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Foreword

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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 4995: "The RObust Header Compression (ROHC) Framework".
- [8] IETF RFC 4996: "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".

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].

<defined term>: *<definition>*.

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
BCCH	Broadcast Control Channel
CRS	Cell-specific Reference Signal
CSG	Closed Subscriber Group
CSI	Channel State Information
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
PDCCH	Physical Downlink Control Channel
PDCP	Packet Data Convergence Protocol
PDSCH	Physical Downlink Shared Channel
PHR	Power Headroom Reporting
PUCCH	Physical Uplink Control Channel
RACH	Random Access Channel
RAT	Radio Access Technology
RLC	Radio Link Control

ROHC	RObust Header Compression
RRC	Radio Resource Control
SI	System Information
SON	Self Organizing Networks
SR	Scheduling Request
SSAC	Service Specific Access Control
TDD	Time Division Duplex
TTI	Transmission Time Interval
UE	User Equipment
UL-SCH	Uplink Shared Channel
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access

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.

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. 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.

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)	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) 75376 (2 layers)	3654144	2 or 4
Category 7	301504	149776 (4 layers) 75376 (2 layers)	3654144	2 or 4
Category 8	2998560	299856	35982720	8
Category 9	452256	149776 (4 layers) 75376 (2 layers)	5481216	2 or 4
Category 10	452256	149776 (4 layers) 75376 (2 layers)	5481216	2 or 4

NOTE: 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

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

UE Category	Total layer 2 buffer size [bytes]
Category 1	150 000
Category 2	700 000
Category 3	1 400 000
Category 4	1 900 000
Category 5	3 500 000
Category 6	3 300 000
Category 7	3 800 000
Category 8	42 200 000
Category 9	4 800 000
Category 10	5 200 000

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

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

4.2 Parameters set by the field *ue-Category*

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.

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 section 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.

4.3 Parameters independent of the field *ue-Category*

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 4995)
- 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 4996)
- 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 4995).

'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.

4.3.1.2 `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.

4.3.1.3 `pdcp-SN-Extension`

This field defines whether the UE supports 15 bit length of PDCP sequence number as specified in TS 36.323 [2].

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.

4.3.2 RLC parameters

4.3.2.1 Void

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 number of spatial multiplexing layers in the uplink direction in a certain `supportedBandCombination` supported by the UE.

4.3.4.7 `supportedMIMO-CapabilityDL-r10`

This field defines the number of spatial multiplexing layers in the downlink direction in a certain `supportedBandCombination` supported by the UE.

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* 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.

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.

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.

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.

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.

4.3.4.22 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*.

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.

4.3.5 RF parameters

4.3.5.1 supportedBandListEUTRA

This field defines which E-UTRA radio frequency bands [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.

4.3.5.2 supportedBandCombination

This field defines the carrier aggregation, MIMO and MBMS reception capabilities 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. A MIMO capability applies to all carriers 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 between 2 and 10 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 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).

The UE supporting MBMS procedures shall support MBMS reception on the PCell, and it may indicate support for MBMS reception 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 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 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.

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 carrier aggregation.

4.3.5.5 supportedCSI-Proc

This field defines the maximum number of CSI processes supported on a component carrier within a band with PDSCH transmission mode 10.

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 measurements on each other supported E-UTRA radio frequency band and 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 measurements on each supported E-UTRA radio frequency band and on each supported RAT/band combination.

4.3.6.2 rsrqMeasWideband

This field defines whether the UE can perform RSRQ measurements in IDLE and RRC_CONNECTED with wider bandwidth as specified in TS 36.133 [16].

4.3.7 Inter-RAT parameters

4.3.7.1 Support of UTRA FDD

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 Support of UTRA TDD 1.28 Mcps

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 Support of UTRA TDD 3.84 Mcps

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 Support of UTRA TDD 7.68 Mcps

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 Support of 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 Support of 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 Support of 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 mfb-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].

4.3.8 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.

4.3.8.2 deviceType

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

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

4.3.14 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].

4.3.15.5 mbms-SCell-r11

This parameter defines whether the UE in RRC_CONNECTED supports MBMS reception 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].

4.3.15.6 mbms-NonServingCell-r11

This parameter defines whether the UE in RRC_CONNECTED supports MBMS reception 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 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].

4.3.15.7 freqBandRetrieval-r11

This parameter defines whether the UE supports CA band combination capability signalling indicated by *requestedFrequencyBands* 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 [13].

4.3.16.2 interFreqRSTDmeasurement

This parameter defines whether the UE supports inter-frequency RSTD measurements for OTDOA positioning [13].

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, 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 European 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].

6.4 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 sub-clause 6.6.1.

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].

6.8 Other features

6.8.1 System Information Block Type 16

It is optional for UE to support the reception of *SystemInformationBlockType16* as specified in TS 36.331 [5].

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].

7 Conditionally Mandatory features

7.1 Access control features

7.1.1 SSAC

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

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 $P-MPR_c$ [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 23.216 [19].

7.4.3 SRVCC to EUTRAN 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 4.3.1.1, for UEs which are supporting SRVCC to EUTRAN 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, B.1].

7.5 Delay Tolerant Access Features

7.5.1 extendedWaitTime

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

7.6 RRC Connection

7.6.1 Additional Spectrum Emission

It is mandatory to support handling of *additionalSpectrumEmissionPCell* for UEs which are carrier aggregation capable.

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.

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, 5.5.7] for UEs indicating support for inter-frequency RSTD measurements for OTDOA [13] and requiring measurement gaps for performing these measurements.

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 and 2 are same. It is not expected that category 1 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	Maximum number of PDCP SDUs per TTI
Category 1	10
Category 2	10
Category 3	20
Category 4	30
Category 5	50
Category 6	50
Category 7	50

Annex B (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
11/2007	RP-38	RP-070916			Presented for approval at TSG RAN-38	0.2.0	1.0.0
12/2007		-			Approved at TSG RAN-38 and placed under change control	1.0.0	8.0.0
03/2008	RP-39	RP-080194	0001	1	CR to 36.306 with Update to E-UTRA UE capabilities	8.0.0	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	8.1.0	8.2.0
03/2009	RP-43	RP-090126	0007	-	CR to remove the sections on MBMS	8.2.0	8.3.0
	RP-43	RP-090126	0008	-	Final values for L2 buffer sizes	8.2.0	8.3.0
	RP-43	RP-090126	0009	-	Various Corrections	8.2.0	8.3.0
	RP-43	RP-090126	0010	-	CR to update uplink transmit diversity (UE transmit antenna selection)	8.2.0	8.3.0
	RP-43	RP-090126	0011	-	Downlink PDCP SDU limitation	8.2.0	8.3.0
	RP-43	RP-090126	0014	-	Thoughts on UE capability for RoHC	8.2.0	8.3.0
	RP-43	RP-090126	0015	1	Capturing USIMless UE to stage 3	8.2.0	8.3.0
06/2009	RP-44	RP-090511	0016	2	Support of inter-RAT PS handover to GERAN Editor Note Removal	8.3.0	8.4.0
	RP-44	RP-090511	0017	1	Clarification of Half Duplex in TDD	8.3.0	8.4.0
	RP-44	RP-090511	0018	-	Correcting the maximum number of bits received during one TTI	8.3.0	8.4.0
	RP-44	RP-090511	0019	-	Clarification of field names used in TS 36.331	8.3.0	8.4.0
	RP-44	RP-090511	0021	-	Clarification on disabling E-UTRA capabilities with a USIM	8.3.0	8.4.0
09/2009	RP-45	RP-090906	0023	-	Unit for "Total layer 2 buffer size"	8.4.0	8.5.0
12/2009	RP-46	-	-	-	Upgrade to the Release 9 - no technical change	8.5.0	9.0.0
03/2010	RP-47	RP-100308	0024	1	CR to 36.306 on Optionality of Rel-9 UE features	9.0.0	9.1.0
	RP-47	RP-100308	0025	-	Introduction of power-limited device indication in UE capability.	9.0.0	9.1.0
	RP-47	RP-100308	0026	-	UE capability for enhanced 1xRTT CS fallback	9.0.0	9.1.0
	RP-47	RP-100285	0028	1	Bounds to RoHC requirements for IMS capable UEs supporting voice	9.0.0	9.1.0
	RP-47	RP-100309	0029	1	CR to 36.306 on Redirection enhancements to UTRAN	9.0.0	9.1.0
	RP-47	RP-100188	0030	1	Redirection enhancements to GERAN	9.0.0	9.1.0
06/2010	RP-48	RP-100556	0031	1	Clarification regarding / alignment of REL-9 UE capabilities	9.1.0	9.2.0
	RP-48	RP-100531	0033	-	Correction on the definition of ue-SpecificRefSigsSupported	9.1.0	9.2.0
09/2010	RP-49	RP-100853	0035	-	Clarification of MBMS UE capability	9.2.0	9.3.0
12/2010	RP-50	RP-101268	0037	-	Inclusion of new UE categories in Rel-10	9.3.0	10.0.0
03/2011	RP-51	RP-110290	0038	-	Description of carrier aggregation and MIMO capabilities	10.0.0	10.1.0
	RP-51	RP-110290	0039	-	L2 buffer sizes for Rel-10 categories	10.0.0	10.1.0
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	RP-51	RP-110288	0042	1	UE UL&DL MIMO Capabilities	10.0.0	10.1.0
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06/2011	RP-52	RP-110828	0048	-	Clarification of optionality of UE features without capability	10.1.0	10.2.0
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	RP-52	RP-110840	0056	1	CR to 36.306 on UE capabilities for Rel-10 LTE features	10.1.0	10.2.0
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	RP-52	RP-110839	0062	-	Introduction of UE capability for enhanced redirection to UTRA TDD	10.1.0	10.2.0
	RP-52	RP-110834	0063	2	Clarification of "supportedMIMO-CapabilityDL"	10.1.0	10.2.0
	RP-52	RP-110627	0064	-	Correction of "total number of soft channel bits" for category 6 and 7	10.1.0	10.2.0
09/2011	RP-53	RP-111291	0065	-	The SON feature in optional features without UE radio access capability parameters	10.2.0	10.3.0
	RP-53	RP-111283	0067	-	AdditionalSpectrumEmissions in CA	10.2.0	10.3.0
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12/2011	RP-54	RP-111716	0070	1	Corrections to enhancedDualLayerTDD	10.3.0	10.4.0
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	RP-54	RP-111714	0077	-	Correction to the number of soft channel bits	10.3.0	10.4.0
03/2012	RP-55	RP-120321	0078	-	Clarification on physical layer parameter values requirement	10.4.0	10.5.0
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06/2012	RP-56	RP-120813	0090	-	Korean Public Alert System (KPAS) in relation to CMAS	10.5.0	10.6.0
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09/2012	RP-57	RP-121359	0100	-	Voice support Capabilities	11.0.0	11.1.0

	RP-57	RP-121375	0103	-	Introducing MBMS enhancements	11.0.0	11.1.0
	RP-57	RP-121395	0105	-	Clarification on spatial multiplexing requirement in supportedBandCombination	11.0.0	11.1.0
12/2012	RP-58	RP-121936	0120	-	Power Management Indicator in PHR	11.1.0	11.2.0
	RP-58	RP-121936	0124	1	Clarification on UL CA in supportedBandCombination	11.1.0	11.2.0
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03/2013	RP-59	RP-130243	0133	2	DL COMP capability related correction	11.2.0	11.3.0
	RP-59	RP-130233	0135	-	MIMO capability related correction	11.2.0	11.3.0
	RP-59	RP-130241	0137	-	Correction to supported DL MIMO capability for TM10	11.2.0	11.3.0
	RP-59	RP-130240	0138	-	Optional support of RLF report for inter-RAT MRO	11.2.0	11.3.0
	RP-59	RP-130248	0140	1	Corrections to UE capability naming and definition	11.2.0	11.3.0
	RP-59	RP-130233	0142	-	Clarification on cross carrier scheduling capability	11.2.0	11.3.0
	RP-59	RP-130226	0146	-	Introduction of PDSCH TM5 capabilities for FDD and TDD	11.2.0	11.3.0
09/2013	RP-61	RP-131315	0151	-	Remove TBD in max MCH TB size table	11.3.0	11.4.0
	RP-61	RP-131314	0157	-	Clarification of InterFreqRSTDMeasurementIndication procedure support	11.3.0	11.4.0
12/2013	RP-62	RP-131986	0160	-	Introduction of capability bit for UTRA MFBI	11.4.0	11.5.0
	RP-62	RP-132003	0161	1	Capturing mandatory/optional agreements on Rel-11 UE features	11.4.0	11.5.0
	RP-62	RP-131991	0163	-	Clarification on eRedirection to UMTS TDD with multiple UMTS TDD frequencies	11.4.0	11.5.0
	RP-62	RP-131984	0165	-	Addition of inter-frequency RSTD measurement capability indicator for OTDOA	11.4.0	11.5.0
	RP-62	RP-131789	0166	1	MBMS reception on any configured or configurable SCell	11.4.0	11.5.0
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03/2014	RP-63	RP-140364	0168	1	New UE categories for DL 450Mbps class	11.5.0	11.6.0
	RP-63	RP-140349	0170	-	SS and common channel interference handling	11.5.0	11.6.0
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06/2014	RP-64	RP-140873	0193	1	Network-requested CA Band Combination Capability Signalling	11.6.0	11.7.0
	RP-64	RP-141027	0197	3	eMBMS reception on SCell and Non-Serving Cell	11.6.0	11.7.0

History

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