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(Release 14)

 

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# 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 E-UTRA 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 36.323: "Evolved Universal Terrestrial Radio Access (E-UTRA) Packet Data Convergence Protocol (PDCP) specification".

[3] 3GPP TS 36.322: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Link Control (RLC) specification".

[4] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA) Medium Access Control (MAC) specification".

[5] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA) Radio Resource Control (RRC) specification".

[6] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA) radio transmission and reception".

[7] IETF RFC 5795: "The RObust Header Compression (ROHC) Framework".

[8] IETF RFC 6846: "RObust Header Compression (ROHC): A Profile for TCP/IP (ROHC-TCP)".

[9] IETF RFC 3095: "RObust Header Compression (RoHC): Framework and four profiles: RTP, UDP, ESP and uncompressed".

[10] IETF RFC 3843: "RObust Header Compression (RoHC): A Compression Profile for IP".

[11] IETF RFC 4815: "RObust Header Compression (ROHC): Corrections and Clarifications to RFC 3095".

[12] IETF RFC 5225: "RObust Header Compression (ROHC) Version 2: Profiles for RTP, UDP, IP, ESP and UDP Lite".

[13] 3GPP TS 36.355: "Evolved Universal Terrestrial Radio Access (E-UTRA) LTE Positioning Protocol (LPP)".

[14] 3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); UE Procedures in Idle Mode".

[15] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2".

[16] 3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".

[17] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".

[18] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[19] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC)".

[20] 3GPP TS 25.307: "Requirement on User Equipments (UEs) supporting a release-independent frequency band".

[21] 3GPP TS 24.312: "Access Network Discovery and Selection Function (ANDSF) Management Object (MO)".

[22] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".

[23] 3GPP TS 36.214: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer - Measurements".

[24] 3GPP TS 23.303: "Proximity-based services (ProSe); Stage 2".

[25] 3GPP TS 36.314: "Evolved Universal Terrestrial Radio Access (E-UTRA); Layer 2- Measurements".

[26] 3GPP TS 36.212: "Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding".

[27] 3GPP TS 36.307: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements on User Equipments (UEs) supporting a release-independent frequency band".

[28] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

[29] 3GPP TS 23.285: "Technical Specification Group Services and System Aspects; Architecture enhancements for V2X services".

[30] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRAN); Overall description; Stage 2".

[31] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 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 TR 21.905 [1].

**Fallback band combination:** A band combination that would result from another band combination (parent band combination) by releasing at least one SCell or uplink configuration of SCell. A fallback band combination and the parent band combination support the same bandwidths for each band of the fallback band combination. An intra-band non-contiguous band combination is not considered to be a fallback band combination of an intra-band contiguous band combination.

**NB-IoT:** NB-IoT allows access to network services via E-UTRA with a channel bandwidth limited to 200 kHz (corresponding to one PRB).

**Primary Cell:** The cell, operating on the primary frequency, in which the UE either performs the initial connection establishment procedure or initiates the connection re-establishment procedure, or the cell indicated as the primary cell in the handover procedure. In this specification, Primary Cell also refers to PSCell defined in TS 36.331 [5] unless explicitly stated otherwise.

**Sidelink**: UE to UE interface for sidelink communication, V2X sidelink communication and sidelink discovery. The Sidelink corresponds to the PC5 interface as defined in TS 23.303 [24].

**Sidelink communication**: AS functionality enabling ProSe Direct Communication as defined in TS 23.303 [24], between two or more nearby UEs, using E-UTRA technology but not traversing any network node. In this version, the terminology "sidelink communication" without "V2X" prefix only concerns PS unless specifically stated otherwise.

**Sidelink discovery**: AS functionality enabling ProSe Direct Discovery as defined in TS 23.303 [24], using E-UTRA technology but not traversing any network node.

**V2X sidelink communication**: AS functionality enabling V2X Communication as defined in TS 23.285 [29], between nearby UEs, using E-UTRA technology but not traversing any network node.

## 3.2 Symbols

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

<symbol> <Explanation>

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

1xRTT CDMA2000 1x Radio Transmission Technology

ACK Acknowledgement

ACDC Application specific Congestion control for Data Communication

ANDSF Access Network Discovery and Selection Function

BCCH Broadcast Control Channel

CG Cell Group

CRS Cell-specific Rerefence Signal

CSG Closed Subscriber Group

CSI Channel State Information

DC Dual Connectivity

DCI Downlink Control Information

DL-SCH Downlink Shared Channel

E-UTRA Evolved Universal Terrestrial Radio Access

E-UTRAN Evolved Universal Terrestrial Radio Access Network

FDD Frequency Division Duplex

GERAN GSM/EDGE Radio Access Network

HARQ Hybrid Automatic Repeat Request

HRPD High Rate Packet Data

IRC Interference Rejection Combining

MAC Medium Access Control

MMSE Minimum Mean Squared Error

MRO Mobility Robustness Optimisation

MUST MultiUser Superposition Transmission

NAICS Network Assisted Interference Cancellation/Suppression

NB-IoT Narrow Band Internet of Things

PCell Primary Cell

PDCCH Physical Downlink Control Channel

PDCP Packet Data Convergence Protocol

PDSCH Physical Downlink Shared Channel

PHR Power Headroom Reporting

ProSe Proximity-based Services

PUCCH Physical Uplink Control Channel

PUSCH Physical Uplink Shared Channel

RACH Random Access CHannel

RAI Release Assistance Indication

RAT Radio Access Technology

RLC Radio Link Control

ROHC RObust Header Compression

RRC Radio Resource Control

SC-PTM Single Cell Point to Multipoint

SCC Secondary Component Carrier

SCell Secondary Cell

SI System Information

SL Sidelink

SL-DCH Sidelink Discovery CHannel

SL-SCH Sidelink Shared CHannel

SON Self Organizing Networks

SR Scheduling Request

SSAC Service Specific Access Control

SSTD SFN and Subframe Timing Difference

TDD Time Division Duplex

TTI Transmission Time Interval

UCI Uplink Control Information

UE User Equipment

UL-SCH Uplink Shared Channel

UMTS Universal Mobile Telecommunications System

UTRA UMTS Terrestrial Radio Access

V2X Vehicle-to-Everything

WLAN Wireless Local Area Network

# 4 UE radio access capability parameters

The following subclauses define the UE radio access capability parameters and minimum capabilities for MBMS capable UE. 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. Also capabilities which are optional or conditionally mandatory for UEs to implement but do not have UE radio access capability parameter are listed in this specification.

E-UTRAN needs to respect the signalled UE radio access capability parameters when configuring the UE and when scheduling the UE.

All parameters shown in italics are signalled and correspond to a field defined in TS 36.331 [5].

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.

The mandatory features required to be supported by a UE are the same for all UE categories unless explicitly specified elsewhere in the specifications.

The following UE radio access capability parameters specified in Chapter 4 are applicable in NB-IoT:

- *ue-Category-NB* in NB-IoT (clause 4.1C)

- *supportedROHC-Profiles-r13* (clause 4.3.1.1A)

- *maxNumberROHC-ContextSessions-r13* (clause 4.3.1.2A)

- *multiTone-r13* (clause 4.3.4.55)

- *multiCarrier-r13* (clause 4.3.4.56)

- *twoHARQ-Processes-r14* (clause 4.3.4.62)

- *multiCarrier-NPRACH-r14* (clause 4.3.4.75)

- *multiCarrierPaging-r14* (clause 4.3.4.76)

- *interferenceRandomisation-r14* (clause 4.3.4.80)

- *supportedBandList-r13* (clause 4.3.5.1A)

- *multiNS-Pmax-r13* (clause 4.3.5.16A)

- *powerClassNB-20dBm-r13* (clause 4.3.5.1A.1)

- *powerClassNB-14dBm-r14* (clause 4.3.5.1A.2)

- *accessStratumRelease-r13* (clause 4.3.8.1A)

- *multipleDRB-r13* (clause 4.3.8.5)

- *logicalChannelSR-ProhibitTimer* (clause 4.3.19.2)

- *dataInactMon-r14* (clause 4.3.19.9)

- *rai-Support-r14* (clause 4.3.19.10)

- *earlyContentionResolution-r14* (clause 4.3.19.12)

The UE radio access capabilities specified in Chapter 4 are not applicable in NB-IoT, unless they are listed above. The optional features without UE radio access capability parameters specified in Chapter 6 are not applicable in NB-IoT, except for System Information Block Type 16, SC-PTM in Idle mode, RRC connection re-establishment for Control Plane CIoT EPS Optimisation, Relaxed monitoring, enhanced random access power control, serving cell idle mode measurements reporting and DL channel quality reporting. The conditionally mandatory features specified in Chapter 7 are not applicable in NB-IoT.

## 4.1 *ue-Category*

The field *ue-Category* defines a combined uplink and downlink capability. The parameters set by the UE Category are defined in subclause 4.2. Tables 4.1-1 and 4.1-2 define the downlink and, respectively, uplink physical layer parameter values for each UE Category. A UE indicating category 6 or 7 shall also indicate category 4. A UE indicating category 8 shall also indicate category 5. A UE indicating category 9 shall also indicate category 6 and 4. A UE indicating category 10 shall also indicate category 7 and 4. A UE indicating category 11 shall also indicate category 9, 6 and 4. A UE indicating category 12 shall also indicate category 10, 7 and 4. Table 4.1-4 defines the minimum capability for the maximum number of bits of a MCH transport block received within a TTI for an MBMS capable UE capable of reception via MBSFN.

Table 4.1-1: Downlink physical layer parameter values set by the field *ue-Category*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE Category | Maximum number of DL-SCH transport block bits received within a TTI (Note 1) | Maximum number of bits of a DL-SCH transport block received within a TTI | Total number of soft channel bits | Maximum number of supported layers for spatial multiplexing in DL |
| Category 1 | 10296 | 10296 | 250368 | 1 |
| Category 2 | 51024 | 51024 | 1237248 | 2 |
| Category 3 | 102048 | 75376 | 1237248 | 2 |
| Category 4 | 150752 | 75376 | 1827072 | 2 |
| Category 5 | 299552 | 149776 | 3667200 | 4 |
| Category 6 | 301504 | 149776 (4 layers, 64QAM)75376 (2 layers, 64QAM) | 3654144 | 2 or 4 |
| Category 7 | 301504 | 149776 (4 layers, 64QAM)75376 (2 layers, 64QAM) | 3654144 | 2 or 4 |
| Category 8 | 2998560 | 299856 | 35982720 | 8 |
| Category 9 | 452256 | 149776 (4 layers, 64QAM)75376 (2 layers, 64QAM) | 5481216 | 2 or 4 |
| Category 10 | 452256 | 149776 (4 layers, 64QAM)75376 (2 layers, 64QAM) | 5481216 | 2 or 4 |
| Category 11 | 603008 | 149776 (4 layers, 64QAM)195816 (4 layers, 256QAM)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM) | 7308288 | 2 or 4 |
| Category 12 | 603008 | 149776 (4 layers, 64QAM)195816 (4 layers, 256QAM)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM) | 7308288 | 2 or 4 |
| NOTE 1: In carrier aggregation operation, the DL-SCH processing capability can be shared by the UE with that of MCH received from a serving cell. If the total eNB scheduling for DL-SCH and an MCH in one serving cell at a given TTI is larger than the defined processing capability, the prioritization between DL-SCH and MCH is left up to UE implementation. |

Table 4.1-2: Uplink physical layer parameter values set by the field *ue-Category*

|  |  |  |  |
| --- | --- | --- | --- |
| UE Category | Maximum number of UL-SCH transport block bits transmitted within a TTI | Maximum number of bits of an UL-SCH transport block transmitted within a TTI | Support for 64QAM in UL |
| Category 1 | 5160 | 5160 | No |
| Category 2 | 25456 | 25456 | No |
| Category 3 | 51024 | 51024 | No |
| Category 4 | 51024 | 51024 | No |
| Category 5 | 75376 | 75376 | Yes |
| Category 6 | 51024 | 51024 | No |
| Category 7 | 102048 | 51024 | No |
| Category 8 | 1497760 | 149776 | Yes |
| Category 9 | 51024 | 51024 | No |
| Category 10 | 102048 | 51024 | No |
| Category 11 | 51024 | 51024 | No |
| Category 12 | 102048 | 51024 | No |

Table 4.1-3: Total layer 2 buffer sizes set by the field *ue-Category*

|  |  |  |
| --- | --- | --- |
| UE Category | Total layer 2 buffer size [bytes] | With support for split bearers |
| Category 1 | 150 000 | 230 000 |
| Category 2 | 700 000 | 1 100 000 |
| Category 3 | 1 400 000 | 2 300 000 |
| Category 4 | 1 900 000 | 3 100 000 |
| Category 5 | 3 500 000 | 5 900 000 |
| Category 6 | 3 300 000 | 5 800 000 |
| Category 7 | 3 800 000 | 6 200 000 |
| Category 8 | 42 200 000 | 61 600 000 |
| Category 9 | 4 800 000 | 7 200 000 |
| Category 10 | 5 200 000 | 7 600 000 |
| Category 11 | 6 200 000 | 11 000 000 |
| Category 12 | 6 700 000 | 11 500 000 |

Table 4.1-4: Maximum number of bits of a MCH transport block received within a TTI set by the field *ue-Category* for an MBMS capable UE capable of reception via MBSFN

|  |  |
| --- | --- |
| UE Category | Maximum number of bits of a MCH transport block received within a TTI |
| Category 1 | 10296 |
| Category 2 | 51024 |
| Category 3 | 75376 |
| Category 4 | 75376 |
| Category 5 | 75376 |
| Category 6 | 75376 |
| Category 7 | 75376 |
| Category 8 | 75376 |
| Category 9 | 75376 |
| Category 10 | 75376 |
| Category 11 | 75376 (64QAM)97896 (256QAM) |
| Category 12 | 75376 (64QAM)97896 (256QAM) |

Table 4.1-5: Half-duplex FDD operation type set by the field *ue-Category* for a half-duplex FDD capable UE

|  |  |
| --- | --- |
| UE Category | Half-duplex FDD operation type |
| Category 1 | Type A |
| Category 2 | Type A |
| Category 3 | Type A |
| Category 4 | Type A |
| Category 5 | Type A |
| Category 6 | Type A |
| Category 7 | Type A |
| Category 8 | Type A |
| Category 9 | Type A |
| Category 10 | Type A |
| Category 11 | Type A |
| Category 12 | Type A |

## 4.1A *ue-CategoryDL* and *ue-CategoryUL*

The fields *ue-CategoryDL* and *ue-CategoryUL* define downlink/uplink capability respectively. The parameters set by the UE DL/UL Categories are defined in subclause 4.2. Tables 4.1A-1 and 4.1A-2 define the downlink and, respectively, uplink physical layer parameter values for each UE DL/UL Category.Table 4.1A-4 defines the minimum capability for the maximum number of bits of a MCH transport block received within a TTI for an MBMS capable UE capable of reception via MBSFN. Table 4.1A-6 defines the only combinations for UE UL and DL Categories that are allowed to be signalled with *ue-CategoryDL* and *ue-CategoryUL*. Table 4.1A-6 also defines which UE Categories a UE shall indicate in addition to the combinations for UE UL and DL Categories. A UE indicating DL category 13 may indicate category 9 or 10 in *ue-Category-v1170*. A UE indicating Category M2 shall also indicate Category M1.

Table 4.1A-1: Downlink physical layer parameter values set by the field *ue-CategoryDL*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE DL Category | Maximum number of DL-SCH transport block bits received within a TTI (Note 1) | Maximum number of bits of a DL-SCH transport block received within a TTI | Total number of soft channel bits | Maximum number of supported layers for spatial multiplexing in DL |
| DL Category M1 | 1000 | 1000 | 25344 | 1 |
| DL Category M2 | 4008 | 4008 | 73152 | 1 |
| DL Category 0 (Note 2) | 1000 | 1000 | 25344 | 1 |
| DL Category 1bis | 10296 | 10296 | 250368 | 1 |
| DL Category 4 | 150752 | 75376 | 1827072 | 2 |
| DL Category 6 | 301504 | 149776 (4 layers, 64QAM)75376 (2 layers, 64QAM) | 3654144 | 2 or 4 |
| DL Category 7 | 301504 | 149776 (4 layers, 64QAM)75376 (2 layers, 64QAM) | 3654144 | 2 or 4 |
| DL Category 9 | 452256 | 149776 (4 layers, 64QAM)75376 (2 layers, 64QAM) | 5481216 | 2 or 4 |
| DL Category 10 | 452256 | 149776 (4 layers, 64QAM)75376 (2 layers, 64QAM) | 5481216 | 2 or 4 |
| DL Category 11 | 603008 | 149776 (4 layers, 64QAM)195816 (4 layers, 256QAM)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM) | 7308288 | 2 or 4 |
| DL Category 12 | 603008 | 149776 (4 layers, 64QAM)195816 (4 layers, 256QAM)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM) | 7308288 | 2 or 4 |
| DL Category 13 | 391632 | 195816 (4 layers, 256QAM)97896 (2 layers, 256QAM) | 3654144 | 2 or 4 |
| DL Category 14 | 3916560 | 391656 (8 layers, 256QAM) | 47431680 | 8 |
| DL Category 15 | 749856-807744 (Note 3) | 149776 (4 layers, 64QAM)195816 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)201936 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is supported)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)100752 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is supported) | 9744384 | 2 or 4 |
| DL Category 16 | 978960 -1051360 (Note 3) | 149776 (4 layers, 64QAM)195816 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)201936 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is supported)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)100752 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is supported) | 12789504 | 2 or 4 |
| DL Category 17 | 25065984 | 391656 (8 layers, 256QAM) | 303562752 | 8 |
| DL Category 18 | 1174752-1211616 (Note 3) | 299856 (8 layers, 64QAM)391656 (8 layers, 256QAM)149776 (4 layers, 64QAM)195816 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)201936 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is supported)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)100752 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is supported) | 14616576 | 2 or 4 or 8 |
| DL Category 19 | 1566336 -1658272 (Note 3) | 299856 (8 layers, 64QAM)391656 (8 layers, 256QAM)149776 (4 layers, 64QAM)195816 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)201936 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is supported)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)100752 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is supported) | 19488768 | 2 or 4 or 8 |
| DL Category 20 | 1948064 - 2019360 (Note 3) | 299856 (8 layers, 64QAM)391656 (8 layers, 256QAM)149776 (4 layers, 64QAM)195816 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)201936 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is supported)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)100752 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is supported) | 24360960 | 2 or 4 or 8 |
| DL Category 21 | 1348960 - 1413120 (Note 3) | 149776 (4 layers, 64QAM)195816 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)201936 (4 layers, 256QAM, if *alternativeTBS-Index-r14* is supported)75376 (2 layers, 64QAM)97896 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is not supported)100752 (2 layers, 256QAM, if *alternativeTBS-Index-r14* is supported) | 17052672 | 2 or 4 |
| NOTE 1: In carrier aggregation operation, the DL-SCH processing capability can be shared by the UE with that of MCH received from a serving cell. If the total eNB scheduling for DL-SCH and an MCH in one serving cell at a given TTI is larger than the defined processing capability, the prioritization between DL-SCH and MCH is left up to UE implementation.NOTE 2: Within one TTI, a UE indicating category 0 shall be able to receive up to 1000 bits for a transport block associated with C-RNTI/Semi-Persistent Scheduling C-RNTI/P-RNTI/SI-RNTI/RA-RNTI and up to 2216 bits for another transport block associated with P-RNTI/SI-RNTI/RA-RNTI.NOTE 3: The UE indicating category x shall reach the value within the defined range indicated by "Maximum number of DL-SCH transport block bits received within a TTI" of category x. The UE shall determine the required value within the defined range indicated by "Maximum number of DL-SCH transport block bits received within a TTI" of the corresponding category, based on its capabilities (i.e. CA band combination, MIMO, Modulation scheme). If the UE capability of CA band combination, MIMO and modulation scheme supported can exceed the upper limit of the defined range, the UE shall support the maximum value of the defined range indicated by "Maximum number of DL-SCH transport block bits received within a TTI" of the corresponding category. |

Table 4.1A-2: Uplink physical layer parameter values set by the field *ue-CategoryUL*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UE UL Category | Maximum number of UL-SCH transport block bits transmitted within a TTI | Maximum number of bits of an UL-SCH transport block transmitted within a TTI | Support for 64QAM in UL | Support for 256QAM in UL |
| UL Category M1(Note 1) | 1000 or 2984 | 1000 or 2984 | No | No |
| UL Category M2 | 6968 | 6968 | No | No |
| UL Category 0 | 1000 | 1000 | No | No |
| UL Category 1bis | 5160 | 5160 | No | No |
| UL Category 3 | 51024 | 51024 | No | No |
| UL Category 5 | 75376 | 75376 | Yes | No |
| UL Category 7 | 102048 | 51024 | No | No |
| UL Category 8 | 1497760 | 149776 | Yes | No |
| UL Category 13 | 150752 | 75376 | Yes | No |
| UL Category 14 | 9585664 | 149776 | Yes | No |
| UL Category 15 | 226128 | 75376 | Yes | No |
| UL Category 16 | 105528 | 105528 | Yes | Yes |
| UL Category 17 | 2119360 | 211936 | Yes | Yes |
| UL Category 18 | 211056 | 105528 | Yes | Yes |
| UL Category 19 | 13563904 | 211936 | Yes | Yes |
| UL Category 20 | 316584 | 105528 | Yes | Yes |
| UL Category 21 | 301504 | 75376 | Yes | No |
| NOTE 1: The UE supports "Maximum number of UL-SCH transport block bits transmitted within a TTI" and "Maximum number of bits of an UL-SCH transport block transmitted within a TTI" of 2984 bits if the UE indicates support of *ce-PUSCH-NB-MaxTBS-r14*. Otherwise the UE supports 1000 bits.  |  |

Table 4.1A-3: Total layer 2 buffer sizes set by the fields *ue-CategoryDL and ue-CategoryUL*

|  |  |  |  |
| --- | --- | --- | --- |
| UE DL Category | UE UL Category | Total layer 2 buffer size [bytes] | With support for split bearers [bytes] |
| DL Category M1 (Note 1) | UL Category M1 | 20 000 or 40 000 | N/A |
| DL Category M2 | UL Category M2 | 100 000 | N/A |
| DL Category 0 | UL Category 0 | 20 000 | N/A |
| DL Category 1bis | UL Category 1bis | 150 000 | 230 000 |
| DL Category 4 | UL Category 5 | 2 200 000 | 3 300 000 |
| DL Category 6 | UL Category 5 | 3 500 000 | 6 000 000 |
| DL Category 6 | UL Category 16 | 3 800 000 | 6 300 000 |
| DL Category 7 | UL Category 13 | 4 200 000 | 6 700 000 |
| DL Category 7 | UL Category 18 | 4 800 000 | 7 300 000 |
| DL Category 9 | UL Category 5 | 5 000 000 | 7 400 000 |
| DL Category 9 | UL Category 16 | 5 200 000 | 7 700 000 |
| DL Category 10 | UL Category 13 | 5 700 000 | 8 100 000 |
| DL Category 10 | UL Category 18 | 6 200 000 | 8 700 000 |
| DL Category 11 | UL Category 5 | 6 400 000 | 11 300 000 |
| DL Category 11 | UL Category 16 | 6 600 000 | 11 500 000 |
| DL Category 12 | UL Category 13 | 7 100 000 | 12 000 000 |
| DL Category 12 | UL Category 15 | 7 700 000 | 12 600 000 |
| DL Category 12 | UL Category 18 | 7 600 000 | 12 500 000 |
| DL Category 12 | UL Category 20 | 8 600 000 | 13 500 000 |
| DL Category 13 | UL Category 3 | 4 200 000 | 7 300 000 |
| DL Category 13 | UL Category 5 | 4 400 000 | 7 600 000 |
| DL Category 13 | UL Category 7 | 4 700 000 | 7 800 000 |
| DL Category 13 | UL Category 13 | 5 100 000 | 8 300 000 |
| DL Category 13 | UL Category 16 | 4 700 000 | 7 800 000 |
| DL Category 13 | UL Category 18 | 5 700 000 | 8 800 000 |
| DL Category 14 | UL Category 8 | 50 800 000 | 76 200 000 |
| DL Category 14 | UL Category 17 | 56 600 000 | 82 000 000 |
| DL Category 15 | UL Category 3 | 8 000 000 | 13 000 000 |
| DL Category 15 | UL Category 5 | 8 200 000 | 13 400 000 |
| DL Category 15 | UL Category 7 | 8 500 000 | 13 600 000 |
| DL Category 15 | UL Category 13 | 8 900 000 | 14 100 000 |
| DL Category 15 | UL Category 16 | 8 500 000 | 13 700 000 |
| DL Category 15 | UL Category 18 | 9 500 000 | 14 700 000 |
| DL Category 16 | UL Category 3 | 10 000 000 | 17 000 000 |
| DL Category 16 | UL Category 5 | 10 600 000 | 17 400 000 |
| DL Category 16 | UL Category 7 | 10 800 000 | 17 600 000 |
| DL Category 16 | UL Category 13 | 11 000 000 | 18 100 000 |
| DL Category 16 | UL Category 15 | 12 000 000 | 18 800 000 |
| DL Category 16 | UL Category 16 | 8 500 000 | 13 700 000 |
| DL Category 16 | UL Category 18 | 11 800 000 | 18 700 000 |
| DL Category 16 | UL Category 20 | 12 800 000 | 19 700 000 |
| DL Category 17 | UL Category 14 | 330 000 000 | 530 000 000 |
| DL Category 17 | UL Category 19 | 360 000 000 | 530 000 000 |
| DL Category 18 | UL Category 3 | 11 800 000 | 21 600 000 |
| DL Category 18 | UL Category 5 | 12 000 000 | 21 800 000 |
| DL Category 18 | UL Category 7 | 12 300 000 | 22 100 000 |
| DL Category 18 | UL Category 13 | 12 700 000 | 22 500 000 |
| DL Category 18 | UL Category 15 | 13 400 000 | 23 200 000 |
| DL Category 18 | UL Category 16 | 12 300 000 | 22 100 000 |
| DL Category 18 | UL Category 18 | 13 300 000 | 23 100 000 |
| DL Category 18 | UL Category 20 | 14 300 000 | 24 100 000 |
| DL Category 19 | UL Category 3 | 16 000 000 | 28 300 000 |
| DL Category 19 | UL Category 5 | 16 300 000 | 28 500 000 |
| DL Category 19 | UL Category 7 | 16 500 000 | 28 800 000 |
| DL Category 19 | UL Category 13 | 17 000 000 | 29 200 000 |
| DL Category 19 | UL Category 15 | 17 700 000 | 29 900 000 |
| DL Category 19 | UL Category 16 | 16 500 000 | 28 800 000 |
| DL Category 19 | UL Category 18 | 17 500 000 | 29 800 000 |
| DL Category 19 | UL Category 20 | 18 500 000 | 30 800 000 |
| DL Category 19 | UL Category 21 | 18 400 000 | 30 600 000 |
| DL Category 20 | UL Category 3 | 19 400 000 | 35 800 000 |
| DL Category 20 | UL Category 5 | 19 600 000 | 36 000 000 |
| DL Category 20 | UL Category 7 | 19 900 000 | 36 300 000 |
| DL Category 20 | UL Category 13 | 20 300 000 | 36 800 000 |
| DL Category 20 | UL Category 15 | 21 100 000 | 37 500 000 |
| DL Category 20 | UL Category 16 | 19 900 000 | 36 300 000 |
| DL Category 20 | UL Category 18 | 20 900 000 | 37 300 000 |
| DL Category 20 | UL Category 20 | 21 900 000 | 38 300 000 |
| DL Category 20 | UL Category 21 | 21 800 000 | 38 200 000 |
| DL Category 21 | UL Category 3 | 13 700 000 | 23 500 000 |
| DL Category 21 | UL Category 5 | 13 900 000 | 23 700 000 |
| DL Category 21 | UL Category 7 | 14 200 000 | 24 000 000 |
| DL Category 21 | UL Category 13 | 14 600 000 | 24 400 000 |
| DL Category 21 | UL Category 15 | 15 300 000 | 25 200 000 |
| DL Category 21 | UL Category 16 | 14 200 000 | 24 000 000 |
| DL Category 21 | UL Category 18 | 15 200 000 | 25 000 000 |
| DL Category 21 | UL Category 20 | 16 200 000 | 26 000 000 |
| NOTE 1: The UE supports "Total layer 2 buffer size" of 40 000 bytes if the UE indicates support of *ce-PUSCH-NB-MaxTBS-r14*. Otherwise the UE supports 20 000 bytes. |

Table 4.1A-4: Maximum number of bits of a MCH transport block received within a TTI set by the field *ue-CategoryDL* for an MBMS capable UE capable of reception via MBSFN

|  |  |
| --- | --- |
| UE DL Category | Maximum number of bits of a MCH transport block received within a TTI |
| DL Category M1 | NA |
| DL Category M2 | NA |
| DL Category 0 | 4584 |
| DL Category 1bis | 10296 |
| DL Category 4 | 75376 |
| DL Category 6 | 75376 |
| DL Category 7 | 75376 |
| DL Category 9 | 75376 |
| DL Category 10 | 75376 |
| DL Category 11 | 75376 (64QAM)97896 (256QAM) |
| DL Category 12 | 75376 (64QAM)97896 (256QAM) |
| DL Category 13 | 75376 (64QAM)97896 (256QAM) |
| DL Category 14 | 75376 (64QAM)97896 (256QAM) |
| DL Category 15 | 75376 (64QAM)97896 (256QAM) |
| DL Category 16 | 75376 (64QAM)97896 (256QAM) |
| DL Category 17 | 75376 (64QAM)97896 (256QAM) |
| DL Category 18 | 75376 (64QAM)97896 (256QAM) |
| DL Category 19 | 75376 (64QAM)97896 (256QAM) |
| DL Category 20 | 75376 (64QAM)97896 (256QAM) |
| DL Category 21 | 75376 (64QAM)97896 (256QAM) |

Table 4.1A-5: Half-duplex FDD operation type set by the field *ue-CategoryDL* for a half-duplex FDD capable UE

|  |  |
| --- | --- |
| UE DL Category | Half-duplex FDD operation type |
| DL Category M1 | Type B |
| DL Category M2 | Type B |
| DL Category 0 | Type B |
| DL Category 1bis | Type A |
| DL Category 4 | Type A |
| DL Category 6 | Type A |
| DL Category 7 | Type A |
| DL Category 9 | Type A |
| DL Category 10 | Type A |
| DL Category 11 | Type A |
| DL Category 12 | Type A |
| DL Category 13 | Type A |
| DL Category 14 | Type A |
| DL Category 15 | Type A |
| DL Category 16 | Type A |
| DL Category 17 | Type A |
| DL Category 18 | Type A |
| DL Category 19 | Type A |
| DL Category 20 | Type A |
| DL Category 21 | Type A |

Table 4.1A-6: supported DL/UL Categories combinations and maximum UE channel bandwidth set by the fields *ue-CategoryDL* and *ue-CategoryUL* and UE categories to be indicated

|  |  |  |  |
| --- | --- | --- | --- |
| UE DL Category | UE UL Category | UE categories | Maximum UE channel bandwidth [MHz] |
| DL Category M1 | UL Category M1 | N/A | 1.4 |
| DL Category M2 | UL Category M2 | N/A | 5(NOTE 2) |
| DL Category 0 | UL Category 0 | N/A | According to maximum channel bandwidth specified per band in TS 36.101 [6]. |
| DL Category 1bis | UL Category 1bis | Category 1 (NOTE 1) |
| DL Category 4 | UL Category 5 | Category 4 |
| DL Category 6 | UL Category 5 | Category 6, 4 |
| DL Category 6 | UL Category 16 | Category 6, 4DL Category 6 and UL Category 5 |
| DL Category 7 | UL Category 13 | Category 7, 4 |
| DL Category 7 | UL Category 18 | Category 7, 4DL Category 7 and UL Category 13 |
| DL Category 9 | UL Category 5 | Category 9, 6, 4 |
| DL Category 9 | UL Category 16 | Category 9, 6, 4DL Category 9 and UL Category 5 |
| DL Category 10 | UL Category 13 | Category 10, 7, 4 |
| DL Category 10 | UL Category 18 | Category 10, 7, 4DL Category 10 and UL Category 13  |
| DL Category 11 | UL Category 5 | Category 11, 9, 6, 4 |
| DL Category 11 | UL Category 16 | Category 11, 9, 6, 4DL Category 11 and UL Category 5 |
| DL Category 12 | UL Category 13 | Category 12, 10, 7, 4 |
| DL Category 12 | UL Category 15 | Category 12, 10, 7, 4DL Category 12 and UL Category 13 |
| DL Category 12 | UL Category 18 | Category 12, 10, 7, 4DL Category 12 and UL Category 13 |
| DL Category 12 | UL Category 20 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 12 and UL Category 15 |
| DL Category 13 | UL Category 3 | Category 6, 4, 9 (if supported) |
| DL Category 13 | UL Category 5 | Category 6, 4, 9 (if supported) |
| DL Category 13 | UL Category 7 | Category 7, 4, 10 (if supported) |
| DL Category 13 | UL Category 13 | Category 7, 4, 10 (if supported) |
| DL Category 13 | UL Category 16 | Category 6, 4DL Category 13 and UL Category 5 |
| DL Category 13 | UL Category 18 | Category 7, 4DL Category 13 and UL Category 13 |
| DL Category 14 | UL Category 8 | Category 8, 5 |
| DL Category 14 | UL Category 17 | Category 8, 5DL Category 14 and UL Category 8 |
| DL Category 15 | UL Category 3 | Category 11, 9, 6, 4 |
| DL Category 15 | UL Category 5 | Category 11, 9, 6, 4DL Category 11 and UL Category 5 |
| DL Category 15 | UL Category 7 | Category 12, 10, 7, 4 |
| DL Category 15 | UL Category 13 | Category 12, 10, 7, 4DL Category 12 and UL Category 13 |
| DL Category 15 | UL Category 16 | Category 11, 9, 6, 4DL Category 11 and UL Category 5DL Category 15 and UL Category 5 |
| DL Category 15 | UL Category 18 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 15 and UL Category 13 |
| DL Category 16 | UL Category 3 | Category 11, 9, 6, 4 |
| DL Category 16 | UL Category 5 | Category 11, 9, 6, 4DL Category 11 and UL Category 5 |
| DL Category 16 | UL Category 7 | Category 12, 10, 7, 4 |
| DL Category 16 | UL Category 13 | Category 12, 10, 7, 4DL Category 12 and UL Category 13 |
| DL Category 16 | UL Category 15 | Category 12, 10, 7, 4DL Category 16,12 and UL Category 13 |
| DL Category 16 | UL Category 16 | Category 11, 9, 6, 4DL Category 11 and UL Category 5DL Category 16 and UL Category 5 |
| DL Category 16 | UL Category 18 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13 |
| DL Category 16 | UL Category 20 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 16 and UL Category 15 |
| DL Category 17 | UL Category 14 | Category 8, 5DL Category 14 and UL Category 8 |
| DL Category 17 | UL Category 19 | Category 8, 5DL Category 14 and UL Category 8DL Category 17 and UL Category 14 |
| DL Category 18 | UL Category 3 | Category 11, 9, 6, 4DL Category 16 and UL Category 3 |
| DL Category 18 | UL Category 5 | Category 11, 9, 6, 4DL Category 16, 11 and UL Category 5 |
| DL Category 18 | UL Category 7 | Category 12, 10, 7, 4DL Category 16 and UL Category 7 |
| DL Category 18 | UL Category 13 | Category 12, 10, 7, 4DL Category 16, 12 and UL Category 13 |
| DL Category 18 | UL Category 15 | Category 12, 10, 7, 4DL Category 16,12 and UL Category 13 |
| DL Category 18 | UL Category 16 | Category 11, 9, 6, 4DL Category 11 and UL Category 5DL Category 16 and UL Category 5DL Category 18 and UL Category 5 |
| DL Category 18 | UL Category 18 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13 |
| DL Category 18 | UL Category 20 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 18 and UL Category 15 |
| DL Category 19 | UL Category 3 | Category 11, 9, 6, 4DL Category 16 and UL Category 3 |
| DL Category 19 | UL Category 5 | Category 11, 9, 6, 4DL Category 16, 11 and UL Category 5 |
| DL Category 19 | UL Category 7 | Category 12, 10, 7, 4DL Category 16 and UL Category 7 |
| DL Category 19 | UL Category 13 | Category 12, 10, 7, 4DL Category 16, 12 and UL Category 13 |
| DL Category 19 | UL Category 15 | Category 12, 10, 7, 4DL Category 16,12 and UL Category 13 |
| DL Category 19 | UL Category 16 | Category 11, 9, 6, 4DL Category 11 and UL Category 5DL Category 16 and UL Category 5DL Category 19 and UL Category 5 |
| DL Category 19 | UL Category 18 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 19 and UL Category 13 |
| DL Category 19 | UL Category 20 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 19 and UL Category 15 |
| DL Category 19 | UL Category 21 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 19 and UL Category 15 |
| DL Category 20 | UL Category 3 | Category 11, 9, 6, 4DL Category 16 and UL Category 3DL Category 19 and UL Category 3 |
| DL Category 20 | UL Category 5 | Category 11, 9, 6, 4DL Category 16, 11 and UL Category 5DL Category 19 and UL Category 5 |
| DL Category 20 | UL Category 7 | Category 12, 10, 7, 4DL Category 16 and UL Category 7DL Category 19 and UL Category 7 |
| DL Category 20 | UL Category 13 | Category 12, 10, 7, 4DL Category 16, 12 and UL Category 13DL Category 19 and UL Category 13 |
| DL Category 20 | UL Category 15 | Category 12, 10, 7, 4DL Category 16,12 and UL Category 13DL Category 19 and UL Category 13DL Category 19 and UL Category 15 |
| DL Category 20 | UL Category 16 | Category 11, 9, 6, 4DL Category 11 and UL Category 5DL Category 16 and UL Category 5DL Category 19 and UL Category 5DL Category 19 and UL Category 16 |
| DL Category 20 | UL Category 18 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 19 and UL Category 13DL Category 19 and UL Category 18 |
| DL Category 20 | UL Category 20 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 19 and UL Category 15DL Category 19 and UL Category 20 |
| DL Category 20 | UL Category 21 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 19 and UL Category 15DL Category 19 and UL Category 21 |
| DL Category 21 | UL Category 3 | Category 11, 9, 6, 4DL Category 16 and UL Category 3DL Category 18 and UL Category 3 |  |
| DL Category 21 | UL Category 5 | Category 11, 9, 6, 4DL Category 16, 11 and UL Category 5DL Category 18 and UL Category 5 |
| DL Category 21 | UL Category 7 | Category 12, 10, 7, 4DL Category 16 and UL Category 7DL Category 18 and UL Category 7 |
| DL Category 21 | UL Category 13 | Category 12, 10, 7, 4DL Category 16, 12 and UL Category 13DL Category 18 and UL Category 13 |
| DL Category 21 | UL Category 15 | Category 12, 10, 7, 4DL Category 16,12 and UL Category 13DL Category 18 and UL Category 13DL Category 18 and UL Category 15 |
| DL Category 21 | UL Category 16 | Category 11, 9, 6, 4DL Category 11 and UL Category 5DL Category 16 and UL Category 5DL Category 18 and UL Category 5DL Category 18 and UL Category 16 |
| DL Category 21 | UL Category 18 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 18 and UL Category 13DL Category 18 and UL Category 18 |
| DL Category 21 | UL Category 20 | Category 12, 10, 7, 4DL Category 12 and UL Category 13DL Category 16 and UL Category 13DL Category 18 and UL Category 15DL Category 18 and UL Category 20 |
| NOTE 1: The UE indicating DL category 1bis is only required to support 1Rx antenna even though the UE indicates UE category 1 for legacy compatibility. |
| NOTE 2: The minimum of 5 MHz and the maximum channel bandwidth specified per band in TS 36.101 [6]. |

## 4.1B ue-CategorySL-C andue-CategorySL-D

The ue-CategorySL-C and ue-CategorySL-D define reception and transmission capabilities for sidelink communication, V2X sidelink communication and sidelink discovery respectively. The parameters set by the UE SL-C (sidelink communication and V2X sidelink communication) category and UE SL-D (sidelink discovery) category are defined in subclause 4.2A. Table 4.1B-1 defines physical layer parameter values for each SL-C Category. Table 4.1B-2 defines physical layer parameter values for each SL-D Category. If a UE of this release supports sidelink communication, the UE shall support SL-C Category 1. If a UE of this release supports V2X sidelink communication, the UE shall support SL-C Category 2. If a UE supports SL-C Category 2, the UE shall support 737280 soft channel bits. If a UE of this release supports sidelink discovery, the UE shall support SL-D Category 1.

Table 4.1B-1: Reception and transmission physical parameter values set by ue-CategorySL-C

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| UE SL-C Category | Maximum number of SL-SCH transport block bits received within a TTI  | Maximum number of bits of a SL-SCH transport block received within a TTI | Maximum number of SL-SCH transport block bits transmitted within a TTI | Maximum number of bits of a SL-SCH transport block transmitted within a TTI | Maximum number of supported layers for spatial multiplexing in SL-C |
| SL-C Category 1 | 25456 | 25456 | 25456 | 25456 | 1 |
| SL-C Category 2 | 31704 | 31704 | 31704 | 31704 | 1 |

Table 4.1B-2: Reception and transmission physical parameter values set by ue-CategorySL-D

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| UE SL-D Category | Maximum number of SL-DCH transport block bits received within a TTI  | Maximum number of bits of a SL-DCH transport block received within a TTI | Maximum number of SL-DCH transport block bits transmitted within a TTI | Maximum number of bits of a SL-DCH transport block transmitted within a TTI | Maximum number of supported layers for spatial multiplexing in SL-D |
| SL-D Category 1 | 11600 | 232 | 232 | 232 | 1 |

## 4.1C *ue-Category-NB*

The field *ue-Category-NB* defines a combined uplink and downlink capability in NB-IoT. The parameters set by the UE Category are defined in subclause 4.2. Tables 4.1C-1 and 4.1C-2 define the downlink and, respectively, uplink physical layer parameter values for each UE Category. A UE indicating Category NB2 shall also indicate Category NB1.

Table 4.1C-1: Downlink physical layer parameter values set by the field *ue-Category-NB*

|  |  |  |  |
| --- | --- | --- | --- |
| UE Category | Maximum number of DL-SCH transport block bits received within a TTI | Maximum number of bits of a DL-SCH transport block received within a TTI | Total number of soft channel bits |
| Category NB1 | 680 | 680 | 2112 |
| Category NB2  | 2536 | 2536 | 6400 |

Table 4.1C-2: Uplink physical layer parameter values set by the field *ue-Category-NB*

|  |  |  |
| --- | --- | --- |
| UE Category | Maximum number of UL-SCH transport block bits transmitted within a TTI | Maximum number of bits of an UL-SCH transport block transmitted within a TTI |
| Category NB1 | 1000 | 1000 |
| Category NB2 | 2536 | 2536 |

Table 4.1C-3: Total layer 2 buffer sizes set by the field *ue-Category-NB*

|  |  |
| --- | --- |
| UE Category | Total layer 2 buffer size [bytes] |
| Category NB1 | 4000 |
| Category NB2 | 8000 |

Table 4.1C-5: Half-duplex FDD operation type set by the field *ue-Category-NB* for a half-duplex FDD capable UE

|  |  |
| --- | --- |
| UE Category | Half-duplex FDD operation type |
| Category NB1 | Type B |
| Category NB2 | Type B |

## 4.2 Parameters set by the field *ue-Category* and *ue-CategoryDL / ue-CategoryUL*

### 4.2.1 Transport channel parameters in downlink

#### 4.2.1.1 Maximum number of DL-SCH transport block bits received within a TTI

Defines the maximum number of DL-SCH transport blocks bits that the UE is capable of receiving within a DL-SCH TTI.

This number does not include the bits of a DL-SCH transport block carrying BCCH in the same subframe.

#### 4.2.1.2 Maximum number of bits of a DL-SCH transport block received within a TTI

Defines the maximum number of DL-SCH transport block bits that the UE is capable of receiving in a single transport block within a DL-SCH TTI per cell.

#### 4.2.1.3 Total number of DL-SCH soft channel bits

Defines the total number of soft channel bits available for HARQ processing.

This number does not include the soft channel bits required by the dedicated broadcast HARQ process for the decoding of system information.

#### 4.2.1.4 Maximum number of bits of a MCH transport block received within a TTI

Defines the maximum number of MCH transport block bits that the UE is capable of receiving within a MCH TTI.

### 4.2.2 Transport channel parameters in uplink

#### 4.2.2.1 Maximum number of bits of an UL-SCH transport block transmitted within a TTI

Defines the maximum number of UL-SCH transport block bits that the UE is capable of transmitting in a single transport block within an UL-SCH TTI.

#### 4.2.2.2 Maximum number of UL-SCH transport block bits transmitted within a TTI

Defines the maximum number of UL-SCH transport blocks bits that the UE is capable of transmitting within an UL-SCH TTI.

### 4.2.3 Physical channel parameters in downlink (DL)

#### 4.2.3.1 Maximum number of supported layers for spatial multiplexing in DL

This field defines the maximum number of supported layers for spatial multiplexing per UE. The UE shall support the number of layers according to its Rel-8/9 category (Cat. 1-5) in all non-CA band combinations. Further requirements on the number of supported layers for spatial multiplexing are provided in clause 4.3.5.2.

For each bandwidth class per band per band combination specified in *supportedBandCombination*, the UE provides the corresponding MIMO capability.

### 4.2.4 Physical channel parameters in uplink (UL)

#### 4.2.4.1 Support for 64QAM in UL

Defines if 64QAM is supported in UL.

### 4.2.5 Total layer 2 buffer size

This parameter defines the 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 for all radio bearers, and for UEs capable of split bearers, also in PDCP reordering windows for all split radio bearers.

### 4.2.6 Half-duplex FDD operation type

This parameter defines the type of half-duplex FDD operation for a half-duplex FDD capable UE. The half-duplex FDD operation type applies whenever the UE is in half-duplex FDD operation. The different types of half-duplex FDD operation are specified in TS 36.211 [17].

### 4.2.7 RF parameters

#### 4.2.7.1Maximum UE channel bandwidth

Defines the maximum channel bandwidth supported by the UE.

## 4.2A Parameters set by ue-CategorySL-C /ue-CategorySL-D

### 4.2A.1 Transport channel parameters in sidelink (SL)

#### 4.2A.1.1 Maximum number of SL-SCH transport block bits received within a TTI

Defines the maximum number of SL-SCH transport block bits that the UE is capable of receiving within a SL-SCH TTI.

#### 4.2A.1.2 Maximum number of bits of a SL-SCH transport block received within a TTI

Defines the maximum number of SL-SCH transport block bits that the UE is capable of receiving in a single transport block within a SL-SCH TTI.

#### 4.2A.1.3 Maximum number of SL-DCH transport block bits received within a TTI

Defines the maximum number of SL-DCH transport block bits that the UE is capable of receiving within a SL-DCH TTI.

#### 4.2A.1.4 Maximum number of bits of a SL-DCH transport block received within a TTI

Defines the maximum number of SL-DCH transport block bits that the UE is capable of receiving in a single transport block within a SL-DCH TTI.

#### 4.2A.1.5 Maximum number of bits of a SL-SCH transport block transmitted within a TTI

Defines the maximum number of SL-SCH transport block bits that the UE is capable of transmitting in a single transport block within a SL-SCH TTI.

#### 4.2A.1.6 Maximum number of SL-SCH transport block bits transmitted within a TTI

Defines the maximum number of SL-SCH transport block bits that the UE is capable of transmitting within a SL-SCH TTI.

#### 4.2A.1.7 Maximum number of bits of a SL-DCH transport block transmitted within a TTI

Defines the maximum number of SL-DCH transport block bits that the UE is capable of transmitting in a single transport block within a SL-DCH TTI.

#### 4.2A.1.8 Maximum number of SL-DCH transport block bits transmitted within a TTI

Defines the maximum number of SL-DCH transport block bits that the UE is capable of transmitting within a SL-DCH TTI.

### 4.2A.2 Physical channel parameters in sidelink (SL)

#### 4.2A.2.1 Maximum number of supported layers for spatial multiplexing in SL-C

This field defines the maximum number of supported layers for spatial multiplexing per UE in sidelink communication or V2X sidelink communication.

#### 4.2A.2.2 Maximum number of supported layers for spatial multiplexing in SL-D

This field defines the maximum number of supported layers for spatial multiplexing per UE in sidelink discovery.

## 4.3 Parameters independent of the field *ue-Category* and *ue-CategoryDL / ue-CategoryUL*

### 4.3.1 PDCP Parameters

#### 4.3.1.1 *supportedROHC-Profiles*

This field defines which ROHC profiles from the list below are supported by the UE.

- 0x0000 ROHC uncompressed (RFC 5795)

- 0x0001 ROHC RTP (RFC 3095, RFC 4815)

- 0x0002 ROHC UDP (RFC 3095, RFC 4815)

- 0x0003 ROHC ESP (RFC 3095, RFC 4815)

- 0x0004 ROHC IP (RFC 3843, RFC 4815)

- 0x0006 ROHC TCP (RFC 6846)

- 0x0101 ROHCv2 RTP (RFC 5225)

- 0x0102 ROHCv2 UDP (RFC 5225)

- 0x0103 ROHCv2 ESP (RFC 5225)

- 0x0104 ROHCv2 IP (RFC 5225)

A UE that supports one or more of the listed ROHC profiles shall support ROHC profile 0x0000 ROHC uncompressed (RFC 5795).

'IMS capable UEs supporting voice' shall support ROHC profiles 0x0000, 0x0001, 0x0002 and be able to compress and decompress headers of PDCP SDUs at a PDCP SDU rate corresponding to supported IMS voice codecs.

#### 4.3.1.1A *supportedROHC-Profiles-r13*

This field defines which ROHC profiles from the list below are supported by the UE:

- 0x0000 ROHC uncompressed (RFC 5795)

- 0x0002 ROHC UDP (RFC 3095, RFC 4815)

- 0x0003 ROHC ESP (RFC 3095, RFC 4815)

- 0x0004 ROHC IP (RFC 3843, RFC 4815)

- 0x0006 ROHC TCP (RFC 6846)

- 0x0102 ROHCv2 UDP (RFC 5225)

- 0x0103 ROHCv2 ESP (RFC 5225)

- 0x0104 ROHCv2 IP (RFC 5225)

A UE that supports one or more of the listed ROHC profiles shall support ROHC profile 0x0000 ROHC uncompressed (RFC 5795). This field is only applicable if the UE supports S1-U data transfer or User plane CIoT EPS Optimisation, see TS 36.331 [5], and any *ue-Category-NB*.

#### 4.3.1.2 *maxNumberROHC-ContextSessions*

This field defines the maximum number of header compression context sessions supported by the UE, excluding context sessions that leave all headers uncompressed.

#### 4.3.1.2A *maxNumberROHC-ContextSessions-r13*

This field defines the maximum number of header compression context sessions supported by the UE, excluding context sessions that leave all headers uncompressed. This field is only applicable if the UE supports S1-U data transfer or User plane CIoT EPS Optimisation, see TS 36.331 [5], and any *ue-Category-NB*.

#### 4.3.1.3 *pdcp-SN-Extension*

This field defines whether the UE supports 15 bit length of PDCP sequence number as specified in TS 36.323 [2]. It is mandatory for UEs supporting split bearers and UEs supporting 18 bit length of PDCP sequence number.

#### 4.3.1.4 *supportRohcContextContinue*

This field defines whether the UE supports ROHC context continuation operation where the UE does not reset the current ROHC context upon handover.

#### 4.3.1.5 *pdcp-SN-Extension-18bits-r13*

This field defines whether the UE supports 18 bit length of PDCP sequence number as specified in TS 36.323 [2].

#### 4.3.1.6 *supportedUplinkOnlyROHC-Profiles*

This field defines 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).

### 4.3.2 RLC parameters

#### 4.3.2.1 Void

#### 4.3.2.2 *extended-RLC-LI-Field-r12*

This field defines whether the UE supports 15 bit RLC Length Indicator (LI) as specified in TS 36.322 [3].

#### 4.3.2.3 *extendedRLC-SN-SO-Field-r13*

This field defines whether the UE supports 16 bit length of RLC sequence number and 16 bit length of RLC Segment Offset (SO) as specified in TS 36.322 [3]. It is mandatory for UEs supporting 16 bit length of MAC L field.

#### 4.3.2.4 *extendedPollByte-r14*

This field defines whether the UE supports extended pollByte values as defined by *pollByte-r14* in TS 36.331 [5].

### 4.3.3 Void

### 4.3.4 Physical layer parameters

#### 4.3.4.1 *ue-TxAntennaSelectionSupported*

This field defines whether the UE supports transmit antenna selection.

#### 4.3.4.2 *ue-SpecificRefSigsSupported*

This field defines whether the UE supports PDSCH transmission mode 7 for FDD.

#### 4.3.4.3 Void

#### 4.3.4.4 *enhancedDualLayerFDD*

This field defines whether the UE supports enhanced dual layer (PDSCH transmission mode 8) for FDD.

#### 4.3.4.5 *enhancedDualLayerTDD*

This field defines whether the UE supports enhanced dual layer (PDSCH transmission mode 8) for TDD. Enhanced dual layer shall be supported by UEs of this version of the specification supporting TDD.

#### 4.3.4.6 *supportedMIMO-CapabilityUL-r10*

This field defines the maximum number of spatial multiplexing layers in the uplink direction for a certain band and bandwidth class in a supportedBandCombination supported by the UE.

#### 4.3.4.7 *supportedMIMO-CapabilityDL-r10*

This field defines the maximum number of spatial multiplexing layers in the downlink direction for a certain band and bandwidth class in a supportedBandCombination supported by the UE. For bandwidth classes that include multiple component carriers (i.e. bandwidth classes B, C, D and so on), the field defines the maximum number of spatial multiplexing layers supported by the UE on all component carriers in the corresponding bandwidth class.

The support for more layers in *supportedMIMO-CapabilityDL* than given by the "maximum number of supported layers for spatial multiplexing in DL" derived from the *ue-Category* (without suffix) in the *UE-EUTRA-Capability* IE is only applicable to transmission mode 9 and transmission mode 10.

#### 4.3.4.8 *two-AntennaPortsForPUCCH-r10*

This field defines whether the UE supports transmit diversity for PUCCH formats 1/1a/1b/2/2a/2b, and if the UE supports PUCCH format 3, transmit diversity for PUCCH format 3.

#### 4.3.4.9 *tm9-With-8Tx-FDD-r10*

This field defines whether the UE supports PDSCH transmission mode 9 with 8 CSI reference signal ports for FDD when not operating in CE mode.

#### 4.3.4.10 *pmi-Disabling-r10*

This field defines whether the UE supports PMI disabling.

#### 4.3.4.11 *crossCarrierScheduling-r10*

This field defines whether the UE supports cross carrier scheduling operation for carrier aggregation, including (if the UE supports carrier aggregation in UL) the use of PCell as the pathloss reference for an SCell when *pathlossReference-r10* within *UplinkPowerControlDedicatedSCell-r10* is configured as "pCell". The UE supports PDCCH DCI formats with CIF if the UE indicates support for cross carrier scheduling.

NOTE: Regardless of whether the UE supports cross carrier scheduling operation or not, it is mandatory for a UE supporting carrier aggregation in UL to support the configuration where *pathlossReference-r10* within *UplinkPowerControlDedicatedSCell-r10* is set to "sCell".

#### 4.3.4.12 *simultaneousPUCCH-PUSCH-r10*

This field defines whether the UE baseband supports simultaneous transmission of PUCCH and PUSCH, and is band agnostic. If the UE indicates support of baseband capability for simultaneous transmission of PUCCH and PUSCH using this field, and if the UE indicates support of RF capability for non-contiguous UL resource allocation within a component carrier for a particular E-UTRA radio frequency band, then the UE supports simultaneous transmission of PUCCH and PUSCH within each component carrier of the band. If the UE indicates support of baseband capability for simultaneous transmission of PUCCH and PUSCH using this field, and if the UE indicates support of carrier aggregation in UL, then the UE supports simultaneous transmission of PUCCH and PUSCH across any UL component carriers which the UE can aggregate. If the UE supports uplink LAA, this field is only applicable for non-LAA cells. For LAA SCells, see subclause 7.7.4. If the UE supports DC, this field is applicable within a CG. If the UE supports PUCCH on SCell, this field is applicable within a PUCCH group as defined in TS 36.213 [22].

#### 4.3.4.13 *multiClusterPUSCH-WithinCC-r10*

This field defines whether the UE baseband supports multi-cluster PUSCH transmission within a component carrier (i.e. PUSCH resource allocation type 1), and is band agnostic. If the UE indicates support of baseband capability for multi-cluster PUSCH transmission within a component carrier using this field, and if the UE indicates support of RF capability for non-contiguous UL resource allocation within a component carrier for a particular E-UTRA radio frequency band, then the UE supports multi-cluster PUSCH transmission within each component carrier of the band.

NOTE: If the UE indicates support of carrier aggregation in UL, then the UE supports PUSCH transmissions over non-contiguous resource blocks across any UL component carriers which the UE can aggregate, regardless of whether or not the UE indicates support of baseband capability for multi-cluster PUSCH transmission within a component carrier using this field..

#### 4.3.4.14 *nonContiguousUL-RA-WithinCC-Info-r10*

This field defines whether the UE RF supports non-contiguous UL resource allocations within a component carrier, and is signalled per E-UTRA radio frequency band which the UE supports.

#### 4.3.4.15 *crs-InterfHandl-r11*

This field defines whether the UE supports CRS interference handling. It is mandatory for UEs of this release of the specification, except for Category 0, M1, 1bis and M2 UEs.

#### 4.3.4.16 Void

#### 4.3.4.17 Void

#### 4.3.4.18 *ePDCCH-r11*

This field defines whether the UE can receive DCI on UE specific search space on Enhanced PDCCH.

#### 4.3.4.19 *multiACK-CSI-Reporting-r11*

This field defines whether the UE supports multi-cell HARQ ACK and periodic CSI reporting and SR on PUCCH format 3 if the UE supports FDD carrier aggregation with more than two DL component carriers or TDD carrier aggregation.

#### 4.3.4.20 *ss-CCH-InterfHandl-r11*

This field defines whether the UE supports synchronisation signal and common channel interference handling if the UE supports *crs-InterfHandl-r11*. It is mandatory for UEs of this release of the specification to support this feature for TDD bands, except for Category 0, M1, 1bis and M2 UEs.

#### 4.3.4.21 *tdd-SpecialSubframe-r11*

This field defines whether the UE supports TDD special subframe as specified in TS 36.211 [17]. It is mandatory for UEs of this release of the specification.

#### 4.3.4.21A *tdd-SpecialSubframe-r14*

This field defines whether the UE supports TDD special subframe configuration 10 as specified in TS 36.211 [17]. A UE indicating support of *tdd-SpecialSubframe-r14* shall not indicate support of *ssp10-TDD-Only-r14*.

#### 4.3.4.21B *ssp10-TDD-Only-r14*

This field defines whether the UE supports TDD special subframe configuration 10 when operating only in TDD carriers (i.e., not in TDD/FDD CA or TDD/FS3 CA) as specified in TS 36.211 [17]. A UE indicating support of *ssp10-TDD-Only-r14* shall not indicate support of *tdd-SpecialSubframe-r14*.

#### 4.3.4.22 *txDiv-PUCCH1b-ChSelect-r11*

This field defines whether the UE supports transmit diversity for PUCCH format 1b with channel selection if the UE supports carrier aggregation and *two-AntennaPortsForPUCCH-r10*. UE supporting *txDiv-PUCCH1b-ChSelect* shall support configuration of *PUCCH-ConfigDedicated-v13c0*.

#### 4.3.4.23 *ul-CoMP-r11*

This field defines whether the UE supports UL Coordinated Multi-Point operation. It is mandatory for UEs of this release of the specification.

#### 4.3.4.24 *tm5-FDD*

This field defines whether the UE supports PDSCH transmission mode 5 for FDD.

#### 4.3.4.25 *tm5-TDD*

This field defines whether the UE supports PDSCH transmission mode 5 for TDD.

#### 4.3.4.26 *interBandTDD-CA-WithDifferentConfig-r11*

This field defines whether the UE supports inter-band TDD carrier aggregation with different UL/DL configuration combinations. It is mandatory for UEs of this release of the specification if inter-band TDD carrier aggregation is supported.

#### 4.3.4.27 *e-HARQ-Pattern-FDD-r12*

This field defines whether the UE supports enhanced HARQ pattern for TTI bundling operation for FDD.

#### 4.3.4.28 *tdd-FDD-CA-PCellDuplex-r12*

The presence of this field indicates that the UE supports TDD/FDD CA in any supported band combination including at least one FDD band with *bandParametersUL* and at least one TDD band with *bandParametersUL*. The first bit is set to "1" if UE supports the TDD PCell. The second bit is set to "1" if UE supports FDD PCell. This field is included only if the UE supports band combination including at least one FDD band with *bandParametersUL* and at least one TDD band with *bandParametersUL*. If this field is included, the UE shall set at least one of the bits as "1". If this field is included with DC, then it is applicable within a CG, and the presence of this field indicates the capability of the UE to support TDD/FDD CA with at least one FDD band and at least one TDD band in the same CG, with the value indicating the support for TDD/FDD PCell (PSCell).

#### 4.3.4.29 *csi-SubframeSet-r12*

This field defines whether the UE supports Rel-12 DL CSI subframe set configuration, Rel-12 DL CSI subframe set dependent CSI measurement/feedback, configuration of up to 2 CSI-IM resources for a CSI process with no more than 4 CSI-IM resources for all CSI processes of one frequency if the UE supports tm10, configuration of two ZP-CSI-RS for tm1-tm9, PDSCH RE mapping with two ZP-CSI-RS configurations, and EPDCCH RE mapping with two ZP-CSI-RS configurations if the UE supports EPDCCH. This field is only applicable for UEs supporting TDD.

#### 4.3.4.30 *phy-TDD-ReConfig-FDD-PCell-r12*

This field defines whether the UE supports TDD UL/DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI on a FDD PCell, and HARQ feedback according to UL and DL HARQ reference configurations.

#### 4.3.4.31 *phy-TDD-ReConfig-TDD-PCell-r12*

This field defines whether the UE supports TDD UL/DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI on a TDD PCell, and HARQ feedback according to UL and DL HARQ reference configurations.

#### 4.3.4.32 *pusch-SRS-PowerControl-SubframeSet-r12*

This field defines whether the UE supports subframe set dependent UL power control for PUSCH and SRS. This field is only applicable for UEs supporting TDD.

#### 4.3.4.33 *enhanced-4TxCodebook-r12*

This field defines whether the UE supports enhanced 4Tx codebook as specified in TS 36.211 [17].

#### 4.3.4.34 *pusch-FeedbackMode-r12*

This field defines whether the UE supports PUSCH feedback mode 3-2 as specified in TS 36.213 [22].

#### 4.3.4.35 *naics-Capability-List-r12*

This field indicates that the UE supports NAICS, i.e. receiving assistance information from serving cell and using it to cancel or suppress interference of a neighbouring cell for at least one band combination. For each entry of the list, the NAICS capability for a band combination is indicated as a combination of *numberOfNAICSCapableCC* and *numberOfAggregatedPRB*.

#### 4.3.4.36 *noResourceRestrictionForTTIBundling-r12*

This field defines whether the UE supports TTI bundling operation without resource allocation restriction. It is mandatory for UEs of this release of the specification except for Category M1 and Category M2 UEs.

#### 4.3.4.37 Void

#### 4.3.4.38 *discoverySignalsInDeactSCell-r12*

This field defines whether the UE supports the behaviour on DL signals and physical channels when SCell is deactivated and discovery signals measurement is configured as specified in TS 36.211 [17]. A UE that supports this feature shall also support carrier aggregation and *crs-DiscoverySignalsMeas-r12*.

#### 4.3.4.39 *ul-64QAM-r12*

This field defines whether the UE supports UL 64QAM. A UE that supports 64QAM in UL shall support 64QAM in UL in all supported frequency bands.

#### 4.3.4.40 *supportedMIMO-CapabilityDL-r12*

This field defines the maximum number of spatial multiplexing layers in the downlink direction supported by the UE on a single component carrier for bandwidth classes that include multiple component carriers (i.e. bandwidth classes B, C, D and so on).

The support for more layers in *supportedMIMO-CapabilityDL-12* than given by the "maximum number of supported layers for spatial multiplexing in DL" derived from the *ue-Category* or *ue-CategoryDL* in the *UE-EUTRA-Capability* IE is only applicable to transmission mode 9 and transmission mode 10.

#### 4.3.4.41 *alternativeTBS-Indices-r12*

This field defines whether alternative TBS indices *I*TBS 26A and 33A as specified in TS 36.213 [22] are supported by the UE which is capable of transmission mode 9 or 10. Support of the alternative TBS index *I*TBS 33A is applied for the UE supporting 256QAM in DL.

#### 4.3.4.42 *codebook-HARQ-ACK-r13*

This field defines whether HARQ ACK codebook size based on the DAI-based solution and/or the number of configured CCs as specified in TS 36.213 [22] is supported by the UE. For both solutions, it is mandatory for UEs of this release of the specification if carrier aggregation with more than 5 DL component carriers is supported.

#### 4.3.4.43 *fdd-HARQ-TimingTDD-r13*

This field defines whether FDD HARQ timing for TDD SCell when configured with TDD PCell as specified in TS 36.213 [22] is supported by the UE.

#### 4.3.4.44 *maxNumberUpdatedCSI-Proc-r13*

This field defines the maximum number of CSI processes to be updated per UE for which aperiodic CSI is requested for CA with more than 5CCs as specified in TS 36.213 [22] which is supported by the UE.

#### 4.3.4.45 *pucch-Format4-r13*

This field defines whether PUCCH format 4 as specified in TS 36.213 [22] is supported by the UE. It is mandatory for UEs of this release of the specification if TDD carrier aggregation with more than 5 DL component carriers is supported. It is mandatory for UEs of this release of the specification if FDD carrier aggregation with more than [FFS] DL component carriers is supported.

#### 4.3.4.46 *pucch-Format5-r13*

This field defines whether PUCCH format 5 as specified in TS 36.213 [22] is supported by the UE.

#### 4.3.4.47 *pucch-SCell-r13*

This field defines whether PUCCH transmission on SCell in CA is supported by the UE.

#### 4.3.4.48 *supportedBlindDecoding-r13*

This field defines blind decoding capabilities supported by the UE as specified in TS 36.213 [22].

##### 4.3.4.48.1 *maxNumberDecoding-r13*

This field defines the maximum number of blind decodes in the UE specific search space per UE in one subframe for CA with more than 5CCs as specified in TS 36.213 [22] which is supported by the UE. The number of blind decodes supported by the UE is the field value \* 32. The UE indicating the maximum number of blind decodes in this field shall also support *pdcch-CandidateReduction-r13* and/or *skipMonitoringDCI-Format0-1A-r13*.

##### 4.3.4.48.2 *pdcch-CandidateReductions-r13*

This field defines whether the UE supports PDCCH candidate reduction on UE specific search space as specified in TS 36.213 [22], clause 9.1.1.

##### 4.3.4.48.3 *skipMonitoringDCI-Format0-1A-r13*

This field defines whether the UE supports blind decoding reduction on UE specific search space by not monitoring DCI Format 0 and 1A as specified in TS 36.213 [22], clause 9.1.1.

#### 4.3.4.49 *crs-InterfMitigationTM10-r13*

The field defines whether the UE supports CRS interference mitigation in transmission mode 10. The UE supporting the *crs-InterfMitigationTM10-r13* capability shall also support the *crs-InterfHandl-r11* capability.

#### 4.3.4.49a *crs-InterfMitigationTM1toTM9-r13*

The field defines whether the UE supports CRS interference mitigation (CRS-IM) while operating in the following transmission modes (TM): TM 1, TM 2, …, TM 8 and TM 9. The UE shall not include the field if it does not support CRS IM in TMs 1-9. If the field is present, the UE supports CRS-IM on at least one arbitrary downlink CC for up to *crs-InterfMitigationTM1toTM9-r13* downlink CC CA configuration. The UE signals *crs-InterfMitigationTM1toTM9-r13* value to indicate the maximum *crs-InterfMitigationTM1toTM9-r13* downlink CC CA configuration where UE may apply CRS IM. For example, the UE sets "*crs-InterfMitigationTM1toTM9-r13* = 3" to indicate that the UE supports CRS-IM on at least one DL CC for supported non-CA, 2DL CA and 3DL CA configurations. The UE supporting the *crs-InterfMitigationTM1toTM9-r13* capability shall also support the *crs-InterfHandl-r11* capability.

If this field is present, UE supports any of the following features:

1) CRS-IM with 2 CRS antenna ports for PDSCH for UEs with 2 receiver antenna ports (as specified in the TS 36.101 [6])

2) CRS-IM with 4 CRS antenna ports for PDSCH for UEs with 2 receiver antenna ports (as specified in the TS 36.101 [6])

3) CRS-IM with 2 CRS antenna ports for PDSCH for UEs with 4 receiver antenna ports (as specified in the TS 36.101 [6])

4) CRS-IM with 4 CRS antenna ports for PDSCH for UEs with 4 receiver antenna ports (as specified in the TS 36.101 [6])

#### 4.3.4.50 *pdsch-CollisionHandling-r13*

This field defines whether PDSCH collision handling as specified in TS 36.213 [22] is supported by the UE.

#### 4.3.4.51 *aperiodicCSI-Reporting-r13*

This field defines whether the UE supports aperiodic CSI reporting with 3 bits of the CSI request field size as specified in TS 36.213 [22], clause 7.2.1 and/or aperiodic CSI reporting mode 1-0 and mode 1-1 as specified in TS 36.213 [22], clause 7.2.1.

#### 4.3.4.52 *crossCarrierScheduling-B5C-r13*

This field defines whether the UE supports cross carrier scheduling beyond 5 DL component carriers. If supported, the UE shall also support *crossCarrierScheduling-r10*, i.e., cross carrier scheduling up to 5 DL component carriers.

#### 4.3.4.53 *spatialBundling-HARQ-ACK-r13*

This field defines whether the UE supports HARQ-ACK spatial bundling on PUCCH or PUSCH as specified in TS 36.213 [22], clauses 7.3.1 and 7.3.2.

#### 4.3.4.54 *uci-PUSCH-Ext-r13*

This field defines whether the UE supports an extension of UCI delivering more than 22 HARQ-ACK bits on PUSCH as specified in TS 36.212 [26], clause 5.2.2.6 and TS 36.213 [22], clause 8.6.3. It is mandatory for UEs of this release of the specification if TDD carrier aggregation with more than 5 DL component carriers is supported. It is mandatory for UEs of this release of the specification if FDD carrier aggregation with more than [FFS] DL component carriers is supported.

#### 4.3.4.55 *multiTone-r13*

This field defines whether the UE supports UL multi-tone transmissions on NPUSCH. This field is only applicable for UEs of any *ue-Category-NB*. It is mandatory for UEs of this release of the specification.

#### 4.3.4.56 *multiCarrier-r13*

This field defines whether the UE supports multi-carrier operation. This field is only applicable for UEs of any *ue-Category-NB*. It is mandatory for UEs of this release of the specification.

#### 4.3.4.57 *cch-InterfMitigation-RefRecTypeA-r13*

This field defines whether the UE supports Type A downlink control channel interference mitigation receiver "LMMSE-IRC + CRS-IC" for PDCCH/PCFICH/PHICH/EPDCCH receive processing (Enhanced downlink control channel performance requirements Type A in the TS 36.101 [6]).

If this field is present, the UE supports at least one the following features:

1) Enhanced downlink control channel interference mitigation Type A receiver for 2 CRS antenna ports for UEs with 2 receiver antenna ports (Enhanced downlink control channel performance requirements Type A in the TS 36.101 [6]).

2) Enhanced downlink control channel interference mitigation Type A receiver for 4 CRS antenna ports for UEs with 2 receiver antenna ports (Enhanced downlink control channel performance requirements Type A in the TS 36.101 [6]).

#### 4.3.4.58 *cch-InterfMitigation-RefRecTypeB-r13*

This field defines whether the UE supports Type B downlink control channel interference mitigation receiver "E-LMMSE-IRC + CRS-IC" for PDCCH/PCFICH/PHICH receive processing in synchronous networks (Enhanced downlink control channel performance requirements Type B in the TS 36.101 [6]). The UE supporting the capability defined by *cch-InterfMitigation-RefRecTypeB-r13* shall also support the capability defined by *cch-InterfMitigation-RefRecTypeA-r13*.

#### 4.3.4.59 *cch-InterfMitigation-MaxNumCCs-r13*

This field indicates that the UE supports downlink control channel interference mitigation on at least one arbitrary downlink CC for up to *cch-InterfMitigation-MaxNumCCs* downlink CC CA configuration.

#### 4.3.4.60 *tdd-TTI-Bundling-r14*

This field defines whether the UE supporting TDD special subframe configuration 10 also supports TTI bundling for TDD configuration 2 and 3 when *ssp10* is configured as specified in TS 36.331 [5].

#### 4.3.4.61 *dmrs-LessUpPTS-r14*

This field defines whether the UE supports not to transmit DMRS for PUSCH in UpPTS as specified in TS 36.211 [17].

#### 4.3.4.62 *twoHARQ-Processes-r14*

This field defines whether the UE supports 2 HARQ processes in DL and UL. This field is only applicable for UEs that support category NB2.

#### 4.3.4.63 *ce-PUSCH-NB-MaxTBS-r14*

This field indicates whether the UE supports the maximum UL TBS size of 2984 bits in 1.4 MHz when operating in coverage enhancement mode A, as specified in TS 36.212 [26] and TS 36.213 [22]. A UE indicating support of *ce-PUSCH-NB-MaxTBS-r14* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.4.64 *ce-PDSCH-PUSCH-MaxBandwidth-r14*

This field indicates support of a maximum PDSCH/PUSCH channel bandwidth larger than 1.4 MHz when the UE is operating in coverage enhancement mode A and B, as specified in TS 36.212 [26] and TS 36.213 [22]. The maximum supported PDSCH channel bandwidth in coverage enhancement mode A and B is indicated by *ce-PDSCH-PUSCH-MaxBandwidth-r14*. The maximum supported PUSCH channel bandwidth is 5 MHz in coverage enhancement mode A and 1.4 MHz in coverage enhancement mode B. This field is not applicable for UEs of Category M1. This field is mandatory for UEs of Category M2. A UE indicating support of *ce-PDSCH-PUSCH-MaxBandwidth-r14* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.4.65 *ce-HARQ-AckBundling-r14*

This field indicates whether the UE supports HARQ-ACK bundling in FDD when operating in coverage enhancement mode A, as specified in TS 36.212 [26] and TS 36.213 [22]. A UE indicating support of *ce-HARQ-AckBundling-r14* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.4.66 *ce-PDSCH-TenProcesses-r14*

This field indicates whether the UE supports 10 DL HARQ processes in FDD when operating in coverage enhancement mode A, as specified in TS 36.212 [26] and TS 36.213 [22]. A UE indicating support of *ce-PDSCH-TenProcesses-r14* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.4.67 *ce-RetuningSymbols-r14*

This field indicates the number of retuning symbols used by the UE when operating in coverage enhancement mode A and B, as specified in TS 36.211 [17]. A UE indicating support of *ce-RetuningSymbols-r14* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.4.68 *ce-PDSCH-PUSCH-Enhancement-r14*

This field indicates whether the UE supports new numbers of repetitions for PUSCH and modulation restriction for PDSCH and PUSCH in coverage enhancement mode A, as specified in TS 36.212 [26] and TS 36.213 [22]. A UE indicating support of *ce-PDSCH-PUSCH-Enhancement-r14* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.4.69 *ce-SchedulingEnhancement-r14*

This field indicates whether the UE supports dynamic HARQ-ACK delay for HD-FDD in coverage enhancement mode A, as specified in TS 36.212 [26] and TS 36.213 [22]. A UE indicating support of *ce-SchedulingEnhancement-r14* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.4.70 *ce-SRS-Enhancement-r14*

This field indicates whether the UE supports SRS coverage enhancement with support of SRS combs 2 and 4, as specified in TS 36.213 [22]. A UE indicating support of *ce-SRS-Enhancement-r14* shall also indicate support of *ce-ModeA-r13* and shall not indicate support of *ce-SRS-EnhancementWithoutComb4-r14*.

#### 4.3.4.70A *ce-SRS-EnhancementWithoutComb4-r14*

This field indicates whether the UE supports SRS coverage enhancement with support of SRS comb 2 but without support of SRS comb 4, as specified in TS 36.213 [22]. A UE indicating support of *ce-SRS-EnhancementWithoutComb4-r14* shall also indicate support of *ce-ModeA-r13* and shall not indicate support of *ce-SRS-Enhancement-r14*.

#### 4.3.4.71 *ce-PUCCH-Enhancement-r14*

This field indicates whether the UE supports repetition levels 64 and 128 for PUCCH in CE Mode B, as specified in TS 36.211 [17] and in TS 36.213 [22]. A UE indicating support of *ce-PUCCH-Enhancement-r14* shall also indicate support of *ce-ModeB-r13*.

#### 4.3.4.72 *ce-ClosedLoopTxAntennaSelection-r14*

This field indicates whether the UE supports UL closed-loop Tx antenna selection in coverage enhancement mode A, as specified in TS 36.212 [26]. A UE indicating support of *ce-ClosedLoopTxAntennaSelection-r14* shall also indicate support of *ce-ModeA-r13* and *ue-TxAntennaSelectionSupported*.

#### 4.3.4.73 *ul-256QAM-r14*

This field indicates UL 256QAM support by the UE on a single component carrier within a band combination (i.e. bandwith class A).

#### 4.3.4.74 *alternativeTBS-Index-r14*

This field defines whether alternative TBS index *I*TBS 33B as specified in TS 36.213 [22] is supported by the UE. Support of the alternative TBS index *I*TBS 33B is applied for the UE supporting 256QAM in DL.

#### 4.3.4.75 *multiCarrier-NPRACH-r14*

This field defines whether the UE supports NPRACH on non-anchor carrier, as specified in TS 36.321 [4] and TS 36.331 [5]. This field is only applicable for UEs of any *ue-Category-NB*. It is mandatory for UEs of this release of the specification.

#### 4.3.4.76 *multiCarrierPaging-r14*

This field defines whether the UE supports paging on non-anchor carriers, as specified in TS 36.331 [5] and TS 36.304 [14]. This field is only applicable for UEs of any *ue-Category-NB*. It is mandatory for UEs of this release of the specification.

#### 4.3.4.77 *ul-256QAM-perCC-InfoListr14*

This field indicates UL 256QAM support by the UE on a single component carrier within a band combination, which the corresponding bandwidth class includes multiple serving carriers (i.e. bandwidth class B, C, D and so on).

#### 4.3.4.78 *unicast-fembmsMixedSCell-r14*

This field defines whether unicast reception from FeMBMS/Unicast mixed cell is supported by the UE. This field is included only if UE supports carrier aggregation.

#### 4.3.4.79 *emptyUnicastRegion-r14*

This field defines the UE supports unicast reception in subframes with empty unicast control region as described in TS36.213 Clause 12. This field is included only if UE supports unicast reception from FeMBMS/Unicast mixed cell.

#### 4.3.4.80 *interferenceRandomisation-r14*

This field indicates whether the UE supports interference randomisation in connected mode as specified in TS 36.211 [17]. This field is only applicable for UEs of any *ue-Category-NB*. It is mandatory for UEs of this release of the specification.

#### 4.3.4.81 *must-CapabilityPerBand-r14*

This field indicates that the UE supports multi-user superposition transmission operation for the corresponding frequency band as specified in TS 36.212 [26], clause 5.3.3.1. UE indicates the support of the different MUST features per band.

##### 4.3.4.81.1 *must-TM234-UpTo2Tx-r14*

This field indicates that the UE supports MUST operation for TM2/3/4 using up to 2Tx.

##### 4.3.4.81.2 *must-TM89-UpToOneInterferingLayer-r14*

This field indicates that the UE supports MUST operation for TM8/9 with assistance information for up to 1 interfering layer.

##### 4.3.4.81.3 *must-TM10-UpToOneInterferingLayer-r14*

This field indicates that the UE supports MUST operation for TM10 with assistance information for up to 1 interfering layer.

##### 4.3.4.81.4 *must-TM89-UpToThreeInterferingLayers-r14*

This field indicates that the UE supports MUST operation for TM8/9 with assistance information for up to 3 interfering layers.

##### 4.3.4.81.5 *must-TM10-UpToThreeInterferingLayers-r14*

This field indicates that the UE supports MUST operation for TM10 with assistance information for up to 3 interfering layers.

#### 4.3.4.82 *crs-LessDwPTS-r14*

This field defines whether the UE supports TDD special subframe configuration 10 without CRS transmission on the 5th symbol of DwPTS (i.e. *ssp10-CRS-LessDwPTS*) as specified in TS 36.211 [17] and TS 36.331 [5].

#### 4.3.4.83 *srs-UpPTS-6sym-r14*

This field indicates whether the UE supports up to 6-symbol SRS in UpPTS.

### 4.3.5 RF parameters

#### 4.3.5.1 *supportedBandListEUTRA*

This field defines which E-UTRA radio frequency bands, see TS 36.101 [6], are supported by the UE. For each band, support for either only half duplex operation, or full duplex operation is indicated. For TDD, the half duplex indication is not applicable.

##### 4.3.5.1.1 *ue-PowerClass-N-r13*, *ue-PowerClass-5-r13*

These fields define for each supported E-UTRA band whether the UE supports power UE Power Class 1, 2, 4 or 5 for the band, as specified in TS 36.101 [6] and TS 36.307 [27]. Absence of these fields means that the UE supports the default UE Power Class for the band, as specified in TS 36.101 [6].

##### 4.3.5.1.2 *intraFreq-CE-NeedForGaps-r13*

This field defines for each supported E-UTRA band whether measurement gaps are required to perform intra-frequency measurements on the E-UTRA band for UE in CE Mode A or CE Mode B.

##### 4.3.5.1.3 *ue-CA-PowerClass-N*

This field defines the power class the UE supports for a E-UTRA band combination, as specified in TS 36.101 [6] and TS 36.307 [27]. Absence of these fields means that the UE supports the default UE Power Class for the band combination, as specified in TS 36.101 [6].

#### 4.3.5.1A *supportedBandList-r13*

This field defines which NB-IoT radio frequency bands, see TS 36.101 [6], are supported by the UE. This field is only applicable for UEs of any *ue-Category-NB*.

##### 4.3.5.1A.1 *powerClassNB-20dBm-r13*

This field defines whether the UE supports power class 20dBm in NB-IoT for the band, as specified in TS 36.101 [6].

##### 4.3.5.1A.2 *powerClassNB-14dBm-r14*

This field defines whether the UE supports power class 14 dBm in NB-IoT for all the bands that are supported by the UE, as specified in TS 36.101 [6]. The UE shall not include the field if it includes *powerClassNB-20dBm-r13*.

#### 4.3.5.2 *supportedBandCombination*

This field defines the carrier aggregation, MIMO and MBMS reception capabilities (via MBSFN or SC-PTM) supported by the UE for configurations with inter-band, intra-band non-contiguous, intra-band contiguous carrier aggregation and without carrier aggregation. For each band in a band combination the UE provides the supported CA bandwidth classes and the corresponding MIMO capabilities for downlink. The UE also has to provide the supported uplink CA bandwidth class and the corresponding MIMO capability for at least one band in the band combination. Applicability of provisioning uplink CA bandwidth class for each band in the band combinations is defined in TS 36.101 [6]. A MIMO capability applies to all carriers of a bandwidth class of a band in a band combination. For bandwidth classes that include multiple component carriers (i.e. bandwidth classes B, C, D and so on), the UE may also indicate a separate MIMO capability that applies to each individual carrier of a bandwidth class of a band in a band combination.

In all non-CA band combinations the UE shall indicate a bandwidth class supporting the maximum channel bandwidth defined for the band.

In all non-CA band combinations the UE shall indicate at least the number of layers for spatial multiplexing according to the UE's Rel-8/9 category (Cat. 1-5). If the UE provides a Rel-10 category (Cat. 6-8) it shall indicate at least the number of layers according to that category for at least one band combination. In all other band combinations a UE indicating a category 2 and higher shall indicate support for at least 2 layers for downlink spatial multiplexing for all bands. The indicated number of layers for spatial multiplexing may exceed the number of layers required according to the category indicated by the UE. The carrier aggregation and MIMO capabilities indicated for at least one band combination together with modulation scheme shall meet the processing requirements defined by the physical layer parameter values in the UE category (i.e., maximum number of DL-SCH/UL-SCH transport block bits received/transmitted within a TTI, maximum number of bits of a DL-SCH/UL-SCH transport block received/transmitted within a TTI, and total number of soft channel bits for downlink).

NOTE: If the UE reports a subset of supported band combinations based on *requestedFrequencyBands* and/or *skipFallbackCombinations* and/or *maximumCCsRetrieval,* reported band combination(s) may or may not meet the processing requirements defined by the physical layer parameter values in the UE category.

The UE that supports MBMS reception via MBSFN shall support MBMS reception via MBSFN on the PCell of MCG, and it may indicate support for MBMS reception via MBSFN on configured SCells (*mbms-SCell*) and for any cell that may be additionally configured as an SCell (*mbms-NonServingCell*) according to this field. The UE may indicate support for MBMS reception from FeMBMS/Unicast mixed cells (*fembmsMixedCell*) or MBMS-dedicated cells (*fembmsDedicatedCell*). The UE that supports MBMS reception via SC-PTM shall support MBMS reception via SC-PTM on the PCell of MCG, and it may indicate support for MBMS reception via SC-PTM on configured SCells (*scptm-SCell*) and for any cell that may be additionally configured as an SCell (*scptm-NonServingCell*) according to this field. The UE shall apply the system information acquisition and change monitoring procedure relevant for MBMS operation for these cells.

The UE indicating more than one frequency in the *MBMSInterestIndication* message as specified in TS 36.331 [5] shall support simultaneous reception of MBMS (via MBSFN or SC-PTM) on the indicated frequencies when the frequencies of the configured serving cells and the indicated frequencies belong to at least one band combination.

NOTE: For the purposes of determining whether the carrier aggregation and MIMO capabilities indicated for a band combination meets the processing requirements defined by the physical layer parameter values in the UE category as described above, the carrier aggregation and MIMO capabilities indicated for a band combination is considered to meet the processing requirements if the UE supports the maximum processing requirements defined by the UE category assuming 20MHz channel bandwidth is supported on all bands.

While PCell is not changed, the UE shall support release of any SCell(s) or any uplink configuration of SCell(s) without requiring reconfiguration of parameters related to UE radio access capabilities for the remaining serving cell(s) in the fallback band combination, except for release of an SCell from a contiguous CA band configuration that results in a non-contiguous CA band configuration.

##### 4.3.5.2.1 *supportedBandCombinationReduced-r13*

This field is used to indicate the carrier aggregation, MIMO and MBMS reception capabilities supported by the UE as defined in 4.3.5.2 if requested by E-UTRAN as specified in TS 36.331 [5]. All descriptions in 4.3.5.2 are applied for this field unless explicitly stated otherwise. It is mandatory for UEs supporting carrier aggregation beyond 5 component carriers.

If a CA band combination beyond 5 component carriers is included in this field, the UE supports Activation/Deactivation MAC Control Element of four octets as specified in TS 36.321 [4]. If a CA band combination beyond 5 component carriers with uplink is included in this field, the UE supports Extended PHR MAC Control Element supporting 32 serving cells with configured uplink as specified in TS 36.321 [4].

If the fallback band combinations for a given band combination are omitted in this field (see TS 36.331 [5]), the UE shall for all the omitted fallback band combinations support the same UE radio access capabilities as for the parent band combination.

NOTE: A fallback band combination may have multiple different parent band combinations.

#### 4.3.5.3 *multipleTimingAdvance*

This field defines whether multiple timing advances are supported for each band combination supported by the UE. It is mandatory for UEs of this release of the specification to support this capability for band combinations having an UL on multiple FDD bands as specified in TS 36.101 [6]. 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. If the band combination comprised of one band entry (i.e., intra-band contiguous band combination), the field indicates that different timing advances across component carriers of the band entry are supported.

#### 4.3.5.4 *simultaneousRx-Tx*

This field defines whether the UE supports simultaneous reception and transmission for inter-band TDD band combination.

#### 4.3.5.5 *supportedCSI-Proc-r11*

This field defines the maximum number of CSI processes supported on a component carrier within a band with PDSCH transmission mode 10. For bandwidth classes that include multiple component carriers (i.e. bandwidth classes B, C, D and so on), the field defines the maximum number of CSI processes supported by the UE on all component carriers in the corresponding band.

#### 4.3.5.6 *freqBandRetrieval-r11*

This parameter defines whether the UE supports reception of *requestedFrequencyBands* as specified in TS 36.331 [5].

#### 4.3.5.7 *dl-256QAM-r12*

This field defines whether the UE supports 256QAM in DL. This field is only applicable for UEs of category 11-12 and UEs of DL category 11 and onwards. It is mandatory for UEs of DL category 13-14 and 17 to support this feature. A UE that supports 256QAM in DL shall support 256QAM in DL in all supported frequency bands.

#### 4.3.5.8 *supportedNAICS-2CRS-AP-r12*

This field defines a bitmap points to the entries of *naics-Capability-List-r12* to indicate NAICS 2 CRS AP capability for the band combination.

#### 4.3.5.9 *dc-Support-r12*

This field defines whether synchronous DC and power control mode 1 is supported by the UE which is capable of *extendedMaxMeasId*, *multipleTimingAdvance* for a given band combination. If the band combination entry is comprised of a single band, DC is supported for the intra-band contiguous band combination. If the band combination entry is comprised of multiple bands, DC is supported for the inter-band or intra-band non-contiguous band combination.

##### 4.3.5.9.1 *asynchronous-r12*

In addition to the UE capability indicated by *dc-Support*, this field defines whether asynchronous DC and power control mode 2 is supported by the UE which is capable of *simultaneousRx-Tx*. If the band combination is comprised of a single band entry for more than two carriers, the UE shall support any permutations of carriers to CGs. If the concerning band combination is comprised of more than two band entries, the carriers corresponding to a band entry shall belong to one cell group. For this band combination, the UE may indicate the supported carrier permutations to CGs.

##### 4.3.5.9.2 *supportedCellGrouping-r12*

In addition to the UE capability indicated by *asynchronous*, this field defines for which mapping of serving cells to cell groups (i.e. MCG or SCG) the UE supports asynchronous DC.

#### 4.3.5.10 *modifiedMPR-Behavior-r10*

This field defines whether the UE supports modified MPR/A-MPR behaviours as specified in TS 36.101 [6].

#### 4.3.5.11 *freqBandPriorityAdjustment-r12*

This field defines whether the UE supports the prioritization of the frequency bands in multiBandInfoList over the band in freqBandIndicator as defined by freqBandIndicatorPriority-r12 in TS 36.331 [5].

#### 4.3.5.12 *commSupportedBandsPerBC-r12*

This field indicates, for a particular band combination, the bands on which the UE supports simultaneous reception of EUTRA and sidelink communication. If the UE indicates support simultaneous transmission (using *commSimultaneousTx-r12*), this field also indicates, for a particular band combination, the bands on which the UE supports simultaneous transmission of EUTRA and sidelink communication. The first bit refers to the first band indicated by *commSupportedBands-r12*, with value 1 indicating sidelink is supported simultaneously.

#### 4.3.5.13 *supportedCSI-Proc-r12*

This field defines the maximum number of CSI processes with PDSCH transmission mode 10 supported by the UE on a single component carrier for bandwidth classes that include multiple component carriers (i.e. bandwidth classes B, C, D and so on).

#### 4.3.5.14 *fourLayerTM3-TM4-r10*

This field defines whether the UE supports 4-layer spatial multiplexing with transmission mode 3 and transmission mode 4.

#### 4.3.5.15 *fourLayerTM3-TM4-perCC-r12*

This field defines whether the UE supports 4-layer spatial multiplexing with transmission mode 3 and transmission mode 4 on a single component carrier for bandwidth classes that include multiple component carriers (i.e. bandwidth classes B, C, D and so on).

#### 4.3.5.16 *multiNS-Pmax-r10*

This field defines whether the UE supports the mechanisms defined for cells broadcasting *NS-PmaxList* as specified in TS 36.331 [5].

#### 4.3.5.16A *multiNS-Pmax-r13*

This field defines whether the UE supports the mechanisms defined for NB-IoT cells broadcasting *NS-PmaxList* as specified in TS 36.331 [5].

#### 4.3.5.17 *differentFallbackSupported-r13*

This field defines whether the UE supports the different capabilities for at least one fallback case of the concerning band combination.

#### 4.3.5.18 *maximumCCsRetrieval-r13*

This field defines whether the UE supports reception of *requestedMaxCCsDL* and *requestedMaxCCsUL*.

#### 4.3.5.19 *skipFallbackCombinations-r13*

This field defines whether the UE supports receiving reception of *skipFallbackCombinations* that requests UE to exclude fallback band combinations from capability signalling. UE that indicates support for this shall also indicate support for *requestReducedFormat-r13*. In this release of the specification, UEs capable of *supportedBandCombinationReduced* shall indicate support for *skipFallbackCombinations-r13*.

#### 4.3.5.20Void

#### 4.3.5.21 *reducedIntNonContComb-r13*

This field defines whether the UE supports receiving *requestReducedIntNonContComb*. If the UE supports *reducedIntNonContComb-r13,* the UE only includes one intra-band non-contiguous CA band combination, and exclude the other intra-band non-contiguous CA band combinations 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.

For example, if the UE supports *reducedIntNonContComb-r13,* the UE only needs to report "DL: CA\_42C-42A, UL: 42A paired with DL 42C", in order to indicate also support of "DL: CA\_42C-42A, UL: 42A paired with DL 42A", "DL: CA\_42A-42C, UL: 42A paired with DL 42A" and "DL: CA\_42A-42C, UL: 42A paired with DL 42C".

For these band combinations not included in the capability, RF parameters specified within *BandCombinationParameters* (e.g., *supportedMIMO-CapabilityUL*, *multipleTimingAdvance* if supported) and measurement parameters specified within *BandCombinationListEUTRA* are the same as the ones for the band combination included in the UE capability.

#### 4.3.5.22 *additionalRx-Tx-PerformanceReq-r13*

This field indicates whether the UE supports the additional Rx and Tx performance requirement for a given band combination as specified in TS 36.101 [6].

#### 4.3.5.23 *maxLayersMIMO-Indication-r12*

This field defines whether the UE supports the network configuration of *maxLayersMIMO* as specified in TS 36.331 [5].

If the UE supports *fourLayerTM3-TM4* or *intraBandContiguousCC-InfoList*, UE supports the configuration of *maxLayersMIMO* for these two cases regardless of indicating *maxLayersMIMO-Indication*.

#### 4.3.5.24 *rf-RetuningTimeDL-r14*

This field indicates the interruption time on DL reception within a band pair during the RF retuning for switching between the band pair to transmit SRS on a PUSCH-less SCell as specified in TS 36.331 [5]. This field is mandatory present if switching between the band pair is supported.

#### 4.3.5.25 *rf-RetuningTimeUL-r14*

This field indicates the interruption time on UL transmission within a band pair during the RF retuning for switching between the band pair to transmit SRS on a PUSCH-less SCell as specified in TS 36.331 [5]. This field is mandatory present if switching between the band pair is supported.

#### 4.3.5.26 *diffFallbackCombReport-r14*

This field indicates whether the UE supports reporting of UE radio access capabilities for the CA band combinations asked by the eNB as well as, if any, reporting of different UE radio access capabilities for their fallback band combination as specified in TS 36.331 [5]. The UE does not report fallback combinations if their UE radio access capabilities are the same as the ones for the CA band combination asked by the eNB. In this release of the specification, UEs capable of *supportedBandCombinationReduced* shall indicate support for *diffFallbackCombReport-r14*. UE that indicates support for this shall also indicate support for *requestReducedFormat-r13*.

#### 4.3.5.27 *v2x-SupportedTxBandCombListPerBC-r14, v2x-SupportedRxBandCombListPerBC-r14*

This field indicates, for a particular band combination of EUTRA, the supported band combination list among *v2x-SupportedTxBandCombinationList* or *v2x-SupportedRxBandCombinationList* on which the UE supports simultaneous transmission and reception of EUTRA and V2X sidelink communication respectively.

#### 4.3.5.28 *txAntennaSwitchDL-r13*

The field indicates the entry number of the first-listed band with UL in the band combination that causes this DL to be affected when transmit antenna switching occurs. If this field is not included, this DL is not affected by transmit antenna switching. All DL and UL that switch together indicate the same entry number.

#### 4.3.5.29 *txAntennaSwitchUL-r13*

The presence of this field indicates the UE supports transmit antenna selection for this UL band in the band combination as described in TS 36.213 [22], clauses 8.2 and 8.7.

The field indicates the entry number of the first-listed band with UL in the band combination that switches together with this UL when transmit antenna switching occurs. All DL and UL that switch together indicate the same entry number.

#### 4.3.5.30 Void

#### 4.3.5.31 Void

#### 4.3.5.32 *srs-MaxSimultaneousCCs-r14*

This field indicates, for a particular band combination, the maximum number of simultaneously configurable target CCs supported by the UE for SRS switching.

#### 4.3.5.33 Void

#### 4.3.5.34 Void

#### 4.3.5.35 *srs-FlexibleTiming-r14*

This field indicates, for a particular band pair, whether the UE supports configuration of *soundingRS-FlexibleTiming-r14*. For a TDD-TDD band pair, UE shall include at least one of *srs-FlexibleTiming-r14* and/or *srs-HARQ-ReferenceConfig-r14* when *rf-RetuningTimeDL-r14* or *rf-RetuningTimeUL-r14* corresponding to the band pair is larger than 1 OFDM symbol.

#### 4.3.5.36 *srs-HARQ-ReferenceConfig-r14*

This field indicates, for a particular band pair, whether the UE supports configuration of *harq-ReferenceConfig-r14*. For a TDD-TDD band pair, UE shall include at least one of *srs-FlexibleTiming-r14* and/or *srs-HARQ-ReferenceConfig-r14* when *rf-RetuningTimeDL-r14* or *rf-RetuningTimeUL-r14* corresponding to the band pair is larger than 1 OFDM symbol.

### 4.3.6 Measurement parameters

#### 4.3.6.1 *interFreqNeedForGaps* and *interRAT-NeedForGaps*

These fields define for each supported E-UTRA band whether measurement gaps are required to perform inter-frequency measurements on each supported E-UTRA radio frequency band and inter-RAT measurements on each supported RAT/band combination. A UE also indicates for each band combination as in the supportedBandCombination whether measurement gaps are required to perform inter-frequency measurements on each supported E-UTRA radio frequency band and inter-RAT measurements on each supported RAT/band combination.

#### 4.3.6.2 *rsrqMeasWideband*

This field defines whether the UE can perform RSRQ measurements in RRC\_IDLE and RRC\_CONNECTED with wider bandwidth as specified in TS 36.133 [16].

#### 4.3.6.3 *timerT312-r12*

This field defines whether the UE supports T312 as specified in TS 36.331 [5].

#### 4.3.6.4 *alternativeTimeToTrigger-r12*

This field defines whether the UE supports alternativeTimeToTrigger as specified in TS 36.331 [5].

#### 4.3.6.5 *benefitsFromInterruption-r11*

This field indicates whether the UE power consumption could benefit from being allowed to cause interruptions to serving cells when performing measurements of deactivated SCell carriers for *measCycleSCell* of less than 640ms, as specified in TS 36.133 [16].

#### 4.3.6.6 *incMonEUTRA-r12*

This field defines whether the UE supports increased number of E-UTRA carrier monitoring in RRC\_IDLE and RRC\_CONNECTED as specified in TS 36.133 [16], and whether the UE supports extended number of cell re-selection priorities for EUTRA frequencies in *RRCConnectionRelease*, as specified in TS 36.331 [5]. It is mandatory for UEs of this release of the specification, except for Category 0 and 1bis UEs.

A UE that supports increased number of E-UTRA carrier monitoring shall also support extended number of measurement identities.

#### 4.3.6.7 *incMonUTRA-r12*

This field defines whether the UE supports increased number of UTRA carrier monitoring in RRC\_IDLE and RRC\_CONNECTED as specified in TS 36.133 [16].

A UE that supports increased number of UTRA carrier monitoring shall also support extended number of measurement identities.

#### 4.3.6.8 *extendedMaxMeasId-r12*

This field defines whether the UE supports extended number of measurement identities as defined by *maxMeasId-r12* in TS 36.331 [5].

It is mandatory for UEs of this release of the specification if *incMonEUTRA-r12* or *incMonUTRA-r12* or *dc-Support-r12* or *extendedMaxObjectId-r13* is supported.

#### 4.3.6.9 *crs-DiscoverySignalsMeas-r12*

This field defines whether the UE supports CRS based discovery signals measurement as specified in TS 36.331 [5], and PDSCH/EPDCCH RE mapping with zero power CSI-RS configured for discovery signals.

#### 4.3.6.10 *csi-RS-DiscoverySignalsMeas-r12*

This field defines whether the UE supports CSI-RS based discovery signals measurement as specified in TS 36.331 [5]. A UE that supports this feature shall also support *crs-DiscoverySignalsMeas-r12*.

#### 4.3.6.11 *extendedRSRQ-LowerRange-r12*

This field defines whether the UE supports the extended RSRQ lower value range from -34dB to -19.5dB in measurement configuration and reporting as specified in TS 36.133 [16].

#### 4.3.6.12 *rsrq-OnAllSymbols-r12*

This field defines whether the UE supports the RSRQ measurement on all OFDM symbols as specified in TS 36.214 [23] and also the extended RSRQ upper value range from -3dB to 2.5dB in measurement configuration and reporting as specified in TS 36.133 [16]. If the UE supports *rsrq-OnAllSymbols-r12* and *rsrqMeasWideband* it shall also support the RSRQ measurement on all OFDM symbols with wider bandwidth.

#### 4.3.6.13 *rs-SINR-Meas-r13*

This field defines whether the UE can perform RS-SINR measurements in RRC\_CONNECTED as specified in TS 36.214 [23].

#### 4.3.6.14 *whiteCellList-r13*

This field defines whether the UE supports configuration and use of white-listed cells as specified in TS 36.331 [5].

#### 4.3.6.15 *extendedFreqPriorities-r13*

This field defines whether the UE supports extended E-UTRA frequency priorities as specified in TS 36.331 [5] and indicated by *cellReselectionSubPriority* field.

#### 4.3.6.16 *extendedMaxObjectId-r13*

This field defines whether the UE supports extended number of measurement object identities as defined by *maxObjectId-r13* in TS 36.331 [5]. The field is mandatory present for the UE supporting the configuration of *sCellToAddModListExt*. A UE indicating support of *extendedMaxObjectId-r13* shall also indicate the support of *extendedMaxMeasId-r12*.

#### 4.3.6.17 *ul-PDCP-Delay-r13*

This parameter defines whether the UE supports UL PDCP Packet Delay per QCI measurement as specified in TS 36.314 [25]. A UE that supports the UL PDCP Delay measurement shall also support the measurement configuration and reporting as specified in TS 36.331 [5].

#### 4.3.6.18 Void

#### 4.3.6.19 *rssi-AndChannelOccupancyReporting-r13*

This field defines whether the UE supports measurement and reporting for RSSI and channel occupancy. This field is only applicable if the UE supports downlink LAA operation.

#### 4.3.6.20 *multiBandInfoReport-r13*

This field defines whether the UE supports the acquisition and reporting of multi band information for *reportCGI* as specified in TS 36.331 [5].

#### 4.3.6.21 Void

#### 4.3.6.22 Void

#### 4.3.6.23 *ceMeasurements-r14*

This field defines whether the UE supports intra-frequency RSRQ measurements and inter-frequency RSRP and RSRQ measurements in RRC\_CONNECTED, as specified in TS 36.133 [16], TS 36.304 [14] and TS 36.331 [5]. In this release of specification, it is mandatory for UEs of Category M1 and M2 and UEs that support coverage enhancements to support *ceMeasurements-r14*. A UE indicating support of *ceMeasurements-r14* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.6.24 *ncsg-r14*

This field defines whether the UE supports NCSG gap as specified in TS 36.133 [16]. If the UE supports *ncsg-r14* and asynchronous DC, the UE shall support NCSG Pattern Id 0, 1, 2 and 3. If the UE supports ncsg-r14 but the UE does not support asynchronous DC, only NCSG Pattern Id 0 and 1 shall be supported.

#### 4.3.6.25 *perServingCellMeasurementGap-r14*

This field defines whether the UE supports per CC measurement gap as specified in TS 36.331 [5].

#### 4.3.6.26 *shortMeasurementGap-r14*

This field defines whether the UE supports shorter measurement gap length (i.e. *gp2* and *gp3*) as specified in TS 36.133 [16].

#### 4.3.6.27 *nonUniformGap-r14*

This field defines whether the UE supports measurement non uniform Pattern Id 1, 2, 3 and 4 as specified in TS 36.133 [16].

#### 4.3.6.28 *rlm-ReportSupport-r14*

This field defines whether the UE supports RLM event and information reporting as specified in TS 36.133 [16].

#### 4.3.6.29 nonCSG-SI-Reporting

This field defines that UE supports reporting of PLMN list from cells not broadcasting the field *csg-Identity*.

### 4.3.7 Inter-RAT parameters

#### 4.3.7.1 *utraFDD*

This parameter defines whether the UE supports UTRA FDD.

A UE that supports UTRAN FDD shall support inter-RAT PS handover to UTRAN.

#### 4.3.7.2 *supportedBandListUTRA-FDD*

Only applicable if the UE supports UTRA FDD. This field defines which UTRA FDD radio frequency bands are supported by the UE.

#### 4.3.7.3 *utraTDD128*

This parameter defines whether the UE supports UTRA TDD 1.28 Mcps.

A UE that supports UTRAN TDD 1.28 Mcps shall support inter-RAT PS handover to UTRAN.

#### 4.3.7.4 *supportedBandListUTRA-TDD128*

Only applicable if the UE supports UTRA TDD 1.28 Mcps. This field defines which UTRA TDD 1.28 Mcps radio frequency bands are supported by the UE.

#### 4.3.7.5 *utraTDD384*

This parameter defines whether the UE supports UTRA TDD 3.84 Mcps.

A UE that supports UTRAN TDD 3.84 Mcps shall support inter-RAT PS handover to UTRAN.

#### 4.3.7.6 *supportedBandListUTRA-TDD384*

Only applicable if the UE supports UTRA TDD 3.84 Mcps. This field defines which UTRA TDD 3.84 Mcps radio frequency bands are supported by the UE.

#### 4.3.7.7 *utraTDD768*

This parameter defines whether the UE supports UTRA TDD 7.68 Mcps.

A UE that supports UTRAN TDD 7.68 Mcps shall support inter-RAT PS handover to UTRAN.

#### 4.3.7.8 *supportedBandListUTRA-TDD768*

Only applicable if the UE supports UTRA TDD 7.68 Mcps. This field defines which UTRA TDD 7.68 Mcps radio frequency bands are supported by the UE.

#### 4.3.7.9 *geran*

This parameter defines whether the UE supports GERAN.

#### 4.3.7.10 *supportedBandListGERAN*

Only applicable if the UE supports GERAN. This field defines which GERAN radio frequency bands are supported by the UE.

#### 4.3.7.11 *interRAT-PS-HO-ToGERAN*

Only applicable if the UE supports GERAN. This field defines whether the UE supports inter-RAT PS handover to GERAN.

#### 4.3.7.12 *cdma2000-HRPD*

This parameter defines whether the UE supports HRPD.

#### 4.3.7.13 *supportedBandListHRPD*

Only applicable if the UE supports HRPD. This field defines which HRPD radio frequency bands are supported by the UE.

#### 4.3.7.14 *tx-ConfigHRPD*

Only applicable if the UE supports HRPD. This field defines whether the UE supports single or dual transmitter. With dual transmitter, UE can transmit simultaneously on both E-UTRAN and HRPD.

#### 4.3.7.15 *rx-ConfigHRPD*

Only applicable if the UE supports HRPD. This field defines whether the UE supports single or dual receiver. With dual receiver, UE can receive simultaneously on both E-UTRAN and HRPD.

#### 4.3.7.16 *cdma2000-1xRTT*

This parameter defines whether the UE supports 1xRTT.

#### 4.3.7.17 *supportedBandList1XRTT*

Only applicable if the UE supports 1xRTT. This field defines which 1xRTT radio frequency bands are supported by the UE.

#### 4.3.7.18 *tx-Config1XRTT*

Only applicable if the UE supports 1xRTT. This field defines whether the UE supports single or dual transmitter. With dual transmitter, UE can transmit simultaneously on both E-UTRAN and 1xRTT.

#### 4.3.7.19 *rx-Config1XRTT*

Only applicable if the UE supports 1xRTT. This field defines whether the UE supports single or dual receiver. With dual receiver, UE can receive simultaneously on both E-UTRAN and 1xRTT.

#### 4.3.7.20 *e-CSFB-1XRTT*

Only applicable if the UE supports CDMA2000 1xRTT. This field defines whether the UE supports enhanced 1xRTT CS fallback.

#### 4.3.7.21 *e-CSFB-ConcPS-Mob1XRTT*

Only applicable if the UE supports CDMA2000 1xRTT and CDMA2000 HRPD simultaneously. This field defines whether the UE supports concurrent enhanced CS fallback to CDMA2000 1xRTT and handover/redirection to CDMA2000 HRPD.

#### 4.3.7.22 *e-RedirectionUTRA*

This parameter defines whether the UE supports use of UTRA system information provided by *RRCConnectionRelease* upon redirection.

#### 4.3.7.23 e-RedirectionGERAN

This parameter defines whether the UE supports use of GERAN system information provided by *RRCConnectionRelease* upon redirection.

A UE that supports CS fallback to GERAN shall support e-Redirection to GERAN.

#### 4.3.7.24 *dtm*

This parameter defines whether the UE supports Dual Transfer Mode (DTM) in GERAN.

#### 4.3.7.25 *e-CSFB-dual-1XRTT*

Only applicable if the UE supports CDMA2000 1xRTT, dual transmitter (i.e. UE can transmit simultaneously on both E-UTRAN and 1xRTT) and dual receiver (i.e. UE can receive simultaneously on both E-UTRAN and 1xRTT). This field defines whether the UE supports dual receiver/transmitter enhanced 1xRTT CS fallback (dual Rx/Tx e1xCSFB).

#### 4.3.7.26 *e-RedirectionUTRA-TDD*

This parameter defines whether the UE supports redirection to multiple carrier frequencies both with and without using UTRA TDD system information for cells on multiple carrier frequencies provided by *RRCConnectionRelease*.

#### 4.3.7.27 *cdma2000-NW-Sharing-r11*

Only applicable if the UE supports CDMA2000 1xRTT or CDMA2000 HRPD. This parameter defines whether the UE supports per PLMN CDMA2000 interworking in E-UTRAN shared networks as specified in TS 36.331 [5].

#### 4.3.7.28 *mfbi-UTRA*

This field is only applicable for a UE supporting UTRA FDD. It indicates if the UE supports the signalling requirements of multiple radio frequency bands in a UTRA FDD cell, as defined in TS 25.307 [20].

#### 4.3.7.29 *supportedBandListWLAN*

This field defines which WLAN radio frequency bands are supported by the UE.

### 4.3.8 General parameters

#### 4.3.8.1 *accessStratumRelease*

This field defines the release of the E-UTRA layer 1, 2, and 3 specifications supported by the UE e.g. Rel-8, Rel-9, etc.

#### 4.3.8.1A *accessStratumRelease-r13*

This field defines the release of the E-UTRA layer 1, 2, and 3 specifications supported by the UE e.g. Rel-13, Rel-14, etc. This field is only applicable for UEs of any *ue-Category-NB*.

#### 4.3.8.2 *deviceType*

This field defines whether the device does not benefit from NW-based battery consumption optimisation.

#### 4.3.8.3 Void

#### 4.3.8.4 Void

#### 4.3.8.5 *multipleDRB-r13*

This field defines whether the UE supports multiple DRBs. This field is only applicable if the UE supports S1-U data transfer or User plane CIoT EPS Optimisation, see TS 24.301 [28], and any *ue-Category-NB*. If a UE of this release supports multiple DRBs, the UE shall support two simultaneous DRBs.

#### 4.3.8.6 Void

### 4.3.9 Void

### 4.3.10 CSG Proximity Indication parameters

#### 4.3.10.1 *intraFreqProximityIndication*

This parameter defines whether the UE supports proximity indication for intra-frequency E-UTRAN cells whose CSG Identities are in the UE's CSG Whitelist.

#### 4.3.10.2 *interFreqProximityIndication*

This parameter defines whether the UE supports proximity indication for inter-frequency E-UTRAN cells whose CSG Identities are in the UE's CSG Whitelist.

#### 4.3.10.3 *utran-ProximityIndication*

This parameter defines whether the UE supports proximity indication for UTRAN cells whose CSG IDs are in the UE's CSG Whitelist.

### 4.3.11 Neighbour cell SI acquisition parameters

#### 4.3.11.1 *intraFreqSI-AcquisitionForHO*

This parameter defines whether the UE supports, upon configuration of *si-RequestForHO* by the network, acquisition of relevant information from a neighbouring intra-frequency cell by reading the SI of the neighbouring cell using autonomous gaps and reporting the acquired information to the network as specified in TS 36.331 [5].

#### 4.3.11.2 *interFreqSI-AcquisitionForHO*

This parameter defines whether the UE supports, upon configuration of *si-RequestForHO* by the network, acquisition of relevant information from a neighbouring inter-frequency cell by reading the SI of the neighbouring cell using autonomous gaps and reporting the acquired information to the network as specified in TS 36.331 [5].

#### 4.3.11.3 *utran-SI-AcquisitionForHO*

This parameter defines whether the UE supports, upon configuration of *si-RequestForHO* by the network, acquisition of relevant information from a neighbouring UMTS cell by reading the SI of the neighbouring cell using autonomous gaps and reporting the acquired information to the network as specified in TS 36.331 [5].

### 4.3.12 SON parameters

#### 4.3.12.1 *rach-Report*

This parameter defines whether the UE supports delivery of *rachReport* upon request from the network.

### 4.3.13 UE-based network performance measurement parameters

#### 4.3.13.1 *loggedMeasurementsIdle*

This parameter defines whether the UE supports logged measurements in RRC\_IDLE upon request from the network. A UE that supports logged measurements in RRC\_IDLE shall also support a minimum of 64kB memory for log storage.

#### 4.3.13.2 *standaloneGNSS-Location*

This parameter defines whether the UE is equipped with a standalone GNSS receiver that may be used to provide detailed location information in RRC measurement report and logged measurements in RRC\_IDLE.

#### 4.3.13.3 Void

#### 4.3.13.4 *loggedMBSFNMeasurements-r12*

This parameter defines whether the UE supports logged MBSFN measurement in RRC\_IDLE and RRC\_CONNECTED upon request from the network. A UE that supports logged MBSFN measurements shall also support a minimum of 64kB memory for log storage. A UE that supports logged MBSFN measurements shall also support logged measurements in RRC\_IDLE upon request from the network.

#### 4.3.13.5 *locationReport-r14*

This parameter defines whether the UE supports reporting of its geographical location information to eNB.

### 4.3.14 IMS Voice parameters

#### 4.3.14.1 *voiceOver-PS-HS-UTRA-FDD*

Only applicable if the UE supports UTRA FDD. This parameter defines whether the UE supports IMS Voice in UTRA FDD according to GSMA IR.58 profile.

#### 4.3.14.2 *voiceOver-PS-HS-UTRA-TDD128*

Only applicable if the UE supports UTRA TDD 1.28Mcps. This parameter defines whether the UE supports IMS Voice in UTRA TDD 1.28Mcps.

#### 4.3.14.3 *srvcc-FromUTRA-FDD-ToGERAN*

Only applicable if the UE supports UTRA FDD and GERAN. This parameter defines whether the UE supports SRVCC handover from UTRA FDD PS HS to GERAN CS.

#### 4.3.14.4 *srvcc-FromUTRA-FDD-ToUTRA-FDD*

Only applicable if the UE supports UTRA FDD. This parameter defines whether the UE supports SRVCC handover from UTRA FDD PS HS to UTRA FDD CS.

#### 4.3.14.5 *srvcc-FromUTRA-TDD128-ToGERAN*

Only applicable if the UE supports UTRA TDD 1.28Mcps and GERAN. This parameter defines whether the UE supports SRVCC handover from UTRA TDD 1.28Mcps PS HS to GERAN CS.

#### 4.3.14.6 *srvcc-FromUTRA-TDD128-ToUTRA-TDD128*

Only applicable if the UE supports UTRA TDD 1.28Mcps. This parameter defines whether the UE supports SRVCC handover from UTRA TDD 1.28Mcps PS HS to UTRA TDD 1.28Mcps CS.

### 4.3.15 Other parameters

#### 4.3.15.1 Void

#### 4.3.15.2 *inDeviceCoexInd-r11*

This parameter defines whether the UE supports in-device coexistence indication as well as autonomous denial functionality as specified in TS 36.331 [5].

#### 4.3.15.3 *powerPrefInd-r11*

This parameter defines whether the UE supports power preference indication as specified in TS 36.331 [5].

#### 4.3.15.4 *ue-Rx-TxTimeDiffMeasurements-r11*

This parameter defines whether the UE supports Rx - Tx time difference measurements as specified in TS 36.331 [5] and TS 36.355 [13]. A TDD UE of this release of the specification that supports UE Rx-Tx time difference measurements, shall support to report UE Rx-Tx time difference measurement result including NTAoffset according to EUTRAN TDD Rx-Tx time difference measurement report mapping as specified in TS 36.133 [16].

#### 4.3.15.5 Void

#### 4.3.15.6 Void

#### 4.3.15.7 Void

#### 4.3.15.8 *inDeviceCoexInd-UL-CA-r11*

This parameter defines whether the UE supports UL CA related in-device coexistence indication as specified in TS 36.331 [5]. A UE that supports UL CA related in-device coexistence indication shall also support in-device coexistence indication.

#### 4.3.15.9 *bwPrefInd-r14*

This parameter defines whether the UE supports maximum PDSCH/PUSCH bandwidth preference indication as specified in TS 36.331 [5]. A UE indicating support of *bwPrefInd-r14* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.15.10 *inDeviceCoexInd-HardwareSharingInd-r13*

This parameter defines whether the UE supports hardware sharing indication as specified in TS 36.331 [5]. A UE that supports hardware sharing indication shall also indicate support of LAA operation.

#### 4.3.15.11 *overheatingInd-r14*

This parameter defines whether the UE supports overheating assistance information as specified in TS 36.331 [5].

### 4.3.16 Positioning parameters

#### 4.3.16.1 *otdoa-UE-assisted*

This parameter defines whether the UE supports UE-assisted OTDOA positioning as specified in TS 36.355 [13].

#### 4.3.16.2 *interFreqRSTDmeasurement*

This parameter defines whether the UE supports inter-frequency RSTD measurements for OTDOA positioning as specified in TS 36.355 [13].

### 4.3.17 MBMS parameters

#### 4.3.17.1 *mbms-SCell-r11*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception via MBSFN on a frequency indicated in an *MBMSInterestIndication* message, when an SCell is configured on that frequency (regardless of whether the SCell is activated or deactivated), as specified in TS 36.331 [5].

#### 4.3.17.2 *mbms-NonServingCell-r11*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception via MBSFN on a frequency indicated in an *MBMSInterestIndication* message, where (according to *supportedBandCombination* and to network synchronization properties) a serving cell may be additionally configured, as specified in TS 36.331 [5]. If this is supported, the UE shall also support MBMS reception via MBSFN on a frequency when an SCell is configured on that frequency (regardless of whether the SCell is activated or deactivated), as specified in TS 36.331 [5].

#### 4.3.17.3 *mbms-AsyncDC-r12*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception via MBSFN on a frequency indicated in an *MBMSInterestIndication* message, where according to *supportedBandCombination*, the carriers are configured or can be configured as serving cells in the MCG and the SCG which are not synchronized, specified in TS 36.331 [5]. In this release of specification, it is mandatory to support this according to *MBMSInterestIndication* and indicated *supportedBandCombination*.

#### 4.3.17.4 *fembmsMixedCell-r14*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception with 15kHz subcarrier spacings via MBSFN from FeMBMS/Unicast mixed cells on a frequency indicated in an *MBMSInterestIndication* message.

#### 4.3.17.5 *fembmsDedicatedCell-r14*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception with 15kHz subcarrier spacings via MBSFN from MBMS-dedicated cells on a frequency indicated in an *MBMSInterestIndication* message.

#### 4.3.17.6 *subcarrierSpacingMBMS-khz1dot25-r14, subcarrierSpacingMBMS-khz7dot5-r14*

This parameter defines the supported subcarrier spacing for MBSFN subframes on FeMBMS/Unicast mixed cells or MBMS-Dedicated cells in addition to 15kHz subcarrier spacing. The *subcarrierSpacingMBMS-khz7dot5-r14* refers to 7.5kHz subcarrier spacing and *subcarrierSpacingMBMS-khz1dot25-r14* refers to 1.25 kHz subcarrier spacing as defined in TS 36.211 [17], clause 6.12. This field is included only if UE supports MBMS reception from FeMBMS/Unicast mixed cell or MBMS-dedicated cell.

#### 4.3.17.7 *mbms-MaxBW-r14*

This parameter defines the maximum supported bandwidth (T) for MBMS reception, see TS 36.213 [22] clause 11.1. If the value is set to *implicitValue*, the corresponding value of T is calculated as specified in TS 36.213 [22], clause 11.1. If the value is set to *explicitValue*, the actual value of T = *explicitValue* \* 40 MHz.

#### 4.3.17.8 *mbms-ScalingFactor1dot25-r14, mbms-ScalingFactor7dot5-r14*

These parameters correspond to A(1.25 and A(7.5, respectively, i.e., scaling factor for processing one unit of bandwidth corresponding to subcarrier spacing of 1.25 kHz and 7.5 kHz, with respect to one unit of bandwidth corresponding to subcarrier spacing of 15 kHz. See TS 36.213 [22], clause 11.1. The field is included only if UE supports corresponding subcarrier spacing for MBSFN subframes on FeMBMS/Unicast mixed cells or MBMS-Dedicated cells in addition to 15kHz subcarrier spacing. The field shall be included if the UE supports corresponding subcarrier spacing for MBSFN subframes on FeMBMS/Unicast mixed cells or MBMS-Dedicated cells in addition to 15kHz subcarrier spacing and *mbms-MaxBW-r14* is included.

### 4.3.18 RAN-assisted WLAN interworking parameters

#### 4.3.18.1 *wlan-IW-RAN-Rules-r12*

This parameter defines whether the UE supports RAN-assisted WLAN interworking based on access network selection and traffic steering rules specified in TS 36.304 [14]. A UE that supports RAN-assisted WLAN interworking based on access network selection and traffic steering rules specified in TS 36.304 [14] shall support to receive, via system information and dedicated signalling, the RAN assistance parameters relevant for those rules.

#### 4.3.18.2 *wlan-IW-ANDSF-Policies-r12*

This parameter defines whether the UE supports RAN-assisted WLAN interworking based on ANDSF policies specified in TS 24.312 [21]. A UE that supports RAN-assisted WLAN interworking based on ANDSF policies specified in TS 24.312 [21] shall support to receive, via system information and dedicated signalling, the RAN assistance parameters relevant for those policies.

#### 4.3.18.3 *rclwi-r13*

This parameter defines whether the UE supports RCLWI as specified in TS 36.331 [5]. A UE that supports RCLWI shall also support WLAN measurements.

### 4.3.19 MAC parameters

#### 4.3.19.1 *longDRX-Command-r12*

This field defines whether the UE supports Long DRX Command MAC Control Element as specified in TS 36.321 [4]. It is mandatory for UEs of this release of the specification.

#### 4.3.19.2 *logicalChannelSR-ProhibitTimer-r12*

This field defines whether the UE supports the *logicalChannelSR-ProhibitTimer* as specified in TS 36.321 [4]. It is mandatory for UEs of any *ue-Category-NB* to support this feature.

#### 4.3.19.3 *extendedMAC-LengthField-r13*

This field defines whether the UE supports 16 bit length of MAC L field as specified in TS 36.321 [4].

#### 4.3.19.4 *extendedLongDRX-r13*

This field defines whether the UE supports the *longDRX-Cycle* values of 5120 and 10240 subframes as specified in TS 36.321 [4].

#### 4.3.19.5 *shortSPS-IntervalFDD-r14*

This field indicates whether the UE supports uplink SPS intervals shorter than 10 subframes in FDD mode. A UE that supports *shortSPS-IntervalFDD-r14* shall also support *skipUplinkSPS-r14*.

#### 4.3.19.6 *shortSPS-IntervalTDD-r14*

This field indicates whether the UE supports uplink SPS intervals shorter than 10 subframes in TDD mode. A UE that supports *shortSPS-IntervalTDD-r14* shall also support *skipUplinkSPS-r14*.

#### 4.3.19.7 *skipUplinkDynamic-r14*

This field 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 36.321 [4].

#### 4.3.19.8 *skipUplinkSPS-r14*

This field indicates whether the UE supports skipping of UL transmission for a configured uplink grant if no data is available for transmission as specified in TS 36.321 [4].

#### 4.3.19.9 *dataInactMon-r14*

This field defines whether the UE supports data inactivity monitoring as specified in TS 36.321 [4].

#### 4.3.19.10 *rai-Support-r14*

This field defines whether the UE supports Release Assistance Indication (RAI) as specified in TS 36.321 [4]. This field is only applicable if the UE supports UE category M1 or UE category M2 or any *ue-Category-NB*.

#### 4.3.19.11 *multipleUplinkSPS-r14*

This field defines whether the UE supports multiple uplink SPS and reporting SPS assistance information. A UE indicating *multipleUplinkSPS* shall also support V2X communication via Uu, as defined in TS 36.300 [30].

#### 4.3.19.12 *earlyContentionResolution-r14*

This field defines whether the UE supports MAC PDU that contains only the UE Contention Resolution Identity MAC control element but no RRC response message, as specified in TS 36.331 [5]. This feature is only applicable if the UE supports any *ue-Category-NB*.

### 4.3.20 Dual Connectivity parameters

#### 4.3.20.1 *drb-TypeSplit-r12*

This field defines whether the DRB type of Split bearer is supported by the UE which is capable of DC.

#### 4.3.20.2 *drb-TypeSCG-r12*

This field defines whether the DRB type of SCG bearer is supported by the UE which is capable of DC.

#### 4.3.20.3 *pdcp-TransferSplitUL-r13*

This field defines whether the PDCP data transfer toward both CGs for split bearer in UL as specified in TS 36.323 [2] is supported by the UE which is capable of DC. This field is only applicable for UEs supporting the DRB type of Split bearer.

#### 4.3.20.4 *ue-SSTD-Meas-r13*

This field defines whether the SSTD measurement between the PCell and the PSCell is supported by the UE which is capable of DC.

### 4.3.21 Sidelink parameters

#### 4.3.21.1 *commSupportedBands-r12*

This field indicates the bands on which the UE supports sidelink communication, as defined in TS 23.303 [24] and specified in TS 36.331 [5]. If a UE supports sidelink communication on at least one band, the UE shall support sidelink communication transmission based on UE autonomous resource selection, eNB scheduled resource allocation, ProSe Per Packet Priority (PPPP) handling and out of coverage sidelink discovery. If a UE supports sidelink communication, the UE shall support 16 sidelink processes for reception of SL-SCH.

#### 4.3.21.2 *commSimultaneousTx-r12*

This parameter indicates whether the UE supports simultaneous transmission of EUTRA and sidelink communication (on different carriers) in all bands for which the UE indicated simultaneous sidelink and EUTRA support in a band combination (using *commSupportedBandsPerBC*).

#### 4.3.21.3 *discSupportedBands-r12*

This field indicates the bands on which the UE supports sidelink discovery, as defined in TS 23.303 [24] and specified in TS 36.331 [5].

#### 4.3.21.4 *discScheduledResourceAlloc-r12*

This parameter indicates whether UE supports transmission of discovery announcements based on network scheduled resource allocation. It is mandatory for UEs of this release of the specification to support this feature if sidelink discovery is supported on at least one band (indicated by *discSupportedBands-r12*).

#### 4.3.21.5 *disc-UE-SelectedResourceAlloc-r12*

This parameter indicates whether UE supports transmission of discovery announcements based on UE autonomous resource selection. It is mandatory for UEs of this release of the specification to support this feature if sidelink discovery is supported on at least one band (indicated by *discSupportedBands-r12*).

#### 4.3.21.6 *disc-SLSS-r12*

This parameter indicates whether the UE supports SideLink Synchronization Signal (SLSS) transmission and reception for sidelink discovery.

#### 4.3.21.7 *discSupportedProc-r12*

This parameter indicates the number of processes supported by the UE for reception of sidelink discovery. This field shall be present if sidelink discovery is supported on at least one band (indicated by *discSupportedBands-r12*).

#### 4.3.21.8 *commMultipleTx-r13*

This parameter indicates whether the UE supports multiple transmissions of sidelink communication to different destinations in one SC period. If *commMultipleTx-r13* is set to supported then the UE supports 8 transmitting sidelink processes.

#### 4.3.21.9 *discInterFreqTx-r13*

This parameter indicates whether the UE supports sidelink discovery announcements either a) on the primary frequency only or b) on other frequencies also, regardless of the UE configuration (e.g. CA, DC). The UE may set *discInterFreqTx-r13* to supported when having a separate transmitter or if it can request sidelink discovery transmission gaps.

#### 4.3.21.10 *discPeriodicSLSS-r13*

This parameter indicates whether the UE supports periodic Sidelink Synchronization Signal (SLSS) transmission and reception for sidelink discovery. It is mandatory for UEs to support this feature if sidelink PS discovery is supported and it is optional otherwise.

#### 4.3.21.11 *discSysInfoReporting-r13*

This parameter indicates whether the UE supports reporting of System Information for inter-frequency/PLMN sidelink discovery.

#### 4.3.21.12 *zoneBasedPoolSelection-r14*

This parameter indicates whether the UE supports zone based transmission resource pool selection for V2X sidelink communication.

#### 4.3.21.13 *v2x-HighReception-r14*

This parameter indicates whether the UE supports reception of 20 PSCCH in a subframe and decoding of 136 RBs per subframe counting both PSCCH and PSSCH in a band for V2X sidelink communication.

#### 4.3.21.14 *v2x-eNB-Scheduled-r14*

This parameter indicates whether the UE supports transmitting PSCCH/PSSCH using dynamic scheduling, SPS in eNB scheduled mode for V2X sidelink communication, reporting SPS assistance information and the UE supports maximum transmit power associated with Power class 3 V2X UE, see TS 36.101 [6] in a band.

#### 4.3.21.15 *ue-AutonomousWithFullSensing-r14*

This parameter indicates whether the UE supports transmitting PSCCH/PSSCH using UE autonomous resource selection mode with full sensing (i.e., continuous channel monitoring) for V2X sidelink communication and the UE supports maximum transmit power associated with Power class 3 V2X UE, see TS 36.101 [6].

#### 4.3.21.16 *ue-AutonomousWithPartialSensing-r14*

This parameters indicates whether the UE supports transmitting PSCCH/PSSCH using UE autonomous resource selection mode with partial sensing (i.e., channel monitoring in a limited set of subframes) for V2X sidelink communication and the UE supports maximum transmit power associated with Power class 3 V2X UE, see TS 36.101 [6].

#### 4.3.21.17 *slss-TxRx-r14*

This parameter indicates whether the UE supports SLSS/PSBCH transmission and reception in UE autonomous resource selection mode and eNB scheduled mode for V2X sidelink communication.

#### 4.3.21.18 *sl-CongestionControl-r14*

This parameter indicates whether the UE supports Channel Busy Ratio measurement and reporting of Channel Busy Ratio measurement to eNB for V2X sidelink communication.

#### 4.3.21.19 *v2x-TxWithShortResvInterval-r14*

This parameter indicates whether the UE supports 20 ms and 50 ms resource reservation periods for UE autonomous resource selection and eNB scheduled resource allocation for V2X sidelink communication.

#### 4.3.21.20 *v2x-numberTxRxTiming-r14*

This parameter indicates the number of multiple reference TX/RX timings counted over all the configured sidelink carriers for V2X sidelink communication.

#### 4.3.21.21 *v2x-nonAdjacentPSCCH-PSSCH-r14*

This parameter indicates whether the UE supports transmission and reception in the configuration of non-adjacent PSCCH and PSSCH for V2X sidelink communication.

#### 4.3.21.22 *v2x-HighPower-r14*

This parameter indicates whether the UE supports maximum transmit power associated with Power class 2 V2X UE for V2X sidelink transmission in a band, see TS 36.101 [6].

#### 4.3.21.23 *v2x-SupportedBandCombinationList-r14*

This field indicates the bands on which the UE supports V2X sidelink communication, as defined in TS 23.285 [29] and specified in TS 36.331 [5]. If a UE supports V2X sidelink communication, the UE shall support a maximum number of 8 sidelink processes associated with the Sidelink HARQ Entity for the transmission of V2X sidelink communication on SL-SCH.

### 4.3.22 SC-PTM parameters

#### 4.3.22.1 *scptm-ParallelReception-r13*

This parameter defines whether UEs supporting SC-PTM support the parallel reception of DL-SCH transport block(s) associated with G-RNTI/SC-RNTI and DL-SCH transport block(s) associated with C-RNTI/Semi-Persistent Scheduling C-RNTI as well as the parallel reception of multiple DL-SCH transport blocks associated with G-RNTI/SC-RNTI in the same subframe. In SC-PTM operation, the DL-SCH processing capability is shared between the DL-SCH transport block(s) associated with G-RNTI/SC-RNTI and the DL-SCH transport block(s) associated with C-RNTI/Semi-Persistent Scheduling C-RNTI. A UE that supports *scptm-ParallelReception-r13* shall also support SC-PTM reception in RRC\_CONNECTED and in RRC\_IDLE according to SC-PTM procedures as specified in TS 36.331 [5], TS 36.321 [4] and TS 36.304 [14].

#### 4.3.22.2 Void

#### 4.3.22.3 *scptm-SCell-r13*

This parameter defines whether UEs supporting SC-PTM support in RRC\_CONNECTED, MBMS reception via SC-PTM on a frequency indicated in an *MBMSInterestIndication* message, when an SCell is configured on that frequency (regardless of whether the SCell is activated or deactivated), as specified in TS 36.331 [5].

#### 4.3.22.4 *scptm-NonServingCell-r13*

This parameter defines whether UEs supporting SC-PTM support in RRC\_CONNECTED, MBMS reception via SC-PTM on a frequency indicated in an *MBMSInterestIndication* message, where (according to *supportedBandCombination* and to network synchronization properties) a serving cell may be additionally configured, as specified in TS 36.331 [5]. If this is supported, the UE shall also support MBMS reception via SC-PTM on a frequency when an SCell is configured on that frequency (regardless of whether the SCell is activated or deactivated), as specified in TS 36.331 [5].

#### *4.3.22.5 scptm-AsyncDC-r13*

This parameter defines whether the UE in RRC\_CONNECTED supports MBMS reception via SC-PTM on a frequency indicated in an *MBMSInterestIndication* message, where according to *supportedBandCombination*, the carriers are configured or can be configured as serving cells in the MCG and the SCG which are not synchronized, specified in TS 36.331 [5]. In this release of specification, it is mandatory to support this according to *MBMSInterestIndication* and indicated *supportedBandCombination*.

### 4.3.23 LAA parameters

#### 4.3.23.1 *downlinkLAA-r13*

This field defines whether the UE supports downlink LAA operation including identification of downlink transmissions on LAA cell(s) for full downlink subframes, decoding of common downlink control signalling on LAA cell(s), CSI feedback for LAA cell(s), RRM measurements on LAA cell(s) based on CRS-based DRS.

#### 4.3.23.2 *crossCarrierSchedulingLAA-DL-r13*

This field defines whether the UE supports cross-carrier scheduling from a licensed carrier for LAA cell(s). This field is only applicable if the UE supports downlink LAA operation.

#### 4.3.23.3 *csi-RS-DRS-RRM-MeasurementsLAA-r13*

This field defines whether the UE supports performing RRM measurements on LAA cell(s) based on CSI-RS-based DRS. This field is only applicable if the UE supports downlink LAA operation.

#### 4.3.23.4 *endingDwPTS-r13*

This field defines whether the UE supports reception ending with a subframe occupied for a DwPTS-duration on LAA cell(s) as described in TS 36.211 [17] and TS 36.213 [22]. This field is only applicable if the UE supports downlink LAA operation.

#### 4.3.23.5 s*econdSlotStartingPosition-r13*

This field defines whether the UE supports reception of subframes with second slot starting position on LAA cell(s) as described in TS 36.211 [17] and TS 36.213 [22]. This field is only applicable if the UE supports downlink LAA operation.

#### 4.3.23.6 *tm9-LAA-r13*

This field defines whether the UE supports tm9 operation on LAA cell(s). This field is only applicable if the UE supports downlink LAA operation.

#### 4.3.23.7 *tm10-LAA-r13*

This field defines whether the UE supports tm10 operation on LAA cell(s). This field is only applicable if the UE supports downlink LAA operation.

#### 4.3.23.8 *uplinkLAA-r14*

This field defines whether the UE supports uplink LAA operation.

#### 4.3.23.9 *crossCarrierSchedulingLAA-UL-r14*

This field defines whether the UE supports cross-carrier scheduling from a licensed carrier for LAA cell(s) for uplink. This field is only applicable if the UE supports uplink LAA operation.

#### 4.3.23.10 *twoStepSchedulingTimingInfo-r14*

This field defines whether the UE supports two step uplink scheduling using PUSCH trigger A and PUSCH trigger B as defined in TS 36.213 [22]. This field also defines the timing between reception of a PUSCH trigger B and the earliest time the UE supports performing the associated UL transmission. This field is only applicable if the UE supports uplink LAA operation.

#### 4.3.23.11 *uss-BlindDecodingAdjustment-r14*

This field defines whether the UE supports blind decoding adjustment on UE specific search space as defined in TS 36.213 [22]. This field is only applicable if the UE supports uplink LAA operation.

#### 4.3.23.12 *uss-BlindDecodingReduction-r14*

This field defines whether the UE supports blind decoding reduction on UE specific search space by not monitoring DCI format 0A/0B/4A/4B as defined in TS 36.213 [22]. This field is only applicable if the UE supports uplink LAA operation.

#### 4.3.23.13 *outOfSequenceGrantHandling-r14*

This field defines whether the UE supports PUSCH transmissions with out of sequence UL grants as defined in TS 36.213 [22]. This field is only applicable if the UE supports uplink LAA operation.

### 4.3.24 LWIP parameters

#### 4.3.24.1 *lwip-r13*

This field defines whether the UE supports LWIP operation. A UE which supports LWIP operation shall also support WLAN measurements.

#### 4.3.24.2 *lwip-Aggregation-UL-r14*

This field defines whether the UE supports aggregation over LWIP in uplink. A UE which supports aggregation over LWIP uplink shall also support LWIP operation.

#### 4.3.24.3 *lwip-Aggregation-DL-r14*

This field defines whether the UE supports aggregation over LWIP in downlink. A UE which supports aggregation over LWIP downlink shall also support LWIP operation.

### 4.3.25 LWA parameters

#### 4.3.25.1 *lwa-r13*

This parameter defines whether the UE supports LWA as specified in TS 36.331 [5]. A UE that supports LWA shall also support WLAN measurements. A UE that supports LWA shall also support switched bearer operation.

#### 4.3.25.2 *lwa-SplitBearer-r13*

Only applicable if the UE supports LWA. This parameter defines whether the UE supports split bearer operation in LWA, i.e. the capability to receive data transmission for the same DRB on both LTE and WLAN simultaneously.

#### 4.3.25.3 *lwa-BufferSize-r13*

Only applicable if the UE supports LWA. This field indicates whether the UE supports the layer 2 buffer sizes corresponding to "with support for split bearers" columns defined in Tables 4.1-3 and 4.1A-3.

#### 4.3.25.4 *wlan-MAC-Address-r13*

Only applicable if the UE supports LWA. This parameter defines the WLAN MAC address of the UE.

#### 4.3.25.5 *lwa-HO-WithoutWT-Change-r14*

Only applicable if the UE supports LWA. This parameter indicates whether the UE supports enhancements to HO operation without WT change for LWA operation as specified in TS 36.331 [5].

#### 4.3.25.6 *lwa-UL-r14*

Only applicable if the UE supports LWA. This parameter indicates whether the UE supports LWA bearer in the UL.

#### 4.3.25.7 *Void*

#### 4.3.25.8 *wlan-SupportedDataRate-r14*

Only applicable if the UE supports LWA. This parameter indicates the maximum WLAN data rate supported by the UE for LWA operation.

#### 4.3.25.9 *lwa-RLC-UM-r14*

Only applicable if the UE supports LWA. This parameter indicates whether the UE supports RLC UM for LWA bearer.

### 4.3.26 Void

#### 4.3.26.1 Void

### 4.3.27 Inter-RAT parameters WLAN

#### 4.3.27.1 *supportedBandListWLAN-r13*

Only applicable if the UE supports WLAN. This field defines which WLAN frequency bands are supported by the UE.

### 4.3.28 EBF FD-MIMO parameters

#### 4.3.28.1 *beamformed-r13*

Indicates the UE capabilities concerning beamformed EBF/ FD-MIMO operation (class B), see TS 36.213 [22], clause 7.2.5. The capabilities comprise of a list of pairs of {k-Max, n-MaxList} values with the nth entry indicating the values that the UE supports for each CSI process in case n CSI processes would be configured, with:

- k-Max: Indicating the maximum number of NZP CSI RS resource configurations supported

- n-Max: Indicating the maximum number of NZP CSI RS ports supported within a CSI process.

The capability parameters are provided separately per transmission mode (TM9, TM10) , which is applicable for all bands of band combinations except when additionally included per band of band combination per TM indicating the concerned capability is different from the per TM capability.

#### 4.3.28.2 *channelMeasRestriction-r13*

Indicates whether the UE supports channel measurement restriction, see TS 36.213 [22], clause 7.2.3. The capability parameter is provided separately per transmission mode (TM9, TM10).

#### 4.3.28.3 *csi-RS-EnhancementsTDD-r13*

Indicates whether the UE supports CSI-RS enhancements applicable for TDD, see TS 36.211 [17], clause 6.10.5. The capability parameter is provided separately per transmission mode (TM9, TM10).

#### 4.3.28.4 *dmrs-Enhancements-r13*

Indicates whether the UE supports DMRS enhancements for the indicated transmission mode, see TS 36.213 [22], clause 7.1.5B and TS 36.212 [26], clause 5.3.3.1.5C/ D.

The capability parameter is provided separately per transmission mode (TM9, TM10), which is applicable for all bands of band combinations except when additionally included per band of band combination per TM indicating the concerned capability is different from the per TM capability.

#### 4.3.28.5 *interferenceMeasRestriction-r13*

Indicates whether the UE supports interference measurement restriction, see TS 36.213 [22], clause 7.2.

#### 4.3.28.6 *nonPrecoded-r13*

Indicates the UE capabilities concerning non-precoded EBF/ FD-MIMO operation (class A) for CSI-RS and CSI reporting using 8, 12 and 16 antenna ports see TS 36.213 [22], clause 7.2.

- config1: Indicates support of codebook configuration 1.

- config2: Indicates support of codebook configuration 2.

- config3: Indicates support of codebook configuration 3.

- config4: Indicates support of codebook configuration 4.

The capability parameters are provided separately per transmission mode (TM9, TM10), which is applicable for all bands of band combinations except when additionally included per band of band combination per TM indicating the concerned capability is different from the per TM capability. See also TS 36.331 [5] subclause 6.3.6, NOTE 8 in *UE-EUTRA-Capability* field descriptions.

#### 4.3.28.7 *srs-Enhancements-r13*

Indicates for a particular transmission mode whether the UE supports SRS enhancements, see TS 36.211 [17], clause 5.5.3.

#### 4.3.28.8 *srs-EnhancementsTDD-r13*

Indicates for a particular transmission mode whether the UE supports TDD specific SRS enhancements, see TS 36.211 [17], clauses 4.2 and 5.5.3.

#### 4.3.28.9 *csi-ReportingAdvanced-r14, csi-ReportingAdvancedMaxPorts-r14*

Indicates the maximum number of CSI-RS ports supported by the UE for advanced CSI reporting. The field *csi-ReportingAdvanced-r14* is included to indicate 32 CSI-RS ports whereas *csi-ReportingAdvancedMaxPorts-r14* is included to indicate 8, 12, 16, 20, 24 or 28 CSI-RS ports (i.e., UE shall not include both *csi-ReportingAdvanced-r14* and *csi-ReportingAdvancedMaxPorts-r14*). The capability parameter is provided separately per transmission mode (TM9, TM10), which is applicable for all bands of band combinations except when additionally included per band of band combination per TM indicating the concerned capability is different from the per TM capability.

#### 4.3.28.10 *Void*

#### 4.3.28.11 *csi-ReportingNP-r14*

Indicates whether the UE supports CSI reporting on non-precoded CSI-RS with 20, 24, 28 or 32 antenna ports, see TS 36.213 [22], Table 7.2.4-9. The capability parameter is provided separately per transmission mode (TM9, TM10), which is applicable for all bands of band combinations except when additionally included per band of band combination per TM indicating the concerned capability is different from the per TM capability. See also TS 36.331 [5] subclause 6.3.6, NOTE 8 in *UE-EUTRA-Capability* field descriptions. A UE indicating support of *csi-ReportingNP-r14* shall also indicate support of *nonPrecoded-r13*.

#### 4.3.28.12 *relWeightTwoLayers-r13, relWeightFourLayers-r13, relWeightEightLayers-r13*

This field indicates relative weight of processing FD-MIMO with 2/ 4/ 8 layers with respect to non-FD-MIMO with the same number of layers, as described in equation 4.3.28.13-1 and TS 36.331 [5] subclause 6.3.6, NOTE 8 in *UE-EUTRA-Capability* field descriptions. This field can be included only if the UE supports the corresponding number of layers (i.e. 2/ 4/ 8 layers).

#### 4.3.28.13 *totalWeightedLayers-r13*

This field indicates total number of weighted layers the UE can process for FD-MIMO, as described in equation 4.3.28.13-1 below and TS 36.331 [5] subclause 6.3.6, NOTE 8 in *UE-EUTRA-Capability* field descriptions.

The FD-MIMO processing capability condition is satisfied if:

where:

- is the maximum number of DL layers configured for CC , and

Equation 4.3.28.13-1: FD-MIMO processing capability condition.

#### 4.3.28.14 *zp-CSI-RS-AperiodicInfo-r14*

Indicates whether the UE supports aperiodic ZP-CSI-RS transmission for the indicated transmission mode, see TS 36.213 [22], clause 7.2.1. The capability parameter is provided separately per transmission mode (TM9, TM10).

#### 4.3.28.15 *ul-dmrs-Enhancements-r14*

Indicates whether the UE supports UL DMRS enhancements, see TS 36.211 [17], clause 6.10.3A. The capability parameter is provided separately per transmission mode (TM9, TM10).

#### 4.3.28.16 *densityReductionNP-r14, densityReductionBF-r14*

Indicates whether the UE supports CSI-RS density reduction with values 1, 1/2 and 1/3 for non-precoded CSI-RS and beamformed CSI-RS respectively, see TS 36.213 [22], clause 7.2.5. The capability parameter is provided separately per transmission mode (TM9, TM10).

#### 4.3.28.17 *hybridCSI-r14*

Indicates whether the UE supports hybrid CSI transmission, see TS 36.213 [22], clauses 7.2.1 and 7.2.2. The capability parameter is provided separately per transmission mode (TM9, TM10).

#### 4.3.28.18 *semiOL-r14*

Indicates whether the UE supports semi-open-loop transmission for the indicated transmission mode, see TS 36.213 [22], clause 7.2.4. The capability parameter is provided separately per transmission mode (TM9, TM10).

### 4.3.29 CE parameters

#### 4.3.29.1 *ce-ModeA-r13*

This field defines whether the UE supports operation in coverage enhancement mode A, as specified in TS 36.211 [17], TS 36.213 [22] and TS 36.331 [5], and PRACH CE levels 0 and 1 at Random Access, as specified in TS 36.321 [4]. It is mandatory for UEs of DL category M1, UL category M1, DL category M2 and UL category M2

#### 4.3.29.2 *ce-ModeB-r13*

This field defines whether the UE supports operation in coverage enhancement mode B, as specified in TS 36.211 [17], TS 36.213 [22] and TS 36.331 [5], and PRACH CE levels 2 and 3 at Random Access, as specified in TS 36.321 [4]. A UE indicating support of *ce-ModeB-r13* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.29.3 *intraFreqA3-CE-ModeA-r13*

This field defines whether the UE when operating in CE Mode A supports *eventA3* for intra-frequency neighbouring cells in normal coverage and CE Mode A, as specified in TS 36.331 [5] and TS 36.133 [16]. It is mandatory for UEs of this release if *ce-ModeA-r13* is supported.

#### 4.3.29.4 *intraFreqA3-CE-ModeB-r13*

This field defines whether the UE when operating in CE Mode B supports *eventA3* for intra-frequency neighbouring cells in normal coverage, CE Mode A and CE Mode B, as specified in TS 36.331 [5] and TS 36.133 [16]. It is mandatory for UEs of this release if *ce-ModeB-r13* is supported.

#### 4.3.29.5 *intraFreqHO-CE-ModeA-r13*

This field defines whether the UE when operating in CE Mode A supports intra-frequency handover to target cell in normal coverage and CE Mode A, as specified in TS 36.331 [5] and TS 36.133 [16]. It is mandatory for UEs of this release if *ce-ModeA-r13* is supported.

#### 4.3.29.6 *intraFreqHO-CE-ModeB-r13*

This field defines whether the UE when operating in CE Mode B supports intra-frequency handover to target cell in normal coverage, CE Mode A or CE Mode B, as specified in TS 36.331 [5] and TS 36.133 [16]. It is mandatory for UEs of this release if *ce-ModeB-r13* is supported.

#### 4.3.29.7 *ue-CE-NeedULGaps-r13*

This field defines whether the UE needs UL gaps during continuous uplink transmission in half-duplex FDD as specified in TS 36.331 [5] and TS 36.211 [17].

#### 4.3.29.8 *unicastFrequencyHopping-r13*

This field, and a specific MAC header field LCID value specified in TS 36.321 [4], define whether the UE supports frequency hopping for unicast MPDCCH/PDSCH (configured by *mpdcch-pdsch-HoppingConfig*) and unicast PUSCH (configured by *pusch-HoppingConfig*). It is mandatory for UEs of this release of the specification if *ce-ModeA-r13* and/or *ce-ModeB-r13* is supported.

#### 4.3.29.9 *ce-SwitchWithoutHO-r14*

This field defines whether the UE supports switching between normal and CE mode without a handover as specified in TS 36.331 [5]. A UE indicating support of *ce-SwitchWithoutHO-r14* shall also indicate support of *ce-ModeA-r13* except for UEs of DL category M1, UL category M1, DL category M2 or UL category M2.

#### 4.3.29.10 *tm9-CE-ModeA-r13*

This field indicates whether the UE supports tm9 operation in CE mode A as specified in TS 36.213 [22], TS 36.321 [4] and TS 36.331 [5]. A UE indicating support of *tm9-CE-ModeA-r13* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.29.11 *tm9-CE-ModeB-r13*

This field indicates whether the UE supports tm9 operation in CE mode B as specified in TS 36.213 [22], TS 36.321 [4] and TS 36.331 [5]. A UE indicating support of *tm9-CE-ModeB-r13* shall also indicate support of *ce-ModeB-r13* and *tm9-CE-ModeA-r13*.

#### 4.3.29.12 *tm6-CE-ModeA-r13*

This field indicates whether the UE supports tm6 operation in CE mode A as specified in TS 36.213 [22] and TS 36.331 [5]. A UE indicating support of *tm6-CE-ModeA-r13* shall also indicate support of *ce-ModeA-r13*.

### 4.3.30 Mobility enhancement parameters

#### 4.3.30.1 *makeBeforeBreak-r14*

This field defines whether the UE supports Make-Before-Break handover and, if the UE supports DC, Make-Before-Break SeNB change, as specified in TS 36.331 [5].

#### 4.3.30.2 *rach-Less-r14*

This field defines whether the UE supports RACH-less handover and, if the UE supports DC, RACH-less SeNB change, as specified in TS 36.213 [22] and TS 36.331 [5].

### 4.3.31 Void

#### 4.3.31.1 Void

#### 4.3.31.2 Void

### 4.3.32 MMTEL parameters

#### 4.3.32.1 *delayBudgetReporting-r14*

This field defines whether the UE supports delay budget reporting as specified in TS 36.331 [5].

#### 4.3.32.2 *pusch-Enhancements-r14*

This field defines whether the UE supports the PUSCH enhancement mode as specified in TS 36.211 [17] and TS 36.213 [22].

#### 4.3.32.3 *recommendedBitRate-r14*

This field defines whether the UE supports the bit rate recommendation message from the eNB to the UE as specified in TS 36.321 [4], clause 6.1.3.13.

4.3.32.4 *recommendedBitRateQuery-r14*

This field defines whether the UE supports the bit rate recommendation query message from the UE to the eNB as specified in TS 36.321 [4], clause 6.1.3.13. This field is only applicable if the UE supports *recommendedBitRate-r14*.

### 4.3.33 High speed enhancement parameters

#### 4.3.33.1 *measurementEnhancements-r14*

This field defines whether UE supports measurement enhancements in high speed scenario as specified in TS 36.133 [16].

#### 4.3.33.2 *demodulationEnhancements-r14*

This field defines whether the UE supports advanced receiver in SFN scenario as specified in TS 36.101 [6].

#### 4.3.33.3 *prach-Enhancements-r14*

This field defines whether the UE supports random access preambles generated from restricted set type B in high speed scenoario as specified in TS 36.211 [17].

# 5 Void

# 6 Optional features without UE radio access capability parameters

The following subclauses list the optional UE features not having UE radio access capability.

NOTE: This chapter does not yet contain complete analysis of all features of this release of specification.

## 6.1 CSG features

It is optional for UE to support some parts of CSG cell and hybrid cell reselection features as specified in TS 36.331 [5], clause B.2.

## 6.2 PWS features

### 6.2.1 ETWS

It is optional for UE to support ETWS reception as specified in TS 36.331 [5].

### 6.2.2 CMAS

It is optional for UE to support CMAS reception as specified in TS 36.331 [5].

### 6.2.3 KPAS

It is optional for UE to support KPAS reception as specified in TS 36.331 [5]. The Korean Public Alert System (KPAS) uses the same AS mechanisms as defined for CMAS. Therefore a KPAS-capable UE shall support all behaviour that is included in TS 36.331 [5] and TS 36.304 [14] for a CMAS-capable UE.

### 6.2.4 EU-Alert

It is optional for UE to support EU-Alert reception as specified in TS 36.331 [5]. The Europearn Union Warning System EU-Alert uses the same AS mechanisms as defined for CMAS. Therefore a EU-Alert-capable UE shall support all behaviour that is included in TS 36.331 [5] and TS 36.304 [14] for a CMAS-capable UE.

## 6.3 MBMS features

It is optional for UE to support MBMS procedures as specified in TS 36.331 [5].

### 6.3.1 MBMS Service Continuity

It is optional for UE to support MBMS Service Continuity for UEs supporting MBMS as specified in TS 36.331 [5].

### 6.3.2 MBMS reception with 256QAM

It is optional to support MBMS reception with 256QAM for UEs supporting MBMS. A UE which supports MBMS reception with 256QAM shall also support *dl-256QAM-r12* as specified in TS 36.331 [5], except UEs configured to operate in Receive Only Mode as defined in TS 23.246 [31].

## 6.4 Void

## 6.5 Positioning features

### 6.5.0 Void

### 6.5.1 Void

## 6.6 UE receiver features

### 6.6.1 MMSE with IRC receiver

It is optional for UE to support MMSE with IRC receiver for all PDSCH transmission modes except for transmission mode 9.

### 6.6.2 MMSE with IRC receiver for PDSCH transmission mode 9

It is optional for UE to support MMSE with IRC receiver for PDSCH transmission mode 9, if the UE supports MMSE with IRC receiver as described in subclause 6.6.1.

### 6.6.3 Single-user MIMO interference mitigation advanced receiver for UEs with 2 receiver antenna ports

It is optional for UE with 2 receiver antenna ports to support receivers with enhanced inter-stream interference suppression for SU-MIMO PDSCH with rank 2 (Enhanced performance requirements Type C for 2 receiver antenna ports capable UEs in the TS 36.101 [6]).

### 6.6.4 Single-user MIMO interference mitigation advanced receiver for UEs with 4 receiver antenna ports

It is optional for UE with 4 receiver antenna ports to support R-ML receivers with enhanced inter-stream interference suppression for SU-MIMO PDSCH with rank 2, 3, and 4 (Enhanced performance requirements Type C for 4 receiver antenna ports capable UEs in the TS 36.101 [6]).

### 6.6.5 MMSE-IRC DL Control Channel interference mitigation receiver for UEs with 4 receiver antenna ports

It is optional for UE with 4 receiver antenna ports to support MMSE-IRC DL Control Channel interference mitigation receivers for UEs with 4 receiver ports (Enhanced downlink control channel performance requirements Type A for 4 receiver antenna ports capable UEs in the TS 36.101 [6]).

## 6.7 RRC Connection

### 6.7.1 RRC Connection Reject with deprioritisation

It is optional for UE to support *RRCConnectionReject with deprioritisationReq* as specified in TS 36.331 [5].

### 6.7.2 RRC Connection Establishment Failure Temporary Qoffset

It is optional for UE to support RRC Connection Establishment failure temporary Qoffset as specified in TS 36.331 [5].

### 6.7.3 *mo-VoiceCall* establishment cause for mobile originating MMTEL video

It is optional for UE to support *mo-VoiceCall* establishment cause for mobile originating MMTEL video as specified in TS 36.331 [5].

### 6.7.4 *mo-VoiceCall* establishment cause for mobile originating MMTEL voice

It is optional for UE to support mo-VoiceCall establishment cause for mobile originating MMTEL voice as specified in TS 36.331 [5].

### 6.7.5 RRC Connection Re-establishment for the Control Plane CIoT EPS Optimization

It is optional for UE to support *RRCConnectionReestablishment* for the Control Plane CIoT EPS Optimization as specified in TS 36.331 [5]. This feature is only applicable if the UE supports any *ue-Category-NB*.

## 6.8 Other features

### 6.8.1 System Information Block Type 16

It is optional for UE, including UEs of any *ue- Category-NB*, to support the reception of *SystemInformationBlockType16* as specified in TS 36.331 [5].

### 6.8.2 QCI1 indication in Radio Link Failure Report

It is optional for the UE to include *drb-EstablishedWithQCI-1* in *RLF-Report* as specified in TS 36.331 [5].

### 6.8.3 Enhanced random access power control

It is optional for UE to support enhanced random access power control as specified in TS 36.321 [4] and TS 36.213 [22], clauses 16.2.1.1.1 and 16.3.1. This feature is only applicable if the UE supports any *ue-Category-NB*.

## 6.9 Void

## 6.10 SON features

### 6.10.1 Radio Link Failure Report for inter-RAT MRO

It is optional for UE to include *previousUTRA-CellId* and *selectedUTRA-CellId* in *RLF-Report* upon request from the network as specified in TS 36.331 [5].

## 6.11 Mobility state features

### 6.11.1 Mobility history information storage

It is optional for UE to support the storage of mobility history information and the reporting in *UEInformationResponse* message as specified in TS 36.331 [5].

## 6.12 Void

## 6.13 Sidelink features

### 6.13.1 Sidelink Relay UE operation

It is optional for UE to support sidelink relay UE operation as specified in TS 36.331 [5].

### 6.13.2 Sidelink Remote UE operation

It is optional for UE to support sidelink remote UE operation as specified in TS 36.331 [5].

### 6.13.3 Sidelink discovery gap

It is optional for UE to support sidelink discovery gaps as specified in TS 36.331 [5].

## 6.14 DRX features

### 6.14.1 Extended DRX in RRC\_IDLE

It is optional for UE to support extended DRX cycle values up to and beyond 10.24 seconds and paging in extended DRX in RRC\_IDLE as specified in TS 36.331 [5] and TS 36.304 [14].

## 6.15 Load balancing features

### 6.15.1 Redistribution in RRC\_IDLE

It is optional for UE to support redistribution in RRC\_IDLE as specified in TS 36.331 [5] and TS 36.304 [14].

## 6.16 SC-PTM features

### 6.16.1 SC-PTM in Idle mode

It is optional for UE to support the SC-PTM reception in RRC\_IDLE as specified in TS 36.331 [5]. This feature is only applicable if the UE supports UE category M1 or UE category M2 or if the UE supports coverage enhancements (*ce-ModeB-r13* and/or *ce-ModeA-r13*) or if the UE supports any *ue-Category-NB*.

## 6.17 Idle mode measurements

### 6.17.1 Relaxed monitoring

It is optional for UE to support relaxed monitoring in RRC\_IDLE as specified in TS 36.304 [14]. This feature is only applicable if the UE supports any *ue-Category-NB* or if the UE supports UE category M1 or UE category M2 or if the UE supports coverage enhancements (*ce-ModeB-r13* and/or *ce-ModeA-r13*).

### 6.17.2 Serving cell idle mode measurements reporting

It is optional for UE to include *measResultServCell-r14* in *RRCConnectionRestablishmentComplete-NB*, *RRCConnectionResumeComplete-NB* and *RRCConnectionSetupComplete-NB* messages as specified in TS 36.331 [5]. This feature is only applicable if the UE supports any *ue-Category-NB*.

### 6.17.3 DL channel quality reporting

It is optional for UE to support DL channel quality reporting of the serving cell, as specified in TS 36.331 [5]. This feature is only applicable if the UE supports any *ue-Category-NB*.

# 7 Conditionally Mandatory features

## 7.1 Access control features

### 7.1.1 SSAC

It is mandatory to support Service Specific Access Control subject to common and per PLMN access barring parameters as specified in TS 36.331 [5], clause 5.3.3.10 for UEs which are IMS voice capable in LTE.

### 7.1.2 CSFB Access Barring Control

It is mandatory to support CSFB Access Barring Control subject to common and per PLMN access barring parameters as specified in TS 36.331 [5], clause 5.3.3.2 for UEs which are supporting CSFB to UTRA or GERAN.

### 7.1.3 Extended Access Barring

It is mandatory to support Extended Access Barring check as specified in TS 36.331 [5], clause 5.3.3.12 for UEs which are supporting an access subject to Extended Access Barring.

### 7.1.4 ACDC

It is mandatory to support barring check for ACDC subject to common and per PLMN barring parameters for ACDC as specified in TS 36.331 [5], clause 5.3.3.13 for UEs which are supporting an access subject to ACDC.

## 7.2 Emergency call features

### 7.2.1 IMS emergency call

It is mandatory to support IMS emergency call for UEs which are IMS voice capable in LTE.

## 7.3 MAC features

### 7.3.1 SR mask

It is mandatory to support configuration indicated by *logicalChannelSR-Mask* for UE which have set bit number 29 of *featureGroupIndicators* to "1" as specified in TS 36.331 [5].

### 7.3.2 Power Management Indicator in PHR

Power management indicator in PHR is mandatory to support for UE applying additional power backoff due to power management (as allowed by P-MPRc, see TS 36.101 [6]).

## 7.4 Inter-RAT Mobility features

### 7.4.1 High Priority CSFB redirection

It is mandatory to support the *RRCConnectionRelease* indicating *'cs-FallbackHighPriority'* for UEs which are supporting CSFB to UTRA as specified in TS 36.331 [5].

### 7.4.2 GERAN A/Gb mode to E-UTRAN Inter RAT handover (PS Handover)

It is mandatory to support at least parameter values corresponding to ue-Category 1 for UEs which are supporting GERAN A/Gb mode to E-UTRAN Inter RAT handover (PS Handover) as specified in TS 23.401 [18].

### 7.4.3 SRVCC to E-UTRAN from GERAN

It is mandatory to support at least parameter values corresponding to ue-Category 1, and ROHC profiles for an 'IMS capable UE supporting voice' as specified in subclause 4.3.1.1, for UEs which are supporting SRVCC to E-UTRAN from GERAN as specified in TS 23.216 [19].

NOTE: Requirements on functionality covered by Feature Group Indicators are specified in TS 36.331 [5], clause B.1.

## 7.5 Delay Tolerant Access Features

### 7.5.1 extendedWaitTime

It is mandatory to support the *RRCConnectionRelease* with *extendedWaitTime* and *RRCConnectionReject* with *extendedWaitTime* for UEs which support Delay Tolerant Access as specified in TS 36.331 [5].

## 7.6 RRC Connection

### 7.6.1 Void

## 7.7 Physical layer features

### 7.7.1 Different UL/ DL configuration for TDD inter-band carrier aggregation

It is mandatory to support different UL/ DL configuration for UEs supporting inter-band TDD carrier aggregation band combinations and for UEs supporting inter-band TDD dual connectivity band combinations within cell group(s) including at least two TDD bands.

### 7.7.2 Full duplex for TDD and FDD carrier aggregation

UE of this version of the specification shall be able to support simultaneous reception and transmission on different bands for each band combination including at least one FDD band and at least one TDD band.

### 7.7.3 Simultaneous transmission of PUCCH and PUSCH across PUCCH groups

It is mandatory to support simultaneous transmission of PUCCH and PUSCH across PUCCH groups if the UE indicates support for *pucch-SCell*.

### 7.7.4 Simultaneous transmission of PUCCH in licensed spectrum and PUSCH in LAA SCells

It is mandatory to support simultaneous transmission of PUCCH in licensed spectrum and PUSCH in LAA SCells if the UE supports uplink LAA operation. If the UE supports dual connectivity, this is applicable within each cell group.

## 7.8 Positioning features

### 7.8.1 OTDOA Inter-frequency RSTD measurement indication

It is mandatory to support delivery of *InterFreqRSTDMeasurementIndication* as specified in TS 36.331 [5], clause 5.5.7 for UEs indicating support for inter-frequency RSTD measurements for OTDOA as specified in TS 36.355 [13] and requiring measurement gaps for performing these measurements.

## 7.9 Void

### 7.9.1 Void

## 7.10 Other features

### 7.10.1 Logged MDT measurement suspension due to IDC interference

It is mandatory to support Logged MDT measurement suspension due to IDC interference for UEs which are supporting logged measurements in RRC\_IDLE upon request from the network and in-device coexistence indication as well as autonomous denial functionality as specified in TS 36.331 [5].

### 7.10.2 Support of extended reporting of WLAN measurements

It is mandatory to support reporting of extended number of measurements of WLAN IDs for UEs which are supporting WLAN measurements as specified in TS 36.331 [5].

### 7.10.3 wlan-ReportAnyWLAN-r14

Indicates whether UE supports reporting of measurements of unknown WLAN as specified in TS 36.331 [5]. It is mandatory to support reporting of measurements of unknown WLAN ID for UEs which are supporting WLAN measurements as specified in TS 36.331 [5].

### *7.10.4 wlan-PeriodicMeas-r14*

This parameter indicates whether the UE supports periodic reporting of WLAN measurements. It is mandatory to support periodic reporting of WLAN measurements for UEs which are supporting WLAN measurements as specified in TS 36.331 [5].

Annex A (informative):
Guideline on maximum number of DL PDCP SDUs per TTI

In order to help the dimensioning of the UE design, values for the maximum number of DL PDCP SDUs per TTI from Table A-1 may be used.

Note: Due to the need for the network buffer data for efficient scheduling, values for Category 1, 1bis and 2 are same. It is not expected that category 1 or category 1bis UE has to sustain the same rate of PDCP SDUs per TTI as category 2 for prolonged period of time.

Table A-1: Maximum values for DL PDCP SDUs per TTI

|  |  |
| --- | --- |
| UE Category / ue-CategoryDL | Maximum number of PDCP SDUs per TTI |
| Category 1 | 10 |
| Category 1bis | 10 |
| Category 2 | 10 |
| Category 3 | 20 |
| Category 4 /DL Category 4 | 30 |
| Category 5 | 50 |
| Category 6 /DL Category 6 | 50 |
| Category 7 /DL Category 7 | 50 |
| Category 9 /DL Category 9 | 80 |
| Category 10 /DL Category 10 | 80 |
| Category 11 /DL Category 11 | 100 |
| Category 12 /DL Category 12 | 100 |
| DL Category 13 | 65 |
| DL Category 15 | 130 |
| DL Category 16 | 180 |
| DL Category 18 | 200 |
| DL Category 19 | 280 |
| DL Category 20 | 360 |
| DL Category 21 | 240 |

Annex B (informative):
Change history

|  |
| --- |
| **Change history** |
| **Date** | **TSG #** | **TSG Doc.** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 11/2007 | RP-38 | RP-070916 |  |  |  | Presented for approval at TSG RAN-38 | 1.0.0 |
| 12/2007 |  | - |  |  |  | Approved at TSG RAN-38 and placed under change control | 8.0.0 |
| 03/2008 | RP-39 | RP-080194 | 0001 | 1 |  | CR to 36.306 with Update to E-UTRA UE capabilities | 8.1.0 |
| 05/2008 | RP-40 | RP-080409 | 0002 | 1 |  | Update to E-UTRA UE capabilities: CR 0002r1 to 36.306 with status after RAN2 #62 | 8.2.0 |
| 03/2009 | RP-43 | RP-090126 | 0007 | - |  | CR to remove the sections on MBMS | 8.3.0 |
|  | RP-43 | RP-090126 | 0008 | - |  | Final values for L2 buffer sizes | 8.3.0 |
|  | RP-43 | RP-090126 | 0009 | - |  | Various Corrections | 8.3.0 |
|  | RP-43 | RP-090126 | 0010 | - |  | CR to update uplink transmit diversity (UE transmit antenna selection) | 8.3.0 |
|  | RP-43 | RP-090126 | 0011 | - |  | Downlink PDCP SDU limitation | 8.3.0 |
|  | RP-43 | RP-090126 | 0014 | - |  | Thoughts on UE capability for RoHC | 8.3.0 |
|  | RP-43 | RP-090126 | 0015 | 1 |  | Capturing USIMless UE to stage 3 | 8.3.0 |
| 06/2009 | RP-44 | RP-090511 | 0016 | 2 |  | Support of inter-RAT PS handover to GERAN Editor Note Removal | 8.4.0 |
|  | RP-44 | RP-090511 | 0017 | 1 |  | Clarification of Half Duplex in TDD | 8.4.0 |
|  | RP-44 | RP-090511 | 0018 | - |  | Correcting the maximum number of bits received during one TTI | 8.4.0 |
|  | RP-44 | RP-090511 | 0019 | - |  | Clarification of field names used in TS 36.331 | 8.4.0 |
|  | RP-44 | RP-090511 | 0021 | - |  | Clarification on disabling E-UTRA capabilities with a USIM | 8.4.0 |
| 09/2009 | RP-45 | RP-090906 | 0023 | - |  | Unit for "Total layer 2 buffer size" | 8.5.0 |
| 12/2009 | RP-46 | - | - |  |  | Upgrade to the Release 9 - no technical change | 9.0.0 |
| 03/2010 | RP-47 | RP-100308 | 0024 | 1 |  | CR to 36.306 on Optionality of Rel-9 UE features | 9.1.0 |
|  | RP-47 | RP-100308 | 0025 | - |  | Introduction of power-limited device indication in UE capability. | 9.1.0 |
|  | RP-47 | RP-100308 | 0026 | - |  | UE capability for enhanced 1xRTT CS fallback | 9.1.0 |
|  | RP-47 | RP-100285 | 0028 | 1 |  | Bounds to RoHC requirements for IMS capable UEs supporting voice | 9.1.0 |
|  | RP-47 | RP-100309 | 0029 | 1 |  | CR to 36.306 on Redirection enhancements to UTRAN | 9.1.0 |
|  | RP-47 | RP-100188 | 0030 | 1 |  | Redirection enhancements to GERAN | 9.1.0 |
| 06/2010 | RP-48 | RP-100556 | 0031 | 1 |  | Clarification regarding / alignment of REL-9 UE capabilities | 9.2.0 |
|  | RP-48 | RP-100531 | 0033 | - |  | Correction on the definition of ue-SpecificRefSigsSupported | 9.2.0 |
| 09/2010 | RP-49 | RP-100853 | 0035 | - |  | Clarification of MBMS UE capability | 9.3.0 |
| 12/2010 | RP-50 | RP-101268 | 0037 | - |  | Inclusion of new UE categories in Rel-10 | 10.0.0 |
| 03/2011 | RP-51 | RP-110290 | 0038 | - |  | Description of carrier aggregation and MIMO capabilities | 10.1.0 |
|  | RP-51 | RP-110290 | 0039 | - |  | L2 buffer sizes for Rel-10 categories | 10.1.0 |
|  | RP-51 | RP-110280 | 0041 | - |  | CR to 36.306 adding UE capability indicator for dual Rx/Tx e1xCSFB | 10.1.0 |
|  | RP-51 | RP-110288 | 0042 | 1 |  | UE UL&DL MIMO Capabilities | 10.1.0 |
|  | RP-51 | RP-110282 | 0043 | - |  | Counter proposal to R2-110795 on UE capabilities for MDT | 10.1.0 |
| 06/2011 | RP-52 | RP-110828 | 0048 | - |  | Clarification of optionality of UE features without capability | 10.2.0 |
|  | RP-52 | RP-110830 | 0051 | - |  | Options for CSFB to GSM | 10.2.0 |
|  | RP-52 | RP-110840 | 0056 | 1 |  | CR to 36.306 on UE capabilities for Rel-10 LTE features | 10.2.0 |
|  | RP-52 | RP-110701 | 0058 | 2 |  | CA and MIMO Capabilities in LTE Rel-10 | 10.2.0 |
|  | RP-52 | RP-110839 | 0062 | - |  | Introduction of UE capability for enhanced redirection to UTRA TDD | 10.2.0 |
|  | RP-52 | RP-110834 | 0063 | 2 |  | Clarification of "supportedMIMO-CapabilityDL" | 10.2.0 |
|  | RP-52 | RP-110627 | 0064 | - |  | Correction of "total number of soft channel bits" for category 6 and 7 | 10.2.0 |
| 09/2011 | RP-53 | RP-111291 | 0065 | - |  | The SON feature in optional features without UE radio access capability parameters | 10.3.0 |
|  | RP-53 | RP-111283 | 0067 | - |  | AdditionalSpectrumEmissions in CA | 10.3.0 |
|  | RP-53 | RP-111278 | 0069 | - |  | Correction to UE capability parameters for handover to CSG cell | 10.3.0 |
| 12/2011 | RP-54 | RP-111716 | 0070 | 1 |  | Corrections to enhancedDualLayerTDD | 10.4.0 |
|  | RP-54 | RP-111710 | 0072 | - |  | Optionality of SR Masking | 10.4.0 |
|  | RP-54 | RP-111709 | 0074 | 1 |  | Optionality of UE Rx-Tx time difference report | 10.4.0 |
|  | RP-54 | RP-111714 | 0077 | - |  | Correction to the number of soft channel bits | 10.4.0 |
| 03/2012 | RP-55 | RP-120321 | 0078 | - |  | Clarification on physical layer parameter values requirement | 10.5.0 |
|  | RP-55 | RP-120326 | 0080 | 1 |  | Clarification on number of PDCP SDUs for categories 6-7 UEs | 10.5.0 |
|  | RP-55 | RP-120326 | 0082 | - |  | UE processing requirement in the presence of MCH transmission | 10.5.0 |
| 06/2012 | RP-56 | RP-120813 | 0090 | - |  | Korean Public Alert System (KPAS) in relation to CMAS | 10.6.0 |
|  | RP-56 | RP-120813 | 0093 | 1 |  | EU-Alert in relation to CMAS | 11.0.0 |
| 09/2012 | RP-57 | RP-121359 | 0100 | - |  | Voice support Capabilities | 11.1.0 |
|  | RP-57 | RP-121375 | 0103 | - |  | Introducing MBMS enhancements | 11.1.0 |
|  | RP-57 | RP-121395 | 0105 | - |  | Clarification on spatial multiplexing requirement in supportedBandCombination | 11.1.0 |
| 12/2012 | RP-58 | RP-121936 | 0120 | - |  | Power Management Indicator in PHR | 11.2.0 |
|  | RP-58 | RP-121936 | 0124 | 1 |  | Clarification on UL CA in supportedBandCombination | 11.2.0 |
|  | RP-58 | RP-122002 | 0125 | 2 |  | Introduction of Rel-11 UE features | 11.2.0 |
|  | RP-58 | RP-121960 | 0132 | - |  | Broadcast of Time Info by Using a New SIB | 11.2.0 |
| 03/2013 | RP-59 | RP-130243 | 0133 | 2 |  | DL COMP capability related correction | 11.3.0 |
|  | RP-59 | RP-130233 | 0135 | - |  | MIMO capability related correction | 11.3.0 |
|  | RP-59 | RP-130241 | 0137 | - |  | Correction to supported DL MIMO capability for TM10 | 11.3.0 |
|  | RP-59 | RP-130240 | 0138 | - |  | Optional support of RLF report for inter-RAT MRO | 11.3.0 |
|  | RP-59 | RP-130248 | 0140 | 1 |  | Corrections to UE capabiliy naming and definition | 11.3.0 |
|  | RP-59 | RP-130233 | 0142 | - |  | Clarification on cross carrier scheduling capability | 11.3.0 |
|  | RP-59 | RP-130226 | 0146 | - |  | Introduction of PDSCH TM5 capabilities for FDD and TDD | 11.3.0 |
| 09/2013 | RP-61 | RP-131315 | 0151 | - |  | Remove TBD in max MCH TB size table | 11.4.0 |
|  | RP-61 | RP-131314 | 0157 | - |  | Clarification of InterFreqRSTDMeasurementIndication procedure support | 11.4.0 |
| 12/2013 | RP-62 | RP-131986 | 0160 | - |  | Introduction of capability bit for UTRA MFBI | 11.5.0 |
|  | RP-62 | RP-132003 | 0161 | 1 |  | Capturing mandatory/optional agreements on Rel-11 UE features | 11.5.0 |
|  | RP-62 | RP-131991 | 0163 | - |  | Clarification on eRedirection to UMTS TDD with multiple UMTS TDD frequencies | 11.5.0 |
|  | RP-62 | RP-131984 | 0165 | - |  | Addition of inter-frequency RSTD measurement capability indicator for OTDOA | 11.5.0 |
|  | RP-62 | RP-131789 | 0166 | 1 |  | MBMS reception on any configured or configurable SCell | 11.5.0 |
|  | RP-62 | RP-131993 | 0167 | - |  | Enabling SRVCC from GERAN without forwarding UE-EUTRA-Capability | 11.5.0 |
| 03/2014 | RP-63 | RP-140364 | 0168 | 1 |  | New UE categories for DL 450Mbps class | 11.6.0 |
|  | RP-63 | RP-140349 | 0170 | - |  | SS and common channel interference handling | 11.6.0 |
|  | RP-63 | RP-140354 | 0176 | 1 |  | IoT indication for inter-band TDD CA with different UL/DL configuration | 11.6.0 |
|  | RP-63 | RP-140353 | 0173 | 1 |  | Corrections to UE capability and feature descriptions | 12.0.0 |
| 06/2014 | RP-64 | RP-140887 | 0181 | - |  | Support of the enhancement for TTI bundling for FDD | 12.1.0 |
|  | RP-64 | RP-140888 | 0185 | 3 |  | Alternative 1: Introduction of FDD/TDD CA full duplex support to 36.306 | 12.1.0 |
|  | RP-64 | RP-140892 | 0190 | 1 |  | Extended RLC LI field | 12.1.0 |
|  | RP-64 | RP-140873 | 0194 | 1 |  | Network-requested CA Band Combination Capability Signalling | 12.1.0 |
|  | RP-64 | RP-140892 | 0196 | 1 |  | Introduction of RRC Connection Establishment failure temporary Qoffset handling | 12.1.0 |
|  | RP-64 | RP-141028 | 0198 | 3 |  | eMBMS reception on SCell and Non-Serving Cell | 12.1.0 |
| 09/2014 | RP-65 | RP-141498 | 0218 | 1 |  | The PDCP SDU number limitation for Category 9-10 UE | 12.2.0 |
|  | RP-65 | RP-141505 | 0215 | - |  | UE capabilities for Hetnet mobility in TS 36.306 | 12.2.0 |
|  | RP-65 | RP-141499 | 0212 | - |  | Introduction of UE eIMTA capabilities | 12.2.0 |
|  | RP-65 | RP-141493 | 0205 | - |  | Corrections to UE capabilities and features | 12.2.0 |
|  | RP-65 | RP-141507 | 0209 | - |  | Introduction of MBSFN MDT capability | 12.2.0 |
|  | RP-65 | RP-141506 | 0207 | 2 |  | Introduction of Category 0 for low complexity UEs | 12.2.0 |
| 12.2014 | RP-66 | RP-142129 | 0225 | - |  | Clarification on DL parallel reception of category 0 UEs | 12.3.0 |
|  | RP-66 | RP-142125 | 0228 | - |  | Optional features for Hetnet mobility in TS 36.306 | 12.3.0 |
|  | RP-66 | RP-142123 | 0230 | - |  | Corrections to eIMTA capabilities | 12.3.0 |
|  | RP-66 | RP-142140 | 0243 | - |  | Introduction of extended RSRQ value range and new RSRQ definition | 12.3.0 |
|  | RP-66 | RP-142132 | 0232 | - |  | Support of Discovery Signals in TS 36.306 | 12.3.0 |
|  | RP-66 | RP-142140 | 0247 | - |  | Prohibit timer for SR | 12.3.0 |
|  | RP-66 | RP-142128 | 0241 | 1 |  | UE capability for IncMon | 12.3.0 |
|  | RP-66 | RP-142115 | 0227 | 1 |  | Introduction of capability for serving cell interruptions | 12.3.0 |
|  | RP-66 | RP-142134 | 0239 | - |  | Introduction of missing Rel-12 UE capabilities | 12.3.0 |
|  | RP-66 | RP-142130 | 0245 | 1 |  | Optionality support of UE mandatory features for Category 0 UEs | 12.3.0 |
|  | RP-66 | RP-142135 | 0238 | 1 |  | Introduction of Dual Connectivity | 12.3.0 |
|  | RP-66 | RP-142139 | 0237 | 2 |  | NAICS Capability | 12.3.0 |
|  | RP-66 | RP-142124 | 0229 | 2 |  | Mandatory support of TTI bundling without resource allocation restriction for LTE coverage enhancements for Rel-12 | 12.3.0 |
|  | RP-66 | RP-141981 | 0248 | - |  | UE capability signaling for WLAN/3GPP radio interworking | 12.3.0 |
|  | RP-66 | RP-142232 | 0233 | 2 |  | Support of 256QAM in TS 36.306 | 12.3.0 |
| 03/2015 | RP-67 | RP-150378 | 0265 | - |  | UE capability for modified MPR behavior | 12.4.0 |
|  | RP-67 | RP-150373 | 0257 | - |  | Correction to UE capabilities for Low Complexity UEs | 12.4.0 |
|  | RP-67 | RP-150373 | 0259 | - |  | Clarification of TDD DC capability | 12.4.0 |
|  | RP-67 | RP-150373 | 0258 | - |  | Extended number of measurement identities capability | 12.4.0 |
|  | RP-67 | RP-150373 | 0253 | - |  | Introduction of total L2 buffer sizes for UEs supporting split bearers*NOTE: Modifications on L2 buffer sizes with support for split bearers for Cat 13-15 in Table 4.1-3 were moved to Table 4.1A-3 due to the clash with CR0261R1.* | 12.4.0 |
|  | RP-67 | RP-150374 | 0267 | - |  | Introduction of ProSe | 12.4.0 |
|  | RP-67 | RP-150376 | 0266 | 1 |  | Change related to configuration of the priority for frequency bands in mFBI | 12.4.0 |
|  | RP-67 | RP-150379 | 0261 | 1 |  | Introduction of UL64QAM based on split of DL and UL categories | 12.4.0 |
| 06/2015 | RP-68 | RP-150921 | 0269 | - |  | Dual Connectivity L2 buffer size for category combinations with UL64QAM | 12.5.0 |
|  | RP-68 | RP-150917 | 0272 | 1 |  | Corrections on MIMO capabilities | 12.5.0 |
|  | RP-68 | RP-150923 | 0277 | - |  | Clarification on UL 64QAM capability | 12.5.0 |
|  | RP-68 | RP-150917 | 0276 | - |  | UE support of CA fallback configurations | 12.5.0 |
|  | RP-68 | RP-150921 | 0283 | 1 |  | Corrections on requirements of sidelink reception in TS 36.306 | 12.5.0 |
|  | RP-68 | RP-150951 | 0280 | 1 |  | Introduction of new DL UE categories 15&16 | 12.5.0 |
| 09/2015 | RP-69 | RP-151438 | 0287 | - |  | Remove support of additionalSpectrumEmissionPCell | 12.6.0 |
|  | RP-69 | RP-151442 | 0288 | - |  | Capturing PCell support for FDD-TDD CA | 12.6.0 |
|  | RP-69 | RP-151442 | 0292 | - |  | Clarification of the maximum number of bits of a single DL-SCH transport block for DL Category 16 | 12.6.0 |
|  | RP-69 | RP-151442 | 0293 | - |  | Capturing mandatory/optional features of Rel-12 UEs | 12.6.0 |
|  | RP-69 | RP-151439 | 0298 | - |  | CR for IDC signalling enhancement for UL CA | 12.6.0 |
|  | RP-69 | RP-151441 | 0289 | 1 |  | Corrections on UE sidelink capabilities in TS 36.306 | 12.6.0 |
|  | RP-69 | RP-151467 | 0290 | 2 |  | Additional MIMO/CSI capability for intra-band contiguous CA | 12.6.0 |
|  | RP-69 | RP-151597 | 0296 | 3 |  | Capability for 4-layer MIMO with TM3 and TM4 | 12.6.0 |
| 12/2015 | RP-70 | RP-152053 | 0309 | - |  | Definitions of sidelink terminologies in TS 36.306 | 12.7.0 |
|  | RP-70 | RP-152055 | 0310 | - |  | Correction on categories in supportedBandCombination | 12.7.0 |
|  | RP-70 | RP-152048 | 0303 | 1 |  | Clarification on support of extended wait time | 12.7.0 |
|  | RP-70 | RP-152053 | 0312 | 1 |  | Clarification on tdd-FDD-CA-PCellDuplex | 12.7.0 |
|  | RP-70 | RP-152049 | 0299 | 2 |  | Alternative new maximum transport block sizes for DL 64QAM and 256QAM in TM9/10 | 12.7.0 |
|  | RP-70 | RP-152048 | 0318 | - |  | Enabling multiple NS and P-Max operation per cell | 12.7.0 |
|  | RP-70 | RP-152055 | 0315 | 1 |  | Correction on capability rsrq-OnAllSymbols | 12.7.0 |
|  | RP-70 | RP-152053 | 0313 | 1 |  | Clarification on Pcell support | 12.7.0 |
| 12/2015 | RP-70 | RP-152074 | 0301 | 1 |  | Introduction of DC enhancement | 13.0.0 |
|  | RP-70 | RP-152078 | 0319 | - |  | Introduction of Licensed-Assisted Access using LTE | 13.0.0 |
|  | RP-70 | RP-152075 | 0308 | 1 |  | Introduction of RS-SINR measurements | 13.0.0 |
|  | RP-70 | RP-152080 | 0304 | 1 |  | Introduction of SC-PTM | 13.0.0 |
|  | RP-70 | RP-152066 | 0314 | - |  | Introduction of Application specific Congestion control for Data Communication in LTE | 13.0.0 |
|  | RP-70 | RP-152084 | 0311 | 1 |  | White-list of cells for EUTRA measurement reporting | 13.0.0 |
|  | RP-70 | RP-152071 | 0305 | 2 |  | Introduction of CA enhancement | 13.0.0 |
|  | RP-70 | RP-152076 | 0322 | - |  | Introducing extended DRX | 13.0.0 |
| 03/2016 | RP-71 | RP-160470 | 0323 | 1 |  | Capture the UE capability for the extension of the MeasObjectId to 64 | 13.1.0 |
|  | RP-71 | RP-160470 | 0330 | - |  | Miscellaneous corrections to TS 36.306 | 13.1.0 |
|  | RP-71 | RP-160460 | 0333 | 1 |  | MDT enhancements support | 13.1.0 |
|  | RP-71 | RP-160460 | 0334 | 1 |  | The introduction of UE capability concerning extended E-UTRA frequency priorities | 13.1.0 |
|  | RP-71 | RP-160459 | 0335 | 3 |  | Introduction of LWIP UE capabilities | 13.1.0 |
|  | RP-71 | RP-160457 | 0337 | 2 |  | Introducing LWA and RCLWI UE capabilities | 13.1.0 |
|  | RP-71 | RP-160460 | 0338 | 1 |  | Leftover UE capabilities for LAA | 13.1.0 |
|  | RP-71 | RP-160470 | 0339 | 1 |  | Minor corrections for CA enhancements | 13.1.0 |
|  | RP-71 | RP-160462 | 0341 | 1 |  | Reference errors for inter-RAT capabilities | 13.1.0 |
|  | RP-71 | RP-160453 | 0342 | 1 |  | UE capabilities for LC and CE  | 13.1.0 |
|  | RP-71 | RP-160454 | 0343 | 2 |  | Introduction of eD2D Capability | 13.1.0 |
|  | RP-71 | RP-160464 | 0344 | 2 |  | Modification of network requested CA band combination retrieval for intra-band non-contiguous CA | 13.1.0 |
|  | RP-71 | RP-160467 | 0346 | 1 |  | Correction on capability phy-TDD-ReConfig-FDD(TDD)-Pcell | 13.1.0 |
|  | RP-71 | RP-160470 | 0347 | 1 |  | ANR in case of MFBI | 13.1.0 |
|  | RP-71 | RP-160455 | 0348 | - |  | 36.306 CR on TM10 CRS-IM UE capability report signalling introduction | 13.1.0 |
|  | RP-71 | RP-160470 | 0349 | - |  | Introduction of capability on PDSCH collision handling | 13.1.0 |
|  | RP-71 | RP-160470 | 0350 | 1 |  | Corrections on SC-PTM | 13.1.0 |
|  | RP-71 | RP-160470 | 0351 | - |  | SC-PTM reception on non-Pcell | 13.1.0 |
|  | RP-71 | RP-160460 | 0352 | 1 |  | Additional Layer 1 capabilities for Rel-13 CA enhancements | 13.1.0 |
| 06/2016 | RP-72 | RP-161080 | 1321 | - |  | Correction to WLAN measurement support for LWIP | 13.2.0 |
|  | RP-72 | RP-161080 | 1322 | - |  | Introducing EBF/FD-MIMO capabilities | 13.2.0 |
|  | RP-72 | RP-161080 | 1315 | - |  | Clarifications on LWA capability | 13.2.0 |
|  | RP-72 | RP-161080 | 1326 | - |  | MBMS reception via MBSFN or SC-PTM | 13.2.0 |
|  | RP-72 | RP-161080 | 1329 | - |  | Corrections on capability linking for measurement object extension | 13.2.0 |
|  | RP-72 | RP-161080 | 1327 | 2 |  | Capturing a new capability signalling format for Rel-13 CA enhancements | 13.2.0 |
|  | RP-72 | RP-161080 | 1330 | - |  | Correction on the value of maxmum channel bandwidth | 13.2.0 |
|  | RP-72 | RP-161080 | 1334 | 2 |  | UE capabilities for eMTC | 13.2.0 |
|  | RP-72 | RP-161080 | 1333 | 1 |  | UE Power Class in UE capability signaling | 13.2.0 |
|  | RP-72 | RP-161080 | 1314 | 2 |  | Miscellaneous corrections to TS 36.306 | 13.2.0 |
|  | RP-72 | RP-161080 | 1323 | 1 |  | Clarification on eD2D capability | 13.2.0 |
|  | RP-72 | RP-161076 | 1317 | - |  | Clarification on maximum number of DL-SCH transport block bits for DL Category 15 and 16 | 13.2.0 |
|  | RP-72 | RP-161076 | 1318 | - |  | UE capability of an additional Rx and Tx requirement for a CA band combination | 13.2.0 |
|  | RP-72 | RP-161081 | 1328 | 2 |  | Introduction of NB-IoT UE capabilities | 13.2.0 |
|  | RP-72 | RP-161076 | 1320 | 2 |  | Definition of a fallback band combination | 13.2.0 |
| 09/2016 | RP-73 | RP-161761 | 1338 | 1 |  | Support of CAT 9/10 and CAT 13 | 13.3.0 |
|  | RP-73 | RP-161760 | 1346 | 2 |  | Introduction of 1.2Gbps and 1.6Gbps UE categories in Rel-13 | 13.3.0 |
|  | RP-73 | RP-161826 | 1347 | 2 |  | Continuous uplink transmission in eMTC | 13.3.0 |
|  | RP-73 | RP-161751 | 1350 | 1 |  | Indication of the maxLayersMIMO | 13.3.0 |
|  | RP-73 | RP-161759 | 1352 | 1 |  | Supporting new UE Rx – Tx time difference  mapping table | 13.3.0 |
|  | RP-73 | RP-161761 | 1353 | - |  | Introducing UE capability of Rel 13 CCH IM | 13.3.0 |
|  | RP-73 | RP-161761 | 1354 | - |  | Introducing UE capability of CRS-IM for TM 1-9 | 13.3.0 |
| 09/2016 | RP-73 | RP-161745 | 1348 | - |  | Introduction of enhanced LAA for LTE | 14.0.0 |
| 12/2016 | RP-74 | RP-162327 | 1361 | 1 |  | Capability for LWIP aggregation | 14.1.0 |
|  | RP-74 | RP-162327 | 1364 | 1 |  | Miscellaneous corrections to TS 36.306 | 14.1.0 |
|  | RP-74 | RP-162318 | 1367 | - |  | Clarification on UE power class 2 indication | 14.1.0 |
|  | RP-74 | RP-162317 | 1369 | 1 |  | Correction on simultaneous transmission of PUCCH and PUSCH for B5C | 14.1.0 |
|  | RP-74 | RP-162321 | 1370 | 1 |  | Correction on simultaneous transmission of PUCCH and PUSCH for eLAA | 14.1.0 |
|  | RP-74 | RP-162327 | 1371 | - |  | Extension of PollByte | 14.1.0 |
|  | RP-74 | RP-162317 | 1373 | - |  | Definition of cch-InterfMitigation-MaxNumCCs | 14.1.0 |
|  | RP-74 | RP-162310 | 1377 | - |  | Clarification on UE category requirement | 14.1.0 |
|  | RP-74 | RP-162329 | 1383 | 1 |  | UE capabilities for Latency Reduction | 14.1.0 |
|  | RP-74 | RP-162314 | 1393 | - |  | Correction on channel bandwidth definition for NB-IoT | 14.1.0 |
|  | RP-74 | RP-162321 | 1397 | - |  | Introduction of capabilities for eLAA | 14.1.0 |
|  | RP-74 | RP-162555 | 1399 | 1 |  | Introduction of new UL UE category 15 for 225Mbps | 14.1.0 |
| 03/2017 | RP-75 | RP-170630 | 1382 | 2 | B | Introduction of mobility enhancement UE capabilities | 14.2.0 |
|  | RP-75 | RP-170639 | 1402 | 1 | A | Introduction of 1Rx UE category | 14.2.0 |
|  | RP-75 | RP-170628 | 1403 | 1 | B | Capability for extended reporting of WLAN measurements | 14.2.0 |
|  | RP-75 | RP-170668 | 1404 | - | B | Introduction of a new special subframe configuration | 14.2.0 |
|  | RP-75 | RP-170637 | 1406 | 2 | B | Introduction of UE capabilities for NB-IoT enhancements | 14.2.0 |
|  | RP-75 | RP-170636 | 1407 | 2 | B | Introduction of UE capabilities for feMTC enhancements | 14.2.0 |
|  | RP-75 | RP-170657 | 1410 | - | A | Support of multiple DRBs for S1-U data transfer | 14.2.0 |
|  | RP-75 | RP-170642 | 1416 | 1 | B | Introduction of data inactivity timer | 14.2.0 |
|  | RP-75 | RP-170652 | 1419 | 1 | A | IOT indication for unicast MPDCCH/PDSCH/PUSCH frequency hopping | 14.2.0 |
|  | RP-75 | RP-170638 | 1423 | 1 | B | Introduction of Voice and Video enhancements for LTE | 14.2.0 |
|  | RP-75 | RP-170646 | 1424 | 1 | B | Introduction of SRS switching capability | 14.2.0 |
|  | RP-75 | RP-170628 | 1425 | 1 | B | Introduction of Enhanced LTE-WLAN Aggregation (eLWA) | 14.2.0 |
|  | RP-75 | RP-170632 | 1426 | 2 | B | Introduction of new UL UE categories for UL 256QAM support | 14.2.0 |
|  | RP-75 | RP-170634 | 1429 | 2 | B | CR for introduction of measurement gap enhancement | 14.2.0 |
|  | RP-75 | RP-170642 | 1430 | 1 | C | Functional modification of retrieving different UE capabilities for a fallback band combination | 14.2.0 |
|  | RP-75 | RP-170636 | 1431 | - | B | FeMTC UE CE mode and maximum PDSCH/PUSCH BW preference indication | 14.2.0 |
|  | RP-75 | RP-170806 | 1434 | 1 | A | Feature optionality for Cat.1bis UE | 14.2.0 |
| 06/2017 | RP-76 | RP-171231 | 1437 | 1 | F | Correction on UE capabilities for eLAA | 14.3.0 |
|  | RP-76 | RP-171225 | 1438 | 2 | B | Introduction of new Transport Block Size for DL 256QAM | 14.3.0 |
|  | RP-76 | RP-171236 | 1439 | 4 | F | UE capabilities for eLWA | 14.3.0 |
|  | RP-76 | RP-171248 | 1442 | 2 | A | Entry-Level UE Support UL 64QAM | 14.3.0 |
|  | RP-76 | RP-171224 | 1443 | 2 | F | Miscellaneous corrections to TS 36.306 | 14.3.0 |
|  | RP-76 | RP-171222 | 1445 | 1 | F | CR for introduction of non-uniform gap in measurement gap enhancement | 14.3.0 |
|  | RP-76 | RP-171247 | 1446 | 1 | B | Introduction of a new UL UE category for 300Mbps with 64QAM | 14.3.0 |
|  | RP-76 | RP-171223 | 1448 | 2 | F | Corrections to capabilities for feMTC | 14.3.0 |
|  | RP-76 | RP-171223 | 1452 | 1 | C | CE mode configuration/deconfiguration without handover | 14.3.0 |
|  | RP-76 | RP-171241 | 1458 | 1 | A | Optional feature without UE capability bit for VoLTE | 14.3.0 |
|  | RP-76 | RP-171243 | 1461 | 2 | A | LAA/WiFi sharing indication | 14.3.0 |
|  | RP-76 | RP-171225 | 1462 | 1 | F | Update of ROHC profile referenc | 14.3.0 |
|  | RP-76 | RP-171225 | 1463 | - | B | UE Capabilitites to enable Uplink-Only RoHC operations | 14.3.0 |
|  | RP-76 | RP-171224 | 1464 | - | F | Corrections to capabilities for NB-IoT | 14.3.0 |
|  | RP-76 | RP-171234 | 1465 | - | F | UL 256QAM capability clarification | 14.3.0 |
|  | RP-76 | RP-171221 | 1470 | - | B | Introduction of FeMBMS to 36.306 | 14.3.0 |
|  | RP-76 | RP-171223 | 1475 | - | F | Correction on the description of ce-srsEnhancement for FeMTC | 14.3.0 |
|  | RP-76 | RP-171223 | 1476 | - | F | Minor correction on TS 36.306 for FeMTC | 14.3.0 |
|  | RP-76 | RP-171407 | 1478 | 2 | B | Introduction of UE capability for V2X in 36.306 | 14.3.0 |
|  | RP-76 | RP-171223 | 1479 | 2 | B | Introduction of enhanced RLM measurement capabilities | 14.3.0 |
|  | RP-76 | RP-171229 | 1480 | - | B | Introduction of UE capabilities for high speed | 14.3.0 |
|  | RP-76 | RP-171223 | 1483 | - | F | Correction to ceMeasurements-r14 measurement capability | 14.3.0 |
|  | RP-76 | RP-171224 | 1484 | - | B | Introduction of RRC connection re-establishment for NB-IoT control plane | 14.3.0 |
| 09/2017 | RP-77 | RP-171919 | 1486 | - | A | RoHC profile support for CIoT-only NB-IoT UE | 14.4.0 |
|  | RP-77 | RP-171914 | 1494 | 1 | F | Correction on UE category combination | 14.4.0 |
|  | RP-77 | RP-171918 | 1498 | 2 | A | Clarification on MBMS reception with 256QAM | 14.4.0 |
|  | RP-77 | RP-171913 | 1499 | - | F | Cat-M1 indication by Cat-M2 UE | 14.4.0 |
|  | RP-77 | RP-171913 | 1500 | - | F | Corrections on TS 36.306 for Rel-14 MTC | 14.4.0 |
|  | RP-77 | RP-171914 | 1501 | 2 | F | Clarification on NCSG UE capability | 14.4.0 |
|  | RP-77 | RP-171915 | 1502 | - | C | UE Capabilty for support of RLC UM for LWA bearer | 14.4.0 |
|  | RP-77 | RP-171913 | 1504 | 2 | C | Introduction of Release Assistance Indication | 14.4.0 |
|  | RP-77 | RP-171920 | 1506 | 2 | A | TM9 capabilities in CE mode | 14.4.0 |
|  | RP-77 | RP-171915 | 1507 | 1 | F | Introduction of interference randomisation in NB-IoT | 14.4.0 |
| 12/2017 | RP-78 | RP-172615 | 1490 | 5 | B | Introduction of the temporary UE capability for overheating indication | 14.5.0 |
|  | RP-78 | RP-172721 | 1508 | 2 | B | Introduction of DL 2Gbps Category | 14.5.0 |
|  | RP-78 | RP-172622 | 1511 | 2 | A | UE capabilities for Tx antenna selection | 14.5.0 |
|  | RP-78 | RP-172616 | 1514 | - | F | UE capability for support of SRS enhancements without support of comb 4 | 14.5.0 |
|  | RP-78 | RP-172616 | 1518 | 1 | B | Introduction of Enhanced CRS and SU-MIMO Interference Mitigation Performance Requirements for LTE | 14.5.0 |
|  | RP-78 | RP-172617 | 1523 | 2 | C | Introduction of relaxed monitoring in NB-IoT | 14.5.0 |
|  | RP-78 | RP-172624 | 1528 | 1 | A | TM6 capabilities in CE mode | 14.5.0 |
|  | RP-78 | RP-172616 | 1533 | - | F | MUST capability | 14.5.0 |
|  | RP-78 | RP-172617 | 1534 | 1 | F | Correction to random access power control in 36.306 | 14.5.0 |
|  | RP-78 | RP-172616 | 1536 | 1 | B | Introduction of a new UE capability for ssp10 with less CRS | 14.5.0 |
| 03/2018 | RP-79 | RP-180443 | 1545 | - | F | Correction to description for HARQ-ACK delay for Rel-14 MTC | 14.6.0 |
|  | RP-79 | RP-180443 | 1552 | 1 | C | Introduction of support of relaxed monitoring for BL and CE UE | 14.6.0 |
|  | RP-79 | RP-180448 | 1555 | 2 | B | Introduction of LTE DL 1.4Gbps Category | 14.6.0 |
|  | RP-79 | RP-180446 | 1561 | 1 | F | Capability for for reading shared PLMN information from non-CSG cells | 14.6.0 |
|  | RP-79 | RP-180446 | 1564 | 1 | F | Supported bandwidths in Fallback band combination | 14.6.0 |
|  | RP-79 | RP-180494 | 1566 | 2 | F | Correction on SRS carrier switching | 14.6.0 |
| 07/2018 | RP-80 | RP-181171 | 1567 | 3 | C | Introduction of support for MAC PDU containing UE contention resolution identity MAC control element without RRC response message in NB-IoT | 14.7.0 |
|  | RP-80 | RP-181234 | 1568 | 3 | F | Addition of the number of SL processes for V2X sidelink communication | 14.7.0 |
|  | RP-80 | RP-101232 | 1574 | 2 | F | Correction on reducedIntNonContComb-r13 description | 14.7.0 |
|  | RP-80 | RP-181232 | 1577 | 3 | A | Different power class support for band combinations | 14.7.0 |
|  | RP-80 | RP-181235 | 1579 | 3 | C | Introduction of serving cell idle mode measurements reporting in 36.306 | 14.70 |
|  | RP-80 | RP-181222 | 1601 | - | F | UE capability for handling of multiple numerologies in FeMBMS | 14.7.0 |
|  | RP-80 | RP-181233 | 1603 | 1 | F | Additional UE capabilities for SRS carrier switching | 14.7.0 |
|  | RP-80 | RP-181232 | 1605 | - | F | Additional UE capabilities for advanced CSI in FD-MIMO | 14.7.0 |
|  | RP-80 | RP-181236 | 1610 | 1 | C | Introduction of DL Channel Quality reporting | 14.7.0 |
| 09/2018 | RP-81 | RP-181963 | 1622 | - | F | Add missing NB-IoT capabilities in section 4 | 14.8.0 |
| 12/2018 | RP-82 | RP-182677 | 1650 | 1 | A | Clarification to CA fallback band combinations | 14.9.0 |
|  | RP-82 | RP-182677 | 1662 | - | F | Mandatory support of skipFallbackCombinations-r13 and diffFallbackCombReport-r14 | 14.9.0 |
|  | RP-82 | RP-182677 | 1671 | 1 | F | n1PUCCH-AN-CS-ListP1-r13 ASN.1 error correction | 14.9.0 |
| 03/2019 | RP-83 | RP-190548 | 1676 | 1 | F | Correction to support of reduced capability format | 14.10.0 |
|  | RP-83 | RP-190549 | 1685 | 1 | F | UE capability for support of special subframe configuration 10 with TDD-only CA | 14.10.0 |
| 06/2019 | RP-84 | RP-191383 | 1694 | 2 | C | UE capability signalling for FD-MIMO processing capabilities | 14.11.0 |
|  | RP-84 | RP-191383 | 1696 | - | F | Additional UE capability signalling for SRS carrier switching | 14.11.0 |
|  | RP-84 | RP-191383 | 1698 | 1 | F | Correction to PDCP profile | 14.11.0 |
|  | RP-84 | RP-191383 | 1702 | 1 | F | Corrections on UE capability for eFD-MIMO | 14.11.0 |
|  | RP-84 | RP-191383 | 1705 | 2 | F | Removing square brackets related to 8Rx | 14.11.0 |

Note: In CR0313R1 " Clarification on Pcell support " for TS 36.306 v12.7.0 of RP-152053 which was approved by RAN #70 wrong CR number, 1313 used in CR coversheet due to a misallocation.