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Technical Specification

**3rd Generation Partnership Project;
Technical Specification Group Radio Access Network;
NR;
User Equipment (UE) radio access capabilities
(Release 15)**

3GPP

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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x   the first digit:

1   presented to TSG for information;

2   presented to TSG for approval;

3   or greater indicates TSG approved document under change control.

y   the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z   the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document defines the NR UE Radio Access Capability Parameters.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception Part 1: Range 1 Standalone".

[3] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception Part 2: Range 2 Standalone".

[4] 3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception Part 3: Range 1 and Range 2 Interworking operation with other radios".

[5] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[6] 3GPP TS 38.211: "NR; Physical channels and modulation".

[7] 3GPP TS 37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR Multi-connectivity".

[8] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification".

[9] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[10] 3GPP TS 38.212: "NR; Multiplexing and channel coding".

[11] 3GPP TS 38.213: "NR; Physical layer procedures for control".

[12] 3GPP TS 38.214: "NR; Physical layer procedures for data".

[13] 3GPP TS 38.215: "NR; Physical layer measurements".

[14] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA) radio transmission and reception".

[15] 3GPP TS 36.306: "Evolved Universal Terrestrial Radio Access (E-UTRA) User Equipment (UE) radio access capabilities".

[16] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".

[17] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC); Protocol Specification".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

Fallback band combination: A band combination that would result from another band combination by releasing at least one SCell or uplink configuration of SCell. An intra-band non-contiguous band combination is not considered to be a fallback band combination of an intra-band contiguous band combination.

Fallback per band feature set: A feature set per band that has same or lower values than the reported values from the reported feature set per band for a given band.

Fallback per CC feature set: A feature set per CC that has lower value of UE supported MIMO layers and BW while keeping the numerology and other parameters the same from the reported feature set per CC for a given carrier per band.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

MaxDLDataRate:	Maximum DL data rate
MaxDLDataRate_MN:	Maximum DL data rate in the MN
MaxDLDataRate_SN:	Maximum DL data rate in the SN
MaxULDataRate:	Maximum UL data rate

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

BC	Band Combination
DL	Downlink
FS	Feature Set
FSPC	Feature Set Per Component-carrier
MAC	Medium Access Control
MCG	Master Cell Group
MN	Master Node
MR-DC	Multi-RAT Dual Connectivity
PDCP	Packet Data Convergence Protocol
RLC	Radio Link Control
RTT	Round Trip Time
SCG	Secondary Cell Group
SDAP	Service Data Adaptation Protocol
SN	Secondary Node
UL	Uplink

4 UE radio access capability parameters

4.1 Supported max data rate

4.1.1 General

The DL and UL max data rate supported by the UE is calculated by band or band combinations supported by the UE. A UE supporting MR-DC shall support the calculated DL and UL max data rate defined in 4.1.2.

4.1.2 Supported max data rate

For NR, the approximate data rate for a given number of aggregated carriers in a band or band combination is computed as follows.

$$\text{data rate (in Mbps)} = 10^{-6} \cdot \sum_{j=1}^{J} \left(v_{Layers}^{(j)} \cdot Q_m^{(j)} \cdot f^{(j)} \cdot R_{max} \cdot \frac{N_{PRB}^{BW(j),\mu} \cdot 12}{T_s^{\mu}} \cdot (1 - OH^{(j)}) \right)$$

wherein

J is the number of aggregated component carriers in a band or band combination

R_{max} = 948/1024

For the j-th CC,

$v_{Layers}^{(j)}$ is the maximum number of supported layers given by higher layer parameter *maxNumberMIMO-LayersPDSCH* for downlink and maximum of higher layer parameters *maxNumberMIMO-LayersCB-PUSCH* and *maxNumberMIMO-LayersNonCB-PUSCH* for uplink.

$Q_m^{(j)}$ is the maximum supported modulation order given by higher layer parameter *supportedModulationOrderDL* for downlink and higher layer parameter *supportedModulationOrderUL* for uplink.

$f^{(j)}$ is the scaling factor given by higher layer parameter *scalingFactor* and can take the values 1, 0.8, 0.75, and 0.4.

μ is the numerology (as defined in TS 38.211 [6])

T_s^{μ} is the average OFDM symbol duration in a subframe for numerology μ, i.e. $T_s^{\mu} = \frac{10^{-3}}{14 \cdot 2^{\mu}}$. Note that normal cyclic prefix is assumed.

$N_{PRB}^{BW(j),\mu}$ is the maximum RB allocation in bandwidth $BW^{(j)}$ with numerology μ, as defined in 5.3 TS 38.101-1 [2] and 5.3 TS 38.101-2 [3], where $BW^{(j)}$ is the UE supported maximum bandwidth in the given band or band combination.

$OH^{(j)}$ is the overhead and takes the following values

0.14, for frequency range FR1 for DL
0.18, for frequency range FR2 for DL
0.08, for frequency range FR1 for UL
0.10, for frequency range FR2 for UL

NOTE: Only one of the UL or SUL carriers (the one with the higher data rate) is counted for a cell operating SUL.

The approximate maximum data rate can be computed as the maximum of the approximate data rates computed using the above formula for each of the supported band or band combinations.

For EUTRA in case of MR-DC, the approximate data rate for a given number of aggregated carriers in a band or band combination is computed as follows.

$$\text{Data rate (in Mbps)} = \quad 10^{-3} * \sum_{j=1}^{J} TBS_j \qquad 10^{-3} \sum_{j=1}^{J} TBS_j$$

wherein

J is the number of aggregated EUTRA component carriers in MR-DC band combination

TBS_j is the total maximum number of DL-SCH transport block bits received within a 1ms TTI for j-th CC, as derived from TS36.213 [22] based on the UE supported maximum MIMO layers for the j-th carrier, and based on the modulation order and number of PRBs based on the bandwidth of the j-th carrier.

The approximate maximum data rate can be computed as the maximum of the approximate data rates computed using the above formula for each of the supported band or band combinations.

For MR-DC, the approximate maximum data rate is computed as the sum of the approximate maximum data rates from NR and EUTRA.

4.1.3 Void

4.1.4 Total layer 2 buffer size

The total layer 2 buffer size is defined as the sum of the number of bytes that the UE is capable of storing in the RLC transmission windows and RLC reception and reordering windows and also in PDCP reordering windows for all radio bearers.

The required total layer 2 buffer size in MR-DC and NR-DC is the maximum value of the calculated values based on the following equations:

- *MaxULDataRate_MN * RLCRTT_MN + MaxULDataRate_SN * RLCRTT_SN + MaxDLDataRate_SN * RLCRTT_SN + MaxDLDataRate_MN * (RLCRTT_SN + X2/Xn delay + Queuing in SN)*

- *MaxULDataRate_MN * RLCRTT_MN + MaxULDataRate_SN * RLCRTT_SN + MaxDLDataRate_MN * RLCRTT_MN + MaxDLDataRate_SN * (RLCRTT_MN + X2/Xn delay + Queuing in MN)*

Otherwise it is calculated by *MaxDLDataRate * RLC RTT + MaxULDataRate * RLC RTT*.

NOTE: Additional L2 buffer required for preprocessing of data is not taken into account in above formula.

The required total layer 2 buffer size is determined as the maximum total layer 2 buffer size of all the calculated ones for each band combination and the applicable Feature Set combination in the supported MR-DC or NR band combinations. The RLC RTT for NR cell group corresponds to the smallest SCS numerology supported in the band combination and the applicable Feature Set combination.

wherein

X2/Xn delay + Queuing in SN = 25ms if SCG is NR, and 55ms if SCG is EUTRA

X2/Xn delay + Queuing in MN = 25ms if MCG is NR, and 55ms if MCG is EUTRA

RLC RTT for EUTRA cell group = 75ms

RLC RTT for NR cell group is defined in Table 4.1.4-1

Table 4.1.4-1: RLC RTT for NR cell group per SCS

SCS (KHz)	RLC RTT (ms)
15KHz	50
30KHz	40
60KHz	30
120KHz	20

4.2   UE Capability Parameters

4.2.1   Introduction

The following subclauses define the UE radio access capability parameters. Only parameters for which there is the possibility for UEs to signal different values are considered as UE radio access capability parameters. Therefore, mandatory features without capability parameters that are the same for all UEs are not listed here.

The UE may support different functionalities between FDD and TDD, and/or between FR1 and FR2. The UE shall indicate the UE capabilities as follows. In the table of UE capability parameter in subsequent sub-clauses, "Yes" in the column by "FDD-TDD DIFF" and "FR1-FR2 DIFF" indicates the UE capability field can have a different value for between FDD and TDD or between FR1 and FR2 and "No" indicates if it cannot. "FD" in the column indicates to refer the associated field description. "FR1 only" or "FR2 only" in the column indicates the associated feature is only supported in FR1 or FR2 and "TDD only" indicates the associated feature is only supported in TDD.

1> set all fields of UE-NR/MRDC-Capability except fdd-Add-UE-NR/MRDC-Capabilities, tdd-Add-UE-NR/MRDC-Capabilities, fr1-Add-UE-NR/MRDC-Capabilities and fr2-Add-UE-NR/MRDC-Capabilities, to include the values applicable for all duplex mode(s) and frequency range(s) that the UE supports;

1> if UE supports both FDD and TDD and if (some of) the UE capability fields have a different value for FDD and TDD

> 2> if for FDD, the UE supports additional functionality compared to what is indicated by the previous fields of UE-NR/MRDC-Capability:

> > 3> include field fdd-Add-UE-NR/MRDC-Capabilities and set it to include fields reflecting the additional functionality applicable for FDD;

> 2> if for TDD, the UE supports additional functionality compared to what is indicated by the previous fields of UE-NR/MRDC-Capability:

> > 3> include field tdd-Add-UE-NR/MRDC-Capabilities and set it to include fields reflecting the additional functionality applicable for TDD;

1> if UE supports both FR1 and FR2 and if (some of) the UE capability fields have a different value for FR1 and FR2:

> 2> if for FR1, the UE supports additional functionality compared to what is indicated by the previous fields of UE-NR/MRDC-Capability:

> > 3> include field fr1-Add-UE-NR/MRDC-Capabilities and set it to include fields reflecting the additional functionality applicable for FR1;

> 2> if for FR2, the UE supports additional functionality compared to what is indicated by the previous fields of UE-NR/MRDC-Capability:

> > 3> include field fr2-Add-UE-NR/MRDC-Capabilities and set it to include fields reflecting the additional functionality applicable for FR2;

NOTE: The fields which indicate "shall be set to 1" in the following tables means these features are purely mandatory and are assumed they are the same as mandatory without capability signaling.

For optional features, the UE radio access capability parameter indicates whether the feature has been implemented and successfully tested. For mandatory features with the UE radio access capability parameter, the parameter indicates

whether the feature has been successfully tested. In the table of UE capability parameter in subsequent sub-clauses, "Yes" in the column by "M" indicates the associated feature is mandatory and "No" indicates the associated feature is optional. "CY" in the column indicates the associated feature is conditional mandatory and the condition is described in the field description. "FD" in the column indicates to refer the associated field description.

UE capability parameters have hierarchical structure. In the table of UE capability parameter in subsequent sub-clauses, "Per" indicates the level the associated parameter is included. "UE" in the column indicates the associated parameter is signalled per UE, "Band" indicates it is signalled per band, "BC" indicates it is signalled per band combination, "FS" indicates it is signalled per feature set (per band per band combination), "FSPC" indicates it is signalled per feature set per component carrier (per CC per band per band combination), and "FD" in the column indicates to refer the associated field description.

4.2.2 General parameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
delayBudgetReporting Indicates whether the UE supports delay budget reporting as specified in TS 38.331 [9].	UE	No	No	No
inactiveState Indicates whether the UE supports RRC_inactive as specified in TS 38.331 [9].	UE	Yes	No	No
overheatingInd Indicates whether the UE supports overheating assistance information.	UE	No	No	No
reducedCP-Latency Indicates whether the UE supports reduced control plane latency as defined in TS 38.331 [9]	UE	No	No	No
splitSRB-WithOneUL-Path Indicates whether the UE supports UL transmission via either MCG path or SCG path for the split SRB as specified in TS 37.340 [7].	UE	No	Yes	No
splitDRB-withUL-Both-MCG-SCG Indicates whether the UE supports UL transmission via both MCG path and SCG path for the split DRB as specified in TS 37.340 [7].	UE	Yes	Yes	No
srb3 Indicates whether the UE supports direct SRB between the SN and the UE as specified in TS 37.340 [7].	UE	Yes	Yes	No
v2x-EUTRA Indicates whether the UE supports EUTRA V2X according to *UE-EUTRA-Capability* as defined in [x], independent of the configured EN-DC band combination.	UE	No	No	No

4.2.3 SDAP Parameters

Definitions for parameters	Per	M	FDD-TDD DIFF
as-ReflectiveQoS Indicates whether the UE supports AS reflective QoS.	UE	No	No

4.2.4   PDCP Parameters

Definitions for parameters	Per	M	FDD-TDD DIFF
continueROHC-Context Defines whether the UE supports ROHC context continuation operation where the UE does not reset the current ROHC context upon handover.	UE	No	No
maxNumberROHC-ContextSessions Defines the maximum number of header compression context sessions supported by the UE, excluding context sessions that leave all headers uncompressed.	UE	No	No
outOfOrderDelivery Indicates whether UE supports Out of order delivery of data to upper layers by PDCP.	UE	No	No
pdcp-DuplicationMCG-OrSCG-DRB Indicates whether the UE supports CA-based PDCP duplication over MCG or SCG DRB as specified in TS 38.323 [16].	UE	No	No
pdcp-DuplicationSplitDRB Indicates whether the UE supports PDCP duplication over split DRB as specified in TS 38.323 [16].	UE	No	No
pdcp-DuplicationSplitSRB Indicates whether the UE supports PDCP duplication over split SRB1/2 as specified in TS 38.323 [16].	UE	No	No
pdcp-DuplicationSRB Indicates whether the UE supports CA-based PDCP duplication over SRB1/2 and/or, if EN-DC is supported, SRB3 as specified in TS 38.323 [16].	UE	No	No
shortSN Indicates whether the UE supports 12 bit length of PDCP sequence number.	UE	Yes	No
supportedROHC-Profiles Defines which ROHC profiles from the list below are supported by the UE: - 0x0000 ROHC No compression (RFC 5795) - 0x0001 ROHC RTP/UDP/IP (RFC 3095, RFC 4815) - 0x0002 ROHC UDP/IP (RFC 3095, RFC 4815) - 0x0003 ROHC ESP/IP (RFC 3095, RFC 4815) - 0x0004 ROHC IP (RFC 3843, RFC 4815) - 0x0006 ROHC TCP/IP (RFC 6846) - 0x0101 ROHC RTP/UDP/IP (RFC 5225) - 0x0102 ROHC UDP/IP (RFC 5225) - 0x0103 ROHC ESP/IP (RFC 5225) - 0x0104 ROHC IP (RFC 5225) A UE that supports one or more of the listed ROHC profiles shall support ROHC profile 0x0000 ROHC uncompressed (RFC 5795).	UE	No	No
uplinkOnlyROHC-Profiles Indicates which ROHC profile(s) from the list below are supported in uplink-only ROHC operation by the UE. - 0x0006 ROHC TCP (RFC [6846]) A UE that supports uplink-only ROHC profile(s) shall support ROHC profile 0x0000 ROHC uncompressed (RFC 5795).	UE	No	No

4.2.5   RLC parameters

Definitions for parameters	Per	M	FDD-TDD DIFF
am-WithShortSN Indicates whether the UE supports AM DRB with 12 bit length of RLC sequence number.	UE	Yes	No
um-WIthLongSN Indicates whether the UE supports UM DRB with 12 bit length of RLC sequence number.	UE	Yes	No
um-WithShortSN Indicates whether the UE supports UM DRB with 6 bit length of RLC sequence number.	UE	Yes	No

4.2.6 MAC parameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
lch-ToSCellRestriction Indicates whether the UE supports restricting data transmission from a given LCH to a configured (sub-) set of serving cells (see allowedServingCells in LogicalChannelConfig). A UE supporting pdcp-Duplication (see PDCP-Config) shall also support lch-ToSCellRestriction.	UE	No	No	No
lcp-Restriction Indicates whether UE supports the selection of logical channels for each UL grant based on RRC configured restriction.	UE	No	No	No
logicalChannelSR-DelayTimer Indicates whether the UE supports the logicalChannelSR-DelayTimer as specified in TS 38.321 [8].	UE	No	Yes	No
longDRX-Cycle Indicates whether UE supports long DRX cycle as specified in TS 38.321 [8].	UE	Yes	Yes	No
multipleConfiguredGrants Indicates whether UE supports more than one configured grant configurations (including both Type 1 and Type 2) in a cell group. For each cell, the UE supports at most one configured grant per BWP and the maximum number of configured grant configurations per cell group is 2. If absent, for each configured cell group, the UE only supports one configured grant configuration on one serving cell.	UE	No	Yes	No
multipleSR-Configurations Indicates whether the UE supports TS 38.321 [8] SR configurations per cell group.	UE	No	Yes	No
recommendedBitRate Indicates whether the UE supports the bit rate recommendation message from the gNB to the UE as specified in TS 38.321 [8].	UE	No	No	No
recommendedBitRateQuery Indicates whether the UE supports the bit rate recommendation query message from the UE to the gNB as specified in TS 38.321 [8]. This field is only applicable if the UE supports recommendedBitRate.	UE	No	No	No
shortDRX-Cycle Indicates whether UE supports short DRX cycle as specified in TS 38.321 [8].	UE	Yes	Yes	No
skipUplinkTxDynamic Indicates whether the UE supports skipping of UL transmission for an uplink grant indicated on PDCCH if no data is available for transmission as specified in TS 38.321 [8].	UE	No	Yes	No

4.2.7 Physical layer parameters

4.2.7.1 *BandCombinationList* parameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
bandEUTRA Defines supported EUTRA frequency band by NR frequency band number, as specified in TS 36.101.	Band	Yes	No	No
bandList Each entry of the list should include at least one bandwidth class for UL or DL.	BC	Yes	No	No
bandNR Defines supported NR frequency band by NR frequency band number, as specified in TS 38.101-1 [2] and TS 38.101-2 [3].	Band	Yes	No	No
ca-BandwidthClassDL-EUTRA Defines for DL, the class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by the UE, as specified in TS 36.101. When all FeatureSetEUTRA-DownlinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent.	Band	No	No	No
ca-BandwidthClassDL-NR Defines for DL, the class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by the UE, as specified in TS 38.101-1 [2] and TS 38.101-2 [3]. When all FeatureSetDownlinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent.	Band	No	No	No
ca-BandwidthClassUL-EUTRA Defines for UL, the class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by the UE, as specified in TS 36.101. When all FeatureSetEUTRA-UplinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent.	Band	No	No	No
ca-BandwidthClassUL-NR Defines for UL, the class defined by the aggregated transmission bandwidth configuration and maximum number of component carriers supported by the UE, as specified in TS 38.101-1 [2] and TS 38.101-2 [3]. When all FeatureSetUplinkId:s in the corresponding FeatureSetsPerBand are zero, this field is absent.	Band	No	No	No
ca-ParametersEUTRA Contains the EUTRA part of band combination parameters for a given EN-DC band combination.	BC	No	No	No
ca-ParametersNR Contains the NR band combination parameters for a given EN-DC and/or NR CA band combination.	BC	No	No	No
featureSetCombination Indicates the feature set that the UE supports on the NR CA and/or MR-DC band combination by FeatureSetCombinationId. It is mandatory for the UE supporting NR CA and/or MR-DC.	BC	CY	No	No
mrdc-Parameters Contains the band combination parameters for a given EN-DC band combination.	BC	No	No	No
srs-SwitchingTimeNR Indicates the interruption time on DL/UL reception within a NR band pair during the RF retuning for switching between a carrier on one band and another (PUSCH-less) carrier on the other band to transmit SRS. *switchingTimeDL/ switchingTimeUL :* n0 represents 0 us, n30us represents 30us, and so on. *switchingTimeDL/ switchingTimeDL* is mandatory present if switching between the NR band pair is supported, otherwise the field is absent. It is signalled per pair of bands per band combination.	FD	No	No	No
srs-SwitchingTimeEUTRA indicates the interruption time on DL/UL reception within a EUTRA band pair during the RF retuning for switching between a carrier on one band and another (PUSCH-less) carrier on the other band to transmit SRS. *switchingTimeDL/ switchingTimeUL:* n0 represents 0 OFDM symbols, n0dot5 represents 0.5 OFDM symbols, n1 represents 1 OFDM symbol and so on. *switchingTimeDL/ switchingTimeUL* is mandatory present if switching between the EUTRA band pair is supported, otherwise the field is absent. It is signalled per pair of bands per band combination.	FD	No	No	No
SRS-TxSwitch Defines whether UE supports SRS antenna port switching as defined in clause 6.2.1.2 of TS 38.214 [12]. The capability signalling comprises of the following parameters: - *supportedSRS-TxPortSwitch* indicates SRS Tx port switching pattern supported by the UE. The indicated UE antenna switching capability of 'xTyR' corresponds to a UE, capable of SRS transmission on 'x' antenna ports over total of 'y' antennas, where 'y' corresponds to all or subset of UE receive antennas, where 2T4R is two pairs of antennas;	BC	Yes	No	No

4.2.7.2 *BandNR parameters*

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
additionalActiveTCI-StatePDCCH Indicates whether the UE supports one additional active TCI-State for control in addition to the supported number of active TCI-States for PDSCH. The UE can include this field only if *maxNumberActiveTCI-PerBWP* in *tci-StatePDSCH* is set to 1. Otherwise, the UE does not include this field.	Band	Yes	No	No
aperiodicBeamReport Indicates whether the UE supports aperiodic 'CRI/RSRP' or 'SSBRI/RSRP' reporting on PUSCH.	Band	Yes	No	No
aperiodicTRS Indicates whether the UE supports DCI triggering aperiodic TRS associated with periodic TRS.	Band	No	No	Yes
bandNR Defines supported NR frequency band by NR frequency band number, as specified in TS 38.101-1 [2] and TS 38.101-2 [3].	Band	Yes	No	No
beamCorrespondenceWithoutUL-BeamSweeping Indicates whether UE supports FR2 beam correspondence as specified in TS38.101-2 [3], subclause 6.6. The UE that fulfils the beam correspondence requirement without the uplink beam sweeping (as specified inTS38.101-2 [3], subclause 6.6) shall set the bit to 1. The UE that fulfils the beam correspondence requirement with the uplink beam sweeping (as specified inTS38.101-2 [3], subclause 6.6) shall set the bit to 0.	Band	Yes	No	FR2 only
beamCorrespondenceCA Indicates whether UE configured with CA supports the same beam correspondence across all CCs as defined in <TBD RAN4 >.	Band	Tbd	No	No
beamManagementSSB-CSI-RS Defines support of SS/PBCH and CSI-RS based RSRP measurements. The capability comprises signalling of - *maxNumberSSB-CSI-RS-ResourceOneTx* indicates maximum total number of configured one port NZP CSI-RS resources and SS/PBCH blocks that are supported by the UE for 'CRI/RSRP' and 'SSBRI/RSRP' reporting within a slot and across all serving cells. Support of n8 is mandatory. - *maxNumberCSI-RS-Resource* indicates maximum total number of configured NZP-CSI-RS resources that are supported by the UE for 'CRI/RSRP' reporting across all serving cells. It is mandated to report at least n8 for FR1. - *maxNumberCSI-RS-ResourceTwoTx* indicates maximum total number of two ports NZP CSI-RS resources that are supported by the UE for 'CRI/RSRP' reporting within a slot and across all serving cells. - *supportedCSI-RS-Density* indicates density of one RE per PRB for one port NZP CSI-RS resource for RSRP reporting, if supported. At least density of CSI-RS = 3 or both 1 and 3 is mandatory. - *maxNumberAperiodicCSI-RS-Resource* indicates maximum number of configured aperiodic CSI-RS resources across all CCs. For FR1 and FR2, the UE is mandated to report at least n4.	Band	Yes	No	Yes
beamReportTiming Indicates the number of OFDM symbols between the last symbol of SSB/CSI-RS and the first symbol of the transmission channel containing beam report. The UE includes this field for each supported sub-carrier spacing.	Band	Yes	No	No
beamSwitchTiming Indicates the minimum number of OFDM symbols between the DCI triggering of aperiodic CSI-RS and aperiodic CSI-RS transmission. The number of OFDM symbols is measured from the last symbol containing the indication to the first symbol of CSI-RS. The UE includes this field for each supported sub-carrier spacing.	Band	No	No	FR2 only
bwp-DiffNumerology Indicates whether the UE supports BWP adaptation up to 4 BWPs with the different numerologies, via DCI and timer. For the UE capable of this feature, the bandwidth of a UE-specific RRC configured BWP includes the bandwidth of the CORESET#0 (if CORESET#0 is present) and SSB for PCell and PSCell (if configured). For SCell(s), the bandwidth of the UE-specific RRC configured BWP includes SSB, if there is SSB on SCell(s).	Band	No	No	No
bwp-SameNumerology	Band	No	No	No

4.2.7.3 CA-ParametersEUTRA

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
additionalRx-Tx-PerformanceReq *additionalRx-Tx-PerformanceReq* defined in 4.3.5.22, TS 36.306 [15].	BC	No	No	No
multipleTimingAdvance *multipleTimingAdvance* defined in 4.3.5.3, TS 36.306 [15].	BC	No	No	No
simultaneousRx-Tx *simultaneousRx-Tx* defined in 4.3.5.4, TS 36.306 [15].	BC	No	No	No
supportedBandwidthCombinationSetEUTRA Indicates the set of supported bandwidth combinations for the LTE part for inter-band EN-DC. The field is encoded as a bit map, where bit N is set to "1" if UE support Bandwidth Combination Set N for this band combination. The leading / leftmost bit (bit 0) corresponds to the Bandwidth Combination Set 0, the next bit corresponds to the Bandwidth Combination Set 1 and so on. The UE shall neither include the field for a EN-DC combination which has only one LTE carrier, nor for a EN-DC combination which has more than one LTE carrier for which the UE only supports Bandwidth Combination Set 0 for the LTE part. If the inter-band EN-DC has more than one LTE carrier, the UE shall support at least one bandwidth combination for the supported LTE part.	BC	CY	No	No
supportedNAICS-2CRS-AP *supportedNAICS-2CRS-AP* defined in 4.3.5.8, TS 36.306 [15].	BC	No	No	No
ue-CA-PowerClass-N *ue-CA-PowerClass-N* defined in 4.3.5.1.3, TS 36.306 [15].	BC	No	No	No

4.2.7.4 *CA-ParametersNR*

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
aperiodic-CSI-diffSCS Indicates whether the UE supports triggering of aperiodic CSI-RS where the CSI-RS is on a carrier with one sub-carrier spacing and the triggering PDCCH is on another carrier with a different sub-carrier spacing compared to the carrier with CSI-RS.	BC	No	No	No
csi-RS-IM-ReceptionForFeedbackPerBandComb Indicates support of CSI-RS and CSI-IM reception for CSI feedback. This capability signalling comprises the following parameters: - *maxNumberSimultaneousNZP-CSI-RS-ActBWP-AllCC* indicates the maximum number of simultaneous CSI-RS resources in active BWPs across all CCs. This parameter limits the total number of NZP-CSI-RS resources that the NW may configure across all CCs (irrespective of the associated codebook type). The network applies this limit in addition to the limits signalled in *MIMO-ParametersPerBand-> maxNumberSimultaneousNZP-CSI-RS-PerCC* and in *Phy-ParametersFRX-Diff-> maxNumberSimultaneousNZP-CSI-RS-PerCC*; - *totalNumberPortsSimultaneousNZP-CSI-RS-ActBWP-AllCC* indicates the total number of CSI-RS ports in simultaneous CSI-RS resources in active BWPs across all CCs. This parameter limits the total number of ports that the NW may configure across all NZP-CSI-RS resources across all CCs (irrespective of the associated codebook type). The network applies this limit in addition to the limits signalled in *MIMO-ParametersPerBand-> totalNumberPortsSimultaneousNZP-CSI-RS-PerCC* and in *Phy-ParametersFRX-Diff-> totalNumberPortsSimultaneousNZP-CSI-RS-PerCC*.	BC	Yes	No	No
diffNumerologyAcrossPUCCH-Group Indicates whether different numerology across two NR PUCCH groups for data and control channel at a given time in NR CA and EN-DC is supported by the UE.	BC	No	No	No
diffNumerologyWithinPUCCH-Group Indicates whether UE supports different numerology across carriers within a PUCCH group and a same numerology between DL and UL per carrier for data/control channel at a given time in NR CA and EN-DC. In case of NR CA and EN-DC with one NR PUCCH group, the UE supports different numerologies across NR carriers within the same NR PUCCH group up to two different numerologies within the same NR PUCCH group for data and control channel at a given time. In case of NR CA with two NR PUCCH groups, the UE supports different numerologies across NR carriers up to two different numerologies within the same NR PUCCH group, wherein NR PUCCH is sent on the carrier with smaller SCS for data and control channel at a given time. In case of EN-DC with two NR PUCCH groups, the UE supports different numerologies across NR carriers up to two different numerologies within an NR PUCCH group in FR1, wherein NR PUCCH is sent on the carrier with smaller SCS, and same numerology across NR carriers within another NR PUCCH group in FR2 for data and control channel at a given time.	BC	No	No	No
dualPA-Architecture For band combinations with single-band with UL CA, this field indicates the support of dual PA. If absent in such band combinations, the UE supports single PA for all the ULs. For other band combinations, this field is not applicable.	BC	No	No	No
multipleTimingAdvances Indicates whether multiple timing advances are supported by the UE. For NR CA band combination, if the band combination comprised of more than one band entry (i.e., inter-band or intra-band non-contiguous band combination), the field indicates that different timing advances on different band entries are supported. For EN-DC band combination, this field is not presented and it is mandatory for the UE supporting EN-DC band combination. In this release, up to two timing advances are supported for EN-DC band combination or NR CA band combination. For NR CA, it is mandatory with IOT bit for inter-band NR CA, otherwise optional. For EN-DC, it is mandatory without IOT bit.	BC	CY	No	No
parallelTxSRS-PUCCH-PUSCH Indicates whether the UE supports parallel transmission of SRS and PUCCH/PUSCH across CCs in an inter-band CA band combination.	BC	No	No	No
parallelTxPRACH-SRS-PUCCH-PUSCH Indicates whether the UE supports parallel transmission of PRACH and SRS/PUCCH/PUSCH across CCs in an inter-band CA band combination.	BC	No	No	No
simultaneousCSI-ReportsAllCC Indicates whether the UE supports CSI report framework and the number of CSI	BC	Yes	No	No

4.2.7.5 *FeatureSetDownlink* parameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
additionalDMRS-DL-Alt Indicates whether the UE supports the alternative additional DMRS position for co-existence with LTE CRS. It is applied to 15kHz SCS and one additional DMRS case only.	FS	No	No	FR1 only
crossCarrierScheduling-OtherSCS Indicates whether the UE supports cross carrier scheduling for the different numerologies with carrier indicator field (CIF) in DL carrier aggregation where numerologies for the scheduling cell and scheduled cell are different.	FS	No	No	No
csi-RS-MeasSCellWithoutSSB Defines whether the UE can perform CSI-RSRP and CSI-RSRQ measurement as specified in TS 38.215 [13], where CSI-RS resource is configured for a cell that does not transmit SS/PBCH block. A UE that supports this feature shall also support scellWithoutSSB.	FS	No	No	No
dl-MCS-TableAlt-DynamicIndication Indicates whether the UE supports dynamic indication of MCS table for PDSCH.	FS	No	No	No
featureSetListPerDownlinkCC Indicates which features the UE supports on the individual DL carriers of the feature set (and hence of a band entry that refer to the feature set) by *FeatureSetDownlinkPerCC-Id*. The UE shall hence include as many *FeatureSetDownlinkPerCC-Id* in this list as the number of carriers it supports according to the *ca-bandwidthClassDL*. The order of the elements in this list is not relevant, i.e., the network may configure any of the carriers in accordance with any of the *FeatureSetDownlinkPerCC-Id* in this list. A fallback per CC feature set resulting from the reported feature set per DL CC is not signalled but the UE shall support it.	FS	Tbd	No	No
intraBandFreqSeparationDL Indicates DL frequency separation class the UE supports, which indicates a maximum frequency separation between lower edge of lowest CC and upper edge of highest CC in a frequency band, for intra-band non-contiguous CA. The UE sets the same value in the FeatureSetDownlink of each band entry within a band. The values c1, c2 and c3 corresponds to the values defined in TS 38.101-2 [3]. It is mandatory to report for UE which supports DL intra-band non-contiguous CA in FR2.	FS	CY	No	FR2 only
oneFL-DMRS-ThreeAdditionalDMRS-DL Defines whether the UE supports DM-RS pattern for DL transmission with 1 symbol front-loaded DM-RS with three additional DM-RS symbols.	FS	No	No	Yes
oneFL-DMRS-TwoAdditionalDMRS-DL Defines support of DM-RS pattern for DL transmission with 1 symbol front-loaded DM-RS with 2 additional DM-RS symbols and more than 1 antenna ports.	FS	Yes	No	Yes
pdcch-MonitoringAnyOccasions Defines the supported PDCCH search space monitoring occasions. withoutDCI-gap indicates whether the UE supports PDCCH search space monitoring occasions in any symbol of the slot for Type 1-PDCCH common search space configured by dedicated RRC signaling, for a Type 3-PDCCH common search space, or for a UE-specific search space with the capability of supporting at least 44, 36, 22, and 20 blind decodes in a slot for 15 kHz, 30 kHz, 60kHz, and 120 kHz subcarrier spacing values respectively. withDCI-gap indicates whether the UE supports PDCCH search space monitoring occasions in any symbol of the slot with minimum time separation between two consecutive transmissions of PDCCH scrambled with C-RNTI or CS-RNTI for Type 1-PDCCH common search space configured by dedicated RRC signaling, for a Type 3-PDCCH common search space, or for a UE-specific search space, with the capability of supporting at least 44, 36, 22, and 20 blind decodes in a slot for 15 kHz, 30 kHz, 60kHz, and 120 kHz subcarrier spacing values respectively.	FS	No	No	No
pdcch-MonitoringAnyOccasionsWithSpanGap Indicates whether the UE supports PDCCH search space monitoring occasions in any symbol of the slot with minimum time separation between two consecutive transmissions of PDCCH with span up to two OFDM symbols for two OFDM symbols or span up to three OFDM symbols for four and seven OFDM symbols. Value set1 indicates the supported value set (X,Y) is (7,3), value set2 indicates the supported value set (X,Y) is (4,3) and (7,3) and value set 3 indicates the supported value set (X,Y) is (2,2), (4,3) and (7,3).	FS	No	No	No
pdsch-ProcessingType1-DifferentTB-PerSlot Defines whether the UE capable of processing time capability 1 supports reception of up to two, four or seven PDSCHs for several transport blocks with PDSCH scrambled using C-RNTI, TC-RNTI, or CS-RNTI in each of the applicable DL CCs	FS	No	No	No

4.2.7.6 *FeatureSetDownlinkPerCC* parameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
channelBW-90mhz Indicates whether the UE supports the channel bandwidth of 90 MHz.	FSPC	No	No	No
maxNumberMIMO-LayersPDSCH Defines the maximum number of spatial multiplexing layer(s) supported by the UE for DL reception. For single CC standalone NR, it is mandatory with capability signaling to support at least 4 MIMO layers in the bands where 4Rx is specified as mandatory for the given UE and at least 2 MIMO layers in FR2.	FSPC	Tbd	No	No
supportedBandwidthDL Indicates maximum DL channel bandwidth supported for a given SCS that UE supports within a single CC, which is defined in Table 5.3.5-1 in TS 38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2. For FR1, all the bandwidths listed in TS38.101-1 v15.0.0 Table 5.3.5-1 for each band shall be mandatory with a single CC. For FR2, the set of mandatory CBW is 50, 100, 200 MHz. When this field is included in a band combination with a signle band entry and a single CC entry (i.e. non-CA band combination), the UE shall indicate the maximum channel bandwith for the band according to TS 38.101-1 [2] and TS 38.101-2 [3].	FSPC	Tbd	No	Tbd
supportedModulationOrderDL Indicates the maximum supported modulation order to be applied for downlink in the carrier in the max data rate calculation as defined in 4.1.2. The network may use a modulation order on this serving cell which is higher than the value indicated in this field as long as UE supports the modulation of higher value for downlink.	FSPC	Tbd	No	Tbd
supportedSubCarrierSpacingDL Defines the supported sub-carrier spacing for DL by the UE, as defined in clause 4.2-1 of TS 38.211 [6], indicating the UE supports simultaneous reception with same or different numerologies in CA. Support of simultaneous reception with same numerology for intra-band NR CA including both contiguous and non-contiguous is mandatory with capability in both FR1 and FR2. Support of simultaneous reception with two different numerologies between FR1 band(s) and FR2 band(s) in DL is mandatory with capability if UE supports inter-band NR CA including both FR1 band(s) and FR2 band(s). Optional for other cases. Support of simultaneous reception of with different numerologies in CA for other cases is optional.	FSPC	CY	No	No

4.2.7.7 *FeatureSetUplink* parameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
scalingFactor Indicates the scaling factor to be applied to the band in the max data rate calculation as defined in 4.1.2. Value f0p4 indicates the scaling factor 0.4, f0p75 indicates 0.75, and so on. If absent, the scaling factor 1 is applied to the band in the max data rate calculation.	FS	Tbd	No	No
crossCarrierScheduling-OtherSCS Indicates whether the UE supports cross carrier scheduling for the different numerologies with carrier indicator field (CIF) in UL carrier aggregation where numerologies for the scheduling cell and scheduled cell are different. The UE shall set this field to the same value as *crossCarrierScheduling-OtherSCS* in the associated *FeatureSetDownlink* (if present).	FS	No	No	No
dynamicSwitchSUL Indicates whether the UE supports supplemental uplink with dynamic switch (DCI based selection of PUSCH carrier).	FS	No	No	No
featureSetListPerUplinkCC Indicates which features the UE supports on the individual UL carriers of the feature set (and hence of a band entry that refer to the feature set) by *FeatureSetUplinkPerCC-Id*. The UE shall hence include as many *FeatureSetUplinkPerCC-Id* in this list as the number of carriers it supports according to the *ca-bandwidthClassUL*. The order of the elements in this list is not relevant, i.e., the network may configure any of the carriers in accordance with any of the *FeatureSetUplinkPerCC-Id* in this list. A fallback per CC feature set resulting from the reported feature set per UL CC is not signalled but the UE shall support it.	FS	Tbd	No	No
intraBandFreqSeparationUL Indicates UL frequency separation class the UE supports, which indicates a maximum frequency separation between lower edge of lowest CC and upper edge of highest CC in a frequency band, for intra-band non-contiguous CA. The UE sets the same value in the FeatureSetUplink of each band entry within a band. The values c1, c2 and c3 corresponds to the values defined in TS 38.101-2 [3]. It is mandatory to report for UE which supports UL non-contiguous CA in FR2.	FS	CY	No	FR2 only
pa-PhaseDiscontinuityImpacts Indicates incapability motivated by impacts of PA phase discontinuity with overlapping transmissions with non-aligned starting or ending times or hop boundaries across carriers for intra-band EN-DC, intra-band CA and FDM based ULSUP.	FS	No	No	No
pusch-ProcessingType1-DifferentTB-PerSlot Indicates whether the UE capable of processing time capability 1 supports transmission of up to two, four or seven PUSCHs for several transport blocks in each of the applicable UL CCs within the same slot only in TDM.	FS	No	No	No
pusch-ProcessingType2 Indicates whether the UE supports PUSCH processing capability 2. The UE supports it only if all serving cells are self-scheduled and if all serving cells in one band on which the network configured processingType2 use the same subcarrier spacing. This capability signalling comprises the following parameters for each sub-carrier spacing supported by the UE. - *fallback* indicates whether the UE supports PUSCH processing capability 2 when the number of configured carriers is larger than *numberOfCarriers* for a reported value of *differentTB-PerSlot*. If *fallback* = 'sc', UE supports capability 2 processing time on lowest cell index among the configured carriers in the band where the value is reported, if *fallback* = 'cap1-only', UE supports only capability 1, in the band where the value is reported; - *differentTB-PerSlot* indicates whether the UE supports processing type 2 for 1, 2, 4 and/or 7 transport blocks per slot; and if so, it indicates up to which number of CA serving cells the UE supports that number of TBs.	FS	No	No	FR1 only
pusch-SeparationWithGap Indicates whether the UE supports separation of two unicast PUSCHs with a gap, applicable to Sub-carrier spacings of 15 KHz, 30 KHz and 60 KHz only. For any two consecutive slots n and n+1, if there are more than 1 unicast PUSCH in either slot, the minimum time separation between starting time of any two unicast PUSCHs within the duration of these slots is 2 OFDM symbols for 15kHz, 4 OFDM symbols for 30kHz and 7 OFDM symbols for 60kHz.	FS	No	No	No
searchSpaceSharingCA-UL Defines whether the UE supports UL PDCCH search space sharing for carrier aggregation operation.	FS	No	No	No

4.2.7.8 *FeatureSetUplinkPerCC* parameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
channelBW-90mhz Indicates whether the UE supports the channel bandwidth of 90 MHz.	FSPC	No	No	No
maxNumberMIMO-LayersCB-PUSCH Defines supported maximum number of MIMO layers at the UE for PUSCH transmission with codebook precoding. UE indicating support of this feature shall also indicate support of PUSCH codebook coherency subset. This feature is not supported for SUL.	FSPC	No	No	No
maxNumberMIMO-LayersNonCB-PUSCH Defines supported maximum number of MIMO layers at the UE for PUSCH transmission using non-codebook precoding. This feature is not supported for SUL.	FSPC	No	No	No
maxNumberSimultaneousSRS-ResourceTx Defines the maximum number of simultaneous transmitted SRS resources at one symbol for non-codebook based transmission to the UE. This feature is not supported for SUL.	FSPC	No	No	No
maxNumberSRS-ResourcePerSet Defines the maximum number of SRS resources per SRS resource set configured for codebook or non-codebook based transmission to the UE. This feature is not supported for SUL.	FSPC	No	No	No
simultaneousTxSUL-NonSUL Indicates whether the UE supports simultaneous transmission of SRS on an SUL/non-SUL carrier and PUSCH/PUCCH/SRS/PRACH on the other UL carrier in the same cell.	FSPC	No	No	No
supportedBandwidthUL Indicates maximum UL channel bandwidth supported for a given SCS that UE supports within a single CC, which is defined in Table 5.3.5-1 in TS38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2. For FR1, all the bandwidths listed in TS38.101-1 v15.0.0 Table 5.3.5-1 for each band shall be mandatory with a single CC. For FR2, the set of mandatory CBW is 50, 100, 200 MHz. When this field is included in a band combination with a single band entry and a single CC entry (i.e. non-CA band combination), the UE shall indicate the maximum channel bandwidth for the band according to TS 38.101-1 [2] and TS 38.101-2 [3].	FSPC	Tbd	No	Tbd
supportedModulationOrderUL Indicates the maximum supported modulation order to be applied for uplink in the carrier in the max data rate calculation as defined in 4.1.2. The network may use a modulation order on this serving cell which is higher than the value indicated in this field as long as UE supports the modulation of higher value for uplink.	FSPC	Tbd	No	Tbd
supportedSubCarrierSpacingUL Defines the supported sub-carrier spacing for UL by the UE, as defined in 4.2-1 of TS 38.211 [6], indicating the UE supports simultaneous transmission with same or different numerologies in CA, or indicating the UE supports different numerologies on NR UL and SUL within one cell. Support of simultaneous transmissions with same numerology for intra-band NR CA including both contiguous and non-contiguous is mandatory with capability in both FR1 and FR2. Support of simultaneous transmission with two different numerologies between FR1 band(s) and FR2 band(s) in UL is mandatory with capability if UE supports inter-band NR CA including both FR1 band(s) and FR2 band(s). Support of simultaneous transmission with different numerologies in CA for other cases is optional.	FSPC	CY	No	No

4.2.7.9 *MRDC-Parameters*

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
asyncIntraBandENDC Indicates whether the UE supports asynchronous FDD-FDD intra-band EN-DC with MRTD and MTTD as specified in clause 7.5 and 7.6 of TS 38.133 [5]. If it is not supported for FDD-FDD intra-band EN-DC, the UE supports only synchronous FDD-FDD intra-band EN-DC.	BC	No	FDD only	FR1 only
dualPA-Architecture For an intra-band band combination, this field indicates the support of dual PAs. If absent in an intra-band band combination, the UE supports single PA for all the ULs in the intra-band band combination. For other band combinations, this field is not applicable.	BC	No	No	No
dynamicPowerSharing Indicates whether the UE supports dynamic EN-DC power sharing or not. If the UE supports this capability it will dynamically share the power between NR and LTE if $P_{LTE} + P_{NR} > P_{CMAX}$, as specified in TS 38.213 [11].	BC	Yes	No	Tbd
intraBandENDC-Support Indicates whether the UE supports intra-band EN-DC with only non-contiguous spectrum, or with both contiguous and non-contiguous spectrum for the EN-DC combination as specified in TS 38.101-3 [4]. If the UE does not include this field for an intra-band EN-DC combination the UE only supports the contiguous spectrum for the intra-band EN-DC combination.	BC	No	No	No
simultaneousRxTxInterBandENDC Indicates whether the UE supports simultaneous transmission and reception in TDD-TDD and TDD-FDD inter-band EN-DC. It is mandatory for certain TDD-FDD and TDD-TDD band combinations defined in TS 38.101-3 [4].	BC	CY	No	No
singleUL-Transmission Indicates that the UE does not support simultaneous UL transmissions as defined in TS 38.101-3 [4]. The UE may only include this field for certain band combinations defined in TS 38.101-3 [4]. If included for a particular band combination, the field applies to all fallback band combinations of this band combination that are defined in TS 38.101-3 [4] as being allowed to include this field and does not apply to any other fallback band combinations defined in TS 38.101-3 [4].	BC	No	No	No
tdm-Pattern Indicates whether the UE supports the *tdm-PatternConfig* for *single UL-transmission* associated functionality, as specified in TS 36.331 [17]. Support is conditionally mandatory for UEs that do not support dynamic power sharing and for UEs that indicate single UL transmission for any BC, and optional otherwise.	BC	CY	Yes	Yes
ul-SharingEUTRA-NR Indicates whether the UE supports EN-DC with EUTRA-NR coexistence in UL sharing via TDM only, FDM only, or both TDM and FDM from UE perspective as specified in TS 38.101-3 [4].	BC	No	No	FR1 only
ul-SwitchingTimeEUTRA-NR Indicates support of switching type between LTE UL and NR UL for EN-DC with LTE-NR coexistence in UL sharing from UE perspective as defined in clause 6.3B of TS 38.101-3 [4]. It is mandatory to report switching time type 1 or type 2 if UE reports *ul-SharingEUTRA-NR* is *tdm* or *both*.	BC	[Yes]	No	FR1 only
ul-TimingAlignmentEUTRA-NR Indicates whether to apply the same UL timing between NR and LTE for dynamic power sharing capable UE operating in a synchronous intra-band contiguous EN-DC. If this field is absent, UE shall be capable of handling a timing difference up to applicable MTTD requirements when operating in a synchronous intra-band contiguous EN-DC network, as specified in TS 38.133 [5].	BC	No	No	No

4.2.7.10 *Phy-Parameters*

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
absoluteTPC-Command Indicates whether the UE supports absolute TPC command mode.	UE	No	No	Yes
almostContiguousCP-OFDM-UL Indicates whether the UE supports almost contiguous UL CP-OFDM transmissions as defined in clause 6.2 of TS 38.101-1 [2].	UE	No	No	Yes
bwp-SwitchingDelay Defines whether the UE supports DCI and timer based active BWP switching delay type1 or type2 specified in clause 8.6.2 of TS 38.133 [5]. It is mandatory to report type 1 or type 2.	UE	Yes	No	No
cbg-FlushIndication-DL Indicates whether the UE supports CBG-based (re)transmission for DL using CBG flushing out information (CBGFI) as specified in TS 38.214 [12].	UE	No	No	No
cbg-TransIndication-DL Indicates whether the UE supports CBG-based (re)transmission for DL using CBG transmission information (CBGTI) as specified in TS 38.214 [12].	UE	No	No	No
cbg-TransIndication-UL Indicates whether the UE supports CBG-based (re)transmission for UL using CBG transmission information (CBGTI) as specified in TS 38.214 [12].	UE	No	No	No
configuredUL-GrantType1 Indicates whether the UE supports Type 1 PUSCH transmissions with configured grant as specified in TS 38.214 [12] with UL-TWG-repK value of one.	UE	No	No	No
configuredUL-GrantType2 Indicates whether the UE supports Type 2 PUSCH transmissions with configured grant as specified in TS 38.214 [12] with UL-TWG-repK value of one.	UE	No	No	No
cqi-TableAlt Indicates whether UE supports the CQI table with target BLER of 10^{-5}.	UE	No	No	Yes
csi-ReportFramework See *csi-ReportFramework* in 4.2.7.2. For a band combination comprised of FR1 and FR2 bands, this parameter, if present, limits the corresponding parameter in *MIMO-ParametersPerBand*.	Band or UE	Yes	No	No
csi-ReportWithoutCQI Indicates whether UE supports CSI reporting with report quantity set to 'CRI/RI/i1' as defined in clause 5.2.1.4 of TS 38.214 [12].	UE	No	No	Yes
csi-ReportWithoutPMI Indicates whether UE supports CSI reporting with report quantity set to 'CRI/RI/CQI' as defined in clause 5.2.1.4 of TS 38.214 [12].	UE	No	No	Yes
csi-RS-CFRA-ForHO Indicates whether the UE can perform handover using a contention free random access on PRACH resources that are associated with CSI-RS resources of the target cell.	UE	No	No	No
csi-RS-IM-ReceptionForFeedback See *csi-RS-IM-ReceptionForFeedback* in 4.2.7.2. For a band combination comprised of FR1 and FR2 bands, this parameter, if present, limits the corresponding parameter in *MIMO-ParametersPerBand*.	Band or UE	Yes	No	No
csi-RS-ProcFrameworkForSRS See *csi-RS-ProcFrameworkForSRS* in 4.2.7.2. For a band combination comprised of FR1 and FR2 bands, this parameter, if present, limits the corresponding parameter in *MIMO-ParametersPerBand*.	Band or UE	No	No	No
dl-64QAM-MCS-TableAlt Indicates whether the UE supports the alternative 64QAM MCS table for PDSCH.	UE	No	No	Yes
dl-SchedulingOffset-PDSCH-TypeA Indicates whether the UE supports DL scheduling slot offset (K0) greater than 0 for PDSCH mapping type A.	UE	Yes	Yes	Yes
dl-SchedulingOffset-PDSCH-TypeB Indicates whether the UE supports DL scheduling slot offset (K0) greater than 0 for PDSCH mapping type B.	UE	Yes	Yes	Yes
downlinkSPS Indicates whether the UE supports PDSCH reception based on semi-persistent scheduling.	UE	No	No	No
dynamicBetaOffsetInd-HARQ-ACK-CSI Indicates whether the UE supports indicating beta-offset (UCI repetition factor onto PUSCH) for HARQ-ACK and/or SR via DCI among the RRC configured beta-offsets.	UE	No	No	No
dynamicHARQ-ACK-Codebook Indicates whether the UE supports HARQ-ACK codebook dynamically constructed	UE	Yes	No	No

4.2.7.11 Other PHY parameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
appliedFreqBandListFilter Mirrors the *FreqBandList* that the NW provided in the capability enquiry, if any. The UE filtered the band combinations in the *supportedBandCombinationList* in accordance with this *appliedFreqBandListFilter*.	UE	No	No	No
downlinkSetEUTRA Indicates the features that the UE supports on the DL carriers corresponding to one EUTRA band entry in a band combination by FeatureSetEUTRA-DownlinkId. The FeatureSetEUTRA-DownlinkId = 0 means that the UE does not support a EUTRA DL carrier in this band of a band combination.	Band	Tbd	No	No
downlinkSetNR Indicates the features that the UE supports on the DL carriers corresponding to one NR band entry in a band combination by FeatureSetDownlinkId. The FeatureSetDownlinkId = 0 means that the UE does not support a DL carrier in this band of a band combination. A fallback per band feature set resulting from the reported DL feature set that has fallback per CC feature set is not signalled but the UE shall support it.	Band	Tbd	No	No
featureSetCombinations Pools of feature sets that the UE supports on the NR CA or MR-DC band combinations.	UE	Tbd	No	No
featureSets Pools of downlink and uplink features sets as well as a pool of FeatureSetCombination elements. A FeatureSetCombination refers to the IDs of the feature set(s) that the UE supports in that FeatureSetCombination. The BandCombination entries in the BandCombinationList then indicate the ID of the FeatureSetCombination that the UE supports fot that band combination.	UE	Tbd	No	No
naics-Capability-List Indicates that UE in MR-DC supports NAICS as defined in defined in TS 36.331 [17].	UE	No	No	No
supportedBandCombinationList Defines the supported CA and/or MR-DC band combinations by the UE. For each band combination the UE identifies the associated feature set combination by featureSetCombinations index referring to featureSetCombination. A fallback band combination resulting from the reported CA and MR-DC band combination is not signalled but the UE shall support it. For intra-band non-contiguous CA band combinations, the UE only includes one band combination, and exclude the others for which the presence of uplink CA bandwidth class in the band combination entry is different. One band combination entry can also indicate support of any other possible permutations in the presence of uplink CA bandwidth class where a paired downlink CA bandwidth class is the same or where the number of UL CCs is smaller than the one of paired DL CCs expressed by the CA bandwidth class, as specified in TS 36.306 [15]. For these band combinations not included in the capability, the supported feature set is the same as the ones for the band combination included in the UE capability.	UE	Yes	No	No
supportedBandListNR Includes the supported NR bands as defined in TS 38.101-1 [2] and TS 38.101-2 [3].	UE	Yes	No	No
uplinkSetEUTRA Indicates the features that the UE supports on the UL carriers corresponding to one EUTRA band entry in a band combination by FeatureSetEUTRA-UplinkId. The FeatureSetUplinkId = 0 means that the UE does not support a UL carrier in this band of a band combination.	Band	Tbd	No	No
uplinkSetNR Indicates the features that the UE supports on the UL carriers corresponding to one NR band entry in a band combination by FeatureSetUplinkId. The FeatureSetUplinkId = 0 means that the UE does not support a UL carrier in this band of a band combination. A fallback per band feature set resulting from the reported UL feature set that has fallback per CC feature set is not signalled but the UE shall support it.	Band	Tbd	No	No

4.2.8 Void

4.2.9 MeasAndMobParameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
csi-RS-RLM Indicates whether the UE can perform radio link monitoring procedure based on measurement of CSI-RS as specified in TS 38.213 [11] and TS 38.133 [5]. This parameter needs FR1 and FR2 differentiation. If the UE supports this feature, the UE needs to report *maxNumberResource-CSI-RS-RLM*.	UE	Yes	No	Yes
csi-RSRP-AndRSRQ-MeasWithSSB Indicates whether the UE can perform CSI-RSRP and CSI-RSRQ measurement as specified in TS 38.215 [13], where CSI-RS resource is configured with an associated SS/PBCH. This parameter needs FR1 and FR2 differentiation. If the UE supports this feature, the UE needs to report *maxNumberCSI-RS-RRM-RS-SINR*.	UE	No	No	Yes
csi-RSRP-AndRSRQ-MeasWithoutSSB Indicates whether the UE can perform CSI-RSRP and CSI-RSRQ measurement as specified in TS 38.215 [13], where CSI-RS resource is configured for a cell that transmits SS/PBCH block and without an associated SS/PBCH block. This parameter needs FR1 and FR2 differentiation. If the UE supports this feature, the UE needs to report *maxNumberCSI-RS-RRM-RS-SINR*.	UE	No	No	Yes
csi-SINR-Meas Indicates whether the UE can perform CSI-SINR measurements based on configured CSI-RS resources as specified in TS 38.215 [13]. This parameter needs FR1 and FR2 differentiation. If the UE supports this feature, the UE needs to report *maxNumberCSI-RS-RRM-RS-SINR*.	UE	No	No	Yes
eutra-CGI-Reporting Defines whether the UE supports acquisition of relevant information from a neighbouring E-UTRA cell by reading the SI of the neighbouring cell and reporting the acquired information to the network as specified in TS 38.331 [9] when the EN-DC is not configured.	UE	Yes	No	No
eventA-MeasAndReport Indicates whether the UE supports NR measurements and events A triggered reporting as specified in TS 38.331 [9]. This field only applies to SN configured measurement when EN-DC is configured. For NR SA, this feature is mandatory supported.	UE	Yes	Yes	No
eventB-MeasAndReport Indicates whether the UE supports EUTRA measurement and event B triggered reporting as specified in TS 38.331 [9]. It is mandated if the UE supports EUTRA.	UE	Yes	No	No
handover-eLTE Indicates whether the UE supports HO to EUTRA connected to 5GC. It is mandated if the UE supports EUTRA connected to 5GC.	UE	Yes	Yes	Yes
handoverFDD-TDD Indicates whether the UE supports HO between FDD and TDD. It is mandated if the UE supports both FDD and TDD. This field only applies to NR SA (e.g. PCell handover). For PSCell change when EN-DC is configured, this feature is mandatory supported.	UE	Yes	No	No
handoverFR1-FR2 Indicates whether the UE supports HO between FR1 and FR2. Support is mandatory for the UE supporting both FR1 and FR2. This field only applies to NR SA(e.g. PCell handover). For PSCell change when EN-DC is configured, this feature is mandatory supported.	UE	Yes	No	No
handoverInterF Indicates whether the UE supports inter-frequency HO. It indicates the support for inter-frequency HO from the corresponding duplex mode if this capability is included in *fdd-Add-UE-NR-Capabilities* or *tdd-Add-UE-NR-Capabilities*. It indicates the support for of inter-frequency HO from the corresponding frequency range if this capability is included in *fr1-Add-UE-NR-Capabilities* or *fr2-Add-UE-NR-Capabilities*. This field only applies to NR SA (e.g. PCell handover). For PSCell change when EN-DC is configured, this feature is mandatory supported.	UE	Yes	Yes	Yes
handoverLTE Indicates whether the UE supports HO to EUTRA connected to EPC. It is mandated if the UE supports EUTRA connected to EPC.	UE	Yes	Yes	Yes

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
independentGapConfig This field indicates whether the UE supports two independent measurement gap configurations for FR1 and FR2 specified in clause 9.1.2 of TS 38.133 [5]. The field also indicates whether the UE supports the FR2 inter-RAT measurement without gaps when EN-DC is not configured.	UE	No	No	No
intraAndInterF-MeasAndReport Indicates whether the UE supports NR intra-frequency and inter-frequency measurements and at least periodical reporting. This field only applies to SN configured measurement when EN-DC is configured. For NR SA, this feature is mandatory supported.	UE	Yes	Yes	No
periodicEUTRA-MeasAndReport Indicates whether the UE supports periodic EUTRA measurement and reporting. It is mandatory if the UE supports EUTRA, otherwise optional.	UE	CY	No	No
maxNumberCSI-RS-RRM-RS-SINR Defines the maximum number of CSI-RS resources for RRM and RS-SINR measurement across all measurement frequencies per slot. If UE supports any of *csi-RSRP-AndRSRQ-MeasWithSSB*, *csi-RSRP-AndRSRQ-MeasWithoutSSB*, and *csi-SINR-Meas*, UE shall report this capability.	UE	CY	No	No
maxNumberResource-CSI-RS-RLM Defines the maximum number of CSI-RS resources within a slot per spCell for CSI-RS based RLM. If UE supports any of *csi-RS-RLM* and *ssb-AndCSI-RS-RLM*, UE shall report this capability.	UE	CY	No	Yes
nr-CGI-Reporting Defines whether the UE supports acquisition of relevant information from a neighbouring intra-frequency or inter-frequency NR cell by reading the SI of the neighbouring cell and reporting the acquired information to the network as specified in TS 38.331 [9] when EN-DC is not configured.	UE	Yes	No	No
nr-CGI-Reporting-ENDC Defines whether the UE supports acquisition of relevant information from a neighbouring intra-frequency or inter-frequency NR cell by reading the SI of the neighbouring cell and reporting the acquired information to the network as specified in TS 38.331 [9] when the EN-DC is configured.	UE	Yes	No	No
simultaneousRxDataSSB-DiffNumerology Indicates whether the UE supports concurrent intra-frequency measurement on serving cell or neighbouring cell and PDCCH or PDSCH reception from the serving cell with a different numerology as defined in clause 8 and 9 of TS 38.133 [5].	UE	No	No	Yes
sftd-MeasPSCell Indicates whether the UE supports SFTD measurements between the Pcell and a configured PSCell.	UE	No	Yes	No
sftd-MeasNR-Cell Indicates whether the SFTD measurement with and without measurement gapsbetween the Pcell and the NR cells is supported by the UE which is capable of EN-DC when EN-DC is not configured. The SFTD measurement without gaps can be used when the UE supports at least one EN-DC band combination consisting of the set of the current E-UTRA serving frequencies and the NR frequency where SFTD measurement is configured.	UE	No	Yes	No
ssb-RLM Indicates whether the UE can perform radio link monitoring procedure based on measurement of SS/PBCH block as specified in TS 38.213 [11] and TS 38.133 [5]. This field shall be set to 1.	UE	Yes	No	No
ssb-AndCSI-RS-RLM Indicates whether the UE can perform radio link monitoring procedure based on measurement of SS/PBCH block and CSI-RS as specified in TS 38.213 [11] and TS 38.133 [5]. If the UE supports this feature, the UE needs to report *maxNumberResource-CSI-RS-RLM*.	UE	No	No	No
ss-SINR-Meas Indicates whether the UE can perform SS-SINR measurement as specified in TS 38.215 [13]. This parameter needs FR1 and FR2 differentiation.	UE	No	No	Yes
supportedGapPattern Indicates measurement gap pattern(s) optionally supported by the UE. The leading / leftmost bit (bit 0) corresponds to the gap pattern 2, the next bit corresponds to the gap pattern 3, as specified in TS 38.133 [5] and so on.	UE	No	No	No

4.2.10 Inter-RAT parameters

Definitions for parameters	Per	M	FDD-TDD DIFF
mfbi-EUTRA Indicates whether the UE supports the mechanisms defined for cells broadcasting multi band information i.e. comprehending *multiBandInfoList* defined in TS 36.331 [17].	UE	Yes	No
modifiedMRP-BehaviorEUTRA *modifiedMPR-Behavior* in 4.3.5.10, TS 36.306 [15].	UE	No	No
multiNS-Pmax-EUTRA *multiNS-Pmax* defined in 4.3.5.16, TS 36.306 [15].	UE	No	No
rs-SINR-MeasEUTRA *rs-SINR-Meas* in 4.3.6.13, TS 36.306 [15].	UE	No	No
rsrqMeasWidebandEUTRA *rsrqMeasWideband* in 4.3.6.2, TS 36.306 [15]	UE	No	Yes

4.2.10.1 Void

4.2.10.2 Void

4.2.11 Void

4.2.12 Void

4.2.13 IMS Parameters

Definitions for parameters	Per	M	FDD-TDD DIFF	FR1-FR2 DIFF
voiceOverEUTRA-5GC Indicates whether the UE supports IMS voice over E-UTRA via 5GC.	UE	No	No	No
voiceOverNR Indicates whether the UE supports IMS voice over NR. It is mandated to the IMS voice capable UE in NR otherwise optional.	UE	No	No	Yes

4.2.14 RRC buffer size

The RRC buffer size is defined as the maximum overall RRC configuration size that the UE is required to store. The RRC buffer size is 45Kbytes.

5 Optional features without UE radio access capability parameters

6 Conditionally mandatory features without UE radio access capability parameters

Features	Condition
Skipping UL configured grant if no data to transmit.	Either *configuredUL-GrantType1* or *configuredUL-GrantType2* is supported.
Downlink SDAP header	Either NAS reflective QoS or *as-ReflectiveQoS* is supported.

7 Void

8 UE Capability Constraints

The following table lists constraints indicating the minimum UE capabilities that the UE shall support.

Parameter	Description	Value
#DRBs	The number of DRBs that a UE shall support.	16 without duplication 8 per MAC entity with duplication.
#minCellperMeasObjectNR	The minimum number of neighbour cells (excluding black list cells) that a UE shall be able to store associated with a MeasObjectNR.	32
#minBlackCellRangesperMeasObjectNR	The minimum number of blacklist cell PCI ranges that a UE shall be able to store associated with a MeasObjectNR.	8
#minCellperMeasObjectEUTRA	The minimum number of neighbour cells that a UE shall be able to store associated with a MeasObjectEUTRA.	32
#minCellTotal	The minimum number of neighbour cells (excluding black list cells) that UE shall be able to store in total from all measurement objects configured.	256 with counting CSI-RS and SSB as 2.
#cell for CGI reporting	the limit regarding the cells NR can configure includes the cell for which the UE is requested to report CGI.	(# minCellperMeasObjectRAT - 1), where RAT represents NR and EUTRA.

Annex A (informative): Change history

Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
06/2017	RAN2#98	R2-1704810				First version	0.0.1
06/2017	RAN2#NR2	R2-1707386					0.0.2
08/2017	RAN2#99	R2-1708750					0.0.3
12/2017	RAN2#100	R2-1712587					0.0.4
12/2017	RAN2#100	R2-1714141					0.0.5
12/2017	RAN2#100	R2-1714271					0.1.0
12/2017	RP-78	RP-172521				Submitted to RAN#78 for approval	1.0.0
12/2017	RP-78					Upgraded to Rel-15	15.0.0
03/2018	RP-79	RP-180440	0003	3	F	Updates on UE capabilities	15.1.0
06/2018	RP-80	RP-181216	0009	2	B	Introduce ANR in NR	15.2.0
	RP-80	RP-181216	0012	1	F	Miscellaneous corrections	15.2.0
	RP-80	RP-181216	0013	-	B	Delay budget report and MAC CE adaptation for NR for TS 38.306	15.2.0
09/2018	RP-81	RP-181940	0008	4	F	Correction on total layer2 buffer size	15.3.0
	RP-81	RP-181942	0024	1	F	Introduction of UE capability constraints	15.3.0
	RP-81	RP-181942	0030	-	F	38.306 corrections and cleanup	15.3.0
12/2018	RP-82	RP-182651	0016	4	F	Clarification for Interruption-based and gap-based SFTD measurement	15.4.0
	RP-82	RP-182653	0033	1	F	Timer based BWP switching	15.4.0
	RP-82	RP-182652	0035	2	F	Additional UE capabilities for NR standalone	15.4.0
	RP-82	RP-182651	0037	1	F	Clarification to UE capability of independentGapConfig for inter-RAT NR measurement not yet configured with EN-DC	15.4.0
	RP-82	RP-182661	0038	2	F	Update of L2 capability parameters	15.4.0
	RP-82	RP-182660	0047	2	F	Clarification on physical layer parameters of UE capability	15.4.0
	RP-82	RP-182666	0050	3	F	Introduce RRC buffer size in NR	15.4.0
	RP-82	RP-182664	0051	2	F	Clarification of multipleConfiguredGrants	15.4.0
	RP-82	RP-182664	0052	2	F	CR to 38.306 for PDCP CA duplication for SRB	15.4.0
	RP-82	RP-182661	0054	1	F	UE capability handling for FDD/TDD and FR1/FR2	15.4.0
	RP-82	RP-182663	0057	1	F	Clarify for per CC UL/DL modulation order capabilities	15.4.0
	RP-82	RP-182664	0058	1	F	Inter-frequency handover capability	15.4.0
	RP-82	RP-182665	0060	3	F	UE capability on PA architecture	15.4.0
	RP-82	RP-182661	0062	1	F	CR on signaling contiguous and non-contiguous EN-DC capability	15.4.0
	RP-82	RP-182813	0063	6	F	Update of UE capabilities	15.4.0
	RP-82	RP-182662	0065	2	F	Introduction of SRS switching capability	15.4.0
	RP-82	RP-182667	0068	2	B	CR on introduction of UE overheating support in NR SA scenario	15.4.0
	RP-82	RP-182664	0071	-	F	Introduction of SRS switching capability	15.4.0
03/2019	RP-83	RP-190634	0073	1	F	Capability for aperiodic CSI-RS triggering with different numerology between PDCCH and CSI-RS	15.5.0
	RP-83	RP-190542	0074	1	F	Layer-1 capability update	15.5.0
	RP-83	RP-190545	0075	2	F	CR to 38.306 on introducing nr-CGI-Reporting-ENDC	15.5.0
	RP-83	RP-190545	0086	2	F	CR to clarify intra-NR handover capabilities	15.5.0
	RP-83	RP-190546	0088	3	F	Clarification for PDSCHs and PUSCHs per slot for different TBs for UE capable of processing time capability 1	15.5.0
	RP-83	RP-190542	0092	2	F	Correction to mandatory supported capability signaling	15.5.0
	RP-83	RP-190542	0097	2	F	Miscellaneous corrections	15.5.0
	RP-83	RP-190545	0098	2	F	Correction on supportedBandwidthCombinationSetEUTRA-v1530 usage	15.5.0
	RP-83	RP-190543	0099	-	F	Clarification on signaling the bandwidth class	15.5.0
	RP-83	RP-190545	0100	1	F	Clarification on Frequency Separation Class	15.5.0
	RP-83	RP-190544	0101	-	F	CR on Processing delay requirements for RRC Resume procedures in TS 38.306	15.5.0