belongs to a 5G NAS security context available in the AMF, and shall verify the MAC of the REGISTRATION REQUEST message. If the verification is successful, the AMF deletes the EPS security context received from the source MME if any, and the AMF re-establishes the secure exchange of NAS messages by either:

1) replying with a REGISTRATION ACCEPT message that is integrity protected and ciphered using the native 5G NAS security context. From this time onward, all NAS messages exchanged between the UE and the AMF are sent integrity protected and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the AMF are sent ciphered; or

2) initiating a security mode control procedure. This can be used by the AMF to take a non-current 5G NAS security context into use or to modify the current 5G NAS security context by selecting new NAS security algorithms.

[TS 24.501, subclause 5.1.4.2]

At inter-system change from S1 mode to N1 mode, the UE shall enter sub states 5GMM-REGISTERED.NORMAL-SERVICE and EMM-REGISTERED.NO-CELL-AVAILABLE and initiate a registration procedure for mobility and periodic registration update indicating "mobility registration updating" in the 5GS registration type IE of the REGISTRATION REQUEST message (see subclause 5.5.1.3).

[TS 24.501, subclause 5.5.1.3.2]

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic registration update by sending a REGISTRATION REQUEST message to the AMF,

...

e) upon Inter-system change from S1 mode to N1 mode;

...

If case b) is the only reason for initiating the registration procedure for mobility and periodic registration update, the UE shall indicate "periodic registration updating" in the 5GS registration type IE; otherwise the UE shall indicate "mobility registration updating".

If the UE indicates "mobility registration updating" in the 5GS registration type IE and the UE supports S1 mode, the UE shall:

- set the S1 mode bit to "S1 mode supported" in the 5GMM capability IE of the REGISTRATION REQUEST message;
- include the S1 UE network capability IE in the REGISTRATION REQUEST message; and
- if the UE supports sending an ATTACH REQUEST message containing a PDN CONNECTIVITY REQUEST message with request type set to "handover" to transfer a PDU session from N1 mode to S1 mode, set the HO attach bit to "attach request message containing PDN connectivity request with request type set to handover to transfer PDU session from N1 mode to S1 mode supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

...

If the last visited registered TAI is available, the UE shall include the last visited registered TAI in the REGISTRATION REQUEST message.

The UE shall handle the 5GS mobility identity IE in the REGISTRATION REQUEST message as follows:

a) if the UE is operating in the single-registration mode, performs Inter-system change from S1 mode to N1 mode, and the UE holds a valid 4G-GUTI, the UE shall include the 5G-GUTI mapped from the 4G-GUTI as specified in 3GPP TS 23.003 [4] in the 5GS mobility identity IE. Additionally, if the UE holds a valid 5G-GUTI, the UE shall include the 5G-GUTI in the Additional GUTI IE in the REGISTRATION REQUEST message in the following order:

- 1) a valid 5G-GUTI that was previously assigned by the same PLMN with which the UE is performing the registration, if available;
- 2) a valid 5G-GUTI that was previously assigned by an equivalent PLMN, if available; and
- 3) a valid 5G-GUTI that was previously assigned by any other PLMN, if available; and

...

If the UE operating in the single-registration mode performs Inter-system change from S1 mode to N1 mode, the UE:

a) shall include the UE status IE with the EMM registration status set to "UE is in EMM-REGISTERED state" in the REGISTRATION REQUEST message;

NOTE 1: Inclusion of the UE status IE with this setting corresponds to the indication that the UE is "moving from EPC" as specified in 3GPP TS 23.502 [9], subclause 4.11.1.3.3 and 4.11.2.3.

b) may include the PDU session status IE in the REGISTRATION REQUEST message indicating the status of the PDU session(s) mapped during the Inter-system change from S1 mode to N1 mode from the PDN connection(s) for which the EPS indicated that interworking to 5GS is supported, if any (see subclause 6.1.4.1); and

c) shall include a TRACKING AREA UPDATE REQUEST message as specified in 3GPP TS 24.301 [15] in the IE in the REGISTRATION REQUEST message.

...

The UE shall send the REGISTRATION REQUEST message including the NAS message container IE as described in subclause 4.4.6:

...

b) when the UE is sending the message after an Inter-system change from S1 mode to N1 mode in 5GMM-IDLE mode and the UE has a valid 5G NAS security context and needs to send non-plaintext IEs.

...

If the UE is sending the REGISTRATION REQUEST message after an Inter-system change from S1 mode to N1 mode in 5GMM-CONNECTED mode and the UE needs to send non-plaintext IEs, the UE shall cipher the NAS message container IE using the mapped 5G NAS security context and shall send the REGISTRATION REQUEST message including the NAS message container IE as described in subclause 4.4.6. If the UE does not need to send non-plaintext IEs, the UE shall send the REGISTRATION REQUEST message without including the NAS message container IE.

[TS 24.301, subclause 5.5.5]

The tracking area updating procedure is used to construct a TRACKING AREA UPDATE REQUEST message for the inter-system change from S1 mode to N1 mode for further security verification by the MME.

The TRACKING AREA UPDATE REQUEST message is created by EMM by request of 5GMM which further includes the message in the REGISTRATION REQUEST message as described in 3GPP TS 24.501 [54].

The TRACKING AREA UPDATE REQUEST message shall contain only mandatory information elements.

The UE shall set the EPS update type IE in the TRACKING AREA UPDATE REQUEST message to "TA updating".

If the UE has a current EPS security context, the UE shall include the eKSI (either KSI_{ASME} or KSI_{SGSN}) in the NAS Key Set Identifier IE in the TRACKING AREA UPDATE REQUEST message. Otherwise, the UE shall set the NAS Key Set Identifier IE to the value "no key is available". If the UE has a current EPS security context, the UE shall integrity protect the TRACKING AREA UPDATE REQUEST message with the current EPS security context and increase the uplink NAS COUNT by one. Otherwise the UE shall not integrity protect the TRACKING AREA UPDATE REQUEST message. The UE shall set associated GUTI in the Old GUTI IE.

When the UE is in EMM-REGISTERED.NO-CELL-AVAILABLE substate and needs to construct the TRACKING AREA UPDATE REQUEST message for inter-system change from S1 mode to N1 mode, the UE shall consider that the tracking area updating procedure is not initiated and the UE shall remain in EMM-REGISTERED.NO-CELL-AVAILABLE state.

9.3.1.2.3 Test description

9.3.1.2.3.1 Pre test conditions

System Simulator:

- 2 cells
- NGC Cell A as defined in TS 38.508-1 [4] Table 6.3.2.2-1. System information combination NR-6 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2.
- E-UTRA Cell A as defined in TS 36.508 [7] Table 6.3.2.2-1. System information combination 31 as defined in TS 36.508 [7], subclause 4.4.3.1.1.

UE:

None.

Preamble:

- With NGC Cell A "Serving cell" and E-UTRA Cell A "Non-suitable "Off" cell", the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.

- the UE is switched-off
- With E-UTRA Cell A "Serving cell" and NGC Cell A "Non-suitable "Off" cell", the UE is brought to state RRC_IDLE Connectivity (*E-UTRA/EPC*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established

9.3.1.2.3.2 Test procedure sequence

Table 9.3.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NGC Cell A as "Serving cell"
- E-UTRA Cell A as "Non-suitable "off" cell". | - | - | - | - |
| 2 | Check: Does the UE perform on the NGC Cell A the Test procedure for UE Tracking area updating for Inter-system change from S1 mode to N1 mode in 5GMM/EMM-IDLE mode as described in TS 38.508-1 [4], Table 4.9.2.2-1, 'connected without release'? | - | - | 1 | - |

9.3.1.2.3.3 Specific message contents

Table 9.3.1.2.3.3-1: REGISTRATION REQUEST (Preamble; TS 38.508-1 [4], Table 4.5.2.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6 | | | |
|---|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM capability | '0000 0xx1' | S1 mode supported

x - not checked | |
| S1 UE network capability | | | |
| All octets with the exception of octet 9, bit 6 | Not checked | | |
| N1 mode supported (N1mode) (octet 9, bit 6) | '1' | N1 mode supported | |

Table 9.3.1.2.3.3-2: REGISTRATION ACCEPT (Preamble; TS 38.508-1 [4], Table 4.5.2.2-2)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|---|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS network feature support | | | |
| Interworking without N26 interface indicator (IWK N26) (octet 3, bit 7) | '0' | Interworking without N26 interface not supported | |

9.3.1.3 Inter-system mobility and periodic registration update / Rejected / Single-registration mode with N26 / Handling of EPC relevant parameters

9.3.1.3.1 Test Purpose (TP)

(1)

with { UE in state 5GMM-REGISTERED on an NGC cell, UE supporting S1 and N1 and operating in single-registration mode, NWK supporting Single-registration mode with N26 interface }

ensure that {

when { UE initiates a Mobility and periodic registration procedure on an NGC cell and receives a REGISTRATION REJECT message including 5GMM cause value #9 (UE identity cannot be derived by the network) }

then { UE deletes the EPS relevant parameters 4G-GUTI, last visited registered TAI and eKSI and enters the state EMM-DEREGISTERED, and, subsequently, when it finds a suitable E-UTRA cell it moves to it and automatically initiates an attach procedure }

}

9.3.1.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], subclause 5.5.1.3.5, TS 24.301 [21], clause 5.5.3.2.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, subclause 5.5.1.3.5]

If the mobility and periodic registration update request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

...

#9 (UE identity cannot be derived by the network).

...

If the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status, 4G-GUTI, last visited registered TAI, TAI list and eKSI as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

[TS 24.301, subclause 5.5.3.2.5]

If the tracking area updating cannot be accepted by the network, the MME sends a TRACKING AREA UPDATE REJECT message to the UE including an appropriate EMM cause value.

...

#9 (UE identity cannot be derived by the network);

The UE shall set the EPS update status to EU2 NOT UPDATED (and shall store it according to subclause 5.1.3.3) and shall delete any GUTI, last visited registered TAI, TAI list and eKSI. The UE shall enter the state EMM-DEREGISTERED.

If the rejected request was not for initiating a PDN connection for emergency bearer services, the UE shall subsequently, automatically initiate the attach procedure.

9.3.1.3.3 Test description

9.3.1.3.3.1 Pre test conditions

System Simulator:

- 2 cells
- NGC Cell A as defined in TS 38.508-1 [4] Table 6.3.2.2-1. System information combination NR-6 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2.
- E-UTRA Cell A as defined in TS 36.508 [7] Table 6.3.2.2-1. System information combination 31 as defined in TS 36.508 [7], subclause 4.4.3.1.1.

UE:

None.

Preamble:

- With E-UTRA Cell A "Serving cell" and NGC Cell A "Non-suitable "Off" cell", the UE is brought to state RRC_IDLE Connectivity (*E-UTRA/EPC*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established
- the UE is switched-off
- With NGC Cell A "Serving cell" and E-UTRA Cell A "Non-suitable "Off" cell", the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.

9.3.1.3.3.2 Test procedure sequence

Table 9.3.1.3.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|----------------------|----|---------|
| | | U - S | Message | | |
| 1 | Wait for 25 seconds (expiry of T3512 periodic registration update timer, the value of 30 sec is provided during the initial registration in the Preamble). | - | - | - | - |
| 2 | The UE transmit a REGISTRATION REQUEST message with the 5GS registration type IE indicating "periodic registration updating". | --> | REGISTRATION REQUEST | - | - |
| 3 | The SS configures:
- E-UTRA Cell A "Suitable neighbour inter-frequency cell". | - | - | - | - |
| 4 | The SS transmits a REGISTRATION REJECT message including 5GMM cause value #9 (UE identity cannot be derived by the network). | <-- | REGISTRATION REJECT | - | - |
| 5 | Check: Does the UE perform on the E-UTRA Cell A an attach procedure as described in TS 38.508-1 [4], Table 4.5.2.2-1? The UE does not provide 4G-GUTI or 4G eKSI; nor last visited registered TAI. | - | - | 1 | - |

9.3.1.3.3.3 Specific message contents

Table 9.3.1.3.3.3-1: REGISTRATION ACCEPT (Preamble; TS 38.508-1 [4] Table 4.5.2.2-2)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7. | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| T3512 value | | | |
| Unit | '100'B | value is incremented in multiples of 30 seconds | |
| Timer value | '0 0001'B | 30 seconds | |

Table 9.3.1.3.3.3-2: REGISTRATION REQUEST (step 2, Table 9.3.1.3.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6. | | | |
|--|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS registration type | '00xxx011' | periodic registration updating

x - not checked | |
| ngKSI | Active ngKSI assigned in the Preamble | | |
| 5GS mobile identity | Active 5G-GUTI assigned in the Preamble | | |
| Last visited registered TAI | The TAI of the NGC Cell A, see TS 38.508-1 [4] Table 6.3.2.2-1 | | |

Table 9.3.1.3.3.3-3: REGISTRATION REJECT (step 4, Table 9.3.1.3.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9. | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '0000 1001'B | #9 - UE identity cannot be derived by the network | |

Table 9.3.1.3.3.3-4: ATTACH REQUEST (step 5, Table 9.3.1.3.3.2-1; step 5, TS 38.508-1 [4] Table 4.5.2.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-4. | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|----------------------------------|-------------|---------------------|--|
| NAS key set identifier | '111' | no key is available | |
| EPS mobile identity | IMSI | | |
| Old P-TMSI signature | Not present | | |
| Last visited registered TAI | Not present | | |
| Old location area identification | Not present | | |
| Old GUTI type | Not present | | |

10 Session management

10.1 5GS session management

Editor's note: Intended to capture tests of 5G Core Network behaviour defined in TS 24.301, TS 24.501 et.al. (TR 24.890).

FFS.

10.1.1 PDU session authentication and authorization

10.1.1.1 PDU session authentication and authorization / during the UE-requested PDU session procedure

10.1.1.1.1 Test Purpose (TP)

(1)

with { UE is establishing UE-requested PDU session by sending PDU Session establishment Request message }

ensure that {

when { UE receives a PDU SESSION AUTHENTICATION COMMAND message }

then { UE transmits a PDU SESSION AUTHENTICATION COMPLETE message }

}

(2)

with { PDU session authentication and authorization procedure is performed during the UE-requested PDU session establishment procedure }

ensure that {

when { UE receives EAP-failure message in the PDU SESSION ESTABLISHMENT REJECT message }

then { UE consider that the PDU session is not established }

}

(3)

with { PDU session authentication and authorization procedure is performed during the UE-requested PDU session establishment procedure }

ensure that {

when { UE receives EAP-success message in the PDU SESSION ESTABLISHMENT ACCEPT message }

then { UE consider that the PDU session is established }

}

10.1.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 6.3.1.2.1, 6.3.1.2.2 and 6.4.1.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 6.3.1.2.1]

In order to initiate the PDU EAP message reliable transport procedure, the SMF shall create a PDU SESSION AUTHENTICATION COMMAND message.

The SMF shall set the PTI IE of the PDU SESSION AUTHENTICATION COMMAND message to "No procedure transaction identity assigned".

The SMF shall set the EAP message IE of the PDU SESSION AUTHENTICATION COMMAND message to the EAP-request message provided by the DN or generated locally.

The SMF shall send the PDU SESSION AUTHENTICATION COMMAND message, and the SMF shall start timer T3590 (see example in figure 6.3.1.1).

Upon receipt of a PDU SESSION AUTHENTICATION COMMAND message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, the UE passes to the upper layers the EAP message received in the EAP message IE of the PDU SESSION AUTHENTICATION COMMAND message. Apart from this action, the authentication and authorization procedure initiated by the DN is transparent to the 5GSM layer of the UE.

[TS 24.501 clause 6.3.1.2.2]

When the upper layers provide an EAP-response message responding to the received EAP-request message, the UE shall create a PDU SESSION AUTHENTICATION COMPLETE message.

The UE shall set the EAP message IE of the PDU SESSION AUTHENTICATION COMPLETE message to the EAP-response message.

The UE shall transport the PDU SESSION AUTHENTICATION COMPLETE message and the PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5. Apart from this action, the authentication and authorization procedure initiated by the DN is transparent to the 5GSM layer of the UE.

Upon receipt of a PDU SESSION AUTHENTICATION COMPLETE message, the SMF shall stop timer T3590 and provides the EAP message received in the EAP message IE of the PDU SESSION AUTHENTICATION COMPLETE message to the DN or handles it locally.

[TS 24.501 clause 6.4.1.4]

If the connectivity with the requested DN is rejected by the network, the SMF shall create a SM PDU SESSION ESTABLISHMENT REJECT message.

The SMF shall set the 5GSM cause IE of the PDU SESSION ESTABLISHMENT REJECT message to indicate the reason for rejecting the PDU session establishment.

The 5GSM cause IE typically indicates one of the following SM cause values:

#8 operator determined barring;

- #26 insufficient resources;
 #27 missing or unknown DNN;
 #28 unknown PDU session type;
 #29 user authentication or authorization failed;

10.1.1.1.3 Test description

10.1.1.1.3.1 Pre-test conditions

System Simulator:

NGC Cell A

UE:

None.

Preamble:

The UE is in state 1N-A with PDU session Active state using the generic procedure NR RRC_IDLE according to TS 38.508-1 [4].

10.1.1.1.3.2 Test procedure sequence

Table 10.1.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | Cause the UE to request connectivity to an additional PDU session. (see Note 1) | - | - | - | - |
| 2 | UE transmits an <i>RRCSetupRequest</i> message followed by a SERVICE REQUEST message with service type IE to “signalling”. | --> | SERVICE REQUEST | - | - |
| 3 | Steps 5 and 6 of the generic procedure for NR RRC_Connected specified in TS 38.508-1 subclause 4.5.4.2 are performed. | - | - | - | - |
| 4 | The SS transmits an <i>RRCReconfiguration</i> message and a SERVICE ACCEPT message to establish SRB2 and DRB. | <-- | NR RRC: RRCReconfiguration
5GMM: SERVICE ACCEPT | - | - |
| 4A | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 5 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message to request an additional PDU session.

Note: PDU SESSION ESTABLISHMENT REQUEST is included in UL NAS transport. UL NAS transport message is included in dedicatedNAS-Message of | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT REQUEST | - | - |

| | | | | | |
|---------|---|-----|---|---|---|
| | <i>ULInformationTransfer</i> message.
DNN information is included in UL NAS transport message. | | | | |
| 6 | The SS transmits PDU SESSION AUTHENTICATION COMMAND including an EAP-Request message. | <-- | PDU SESSION AUTHENTICATION COMMAND | | |
| 7 | Check: Does the UE transmit a PDU SESSION AUTHENTICATION COMPLETE containing EAP-Response message? | --> | PDU SESSION AUTHENTICATION COMPLETE | 1 | P |
| 8 | The SS transmits PDU SESSION ESTABLISHMENT REJECT message with 5GSM cause #29 including an EAP-Failure message. | <-- | PDU SESSION ESTABLISHMENT REJECT | | |
| 9 | The SS releases the RRC connection. | - | | - | - |
| 10 | Cause the UE to request connectivity to an additional PDU session. (see Note 1) | - | - | - | - |
| 11 | UE transmits an RRCSetupRequest message followed by a SERVICE REQUEST message with service type IE to “signalling”. | --> | SERVICE REQUEST | - | - |
| 12 | Steps 5 and 6 of the generic procedure for NR RRC_Connected specified in TS 38.508-1 subclause 4.5.4.2 are performed. | - | - | - | - |
| 13 | The SS transmits an RRCReconfiguration message and a SERVICE ACCEPT message to establish SRB2 and DRB. | <-- | NR RRC: RRCReconfiguration
5GMM: SERVICE ACCEPT | - | - |
| 13
A | The UE transmits an <i>RRCReconfigurationComplete</i> message. | --> | NR RRC:
<i>RRCReconfigurationComplete</i> | - | - |
| 14 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message to request an additional PDU session.

Note: PDU SESSION ESTABLISHMENT REQUEST is included in UL NAS transport. UL NAS transport message is included in dedicatedNAS-Message of <i>ULInformationTransfer</i> message

DNN information is included in UL NAS transport message. | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT REQUEST | 2 | P |
| 15 | The SS transmits PDU SESSION AUTHENTICATION COMMAND including an EAP-Request message. | <-- | PDU SESSION AUTHENTICATION COMMAND | | |
| 16 | Check: Does the UE transmit a PDU SESSION AUTHENTICATION COMPLETE containing EAP-Response message? | --> | PDU SESSION AUTHENTICATION COMPLETE | - | - |
| 17 | The SS transmits <i>RRCReconfiguration</i> message containing PDU SESSION ESTABLISHMENT ACCEPT message | <-- | PDU SESSION ESTABLISHMENT ACCEPT | | |

| | | | | | |
|---|--|---|---|---|---|
| | containing an EAP-Success message. | | | | |
| 18 | The UE transmits <i>RRCReconfigurationComplete</i> message to confirm the establishment of DRB. | - | - | 3 | P |
| - | EXCEPTION: Step 19a1 describes behaviour depending UE implementation; the "lower case letter" identifies a step sequence that take place if the UE performs a specific action. | - | - | - | - |
| 19a
1 | If initiated by the UE, the generic procedure for IP address allocation in the user plane, specified in subclause 4.5.6, takes place performing IP address allocation in the user plane. | - | - | - | - |
| 20 | The SS releases the RRC connection. | - | | - | - |
| Note 1: The request of connectivity to an additional PDU session may be performed by MMI or AT command. | | | | | |

10.1.1.1.3.3 Specific message contents

Table 10.1.1.1.3.3-1: SERVICE REQUEST (step 2 and 11, Table 10.1.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-16 | | | |
|---|-----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |
| Service type | '0000'B | signalling | |
| PDU session status | PDU session IDs | PDU session IDs of the ACTIVE PDU session established during Preamble. | |

Table 10.1.1.1.3.3-2: SERVICE ACCEPT (step 4 and 13, Table 10.1.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-17 | | | |
|---|-----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |
| PDU session status | PDU session IDs | PDU session IDs of the ACTIVE PDU session established during Preamble. | |

Table 10.1.1.1.3.3-3: PDU SESSION ESTABLISHMENT REQUEST (step 5 and 14, Table 10.1.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.2-1 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| | | | |

| | | | |
|----------------|-------|--|--|
| PDU session ID | PSI-1 | UE assigns a particular PSI not yet used between 1 and 15 | |
| PTI | PTI-1 | UE assigns a particular PTI not yet used between 1 and 254 | |

Table 10.1.1.1.3.3-4: UL NAS Transport (step 5 and 14, Table 10.1.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-10 | | | |
|---|----------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0001'B | N1 SM information | |
| PDU session ID | PSI-1 | | |
| Request type | '001'B | Initial request | |
| S-NSSAI | Not Present | | |
| DNN | DNN-1 (New DNN name) | The requested DNN is different from default DNN. | |

Table 10.1.1.1.3.3-5: PDU SESSION ESTABLISHMENT REJECT (step 8, Table 10.1.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.2-3 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | PSI-1 | | |
| PTI | PTI-1 | | |
| 5GSM cause | '00011 101' | User authentication or authorization failed | |

Table 10.1.1.1.3.3-6: PDU SESSION ESTABLISHMENT ACCEPT (step 17, Table 10.1.1.1.3.2-1)

| | | | |
|--|--|--|--|
| Derivation Path: 38.508-1 [4], Table 4.7.2-2 | | | |
|--|--|--|--|

| Information Element | Value/remark | Comment | Condition |
|---------------------------|---------------------|---------------------------------------|-----------|
| PDU session ID | PSI-1 | | |
| PTI | PTI-1 | | |
| Authorized QoS rules | | | |
| QoS rule | | | |
| QoS rule identifier | '0000 0001'B | | |
| Rule operation code | '001'B | Create new QoS rule | |
| DQR bit | '1'B | The QoS rule is the default QoS rule. | |
| Number of packet filters | '0001'B | 1 packet filter | |
| Packet filter list | See table 4.8.2.1-1 | Packet filter list #1 | |
| Packet filter direction | '11'B | bidirectional | |
| Packet filter identifier | '0000'B | Id 0 | |
| Component type 1 ID | '0000 0001'B | Match-all type | |
| QoS rule precedence | '0000 0000'B | 0 | |
| QoS flow identifier (QFI) | '00 0011'B | QFI 3 | |
| EAP message | | | |
| QoS flow description | | | |
| QFI | '00 0011'B | QFI 3 | |
| Operation code | '001'B | Create new QoS flow description | |
| E bit | '1'B | Parameters list is included | |
| Number of parameters | '00 0001'B | 1 parameters | |
| 5QI | '0000 1001'B | 5QI 9 | |
| DNN | DNN-1 | | |

10.1.1.2 PDU session authentication and authorization / after the UE-requested PDU session procedure

10.1.1.2.1 Test Purpose (TP)

(1)

with { the UE is in 5GMM-REGISTERED state with an established PDU session }

ensure that {

when { UE receives a PDU SESSION AUTHENTICATION COMMAND message }

then { UE transmits a PDU SESSION AUTHENTICATION COMPLETE message }

}

(2)

with { PDU session authentication and authorization procedure is performed after the UE-requested PDU session establishment procedure }

ensure that {

when { UE receives EAP-failure message in the PDU SESSION RELEASE COMMAND message }

then { the 5GSM state of the UE is PDU SESSION INACTIVE state }

}

(3)

with { PDU session authentication and authorization procedure is performed after the UE-requested PDU session establishment procedure }

ensure that {

when { UE receives EAP-success message in the PDU SESSION AUTHENTICATION RESULT message }

then { the 5GSM state of the UE is PDU SESSION ACTIVE state }

}

10.1.1.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 6.3.1.1, clause 6.3.1.2.1, 6.3.1.2.2 and 6.3.1.3.1. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501 clause 6.3.1.1]

The purpose of the PDU session authentication and authorization procedure is to enable the DN:

- a) to authenticate the upper layers of the UE, when establishing the PDU session;
- b) to authorize the upper layers of the UE, when establishing the PDU session;
- c) both of the above; or
- d) to re-authenticate the upper layers of the UE after establishment of the PDU session.

The PDU session authentication and authorization procedure can be performed only during or after the UE-requested PDU session procedure establishing a non-emergency PDU session. The PDU session authentication and authorization procedure shall not be performed during or after the UE-requested PDU session establishment procedure establishing an emergency PDU session.

The network authenticates the UE using the Extensible Authentication Protocol (EAP) as specified in IETF RFC 3748 [32].

EAP has defined four types of EAP messages:

- a) an EAP-request message;
- b) an EAP-response message;
- c) an EAP-success message; and
- d) an EAP-failure message.

The EAP-request message is transported from the network to the UE using the PDU SESSION AUTHENTICATION COMMAND message of the PDU EAP message reliable transport procedure.

The EAP-response message to the EAP-request message is transported from the UE to the network using the PDU SESSION AUTHENTICATION COMPLETE message of the PDU EAP message reliable transport procedure.

If the PDU session authentication and authorization procedure is performed during the UE-requested PDU session establishment procedure:

- a) and the DN authentication of the UE completes successfully, the EAP-success message is transported from the network to the UE as part of the UE-requested PDU session establishment procedure in the PDU SESSION ESTABLISHMENT ACCEPT message.
- b) and the DN authentication of the UE completes unsuccessfully, the EAP-failure message is transported from the network to the UE as part of the UE-requested PDU session establishment procedure in the PDU SESSION ESTABLISHMENT REJECT message.

If the PDU session authentication and authorization procedure is performed after the UE-requested PDU session establishment procedure:

- a) and the DN authentication of the UE completes successfully, the EAP-success message is transported from the network to the UE using the PDU SESSION AUTHENTICATION RESULT message of the PDU EAP result message transport procedure.
- b) and the DN authentication of the UE completes unsuccessfully, the EAP-failure message is transported from the network to the UE using the PDU SESSION RELEASE COMMAND message of the network-requested PDU session release procedure.

There can be several rounds of exchange of an EAP-request message and a related EAP-response message for the DN to complete the authentication and authorization of the request for a PDU session (see example in figure 6.3.1.1).

The SMF shall set the authenticator retransmission timer specified in IETF RFC 3748 [34] subclause 4.3 to infinite value.

NOTE: The PDU session authentication and authorization procedure provides a reliable transport of EAP messages and therefore retransmissions at the EAP layer of the SMF do not occur.

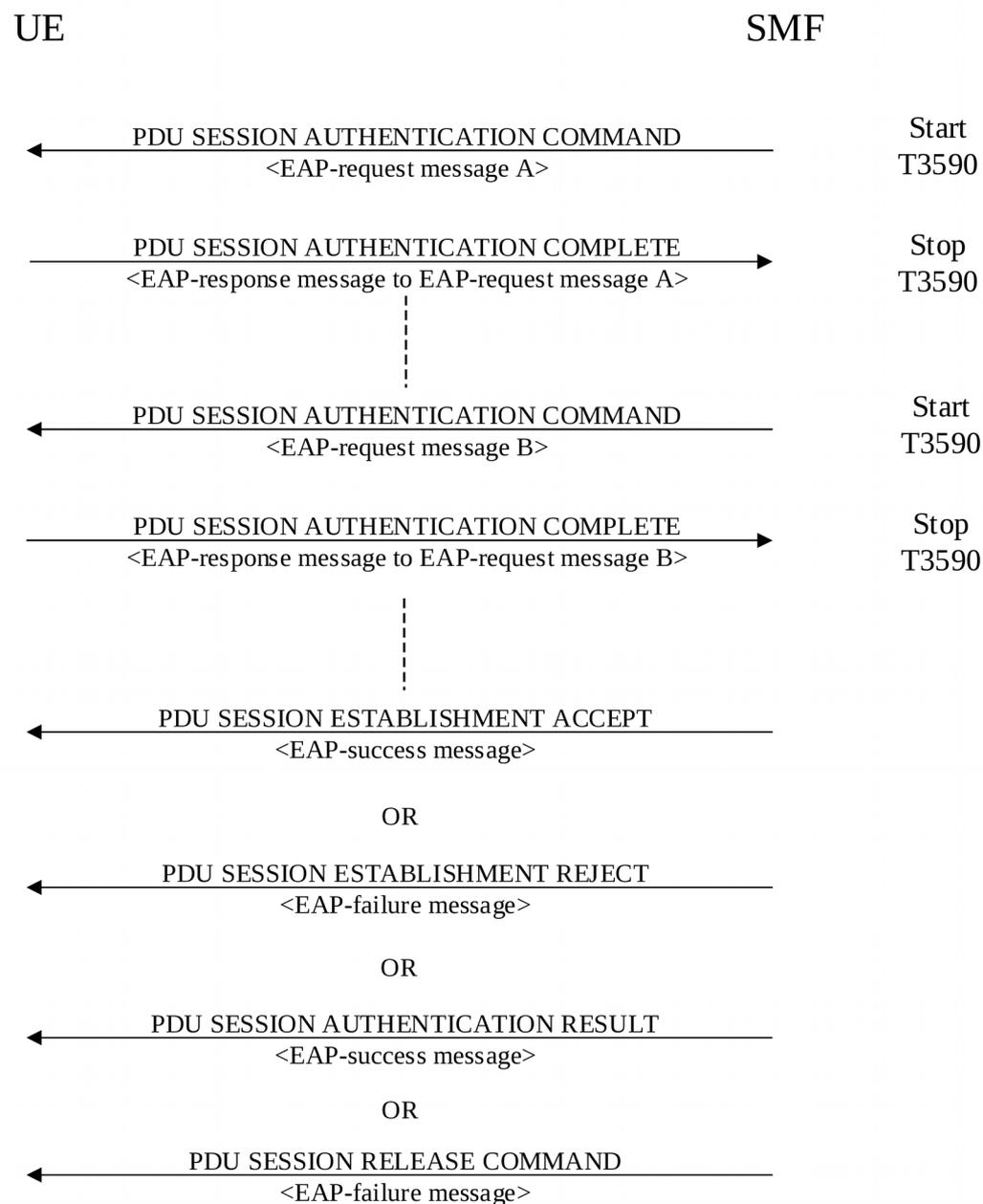


Figure 6.3.1.1: PDU session authentication and authorization procedure

[TS 24.501 clause 6.3.1.2.1]

In order to initiate the PDU EAP message reliable transport procedure, the SMF shall create a PDU SESSION AUTHENTICATION COMMAND message.

The SMF shall set the PTI IE of the PDU SESSION AUTHENTICATION COMMAND message to "No procedure transaction identity assigned".

The SMF shall set the EAP message IE of the PDU SESSION AUTHENTICATION COMMAND message to the EAP-request message provided by the DN or generated locally.

The SMF shall send the PDU SESSION AUTHENTICATION COMMAND message, and the SMF shall start timer T3590 (see example in figure 6.3.1.1).

Upon receipt of a PDU SESSION AUTHENTICATION COMMAND message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, the UE passes to the upper layers the EAP message received in the

EAP message IE of the PDU SESSION AUTHENTICATION COMMAND message. Apart from this action, the authentication and authorization procedure initiated by the DN is transparent to the 5GSM layer of the UE.

[TS 24.501 clause 6.3.1.2.2]

When the upper layers provide an EAP-response message responding to the received EAP-request message, the UE shall create a PDU SESSION AUTHENTICATION COMPLETE message.

The UE shall set the EAP message IE of the PDU SESSION AUTHENTICATION COMPLETE message to the EAP-response message.

The UE shall transport the PDU SESSION AUTHENTICATION COMPLETE message and the PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5. Apart from this action, the authentication and authorization procedure initiated by the DN is transparent to the 5GSM layer of the UE.

Upon receipt of a PDU SESSION AUTHENTICATION COMPLETE message, the SMF shall stop timer T3590 and provides the EAP message received in the EAP message IE of the PDU SESSION AUTHENTICATION COMPLETE message to the DN or handles it locally.

[TS 24.501 clause 6.3.1.3.1]

In order to initiate the PDU EAP result message transport procedure, the SMF shall create a PDU SESSION AUTHENTICATION RESULT message.

The SMF shall set the PTI IE of the PDU SESSION AUTHENTICATION RESULT message to "No procedure transaction identity assigned".

The SMF shall set the EAP message IE of the PDU SESSION AUTHENTICATION RESULT message to the EAP-success message provided by the DN.

The SMF shall send the PDU SESSION AUTHENTICATION RESULT message.

Upon receipt of a PDU SESSION AUTHENTICATION RESULT message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, the UE passes to the upper layers the EAP message received in the EAP message IE of the PDU SESSION AUTHENTICATION RESULT message. Apart from this action, the authentication and authorization procedure initiated by the DN is transparent to the 5GSM layer of the UE.

10.1.1.2.3 Test description

10.1.1.2.3.1 Pre-test conditions

System Simulator:

NGC Cell A

UE:

None.

Preamble:

The UE is in state 1N-A, 'connected without Release' with PDU session Active state using the generic procedure NR RRC_IDLE according to TS 38.508-1 [4].

10.1.1.2.3.2 Test procedure sequence

Table 10.1.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|------------------------------|------------------|------------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits PDU SESSION | <-- | PDU SESSION AUTHENTICATION COMMAND | - | - |

| | | | | | |
|-------|---|-----|-------------------------------------|---|---|
| | AUTHENTICATION COMMAND including an EAP-Request message. | | | | |
| 2 | Check: Does the UE transmit a PDU SESSION AUTHENTICATION COMPLETE containing EAP-Response message? | --> | PDU SESSION AUTHENTICATION COMPLETE | 1 | P |
| 3 | The SS transmits PDU SESSION AUTHENTICATION RESULT message containing an EAP-Success message. | <-- | PDU SESSION AUTHENTICATION RESULT | - | - |
| 4 | The SS transmits PDU SESSION AUTHENTICATION COMMAND including an EAP-Request message. | <-- | PDU SESSION AUTHENTICATION COMMAND | - | - |
| 5 | Check: Does the UE transmit a PDU SESSION AUTHENTICATION COMPLETE containing EAP-Response message? | --> | PDU SESSION AUTHENTICATION COMPLETE | 3 | P |
| 6 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #26 "insufficient resources". | <-- | PDU SESSION RELEASE COMMAND | - | - |
| 7 | The UE transmit a PDU SESSION RELEASE COMPLETE message. | --> | PDU SESSION RELEASE COMPLETE | - | - |
| 7A | The SS releases the RRC connection. | - | | - | - |
| 8 | Cause the UE to request establishment of PDU session. (see Note 1) | - | - | - | - |
| 9 | UE transmits an RRCSetupRequest message followed by a SERVICE REQUEST message with service type IE to "signalling". | --> | SERVICE REQUEST | - | - |
| 10-11 | Steps 5 and 6 of the generic procedure for NR RRC_Connected specified in TS 38.508-1 subclause 4.5.4.2 are performed. | - | - | - | - |
| 12 | The SS transmits an RRCReconfiguration message and a SERVICE ACCEPT message to establish SRB2. | <-- | SERVICE ACCEPT | - | - |
| 13 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message to request an additional PDU session.

Note: PDU SESSION ESTABLISHMENT REQUEST is included in UL NAS transport. UL NAS transport message is included in dedicatedNAS-Message of <i>ULInformationTransfer</i> message

DNN information is included in UL NAS transport message. | --> | PDU SESSION ESTABLISHMENT REQUEST | - | - |
| 14 | The SS transmits <i>RRCReconfiguration</i> message containing PDU SESSION ESTABLISHMENT ACCEPT message. | <-- | PDU SESSION ESTABLISHMENT ACCEPT | - | - |
| 15 | The UE transmits <i>RRCReconfigurationComplete</i> message to | - | - | - | - |

| | | | | | |
|---|--|-----|--|---|---|
| | confirm the establishment of DRB. | | | | |
| - | EXCEPTION: Step 15a1 describes behaviour depending UE implementation; the "lower case letter" identifies a step sequence that take place if the UE performs a specific action. | - | - | - | - |
| 15a1 | If initiated by the UE, the generic procedure for IP address allocation in the user plane, specified in subclause 4.5.6, takes place performing IP address allocation in the user plane. | - | - | - | - |
| 16 | The SS transmits PDU SESSION AUTHENTICATION COMMAND including an EAP-Request message. | <-- | PDU SESSION AUTHENTICATION COMMAND | - | - |
| 17 | UE transmits a PDU SESSION AUTHENTICATION COMPLETE containing EAP-Response message? | --> | PDU SESSION AUTHENTICATION COMPLETE | - | - |
| 18 | SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #29 "user authentication or authorization failed". | --> | PDU SESSION PDU SESSION RELEASE COMMAND | - | - |
| 19 | Check: Does UE transmit a PDU SESSION RELEASE COMPLETE message? | --> | PDU SESSION PDU SESSION RELEASE COMPLETE | 2 | P |
| Note 1: The request of connectivity to an additional PDU session may be performed by MMI or AT command. | | | | | |

10.1.1.2.3.3 Specific message contents

Table 10.1.1.2.3.3-1: Void

Table 10.1.1.2.3.3-2: Void

Table 10.1.1.2.3.3-2A: Message AUTHENTICATION RESULT (step 3, Table 10.1.1.2.3.2-1)

| Derivation path: TS 38.508-1 [4], table 4.7.1-3 | | | |
|---|--------------|---------|----------------|
| Information Element | Value/Remark | Comment | Condition |
| EAP message | EAP-Success | | EAP-AKA |

Table 10.1.1.2.3.3-3: PDU SESSION RELEASE COMMAND (step 6, Table 10.1.1.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 13 in Table 10.1.1.2.3.2-1 | | |
| 5GSM cause | '0001 1010'B | insufficient resources | |

| | | | |
|----------------------|--------------|-----------|--|
| Back-off timer value | '1010 0000'B | 0 minutes | |
|----------------------|--------------|-----------|--|

Table 10.1.1.2.3.3-3A: SERVICE REQUEST (Step 9, Table 10.1.1.2.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-16 | | | |
|---|--------------|------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Service type | | | |
| Service type value | '0000'B | signalling | |

Table 10.1.1.2.3.3-4: PDU SESSION ESTABLISHMENT REQUEST (step 13, Table 10.1.1.2.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.2-1 | | | |
|--|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | PSI-1 | UE assigns a particular PSI not yet used between 1 and 15 | |
| PTI | PTI-1 | UE assigns a particular PTI not yet used between 1 and 254 | |

Table 10.1.1.2.3.3-5: PDU SESSION RELEASE COMMAND (step 18, Table 10.1.1.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 13 in Table 10.1.1.2.3.2-1 | | |
| 5GSM cause | '0001 1101'B | user authentication or authorization failed | |
| Back-off timer value | '1010 0000'B | 0 minutes | |

10.1.2 Network-requested PDU session modification

10.1.2.1 Network-requested PDU session modification / Accepted

10.1.2.1.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state with an established PDU session }

ensure that {

when { the UE receives a PDU SESSION MODIFICATION COMMAND message }

then { UE sends a PDU SESSION MODIFICATION COMPLETE message and modifies the PDU session accordingly }

}

(2)

with { the UE in 5GMM-REGISTERED state with an established PDU session has been modified }

ensure that {

when { the UE has IP packets for transmission where each IP packet matches the modified packet filters configured in the UL TFTs for the PDU session }

then { the UE evaluates the packet filters in the correct evaluation order and transmits IP packets in uplink on the dedicated PDU session associated with the matched packet filter }

}

10.1.2.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 6.3.2.3 and TS 24.008, clause 10.5.6.12. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.3.2.3]

Upon receipt of the PDU SESSION MODIFICATION COMMAND message, if the UE provided a DNN during the PDU session establishment, the UE shall stop timer T3396, if it is running for the DNN provided by the UE. If the UE did not provide a DNN during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3396 associated with no DNN if it is running. If the PDU SESSION MODIFICATION COMMAND message was received for an emergency PDU session, the UE shall not stop the timer T3396 associated with no DNN if it is running.

Upon receipt of the PDU SESSION MODIFICATION COMMAND message, if the UE provided an S-NSSAI and a DNN during the PDU session establishment, the UE shall stop timer T3584, if it is running for the same [S-NSSAI, DNN] combination provided by the UE. If the UE did not provide an S-NSSAI during the PDU session establishment, the UE shall stop timer T3584, if it is running for the same [no S-NSSAI, DNN] combination provided by the UE. If the UE provided neither a DNN nor an S-NSSAI during the PDU session establishment, the UE shall stop timer T3584, if it is running for the same [no S-NSSAI, no DNN] combination provided by the UE.

Upon receipt of the PDU SESSION MODIFICATION COMMAND message, if the UE provided an S-NSSAI during the PDU session establishment, the UE shall stop timer T3585, if it is running for the S-NSSAI provided by the UE. If the UE did not provide an S-NSSAI during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3585 associated with no S-NSSAI if it is running. If the PDU SESSION MODIFICATION COMMAND message was

received for an emergency PDU session, the UE shall not stop the timer T3585 associated with no S-NSSAI if it is running.

NOTE 1: Upon receipt of the PDU SESSION MODIFICATION COMMAND message for a PDU session, if the UE provided a DNN (or no DNN) and an S-NSSAI (or no S-NSSAI) when the PDU session is established, timer T3396 associated with the DNN (or no DNN, if no DNN was provided by the UE) is running, and timer T3584 associated with the DNN (or no DNN, if no DNN was provided by the UE) and the S-NSSAI (or no S-NSSAI, if no S-NSSAI was provided by the UE) is running, then the UE stops both the timer T3396 and the timer T3584.

NOTE 2: Upon receipt of the PDU SESSION MODIFICATION COMMAND message for a PDU session, if the UE provided a DNN (or no DNN) and an S-NSSAI (or no S-NSSAI) when the PDU session is established, timer T3585 associated with the S-NSSAI (or no S-NSSAI, if no S-NSSAI was provided by the UE) is running, and timer T3584 associated with the DNN (or no DNN, if no DNN was provided by the UE) and the S-NSSAI (or no S-NSSAI, if no S-NSSAI was provided by the UE) is running, then the UE stops both the timer T3585 and the timer T3584.

If the PDU SESSION MODIFICATION COMMAND message includes the Authorized QoS rules IE, the UE shall process the QoS rules sequentially starting with the first QoS rule.

The UE shall replace the stored authorized QoS rules, authorized QoS flow descriptions and session-AMBR of the PDU session with the received value(s), if any, in the PDU SESSION MODIFICATION COMMAND message.

If the PDU SESSION MODIFICATION COMMAND message includes a Mapped EPS bearer contexts IE, the UE shall check each mapped EPS bearer context for different types of errors as follows:

NOTE 3: An error detected in a mapped EPS bearer context does not cause the UE to discard the Authorized QoS rules IE and Authorized QoS flow descriptions IE included in the PDU SESSION MODIFICATION COMMAND message, if any.

a) Semantic error in the mapped EPS bearer operation:

- 1) operation code = "Create new EPS bearer" and there is already an existing mapped EPS bearer context with the same EPS bearer identity associated with any PDU session.
- 2) operation code = "Delete existing EPS bearer" and there is no existing mapped EPS bearer context with the same EPS bearer identity associated with the PDU session that is being modified.
- 3) operation code = "Modify existing EPS bearer" and there is no existing mapped EPS bearer context with the same EPS bearer identity associated with the PDU session that is being modified.

In case 1, if the existing mapped EPS bearer context is associated with the PDU session that is being modified, the UE shall not diagnose an error, further process the create request and, if it was process successfully, delete the old EPS bearer context.

In case 2, the UE shall not diagnose an error, further process the delete request and, if it was processed successfully, consider the mapped EPS bearer context as successfully deleted.

Otherwise, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #85 "Invalid mapped EPS bearer identity".

b) if the mapped EPS bearer context includes a traffic flow template, the UE shall check the traffic flow template for different types of TFT IE errors as follows:

2) Semantic errors in TFT operations:

- i) TFT operation = "Create a new TFT" when there is already an existing TFT for the EPS bearer context.
- ii) When the TFT operation is an operation other than "Create a new TFT" and there is no TFT for the EPS bearer context.
- iii) TFT operation = "Delete packet filters from existing TFT" when it would render the TFT empty.
- iv) TFT operation = "Delete existing TFT" for a dedicated EPS bearer context.

In case iv, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #41 "semantic error in the TFT operation".

In the other cases the UE shall not diagnose an error and perform the following actions to resolve the inconsistency:

In case i, the UE shall further process the new activation request and, if it was processed successfully, delete the old TFT.

In case ii, the UE shall:

- process the new request and if the TFT operation is "Delete existing TFT" or "Delete packet filters from existing TFT", and if no error according to items b, c, and d was detected, consider the TFT as successfully deleted;
- process the new request as an activation request, if the TFT operation is "Add packet filters in existing TFT" or "Replace packet filters in existing TFT".

In case iii, if the packet filters belong to a dedicated EPS bearer context, the UE shall process the new deletion request and, if no error according to items b, c, and d was detected, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #41 "semantic error in the TFT operation".

In case iii, if the packet filters belong to the default EPS bearer context, the UE shall process the new deletion request and if no error according to items b, c, and d was detected then delete the existing TFT, this corresponds to using match-all packet filter for the default EPS bearer context.

2) Syntactical errors in TFT operations:

- i) When the TFT operation = "Create a new TFT", "Add packet filters in existing TFT", "Replace packet filters in existing TFT" or "Delete packet filters from existing TFT" and the packet filter list in the TFT IE is empty.
- ii) TFT operation = "Delete existing TFT" or "No TFT operation" with a non-empty packet filter list in the TFT IE.
- iii) TFT operation = "Replace packet filters in existing TFT" when the packet filter to be replaced does not exist in the original TFT.
- iv) TFT operation = "Delete packet filters from existing TFT" when the packet filter to be deleted does not exist in the original TFT.
- v) TFT operation = "Delete packet filters from existing TFT" with a packet filter list also including packet filters in addition to the packet filter identifiers.
- vi) When there are other types of syntactical errors in the coding of the TFT IE, such as a mismatch between the number of packet filters subfield, and the number of packet filters in the packet filter list.

In case iii, the UE shall not diagnose an error, further process the replace request and, if no error according to items c and d was detected, include the packet filters received to the existing TFT.

In case iv, the UE shall not diagnose an error, further process the deletion request and, if no error according to items c and d was detected, consider the respective packet filter as successfully deleted.

Otherwise, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #42 "syntactical error in the TFT operation".

3) Semantic errors in packet filters:

- i) When a packet filter consists of conflicting packet filter components which would render the packet filter ineffective, i.e. no IP packet will ever fit this packet filter. How the UE determines a semantic error in a packet filter is outside the scope of the present document.
- ii) When the resulting TFT, which is assigned to a dedicated EPS bearer context, does not contain any packet filter applicable for the uplink direction among the packet filters created on request from the network.

After sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #44 "semantic errors in packet filter(s)".

4) Syntactical errors in packet filters:

i) When the TFT operation = "Create a new TFT", "Add packet filters to existing TFT", and two or more packet filters in the resultant TFT would have identical packet filter identifiers.

ii) When the TFT operation = "Create a new TFT", "Add packet filters to existing TFT" or "Replace packet filters in existing TFT", and two or more packet filters among all TFTs associated with this PDN connection would have identical packet filter precedence values.

iii) When there are other types of syntactical errors in the coding of packet filters, such as the use of a reserved value for a packet filter component identifier.

In case i, if two or more packet filters with identical packet filter identifiers are contained in the new request, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #45 "syntactical error in packet filter(s)". Otherwise, the UE shall not diagnose an error, further process the new request and, if it was processed successfully, delete the old packet filters which have the identical packet filter identifiers.

In case ii, if the old packet filters do not belong to the default EPS bearer context, the UE shall not diagnose an error, shall further process the new request and, if it was processed successfully, shall delete the old packet filters which have identical filter precedence values.

In case ii, if one or more old packet filters belong to the default EPS bearer context, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #45 "syntactical errors in packet filter(s)".

Otherwise, after sending the PDU SESSSION MODIFICATION COMPLETE for the ongoing PDU session modification procedure, the UE shall initiate a PDU session modification procedure by sending a PDU SESSION MODIFICATION REQUEST message to delete the mapped EPS bearer context with 5GSM cause #45 "syntactical error in packet filter(s)".

And if a new EPS bearer identity parameter in authorized QoS flow descriptions IE is received for a QoS flow which can be transferred to EPS, the UE shall update the association between the QoS flow and the mapped EPS bearer context, based on the new EPS bearer identity and the mapped EPS bearer contexts. If the "Delete existing EPS bearer" operation code in the Mapped EPS bearer contexts IE was received, the UE shall discard the association between the QoS flow and the corresponding mapped EPS bearer context.

Upon receipt of a PDU SESSION MODIFICATION COMMAND message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, if the UE accepts the PDU SESSION MODIFICATION COMMAND message, the UE considers the PDU session as modified and the UE shall create a PDU SESSION MODIFICATION COMPLETE message.

If the PDU SESSION MODIFICATION COMMAND message contains the PTI value allocated in the UE-requested PDU session modification procedure, the UE shall stop the timer T3581. The UE should ensure that the PTI value assigned to this procedure is not released immediately.

NOTE 4: The way to achieve this is implementation dependent. For example, the UE can ensure that the PTI value assigned to this procedure is not released during the time equal to or greater than the default value of timer T3591.

While the PTI value is not released, the UE regards any received PDU SESSION MODIFICATION COMMAND message with the same PTI value as a network retransmission (see subclause 7.3.1).

If the selected SSC mode of the PDU session is "SSC mode 3" and the PDU SESSION MODIFICATION COMMAND message includes 5GSM cause #39 "reactivation requested", the UE can provide to the upper layers the PDU session address lifetime if received in the PDU session address lifetime PCO parameter of the Extended protocol configuration options IE of the PDU SESSION MODIFICATION COMMAND message. After the completion of the network-

requested PDU session modification procedure, the UE should re-initiate the UE-requested PDU session establishment procedure with a new PDU session ID as specified in subclause 6.4.1 for:

- a) the PDU session type associated with the present PDU session;
- b) the SSC mode associated with the present PDU session;
- c) the DNN associated with the present PDU session; and
- d) the S-NSSAI associated with (if available in roaming scenarios) a mapped S-NSSAI if provided in the UE-requested PDU session establishment procedure of the present PDU session.

The UE shall include the PDU session ID of the old PDU session which is about to get released in the old PDU session ID IE of the UL NAS TRANSPORT message that transports the PDU SESSION ESTABLISHMENT REQUEST message.

NOTE 5: The UE is expected to maintain the PDU session for which the PDU SESSION MODIFICATION COMMAND message including 5GSM cause #39 "reactivation requested" is received during the time indicated by the PDU session address lifetime value or until receiving an indication from upper layers (e.g. that the old PDU session is no more needed).

If the selected PDU session type of the PDU session is "Unstructured" or "Ethernet", the UE supports inter-system change from N1 mode to S1 mode, the UE does not support establishment of a PDN connection for the PDN type set to "non-IP" in S1 mode, and the parameters list field of one or more authorized QoS flow descriptions received in the authorized QoS flow descriptions IE of the PDU SESSION MODIFICATION COMMAND message contains an EPS bearer identity (EBI) then the UE shall locally remove the EPS bearer identity (EBI) from the parameters list field of such one or more authorized QoS flow descriptions.

If the Always-on PDU session indication IE is included in the PDU SESSION MODIFICATION COMMAND message and:

- a) the value of the IE is set to "Always-on PDU session required", the UE shall consider the established PDU session as an always-on PDU session; or
- b) the value of the IE is set to "Always-on PDU session not allowed", the UE shall not consider the established PDU session as an always-on PDU session.

If the UE does not receive the Always-on PDU session indication IE in the PDU SESSION MODIFICATION COMMAND message:

- a) if the network-requested PDU session modification procedure is triggered by a UE-requested PDU session modification procedure upon the first inter-system change from S1 mode to N1 mode for a PDN connection established when in S1 mode, the UE shall not consider the modified PDU session as an always-on PDU session; or
- b) otherwise:
 - 1) if the UE has received the Always-on PDU session indication IE with the value set to "Always-on PDU session required" for this PDU session, the UE shall consider the PDU session as an always-on PDU session; or
 - 2) otherwise the UE shall not consider the PDU session as an always-on PDU session.

The UE shall transport the PDU SESSION MODIFICATION COMPLETE message and the PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5.

After sending the PDU SESSION MODIFICATION COMPLETE message, if the "Create new EPS bearer" operation code in the mapped EPS bearer contexts IE was received in the PDU SESSION MODIFICATION COMMAND message and there is neither a corresponding authorized QoS flow descriptions IE in the PDU SESSION MODIFICATION COMMAND message nor an existing QoS flow description corresponding to the EPS bearer identity included in the mapped EPS bearer context, the UE shall send a PDU SESSION MODIFICATION REQUEST message including a mapped EPS bearer contexts IE to delete the mapped EPS bearer context.

Upon receipt of a PDU SESSION MODIFICATION COMPLETE message, the SMF shall stop timer T3591 and shall consider the PDU session as modified. If the selected SSC mode of the PDU session is "SSC mode 3" and the PDU SESSION MODIFICATION COMMAND message included 5GSM cause #39 "reactivation requested", the SMF shall

start timer T3593. If the PDU Session Address Lifetime value is sent to the UE in the PDU SESSION MODIFICATION COMMAND message then timer T3593 shall be started with the same value, otherwise it shall use a default value.

[TS 24.008, clause 10.5.6.12]

The purpose of the *traffic flow template* information element is to specify the TFT parameters and operations for a PDP context. In addition, this information element may be used to transfer extra parameters to the network (e.g. the Authorization Token; see 3GPP TS 24.229 [95]). The TFT may contain packet filters for the downlink direction, the uplink direction or packet filters that are applicable to both directions. The packet filters determine the traffic mapping to PDP contexts. The downlink packet filters shall be used by the network and the uplink packet filters shall be used by the MS. A packet filter that is applicable to both directions shall be used by the network as a downlink packet filter and by the MS as an uplink packet filter.

The *traffic flow template* is a type 4 information element with a minimum length of 3 octets. The maximum length for the IE is 257 octets.

NOTE 1: The IE length restriction is due to the maximum length that can be encoded in a single length octet.

NOTE 2: A maximum size IPv4 packet filter can be 32 bytes. Therefore, 7 maximum size IPv4 type packet filters, plus the last packet filter which can contain max 30 octets can fit into one TFT IE, i.e. if needed not all packet filter components can be defined into one message. A maximum size IPv6 packet filter can be 60 bytes. Therefore, only 4 maximum size IPv6 packet filters can fit into one TFT IE. However, using "Add packet filters to existing TFT", it's possible to create a TFT data structure including 16 maximum size IPv4 or IPv6 filters.

The *traffic flow template* information element is coded as shown in figure 10.5.144/3GPP TS 24.008 and table 10.5.162/3GPP TS 24.008.

NOTE 3: The 3GPP TS 24.301 [120] reuses the traffic flow template information element for the purpose of the traffic flow aggregate description, where the use of individual TFT parameters, e.g. the packet filter identifier in the parameter list, can differ from this specification.

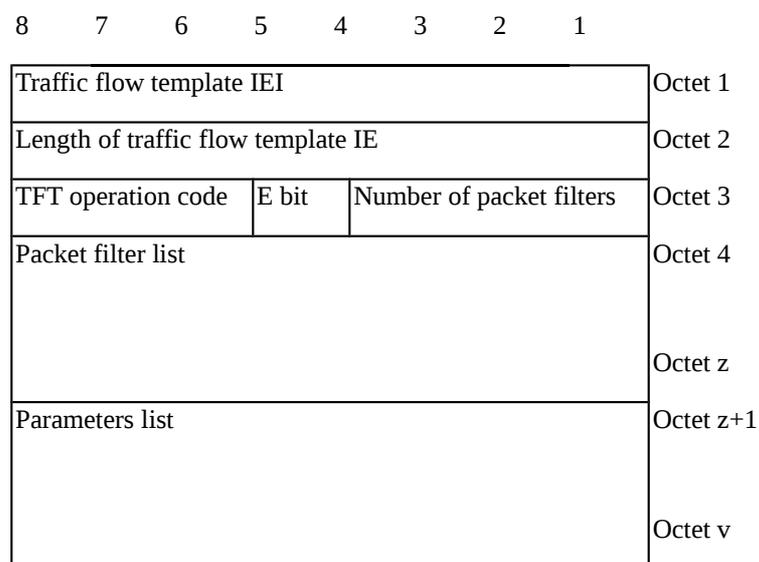
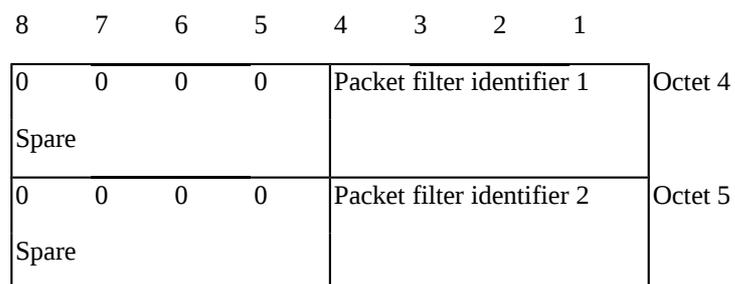


Figure 10.5.144/3GPP TS 24.008: *Traffic flow template* information element



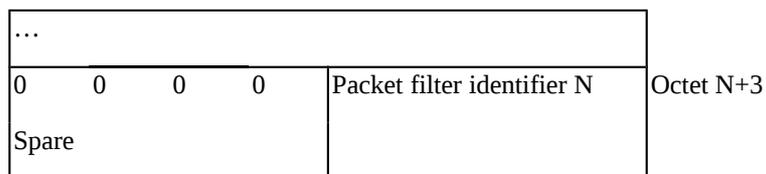


Figure 10.5.144a/3GPP TS 24.008: *Packet filter list* when the TFT operation is "delete packet filters from existing TFT" (z=N+3)

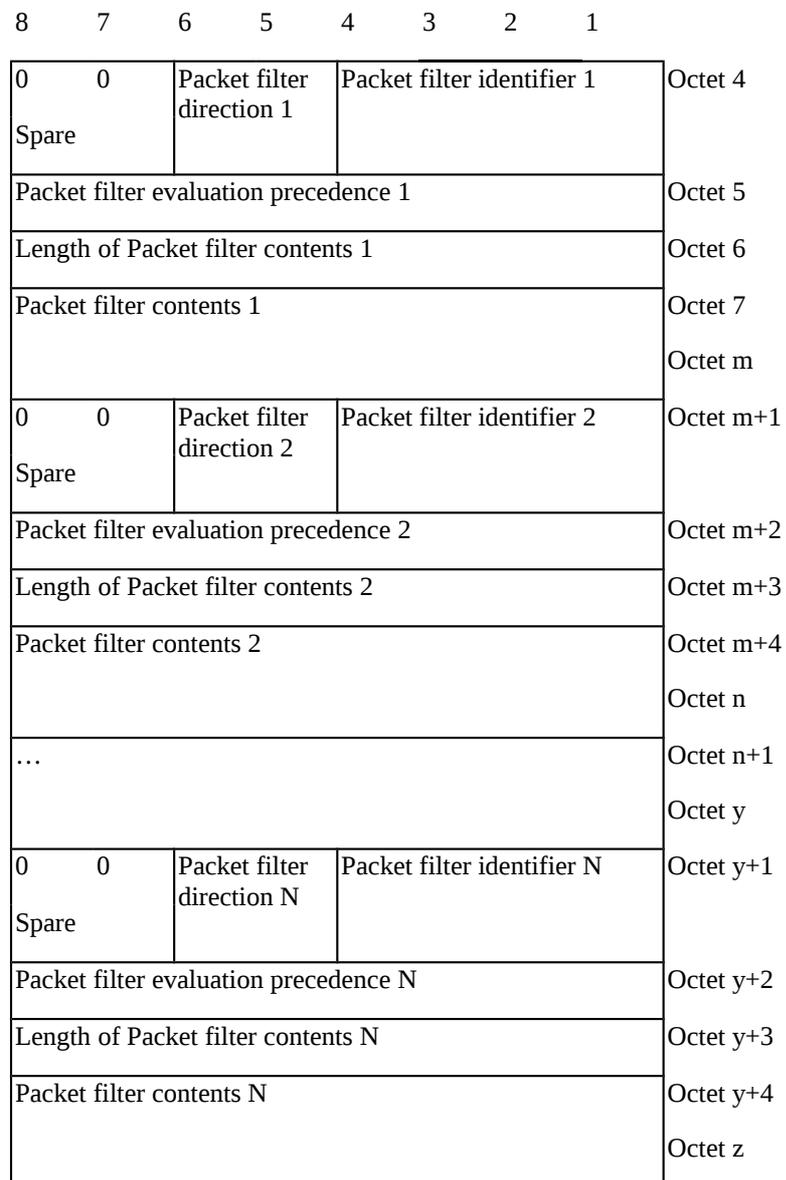
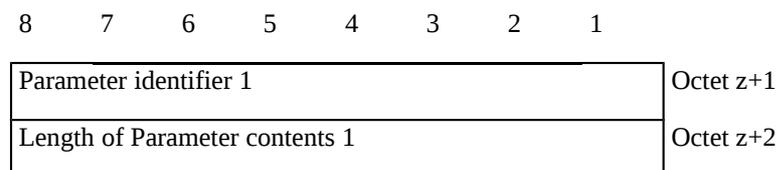


Figure 10.5.144b/3GPP TS 24.008: *Packet filter list* when the TFT operation is "create new TFT", or "add packet filters to existing TFT" or "replace packet filters in existing TFT"



| | |
|--------------------------------|-----------|
| Parameter contents 1 | Octet z+3 |
| | Octet k |
| Parameter identifier 2 | Octet k+1 |
| Length of Parameter contents 2 | Octet k+2 |
| Parameter contents 2 | Octet k+3 |
| | Octet p |
| ... | Octet p+1 |
| | Octet q |
| Parameter identifier N | Octet q+1 |
| Length of Parameter contents N | Octet q+2 |
| Parameter contents N | Octet q+3 |
| | Octet v |

Figure 10.5.144c/3GPP TS 24.008: *Parameters list*Table 10.5.162/3GPP TS 24.008: *Traffic flow template* information element

| |
|--|
| TFT operation code (octet 3) |
| Bits |
| 8 7 6 |
| 0 0 0 Ignore this IE |
| 0 0 1 Create new TFT |
| 0 1 0 Delete existing TFT |
| 0 1 1 Add packet filters to existing TFT |
| 1 0 0 Replace packet filters in existing TFT |
| 1 0 1 Delete packet filters from existing TFT |
| 1 1 0 No TFT operation |
| 1 1 1 Reserved |
|
 |
| The TFT operation code "No TFT operation" shall be used if a <i>parameters list</i> is included but no <i>packet filter list</i> is included in the <i>traffic flow template</i> information element. |
|
 |
| The TFT operation code "Ignore this IE" shall be used by the MS if the Traffic flow aggregate information element has presence requirement "M" in a message, but the information element does not serve any useful purpose in the specific procedure for which the message is sent (see 3GPP TS 24.301 [120], subclauses 6.5.3.2 and 6.5.4.2). If the TFT operation code indicates "Ignore this IE", the MS shall also set the E bit and the number of packet filters to zero. |

If the TFT operation code is set to "Ignore this IE" and the E bit and the number of packet filters to zero, then the network shall ignore the contents of the traffic flow template information element.

E bit (bit 5 of octet 3)

The *E bit* indicates if a *parameters list* is included in the TFT IE and it is encoded as follows:

0 *parameters list* is not included

1 *parameters list* is included

Number of packet filters (octet 3)

The *number of packet filters* contains the binary coding for the number of packet filters in the *packet filter list*. The *number of packet filters* field is encoded in bits 4 through 1 of octet 3 where bit 4 is the most significant and bit 1 is the least significant bit. For the "delete existing TFT" operation and for the "no TFT operation", the *number of packet filters* shall be coded as 0. For all other operations, the number of packet filters shall be greater than 0 and less than or equal to 15.

Packet filter list (octets 4 to z)

The *packet filter list* contains a variable number of packet filters. For the "delete existing TFT" operation and the "no TFT operation", the *packet filter list* shall be empty.

For the "delete packet filters from existing TFT" operation, the *packet filter list* shall contain a variable number of packet filter identifiers. This number shall be derived from the coding of the *number of packet filters* field in octet 3.

For the "create new TFT", "add packet filters to existing TFT" and "replace packet filters in existing TFT" operations, the *packet filter list* shall contain a variable number of packet filters. This number shall be derived from the coding of the *number of packet filters* field in octet 3.

Each packet filter is of variable length and consists of

- a packet filter identifier and direction (1 octet);
- a packet filter evaluation precedence (1 octet);
- the length of the packet filter contents (1 octet); and
- the packet filter contents itself (v octets).

The *packet filter identifier* field is used to identify each packet filter in a TFT. The least significant 4 bits are used.

The *packet filter direction* is used to indicate, in bits 5 and 6, for what traffic direction the filter applies:

00 - pre Rel-7 TFT filter

01 - downlink only

10 - uplink only

11 - bidirectional

Bits 8 through 7 are spare bits.

The *packet filter evaluation precedence* field is used to specify the precedence for the packet filter among all packet filters in all TFTs associated with this PDP address. Higher the value of the *packet filter evaluation precedence* field, lower the precedence of that packet filter is. The first bit in transmission order is the most significant bit.

The *length of the packet filter contents* field contains the binary coded representation of the length of the *packet filter contents* field of a packet filter. The first bit in transmission order is the most significant bit.

The *packet filter contents* field is of variable size and contains a variable number (at least one) of *packet filter components*. Each *packet filter component* shall be encoded as a sequence of a one octet *packet filter component type identifier* and a fixed length *packet filter component value* field. The *packet filter component type identifier* shall be transmitted first.

In each packet filter, there shall not be more than one occurrence of each packet filter component type. Among the "IPv4 remote address type" and "IPv6 remote address type" packet filter components, only one shall be present in one packet filter. Among the "single local port type" and "local port range type" packet filter components, only one shall be present in one packet filter. Among the "single remote port type" and "remote port range type" packet filter components, only one shall be present in one packet filter.

The term *local* refers to the MS and the term *remote* refers to an external network entity.

Packet filter component type identifier

Bits

8 7 6 5 4 3 2 1

| | |
|-----------------|--|
| 0 0 0 1 0 0 0 0 | IPv4 remote address type |
| 0 0 0 1 0 0 0 1 | IPv4 local address type |
| 0 0 1 0 0 0 0 0 | IPv6 remote address type |
| 0 0 1 0 0 0 0 1 | IPv6 remote address/prefix length type |
| 0 0 1 0 0 0 1 1 | IPv6 local address/prefix length type |
| 0 0 1 1 0 0 0 0 | Protocol identifier/Next header type |
| 0 1 0 0 0 0 0 0 | Single local port type |
| 0 1 0 0 0 0 0 1 | Local port range type |
| 0 1 0 1 0 0 0 0 | Single remote port type |
| 0 1 0 1 0 0 0 1 | Remote port range type |
| 0 1 1 0 0 0 0 0 | Security parameter index type |
| 0 1 1 1 0 0 0 0 | Type of service/Traffic class type |
| 1 0 0 0 0 0 0 0 | Flow label type |
| 1 0 0 0 0 0 0 1 | Destination MAC address type |
| 1 0 0 0 0 0 1 0 | Source MAC address type |
| 1 0 0 0 0 0 1 1 | 802.1Q C-TAG VID type |
| 1 0 0 0 0 1 0 0 | 802.1Q S-TAG VID type |

| | |
|-----------------|---------------------------|
| 1 0 0 0 0 1 0 1 | 802.1Q C-TAG PCP/DEI type |
| 1 0 0 0 0 1 1 0 | 802.1Q S-TAG PCP/DEI type |
| 1 0 0 0 0 1 1 1 | Ethertype type |

All other values are reserved.

The description and valid combinations of packet filter component type identifiers in a packet filter are defined in 3GPP TS 23.060 [74] subclause 15.3.2.

For "IPv4 remote address type", the *packet filter component value* field shall be encoded as a sequence of a four octet *IPv4 address* field and a four octet *IPv4 address mask* field. The *IPv4 address* field shall be transmitted first.

For "IPv4 local address type", the *packet filter component value* field shall be encoded as defined for "IPv4 remote address type".
Both the MS and network indication for support of the Local address in TFTs are required to use this packet filter component.

For "IPv6 remote address type", the *packet filter component value* field shall be encoded as a sequence of a sixteen octet *IPv6 address* field and a sixteen octet *IPv6 address mask* field. The *IPv6 address* field shall be transmitted first.

For "IPv6 remote address/prefix length type", the packet filter component value field shall be encoded as a sequence of a sixteen octet IPv6 address field and one octet prefix length field. The IPv6 address field shall be transmitted first.
This parameter shall be used, instead of IPv6 remote address type, when both the MS and network indication for support of the Local address in TFT are present.

For "IPv6 local address/prefix length type", the packet filter component value field shall be encoded as defined for "IPv6 remote address /prefix length".

Both the MS and network indication for support of the Local address in TFTs are required to use this packet filter component.

NOTE: Local IP address and mask can be used when IPv6 prefix delegation is used (see 3GPP TS 23.060 [74] subclause 9.2.1.2).

For "Protocol identifier/Next header type", the *packet filter component value* field shall be encoded as one octet which specifies the IPv4 protocol identifier or IPv6 next header.

For "Single local port type" and "Single remote port type", the *packet filter component value* field shall be encoded as two octet which specifies a port number.

For "Local port range type" and "Remote port range type", the *packet filter component value* field shall be encoded as a sequence of a two octet *port range low limit* field and a two octet *port range high limit* field. The *port range low limit* field shall be transmitted first.

For "Security parameter index", the *packet filter component value* field shall be encoded as four octet which specifies the IPsec security parameter index.

For "Type of service/Traffic class type", the *packet filter component value* field shall be encoded as a sequence of a one octet *Type-of-Service/Traffic Class* field and a one octet *Type-of-Service/Traffic Class mask* field. The *Type-of-Service/Traffic Class* field shall be transmitted first.

For "Flow label type", the *packet filter component value* field shall be encoded as three octet which specifies the IPv6 flow label. The bits 8 through 5 of the first octet shall be spare whereas the remaining 20 bits shall contain the IPv6 flow label.

Parameters list (octets z+1 to v)

For "destination MAC address type" and "source MAC address type", the *packet filter component value* field shall be encoded as 6 octets which specify a MAC address.

For "802.1Q C-TAG VID type", the *packet filter component value* field shall be encoded as two octets which specify the VID of the customer-VLAN tag (C-TAG). The bits 8 through 5 of the first octet shall be spare whereas the remaining 12 bits shall contain the VID.

For "802.1Q S-TAG VID type", the *packet filter component value* field shall be encoded as two octets which specify the VID of the service-VLAN tag (S-TAG). The bits 8 through 5 of the first octet shall be spare whereas the remaining 12 bits shall contain the VID.

For "802.1Q C-TAG PCP/DEI type", the *packet filter component value* field shall be encoded as one octet which specifies the 802.1Q C-TAG PCP and DEI. The bits 8 through 5 of the octet shall be spare, the bits 4 through 2 contain the PCP and bit 1 contains the DEI.

For "802.1Q S-TAG PCP/DEI type", the *packet filter component value* field shall be encoded as one octet which specifies the 802.1Q S-TAG PCP. The bits 8 through 5 of the octet shall be spare, the bits 4 through 2 contain the PCP and bit 1 contains the DEI.

For "ethertype type", the *packet filter component value* field shall be encoded as two octets which specify an ethertype.

The *parameters list* contains a variable number of parameters that may be transferred. If the *parameters list* is included, the *E bit* is set to 1; otherwise, the *E bit* is set to 0.

Each parameter included in the *parameters list* is of variable length and consists of:

- a parameter identifier (1 octet);
- the length of the parameter contents (1 octet); and
- the parameter contents itself (v octets).

The *parameter identifier* field is used to identify each parameter included in the *parameters list* and it contains the hexadecimal coding of the parameter identifier. Bit 8 of the *parameter identifier* field contains the most significant bit and bit 1 contains the least significant bit. In this version of the protocol, the following parameter identifiers are specified:

- 01H (Authorization Token);
- 02H (Flow Identifier); and
- 03H (Packet Filter Identifier).

If the *parameters list* contains a parameter identifier that is not supported by the receiving entity the corresponding parameter shall be discarded.

The *length of parameter contents* field contains the binary coded representation of the length of the *parameter contents* field. The first bit in transmission order is the most significant bit.

When the *parameter identifier* indicates Authorization Token, the *parameter contents* field contains an authorization token, as specified in 3GPP TS 29.207 [100]. The first octet is the most significant octet of the authorization token and the last octet is the least significant octet of the authorization token.

The *parameters list* shall be coded in a way that an Authorization Token (i.e. a parameter with identifier 01H) is always followed by one or more Flow Identifiers (i.e. one or more parameters with identifier 02H).

If the *parameters list* contains two or more consecutive Authorization Tokens without any Flow Identifiers in between, the receiver shall treat this as a semantical TFT error.

When the *parameter identifier* indicates Flow Identifier, the *parameter contents* field contains the binary representation of a flow identifier. The Flow Identifier consists of four octets. Octets 1 and 2 contains the Media Component number as specified in 3GPP TS 29.207 [100]. Bit 1 of octet 2 is the least significant bit, and bit 8 of octet 1 is the most significant bit. Octets 3 and 4 contains the IP flow number as specified in 3GPP TS 29.207 [100]. Bit 1 of octet 4 is the least significant bit, and bit 8 of octet 3 is the most significant bit.

When the *parameter identifier* indicates Packet Filter Identifier, the parameter contents field contains the binary representation of one or more packet filter

identifiers. Each packet filter identifier is encoded in one octet, in the 4 least significant bits. This parameter is used by the MS and the network to identify one or more packet filters in a TFT when modifying the QoS of a PDP context without modifying the packet filter itself.

10.1.2.1.3 Test description

10.1.2.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state 3N-A on NGC Cell A with at least one PDU session for Internet active according to TS 38.508-1 [4], clause 4.4A.3 Table 4.4A.3-1 and using the message condition UE TEST LOOP MODE B active.

10.1.2.1.3.2 Test procedure sequence

Table 10.1.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|-----------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a PDU session modification command message with PDU session ID IE is set to the same value as the first PDU session ID for Internet in the PDU SESSION ESTABLISHMENT REQUEST message. This message is included in a DLInformationTransfer message. | <-- | PDU SESSION MODIFICATION COMMAND | - | - |
| 2 | Check: Does the UE transmit a PDU session modification complete? | --> | PDU SESSION MODIFICATION COMPLETE | 1 | P |
| 3 | The SS transmits one IP Packet matching with new packet filter (reference packet filter list #2). | - | - | - | - |
| 4 | Check: Does UE send the IP Packet on the data radio bearer associated with the PDU QoS rule? | - | - | 2 | P |

10.1.2.1.3.3 Specific message contents

Table 10.1.2.1.3.3-1: PDU SESSION MODIFICATION COMMAND (Step 1, Table 10.1.2.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.2-9 | | | |
|--|--|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session ID | The value the first PDU session ID for Internet indicated in PDU | | |

| | | | |
|----------------------|---|--|--|
| | SESSION ESTABLISHMENT REQUEST message in the preamble | | |
| Authorized QoS rules | Reference QoS rule #3 as defined in 38.508-1 [4] table 4.8.2.1-3. | | |

10.1.2.2 Network-requested PDU session modification / Abnormal / PDU session in state PDU SESSION INACTIVE

10.1.2.2.1 Test Purpose (TP)

(1)

with { the UE in PDU SESSION ACTIVE state and 5GMM-CONNECTED mode }

ensure that {

when { the UE receives a PDU SESSION MODIFICATION COMMAND message include the PDU session ID which belong to any PDU session in PDU SESSION INACTIVE state in UE }

then { UE sends a 5GSM STATUS message and set the 5GSM cause to #43: invalid PDU session identity }

}

10.1.2.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 6.3.2.4, 6.3.2.6 and 7.3.2. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.3.2.4]

Upon receipt of a PDU SESSION MODIFICATION COMMAND message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, if the UE rejects the PDU SESSION MODIFICATION COMMAND message, the UE shall create a PDU SESSION MODIFICATION COMMAND REJECT message.

If the PDU SESSION MODIFICATION COMMAND message contains the PTI value allocated in the UE-requested PDU session modification procedure, the UE shall stop the timer T3581. The UE should ensure that the PTI value assigned to this procedure is not released immediately.

NOTE 1: The way to achieve this is implementation dependent. For example, the UE can ensure that the PTI value assigned to this procedure is not released during the time equal to or greater than the default value of timer T3591.

While the PTI value is not released, the UE regards any received PDU SESSION MODIFICATION COMMAND message with the same PTI value as a network retransmission (see subclause 7.3.1).

The UE shall set the 5GSM cause IE of the PDU SESSION MODIFICATION COMMAND REJECT message to indicate the reason for rejecting the PDU session modification.

The 5GSM cause IE typically indicates one of the following 5GSM cause values:

- #26 insufficient resources;
- #43 invalid PDU session identity;
- #44 semantic error in packet filter(s);
- #45 syntactical error in packet filter(s);

#83 semantic error in the QoS operation; or

#84 syntactical error in the QoS operation.

[TS 24.501, clause 6.3.2.6]

The following abnormal cases can be identified:

a) PDU session inactive for the received PDU session ID.

If the PDU session ID in the PDU SESSION MODIFICATION COMMAND message belongs to any PDU session in state PDU SESSION INACTIVE in the UE, the UE shall set the 5GSM cause IE to #43 "Invalid PDU session identity" in the 5GSM STATUS message, and set the PDU session ID to the received PDU session ID in the UL NAS TRANSPORT message as specified in subclause 5.4.5.

[TS 24.501, clause 7.3.2]

The following UE procedures shall apply for handling an unknown, erroneous, or unforeseen PDU session identity received in the header of a 5GSM message:

a) If the UE receives a 5GSM message which includes an unassigned or reserved PDU session identity value, the UE shall ignore the message.

b) If the UE receives a 5GSM message which includes a PDU session identity belonging to any PDU session in state PDU SESSION INACTIVE in the UE, the UE shall respond with a 5GSM STATUS message including 5GSM cause #43 "invalid PDU session identity".

10.1.2.2.3 Test description

10.1.2.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state 3N-A on NGC Cell A according to 38.508-1[4]

10.1.2.2.3.2 Test procedure sequence

Table 10.1.2.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|----------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a PDU session release command message with PDU session ID IE is set to one of value from the value set in PDU SESSION ESTABLISHMENT REQUEST message in preamble. This message is included in a DLInformationTransfer message. | <-- | PDU SESSION RELEASE COMMAND | - | - |
| 2 | UE transmits a PDU session release complete message with PDU session ID IE is set to the value indicated in PDU SESSION RELEASE COMMAND message. | --> | PDU SESSION RELEASE COMPLETE | - | - |
| 3 | The SS transmits a PDU session modification command message with PDU session ID IE is set to the same value in PDU SESSION | <-- | PDU SESSION MODIFICATION COMMAND | - | - |

| | | | | | |
|---|--|-----|----------------------------------|---|---|
| | RELEASE COMMAND message. This message is included in a DLInformationTransfer message. | | | | |
| 4 | Check: Does the UE transmit a 5GSM STATUS with the 5GSM cause IE indicating #43 "invalid PDU session identity"? | --> | 5GSM STATUS | 1 | P |
| 1 | The SS transmits a PDU session modification command message with PDU session ID IE is set to a different value from the value set in PDU SESSION ESTABLISHMENT REQUEST message. This message is included in a DLInformationTransfer message. | <-- | PDU SESSION MODIFICATION COMMAND | - | - |
| 2 | Check: Does the UE transmit a PDU session modification reject with the 5GSM cause IE indicating #43 "invalid PDU session identity"? | --> | PDU SESSION MODIFICATION REJECT | 1 | P |

10.1.2.2.3.3 Specific message contents

Table 10.1.2.2.3.3-1: PDU SESSION MODIFICATION COMMAND (Step 3, Table 10.1.2.2.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.2-9 | | | |
|--|---|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session ID | The same value in PDU SESSION RELEASE COMMAND message | | |

Table 10.1.2.2.3.3-2: 5GSM STATUS (Step 4, Table 10.1.2.2.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.2-16 | | | |
|---|---|------------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session ID | The same value as the value set in PDU SESSION modification command message | | |
| 5GSM cause | '00101011'B | Invalid PDU session identity | |

Table 10.1.2.2.3.3-3: PDU SESSION RELEASE COMMAND (Step 1, Table 10.1.2.2.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.2-14 | | | |
|---|--|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session ID | One of value from the value set in PDU SESSION ESTABLISHMENT REQUEST message in preamble | | |

10.1.3 Network-requested PDU session release

10.1.3.1 Network-requested PDU session release / Accepted / Reactivation / For the same [S-NSSAI, DNN] combination

10.1.3.1.1 Test Purpose (TP)

(1)

with { the UE in PDU SESSION ACTIVE state }

ensure that {

when { the UE receives a PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" }

then { the UE re-initiates a PDU SESSION establishment procedure for the same [S-NSSAI, DNN] combination provided in PDU session establishment procedure }

}

10.1.3.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 6.3.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.3.3.3]

Upon receipt of a PDU SESSION RELEASE COMMAND message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, the UE considers the PDU session as released and the UE shall create a PDU SESSION RELEASE COMPLETE message.

If the PDU SESSION RELEASE COMMAND message contains the PTI value allocated in the UE-requested PDU session release procedure, the UE shall stop the timer T3582. The UE should ensure that the PTI value assigned to this procedure is not released immediately.

NOTE 1: The way to achieve this is implementation dependent. For example, the UE can ensure that the PTI value assigned to this procedure is not released during the time equal to or greater than the default value of timer T3592.

While the PTI value is not released, the UE regards any received PDU SESSION RELEASE COMMAND message with the same PTI value as a network retransmission (see subclause 7.3.1).

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested", then after completion of the network-requested PDU session release procedure, the UE should re-initiate the UE-requested PDU session establishment procedure as specified in subclause 6.4.1 for:

- a) the PDU session type associated with the released PDU session;
- b) the SSC mode associated with the released PDU session;
- c) the DNN associated with the released PDU session; and
- d) the S-NSSAI associated with (if available in roaming scenarios) a mapped S-NSSAI if provided in the UE-requested PDU session establishment procedure of the released PDU session.

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" and the UE provided an S-NSSAI during the PDU session establishment, the UE shall stop timer T3585 if it is running for the S-NSSAI provided by the UE. The UE should then re-initiate the UE requested PDU session establishment procedure for the same S-NSSAI. If the UE did not provide an S-NSSAI during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3585 associated with no S-NSSAI if it is running, and should re-initiate the UE requested PDU session

establishment procedure without including an S-NSSAI. If the PDU SESSION RELEASE COMMAND message was received for an emergency PDU session, the UE shall not stop the timer T3585 associated with no S-NSSAI if it is running.

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" and the UE provided a DNN during the PDU session establishment, the UE shall stop timer T3396 if it is running for the DNN provided by the UE. The UE should then re-initiate the UE requested PDU session establishment procedure for the same DNN. If the UE did not provide a DNN during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3396 associated with no DNN if it is running, and should re-initiate the UE requested PDU session establishment procedure without including a DNN. If the PDU SESSION RELEASE COMMAND message was received for an emergency PDU session, the UE shall not stop the timer T3396 associated with no DNN if it is running.

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" and the UE provided an S-NSSAI and a DNN during the PDU session establishment, the UE shall stop timer T3584 if it is running for the same [S-NSSAI, DNN] combination provided by the UE. The UE should then re-initiate the UE requested PDU session establishment procedure for the same [S-NSSAI, DNN] combination. If the UE did not provide an S-NSSAI during the PDU session establishment, the UE shall stop the timer T3584 associated with [no S-NSSAI, DNN] if it is running, and should re-initiate the UE requested PDU session establishment procedure with the same DNN but without an S-NSSAI. If the UE did not provide a DNN during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3584 associated with [S-NSSAI, no DNN] if it is running, and should re-initiate the UE requested PDU session establishment procedure with the same S-NSSAI but without a DNN. If the PDU SESSION RELEASE COMMAND message was received for an emergency PDU session, the UE shall not stop the timer T3584 associated with [S-NSSAI, no DNN] if it is running. If the UE provided neither a DNN nor an S-NSSAI during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3584 associated with [no S-NSSAI, no DNN] if it is running, and should re-initiate the UE requested PDU session establishment procedure without an S-NSSAI and a DNN. If the PDU SESSION RELEASE COMMAND message was received for an emergency PDU session, the UE shall not stop the timer T3584 associated with [no S-NSSAI, no DNN] if it is running.

NOTE 2: User interaction is necessary in some cases when the UE cannot re-initiate the UE-requested PDU session establishment procedure automatically.

NOTE 3: If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" for a PDU session, the UE provided a DNN (or no DNN) and an S-NSSAI (or no S-NSSAI) when the PDU session is established, timer T3396 associated with the DNN (or no DNN, if no DNN was provided by the UE) is running, and timer T3584 associated with the DNN (or no DNN, if no DNN was provided by the UE) and the S-NSSAI (or no S-NSSAI, if no S-NSSAI was provided by the UE) is running, then the UE stops both the timer T3396 and the timer T3584.

NOTE 4: If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" for a PDU session, the UE provided a DNN (or no DNN) and an S-NSSAI (or no S-NSSAI) when the PDU session is established, timer T3585 associated with the S-NSSAI (or no S-NSSAI, if no S-NSSAI was provided by the UE) is running, and timer T3584 associated with the DNN (or no DNN, if no DNN was provided by the UE) and the S-NSSAI (or no S-NSSAI, if no S-NSSAI was provided by the UE) is running, then the UE stops both the timer T3585 and the timer T3584.

10.1.3.1.3 Test description

10.1.3.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state 3N-A on NGC Cell A according to 38.508-1[4]

10.1.3.1.3.2 Test procedure sequence

Table 10.1.3.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #39 "reactivation requested " with PDU session ID IE is set to the same value in PDU SESSION ESTABLISHMENT REQUEST message in preamble. | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 2 | UE transmits a PDU session release complete message with PDU session ID IE is set to the value indicated in PDU SESSION RELEASE COMMAND message. | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMPLETE | - | - |
| 3 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST and the S-NSSAI and DNN in UL NAS TRANSPORT message are the same values in UL NAS TRANSPORT message in preamble? | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT REQUEST | 1 | P |
| 4 | The SS transmits an PDU SESSION ESTABLISHMENT ACCEPT | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT ACCEPT | | |

10.1.3.1.3.3 Specific message contents

Table 10.1.3.1.3.3-1: PDU SESSION RELEASE COMMAND (Step 1, Table 10.1.3.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.2-14 | | | |
|---|---|------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session ID | The same value indicated in PDU SESSION ESTABLISHMENT REQUEST message in preamble | | |
| 5GSM cause | '00100111'B | Reactivation requested | |

Table 10.1.3.1.3.3-2: UL NAS TRANSPORT (Step 3, Table 10.1.3.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-10 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |

| | | | |
|---------|--|--|--|
| S-NSSAI | The same value indicated in UL NAS TRANSPORT message in preamble | | If present in UL NAS TRANSPORT message in preamble |
| | Not present | | If not present in UL NAS TRANSPORT message in preamble |
| DNN | The same value indicated in UL NAS TRANSPORT message in preamble | | If present in UL NAS TRANSPORT message in preamble |
| | Not present | | If not present in UL NAS TRANSPORT message in preamble |

10.1.3.2 Network-requested PDU session release / Accepted / Insufficient resources / T3396, Accepted / Insufficient resources for specific slice and DNN / T3584, Abnormal / No PDU session context active for the received PDU session ID

Editor's Note: The configuration of PDU session establishment by UE with NSSAI/DNN parameters is FFS.

10.1.3.2.1 Test Purpose (TP)

(1)

with { UE is in PDU SESSION ACTIVE state }

ensure that {

when { UE receives a PDU SESSION RELEASE COMMAND message including 5GSM cause #26 "insufficient resources" and the Back-off timer value that indicates neither zero nor deactivated }

then { UE does not send a PDU SESSION ESTABLISHMENT REQUEST until timer T3396 expires or timer T3396 is stopped }

}

(2)

with { UE is in PDU SESSION ACTIVE state }

ensure that {

when { UE receives a PDU SESSION RELEASE COMMAND message including 5GSM cause #26 "insufficient resources" and the Back-off timer value that indicates zero }

then { UE sends a PDU SESSION ESTABLISHMENT REQUEST message }

}

(3)

with { UE is in PDU SESSION ACTIVE state }

ensure that {

when { UE receives a PDU SESSION RELEASE COMMAND message including 5GSM cause #26 "insufficient resources" and the Back-off timer value that indicates deactivated }

then { UE does not send a PDU SESSION ESTABLISHMENT REQUEST message until the UE is switched off or the USIM is removed }

}

(4)

with { UE is in PDU SESSION ACTIVE state }

ensure that {

when { UE receives a PDU SESSION RELEASE COMMAND message including 5GSM cause #67 "insufficient resources for specific slice and DNN" and the Back-off timer value that indicates neither zero nor deactivated }

then { UE does not send a PDU SESSION ESTABLISHMENT REQUEST message for the same [S-NSSAI, DNN] combination until timer T3584 expires }

}

(5)

with { UE is in PDU SESSION ACTIVE state }

ensure that {

when { UE receives a PDU SESSION RELEASE COMMAND message including 5GSM cause #67 "insufficient resources for specific slice and DNN" and the Back-off timer value that indicates zero }

then { UE sends a PDU SESSION ESTABLISHMENT REQUEST message for the same [S-NSSAI, DNN] combination }

}

(6)

with { UE is in PDU SESSION ACTIVE state }

ensure that {

when { UE receives a PDU SESSION RELEASE COMMAND message including 5GSM cause #67 "insufficient resources for specific slice and DNN" and the Back-off timer value that indicates deactivated }

then { UE does not send a PDU SESSION ESTABLISHMENT REQUEST message for the same [S-NSSAI, DNN] combination until the UE is switched off or the USIM is removed }
}

(7)

with { UE is in PDU SESSION ACTIVE state }

ensure that {

when { UE receives a PDU SESSION RELEASE COMMAND message, in which the PDU session ID belongs to any PDU session in state PDU SESSION INACTIVE in the UE }

then { UE sends 5GSM STATUS message including 5GSM cause #43 "Invalid PDU session identity" }

}

10.1.3.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501, clause 6.3.3.2 and 6.3.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.3.3.2]

In order to initiate the network-requested PDU session release procedure, the SMF shall create a PDU SESSION RELEASE COMMAND message.

The SMF shall set the SM cause IE of the PDU SESSION RELEASE COMMAND message to indicate the reason for releasing the PDU session.

The SM cause IE typically indicates one of the following SM cause values:

#26 insufficient resources;

...

#67 insufficient resources for specific slice and DNN;

...

The SMF may include a Back-off timer value IE in the PDU SESSION RELEASE COMMAND message when the 5GSM cause value #26 "insufficient resources" is included in the PDU SESSION RELEASE COMMAND message. If the 5GSM cause value is #26 "insufficient resources" and the PDU SESSION RELEASE COMMAND message is sent to a UE configured for high priority access in selected PLMN or the request type was set to "initial emergency request" or "existing emergency PDU session" for the establishment of the PDU session, the network shall not include a Back-off timer value IE.

The SMF may include a Back-off timer value IE in the PDU SESSION RELEASE COMMAND message when the 5GSM cause value #67 "insufficient resources for specific slice and DNN" is included in the PDU SESSION RELEASE COMMAND message. If the 5GSM cause value is #67 "insufficient resources for specific slice and DNN" and the PDU SESSION RELEASE COMMAND message is sent to a UE configured for high priority access in selected PLMN or the request type was set to "initial emergency request" or "existing emergency PDU session" for the establishment of the PDU session, the network shall not include a Back-off timer value IE.

[TS 24.501, clause 6.3.3.3]

Upon receipt of a PDU SESSION RELEASE COMMAND message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, the UE considers the PDU session as released and the UE shall create a PDU SESSION RELEASE COMPLETE message.

...

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #26 "insufficient resources" and the Back-off timer value IE, the UE shall take different actions depending on the timer value received for timer T3396 in the Back-off timer value:

a) If the timer value indicates neither zero nor deactivated and a DNN was provided during the PDU session establishment, the UE shall stop timer T3396 associated with the corresponding DNN, if it is running. If the timer value indicates neither zero nor deactivated and no DNN was provided during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop timer T3396 associated with no DNN if it is running. The UE shall then start timer T3396 with the value provided in the Back-off timer value IE and:

1) shall not send a PDU SESSION ESTABLISHMENT REQUEST message or PDU SESSION MODIFICATION REQUEST message with exception of those identified in subclause 6.4.2.1, for the same DNN that was sent by the UE, until timer T3396 expires or timer T3396 is stopped; and

2) shall not send a PDU SESSION ESTABLISHMENT REQUEST message without an DNN and with request type different from "initial emergency request" and different from "existing emergency PDU session", or a PDU SESSION MODIFICATION REQUEST message with exception of those identified in subclause 6.4.2.1, for a non-emergency PDU session established without an DNN provided by the UE, if no DNN was provided during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", until timer T3396 expires or timer T3396 is stopped.

The UE shall not stop timer T3396 upon a PLMN change or inter-system change;

b) if the timer value indicates that this timer is deactivated and a DNN was provided during the PDU session establishment, the UE shall stop timer T3396 associated with the corresponding DNN, if it is running. If the timer value indicates that this timer is deactivated and no DNN was provided during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop timer T3396 associated with no DNN if it is running. The UE:

1) shall not send a PDU SESSION ESTABLISHMENT REQUEST message or PDU SESSION MODIFICATION REQUEST message with exception of those identified in subclause 6.4.2.1, for the same DNN until the UE is switched off or the USIM is removed, or the UE receives a PDU SESSION MODIFICATION COMMAND message for the same DNN from the network or a PDU SESSION RELEASE COMMAND message including 5GSM cause #39 "reactivation requested" for the same DNN from the network; and

2) shall not send a PDU SESSION ESTABLISHMENT REQUEST message without an DNN and with request type different from "initial emergency request" and different from "existing emergency PDU session", or a PDU SESSION MODIFICATION REQUEST message with exception of those identified in subclause 6.4.2.1, for a non-emergency PDU session established without an DNN provided by the UE, if no DNN was provided during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", until the UE is switched off or the USIM is removed, or the UE receives a PDU SESSION MODIFICATION COMMAND message for a non-emergency PDU session established without an DNN provided by the UE, or a PDU SESSION RELEASE COMMAND message including 5GSM cause IE set to 5GSM cause #39 "reactivation requested" for a non-emergency PDU session established without an DNN provided by the UE.

The timer T3396 remains deactivated upon a PLMN change or inter-system change; and

c) if the timer value indicates zero, the UE:

1) shall stop timer T3396 associated with the corresponding DNN, if running, and may send a PDU SESSION ESTABLISHMENT REQUEST message or PDU SESSION MODIFICATION REQUEST message for the same DNN; and

2) if no DNN was provided during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop timer T3396 associated with no DNN, if running, and may send a PDU SESSION ESTABLISHMENT REQUEST message without a DNN, or a PDU SESSION MODIFICATION REQUEST message without an DNN provided by the UE.

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #26 "insufficient resources" and the Back-off timer value IE is not included, then the UE may send a PDU SESSION ESTABLISHMENT REQUEST message or PDU SESSION MODIFICATION REQUEST message for the same DNN or without a DNN.

When the timer T3396 is running or the timer is deactivated, the UE is allowed to initiate a PDU session establishment procedure for emergency services.

If the timer T3396 is running when the UE enters state 5GMM-DEREGISTERED, the UE remains switched on, and the USIM in the UE remains the same, then timer T3396 is kept running until it expires or it is stopped.

If the UE is switched off when the timer T3396 is running, and if the USIM in the UE remains the same when the UE is switched on, the UE shall behave as follows:

- let t_1 be the time remaining for T3396 timeout at switch off and let t be the time elapsed between switch off and switch on. If t_1 is greater than t , then the timer shall be restarted with the value $t_1 - t$. If t_1 is equal to or less than t , then the timer need not be restarted. If the UE is not capable of determining t , then the UE shall restart the timer with the value t_1 .

If the 5GSM cause value is #67 "insufficient resources for specific slice and DNN" and the Back-off timer value IE is included, the UE shall take different actions depending on the timer value received for timer T3584 in the Back-off timer value:

- a) If the timer value indicates neither zero nor deactivated, the UE shall stop timer T3584 associated with the same [S-NSSAI, DNN] combination as that the UE provided when the PDU session is established, if it is running. The UE shall then start timer T3584 with the value provided in the Back-off timer value IE.

The UE shall not send another PDU SESSION ESTABLISHMENT REQUEST message with request type different from "initial emergency request" and different from "existing emergency PDU session", or PDU SESSION MODIFICATION REQUEST message with exception of those identified in subclause 6.4.2.1, for the same [S-NSSAI, DNN] combination that was sent by the UE, until timer T3584 expires or timer T3584 is stopped;

The UE shall not stop timer T3584 upon a PLMN change or inter-system change;

- b) if the timer value indicates that this timer is deactivated, the UE shall stop timer T3584 associated with the same [S-NSSAI, DNN] combination as that the UE provided when the PDU session is established, if it is running.

The UE shall not send another PDU SESSION ESTABLISHMENT REQUEST message with request type different from "initial emergency request" and different from "existing emergency PDU session", or PDU SESSION MODIFICATION REQUEST message with exception of those identified in subclause 6.4.2.1, for the same [S-NSSAI, DNN] combination that was sent by the UE, until the UE is switched off or the USIM is removed, or the UE receives a PDU SESSION MODIFICATION REQUEST message for the same [S-NSSAI, DNN] combination from the network or a PDU SESSION RELEASE COMMAND message including 5GSM cause #39 "reactivation requested" for the same [S-NSSAI, DNN] combination from the network; and

The timer T3584 remains deactivated upon a PLMN change or inter-system change; and

- c) if the timer value indicates zero, the UE shall stop timer T3584 associated with the same [S-NSSAI, DNN] combination that was sent by the UE, if running, and may send another PDU SESSION ESTABLISHMENT REQUEST message or PDU SESSION MODIFICATION REQUEST message for the same [S-NSSAI, DNN] combination.

If the 5GSM cause value is #67 "insufficient resources for specific slice and DNN" and the Back-off timer value IE is not included, then the UE may send another PDU SESSION ESTABLISHMENT REQUEST message or PDU SESSION MODIFICATION REQUEST message for the same [S-NSSAI, DNN] combination.

When the timer T3584 is running or the timer is deactivated, the UE is allowed to initiate a PDU session establishment procedure for emergency services.

If the timer T3584 is running when the UE enters state 5GMM-DEREGISTERED, the UE remains switched on, and the USIM in the UE remains the same, then timer T3584 is kept running until it expires or it is stopped.

If the UE is switched off when the timer T3584 is running, and if the USIM in the UE remains the same when the UE is switched on, the UE shall behave as follows:

- let t_1 be the time remaining for T3584 timeout at switch off and let t be the time elapsed between switch off and switch on. If t_1 is greater than t , then the timer shall be restarted with the value $t_1 - t$. If t_1 is equal to or less than t , then the timer need not be restarted. If the UE is not capable of determining t , then the UE shall restart the timer with the value t_1 .

[TS 24.501, clause 6.3.3.6]

The following abnormal cases can be identified:

a) PDU session inactive for the received PDU session ID.

If the PDU session ID in the PDU SESSION RELEASE COMMAND message belongs to any PDU session in state PDU SESSION INACTIVE in the UE, the UE shall include the 5GSM cause #43 "Invalid PDU session identity" in the 5GSM STATUS message, and set the PDU session ID to the received PDU session ID in the UL NAS TRANSPORT message as specified in subclause 5.4.5.

[TS 24.501, clause B.1]

Cause #43 –Invalid PDU session identity

This 5GSM cause is used by the network or the UE to indicate that the PDU session identity value provided to it is not a valid value or the PDU session identified by the PDU session identity IE in the request or the command is not active.

[24.501, clause 7.3.2]

...

The following UE procedures shall apply for handling an unknown, erroneous, or unforeseen PDU session identity received in the header of a 5GSM message:

a) If the UE receives a 5GSM message which includes an unassigned or reserved PDU session identity value, the UE shall ignore the message.

b) If the UE receives a 5GSM message which includes a PDU session identity belonging to any PDU session in state PDU SESSION INACTIVE in the UE, the UE shall respond with a 5GSM STATUS message including 5GSM cause #43 "invalid PDU session identity".

10.1.3.2.3 Test description

10.1.3.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

None.

Preamble:

- The UE is in state 3N-A on NGC Cell A according to TS 38.508-1 [4] with 2 PDU sessions active. The first PDU session is requested to establish by UE without DNN provided. The second PDU session is requested to establish by UE with [S-NSSAI, DNN] combination provided.

10.1.3.2.3.2 Test procedure sequence

Table 10.1.3.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U – S | Message | | |
| 1 | Cause the UE to request establishment of PDU session without DNN.(Note 1) | - | - | - | - |
| 2 | The PDU session establishment procedure as specified in TS 38.508-1 [4] subclause 4.5A.2 | - | - | - | - |

| | | | | | |
|----|---|-----|---|---|---|
| | take place. | | | | |
| 3 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #26 "insufficient resources" and T3396 value (5 minutes). | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 4 | The UE transmits a PDU SESSION RELEASE COMPLETE message. | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMPLETE | - | - |
| 5 | Cause the UE to request establishment of PDU session without DNN.(Note 1) | - | - | - | - |
| 6 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST message before timer T3396 has expired? | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT REQUEST | 1 | F |
| 7 | Cause the UE to request establishment of PDU session without DNN.(Note 1) | - | - | - | - |
| 8 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST message? | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT REQUEST | 1 | P |
| 9 | The SS transmits a PDU SESSION ESTABLISHMENT ACCEPT message. | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT ACCEPT | - | - |
| 10 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #26 "insufficient resources" and T3396 value (zero). | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 11 | The UE transmits a PDU SESSION RELEASE COMPLETE message. | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMPLETE | - | - |
| 12 | Cause the UE to request establishment of PDU session without DNN.(Note 1) | - | - | - | - |
| 13 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST message? | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT REQUEST | 2 | P |
| 14 | The SS transmits a PDU SESSION ESTABLISHMENT ACCEPT message. | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT ACCEPT | - | - |
| 15 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #26 "insufficient resources" and T3396 value (deactivated). | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 16 | The UE transmits a PDU SESSION RELEASE COMPLETE message. | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMPLETE | - | - |

| | | | | | |
|----|---|-----|---|---|---|
| 17 | Cause the UE to request establishment of PDU session without DNN.(Note 1) | - | - | - | - |
| 18 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST message? | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT REQUEST | 3 | F |
| 19 | Switch off UE in RRC CONNECTED as described in TS38.508-1 [4] subclause 4.9.6.3 | - | | | |
| 20 | Switch on UE. | - | | | |
| 21 | The general procedure is completed by executing of the UE registration procedure in TS 38.508-1 [4] table 4.5.2.2-2 , ' <i>connected without release</i> '. | - | | | |
| 22 | Cause the UE to request establishment of PDU session without DNN.(Note 1) | - | - | - | - |
| 23 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST message? | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT REQUEST | 3 | P |
| 24 | The SS transmits a PDU SESSION ESTABLISHMENT ACCEPT message. | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT ACCEPT | - | - |
| 25 | Cause the UE to request establishment of PDU session with [S-NSSAI, DNN] combination. (Note 1) | - | - | - | - |
| 26 | The PDU session establishment procedure as specified in TS 38.508-1 [4] subclause 4.5A.2 take place. | - | - | - | - |
| 27 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #67 "insufficient resources for specific slice and DNN" and T3584 value (5 minutes). | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 28 | The UE transmits a PDU SESSION RELEASE COMPLETE message. | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMPLETE | - | - |
| 29 | Cause the UE to request establishment of PDU session with the same [S-NSSAI, DNN] combination as the PDU session established at step 26.(Note 1) | - | - | - | - |
| 30 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST before timer T3584 has expired? | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT REQUEST | 4 | F |
| 31 | Cause the UE to request establishment of PDU session with the same [S-NSSAI, DNN] combination as the PDU session established at step 26.(Note 1) | - | - | - | - |
| 32 | Check: Does the UE transmit a PDU | --> | 5GMM: UL NAS TRANSPORT | 4 | P |

| | | | | | |
|----|--|-----|---|---|---|
| | SESSION ESTABLISHMENT REQUEST? | | 5GSM: PDU SESSION ESTABLISHMENT REQUEST | | |
| 33 | The SS transmits a PDU SESSION ESTABLISHMENT ACCEPT message. | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT ACCEPT | - | - |
| 34 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #67 "insufficient resources for specific slice and DNN" and T3584 value (zero). | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 35 | The UE transmits a PDU SESSION RELEASE COMPLETE message. | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMPLETE | - | - |
| 36 | Cause the UE to request establishment of PDU session with the same [S-NSSAI, DNN] combination as the PDU session established at step 26.(Note 1) | - | - | - | - |
| 37 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST? | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT REQUEST | 5 | P |
| 38 | The SS transmits a PDU SESSION ESTABLISHMENT ACCEPT message. | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT ACCEPT | - | - |
| 39 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #67 "insufficient resources for specific slice and DNN" and T3584 value (deactivated). | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 40 | The UE transmits a PDU SESSION RELEASE COMPLETE message. | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMPLETE | - | - |
| 41 | Cause the UE to request establishment of PDU session with the same [S-NSSAI, DNN] combination as the PDU session established at step 26.(Note 1) | - | - | - | - |
| 42 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST? | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT REQUEST | 6 | F |
| 43 | The SS transmits a PDU SESSION RELEASE COMMAND including the PDU session ID UE requested in step 42. | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 44 | Check: Does the UE transmit a 5GSM STATUS message with value #43? | --> | 5GSM: UL NAS TRANSPORT
5GSM: 5GSM STATUS | 7 | P |
| 45 | Switch off UE in RRC CONNECTED as described in TS38.508-1 [4] subclause 4.9.6.3 | - | - | - | - |
| 46 | Switch on UE. | - | - | - | - |

| | | | | | |
|---|--|-----|---|---|---|
| 47 | The general procedure is completed by executing of the UE registration procedure in TS 38.508-1 [4] table 4.5.2.2-2 , 'connected without release'. | - | - | - | - |
| 48 | Cause the UE to request establishment of PDU session with the same [S-NSSAI, DNN] combination as the PDU session established at step 26.(Note 1) | - | - | - | - |
| 49 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST? | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT REQUEST | 6 | P |
| 50 | The SS transmits a PDU SESSION ESTABLISHMENT ACCEPT message. | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT ACCEPT | - | - |
| Note 1: The request to establish a PDU session may be performed by [FFS]. | | | | | |
| Note 2: The request to modify a PDU session may be performed by [FFS]. | | | | | |

Table 10.1.3.2.3.2-2: Void

Table 10.1.3.2.3.2-3: Void

10.1.3.2.3.3 Specific message contents

Table 10.1.3.2.3.3-1: UL NAS TRANSPORT (step 2, 8, 13 and 23, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.1-10 | | | |
|---|-----------------------------------|-------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0001'B | N1 SM information | |
| Payload container | PDU SESSION ESTABLISHMENT REQUEST | | |
| DNN | Not present | | |

Table 10.1.3.2.3.3-2: PDU SESSION RELEASE COMMAND (step 3, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|---|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 2 in Table 10.1.3.2.3.2-1 | | |
| 5GSM cause | '0001 1010'B | insufficient resources | |
| Back-off timer value | '1010 0101'B | 5 minutes | |

Table 10.1.3.2.3.3-3: Void

Table 10.1.3.2.3.3-4: PDU SESSION RELEASE COMMAND (step 10, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|---|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 8 in Table 10.1.3.2.3.2-1 | | |
| 5GSM cause | '0001 1010'B | insufficient resources | |
| Back-off timer value | '1010 0000'B | 0 minutes | |

Table 10.1.3.2.3.3-5: PDU SESSION RELEASE COMMAND (step 15, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 13 in Table 10.1.3.2.3.2-1 | | |
| 5GSM cause | '0001 1010'B | insufficient resources | |
| Back-off timer value | '1110 0000'B | deactivated | |

Table 10.1.3.2.3.3-6: UL NAS TRANSPORT (step 26, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.1-10 | | | |
|---|-----------------------------------|-------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0001'B | N1 SM information | |
| Payload container | PDU SESSION ESTABLISHMENT REQUEST | | |
| S-NSSAI | present | | |
| DNN | present | | |

Table 10.1.3.2.3.3-7: PDU SESSION RELEASE COMMAND (step 27, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 26 in Table 10.1.3.2.3.2-1 | | |
| 5GSM cause | '0100 0011'B | insufficient resources for specific slice and | |

| | | | |
|----------------------|--------------|-----------|--|
| | | DNN | |
| Back-off timer value | '1010 0101'B | 5 minutes | |

Table 10.1.3.2.3.3-8: UL NAS TRANSPORT (step 32, 37 and 49, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.1-10 | | | |
|---|--|-------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| Payload container type | '0001'B | N1 SM information | |
| Payload container | PDU SESSION ESTABLISHMENT REQUEST | | |
| S-NSSAI | The same S-NSSAI as the S-NSSAI of the PDU session which UE request at step 26 | | |
| DNN | The same DNN as the DNN of the PDU session which UE request at step 26 | | |

Table 10.1.3.2.3.3-9: PDU SESSION RELEASE COMMAND (step 34, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 32 in Table 10.1.3.2.3.2-1 | | |
| 5GSM cause | '0100 0011'B | insufficient resources for specific slice and DNN | |
| Back-off timer value | '1010 0000'B | 0 minutes | |

Table 10.1.3.2.3.3-10: PDU SESSION RELEASE COMMAND (step 39, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 37 in Table 10.1.3.2.3.2-1 | | |
| 5GSM cause | '0100 0011'B | insufficient resources for specific slice and DNN | |

| | | | |
|----------------------|--------------|-------------|--|
| Back-off timer value | '1110 0000'B | deactivated | |
|----------------------|--------------|-------------|--|

Table 10.1.3.2.3.3-11: PDU SESSION RELEASE COMMAND (step 43, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 37 in Table 10.1.3.2.3.2-1 | | |
| 5GSM cause | '0010 0100'B | #36 regular deactivation | |

Table 10.1.3.2.3.3-11A: UL NAS TRANSPORT (step 44, Table 10.1.3.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.1-10 | | | |
|---|--|-------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 37 in Table 10.1.3.2.3.2-1 | | |
| Payload container type | '0001'B | N1 SM information | |
| Payload container | 5GSM STATUS | | |

Table 10.1.3.2.3.3-12: 5GSM STATUS (Table 10.1.3.2.3.3-11)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-16 | | | |
|---|--------------|----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GSM cause | '0010 1011'B | #43 Invalid PDU session identity | |

10.1.4

10.1.4.1 UE-requested PDU session establishment / Abnormal / T3580

10.1.4.1.1 Test Purpose (TP)

(1)

with { the UE in 5GMM-REGISTERED state and has sent a PDU SESSION ESTABLISHMENT REQUEST message }

ensure that {

when { On the 1st expiry of timer T3580 }

then { the UE retransmits PDU SESSION ESTABLISHMENT REQUEST message }

}

(2)

with { the UE in 5GMM-REGISTERED state and has sent a PDU SESSION ESTABLISHMENT REQUEST message }

ensure that {

when { on the maximum 5th expiry of timer T3580 }

then { the UE aborts the procedure }

}

10.1.4.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 6.4.1.6. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.4.1.6]

The following abnormal cases can be identified:

a) Expiry of timer T3580

The UE shall, on the first expiry of the timer T3580, retransmit the PDU SESSION ESTABLISHMENT REQUEST message and the PDU session information which was transported together with the initial transmission of the PDU SESSION ESTABLISHMENT REQUEST message and shall reset and start timer T3580, if still needed. This retransmission can be repeated up to four times, i.e. on the fifth expiry of timer T3580, the UE shall abort the procedure, release the allocated PTI and enter the state PROCEDURE TRANSACTION INACTIVE.

10.1.4.1.3 Test description

10.1.4.1.3.1 Pre-test conditions

- The UE is in state Switched OFF [State 0-A as per TS 38.508-1 [4] Table 4.4A.2-0].

10.1.4.1.3.2 Test procedure sequence

Table 10.1.4.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|--|------------------|-----------------------------------|----|---------|
| | | U - S | Message | | |
| 1-15 | Steps 1-15 of Table 4.5.2.2-2 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 16 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message to request an additional PDU session. | --> | PDU SESSION ESTABLISHMENT REQUEST | - | - |
| 17 | The SS waits 16 seconds (T3580). | - | - | - | - |
| 18 | Check: Does the UE re-transmit the PDU SESSION ESTABLISHMENT REQUEST message sent in step 11? | --> | PDU SESSION ESTABLISHMENT REQUEST | 1 | P |
| 19 | The SS sets attemptCounter=1. | - | - | - | - |

| | | | | | |
|------------|---|-----|-----------------------------------|---|---|
| | | | | | |
| 20 | The SS sets repeatCounter=1. | - | - | - | - |
| - | EXCEPTION: Steps 21a1 to 21b1 describe behaviour which depends on UE implementation; the "lower case letter" identifies a step sequence which takes place in order to handle UEs designed to send yet another PDU SESSION ESTABLISHMENT REQUEST after the second expiry of T3580. | - | - | - | - |
| - | EXCEPTION: Steps 21a1 to 21a4b2 are repeated as long as repeatCounter<=6.

NOTE: The number 6 has been chosen to provide one extra T3580 interval to the allowed max of 5 expirations before the UE should abandon the procedure to catch any non-compliant UE behaviour. | - | - | - | - |
| 21a
1 | IF repeatCounter<=6 THEN the SS starts timer 16 seconds (T3580). | - | - | - | - |
| 21a
2 | Timer 16 seconds (T3580) expires. | - | - | - | - |
| 21a
3 | SS start Timer=1 sec (a guarding timer to wait for a new PDU SESSION ESTABLISHMENT REQUEST message). | - | - | - | - |
| - | EXCEPTION: Steps 21a4a1 to 21a4b2 describe behaviour which depends on UE implementation; the "lower case letter" identifies a step sequence that take place if the UE is designed to send yet another PDU SESSION ESTABLISHMENT REQUEST after the second expiry of T3580. | - | - | - | - |
| 21a
4a1 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message. | --> | PDU SESSION ESTABLISHMENT REQUEST | - | - |
| 21a
4a2 | The SS sets attemptCounter=attemptCounter+1 | - | - | - | - |
| 21a
4a3 | The SS sets repeatCounter=repeatCounter+1 | - | - | - | - |
| 21a
4b1 | Timer=1 sec expires. | - | - | - | - |
| 21a
4b2 | SS sets repeatCounter=7.

NOTE: In order to move out of the loop, the value 7 is chosen as no more messages are expected. | - | - | - | - |
| 21b
1 | ELSE IF repeatCounter>6 THEN Check: Is the attemptCounter equal or higher than 5? | - | - | 2 | F |

Editor's note: Number of retransmission of PDU SESSION ESTABLISHMENT REQUEST is FFS. Currently, Test case assumes number of retransmission as 5.

10.1.4.1.3.3 Specific message contents

None.

10.1.5 UE-requested PDU session modification

10.1.5.1 UE-requested PDU session modification

10.1.5.1.1 Test Purpose (TP)

(1)

with { UE in PDU SESSION ACTIVE state and in 5GMM-CONNECTED mode }

ensure that {

when { UE is requested to modify of PDU session }

then { UE sends a PDU SESSION MODIFICATION REQUEST message }

}

10.1.5.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clause 6.4.2.1 and 6.4.2.2. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.4.2.1]

The purpose of the UE-requested PDU session modification procedure is:

- a) to enable the UE to request modification of a PDU session;
- b) to indicate a change of 3GPP PS data off UE status for a PDU session;
- c) to revoke the previously indicated support for reflective QoS;
- d) to request specific QoS handling and segregation of service data flows;
- e) to indicate to the network the relevant 5GSM parameters and capabilities (e.g. the UE's 5GSM capabilities, whether the UE supports more than 16 packet filters, the maximum data rate per UE for user-plane integrity protection supported by the UE for uplink and the maximum data rate per UE for user-plane integrity protection supported by the UE for downlink) for a PDN connection established when in S1 mode, after the first inter-system change from S1 mode to N1 mode, if the UE is operating in single-registration mode in the network supporting N26 interface; or
- f) to delete one or more mapped EPS bearer contexts.

NOTE: The UE does not request a PDU session modification for an LADN when the UE is located outside the LADN service area.

[TS 24.501, clause 6.4.2.2]

In order to initiate the UE-requested PDU session modification procedure, the UE shall create a PDU SESSION MODIFICATION REQUEST message.

The UE shall allocate a PTI value currently not used and shall set the PTI IE of the PDU SESSION MODIFICATION REQUEST message to the allocated PTI value.

The UE shall not perform the UE-requested PDU session modification procedure for an emergency PDU session.

The UE shall not perform the UE-requested PDU session modification procedure for a PDU session for LADN when the UE is located outside the LADN service area.

If the UE requests a specific QoS handling, the UE shall include the requested QoS rules IE indicating requested QoS rules and the requested QoS flow descriptions IE indicating requested QoS flow descriptions for the specific QoS handling. The QoS rules IE includes the packet filters which describe the service data flows requested by the UE. The specific QoS parameters requested by the UE is specified in the QoS flow descriptions IE. If the UE requests the network to bind specific service data flows to a dedicated QoS flow, the UE shall create a new QoS rule by setting the rule operation code to "Create new QoS rule" and shall set the segregation bit to "Segregation requested" for the corresponding QoS rule in the QoS rules IE. The UE shall set the QRI values to "no QoS rule identifier assigned" in the requested QoS rules IE, if the QoS rules are newly created; otherwise, the UE shall set the QRI values to those of the existing QoS rules for which the specific QoS handling applies. The UE shall set the QFI values to "no QoS flow identifier assigned" in the requested QoS flow descriptions IE, if the QoS flow descriptions are newly created; otherwise, the UE shall set the QFI values to the QFIs of the existing QoS flow descriptions for which the specific QoS handling applies.

...

If the UE is performing the PDU session modification procedure to request the deletion of a non-default QoS rule due to errors in QoS operations or packet filters, the UE shall include the 5GSM cause IE in the PDU SESSION MODIFICATION REQUEST message as described in subclause 6.4.1.3.

Even if the timer T3396, T3584, or T3585 is running or is deactivated, the UE shall indicate a change of 3GPP PS data off UE status associated to a PDU session, by including the extended protocol configuration options IE in the PDU SESSION MODIFICATION REQUEST message and setting the 3GPP PS data off UE status.

For a PDN connection established when in S1 mode, after the first inter-system change from S1 mode to N1 mode, if the UE is operating in single-registration mode in the network supporting N26 interface and the UE requests the PDU session to be an always-on PDU session in the 5GS, the UE shall include the Always-on PDU session requested IE and set the value of the IE to "Always-on PDU session requested" in the PDU SESSION MODIFICATION REQUEST message.

The UE shall transport the PDU SESSION MODIFICATION REQUEST message, the PDU session ID, and the request type set to "modification request", using the NAS transport procedure as specified in subclause 5.4.5, and the UE shall start timer T3581 (see example in figure 6.4.2.2.1).

10.1.5.1.3 Test description

10.1.5.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

- None.

Preamble:

- The UE is in state 3N-A on NGC Cell A with PDU SESSION ACTIVE according to TS 38.508-1[4].

10.1.5.1.3.2 Test procedure sequence

Table 10.1.5.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | Cause the UE to pdu session modification with the previously established PDN session | - | - | - | - |

| | | | | | |
|--|---|-----|-----------------------------------|---|---|
| | at preamble. (see Note) | | | | |
| 2 | Check: Does the UE transmit a PDU SESSION MODIFICATION REQUEST message? | --> | PDU SESSION MODIFICATION REQUEST | 1 | P |
| 3 | The SS transmits an PDU SESSION MODIFICATION COMMAND message. | <-- | PDU SESSION MODIFICATION COMMAND | - | - |
| 4 | the UE transmit an PDU SESSION MODIFICATION COMPLETE message. | --> | PDU SESSION MODIFICATION COMPLETE | - | - |
| Note: The request of pdu session modification may be performed by MMI or AT command. | | | | | |

10.1.5.1.3.3 Specific message contents

Table 10.1.5.1.3.3-1: PDU SESSION MODIFICATION COMMAND (step 3, Table 10.1.5.1.3.2-1)

| Derivation Path: 36.508, Table 4.7.2-9 | | | |
|--|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The value indicated in PDU SESSION MODIFICATION REQUEST | | |
| PTI | The value indicated in PDU SESSION MODIFICATION REQUEST | | |
| Authorized QoS rules | According to QoS rule #1 except for Rule operation code set to '100'B and QoS rule precedence set to '0000 0010'- see TS 38.508-1[4] | | |

10.1.6 UE-requested PDU session release

10.1.6.1 UE-requested PDU session release / Abnormal / Collision with network-requested PDU session modification procedure

10.1.6.1.1 Test Purpose (TP)

(1)

with { the UE is in PDU SESSION ACTIVE state and has sent a PDU SESSION RELEASE REQUEST message }

ensure that {

when { UE receives a PDU SESSION MODIFICATION COMMAND message indicating a PDU session that UE wants to release }

then { the UE ignores the PDU SESSION MODIFICATION COMMAND message and proceed with the PDU session release procedure }

}

10.1.6.1.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501, clause 6.4.3.2, 6.4.3.3 and 6.4.3.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.4.3.2]

In order to initiate the UE-requested PDU session release procedure, the UE shall create a PDU SESSION RELEASE REQUEST message.

The UE may set the 5GSM cause IE of the PDU SESSION RELEASE REQUEST message to indicate the reason for releasing the PDU session.

The 5GSM cause IE typically indicates one of the following 5GSM cause values:

- #36 regular deactivation;
- #41 Semantic error in the TFT operation;
- #42 Syntactical error in the TFT operation;
- #44 Semantic errors in packet filter(s);
- #45 Syntactical error in packet filter(s).

The UE shall allocate a PTI value currently not used and shall set the PTI IE of the PDU SESSION RELEASE REQUEST message to the allocated PTI value.

The UE shall transport the PDU SESSION RELEASE REQUEST message and the PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, and the UE shall start timer T3582 (see example in figure 6.4.3.2.1).

[TS 24.501, clause 6.4.3.3]

Upon receipt of a PDU SESSION RELEASE REQUEST message and a PDU session ID, if the SMF accepts the request to release the PDU session, and shall perform the network-requested PDU session release procedure as specified in subclause 6.3.3.

[TS 24.501, clause 6.4.3.5]

The following abnormal cases can be identified:

- b) Collision of UE-requested PDU session release procedure and network-requested PDU session modification procedure.

When the UE receives a PDU SESSION MODIFICATION COMMAND message during the UE-requested PDU session release procedure, and the PDU session indicated in PDU SESSION MODIFICATION COMMAND message is the PDU session that the UE had requested to release, the UE shall ignore the PDU SESSION MODIFICATION COMMAND message and proceed with the PDU session release procedure.

10.1.6.1.3 Test description

10.1.6.1.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

None.

Preamble:

The UE is in state 3N-A on NGC Cell A according to TS 38.508-1 [4].

10.1.6.1.3.2 Test procedure sequence

Table 10.1.6.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|----------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | Cause the UE to request establishment of PDU session to the DN.(Note 1) | - | - | - | - |
| 2 | The PDU session establishment procedure as specified in TS 38.508-1 [4] subclause 4.5A.2 take place. | - | - | - | - |
| 3 | Cause the UE to request release of PDU session established during step 2.(Note 2) | - | - | - | - |
| 4 | The UE transmits a PDU SESSION RELEASE REQUEST message. | --> | PDU SESSION RELEASE REQUEST | - | - |
| 5 | The SS transmits a PDU SESSION MODIFICATION COMMAND message. | <-- | PDU SESSION MODIFICATION COMMAND | - | - |
| 6 | Check: Does the UE transmit a PDU SESSION MODIFICATION COMPLETE or PDU SESSION MODIFICATION COMMAND REJECT message in the next 3 seconds? | - | - | 1 | F |
| 7 | The SS transmits a PDU SESSION RELEASE COMMAND message. | <-- | PDU SESSION RELEASE COMMAND | - | - |
| 8 | Check: Does the UE transmit PDU SESSION RELEASE COMPLETE message? | --> | PDU SESSION RELEASE COMPLETE | 1 | P |

Note 1: The request to establish a PDU session may be performed by MMI or AT command.
Note 2: The request to release a PDU session may be performed by MMI.

10.1.6.1.3.3 Specific message contents

Table 10.1.6.1.3.3-1: PDU SESSION RELEASE REQUEST (step 4, Table 10.1.6.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-12 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Set to the ID UE requested in step 2 in Table 10.1.6.1.3.2-1 | | |
| PTI | Any value from 1 to 254 | | |

Table 10.1.6.1.3.3-2: PDU SESSION MODIFICATION COMMAND (step 5, Table 10.1.6.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-9 | | | |
|--|--|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Set to the ID UE requested in step 2 in Table 10.1.6.1.3.2-1 | | |
| PTI | '0000 0000'B | No procedure transaction identity assigned | |

Table 10.1.6.1.3.3-3: PDU SESSION RELEASE COMMAND (step 7, Table 10.1.6.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Same ID as the ID UE requested in step 2 in Table 10.1.6.1.3.2-1 | | |
| PTI | The value indicated in PDU SESSION RELEASE REQUEST | | |
| 5GSM cause | '0010 0100'B | #36 regular deactivation | |

Table 10.1.6.1.3.3-4: PDU SESSION RELEASE COMPLETE (step 8, Table 10.1.6.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-15 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Same ID as the ID UE requested in step 2 in Table 10.1.6.1.3.2-1 | | |
| PTI | The value indicated in PDU SESSION RELEASE REQUEST | | |

10.1.6.2 UE-requested PDU session release / Abnormal / Collision with network-requested PDU session release procedure

10.1.6.2.1 Test Purpose (TP)

(1)

with { the UE is in PDU SESSION ACTIVE state and transported the PDU SESSION RELEASE REQUEST message }

ensure that {

when { UE receives a PDU SESSION RELEASE COMMAND message with the PTI IE set to “No procedure transaction identity assigned” indicating a PDU session that UE wants to release }

then { the UE aborts the UE-requested PDU session release procedure and proceeds with the network-requested PDU session release procedure }

}

10.1.6.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS 24.501, clause 6.4.3.2, 6.4.3.3 and 6.4.3.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.4.3.2]

In order to initiate the UE-requested PDU session release procedure, the UE shall create a PDU SESSION RELEASE REQUEST message.

The UE may set the 5GSM cause IE of the PDU SESSION RELEASE REQUEST message to indicate the reason for releasing the PDU session.

The 5GSM cause IE typically indicates one of the following 5GSM cause values:

#36 regular deactivation;

- #41 Semantic error in the TFT operation;
- #42 Syntactical error in the TFT operation;
- #44 Semantic errors in packet filter(s);
- #45 Syntactical error in packet filter(s).

The UE shall allocate a PTI value currently not used and shall set the PTI IE of the PDU SESSION RELEASE REQUEST message to the allocated PTI value.

The UE shall transport the PDU SESSION RELEASE REQUEST message and the PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, and the UE shall start timer T3582 (see example in figure 6.4.3.2.1).

[TS 24.501, clause 6.4.3.3]

Upon receipt of a PDU SESSION RELEASE REQUEST message and a PDU session ID, if the SMF accepts the request to release the PDU session, and shall perform the network-requested PDU session release procedure as specified in subclause 6.3.3.

[TS 24.501, clause 6.4.3.5]

The following abnormal cases can be identified:

...

- c) Collision of UE-requested PDU session release procedure and network-requested PDU session release procedure.

When the UE receives a PDU SESSION RELEASE COMMAND message with the PTI IE set to "No procedure transaction identity assigned" during the UE-requested PDU session release procedure, and the PDU session indicated in the PDU SESSION RELEASE COMMAND message is the same as the PDU session that the UE requests to release, the UE shall abort the UE-requested PDU session release procedure and proceed with the network-requested PDU session release procedure.

10.1.6.2.3 Test description

10.1.6.2.3.1 Pre-test conditions

System Simulator:

- NGC Cell A.

UE:

None.

Preamble:

- The UE is in state 3N-A on NGC Cell A according to TS 38.508-1 [4].

10.1.6.2.3.2 Test procedure sequence

Table 10.1.6.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | Cause the UE to request establishment of PDU session to the DN.(Note 1) | - | - | - | - |
| 2 | The PDU session establishment procedure as specified in TS 38.508-1 [4] subclause 4.5A.2 take place. | - | - | - | - |
| 3 | Cause the UE to request release of PDU session established during step 2.(Note 2) | - | - | - | - |
| 4 | The UE transmits a PDU SESSION RELEASE REQUEST message. | --> | PDU SESSION RELEASE REQUEST | - | - |
| 5 | The SS transmits a PDU SESSION RELEASE COMMAND message. | <-- | PDU SESSION RELEASE COMMAND | - | - |
| 6 | Check: Does the UE transmit PDU SESSION RELEASE COMPLETE message? | --> | PDU SESSION RELEASE COMPLETE | 1 | P |

Note 1: The request to establish a PDU session may be performed by MMI or AT command.

Note 2: The request to release a PDU session may be performed by MMI.

10.1.6.2.3.3 Specific message contents

Table 10.1.6.2.3.3-1: PDU SESSION RELEASE REQUEST (step 4, Table 10.1.6.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-12 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Set to the ID UE requested in step 2 in Table 10.1.6.2.3.2-1 | | |
| PTI | Any value from 1 to 254 | | |

Table 10.1.6.2.3.3-2: PDU SESSION RELEASE COMMAND (step 5, Table 10.1.6.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Set to the ID UE requested in step 2 in Table 10.1.6.2.3.2-1 | | |
| PTI | '0000 0000'B | No procedure transaction identity assigned | |
| 5GSM cause | '0010 0100'B | #36 regular deactivation | |

Table 10.1.6.2.3.3-3: PDU SESSION RELEASE COMPLETE (step 6, Table 10.1.6.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-15 | | | |
|---|--|------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Set to the ID UE requested in step 2 in Table 10.1.6.2.3.2-1 | | |
| PTI | '0000 0000'B | unassigned | |

10.2 EN-DC session management

10.2.1 Network initiated procedures

10.2.1.1 Default EPS bearer context activation

10.2.1.1.1 Test Purpose (TP)

(1)

with { UE has sent a PDN CONNECTIVITY REQUEST message }

ensure that {

when { UE receives an RRCConnectionReconfiguration message including an ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message with IE Procedure transaction identity matching the PDN CONNECTIVITY REQUEST message and including the Extended APN-AMBR IE }

then { UE transmits an ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message and enters BEARER CONTEXT ACTIVE state }

}

10.2.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.301, clause 6.4.1.3, 8.3.6.17 and 9.9.4.29. Unless otherwise stated these are Rel-15 requirements.

[TS 24.301, clause 6.4.1.3]

Upon receipt of the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, if the UE provided an APN for the establishment of the PDN connection, the UE shall stop timer T3396 if it is running for the APN provided by the UE. If the UE did not provide an APN for the establishment of the PDN connection and the request type was different from "emergency" and from "handover of emergency bearer services", the UE shall stop the timer T3396 associated with no APN if it is running. If the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message was received in response to a request for an emergency PDN connection, the UE shall not stop the timer T3396 associated with no APN if it is running. For any case, the UE shall then send an ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message and enter the state BEARER CONTEXT ACTIVE. When the default bearer is activated as part of the attach procedure, the UE shall send the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message together with ATTACH COMPLETE message. When the default bearer is activated as the response to the stand-alone PDN CONNECTIVITY REQUEST message, the UE shall send the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message alone.

If a WLAN offload indication information element is included in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, the UE shall store the WLAN offload acceptability values for this PDN connection and use the E-UTRAN offload acceptability value to determine whether this PDN connection is offloadable to WLAN or not.

The UE checks the PTI in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message to identify the UE requested PDN connectivity procedure to which the default bearer context activation is related (see subclause 6.5.1).

If the UE receives a serving PLMN rate control IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, the UE shall store the serving PLMN rate control IE value and use the stored serving PLMN rate control value as the maximum allowed limit of uplink User data container IEs included in ESM DATA TRANSPORT messages for the corresponding PDN connection in accordance with 3GPP TS 23.401 [10].

If the UE receives an APN rate control parameters container in the protocol configuration options IE or extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, the UE shall store the APN rate control parameters value and use the stored APN rate control parameters value as the maximum allowed limit of uplink user data related to the APN indicated in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message in accordance with 3GPP TS 23.401 [10]. If the UE has a previously stored APN rate control

parameters value for this APN, the UE shall replace the stored APN rate control parameters value for this APN with the received APN rate control parameters value.

If the UE receives an additional APN rate control parameters for exception data container in the protocol configuration options IE or extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, the UE shall store the additional APN rate control parameters for exception data value and use the stored additional APN rate control parameters for exception data value as the maximum allowed limit of uplink exception data related to the APN indicated in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message in accordance with 3GPP TS 23.401 [10]. If the UE has a previously stored additional APN rate control parameters for exception data value for this APN, the UE shall replace the stored additional APN rate control parameters for exception data value for this APN with the received additional APN rate control parameters for exception data value.

If the UE receives non-IP Link MTU parameter or IPv4 Link MTU parameter of the protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, the UE shall pass the received Non-IP Link MTU or IPv4 Link MTU to the upper layer.

NOTE: The Non-IP Link MTU and the IPv4 Link MTU size correspond to the maximum length of user data that can be sent either in the user data container in the ESM DATA TRANSPORT message or via S1-U interface.

If the UE receives a session-AMBR and QoS rule(s), which correspond to the default EPS bearer of the PDN connectivity being activated, in the protocol configuration options IE or the extended protocol configuration options IE in the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message, the UE stores the session-AMBR and QoS rule(s) for use during inter-system change from S1 mode to N1 mode.

Upon receipt of the ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message, the MME shall enter the state BEARER CONTEXT ACTIVE and stop the timer T3485, if the timer is running. If the PDN CONNECTIVITY REQUEST message included a low priority indicator set to "MS is configured for NAS signalling low priority", the MME shall store the NAS signalling low priority indication within the default EPS bearer context.

[TS 24.301, clause 8.3.6.17]

This IE shall be included in the message only if the network wishes to transmit the APN-AMBR values to the UE for possible uplink policy enforcement and at least one of the values to be transmitted exceeds the maximum value specified in the APN aggregate maximum bit rate information element in subclause 9.9.4.2.

[TS 24.301, clause 9.9.4.29]

The purpose of the extended APN aggregate maximum bit rate information element is to indicate the initial subscribed APN-AMBR with a value higher than 65280 Mbps when the UE establishes a PDN connection or to indicate the new APN-AMBR with a value higher than 65280 Mbps if it is changed by the network.

The receiving entity shall ignore the bit rate values which are included in the extended APN aggregate maximum bit rate information element and not higher than 65280 Mbps.

The extended APN aggregate maximum bit rate information element is coded as shown in figure 9.9.4.29.1 and table 9.9.4.29.1.

The extended APN aggregate maximum bit rate is a type 4 information element with a length of 8 octets.

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|--|---|---|---|---|---|---|---|---------|
| Extended APN aggregate maximum bit rate IEI | | | | | | | | octet 1 |
| Length of extended APN aggregate maximum bit rate contents | | | | | | | | octet 2 |
| Unit for extended APN-AMBR for downlink | | | | | | | | octet 3 |
| Extended APN-AMBR for downlink | | | | | | | | octet 4 |
| Extended APN-AMBR for downlink (continued) | | | | | | | | octet 5 |
| Unit for extended APN-AMBR for uplink | | | | | | | | octet 6 |

| | |
|--|---------|
| Extended APN-AMBR for uplink | octet 7 |
| Extended APN-AMBR for uplink (continued) | octet 8 |

Figure 9.9.4.29.1: Extended APN aggregate maximum bit rate information element

Table 9.9.4.29.1: Extended APN aggregate maximum bit rate information element

Unit for extended APN-AMBR for downlink (octet 3)

| | |
|-----------------|---|
| 0 0 0 0 0 0 0 0 | value is not used |
| 0 0 0 0 0 0 0 1 | value is not used |
| 0 0 0 0 0 0 1 0 | value is not used |
| 0 0 0 0 0 0 1 1 | value is incremented in multiples of 4 Mbps |
| 0 0 0 0 0 1 0 0 | value is incremented in multiples of 16 Mbps |
| 0 0 0 0 0 1 0 1 | value is incremented in multiples of 64 Mbps |
| 0 0 0 0 0 1 1 0 | value is incremented in multiples of 256 Mbps |
| 0 0 0 0 0 1 1 1 | value is incremented in multiples of 1 Gbps |
| 0 0 0 0 1 0 0 0 | value is incremented in multiples of 4 Gbps |
| 0 0 0 0 1 0 0 1 | value is incremented in multiples of 16 Gbps |
| 0 0 0 0 1 0 1 0 | value is incremented in multiples of 64 Gbps |
| 0 0 0 0 1 0 1 1 | value is incremented in multiples of 256 Gbps |
| 0 0 0 0 1 1 0 0 | value is incremented in multiples of 1 Tbps |
| 0 0 0 0 1 1 0 1 | value is incremented in multiples of 4 Tbps |
| 0 0 0 0 1 1 1 0 | value is incremented in multiples of 16 Tbps |
| 0 0 0 0 1 1 1 1 | value is incremented in multiples of 64 Tbps |
| 0 0 0 1 0 0 0 0 | value is incremented in multiples of 256 Tbps |
| 0 0 0 1 0 0 0 1 | value is incremented in multiples of 1 Pbps |
| 0 0 0 1 0 0 1 0 | value is incremented in multiples of 4 Pbps |
| 0 0 0 1 0 0 1 1 | value is incremented in multiples of 16 Pbps |
| 0 0 0 1 0 1 0 0 | value is incremented in multiples of 64 Pbps |
| 0 0 0 1 0 1 0 1 | value is incremented in multiples of 256 Pbps |

Other values shall be interpreted as multiples of 256 Pbps in this version of the protocol.

Extended APN-AMBR for downlink (octets 4 and 5)

Octets 4 and 5 represent the binary coded value of extended APN-AMBR for downlink in units defined by octet 3

Unit for extended APN-AMBR for uplink (octet 6)

The coding is identical to that of the unit for extended APN-AMBR for downlink (octet 3)

10.2.1.1.3 Test description

10.2.1.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

None.

Preamble:

- The UE is in RRC_IDLE state on E-UTRA Cell 1 using generic procedure parameter Connectivity (*EN-DC*) and Bearers (*MCG only*) established according to TS 38.508-1 [4].

10.2.1.1.3.2 Test procedure sequence

Table 10.2.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | Cause the UE to request connectivity to an additional PDN (see Note 1) | - | - | - | - |
| 2 | UE transmit an <i>RRCConnectionRequest</i> message with <i>establishmentCause</i> set to 'mo-Data' followed by a SERVICE REQUEST message. | --> | SERVICE REQUEST | - | - |
| 3 | The SS establishes SRB2 and DRB associated with default EPS bearer context (a first PDN obtained during the attach procedure). | - | - | - | - |
| 4 | The UE transmit a PDN CONNECTIVITY REQUEST message as specified to request an additional PDN. | --> | PDN CONNECTIVITY REQUEST | - | - |
| 5 | The SS transmits an <i>RRCConnectionReconfiguration</i> message containing NR <i>RRCReconfiguration</i> message to add NR <i>PSCell</i> with SCG DRB. The <i>RRCConnectionReconfiguration</i> message contains ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message containing Extended APN-AMBR IE. | <-- | RRC:
<i>RRCConnectionReconfiguration</i> ((<i>RR</i>
<i>RRCReconfiguration</i>)

NAS: ACTIVATE DEFAULT EPS
BEARER CONTEXT REQUEST | - | - |
| 6 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message to confirm the establishment of default bearer. | --> | RRC:
<i>RRCConnectionReconfigurationCo</i>
<i>mplete</i>
(<i>RRCReconfigurationComplete</i>) | - | - |
| - | EXCEPTION: In parallel to the event described in step 7 below, if initiated by the UE the generic procedure for IP address allocation in the U-plane specified in TS 36.508 subclause 4.5A.1 takes place | - | - | - | - |

| | | | | | |
|---|--|-----|--|---|---|
| | performing IP address allocation in the U-plane. | | | | |
| 7 | The UE transmits ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message. | --> | RRC: <i>ULInformationTransfer</i>
NAS: ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT | 1 | P |
| Note 1: The request of connectivity to an additional PDN may be performed by MMI or AT command. | | | | | |

10.2.1.1.3.3 Specific message contents

Table 10.2.1.1.3.3-1: PDN CONNECTIVITY REQUEST (step 4, Table 10.2.1.1.3.2-1)

| Derivation Path: 36.508 [7], Table 4.7.3-20 | | | |
|---|---------------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | ESM | | |
| EPS bearer identity | 0 | No EPS bearer identity assigned | |
| Procedure transaction identity | PTI-1 | UE assigns a particular PTI not yet used between 1 and 254 | |
| Access point name | APN-1(New PDN name) | The requested PDN is different from default PDN | |

Table 10.2.1.1.3.3-2: ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST (step 5, Table 10.2.1.1.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.3-6 | | | |
|---|-------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Protocol discriminator | ESM | | |
| EPS bearer identity | 6 | | |
| Procedure transaction identity | PTI-1 | SS re-uses the particular PTI defined by UE for this present additional PDN connectivity request procedure. | |
| EPS QoS | | | |
| QCI | 8 | | |
| Maximum bit rate for uplink | 384 kbps | | |
| Maximum bit rate for downlink | '11111110'B (8640 kbps) | | |
| Guaranteed bit rate for uplink | 128 kbps | | |
| Guaranteed bit rate for downlink | 128 kbps | | |

| | | | |
|---|---|--|--|
| Maximum bit rate for uplink (extended) | 0 | | |
| Maximum bit rate for downlink (extended) | '11111010'B (256 Mbps) | | |
| Guaranteed bit rate for uplink (extended) | 0 | | |
| Guaranteed bit rate for downlink (extended) | 0 | | |
| Maximum bit rate for uplink (extended-2) | 0 | | |
| Maximum bit rate for downlink (extended-2) | '11110110'B (10 Gbps) | | |
| Guaranteed bit rate for uplink (extended-2) | 0 | | |
| Guaranteed bit rate for downlink (extended-2) | 0 | | |
| APN-AMBR | | | |
| APN-AMBR for downlink | '11111110'B (8640 kbps) | | |
| APN-AMBR for uplink | '11111110'B (8640 kbps) | | |
| APN-AMBR for downlink (extended) | '11111010' B(256 Mbps) | | |
| APN-AMBR for uplink (extended) | '11111010' B(256 Mbps) | | |
| APN-AMBR for downlink (extended-2) | '11111110'B (65280 Mbps) | | |
| APN-AMBR for uplink (extended-2) | 0 | | |
| Access point name | APN-1 | SS re-uses the particular APN defined by UE for this present additional PDN connectivity request procedure | |
| Extended APN-AMBR | | | |
| Unit for extended APN-AMBR for downlink | '00000111'B (value is incremented in multiples of 1 Gbps) | | |
| Extended APN-AMBR for downlink | '0000000010000000'
(128 Gbps) | | |
| Unit for extended APN-AMBR for uplink | 0 | | |
| Extended APN-AMBR for uplink | 0 | | |

10.2.1.2 Dedicated EPS bearer context activation

10.2.1.2.1 Test Purpose (TP)

(1)

with { UE in EMM-REGISTERED state }

ensure that {

when { UE receives an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message, including the Extended EPS QoS IE, linked to the existing default EPS bearer }

then { UE transmits an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT }

}

(2)

with { the UE in BEARER CONTEXT ACTIVE STATE and in EMM-CONNECTED mode }

ensure that {

when { the UE receives a MODIFY EPS BEARER CONTEXT REQUEST message including the Extended EPS QoS and Extended APN-AMBR IEs }

then { UE transmits a MODIFY EPS BEARER CONTEXT ACCEPT }

}

10.2.1.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.301, clauses 6.4.2.3, 6.4.3.1, 6.4.3.2, 6.4.3.3, 8.3.3.11, 9.9.4.29 and 9.9.4.30. Unless otherwise stated these are Rel-15 requirements.

[TS 24.301, clause 6.4.2.3]

Upon receipt of the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message, if the UE provided an APN for the establishment of the PDN connection, the UE shall stop timer T3396, if it is running for the APN provided by the UE. If the UE did not provide an APN for the establishment of the PDN connection and the request type was different from "emergency" and from "handover of emergency bearer services", the UE shall stop the timer T3396 associated with no APN if it is running. If the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message was received for an emergency PDN connection, the UE shall not stop the timer T3396 associated with no APN if it is running. For any case, the UE shall then check the received TFT before taking it into use, send an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message and enter the state BEARER CONTEXT ACTIVE. The ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message shall include the EPS bearer identity.

The linked EPS bearer identity included in the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message indicates to the UE to which default bearer, IP address and PDN the dedicated bearer is linked.

If the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains a PTI value other than "no procedure transaction identity assigned" and "reserved" (see 3GPP TS 24.007 [12]), the UE uses the PTI to identify the UE requested bearer resource allocation procedure or the UE requested bearer resource modification procedure to which the dedicated bearer context activation is related.

[TS 24.301, clause 6.4.3.1]

The purpose of the EPS bearer context modification procedure is to modify an EPS bearer context with a specific QoS and TFT, or re-negotiate header compression configuration associated to an EPS bearer context. The EPS bearer context modification procedure is initiated by the network, but it may also be initiated as part of the UE requested bearer resource allocation procedure or the UE requested bearer resource modification procedure.

The network may also initiate the EPS bearer context modification procedure to update the APN-AMBR of the UE, for instance after an inter-system handover. See 3GPP TS 23.401 [10] annex E.

[TS 24.301, clause 6.4.3.2]

The MME shall initiate the EPS bearer context modification procedure by sending a MODIFY EPS BEARER CONTEXT REQUEST message to the UE, starting the timer T3486, and entering the state BEARER CONTEXT MODIFY PENDING (see example in figure 6.4.3.2.1).

The MME shall include an EPS bearer identity that identifies the EPS bearer context to be modified in the MODIFY EPS BEARER CONTEXT REQUEST message.

[TS 24.301, clause 6.4.3.3]

Upon receipt of the MODIFY EPS BEARER CONTEXT REQUEST message, if the UE provided an APN for the establishment of the PDN connection, the UE shall stop timer T3396, if it is running for the APN provided by the UE. If the UE did not provide an APN for the establishment of the PDN connection and the request type was different from "emergency" and from "handover of emergency bearer services", the UE shall stop the timer T3396 associated with no APN if it is running. If the MODIFY EPS BEARER CONTEXT REQUEST message was received for an emergency PDN connection, the UE shall not stop the timer T3396 associated with no APN if it is running. For any case, the UE shall then check the received TFT before taking it into use and send a MODIFY EPS BEARER CONTEXT ACCEPT message to the MME.

If the MODIFY EPS BEARER CONTEXT REQUEST message contains a PTI value other than "no procedure transaction identity assigned" and "reserved" (see 3GPP TS 24.007 [12]), the UE uses the PTI to identify the UE requested bearer resource allocation procedure or the UE requested bearer resource modification procedure to which the EPS bearer context modification is related (see subclause 6.5.3 and subclause 6.5.4).

If the MODIFY EPS BEARER CONTEXT REQUEST message contains a PTI value other than "no procedure transaction identity assigned" and "reserved" (see 3GPP TS 24.007 [12]) and the PTI is associated to a UE requested bearer resource allocation procedure or a UE requested bearer resource modification procedure, the UE shall release the traffic flow aggregate description associated to the PTI value provided.

...

Upon receipt of the MODIFY EPS BEARER CONTEXT ACCEPT message, the MME shall stop the timer T3486 and enter the state BEARER CONTEXT ACTIVE.

[TS 24.301, clause 8.3.3.11]

This IE shall be included in the message only if the network wishes to transmit the maximum and guaranteed bit rate values to the UE and at least one of the values to be transmitted exceeds the maximum value specified in the EPS quality of service information element in subclause 9.9.4.3

[TS 24.301, clause 9.9.4.29]

The purpose of the extended APN aggregate maximum bit rate information element is to indicate the initial subscribed APN-AMBR with a value higher than 65280 Mbps when the UE establishes a PDN connection or to indicate the new APN-AMBR with a value higher than 65280 Mbps if it is changed by the network.

The receiving entity shall ignore the bit rate values which are included in the extended APN aggregate maximum bit rate information element and not higher than 65280 Mbps.

The extended APN aggregate maximum bit rate information element is coded as shown in figure 9.9.4.29.1 and table 9.9.4.29.1.

The extended APN aggregate maximum bit rate is a type 4 information element with a length of 8 octets

[TS 24.301, clause 9.9.4.30]

The purpose of the Extended EPS quality of service information element is to indicate for an EPS bearer context the maximum bit rates for uplink and downlink and the guaranteed bit rates for uplink and downlink, if at least one of the bit rates has a value higher than 10 Gbps.

The Extended EPS quality of service information element is coded as shown in figure 9.9.4.30.1 and table 9.9.4.30.1. For uplink and downlink, if sending entity only has to indicate one bit rate (i.e., with a value higher than 10 Gbps), it shall encode the other bit rate (i.e., with a value smaller or equal to 10 Gbps) as "00000000". The receiving entity shall ignore the bit rate which is included in the extended quality of service information element and has a value smaller or equal to 10 Gbps.

10.2.1.2.3 Test description

10.2.1.2.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 is the PCell and NR Cell 1 is the PSCell.

UE:

- None.

Preamble:

- The UE is in RRC_IDLE state on E-UTRA Cell 1 using generic procedure parameter Connectivity (EN-DC) according to TS 38.508-1 [4].

10.2.1.2.3.2 Test procedure sequence

Table 10.2.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|---|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1-6 | Steps 1 to 6 of generic procedure defined in clause 4.5.4 in TS 38.508-1 [4]. | - | - | - | - |
| 7 | The SS configures a dedicated EPS bearer associated with the default EPS bearer context by sending ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST including the Extended QoS IE.

(See Note 1 and Note 2). | <-- | NAS: ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST | - | - |
| 8 | Check: Does the UE transmit an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message as specified? | --> | ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT | 1 | P |
| 9 | The SS transmits a MODIFY EPS BEARER CONTEXT REQUEST message with Extended EPS QoS and Extended APN-AMBR IEs. This message is included in a DLInformationTransfer message. | <-- | MODIFY EPS BEARER CONTEXT REQUEST | - | - |
| 10 | Check: Does the UE transmit a MODIFY EPS BEARER CONTEXT ACCEPT message? | --> | MODIFY EPS BEARER CONTEXT ACCEPT | 2 | P |
| <p>Note 1: The ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message is included in a <i>RRCConnectionReconfiguration</i> message including a DRB setup for the same EPS bearer ID.</p> <p>Note 2: The <i>RRCConnectionReconfiguration</i> uses the condition for DC bearer MCG and SCG</p> | | | | | |

10.2.1.2.3.3 Specific message contents

Table 10.2.1.2.3.3-1: ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST (step 7, Table 10.2.1.2.3.2-1)

| Derivation Path: TS 38.508-1[4], Table 4.5.4.3-1 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|---|--|--|--|
| Protocol discriminator | ESM | | |
| EPS bearer identity | 6 | | |
| Procedure transaction identity | '0000 0000'B | No procedure transaction identity assigned | |
| EPS QoS | | | |
| QCI | 8 | | |
| Maximum bit rate for uplink | '01101000'B (384 kbps) | | |
| Maximum bit rate for downlink | '11111110'B (8640 kbps) | | |
| Guaranteed bit rate for uplink | '01001000'B (128 kbps) | | |
| Guaranteed bit rate for downlink | '01001000'B (128 kbps) | | |
| Maximum bit rate for uplink (extended) | 0 | | |
| Maximum bit rate for downlink (extended) | '11111010'B (256 Mbps) | | |
| Guaranteed bit rate for uplink (extended) | 0 | | |
| Guaranteed bit rate for downlink (extended) | 0 | | |
| Maximum bit rate for uplink (extended-2) | 0 | | |
| Maximum bit rate for downlink (extended-2) | '11110110'B (10 Gbps) | | |
| Guaranteed bit rate for uplink (extended-2) | 0 | | |
| Guaranteed bit rate for downlink (extended-2) | 0 | | |
| Extended EPS QoS | | | |
| Unit for maximum bit rate | '00000111' (value is incremented in multiples of 1 Gbps) | | |
| Maximum bit rate for uplink | '0000000000000000'B | | |
| Maximum bit rate for downlink | '000000000001100'B (12 Gbps) | | |
| Unit for guaranteed bit rate | '00000000'B | | |
| Guaranteed bit rate for uplink | '00000000'B | | |
| Guaranteed bit rate for downlink | '00000000'B | | |

Table 10.2.1.2.3.3-2: MODIFY EPS BEARER CONTEXT REQUEST (step 9, Table 10.2.1.2.3.2-1)

| Derivation path: 36.508 [7], Table 4.7.3-18 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| New EPS QoS | | | |
| QCI | 8 | | |

| | | | |
|---|---|--|--|
| Maximum bit rate for uplink | '01101000'B (384 kbps) | | |
| Maximum bit rate for downlink | '11111110'B (8640 kbps) | | |
| Guaranteed bit rate for uplink | '01001000'B (128 kbps) | | |
| Guaranteed bit rate for downlink | '01001000'B (128 kbps) | | |
| Maximum bit rate for uplink (extended) | 0 | | |
| Maximum bit rate for downlink (extended) | '11111010'B (256 Mbps) | | |
| Guaranteed bit rate for uplink (extended) | 0 | | |
| Guaranteed bit rate for downlink (extended) | 0 | | |
| Maximum bit rate for uplink (extended-2) | 0 | | |
| Maximum bit rate for downlink (extended-2) | '11110110'B (10 Gbps) | | |
| Guaranteed bit rate for uplink (extended-2) | 0 | | |
| Guaranteed bit rate for downlink (extended-2) | 0 | | |
| APN-AMBR | | | |
| APN-AMBR for downlink | '11111110'B (8640 kbps) | | |
| APN-AMBR for uplink | '11111110'B (8640 kbps) | | |
| APN-AMBR for downlink (extended) | '11111010' B(256 Mbps) | | |
| APN-AMBR for uplink (extended) | '11111010' B(256 Mbps) | | |
| APN-AMBR for downlink (extended-2) | '11111110'B (65280 Mbps) | | |
| APN-AMBR for uplink (extended-2) | 0 | | |
| Extended APN-AMBR | | | |
| Unit for extended APN-AMBR for downlink | '00000111'B (value is incremented in multiples of 1 Gbps) | | |
| Extended APN-AMBR for downlink | '0000000010000000'
(128 Gbps) | | |
| Unit for extended APN-AMBR for uplink | 0 | | |
| Extended APN-AMBR for uplink | 0 | | |
| Extended EPS QoS | | | |
| Unit for maximum bit rate | '00000111' (value is incremented in multiples of 1 Gbps) | | |
| Maximum bit rate for uplink | '0000000000000000'B | | |
| Maximum bit rate for downlink | '0000000000001110'B | | |
| Unit for guaranteed bit rate | '00000000'B | | |
| Guaranteed bit rate for uplink | '00000000'B | | |

| | | | |
|----------------------------------|-------------|--|--|
| Guaranteed bit rate for downlink | '00000000'B | | |
|----------------------------------|-------------|--|--|

10.2.2 UE initiated procedures

10.2.2.1 EPS bearer resource allocation / modification

10.2.2.1.1 Test Purpose (TP)

(1)

with { UE in PROCEDURE TRANSACTION INACTIVE state and in EMM-IDLE mode }

ensure that {

when { UE is requested to allocate bearer resource using Extended EPS QoS }

then { UE sends a BEARER RESOURCE ALLOCATION REQUEST including the Extended EPS QoS IE }

}

(2)

with { UE has sent the BEARER RESOURCE ALLOCATION REQUEST message }

ensure that {

when { UE receives an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message with the procedure transaction identity (PTI) indicated in the BEARER RESOURCE ALLOCATION REQUEST message }

then { UE sends an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message }

}

(3)

with { UE in PROCEDURE TRANSACTION INACTIVE state and in EMM-CONNECTED mode }

ensure that {

when { UE is requested to modify of bearer resource corresponding to the dedicated bearer using Extended EPS QoS }

then { UE sends a BEARER RESOURCE MODIFICATION REQUEST message including the Extended EPS QoS IE }

}

(4)

with { UE having sent the BEARER RESOURCE MODIFICATION REQUEST message }

ensure that {

when { UE receives an MODIFY EPS BEARER CONTEXT REQUEST message with the procedure transaction identity (PTI) indicated in the BEARER RESOURCE MODIFICATION REQUEST message }

then { UE sends a MODIFY EPS BEARER CONTEXT ACCEPT message }

}

10.2.2.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.301, clauses 6.4.2.3, 6.5.3.2, 6.5.3.3, 6.5.4.2, 6.5.4.3, 8.3.8, 8.3.10 and 9.9.4.30. Unless otherwise stated these are Rel-15 requirements.

[TS 24.301, clause 6.4.2.3]

The linked EPS bearer identity included in the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message indicates to the UE to which default bearer, IP address and PDN the dedicated bearer is linked.

If the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message contains a PTI value other than "no procedure transaction identity assigned" and "reserved" (see 3GPP TS 24.007 [12]), the UE uses the PTI to identify the UE requested bearer resource allocation procedure or the UE requested bearer resource modification procedure to which the dedicated bearer context activation is related.

[TS 24.301, clause 6.5.3.2]

In order to request the allocation of bearer resources for one traffic flow aggregate, the UE shall send a BEARER RESOURCE ALLOCATION REQUEST message to the MME, start timer T3480 and enter the state PROCEDURE TRANSACTION PENDING (see example in figure 6.5.3.2.1).

The UE shall include the EPS bearer identity of the default EPS bearer associated with the requested bearer resource in the Linked EPS bearer identity IE. The UE shall set the TFT operation code in the Traffic flow aggregate IE to "Create new TFT". The packet filters in the Traffic flow aggregate IE shall include at least one packet filter applicable for the uplink direction. In the Required traffic flow QoS IE, the UE shall indicate a QCI and, if the UE also includes a GBR, the additional GBR required for the traffic flow aggregate.

[TS 24.301, clause 6.5.3.3]

If the bearer resource allocation requested is accepted by the network, the MME shall initiate either a dedicated EPS bearer context activation procedure or an EPS bearer context modification procedure. Upon receipt of an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST or MODIFY EPS BEARER CONTEXT REQUEST message with a PTI which matches the value used for the BEARER RESOURCE ALLOCATION REQUEST message, the UE shall stop timer T3480 and enter the state PROCEDURE TRANSACTION INACTIVE. The UE should ensure that the procedure transaction identity (PTI) assigned to this procedure is not released immediately. The way to achieve this is implementation dependent. While the PTI value is not released, the UE regards any received ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST or MODIFY EPS BEARER CONTEXT REQUEST message with the same PTI value as a network retransmission (see subclause 7.3.1).

If the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message is received, the UE shall verify that the EPS bearer identity given in the EPS bearer identity IE is not already used by any EPS bearer context. The UE shall then proceed as described in subclause 6.4.2.3 or subclause 6.4.2.4.

[TS 24.301, clause 6.5.4.2]

In order to request the modification of bearer resources for one traffic flow aggregate, the UE shall send a BEARER RESOURCE MODIFICATION REQUEST message to the MME, start timer T3481 and enter the state PROCEDURE TRANSACTION PENDING (see example in figure 6.5.4.2.1).

[TS 24.301, clause 6.5.4.3]

Upon receipt of the BEARER RESOURCE MODIFICATION REQUEST message, the MME checks whether the resources requested by the UE can be established, modified or released by verifying the EPS bearer identity given in the EPS bearer identity for packet filter IE.

If the bearer resource modification requested is accepted by the network, the MME shall initiate either a dedicated EPS bearer context activation procedure, an EPS bearer context modification procedure or an EPS bearer context deactivation procedure.

...

Upon receipt of an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST, MODIFY EPS BEARER CONTEXT REQUEST or DEACTIVATE EPS BEARER CONTEXT REQUEST message with a PTI which matches the value used for the BEARER RESOURCE MODIFICATION REQUEST message, the UE shall stop timer T3481 and enter the state PROCEDURE TRANSACTION INACTIVE. The UE should ensure that the procedure transaction identity (PTI) assigned to this procedure is not released immediately. The way to achieve this is implementation dependent. While the PTI value is not released, the UE regards any received ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST or MODIFY EPS BEARER CONTEXT REQUEST message with the same PTI value as a network retransmission (see subclause 7.3.1).

i) If the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message is received, the UE shall verify that the EPS bearer identity given in the EPS bearer identity IE is not already used by any EPS bearer context. The UE shall then proceed as described in subclause 6.4.2.3 or subclause 6.4.2.4.

[TS 24.301, clause 8.3.8]

This IE shall be included in the message only if the UE wishes to transmit the maximum and guaranteed bit rate values to the network and at least one of the values to be transmitted exceeds the maximum value specified in the EPS quality of service information element in subclause 9.9.4.3.

[TS 24.301, clause 8.3.10]

This IE shall be included in the message only if the UE wishes to transmit the maximum and guaranteed bit rate values to the network and at least one of the values to be transmitted exceeds the maximum value specified in the EPS quality of service information element in subclause 9.9.4.3.

[TS 24.301, clause 9.9.4.30]

The purpose of the Extended quality of service information element is to indicate for an EPS bearer context the maximum bit rates for uplink and downlink and the guaranteed bit rates for uplink and downlink, if at least one of the bit rates has a value higher than 10 Gbps.

The Extended quality of service information element is coded as shown in figure 9.9.4.30.1 and table 9.9.4.30.1. For uplink and downlink, if the sending entity only has to indicate one bit rate (i.e., with a value higher than 10 Gbps), it shall encode the other bit rate (i.e., with a value smaller or equal to 10 Gbps) as "00000000". The receiving entity shall ignore a bit rate which is included in the extended quality of service information element and has a value smaller or equal to 10 Gbps.

The Extended quality of service is a type 4 information element with a length of 12 octets.

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|--|---|---|---|---|---|---|---|----------|
| Extended quality of service IEI | | | | | | | | octet 1 |
| Length of Extended quality of service contents | | | | | | | | octet 2 |
| Unit for maximum bit rate | | | | | | | | octet 3 |
| Maximum bit rate for uplink | | | | | | | | octet 4 |
| Maximum bit rate for uplink (continued) | | | | | | | | octet 5 |
| Maximum bit rate for downlink | | | | | | | | octet 6 |
| Maximum bit rate for downlink (continued) | | | | | | | | octet 7 |
| Unit for guaranteed bit rate | | | | | | | | octet 8 |
| Guaranteed bit rate for uplink | | | | | | | | octet 9 |
| Guaranteed bit rate for uplink (continued) | | | | | | | | octet 10 |
| Guaranteed bit rate for downlink | | | | | | | | octet 11 |
| Guaranteed bit rate for downlink (continued) | | | | | | | | octet 12 |

Figure 9.9.4.30.1: Extended quality of service information element

Table 9.9.4.30.1: Extended quality of service information element

| Unit for maximum bit rate (octet 3) | |
|-------------------------------------|---|
| 0 0 0 0 0 0 0 0 | value is not used |
| 0 0 0 0 0 0 0 1 | value is incremented in multiples of 200 kbps |
| 0 0 0 0 0 0 1 0 | value is incremented in multiples of 1 Mbps |
| 0 0 0 0 0 0 1 1 | value is incremented in multiples of 4 Mbps |
| 0 0 0 0 0 1 0 0 | value is incremented in multiples of 16 Mbps |
| 0 0 0 0 0 1 0 1 | value is incremented in multiples of 64 Mbps |
| 0 0 0 0 0 1 1 0 | value is incremented in multiples of 256 Mbps |
| 0 0 0 0 0 1 1 1 | value is incremented in multiples of 1 Gbps |
| 0 0 0 0 1 0 0 0 | value is incremented in multiples of 4 Gbps |
| 0 0 0 0 1 0 0 1 | value is incremented in multiples of 16 Gbps |
| 0 0 0 0 1 0 1 0 | value is incremented in multiples of 64 Gbps |
| 0 0 0 0 1 0 1 1 | value is incremented in multiples of 256 Gbps |
| 0 0 0 0 1 1 0 0 | value is incremented in multiples of 1 Tbps |
| 0 0 0 0 1 1 0 1 | value is incremented in multiples of 4 Tbps |
| 0 0 0 0 1 1 1 0 | value is incremented in multiples of 16 Tbps |
| 0 0 0 0 1 1 1 1 | value is incremented in multiples of 64 Tbps |
| 0 0 0 1 0 0 0 0 | value is incremented in multiples of 256 Tbps |
| 0 0 0 1 0 0 0 1 | value is incremented in multiples of 1 Pbps |
| 0 0 0 1 0 0 1 0 | value is incremented in multiples of 4 Pbps |
| 0 0 0 1 0 0 1 1 | value is incremented in multiples of 16 Pbps |
| 0 0 0 1 0 1 0 0 | value is incremented in multiples of 64 Pbps |
| 0 0 0 1 0 1 0 1 | value is incremented in multiples of 256 Pbps |

Other values shall be interpreted as multiples of 256 Pbps in this version of the protocol.

Maximum bit rate for uplink (octets 4 and 5)

Octets 4 and 5 represent the binary coded value of maximum bit rate for uplink in units defined by octet 3.

Maximum bit rate for downlink (octets 6 and 7)

Octets 6 and 7 represent the binary coded value of maximum bit rate for downlink in units defined by octet 3.

Unit for guaranteed bit rate (octet 8)

The coding is identical to that of the unit for maximum bit rate (octet 3).

Guaranteed bit rate for uplink (octets 9 and 10)

Octets 9 and 10 represent the binary coded value of guaranteed bit rate for uplink in units defined by octet 8.

Guaranteed bit rate for downlink (octets 11 and 12)

Octets 11 and 12 represent the binary coded value of guaranteed bit rate for downlink in units defined by octet 8.

10.2.2.1.3 Test description

10.2.2.1.3.1 Pre-test conditions

System Simulator:

- E-UTRA Cell 1 and NR Cell 1.

UE:

- None.

Preamble:

- The UE is in state RRC_IDLE using generic procedure parameter Connectivity (*EN-DC*) according to [4].

10.2.2.1.3.2 Test procedure sequence

Table 10.2.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|---|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | Cause the UE to request bearer resource allocation of dedicated EPS bearer associated with non-IMS PDN connectivity if pc_MULTI_PDN=TRUE else first PDN connectivity. (Note 1). | - | - | - | - |
| 2 | The UE transmits a SERVICE REQUEST message. | --> | SERVICE REQUEST | - | - |
| 3 | The SS establishes SRB2 and the MCG DRBs associated with the default EPS bearer context activated during the preamble. | - | - | - | - |
| 4 | Check: Does the UE transmit a BEARER RESOURCE ALLOCATION REQUEST message? | --> | BEARER RESOURCE ALLOCATION REQUEST | 1 | P |
| 5 | The SS transmits an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message and establishes a RLC-AM SCG DRB bearer using MCG_and_SCG condition. | <-- | ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST | - | - |
| 6 | Check: Does the UE transmit an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message? | --> | ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT | 2 | P |
| 7 | Cause the UE to request bearer resource modification of dedicated EPS bearer associated with non-IMS PDN connectivity if pc_MULTI_PDN=TRUE else first PDN connectivity. (Note 2). | - | - | - | - |
| 8 | Check: Does the UE transmit a BEARER RESOURCE MODIFICATION REQUEST message? | --> | BEARER RESOURCE MODIFICATION REQUEST | 3 | P |
| 9 | The SS transmits an ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message. | <-- | MODIFY EPS BEARER CONTEXT REQUEST | - | - |
| 10 | Check: Does the UE transmit an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message? | --> | MODIFY EPS BEARER CONTEXT ACCEPT | 4 | P |
| Note 1: The request is assumed to be triggered by AT command +CGDSCONT, and +CGACT (activated). | | | | | |
| Note 2: The request is assumed to be triggered by AT command +CGCMOD. | | | | | |

10.2.2.1.3.3 Specific message contents

Table 10.2.2.1.3.3-1: Message BEARER RESOURCE ALLOCATION REQUEST (step 4, Table 10.2.2.1.3.2-1)

| Derivation path: TS 36.508 [7], Table 4.7.3-6B | | | |
|---|-------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Linked EPS bearer identity | 12 | | |
| EPS QoS | | | |
| QCI | 1 | | |
| Maximum bit rate for uplink | 384 kbps | | |
| Maximum bit rate for downlink | '11111110'B (8640 kbps) | | |
| Guaranteed bit rate for uplink | 128 kbps | | |
| Guaranteed bit rate for downlink | 128 kbps | | |
| Maximum bit rate for uplink (extended) | 0 | | |
| Maximum bit rate for downlink (extended) | '11111010'B (256 Mbps) | | |
| Guaranteed bit rate for uplink (extended) | 0 | | |
| Guaranteed bit rate for downlink (extended) | 0 | | |
| Maximum bit rate for uplink (extended-2) | 0 | | |
| Maximum bit rate for downlink (extended-2) | '11110110'B (10 Gbps) | | |
| Guaranteed bit rate for uplink (extended-2) | 0 | | |
| Guaranteed bit rate for downlink (extended-2) | 0 | | |
| Extended EPS QoS | | | |
| Unit for maximum bit rate | Any value(Note1) | | |
| Maximum bit rate for uplink | '00000000'B | | |
| Maximum bit rate for downlink | Any value(Note1) | | |
| Unit for guaranteed bit rate | '00000000'B | | |
| Guaranteed bit rate for uplink | '00000000'B | | |
| Guaranteed bit rate for downlink | '00000000'B | | |
| Note1: The product of Unit for maximum bit rate and maximum bit rate for downlink should be 12Gbps. | | | |

Table 10.2.2.1.3.3-2: Message ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST (step 5, Table 10.2.2.1.3.2-1)

| Derivation path: TS 38.508-1 [4], Table 4.5.4.3-1 , condition UE-INITIATED | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| EPS bearer identity | 6 | | |
| EPS QoS | | | |

| | | | |
|---|--|--|--|
| QCI | 1 | | |
| Maximum bit rate for uplink | 384 kbps | | |
| Maximum bit rate for downlink | '11111110'B (8640 kbps) | | |
| Guaranteed bit rate for uplink | 128 kbps | | |
| Guaranteed bit rate for downlink | 128 kbps | | |
| Maximum bit rate for uplink (extended) | 0 | | |
| Maximum bit rate for downlink (extended) | '11111010'B (256 Mbps) | | |
| Guaranteed bit rate for uplink (extended) | 0 | | |
| Guaranteed bit rate for downlink (extended) | 0 | | |
| Maximum bit rate for uplink (extended-2) | 0 | | |
| Maximum bit rate for downlink (extended-2) | '11110110'B (10 Gbps) | | |
| Guaranteed bit rate for uplink (extended-2) | 0 | | |
| Guaranteed bit rate for downlink (extended-2) | 0 | | |
| Extended EPS QoS | | | |
| Unit for maximum bit rate | '00000111' (value is incremented in multiples of 1 Gbps) | | |
| Maximum bit rate for uplink | '00000000'B | | |
| Maximum bit rate for downlink | '0000000000001100' B (12 Gbps) | | |
| Unit for guaranteed bit rate | '00000000'B | | |
| Guaranteed bit rate for uplink | '00000000'B | | |
| Guaranteed bit rate for downlink | '00000000'B | | |

Table 10.2.2.1.3.3-3: Message BEARER RESOURCE MODIFICATION REQUEST (step 8, Table 10.2.2.1.3.2-1)

| Derivation path: TS 36.508 [7], Table 4.7.3-8 | | | |
|---|-------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| EPS bearer identity for packet filter | 6 | | |
| Required traffic flow QoS | | | |
| QCI | 1 | | |
| Maximum bit rate for uplink | 384 kbps | | |
| Maximum bit rate for downlink | '11111110'B (8640 kbps) | | |
| Guaranteed bit rate for uplink | 128 kbps | | |
| Guaranteed bit rate for downlink | 128 kbps | | |
| Maximum bit rate for uplink (extended) | 0 | | |

| | | | |
|---|------------------------|--|--|
| Maximum bit rate for downlink (extended) | '11111010'B (256 Mbps) | | |
| Guaranteed bit rate for uplink (extended) | 0 | | |
| Guaranteed bit rate for downlink (extended) | 0 | | |
| Maximum bit rate for uplink (extended-2) | 0 | | |
| Maximum bit rate for downlink (extended-2) | '11110110'B (10 Gbps) | | |
| Guaranteed bit rate for uplink (extended-2) | 0 | | |
| Guaranteed bit rate for downlink (extended-2) | 0 | | |
| Extended EPS QoS | | | |
| Unit for maximum bit rate | Any value (Note1) | | |
| Maximum bit rate for uplink | '00000000'B | | |
| Maximum bit rate for downlink | Any value (Note1) | | |
| Unit for guaranteed bit rate | '00000000'B | | |
| Guaranteed bit rate for uplink | '00000000'B | | |
| Guaranteed bit rate for downlink | '00000000'B | | |
| Note1: The product of Unit for maximum bit rate and maximum bit rate for downlink should be 16Gbps. | | | |

Table 10.2.2.1.3.3-4: Message MODIFY EPS BEARER CONTEXT REQUEST (step 7, Table 10.2.2.1.3.2-1)

| Derivation path: TS 36.508 [7], Table 4.7.3-18, condition UE-INITIATED | | | |
|--|-------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| EPS bearer identity | 6 | | |
| Linked EPS bearer identity | 12 | | |
| New EPS QoS | | | |
| QCI | 1 | | |
| Maximum bit rate for uplink | 384 kbps | | |
| Maximum bit rate for downlink | '11111110'B (8640 kbps) | | |
| Guaranteed bit rate for uplink | 128 kbps | | |
| Guaranteed bit rate for downlink | 128 kbps | | |
| Maximum bit rate for uplink (extended) | 0 | | |
| Maximum bit rate for downlink (extended) | '11111010'B (256 Mbps) | | |
| Guaranteed bit rate for uplink (extended) | 0 | | |
| Guaranteed bit rate for downlink (extended) | 0 | | |
| Maximum bit rate for uplink (extended-2) | 0 | | |
| Maximum bit rate for downlink (extended-2) | '11110110'B (10 Gbps) | | |

| | | | |
|---|---|--|--|
| Guaranteed bit rate for uplink (extended-2) | 0 | | |
| Guaranteed bit rate for downlink (extended-2) | 0 | | |
| APN-AMBR | | | |
| APN-AMBR for downlink | '11111110'B (8640 kbps) | | |
| APN-AMBR for uplink | '11111110'B (8640 kbps) | | |
| APN-AMBR for downlink (extended) | '11111010' B(256 Mbps) | | |
| APN-AMBR for uplink (extended) | '11111010' B(256 Mbps) | | |
| APN-AMBR for downlink (extended-2) | '11111110'B (65280 Mbps) | | |
| APN-AMBR for uplink (extended-2) | 0 | | |
| Extended APN-AMBR | | | |
| Unit for extended APN-AMBR for downlink | '00000111'B (value is incremented in multiples of 1 Gbps) | | |
| Extended APN-AMBR for downlink | '0000000010000000' (128 Gbps) | | |
| Unit for extended APN-AMBR for uplink | 0 | | |
| Extended APN-AMBR for uplink | 0 | | |
| Extended EPS QoS | | | |
| Unit for maximum bit rate | '00000111' (value is incremented in multiples of 1 Gbps) | | |
| Maximum bit rate for uplink | '00000000'B | | |
| Maximum bit rate for downlink | '000000000010000' B (16 Gbps) | | |
| Unit for guaranteed bit rate | '00000000'B | | |
| Guaranteed bit rate for uplink | '00000000'B | | |
| Guaranteed bit rate for downlink | '00000000'B | | |

10.3 5GS Non-3GPP Access Session Management

10.3.1 PDU session authentication and authorization

10.3.1.1 PDU session authentication and authorization / during the UE-requested PDU session procedure

10.3.1.1.1 Test Purpose (TP)

Same Test Purpose as in clause 10.1.1.1.1

10.3.1.1.2 Conformance requirements

Same conformance requirements as in clause 10.1.1.1.2

10.3.1.1.3 Test description

10.3.1.1.3.1 Pre-test conditions

System Simulator:

WLAN Cell 27

UE:

None.

Preamble:

The UE is in state 1W-A with PDU session Active state according to TS 38.508-1 [4].

10.3.1.1.3.2 Test procedure sequence

Table 10.3.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | Cause the UE to request connectivity to an additional PDU session. (see Note 1) | - | - | - | - |
| 2 | UE transmits establishes a IPSEC SA and NAS signalling connection as per generic procedure in table 4.5A.4.2.2-1 of 38.508-1 [4]". | - | - | - | - |
| 3 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message to request an additional PDU session.

Note: PDU SESSION ESTABLISHMENT REQUEST is included in UL NAS transport. UL NAS transport message is included in dedicatedNAS-Message of <i>ULInformationTransfer</i> message.

DNN information is included in UL NAS transport message. | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT REQUEST | - | - |
| 4 | The SS transmits PDU SESSION AUTHENTICATION COMMAND including an EAP-Request message. | <-- | PDU SESSION AUTHENTICATION COMMAND | | |
| 5 | Check: Does the UE transmit a PDU SESSION AUTHENTICATION COMPLETE containing EAP-Response message? | --> | PDU SESSION AUTHENTICATION COMPLETE | 1 | P |
| 6 | The SS transmits PDU SESSION ESTABLISHMENT REJECT message with 5GSM cause #29 including an EAP-Failure | <-- | PDU SESSION ESTABLISHMENT REJECT | | |

| | | | | | |
|----------|---|-----|---|---|---|
| | message. | | | | |
| 7 | The generic procedure for SS-requested IPsec Secure tunnel disconnection, specified in subclause 4.5A.3 of TS 38.508-1 [4], takes place performing disconnection of security association. | - | | - | - |
| 8 | Cause the UE to request connectivity to an additional PDU session. (see Note 1) | - | - | - | - |
| 9 | UE transmits establishes a IPSEC SA and NAS signalling connection as per generic procedure in table 4.5A.4.2.2-1 of 38.508-1 [4]”. | - | - | - | - |
| 10 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message to request an additional PDU session.

Note: PDU SESSION ESTABLISHMENT REQUEST is included in UL NAS transport. UL NAS transport message is included in dedicatedNAS-Message of <i>ULInformationTransfer</i> message

DNN information is included in UL NAS transport message. | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT REQUEST | 2 | P |
| 11 | The SS transmits PDU SESSION AUTHENTICATION COMMAND including an EAP-Request message. | <-- | PDU SESSION AUTHENTICATION COMMAND | | |
| 12 | Check: Does the UE transmit a PDU SESSION AUTHENTICATION COMPLETE containing EAP-Response message? | --> | PDU SESSION AUTHENTICATION COMPLETE | - | - |
| 13 | The SS establishes an IPsec child security association according to the IKEv2 specification in RFC 7296 [32] | - | - | - | |
| 14 | The SS transmits PDU SESSION ESTABLISHMENT ACCEPT message containing an EAP-Success message. | <-- | PDU SESSION ESTABLISHMENT ACCEPT | | |
| 15 | SS Transmits PDU SESSION MODIFICATION COMMAND | <-- | PDU SESSION MODIFICATION COMMAND | - | - |
| | Check: Does the UE transmit a PDU SESSION MODIFICATION COMPLETE? | --> | PDU SESSION MODIFICATION COMPLETE | 3 | P |
| - | EXCEPTION: Step 16a1 describes behaviour depending UE implementation; the "lower case letter" identifies a step sequence that take place if the UE performs a specific action. | - | - | - | - |
| 16a
1 | If initiated by the UE, the generic procedure for IP address allocation in the user plane, specified in subclause 4.5.6, takes place performing IP address allocation in the user plane. | - | - | - | - |

Note 1: The request of connectivity to an additional PDU session may be performed by MMI or AT command.

10.3.1.1.3.3 Specific message contents

Table 10.3.1.1.3.3-1: SERVICE REQUEST (step 2 and 9, Table 10.3.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-16 | | | |
|---|-----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| Service type | '0000'B | signalling | |
| PDU session status | PDU session IDs | PDU session IDs of the ACTIVE PDU session established during Preamble. | |

Table 10.3.1.1.3.3-2: SERVICE ACCEPT (step 2 and 9, Table 10.3.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-17 | | | |
|---|-----------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session status | PDU session IDs | PDU session IDs of the ACTIVE PDU session established during Preamble. | |

Table 10.3.1.1.3.3-3: PDU SESSION ESTABLISHMENT REQUEST (step 3 and 10, Table 10.3.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.2-1 | | | |
|--|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | PSI-1 | UE assigns a particular PSI not yet used between 1 and 15 | |
| PTI | PTI-1 | UE assigns a particular PTI not yet used between 1 and 254 | |

Table 10.3.1.1.3.3-4: UL NAS Transport (step 3 and 10, Table 10.3.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.1-10 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|------------------------|----------------------|--|--|
| | | | |
| Payload container type | '0001'B | N1 SM information | |
| PDU session ID | PSI-1 | | |
| Request type | '001'B | Initial request | |
| S-NSSAI | Not Present | | |
| DNN | DNN-1 (New DNN name) | The requested DNN is different from default DNN. | |

Table 10.3.1.1.3.3-5: PDU SESSION ESTABLISHMENT REJECT (step 6, Table 10.3.1.1.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.7.2-3 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | PSI-1 | | |
| PTI | PTI-1 | | |
| 5GSM cause | '00011 101' | User authentication or authorization failed | |

Table 10.3.1.1.3.3-6: PDU SESSION ESTABLISHMENT ACCEPT (step 14, Table 10.3.1.1.3.2-1)

| |
|--|
| Derivation Path: 38.508-1 [4], Table 4.7.2-2 |
|--|

| Information Element | Value/remark | Comment | Condition |
|---------------------------|---------------------|---------------------------------------|-----------|
| PDU session ID | PSI-1 | | |
| PTI | PTI-1 | | |
| Authorized QoS rules | | | |
| QoS rule | | | |
| QoS rule identifier | '0000 0001'B | | |
| Rule operation code | '001'B | Create new QoS rule | |
| DQR bit | '1'B | The QoS rule is the default QoS rule. | |
| Number of packet filters | '0001'B | 1 packet filter | |
| Packet filter list | See table 4.8.2.1-1 | Packet filter list #1 | |
| Packet filter direction | '11'B | bidirectional | |
| Packet filter identifier | '0000'B | Id 0 | |
| Component type 1 ID | '0000 0001'B | Match-all type | |
| QoS rule precedence | '0000 0000'B | 0 | |
| QoS flow identifier (QFI) | '00 0011'B | QFI 3 | |
| EAP message | | | |
| QoS flow description | | | |
| QFI | '00 0011'B | QFI 3 | |
| Operation code | '001'B | Create new QoS flow description | |
| E bit | '1'B | Parameters list is included | |
| Number of parameters | '00 0001'B | 1 parameters | |
| 5QI | '0000 1001'B | 5QI 9 | |
| DNN | DNN-1 | | |

10.3.2 Network-requested PDU session modification

10.3.2.1 Network-requested PDU session modification /Accepted/Rejected

10.3.2.1.1 Test Purpose (TP)

(1)

with { the UE in PDU SESSION ACTIVE state and 5GMM-CONNECTED mode }

ensure that {

when { the UE receives a PDU SESSION MODIFICATION COMMAND message include the PDU session ID which does not belong to any PDU session in PDU SESSION ACTIVE state in UE }

then { UE sends a PDU SESSION MODIFICATION COMMAND REJECT message and set the 5GSM cause to #43: invalid PDU session identity }

}

(2)

with { the UE in PDU SESSION ACTIVE state and 5GMM-CONNECTED mode }

ensure that {

when { the UE receives a PDU SESSION MODIFICATION COMMAND message include the PDU session ID which belongs to a PDU session in PDU SESSION ACTIVE state in UE }

then { UE sends a PDU SESSION MODIFICATION COMMAND REJECT message and set the 5GSM cause to #43: invalid PDU session identity }

}

10.3.2.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 6.3.2.2, 6.3.2.4. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.3.2.2]

In order to initiate the network-requested PDU session modification procedure, the SMF shall create a PDU SESSION MODIFICATION COMMAND message.

If the authorized QoS rules of the PDU session is modified, the SMF shall set the authorized QoS rules IE of the PDU SESSION MODIFICATION COMMAND message to the authorized QoS rules of the PDU session. The SMF shall ensure that the number of the packet filters used in the authorized QoS rules of the PDU Session does not exceed the maximum number of packet filters supported by the UE for the PDU session. The SMF may bind service data flows for which the UE has requested traffic segregation to a dedicated QoS flow for the PDU session, if possible. Otherwise the SMF may bind the service data flows to an existing QoS flow. The SMF shall use only one dedicated QoS flow for traffic segregation. If the UE has requested traffic segregation for multiple service data flows with different QoS handling, the SMF shall bind all these service data flows to a single QoS flow. If the SMF allows traffic segregation for service data flows in a QoS rule, then the SMF shall create a new authorized QoS rule for these service data flows and shall delete packet filters corresponding to these service data flows from the other authorized QoS rules.

If the authorized QoS flow descriptions of the PDU session is modified, the SMF shall set the authorized QoS flow descriptions IE of the PDU SESSION MODIFICATION COMMAND message to the authorized QoS flow descriptions of the PDU session.

If SMF creates a new authorized QoS rule for a new QoS flow, then SMF shall include the authorized QoS flow description for that QoS flow in the authorized QoS flow descriptions IE of the PDU SESSION MODIFICATION COMMAND message, if:

- a) the newly created authorized QoS rules is for a new GBR QoS flow;
- b) the QFI of the new QoS flow is not the same as the 5QI of the QoS flow identified by the QFI; or
- c) the new QoS flow can be mapped to an EPS bearer as specified in subclause 4.11.2 of 3GPP TS 23.502 [9].

If the session-AMBR of the PDU session is modified, the SMF shall set the selected Session-AMBR IE of the PDU SESSION MODIFICATION COMMAND message to the session-AMBR of the PDU session.

If interworking with EPS is supported for the PDU session and if the mapped EPS bearer contexts of the PDU session is modified, the SMF shall set the mapped EPS bearer contexts IE of the PDU SESSION MODIFICATION COMMAND message to the mapped EPS bearer contexts of the PDU session. If the association between a QoS flow and the mapped EPS bearer context is changed, the SMF shall set the EPS bearer identity parameter in authorized QoS flow descriptions IE of the PDU SESSION MODIFICATION COMMAND message to the new EPS bearer identity associated with the QoS flow.

If the network-requested PDU session modification procedure is triggered by a UE-requested PDU session modification procedure and the PDU SESSION MODIFICATION REQUEST message includes a 5GSM capability IE, the SMF shall:

- a) if the RQoS bit is set to:
 - 1) "Reflective QoS supported", consider that the UE supports reflective QoS for this PDU session; or
 - 2) "Reflective QoS not supported", consider that the UE does not support reflective QoS for this PDU session; and;
- b) if the MH6-PDU bit is set to:
 - 1) "Multi-homed IPv6 PDU session supported", consider that this PDU session is supported to use multiple IPv6 prefixes; or

2) "Multi-homed IPv6 PDU session not supported", consider that this PDU session is not supported to use multiple IPv6 prefixes.

If the SMF considers that reflective QoS is supported for QoS flows belonging to this PDU session, the SMF may include the RQ timer IE set to an RQ timer value in the PDU SESSION MODIFICATION COMMAND message.

If the network-requested PDU session modification procedure is triggered by a UE-requested PDU session modification procedure, the PDU session type is "IPv4", "IPv6", "IPv4v6" or "Ethernet" and the PDU SESSION MODIFICATION REQUEST message includes a Maximum number of supported packet filters IE, the SMF shall consider this number as the maximum number of packet filters that can be supported by the UE for this PDU session. Otherwise the SMF considers that the UE supports 16 packet filters for this PDU session.

For a PDN connection established when in S1 mode, upon the first inter-system change from S1 mode to N1 mode, if the network-requested PDU session modification procedure is triggered by a UE-requested PDU session modification procedure, the SMF shall consider that the maximum data rate per UE for user-plane integrity protection supported by the UE for uplink and the maximum data rate per UE for user-plane integrity protection supported by the UE for downlink are valid for the lifetime of the PDU session.

For a PDN connection established when in S1 mode, upon the first inter-system change from S1 mode to N1 mode, if the network-requested PDU session modification procedure is triggered by a UE-requested PDU session modification procedure and the SMF determines, based on local policies or configurations in the SMF and the Always-on PDU session requested IE in the PDU SESSION MODIFICATION REQUEST message (if available), that either:

a) the requested PDU session needs to be an always-on PDU session, the SMF shall include the Always-on PDU session indication IE in the PDU SESSION MODIFICATION COMMAND message and shall set the value to "Always-on PDU session required"; or

b) the requested PDU session shall not be an always-on PDU session and:

i) if the UE included the Always-on PDU session requested IE, the SMF shall include the Always-on PDU session indication IE in the PDU SESSION MODIFICATION COMMAND message and shall set the value to "Always-on PDU session not allowed"; or

ii) if the UE did not include the Always-on PDU session requested IE, the SMF shall not include the Always-on PDU session indication IE in the PDU SESSION MODIFICATION COMMAND message.

If the value of the RQ timer is set to "deactivated" or has a value of zero, the UE considers that RQoS is not applied for this PDU session and remove the derived QoS rule(s) associated with the PDU session, if any.

If the network-requested PDU session modification procedure is triggered by a UE-requested PDU session modification procedure, the SMF shall set the PTI IE of the PDU SESSION MODIFICATION COMMAND message to the PTI of the PDU SESSION MODIFICATION REQUEST message received as part of the UE-requested PDU session modification procedure.

If the network-requested PDU session modification procedure is not triggered by a UE-requested PDU session modification procedure, the SMF shall set the PTI IE of the PDU SESSION MODIFICATION COMMAND message to "No procedure transaction identity assigned".

If the selected SSC mode of the PDU session is "SSC mode 3" and the SMF requests the relocation of SSC mode 3 PDU session anchor with multiple PDU sessions as specified in 3GPP TS 23.502 [9], the SMF shall include 5GSM cause #39 "reactivation requested", in the PDU SESSION MODIFICATION COMMAND message, and may include the PDU session address lifetime in a PDU session address lifetime PCO parameter in the Extended protocol configuration options IE of the PDU SESSION MODIFICATION COMMAND message.

The SMF shall send the PDU SESSION MODIFICATION COMMAND message, and the SMF shall start timer T3591 (see example in figure 6.3.2.2.1).

NOTE: If the SMF requests the relocation of SSC mode 3 PDU session anchor with multiple PDU sessions as specified in 3GPP TS 23.502 [9], the reallocation requested indication indicating whether the SMF is to be reallocated or the SMF is to be reused is provided to the AMF.

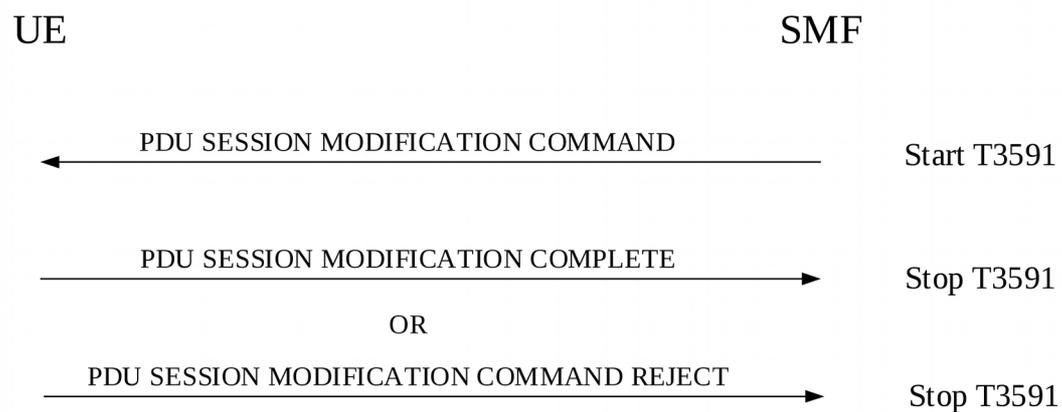


Figure 6.3.2.2.1: Network-requested PDU session modification procedure

[TS 24.501, clause 6.3.2.4]

Upon receipt of a PDU SESSION MODIFICATION COMMAND message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, if the UE rejects the PDU SESSION MODIFICATION COMMAND message, the UE shall create a PDU SESSION MODIFICATION COMMAND REJECT message.

If the PDU SESSION MODIFICATION COMMAND message contains the PTI value allocated in the UE-requested PDU session modification procedure, the UE shall release the PTI indicated by the PTI IE and shall stop the timer T3581.

The UE shall set the 5GSM cause IE of the PDU SESSION MODIFICATION COMMAND REJECT message to indicate the reason for rejecting the PDU session modification.

The 5GSM cause IE typically indicates one of the following 5GSM cause values:

- #26 insufficient resources;
- #43 invalid PDU session identity;
- #44 semantic error in packet filter(s);
- #45 syntactical error in packet filter(s);
- #83 semantic error in the QoS operation; or
- #84 syntactical error in the QoS operation.

10.3.2.1.3 Test description

10.3.2.1.3.1 Pre-test conditions

System Simulator:

WLAN Cell 27

UE:

None.

Preamble:

The UE is in state 3W-A on WLAN Cell 27 with PDU session Active state according to TS 38.508-1 [4].

10.3.2.1.3.2 Test procedure sequence

Table 10.3.2.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|-----------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a PDU session modification command message with PDU session ID IE is set to a different value from the value set in PDU SESSION ESTABLISHMENT REQUEST message. This message is included in a DLInformationTransfer message. | <-- | PDU SESSION MODIFICATION COMMAND | - | - |
| 2 | Check: Does the UE transmit a PDU session modification reject with the 5GSM cause IE indicating #43 "invalid PDU session identity"? | --> | PDU SESSION MODIFICATION REJECT | 1 | P |
| 3 | The SS transmits a PDU session modification command message with PDU session ID IE is the value set in PDU SESSION ESTABLISHMENT REQUEST message. This message is included in a DLInformationTransfer message. | <-- | PDU SESSION MODIFICATION COMMAND | - | - |
| 4 | Check: Does the UE transmit a PDU session modification complete? | --> | PDU SESSION MODIFICATION COMPLETE | 2 | P |

10.3.2.1.3.3 Specific message contents

Table 10.3.2.1.3.3-1: PDU SESSION MODIFICATION COMMAND (Step 1, Table 10.3.2.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.2-9 | | | |
|--|---|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session ID | The different value from the value set in PDU SESSION ESTABLISHMENT REQUEST message in preamble | | |

Table 10.3.2.1.3.3-2: PDU SESSION MODIFICATION REJECT (Step 2, Table 10.3.2.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.2-8 | | | |
|--|---|-------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session ID | The same value as the value set in PDU SESSION modification command message | | |
| 5GSM cause | '00101011'B | Invalid PDU | |

| | | | |
|--|--|------------------|--|
| | | session identity | |
|--|--|------------------|--|

Table 10.3.2.1.3.3-1: PDU SESSION MODIFICATION COMMAND (Step 3, Table 10.3.2.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.2-9 | | | |
|--|--|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session ID | The value set in PDU SESSION ESTABLISHMENT REQUEST message in preamble | | |
| Authorized QoS rules | Reference QoS rule #3 as defined in 38.508-1 [4]Table 4.8.2.1-1. | | |

10.3.3 Network-requested PDU session Release

10.3.3.1 Network-requested PDU session release / accepted/ with and without reactivation

10.3.3.1.1 Test Purpose (TP)

(1)

with { the UE in PDU SESSION ACTIVE state }

ensure that {

when { the UE receives a PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" }

then { the UE re-initiates a PDU SESSION establishment procedure for the same [S-NSSAI, DNN] combination provided in PDU session establishment procedure }

}

(2)

with { UE is in PDU SESSION ACTIVE state }

ensure that {

when { UE receives a PDU SESSION RELEASE COMMAND message including 5GSM cause #26 "insufficient resources" and the Back-off timer value that indicates deactivated }

then { UE does not send a PDU SESSION ESTABLISHMENT REQUEST message until the UE is switched off or the USIM is removed }

}

10.3.3.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 6.3.3.2, 6.3.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 6.3.3.2]

In order to initiate the network-requested PDU session release procedure, the SMF shall create a PDU SESSION RELEASE COMMAND message.

The SMF shall set the SM cause IE of the PDU SESSION RELEASE COMMAND message to indicate the reason for releasing the PDU session.

The SM cause IE typically indicates one of the following SM cause values:

#26 insufficient resources;

...

The SMF may include a Back-off timer value IE in the PDU SESSION RELEASE COMMAND message when the 5GSM cause value #26 "insufficient resources" is included in the PDU SESSION RELEASE COMMAND message. If the 5GSM cause value is #26 "insufficient resources" and the PDU SESSION RELEASE COMMAND message is sent to a UE configured for high priority access in selected PLMN or the request type was set to "initial emergency request" or "existing emergency PDU session" for the establishment of the PDU session, the network shall not include a Back-off timer value IE.

The SMF may include a Back-off timer value IE in the PDU SESSION RELEASE COMMAND message when the 5GSM cause value #67 "insufficient resources for specific slice and DNN" is included in the PDU SESSION RELEASE COMMAND message. If the 5GSM cause value is #67 "insufficient resources for specific slice and DNN" and the PDU SESSION RELEASE COMMAND message is sent to a UE configured for high priority access in selected PLMN or the request type was set to "initial emergency request" or "existing emergency PDU session" for the establishment of the PDU session, the network shall not include a Back-off timer value IE.

[TS 24.501, clause 6.3.3.3]

Upon receipt of a PDU SESSION RELEASE COMMAND message and a PDU session ID, using the NAS transport procedure as specified in subclause 5.4.5, the UE considers the PDU session as released and the UE shall create a PDU SESSION RELEASE COMPLETE message.

If the PDU SESSION RELEASE COMMAND message contains the PTI value allocated in the UE-requested PDU session release procedure, the UE shall stop the timer T3582. The UE should ensure that the PTI value assigned to this procedure is not released immediately.

NOTE 1: The way to achieve this is implementation dependent. For example, the UE can ensure that the PTI value assigned to this procedure is not released during the time equal to or greater than the default value of timer T3592.

While the PTI value is not released, the UE regards any received PDU SESSION RELEASE COMMAND message with the same PTI value as a network retransmission (see subclause 7.3.1).

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested", then after completion of the network-requested PDU session release procedure, the UE should re-initiate the UE-requested PDU session establishment procedure as specified in subclause 6.4.1 for:

- a) the PDU session type associated with the released PDU session;
- b) the SSC mode associated with the released PDU session;
- c) the DNN associated with the released PDU session; and
- d) the S-NSSAI associated with (if available in roaming scenarios) a mapped S-NSSAI if provided in the UE-requested PDU session establishment procedure of the released PDU session.

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" and the UE provided an S-NSSAI during the PDU session establishment, the UE shall stop timer T3585 if it is running for the S-NSSAI provided by the UE. The UE should then re-initiate the UE requested PDU session establishment procedure for the same S-NSSAI. If the UE did not provide an S-NSSAI during the PDU session establishment and the request type

was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3585 associated with no S-NSSAI if it is running, and should re-initiate the UE requested PDU session establishment procedure without including an S-NSSAI. If the PDU SESSION RELEASE COMMAND message was received for an emergency PDU session, the UE shall not stop the timer T3585 associated with no S-NSSAI if it is running.

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" and the UE provided a DNN during the PDU session establishment, the UE shall stop timer T3396 if it is running for the DNN provided by the UE. The UE should then re-initiate the UE requested PDU session establishment procedure for the same DNN. If the UE did not provide a DNN during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3396 associated with no DNN if it is running, and should re-initiate the UE requested PDU session establishment procedure without including a DNN. If the PDU SESSION RELEASE COMMAND message was received for an emergency PDU session, the UE shall not stop the timer T3396 associated with no DNN if it is running.

If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" and the UE provided an S-NSSAI and a DNN during the PDU session establishment, the UE shall stop timer T3584 if it is running for the same [S-NSSAI, DNN] combination provided by the UE. The UE should then re-initiate the UE requested PDU session establishment procedure for the same [S-NSSAI, DNN] combination. If the UE did not provide an S-NSSAI during the PDU session establishment, the UE shall stop the timer T3584 associated with [no S-NSSAI, DNN] if it is running, and should re-initiate the UE requested PDU session establishment procedure with the same DNN but without an S-NSSAI. If the UE did not provide a DNN during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3584 associated with [S-NSSAI, no DNN] if it is running, and should re-initiate the UE requested PDU session establishment procedure with the same S-NSSAI but without a DNN. If the PDU SESSION RELEASE COMMAND message was received for an emergency PDU session, the UE shall not stop the timer T3584 associated with [S-NSSAI, no DNN] if it is running. If the UE provided neither a DNN nor an S-NSSAI during the PDU session establishment and the request type was different from "initial emergency request" and different from "existing emergency PDU session", the UE shall stop the timer T3584 associated with [no S-NSSAI, no DNN] if it is running, and should re-initiate the UE requested PDU session establishment procedure without an S-NSSAI and a DNN. If the PDU SESSION RELEASE COMMAND message was received for an emergency PDU session, the UE shall not stop the timer T3584 associated with [no S-NSSAI, no DNN] if it is running.

NOTE 2: User interaction is necessary in some cases when the UE cannot re-initiate the UE-requested PDU session establishment procedure automatically.

NOTE 3: If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" for a PDU session, the UE provided a DNN (or no DNN) and an S-NSSAI (or no S-NSSAI) when the PDU session is established, timer T3396 associated with the DNN (or no DNN, if no DNN was provided by the UE) is running, and timer T3584 associated with the DNN (or no DNN, if no DNN was provided by the UE) and the S-NSSAI (or no S-NSSAI, if no S-NSSAI was provided by the UE) is running, then the UE stops both the timer T3396 and the timer T3584.

NOTE 4: If the PDU SESSION RELEASE COMMAND message includes 5GSM cause #39 "reactivation requested" for a PDU session, the UE provided a DNN (or no DNN) and an S-NSSAI (or no S-NSSAI) when the PDU session is established, timer T3585 associated with the S-NSSAI (or no S-NSSAI, if no S-NSSAI was provided by the UE) is running, and timer T3584 associated with the DNN (or no DNN, if no DNN was provided by the UE) and the S-NSSAI (or no S-NSSAI, if no S-NSSAI was provided by the UE) is running, then the UE stops both the timer T3585 and the timer T3584.

10.3.3.1.3 Test description

10.3.3.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- None.

Preamble:

- The UE is in state 3W-A on WLAN Cell 27 according to TS 38.508-1 [4].

10.3.3.1.3.2 Test procedure sequence

Table 10.3.3.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #39 "reactivation requested " with PDU session ID IE is set to the same value in PDU SESSION ESTABLISHMENT REQUEST message in preamble. | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 2 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST and the S-NSSAI and DNN in UL NAS TRANSPORT message are the same values in UL NAS TRANSPORT message in preamble? | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT REQUEST | 1 | P |
| 3 | The SS transmits an PDU SESSION ESTABLISHMENT ACCEPT | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT ACCEPT | | |
| 4 | The SS transmits a PDU SESSION RELEASE COMMAND including 5GSM cause #26 "insufficient resources" and T3396 value (deactivated). | <-- | 5GMM: DL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 5 | The UE transmits a PDU SESSION RELEASE COMPLETE message. | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION RELEASE COMPLETE | - | - |
| 6 | Cause the UE to request establishment of PDU session without DNN.(Note 1) | - | - | - | - |
| 7 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST message? | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION ESTABLISHMENT REQUEST | 2 | F |
| 8 | Switch off procedure in Ipcsec_SA_Established specified in TS 38.508-1 [4] subclause 4.9.6.5 is performed. | - | | | |
| 9 | Switch on UE. | - | | | |
| 10 | The general procedure is completed by executing of the UE registration procedure in TS 38.508-1 [4] table 4.5.2.2-3 , 'connected without release'. | - | | | |
| 11 | Cause the UE to request establishment of PDU session without DNN.(Note 1) | - | - | - | - |
| 12 | Check: Does the UE transmit a PDU SESSION ESTABLISHMENT REQUEST message? | --> | 5GMM: UL NAS TRANSPORT

5GSM: PDU SESSION | 3 | P |

| | | | | | |
|---|--|-----|--|---|---|
| | | | ESTABLISHMENT REQUEST | | |
| 13 | The SS transmits a PDU SESSION ESTABLISHMENT ACCEPT message. | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION ESTABLISHMENT ACCEPT | - | - |
| Note 1: The request to establish a PDU session may be performed by MMI or AT command. | | | | | |

10.3.3.1.3.3 Specific message contents

Table 10.3.3.1.3.3-1: PDU SESSION RELEASE COMMAND (Step 1, Table 10.3.3.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.2-14 | | | |
|---|---|------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| PDU session ID | The same value indicated in PDU SESSION ESTABLISHMENT REQUEST message in preamble | | |
| 5GSM cause | '00100111'B | Reactivation requested | |

Table 10.3.3.1.3.3-2: UL NAS TRANSPORT (Step 2, Table 10.3.3.1.3.2-1)

| Derivation path: 38.508-1 [4], table 4.7.1-10 | | | |
|---|--|---------|--|
| Information Element | Value/Remark | Comment | Condition |
| S-NSSAI | The same value indicated in UL NAS TRANSPORT message in preamble | | If present in UL NAS TRANSPORT message in preamble |
| | Not present | | If not present in UL NAS TRANSPORT message in preamble |
| DNN | The same value indicated in UL NAS TRANSPORT message in preamble | | If present in UL NAS TRANSPORT message in preamble |

| | | | |
|--|-------------|--|--|
| | Not present | | If not present in UL NAS TRANSPORT message in preamble |
|--|-------------|--|--|

Table 10.3.3.1.3.3-3: PDU SESSION RELEASE COMMAND (step 4, Table 10.3.3.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | The same ID as the ID of PDU session which UE request in step 13 in Table 10.1.3.2.3.2-1 | | |
| 5GSM cause | '0001 1010'B | insufficient resources | |
| Back-off timer value | '1110 0000'B | deactivated | |

10.3.4 UE-requested PDU session establishment

10.3.4.1 UE-requested PDU session establishment / Abnormal / T3580

10.3.4.1.1 Test Purpose (TP)

Same test purpose as in clause 10.1.4.2.1

10.3.4.1.2 Conformance requirements

Same conformance requirements as in clause 10.1.4.2.2

10.3.4.1.3 Test description

10.3.4.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27

UE:

- None.

Preamble:

- The UE is in state Switched OFF [State 0-A as per TS 38.508-1 [4] Table 4.4A.2-0].

10.3.4.1.3.2 Test procedure sequence

Table 10.3.4.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | TP | Verdict |
|----|-----------|------------------|----|---------|
|----|-----------|------------------|----|---------|

| | | U - S | Message | | |
|------|---|-------|-----------------------------------|---|---|
| 1 | UE is switched on | - | - | - | - |
| 2-10 | Steps 1-9 of Table 4.5.2.2-3 of the generic procedure in TS 38.508-1 [4] are performed. | - | - | - | - |
| 11 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message to request an additional PDU session. | --> | PDU SESSION ESTABLISHMENT REQUEST | - | - |
| - | EXCEPTION: Steps 12-13 shall be repeated for 4 times | - | - | - | - |
| 12 | The SS waits 16 seconds (T3580). | - | - | - | - |
| 13 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message to request an additional PDU session.

(Attempt counter = 5) | --> | PDU SESSION ESTABLISHMENT REQUEST | 1 | P |
| 15 | The UE transmits a PDU SESSION ESTABLISHMENT REQUEST message to request an additional PDU session. | --> | PDU SESSION ESTABLISHMENT REQUEST | 2 | F |

10.3.4.1.3.3 Specific message contents

None.

10.3.5 UE-requested PDU session modification

10.3.5.1 UE-requested PDU session modification/Success

10.3.5.1.1 Test Purpose (TP)

(1)

with { UE in PDU SESSION ACTIVE state and in 5GMM-CONNECTED mode }

ensure that {

when { UE is requested to modify of PDU session }

then { UE sends a PDU SESSION MODIFICATION REQUEST message }

}

10.3.5.1.2 Conformance requirements

Same conformance requirements as in clause 10.1.5.1.2

10.3.5.1.3 Test description

10.3.5.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27.

UE:

- None.

Preamble:

- The UE is in state 3W-A on WLAN Cell 27 with PDU SESSION ACTIVE according to TS 38.508-1[4].

10.3.5.1.3.2 Test procedure sequence

Same test procedure sequence as in clause 10.1.5.1.3.2

10.3.5.1.3.3 Specific message contents

Same specific message contents as in clause 10.1.5.1.3.3

10.3.6 UE-requested PDU session release

10.3.6.1 UE-requested PDU session release / Abnormal / Collision with network-requested PDU session modification procedure

10.3.6.1.1 Test Purpose (TP)

(1)

with { the UE is in PDU SESSION ACTIVE state and has sent a PDU SESSION RELEASE REQUEST message }

ensure that {

when { UE receives a PDU SESSION MODIFICATION COMMAND message indicating a PDU session that UE wants to release }

then { the UE ignores the PDU SESSION MODIFICATION COMMAND message and proceed with the PDU session release procedure }

}

10.3.6.1.2 Conformance requirements

Same conformance requirements as in clause 10.1.6.1.2

10.3.6.1.3 Test description

10.3.6.1.3.1 Pre-test conditions

System Simulator:

- WLAN Cell 27.

UE:

None.

Preamble:

- The UE is in state 3W-A on WLAN Cell 27 according to TS 38.508-1 [4].

10.3.6.1.3.2 Test procedure sequence

Table 10.3.6.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | Cause the UE to request establishment of PDU session to the DN.(Note 1) | - | - | - | - |
| 2 | New PDU session establishment procedure is performed as per generic procedure in clause 4.5A.2A of TS 38.508-1 [4] | - | - | - | - |
| 3 | Cause the UE to request release of PDU session established during preamble.(Note 2) | - | - | - | - |
| 4 | The UE transmits a PDU SESSION RELEASE REQUEST message. | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION RELEASE REQUEST | - | - |
| 5 | The SS transmits a PDU SESSION MODIFICATION COMMAND message. | <-- | 5GMM: DL NAS TRANSPROT
5GSM: PDU SESSION MODIFICATION COMMAND | - | - |
| 6 | The SS transmits a PDU SESSION RELEASE COMMAND message. | <-- | 5GMM: DL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMMAND | - | - |
| 7 | Check: Does the UE transmit PDU SESSION RELEASE COMPLETE message? | --> | 5GMM: UL NAS TRANSPORT
5GSM: PDU SESSION RELEASE COMPLETE | 1 | P |
| 8 | The SS deletes the payload associated with IPSec child security association according to the IKEv2 specification in RFC 7296 [32] | - | - | - | - |

Note 1: The request to establish a PDU session may be performed by MMI or AT command.

Note 2: The request to release a PDU session may be performed by MMI or AT command.

10.3.6.1.3.3 Specific message contents

Table 10.3.6.1.3.3-1: PDU SESSION RELEASE REQUEST (step 4, Table 10.3.6.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-12 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Set to the ID UE requested in step 2 in Table 10.3.6.1.3.2-1 | | |
| PTI | Any value from 1 to 254 | | |

Table 10.3.6.1.3.3-2: PDU SESSION MODIFICATION COMMAND (step 5, Table 10.3.6.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-9 | | | |
|--|--|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Set to the ID UE requested in step 2 in Table 10.3.6.1.3.2-1 | | |
| PTI | '0000 0000'B | No procedure transaction identity assigned | |

Table 10.3.6.1.3.3-3: PDU SESSION RELEASE COMMAND (step 6, Table 10.3.6.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-14 | | | |
|---|--|--------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Set to the ID UE requested in step 2 in Table 10.3.6.1.3.2-1 | | |
| PTI | The value indicated in PDU SESSION RELEASE REQUEST | | |
| 5GSM cause | '0010 0100'B | #36 regular deactivation | |

Table 10.3.6.1.3.3-4: PDU SESSION RELEASE COMPLETE (step 7, Table 10.3.6.1.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.7.2-15 | | | |
|---|--|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| PDU session ID | Set to the ID UE requested in step 2 in Table 10.3.6.1.3.2-1 | | |
| PTI | The value indicated in PDU SESSION RELEASE REQUEST | | |

11 Multilayer Procedures

11.1 5GS\EPS Fallback

11.1.1 MO MMTEL voice call setup from NR RRC_IDLE / EPS Fallback with redirection / Single registration mode with N26 interface / Success

11.1.1.1 Test Purpose (TP)

(1)

with { UE supporting both S1 mode and N1 mode and operating in single-registration mode and the Network having indicated "interworking without N26 interface not supported" and the UE in NR RRC_IDLE state }

ensure that {

when { User initiates an MMTEL call and the UE completes Access control and checking in 5GMM-IDLE mode }

then { UE requests the establishment of an MMTEL call by transmitting an RRCSetupRequest message with establishmentCause set to 'mo-VoiceCall' and a SERVICE REQUEST message with Service type set to 'data' }

}

(2)

with { UE being in NR RRC_CONNECTED state after having requested an MMTEL call establishment and the MO IMS voice session establishment has been initiated }

ensure that {

when { UE receives an RRCRelease message which includes redirectedCarrierInfo indicating redirection to E-UTRA }

then { UE selects the E-UTRA cell, performs a TAU procedure, and, successfully completes the MMTEL call setup in EPS }

}

11.1.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501, clauses 4.5.4.1, 5.6.1.2 and TS 38.331: clauses 5.3.3.2, 5.3.3.3. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 4.5.4.1]

When the UE is in 5GMM-IDLE mode, upon receiving a request from the upper layers for an access attempt, the NAS shall categorize the access attempt into access identities and an access category following subclause 4.5.2, table 4.5.2.1 and table 4.5.2.2, and subclause 4.5.3, and provide the applicable access identities and the access category to the lower layers for the purpose of access control checking. In this request to the lower layer the NAS can also provide to the lower layer the RRC establishment cause determined as specified in subclause 4.5.6 of this specification.

NOTE 1: The access barring check is performed by the lower layers.

NOTE 2: As an implementation option, the NAS can provide the RRC establishment cause to the lower layers after being informed by the lower layers that the access attempt is allowed.

If the UE has uplink user data pending for one or more PDU sessions when it builds a REGISTRATION REQUEST or SERVICE REQUEST message as initial NAS message, the UE shall indicate the respective PDU sessions in the Uplink data status IE as specified in subclause 5.5.1.3.2 and 5.6.1.2, regardless of the access category for which the access barring check is performed.

NOTE 3: The UE indicates pending user data for all the respective PDU sessions, even if barring timers are running for some of the corresponding access categories.

If the lower layers indicate that the access attempt is allowed, the NAS shall initiate the procedure to send the initial NAS message for the access attempt.

[TS 24.501, clause 5.6.1.2]

For cases d) and e) in subclause 5.6.1.1, the Uplink data status IE shall be included in the SERVICE REQUEST message to indicate the PDU session(s) the UE has pending user data to be sent. If the UE is not a UE configured for high priority access in selected PLMN:

a) if there exists an emergency PDU session which is indicated in the Uplink data status IE the service type IE in the SERVICE REQUEST message shall be set to "emergency services"; or

b) otherwise, the service type IE in the SERVICE REQUEST message shall be set to "data".

[TS 38.331, clause 5.3.3.2]

The UE initiates the procedure when upper layers request establishment of an RRC connection while the UE is in RRC_IDLE and it has acquired essential system information as described in 5.2.2.1.

The UE shall ensure having valid and up to date essential system information as specified in clause 5.2.2.2 before initiating this procedure.

Upon initiation of the procedure, the UE shall:

1> if the upper layers provide an Access Category and one or more Access Identities upon requesting establishment of an RRC connection:

2> perform the unified access control procedure as specified in 5.3.14 using the Access Category and Access Identities provided by upper layers;

[TS 38.331, clause 5.3.3.3]

The UE shall set the contents of *RRCSetupRequest* message as follows:

1> set the *ue-Identity* as follows:

2> if upper layers provide a 5G-S-TMSI:

3> set the *ue-Identity* to *ng-5G-S-TMSI-Part1*;

2> else:

3> draw a 39-bit random value in the range $0..2^{39}-1$ and set the *ue-Identity* to this value;

NOTE 1: Upper layers provide the *5G-S-TMSI* if the UE is registered in the TA of the current cell.

1> set the *establishmentCause* in accordance with the information received from upper layers;

The UE shall submit the *RRCSetupRequest* message to lower layers for transmission.

11.1.1.3 Test Description

11.1.1.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is configured according to TS 38.508-1 [4] Table 4.4.2-3 and is connected to 5GC.
- E-UTRA Cell 1 is configured to TS 36.508 [7] Table 4.4.2-2 and is connected to EPC.
- System information for the NR cell in accordance with combination NR-6 in TS 38.508-1 [4] sub-clause 4.4.3.1.2, and, for the E-UTRA cell in accordance with system information combination 31 as defined in TS 36.508 [7], subclause 4.4.3.1.1.
- N26 interface is configured.
- Power levels are constant and as defined in Table 11.1.1.3.1-1

Table 11.1.1.3.1-1: Cell power levels

| | Parameter name | Unit | NR Cell 1 | E-UTRA Cell 1 |
|----|-----------------------------|---------|----------------|----------------|
| T0 | SS PBCH EPRE | dBm/SCS | "Serving Cell" | "Serving Cell" |
| | Cell Specific RS EPRE (FDD) | dBm/SCS | | "Serving Cell" |

UE:

None.

Preamble:

With E-UTRA Cell 1 "Serving cell" and NR Cell 1 "Non-suitable "Off" cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state RRC_IDLE Connectivity (*E-UTRA/EPC*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established

The UE is switched-off

With E-UTRA Cell 1 "Non-suitable "Off" cell" and NR Cell 1 "Serving cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.

11.1.1.3.2 Test procedure sequence

Table 11.1.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----------|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 0 | Set the power levels according to "T0" as per Table 11.1.1.3.1-1 | - | - | - | - |
| 1 | Make the UE attempt an MTSI MO Speech Call (Note 1) | - | - | - | - |
| 2 | Check: Does the UE send NR <i>RRCSetupRequest</i> with <i>EstablishmentCause</i> set to 'mo-VoiceCall'? | --> | NR RRC: <i>RRCSetupRequest</i> | 1 | P |
| 3 | SS transmits an NR <i>RRCSetup</i> message | <-- | NR RRC: <i>RRCSetup</i> | - | - |
| 4 | Check: Does the UE transmit an NR <i>RRCSetupComplete</i> message to confirm the successful completion of the connection establishment including initiation of 5GSM procedure by including the SERVICE REQUEST message with <i>Service Type</i> set to 'data'? | --> | NR RRC: <i>RRCSetupComplete</i>
5GSM: SERVICE REQUEST | 1 | P |
| 5-8 | Steps 5-8 of expected sequence from Table 4.5.4.2-3 as defined in TS 38.508-1 [4] are performed | - | - | - | - |
| 9-13 | Steps 1-5 of expected sequence from C.21g as defined in TS 34.229-1 [35] are performed for setting up MTSI MO speech call - EPS fallback. | - | - | - | - |
| 14 | SS transmits <i>RRCRelease</i> message indicating redirection to E-UTRA Cell 1 | <--← | NR RRC: <i>RRCRelease</i> | - | - |
| 15-20 | UE performs generic procedure as defined in TS 38.508-1 [4], Table 4.9.7.2.2-1 Steps 1-6 for N1 to S1 Inter mode change with condition 'connected without release' & 'mapped 5G security context' | - | - | - | - |
| 21-24 | Generic Test Procedure as defined in Steps 5-8 of TS 36.508-1 [4] Table 4.5A.6.3-1 is performed to establish radio bearer corresponding to IMS PDN | - | - | - | - |
| | EXCEPTION: Steps 25a1-25a2 describe a step sequence depending on UE implementation | - | - | - | - |
| 25a1-25a | The UE may perform steps 1-2 according to TS 34.229-1 subclause C.46 to perform IMS | - | - | - | - |

| | | | | | |
|--|---|-----|--|---|---|
| 2 | re-registration on EUTRAN | | | | |
| 26 | The SS configures a new RLC-UM data radio bearer with condition DRB 0,1), associated with the dedicated EPS bearer context.
<i>RRCConnectionReconfiguration</i> message contains the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message. EPS bearer context #4 (QCI 1) according to table 6.6.2-1: Reference dedicated EPS bearer contexts. | <-- | RRC:
<i>RRCConnectionReconfiguration</i>

NAS:

ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST | - | - |
| - | EXCEPTION: In parallel to the events described in steps 27-28 the steps specified in table 11.1.1.3.2-2 will take place | - | - | - | - |
| 27 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message to confirm the establishment of the new data radio bearer, associated with the dedicated EPS bearer. | --> | RRC:
<i>RRCConnectionReconfigurationComplete</i> | - | - |
| 28 | The UE transmits an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message. | --> | RRC: ULInformationTransfer

NAS:ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT | - | - |
| 29 | UE is triggered by MMI to release the call | - | - | - | - |
| 30-33 | Follow the Test Steps 2-5 as defined in TS 34.229-1 [35] subclause C.32 for Generic test procedure for MO release of IMS call followed by EPS Bearer Deactivation | - | - | - | - |
| 34 | SS transmits <i>RRCConnectionRelease</i> message indicating redirection to NR Cell 1 | | RRC: <i>RRCConnectionRelease</i> | - | - |
| 35-39 | Generic Test procedure for Tracking area updating / Inter-system change from S1 mode to N1 mode in 5GMM/EMM-IDLE mode as mentioned in TS 38.508-1 [4] Table 4.9.9.2.2-1is performed | - | - | - | - |
| 36-37 | IF 'UE performed IMS re-registration over E-UTRAN in Steps 25a1-25a2,

THEN the UE may perform IMS re-registration on NR Cell1 as per steps 1 & 2 as defined in TS 34.229-1 subclause C.46. | - | - | - | - |
| 38-41 | Generic Procedure as defined in TS 38.508-1 [4] Table 4.9.6.3-1 to switch off the UE in NR RRC_CONNECTED mode is performed | - | - | | |
| Note 1: UE is configured such that Access Control check passes for MO MMTEL Voice call | | | | | |

Table 11.1.1.3.2-2: Parallel behaviour

| St | Procedure | Message Sequence | TP | Verdict |
|----|-----------|------------------|----|---------|
|----|-----------|------------------|----|---------|

| | | U - S | Message | | |
|-----|---|-------|---------|---|---|
| 1-5 | Steps 6 to 9 of the Generic test procedure for setting up MTSI MO speech call - EPS fallback according TS 34.229-1 [35] subclause C.21g take place. | - | - | - | - |
| 6 | Step 10 of the Generic test procedure for setting up MTSI MO speech call - EPS fallback according TS 34.229-1 [35] subclause C.21g takes place. | - | - | 2 | P |

11.1.1.3.3 Specific message contents

Table 11.1.1.3.3-1: RRCSetupRequest (step 2, table 11.1.1.3.1-2)

| Derivation Path: TS 38.508-1 [4] Table 4.6.1-23 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCSetupRequest ::= SEQUENCE { | | | |
| rrcSetupRequest SEQUENCE { | | | |
| establishmentCause | Mo-Voicecall | | |
| } | | | |
| } | | | |

Table 11.1.1.3.3-2: SERVICE REQUEST (step 4, table 11.1.1.3.1-2)

| Derivation path: 38.508-1 [4] Table 4.7.1-16 | | | |
|--|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Service type | '0001'B | data | |
| Uplink data status | Present | PSI bit corresponding to IMS PDN needs to be set | |

Table 11.1.1.3.3-3: RRCRelease (step 14, table 11.1.1.3.1-2)

| Derivation path: 38.508-1 [4] Table Table 4.6.1-16 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo ::= CHOICE { | | | |
| eutra.SEQUENCE{ | | | |

| | | | |
|----------------|---------------------------------|--|--|
| eutraFrequency | Downlink EARFCN of EUTRA cell 1 | | |
| cnType | epc | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 11.1.1.3.3-4: RRCConnectionRelease (step 34, table 11.1.1.3.1-2)

| Derivation path: 36.508 table 4.6.1-15 | | | |
|--|---|---------|---------------------------|
| Information Element | Value/Remark | Comment | Condition |
| RRCConnectionRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| c1 CHOICE { | | | |
| rrcConnectionRelease-r8 SEQUENCE { | | | |
| redirectedCarrierInfo ::= SEQUENCE { | | | |
| nr-r15 ::= SEQUENCE { | | | |
| carrierFreq-r15 | Downlink NR SSB ARFCN of cell NR Cell 1 | | TS 38.508-1 [4]cl.6.2.3.1 |
| subcarrierSpacingSSB-r15 | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

4

11.1.2 MO MMTEL voice call setup from NR RRC_IDLE / EPS Fallback with redirection / Single registration mode without N26 interface / Success

11.1.2.1 Test Purpose (TP)

(1)

with {UE supporting both S1 mode and N1 mode and operating in single-registration mode, and, the Network has indicated "interworking without N26 interface supported", and, the UE is in NR RRC_IDLE state}

ensure that {

when {User initiates a MMTEL call and the UE completes Access control and checking in 5GMM-IDLE mode}

then {UE requests the establishment of a MMTEL call by transmitting an RRCSetupRequest message with establishmentCause set to 'mo-VoiceCall', and, a SERVICE REQUEST message with Service type set to 'data'}

}

(2)

with {the UE is NR RRC_CONNECTED state after having requested a MMTEL call establishment and the MO IMS voice session establishment has been initiated}

ensure that {

when {the UE receives a RRCRelease message which includes redirectedCarrierInfo indicating redirection to eutra}

then {the UE selects the E-UTRA cell, performs an ATTACH or a TAU procedure, and, successfully completes the MO MMTEL call setup in EPS}

}

11.1.2.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS23.502, clauses 4.11.2.2, 4.13.6.1; TS 24.501, clauses 4.5.4.1, 4.8.2.3; TS 38.331, clauses 5.3.3.2, 5.3.3.3, 5.3.8.3, and 5.3.11. Unless otherwise stated these are Rel-15 requirements.

[TS 23.502, clause 4.11.2.2]

The following procedure is used by UEs in single-registration or dual registration mode on mobility from 5GS to EPS.

In the case of network sharing the UE selects the target PLMN ID according to clause 5.18.3 of TS 23.501 [2].

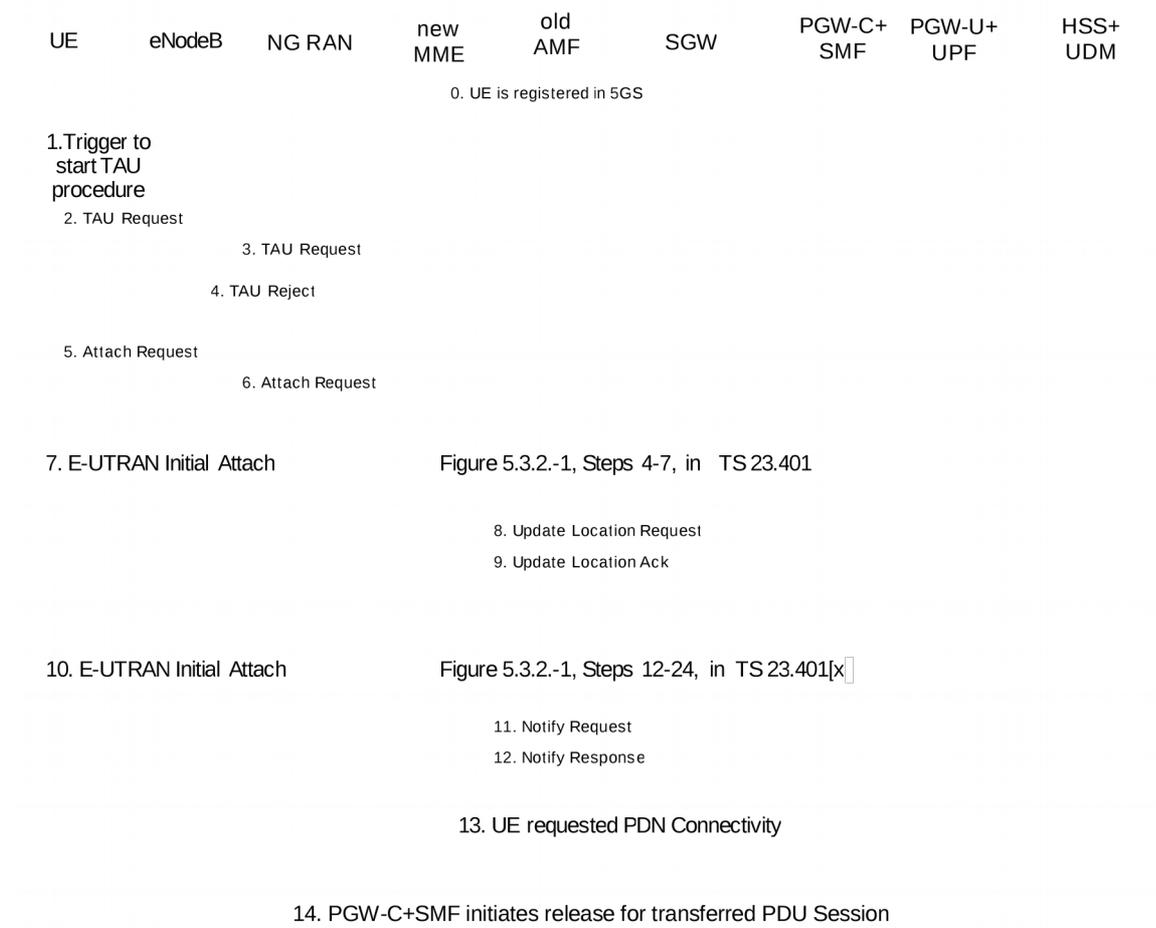


Figure 4.11.2.2-1: Mobility procedure from 5GS to EPS without N26 interface

The UE operating in single-registration mode can start the procedure from Step 1 or Step 5. The UE operating in dual-registration mode starts the procedure from Step 5.

NOTE 1: The network has indicated the "Interworking without N26" to the UE. To support IP address preservation, the UE in single-registration mode starts the procedure from Step 5. If the UE in single-registration mode starts the procedure from Step 1, the IP address preservation is not provided.

0. UE is registered in 5GS and established PDU sessions. The FQDN for the S5/S8 interface of the PGW-C+SMF is also stored in the UDM by the PGW-C+SMF during PDU Session setup in addition to what is specified in clause 4.3.2.2.1 and clause 4.3.2.2.2.

NOTE 2: At 5GS to EPS mobility, the MME use the FQDN for the S5/S8 interface of the PGW-C+SMF to find the PGW-C+SMF, and when UE moves back from EPS to 5GS, the AMF uses FQDN for the S5/S8 interface of the PGW-C+SMF to find the PGW-C+SMF.

1. Step 1 as in clause 5.3.3.1 (Tracking Area Update) in TS 23.401 [13].

2. Step 2 as in clause 5.3.3.1 (Tracking Area Update) in TS 23.401 [13] with the following modifications:

The UE shall provide a EPS-GUTI that is mapped from the 5G-GUTI following the mapping rules specified in TS 23.501 [2]. The UE indicates that it is moving from 5GC.

3. Step 3 as in clause 5.3.3.1 (Tracking Area Update) in TS 23.401 [13].

4. If the MME determined that the old node is an AMF based on UE's GUTI mapped from 5G-GUTI and the MME is configured to support 5GS-EPS interworking without N26 procedure, the MME sends a TAU Reject to the UE.

5. Step 1 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13] with the modifications captured in clause 4.11.2.4.1.
6. Step 2 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13].
7. Steps 4-7 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the modifications captured in clause 4.11.2.4.1.
8. Step 8 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the modifications captured in clause 4.11.2.4.1.
9. Step 11 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the following modifications:

The subscription profile the MME receives from HSS+UDM includes per DNN/APN at most one PGW-C+SMF FQDN as described in in clause 5.17.2.1 in TS 23.501 [2].
10. Steps 12-24 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the modifications as described in clause 4.11.2.4.1.
11. Step 25 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13].
12. Step 26 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13].
13. If the UE has remaining PDU Sessions in 5GS which it wants to transfer to EPS and maintain the same IP address/prefix, the UE performs the UE requested PDN Connectivity Procedure as specified in TS 23.401 [13] clause 5.10.2 and sets the Request Type to "handover" in Step 1 of the procedure with modification captured in clause 4.11.2.4.2. UE provides an APN and the PDU Session ID corresponding to the PDU Session it wants to transfer to EPS. The UE provides the PDU Session ID in PCO as described in clause 4.11.1.1.

UEs in single-registration mode performs this step for each PDU Session immediately after completing the E-UTRAN Initial Attach procedure. UEs in dual-registration mode may perform this step any time after the completing of E-UTRAN Initial Attach procedure. Also, UEs in dual-registration mode may perform this step only for a subset of PDU Sessions.

The MME determines the PGW-C+SMF address for the Create Session Request based on the APN received from the UE and the subscription profile received from the HSS+UDM in Step 9 or when the HSS+UDM notifies the MME for the new PGW-C+SMF ID in the updated subscription profile.

The PGW-C+SMF uses the PDU Session ID to correlate the transferred PDN connection with the PDU Session in 5GC.

As a result of the procedure the PGW-U+UPF starts routing DL data packets to the Serving GW for the default and any dedicated EPS bearers established for this PDN connection.

14. The PGW-C+SMF initiates release of the PDU Session(s) in 5GS transferred to EPS as specified in clause 4.3.4.2 with the following clarification:

In step 2, the PGW-C+SMF shall not release IP address/prefix(es) allocated for the PDU Session.

If UP connection of the PDU Session is not active, step 3b is not executed, thus the steps triggered by step 3b are not executed;

If UP connection of the PDU Session is active, the SMF invokes the Namf_Communication_N1N2MessageTransfer service operation without including N1 SM container (PDU Session Release Command).

[TS 23.502, clause 4.13.6.1]

Figure 4.13.6.1-1 describes the EPS fallback procedure for IMS voice.

When the UE is served by the 5G System, the UE has one or more ongoing PDU Sessions each including one or more QoS Flows. The serving PLMN AMF has sent an indication towards the UE during the Registration procedure that IMS voice over PS session is supported, see clause 5.16.3.10 in TS 23.501 [2] and the UE has registered in the IMS. If N26 is not supported, the serving PLMN AMF sends an indication towards the UE during the Registration procedure that interworking without N26 is supported, see clause 5.17.2.3.1 in TS 23.501 [2].

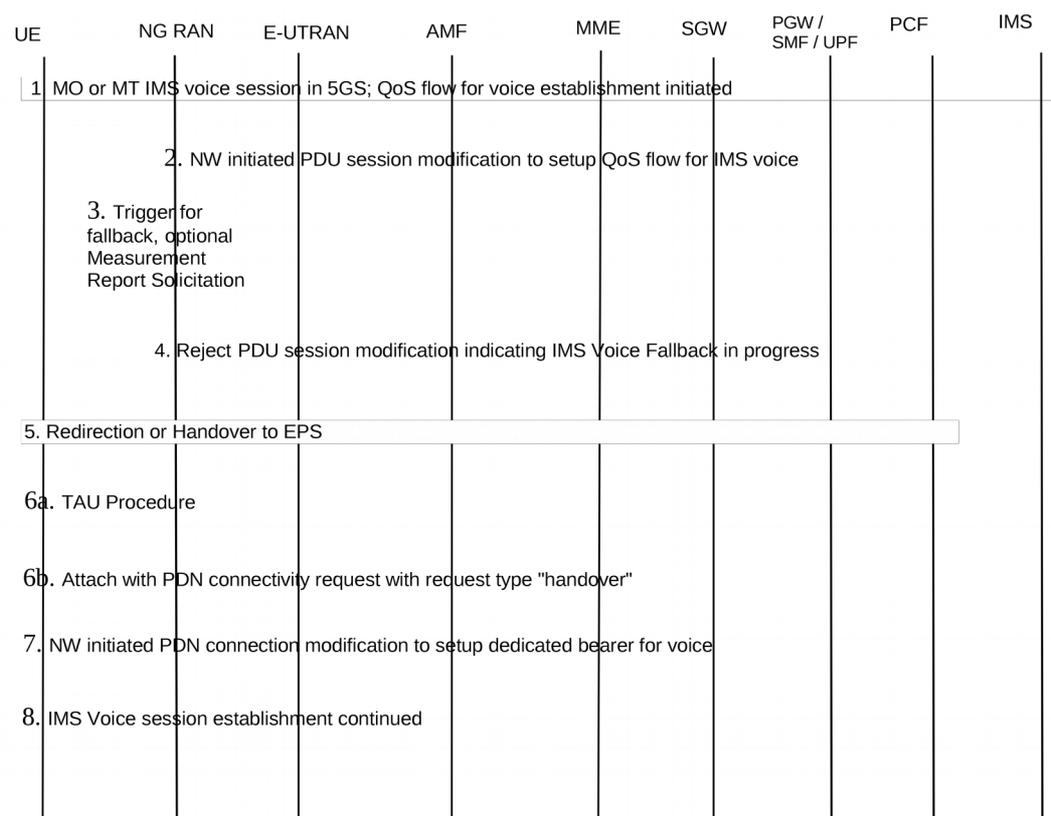


Figure 4.13.6.1-1: EPS Fallback for IMS voice

1. UE camps on NG-RAN in the 5GS and an MO or MT IMS voice session establishment has been initiated.
2. Network initiated PDU Session modification to setup QoS flow for voice reaches the NG-RAN (see N2 PDU Session Request in clause 4.3.3).
3. NG-RAN is configured to support EPS fallback for IMS voice and decides to trigger fallback to EPS, taking into account UE capabilities, indication from AMF that "Redirection for EPS fallback for voice is possible" (received as part of initial context setup as defined in TS 38.413 [10]), network configuration (e.g. N26 availability configuration) and radio conditions. If NG-RAN decides not to trigger fallback to EPS, then the procedure stops here and following steps are not executed.

NG-RAN may initiate measurement report solicitation from the UE including E-UTRAN as target.

NOTE 1: If AMF has indicated that "Redirection for EPS fallback for voice is not possible", then AN Release via inter-system redirection to EPS is not performed in step 5.

4. NG-RAN responds indicating rejection of the PDU Session modification to setup QoS flow for IMS voice received in step 2 by PDU Session Response message towards the PGW-C+SMF (or H-SMF+P-GW-C via V-SMF, in case of roaming scenario) via AMF with an indication that mobility due to fallback for IMS voice is ongoing. The PGW-C+SMF maintains the PCC rule(s) associated with the QoS Flow(s).
5. NG-RAN initiates either handover (see clause 4.11.1.2.1), or AN Release via inter-system redirection to EPS (see clause 4.2.6 and clause 4.11.1.3.2), taking into account UE capabilities. The PGW-C+SMF reports change of the RAT type if subscribed by PCF as specified in clause 4.11.1.2.1, or clause 4.11.1.3.2.6. When the UE is connected to EPS, either 6a or 6b is executed
- 6a. In the case of 5GS to EPS handover, see clause 4.11.1.2.1, and in the case of inter-system redirection to EPS with N26 interface, see clause 4.11.1.3.2. In either case the UE initiates TAU procedure; or
- 6b. In the case of inter-system redirection to EPS without N26 interface, see clause 4.11.2.2. If the UE supports Request Type flag "handover" for PDN connectivity request during the attach procedure as described in clause 5.3.2.1 of TS 23.401 [13] and has received the indication that interworking without N26 is supported, then the UE initiates Attach with PDN connectivity request with request type "handover".

In inter-system redirection, the UE uses the emergency indication in the RRC message as specified in clause 6.2.2 of TS 36.331 [16] and E-UTRAN provides the emergency indication to MME during Tracking Area Update or Attach procedure. For the handover procedure see clause 4.11.1.2.1, step 1.

7. After completion of the mobility procedure to EPS or as part of the 5GS to EPS handover procedure (see clause 4.11.1.2.1), the SMF/PGW re-initiates the setup of the dedicated bearer for IMS voice, mapping the 5G QoS to EPC QoS parameters. The PGW-C+SMF behaves as specified in clause 4.9.1.3.1. The PGW-C+SMF reports about Successful Resource Allocation and Access Network Information if subscribed by PCF.

8. The IMS voice session establishment is continued.

At least for the duration of the voice call in EPS the E-UTRAN is configured to not trigger any handover to 5GS.

[TS 24.501, clause 4.5.4.1]

When the UE is in 5GMM-IDLE mode, upon receiving a request from the upper layers for an access attempt, the NAS shall categorize the access attempt into access identities and an access category following subclause 4.5.2, table 4.5.2.1 and table 4.5.2.2, and subclause 4.5.3, and provide the applicable access identities and the access category to the lower layers for the purpose of access control checking. In this request to the lower layer the NAS can also provide to the lower layer the RRC establishment cause determined as specified in subclause 4.5.6 of this specification.

NOTE 1: The access barring check is performed by the lower layers.

NOTE 2: As an implementation option, the NAS can provide the RRC establishment cause to the lower layers after being informed by the lower layers that the access attempt is allowed.

If the UE has uplink user data pending for one or more PDU sessions when it builds a REGISTRATION REQUEST or SERVICE REQUEST message as initial NAS message, the UE shall indicate the respective PDU sessions in the Uplink data status IE as specified in subclause 5.5.1.3.2 and 5.6.1.2, regardless of the access category for which the access barring check is performed.

NOTE 3: The UE indicates pending user data for all the respective PDU sessions, even if barring timers are running for some of the corresponding access categories.

If the lower layers indicate that the access attempt is allowed, the NAS shall initiate the procedure to send the initial NAS message for the access attempt.

If the lower layers indicate that the access attempt is barred, the NAS shall not initiate the procedure to send the initial NAS message for the access attempt. Additionally:

a) if the event which triggered the access attempt was an MO-MMTEL-voice-call-started indication or an MO-MMTEL-video-call-started indication:

1) if the UE is operating in the single-registration mode and the UE's usage setting is "voice centric", the UE may attempt to select an E-UTRA cell connected to EPC. If the UE finds a suitable E-UTRA cell connected to EPC, it then proceeds with the appropriate EMM specific procedures and, if necessary, ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.2 and 3GPP TS 24.301 [15];

2) if the UE is operating in the dual-registration mode, the UE may proceed in S1 mode with the appropriate EMM specific procedures and ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.3 and 3GPP TS 24.301 [15];

3) otherwise, the NAS shall notify the upper layers that the access attempt is barred. In this case, upon receiving an indication from the lower layers that the barring is alleviated for the access category with which the access attempt was associated, the NAS shall notify the upper layers that the barring is alleviated for the access category and may initiate the procedure to send the initial NAS message, if still needed; and

b) if the event which triggered the access attempt was an MO-SMSoIP-attempt-started indication:

1) if the UE is operating in the single-registration mode, the UE may attempt to select an E-UTRA cell connected to EPC. If the UE finds a suitable E-UTRA cell connected to EPC, it then proceeds with the appropriate EMM specific procedures and, if necessary, ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.2 and 3GPP TS 24.301 [15];

2) if the UE is operating in the dual-registration mode, the UE may proceed in S1 mode with the appropriate EMM specific procedures and ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.3 and 3GPP TS 24.301 [15];

3) otherwise, the NAS layer shall notify the upper layers that the access attempt is barred. In this case, upon receiving an indication from the lower layers that the barring is alleviated for the access category with which the access attempt was associated, the NAS shall notify the upper layers that the barring is alleviated for the access category and may initiate the procedure to send the initial NAS message, if still needed.

NOTE 4: Barring timers, on a per access category basis, are run by the lower layers. At expiry of barring timers, the indication of alleviation of access barring is indicated to the NAS on a per access category basis.

[TS 24.501, clause 4.8.2.3]

At inter-system change from N1 mode to S1 mode in EMM-IDLE mode when: (PDU SEESION ACTIVE)

- a) the UE supports non-IP PDN type and at least one PDU session is active; or
- b) the UE does not support non-IP PDN type and at least one PDU session of IPv4, IPv6 or IPv4v6 PDU session type is active,

the UE shall proceed as follows:

a) if the UE supports sending an ATTACH REQUEST message containing a PDN CONNECTIVITY REQUEST message with request type set to "handover" to transfer a PDU session from N1 mode to S1 mode and the UE has received an "interworking without N26 interface supported" indication from the network, the UE shall:

- 1) enter substates EMM-DEREGISTERED.NORMAL-SERVICE and 5GMM-REGISTERED.NO-CELL-AVAILABLE;
- 2) map the PDU session(s) which the UE intends to transfer to EPS to the default EPS bearer context of the corresponding PDN connection(s) as specified in subclause 6.1.4.2; and
- 3) initiate an EPS attach procedure and include a PDN CONNECTIVITY REQUEST message with request type set to "handover" in the ATTACH REQUEST message to activate a default EPS bearer context for one of the active PDU sessions which the UE intends to transfer to EPS.

After successful completion of the EPS attach procedure, the UE shall reset the registration attempt counter and the attach attempt counter (see 3GPP TS 24.301 [15]) and attempt to activate each of the other default EPS bearer contexts, if any, by initiating a stand-alone PDN connectivity procedure with request type set to "handover" in the PDN CONNECTIVITY REQUEST message; and

b) otherwise, enter substates EMM-REGISTERED.NORMAL-SERVICE and 5GMM-REGISTERED.NO-CELL-AVAILABLE and initiate a tracking area update procedure (see 3GPP TS 24.301 [15]).

At inter-system change from N1 mode to S1 mode in EMM-IDLE mode when: (NO PDU SESSION)

- a) the UE supports non-IP PDN type and no PDU session is active; or
- b) the UE does not support non-IP PDN type and no PDU session of IPv4, IPv6 or IPv4v6 PDU session type is active,

the UE shall enter substates EMM-DEREGISTERED.NORMAL-SERVICE and 5GMM-DEREGISTERED.NO-CELL-AVAILABLE, and initiate an attach procedure.

At inter-system change from S1 mode to N1 mode in 5GMM-IDLE mode, the UE shall:

- a) enter substate 5GMM-REGISTERED.NORMAL-SERVICE and substate EMM-REGISTERED.NO-CELL-AVAILABLE;
- b) map the default EPS bearer context(s) of the PDN connection(s) which the UE intends to transfer to 5GS, if any, to the corresponding PDU session(s) as specified in subclause 6.1.4.2; and
- c) initiate the registration procedure for mobility and periodic registration update indicating "mobility registration updating" in the 5GS registration type IE of the REGISTRATION REQUEST message (see subclause 5.5.1.3).

After having successfully registered in N1 mode the UE shall reset the registration attempt counter and the attach attempt counter (see 3GPP TS 24.301 [15]) and:

- a) if the UE supports the PDU session establishment procedure with request type set to "existing PDU session" to transfer a PDN connection from S1 mode to N1 mode and the UE has received an "interworking without N26 interface supported" indication from the network, attempt to transfer the PDN connection(s) which the UE intends to transfer to 5GS, if any, from S1 mode to N1 mode by initiating the PDU session establishment procedure with request type set to "existing PDU session"; and
- b) otherwise, establish PDU session(s) corresponding to the PDN connection(s) which the UE intends to transfer to 5GS, if any, by initiating the PDU session establishment procedure with request type set to "initial request".

See subclause 5.1.4.3 for coordination between 5GMM and EMM and subclause 6.1.4.2 for coordination between 5GSM and ESM.

[TS 38.331, clause 5.3.11]

UE shall:

- 1> reset MAC;
- 1> if T302 is running:
 - 2> stop timer T302;
 - 2> perform the actions as specified in 5.3.14.4;
- 1> stop all timers that are running except T320 and T325;
- 1> discard the UE Inactive AS context;
- 1> set the variable *pendingRnaUpdate* to *false*, if that is set to *true*;
- 1> discard the K_{gNB} , the K_{RRCEnc} key, the K_{RRCint} , the K_{UPint} key and the K_{UPenc} key, if any;
- 1> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity and SDAP for all established RBs;
- 1> indicate the release of the RRC connection to upper layers together with the release cause;
- 1> enter RRC_IDLE and perform cell selection as specified in TS 38.304 [20], except if going to RRC_IDLE was triggered by selecting an inter-RAT cell while T311 was running;
- 1> if going to RRC_IDLE was triggered by reception of the *RRCRelease* message including a *waitTime*:
 - 2> start timer T302 with the value set to the *waitTime*;
 - 2> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2'.

11.1.2.3 Test description

11.1.2.3.1 Pre-test conditions

System Simulator:

- 2 cells
- NR Cell 1 as defined in TS 38.508-1 [4] Table 4.4.2-3. System information combination NR-6 as defined in TS 38.508-1 [4], sub-clause 4.4.3.1.2.
- E-UTRA Cell 1 as defined in TS 36.508 [7] Table 4.4.2-2. System information combination 31 as defined in TS 36.508 [7], sub-clause 4.4.3.1.1.

UE:

- None

Preamble:

- With E-UTRA Cell 1 "Serving cell" and NR Cell 1 "Non-suitable "Off" cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state RRC_IDLE Connectivity (*E-UTRA/EPC*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established
- The UE is switched-off
- With E-UTRA Cell 1 "Non-suitable "Off" cell" and NR Cell 1 "Serving cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), in accordance with the procedure described in TS 38.508-1 [4], with one IMS PDU session on NR Cell 1, Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.

11.1.2.3.2 Test procedure sequence

Table 11.1.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|--|----|---------|
| | | U – S | Message | | |
| 1 | The SS configures:
- E-UTRA Cell 1 as "Suitable neighbour intra-frequency cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3. | - | - | - | - |
| - | EXCEPTION: Unless otherwise stated the following messages are exchange on NR Cell 1. | - | - | - | - |
| 2 | User initiates a MMTEL call. | - | - | - | - |
| 3 | Check: Does the UE transmits an <i>RRCSetupRequest</i> message? | --> | NR RRC: <i>RRCSetupRequest</i> | 1 | P |
| 4 | The SS transmits an <i>RRCSetup</i> message. | <-- | NR RRC: <i>RRCSetup</i> | - | - |
| 5 | Check: Does the UE transmits an <i>RRCSetupComplete</i> message and a SERVICE REQUEST message? | --> | NR RRC: <i>RRCSetupComplete</i>
5GMM: SERVICE REQUEST | 1 | P |
| 6 | The SS transmits an <i>RRCRelease</i> message. | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| - | EXCEPTION: Unless otherwise stated the following messages are exchange on E-UTRA Cell 1. | - | - | - | - |
| 7 | The UE transmits an <i>RRCConnectionRequest</i> message on the cell specified in the test case. | --> | RRC: <i>RRCConnectionRequest</i> | - | - |
| 8 | SS transmits an <i>RRCConnectionSetup</i> message. | <-- | RRC: <i>RRCConnectionSetup</i> | - | - |
| - | EXCEPTION: Steps 8a1 to 8b18 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation. | - | - | - | - |
| 8a1 | If the UE tries to preserve the IP address of the | --> | RRC: | 2 | P |

| | | | | | |
|-------|---|-----|--|---|---|
| | PDN connection then check does the UE transmits an ATTACH REQUEST message? | | <i>RRCConnectionSetupComplete</i>
NAS: ATTACH REQUEST | | |
| 8b1 | Else check: does the UE transmit a TRACKING AREA UPDATE REQUEST message? | --> | RRC:
<i>RRCConnectionSetupComplete</i>
NAS: TRACKING AREA UPDATE REQUEST | 2 | P |
| 8b2 | The SS transmits a TRACKING AREA UPDATE REJECT message to UE. | <-- | RRC: <i>DLInformationTransfer</i>
NAS: TRACKING AREA UPDATE REQUEST REJECT | - | - |
| 8b3 | The UE transmits an ATTACH REQUEST message. | --> | RRC: <i>ULInformationTransfer</i>
NAS: ATTACH REQUEST | - | - |
| 9-20 | Steps 5 to 16 of the generic test procedure for UE registration (TS 36.508 [2] Table 4.5.2.3-1) | - | - | - | - |
| - | EXCEPTION: In parallel to the events described in steps 10 to 16 the UE may perform IMS re-registration on EUTRAN assteps as defined in TS 34.229-1 [35] subclause C.46 | - | - | - | - |
| 21-27 | Steps 7-13 from the Generic Test Procedure for MTSI MO speech call establishment (TS 36.508 [2] table 4.5A.6.3-1) are performed. | - | - | - | - |
| 29 | The SS waits 1 second. | - | - | - | - |
| 30 | Release IMS Call as specified in the generic procedure in TS 34.229-1 [35] subclause C.32. | - | - | - | - |
| 31 | The SS transmits a DEACTIVATE EPS BEARER CONTEXT REQUEST including the EPS bearer identity of the default EPS bearer to the emergency PDN. | <-- | DEACTIVATE EPS BEARER CONTEXT REQUEST | - | - |
| 32 | The UE transmits a DEACTIVATE EPS BEARER CONTEXT ACCEPT. | --> | DEACTIVATE EPS BEARER CONTEXT ACCEPT | - | - |

11.1.2.3.3 Specific message contents

Table 11.1.2.3.3-0: REGISTRATION ACCEPT (preamble; step 14, TS 38.508-1 [4], Table 4.5.2.2-2)

| Derivation Path: 38.508-1[4] Table 4.7.1-7 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Extended protocol discriminator | '0111 1110'B | 5GS mobility management messages | |
| Security header type | '0000'B | Plain 5GS NAS message, not security protected | |
| Spare half octet | '0000'B | | |

| | | | |
|-----------------------------|------------------------|--|--|
| 5GS network feature support | '0100 0001 0000 0000'B | Interworking without N26 interface supported | |
|-----------------------------|------------------------|--|--|

Table 11.1.2.3.3-1: RRCSetupRequest (step 3, table 11.1.2.3.2-1)

| Derivation Path: TS 38.508-1 [4] Table 4.6.1-23 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCSetupRequest ::= SEQUENCE { | | | |
| rrcSetupRequest SEQUENCE { | | | |
| establishmentCause | Mo-Voicecall | | |
| } | | | |
| } | | | |

Table 11.1.2.3.3-2: SERVICE REQUEST (step 5, table 11.1.2.3.2-1)

| Derivation path: 38.508-1 [4] Table 4.7.1-16 | | | |
|--|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Service type | '0001'B | data | |
| Uplink data status | Present | PSI bit corresponding to IMS PDN needs to be set | |

Table 11.1.2.3.3-3: RRCRelease (step 6, table 11.1.2.3.2-1)

| Derivation path: 38.508-1 [4] Table 4.6.1-16 | | | |
|--|----------------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo ::= CHOICE { | | | |
| eutra.SEQUENCE{ | | | |
| eutraFrequency | Downlink EARFCN of E-UTRA cell 1 | | |
| cnType | epc | | |
| } | | | |
| } | | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
| } | | | |

Table 11.1.2.3.3-3A: ATTACH REQUEST (step 8a1, table 11.1.2.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-4. | | | |
|--|---|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| NAS key set identifier | KSI _{ASME} that was created when the UE last registered to EPC E-UTRA | | |
| Old GUTI | GUTI, mapped from the 5G-GUTI assigned at the initial registration when the UE entered N1 | | |
| Last visited registered TAI | The TAI the last visited E-UTRA Cell belonged to, if any. Not included if the UE does not have last stored EPC TAI. | | |
| Old GUTI type | "Native GUTI" | | |
| ESM message container | PDN CONNECTIVITY REQUEST message to active PDU sessions which the UE intends to transfer to EPS. | | |

Table 11.1.5.3.3-3B: PDN CONNECTIVITY REQUEST (step 8a1, table 11.1.2.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.3-20 | | | |
|--|---|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| EPS bearer identity | '0000'B | No EPS bearer identity assigned | |
| Procedure transaction identity | Any value from 1 to 254 | | |
| PDN connectivity request message identity | '1101 0000'B | PDN connectivity request | |
| Request type | '010'B | Handover | |
| PDN type | Any value between '001'B, '010'B, '011'B and '100'B | The allowed values are respectively IPv4, IPv6, IPv4v6 and "unused but interpreted as IPv6 by the network" | |
| Protocol configuration options | PDU session ID of 5GS | | |

| | | | |
|--|-------------|--|--|
| | PDU session | | |
|--|-------------|--|--|

Table 11.1.2.3.3-4: TRACKING AREA UPDATE REQUEST (step 8b1, table 11.1.2.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-27, condition NR. | | | |
|---|---|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| "Active" flag | 0001 | Bearer Establishment requested | |
| EPS bearer context status | Present | EBI corresponding to active PDU Sessions need to be set to 1 | |
| NAS key set identifier | KSI _{ASME} that was created when the UE last registered to EPC E-UTRA | | |
| Old GUTI | GUTI, mapped from the 5G-GUTI assigned at the initial registration when the UE entered N1 | | |
| Last visited registered TAI | The TAI the last visited E-UTRA Cell belonged to, if any. Not included if the UE does not have last stored EPC TAI. | | |
| Old GUTI type | "Native GUTI" | | |
| UE status | "UE is in 5GMM-REGISTERED state" | | |

Table 11.1.2.3.3-5: TRACKING AREA UPDATE REJECT (step 8b2, table 11.1.2.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-26. | | | |
|---|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| EMM cause | '0000 1001'B | #9"UE identity cannot be derived by the network" | |

Table 11.1.2.3.3-6: ATTACH REQUEST (step 8b3, table 11.1.2.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-4. | | | |
|--|----------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| IMSI | IMSI of the UE | | |

11.1.3 MO MMTEL voice call setup from NR RRC_CONNECTED / EPS Fallback with handover / Single registration mode with N26 interface / Success

11.1.3.1 Test Purpose (TP)

(1)

with { UE supporting both S1 mode and N1 mode and operating in single-registration mode, and, the Network has indicated "interworking without N26 interface not supported", **and**, the UE is in NR RRC_CONNECTED state after having established connection with *establishmentCause* set to 'mo-Data', and, the UE is receiving and transmitting PS data }

ensure that {

when { User initiates a MMTEL call, the MO IMS voice session establishment has been initiated and the UE receives a *MobilityFromNRCommand* message which includes *targetRAT-Type* set to *eutra* }

then { UE performs a handover to the E-UTRA including a TAU procedure, **and**, while the UE continues receiving and transmitting PS data the UE successfully completes the MO MMTEL call in EPS }

}

11.1.3.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 23.502, clauses 4.13.6.1, TS 24.501, clauses 4.8.2.2, 5.5.1.2.2, 5.5.1.2.4, 5.1.4.2 and 6.1.4.1, TS 38.331, clause 5.4.3.3 and 5.4.3.4. Unless otherwise stated these are Rel-15 requirements.

[TS 23.502, clause 4.13.6.1]

Figure 4.13.6.1-1 describes the EPS fallback procedure for IMS voice.

When the UE is served by the 5G System, the UE has one or more ongoing PDU Sessions each including one or more QoS Flows. The serving PLMN AMF has sent an indication towards the UE during the Registration procedure that IMS voice over PS session is supported, see clause 5.16.3.10 in TS 23.501 [2] and the UE has registered in the IMS. If N26 is not supported, the serving PLMN AMF sends an indication towards the UE during the Registration procedure that interworking without N26 is supported, see clause 5.17.2.3.1 in TS 23.501 [2].

In inter-system redirection, the UE uses the emergency indication in the RRC message as specified in clause 6.2.2 of TS 36.331 [16] and E-UTRAN provides the emergency indication to MME during Tracking Area Update or Attach procedure. For the handover procedure see clause 4.11.1.2.1, step 1.

7. After completion of the mobility procedure to EPS or as part of the 5GS to EPS handover procedure (see clause 4.11.1.2.1), the SMF/PGW re-initiates the setup of the dedicated bearer for IMS voice, mapping the 5G QoS to EPC QoS parameters. The PGW-C+SMF behaves as specified in clause 4.9.1.3.1. The PGW-C+SMF reports about Successful Resource Allocation and Access Network Information if subscribed by PCF.

8. The IMS voice session establishment is continued.

At least for the duration of the voice call in EPS the E-UTRAN is configured to not trigger any handover to 5GS.

[TS 24.501, clause 4.8.2.2]

See subclause 5.1.4.2 for coordination between 5GMM and EMM and subclause 6.1.4.1 for coordination between 5GSM and ESM.

[TS 24.501, clause 5.5.1.2.2]

If the UE supports S1 mode, the UE shall:

- set the S1 mode bit to "S1 mode supported" in the 5GMM capability IE of the REGISTRATION REQUEST message;
- include the S1 UE network capability IE in the REGISTRATION REQUEST message; and
- if the UE supports sending an ATTACH REQUEST message containing a PDN CONNECTIVITY REQUEST message with request type set to "handover" to transfer a PDU session from N1 mode to S1 mode, set the HO attach bit to "attach request message containing PDN connectivity request with request type set to handover to transfer PDU session from N1 mode to S1 mode supported" in the 5GMM capability IE of the REGISTRATION REQUEST message.

[TS 24.501, clause 5.5.1.2.4]

If the UE included S1 mode supported indication in the REGISTRATION REQUEST message, the AMF supporting interworking with EPS shall set the IWK N26 bit to either:

- a) "interworking without N26 interface not supported" if the AMF supports N26 interface ; or
- b) "interworking without N26 interface supported" if the AMF does not support N26 interface

in the 5GS network feature support IE in the REGISTRATION ACCEPT message.

The UE supporting S1 mode shall operate in the mode for interworking with EPS as follows:

- a) if the IWK N26 bit in the 5GS network feature support IE is set to "interworking without N26 interface not supported", the UE shall operate in single-registration mode;
- b) if the IWK N26 bit in the 5GS network feature support IE is set to "interworking without N26 interface supported" and the UE supports dual-registration mode, the UE may operate in dual-registration mode; or

NOTE 3: The registration mode used by the UE is implementation dependent.

- c) if the IWK N26 bit in the 5GS network feature support IE is set to "interworking without N26 interface supported" and the UE only supports single-registration mode, the UE shall operate in single-registration mode.

The UE shall treat the received interworking without N26 interface indicator for interworking with EPS as valid in the entire PLMN and its equivalent PLMN(s).

The network informs the UE about the support of specific features, such as IMS voice over PS session, emergency services or emergency services fallback, in the 5GS network feature support information element. In a UE with IMS voice over PS session capability, the IMS voice over PS session indicator, the Emergency services support indicator, and the Emergency services fallback indicator shall be provided to the upper layers. The upper layers take the IMS voice over PS session indicator into account when selecting the access domain for voice sessions or calls. When initiating an emergency call, the upper layers also take the IMS voice over PS session indicator, the Emergency services support indicator, and the Emergency services fallback indicator into account for the access domain selection.

[TS 24.501, clause 5.1.4.2]

At inter-system change from N1 mode to S1 mode when there is at least one active PDU session for which interworking with EPS is supported as specified in subclause 6.1.4.1, the UE shall enter substates EMM-REGISTERED.NORMAL-SERVICE and 5GMM-REGISTERED.NO-CELL-AVAILABLE and initiate a tracking area updating procedure (see 3GPP TS 24.301 [15]).

[TS 24.501, clause 6.1.4.1]

Upon inter-system change from N1 mode to S1 mode, the UE shall create the default EPS bearer context and the dedicated EPS bearer context(s) based on the parameters of the mapped EPS bearer contexts or the associations between QoS flow and mapped EPS bearer in the PDU session, if available. The EPS bearer identity assigned for the QoS flow of the default QoS rule becomes the EPS bearer identity of the default bearer in the corresponding PDN connection. If there is no EPS bearer identity assigned to the QoS flow of the default QoS rule, the UE shall release locally the PDU session. If there is no EPS bearer identity assigned to the QoS flow(s) which is not associated with the default QoS rule, the UE shall locally delete the QoS rules and the QoS flow level QoS parameters associated with the QoS flow(s). The UE uses the parameters from each PDU session for which interworking with EPS is supported to create corresponding default EPS bearer context and optionally dedicated EPS bearer context(s) as follows:

- a) the PDN session type of the PDU session shall be mapped to the PDN type of the default EPS bearer context as follows:
 - 1) the PDN type shall be set to "non-IP" if the PDU session type is "Ethernet" or "Unstructured";
 - 2) the PDN type shall be set to "IPv4" if the PDU session type is "IPv4";
 - 3) the PDN type shall be set to "IPv6" if the PDU session type is "IPv6"; and
 - 4) the PDN type shall be set to "IPv4v6" if the PDU session type is "IPv4v6";
- b) the PDU address of the PDU session shall be mapped to the PDN address of the default EPS bearer context as follows:
 - 1) the PDN address of the default EPS bearer context is set to the PDU address of the PDU session, if the PDU session type is "IPv4", "IPv6" or "IPv4v6"; and
 - 2) the PDN address of the default EPS bearer context is set to zero, if the PDU session type is "Ethernet" or "Unstructured";
- c) the DNN of the PDU session shall be mapped to the APN of the default EPS bearer context;
- d) the APN-AMBR and extended APN-AMBR received in the parameters of the default EPS bearer context of the mapped EPS bearer contexts shall be mapped to the APN-AMBR and extended APN-AMBR of the default EPS bearer context;
- e) for each PDU session in state PDU SESSION ACTIVE, PDU SESSION MODIFICATION PENDING or PDU SESSION INACTIVE PENDING the UE shall set the state of the mapped EPS bearer context(s) to BEARER CONTEXT ACTIVE; and
- f) for any other PDU session the UE shall set the state of the mapped EPS bearer context(s) to BEARER CONTEXT INACTIVE.

Additionally, for each mapped EPS bearer context or the association between QoS flow and mapped EPS bearer in the PDU session:

- a) the EPS bearer identity shall be set to the EPS bearer identity received in the mapped EPS bearer context, or the EPS bearer identity associated with the QoS flow;
- b) the EPS QoS parameters shall be set to the mapped EPS QoS parameters of the EPS bearer received in the mapped EPS bearer context, or the EPS QoS parameters associated with the QoS flow;
- c) the extended EPS QoS parameters shall be set to the mapped extended EPS QoS parameters of the EPS bearer received in the mapped EPS bearer context, or the extended EPS QoS parameters associated with the QoS flow; and
- d) the traffic flow template shall be set to the mapped traffic flow template of the EPS bearer received in the mapped EPS bearer context, or the stored traffic flow template associated with the QoS flow, if available.

After inter-system change from N1 mode to S1 mode, the UE shall associate the PDU session identity, the S-NSSAI, and the session-AMBR with the default EPS bearer context, and for each EPS bearer context mapped from one or more QoS flows, associate the QoS rule(s) for the QoS flow(s) and the QoS flow description(s) for the QoS flow(s) with the EPS bearer context.

After inter-system change from N1 mode to S1 mode, the UE and the SMF shall maintain the PDU session type of the PDU session until the PDN connection corresponding to the PDU session is released if the UE supports non-IP PDN type and the PDU session type is "Ethernet" or "Unstructured".

After inter-system change from N1 mode to S1 mode, the UE and the SMF shall maintain the always-on PDU session indication.

After inter-system change from N1 mode to S1 mode, the UE and the SMF shall maintain the maximum number of supported packet filters until the PDN connection corresponding to the PDU session is released.

[TS 38.331, clause 5.4.3.3]

The UE shall:

- 1> if T390 is running;
- 2> stop timer T390 for all access categories;
- 2> perform the actions as specified in 5.3.14.4;
- 1> if the *targetRAT-Type* is set to *eutra*:
 - 2> consider inter-RAT mobility as initiated towards E-UTRA;
 - 2> forward the *nas-SecurityParamFromNR* to the upper layers, if included;
- 1> access the target cell indicated in the inter-RAT message in accordance with the specifications of the target RAT.

[TS 38.331, clause 5.4.3.4]

Upon successfully completing the handover, at the source side the UE shall:

- 1> reset MAC;
- 1> stop all timers that are running;
- 1> release *ran-NotificationAreaInfo*, if stored;
- 1> release the AS security context including the K_{RRCEnc} key, the K_{RRCint} key, the K_{UPint} key and the K_{UPenc} key, if stored;
- 1> release all radio resources, including release of the RLC entity and the MAC configuration;
- 1> if the E-UTRA *RRCConnectionReconfiguration* message included in the received *MobilityFromNRCommand* does not include *fullConfig*:
 - 2> maintain source RAT configuration of PDCP and SDAP for applicable RBs which is used for target RAT RBs;
- 1> else:
 - 2> release the associated PDCP entity and SDAP entity for all established RBs;
- 1> indicate the release of the RRC connection to upper layers together with the release cause 'other'.

11.1.3.3 Test Description

11.1.3.3.1 Pre-test conditions

System Simulator:

- 2 cells

- NR Cell 1 as defined in TS 38.508-1 [4] Table 4.4.2-3. System information combination NR-6 as defined in TS 38.508-1 [4], sub-clause 4.4.3.1.2.
- E-UTRA Cell 1 as defined in TS 36.508 [7] Table 4.4.2-2. System information combination 31 as defined in TS 36.508 [7], sub-clause 4.4.3.1.1.
- N26 interface is configured.

UE:

None.

Preamble:

- With E-UTRA Cell 1 "Serving cell" and NR Cell 1 "Non-suitable "Off" cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state RRC_IDLE Connectivity (*E-UTRA/EPC*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established.
- The UE is switched-off.
- With E-UTRA Cell 1 "Non-suitable "Off" cell" and NR Cell 1 "Serving cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR) with at least one Internet PDU session and one IMS PDU session on NR Cell 1, in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned.

11.1.3.3.2 Test procedure sequence

Table 11.1.3.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|------|--|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- E-UTRA Cell 1 as "Suitable neighbour intra-frequency cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3. | | | | |
| - | The following messages are to be observed on NR Cell 1 unless explicitly stated otherwise. | - | - | - | - |
| 2 | The SS transmits a <i>Paging</i> message. | <-- | NR RRC: <i>Paging</i> | - | - |
| 3 | The UE transmits an <i>RRCSetupRequest</i> message. | --> | NR RRC: <i>RRCSetupRequest</i> | - | - |
| 4-9 | Steps 3 to 8 of the NR RRC_CONNECTED procedure in TS 38.508-1 [4] Table 4.5.4.2-3 are executed to successfully complete the service request procedure. | - | - | - | - |
| - | EXCEPTION: Step 10a1 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation | | | | |
| 10a1 | IF pc_IP_Ping = TRUE, THEN Check: Does the test result of generic test procedure 1a1-1b2 in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data | | | 1 | P |

| | | | | | |
|-------|---|-----|---|---|---|
| | on DRB#2? | | | | |
| 11 | Make the UE attempt an MTSI MO Speech Call. | - | - | - | - |
| 12-16 | Steps 1-5 of the MTSI MO speech call for 5GS procedure according TS 34.229-1 [35] subclause C.21g take place. | - | - | - | - |
| 17 | The SS transmits a <i>MobilityFromNRCommand</i> message which includes targetRAT-Type set to eutra according to 38.508-1 [4] Table 4.6.1-8. | <-- | NR RRC:
<i>MobilityFromNRCommand</i> | - | - |
| - | The following messages are to be observed on E-UTRA Cell 1 unless explicitly stated otherwise. | - | - | - | - |
| 18 | Check: Does the UE transmit an <i>RRCConnectionReconfigurationComplete</i> message to confirm the successful completion of handover? | --> | RRC:
<i>RRCConnectionReconfigurationComplete</i> | 1 | P |
| 19 | The UE transmits an <i>ULInformationTransfer</i> message on the cell specified in the test case. This message includes a TRACKING AREA UPDATE REQUEST message. | --> | RRC: <i>ULInformationTransfer</i>

NAS: TRACKING AREA UPDATE REQUEST | 1 | P |
| 20-23 | Steps 4a1-6 of the generic test procedure in TS 38.508-1 [4] Table 4.9.7.2.2-1 for N1 to S1 Inter mode change with condition 'connected without release' & 'mapped 5G security context' are performed to make sure successfully camped on E-UTRAN cell upon mobility from NR. | - | - | - | - |
| 24 | The SS configures a new RLC-UM data radio bearer with condition DRB (0,1), associated with the dedicated EPS bearer context. <i>RRCConnectionReconfiguration</i> message contains the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message. EPS bearer context #4 (QCI 1) according to TS 36.508 [7] Table 6.6.2-1: Reference dedicated EPS bearer contexts.

Reference dedicated EPS bearer contexts is to establish the dedicated EPS bearer context on IMS PDN. | <-- | RRC:
<i>RRCConnectionReconfiguration</i>

NAS: ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST | - | - |
| - | EXCEPTION: In parallel to the events described in steps 25-28 below, the steps specified in table 11.1.3.3.2-3 will take place. | - | - | - | - |
| 25 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message. | --> | RRC:
<i>RRCConnectionReconfigurationComplete</i> | - | - |
| 26 | The UE transmits an <i>ULInformationTransfer</i> message including the ACTIVATE | --> | RRC: <i>ULInformationTransfer</i> | - | - |

| | | | | | |
|------|---|---|---|---|---|
| | DEDICATED EPS BEARER CONTEXT ACCEPT message. | | NAS: ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT | | |
| 27 | The SS waits 1 second for call duration. | - | - | - | - |
| | EXCEPTION: Step 28a1 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation | | | | |
| 28a1 | IF pc_IP_Ping = TRUE, THEN Check: Does the test result of generic test procedure 1a1-1b2 in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on DRB#2? | | | 1 | P |
| 29 | Release IMS Call as specified in the generic procedure in TS 34.229-1 [35] subclause C.32. | - | - | - | - |

Table 11.1.3.3.2-2: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|---------|---|------------------|----------|----|---------|
| | | U - S | Message | | |
| - | EXCEPTION: Steps 1a1 to 1b7 describe behaviour that depends on the UE capability; the "lower case letter" identifies a step sequence that take place if a capability is supported | - | - | - | - |
| 1a1-a2 | The UE performs IMS re-registration on EUTRAN as per steps 1-2 as defined in TS 34.229-1 [35] C.46. | - | - | - | - |
| 1a3-1a7 | Steps 6-10 of the Generic test procedure for setting up MTSI MO speech call - EPS fallback according TS 34.229-1 [35] subclause C.21g takes place. | - | - | - | - |
| 1a8 | Check: Does the UE send an ACK to acknowledge receipt of the 200 OK for INVITE? | --> | SIP: ACK | 1 | P |
| 1b1-1b5 | Steps 6-10 of the Generic test procedure for setting up MTSI MO speech call - EPS fallback according TS 34.229-1 [35] subclause C.21g takes place. | - | - | - | - |
| 1b6 | Check: Does the UE send an ACK to acknowledge receipt of the 200 OK for INVITE? | --> | SIP: ACK | 1 | P |

11.1.3.3.3 Specific message contents

Table 11.1.3.3.3-1: REGISTRATION REQUEST (preamble, Table 11.1.3.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.7.1-6 | | | |
|---|----------------------------------|-------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM capability | | | |
| S1 mode | '1'B | S1 mode supported | |
| S1 UE network capability | Present but contents not checked | | |

Table 11.1.3.3.3-2: REGISTRATION ACCEPT (preamble, Table 11.1.3.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.7.1-7 | | | |
|---|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS network feature support | | | |
| IMS- VoPS-3GPP | '1'B | IMS voice over PS session supported over 3GPP access | |
| IWK N26 | '0'B | Interworking without N26 interface not supported | |

Table 11.1.3.3.3-3: PDU SESSION ESTABLISHMENT ACCEPT (preamble for PDU Session for PS data, Table 11.1.3.3.2-1)

| |
|--|
| Derivation Path: 38.508-1 [4] Table 4.7.2-2, condition Interworking_with_EPS |
|--|

Table 11.1.3.3.3-4: PDU SESSION ESTABLISHMENT ACCEPT (preamble for IMS PDU Session, Table 11.1.3.3.2-1)

| |
|---|
| Derivation Path: 38.508-1 [4] Table 4.7.2-2, condition Interworking_with_EPS, IMS_DNN_Requested |
|---|

Table 11.1.3.3.3-5: *RRCSetupRequest* (step 3, Table 11.1.3.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.6.1-4H | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCSetupRequest ::= SEQUENCE { | | | |
| rrcSetupRequest SEQUENCE { | | | |
| establishmentCause | mo-Data | | |
| } | | | |

| | | | |
|---|--|--|--|
| } | | | |
|---|--|--|--|

Table 11.1.3.3.3-6: MobilityFromNRCommand (step 17, Table 11.1.3.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.6.1-8 | | | |
|---|---------------------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| MobilityFromNRCommand ::= SEQUENCE { | | | |
| rrc-TransactionIdentifier | RRC-TransactionIdentifier | | |
| criticalExtensions CHOICE { | | | |
| mobilityFromNRCommand ::= SEQUENCE { | | | |
| targetRAT-Type | eutra | | |
| targetRAT-MessageContainer | RRConnectionReconfiguration | | |
| nas-SecurityParamFromNR | 8 LSB of the downlink NAS COUNT | | |
| } | | | |
| } | | | |
| } | | | |

Table 11.1.3.3.3-7: RRConnectionReconfiguration (Table 11.1.3.3.3-6)

| |
|--|
| Derivation Path: 36.508-1 Table 4.6.1-8 condition HO-TO-EUTRA(2,0) |
|--|

Table 11.1.3.3.3-8: MobilityControlInfo (Table 11.1.3.3.3-7)

| Derivation Path: 36.508 [7], Table 4.6.5-1 | | | |
|--|--|---------|-------------|
| Information Element | Value/remark | Comment | Condition |
| MobilityControlInfo ::= SEQUENCE { | | | |
| targetPhysCellId | PhysicalCellIdentity of E-UTRA Cell 1 | | |
| carrierFreq SEQUENCE { | | | |
| dl-CarrierFreq | Same downlink EARFCN as used for E-UTRA Cell 1 | | |
| } | | | |
| carrierFreq | Not present | | Band > 64 |
| carrierBandwidth SEQUENCE { | | | |
| dl-Bandwidth | Downlink system bandwidth under test. | | |
| ul-Bandwidth | Uplink Bandwidth under test. | | FDD |
| ul-Bandwidth | Not present | | TDD |
| } | | | |
| additionalSpectrumEmission | 1 | | HO-to-EUTRA |
| carrierFreq-v9e0 SEQUENCE { | | | Band > 64 |
| dl-CarrierFreq-v9e0 | Same downlink EARFCN as used for E-UTRA Cell 1 | | |
| } | | | |
| } | | | |

| Condition | Explanation |
|-----------|--------------------------|
| FDD | FDD cell environment |
| TDD | TDD cell environment |
| Band > 64 | If band > 64 is selected |

Table 11.1.3.3.3-9: TRACKING AREA UPDATE REQUEST (step 19, Table 11.1.3.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-27, condition NR. | | | |
|---|---|-----------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| EPS update type | | | |
| EPS update type Value | '000'B | TA updating | |
| "Active" flag | '0'B | No bearer establishment requested | |
| NAS key set identifier | the eKSI indicating the 5G NAS security context value assigned at the initial registration when the UE entered N1 | | |
| Old GUTI | GUTI, mapped from the 5G-GUTI assigned at the initial registration when the UE entered N1 | | |
| Last visited registered TAI | The TAI to which the NR cell belonged to (the cell in which the UE was when in N1 before moving to S1). | | |

| | | | |
|--|----------------------------------|--|--|
| UE radio capability information update needed | '1'B | UE radio capability information update needed | |
| EPS bearer context status | Present, Content not checked | EBI corresponding to active PDU Sessions need to be set to 1 | |
| Old GUTI type | "Native GUTI" | | |
| UE status | "UE is in 5GMM-REGISTERED state" | | |
| NOTE: The message shall be integrity protected using the 5GS security context available in the UE. | | | |

11.1.4 MO MMTEL voice call setup from NR RRC_CONNECTED / EPS Fallback with redirection / Single registration mode with N26 interface / E-UTRAN cell reselection using cell status barred / Success

11.1.4.1 Test Purpose (TP)

(1)

with { UE supporting both S1 mode and N1 mode and operating in single-registration mode, and, the Network has indicated "interworking without N26 interface not supported", **and**, the UE in NR RRC_CONNECTED state after having established connection with *establishmentCause* set to 'mo-Data', and, the UE receiving and transmitting PS data }

ensure that {

when { User initiates a MMTEL call, the MO IMS voice session establishment has been initiated and the UE receives a *RRCRelease* message which includes *redirectedCarrierInfo* indicating redirection to *eutra*, and, a higher ranked E-UTRA cell is found with cell status "barred" and a lower ranked E-UTRA cell is found which is not "barred" }

then { UE selects the not "barred" E-UTRA cell, performs a TAU procedure, **and**, while the UE continues receiving and transmitting PS data the UE successfully completes the MO MMTEL call in EPS }

}

11.1.4.2 Conformance requirements

References: The conformance requirements covered in the present test case are specified in: TS 23.502, clause 4.13.6.1, and clause 4.11.1.3.2. Unless otherwise stated these are Rel-15 requirements.

[TS 23.502, clause 4.13.6.1]

Figure 4.13.6.1-1 describes the EPS fallback procedure for IMS voice.

When the UE is served by the 5G System, the UE has one or more ongoing PDU Sessions each including one or more QoS Flows. The serving PLMN AMF has sent an indication towards the UE during the Registration procedure that IMS voice over PS session is supported, see clause 5.16.3.10 in TS 23.501 [2] and the UE has registered in the IMS. If N26 is not supported, the serving PLMN AMF sends an indication towards the UE during the Registration procedure that interworking without N26 is supported, see clause 5.17.2.3.1 in TS 23.501 [2].

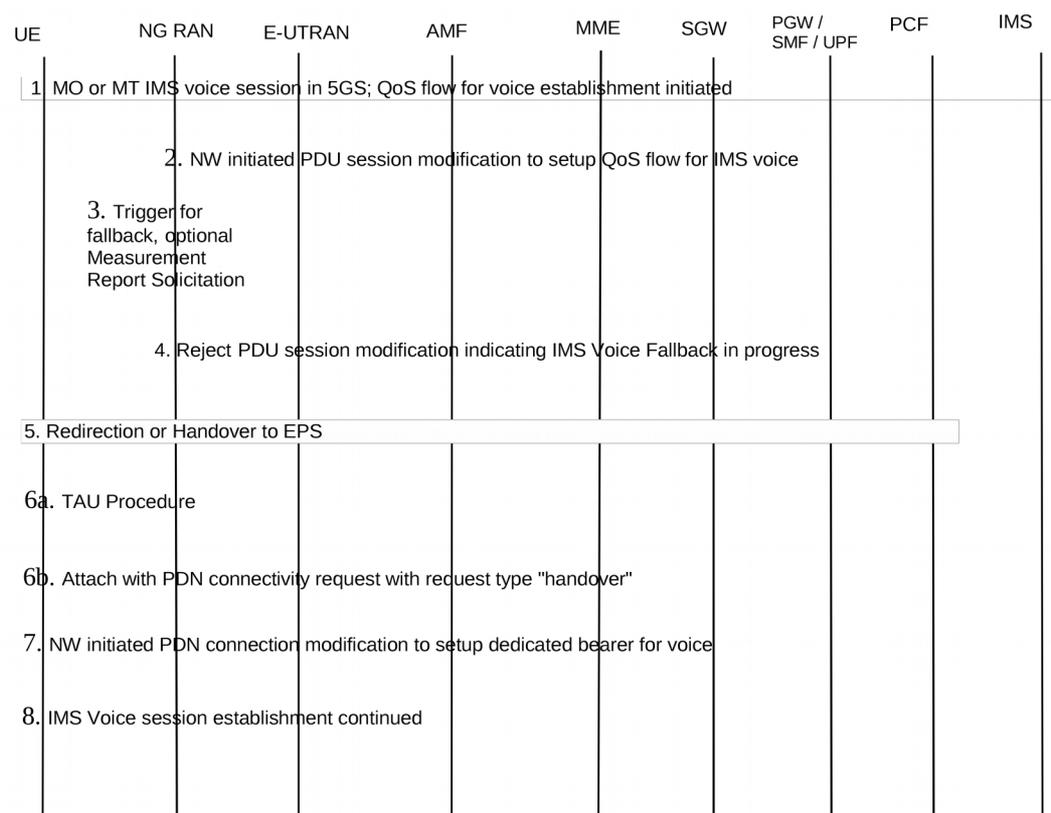


Figure 4.13.6.1-1: EPS Fallback for IMS voice

1. UE camps on NG-RAN in the 5GS and an MO or MT IMS voice session establishment has been initiated.
2. Network initiated PDU Session modification to setup QoS flow for voice reaches the NG-RAN (see N2 PDU Session Request in clause 4.3.3).
3. NG-RAN is configured to support EPS fallback for IMS voice and decides to trigger fallback to EPS, taking into account UE capabilities, indication from AMF that "Redirection for EPS fallback for voice is possible" (received as part of initial context setup as defined in TS 38.413 [10]), network configuration (e.g. N26 availability configuration) and radio conditions. If NG-RAN decides not to trigger fallback to EPS, then the procedure stops here and following steps are not executed.

NG-RAN may initiate measurement report solicitation from the UE including E-UTRAN as target.

NOTE 1: If AMF has indicated that "Redirection for EPS fallback for voice is not possible", then AN Release via inter-system redirection to EPS is not performed in step 5.

4. NG-RAN responds indicating rejection of the PDU Session modification to setup QoS flow for IMS voice received in step 2 by PDU Session Response message towards the PGW-C+SMF (or H-SMF+P-GW-C via V-SMF, in case of roaming scenario) via AMF with an indication that mobility due to fallback for IMS voice is ongoing. The PGW-C+SMF maintains the PCC rule(s) associated with the QoS Flow(s).
5. NG-RAN initiates either handover (see clause 4.11.1.2.1), or AN Release via inter-system redirection to EPS (see clause 4.2.6 and clause 4.11.1.3.2), taking into account UE capabilities. The PGW-C+SMF reports change of the RAT type if subscribed by PCF as specified in clause 4.11.1.2.1, or clause 4.11.1.3.2.6. When the UE is connected to EPS, either 6a or 6b is executed
- 6a. In the case of 5GS to EPS handover, see clause 4.11.1.2.1, and in the case of inter-system redirection to EPS with N26 interface, see clause 4.11.1.3.2. In either case the UE initiates TAU procedure; or
- 6b. In the case of inter-system redirection to EPS without N26 interface, see clause 4.11.2.2. If the UE supports Request Type flag "handover" for PDN connectivity request during the attach procedure as described in clause 5.3.2.1 of

TS 23.401 [13] and has received the indication that interworking without N26 is supported, then the UE initiates Attach with PDN connectivity request with request type "handover".

In inter-system redirection, the UE uses the emergency indication in the RRC message as specified in clause 6.2.2 of TS 36.331 [16] and E-UTRAN provides the emergency indication to MME during Tracking Area Update or Attach procedure. For the handover procedure see clause 4.11.1.2.1, step 1.

7. After completion of the mobility procedure to EPS or as part of the 5GS to EPS handover procedure (see clause 4.11.1.2.1), the SMF/PGW re-initiates the setup of the dedicated bearer for IMS voice, mapping the 5G QoS to EPC QoS parameters. The PGW-C+SMF behaves as specified in clause 4.9.1.3.1. The PGW-C+SMF reports about Successful Resource Allocation and Access Network Information if subscribed by PCF.

8. The IMS voice session establishment is continued.

At least for the duration of the voice call in EPS the E-UTRAN is configured to not trigger any handover to 5GS.

[TS 23.502, clause 4.11.1.3.2]

Clause 4.11.1.3.2 covers the case of idle mode mobility from 5GC to EPC. UE performs Tracking Area Update procedure in E-UTRA/EPS when it moves from NG-RAN/5GS to E-UTRA/EPS coverage area.

The procedure involves a Tracking Area Update to EPC and setup of default EPS bearer and dedicated bearers in EPC in steps 1-11 and re-activation, if required.

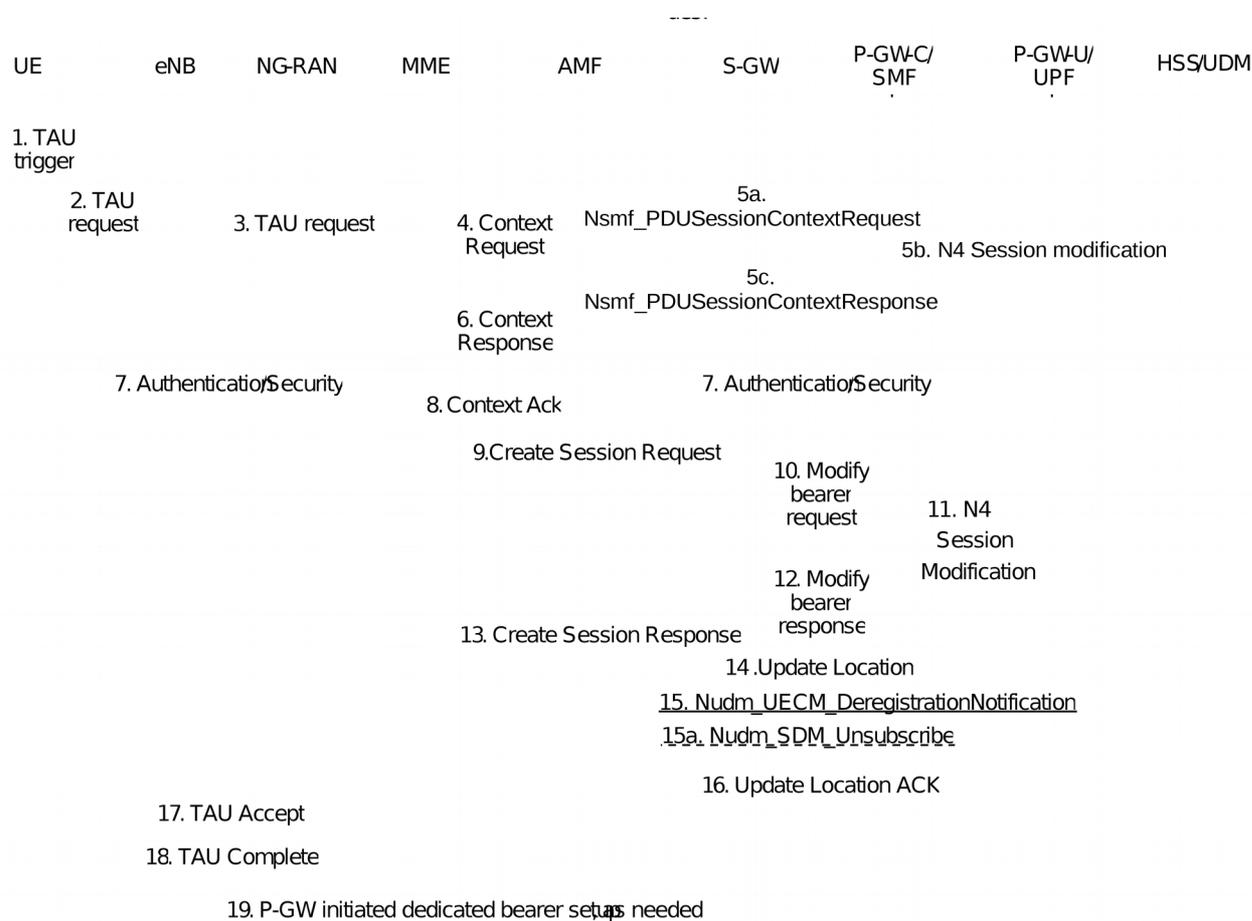


Figure 4.11.1.3.2-1: 5GS to EPS Idle mode mobility using N26 interface

The TAU procedure in TS 23.401 [13] is used with the following 5GS interaction:

1. Step 1 from clause 5.3.3.1 (Tracking Area Update procedure with Serving GW change) in TS 23.401 [13].

2. Step 2 from clause 5.3.3.1 (Tracking Area Update procedure with Serving GW change) in TS 23.401 [13] with the modification captured in clause 4.11.1.5.3.

3-4. Steps 3-4 from clause 5.3.3.1 (Tracking Area Update procedure with Serving GW change) in TS 23.401 [13].

5a. The AMF verifies the integrity of the TAU request message and requests the PGW-C+SMF to provide SM Context by using Nsmf_PDUSession_ContextRequest that also includes the mapped EPS Bearer Contexts. The AMF provides the target MME capability to SMF in the request to allow the SMF to determine whether to include EPS Bearer context for non-IP PDN Type or not. This step is performed with all the PGW-C+SMFs corresponding to PDU Sessions of the UE which are associated with 3GPP access and have EBI(s) allocated to them. In this step, if the AMF correctly validates the UE, then the AMF starts a timer.

NOTE 1: The AMF knows the MME capability to support non-IP PDN type or not through local configuration.

5b. For Non-roaming or roaming with local breakout scenario, if CN Tunnel Info is allocated by the PGW-U+UPF, the SMF sends N4 Session Modification Request to PGW-U+UPF to establish the tunnel for each EPS bearers, and PGW-U+UPF provides the PGW-U Tunnel Info for each EPS bearers to PGW-C+SMF.

NOTE2: In home routed roaming case, the CN Tunnel Info for each EPS bearer has been prepared by the PGW-C+SMF and provided to the V-SMF as specified in clause 4.11.1.4.1.

5c. SMF returns mapped EPS bearer contexts, which includes PGW-C control plane tunnel information of the PDN connection corresponding to the PDU session, EBI for each EPS bearer, PGW-U tunnel information for each EPS bearer, and EPS QoS parameters for each EPS bearer. For PDU Sessions with PDU Session Type Ethernet or Unstructured, the SMF provides SM Context for non-IP PDN Type.

6. The AMF responds with a Context Response message carrying mapped MM context (including mapped security context), Return preferred and SM EPS UE Context (default and dedicated GBR bearers) to the MME. If the verification of the integrity protection fails, the AMF returns an appropriate error cause. Return preferred is an optional indication by the AMF of a preferred return of the UE to the 5GS PLMN at a later access change to a 5GS shared network. The AMF may start an implementation specific (guard) timer for the UE context.

7 - 14. Steps 6-12 from clause 5.3.3.1 (Tracking Area Update procedure with Serving GW change) in TS 23.401 [13] are performed with following addition and modification:

In the step 10, If the QoS Flow associated with the default QoS rule has an EPS Bearer ID assigned, the PGW-C+SMF keeps the PDU Session (PDN connection) and for the remaining QoS Flows that do not have EPS bearer ID(s) assigned, the PGW-C+SMF deletes the PCC rule(s) associated with those QoS Flows and informs the PCF about the removed PCC rule(s).

In the step 11, the PGW-C+SMF requests the PGW-U+UPF to establish the tunnel for each EPS bearer by providing SGW-U Tunnel Info, and PGW-U Tunnel Info if the PGW-U Tunnel Info is allocated by the PGW-C+SMF.

In step 10, the PGW-C+SMF may need to report some subscribed event to the PCF by performing an SMF initiated SM Policy Association Modification procedure as defined in clause 4.16.5.

Step 9a from clause 5.3.3.1 (Tracking Area Update procedure with Serving GW change) in TS 23.401 [13] with the modification captured in clause 4.11.1.5.3

15a. The HSS+UDM invokes Nudm_UECM_DeregistrationNotification to notify the AMF associated with 3GPP access with reason as 5GS to EPS Mobility. If the timer started in step 6 is not running, the old AMF removes the UE context. Otherwise, the AMF may remove UE context when the timer expires. The AMF request the release of the PDU Session which is associated with 3GPP access, not expected to be transferred to EPC, i.e. no EBI(s) allocated to them, and corresponding to the PGW-C+SMF which is not contacted by AMF for SM context at step 5a. The AMF requests the release of the SM context in the V-SMF only, for Home Routed PDU Session with EBIs allocated. The 5GC may also keep UE context to allow the use of native security parameters when UE moves back from EPS to 5GS later.

Registration associated with the non-3GPP access in the AMF is not removed (i.e. an AMF that was serving the UE over both 3GPP and non-3GPP accesses does not consider the UE as deregistered over non 3GPP access and will remain registered and subscribed to subscription data updates in UDM).

When the UE decides to deregister over non-3GPP access or the old AMF decides not to maintain a UE registration for non-3GPP access anymore, the old AMF then deregisters from UDM by sending a Nudm_UECM_Deregistration service operation, unsubscribes from Subscription Data updates by sending an Nudm_SDM_Unsubscribe service operation to UDM and releases all the AMF and AN resources related to the UE.

16 - 18. Steps 17-21 from clause 5.3.3.1 (Tracking Area Update procedure with Serving GW change) in TS 23.401 [13] with the following modification:

The MME may provide the eNodeB with a PLMN list in the Handover Restriction List taking into account the last used 5GS PLMN ID and the Return preferred indication. The Handover Restriction List contains a list of PLMN IDs as specified by TS 23.251 [35] clause 5.2a for eNodeB functions.

The MME may not release the signaling connection with the UE based on the indication received in the step 1 that the UE is moving from 5GC.

19. [conditional] Step 19 from clause 4.11.1.2.1 applies.

11.1.4.3 Test Description

11.1.4.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 is configured according to TS 38.508-1 [4] Table 4.4.2-3.
- E-UTRA Cell 1 and E-UTRA Cell 2 are configured to TS 36.508 [7] Table 4.4.2-2 and is connected to EPC.
- E-UTRA Cell 1 is barred.
- System information on the NR cell in accordance with combination NR-6 in TS 38.508-1 [4] sub-clause 4.4.3.1.2, and, on the E-UTRA cell in accordance with combination 31 as defined in TS 36.508 [7], subclause 4.4.3.1.1.
- N26 interface is configured.

UE:

None.

Preamble:

- With E-UTRA Cell 2 "Serving cell" and NR Cell 1 "Non-suitable "Off" cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state RRC_IDLE Connectivity (*E-UTRA*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established.
- The UE is switched-off.
- With E-UTRA Cell 2 "Non-suitable "Off" cell" and NR Cell 1 "Serving cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR) with at least one Internet PDU session and one IMS PDU session on NR Cell 1, in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned.

11.1.4.3.2 Test procedure sequence

Table 11.1.4.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- E-UTRA Cell 2 as "Suitable neighbour intra-frequency cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3. | | | | |
| - | The following messages are to be observed on NR Cell 1 unless explicitly stated otherwise. | - | - | - | - |

| | | | | | |
|-------|---|-----|---|---|---|
| 2 | The SS transmits a <i>Paging</i> message. | <-- | NR RRC: <i>Paging</i> | | |
| 3 | The UE transmits an <i>RRCSetupRequest</i> message. | --> | NR RRC: <i>RRCSetupRequest</i> | - | - |
| 4-9 | Steps 3 to 8 of the NR RRC_CONNECTED procedure in TS 38.508-1 [4] Table 4.5.4.2-3 are executed to successfully complete the service request procedure. | - | - | - | - |
| - | EXCEPTION: Steps 10a1 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation | | | | |
| 10a1 | IF pc_IP_Ping = TRUE, THEN Check: Does the test result of generic test procedure 1a1-1b2 in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on DRB#2? | | | 1 | P |
| 11 | Make the UE attempt an IMS speech call. | - | - | - | - |
| 12-16 | Steps 1-5 of the MTSI MO speech call for 5GS procedure according TS 34.229-1 [35] subclause C.21g take place. | - | - | - | - |
| 17 | The SS transmits an <i>RRCRelease</i> message | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| - | The following messages are to be observed on E-UTRA Cell 2 unless explicitly stated otherwise. | - | - | - | - |
| 18 | Generic test procedure in TS 38.508-1 [4] Table 4.9.7.2.2-1 is performed without ' <i>connected without release</i> ' on E-UTRAN cell upon mobility from NR. | - | - | - | - |
| 19 | The SS configures a new RLC-UM data radio bearer with condition DRB (0,1), associated with the dedicated EPS bearer context. <i>RRCConnectionReconfiguration</i> message contains the ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST message. EPS bearer context #4 (QCI 1) according to TS 36.508 [7] Table 6.6.2-1: Reference dedicated EPS bearer contexts.

Reference dedicated EPS bearer contexts is to establish the dedicated EPS bearer context on IMS PDN. | <-- | RRC:
<i>RRCConnectionReconfiguration</i>

NAS: ACTIVATE DEDICATED EPS BEARER CONTEXT REQUEST | - | - |
| - | EXCEPTION: In parallel to the events described in steps 19-22 below, the steps specified in table 11.1.4.3.2-3 will take place. | - | - | - | - |
| 20 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message. | --> | RRC:
<i>RRCConnectionReconfigurationComplete</i> | - | - |
| 21 | The UE transmits an <i>ULInformationTransfer</i> | --> | RRC: <i>ULInformationTransfer</i> | - | - |

| | | | | | |
|------|---|---|---|---|---|
| | message including the ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message. | | NAS: ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT | | |
| 22 | The SS waits 1 second for call duration. | - | - | - | - |
| | EXCEPTION: Steps 23a1 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation | | | | |
| 23a1 | IF pc_IP_Ping = TRUE, THEN Check: Does the test result of generic test procedure 1a1-1b2 in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on DRB#2? | | | 1 | P |
| 24 | Release IMS Call as specified in the generic procedure in TS 34.229-1 [35] subclause C.32. | - | - | - | - |

Table 11.1.4.3.2-2: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|---------|---|------------------|----------|----|---------|
| | | U - S | Message | | |
| | EXCEPTION: Steps 1a1 to 1b7 describe behaviour that depends on the UE capability; the "lower case letter" identifies a step sequence that take place if a capability is supported | - | - | - | - |
| 1a1-1a2 | The UE performs IMS re-registration on EUTRAN as per steps 1-2 as defined in TS 34.229-1 [35] C.46. | - | - | - | - |
| 1a3-1a7 | Steps 6-10 of the Generic test procedure for setting up MTSI MO speech call - EPS fallback according TS 34.229-1 [35] subclause C.21g takes place. | - | - | - | - |
| 1a8 | Check: Does the UE send an ACK to acknowledge receipt of the 200 OK for INVITE? | --> | SIP: ACK | 1 | P |
| 1b1-1b5 | Steps 6-10 of the Generic test procedure for setting up MTSI MO speech call - EPS fallback according TS 34.229-1 [35] subclause C.21g takes place. | - | - | - | - |
| 1b6 | Check: Does the UE send an ACK to acknowledge receipt of the 200 OK for INVITE? | --> | SIP: ACK | 1 | P |

11.1.4.3.3 Specific message contents

Table 11.1.4.3.3-1: REGISTRATION REQUEST (preamble, Table 11.1.4.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.7.1-6 | | | |
|---|----------------------------------|-------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM capability | | | |
| S1 mode | '1'B | S1 mode supported | |
| S1 UE network capability | Present but contents not checked | | |

Table 11.1.4.3.3-2: REGISTRATION ACCEPT (preamble, Table 11.1.4.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.7.1-7 | | | |
|---|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS network feature support | | | |
| IMS- VoPS-3GPP | '1'B | IMS voice over PS session supported over 3GPP access | |
| IWK N26 | '0'B | Interworking without N26 interface not supported | |

Table 11.1.4.3.3-3: PDU SESSION ESTABLISHMENT ACCEPT (preamble for PDU Session for PS data, Table 11.1.4.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.7.2-2, condition Interworking_with_EPS |
|--|
|--|

Table 11.1.4.3.3-4: PDU SESSION ESTABLISHMENT ACCEPT (preamble for IMS PDU Session, Table 11.1.4.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.7.2-2, condition Interworking_with_EPS, IMS_DNN_Requested |
|---|
|---|

Table 11.1.4.3.3-5: *RRCSetupRequest* (step 1a1 and 3, Table 11.1.4.3.2-1)

| Derivation Path: 38.508-1 [4] Table 4.6.1-4H | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCSetupRequest ::= SEQUENCE { | | | |
| rrcSetupRequest SEQUENCE { | | | |
| establishmentCause | mo-Data | | |
| } | | | |
| } | | | |

11.1.5 MO MMTEL voice call setup from NR RRC_CONNECTED / EPS Fallback with redirection / Single registration mode without N26 interface / E- UTRAN cell reselection using cell status reservation / Success

11.1.5.1 Test Purpose (TP)

(1)

with {UE supporting both S1 mode and N1 mode and operating in single-registration mode, and, the Network has indicated "interworking without N26 interface supported", and, the UE is in in NR RRC_CONNECTED state after having established connection with establishmentCause set to 'mo-Data', and, the UE receiving and transmitting PS data}

ensure that {

when {User initiates a MMTEL call, the MO IMS voice session establishment has been initiated and the UE receives a RRCRelease message which includes redirectedCarrierInfo indicating redirection to eutra, and, a higher ranked E-UTRA cell is found with cell status "reserved for operator use" and a lower ranked E-UTRA cell is found which is not "reserved for operator use" both cells belonging to the UE's HPLMN}

then { UE selects the E-UTRA cell respecting the UE Access Class, performs an ATTACH or a TAU procedure, and, while the UE continues receiving and transmitting PS data the UE successfully completes the MO MMTEL call in EPS}

}

11.1.5.2 Conformance requirements

References: The conformance requirements covered in the current TC are specified in: TS23.502, clauses 4.11.2.2, 4.13.6.1; TS 24.501, clause 6.1.4.2; TS 38.331, clause 5.3.11. Unless otherwise stated these are Rel-15 requirements.

[TS 23.502, clause 4.11.2.2]

The following procedure is used by UEs in single-registration or dual registration mode on mobility from 5GS to EPS.

In the case of network sharing the UE selects the target PLMN ID according to clause 5.18.3 of TS 23.501 [2].

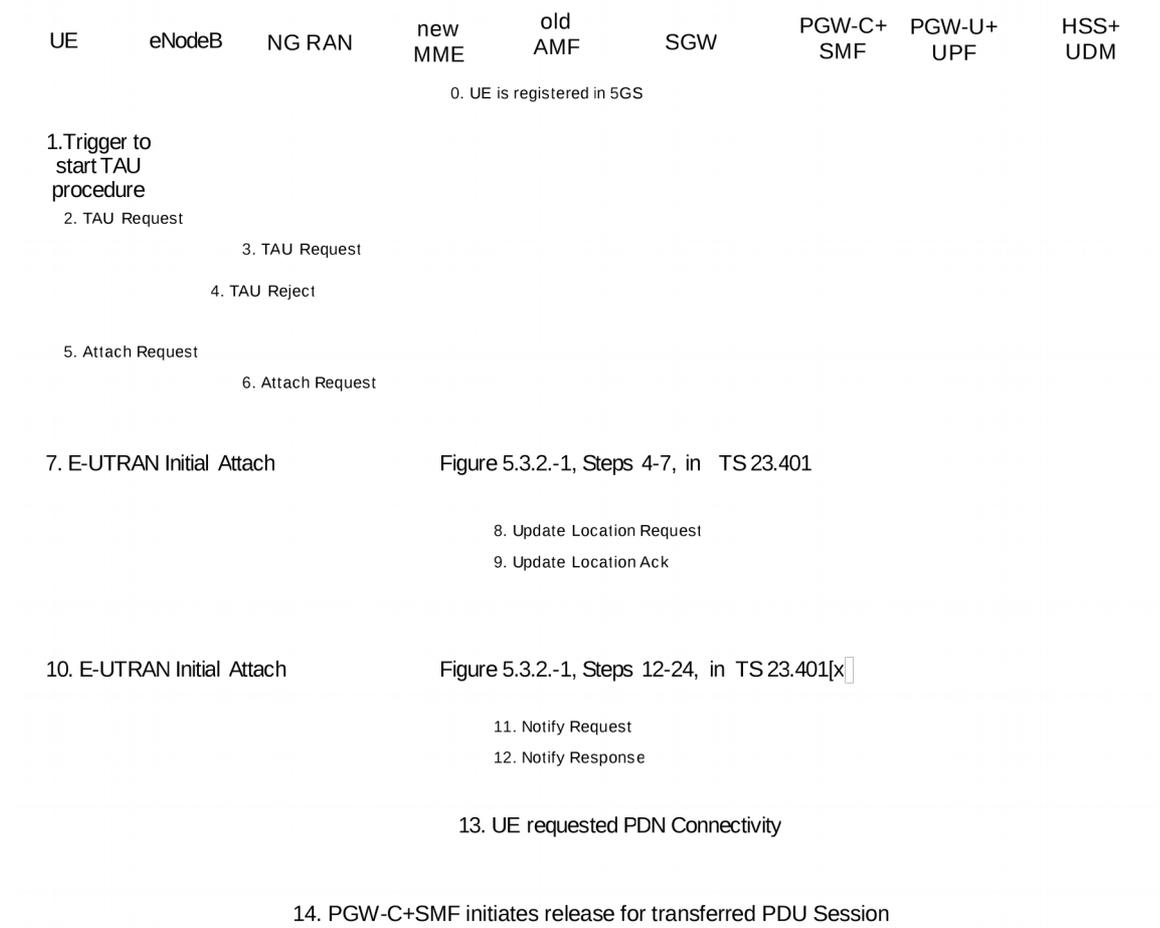


Figure 4.11.2.2-1: Mobility procedure from 5GS to EPS without N26 interface

The UE operating in single-registration mode can start the procedure from Step 1 or Step 5. The UE operating in dual-registration mode starts the procedure from Step 5.

NOTE 1: The network has indicated the " Interworking without N26" to the UE. To support IP address preservation, the UE in single-registration mode starts the procedure from Step 5. If the UE in single-registration mode starts the procedure from Step 1, the IP address preservation is not provided.

0. UE is registered in 5GS and established PDU sessions. The FQDN for the S5/S8 interface of the PGW-C+SMF is also stored in the UDM by the PGW-C+SMF during PDU Session setup in addition to what is specified in clause 4.3.2.2.1 and clause 4.3.2.2.2.

NOTE 2: At 5GS to EPS mobility, the MME use the FQDN for the S5/S8 interface of the PGW-C+SMF to find the PGW-C+SMF, and when UE moves back from EPS to 5GS, the AMF uses FQDN for the S5/S8 interface of the PGW-C+SMF to find the PGW-C+SMF.

1. Step 1 as in clause 5.3.3.1 (Tracking Area Update) in TS 23.401 [13].

2. Step 2 as in clause 5.3.3.1 (Tracking Area Update) in TS 23.401 [13] with the following modifications:

The UE shall provide a EPS-GUTI that is mapped from the 5G-GUTI following the mapping rules specified in TS 23.501 [2]. The UE indicates that it is moving from 5GC.

3. Step 3 as in clause 5.3.3.1 (Tracking Area Update) in TS 23.401 [13].

4. If the MME determined that the old node is an AMF based on UE's GUTI mapped from 5G-GUTI and the MME is configured to support 5GS-EPS interworking without N26 procedure, the MME sends a TAU Reject to the UE.

5. Step 1 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13] with the modifications captured in clause 4.11.2.4.1.
6. Step 2 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13].
7. Steps 4-7 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the modifications captured in clause 4.11.2.4.1.
8. Step 8 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the modifications captured in clause 4.11.2.4.1.
9. Step 11 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the following modifications:

The subscription profile the MME receives from HSS+UDM includes per DNN/APN at most one PGW-C+SMF FQDN as described in in clause 5.17.2.1 in TS 23.501 [2].
10. Steps 12-24 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the modifications as described in clause 4.11.2.4.1.
11. Step 25 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13].
12. Step 26 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13].
13. If the UE has remaining PDU Sessions in 5GS which it wants to transfer to EPS and maintain the same IP address/prefix, the UE performs the UE requested PDN Connectivity Procedure as specified in TS 23.401 [13] clause 5.10.2 and sets the Request Type to "handover" in Step 1 of the procedure with modification captured in clause 4.11.2.4.2. UE provides an APN and the PDU Session ID corresponding to the PDU Session it wants to transfer to EPS. The UE provides the PDU Session ID in PCO as described in clause 4.11.1.1.

UEs in single-registration mode performs this step for each PDU Session immediately after completing the E-UTRAN Initial Attach procedure. UEs in dual-registration mode may perform this step any time after the completing of E-UTRAN Initial Attach procedure. Also, UEs in dual-registration mode may perform this step only for a subset of PDU Sessions.

The MME determines the PGW-C+SMF address for the Create Session Request based on the APN received from the UE and the subscription profile received from the HSS+UDM in Step 9 or when the HSS+UDM notifies the MME for the new PGW-C+SMF ID in the updated subscription profile.

The PGW-C+SMF uses the PDU Session ID to correlate the transferred PDN connection with the PDU Session in 5GC.

As a result of the procedure the PGW-U+UPF starts routing DL data packets to the Serving GW for the default and any dedicated EPS bearers established for this PDN connection.

14. The PGW-C+SMF initiates release of the PDU Session(s) in 5GS transferred to EPS as specified in clause 4.3.4.2 with the following clarification:

In step 2, the PGW-C+SMF shall not release IP address/prefix(es) allocated for the PDU Session.

If UP connection of the PDU Session is not active, step 3b is not executed, thus the steps triggered by step 3b are not executed;

If UP connection of the PDU Session is active, the SMF invokes the Namf_Communication_N1N2MessageTransfer service operation without including N1 SM container (PDU Session Release Command).

[TS 23.502, clause 4.13.6.1]

Figure 4.13.6.1-1 describes the EPS fallback procedure for IMS voice.

When the UE is served by the 5G System, the UE has one or more ongoing PDU Sessions each including one or more QoS Flows. The serving PLMN AMF has sent an indication towards the UE during the Registration procedure that IMS voice over PS session is supported, see clause 5.16.3.10 in TS 23.501 [2] and the UE has registered in the IMS. If N26 is not supported, the serving PLMN AMF sends an indication towards the UE during the Registration procedure that interworking without N26 is supported, see clause 5.17.2.3.1 in TS 23.501 [2].

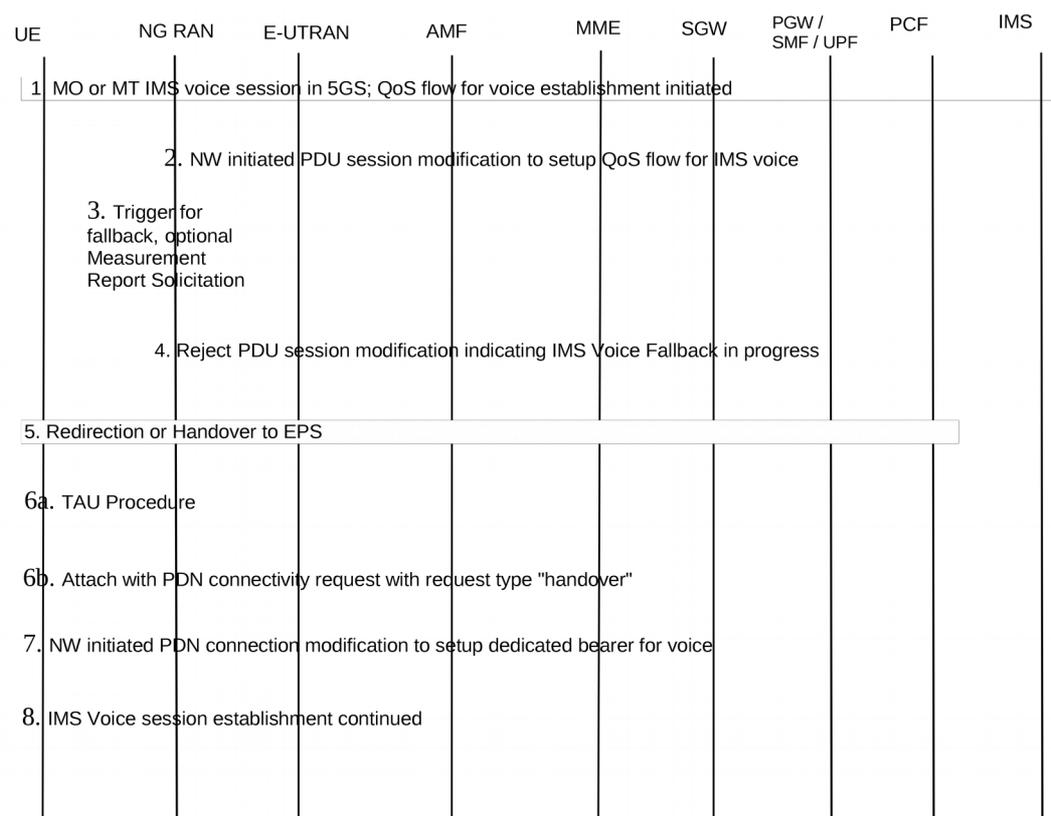


Figure 4.13.6.1-1: EPS Fallback for IMS voice

1. UE camps on NG-RAN in the 5GS and an MO or MT IMS voice session establishment has been initiated.
2. Network initiated PDU Session modification to setup QoS flow for voice reaches the NG-RAN (see N2 PDU Session Request in clause 4.3.3).
3. NG-RAN is configured to support EPS fallback for IMS voice and decides to trigger fallback to EPS, taking into account UE capabilities, indication from AMF that "Redirection for EPS fallback for voice is possible" (received as part of initial context setup as defined in TS 38.413 [10]), network configuration (e.g. N26 availability configuration) and radio conditions. If NG-RAN decides not to trigger fallback to EPS, then the procedure stops here and following steps are not executed.

NG-RAN may initiate measurement report solicitation from the UE including E-UTRAN as target.

NOTE 1: If AMF has indicated that "Redirection for EPS fallback for voice is not possible", then AN Release via inter-system redirection to EPS is not performed in step 5.

4. NG-RAN responds indicating rejection of the PDU Session modification to setup QoS flow for IMS voice received in step 2 by PDU Session Response message towards the PGW-C+SMF (or H-SMF+P-GW-C via V-SMF, in case of roaming scenario) via AMF with an indication that mobility due to fallback for IMS voice is ongoing. The PGW-C+SMF maintains the PCC rule(s) associated with the QoS Flow(s).
5. NG-RAN initiates either handover (see clause 4.11.1.2.1), or AN Release via inter-system redirection to EPS (see clause 4.2.6 and clause 4.11.1.3.2), taking into account UE capabilities. The PGW-C+SMF reports change of the RAT type if subscribed by PCF as specified in clause 4.11.1.2.1, or clause 4.11.1.3.2.6. When the UE is connected to EPS, either 6a or 6b is executed
- 6a. In the case of 5GS to EPS handover, see clause 4.11.1.2.1, and in the case of inter-system redirection to EPS with N26 interface, see clause 4.11.1.3.2. In either case the UE initiates TAU procedure; or
- 6b. In the case of inter-system redirection to EPS without N26 interface, see clause 4.11.2.2. If the UE supports Request Type flag "handover" for PDN connectivity request during the attach procedure as described in clause 5.3.2.1 of

TS 23.401 [13] and has received the indication that interworking without N26 is supported, then the UE initiates Attach with PDN connectivity request with request type "handover".

In inter-system redirection, the UE uses the emergency indication in the RRC message as specified in clause 6.2.2 of TS 36.331 [16] and E-UTRAN provides the emergency indication to MME during Tracking Area Update or Attach procedure. For the handover procedure see clause 4.11.1.2.1, step 1.

7. After completion of the mobility procedure to EPS or as part of the 5GS to EPS handover procedure (see clause 4.11.1.2.1), the SMF/PGW re-initiates the setup of the dedicated bearer for IMS voice, mapping the 5G QoS to EPC QoS parameters. The PGW-C+SMF behaves as specified in clause 4.9.1.3.1. The PGW-C+SMF reports about Successful Resource Allocation and Access Network Information if subscribed by PCF.

8. The IMS voice session establishment is continued.

At least for the duration of the voice call in EPS the E-UTRAN is configured to not trigger any handover to 5GS.

[TS 24.501, clause 6.1.4.2]

When the network does not support N26 interface, the SMF does not provide the UE with the mapped EPS bearer context for a PDU session.

NOTE 1: Since the SMF does not provide the UE with the mapped EPS bearer context for a PDU session, the UE does not know whether interworking with EPS is supported for a PDU session before attempting to transfer the PDU session from N1 mode to S1 mode.

NOTE 2: It is up to UE implementation to decide which PDU session(s) to be attempted to transfer from N1 mode to S1 mode, e.g. based on UE policy or user preference.

Upon inter-system change from N1 mode to S1 mode in EMM-IDLE mode, the UE shall use the parameters from each PDU session which the UE intends to transfer to EPS to create the contents of a PDN CONNECTIVITY REQUEST message as follows:

- a) if the PDU session is an emergency PDU session, the request type shall be set to "handover of emergency bearer services". Otherwise the request type shall be set to "handover";
- b) the PDU session type of the PDU session shall be mapped to the PDN type of the default EPS bearer context as follows:
 - 1) the PDN type shall be set to "non-IP" if the PDU session type is "Ethernet" or "Unstructured";
 - 2) the PDN type shall be set to "IPv4" if the PDU session type is "IPv4";
 - 3) the PDN type shall be set to "IPv6" if the PDU session type is "IPv6"; and
 - 4) the PDN type shall be set to "IPv4v6" if the PDU session type is "IPv4v6";
- c) the DNN of the PDU session shall be mapped to the APN of the default EPS bearer context; and
- d) the PDU session ID parameter in the PCO IE shall be set to the PDU session identity of the PDU session.

After inter-system change from N1 mode to S1 mode, the UE shall associate the PDU session identity with the default EPS bearer context.

Upon successful completion of an EPS attach procedure after inter-system change from N1 mode to S1 mode (see 3GPP TS 24.301 [15]), the UE shall delete any UE derived QoS rules.

The UE shall locally release the PDU session(s) and QoS flow(s) associated with the 3GPP access which have not been transferred to EPS.

...

[TS 38.331, clause 5.3.11]

UE shall:

- 1> reset MAC;

- 1> if T302 is running:
- 2> stop timer T302;
- 2> perform the actions as specified in 5.3.14.4;
- 1> stop all timers that are running except T320 and T325;
- 1> discard the UE Inactive AS context;
- 1> set the variable *pendingRnaUpdate* to *false*, if that is set to *true*;
- 1> discard the K_{gNB} , the $K_{RRCCenc}$ key, the K_{RRCint} , the K_{UPint} key and the K_{UPenc} key, if any;
- 1> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity and SDAP for all established RBs;
- 1> indicate the release of the RRC connection to upper layers together with the release cause;
- 1> enter RRC_IDLE and perform cell selection as specified in TS 38.304 [20], except if going to RRC_IDLE was triggered by selecting an inter-RAT cell while T311 was running;
- 1> if going to RRC_IDLE was triggered by reception of the *RRCRelease* message including a *waitTime*:
- 2> start timer T302 with the value set to the *waitTime*;
- 2> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2'.

11.1.5.3 Test description

11.1.5.3.1 Pre-test conditions

System Simulator:

- 3 cells
- NR Cell 1 as defined in TS 38.508-1 [4] Table 4.4.2-3. System information combination NR-6 as defined in TS 38.508-1 [4], sub-clause 4.4.3.1.2.
- E-UTRA Cell 1 as defined in TS 36.508 [7] Table 4.4.2-2. System information combination 31 as defined in TS 36.508 [7], sub-clause 4.4.3.1.1.
- E-UTRA Cell 2 as defined in TS 36.508 [7] Table 4.4.2-2. System information combination 1 as defined in TS 36.508 [7], sub-clause 4.4.3.1.1. Cell 2 is set as "reserved for operator use" in SIB1.

UE:

- The UE fitted with a USIM with access class 0..9

Preamble:

- With E-UTRA Cell 1 "Serving cell", E-UTRA Cell 2 "Non-suitable "Off" cell" and NR Cell 1 "Non-suitable "Off" cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state RRC_IDLE Connectivity (*E-UTRA/EPC*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established
- The UE is switched-off
- With E-UTRA Cell 1 "Non-suitable "Off" cell", E-UTRA Cell 2 "Non-suitable "Off" cell" and NR Cell 1 "Serving cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), with one Internet PDU session and one IMS PDU session on NR Cell 1, in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned.

11.1.5.3.2 Test procedure sequence

Table 11.1.5.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-------|--|------------------|--|----|---------|
| | | U – S | Message | | |
| - | EXCEPTION: The following messages are to be observed on NR Cell 1 unless explicitly stated otherwise. | - | - | - | - |
| 1 | The SS transmits a <i>Paging</i> message. | <-- | NR RRC: <i>Paging</i> | - | - |
| 2 | The UE transmits an <i>RRCSetupRequest</i> message. | --> | NR RRC: <i>RRCSetupRequest</i> | - | - |
| 3-9a2 | Steps 3 to 9a2 of the NR RRC_CONNECTED procedure in TS 38.508-1 [4] Table 4.5.4.2-3 are executed to successfully complete the service request procedure. | - | - | - | - |
| 10 | Make the UE attempt an MTSI MO Speech Call. | - | - | - | - |
| 11 | The UE transmits an INVITE message. | - | - | - | - |
| 12 | Void | - | - | - | - |
| - | EXCEPTION: Steps 12a1 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation | - | - | | |
| 12a1 | IF pc_IP_Ping = TRUE, THEN Check: Does the test result of generic test procedure 1a1-1b2 in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on DRB#2? | - | | 1 | P |
| 13 | The SS transmits an <i>RRCRelease</i> message. | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| - | EXCEPTION: The following messages are to be observed on E-UTRA Cell 1 unless explicitly stated otherwise. | - | - | - | - |
| 14 | UE transmits an <i>RRCConnectionRequest</i> message. | --> | RRC: <i>RRCConnectionRequest</i> | | |
| 15 | SS transmits an <i>RRCConnectionSetup</i> message. | <-- | RRC: <i>RRCConnectionSetup</i> | | |
| - | EXCEPTION: Steps 15a1 to 15b3 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation. | - | - | - | - |
| 15a1 | If the UE tries to preserve the IP address of the PDN connection then check does the UE transmits an ATTACH REQUEST message? | --> | RRC:
<i>RRCConnectionSetupComplete</i>
NAS: ATTACH REQUEST | 1 | P |
| 15b1 | Else check: does the UE transmit a TRACKING AREA UPDATE REQUEST message? | --> | RRC:
<i>RRCConnectionSetupComplete</i>
NAS: TRACKING AREA UPDATE REQUEST | 1 | P |

| | | | | | |
|-----------|---|-----|---|---|---|
| 15b
2 | The SS transmits a TRACKING AREA UPDATE REJECT message to UE. | <-- | RRC: <i>DLInformationTransfer</i>

NAS: TRACKING AREA UPDATE REQUEST REJECT | - | - |
| 15b
3 | The UE transmits an ATTACH REQUEST message. | --> | RRC: <i>ULInformationTransfer</i>

NAS: ATTACH REQUEST | - | - |
| 16-
27 | Steps 5 to 16 of the generic test procedure for UE registration(TS36.508 [2] Table 4.5.2.3-1) | - | - | - | - |
| - | EXCEPTION: In parallel to the events described in steps 30 to 41 the UE may perform IMS re-registration on EUTRAN as per steps as defined in 34.229-1 [35] subclause C.46. | - | - | - | - |
| - | EXCEPTION: In parallel to the events described in steps 28 to 36 the steps specified in Table 11.1.5.3.2-2 will take place to transfer internet PDU session to EPS. | - | - | - | - |
| - | EXCEPTION: In parallel to the events described in steps 28 to 39 the UE may perform IMS re-registration on EUTRAN as per steps 3-11 as defined in 34.229-1 [35] subclause C.46. | - | - | - | - |
| 28-
34 | Steps 7-13 from the Generic Test Procedure for MTSI MO speech call establishment (TS 36.508 table 4.5A.6.3-1) are performed. | - | - | - | - |
| 35 | Check: Does the UE transmit an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message? | --> | RRC: <i>ULInformationTransfer</i>

NAS:ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT | 1 | P |
| 36 | The SS waits 1 second. | - | - | - | - |
| - | EXCEPTION: Steps 36a1 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation | - | - | | |
| 36a
1 | IF pc_IP_Ping = TRUE, THEN Check: Does the test result of generic test procedure 1a1-1b2 in TS 38.508-1 subclause 4.9.1 indicate that the UE is capable of exchanging IP data on DRB#2? | - | | 1 | P |
| 37 | Release IMS Call as specified in the generic procedure in TS 34.229-1 [35] subclause C.32. | - | - | - | - |
| 38 | The SS transmits a DEACTIVATE EPS BEARER CONTEXT REQUEST including the EPS bearer identity of the default EPS bearer to the emergency PDN. | <-- | DEACTIVATE EPS BEARER CONTEXT REQUEST | - | - |
| 39 | The UE transmits a DEACTIVATE EPS BEARER CONTEXT ACCEPT. | --> | DEACTIVATE EPS BEARER CONTEXT ACCEPT | - | - |

Table 11.1.5.3.2-2: Parallel behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | Check: Does the UE transmit a PDN CONNECTIVITY REQUEST message to request an additional PDN. | --> | RRC: <i>ULInformationTransfer</i>

NAS: PDN CONNECTIVITY REQUEST | 1 | P |
| 2 | The SS configures a new data radio bearer, associated with the additional default EPS bearer context.
<i>RRCConnectionReconfiguration</i> message contains the ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST message. | <-- | RRC:
<i>RRCConnectionReconfiguration</i>

NAS:

ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST | | |
| 3 | The UE transmits an <i>RRCConnectionReconfigurationComplete</i> message to confirm the establishment of additional default bearer. | --> | RRC:
<i>RRCConnectionReconfigurationComplete</i> | | |
| - | EXCEPTION: In parallel to the event described in step 4 below, if initiated by the UE the generic procedure for IP address allocation in the U-plane specified in TS 36.508 subclause 4.5A.1 takes place performing IP address allocation in the U-plane. | - | - | | |
| 4 | The UE transmits an ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT message. | --> | RRC: <i>ULInformationTransfer</i>

NAS: ACTIVATE DEFAULT EPS BEARER CONTEXT ACCEPT | | |

11.1.5.3.3 Specific message contents

Table 11.1.5.3.3-0: REGISTRATION ACCEPT (preamble; step 14, TS 38.508-1 [4], Table 4.5.2.2-2)

| Derivation Path: 38.508-1[4] Table 4.7.1-7 | | | |
|--|------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Extended protocol discriminator | '0111 1110'B | 5GS mobility management messages | |
| Security header type | '0000'B | Plain 5GS NAS message, not security protected | |
| Spare half octet | '0000'B | | |
| 5GS network feature support | '0100 0001 0000 0000'B | Interworking without N26 interface supported | |

Table 11.1.5.3.3-1: RRCRelease (step 5, table 11.1.5.3.2-1)

| Derivation path: 38.508-1 [4] Table Table 4.6.1-16 | | | |
|--|---------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo ::= CHOICE { | | | |
| eutra.SEQUENCE{ | | | |
| eutraFrequency | Downlink EARFCN of cell 1 | | |
| cnType | epc | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 11.1.5.3.3-2: ATTACH REQUEST (step 15a1, table 11.1.5.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-4 | | | |
|---|---|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| NAS key set identifier | KSI _{ASME} that was created when the UE last registered to EPC E-UTRA | | |
| Old GUTI | GUTI, mapped from the 5G-GUTI assigned at the initial registration when the UE entered N1 | | |
| Last visited registered TAI | The TAI the last visited E-UTRA Cell belonged to, if any. Not included if the UE does not have last stored EPC TAI. | | |
| Old GUTI type | "Native GUTI" | | |
| ESM message container | PDN CONNECTIVITY REQUEST message to active PDU sessions which the UE intends to transfer to EPS. | | |

Table 11.1.5.3.3-3: PDN CONNECTIVITY REQUEST (step 15a1, table 11.1.5.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.3-20 |
|--|
|--|

| Information Element | Value/remark | Comment | Condition |
|---|---|--|-----------|
| EPS bearer identity | 0 | No EPS bearer identity assigned | |
| Procedure transaction identity | Any value from 1 to 254 | | |
| PDN connectivity request message identity | '1101 0000'B | PDN connectivity request | |
| Request type | '010'B | Handover | |
| PDN type | Any value between '001'B, '010'B, '011'B and '100'B | The allowed values are respectively IPv4, IPv6, IPv4v6 and "unused but interpreted as IPv6 by the network" | |
| Protocol configuration options | PDU session ID of IMS
PDU session | | |

Table 11.1.5.3.3-4: TRACKING AREA UPDATE REQUEST (step 15b1, table 11.1.5.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-27, condition NR. | | | |
|---|---|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| "Active" flag | 0001 | Bearer Establishment requested | |
| EPS bearer context status | Present | EBI corresponding to active PDU Sessions need to be set to 1 | |
| NAS key set identifier | KSI _{ASME} that was created when the UE last registered to EPC E-UTRA | | |
| Old GUTI | GUTI, mapped from the 5G-GUTI assigned at the initial registration when the UE entered N1 | | |
| Last visited registered TAI | The TAI the last visited E-UTRA Cell belonged to, if any. Not included if the UE does not have last stored EPC TAI. | | |
| Old GUTI type | "Native GUTI" | | |
| UE status | "UE is in 5GMM-REGISTERED state" | | |

Table 11.1.5.3.3-5: TRACKING AREA UPDATE REJECT (step15b2, table 11.1.5.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-26. | | | |
|---|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| EMM cause | '0000 1001'B | #9"UE identity cannot be derived by the network" | |

Table 11.1.5.3.3-6: ATTACH REQUEST (step 15b3, table 11.1.5.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-4. | | | |
|--|----------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| IMSI | IMSI of the UE | | |

Table 11.1.5.3.3-7: PDN CONNECTIVITY REQUEST (step 1, table 11.1.5.3.2-2)

| Derivation Path: TS 36.508 [7], Table 4.7.3-20 | | | |
|--|---|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| EPS bearer identity | '0000'B | No EPS bearer identity assigned | |
| Procedure transaction identity | Any value from 1 to 254 | | |
| PDN connectivity request message identity | '1101 0000'B | PDN connectivity request | |
| Request type | '010'B | Handover | |
| PDN type | Any value between '001'B, '010'B, '011'B and '100'B | The allowed values are respectively IPv4, IPv6, IPv4v6 and "unused but interpreted as IPv6 by the network" | |
| Protocol configuration options | PDU session ID of internet PDU session | | |

11.1.6 MT MMTEL voice call setup from NR RRC_IDLE / EPS Fallback with redirection / Single registration mode without N26 interface / Success

11.1.6.1 Test Purpose (TP)

(1)

with {UE supporting both S1 mode and N1 mode and operating in single-registration mode, and, the Network has indicated "interworking without N26 interface supported", and, the UE is in NR RRC_IDLE state}

NOTE 1: The network has indicated the "Interworking without N26" to the UE. To support IP address preservation, the UE in single-registration mode starts the procedure from Step 5. If the UE in single-registration mode starts the procedure from Step 1, the IP address preservation is not provided.

0. UE is registered in 5GS and established PDU sessions. The FQDN for the S5/S8 interface of the PGW-C+SMF is also stored in the UDM by the PGW-C+SMF during PDU Session setup in addition to what is specified in clause 4.3.2.2.1 and clause 4.3.2.2.2.

NOTE 2: At 5GS to EPS mobility, the MME use the FQDN for the S5/S8 interface of the PGW-C+SMF to find the PGW-C+SMF, and when UE moves back from EPS to 5GS, the AMF uses FQDN for the S5/S8 interface of the PGW-C+SMF to find the PGW-C+SMF.

1. Step 1 as in clause 5.3.3.1 (Tracking Area Update) in TS 23.401 [13].

2. Step 2 as in clause 5.3.3.1 (Tracking Area Update) in TS 23.401 [13] with the following modifications:

The UE shall provide a EPS-GUTI that is mapped from the 5G-GUTI following the mapping rules specified in TS 23.501 [2]. The UE indicates that it is moving from 5GC.

3. Step 3 as in clause 5.3.3.1 (Tracking Area Update) in TS 23.401 [13].

4. If the MME determined that the old node is an AMF based on UE's GUTI mapped from 5G-GUTI and the MME is configured to support 5GS-EPS interworking without N26 procedure, the MME sends a TAU Reject to the UE.

5. Step 1 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13] with the modifications captured in clause 4.11.2.4.1.

6. Step 2 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13].

7. Steps 4-7 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the modifications captured in clause 4.11.2.4.1.

8. Step 8 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the modifications captured in clause 4.11.2.4.1.

9. Step 11 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the following modifications:

The subscription profile the MME receives from HSS+UDM includes per DNN/APN at most one PGW-C+SMF FQDN as described in in clause 5.17.2.1 in TS 23.501 [2].

10. Steps 12-24 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13], with the modifications as described in clause 4.11.2.4.1.

11. Step 25 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13].

12. Step 26 as in clause 5.3.2.1 (E-UTRAN Initial Attach) in TS 23.401 [13].

13. If the UE has remaining PDU Sessions in 5GS which it wants to transfer to EPS and maintain the same IP address/prefix, the UE performs the UE requested PDN Connectivity Procedure as specified in TS 23.401 [13] clause 5.10.2 and sets the Request Type to "handover" in Step 1 of the procedure with modification captured in clause 4.11.2.4.2. UE provides an APN and the PDU Session ID corresponding to the PDU Session it wants to transfer to EPS. The UE provides the PDU Session ID in PCO as described in clause 4.11.1.1.

UEs in single-registration mode performs this step for each PDU Session immediately after completing the E-UTRAN Initial Attach procedure. UEs in dual-registration mode may perform this step any time after the completing of E-UTRAN Initial Attach procedure. Also, UEs in dual-registration mode may perform this step only for a subset of PDU Sessions.

The MME determines the PGW-C+SMF address for the Create Session Request based on the APN received from the UE and the subscription profile received from the HSS+UDM in Step 9 or when the HSS+UDM notifies the MME for the new PGW-C+SMF ID in the updated subscription profile.

The PGW-C+SMF uses the PDU Session ID to correlate the transferred PDN connection with the PDU Session in 5GC.

As a result of the procedure the PGW-U+UPF starts routing DL data packets to the Serving GW for the default and any dedicated EPS bearers established for this PDN connection.

14. The PGW-C+SMF initiates release of the PDU Session(s) in 5GS transferred to EPS as specified in clause 4.3.4.2 with the following clarification:

In step 2, the PGW-C+SMF shall not release IP address/prefix(es) allocated for the PDU Session.

If UP connection of the PDU Session is not active, step 3b is not executed, thus the steps triggered by step 3b are not executed;

If UP connection of the PDU Session is active, the SMF invokes the `Namf_Communication_N1N2MessageTransfer` service operation without including N1 SM container (PDU Session Release Command).

[TS 23.502, clause 4.13.6.1]

Figure 4.13.6.1-1 describes the EPS fallback procedure for IMS voice.

When the UE is served by the 5G System, the UE has one or more ongoing PDU Sessions each including one or more QoS Flows. The serving PLMN AMF has sent an indication towards the UE during the Registration procedure that IMS voice over PS session is supported, see clause 5.16.3.10 in TS 23.501 [2] and the UE has registered in the IMS. If N26 is not supported, the serving PLMN AMF sends an indication towards the UE during the Registration procedure that interworking without N26 is supported, see clause 5.17.2.3.1 in TS 23.501 [2].

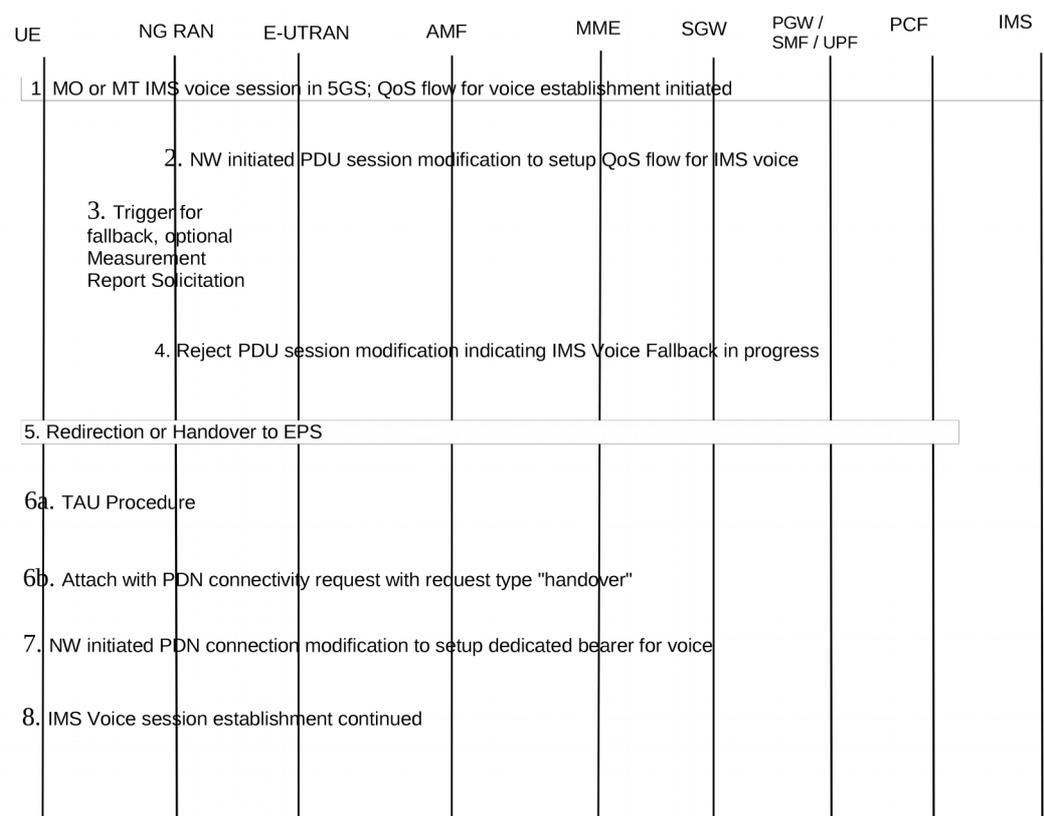


Figure 4.13.6.1-1: EPS Fallback for IMS voice

1. UE camps on NG-RAN in the 5GS and an MO or MT IMS voice session establishment has been initiated.
2. Network initiated PDU Session modification to setup QoS flow for voice reaches the NG-RAN (see N2 PDU Session Request in clause 4.3.3).
3. NG-RAN is configured to support EPS fallback for IMS voice and decides to trigger fallback to EPS, taking into account UE capabilities, indication from AMF that "Redirection for EPS fallback for voice is possible" (received as part of initial context setup as defined in TS 38.413 [10]), network configuration (e.g. N26 availability configuration) and

radio conditions. If NG-RAN decides not to trigger fallback to EPS, then the procedure stops here and following steps are not executed.

NG-RAN may initiate measurement report solicitation from the UE including E-UTRAN as target.

NOTE 1: If AMF has indicated that "Redirection for EPS fallback for voice is not possible", then AN Release via inter-system redirection to EPS is not performed in step 5.

4. NG-RAN responds indicating rejection of the PDU Session modification to setup QoS flow for IMS voice received in step 2 by PDU Session Response message towards the PGW-C+SMF (or H-SMF+P-GW-C via V-SMF, in case of roaming scenario) via AMF with an indication that mobility due to fallback for IMS voice is ongoing. The PGW-C+SMF maintains the PCC rule(s) associated with the QoS Flow(s).

5. NG-RAN initiates either handover (see clause 4.11.1.6.1), or AN Release via inter-system redirection to EPS (see clause 4.2.6 and clause 4.11.1.3.2), taking into account UE capabilities. The PGW-C+SMF reports change of the RAT type if subscribed by PCF as specified in clause 4.11.1.6.1, or clause 4.11.1.3.2.6. When the UE is connected to EPS, either 6a or 6b is executed

6a. In the case of 5GS to EPS handover, see clause 4.11.1.6.1, and in the case of inter-system redirection to EPS with N26 interface, see clause 4.11.1.3.2. In either case the UE initiates TAU procedure; or

6b. In the case of inter-system redirection to EPS without N26 interface, see clause 4.11.2.2. If the UE supports Request Type flag "handover" for PDN connectivity request during the attach procedure as described in clause 5.3.2.1 of TS 23.401 [13] and has received the indication that interworking without N26 is supported, then the UE initiates Attach with PDN connectivity request with request type "handover".

In inter-system redirection, the UE uses the emergency indication in the RRC message as specified in clause 6.2.2 of TS 36.331 [16] and E-UTRAN provides the emergency indication to MME during Tracking Area Update or Attach procedure. For the handover procedure see clause 4.11.1.6.1, step 1.

7. After completion of the mobility procedure to EPS or as part of the 5GS to EPS handover procedure (see clause 4.11.1.6.1), the SMF/PGW re-initiates the setup of the dedicated bearer for IMS voice, mapping the 5G QoS to EPC QoS parameters. The PGW-C+SMF behaves as specified in clause 4.9.1.3.1. The PGW-C+SMF reports about Successful Resource Allocation and Access Network Information if subscribed by PCF.

8. The IMS voice session establishment is continued.

At least for the duration of the voice call in EPS the E-UTRAN is configured to not trigger any handover to 5GS.

[TS 24.501, clause 4.5.4.1]

When the UE is in 5GMM-IDLE mode, upon receiving a request from the upper layers for an access attempt, the NAS shall categorize the access attempt into access identities and an access category following subclause 4.5.2, table 4.5.2.1 and table 4.5.2.2, and subclause 4.5.3, and provide the applicable access identities and the access category to the lower layers for the purpose of access control checking. In this request to the lower layer the NAS can also provide to the lower layer the RRC establishment cause determined as specified in subclause 4.5.6 of this specification.

NOTE 1: The access barring check is performed by the lower layers.

NOTE 2: As an implementation option, the NAS can provide the RRC establishment cause to the lower layers after being informed by the lower layers that the access attempt is allowed.

If the UE has uplink user data pending for one or more PDU sessions when it builds a REGISTRATION REQUEST or SERVICE REQUEST message as initial NAS message, the UE shall indicate the respective PDU sessions in the Uplink data status IE as specified in subclause 5.5.1.3.2 and 5.6.1.2, regardless of the access category for which the access barring check is performed.

NOTE 3: The UE indicates pending user data for all the respective PDU sessions, even if barring timers are running for some of the corresponding access categories.

If the lower layers indicate that the access attempt is allowed, the NAS shall initiate the procedure to send the initial NAS message for the access attempt.

If the lower layers indicate that the access attempt is barred, the NAS shall not initiate the procedure to send the initial NAS message for the access attempt. Additionally:

a) if the event which triggered the access attempt was an MO-MMTEL-voice-call-started indication or an MO-MMTEL-video-call-started indication:

- 1) if the UE is operating in the single-registration mode and the UE's usage setting is "voice centric", the UE may attempt to select an E-UTRA cell connected to EPC. If the UE finds a suitable E-UTRA cell connected to EPC, it then proceeds with the appropriate EMM specific procedures and, if necessary, ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.2 and 3GPP TS 24.301 [15];
- 2) if the UE is operating in the dual-registration mode, the UE may proceed in S1 mode with the appropriate EMM specific procedures and ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.3 and 3GPP TS 24.301 [15];
- 3) otherwise, the NAS shall notify the upper layers that the access attempt is barred. In this case, upon receiving an indication from the lower layers that the barring is alleviated for the access category with which the access attempt was associated, the NAS shall notify the upper layers that the barring is alleviated for the access category and may initiate the procedure to send the initial NAS message, if still needed; and

b) if the event which triggered the access attempt was an MO-SMSoIP-attempt-started indication:

- 1) if the UE is operating in the single-registration mode, the UE may attempt to select an E-UTRA cell connected to EPC. If the UE finds a suitable E-UTRA cell connected to EPC, it then proceeds with the appropriate EMM specific procedures and, if necessary, ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.2 and 3GPP TS 24.301 [15];
- 2) if the UE is operating in the dual-registration mode, the UE may proceed in S1 mode with the appropriate EMM specific procedures and ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.3 and 3GPP TS 24.301 [15];
- 3) otherwise, the NAS layer shall notify the upper layers that the access attempt is barred. In this case, upon receiving an indication from the lower layers that the barring is alleviated for the access category with which the access attempt was associated, the NAS shall notify the upper layers that the barring is alleviated for the access category and may initiate the procedure to send the initial NAS message, if still needed.

NOTE 4: Barring timers, on a per access category basis, are run by the lower layers. At expiry of barring timers, the indication of alleviation of access barring is indicated to the NAS on a per access category basis.

[TS 24.501, clause 4.8.2.3]

At inter-system change from N1 mode to S1 mode in EMM-IDLE mode when: (PDU SEESION ACTIVE)

- a) the UE supports non-IP PDN type and at least one PDU session is active; or
- b) the UE does not support non-IP PDN type and at least one PDU session of IPv4, IPv6 or IPv4v6 PDU session type is active,

the UE shall proceed as follows:

- a) if the UE supports sending an ATTACH REQUEST message containing a PDN CONNECTIVITY REQUEST message with request type set to "handover" to transfer a PDU session from N1 mode to S1 mode and the UE has received an "interworking without N26 interface supported" indication from the network, the UE shall:
 - 1) enter substates EMM-DEREGISTERED.NORMAL-SERVICE and 5GMM-REGISTERED.NO-CELL-AVAILABLE;
 - 2) map the PDU session(s) which the UE intends to transfer to EPS to the default EPS bearer context of the corresponding PDN connection(s) as specified in subclause 6.1.4.2; and
 - 3) initiate an EPS attach procedure and include a PDN CONNECTIVITY REQUEST message with request type set to "handover" in the ATTACH REQUEST message to activate a default EPS bearer context for one of the active PDU sessions which the UE intends to transfer to EPS.

After successful completion of the EPS attach procedure, the UE shall reset the registration attempt counter and the attach attempt counter (see 3GPP TS 24.301 [15]) and attempt to activate each of the other default EPS bearer contexts, if any, by initiating a stand-alone PDN connectivity procedure with request type set to "handover" in the PDN CONNECTIVITY REQUEST message; and

b) otherwise, enter substates EMM-REGISTERED.NORMAL-SERVICE and 5GMM-REGISTERED.NO-CELL-AVAILABLE and initiate a tracking area update procedure (see 3GPP TS 24.301 [15]).

At inter-system change from N1 mode to S1 mode in EMM-IDLE mode when: (NO PDU SESSION)

- a) the UE supports non-IP PDN type and no PDU session is active; or
 - b) the UE does not support non-IP PDN type and no PDU session of IPv4, IPv6 or IPv4v6 PDU session type is active,
- the UE shall enter substates EMM-DEREGISTERED.NORMAL-SERVICE and 5GMM-DEREGISTERED.NO-CELL-AVAILABLE, and initiate an attach procedure.

At inter-system change from S1 mode to N1 mode in 5GMM-IDLE mode, the UE shall:

- a) enter substate 5GMM-REGISTERED.NORMAL-SERVICE and substate EMM-REGISTERED.NO-CELL-AVAILABLE;
- b) map the default EPS bearer context(s) of the PDN connection(s) which the UE intends to transfer to 5GS, if any, to the corresponding PDU session(s) as specified in subclause 6.1.4.2; and
- c) initiate the registration procedure for mobility and periodic registration update indicating "mobility registration updating" in the 5GS registration type IE of the REGISTRATION REQUEST message (see subclause 5.5.1.3).

After having successfully registered in N1 mode the UE shall reset the registration attempt counter and the attach attempt counter (see 3GPP TS 24.301 [15]) and:

- a) if the UE supports the PDU session establishment procedure with request type set to "existing PDU session" to transfer a PDN connection from S1 mode to N1 mode and the UE has received an "interworking without N26 interface supported" indication from the network, attempt to transfer the PDN connection(s) which the UE intends to transfer to 5GS, if any, from S1 mode to N1 mode by initiating the PDU session establishment procedure with request type set to "existing PDU session"; and
- b) otherwise, establish PDU session(s) corresponding to the PDN connection(s) which the UE intends to transfer to 5GS, if any, by initiating the PDU session establishment procedure with request type set to "initial request".

See subclause 5.1.4.3 for coordination between 5GMM and EMM and subclause 6.1.4.2 for coordination between 5GSM and ESM.

[TS 38.331, clause 5.3.11]

UE shall:

- 1> reset MAC;
- 1> if T302 is running;
- 2> stop timer T302;
- 2> perform the actions as specified in 5.3.14.4;
- 1> stop all timers that are running except T320 and T325;
- 1> discard the UE Inactive AS context;
- 1> set the variable *pendingRnaUpdate* to *false*, if that is set to *true*;
- 1> discard the K_{gNB} , the K_{RRCEnc} key, the K_{RRCint} , the K_{UPint} key and the K_{UPenc} key, if any;
- 1> release all radio resources, including release of the RLC entity, the MAC configuration and the associated PDCP entity and SDAP for all established RBs;
- 1> indicate the release of the RRC connection to upper layers together with the release cause;
- 1> enter RRC_IDLE and perform cell selection as specified in TS 38.304 [20], except if going to RRC_IDLE was triggered by selecting an inter-RAT cell while T311 was running;
- 1> if going to RRC_IDLE was triggered by reception of the *RRCRelease* message including a *waitTime*:

2> start timer T302 with the value set to the *waitTime*;

2> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2'.

11.1.6.3 Test description

11.1.6.3.1 Pre-test conditions

System Simulator:

- 2 cells
- NR Cell 1 as defined in TS 38.508-1 [4] Table 4.4.2-3. System information combination NR-6 as defined in TS 38.508-1 [4], sub-clause 4.4.3.1.2.
- E-UTRA Cell 1 as defined in TS 36.508 [7] Table 4.4.2-2. System information combination 31 as defined in TS 36.508 [7], sub-clause 4.4.3.1.1.

UE:

None.

Preamble:

- With E-UTRA Cell 1 "Serving cell" and NR Cell 1 "Non-suitable "Off" cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state RRC_IDLE Connectivity (*E-UTRA/EPC*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established
- The UE is switched-off
- With E-UTRA Cell 1 "Non-suitable "Off" cell" and NR Cell 1 "Serving cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), in accordance with the procedure described in TS 38.508-1 [4], with one IMS PDU session on NR Cell 1, Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.

11.1.6.3.2 Test procedure sequence

Table 11.1.6.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U – S | Message | | |
| 1 | The SS configures:
- E-UTRA Cell 1 as "Suitable neighbour intra-frequency cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3. | - | - | - | - |
| - | EXCEPTION: Unless otherwise stated the following messages are exchange on NRCell 1. | - | - | - | - |
| 2 | The SS transmits a <i>Paging</i> message. | <-- | NR RRC: Paging | - | - |
| 3 | The UE transmits an <i>RRCSetupRequest</i> message. | --> | NR RRC: RRCSetupRequest | - | - |
| 4 | The SS transmits an <i>RRCSetup</i> message. | <-- | NR RRC: RRCSetup | - | - |
| 5 | The UE transmits an <i>RRCSetupComplete</i> message and a SERVICE REQUEST message. | --> | NR RRC: RRCSetupComplete
5GMM: SERVICE REQUEST | - | - |

| | | | | | |
|-------|--|-----|---|---|---|
| 6 | The SS transmits an <i>RRCRelease</i> message. | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| - | EXCEPTION: The following message was sent on on E-UTRA Cell 1. | - | - | - | - |
| 7 | UE transmits an <i>RRCConnectionRequest</i> message. | --> | RRC: <i>RRCConnectionRequest</i> | | |
| 8 | SS transmits an <i>RRCConnectionSetup</i> message. | <-- | RRC: <i>RRCConnectionSetup</i> | | |
| - | EXCEPTION: Steps 8a1 to 8b3 describe behaviour that depends on the UE implementation; the "lower case letter" identifies a step sequence that take place depending on the UE implementation. | - | - | - | - |
| 8a1 | If the UE tries to preserve the IP address of the PDN connection then check does the UE transmits an ATTACH REQUEST message? | --> | RRC:
<i>RRCConnectionSetupComplete</i>
NAS: ATTACH REQUEST | 1 | P |
| 8b1 | Else check: does the UE transmit a TRACKING AREA UPDATE REQUEST message? | --> | RRC:
<i>RRCConnectionSetupComplete</i>
NAS: TRACKING AREA UPDATE REQUEST | 1 | P |
| 8b2 | The SS transmits a TRACKING AREA UPDATE REJECT message to UE. | <-- | RRC: <i>DLInformationTransfer</i>

NAS: TRACKING AREA UPDATE REQUEST REJECT | - | - |
| 8b3 | The UE transmits an ATTACH REQUEST message. | --> | RRC: <i>ULInformationTransfer</i>

NAS: ATTACH REQUEST | - | - |
| 9-20 | Steps 5 to 16 of the generic test procedure for UE registration(TS36.508 Table 4.5.2.3-1) | - | - | - | - |
| - | EXCEPTION: In parallel to the events described in steps 21 to 29 the UE may perform IMS re-registration on EUTRAN as per steps as defined in 34.229-1 subclause C.46. | - | - | - | - |
| 21-28 | Steps 7-14 from the Generic Test Procedure for MTSI MT speech call establishment (TS 36.508 table 4.5A.7.3-1) are performed. | - | - | - | - |
| 29 | Check: Does the UE transmit an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message? | --> | RRC: <i>ULInformationTransfer</i>

NAS:ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT | 1 | P |
| 30-40 | Steps16-26 from the Generic Test Procedure for MTSI MT speech call establishment (TS 36.508 table 4.5A.7.3-1) are performed. | - | - | - | - |
| 41 | The SS transmits a DEACTIVATE EPS BEARER CONTEXT REQUEST including the EPS bearer identity of the default EPS bearer to the emergency PDN. | <-- | DEACTIVATE EPS BEARER CONTEXT REQUEST | - | - |
| 42 | The UE transmits a DEACTIVATE EPS | --> | DEACTIVATE EPS BEARER | - | - |

| | | | | | |
|--|------------------------|--|----------------|--|--|
| | BEARER CONTEXT ACCEPT. | | CONTEXT ACCEPT | | |
|--|------------------------|--|----------------|--|--|

11.1.6.3.3 Specific message contents

Table 11.1.6.3.3-0: REGISTRATION ACCEPT (preamble; step 14, TS 38.508-1 [4], Table 4.5.2.2-2)

| Derivation Path: 38.508-1[4] Table 4.7.1-7 | | | |
|--|------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Extended protocol discriminator | '0111 1110'B | 5GS mobility management messages | |
| Security header type | '0000'B | Plain 5GS NAS message, not security protected | |
| Spare half octet | '0000'B | | |
| 5GS network feature support | '0100 0001 0000 0000'B | Interworking without N26 interface supported | |

Table 11.1.6.3.3-1: RRCRelease (step 6, table 11.1.6.3.2-1)

| Derivation path: 38.508-1 [4] Table Table 4.6.1-16 | | | |
|--|---------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo ::= CHOICE { | | | |
| eutra.SEQUENCE{ | | | |
| eutraFrequency | Downlink EARFCN of cell 1 | | |
| cnType | epc | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 11.1.6.3.3-1A: ATTACH REQUEST (step 8a1, table 11.1.6.3.2-1)

| |
|--|
| Derivation Path: TS 36.508 [7], Table 4.7.2-4. |
|--|

| Information Element | Value/Remark | Comment | Condition |
|-----------------------------|---|---------|-----------|
| NAS key set identifier | KSI _{ASME} that was created when the UE last registered to EPC E-UTRA | | |
| Old GUTI | GUTI, mapped from the 5G-GUTI assigned at the initial registration when the UE entered N1 | | |
| Last visited registered TAI | The TAI the last visited E-UTRA Cell belonged to, if any. Not included if the UE does not have last stored EPC TAI. | | |
| Old GUTI type | "Native GUTI" | | |
| ESM message container | PDN CONNECTIVITY REQUEST message to active PDU sessions which the UE intends to transfer to EPS. | | |

Table 11.1.5.3.3-1B: PDN CONNECTIVITY REQUEST (step 8a1, table 11.1.6.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.3-20 | | | |
|--|---|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| EPS bearer identity | '0000'B | No EPS bearer identity assigned | |
| Procedure transaction identity | Any value from 1 to 254 | | |
| PDN connectivity request message identity | '1101 0000'B | PDN connectivity request | |
| Request type | '010'B | Handover | |
| PDN type | Any value between '001'B, '010'B, '011'B and '100'B | The allowed values are respectively IPv4, IPv6, IPv4v6 and "unused but interpreted as IPv6 by the network" | |
| Protocol configuration options | PDU session ID of 5GS
PDU session | | |

Table 11.1.6.3.3-2: TRACKING AREA UPDATE REQUEST (step 8b1, table 11.1.6.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-27, condition NR. | | | |
|---|--------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |

| | | | |
|-----------------------------|---|--|--|
| "Active" flag | 0001 | Bearer Establishment requested | |
| EPS bearer context status | Present | EBI corresponding to active PDU Sessions need to be set to 1 | |
| NAS key set identifier | KSI _{ASME} that was created when the UE last registered to EPC E-UTRA | | |
| Old GUTI | GUTI, mapped from the 5G-GUTI assigned at the initial registration when the UE entered N1 | | |
| Last visited registered TAI | The TAI the last visited E-UTRA Cell belonged to, if any. Not included if the UE does not have last stored EPC TAI. | | |
| Old GUTI type | "Native GUTI" | | |
| UE status | "UE is in 5GMM-REGISTERED state" | | |

Table 11.1.6.3.3-3: TRACKING AREA UPDATE REJECT (step8b2, table 11.1.6.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-26. | | | |
|---|--------------|--|-----------|
| Information Element | Value/Remark | Comment | Condition |
| EMM cause | '0000 1001'B | #9"UE identity cannot be derived by the network" | |

Table 11.1.6.3.3-4: ATTACH REQUEST (step 8b3, table 11.1.6.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-4. | | | |
|--|----------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| IMSI | IMSI of the UE | | |

11.1.7 Emergency call setup from NR RRC_IDLE / Emergency Services Fallback to EPS with redirection / Single registration mode with N26 interface / Success

11.1.7.1 Test Purpose (TP)

(1)

with { UE supporting both S1 mode and N1 mode and operating in single-registration mode, and, the Network has indicated "interworking without N26 interface not supported", and, the UE in NR RRC_IDLE state }

ensure that {

when { User initiates an Emergency call and the UE completes Access control and checking in 5GMM-IDLE mode }

then { UE requests the establishment of an Emergency call by transmitting an *RRCSetupRequest* message with *establishmentCause* set to 'emergency', and, a SERVICE REQUEST message with Service type set to 'emergency services fallback' }

}

(2)

with { UE is NR RRC_CONNECTED state after having requested a MMTEL call establishment and the MO IMS voice session establishment has been initiated }

ensure that {

when { UE receives a RRCRelease message which includes *redirectedCarrierInfo* indicating redirection with *cnType=epc* }

then { UE selects the E-UTRA cell, performs a TAU procedure, and, successfully completes the Emergency call setup in EPS }

}

11.1.7.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], subclauses 5.6.1.1, 5.6.1.2, 5.6.1.4; TS 23.502 [31], subclause 4.13.4.2; TS 24.301 [21], subclauses 4.4.2.3, 5.5.3.2.2. Unless otherwise stated these are Rel-15 requirements.

NOTE: Conformance requirements in regard to establishing an emergency call in EPS are not provided. This can be found in IMS Emergency tests specified in TS 36.523-1 [13].

[TS 24.501, subclause 5.6.1.1]

The UE shall invoke the service request procedure when:

...

h) the UE, in 5GMM-IDLE, 5GMM-CONNECTED mode over 3GPP access, or 5GMM-CONNECTED mode with RRC inactive indication, receives a request for emergency services fallback from the upper layer and performs emergency services fallback as specified in subclause 4.13.4.2 of 3GPP TS 23.502 [9]; or

[TS 24.501, subclause 5.6.1.2]

For case h) in subclause 5.6.1.1, the UE shall send a SERVICE REQUEST message with service type set to "emergency services fallback".

[TS 24.501, subclause 5.6.1.4]

For case h) in subclause 5.6.1.1, the UE shall treat the indication from the lower layers when the UE has changed to S1 mode or E-UTRA connected to 5GCN (see 3GPP TS 23.502 [9]) as successful completion of the procedure and stop timer T3517.

[TS 23.502, subclause 4.13.4.2]

The call flow in Figure 4.13.4.2-1 describes the procedure for emergency services fallback.

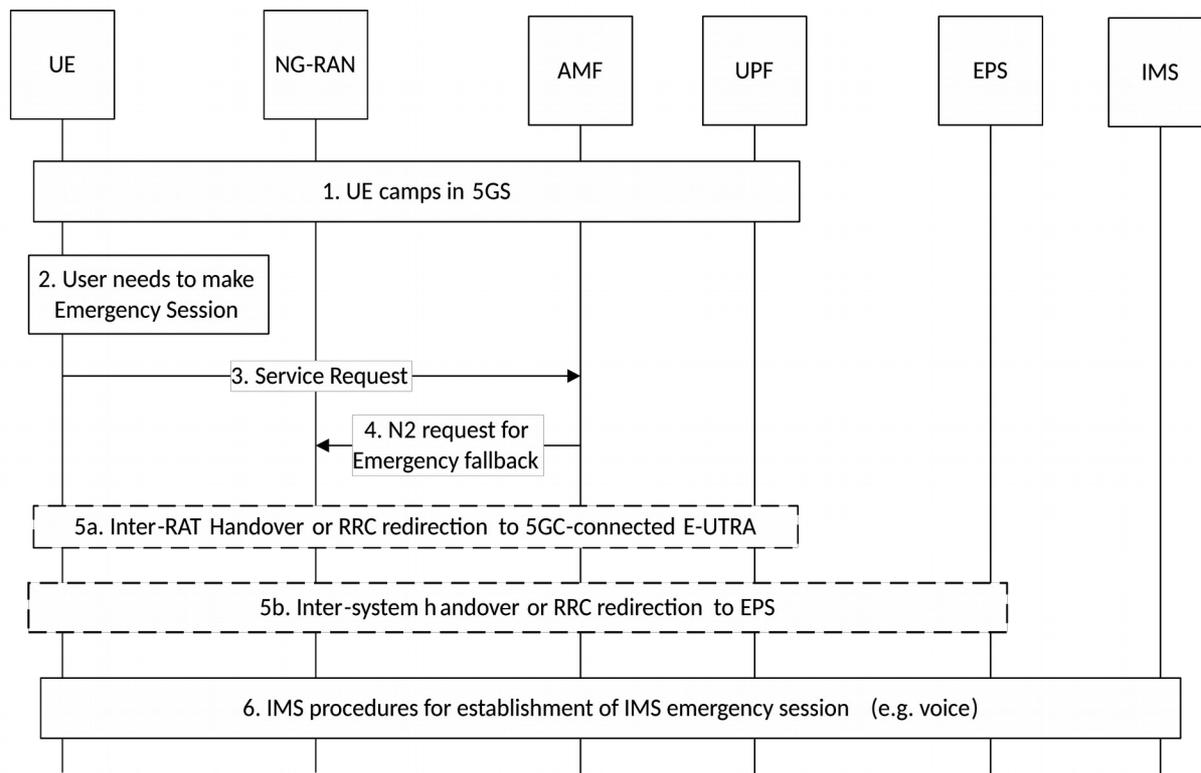


Figure 4.13.4.2-1: Emergency Services Fallback

1. UE camps on E-UTRA or NR cell in the 5GS (in either CM_IDLE or CM_CONNECTED state).
2. UE has a pending IMS emergency session request (e.g. voice) from the upper layers.
3. If the AMF has indicated support for emergency services using fallback via the Registration Accept message for the current RAT, the UE sends a Service Request message indicating that it requires emergency services fallback.
- ...
5. Based on the target CN indicated in message 4, one of the following procedures is executed by NG-RAN:
 - 5a. Inter-RAT Handover or RRC redirection to 5GC-connected E-UTRA
 - 5b. Inter-system handover or RRC redirection to EPS. NG-RAN uses the security context provided by the AMF to secure the redirection procedure.
- ...

If the redirection procedure is used either in 5a or 5b the target CN is also conveyed to the UE in order to be able to perform the appropriate NAS procedures (S1 or N1 Mode).

[TS 24.301, subclause 4.4.2.3]

Secure exchange of NAS messages via a NAS signalling connection is usually established by the MME during the attach procedure by initiating a security mode control procedure. After successful completion of the security mode control procedure, all NAS messages exchanged between the UE and the MME are sent integrity protected using the current EPS security algorithms, and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered using the current EPS security algorithms.

...

During inter-system change from N1 mode to S1 mode in 5GMM-IDLE mode, if the UE is operating in the single-registration mode and:

1) if the tracking area updating procedure is initiated as specified in 3GPP TS 24.501 [54], the UE shall transmit a TRACKING AREA UPDATE REQUEST message integrity protected with the current 5G NAS security context and the UE shall derive a mapped EPS security context (see subclause 8.6.1 of 3GPP TS 33.501 [56]). The UE shall include the eKSI indicating the 5G NAS security context value in the TRACKING AREA UPDATE REQUEST message.

After receiving the TRACKING AREA UPDATE REQUEST message including the eKSI, the MME forwards the TRACKING AREA UPDATE REQUEST message to the source AMF, if possible, to obtain the mapped EPS security context from the AMF as specified in 3GPP TS 33.501 [56]. The MME re-establishes the secure exchange of NAS messages by either:

- replying with a TRACKING AREA UPDATE ACCEPT message that is integrity protected and ciphered using the mapped EPS NAS security context. From this time onward, all NAS messages exchanged between the UE and the MME are sent integrity protected and except for the messages specified in subclause 4.4.5, all NAS messages exchanged between the UE and the MME are sent ciphered; or

[TS 24.301, subclause 5.5.3.2.2]

The UE in state EMM-REGISTERED shall initiate the tracking area updating procedure by sending a TRACKING AREA UPDATE REQUEST message to the MME,

...

z) when the UE performs inter-system change from N1 mode to S1 mode in EMM-IDLE mode, the UE operates in single-registration mode, and conditions specified in 3GPP TS 24.501 [54] apply;

...

zd) when the UE performs inter-system change from N1 mode to S1 mode in EMM-CONNECTED mode.

For all cases except case b, the UE shall set the EPS update type IE in the TRACKING AREA UPDATE REQUEST message to "TA updating". For case b, the UE shall set the EPS update type IE to "periodic updating".

...

When initiating a tracking area updating procedure while in S1 mode, the UE shall use the current EPS NAS integrity key to integrity protect the TRACKING AREA UPDATE REQUEST message, unless the UE is performing inter-system change from N1 mode to S1 mode.

...

If a UE has established PDN connection(s) and uplink user data pending to be sent via user plane when it initiates the tracking area updating procedure, or uplink signalling not related to the tracking area updating procedure when the UE does not support control plane CIoT EPS optimization, it may also set an "active" flag in the TRACKING AREA UPDATE REQUEST message to indicate the request to establish the user plane to the network and to keep the NAS signalling connection after the completion of the tracking area updating procedure.

...

If the UE has a current EPS security context, the UE shall include the eKSI (either KSI_{ASME} or KSI_{SGSN}) in the NAS Key Set Identifier IE in the TRACKING AREA UPDATE REQUEST message. Otherwise, the UE shall set the NAS Key Set Identifier IE to the value "no key is available". If the UE has a current EPS security context, the UE shall integrity protect the TRACKING AREA UPDATE REQUEST message with the current EPS security context. Otherwise the UE shall not integrity protect the TRACKING AREA UPDATE REQUEST message.

...

For the case z and zd, the TRACKING AREA UPDATE REQUEST message shall be integrity protected using the 5GS security context available in the UE. The UE shall include a GUTI, mapped from 5G-GUTI (see 3GPP TS 23.501 [54] and 3GPP TS 23.003 [2]), in the Old GUTI IE in the TRACKING AREA UPDATE REQUEST message. In addition, the UE shall include Old GUTI type IE with GUTI set to "Native GUTI", and the UE shall include a UE status IE with a 5GMM registration status set to "UE is in 5GMM-REGISTERED state".

When the tracking area updating procedure is initiated in EMM-IDLE mode, the UE may also include an EPS bearer context status IE in the TRACKING AREA UPDATE REQUEST message, indicating which EPS bearer contexts are active in the UE. The UE shall include the EPS bearer context status IE in TRACKING AREA UPDATE REQUEST message:

- ...
- for the case z; and

...

If the UE initiates the first tracking area updating procedure following an initial registration in N1 mode and the UE is operating in the single-registration mode, the UE shall include a UE radio capability information update needed IE in the TRACKING AREA UPDATE REQUEST message.

...

If the UE supports NB-S1 mode, Non-IP PDN type, or N1 mode, then the UE shall support the extended protocol configuration options IE.

For all cases except case b, if the UE supports the extended protocol configuration options IE, then the UE shall set the ePCO bit to "extended protocol configuration options supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message.

...

For all cases except case b, if the UE supports dual connectivity with NR, then the UE shall set the DCNR bit to "dual connectivity with NR supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message and shall include the UE additional security capability IE in the TRACKING AREA UPDATE REQUEST message.

...

For all cases except case b, if the UE supports N1 mode, the UE shall set the N1mode bit to "N1 mode supported" in the UE network capability IE of the TRACKING AREA UPDATE REQUEST message and shall include the UE additional security capability IE in the TRACKING AREA UPDATE REQUEST message.

11.1.7.3 Test description

11.1.7.3.1 Pre-test conditions

System Simulator:

- 2 cells
- NR Cell 1 as defined in TS 38.508-1 [4] Table 4.4.2-3. System information combination NR-6 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2.
- E-UTRA Cell 1 as defined in TS 36.508 [7] Table 4.4.2-2. System information combination 31 as defined in TS 36.508 [7], subclause 4.4.3.1.1.

UE:

None.

Preamble:

- With E-UTRA Cell 1 "Serving cell" and NR Cell 1 "Non-suitable "Off" cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state RRC_IDLE Connectivity (*E-UTRA/EPC*) in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-1. 4G GUTI and eKSI are assigned and security context established
- the UE is switched-off
- With E-UTRA Cell 1 "Non-suitable "Off" cell" and NR Cell 1 "Serving cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3, the UE is brought to state 1N-A, RRC_IDLE Connectivity (NR), in accordance with the procedure described in TS 38.508-1 [4], Table 4.5.2.2-2. 5G-GUTI and ngKSI are assigned and security context established.

11.1.7.2 Test procedure sequence

Table 11.1.7.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----------|---|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- E-UTRA Cell 1 as "Suitable neighbour intra-frequency cell" in accordance with TS 38.508-1 [4], Table 6.2.2.1-3. | - | - | - | - |
| - | EXCEPTION: Unless otherwise stated the following messages are exchange on NR Cell 1. | - | - | - | - |
| 2 | Make the UE initiate an Emergency call. | - | - | - | - |
| 3 | Check: Does the UE transmit an <i>RRCSetupRequest</i> message with <i>establishmentCause</i> set to 'emergency'? | --> | NR RRC: <i>RRCSetupRequest</i> | 1 | P |
| 4 | The SS transmits an <i>RRCSetup</i> message. | <-- | NR RRC: <i>RRCSetup</i> | - | - |
| 5 | Check: Does the UE transmit a SERVICE REQUEST message with Service type set to 'emergency services fallback'?

NOTE: The UE shall request 'emergency services fallback' when the AMF has indicated support for emergency services using fallback via the Registration Accept message for the current RAT as per TS 23.502 [31], subclause 4.13.4.2. | --> | NR RRC: <i>RRCSetupComplete</i>
5GMM: SERVICE REQUEST | 1 | P |
| 6 | SS transmits <i>RRCRelease</i> message indicating redirection to E-UTRA Cell 1. | <-- | NR RRC: <i>RRCRelease</i> | | |
| - | EXCEPTION: Unless otherwise stated the following messages are exchange on E-UTRA Cell 1. | - | - | - | - |
| 7 | The UE transmits an <i>RRCConnectionRequest</i> message with 'establishmentCause' set to 'emergency'. | --> | RRC: <i>RRCConnectionRequest</i> | 2 | P |
| 8-10
A | Steps 2-5 from the Tracking area updating procedure as specified in TS 38.508-1 [4], Table 4.9.7.2.2-1 are performed (UE performs inter-system change from N1 to S1, mapped | - | - | - | - |

| | | | | | |
|-------|---|-----|--|---|---|
| | EPS NAS security context from the 5GC). | | | | |
| 11 | Check: Does the UE transmit a TRACKING AREA UPDATE COMPLETE message? | --> | RRC: <i>ULInformationTransfer</i>
NAS: TRACKING AREA UPDATE COMPLETE | 2 | P |
| 12-19 | Steps 7-14 from the Generic Test Procedure for IMS Emergency call establishment in EUTRA: Normal Service as specified in TS 36.508 [7], Table 4.5A.4.3-1 are performed. | - | - | - | - |
| 20 | Check: Does the UE transmit an ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT message? | --> | RRC: <i>ULInformationTransfer</i>
NAS: ACTIVATE DEDICATED EPS BEARER CONTEXT ACCEPT | 2 | P |
| 21 | The SS waits 1 second. | - | - | - | - |
| 22 | Release IMS Call as specified in the generic procedure in TS 34.229-1 [35] subclause C.32. | - | - | - | - |

11.1.7.3.3 Specific message contents

Table 11.1.7.3.1-1: REGISTRATION REQUEST (Preamble; TS 38.508-1 [4], Table 4.5.2.2-2)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6 | | | |
|---|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM capability | '0000 0xx1' | S1 mode supported

x - not checked | |

Table 11.1.7.3.1-2: REGISTRATION ACCEPT (Preamble; TS 38.508-1 [4], Table 4.5.2.2-2)

| Derivation Path: 38.508-1 [4], Table 4.7.1-7 | | | |
|---|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS network feature support | | | |
| Emergency service fallback indicator for 3GPP access (EMF) (octet 3, bit 5 and bit 6) | '01' | Emergency services fallback supported in NR connected to 5GCN only | |

Table 11.1.7.3.1-3: RRCSetupRequest (step 3, table 11.1.7.3.1-2)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-23 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCSetupRequest ::= SEQUENCE { | | | |

| | | | |
|----------------------------|-----------|--|--|
| rrcSetupRequest SEQUENCE { | | | |
| establishmentCause | emergency | | |
| } | | | |
| } | | | |

Table 11.1.7.3.1-4: SERVICE REQUEST (step 5, table 11.1.7.3.1-2)

| Derivation path: TS 38.508-1 [4], Table 4.7.1-16 | | | |
|--|--------------|-----------------------------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Service type | '0100'B | emergency services fallback | |

Table 11.1.7.3.1-5: RRCRelease (step 6, table 11.1.7.3.1-2)

| Derivation path: TS 38.508-1 [4], Table 4.6.1-16 | | | |
|--|----------------------------------|---------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| redirectedCarrierInfo ::= CHOICE { | | | |
| eutra SEQUENCE { | | | |
| eutraFrequency | Downlink EARFCN of E-UTRA Cell 1 | | |
| cnType | epc | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 11.1.7.3.1-6: RRCConnectionRequest (step 7, Table 11.2.1.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.6.1-16 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCConnectionRequest ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcConnectionRequest-r8 SEQUENCE { | | | |

| | | | |
|--------------------|-----------|--|--|
| establishmentCause | emergency | | |
| } | | | |
| } | | | |
| } | | | |

Table 11.1.7.3.1-7: Void

Table 11.1.7.3.1-8: Void

Table 11.1.7.3.1-9: Message PDN CONNECTIVITY REQUEST (step 14, Table 11.2.1.3.2-1)

| Derivation Path: TS 36.508 [7], Table 4.7.2-1. | | | |
|--|--------------|-----------|-----------|
| Information Element | Value/Remark | Comment | Condition |
| Request type | '0100'B | emergency | |
| Access point name | Not present | | |

Table 11.1.7.3.1-10: Message ACTIVATE DEFAULT EPS BEARER CONTEXT REQUEST (step 15, Table 11.2.1.3.2-1)

| Derivation path: TS 36.508 [7], Table 4.7.3-6 and table 4.6.1-8 with condition UM-DRB-ADD(2). | | | |
|---|---|---|-----------|
| Information Element | Value/Remark | Comment | Condition |
| EPS bearer identity | an additional EPS Bearer Id different from default EPS Bearer Id or/and any mapped EPS bearer | | |
| Access point name | sos | APN value as recommended by IR.88 clause 6.4 [39] | |

11.2 5GS/RAT Fallback

FFS

11.3 Unified Access Control (UAC)

11.3.1 to 11.3.2

11.3.3 UAC / Access Identity 0 / AC8 / RRC_INACTIVE / RNAUpdate/RRC Resume

11.3.3.1 Test Purpose (TP)

(1)

with { UE not configured for special AIs (1,2,11-15) having received SIB1 indicating UAC info containing 0% accessibility for Access category 8 in NR RRC_INACTIVE state }

ensure that {

when { RRC connection is to be resumed due to an RNA update with no emergency services ongoing }

then { UE resume attempt is barred and UE does not attempt the connection }

}

(2)

with { SIB1 indicating UAC info containing 100% accessibility for Access category 8 in NR RRC_INACTIVE state }

ensure that {

when { Access Barring is alleviated for Access Category 8 & upper layers do not request resumption of an RRC connection & variable pendingRnaUpdate is set to true }

then { UE initiates RRC connection resume procedure with resumeCause value set to rna-Update }

}

11.3.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331, clause 5.3.13.2, 5.3.13.8, 5.3.14.2, 5.3.14.4 and 5.3.14.5. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, clause 5.3.13.2]

The UE initiates the procedure when upper layers or AS (when responding to RAN paging or upon triggering RNA updates while the UE is in RRC_INACTIVE) requests the resume of a suspended RRC connection.

The UE shall ensure having valid and up to date essential system information as specified in clause 5.2.2.2 before initiating this procedure.

Upon initiation of the procedure, the UE shall:

...

1> else if the resumption of the RRC connection is triggered due to an RNA update as specified in 5.3.13.8:

2> if an emergency service is ongoing:

NOTE: How the RRC layer in the UE is aware of an ongoing emergency service is up to UE implementation.

3> select '2' as the Access Category;

- 3> set the *resumeCause* to *emergency*;
- 2> else:
 - 3> select '8' as the Access Category;
 - 2> perform the unified access control procedure as specified in 5.3.14 using the selected Access Category and one or more Access Identities to be applied as specified in TS 24.501 [23];
 - 3> if the access attempt is barred:
 - 4> set the variable *pendingRnaUpdate* to *true*;
 - 4> the procedure ends;

[TS 38.331, clause 5.3.13.8]

In RRC_INACTIVE state, the UE shall:

- 1> if T380 expires; or
- 1> if RNA Update is triggered at reception of SIB1, as specified in 5.2.2.4.2:
 - 2> initiate RRC connection resume procedure in 5.3.13.2 with *resumeCause* set to *rna-Update*;
 - 1> if barring is alleviated for Access Category '8', as specified in 5.3.14.4:
 - 2> if upper layers do not request RRC the resumption of an RRC connection, and
 - 2> if the variable *pendingRnaUpdate* is set to *true*:
 - 3> initiate RRC connection resume procedure in 5.3.13.2 with *resumeCause* value set to *rna-Update*.

[TS 38.331, clause 5.3.14.2]

Upon initiation of the procedure, the UE shall:

- 1> if timer T390 is running for the Access Category:
 - 2> consider the access attempt as barred;
 - 1> else if timer T302 is running and the Access Category is neither '2' nor '0':
 - 2> consider the access attempt as barred;
 - 1> else:
 - 2> if the Access Category is '0':
 - 3> consider the access attempt as allowed;
 - 2> else:
 - ...
 - 3> else if SIB1 includes *uac-BarringForCommon*:
 - 4> in the remainder of this procedure use the *uac-BarringForCommon* (i.e. presence or absence of these parameters) included in *SIB1*;
 - 3> else:
 - 4> consider the access attempt as allowed;
 - 3> if *uac-BarringForCommon* is applicable or the *uac-ACBarringListType* indicates that *uac-ExplicitACBarringList* is used:

4> if the corresponding *UAC-BarringPerCatList* contains a *UAC-BarringPerCat* entry corresponding to the Access Category:

5> select the *UAC-BarringPerCat* entry;

5> if the *uac-BarringInfoSetList* contains a *UAC-BarringInfoSet* entry corresponding to the selected *uac-barringInfoSetIndex* in the *UAC-BarringPerCat*:

6> select the *UAC-BarringInfoSet* entry;

6> perform access barring check for the Access Category as specified in 5.3.14.5, using the selected *UAC-BarringInfoSet* as "UAC barring parameter";

5> else:

6> consider the access attempt as allowed;

4> else:

5> consider the access attempt as allowed;

[TS 38.331, clause 5.3.14.4]

The UE shall:

...

1> else if timer T390 corresponding to an Access Category other than '2' expires or is stopped, and if timer T302 is not running:

2> consider the barring for this Access Category to be alleviated;

...

1> when barring for an Access Category is considered being alleviated:

2> if the Access Category was informed to upper layers as barred:

3> inform upper layers about barring alleviation for the Access Category.

2> if barring is alleviated for Access Category '8':

3> perform actions specified in 5.3.13.8;

[TS 38.331, clause 5.3.14.5]

The UE shall:

1> if one or more Access Identities are indicated according to TS 24.501 [23], and

1> if for at least one of these Access Identities the corresponding bit in the *uac-BarringForAccessIdentity* contained in "UAC barring parameter" is set to *zero*:

2> consider the access attempt as allowed;

1> else:

2> draw a random number '*rand*' uniformly distributed in the range: $0 \leq rand < 1$;

2> if '*rand*' is lower than the value indicated by *uac-BarringFactor* included in "UAC barring parameter":

3> consider the access attempt as allowed;

2> else:

3> consider the access attempt as barred;

1> if the access attempt is considered as barred:

2> draw a random number '*rand*' that is uniformly distributed in the range $0 \leq rand < 1$;

2> start timer T390 for the Access Category with the timer value calculated as follows, using the *uac-BarringTime* included in "AC barring parameter":

$$T390 = (0.7 + 0.6 * rand) * uac-BarringTime.$$

11.3.3.3 Test description

11.3.3.3.1 Pre-test conditions

System Simulator:

- NR Cell 1
- System information combination NR-1 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR cells.

UE:

- None.

Preamble:

- The UE is in state 2N-A on NR cell 1 according to TS 38.508-1 [4] Table 4.4A.2-2.

11.3.3.3.2 Test procedure sequence

Table 11.3.3.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | Wait for 5 minute to make the timer T380 expire and trigger the RNA update procedure in UE. | | | | |
| 2 | Check: Does the UE transmit an <i>RRCResumeRequest</i> message with resumeCause value set to rna-Update on NR Cell 1 within 60s? | --> | NR RRC: <i>RRCResumeRequest</i> | 1 | F |
| 3 | The SS changes the SIB1 according to 38.508-1 [4] Table 4.6.1-28 and transmits a Short message on PDCCH using P-RNTI indicating a systemInfoModification. | <-- | PDCCH (DCI 1_0): Short Message | - | - |
| 4 | Check: Does the UE transmit an <i>RRCResumeRequest</i> message with resumeCause value set to rna-Update on NR Cell 1? | --> | NR RRC: <i>RRCResumeRequest</i> | 2 | P |

11.3.3.3.3 Specific message contents

Table 11.3.3.3.3-1: *SIB1* for NR Cell 1 (preamble, Table 11.3.3.3.2-1)

| Derivation Path: TS 38.331 [6], clause 6.2.2 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |

| | | | |
|--|------------|--|--|
| SIB1 ::= SEQUENCE { | | | |
| uac-BarringForCommon SEQUENCE { | | | |
| UAC-BarringPerCatList ::= SEQUENCE (SIZE (1..maxAccessCat-1)) OF SEQUENCE { | | | |
| accessCategory | 8 | | |
| uac-barringInfoSetIndex | 1 | | |
| } | | | |
| } | | | |
| uac-BarringInfoSetList ::= SEQUENCE (SIZE(1..maxBarringInfoSet)) OF SEQUENCE { | 1 entry | | |
| uac-BarringFactor | p00 | | |
| uac-BarringTime | s64 | | |
| uac-BarringForAccessIdentity | '0000000'B | | |
| } | | | |
| } | | | |

Table 11.3.3.3.3-2: *RRCRelease* (preamble, Table 11.3.3.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-16 | | | |
|---|--------------|-----------|---------------------|
| Information Element | Value/remark | Comment | Condition |
| RRCRelease ::= SEQUENCE { | | | |
| criticalExtensions CHOICE { | | | |
| rrcRelease SEQUENCE { | | | |
| suspendConfig SEQUENCE { | | | NR_RRC_I
NACTIVE |
| t380 | min5 | 5 minutes | |
| } | | | |
| } | | | |
| } | | | |
| } | | | |

Table 11.3.3.3.3-3: *RRCResumeRequest* (step 2 and step 5, Table 11.3.3.3.2-1)

| Derivation Path: 38.508-1 [4], Table 4.6.1-19 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCResumeRequest ::= SEQUENCE { | | | |

| | | | |
|-----------------------------|------------|--|--|
| rrcResumeRequest SEQUENCE { | | | |
| resumeCause | rna-Update | | |
| } | | | |
| } | | | |

11.3.4 UAC / Access Identity 0 / Registration procedure for mobility and periodic registration update / BarringPerPLMN/Implicit AC Barring List

11.3.4.1 Test Purpose (TP)

(1)

with { UE in NR RRC_IDLE not configured for special AIs (1,2,11-15) having received a SIB1 message including UAC set to 0% accessibility for Access Category 3 }

ensure that {

when { UE finds a new cell (AC 3) with SIB1 containing UAC Barring Info Per PLMN with Implicit AC Barring List }

then { UE does not move to the new cell until barring is alleviated }

}

11.3.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 clause 4.5.2, 4.5.4.1 and 5.5.1.3.7, TS 38.331 clause 5.3.14.2, 5.3.14.4 and 5.3.14.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 4.5.2]

When the UE needs to initiate an access attempt in one of the events listed in subclause 4.5.1, the UE shall determine one or more access identities from the set of standardized access identities, and one access category from the set of standardized access categories and operator-defined access categories, to be associated with that access attempt.

The set of the access identities applicable for the request is determined by the UE in the following way:

- a) for each of the access identities 1, 2, 11, 12, 13, 14 and 15 in table 4.5.2.1, the UE shall check whether the access identity is applicable in the selected PLMN, if a new PLMN is selected, or otherwise if it is applicable in the RPLMN or equivalent PLMN; and
- b) if none of the above access identities is applicable, then access identity 0 is applicable.

Table 4.5.2.1: Access identities

| Access Identity number | UE configuration |
|------------------------|--|
| 0 | UE is not configured with any parameters from this table |
| 1 (NOTE 1) | UE is configured for multimedia priority service (MPS). |
| 2 (NOTE 2) | UE is configured for mission critical service (MCS). |
| 3-10 | Reserved for future use |
| 11 (NOTE 3) | Access Class 11 is configured in the UE. |

| | |
|--|--|
| 12 (NOTE 3) | Access Class 12 is configured in the UE. |
| 13 (NOTE 3) | Access Class 13 is configured in the UE. |
| 14 (NOTE 3) | Access Class 14 is configured in the UE. |
| 15 (NOTE 3) | Access Class 15 is configured in the UE. |
| <p>NOTE 1: Access identity 1 is valid when:</p> <ul style="list-style-type: none"> - the USIM file EFUAC_AIC indicates the UE is configured for access identity 1 and the RPLMN is the HPLMN (if the EHPLMN list is not present or is empty) or EHPLMN (if the EHPLMN list is present), or a visited PLMN of the home country (see the definition of home country in 3GPP TS 24.301 [15]); or - the UE receives the 5GS network feature support IE with the MPS indicator bit set to "Access identity 1 valid in RPLMN or equivalent PLMN" from the RPLMN as described in subclause 5.5.1.2.4 and subclause 5.5.1.3.4. <p>NOTE 2: Access identity 2 is used by UEs configured for MCS and is valid when:</p> <ul style="list-style-type: none"> - the USIM file EFUAC_AIC indicates the UE is configured for access identity 2 and the RPLMN is the HPLMN (if the EHPLMN list is not present or is empty) or EHPLMN (if the EHPLMN list is present), or a visited PLMN of the home country (see 3GPP TS 23.122 [5]); or - the UE receives the 5GS network feature support IE with the MCS indicator bit set to "Access identity 2 valid in RPLMN or equivalent PLMN" from the RPLMN as described in subclause 5.5.1.2.4 and subclause 5.5.1.3.4. <p>NOTE 3: Access identities 11 and 15 are valid in HPLMN (if the EHPLMN list is not present or is empty) or EHPLMN (if the EHPLMN list is present). Access Identities 12, 13 and 14 are valid in HPLMN and visited PLMNs of home country only (see the definition of home country in 3GPP TS 24.301 [15]).</p> | |

...

In order to determine the access category applicable for the access attempt, the NAS shall check the rules in table 4.5.2.2, and use the access category for which there is a match for barring check. If the access attempt matches more than one rule, the access category of the lowest rule number shall be selected. If the access attempt matches more than one operator-defined access category definition, the UE shall select the access category from the operator-defined access category definition with the lowest precedence value (see subclause 4.5.3).

NOTE: The case when an access attempt matches more than one rule includes the case when multiple events trigger an access attempt at the same time.

Table 4.5.2.2: Mapping table for access categories

| Rule # | Type of access attempt | Requirements to be met | Access Category |
|--------|---|---|---|
| 1 | Response to paging or NOTIFICATION over non-3GPP access;

5GMM connection management procedure initiated for the purpose of transporting an LPP message | Access attempt is for MT access | 0 (= MT_acc) |
| 2 | Emergency | UE is attempting access for an emergency session (NOTE 1, NOTE 2) | 2 (= emergency) |
| 3 | Access attempt for operator-defined access category | UE stores operator-defined access category definitions valid in the current PLMN as specified in subclause 4.5.3, and access attempt is matching criteria of an operator-defined access category definition | 32-63
(= based on operator classification) |
| 4 | Access attempt for delay | (a) UE is configured for NAS signalling | 1 (= delay) |

| | | | |
|----|--|---|-------------------------|
| | tolerant service | low priority or UE supporting S1 mode is configured for EAB (see the "ExtendedAccessBarring" leaf of NAS configuration MO in 3GPP TS 24.368 [17] or 3GPP TS 31.102 [22]) where "EAB override" does not apply, and

(b).the UE received one of the categories a, b or c as part of the parameters for unified access control in the broadcast system information, and the UE is a member of the broadcasted category in the selected PLMN or RPLMN/equivalent PLMN

(NOTE 3, NOTE 5, NOTE 6, NOTE 7, NOTE 8) | tolerant) |
| 5 | MO MMTel voice call | Access attempt is for MO MMTel voice call or for NAS signalling connection recovery during ongoing MO MMTel voice call (NOTE 2) | 4 (= MO MMTel voice) |
| 6 | MO MMTel video call | Access attempt is for MO MMTel video call or for NAS signalling connection recovery during ongoing MO MMTel video call (NOTE 2) | 5 (= MO MMTel video) |
| 7 | MO SMS over NAS or MO SMSoIP | Access attempt is for MO SMS over NAS (NOTE 4) or MO SMS over SMSoIP transfer or for NAS signalling connection recovery during ongoing MO SMS or SMSoIP transfer (NOTE 2) | 6 (= MO SMS and SMSoIP) |
| 8 | UE NAS initiated 5GMM specific procedures | Access attempt is for MO signalling | 3 (= MO_sig) |
| 9 | UE NAS initiated 5GMM connection management procedure or 5GMM NAS transport procedure | Access attempt is for MO data | 7 (= MO_data) |
| 10 | An uplink user data packet is to be sent for a PDU session with suspended user-plane resources | No further requirement is to be met | 7 (= MO_data) |

NOTE 1: This includes 5GMM specific procedures while the service is ongoing and 5GMM connection management procedures required to establish a PDU session with request type = "initial emergency request" or "existing emergency PDU session", or to re-establish user-plane resources for such a PDU session. This further includes the service request procedure initiated with a SERVICE REQUEST message with the Service type IE set to "emergency services fallback".<

NOTE 2: Access for the purpose of NAS signalling connection recovery during an ongoing service, or for the purpose of NAS signalling connection establishment following fallback indication from lower layers during an ongoing service, is mapped to the access category of the ongoing service in order to derive an RRC establishment cause, but barring checks will be skipped for this access attempt.

NOTE 3: If the UE selects a new PLMN, then the selected PLMN is used to check the membership;

otherwise the UE uses the RPLMN or a PLMN equivalent to the RPLMN.

NOTE 4: This includes the 5GMM connection management procedures triggered by the UE-initiated NAS transport procedure for transporting the MO SMS.

NOTE 5: The UE configured for NAS signalling low priority is not supported in this release of specification. If a UE supporting both S1 mode and N1 mode is configured for NAS signalling low priority in S1 mode as specified in 3GPP TS 24.368 [17] or 3GPP TS 31.102 [22], the UE shall ignore the configuration for NAS signalling low priority when in N1 mode.

NOTE 6: If the access category applicable for the access attempt is 1, then the UE shall additionally determine a second access category from the range 3 to 7. If more than one access category matches, the access category of the lowest rule number shall be chosen. The UE shall use the second access category only to derive an RRC establishment cause for the access attempt.

NOTE 7: "EAB override" does not apply, if the UE is not configured to allow overriding EAB (see the "Override_ExtendedAccessBarring" leaf of NAS configuration MO in 3GPP TS 24.368 [17] or 3GPP TS 31.102 [22]), or if NAS has not received an indication from the upper layers to override EAB and the UE does not have a PDU session that was established with EAB override.

NOTE 8: For the definition of categories a, b and c associated with access category 1, see 3GPP TS 22.261 [3]. The categories associated with access category 1 are distinct from the categories a, b and c associated with EAB (see 3GPP TS 22.011 [1A]).

[TS 24.501, clause 4.5.4.1]

When the UE is in 5GMM-IDLE mode, upon receiving a request from the upper layers for an access attempt, the NAS shall categorize the access attempt into access identities and an access category following subclause 4.5.2, table 4.5.2.1 and table 4.5.2.2, and subclause 4.5.3, and provide the applicable access identities and the access category to the lower layers for the purpose of access control checking. In this request to the lower layer the NAS can also provide to the lower layer the RRC establishment cause determined as specified in subclause 4.5.6 of this specification.

NOTE 1: The access barring check is performed by the lower layers.

NOTE 2: As an implementation option, the NAS can provide the RRC establishment cause to the lower layers after being informed by the lower layers that the access attempt is allowed.

...

If the lower layers indicate that the access attempt is allowed, the NAS shall initiate the procedure to send the initial NAS message for the access attempt.

If the lower layers indicate that the access attempt is barred, the NAS shall not initiate the procedure to send the initial NAS message for the access attempt. Additionally:

a) if the event which triggered the access attempt was an MO-MMTEL-voice-call-started indication or an MO-MMTEL-video-call-started indication:

1) if the UE is operating in the single-registration mode and the UE's usage setting is "voice centric", the UE may attempt to select an E-UTRA cell connected to EPC. If the UE finds a suitable E-UTRA cell connected to EPC, it then proceeds with the appropriate EMM specific procedures and, if necessary, ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.2 and 3GPP TS 24.301 [15];

2) if the UE is operating in the dual-registration mode, the UE may proceed in S1 mode with the appropriate EMM specific procedures and ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.3 and 3GPP TS 24.301 [15];

3) otherwise, the NAS shall notify the upper layers that the access attempt is barred. In this case, upon receiving an indication from the lower layers that the barring is alleviated for the access category with which the access attempt was associated, the NAS shall notify the upper layers that the barring is alleviated for the access category and may initiate the procedure to send the initial NAS message, if still needed; and

b) if the event which triggered the access attempt was an MO-SMSoIP-attempt-started indication:

- 1) if the UE is operating in the single-registration mode, the UE may attempt to select an E-UTRA cell connected to EPC. If the UE finds a suitable E-UTRA cell connected to EPC, it then proceeds with the appropriate EMM specific procedures and, if necessary, ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.2 and 3GPP TS 24.301 [15];
- 2) if the UE is operating in the dual-registration mode, the UE may proceed in S1 mode with the appropriate EMM specific procedures and ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.3 and 3GPP TS 24.301 [15];
- 3) otherwise, the NAS layer shall notify the upper layers that the access attempt is barred. In this case, upon receiving an indication from the lower layers that the barring is alleviated for the access category with which the access attempt was associated, the NAS shall notify the upper layers that the barring is alleviated for the access category and may initiate the procedure to send the initial NAS message, if still needed.

NOTE 4: Barring timers, on a per access category basis, are run by the lower layers. At expiry of barring timers, the indication of alleviation of access barring is indicated to the NAS on a per access category basis.

[TS 24.501, clause 5.5.1.3.7]

- b) The lower layers indicate that the access attempt is barred.

The UE shall not start the registration procedure for mobility and periodic registration update. The UE stays in the current serving cell and applies the normal cell reselection process.

The registration procedure for mobility and periodic registration update is started, if still needed, when the lower layers indicate that the barring is alleviated for the access category with which the access attempt was associated.

- ba) The lower layers indicate that access barring is applicable for all access categories except categories 0 and 2 and the access category with which the access attempt was associated is other than 0 and 2.

If the REGISTRATION REQUEST message has not been sent, the UE shall proceed as specified for case b. If the REGISTRATION REQUEST message has been sent, the UE shall proceed as specified for case e and, additionally, the registration procedure for mobility and periodic registration update is started, if still needed, when the lower layers indicate that the barring is alleviated for the access category with which the access attempt was associated. For additional UE requirements for both cases see subclause 4.5.5.

[TS 38.331, clause 5.3.14.2]

Upon initiation of the procedure, the UE shall:

- 1> if timer T390 is running for the Access Category:
- 2> consider the access attempt as barred;
- ...
- 1> else:
- 2> if the Access Category is '0':
- 3> consider the access attempt as allowed;
- 2> else:
- 3> if *SIB1* includes *uac-BarringPerPLMN-List* and the *uac-BarringPerPLMN-List* contains an *UAC-BarringPerPLMN* entry with the *plmn-IdentityIndex* corresponding to the PLMN selected by upper layers (see TS 24.501 [23]):
- 4> select the *UAC-BarringPerPLMN* entry with the *plmn-IdentityIndex* corresponding to the PLMN selected by upper layers;
- 4> in the remainder of this procedure, use the selected *UAC-BarringPerPLMN* entry (i.e. presence or absence of access barring parameters in this entry) irrespective of the *uac-BarringForCommon* included in *SIB1*;
- ...
- 3> else if the *uac-ACBarringListType* indicates that *uac-ImplicitACBarringList* is used:

- 1> if one or more Access Identities are indicated according to TS 24.501 [23], and
- 1> if for at least one of these Access Identities the corresponding bit in the *uac-BarringForAccessIdentity* contained in "UAC barring parameter" is set to *zero*:
- 2> consider the access attempt as allowed;
- 1> else:
- 2> draw a random number '*rand*' uniformly distributed in the range: $0 \leq rand < 1$;
- 2> if '*rand*' is lower than the value indicated by *uac-BarringFactor* included in "UAC barring parameter":
- 3> consider the access attempt as allowed;
- 2> else:
- 3> consider the access attempt as barred;
- 1> if the access attempt is considered as barred:
- 2> draw a random number '*rand*' that is uniformly distributed in the range $0 \leq rand < 1$;
- 2> start timer T390 for the Access Category with the timer value calculated as follows, using the *uac-BarringTime* included in "AC barring parameter":

$$T390 = (0.7 + 0.6 * rand) * uac-BarringTime.$$

11.3.4.3 Test description

11.3.4.3.1 Pre-test conditions

System Simulator:

- NR Cell 1 and NR Cell 11 have different tracking areas according to TS 38.508-1 [4] Table 4.4.2-3.
- System information combination NR-2 as defined in TS 38.508-1 [4] clause 4.4.3.1.2 is used in NR Cells.

UE:

- None.

Preamble:

- The UE is in state 1N-A on NR cell 1 according to TS 38.508-1 [4] Table 4.4A.2-1.

11.3.4.3.2 Test procedure sequence

Table 11.3.4.3.2-1/2 illustrate the downlink power levels and other changing parameters to be applied for the cell at various time instants of the test execution. The exact instants on which these values shall be applied are described in the texts in this clause. The configuration T0 indicates the initial conditions for preamble. Configurations marked "T1" is applied at the points indicated in the Main behaviour description in Table 11.3.4.3.2-3.

Table 11.3.4.3.2-1: Time instances of cell power level and parameter changes for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 11 | Remark |
|----|---------------------|-------------|-----------|------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -88 | Off | |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -88 | -80 | The power level values are assigned to satisfy $R_{NRCell 1} < R_{NRCell 11}$ |

Table 11.3.4.3.2-2: Time instances of cell power level and parameter changes for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 11 | Remark |
|----|---------------------|-------------|-----------|------------|---|
| T0 | SS/PBCH
SSS EPRE | dBm/
SCS | -91 | Off | |
| T1 | SS/PBCH
SSS EPRE | dBm/
SCS | -91 | -82 | The power level values are assigned to satisfy $R_{NRCell 1} < R_{NRCell 11}$ |

Table 11.3.4.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS changes the SIB1 of NR Cell 11 according to Table 11.3.4.3.3-1 | | | | |
| 2 | The SS adjusts the SS/PBCH EPRE levels and according to row "T1" in table 11.3.4.3.2-1/2. | - | - | - | - |
| 3 | Wait for 10 seconds to allow UE to recognise the change. | | | | |
| 4 | Check: Does the UE transmit an RRCSetupRequest message on NR cell 11? | --> | NR RRC: RRCSetupRequest | 1 | F |
| 5 | The SS changes the SIB1 according to 38.508-1 [4] Table 4.6.1-28 and transmits a Short message on PDCCH using P-RNTI indicating a systemInfoModification. | <-- | PDCCH (DCI 1_0): Short Message | - | - |
| 6 | Wait for 1 second for the UE to receive the modified system information. | | | | |
| 7 | Check: Does UE transmit RRCSetupRequest message on NR cell 11? | --> | NR RRC: RRCSetupRequest | 1 | P |

11.3.4.3.3 Specific message contents

Table 11.3.4.3.3-1: SIB1 for NR Cell 11 (step 1, Table 11.3.4.3.3-1)

| Derivation Path: TS 38.331 [6], clause 6.2.2 | | | |
|--|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | | | |
| cellAccessRelatedInfo SEQUENCE { | | | |
| PLMN-IdentityInfoList ::= SEQUENCE (SIZE (1..maxPLMN)) OF SEQUENCE { | | | |
| plmn-IdentityList SEQUENCE (SIZE (1..maxPLMN)) OF PLMN-Identity { | | | |

| | | | |
|---|---|-----------------------|--|
| plmn-Identity | | PLMN ID of NR Cell 11 | |
| } | | | |
| } | | | |
| } | | | |
| uac-BarringInfo SEQUENCE { | | | |
| uac-BarringPerPLMN-List ::= SEQUENCE (SIZE (1.. maxPLMN)) OF SEQUENCE { | | | |
| plmn-IdentityIndex | 1 | | |
| uac-ACBarringListType CHOICE { | | | |
| uac-ImplicitACBarringList SEQUENCE (SIZE(maxAccessCat-1)) OF SEQUENCE { | | | |
| UAC-BarringInfoSetIndex[1] | 2 | | |
| UAC-BarringInfoSetIndex[2] | 2 | | |
| UAC-BarringInfoSetIndex[3] | 2 | | |
| UAC-BarringInfoSetIndex[4] | 1 | | |
| UAC-BarringInfoSetIndex[5] | 2 | | |
| UAC-BarringInfoSetIndex[6] | 2 | | |
| UAC-BarringInfoSetIndex[7] | 2 | | |
| UAC-BarringInfoSetIndex[8] | 2 | | |
| UAC-BarringInfoSetIndex[9] | 2 | | |
| UAC-BarringInfoSetIndex[10] | 2 | | |
| UAC-BarringInfoSetIndex[11] | 2 | | |
| UAC-BarringInfoSetIndex[12] | 2 | | |
| UAC-BarringInfoSetIndex[13] | 2 | | |
| UAC-BarringInfoSetIndex[14] | 2 | | |
| UAC-BarringInfoSetIndex[15] | 2 | | |
| UAC-BarringInfoSetIndex[16] | 2 | | |
| UAC-BarringInfoSetIndex[17] | 2 | | |
| UAC-BarringInfoSetIndex[18] | 2 | | |
| UAC-BarringInfoSetIndex[19] | 2 | | |
| UAC-BarringInfoSetIndex[20] | 2 | | |
| UAC-BarringInfoSetIndex[21] | 2 | | |
| UAC-BarringInfoSetIndex[22] | 2 | | |
| UAC-BarringInfoSetIndex[23] | 2 | | |

| | | | |
|-----------------------------|---|--|--|
| UAC-BarringInfoSetIndex[24] | 2 | | |
| UAC-BarringInfoSetIndex[25] | 2 | | |
| UAC-BarringInfoSetIndex[26] | 2 | | |
| UAC-BarringInfoSetIndex[27] | 2 | | |
| UAC-BarringInfoSetIndex[28] | 2 | | |
| UAC-BarringInfoSetIndex[29] | 2 | | |
| UAC-BarringInfoSetIndex[30] | 2 | | |
| UAC-BarringInfoSetIndex[31] | 2 | | |
| UAC-BarringInfoSetIndex[32] | 2 | | |
| UAC-BarringInfoSetIndex[33] | 2 | | |
| UAC-BarringInfoSetIndex[34] | 2 | | |
| UAC-BarringInfoSetIndex[35] | 2 | | |
| UAC-BarringInfoSetIndex[36] | 2 | | |
| UAC-BarringInfoSetIndex[37] | 2 | | |
| UAC-BarringInfoSetIndex[38] | 2 | | |
| UAC-BarringInfoSetIndex[39] | 2 | | |
| UAC-BarringInfoSetIndex[40] | 2 | | |
| UAC-BarringInfoSetIndex[41] | 2 | | |
| UAC-BarringInfoSetIndex[42] | 2 | | |
| UAC-BarringInfoSetIndex[43] | 2 | | |
| UAC-BarringInfoSetIndex[44] | 2 | | |
| UAC-BarringInfoSetIndex[45] | 2 | | |
| UAC-BarringInfoSetIndex[46] | 2 | | |
| UAC-BarringInfoSetIndex[47] | 2 | | |
| UAC-BarringInfoSetIndex[48] | 2 | | |
| UAC-BarringInfoSetIndex[49] | 2 | | |
| UAC-BarringInfoSetIndex[50] | 2 | | |
| UAC-BarringInfoSetIndex[51] | 2 | | |
| UAC-BarringInfoSetIndex[52] | 2 | | |
| UAC-BarringInfoSetIndex[53] | 2 | | |
| UAC-BarringInfoSetIndex[54] | 2 | | |
| UAC-BarringInfoSetIndex[55] | 2 | | |
| UAC-BarringInfoSetIndex[56] | 2 | | |

| | | | |
|---|------------|--|--|
| UAC-BarringInfoSetIndex[57] | 2 | | |
| UAC-BarringInfoSetIndex[58] | 2 | | |
| UAC-BarringInfoSetIndex[59] | 2 | | |
| UAC-BarringInfoSetIndex[60] | 2 | | |
| UAC-BarringInfoSetIndex[61] | 2 | | |
| UAC-BarringInfoSetIndex[62] | 2 | | |
| UAC-BarringInfoSetIndex[63] | 2 | | |
| } | | | |
| } | | | |
| } | | | |
| uac-BarringInfoSetList ::= SEQUENCE
(SIZE(1..maxBarringInfoSet)) OF SEQUENCE { | 1 entry | | |
| uac-BarringFactor | p00 | | |
| uac-BarringTime | s64 | | |
| uac-BarringForAccessIdentity | '0000000'B | | |
| } | | | |
| } | | | |
| } | | | |
| Note : UAC-BarringInfoSetIndex value 2 referring to an entry not included in uac-BarringInfoSetList indicates no barring for the Access Category. | | | |

11.3.5

11.3.6 UAC / Access Identity 2 / New cell not in the country of its HPLMN/EHPLMN 0% access probability/MCS indicator / HPLMN/0%/100% accessibility AC7/RRC_INACTIVE

11.3.6.1 Test Purpose (TP)

(1)

with { UE configured for Access Identity 2 }

ensure that {

when { UE moves to a new cell which is not in the country of its HPLMN or in an EHPLMN (if the EHPLMN list is present) having received SIB1 message including UAC set to 0% accessibility for Access Identity 2 }

then { UE does not consider Access Identity 2 as valid and continues with the REGISTRATION procedure }

}

(2)

with { UE configured for Access Identity 2 }**ensure that** {

when { UE moves to a new cell which is not in the country of its HPLMN or in an EHPLMN (if the EHPLMN list is present) but receives the MCS indicator bit of the 5GS network feature support IE in the REGISTRATION ACCEPT message being set to ""Access identity 2 valid"" }

then { UE does consider Access Identity 2 as valid }

}

(3)

with { UE configured for Access Identity 2 having received SIB1 containing UAC Info indicating 0% accessibility for Access Category 7 camped in NR RRC_INACTIVE state on HPLMN }**ensure that** {

when { UE attempts to send uplink user data packet for a PDU session with suspended user-plane resources }

then { UE does not attempt to initiate connection on the NR Cell until barring is alleviated }

(4)

with { UE configured for Access Identity 2 having received SIB1 containing UAC Info indicating 100% accessibility for Access Category 7 while camped on HPLMN in NR RRC_INACTIVE state }**ensure that** {

when { UE attempts to send uplink user data packet for a PDU session with suspended user-plane resources }

then { UE initiates RRC Resume procedure with establishmentCause set to mcs-PriorityAccess }

11.3.6.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in TS 24.501: clause 4.5.2, 4.5.4.1 and 4.5.6 and TS 38.331: clause 5.3.14.1, 5.3.14.2, 5.3.14.4 and 5.3.14.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, clause 4.5.2]

When the UE needs to initiate an access attempt in one of the events listed in subclause 4.5.1, the UE shall determine one or more access identities from the set of standardized access identities, and one access category from the set of standardized access categories and operator-defined access categories, to be associated with that access attempt.

The set of the access identities applicable for the request is determined by the UE in the following way:

- a) for each of the access identities 1, 2, 11, 12, 13, 14 and 15 in table 4.5.2.1, the UE shall check whether the access identity is applicable in the selected PLMN, if a new PLMN is selected, or otherwise if it is applicable in the RPLMN or equivalent PLMN; and
- b) if none of the above access identities is applicable, then access identity 0 is applicable.

Table 4.5.2.1: Access identities

| Access Identity number | UE configuration |
|------------------------|------------------|
|------------------------|------------------|

| | |
|--|--|
| 0 | UE is not configured with any parameters from this table |
| 1 (NOTE 1) | UE is configured for multimedia priority service (MPS). |
| 2 (NOTE 2) | UE is configured for mission critical service (MCS). |
| 3-10 | Reserved for future use |
| 11 (NOTE 3) | Access Class 11 is configured in the UE. |
| 12 (NOTE 3) | Access Class 12 is configured in the UE. |
| 13 (NOTE 3) | Access Class 13 is configured in the UE. |
| 14 (NOTE 3) | Access Class 14 is configured in the UE. |
| 15 (NOTE 3) | Access Class 15 is configured in the UE. |
| <p>NOTE 1: Access identity 1 is valid when:</p> <ul style="list-style-type: none"> - the USIM file EF_{UAC_AIC} indicates the UE is configured for access identity 1 and the RPLMN is the HPLMN (if the EHPLMN list is not present or is empty) or EHPLMN (if the EHPLMN list is present), or a visited PLMN of the home country (see the definition of home country in 3GPP TS 24.301 [15]); or - the UE receives the 5GS network feature support IE with the MPS indicator bit set to "Access identity 1 valid in RPLMN or equivalent PLMN" from the RPLMN as described in subclause 5.5.1.2.4 and subclause 5.5.1.3.4. <p>NOTE 2: Access identity 2 is used by UEs configured for MCS and is valid when:</p> <ul style="list-style-type: none"> - the USIM file EF_{UAC_AIC} indicates the UE is configured for access identity 2 and the RPLMN is the HPLMN (if the EHPLMN list is not present or is empty) or EHPLMN (if the EHPLMN list is present), or a visited PLMN of the home country (see 3GPP TS 23.122 [5]); or - the UE receives the 5GS network feature support IE with the MCS indicator bit set to "Access identity 2 valid in RPLMN or equivalent PLMN" from the RPLMN as described in subclause 5.5.1.2.4 and subclause 5.5.1.3.4. <p>NOTE 3: Access identities 11 and 15 are valid in HPLMN (if the EHPLMN list is not present or is empty) or EHPLMN (if the EHPLMN list is present). Access Identities 12, 13 and 14 are valid in HPLMN and visited PLMNs of home country only (see the definition of home country in 3GPP TS 24.301 [15]).</p> | |

The UE uses the MPS indicator bit of the 5GS network feature support IE to determine if access identity 1 is valid. Processing of the MPS indicator bit of the 5GS network feature support IE in the REGISTRATION ACCEPT message is described in subclause 5.5.1.2.4 and subclause 5.5.1.3.4. The UE shall not consider access identity 1 to be valid when the UE is not in the country of its HPLMN prior to receiving the MPS indicator bit of the 5GS network feature support IE in the REGISTRATION ACCEPT message being set to "Access identity 1 valid in RPLMN or equivalent PLMN".

When the UE is in the country of its HPLMN, the contents of the USIM files EF_{UAC_AIC} and EF_{ACC} as specified in 3GPP TS 31.102 [22] and the rules specified in table 4.5.2.1 are used to determine the applicability of access identity 1 and access classes 11 - 15. When the UE is in the country of its HPLMN, and the USIM file EF_{UAC_AIC} does not indicate the UE is configured for access identity 1, the UE uses the MPS indicator bit of the 5GS network feature support IE in the REGISTRATION ACCEPT message to determine if access identity 1 is valid. When the UE is in the country of its HPLMN, and the USIM file EF_{UAC_AIC} indicates the UE is configured for access identity 1, the MPS indicator bit of the 5GS network feature support IE is not applicable. When the UE is not in the country of its HPLMN, the contents of the USIM files EF_{UAC_AIC} and EF_{ACC} are not applicable.

The UE uses the MCS indicator bit of the 5GS network feature support IE to determine if access identity 2 is valid. Processing of the MCS indicator bit of the 5GS network feature support IE in the REGISTRATION ACCEPT message is described in subclause 5.5.1.2.4 and subclause 5.5.1.3.4. The UE shall not consider access identity 2 to be valid when the UE is not in the country of its HPLMN prior to receiving the MCS indicator bit of the 5GS network feature support IE in the REGISTRATION ACCEPT message being set to "Access identity 2 valid in RPLMN or equivalent PLMN".

When the UE is in the country of its HPLMN, the contents of the USIM files EF_{UAC_AIC} and EF_{ACC} as specified in 3GPP TS 31.102 [22] and the rules specified in table 4.5.2.1 are used to determine the applicability of access identity 2 and access classes 11 - 15. When the UE is in the country of its HPLMN, and the USIM file EF_{UAC_AIC} does not indicate

the UE is configured for access identity 2, the UE uses the MCS indicator bit of the 5GS network feature support IE in the REGISTRATION ACCEPT message to determine if access identity 2 is valid. When the UE is in the country of its HPLMN, and the USIM file EF_{UAC_AIC} indicates the UE is configured for access identity 2, the MCS indicator bit of the 5GS network feature support IE is not applicable. When the UE is not in the country of its HPLMN, the contents of the USIM files EF_{UAC_AIC} and EF_{ACC} are not applicable.

In order to determine the access category applicable for the access attempt, the NAS shall check the rules in table 4.5.2.2, and use the access category for which there is a match for barring check. If the access attempt matches more than one rule, the access category of the lowest rule number shall be selected. If the access attempt matches more than one operator-defined access category definition, the UE shall select the access category from the operator-defined access category definition with the lowest precedence value (see subclause 4.5.3).

NOTE: The case when an access attempt matches more than one rule includes the case when multiple events trigger an access attempt at the same time.

Table 4.5.2.2: Mapping table for access categories

| Rule # | Type of access attempt | Requirements to be met | Access Category |
|--------|---|---|---|
| 1 | Response to paging or NOTIFICATION over non-3GPP access;

5GMM connection management procedure initiated for the purpose of transporting an LPP message | Access attempt is for MT access | 0 (= MT_acc) |
| 2 | Emergency | UE is attempting access for an emergency session (NOTE 1, NOTE 2) | 2 (= emergency) |
| 3 | Access attempt for operator-defined access category | UE stores operator-defined access category definitions valid in the current PLMN as specified in subclause 4.5.3, and access attempt is matching criteria of an operator-defined access category definition | 32-63
(= based on operator classification) |
| 4 | Access attempt for delay tolerant service | (a) UE is configured for NAS signalling low priority or UE supporting S1 mode is configured for EAB (see the "ExtendedAccessBarring" leaf of NAS configuration MO in 3GPP TS 24.368 [17] or 3GPP TS 31.102 [22]) where "EAB override" does not apply, and

(b).the UE received one of the categories a, b or c as part of the parameters for unified access control in the broadcast system information, and the UE is a member of the broadcasted category in the selected PLMN or RPLMN/equivalent PLMN

(NOTE 3, NOTE 5, NOTE 6, NOTE 7, NOTE 8) | 1 (= delay tolerant) |
| 5 | MO MMTel voice call | Access attempt is for MO MMTel voice call

or for NAS signalling connection recovery during ongoing MO MMTel voice call (NOTE 2) | 4 (= MO MMTel voice) |
| 6 | MO MMTel video call | Access attempt is for MO MMTel video call | 5 (= MO |

| | | | |
|----|--|--|-------------------------|
| | | or for NAS signalling connection recovery during ongoing MO MMTel video call (NOTE 2) | MMTel video) |
| 7 | MO SMS over NAS or MO SMSoIP | Access attempt is for MO SMS over NAS (NOTE 4) or MO SMS over SMSoIP transfer

or for NAS signalling connection recovery during ongoing MO SMS or SMSoIP transfer (NOTE 2) | 6 (= MO SMS and SMSoIP) |
| 8 | UE NAS initiated 5GMM specific procedures | Access attempt is for MO signalling | 3 (= MO_sig) |
| 9 | UE NAS initiated 5GMM connection management procedure or 5GMM NAS transport procedure | Access attempt is for MO data | 7 (= MO_data) |
| 10 | An uplink user data packet is to be sent for a PDU session with suspended user-plane resources | No further requirement is to be met | 7 (= MO_data) |

NOTE 1: This includes 5GMM specific procedures while the service is ongoing and 5GMM connection management procedures required to establish a PDU session with request type = "initial emergency request" or "existing emergency PDU session", or to re-establish user-plane resources for such a PDU session. This further includes the service request procedure initiated with a SERVICE REQUEST message with the Service type IE set to "emergency services fallback".<

NOTE 2: Access for the purpose of NAS signalling connection recovery during an ongoing service, or for the purpose of NAS signalling connection establishment following fallback indication from lower layers during an ongoing service, is mapped to the access category of the ongoing service in order to derive an RRC establishment cause, but barring checks will be skipped for this access attempt.

NOTE 3: If the UE selects a new PLMN, then the selected PLMN is used to check the membership; otherwise the UE uses the RPLMN or a PLMN equivalent to the RPLMN.

NOTE 4: This includes the 5GMM connection management procedures triggered by the UE-initiated NAS transport procedure for transporting the MO SMS.

NOTE 5: The UE configured for NAS signalling low priority is not supported in this release of specification. If a UE supporting both S1 mode and N1 mode is configured for NAS signalling low priority in S1 mode as specified in 3GPP TS 24.368 [17] or 3GPP TS 31.102 [22], the UE shall ignore the configuration for NAS signalling low priority when in N1 mode.

NOTE 6: If the access category applicable for the access attempt is 1, then the UE shall additionally determine a second access category from the range 3 to 7. If more than one access category matches, the access category of the lowest rule number shall be chosen. The UE shall use the second access category only to derive an RRC establishment cause for the access attempt.

NOTE 7: "EAB override" does not apply, if the UE is not configured to allow overriding EAB (see the "Override_ExtendedAccessBarring" leaf of NAS configuration MO in 3GPP TS 24.368 [17] or 3GPP TS 31.102 [22]), or if NAS has not received an indication from the upper layers to override EAB and the UE does not have a PDU session that was established with EAB override.

NOTE 8: For the definition of categories a, b and c associated with access category 1, see 3GPP TS 22.261 [3]. The categories associated with access category 1 are distinct from the categories a, b and c associated with EAB (see 3GPP TS 22.011 [1A]).

[TS 24.501, clause 4.5.4.1]

When the UE is in 5GMM-IDLE mode, upon receiving a request from the upper layers for an access attempt, the NAS shall categorize the access attempt into access identities and an access category following subclause 4.5.2, table 4.5.2.1 and table 4.5.2.2, and subclause 4.5.3, and provide the applicable access identities and the access category to the lower layers for the purpose of access control checking. In this request to the lower layer the NAS can also provide to the lower layer the RRC establishment cause determined as specified in subclause 4.5.6 of this specification.

NOTE 1: The access barring check is performed by the lower layers.

NOTE 2: As an implementation option, the NAS can provide the RRC establishment cause to the lower layers after being informed by the lower layers that the access attempt is allowed.

If the UE has uplink user data pending for one or more PDU sessions when it builds a REGISTRATION REQUEST or SERVICE REQUEST message as initial NAS message, the UE shall indicate the respective PDU sessions in the Uplink data status IE as specified in subclause 5.5.1.3.2 and 5.6.1.2, regardless of the access category for which the access barring check is performed.

NOTE 3: The UE indicates pending user data for all the respective PDU sessions, even if barring timers are running for some of the corresponding access categories.

If the lower layers indicate that the access attempt is allowed, the NAS shall initiate the procedure to send the initial NAS message for the access attempt.

If the lower layers indicate that the access attempt is barred, the NAS shall not initiate the procedure to send the initial NAS message for the access attempt. Additionally:

a) if the event which triggered the access attempt was an MO-MMTEL-voice-call-started indication or an MO-MMTEL-video-call-started indication:

1) if the UE is operating in the single-registration mode and the UE's usage setting is "voice centric", the UE may attempt to select an E-UTRA cell connected to EPC. If the UE finds a suitable E-UTRA cell connected to EPC, it then proceeds with the appropriate EMM specific procedures and, if necessary, ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.2 and 3GPP TS 24.301 [15];

2) if the UE is operating in the dual-registration mode, the UE may proceed in S1 mode with the appropriate EMM specific procedures and ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.3 and 3GPP TS 24.301 [15];

3) otherwise, the NAS shall notify the upper layers that the access attempt is barred. In this case, upon receiving an indication from the lower layers that the barring is alleviated for the access category with which the access attempt was associated, the NAS shall notify the upper layers that the barring is alleviated for the access category and may initiate the procedure to send the initial NAS message, if still needed; and

b) if the event which triggered the access attempt was an MO-SMSoIP-attempt-started indication:

1) if the UE is operating in the single-registration mode, the UE may attempt to select an E-UTRA cell connected to EPC. If the UE finds a suitable E-UTRA cell connected to EPC, it then proceeds with the appropriate EMM specific procedures and, if necessary, ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.2 and 3GPP TS 24.301 [15];

2) if the UE is operating in the dual-registration mode, the UE may proceed in S1 mode with the appropriate EMM specific procedures and ESM procedures to make a PDN connection providing access to IMS available; see subclause 4.8.3 and 3GPP TS 24.301 [15];

3) otherwise, the NAS layer shall notify the upper layers that the access attempt is barred. In this case, upon receiving an indication from the lower layers that the barring is alleviated for the access category with which the access attempt was associated, the NAS shall notify the upper layers that the barring is alleviated for the access category and may initiate the procedure to send the initial NAS message, if still needed.

NOTE 4: Barring timers, on a per access category basis, are run by the lower layers. At expiry of barring timers, the indication of alleviation of access barring is indicated to the NAS on a per access category basis.

[TS 24.501, clause 4.5.6]

When 5GMM requests the establishment of a NAS-signalling connection, the RRC establishment cause used by the UE shall be selected according to one or more access identities (see subclause 4.5.2) and the determined access category as specified in table 4.5.6.1 and table 4.5.6.2. If the determined access category is an operator-defined access category, then the RRC establishment cause used by the UE shall be selected according to table 4.5.6.1 and table 4.5.6.2 based on one or more access identities (see subclause 4.5.2) and the standardized access category determined for the operator-defined access category as described in subclause 4.5.3.

Table 4.5.6.1: Mapping table for access identities/access categories and RRC establishment cause when establishing N1 NAS signalling connection via NR connected to 5GCN

| Access identities | Access categories | RRC establishment cause is set to |
|--|-------------------------|-----------------------------------|
| 0 | 0 (= MT_acc) | mt-Access |
| | 1 (= delay tolerant) | Not applicable (NOTE 1) |
| | 2 (= emergency) | emergency |
| | 3 (= MO_sig) | mo-Signalling |
| | 4 (= MO MMTel voice) | mo-VoiceCall |
| | 5 (= MO MMTel video) | mo-VideoCall |
| | 6 (= MO SMS and SMSoIP) | mo-SMS |
| | 7 (= MO_data) | mo-Data |
| 1 | Any category | mps-PriorityAccess |
| 2 | Any category | mcs-PriorityAccess |
| 11, 15 | Any category | highPriorityAccess |
| 12,13,14, | Any category | highPriorityAccess |
| NOTE 1: A UE using access category 1 for the access barring check will determine a second access category in the range 3 to 7 that is to be used for determination of the RRC establishment cause. See subclause 4.5.2, table 4.5.2.2, NOTE 6. | | |
| NOTE 2: See subclause 4.5.2, table 4.5.2.1 for use of the access identities of 0, 1, 2, and 11-15. | | |

Table 4.5.6.2: Mapping table for access identities/access categories and RRC establishment cause when establishing N1 NAS signalling connection via E-UTRA connected to 5GCN

| Access identities | Access categories | RRC establishment cause is set to |
|-------------------|-------------------------|-----------------------------------|
| 0 | 0 (= MT_acc) | mt-Access |
| | 1 (= delay tolerant) | Not applicable (NOTE 1) |
| | 2 (= emergency) | emergency |
| | 3 (= MO_sig) | mo-Signalling |
| | 4 (= MO MMTel voice) | mo-VoiceCall |
| | 5 (= MO MMTel video) | mo-VoiceCall |
| | 6 (= MO SMS and SMSoIP) | mo-Data |
| | 7 (= MO_data) | mo-Data |
| 1 | Any category | highPriorityAccess |

| | | |
|--|--------------|--------------------|
| 2 | Any category | highPriorityAccess |
| 11, 15 | Any category | highPriorityAccess |
| 12,13,14, | Any category | highPriorityAccess |
| NOTE 1: A UE using access category 1 for the access barring check will determine a second access category in the range 3 to 7 that is to be used for determination of the RRC establishment cause. See subclause 4.5.2, table 4.5.2.2, NOTE 6. | | |
| NOTE 2: See subclause 4.5.2, table 4.5.2.1 for use of the access identities of 0, 1, 2, and 11-15. | | |

[TS 38.331, clause 5.3.14.1]

The purpose of this procedure is to perform access barring check for an access attempt associated with a given Access Category and one or more Access Identities upon request from upper layers according to TS 24.501 [23] or the RRC layer.

After a handover resulting in change of PCell in RRC_CONNECTED the UE shall defer access barring checks until it has obtained valid UAC information (from *SIB1*) from the target cell.

[TS 38.331, clause 5.3.14.2]

Upon initiation of the procedure, the UE shall:

1> if timer T390 is running for the Access Category:

2> consider the access attempt as barred;

1> else if timer T302 is running and the Access Category is neither '2' nor '0':

2> consider the access attempt as barred;

1> else:

2> if the Access Category is '0':

3> consider the access attempt as allowed;

2> else:

3> if *SIB1* includes *uac-BarringPerPLMN-List* and the *uac-BarringPerPLMN-List* contains an *UAC-BarringPerPLMN* entry with the *plmn-IdentityIndex* corresponding to the PLMN selected by upper layers (see TS 24.501 [23]):

4> select the *UAC-BarringPerPLMN* entry with the *plmn-IdentityIndex* corresponding to the PLMN selected by upper layers;

4> in the remainder of this procedure, use the selected *UAC-BarringPerPLMN* entry (i.e. presence or absence of access barring parameters in this entry) irrespective of the *uac-BarringForCommon* included in *SIB1*;

3> else if *SIB1* includes *uac-BarringForCommon*:

4> in the remainder of this procedure use the *uac-BarringForCommon* (i.e. presence or absence of these parameters) included in *SIB1*;

3> else:

4> consider the access attempt as allowed;

3> if *uac-BarringForCommon* is applicable or the *uac-ACBarringListType* indicates that *uac-ExplicitACBarringList* is used:

4> if the corresponding *UAC-BarringPerCatList* contains a *UAC-BarringPerCat* entry corresponding to the Access Category:

5> select the *UAC-BarringPerCat* entry;

5> if the *uac-BarringInfoSetList* contains a *UAC-BarringInfoSet* entry corresponding to the selected *uac-barringInfoSetIndex* in the *UAC-BarringPerCat*:

6> select the *UAC-BarringInfoSet* entry;

6> perform access barring check for the Access Category as specified in 5.3.14.5, using the selected *UAC-BarringInfoSet* as "UAC barring parameter";

5> else:

6> consider the access attempt as allowed;

4> else:

5> consider the access attempt as allowed;

3> else if the *uac-ACBarringListType* indicates that *uac-ImplicitACBarringList* is used:

4> select the *uac-BarringInfoSetIndex* corresponding to the Access Category in the *uac-ImplicitACBarringList*;

4> if the *uac-BarringInfoSetList* contains the *UAC-BarringInfoSet* entry corresponding to the selected *uac-BarringInfoSetIndex*:

5> select the *UAC-BarringInfoSet* entry;

5> perform access barring check for the Access Category as specified in 5.3.14.5, using the selected *UAC-BarringInfoSet* as "UAC barring parameter";

4> else:

5> consider the access attempt as allowed;

3> else:

4> consider the access attempt as allowed;

1> if the access barring check was requested by upper layers:

2> if the access attempt is considered as barred:

3> if timer T302 is running:

4> inform the upper layer that access barring is applicable for all access categories except categories '0' and '2', upon which the procedure ends;

3> else:

4> inform upper layers that the access attempt for the Access Category is barred, upon which the procedure ends;

2> else:

3> inform upper layers that the access attempt for the Access Category is allowed, upon which the procedure ends;

1> else:

2> the procedure ends.

[TS 38.331, clause 5.3.14.4]

The UE shall:

1> if timer T302 expires or is stopped, and if timer T390 corresponding to an Access Category is not running; or

1> if timer T390 corresponding to an Access Category other than '2' expires or is stopped, and if timer T302 is not running; or

- 1> if timer T390 corresponding to the Access Category '2' expires or is stopped:
- 2> consider the barring for this Access Category to be alleviated;
- 1> when barring for an Access Category is considered being alleviated:
- 2> if the Access Category was informed to upper layers as barred:
- 3> inform upper layers about barring alleviation for the Access Category.
- 2> if barring is alleviated for Access Category '8':
- 3> perform actions specified in 5.3.13.8;

[TS 38.331, clause 5.3.14.5]

The UE shall:

- 1> if one or more Access Identities are indicated according to TS 24.501 [23], and
- 1> if for at least one of these Access Identities the corresponding bit in the *uac-BarringForAccessIdentity* contained in "UAC barring parameter" is set to *zero*:
- 2> consider the access attempt as allowed;
- 1> else:
- 2> draw a random number '*rand*' uniformly distributed in the range: $0 \leq rand < 1$;
- 2> if '*rand*' is lower than the value indicated by *uac-BarringFactor* included in "UAC barring parameter":
- 3> consider the access attempt as allowed;
- 2> else:
- 3> consider the access attempt as barred;
- 1> if the access attempt is considered as barred:
- 2> draw a random number '*rand*' that is uniformly distributed in the range $0 \leq rand < 1$;
- 2> start timer T390 for the Access Category with the timer value calculated as follows, using the *uac-BarringTime* included in "AC barring parameter":

$$T390 = (0.7 + 0.6 * rand) * uac-BarringTime.$$

11.3.6.3 Test description

11.3.6.3.1 Pre-test conditions

System Simulator:

- 2 NR cells: NR Cell 1 and 12 as specified in TS 38.508-1[4] table 4.4.2-3 are configured as shown in Table 11.3.6.3.1-1.

Table 11.3.6.3.1-1: PLMN identifiers

| NR Cell | PLMN names | MCC | MNC |
|------------|------------|-----|-----|
| NR Cell 1 | PLMN1 | 001 | 01 |
| NR Cell 12 | PLMN2 | 002 | 11 |

- System information combination NR-1 as defined in TS 38.508-1 [4] Table 4.4.3.1.2-1 is used in NR cells.

UE:

- The UE is equipped with a USIM configuration as defined in TS 38.508-1 [4] Table 6.4.1-19.

Preamble:

- The UE is in state 1N-A on NR Cell 1(serving cell) according to TS 38.508-1 [4] Table 4.4A.2-1 and using the message condition UE TEST LOOP MODE B active with IP PDU delay = 1 second according to TS 38.508-1 [4].

11.3.6.3.2 Test procedure sequence

Table 11.3.6.3.2-1 for FR1 and Table 11.3.6.3.2-2 for FR2 illustrates the downlink power levels and other changing parameters to be applied for the cells at various time instants of the test execution. Row marked "T0" denotes the initial conditions in preamble, while columns marked "T1", "T2" and "T3" are to be applied subsequently in the Main behaviour. The exact instants on which these values shall be applied are described in the texts in this clause.

Table 11.3.6.3.2-1: Cell configuration changes over time for FR1

| | Parameter | Unit | NR Cell 1 | NR Cell 12 | Remarks |
|--|---------------------|---------|-----------|------------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/SCS | -88 | Off | The power level values are assigned to ensure UE registered on NR Cell 1. |
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | Off | -80 | The power level values are assigned to ensure UE registered on NR Cell 12. |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | -80 | Off | The power level values are assigned to ensure UE registered on NR Cell 1. |
| Note 1: Power level "Off" is defined in TS 38.508-1 [4] Table 6.2.2.1-3. | | | | | |

Table 11.3.6.3.2-2: Cell configuration changes over time for FR2

| | Parameter | Unit | NR Cell 1 | NR Cell 12 | Remarks |
|--|---------------------|---------|-----------|------------|--|
| T0 | SS/PBCH
SSS EPRE | dBm/SCS | FFS | Off | The power level values are assigned to ensure UE registered on NR Cell 1. |
| T1 | SS/PBCH
SSS EPRE | dBm/SCS | Off | FFS | The power level values are assigned to ensure UE registered on NR Cell 12. |
| T2 | SS/PBCH
SSS EPRE | dBm/SCS | FFS | Off | The power level values are assigned to ensure UE registered on NR Cell 1. |
| Note 1: Power level "Off" is defined in TS 38.508-1 [4] Table 6.2.2.2-2. | | | | | |

Table 11.3.6.3.2-3: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|-----|---|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS adjusts the NR Cells power levels according to row "T1" in table 11.3.6.3.2-1/2. | - | - | - | - |
| 2 | The UE transmit a <i>RRCSetupRequest</i> message within 10 s on NR cell 12.

Check: Does the <i>RRCSetupRequest</i> message include the <i>establishmentCause</i> which is any value except <i>mcs-PriorityAccess</i> ? | --> | NR RRC: <i>RRCSetupRequest</i> | 1 | P |
| 3-6 | Steps 2 to 5 of the mobility registration updating procedure described in TS 38.508-1 [4] Table 4.9.5.2.2-1 are performed on NR Cell 12. (Note 1) | - | - | - | - |
| 7 | The SS transmits one IP PDU. | - | - | - | - |

| | | | | | |
|-------|---|-----|-------------------------------------|---|---|
| 8 | The SS transmits an <i>RRCRelease</i> message and move the UE to RRC_IDLE. | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| 9 | Check: Does the UE transmit a <i>RRCSetupRequest</i> message including <i>establishmentCause</i> of <i>mcs-PriorityAccess</i> within 10 s?. | --> | NR RRC: <i>RRCSetupRequest</i> | 2 | P |
| 10 | SS transmit an <i>RRCSetup</i> message. | <-- | NR RRC: <i>RRCSetup</i> | - | - |
| 11 | The UE transmits an <i>RRCSetupComplete</i> message to confirm the successful completion of the connection establishment. | --> | NR RRC: <i>RRCSetupComplete</i> | - | - |
| 12 | The UE loop back the IP PDU. | - | - | - | - |
| 13 | The SS transmits an <i>RRCRelease</i> message to release RRC connection and move the UE to RRC_IDLE. | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| 14 | The SS adjusts the NR Cells power levels according to row "T2" in table 11.3.6.3.2-1/2. | - | - | - | - |
| 15-19 | Steps 1 to 5 of the mobility registration updating procedure described in TS 38.508-1 [4] Table 4.9.5.2.2-1 are performed on NR Cell 1. (Note 2) | - | - | - | - |
| 20 | The SS transmits one IP PDU. | - | - | - | - |
| 21 | The SS transmits an <i>RRCRelease</i> message with suspend configuration and move the UE to RRC_INACTIVE. | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| 22 | Check: Does the UE transmit a <i>RRCResumeRequest</i> message including <i>resumeCause</i> of <i>mcs-PriorityAccess</i> within 10 s?. | --> | NR RRC: <i>RRCResumeRequest</i> | 3 | F |
| 23 | SS changes SIB1 according to Table 11.3.6.3.3-5. And the SS notifies the UE of change of System Information on NR Cell 1 by send Short Message on PDCCH using P-RNTI. | <-- | NR RRC: <i>Paging</i> | - | - |
| 24 | Check: Does the UE transmit a <i>RRCResumeRequest</i> message including <i>resumeCause</i> of <i>mcs-PriorityAccess</i> within 21 s?.(Note 3) | --> | NR RRC: <i>RRCResumeRequest</i> | 4 | P |
| 25 | SS transmit an <i>RRCResume</i> message. | <-- | NR RRC: <i>RRCResume</i> | - | - |
| 26 | The UE transmits an <i>RRCResumeComplete</i> message to confirm the successful completion of the connection establishment. | --> | NR RRC:
<i>RRCResumeComplete</i> | - | - |
| 27 | The UE loop back the IP PDU. | - | - | - | - |
| 28 | The SS transmits an <i>RRCRelease</i> message to release RRC connection and move the UE to RRC_IDLE. | <-- | NR RRC: <i>RRCRelease</i> | - | - |

Note 1: The SS includes a 5GS network feature support IE in the REGISTRATION ACCEPT message configured

as Table 11.3.6.3.3-3.

Note 2: The UE performs registration and the RRC connection is released.

Note 3: The wait time is selected to cover $(0.7 + 0.6 * rand) * uac\text{-}BarringTime(16s) = 20.8s$ rounded up to 21s - 10s (wait time in step 28) = 11s when 'rand' takes the maximum value of 1. Therefore, the actual wait time is selected to 21s, in order to be greater than 11s.

11.3.6.3.3 Specific message contents

Table 11.3.6.3.3-1: SIB1 of NR Cell 12 (preamble and all steps, Table 11.3.6.3.2-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-28 | | | |
|--|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | | | |
| uac-BarringInfo SEQUENCE { | | | |
| uac-BarringForCommon SEQUENCE
(SIZE (1..maxAccessCat-1)) OF
SEQUENCE { | | | |
| accessCategory [1] | 3 | (= MO_sig) | |
| uac-barringInfoSetIndex [1] | 1 | Value 1 corresponds
to the first entry in
uac-
BarringInfoSetList | |
| } | | | |
| uac-BarringPerPLMN-List | Not present | | |
| uac-BarringInfoSetList SEQUENCE
(SIZE(1..maxBarringInfoSet)) OF
SEQUENCE { | 1 entry | | |
| uac-BarringFactor [1] | p00 | 0% access probability | |
| uac-BarringTime [1] | s16 | 16 s | |
| uac-BarringForAccessIdentity [1] | '111111'B | Value 1 means that
access attempt is not
allowed for the
corresponding access
identity.

The leftmost bit, bit 0
in the bit string
corresponds to Access
Identity 1. | |
| } | | | |
| uac-AccessCategory1-
SelectionAssistanceInfo | Not present | | |
| } | | | |
| } | | | |

Table 11.3.6.3.3-2: *RRCSetupRequest* (step 2 and step 9, Table 11.3.6.3.2-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-23: | | | |
|---|---|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCSetupRequest ::= SEQUENCE { | | | |
| rrcSetupRequest SEQUENCE { | | | |
| establishmentCause | Any allowed value other than mcs-PriorityAccess | | Step 2 |
| | mcs-PriorityAccess | | Step 9 |
| } | | | |
| } | | | |

Table 11.3.6.3.3-3: REGISTRATION ACCEPT(step 5, Table 11.3.6.3.2-3)

| Derivation Path: 38.508 [4] Table 4.7.1-7 | | | |
|---|------------------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS network feature support | '0000 0001 0000 0010'B | Access identity 2 valid in RPLMN or equivalent PLMN.

IMS voice over PS session supported over 3GPP access.

All other features set to "not supported" including the

'Interworking without N26 interface not supported'. | |

Table 11.3.6.3.3-4: *SIB1* of NR Cell 1 (step 14, Table 11.3.6.3.2-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-28 | | | |
|--|--------------|--|-----------|
| Information Element | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | | | |
| uac-BarringInfo SEQUENCE { | | | |
| uac-BarringForCommon SEQUENCE (SIZE (1..maxAccessCat-1)) OF SEQUENCE { | | | |
| accessCategory [1] | 7 | (= MO_data) | |
| uac-barringInfoSetIndex [1] | 1 | Value 1 corresponds to the first entry in uac-BarringInfoSetList | |
| } | | | |
| uac-BarringPerPLMN-List | Not present | | |

| | | | |
|--|-------------|---|--|
| uac-BarringInfoSetList SEQUENCE
(SIZE(1..maxBarringInfoSet)) OF
SEQUENCE { | 1 entry | | |
| uac-BarringFactor [1] | P00 | 0% access probability | |
| uac-BarringTime [1] | s16 | 16 s | |
| uac-BarringForAccessIdentity [1] | 1111111 | Value 1 means that
access attempt is not
allowed for the
corresponding access
identity.

The leftmost bit, bit 0
in the bit string
corresponds to Access
Identity 1. | |
| } | | | |
| uac-AccessCategory1-
SelectionAssistanceInfo | Not present | | |
| } | | | |
| } | | | |

Table 11.3.6.3.3-5: RRCResumeRequest (step 22 and step 24, Table 11.3.6.3.2-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-19: | | | |
|---|--------------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| RRCResumeRequest ::= SEQUENCE { | | | |
| rrcResumeRequest SEQUENCE { | | | |
| resumeCause | mcs-PriorityAccess | | |
| } | | | |
| } | | | |

Table 11.3.6.3.3-6: SIB1 of NR Cell 1 (step 23, Table 11.3.6.3.2-3)

| Derivation Path: TS 38.508-1 [4], Table 4.6.1-28 | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| SIB1 ::= SEQUENCE { | | | |
| uac-BarringInfo SEQUENCE { | Not present | | |
| } | | | |

11.4 Emergency Services

11.4.1 5GMM-REGISTERED.NORMAL-SERVICE / 5GMM-IDLE / Emergency call / Utilising emergency number stored on the USIM / New emergency PDU session

11.4.1.1 Test Purpose (TP)

(1)

with { UE in 5GMM-REGISTERED.NORMAL-SERVICE state and 5GMM-IDLE mode }

ensure that {

when { UE is requested to make an outgoing call using an emergency number stored on the USIM }

then { UE establishes an RRC connection with the RRC *establishmentCause* set to "emergency", **and**, sends a SERVICE REQUEST message with Service type IE set to "emergency services", **and**, establishes a New emergency PDU session by sending an UL NAS TRANSPORT message with Request type set to "initial emergency request" and a PDU SESSION ESTABLISHMENT REQUEST }

}

11.4.1.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331 [12], subclause 5.3.3.3, TS 24.501 [22], subclauses 5.6.1.2, 6.4.1.2, TS 31.102 [36], subclause 10.1.1. Unless otherwise stated these are Rel-15 requirements.

[TS 38.331, subclause 5.3.3.3]

The UE shall set the contents of *RRCSetupRequest* message as follows:

...

1> set the *establishmentCause* in accordance with the information received from upper layers;

The UE shall submit the *RRCSetupRequest* message to lower layers for transmission.

[TS 24.501, subclause 5.6.1.2]

The UE initiates the service request procedure by sending a SERVICE REQUEST message to the AMF and starts timer T3517.

If the UE is sending the SERVICE REQUEST message from 5GMM-IDLE mode and the UE needs to send non-clear text IEs, the UE shall send the SERVICE REQUEST message including the NAS message container IE as described in subclause 4.4.6.

...

For case c) in subclause 5.6.1.1, the Uplink data status IE shall not be included in the SERVICE REQUEST message except if the UE has one or more active always-on PDU sessions associated with the access type over which the SERVICE REQUEST message is sent. If the UE is not a UE configured for high priority access in selected PLMN and:

a) if the SERVICE REQUEST message is triggered by a request for emergency services from the upper layer, the UE shall set the service type IE in the SERVICE REQUEST message to "emergency services"; or

[TS 24.501, subclause 6.4.1.2]

In order to initiate the UE-requested PDU session establishment procedure, the UE shall create a PDU SESSION ESTABLISHMENT REQUEST message.

NOTE 0: When IMS voice is available over either 3GPP access or non-3GPP access, the "voice centric" UE in 5GMM-REGISTERED state will receive a request from upper layers to establish the PDU session for IMS signalling, if the conditions for performing an initial registration with IMS indicated in 3GPP TS 24.229 [14] subclause U.3.1.2 are satisfied.

If the UE requests to establish a new PDU session, the UE shall allocate a PDU session ID which is not currently being used by another PDU session over either 3GPP access or non-3GPP access.

The UE shall allocate a PTI value currently not used and shall set the PTI IE of the PDU SESSION ESTABLISHMENT REQUEST message to the allocated PTI value.

...

If the UE requests to establish a new emergency PDU session, the UE shall set the SSC mode IE of the PDU SESSION ESTABLISHMENT REQUEST message to "SSC mode 1".

...

The UE shall transport:

- a) the PDU SESSION ESTABLISHMENT REQUEST message;
- b) the PDU session ID of the PDU session being established, or being handed over or being transferred;

..

- e) the request type which is set to:

...

- 3) "initial emergency request", if the UE requests to establish a new emergency PDU session; and

...

If the request type is set to "initial emergency request" or "existing emergency PDU session", neither DNN nor S-NSSAI is transported by the UE using the NAS transport procedure as specified in subclause 5.4.5.

[TS 31.102, subclause 10.1.1]

The ME shall identify an emergency number dialled by the end user as a valid emergency number and initiate emergency call establishment if it occurs under one or more of the following conditions. If it occurs outside of the following conditions, the ME should not initiate emergency call establishment but normal call establishment. Emergency number identification takes place before and takes precedence over any other (e.g. supplementary service related) number analysis.

...

- b) Any emergency call number stored on a SIM/USIM when the SIM/USIM is present.

11.4.1.3 Test description

11.4.1.3.1 Pre-test conditions

System Simulator:

- 1 NR Cell
- NR Cell 1 as defined in TS 38.508-1 [4] Table 4.4.2-3. System information combination NR-1 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2. SIB1 indicates ims-EmergencySupport.

UE:

- The UE is equipped with a test USIM with USIM Configuration 20 as defined in TS 38.508-1 [4] Table 6.4.1-20 (USIM contains two Emergency Numbers: 144, 117).

Preamble:

- The UE is in test state 1N-A as defined in TS 38.508-1 [4], subclause 4.4A.2 on NR Cell 1.

11.4.1.3.2 Test procedure sequence

Table 11.4.1.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | Make the UE attempt an IMS emergency call dialling the number 144 which is stored on the USIM. (NOTE 1) | - | - | - | - |
| 2 | Check: Does the UE performs Generic Test Procedure for IMS Emergency call establishment with IMS emergency registration as specified in TS 38.508-1 [4], subclause 4.9.11? | - | - | 1 | - |
| 3 | Make the UE release the emergency call. (NOTE 1) | - | - | - | - |
| 4 | The Generic test procedure for IMS MO Emergency call release as specified in TS 38.508-1 [4], subclause 4.9.12A takes place. | - | - | - | - |

NOTE 1: This could be done by e.g. MMI or AT command.

11.4.1.3.3 Specific message contents

None.

11.4.2 5GMM-DEREGISTERED.LIMITED-SERVICE / Emergency call / Utilisation of emergency numbers stored on the ME / Initial registration for emergency services / Handling of forbidden PLMNs

11.4.2.1 Test Purpose (TP)

(1)

with { UE in 5GMM-DEREGISTERED.LIMITED-SERVICE state }

ensure that {

when { UE is requested to make an outgoing call using an emergency number stored on the ME }

then { UE establishes an RRC connection with the RRC *establishmentCause* set to "emergency", **and**, attempts an Initial registration for emergency services by sending a REGISTRATION REQUEST message with IE Service type set to "emergency services", **and**, accepts and applies security with NULL security and integrity algorithms, **and**, after successful completion of the registration for emergency services establishes an emergency PDU session by sending an UL NAS TRANSPORT message with Request type set to "initial emergency request" and a PDU SESSION ESTABLISHMENT REQUEST }

}

(2)

with { UE in 5GMM-DEREGISTERED.LIMITED-SERVICE state }

ensure that {

when { UE has performed an IMS Emergency call on a forbidden PLMN }

then { UE does not remove the PLMN code of the accessed PLMN from the list of forbidden PLMNs }

}

11.4.2.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331 [12], subclause 5.3.3.3, TS 23.501 [37], subclause 5.16.4.1, TS 23.122 [38], subclauses 2, 3.1, 3.5, TS 24.501 [22], subclauses 4.4.4.1, 5.1.3.2.1.3.3, 5.3.2, 5.4.2.3, 5.5.1.2.2, 5.5.1.2.4, 6.4.1.2, TS 22.101 [42], subclause 10.1.1. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, subclause 5.3.3.3]

The UE shall set the contents of *RRCSetupRequest* message as follows:

...

1> set the *establishmentCause* in accordance with the information received from upper layers;

The UE shall submit the *RRCSetupRequest* message to lower layers for transmission.

[TS 23.501, subclause 5.16.4.1]

UEs that are in limited service state, as specified in TS 23.122 [17], or that camp normally on a cell but failed to register successfully to the network under conditions specified in TS 24.501 [47], initiate the Registration procedure by indicating that the registration is to receive Emergency Services, referred to as Emergency Registration, and a Follow-on request is included in the Registration Request to initiate PDU Session Establishment procedure with a Request Type indicating "Emergency Request". UEs that had registered for normal services and do not have emergency PDU Sessions established and that are subject to Mobility Restriction in the present area or RAT (e.g. because of restricted tracking area) shall initiate the UE Requested PDU Session Establishment procedure to receive Emergency Services, i.e. with a Request Type indicating "Emergency Request". Based on local regulation, the network supporting Emergency Services for UEs in limited service state provides Emergency Services to these UE, regardless whether the UE can be authenticated, has roaming or Mobility Restrictions or a valid subscription.

[TS 23.122, clause 2]

If the MS is unable to find a suitable cell to camp on, or the SIM is not inserted, or if it receives certain responses to an LR request (e.g., "illegal MS"), it attempts to camp on a cell irrespective of the PLMN identity, and enters a "limited service" state in which it can only attempt to make emergency calls. An MS operating in NB-S1 mode, never attempts to make emergency calls.

[TS 23.122, subclause 3.1]

An MS that is attaching for emergency bearer services or is attached for emergency bearer services may access PLMNs in the list of "forbidden PLMNs" or the list of "forbidden PLMNs for GPRS service". The MS shall not remove any entry from the list of "forbidden PLMNs" or the list of "forbidden PLMNs for GPRS service" as a result of such accesses.

[TS 23.122, subclause 3.5]

There are a number of situations in which the MS is unable to obtain normal service from a PLMN. These include:

a) Failure to find a suitable cell of the selected PLMN;

...

(In automatic PLMN selection mode, items a, c and f would normally cause a new PLMN selection, but even in this case, the situation may arise when no PLMNs are available and allowable for use).

For the items a to f, the MS attempts to camp on an acceptable cell, irrespective of its PLMN identity, so that emergency calls can be made if necessary, with the exception that an MS operating in NB-S1 mode, shall never attempt to make emergency calls. When in the limited service state with a valid SIM, the MS shall search for available and allowable PLMNs in the manner described in subclause 4.4.3.1 and when indicated in the SIM also as described in subclause 4.4.3.4. For an MS that is not in eCall only mode, with the exception of performing GPRS attach or EPS attach for emergency bearer services, or performing registration for emergency services, no LR requests are made until a valid SIM is present and either a suitable cell is found or a manual network reselection is performed. For an MS in eCall only mode, no LR requests are made except for performing EPS attach for emergency bearer services or registration for emergency services. When performing GPRS attach or EPS attach for emergency bearer services, or registration for emergency services, the PLMN of the current serving cell is considered as the selected PLMN for the duration the MS is attached for emergency bearer services or registered for emergency services. In the limited service state the presence of the MS need not be known to the PLMN on whose cell it has camped.

There are also other conditions under which only emergency calls may be made. These are shown in table 2 in clause 5. ProSe direct communication and ProSe direct discovery for public safety use can be initiated if necessary (see 3GPP TS 24.334 [51]) when in the limited service state due to items a) or c) or f). V2X communication over PC5 can be initiated if necessary (see 3GPP TS 24.386 [59]) when in the limited service state due to items a) or c) or f).

[TS 24.501, subclause 4.4.4.1]

The use of "null integrity protection algorithm" 5G-IA0 (see subclause 9.11.3.32) in the current 5G NAS security context is only allowed for an unauthenticated UE for which establishment of emergency services is allowed. For setting the security header type in outbound NAS messages, the UE and the AMF shall apply the same rules irrespective of whether the "null integrity protection algorithm" or any other integrity protection algorithm is indicated in the 5G NAS security context.

If the "null integrity protection algorithm" 5G-IA0 has been selected as an integrity protection algorithm, the receiver shall regard the NAS messages with the security header indicating integrity protection as integrity protected.

[TS 24.501, subclause 5.1.3.2.1.3.3]

The substate 5GMM-DEREGISTERED.LIMITED-SERVICE is chosen in the UE, when it is known that a selected cell for 3GPP access or TA for non-3GPP access is unable to provide normal service (e.g. the selected cell over 3GPP access is in a forbidden PLMN or is in a forbidden tracking area or TA for non-3GPP access is forbidden).

[TS 24.501, subclause 5.3.2]

The UE provides the SUPI to the network in concealed form. The SUCI is a privacy preserving identifier containing the concealed SUPI. When the SUPI contains a network specific identifier, the SUCI shall take the form of an NAI as specified in 3GPP TS 23.003 [4].

A UE supporting N1 mode includes a SUCI:

a) in the REGISTRATION REQUEST message when the UE is attempting initial registration procedure and a valid 5G-GUTI is not available; or

...

The UE shall use the "null-scheme" as specified in 3GPP TS 33.501 [24] to generate the SUCI, if the following applies:

a) the UE performs a registration procedure for emergency services or initiates a de-registration procedure before the registration procedure for emergency services was completed successfully; and

[TS 24.501, subclause 5.4.2.3]

If the UE is registered for emergency services, performing initial registration for emergency services or establishing an emergency PDU session and the SECURITY MODE COMMAND message is received with ngKSI value "000" and 5G-IA0 and 5G-EA0 as selected 5G NAS security algorithms, the UE shall locally derive and take in use 5G NAS security context. The UE shall delete existing current 5G NAS security context.

The UE shall accept a SECURITY MODE COMMAND message indicating the "null integrity protection algorithm" 5G-EA0 as the selected 5G NAS integrity algorithm only if the message is received when the UE is registered for emergency services, performing initial registration for emergency services or establishing an emergency PDU session.

[TS 24.501, subclause 5.5.1.2.2]

The UE in state 5GMM-DEREGISTERED shall initiate the registration procedure for initial registration by sending a REGISTRATION REQUEST message to the AMF,

...

b) when the UE performs initial registration for emergency services;

...

If the UE initiates an initial registration for emergency services or needs to prolong the established NAS signalling connection after the completion of the initial registration procedure (e.g. due to uplink signalling pending), the UE shall set the Follow-on request indicator to 1.

[TS 24.501, subclause 5.5.1.2.4]

If the initial registration procedure is not for emergency services, and if the PLMN identity of the registered PLMN is a member of the list of "forbidden PLMNs", any such PLMN identity shall be deleted from the corresponding list(s).

[TS 24.501, subclause 6.4.1.2]

In order to initiate the UE-requested PDU session establishment procedure, the UE shall create a PDU SESSION ESTABLISHMENT REQUEST message.

NOTE 0: When IMS voice is available over either 3GPP access or non-3GPP access, the "voice centric" UE in 5GMM-REGISTERED state will receive a request from upper layers to establish the PDU session for IMS signalling, if the conditions for performing an initial registration with IMS indicated in 3GPP TS 24.229 [14] subclause U.3.1.2 are satisfied.

If the UE requests to establish a new PDU session, the UE shall allocate a PDU session ID which is not currently being used by another PDU session over either 3GPP access or non-3GPP access.

The UE shall allocate a PTI value currently not used and shall set the PTI IE of the PDU SESSION ESTABLISHMENT REQUEST message to the allocated PTI value.

...

If the UE requests to establish a new emergency PDU session, the UE shall set the SSC mode IE of the PDU SESSION ESTABLISHMENT REQUEST message to "SSC mode 1".

...

The UE shall transport:

a) the PDU SESSION ESTABLISHMENT REQUEST message;

b) the PDU session ID of the PDU session being established, or being handed over or being transferred;

..

e) the request type which is set to:

...

3) "initial emergency request", if the UE requests to establish a new emergency PDU session; and

...

If the request type is set to "initial emergency request" or "existing emergency PDU session", neither DNN nor S-NSSAI is transported by the UE using the NAS transport procedure as specified in subclause 5.4.5.

[TS 22.101, subclause 10.1.1]

The ME shall identify an emergency number dialled by the end user as a valid emergency number and initiate emergency call establishment if it occurs under one or more of the following conditions. If it occurs outside of the following conditions, the ME should not initiate emergency call establishment but normal call establishment. Emergency number identification takes place before and takes precedence over any other (e.g. supplementary service related) number analysis.

a) 112 and 911 shall always be available. These numbers shall be stored on the ME.

11.4.2.3 Test description

11.4.2.3.1 Pre-test conditions

System Simulator:

- 1 NR Cell
- NR Cell 12, as defined in TS 38.508-1 [4] Table 4.4.2-3. System information combination NR-1 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2. SIB1 indicates *ims-EmergencySupport*.
- NR Cell 12 belongs to PLMN2.

UE:

- The UE is equipped with a test USIM with USIM Configuration 15 as defined in TS 38.508-1 [4] Table 6.4.1-15 (PLMN2 is set in it as 'forbidden PLMN', PLMN1 is the HPLMN).

Preamble:

- The UE is in test state 0N-B (Switched Off) as defined in TS 38.508-1 [4], subclause 4.4A.2. Prior to being switched off the UE is registered on PLMN1.

11.4.2.3.2 Test procedure sequence

Table 11.4.2.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | Void | - | - | - | - |
| 2 | Switch the UE on. | - | - | - | - |
| 3 | Make the UE attempt an IMS emergency call dialling a number which is stored on the ME (e.g. 112 or 911). (NOTE 1) | - | - | - | - |
| 4 | Check: Does the UE performs Generic Test Procedure for IMS Emergency call establishment without IMS emergency registration as specified in TS 38.508-1 [4], subclause 4.9.12? | - | - | 1 | - |
| 5 | Make the UE release the emergency call. (NOTE 1) | - | - | - | - |
| 6 | The Generic test procedure for IMS MO Emergency call release as specified in TS 38.508-1 [4], subclause 4.9.12A takes place. | - | - | - | - |
| 7 | Start Timer=10 sec. | - | - | - | - |

| | | | | | |
|---|--|-----|--|---|---|
| | NOTE: This is an arbitrary value to wait for UE initiated detach. | | | | |
| - | EXCEPTION: Steps 8a1-8b3 describes optional behaviour that depends on the UE implementation. | - | - | - | - |
| 8a1 | The UE transmits a DEREGISTRATION REQUEST message with De-registration type IE set to "Normal de-registration". | --> | NR RRC: <i>ULInformationTransfer</i>
5GMM: DEREGISTRATION REQUEST | - | - |
| 8a2 | The UE transmits a DEREGISTRATION ACCEPT message. | <-- | NR RRC: <i>DLInformationTransfer</i>
5GMM: DEREGISTRATION REQUEST | - | - |
| 8a3 | Stop Timer=10. | - | - | - | - |
| 8b1 | Timer=10 sec expires | - | - | - | - |
| 8b2 | The SS transmits a DEREGISTRATION REQUEST message with Deregistration type IE set to "re-registration required". | <-- | NR RRC: <i>DLInformationTransfer</i>
5GMM: DEREGISTRATION REQUEST | - | - |
| 8b3 | The UE transmits a DEREGISTRATION ACCEPT message. | --> | NR RRC: <i>ULInformationTransfer</i>
5GMM: DEREGISTRATION REQUEST | - | - |
| 9 | SS releases the RRC connection | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| 10 | Start Timer=30 sec.

NOTE: This is an arbitrary value to wait for catching not allowed UE behaviour. | - | - | - | - |
| - | EXCEPTION: Steps 11a1-11b1 describes optional behaviour that depends on the UE behaviour. | - | - | - | - |
| 11a1 | Check: Does the UE transmit an <i>RRCSetupRequest</i> message? | --> | NR RRC: <i>RRCSetupRequest</i> | 2 | F |
| 11b1 | Timer=30 sec expires | - | - | 2 | P |
| NOTE 1: This could be done by e.g. MMI or AT command. | | | | | |

11.4.2.3.3 Specific message contents

Table 11.4.2.3.3-1: REGISTRATION REQUEST (step 4, Table 11.4.2.3.2-1; step 3, TS 38.508-1 [4], Table 4.9.12.2.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6, condition EMERGENCY. | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS mobile identity | SUCI | The UE shall use the "null-scheme" as specified in 3GPP TS 33.501 | |

| | | | |
|--|--|---------------------------|--|
| | | [20] to generate the SUCI | |
|--|--|---------------------------|--|

Table 11.4.2.3.3-2: DEREGISTRATION REQUEST (Step 8a1, Table 11.4.2.3.2-1)

| |
|---|
| Derivation Path: TS 38.508-1 [4], Table 4.7.1-12, Condition NORMAL. |
|---|

Table 11.4.2.3.3-3: DEREGISTRATION REQUEST (Step 8b2, Table 11.4.2.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-14. | | | |
|---|--------------|------------------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| De-registration type | | | |
| bit 3 | '0'B | re-registration not required | |
| Access type | '01'B | 3GPP access | |
| 5GMM cause | "#11 | PLMN not allowed | |

11.4.3 5GMM-DEREGISTERED.NO-SUPI / Emergency call / Utilisation of emergency numbers stored on the ME / Initial registration for emergency services

11.4.3.1 Test Purpose (TP)

(1)

with { UE in 5GMM-DEREGISTERED.NO-SUPI state (no USIM) }

ensure that {

when { UE is requested to make an outgoing call using an emergency number stored on the ME }

then { UE establishes an RRC connection with the RRC *establishmentCause* set to "emergency", **and**, attempts an Initial registration for emergency services by sending a REGISTRATION REQUEST message with IE Service type set to "emergency services", **and**, accepts and applies security with NULL security and integrity algorithms, **and**, after successful completion of the registration for emergency services establishes an emergency PDU session by sending an UL NAS TRANSPORT message with Request type set to "initial emergency request" and a PDU SESSION ESTABLISHMENT REQUEST }

}

11.4.3.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 38.331 [12], subclause 5.3.3.3, TS 23.501 [37], subclause 5.16.4.1, TS 23.122 [38], subclauses 2, 3.5, TS 24.501 [22], subclauses 4.4.4.1, 5.1.3.2.1.3.6, 5.3.2, 5.4.2.3, 5.5.1.2.2, 6.4.1.2, TS 22.101 [42], subclause 10.1.1. Unless otherwise stated these are Rel-15 requirements.

[TS 36.331, subclause 5.3.3.3]

The UE shall set the contents of *RRCSetupRequest* message as follows:

...

1> set the *establishmentCause* in accordance with the information received from upper layers;

The UE shall submit the *RRCSetupRequest* message to lower layers for transmission.

[TS 23.501, subclause 5.16.4.1]

UEs that are in limited service state, as specified in TS 23.122 [17], or that camp normally on a cell but failed to register successfully to the network under conditions specified in TS 24.501 [47], initiate the Registration procedure by indicating that the registration is to receive Emergency Services, referred to as Emergency Registration, and a Follow-on request is included in the Registration Request to initiate PDU Session Establishment procedure with a Request Type indicating "Emergency Request". UEs that had registered for normal services and do not have emergency PDU Sessions established and that are subject to Mobility Restriction in the present area or RAT (e.g. because of restricted tracking area) shall initiate the UE Requested PDU Session Establishment procedure to receive Emergency Services, i.e. with a Request Type indicating "Emergency Request". Based on local regulation, the network supporting Emergency Services for UEs in limited service state provides Emergency Services to these UE, regardless whether the UE can be authenticated, has roaming or Mobility Restrictions or a valid subscription.

[TS 23.122, clause 2]

If the MS is unable to find a suitable cell to camp on, or the SIM is not inserted, or if it receives certain responses to an LR request (e.g., "illegal MS"), it attempts to camp on a cell irrespective of the PLMN identity, and enters a "limited service" state in which it can only attempt to make emergency calls. An MS operating in NB-S1 mode, never attempts to make emergency calls.

[TS 23.122, subclause 3.5]

There are a number of situations in which the MS is unable to obtain normal service from a PLMN. These include:

...

b) No SIM in the MS;

...

For the items a to f, the MS attempts to camp on an acceptable cell, irrespective of its PLMN identity, so that emergency calls can be made if necessary, with the exception that an MS operating in NB-S1 mode, shall never attempt to make emergency calls. When in the limited service state with a valid SIM, the MS shall search for available and allowable PLMNs in the manner described in subclause 4.4.3.1 and when indicated in the SIM also as described in subclause 4.4.3.4. For an MS that is not in eCall only mode, with the exception of performing GPRS attach or EPS attach for emergency bearer services, or performing registration for emergency services, no LR requests are made until a valid SIM is present and either a suitable cell is found or a manual network reselection is performed. For an MS in eCall only mode, no LR requests are made except for performing EPS attach for emergency bearer services or registration for emergency services. When performing GPRS attach or EPS attach for emergency bearer services, or registration for emergency services, the PLMN of the current serving cell is considered as the selected PLMN for the duration the MS is attached for emergency bearer services or registered for emergency services. In the limited service state the presence of the MS need not be known to the PLMN on whose cell it has camped.

There are also other conditions under which only emergency calls may be made. These are shown in table 2 in clause 5. ProSe direct communication and ProSe direct discovery for public safety use can be initiated if necessary (see 3GPP TS 24.334 [51]) when in the limited service state due to items a) or c) or f). V2X communication over PC5 can be initiated if necessary (see 3GPP TS 24.386 [59]) when in the limited service state due to items a) or c) or f).

[TS 24.501, subclause 4.4.4.1]

The use of "null integrity protection algorithm" 5G-IA0 (see subclause 9.11.3.32) in the current 5G NAS security context is only allowed for an unauthenticated UE for which establishment of emergency services is allowed. For setting the security header type in outbound NAS messages, the UE and the AMF shall apply the same rules irrespective of whether the "null integrity protection algorithm" or any other integrity protection algorithm is indicated in the 5G NAS security context.

If the "null integrity protection algorithm" 5G-IA0 has been selected as an integrity protection algorithm, the receiver shall regard the NAS messages with the security header indicating integrity protection as integrity protected.

[TS 24.501, subclause 5.1.3.2.1.3.6]

The substate 5GMM-DEREGISTERED.NO-SUPI is chosen in the UE, if the N1 mode is enabled and the UE has no valid subscriber data available (SIM/USIM not available, the SIM/USIM is considered invalid by the UE).

[TS 24.501, subclause 5.3.2]

A UE supporting NG-RAN includes a PEI:

a) when neither SUPI nor valid 5G-GUTI is available to use for emergency services in the REGISTRATION REQUEST message with 5GS registration type IE set to "emergency registration"; and

[TS 24.501, subclause 5.4.2.3]

If the UE is registered for emergency services, performing initial registration for emergency services or establishing an emergency PDU session and the SECURITY MODE COMMAND message is received with ngKSI value "000" and 5G-IA0 and 5G-EA0 as selected 5G NAS security algorithms, the UE shall locally derive and take in use 5G NAS security context. The UE shall delete existing current 5G NAS security context.

The UE shall accept a SECURITY MODE COMMAND message indicating the "null integrity protection algorithm" 5G-EA0 as the selected 5G NAS integrity algorithm only if the message is received when the UE is registered for emergency services, performing initial registration for emergency services or establishing an emergency PDU session.

[TS 24.501, subclause 5.5.1.2.2]

The UE in state 5GMM-DEREGISTERED shall initiate the registration procedure for initial registration by sending a REGISTRATION REQUEST message to the AMF,

...

b) when the UE performs initial registration for emergency services;

...

If the UE initiates an initial registration for emergency services or needs to prolong the established NAS signalling connection after the completion of the initial registration procedure (e.g. due to uplink signalling pending), the UE shall set the Follow-on request indicator to 1.

[TS 24.501, subclause 6.4.1.2]

In order to initiate the UE-requested PDU session establishment procedure, the UE shall create a PDU SESSION ESTABLISHMENT REQUEST message.

NOTE 0: When IMS voice is available over either 3GPP access or non-3GPP access, the "voice centric" UE in 5GMM-REGISTERED state will receive a request from upper layers to establish the PDU session for IMS signalling, if the conditions for performing an initial registration with IMS indicated in 3GPP TS 24.229 [14] subclause U.3.1.2 are satisfied.

If the UE requests to establish a new PDU session, the UE shall allocate a PDU session ID which is not currently being used by another PDU session over either 3GPP access or non-3GPP access.

The UE shall allocate a PTI value currently not used and shall set the PTI IE of the PDU SESSION ESTABLISHMENT REQUEST message to the allocated PTI value.

...

If the UE requests to establish a new emergency PDU session, the UE shall set the SSC mode IE of the PDU SESSION ESTABLISHMENT REQUEST message to "SSC mode 1".

...

The UE shall transport:

a) the PDU SESSION ESTABLISHMENT REQUEST message;

b) the PDU session ID of the PDU session being established, or being handed over or being transferred;

..

e) the request type which is set to:

...

3) "initial emergency request", if the UE requests to establish a new emergency PDU session; and

...

If the request type is set to "initial emergency request" or "existing emergency PDU session", neither DNN nor S-NSSAI is transported by the UE using the NAS transport procedure as specified in subclause 5.4.5.

[TS 22.101, subclause 10.1.1]

The ME shall identify an emergency number dialled by the end user as a valid emergency number and initiate emergency call establishment if it occurs under one or more of the following conditions. If it occurs outside of the following conditions, the ME should not initiate emergency call establishment but normal call establishment. Emergency number identification takes place before and takes precedence over any other (e.g. supplementary service related) number analysis.

a) 112 and 911 shall always be available. These numbers shall be stored on the ME.

11.4.3.3 Test description

11.4.3.3.1 Pre-test conditions

System Simulator:

- 1 NR Cells
- NR Cell 1, as defined in TS 38.508-1 [4] Table 4.4.2-3. System information combination NR-1 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2. SIB1 indicates ims-EmergencySupport.

UE:

- The UE is NOT equipped with USIM.

Preamble:

- The UE is in test state 0N-B (Switched Off) as defined in TS 38.508-1 [4], subclause 4.4A.2.

11.4.3.3.2 Test procedure sequence

Table 11.4.3.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---------|----|---------|
| | | U - S | Message | | |
| 1 | Switch the UE on. | - | - | - | - |
| 2 | Make the UE attempt an IMS emergency call dialling a number which is stored on the ME (e.g. 112 or 911). (NOTE 1) | - | - | - | - |
| 3 | Check: Does the UE performs Generic Test Procedure for IMS Emergency call establishment without IMS emergency registration as specified in TS 38.508-1 [4], subclause 4.9.12? | - | - | 1 | - |

| | | | | | |
|---|--|-----|--|---|---|
| 4 | Make the UE release the emergency call.
(NOTE 1) | - | - | - | - |
| 5 | The Generic test procedure for IMS MO Emergency call release as specified in TS 38.508-1 [4], subclause 4.9.12A takes place. | - | - | - | - |
| 6 | Start Timer=10 sec.

NOTE: This is an arbitrary value to wait for UE initiated detach. | - | - | - | - |
| - | EXCEPTION: Steps 7a1-7b1 describes optional behaviour that depends on the UE implementation. | - | - | - | - |
| 7a1 | The UE transmits a DEREGISTRATION REQUEST message with De-registration type IE set to "Normal de-registration". | --> | NR RRC: <i>ULInformationTransfer</i>

5GMM: DEREGISTRATION REQUEST | - | - |
| 7a2 | The UE transmits a DEREGISTRATION ACCEPT message. | <-- | NR RRC: <i>DLInformationTransfer</i>

5GMM: DEREGISTRATION REQUEST | - | - |
| 7a3 | Stop Timer=10. | - | - | - | - |
| 7b1 | Timer=10 sec expires | - | - | - | - |
| NOTE 1: This could be done by e.g. MMI or AT command. | | | | | |

11.4.3.3.3 Specific message contents

Table 11.4.3.3.3-1: REGISTRATION REQUEST (step 3, Table 11.4.3.3.2-1; step 3, TS 38.508-1 [4], Table 4.9.12.2.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-6, condition EMERGENCY. | | | |
|---|--------------|---------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GS mobile identity | PEI | | |

Table 11.4.3.3.3-2: DEREGISTRATION REQUEST (Step 7a1, Table 11.4.3.3.2-1)

| |
|---|
| Derivation Path: TS 38.508-1 [4], Table 4.7.1-12, Condition NORMAL. |
|---|

11.4.4 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE T3346 running / Emergency call establishment

11.4.4.1 Test Purpose (TP)

(1)

with { UE in 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE state, timer T3346 is running and 5GMM-IDLE mode }

ensure that {

when { UE is requested to make an Emergency call }

then { UE initiate the registration procedure for mobility and periodic registration update, and, establishes the Emergency call }

}

11.4.4.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], subclause 5.5.1.3.5, 5.3.9, 5.5.1.3.2. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, subclause 5.5.1.3.5]

If the mobility and periodic registration update request cannot be accepted by the network, the AMF shall send a REGISTRATION REJECT message to the UE including an appropriate 5GMM cause value.

...

The UE shall take the following actions depending on the 5GMM cause value received in the REGISTRATION REJECT message.

...

#22 (Congestion).

If the T3346 value IE is present in the REGISTRATION REJECT message and the value indicates that this timer is neither zero nor deactivated, the UE shall proceed as described below, otherwise it shall be considered as an abnormal case and the behaviour of the UE for this case is specified in subclause 5.5.1.3.7.

The UE shall abort the registration procedure for mobility and periodic registration update. If the rejected request was not for initiating an emergency PDU session, the UE shall set the 5GS update status to 5U2 NOT UPDATED and change to state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE.

The UE shall stop timer T3346 if it is running.

If the REGISTRATION REJECT message is integrity protected, the UE shall start timer T3346 with the value provided in the T3346 value IE.

...

The UE stays in the current serving cell and applies the normal cell reselection process. The registration procedure for mobility and periodic registration update is started, if still necessary, when timer T3346 expires or is stopped.

[TS 24.501, subclause 5.3.9]

If timer T3346 is running or is deactivated, and the UE is a UE configured for high priority access in selected PLMN, or the UE needs to initiate signalling for emergency services or emergency services fallback, then the UE is allowed to initiate 5GMM procedures.

[TS 24.501, subclause 5.5.1.3.2]

The UE in state 5GMM-REGISTERED shall initiate the registration procedure for mobility and periodic registration update by sending a REGISTRATION REQUEST message to the AMF,

...

k) when the UE in state 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE receives a request from the upper layers to establish an emergency PDU session or perform emergency services fallback;

11.4.4.3 Test description

11.4.4.3.1 Pre-test conditions

System Simulator:

- 2 NR Cells
- NR Cell 1 and NR Cell 11 as defined in TS 38.508-1 [4] Table 4.4.2-3.
- On all cells when active: System information combination NR-1 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2. SIB1 indicates ims-EmergencySupport.

UE:

None.

Preamble:

- Cell configuration " in accordance with TS 38.508-1 [4], Table 4.4.2-3:
- NR Cell 1 "Serving cell"
- NR Cell 11 "Non-Suitable "Off" cell"
- The UE is in test state 1N-A as defined in TS 38.508-1 [4], subclause 4.4A.2 on NR Cell 1
- During the initial registration:
- The list of tracking areas provided by the AMF (IE "TAI list") contains only the TAI of NR Cell 1.

11.4.4.3.2 Test procedure sequence

Table 11.4.4.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NR Cell 11 as "Serving cell"
- NR Cell 1 as "Non-Suitable "Off" cell". | - | - | - | - |
| - | EXCEPTION: The following messages are to be observed on NR Cell 11 unless explicitly stated otherwise. | - | - | - | - |
| 2 | The UE transmits an <i>RRCCoalitionRequest</i> message. | --> | NR RRC: <i>RRCCoalitionRequest</i> | - | - |
| 3 | SS transmit an <i>RRCCoalitionSetup</i> message. | <-- | NR RRC: <i>RRCCoalitionSetup</i> | - | - |
| 4 | The UE transmits an <i>RRCCoalitionSetupComplete</i> message to confirm the successful completion of the connection establishment and a REGISTRATION REQUEST message indicating "mobility registration updating" is sent to update the registration of the actual tracking area. | --> | NR RRC: <i>RRCCoalitionSetupComplete</i>

5GMM: REGISTRATION REQUEST | - | - |

| | | | | | |
|---|--|-----|---|---|---|
| 5 | SS sends a REGISTRATION REJECT message containing 5GMM cause value = #22 (Congestion). | <-- | NR RRC: <i>DLInformationTransfer</i>
5GMM: REGISTRATION REJECT | - | - |
| 6 | The SS transmits an <i>RRCConnectionRelease</i> message. | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| 7 | Make the UE attempt an IMS emergency call dialling an emergency number e.g. 112 or 911). (NOTE 1) | - | - | - | - |
| 8 | Check: Does the UE perform on NR Cell 2 the Registration procedure for mobility registration update as specified in TS 38.508-1 [4] subclause 4.9.5, ' <i>connected without release</i> '? | - | - | 1 | - |
| 9 | Check: Does the UE performs Generic Test Procedure for IMS Emergency call establishment with IMS Emergency registration as specified in TS 38.508-1 [4], subclause 4.9.11? | - | - | 1 | - |
| 10 | Make the UE release the emergency call. (NOTE 1) | - | - | - | - |
| 11 | The Generic test procedure for IMS MO Emergency call release as specified in TS 38.508-1 [4], subclause 4.9.12A takes place. | - | - | - | - |
| NOTE 1: This could be done by e.g. MMI or AT command. | | | | | |

11.4.4.3.3 Specific message contents

Table 11.4.4.3.3-1: REGISTRATION REJECT (step 5, Table 11.4.4.3.2-1)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-9 | | | |
|---|--------------|------------------|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '00010110'B | #22 (Congestion) | |
| T3346 value | '00100011'B | 3 minutes | |

11.4.5 5GMM-REGISTERED.LIMITED-SERVICE / 5GMM-IDLE / Emergency call establishment and release / Handling of 5GS forbidden tracking areas for roaming

11.4.5.1 Test Purpose (TP)

(1)

with { UE in 5GMM-REGISTERED.LIMITED-SERVICE state and 5GMM-IDLE mode }

ensure that {

when { UE is requested to make an Emergency call }

then { UE establishes the Emergency call }
}

(2)

with { UE in 5GMM-REGISTERED.LIMITED-SERVICE state and 5GMM-IDLE mode having established an Emergency call }

ensure that {

when { UE is requested to release the Emergency call }

then { UE releases the Emergency call, **and**, the UE considers the current cell as belonging to 5GS forbidden tracking areas for roaming }

}

11.4.5.2 Conformance requirement

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], subclause 5.5.1.3.5, TS 23.122 [38], subclause 3.4.2. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, subclause 5.5.1.3.5]

#15 (No suitable cells in tracking area).

The UE shall set the 5GS update status to 5U3 ROAMING NOT ALLOWED (and shall store it according to subclause 5.1.3.2.2). The UE shall reset the registration attempt counter and shall enter the state 5GMM-REGISTERED.LIMITED-SERVICE. The UE shall search for a suitable cell in another tracking area according to 3GPP TS 38.304 [28].

The UE shall store the current TAI in the list of "5GS forbidden tracking areas for roaming" and shall remove the current TAI from the stored TAI list, if present.

If the UE is operating in single-registration mode, the UE shall handle the EMM parameters EMM state, EPS update status and tracking area updating attempt counter as specified in 3GPP TS 24.301 [15] for the case when the normal tracking area updating procedure is rejected with the EMM cause with the same value.

[TS 23.122, subclause 3.4.2]

The MS is not allowed to request 5GS services except emergency services when camped on a cell of a TA of which belongs to the list of "5GS forbidden tracking areas for regional provision of service".

11.4.5.3 Test description

11.4.5.3.1 Pre-test conditions

System Simulator:

- 3 NR Cells
- NR Cell 1, NR Cell 2 and NR Cell 11 as defined in TS 38.508-1 [4], Table 4.4.2-3.
- Maximum of 2 cells are active at any point of time.
- On all cells when active: System information combination NR-1 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2. SIB1 indicates ims-EmergencySupport.

UE:

None.

Preamble:

- Cell configuration " in accordance with TS 38.508-1 [4], Table 4.4.2-3:
- NR Cell 1 "Serving cell"
- NR Cell 2 "Non-Suitable "Off" cell"
- NR Cell 11 "Non-Suitable "Off" cell"
- The UE is in test state 1N-A as defined in TS 38.508-1 [4], subclause 4.4A.2 on NR Cell 1
- During the initial registration:
- In the list of tracking areas provided by the AMF (IE "TAI list") contains only the TAI of NR Cell 1.

11.4.5.3.2 Test procedure sequence

Table 11.4.5.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|---|------------------|---|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NR Cell 11 as "Serving cell"
- NR Cell 1 as "Non-Suitable "Off" cell"
- NR Cell 2 as "Non-Suitable "Off" cell". | - | - | - | - |
| - | EXCEPTION: The following messages are to be observed on NR Cell 11 unless explicitly stated otherwise. | - | - | - | - |
| 2 | The UE transmits an <i>RRCConnectionRequest</i> message. | --> | NR RRC: <i>RRCSetupRequest</i> | - | - |
| 3 | SS transmit an <i>RRCConnectionSetup</i> message. | <-- | NR RRC: <i>RRCSetup</i> | - | - |
| 4 | The UE transmits an <i>RRCConnectionSetupComplete</i> message to confirm the successful completion of the connection establishment and a REGISTRATION REQUEST message indicating "mobility registration updating" is sent to update the registration of the actual tracking area. | --> | NR RRC: <i>RRCSetupComplete</i>

5GMM: REGISTRATION REQUEST | - | - |
| 5 | SS sends a REGISTRATION REJECT message containing 5GMM cause value = #15 (No suitable cells in tracking area). | <-- | NR RRC: <i>DLInformationTransfer</i>

5GMM: REGISTRATION REJECT | - | - |
| 6 | The SS transmits an <i>RRCConnectionRelease</i> message. | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| 7 | Make the UE attempt an IMS emergency call dialling an emergency number e.g. 112 or | - | - | - | - |

| | | | | | |
|---|--|-----|---------------------------|---|---|
| | 911). (NOTE 1) | | | | |
| 8 | Check: Does the UE performs Generic Test Procedure for IMS Emergency call establishment with IMS Emergency registration as specified in TS 38.508-1 [4], subclause 4.9.11? | - | - | 1 | - |
| 9 | Make the UE release the emergency call. (NOTE 1) | - | - | - | - |
| 10 | The Generic test procedure for IMS MO Emergency call release as specified in TS 38.508-1 [4], subclause 4.9.12A takes place. | - | - | - | - |
| 11 | The SS transmits an <i>RRCConnectionRelease</i> message. | <-- | NR RRC: <i>RRCRelease</i> | - | - |
| 12 | Check: Does the UE respond to paging (the Generic Test Procedure for no response to paging as specified in TS 38.508-1 [4], subclause 4.9.13 is performed)? | - | - | 2 | - |
| 13 | The SS configures:
- NR Cell 2 as "Serving cell"
- NR Cell 11 as "Non-Suitable "Off" cell"
- NR Cell 1 as "Non-Suitable "Off" cell". | - | - | - | - |
| 14 | Check: Does the UE perform on NR Cell 2 the Registration procedure for mobility registration update as specified in TS 38.508-1 [4] subclause 4.9.5, ' <i>connected without release</i> '? | - | - | 2 | - |
| NOTE 1: This could be done by e.g. MMI or AT command. | | | | | |

11.4.5.3.3 Specific message contents

Table 11.4.5.3.3-1: REGISTRATION REJECT (step 5, Table 11.4.5.3.2-1)

| Derivation path: 38.508-1 [4] table 4.7.1-9 | | | |
|---|--------------|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| 5GMM cause | '00001111'B | #15 (No suitable cells in tracking area). | |

11.4.6 5GMM-REGISTERED.NON-ALLOWED-SERVICE / Emergency call establishment and release / Handling of non-allowed tracking areas

11.4.6.1 Test Purpose (TP)

(1)

with { UE in 5GMM-REGISTERED.NON-ALLOWED-SERVICE state and 5GMM-IDLE mode }

```
ensure that {  
  when { UE is requested to make an Emergency call }  
  then { UE establishes the Emergency call }  
}
```

(2)

```
with { UE in 5GMM-REGISTERED.NON-ALLOWED-SERVICE state and 5GMM-IDLE mode having established an  
Emergency call }
```

```
ensure that {  
  when { UE is requested to release the Emergency call }  
  then { UE releases the Emergency call, and, the UE considers the current cell as belonging to non-allowed tracking  
areas }  
}
```

11.4.6.2 Conformance requirements

References: The conformance requirements covered in the present TC are specified in: TS 24.501 [22], subclause 5.3.5. Unless otherwise stated these are Rel-15 requirements.

[TS 24.501, subclause 5.3.5]

When the UE receives a Service area list IE with a non-allowed area indication during a registration procedure or a generic UE configuration update procedure, the UE shall delete the old list of "non-allowed tracking areas" and store the tracking areas in the non-allowed area as the list of "non-allowed tracking areas". If the UE has a stored list of "allowed tracking areas", the UE shall delete that list.

...

If the UE is successfully registered to a PLMN and has a stored list of "non-allowed tracking areas":

...

b) while camped on a cell whose TAI is in the list of "non-allowed tracking areas", the UE shall enter the state 5GMM-REGISTERED.NON-ALLOWED-SERVICE, and:

1) if the UE is in 5GMM-IDLE mode over 3GPP access, the UE:

...

ii) shall not initiate a service request procedure except for emergency services, high priority access, responding to paging or notification or indicating a change of 3GPP PS data off UE status; and

11.4.6.3 Test description

11.4.6.3.1 Pre-test conditions

System Simulator:

- 3 NR Cells
- NR Cell 1, NR Cell 2 and NR Cell 11 as defined in TS 38.508-1 [4] Table 4.4.2-3.
- Maximum of 2 cells are active at any point of time.

- On all cells when active: System information combination NR-1 as defined in TS 38.508-1 [4], subclause 4.4.3.1.2. SIB1 indicates ims-EmergencySupport.

UE:

None.

Preamble:

- Cell configuration " in accordance with TS 38.508-1 [4], Table 4.4.2-3:
- NR Cell 1 "Serving cell"
- NR Cell 2 "Non-Suitable "Off" cell"
- NR Cell 11 "Non-Suitable "Off" cell"
- The UE is in test state 1N-A as defined in TS 38.508-1 [4], subclause 4.4A.2 on NR Cell 1
- During the initial registration:
- The list of tracking areas provided by the AMF (IE "TAI list") contains only the TAI of NR Cell 1 whereas the TAI of NR Cell 11 is indicated in the Service area list IE with non-allowed areas.

11.4.6.3.2 Test procedure sequence

Table 11.4.6.3.2-1: Main behaviour

| St | Procedure | Message Sequence | | TP | Verdict |
|----|--|------------------|--------------------------------|----|---------|
| | | U - S | Message | | |
| 1 | The SS configures:
- NR Cell 11 as "Serving cell"
- NR Cell 1 as "Non-Suitable "Off" cell"
- NR Cell 2 as "Non-Suitable "Off" cell". | - | - | - | - |
| - | EXCEPTION: The following messages are to be observed on NR Cell 11 unless explicitly stated otherwise. | - | - | - | - |
| 2 | Check: Does in the next 5 sec the UE transmit an <i>RRCSetupRequest</i> message? | --> | NR RRC: <i>RRCSetupRequest</i> | 1 | F |
| 3 | Make the UE attempt an IMS emergency call dialling an emergency number e.g. 112 or 911). (NOTE 1) | - | - | - | - |
| 4 | Check: Does the UE performs Generic Test Procedure for IMS Emergency call establishment with IMS Emergency registration as specified in TS 38.508-1 [4], subclause 4.9.11? | - | - | 1 | - |
| 5 | Make the UE release the emergency call. (NOTE 1) | - | - | - | - |
| 6 | The Generic test procedure for IMS MO Emergency call release as specified in TS 38.508-1 [4], subclause 4.9.12A takes place. | - | - | - | - |
| 6 | SS releases the RRC connection | <-- | NR RRC: <i>RRCRelease</i> | - | - |

| | | | | | |
|---|--|-----|--------------------------------|---|---|
| 7 | Make the UE attempt an IMS [none-emergency] call. (NOTE 1) | | | | |
| 8 | Check: Does the UE transmit in the next 10 sec an <i>RRCSetupRequest</i> message? | --> | NR RRC: <i>RRCSetupRequest</i> | 2 | F |
| 9 | The SS configures:
- NR Cell 2 as "Serving cell"
- NR Cell 11 as "Non-Suitable "Off" cell"
- NR Cell 1 as "Non-Suitable "Off" cell". | - | - | - | - |
| 10 | Check: Does the UE perform on NR Cell 2 the Registration procedure for mobility registration update as specified in TS 38.508-1 [4] subclause 4.9.5, ' <i>connected without release</i> '? | - | - | 2 | - |
| NOTE 1: This could be done by e.g. MMI or AT command. | | | | | |

11.4.6.3.3 Specific message contents

Table 11.4.6.3.3-2: REGISTRATION ACCEPT (Preamble)

| Derivation Path: TS 38.508-1 [4], Table 4.7.1-7. | | | |
|--|--|---|-----------|
| Information Element | Value/remark | Comment | Condition |
| Service area list | | | |
| Allowed type (octet 1) | '1'B | TAIs in the list are in the non-allowed area | |
| Type of list (octet 1) | '00'B | list of TACs belonging to one PLMN, with non-consecutive TAC values | |
| Number of elements (octet 1) | '00000'B | 1 element | |
| MCC | As defined for NR Cell 11 in TS 38.508-1 [4], Table 4.4.2-3. | | |
| MNC | As defined for NR Cell 11 in TS 38.508-1 [4], Table 4.4.2-3. | | |
| TAC 1 | As defined for NR Cell 11 in TS 38.508-1 [4], Table 4.4.2-3. | | |

Annex A (informative): Change history

| Change history | | | | | | | |
|----------------|---------|-----------|----|-----|-----|---|-------------|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2017-08 | RAN5#76 | R5-174427 | - | - | - | Introduction of TS 38.523-1. | 0.0.1 |
| 2017-12 | RAN5#77 | R5-176926 | - | - | - | Addition of new NR PDCP test case 7.3.1.2 | 0.1.0 |
| 2017-12 | RAN5#77 | R5-176928 | - | - | - | Addition of new NR MAC test case 7.1.3.1 | 0.1.0 |
| 2017-12 | RAN5#77 | R5-177072 | - | - | - | Addition of new NR RLC UM test case 7.2.2.1 | 0.1.0 |
| 2017-12 | RAN5#77 | R5-177073 | - | - | - | Addition of new NR RLC UM test case 7.2.2.2 | 0.1.0 |
| 2017-12 | RAN5#77 | R5-177074 | - | - | - | Addition of new NR PDCP test case 7.3.1.1 | 0.1.0 |
| 2017-12 | RAN5#77 | R5-177075 | - | - | - | Addition of new NR MAC test case 7.1.2.1 | 0.1.0 |
| 2018-03 | RAN5#77 | R5-181171 | - | - | - | 5GS RRC TC 8.2.2.2.1 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181172 | - | - | - | 5GS RRC TC 8.2.2.2.6 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181173 | - | - | - | 5GS RRC TC 8.2.3.1 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181174 | - | - | - | 5GS RRC TC 8.2.3.16 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181175 | - | - | - | 5GS RRC TC 8.2.5.1 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181176 | - | - | - | 5GS MAC Test case 7.1.1.2 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181177 | - | - | - | Addition of new NR MAC test case 7.1.3.2 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181178 | - | - | - | Addition of new NR MAC test case 7.1.3.3 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181179 | - | - | - | Addition of new NR MAC test case 7.1.3.4 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181180 | - | - | - | Addition of new NR MAC test case 7.1.3.5 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181181 | - | - | - | Addition of new NR MAC test case 7.1.3.6 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181182 | - | - | - | Addition of new NR RLC test case 7.2.3.1 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181183 | - | - | - | Addition of new NR RLC test case 7.2.3.2 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181184 | - | - | - | Addition of new NR PDCP test case 7.3.2.1 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181185 | - | - | - | Addition of new NR PDCP test case 7.3.2.2 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181186 | - | - | - | Addition of new NR PDCP test case 7.3.2.3 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181187 | - | - | - | Addition of new NR PDCP test case 7.3.3.1 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181188 | - | - | - | Addition of new NR PDCP test case 7.3.3.2 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181189 | - | - | - | Addition of new NR PDCP test case 7.3.3.3 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181201 | - | - | - | Addition of new NR MAC test case 7.1.5.1 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181202 | - | - | - | Addition of new NR MAC test case 7.1.5.2 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181203 | - | - | - | Addition of new NR PDCP test case 7.3.5.1 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181204 | - | - | - | Addition of new NR RRC test case 8.2.2.2.5 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181205 | - | - | - | Addition of new NR RRC test case 8.2.3.5 | 0.2.0 |

| | | | | | | | |
|---------|--------------------|-----------|---|---|---|---|-------|
| 2018-03 | RAN5#77 | R5-181206 | - | - | - | Update of NR MAC test cases | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181207 | - | - | - | Update of NR RLC test cases | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181208 | - | - | - | Update of NR PDCP test cases | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181209 | - | - | - | 5GS MAC Test case 7.1.5.3 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181312 | - | - | - | Addition of new NR PDCP test case 7.3.5.2 | 0.2.0 |
| 2018-03 | RAN5#77 | R5-181334 | - | - | - | Addition of new NR PDCP test case 7.3.4.2 | 0.2.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181805 | - | - | - | Corrections to RRC TC 8.2.3.1 Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181806 | - | - | - | 5GS RRC TC 8.2.1.2 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181914 | - | - | - | Addition of 5GS NR RRC test case 8.2.3.6 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181951 | - | - | - | Correction to RLC UM Test cases | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181952 | - | - | - | Correction to RLC AM Test cases | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181967 | - | - | - | Correction to PDCP ciphering test cases | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181980 | - | - | - | 5GS RRC TC 8.2.2.2.9 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181981 | - | - | - | Corrections to RRC TC 8.2.3.16 Handover with PSCell release / SCG DRB | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181982 | - | - | - | 5GS RRC TC 8.2.3.2 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181983 | - | - | - | 5GS RRC TC 8.2.3.3 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181984 | - | - | - | 5GS RRC TC 8.2.3.4 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181986 | - | - | - | Addition of new NR RRC test case 8.2.2.2.4 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181988 | - | - | - | Addition of new NR NAS test case for dedicated EPS bearer context activation | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181991 | - | - | - | Addition of text to clarify that 5GS requirements may be implicitly tested in other specs | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181992 | - | - | - | New NAS test case EPS bearer resource allocation / New EPS bearer context | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181994 | - | - | - | Addition of new NR MAC test case 7.1.4.1.1 | 0.3.0 |

| | | | | | | | |
|---------|--------------------|-----------|---|---|---|--|-------|
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181995 | - | - | - | Addition of new NR MAC test case 7.1.4.1.2 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181996 | - | - | - | Addition of new NR MAC test case 7.1.4.1.3 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181997 | - | - | - | Addition of new NR MAC test case 7.1.4.1.4 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181998 | - | - | - | Addition of new NR RLC test case 7.2.2.6 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-181999 | - | - | - | Addition of new NR RLC test case 7.2.3.5 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182050 | - | - | - | Addition of new NR RLC test case 7.2.2.5 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182051 | - | - | - | Addition of new NR RLC test case 7.2.3.6 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182052 | - | - | - | Addition of new NR RLC test case 7.2.3.7 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182053 | - | - | - | Addition of new NR RLC test case 7.2.3.8 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182054 | - | - | - | Addition of new NR RLC test case 7.2.3.3 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182055 | - | - | - | Addition of new NR RLC test case 7.2.3.4 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182056 | - | - | - | Addition of new NR RRC test case 8.2.3.9 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182057 | - | - | - | Addition of new NR RRC test case 8.2.3.10 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182058 | - | - | - | Addition of new NR RRC test case 8.2.3.11 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182059 | - | - | - | Addition of new NR RRC test case 8.2.3.12 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182060 | - | - | - | Correction to MAC test case 7.1.2.1 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182061 | - | - | - | Addition of new NR RRC test case 8.2.3.19 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182076 | - | - | - | 5GS PDCP Test case 7.3.4.1 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182077 | - | - | - | 5GS PDCP Test case 7.3.5.4 | 0.3.0 |

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| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182078 | - | - | - | 5GS RLC test case 7.2.3.11 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182079 | - | - | - | 5GS RLC test case 7.2.3.12 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182080 | - | - | - | Addition of new NR RRC test case 8.2.3.7 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182081 | - | - | - | Addition of new NR RLC test case 7.2.2.3 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182082 | - | - | - | Addition of new NR RLC test case 7.2.2.4 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182083 | - | - | - | Addition of new NR RRC test case 8.2.3.17 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182085 | - | - | - | Correction to PDCP integrity protection test cases | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182089 | - | - | - | 5GS RRC TC 8.2.5.5 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182100 | - | - | - | 5GS RRC TC 8.2.5.6 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182101 | - | - | - | 5GS RRC TC 8.2.5.7 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182102 | - | - | - | 5GS RRC TC 8.2.2.2.7 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182103 | - | - | - | Corrections to RRC TC 8.2.5.1 RRC connection reconfiguration / PSCell addition failure | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182104 | - | - | - | Corrections to RRC TC 8.2.2.2.1 PSCell addition, modification and release / SCG DRB | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182105 | - | - | - | Corrections to RRC TC 8.2.2.2.6 Bearer Modification / SCG DRB / Split DRB Reconfiguration | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182106 | - | - | - | Addition of new NR RRC test case 8.2.2.1.2 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182115 | - | - | - | Introduction of 5GS RRC TC 8.2.4.3.1 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182116 | - | - | - | Adding NR test case 8.2.2.1.1 | 0.3.0 |
| 2018-04 | RAN5#2-5G-NR Adhoc | R5-182117 | - | - | - | Adding NR test case 8.2.2.1.3 | 0.3.0 |
| 2018-04 | post RAN5#2-5G-NR | - | - | - | - | Editorial update to apply with the 3GPP drafting rules (styles) | 0.3.1 |

| | Adhoc | | | | | | |
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| 2018-05 | RAN5#79 | R5-183094 | - | - | - | Addition of UE power headroom reporting test case 7.1.1.3.7 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183101 | - | - | - | Addition of DRX Operation test case 7.1.1.5.4 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183102 | - | - | - | Addition of Correct handling of DL assignment/Semi-persistent test case 7.1.1.6.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183103 | - | - | - | Addition of AM RLC test case 7.1.2.3.10 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183227 | - | - | - | Editorial updates to 38.523-1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183229 | - | - | - | Correction to PDCP Test case - PDCP reordering/Maximum re-ordering delay below t-Reordering/ t-Reordering timer operations | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183109 | - | - | - | Update to MAC Test case - Random access procedure / Successful/ C-RNTI Based/Preamble selected by MAC itself | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183111 | - | - | - | Update RLC test case - AM RLC / Re-transmission of RLC PDU with and without re-segmentation | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183112 | - | - | - | Correction to MAC Test case - DRX operation / Short cycle configured / Parameters configured by RRC | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183113 | - | - | - | Correction to PDCP Test case - PDCP handover / Lossless handover / PDCP sequence number maintenance/PDCP status report to convey the information on missing or acknowledged PDCP SDUs at handover/ In-order delivery and duplicate elimination in the downlink | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182497 | - | - | - | Corrections to RRC TC - BandwidthPart Configuration / SCG | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183230 | - | - | - | Corrections to RRC TC - PSCell addition, modification and release / SCG DRB | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183114 | - | - | - | Corrections to RRC TC - Bearer Modification / Handling for bearer type change with security key change | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183115 | - | - | - | Corrections to RRC TC - Bearer Modification / Uplink data path / Split DRB Reconfiguration | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183117 | - | - | - | Corrections to RRC TC - Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183116 | - | - | - | Corrections to RRC TC - RRC connection reconfiguration / PSCell addition failure | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183231 | - | - | - | Corrections to RRC TC - NR SCG Failure Information / RLC-MaxNumRetx | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183118 | - | - | - | Corrections to RRC TC - SCG Reconfiguration Failure / SRB3 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183119 | - | - | - | Corrections to RRC TC - SCG Reconfiguration Failure / SRB1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182508 | - | - | - | Void RRC TC - Handover with PSCell release / SCG DRB | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182509 | - | - | - | Void RRC TC - Bearer Modification / SCG DRB / Split DRB Reconfiguration | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183120 | - | - | - | Correction to NR RRC test case 8.2.3.17 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183121 | - | - | - | Correction to NR RRC test case 8.2.3.19 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183228 | - | - | - | Correction to NR MAC test case 7.1.1.3.2 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183122 | - | - | - | Correction to NR PDCP test case 7.1.3.4.2 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183123 | - | - | - | Addition of new NR RRC test case 8.2.5.2.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183124 | - | - | - | Addition of new NR RRC test case 8.2.5.4.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182601 | - | - | - | Removal of NR RRC test case 8.2.2.2.5 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183126 | - | - | - | Addition of new 5GS RRC TC 8.2.4.3.1.1 | 1.0.0 |

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| 2018-05 | RAN5#79 | R5-183127 | - | - | - | Addition of new NR RRC test case - Bearer Modification / Handling for bearer type change without security key change / EN-DC | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182652 | - | - | - | Void RRC TC - Bearer Modification / MCG DRB / SCG DRB Reconfiguration | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182774 | - | - | - | Addition of 5GS NR RRC test case 8.2.3.8.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183130 | - | - | - | Removal of RRC TC 8.2.4.3.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182798 | - | - | - | Update of 5GS NR RRC test case 8.2.3.6 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183232 | - | - | - | Addition of 5GS NR RRC test case 8.2.2.6.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183233 | - | - | - | Addition of 5GS NR PDCP test case 7.1.3.5.3 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183132 | - | - | - | Update of NR RRC TC - Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells / RSRQ based measurements | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183133 | - | - | - | Update of NR RRC TC - Measurement configuration control and reporting / Inter-RAT measurements / Periodic reporting / Measurement of NR cells | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183134 | - | - | - | Update of NR RRC TC - Measurement configuration control and reporting / Event A1 / Measurement of NR PSCell | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183135 | - | - | - | Addition of NR RRC TC - PSCell addition, modification and release / Split DRB / EN-DC | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183137 | - | - | - | Addition of 5GS NR RRC test case 8.2.1.1.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183138 | - | - | - | Addition of new NR MAC UL TBS test case 7.1.1.4.2.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183139 | - | - | - | Addition of new NR MAC UL TBS test case 7.1.1.4.2.2 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183140 | - | - | - | Addition of new NR MAC UL TBS test case 7.1.1.4.2.3 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183141 | - | - | - | Addition of new NR MAC UL TBS test case 7.1.1.4.2.4 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183142 | - | - | - | Addition of Layer 2 test case specific parameters | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183143 | - | - | - | Correction to MAC Pre-test conditions | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183144 | - | - | - | Correction to RLC Pre-test conditions | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183145 | - | - | - | Correction to PDCP Pre-test conditions | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183146 | - | - | - | Correction to MAC RACH Test Cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182940 | - | - | - | Correction to MAC DL Data Transfer test cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183147 | - | - | - | Correction to MAC UL Data Transfer test cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183148 | - | - | - | Correction to MAC DL-SCH TBS test cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183149 | - | - | - | Correction to RLC UM Test cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183150 | - | - | - | Correction to RLC AM Test cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182945 | - | - | - | Corrections to PDCP sequence number test cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183151 | - | - | - | Correction to PDCP integrity protection test cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182947 | - | - | - | Correction to PDCP Ciphering test cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183152 | - | - | - | Corrections to PDCP other test cases | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183153 | - | - | - | Addition of new NR RACH test case 7.1.1.1.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-182966 | - | - | - | Correction to NR RLC test case 7.1.2.3.4 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183154 | - | - | - | Correction to PDCP test case 7.1.3.5.2 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183155 | - | - | - | Correction to NR MAC DRX Test cases | 1.0.0 |

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| 2018-05 | RAN5#79 | R5-183156 | - | - | - | Correction to NR RRC intra frequency measurement Test case 8.2.3.9 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183157 | - | - | - | Correction to NR RRC inter frequency measurement Test case 8.2.3.10 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183016 | - | - | - | Removal of NR RRC test case 8.2.3.11 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183017 | - | - | - | Removal of NR RRC test case 8.2.3.12 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183129 | - | - | - | Addition of new 5GS RRC TC 8.2.3.13.1 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183136 | - | - | - | Correction to NR RRC test case 8.2.3.5 | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183263 | - | - | - | Addition of new NR NAS test case Default EPS bearer context activation | 1.0.0 |
| 2018-05 | RAN5#79 | R5-183265 | - | - | - | Updates to session management TC 10.2.2.1 | 1.0.0 |
| 2018-06 | RAN#80 | RP-181210 | - | - | - | put under revision control as v15.0.0 with small editorial changes | 15.0.0 |
| 2018-09 | RAN#81 | R5-184226 | 0010 | - | F | Addition of Correct handling of Configured UL grant Type 1 test case 7.1.1.6.2 | 15.1.0 |
| 2018-09 | RAN#81 | R5-184227 | 0011 | - | F | Addition of Correct handling of Configured UL grant Type 2 test case 7.1.1.6.3 | 15.1.0 |
| 2018-09 | RAN#81 | R5-184228 | 0012 | - | F | CR of Correct handling of DL assignment Semi persistent test case 7.1.1.6.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-184229 | 0013 | - | F | CR of UE power headroom reporting test case 7.1.1.3.7 | 15.1.0 |
| 2018-09 | RAN#81 | R5-184343 | 0020 | - | F | Correction to 5GS PDCP Test case 7.1.3.4.1 PDCP handover / Lossless handover / PDCP sequence number maintenance / PDCP status report to convey the information on missing or acknowledged PDCP SDUs at handover / In-order delivery and duplicate elimination in the downlink | 15.1.0 |
| 2018-09 | RAN#81 | R5-184344 | 0021 | - | F | Correction to 5GS PDCP Test case 7.1.3.5.4 PDCP reordering / Maximum re-ordering delay below t-Reordering / t-Reordering timer operations | 15.1.0 |
| 2018-09 | RAN#81 | R5-184353 | 0023 | - | F | Corrections to RRC TC - BandwidthPart Configuration / SCG / EN-DC | 15.1.0 |
| 2018-09 | RAN#81 | R5-184500 | 0031 | - | F | Addition of new 5GS RRC TC 8.2.4.3.1.3 | 15.1.0 |
| 2018-09 | RAN#81 | R5-184517 | 0032 | - | F | Correction to NR PDCP test case 7.1.3.4.2 | 15.1.0 |
| 2018-09 | RAN#81 | R5-184523 | 0036 | - | F | Corrections to MAC TBS test cases | 15.1.0 |
| 2018-09 | RAN#81 | R5-184527 | 0040 | - | F | Addition of new MAC test case for Reset | 15.1.0 |
| 2018-09 | RAN#81 | R5-184680 | 0055 | - | F | Update of RRC SCG failure TC 8.2.5.5.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-184681 | 0056 | - | F | Update of RRC SCG failure TC 8.2.5.6.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-184760 | 0059 | - | F | Correction to RRC TC - PSCell addition, modification and release / Split DRB / EN-DC | 15.1.0 |
| 2018-09 | RAN#81 | R5-184761 | 0060 | - | F | Correction to RRC TC - Measurement configuration control and reporting / Inter-RAT measurements / Periodic reporting / Measurement of NR cells / EN-DC | 15.1.0 |
| 2018-09 | RAN#81 | R5-184763 | 0061 | - | F | Correction to RRC TC - Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells / RSRQ based measurements / EN-DC | 15.1.0 |
| 2018-09 | RAN#81 | R5-184769 | 0063 | - | F | Update of 5GS NR RRC test case 8.2.2.6.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185059 | 0001 | 1 | F | Correction to NR MAC test case 7.1.1.3.2 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185060 | 0004 | 1 | F | Addition of Correct Handling of DL HARQ process PDSCH Aggregation test case 7.1.1.2.2 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185061 | 0005 | 1 | F | Addition of NR CA reconfiguration test case 8.2.4.2.1.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185062 | 0006 | 1 | F | Addition of NR CA reconfiguration test case 8.2.4.2.1.2 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185064 | 0015 | 1 | F | Addition of 5GS NR SDAP test case 7.1.4.1 | 15.1.0 |

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| 2018-09 | RAN#81 | R5-185065 | 0016 | 1 | F | Correction to 5GS MAC Test case 7.1.1.1.2 Random access procedure / Successful / C-RNTI Based / Preamble selected by MAC itself | 15.1.0 |
| 2018-09 | RAN#81 | R5-185066 | 0017 | 1 | F | Correction to 5GS MAC Test case 7.1.1.5.3 DRX operation / Short cycle configured / Parameters configured by RRC | 15.1.0 |
| 2018-09 | RAN#81 | R5-185067 | 0018 | 1 | F | Correction to 5GS RLC Test case 7.1.2.3.10 AM RLC / Re-transmission of RLC PDU with and without re-segmentation | 15.1.0 |
| 2018-09 | RAN#81 | R5-185068 | 0019 | 1 | F | Correction to 5GS RLC Test case 7.1.2.3.11 AM RLC / RLC re-establishment procedure | 15.1.0 |
| 2018-09 | RAN#81 | R5-185069 | 0022 | 1 | F | Addition of NR CA / NR SCell addition / modification / release / Success test cases 8.2.4.1.1.1, 8.2.4.1.1.2 and 8.2.4.1.1.3 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185070 | 0027 | 1 | F | Corrections to RRC TC - Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells / EN-DC | 15.1.0 |
| 2018-09 | RAN#81 | R5-185071 | 0029 | 1 | F | Correction to 5GS RRC TC 8.2.4.3.1.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185072 | 0030 | 1 | F | Addition of 5GS RRC TC 8.2.4.3.1.2 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185073 | 0033 | 1 | F | Corrections to Layer 2 test cases | 15.1.0 |
| 2018-09 | RAN#81 | R5-185074 | 0034 | 1 | F | Corrections to MAC test case 7.1.2.2.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185075 | 0035 | 1 | F | Corrections to MAC test case 7.1.2.3.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185076 | 0037 | 1 | F | Addition of new MAC RACH test case for PDCCH order | 15.1.0 |
| 2018-09 | RAN#81 | R5-185077 | 0039 | 1 | F | Addition of new MAC test case for SCell Activation Deactivation | 15.1.0 |
| 2018-09 | RAN#81 | R5-185078 | 0041 | 1 | F | Addition of new MAC UL TBS test case with transform precoding configured | 15.1.0 |
| 2018-09 | RAN#81 | R5-185079 | 0042 | 1 | F | Correction to default pre-test conditions for UM RLC test cases | 15.1.0 |
| 2018-09 | RAN#81 | R5-185080 | 0043 | 1 | F | New NAS test case 9.1.5.1.12 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185082 | 0045 | 1 | F | Correction to NR PDCP test case 7.1.3.5.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185083 | 0046 | 1 | F | Correction to NR RLC test case 7.1.2.3.3 and 7.1.2.3.4 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185089 | 0049 | 1 | F | Corrections to RRC TC - Measurement configuration control and reporting / Inter-RAT measurements / Event B2 / Measurement of NR cells / EN-DC | 15.1.0 |
| 2018-09 | RAN#81 | R5-185090 | 0050 | 1 | F | CR of AM RLC test case 7.1.2.3.10 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185091 | 0051 | 1 | F | Update of RRC SCG failure TC 8.2.5.1.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185092 | 0052 | 1 | F | Update of RRC SCG failure TC 8.2.5.2.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185093 | 0053 | 1 | F | Update of RRC SCG failure TC 8.2.5.3.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185094 | 0054 | 1 | F | Update of RRC SCG failure TC 8.2.5.4.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185095 | 0057 | 1 | F | Addition of 5GS NR SDAP test case 7.1.4.2 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185096 | 0064 | 1 | F | Update of 5GS NR RRC test case 8.2.3.6.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185097 | 0066 | 1 | F | Update of 5GS NR RRC test case 8.2.3.8.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185098 | 0067 | 1 | F | Update of 5GS NR RRC test case 8.2.1.1.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185099 | 0068 | 1 | F | L2 Preamble Parameter Update for Multi-PDN configuration | 15.1.0 |
| 2018-09 | RAN#81 | R5-185100 | 0069 | 1 | F | Correction to NR RLC test cases 7.1.2.2.3 and 7.1.2.2.4 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185101 | 0070 | 1 | F | Correction to NR RRC test case 8.2.3.14.1 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185148 | 0007 | 1 | F | Addition of NR CA reconfiguration test case 8.2.4.2.1.3 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185149 | 0024 | 1 | F | Corrections to RRC TC - PSCell addition, modification and release / SCG | 15.1.0 |

| | | | | | | DRB / EN-DC | |
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| 2018-09 | RAN#81 | R5-185150 | 0025 | 1 | F | Corrections to RRC TC - Bearer Modification / Handling for bearer type change with security key change / EN-DC | 15.1.0 |
| 2018-09 | RAN#81 | R5-185151 | 0026 | 1 | F | Corrections to RRC TC - Bearer Modification / Uplink data path / Split DRB Reconfiguration / EN-DC | 15.1.0 |
| 2018-09 | RAN#81 | R5-185152 | 0038 | 1 | F | Addition of new MAC test case for Power Headroom report | 15.1.0 |
| 2018-09 | RAN#81 | R5-185153 | 0047 | 1 | F | Addition of RRC Default Pre-test conditions for NSA | 15.1.0 |
| 2018-09 | RAN#81 | R5-185154 | 0058 | 1 | F | Correction to RRC TC - Measurement configuration control and reporting / Event A1 / Measurement of NR PSCell / EN-DC | 15.1.0 |
| 2018-09 | RAN#81 | R5-185155 | 0062 | 1 | F | Updates to NAS test case 10.2.1.2 | 15.1.0 |
| 2018-09 | RAN#81 | R5-185167 | 0071 | 1 | F | Update to EPS SM Test case for Multi-PDN | 15.1.0 |
| 2018-12 | RAN#82 | R5-186649 | 0157 | - | F | Correction to NR PDCP test case 7.1.3.5.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-186650 | 0158 | - | F | Correction to NR PDCP test case 7.1.3.5.2 | 15.2.0 |
| 2018-12 | RAN#82 | R5-186679 | 0163 | - | F | Corrections to PDCP test case 7.1.3.5.3 | 15.2.0 |
| 2018-12 | RAN#82 | R5-186725 | 0167 | - | F | Correction to 5GS test case 7.1.2.2.5 | 15.2.0 |
| 2018-12 | RAN#82 | R5-186801 | 0178 | - | F | Update RRC TC 8.2.2.2.1 - Split SRB Establishment and Release / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-186802 | 0179 | - | F | Update RRC TC 8.2.2.7.1 - Bearer Modification / Handling for bearer type change without security key change / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-186803 | 0180 | - | F | Update RRC TC8.2.3.7.1 - Measurement configuration control and reporting / Event A4 (intra-frequency, inter-frequency and inter-band measurements) / Measurement of Neighbour NR cell / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-186872 | 0181 | - | F | Removal of RRC SCG failure TC 8.2.5.5.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-186873 | 0182 | - | F | Removal of RRC SCG failure TC 8.2.5.6.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-186890 | 0185 | - | F | Correction to NR RRC test case 8.2.3.14.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-186891 | 0186 | - | F | Correction to NR RRC test case 8.2.3.13.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-186892 | 0187 | - | F | Correction to NR PDCP test case 7.1.3.4.2 | 15.2.0 |
| 2018-12 | RAN#82 | R5-186995 | 0228 | - | F | CR of test case 8.2.4.2_NR CA release_Resubmission of 186101 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187104 | 0229 | - | F | Correction to MAC test cases | 15.2.0 |
| 2018-12 | RAN#82 | R5-187105 | 0230 | - | F | Correction to RLC UM test cases | 15.2.0 |
| 2018-12 | RAN#82 | R5-187106 | 0231 | - | F | Correction to RLC AM test cases | 15.2.0 |
| 2018-12 | RAN#82 | R5-187236 | 0235 | - | F | Update RRC TC 8.2.1.2.1 - BandwidthPart Configuration / SCG / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-187237 | 0236 | - | F | Update RRC TC 8.2.2.4.1 - PSCell addition, modification and release / SCG DRB / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-187238 | 0237 | - | F | Update RRC TC 8.2.2.8.1 - Bearer Modification / Handling for bearer type change with security key change / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-187239 | 0238 | - | F | Update RRC TC 8.2.2.9.1 - Bearer Modification / Uplink data path / Split DRB Reconfiguration / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-187248 | 0247 | - | F | Correction to MAC Test case 7.1.1.1.2 Random access procedure / Successful / C-RNTI Based / Preamble selected by MAC itself | 15.2.0 |
| 2018-12 | RAN#82 | R5-187249 | 0248 | - | F | Correction to MAC Test case 7.1.1.5.3 DRX operation / Short cycle configured / Parameters configured by RRC | 15.2.0 |
| 2018-12 | RAN#82 | R5-187250 | 0249 | - | F | Correction to RLC Test case 7.1.2.3.10 AM RLC / Re-transmission of RLC PDU with and without re-segmentation | 15.2.0 |
| 2018-12 | RAN#82 | R5-187251 | 0250 | - | F | Correction to RLC Test case 7.1.2.3.11 AM RLC / RLC re-establishment | 15.2.0 |

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| 2018-12 | RAN#82 | R5-187252 | 0251 | - | F | Correction to PDCP Test case 7.1.3.4.1 PDCP handover / Lossless handover / PDCP sequence number maintenance / PDCP status report to convey the information on missing or acknowledged PDCP SDUs at handover / In-order delivery and duplicate elimination | 15.2.0 |
| 2018-12 | RAN#82 | R5-187254 | 0253 | - | F | Update RRC TCs 8.2.4.1.1.1, 8.2.4.1.1.2 and 8.2.4.1.1.3 NR CA / NR SCell addition / modification / release / Success | 15.2.0 |
| 2018-12 | RAN#82 | R5-187255 | 0254 | - | F | Correction to EN-DC NAS test case 10.2.1.1 - Default EPS bearer context activation | 15.2.0 |
| 2018-12 | RAN#82 | R5-187302 | 0260 | - | F | Correction to test case 8.2.4.3.1.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187410 | 0273 | - | F | Update of 5GS NR RRC test case 8.2.2.6.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187411 | 0274 | - | F | Addition of 5GS NR MAC test case 7.1.1.3.9 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187492 | 0278 | - | F | Correction to test case 8.2.2.1.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187497 | 0279 | - | F | Correction to test case 8.2.2.3.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187528 | 0285 | - | F | Update to RRC TC - PSCell addition, modification and release / Split DRB / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-187530 | 0286 | - | F | Update to RRC TC - Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells / RSRQ based measurements / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-187534 | 0287 | - | F | Update to RRC TC - Measurement configuration control and reporting / Inter-RAT measurements / Periodic reporting / Measurement of NR cells / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-187540 | 0290 | - | F | Update to 5G-NR RRC TCs for Multi-PDN support and specific message content IEs | 15.2.0 |
| 2018-12 | RAN#82 | R5-187611 | 0294 | - | F | Correction to MAC TBS test cases | 15.2.0 |
| 2018-12 | RAN#82 | R5-187686 | 0283 | 1 | F | Adding test case 6.1.1.7 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187688 | 0202 | 1 | F | Addition of NR test case 7.1.1.1.3_SI Request | 15.2.0 |
| 2018-12 | RAN#82 | R5-187689 | 0203 | 1 | F | Addition of NR test case 7.1.1.1.6_Random access | 15.2.0 |
| 2018-12 | RAN#82 | R5-187690 | 0204 | 1 | F | Addition of NR test case 7.1.1.2.3_CCCH HARQ | 15.2.0 |
| 2018-12 | RAN#82 | R5-187691 | 0213 | 1 | F | CR of NR test case 7.1.2.3.9_RLC Reassembling | 15.2.0 |
| 2018-12 | RAN#82 | R5-187692 | 0252 | 1 | F | Correction to PDCP Test case 7.1.3.5.4 PDCP reordering / Maximum re-ordering delay below t-Reordering / t-Reordering timer operations | 15.2.0 |
| 2018-12 | RAN#82 | R5-187693 | 0234 | 1 | F | Correction to SDAP test cases | 15.2.0 |
| 2018-12 | RAN#82 | R5-187695 | 0243 | 1 | F | Addition of 5GS SA RRC TC 8.1.1.1.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187696 | 0246 | 1 | F | Addition of 5GS SA RRC TC 8.1.5.2.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187698 | 0159 | 1 | F | Correction to NR RRC test case 8.2.3.5.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187699 | 0160 | 1 | F | Correction to NR RRC test case 8.2.3.9.1 and 8.2.3.10.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187700 | 0239 | 1 | F | Update RRC TC 8.2.3.1.1 - Measurement configuration control and reporting / Inter-RAT measurements / Event B1 / Measurement of NR cells / EN-DC | 15.2.0 |
| 2018-12 | RAN#82 | R5-187701 | 0272 | 1 | F | Update RRC TC 8.2.3.12.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187702 | 0276 | 1 | F | Update of 5GS NR RRC test case 8.2.3.6.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187703 | 0277 | 1 | F | Update of 5GS NR RRC test case 8.2.3.8.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187704 | 0288 | 1 | F | Update to RRC TC - Measurement configuration control and reporting / Event A1 / Measurement of NR PSCell / EN-DC | 15.2.0 |

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| 2018-12 | RAN#82 | R5-187705 | 0289 | 1 | F | Update to 5G-NR RRC measurement report TCs for FR1/FR2 cell power level | 15.2.0 |
| 2018-12 | RAN#82 | R5-187706 | 0168 | 1 | F | Updates to EN-DC TC 8.2.5.3.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187707 | 0140 | 1 | F | Corrections to NAS test case 9.1.5.1.14 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187778 | 0284 | 1 | F | Adding test case 6.1.1.8 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187779 | 0226 | 1 | F | Addition of NR test case 7.1.1.1.4_Beam Failure | 15.2.0 |
| 2018-12 | RAN#82 | R5-187780 | 0227 | 1 | F | Addition of NR test case 7.1.1.1.5 SUL | 15.2.0 |
| 2018-12 | RAN#82 | R5-187781 | 0281 | 1 | F | Correction to NR MAC test case 7.1.1.3.2 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187782 | 0291 | 1 | F | Addition of 5GS NR MAC test case 7.1.1.8.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187784 | 0184 | 1 | F | Correction to the default Pre-Test Conditions for AM and UM RLC test cases | 15.2.0 |
| 2018-12 | RAN#82 | R5-187785 | 0232 | 1 | F | Correction to PDCP Ciphering test cases | 15.2.0 |
| 2018-12 | RAN#82 | R5-187786 | 0233 | 1 | F | Correction to PDCP Integrity test cases | 15.2.0 |
| 2018-12 | RAN#82 | R5-187787 | 0216 | 1 | F | Addition of NR test case 8.1.1.2.3_T300 expiry | 15.2.0 |
| 2018-12 | RAN#82 | R5-187789 | 0245 | 1 | F | Addition of 5GS SA RRC TC 8.1.1.2.5 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187790 | 0275 | 1 | F | Addition of 5GS NR RRC test case 8.1.1.3.2 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187792 | 0224 | 1 | F | Addition of NR test case 8.2.3.11.1_gapFR1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187794 | 0221 | 1 | F | Addition of NR test case 8.1.5.3.1_PWS notification | 15.2.0 |
| 2018-12 | RAN#82 | R5-187795 | 0240 | 1 | F | Update RRC SCG failure TC 8.2.5.1.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-187797 | 0263 | 1 | F | Addition of new 5GC TC 9.1.6.1.1 | 15.2.0 |
| 2018-12 | RAN#82 | R5-188159 | 0222 | 2 | F | Addition of NR test case 9.1.5.1.1_Registration Request | 15.2.0 |
| 2018-12 | RAN#82 | R5-188187 | 0296 | - | F | Correction to NR MAC DRX test cases 7.1.1.5.1 and 7.1.1.5.2 | 15.2.0 |
| 2018-12 | RAN#82 | R5-188188 | 0217 | 2 | F | Addition of NR test case 8.1.1.3.1_Redirection to NR | 15.2.0 |
| 2018-12 | RAN#82 | R5-188190 | 0225 | 2 | F | Addition of NR test case 8.2.3.11.2_gapFR2 | 15.2.0 |
| 2019-01 | RAN#82 | R5-188192 | 0205 | 2 | F | Addition of NR test case 7.1.1.2.4_BCCH HARQ | 15.2.1 |
| 2019-01 | RAN#82 | R5-188193 | 0295 | 2 | F | Correction to Layer 2 Pre Test conditions | 15.2.1 |
| 2019-01 | RAN#82 | R5-188194 | 0218 | 2 | F | Addition of NR test case 8.1.3.1.1_Event A1 | 15.2.1 |
| 2019-01 | RAN#82 | R5-188195 | 0183 | 2 | F | Update to 5G TC TA registration update | 15.2.1 |
| 2019-01 | RAN#82 | R5-188202 | 0280 | 2 | F | Update of 5GS NR RRC test case 8.2.1.1.1 | 15.2.1 |
| 2019-03 | RAN#83 | R5-191197 | 0421 | - | F | Correction to 5GS RLC Test case 7.1.2.2.5 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191198 | 0422 | - | F | Correction to 5GS RLC Test case 7.1.2.3.8 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191199 | 0423 | - | F | Correction to 5GS RLC Test case 7.1.2.3.9 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191200 | 0424 | - | F | Correction to EN-DC RRC test case 8.2.5.3.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191202 | 0426 | - | F | Correction to 5GS RLC Test case 7.1.2.3.10 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191203 | 0427 | - | F | Correction to EN-DC RRC test case 8.2.2.2.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191353 | 0431 | - | F | Correcting test case 7.1.1.3.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191393 | 0445 | - | F | Correction to NR test case 7.1.1.1.6-Random access procedure | 15.3.0 |
| 2019-03 | RAN#83 | R5-191397 | 0449 | - | F | Correction to NR test case 7.1.2.3.9-RLC Reassembling | 15.3.0 |
| 2019-03 | RAN#83 | R5-191403 | 0455 | - | F | Correction to NR test case 8.1.3.1.1-Event A1 and A2 | 15.3.0 |

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| 2019-03 | RAN#83 | R5-191405 | 0457 | - | F | Correction to NR test case 8.2.3.11.2-ENDC measurement gap FR2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191415 | 0466 | - | F | Addition of TC 8.1.3.2.3-inter-RAT measurement B2 RSRQ | 15.3.0 |
| 2019-03 | RAN#83 | R5-191426 | 0475 | - | F | Addition of NR test case 6.1.2.4-Cell Reselection for interband operation | 15.3.0 |
| 2019-03 | RAN#83 | R5-191427 | 0476 | - | F | Addition of NR test case 6.1.2.5-Cell Reselection for interband operation using Pcompensation Between FDD and TDD | 15.3.0 |
| 2019-03 | RAN#83 | R5-191430 | 0479 | - | F | Addition of NR test case 6.1.2.21-Cell reselection,SIntra SearchQ and SnonIntraSeqrchQ | 15.3.0 |
| 2019-03 | RAN#83 | R5-191431 | 0480 | - | F | Addition of NR test case 6.1.2.22-Inter-frequency cell reselection with parameters ThreshX, HighQ, ThreshX, LowQ and ThreshServing, LowQ | 15.3.0 |
| 2019-03 | RAN#83 | R5-191432 | 0481 | - | F | Correction to NR test case 7.1.1.3.7-Power Headroom Reporting | 15.3.0 |
| 2019-03 | RAN#83 | R5-191433 | 0482 | - | F | Correction to NR test case 7.1.1.6.1-Correct handling of DL assignment Semi persistent | 15.3.0 |
| 2019-03 | RAN#83 | R5-191434 | 0483 | - | F | Addition of NR test case 8.1.1.1.2-Paging | 15.3.0 |
| 2019-03 | RAN#83 | R5-191435 | 0484 | - | F | Correction to NR test case 8.1.1.2.1-T300 expiry | 15.3.0 |
| 2019-03 | RAN#83 | R5-191436 | 0485 | - | F | Addition of NR test case 8.1.5.3.3-PWS notification | 15.3.0 |
| 2019-03 | RAN#83 | R5-191445 | 0494 | - | F | Correction to NR test case 9.1.5.1.1-Initial Registration | 15.3.0 |
| 2019-03 | RAN#83 | R5-191447 | 0495 | - | F | Addition of NR test case 8.1.3.1.5-Two event A3 RSRQ | 15.3.0 |
| 2019-03 | RAN#83 | R5-191448 | 0496 | - | F | Addition of NR test case 8.1.3.1.6_Two event A5 SINR | 15.3.0 |
| 2019-03 | RAN#83 | R5-191449 | 0497 | - | F | Correction to NR test case 8.1.5.3.1-ETWS | 15.3.0 |
| 2019-03 | RAN#83 | R5-191509 | 0504 | - | F | Addition of new RRC TC 8.1.5.3.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191621 | 0514 | - | F | Update of 5GS NR RRC test case 8.1.1.3.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191641 | 0523 | - | F | Updates to 5GS SA RRC TC - RRC / Paging for connection / Multiple paging records | 15.3.0 |
| 2019-03 | RAN#83 | R5-191642 | 0524 | - | F | Updates to 5GS SA RRC TC - RRC connection establishment / RRC Reject with wait time | 15.3.0 |
| 2019-03 | RAN#83 | R5-191643 | 0525 | - | F | Updates to 5GS SA RRC TC - SI change / Notification of BCCH modification / Short message for SI update | 15.3.0 |
| 2019-03 | RAN#83 | R5-191651 | 0530 | - | F | Update EN-DC RRC TC 8.2.2.4.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191652 | 0531 | - | F | Update EN-DC RRC TC 8.2.2.8.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191653 | 0532 | - | F | Update EN-DC RRC TC 8.2.2.9.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191654 | 0533 | - | F | Update EN-DC RRC TC 8.2.4.1.1.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191656 | 0535 | - | F | Update EN-DC RRC TC 8.2.5.3.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191660 | 0539 | - | F | Addition of 5GC TC- PDU session authentication and authorization / during the UE-requested PDU session procedure | 15.3.0 |
| 2019-03 | RAN#83 | R5-191661 | 0540 | - | F | Addition of Idle Mode TC - Steering of UE in roaming during registration/security check successful using List Type 1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191663 | 0542 | - | F | Addition of Idle mode Test Case - PLMN selection of RPLMN, HPLMN/EHPLMN, UPLMN and OPLMN / Automatic mode | 15.3.0 |
| 2019-03 | RAN#83 | R5-191733 | 0546 | - | F | Update RRC TC 8.2.2.1.1 - SRB3 Establishment, Reconfiguration and Release / NR addition, modification and release / EN-DC | 15.3.0 |
| 2019-03 | RAN#83 | R5-191764 | 0550 | - | F | Addition of new TC 8.2.3.15 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191804 | 0552 | - | F | Title correction to MAC TC 7.1.1.7.1.1 | 15.3.0 |

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| 2019-03 | RAN#83 | R5-191806 | 0553 | - | F | Addition of new RRC TC 8.1.1.4.3 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191810 | 0554 | - | F | Addition of new 5GC TC 9.1.5.2.9 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191823 | 0555 | - | F | Addition of new 5GC TC 9.1.6.1.4 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191827 | 0556 | - | F | Addition of new RRC TC 8.1.1.4.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191859 | 0559 | - | F | Addition of new 5G-NR Idle Mode TC 6.1.1.6 - PLMN selection / Periodic reselection / MinimumPeriodicSearchTimer | 15.3.0 |
| 2019-03 | RAN#83 | R5-191869 | 0561 | - | F | Update to 5G-NR RRC Measurement configuration and reporting TC 8.2.3.3.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191877 | 0562 | - | F | Update to 5G-NR RRC Measurement configuration and reporting TC 8.2.3.4.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191897 | 0570 | - | F | Update to TC 8.2.5.4.1 SCG change failure / EN-DC | 15.3.0 |
| 2019-03 | RAN#83 | R5-191898 | 0571 | - | F | Editorial update to TC 7.1.3.2.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-191911 | 0574 | - | F | Correction to MAC TBS test cases | 15.3.0 |
| 2019-03 | RAN#83 | R5-191916 | 0577 | - | F | Introduction of Non 3GPP Access over WLAN test cases | 15.3.0 |
| 2019-03 | RAN#83 | R5-192203 | 0587 | - | F | Update to 5G-NR RRC Measurement configuration and reporting TCs 8.2.3.x.x | 15.3.0 |
| 2019-03 | RAN#83 | R5-192222 | 0589 | - | F | Correction to NR RRC test case 8.2.3.5.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192282 | 0429 | 1 | F | Addition of new 5G-NR Idle Mode TC 6.1.2.19 - Speed-dependent cell reselection | 15.3.0 |
| 2019-03 | RAN#83 | R5-192283 | 0440 | 1 | F | Addition of NR test case 6.1.2.15-Cell reselection in shared network environment | 15.3.0 |
| 2019-03 | RAN#83 | R5-192284 | 0441 | 1 | F | Addition of NR test case 6.1.2.17-Cell reselection | 15.3.0 |
| 2019-03 | RAN#83 | R5-192285 | 0541 | 1 | F | Addition of Idle mode Test Case 6.1.2.7: Cell reselection / Equivalent PLMN | 15.3.0 |
| 2019-03 | RAN#83 | R5-192286 | 0446 | 1 | F | Correction to NR test case 7.1.1.5.4-CDRX | 15.3.0 |
| 2019-03 | RAN#83 | R5-192287 | 0447 | 1 | F | Correction to NR test case 7.1.1.6.2-Configured grant Type 1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192288 | 0448 | 1 | F | Correction to NR test case 7.1.1.6.3-Configured grant Type 2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192289 | 0548 | 1 | F | Addition of a new test purpose to TC 7.1.1.2.1 and TC 7.1.1.3.1 for a TDD-UL-DL-ConfigCommon including pattern2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192291 | 0575 | 1 | F | Reduction of loops in MAC TBS test cases | 15.3.0 |
| 2019-03 | RAN#83 | R5-192293 | 0565 | 1 | F | Correction to 5GS RLC Test case 7.1.2.3.11 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192296 | 0536 | 1 | F | Correction to PDCP Test case 7.1.3.4.1 PDCP handover / Lossless handover / PDCP sequence number maintenance / PDCP status report to convey the information on missing or acknowledged PDCP SDUs at handover / In-order delivery and duplicate elimination in th | 15.3.0 |
| 2019-03 | RAN#83 | R5-192297 | 0544 | 1 | F | Correction to SDAP Test Cases | 15.3.0 |
| 2019-03 | RAN#83 | R5-192298 | 0451 | 1 | F | Addition of NR test case 8.1.1.3.4-RRCRelease with priority information of E-UTRA | 15.3.0 |
| 2019-03 | RAN#83 | R5-192299 | 0526 | 1 | F | Addition of 5GS SA RRC TC - RRC connection release / With priority information / T320 expiry | 15.3.0 |
| 2019-03 | RAN#83 | R5-192300 | 0527 | 1 | F | Addition of 5GS SA RRC TC - RRC connection release / With priority information / T320 expiry / E-UTRA | 15.3.0 |
| 2019-03 | RAN#83 | R5-192301 | 0528 | 1 | F | Addition of 5GS SA RRC TC - RRC resume / Suspend-Resume / Success | 15.3.0 |
| 2019-03 | RAN#83 | R5-192302 | 0588 | 1 | F | Addition of 5GS SA RRC TC - 8.1.2.1.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192303 | 0590 | 1 | F | Addition of 5GS SA RRC TC - 8.1.2.1.3 | 15.3.0 |

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| 2019-03 | RAN#83 | R5-192304 | 0591 | 1 | F | Addition of 5GS SA RRC TC - 8.1.5.3.4 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192307 | 0557 | 1 | F | Update ENDC TC 8.2.2.3.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192308 | 0420 | 1 | F | Update to 5G-NR RRC Measurement configuration and reporting TC 8.2.3.2.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192329 | 0456 | 1 | F | Correction to NR test case 8.2.3.11.1-ENDC measurement gap FR1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192330 | 0428 | 1 | F | Correction to NR RRC test case 8.2.3.13.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192331 | 0579 | 1 | F | Correction to NR RRC test case 8.2.3.12.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192332 | 0581 | 1 | F | Correction to NR RRC test case 8.2.3.14.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192333 | 0582 | 1 | F | Correction to NR RRC test case 8.2.3.1.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192334 | 0596 | 1 | F | Correction to NR RRC test case 8.2.3.9.1 and 8.2.3.10.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192339 | 0534 | 1 | F | Update EN-DC RRC TC 8.2.5.1.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192340 | 0506 | 1 | F | Update to 5G testcase 9.1.5.1.14 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192341 | 0572 | 1 | F | Update to 5G TC 9.1.5.2.1 TA registration update | 15.3.0 |
| 2019-03 | RAN#83 | R5-192342 | 0543 | 1 | F | Correction to EN-DC NAS test case 10.2.1.1 - Default EPS bearer context activation | 15.3.0 |
| 2019-03 | RAN#83 | R5-192343 | 0537 | 1 | F | Addition of 5GC TC SMS over NAS service | 15.3.0 |
| 2019-03 | RAN#83 | R5-192383 | 0459 | 1 | F | Addition of NR test case 9.1.5.1.10-PLMN not allowed | 15.3.0 |
| 2019-03 | RAN#83 | R5-192385 | 0498 | 1 | F | Addition of new 5GC TC 9.1.7.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192386 | 0502 | 1 | F | Addition of new 5GC TC 9.1.5.1.11 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192387 | 0503 | 1 | F | Addition of new 5GC TC 9.1.5.1.12 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192388 | 0507 | 1 | F | Addition of 5G testcase 9.1.5.1.4 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192389 | 0508 | 1 | F | Addition of 5G testcase 9.1.3.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192390 | 0538 | 1 | F | Addition of 5GC TC - Initial registration / 5GS services / NSSAI handling | 15.3.0 |
| 2019-03 | RAN#83 | R5-192391 | 0545 | 1 | F | Addition of new 5GC TC 9.1.5.1.5 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192392 | 0547 | 1 | F | Introduction of TC 9.1.1.1 EAP based primary authentication and key agreement | 15.3.0 |
| 2019-03 | RAN#83 | R5-192393 | 0549 | 1 | F | Introduction of TC 9.1.1.3 EAP based primary authentication and key agreement | 15.3.0 |
| 2019-03 | RAN#83 | R5-192394 | 0558 | 1 | F | Addition of new 5GC TC 9.1.5.1.7 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192396 | 0564 | 1 | F | Addition of new 5GC TC 9.1.5.1.8 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192397 | 0566 | 1 | F | Update TC 9.1.6.1.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192398 | 0573 | 1 | F | Introduction of TC 9.1.5.2.4 Mobility registration update / The lower layer requests NAS signalling connection recovery | 15.3.0 |
| 2019-03 | RAN#83 | R5-192399 | 0580 | 1 | F | New 5GC test case 9.1.2.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192700 | 0499 | 1 | F | Addition of new 5GC TC 10.1.3.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192701 | 0500 | 1 | F | Addition of new 5GC TC 10.1.6.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192702 | 0501 | 1 | F | Addition of new 5GC TC 10.1.6.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192703 | 0563 | 1 | F | Addition of new 5GC TC 10.1.2.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192749 | 0474 | 1 | F | Addition of NR test case 6.1.2.2-Cell selection based on Qqualmin | 15.3.0 |

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| 2019-03 | RAN#83 | R5-192750 | 0432 | 1 | F | Correcting test case 6.1.1.7 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192751 | 0433 | 1 | F | Updating test case 6.1.1.8 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192754 | 0599 | - | F | Addition of NR test case 6.1.2.1-Cell selection based on Qrxlevmin and Cell Reselection for Intra Frequency | 15.3.0 |
| 2019-03 | RAN#83 | R5-192756 | 0600 | - | F | Addition of NR test case 6.1.2.3-Cell selection-Serving cell bar | 15.3.0 |
| 2019-03 | RAN#83 | R5-192757 | 0470 | 1 | F | Addition of NR test case 6.1.1.2- PLMN selection of Other PLMN | 15.3.0 |
| 2019-03 | RAN#83 | R5-192758 | 0471 | 1 | F | Addition of NR test case 6.1.1.3-Cell reselection of ePLMN | 15.3.0 |
| 2019-03 | RAN#83 | R5-192759 | 0473 | 1 | F | Addition of NR test case 6.1.1.5-PLMN selection | 15.3.0 |
| 2019-03 | RAN#83 | R5-192760 | 0477 | 1 | F | Addition of NR test case 6.1.2.9-Cell Reselection using Qhyst, Qoffset and Treselection | 15.3.0 |
| 2019-03 | RAN#83 | R5-192761 | 0478 | 1 | F | Addition of NR test case 6.1.2.20-Inter-frequency cell reselection according to priority | 15.3.0 |
| 2019-03 | RAN#83 | R5-192762 | 0509 | 1 | F | Adding test case 6.2.1.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192763 | 0510 | 1 | F | Adding test case 6.2.1.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192764 | 0511 | 1 | F | Adding test case 6.2.1.3 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192765 | 0512 | 1 | F | Adding test case 6.2.1.4 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192766 | 0513 | 1 | F | Adding test case 6.2.1.5 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192767 | 0592 | 1 | F | Addition of Idle Mode test case 6.1.2.8 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192768 | 0472 | 1 | F | Addition of NR test case 6.1.1.4-PLMN selection in shared network environment | 15.3.0 |
| 2019-03 | RAN#83 | R5-192769 | 0444 | 1 | F | Correction to NR test case 7.1.1.1.3-SI request | 15.3.0 |
| 2019-03 | RAN#83 | R5-192770 | 0585 | 1 | F | Update to NR MAC Bandwidth Part operation TC 7.1.1.8.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192771 | 0521 | 1 | F | Correction to 5GS PDCP Test case 7.1.3.5.3 PDCP Data Recovery | 15.3.0 |
| 2019-03 | RAN#83 | R5-192772 | 0450 | 1 | F | Addition of NR test case 8.1.1.3.3-RRC connection release-Success-With priority information | 15.3.0 |
| 2019-03 | RAN#83 | R5-192774 | 0453 | 1 | F | Addition of NR test case 8.1.4.2.2.1-L2NR handover success | 15.3.0 |
| 2019-03 | RAN#83 | R5-192776 | 0464 | 1 | F | Addition of TC 8.1.3.2.1-Event B1 E-UTRA | 15.3.0 |
| 2019-03 | RAN#83 | R5-192777 | 0465 | 1 | F | Addition of TC 8.1.3.2.2-Event B2 E-UTRA | 15.3.0 |
| 2019-03 | RAN#83 | R5-192782 | 0488 | 1 | F | Addition of NR test case 8.1.3.1.11.1_intra-band Contiguous CA Event A6 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192783 | 0489 | 1 | F | Addition of NR test case 8.1.3.1.11.2_inter-band CA Event A6 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192784 | 0490 | 1 | F | Addition of NR test case 8.1.3.1.11.3_intra-band non Contiguous CA Event A6 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192785 | 0491 | 1 | F | Addition of NR test case 8.1.3.1.12.1_ Additional intra-band Contiguous CA | 15.3.0 |
| 2019-03 | RAN#83 | R5-192786 | 0492 | 1 | F | Addition of NR test case 8.1.3.1.12.2_ Additional inter-band CA | 15.3.0 |
| 2019-03 | RAN#83 | R5-192787 | 0493 | 1 | F | Addition of NR test case 8.1.3.1.12.3_ Additional intra-band non Contiguous CA | 15.3.0 |
| 2019-03 | RAN#83 | R5-192794 | 0516 | 1 | F | Addition of 5GS NR RRC test case 8.1.5.1.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192795 | 0586 | 1 | F | Addition of TC 8.1.4.2.1.1 Inter-RAT handover / From NR to E-UTRA | 15.3.0 |
| 2019-03 | RAN#83 | R5-192796 | 0598 | 1 | F | New RRC test case 8.1.5.2.2 SI change / Notification of BCCH modification / Short message for SI update in NR RRC_CONNECTED state | 15.3.0 |
| 2019-03 | RAN#83 | R5-192798 | 0425 | 1 | F | Update to EN-DC test case 8.2.3.7.1 | 15.3.0 |

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| 2019-03 | RAN#83 | R5-192800 | 0435 | 1 | F | Addition of 5GC test case 9.1.1.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192801 | 0458 | 1 | F | Addition of NR test case 9.1.1.6-Authentication abnormal | 15.3.0 |
| 2019-03 | RAN#83 | R5-192802 | 0460 | 1 | F | Addition of NR test case 9.1.6.1.2-T3521 timeout | 15.3.0 |
| 2019-03 | RAN#83 | R5-192803 | 0461 | 1 | F | Addition of NR test case 9.1.6.2.1-Network-initiated deregistration-deregistration for 3GPP access-reregistration required | 15.3.0 |
| 2019-03 | RAN#83 | R5-192805 | 0463 | 1 | F | Addition of NR test case 9.1.7.2-Service request for user data pending | 15.3.0 |
| 2019-03 | RAN#83 | R5-192806 | 0568 | 1 | F | Addition of new 5GC TC 9.1.5.2.2 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192815 | 0567 | 1 | F | Addition of new 5GC TC 9.1.2.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192816 | 0569 | 1 | F | Addition of 5GC Test case 10.1.5.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192819 | 0576 | 2 | F | Update of 5GS NR MAC test case 7.1.1.9.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192824 | 0560 | 2 | F | Addition of new 5GC TC 9.1.5.1.13 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192829 | 0517 | 2 | F | Update of 5GS NR RRC test case 8.2.1.1.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192830 | 0595 | 2 | F | Addition of 5GS PDCP TC 7.1.3.5.5 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192838 | 0603 | - | F | Addition of 5GS SA RRC TC - 8.1.3.1.13 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192839 | 0604 | - | F | Addition of 5GS SA RRC TC - 8.1.3.1.14 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192852 | 0601 | 1 | F | Addition of NR test case Event A4 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192853 | 0602 | 1 | F | Addition of NR test case Event A5 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192854 | 0518 | 2 | F | Update of 5GS NR RRC test case 8.2.3.6.1 and 8.2.3.8.1 | 15.3.0 |
| 2019-03 | RAN#83 | R5-192855 | 0462 | 2 | F | Addition of NR test case 9.1.6.2.2-Reregistration not required | 15.3.0 |
| 2019-03 | RAN#83 | - | - | - | - | Editorial update to align referenced to TS 38.508-1 table numbers | 15.3.0 |
| 2019-06 | RAN#84 | R5-193861 | 0676 | - | F | Correction to NR RLC test cases 7.1.2.2.3 and 7.1.2.2.4 | 15.4.0 |
| 2019-06 | RAN#84 | R5-193869 | 0677 | - | F | Correction to 5GMM test case 9.1.5.2.4 | 15.4.0 |
| 2019-06 | RAN#84 | R5-193884 | 0681 | - | F | Update of TC 9.1.5.1.13 | 15.4.0 |
| 2019-06 | RAN#84 | R5-193898 | 0687 | - | F | Removal of TC 9.1.5.1.7 | 15.4.0 |
| 2019-06 | RAN#84 | R5-193984 | 0689 | - | F | Clarification on DRB to use in MAC test cases | 15.4.0 |
| 2019-06 | RAN#84 | R5-193986 | 0691 | - | F | Clarification on DRB to use in RLC test cases | 15.4.0 |
| 2019-06 | RAN#84 | R5-193987 | 0692 | - | F | Correction to NR RLC test case 7.1.2.3.9 | 15.4.0 |
| 2019-06 | RAN#84 | R5-193988 | 0693 | - | F | Clarification on DRB to use in PDCP test cases | 15.4.0 |
| 2019-06 | RAN#84 | R5-194008 | 0698 | - | F | Correction to EN-DC RRC test case 8.2.5.2.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194031 | 0703 | - | F | Correction to PDCP test case 7.1.3.5.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194033 | 0705 | - | F | Correction to 5GC NAS test case 9.1.8.1 - SMS over NAS / MO and MT SMS over NAS - Idle mode | 15.4.0 |
| 2019-06 | RAN#84 | R5-194045 | 0713 | - | F | Updates to 5GS SA RRC TC 8.1.1.4.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194046 | 0714 | - | F | Updates to 5GS SA RRC TC 8.1.5.2.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194050 | 0718 | - | F | Addition of 5GS SA RRC TC - Intra NR handover / Success / Security key reconfiguration | 15.4.0 |
| 2019-06 | RAN#84 | R5-194051 | 0719 | - | F | Addition of 5GS SA RRC TC - Intra NR handover / Failure / Security key reconfiguration | 15.4.0 |
| 2019-06 | RAN#84 | R5-194119 | 0730 | - | F | Correction to EN-DC RRC measurement test cases | 15.4.0 |

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| 2019-06 | RAN#84 | R5-194266 | 0735 | - | F | Correction to EN-DC RRC test case 8.2.5.1.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194288 | 0742 | - | F | Correction to EN-DC RRC test case 8.2.5.3.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194296 | 0745 | - | F | Correction to RLC test case - AM RLC / RLC re-establishment procedure | 15.4.0 |
| 2019-06 | RAN#84 | R5-194395 | 0751 | - | F | Update of NR RRC TC 8.2.3.12.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194396 | 0752 | - | F | Addition of new RRC TC 8.1.5.6.5.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194448 | 0759 | - | F | Addition of new TC 9.1.5.1.6 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194481 | 0764 | - | F | Updates to 5GC NAS test case 9.1.2.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194514 | 0776 | - | F | Update of TC 9.1.5.2.4 Mobility registration update / The lower layer requests NAS signalling connection recovery | 15.4.0 |
| 2019-06 | RAN#84 | R5-194637 | 0786 | - | F | Update to TC 8.1.4.2.1.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194696 | 0791 | - | F | Correction to NR RLC test case 7.1.2.3.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194699 | 0793 | - | F | Correction to NR PDCP test case 7.1.3.5.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194787 | 0795 | - | F | Correction to NR test case 6.1.2.3-Cell selection-Serving cell bar | 15.4.0 |
| 2019-06 | RAN#84 | R5-194788 | 0796 | - | F | Correction to NR test case 6.1.2.9-Cell reselection using Qhyst, Qoffset and Treselection | 15.4.0 |
| 2019-06 | RAN#84 | R5-194792 | 0797 | - | F | Update to IDLE mode test case 6.1.1.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194819 | 0727 | 1 | F | Correcton to MAC test cases | 15.4.0 |
| 2019-06 | RAN#84 | R5-194822 | 0629 | 1 | F | Correction to NR test case 7.1.1.1.3-SI request | 15.4.0 |
| 2019-06 | RAN#84 | R5-194823 | 0611 | 1 | F | Addition of NR test case 6.1.2.12-Cell reselection CellReservedForOtherUse | 15.4.0 |
| 2019-06 | RAN#84 | R5-194833 | 0628 | 1 | F | Correction to NR test case 6.1.2.1-Cell selection Qrxlevmin | 15.4.0 |
| 2019-06 | RAN#84 | R5-194834 | 0746 | 1 | F | Editorial Corrections to Test Cases 6.3.1.1, 6.1.1.1, 6.1.2.7, 7.1.1.1.3, 8.1.1.3.1, 8.1.1.3.5, 9.1.5.2.4 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194835 | 0747 | 1 | F | Corrections to Test Case 6.3.1.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194836 | 0726 | 1 | F | Correction to EN-DC RLC test cases 7.1.2.2.1, 7.1.2.2.2, 7.1.2.3.1 and 7.1.2.3.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194837 | 0704 | 1 | F | Correction to PDCP test case 7.1.3.5.4 - PDCP reordering / Maximum re-ordering delay below t-Reordering / t-Reordering timer operations | 15.4.0 |
| 2019-06 | RAN#84 | R5-194838 | 0711 | 1 | F | Updates to 5GS SA RRC TC 8.1.1.1.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194839 | 0712 | 1 | F | Updates to 5GS SA RRC TC 8.1.1.2.3 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194840 | 0734 | 1 | F | Correction of 5GC Test case 8.1.1.3.5 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194841 | 0641 | 1 | F | Correction of NR test case 8.1.3.1.5-Intra Freq Event A4 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194842 | 0642 | 1 | F | Correction of NR test case 8.1.3.1.8-Intra Freq Event A5 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194843 | 0717 | 1 | F | Removal of EN-DC RRC TC - BandwidthPart Configuration / SCG | 15.4.0 |
| 2019-06 | RAN#84 | R5-194844 | 0770 | 1 | F | Update of 5GS NR RRC test case 8.2.1.1.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194845 | 0657 | 1 | F | Correction to NR test case 8.2.3.11.1-ENDC measurement gap FR1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194846 | 0658 | 1 | F | Correction to NR test case 8.2.3.11.2-ENDC measurement gap FR2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194847 | 0661 | 1 | F | Corrections to 5G-NR RRC Measurement configuration and reporting test cases | 15.4.0 |
| 2019-06 | RAN#84 | R5-194848 | 0673 | 1 | F | Correction to EN-DC RRC test case 8.2.3.6.1 | 15.4.0 |

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| 2019-06 | RAN#84 | R5-194849 | 0674 | 1 | F | Correction to EN-DC RRC test case 8.2.3.7.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194850 | 0675 | 1 | F | Correction to EN-DC RRC test case 8.2.3.3.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194851 | 0740 | 1 | F | Correction to EN-DC RRC test case 8.2.3.8.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194853 | 0741 | 1 | F | Correction to EN-DC RRC test case 8.2.3.4.1 and 8.2.3.5.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194854 | 0749 | 1 | F | Update TC 8.2.3.15.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194855 | 0755 | 1 | F | Correction to EN-DC RRC measurement test cases 8.2.3.9.1 and 8.2.3.10.1

Editor's note: could not be implemented | 15.4.0 |
| 2019-06 | RAN#84 | R5-194856 | 0665 | 1 | F | Update of RRC TC 8.2.5.4.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194857 | 0679 | 1 | F | Correction to 5GMM test case 9.1.2.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194858 | 0756 | 1 | F | Correction to NR5GC testcase 9.1.3.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194859 | 0659 | 1 | F | Correction to NR test case 9.1.5.1.1-Registration Request | 15.4.0 |
| 2019-06 | RAN#84 | R5-194867 | 0668 | 1 | F | Update of TC 9.1.6.1.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194868 | 0758 | 1 | F | Correction to NR5GC testcase 9.1.5.1.14 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194869 | 0609 | 1 | F | Correction to 5GC TC 9.1.7.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194871 | 0610 | 1 | F | Correction to 5GC TC 10.1.3.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194872 | 0680 | 1 | F | Correction on 5GC TC 10.1.2.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194873 | 0607 | 1 | F | Correction to 5GC TC 10.1.6.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194874 | 0608 | 1 | F | Correction to 5GC TC 10.1.6.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-194890 | 0728 | 1 | F | Introduction of Non 3GPP Access over WLAN test cases | 15.4.0 |
| 2019-06 | RAN#84 | R5-195208 | 0765 | 1 | F | Addition of new TC 9.1.5.1.9 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195209 | 0707 | 1 | F | Addition of 5GC NAS Test Case - Generic UE configuration update / New 5G-GUTI / NITZ / registration requested / Network slicing indication / New Allowed NSSAI / acknowledgement from the UE | 15.4.0 |
| 2019-06 | RAN#84 | R5-195210 | 0708 | 1 | F | Addition of 5GC NAS Test Case - UE-initiated de-registration / Abnormal / Change of cell into a new tracking area | 15.4.0 |
| 2019-06 | RAN#84 | R5-195211 | 0757 | 1 | F | Addition of NR5GC testcase 9.1.5.1.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195212 | 0774 | 1 | F | Introduction of TC 9.1.5.2.7 Mobility and periodic registration update / Rejected / UE identity cannot be derived by the network | 15.4.0 |
| 2019-06 | RAN#84 | R5-195213 | 0775 | 1 | F | Introduction of TC 9.1.5.2.8 Mobility and periodic registration update / Rejected / Implicitly de-registered | 15.4.0 |
| 2019-06 | RAN#84 | R5-195226 | 0794 | 1 | F | Addition of 5GSM test case 10.1.1.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195228 | 0777 | 1 | F | Introduction of TC 9.3.1.1 Mobility registration update / Single-registration mode with N26 / 5GMM-IDLE / 5GC to EPC | 15.4.0 |
| 2019-06 | RAN#84 | R5-195229 | 0778 | 1 | F | Introduction of TC 9.3.1.2 Mobility registration update / Single-registration mode with N26 / 5GMM-IDLE / EPC to 5GC | 15.4.0 |
| 2019-06 | RAN#84 | R5-195230 | 0779 | 1 | F | Introduction of TC 9.3.1.3 Mobility and periodic registration update / Rejected / Single-registration mode with N26 / Handling of EPS relevant parameters | 15.4.0 |
| 2019-06 | RAN#84 | R5-195231 | 0682 | 1 | F | New multilayer test case 11.1.3 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195238 | 0780 | 1 | F | Introduction of new TC 11.1.7 Emergency call setup from NR RRC_IDLE / Emergency Services Fallback to EPS with redirection / Single registration mode with N26 interface / Success | 15.4.0 |
| 2019-06 | RAN#84 | R5-195243 | 0616 | 1 | F | Addition of NR test case 6.2.3.3-Inter-RAT Cell reselection NR2L by | 15.4.0 |

| | | | | | | priority Srxlev based | |
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| 2019-06 | RAN#84 | R5-195244 | 0612 | 1 | F | Addition of NR test case 6.1.2.13-Cell reselection CellReservedForOperatorUse with Access Identity 1-2-12-13-14 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195245 | 0613 | 1 | F | Addition of NR test case 6.1.2.14-Cell reselection CellReservedForOperatorUse with Access Identity 11-15 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195247 | 0618 | 1 | F | Addition of NR test case 6.2.3.5-Inter-RAT Cell reselection NR2L by priority from dedicated signalling | 15.4.0 |
| 2019-06 | RAN#84 | R5-195249 | 0620 | 1 | F | Addition of NR test case 6.2.3.7-Inter-RAT Cell reselection NR2L Snointrasearch | 15.4.0 |
| 2019-06 | RAN#84 | R5-195252 | 0623 | 1 | F | Addition of NR test case 6.4.2.1-Cell selection Qrxlevmin and Cell reselection | 15.4.0 |
| 2019-06 | RAN#84 | R5-195256 | 0627 | 1 | F | Addition of NR test case 6.4.1.2-Cell reselection of ePLMN in manual mode | 15.4.0 |
| 2019-06 | RAN#84 | R5-195257 | 0709 | 1 | F | Addition of Idle Mode Test Case - Steering of UE in roaming during registration/security check successful but SOR Transparent container indicates ACK has been NOT been requested | 15.4.0 |
| 2019-06 | RAN#84 | R5-195259 | 0631 | 1 | F | Addition of NR test case 8.1.3.1.6-Inter Freq Event A4 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195260 | 0632 | 1 | F | Addition of NR test case 8.1.3.1.7-Inter Band Event A4 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195261 | 0633 | 1 | F | Addition of NR test case 8.1.3.1.9-Inter Freq Event A5 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195262 | 0634 | 1 | F | Addition of NR test case 8.1.3.1.10-Inter Band Event A5 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195268 | 0640 | 1 | F | Addition of NR test case 8.1.3.2.5-Event A2 and B2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195269 | 0643 | 1 | F | Correction of NR test case 8.1.3.1.11-Two Event A3 RSRQ | 15.4.0 |
| 2019-06 | RAN#84 | R5-195270 | 0644 | 1 | F | Correction of NR test case 8.1.3.1.12-Two Event A5 SINR | 15.4.0 |
| 2019-06 | RAN#84 | R5-195271 | 0645 | 1 | F | Correction of NR test case 8.1.3.1.17.1-Intra Band Event A6 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195272 | 0646 | 1 | F | Correction of NR test case 8.1.3.1.17.2-Inter Band Event A6 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195273 | 0647 | 1 | F | Correction of NR test case 8.1.3.1.17.3-Intra Band non Contiguous Event A6 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195274 | 0648 | 1 | F | Correction of NR test case 8.1.3.1.18.1-Additional Reporting Intra Band | 15.4.0 |
| 2019-06 | RAN#84 | R5-195275 | 0649 | 1 | F | Correction of NR test case 8.1.3.1.18.2-Additional Reporting Inter Band | 15.4.0 |
| 2019-06 | RAN#84 | R5-195276 | 0650 | 1 | F | Correction of NR test case 8.1.3.1.18.3-Additional Reporting Intra Band non Contiguous | 15.4.0 |
| 2019-06 | RAN#84 | R5-195277 | 0782 | 1 | F | Addition of 5GS NR RRC test case 8.1.3.1.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195278 | 0783 | 1 | F | Addition of 5GS NR RRC test case 8.1.3.1.3 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195279 | 0784 | 1 | F | Addition of 5GS NR RRC test case 8.1.3.1.4 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195280 | 0790 | 1 | F | Addition of 5GS NR RRC test case for Intra NR measurements / Blacklisting | 15.4.0 |
| 2019-06 | RAN#84 | R5-195285 | 0699 | 1 | F | New 5GS SA RRC TC 8.1.4.1.9.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195286 | 0700 | 1 | F | New 5GS SA RRC TC 8.1.4.1.9.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195287 | 0701 | 1 | F | New 5GS SA RRC TC 8.1.4.1.9.3 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195288 | 0724 | 1 | F | Addition of 5GS SA RRC TC - Intra NR handover / Failure / Re-establishment successful | 15.4.0 |
| 2019-06 | RAN#84 | R5-195289 | 0725 | 1 | F | Addition of 5GS SA RRC TC - Intra NR handover / Failure / Re-establishment failure | 15.4.0 |
| 2019-06 | RAN#84 | R5-195290 | 0731 | 1 | F | Addition of Intra-NR intra-frequency handover test case 8.1.4.1.1 | 15.4.0 |

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| 2019-06 | RAN#84 | R5-195291 | 0732 | 1 | F | Addition of Intra-NR inter-frequency handover test case 8.1.4.1.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195292 | 0720 | 1 | F | Addition of 5GS SA RRC TC - Redirection to NR / From E-UTRA / Success | 15.4.0 |
| 2019-06 | RAN#84 | R5-195293 | 0736 | 1 | F | New 5G Radio link failure test case 8.1.5.6.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195294 | 0753 | 1 | F | Addition of new RRC TC 8.1.5.6.5.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195295 | 0754 | 1 | F | Addition of new RRC TC 8.1.5.6.5.3

Editor's note: could not be implemented | 15.4.0 |
| 2019-06 | RAN#84 | R5-195296 | 0768 | 1 | F | Addition of 5GS NR RRC test case 8.1.5.4.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195297 | 0771 | 1 | F | New 5G Radio link failure test case 8.1.5.6.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195298 | 0772 | 1 | F | New 5G Radio link failure test case 8.1.5.6.3 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195299 | 0773 | 1 | F | New 5G Radio link failure test case 8.1.5.6.4 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195300 | 0696 | 1 | F | Correction to RRC test case 8.2.3.13.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195301 | 0697 | 1 | F | Correction to RRC test case 8.2.3.14.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195302 | 0722 | 1 | F | Addition of new EN-DC RRC TC - Measurement configuration control and reporting / Event A4 / Measurement of Neighbor NR cell / Inter-frequency measurements / EN-DC | 15.4.0 |
| 2019-06 | RAN#84 | R5-195303 | 0723 | 1 | F | Addition of new EN-DC RRC TC - Measurement configuration control and reporting / Event A4 / Measurement of Neighbor NR cell / Inter-band measurements / EN-DC | 15.4.0 |
| 2019-06 | RAN#84 | R5-195336 | 0690 | 1 | F | Correction to NR MAC test case 7.1.1.1.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195338 | 0694 | 1 | F | Correction to NR PDCP test case 7.1.3.4.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195339 | 0715 | 1 | F | Updates to PDCP Integrity Protection TCs 7.1.3.2.x | 15.4.0 |
| 2019-06 | RAN#84 | R5-195340 | 0716 | 1 | F | Updates to PDCP Ciphering and Deciphering TCs 7.1.3.3.x | 15.4.0 |
| 2019-06 | RAN#84 | R5-195341 | 0662 | 1 | F | Update of RRC TC 8.1.1.4.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195342 | 0743 | 1 | F | Correction to RRC test case 8.1.2.1.3 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195343 | 0744 | 1 | F | Correction to 5GS SA RRC TC - 8.1.2.1.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195344 | 0669 | 1 | F | Correction of NR test case 8.1.3.1.1-Intra Freq Event A1 A2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195345 | 0670 | 1 | F | Correction of NR test case 8.1.3.2.1-Event B1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195346 | 0671 | 1 | F | Correction of NR test case 8.1.3.2.2-Event B2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195347 | 0672 | 1 | F | Correction of NR test case 8.1.3.2.3-Event B2 RSRQ | 15.4.0 |
| 2019-06 | RAN#84 | R5-195350 | 0667 | 1 | F | Update of 5GC TC 9.1.5.1.5 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195351 | 0688 | 1 | F | New multilayer test case 11.1.4 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195352 | 0683 | 1 | F | Addition of Multilayer test case 11.1.2 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195353 | 0684 | 1 | F | Addition of Multilayer test case 11.1.5 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195354 | 0685 | 1 | F | Addition of Multilayer test case 11.1.6 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195355 | 0710 | 1 | F | Addition of 5GS Multilayer Test Case 11.1.1 MO MMTEL voice call setup from NR RRC_IDLE / EPS Fallback with redirection / Single registration mode with N26 interface / Success | 15.4.0 |
| 2019-06 | RAN#84 | R5-195358 | 0798 | 1 | F | Update of EN-DC RRC TC 8.2.3.2.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195363 | 0781 | 2 | F | Update to NR MAC Bandwidth Part operation TC 7.1.1.8.1 | 15.4.0 |
| 2019-06 | RAN#84 | R5-195364 | 0695 | 2 | F | Correction to NR PDCP test case 7.1.3.4.2 | 15.4.0 |

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| 2019-06 | RAN#84 | R5-195365 | 0785 | 2 | F | Addition of 5GS NR RRC test case 8.2.3.6.1a | 15.4.0 |
| 2019-06 | RAN#84 | R5-195366 | 0787 | 2 | F | Addition of 5GS NR RRC test case 8.2.3.6.1b | 15.4.0 |
| 2019-06 | RAN#84 | R5-195367 | 0788 | 2 | F | Addition of 5GS NR RRC test case 8.2.3.8.1a | 15.4.0 |
| 2019-06 | RAN#84 | R5-195368 | 0789 | 2 | F | Addition of 5GS NR RRC test case 8.2.3.8.1b | 15.4.0 |
| 2019-06 | RAN#84 | R5-195369 | 0799 | 2 | F | Correction to EN-DC RRC Measurement test cases for FR2 Power table | 15.4.0 |
| 2019-06 | RAN#84 | R5-195370 | 0666 | 2 | F | Update of 5GC TC 9.1.6.1.2 | 15.4.0 |
| 2019-06 | RAN#84 | - | - | - | - | Administrative release upgrade to match the release of 3GPP TS 38.508-1 which was upgraded at RAN#84 to Rel-16 due to Rel-16 relevant CR(s) | 16.0.0 |
| 2019-09 | RAN#85 | R5-195649 | 0810 | - | F | Addition of NR test case 6.4.1.1-HPLMN in Automatic PLMN Selection Mode in RRC_INACTIVE state | 16.1.0 |
| 2019-09 | RAN#85 | R5-195650 | 0811 | - | F | Addition of NR test case 6.4.2.2-Inter-Freq Cell reselection by priority of SIBs | 16.1.0 |
| 2019-09 | RAN#85 | R5-195663 | 0824 | - | F | Addition of NR test case 8.1.4.1.7.2-PCell Change and SCell addition Inter-band CA | 16.1.0 |
| 2019-09 | RAN#85 | R5-195664 | 0825 | - | F | Addition of NR test case 8.1.4.1.7.3-PCell Change and SCell addition Intra-band non-contiguous CA | 16.1.0 |
| 2019-09 | RAN#85 | R5-195666 | 0827 | - | F | Addition of NR test case 8.1.4.1.8.2-SCell no change Inter-band CA | 16.1.0 |
| 2019-09 | RAN#85 | R5-195667 | 0828 | - | F | Addition of NR test case 8.1.4.1.8.3-SCell no change Intra-band non-contiguous CA | 16.1.0 |
| 2019-09 | RAN#85 | R5-195676 | 0837 | - | F | Correction to NR test case 8.1.5.3.1-PWS reception in NR RRC_IDLE state | 16.1.0 |
| 2019-09 | RAN#85 | R5-195677 | 0838 | - | F | Correction to NR test case 8.1.5.3.3-PWS reception in NR RRC_CONNECTED state | 16.1.0 |
| 2019-09 | RAN#85 | R5-195681 | 0842 | - | F | Correction to NR test case 9.1.5.1.10-PLMN not allowed | 16.1.0 |
| 2019-09 | RAN#85 | R5-195712 | 0850 | - | F | Update to RRC measurement test cases in EN-DC for FR2 support | 16.1.0 |
| 2019-09 | RAN#85 | R5-195929 | 0863 | - | F | Update to PDCP test cases in EN-DC for FR2 support | 16.1.0 |
| 2019-09 | RAN#85 | R5-195947 | 0870 | - | F | Correction to references to test procedure for Switch off / Power off UE | 16.1.0 |
| 2019-09 | RAN#85 | R5-195948 | 0871 | - | F | Correction of power level units for test case 7.1.1.7.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-195949 | 0872 | - | F | Correction of power level units for test cases 8.1.3.1.11, 8.1.3.1.12, 8.1.3.1.15A, 8.1.3.2.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-195981 | 0876 | - | F | Correction to 5GC TC 10.1.6.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-195996 | 0878 | - | F | Update PDCP test case 7.1.3.2.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-195997 | 0879 | - | F | Update PDCP test case 7.1.3.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196002 | 0884 | - | F | Update RRC measurement test case 8.2.3.14 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196039 | 0889 | - | F | Addition of new 5GC TC 10.1.2.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196046 | 0895 | - | F | Correction to 5GC TC 8.1.5.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196055 | 0902 | - | F | Correction to TC 9.1.7.1-Service Request in Idle state | 16.1.0 |
| 2019-09 | RAN#85 | R5-196093 | 0919 | - | F | Correction to RLC test case 7.1.2.3.11 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196109 | 0930 | - | F | To void TC 8.1.1.3.5 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196110 | 0931 | - | F | To void TC 8.1.1.3.6 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196111 | 0932 | - | F | To void TC 8.1.1.4.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196112 | 0933 | - | F | To void TC 8.1.4.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196113 | 0934 | - | F | To void TC 8.1.4.1.4 | 16.1.0 |

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| 2019-09 | RAN#85 | R5-196114 | 0935 | - | F | Correction to EN-DC RRC TCs 8.2.2.4.1 & 8.2.2.5.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196118 | 0939 | - | F | Updates to EN-DC RRC TC 8.2.3.7.1a | 16.1.0 |
| 2019-09 | RAN#85 | R5-196119 | 0940 | - | F | Updates to EN-DC RRC TC 8.2.3.7.1b | 16.1.0 |
| 2019-09 | RAN#85 | R5-196156 | 0947 | - | F | Correction to NR Idle test case 6.1.1.6 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196217 | 0954 | - | F | Update of NR test case 6.1.2.2-Intra-NR Cell Selection Qqualmin based | 16.1.0 |
| 2019-09 | RAN#85 | R5-196218 | 0955 | - | F | Update of NR test case 6.1.2.21-Cell reselection, SIntraSearchQ and SnonIntraSearchQ | 16.1.0 |
| 2019-09 | RAN#85 | R5-196261 | 0962 | - | F | Correction to NR test case 7.1.3.4.1 - PDCP Lossless handover | 16.1.0 |
| 2019-09 | RAN#85 | R5-196285 | 0964 | - | F | Correction to EN-DC RRC test case 8.2.5.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196306 | 0969 | - | F | Removal of NR RRC test case 8.1.2.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196353 | 0971 | - | F | Correction to test cases 6.1.1.8 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196354 | 0972 | - | F | Update sub-clause 6.2.1 test cases with the latest generic procedure references | 16.1.0 |
| 2019-09 | RAN#85 | R5-196355 | 0973 | - | F | Update to test case 9.1.5.1.5 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196489 | 0976 | - | F | Update of RRC TC 8.1.5.6.5.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196492 | 0977 | - | F | New RRC TC 8.1.5.6.5.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196598 | 0982 | - | F | Correction to Idle TC 6.1.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196610 | 0985 | - | F | Correction to Idle TC 6.1.2.8 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196614 | 0988 | - | F | Deletion of TC 8.1.4.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196624 | 0991 | - | F | Correction to RLC TC 7.1.2.2.5 and 7.1.2.2.6 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196633 | 0995 | - | F | Correction to 5GC TC 9.1.6.1.4 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196642 | 0996 | - | F | Adding specs to TS 38.523-1 References section | 16.1.0 |
| 2019-09 | RAN#85 | R5-196730 | 1009 | - | F | Update of test case 9.3.1.1 Mobility registration update / Single-registration mode with N26 / 5GMM-IDLE / 5GC to EPC | 16.1.0 |
| 2019-09 | RAN#85 | R5-196731 | 1010 | - | F | Update of test case 9.3.1.2 Mobility registration update / Single-registration mode with N26 / 5GMM-IDLE / EPC to 5GC | 16.1.0 |
| 2019-09 | RAN#85 | R5-196732 | 1011 | - | F | Update of test case 9.3.1.3 Mobility and periodic registration update / Rejected / Single-registration mode with N26 / Handling of EPC relevant parameters | 16.1.0 |
| 2019-09 | RAN#85 | R5-196745 | 1013 | - | F | Correction to pre-condition of MAC test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-196753 | 1019 | - | F | Correction to ENDC test case 7.1.2.2.6 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196755 | 1020 | - | F | Correction to NR5GC test case 9.1.5.2.8 | 16.1.0 |
| 2019-09 | RAN#85 | R5-196779 | 1029 | - | F | Update to TC 8.1.3.1.15A | 16.1.0 |
| 2019-09 | RAN#85 | R5-196827 | 1031 | - | F | Removal of Radio Link Failure test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-196828 | 1032 | - | F | Editorial changes to SERVICE REQUEST parameters for multi layer test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-196835 | 1036 | - | F | Update to 5GS NR RRC test case 8.1.5.4.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197001 | 0941 | 1 | F | Correction of NR test case 7.1.1.3.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197002 | 0943 | 1 | F | Correction to test case 7.1.1.3.4 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197003 | 0944 | 1 | F | Correction to test case 7.1.1.3.5 | 16.1.0 |

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| 2019-09 | RAN#85 | R5-197005 | 0905 | 1 | F | Correction to test case 8.1.1.4.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197006 | 0914 | 1 | F | Correction to ENDC test case 10.2.2.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197007 | 0983 | 1 | F | Correction to RLC AM test case 7.1.2.3.9 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197008 | 0953 | 1 | F | Correction to RLC test case 7.1.2.3.10 in EN-DC | 16.1.0 |
| 2019-09 | RAN#85 | R5-197011 | 1026 | 1 | F | Corrcion to ENDC test case 7.1.2.3.5 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197012 | 0918 | 1 | F | Correction to PDCP test case 7.1.3.2.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197013 | 1002 | 1 | F | Correction to NR PDCP test case 7.1.3.4.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197015 | 0904 | 1 | F | Updates to EN-DC RRC measurement test case 8.2.3.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197016 | 1012 | 1 | F | Correction to EN-DC RRC test case 8.2.3.4.1 and 8.2.3.7.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197017 | 0865 | 1 | F | Update to NR RRC Idle mode test cases for FR2 support | 16.1.0 |
| 2019-09 | RAN#85 | R5-197018 | 0864 | 1 | F | Update to CA test cases in EN-DC for FR2 support | 16.1.0 |
| 2019-09 | RAN#85 | R5-197019 | 0897 | 1 | F | Correction to NR test case 6.1.2.1-cell selection | 16.1.0 |
| 2019-09 | RAN#85 | R5-197020 | 0898 | 1 | F | Correction to NR test case 6.1.2.13-Cell reselection
CellReservedForOperatorUse with Access Identity 0-1-2-12-13-14 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197021 | 0814 | 1 | F | Correction to NR test case 7.1.1.1.4-BeamFailure | 16.1.0 |
| 2019-09 | RAN#85 | R5-197022 | 0899 | 1 | F | Correction to TC 7.1.1.3.5-Padding BSR | 16.1.0 |
| 2019-09 | RAN#85 | R5-197023 | 0961 | 1 | F | Correction to NR test case 7.1.1.9.1 - MAC Reset | 16.1.0 |
| 2019-09 | RAN#85 | R5-197026 | 0978 | 1 | F | Correction to Several MAC test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197027 | 0990 | 1 | F | Correction to MAC TC 7.1.1.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197029 | 0911 | 1 | F | Correction to 5GS RLC test case 7.1.2.3.6 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197030 | 0974 | 1 | F | Correction to RLC test case 7.1.2.3.7 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197051 | 0949 | 1 | F | Updates to 5GS PDCP test cases 7.1.3.1.1 and 7.1.3.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197052 | 0901 | 1 | F | Correction to TC 8.1.1.3.4-NR2L reselection by RRCRelease | 16.1.0 |
| 2019-09 | RAN#85 | R5-197053 | 0927 | 1 | F | Updates to 5GS SA RRC TC 8.1.1.4.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197054 | 0956 | 1 | F | Correction to TC 8.1.1.2.1-T300 expiry | 16.1.0 |
| 2019-09 | RAN#85 | R5-197055 | 0957 | 1 | F | Correction to TC 8.1.1.3.3-T320 expiry | 16.1.0 |
| 2019-09 | RAN#85 | R5-197057 | 0968 | 1 | F | Correction to NR RRC Test case 8.1.2.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197058 | 0832 | 1 | F | Correction to NR test case 8.1.3.1.11-two RSRQ A3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197059 | 0833 | 1 | F | Correction to NR test case 8.1.3.1.12-two SINR A5 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197060 | 0834 | 1 | F | Correction to NR test case 8.1.3.1.17.3-A6 intraband non contiguous | 16.1.0 |
| 2019-09 | RAN#85 | R5-197061 | 0835 | 1 | F | Correction to NR test case 8.1.3.1.18.3-A6 intraband non contiguous
additional reporting | 16.1.0 |
| 2019-09 | RAN#85 | R5-197062 | 0836 | 1 | F | Correction to NR test case 8.1.3.2.5-A2 and B2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197063 | 0861 | 1 | F | Editorial update MeasurementReport table | 16.1.0 |
| 2019-09 | RAN#85 | R5-197064 | 1028 | 1 | F | Correction to RRC TC 8.1.3.1.11, 8.1.3.1.12, 8.1.3.2.3 and 8.1.4.1.9.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197065 | 0928 | 1 | F | Updates to 5GS SA RRC TC 8.1.5.2.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197066 | 0929 | 1 | F | Updates to 5GS SA RRC TC 8.1.5.5.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197067 | 1033 | 1 | F | Updates to RLF test case 8.1.5.6.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197068 | 1034 | 1 | F | Updates to RLF test case 8.1.5.6.3 | 16.1.0 |

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| 2019-09 | RAN#85 | R5-197070 | 1001 | 1 | F | Correction to EN-DC RRC test case 8.2.1.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197071 | 1003 | 1 | F | Correction to EN-DC RRC test case 8.2.2.7.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197072 | 0839 | 1 | F | Correction to NR test case 8.2.3.15.1-A2 and A3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197073 | 0873 | 1 | F | Correction to EN-DC RRC measurement test case 8.2.3.9.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197074 | 1030 | 1 | F | Correction to EN-DC RRC measurement test case 8.2.3.10.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197075 | 0948 | 1 | F | Correction to EN-DC RRC test case 8.2.4.3.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197076 | 1035 | 1 | F | Updates to test cases using SERVICE REQUEST procedure | 16.1.0 |
| 2019-09 | RAN#85 | R5-197077 | 0840 | 1 | F | Correction to NR test case 9.1.1.6-5G AKA authentication abnormal | 16.1.0 |
| 2019-09 | RAN#85 | R5-197078 | 0993 | 1 | F | Correction to 5GC TC 9.1.2.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197079 | 0841 | 1 | F | Correction to NR test case 9.1.5.1.1-Initial registration | 16.1.0 |
| 2019-09 | RAN#85 | R5-197080 | 0843 | 1 | F | Correction to NR test case 9.1.5.2.4-Mobility registration update by lower layer failure | 16.1.0 |
| 2019-09 | RAN#85 | R5-197081 | 0896 | 1 | F | Correction to 5GC TC 9.1.5.1.9 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197082 | 0920 | 1 | F | Correction to 5GC NAS test case 9.1.6.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197083 | 0945 | 1 | F | Update of 5GC TC 9.1.5.1.11 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197084 | 0946 | 1 | F | Update of 5GC TC 9.1.5.1.12 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197085 | 0965 | 1 | F | Correction to NR5GC testcase 9.1.5.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197086 | 0966 | 1 | F | Correction to NR5GC testcase 9.1.5.1.14 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197087 | 0981 | 1 | F | Correction to 5GC test case 9.1.6.1.1 De-registration | 16.1.0 |
| 2019-09 | RAN#85 | R5-197088 | 0844 | 1 | F | Correction to NR test case 9.1.7.2-Data pending without user-plane resource | 16.1.0 |
| 2019-09 | RAN#85 | R5-197089 | 0924 | 1 | F | Corrections to 5GS Multilayer Test Case 11.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197090 | 0975 | 1 | F | Correction to 5GS\EPS Fallback test case 11.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197091 | 0997 | 1 | F | Update of 5GS\EPS Fallback test cases for System information, type of cells and more | 16.1.0 |
| 2019-09 | RAN#85 | R5-197092 | 1007 | 1 | F | Correction to 5GS\EPS Fallback test case 11.1.4 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197093 | 1015 | 1 | F | Update multi-layer test case 11.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197094 | 1016 | 1 | F | Update multi-layer test case 11.1.5 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197095 | 1017 | 1 | F | Update multi-layer test case 11.1.6 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197097 | 1039 | - | F | Correction to NR test case 8.1.5.3.4-PWS reception using dedicatedSystemInformationDelivery | 16.1.0 |
| 2019-09 | RAN#85 | R5-197185 | 0804 | 1 | F | Addition of NR test case 6.2.3.1-Inter-RAT Cell reselection L2NR by priority Srxlev based | 16.1.0 |
| 2019-09 | RAN#85 | R5-197186 | 0805 | 1 | F | Addition of NR test case 6.2.3.2-Inter-RAT Cell reselection L2NR by priority Squal based | 16.1.0 |
| 2019-09 | RAN#85 | R5-197187 | 0806 | 1 | F | Addition of NR test case 6.2.3.4-Inter-RAT Cell reselection NR2L by priority Squal based | 16.1.0 |
| 2019-09 | RAN#85 | R5-197188 | 0807 | 1 | F | Addition of NR test case 6.2.3.6-Inter-RAT Cell reselection L2NR by priority from dedicated signalling | 16.1.0 |
| 2019-09 | RAN#85 | R5-197189 | 0808 | 1 | F | Addition of NR test case 6.2.3.8-Inter-RAT Cell reselection L2NR Snonintrasearch | 16.1.0 |

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| 2019-09 | RAN#85 | R5-197190 | 0809 | 1 | F | Addition of NR test case 6.2.3.9-Inter-RAT Cell reselection NR2L Speed Dependent | 16.1.0 |
| 2019-09 | RAN#85 | R5-197191 | 0812 | 1 | F | Addition of NR test case 6.4.3.1-Inter-RAT Cell reselection NR2L Srxlev based | 16.1.0 |
| 2019-09 | RAN#85 | R5-197192 | 1043 | - | F | Correction to UE capability transfer test case 8.1.5.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197193 | 0813 | 1 | F | Update of NR test case 6.1.2.22-Inter-frequency cell reselection with parameters | 16.1.0 |
| 2019-09 | RAN#85 | R5-197195 | 0846 | 1 | F | Addition of test case 6.3.1.3 of TS 38.523-1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197196 | 0847 | 1 | F | Addition of test case 6.3.1.4 of TS 38.523-1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197197 | 0848 | 1 | F | Addition of test case 6.3.1.8 of TS 38.523-1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197198 | 0849 | 1 | F | Addition of test case 6.3.1.9 of TS 38.523-1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197199 | 0893 | 1 | F | Addition of NR Idle test case 6.1.2.23 - Cell reselection/ MFBI | 16.1.0 |
| 2019-09 | RAN#85 | R5-197201 | 1014 | 1 | F | Update of 5GC test case 9.1.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197202 | 1038 | 1 | F | Addition of new NR MAC test case 7.1.1.3.2b | 16.1.0 |
| 2019-09 | RAN#85 | R5-197203 | 0923 | 1 | F | Addition of Idle Mode Test Case -Cell reselection, Sintrasearch, Snonintrasearch | 16.1.0 |
| 2019-09 | RAN#85 | R5-197205 | 0866 | 1 | F | Add RRC reconfiguration test case 8.1.2.1.4 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197206 | 0867 | 1 | F | Add RRC reconfiguration test case 8.1.2.1.5.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197207 | 0868 | 1 | F | Add RRC reconfiguration test case 8.1.2.1.5.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197208 | 0869 | 1 | F | Add RRC reconfiguration test case 8.1.2.1.5.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197209 | 0817 | 1 | F | Addition of NR test case 8.1.3.1.16-whitelisting | 16.1.0 |
| 2019-09 | RAN#85 | R5-197210 | 0818 | 1 | F | Addition of NR test case 8.1.3.1.20-GapFR1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197211 | 0819 | 1 | F | Addition of NR test case 8.1.3.1.21-GapFR2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197213 | 0822 | 1 | F | Addition of NR test case 8.1.3.2.4-Event B2 SINR | 16.1.0 |
| 2019-09 | RAN#85 | R5-197214 | 0984 | 1 | F | Addition of SA NR measurement test case TC 8.1.3.1.23 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197215 | 0823 | 1 | F | Addition of NR test case 8.1.4.1.7.1-PCell Change and SCell addition Intra-band Contiguous CA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197216 | 0826 | 1 | F | Addition of NR test case 8.1.4.1.8.1-SCell no change Intra-band Contiguous CA | 16.1.0 |
| 2019-09 | RAN#85 | R5-197217 | 0894 | 1 | F | Addition of 5GC test case 9.1.1.4 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197218 | 0887 | 1 | F | Addition of new 5GC TC 10.1.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197219 | 0998 | 1 | F | Introduction of new TC 11.4.1 5GMM-REGISTERED.NORMAL-SERVICE / 5GMM-IDLE / Emergency call / Utilising emergency number stored on the USIM / New emergency PDU session | 16.1.0 |
| 2019-09 | RAN#85 | R5-197220 | 0999 | 1 | F | Introduction of new TC 11.4.2 5GMM-DEREGISTERED.LIMITED-SERVICE / Emergency call / Handling of forbidden PLMNs | 16.1.0 |
| 2019-09 | RAN#85 | R5-197221 | 1000 | 1 | F | Introduction of new TC 11.4.3 5GMM-DEREGISTERED.NO-SUPI / Emergency call / Utilisation of emergency numbers stored on the ME / Initial registration for emergency services | 16.1.0 |
| 2019-09 | RAN#85 | R5-197227 | 0979 | 1 | F | Non 3GPP Access over WLAN test cases | 16.1.0 |
| 2019-09 | RAN#85 | R5-197247 | 0877 | 1 | F | Update MAC test case 7.1.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197250 | 0989 | 1 | F | Correction to RLC UM test case 7.1.2.2.5 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197255 | 0938 | 1 | F | Correction to PDCP TC 7.1.3.5.3 | 16.1.0 |

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| 2019-09 | RAN#85 | R5-197256 | 0986 | 1 | F | Corrections to TC 8.1.4.1.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197258 | 1023 | 1 | F | Correction to test cases 8.1.1.2.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197259 | 0917 | 1 | F | Correction to test case 10.1.5.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197260 | 0880 | 1 | F | Update PDCP test case 7.1.3.4.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197263 | 0915 | 2 | F | Correction to NR test case 7.1.1.2.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197264 | 0916 | 2 | F | Correction to NR test case 7.1.1.3.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197266 | 1027 | 1 | F | Correction to test case 7.1.2.3.8 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197267 | 0922 | 1 | F | Initial registration / 5GS services / NSSAI handling / NSSAI Storage | 16.1.0 |
| 2019-09 | RAN#85 | R5-197292 | 1044 | - | F | Update of 5GC test case 9.1.1.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197297 | 1045 | - | F | Update of 5GC test case 9.1.1.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197299 | 1005 | 2 | F | Correction to NR MAC test case 7.1.1.3.2 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197661 | 1037 | 1 | F | Update to NR MAC Bandwidth Part operation TC 7.1.1.8.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197662 | 1042 | 1 | F | Corrections to NR MAC test case 7.1.1.1.1a | 16.1.0 |
| 2019-09 | RAN#85 | R5-197663 | 0900 | 2 | F | Correction to TC 7.1.2.3.4-18 bit SN processing | 16.1.0 |
| 2019-09 | RAN#85 | R5-197664 | 1022 | 3 | F | Correction to ENDC test case 7.1.2.3.3 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197665 | 1041 | 1 | F | Correction to EN-DC RRC Test case 8.2.3.13.1 | 16.1.0 |
| 2019-09 | RAN#85 | R5-197666 | 1040 | 1 | F | Correction to NR test case 9.1.3.1-Identification procedure | 16.1.0 |
| 2019-12 | RAN#86 | R5-197740 | 1046 | - | F | Update RRC reconfiguration test case 8.1.2.1.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-197741 | 1047 | - | F | Update RRC reconfiguration test case 8.1.2.1.5.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-197744 | 1049 | - | F | Update RRC reconfiguration test case 8.1.3.1.18.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-197745 | 1050 | - | F | Update RRC reconfiguration test case 8.1.5.6.5.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-197838 | 1054 | - | F | Update of TC 6.4.1.1-HPLMN in Automatic PLMN Selection Mode | 16.2.0 |
| 2019-12 | RAN#86 | R5-197839 | 1055 | - | F | Correction to NR test case 6.1.2.14-Cell reselection
CellReservedForOperatorUse with Access Identity 11 or 15 | 16.2.0 |
| 2019-12 | RAN#86 | R5-197840 | 1056 | - | F | Correction of NR test case 6.2.3.2-Inter-RAT cell reselection from L2NR | 16.2.0 |
| 2019-12 | RAN#86 | R5-197841 | 1057 | - | F | Correction of NR test case 6.2.3.4-Inter-RAT cell reselection from NR2L | 16.2.0 |
| 2019-12 | RAN#86 | R5-197842 | 1058 | - | F | Correction of NR test case 6.2.3.5-Inter-RAT cell reselection from N2L by
dedicated signalling | 16.2.0 |
| 2019-12 | RAN#86 | R5-197843 | 1059 | - | F | Correction of NR test case 6.2.3.6-Inter-RAT cell reselection from L2N by
dedicated signalling | 16.2.0 |
| 2019-12 | RAN#86 | R5-197849 | 1065 | - | F | Correction to NR test case 7.1.2.3.5-Control of receive window for AM
RLC | 16.2.0 |
| 2019-12 | RAN#86 | R5-197854 | 1070 | - | F | Correction of NR test case 8.1.3.1.2 - Event A3 intra-Freq | 16.2.0 |
| 2019-12 | RAN#86 | R5-197856 | 1072 | - | F | Correction to NR TC 8.1.3.1.8-Event A5 Intra-Freq | 16.2.0 |
| 2019-12 | RAN#86 | R5-197860 | 1076 | - | F | Correction to NR test case 8.1.5.3.1-PWS reception in NR RRC_IDLE state | 16.2.0 |
| 2019-12 | RAN#86 | R5-197867 | 1083 | - | F | Correction to NR test case 9.1.6.2.2-Re-registration not required | 16.2.0 |
| 2019-12 | RAN#86 | R5-197904 | 1089 | - | F | Correction to NR MAC test case 7.1.1.3.5 to accommodate the DCI format
change to DCI_0_1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198006 | 1099 | - | F | Addition of new 5GC test case 9.1.2.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198085 | 1110 | - | F | Update of References in 38.523-1 | 16.2.0 |

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| 2019-12 | RAN#86 | R5-198086 | 1111 | - | F | Introduction of new TC 9.1.5.2.6 Mobility registration update / Registered slice(s) change | 16.2.0 |
| 2019-12 | RAN#86 | R5-198147 | 1127 | - | F | Updates to 5GMM test case 9.1.4.1 for NAS cells definition in pre-test conditions | 16.2.0 |
| 2019-12 | RAN#86 | R5-198148 | 1128 | - | F | Updates to 5GMM initial registration test cases for NAS cells definition in pre-test conditions | 16.2.0 |
| 2019-12 | RAN#86 | R5-198180 | 1130 | - | F | Correction to PDCP Test Case 7.1.3.5.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198181 | 1131 | - | F | Correction to EN-DC Inter-RAT Measurement Test Cases 8.2.3.1.1, 8.2.3.2.1, 8.2.3.3.1, 8.2.3.12.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198184 | 1134 | - | F | Corrections to 5GC NAS Test Case 10.1.1.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198185 | 1135 | - | F | Corrections to 5GC NAS Test Case 9.1.6.1.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198186 | 1136 | - | F | Corrections to 5GC NAS Test Case 9.1.4.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198187 | 1137 | - | F | Correction to RLC Test Case 7.1.2.3.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198188 | 1138 | - | F | Correction to RLC Test Case 7.1.2.3.11 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198189 | 1139 | - | F | Correction to 5GC NAS NSSAI Test Case 9.1.5.1.3a | 16.2.0 |
| 2019-12 | RAN#86 | R5-198216 | 1149 | - | F | Correction to TC 7.1.1.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198235 | 1151 | - | F | Correction to 5GC test case 9.1.1.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198242 | 1153 | - | F | Correction to 5GC test case 9.1.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198299 | 1164 | - | F | Correction to NR TC 9.1.5.1.9 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198322 | 1166 | - | F | Corrections to 5GC test case 10.1.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198323 | 1167 | - | F | Correction to NR MAC test case 7.1.1.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198325 | 1168 | - | F | Correction to 5GC test case 9.1.5.1.6 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198331 | 1169 | - | F | Correction to NR MAC test cases 7.1.1.2.1 and 7.1.1.3.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198355 | 1174 | - | F | Correction to ENDC RLC AM testcases 7.1.2.3.1 and 7.1.2.3.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198361 | 1176 | - | F | Update to test case 10.2.1.1 to align EPS bearer ID description | 16.2.0 |
| 2019-12 | RAN#86 | R5-198362 | 1177 | - | F | Update to test case 11.1.5 to align EPS bearer ID description | 16.2.0 |
| 2019-12 | RAN#86 | R5-198438 | 1182 | - | F | Updates of 5GC test case titles | 16.2.0 |
| 2019-12 | RAN#86 | R5-198757 | 1199 | - | F | Correction to test cases 8.1.1.2.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198759 | 1200 | - | F | Correction to NR MAC test case 7.1.1.3.2b | 16.2.0 |
| 2019-12 | RAN#86 | R5-198772 | 1210 | - | F | Correction to test case 9.1.5.2.7 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198784 | 1214 | - | F | Corrections to MAC Test Case 7.1.1.5.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198786 | 1215 | - | F | Update of 5GC TC 9.1.5.2.9 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198825 | 1219 | - | F | Update of test case 8.1.5.1.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198874 | 1053 | 1 | F | Addition of NR TC 6.1.2.11-systemInformationAreaID | 16.2.0 |
| 2019-12 | RAN#86 | R5-198875 | 1060 | 1 | F | Correction of NR test case 6.2.3.7-Inter-RAT cell reselection N2L, Snonintrasearch | 16.2.0 |
| 2019-12 | RAN#86 | R5-198877 | 1132 | 1 | F | Corrections to Idle Mode SoR Test Case 6.3.1.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198878 | 1133 | 1 | F | Corrections to Idle Mode SoR Test Case 6.3.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198879 | 1178 | 1 | F | Correction to FR1 power levels for several test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-198880 | 1195 | 1 | F | Update to test cases 6.1.1.7 and 6.1.1.8 | 16.2.0 |

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| 2019-12 | RAN#86 | R5-198881 | 1196 | 1 | F | Update to test cases 6.2.1.1 and 6.2.1.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198882 | 1197 | 1 | F | Update to test cases 6.2.1.2, 6.2.1.3 and 6.2.1.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198883 | 1183 | 1 | F | Update FR2 power of NR TC 7.1.1.1.3-SI request | 16.2.0 |
| 2019-12 | RAN#86 | R5-198884 | 1091 | 1 | F | Correction to NR MAC test case 7.1.1.4.2.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198885 | 1129 | 1 | F | Correction to NR MAC transport size selection test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-198886 | 1145 | 1 | F | Corrections to MAC Test Case 7.1.1.1.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198887 | 1154 | 1 | F | Update to NR MAC test case 7.1.1.1.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198888 | 1158 | 1 | F | Correction to EN-DC MAC Test Case 7.1.1.1.1a | 16.2.0 |
| 2019-12 | RAN#86 | R5-198889 | 1184 | 1 | F | Correction to MAC test case 7.1.1.7.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198890 | 1186 | 1 | F | Addition of new MAC test case for data inactivity timer | 16.2.0 |
| 2019-12 | RAN#86 | R5-198891 | 1187 | 1 | F | Split of CA MAC test case into 3 variants | 16.2.0 |
| 2019-12 | RAN#86 | R5-198892 | 1095 | 1 | F | Correction to NR test case 7.1.2.3.10-Re-transmission of RLC PDU | 16.2.0 |
| 2019-12 | RAN#86 | R5-198893 | 1090 | 1 | F | Correction to NR RLC test cases to accommodate the DCI format change to DCI_0_1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198894 | 1093 | 1 | F | Correction to RLC UM test case 7.1.2.2.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198900 | 1123 | 1 | F | Correction to NR RLC test case 7.1.2.3.10 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198901 | 1157 | 1 | F | Correction to RLC test case 7.1.2.2.6 in EN-DC | 16.2.0 |
| 2019-12 | RAN#86 | R5-198902 | 1172 | 1 | F | Correction to RLC AM test case 7.1.2.3.9 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198903 | 1193 | 1 | F | Correction to RLC AM Test case 7.1.2.3.8 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198904 | 1122 | 1 | F | Correction to NR PDCP test case 7.1.3.4.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198905 | 1141 | 1 | F | Corrections to PDCP Test Case 7.1.3.5.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198906 | 1150 | 1 | F | Correction to PDCP TC 7.1.3.4.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198907 | 1092 | 1 | F | Corrections to SDAP test cases 7.1.4.1 and 7.1.4.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198909 | 1221 | - | F | Correction to NR TCs | 16.2.0 |
| 2019-12 | RAN#86 | R5-198910 | 1175 | 1 | F | Update to 5GS NR RRC test case 8.1.1.3.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198911 | 1198 | 1 | F | Correction to test case 8.1.1.2.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198912 | 1201 | 1 | F | Correction to test case 8.1.1.4.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198913 | 1066 | 1 | F | Addition of NR test case 8.1.2.1.2-uplinkTxDirectCurrentList | 16.2.0 |
| 2019-12 | RAN#86 | R5-198914 | 1048 | 1 | F | Update RRC reconfiguration test case 8.1.3.1.17.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198915 | 1067 | 1 | F | Addition of NR TC 8.1.3.3.1-CGI reporting of NR cell | 16.2.0 |
| 2019-12 | RAN#86 | R5-198916 | 1068 | 1 | F | Addition of NR TC 8.1.3.3.2-CGI reporting of E-UTRA cell | 16.2.0 |
| 2019-12 | RAN#86 | R5-198917 | 1071 | 1 | F | Correction to NR TC 8.1.3.1.5-Event A4 Intra-Freq | 16.2.0 |
| 2019-12 | RAN#86 | R5-198918 | 1073 | 1 | F | correction of NR TC 8.1.3.1.18.1-Additional measurement report of Intra-band Contiguous CA | 16.2.0 |
| 2019-12 | RAN#86 | R5-198920 | 1222 | - | F | correction of NR TCs 8.1.3.2.1 and TC 8.1.3.2.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198921 | 1220 | 1 | F | Update of test case 8.1.3.2.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198922 | 1075 | 1 | F | Correction to NR test case 8.1.4.2.2.1 E-UTRA To NR handover success | 16.2.0 |
| 2019-12 | RAN#86 | R5-198923 | 1203 | 1 | F | Correction to test case 8.1.4.2.2.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198924 | 1119 | 1 | F | Correction to 5GS SA RRC test case 8.1.4.1.5 | 16.2.0 |

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| 2019-12 | RAN#86 | R5-198925 | 1077 | 1 | F | Correction to NR test case 8.1.5.3.4-PWS reception using dedicatedSystemInformationDelivery | 16.2.0 |
| 2019-12 | RAN#86 | R5-198926 | 1204 | 1 | F | Correction to test case 8.1.5.5.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198927 | 1173 | 1 | F | Update to 5GS NR RRC test case 8.1.5.4.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198928 | 1148 | 1 | F | Correction to ENDC test case 8.2.2.8.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198930 | 1216 | 1 | F | Correction to test case 8.2.2.6.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198931 | 1078 | 1 | F | Correction to NR test case 8.2.3.11.X-ENDC-GAP | 16.2.0 |
| 2019-12 | RAN#86 | R5-198932 | 1125 | 1 | F | Correction to EN-DC RRC measurement test case 8.2.3.9.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198933 | 1126 | 1 | F | Correction to EN-DC RRC measurement test case 8.2.3.10.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198935 | 1069 | 1 | F | Addition of NR TC 8.2.6.2.1-Processing delay of ENDC | 16.2.0 |
| 2019-12 | RAN#86 | R5-198937 | 1096 | 1 | F | Addition of 5GC test case 9.1.1.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198938 | 1152 | 1 | F | Correction to 5GC test case 9.1.1.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198939 | 1080 | 1 | F | Correction to NR test case 9.1.2.1-NAS security mode command | 16.2.0 |
| 2019-12 | RAN#86 | R5-198940 | 1100 | 1 | F | Addition of new 5GC test case 9.1.2.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198941 | 1101 | 1 | F | Addition of new 5GC test case 9.1.2.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198942 | 1103 | 1 | F | Addition of new 5GC test case 9.1.2.7 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198943 | 1104 | 1 | F | Addition of new 5GC test case 9.1.2.8 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198944 | 1102 | 1 | F | Addition of new 5GC test case 9.1.2.6 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198947 | 1052 | 1 | F | Correction to 5GC TC 9.1.5.1.12 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198948 | 1081 | 1 | F | Correction to NR test case 9.1.5.1.10-PLMN not allowed | 16.2.0 |
| 2019-12 | RAN#86 | R5-198949 | 1082 | 1 | F | Correction to NR test case 9.1.6.1.2-Transmission failure of De-registration | 16.2.0 |
| 2019-12 | RAN#86 | R5-198950 | 1084 | 1 | F | Update of NR TC 9.1.7.2-Service request | 16.2.0 |
| 2019-12 | RAN#86 | R5-198951 | 1140 | 1 | F | Correction to 5GC NAS NSSAI Test Case 9.1.5.1.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198952 | 1189 | 1 | F | Correction to NR5GC testcase 9.1.5.1.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198953 | 1208 | 1 | F | Correction to test case 9.1.5.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198954 | 1217 | 1 | F | Update of 5GC TC 9.1.6.1.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198972 | 1098 | 1 | F | Correction to 5GC test case 10.1.2.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198975 | 1112 | 1 | F | Update of 11.1.7 Emergency call setup from NR RRC_IDLE - Emergency Services Fallback to EPS with redirection | 16.2.0 |
| 2019-12 | RAN#86 | R5-198977 | 1224 | - | F | Editorial improvements of Multilayer EPS Fallback test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-198978 | 1161 | 1 | F | Update EPS fallback test case 11.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198979 | 1162 | 1 | F | Update EPS fallback test case 11.1.5 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198980 | 1163 | 1 | F | Update EPS fallback test case 11.1.6 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198981 | 1170 | 1 | F | Correction to test case 11.1.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198982 | 1171 | 1 | F | Correction to test case 11.1.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198985 | 1106 | 1 | F | Addition of new UAC test case 11.3.4 | 16.2.0 |
| 2019-12 | RAN#86 | R5-198986 | 1113 | 1 | F | Update to TC 11.4.1 5GMM-REGISTERED.NORMAL-SERVICE / 5GMM-IDLE / Emergency call / ... / New emergency PDU session | 16.2.0 |

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| 2019-12 | RAN#86 | R5-198987 | 1114 | 1 | F | Update to TC 11.4.2 5GMM-DEREGISTERED.LIMITED-SERVICE / Emergency call / ... / Handling of forbidden PLMNs | 16.2.0 |
| 2019-12 | RAN#86 | R5-198988 | 1115 | 1 | F | Update to TC 11.4.3 5GMM-DEREGISTERED.NO-SUPI / Emergency call / ... / Initial registration for emergency services | 16.2.0 |
| 2019-12 | RAN#86 | R5-198989 | 1116 | 1 | F | Introduction of new TC 11.4.4 5GMM-REGISTERED.ATTEMPTING-REGISTRATION-UPDATE T3346 running / Emergency call establishment | 16.2.0 |
| 2019-12 | RAN#86 | R5-198990 | 1117 | 1 | F | Introduction of new 11.4.5 5GMM-REGISTERED.LIMITED-SERVICE / 5GMM-IDLE / Emergency call establishment and release / Handling of 5GS forbidden tracking areas for roaming | 16.2.0 |
| 2019-12 | RAN#86 | R5-198991 | 1118 | 1 | F | Introduction of new TC 11.4.6 5GMM-REGISTERED.NON-ALLOWED-SERVICE / Emergency call establishment and release / Handling of non-allowed tracking areas | 16.2.0 |
| 2019-12 | RAN#86 | R5-199000 | 1185 | 1 | F | Non 3GPP Access over WLAN test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-199027 | 1190 | 1 | F | Update of QBASED in pre-test condition for RSRQ test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-199028 | 1194 | 1 | F | Addition of NR Idle mode cell reselection test case 6.1.2.16 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199029 | 1202 | 1 | F | Correction to test case 8.1.1.4.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199030 | 1156 | 1 | F | Correction to RRC test case 8.2.2.1.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199033 | 1223 | 1 | F | Corrections to Test Case 8.2.4.1.1.1 and 8.2.4.1.1.2 and 8.2.4.1.1.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199034 | 1207 | 1 | F | Correction to test case 9.1.3.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199035 | 1227 | - | F | New 5GC NAS test case 10.1.4.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199036 | 1086 | 1 | F | Addition of new NR test case 11.3.6-Access Identity 2-accessibility AC7-RRC_INACTIVE | 16.2.0 |
| 2019-12 | RAN#86 | R5-199037 | 1105 | 1 | F | Addition of new UAC test case 11.3.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199038 | 1191 | 1 | F | Correction to RRC test case 8.1.3.1.2 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199072 | 1107 | 2 | F | Update of 5G Idle test case 6.1.2.23 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199095 | 1225 | 1 | F | Correction to NR RRC Test case 8.1.5.6.3 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199096 | 1212 | 1 | F | Correction to test cases 8.2.3.6.1 / 1a and 1b | 16.2.0 |
| 2019-12 | RAN#86 | R5-199097 | 1228 | 1 | F | Corrections to EN-DC inter frequency and inter band measurement test cases | 16.2.0 |
| 2019-12 | RAN#86 | R5-199098 | 1079 | 2 | F | Correction to NR test case 9.1.1.6-5G AKA authentication abnormal | 16.2.0 |
| 2019-12 | RAN#86 | R5-199099 | 1211 | 2 | F | Correction to test case 9.1.7.1 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199101 | 1051 | 2 | F | Correction to 5GC TC 9.1.5.1.11 | 16.2.0 |
| 2019-12 | RAN#86 | R5-199102 | 1226 | 1 | F | Correction to NR Idle mode test case 6.1.2.1 | 16.2.0 |