**3GPP TSG-RAN WG2 Meeting #109-e *draft*R2-2001871**

**Online, 24th February – 6th March 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **36.306** | **CR** | **1735** | **rev** | **1** | **Current version:** | **15.7.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:***  | Introduction of additional enhancements for eMTC |
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| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | LTE\_eMTC5-Core |  | ***Date:*** | 2019-03-10 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | Introduction of UE capabilities related to additional enhancements for eMTC in Rel-16 |
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| ***Summary of change:*** | The following capabilities and agreements have been captured in this CR:MT-EDT:RAN2#108: If the UE supports MT-EDT (optional) for the CP solution, it shall also support MO-EDT for the CP solution. If the UE supports MT-EDT (optional) for the UP solution, it shall also support MO-EDT for the UP solution. Support of MT-EDT is optional at the UE without AS capability. It should be possible for the UE to indicate separate capability for CP MT-EDT and UP MT-EDT at NAS level.PURRAN2#107bis: PUR configuration can be provided without PUR Configuration Request from the UE, therefore optional radio access capabilities (separate for UP and CP) to indicate UE is capable of performing UL transmissions using PUR are introduced.Multiple TB SchedulingRAN2#106 UE capability for multiple TB is indicated separately for CE Mode A and CE mode B. UE capability for multiple TB is indicated separately for uplink and downlink.Channel Quality Report RAN2#107 UE capability reporting is not needed for the DL quality report in Msg3 in idle mode. UE capability reporting is introduced for the aperiodic DL quality report in connected mode.MPDCCH performance improvement using CRSRAN2#104 UEs report capability to indicate support of using CRS for improving MPDCCH channel estimation.ETWS/CMAS indication reception in RRC CONNECTEDRAN2#107bis Introduce capability for support of ETWS/CMAS indication reception in RRC CONNECTED by UE supporting CE Mode A. Introduce capability for support of ETWS/CMAS indication reception in RRC CONNECTED by UE supporting CE Mode B.Feedback based on CSI-RSRAN2#108 For feedback based on CSI-RS, capability bit is introduced only for CE Mode A.Stand-alone deploymentRAN2#105 Introduce UE capability to indicate that UE supports unicast PDSCH reception in LTE control channel region.Connection to 5GCRAN2#106 RRC\_INACTIVE state with short eDRX cycles is optionally supported for eMTC connected to 5GC with capability signalling. UP optimization solution is supported for both eMTC and NB-IoT connected to 5GC with capability signalling.RAN2#107 Control Plane optimization feature is optional for eMTC devices connecting to 5GC and mandatory for NB-IoT devices connected to 5GC. Support of User Plane CIoT 5GS optimization is optional for both eMTC and NB-IoT devices connected to 5GC without capability signaling. Indication for support is provided in Msg5, i.e. RRCConnectionSetupComplete. For eMTC, introduce new parameters, up-CIoT-5GS-Optimisation-r16 and cp-CIoT-5GS-Optimisation-r16 in RRCConnectionSetupComplete when accessing 5GC. Introduce a new UE capability earlyData-UP-5GC-r16 in UE-EUTRA-Capability, UE-Capability-NB to indicate support of UP MO-EDT in 5GC. No additional capability is needed to indicate support for short extended DRX operation in RRC\_INACTIVE state. UE signaling category M1 shall set the LTE-M indication in RRCConnectionSetupComplete message. Introduce ‘LTE-M Indication enumerated {TRUE} optional’ in RRCConnectionSetupComplete message.RAN2#108 For EPS it is optional for a UE to support AS RAI, with capability reporting. |
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| ***Consequences if not approved:*** | WI cannot be completed. |
|  |  |
| ***Clauses affected:*** | 2, 3.3, 4.3.4.xa(new), 4.3.4.xb(new), 4.3.4.xc(new), 4.3.4.xd(new), 4.3.4.xe(new), 4.3.4.xf(new), 4.3.4.xg(new), 4.3.6.xa(new), 4.3.8.7, 4.3.8.xa(new), 4.3.8.xb(new), 4.3.19.xa(new), 4.3.29.xa(new), 4.3.29.xb(new) 4.3.36.xa(new), 4.3.36.xb(new), 6.8.4, 6.8.xa(new), 6.8.xb(new), 6.17.2, 6.xy (new), 6.xy.a (new), 6.xy.b (new) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **x** |  |  Other core specifications  | TS/TR 36.331 CR xxxx  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR 36.304 CR xxxx  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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| FIRST CHANGE |

# 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".

[32] 3GPP TS 38.306 "NR; UE Radio Access Capabilities".

[33] 3GPP TS 38.101-1: "NR User Equipment (UE) radio transmission and reception Part 1: Range 1 Standalone".

[34] 3GPP TS 38.101-2: "NR User Equipment (UE) radio transmission and reception Part 2: Range 2 Standalone".

[35] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification".

[36] 3GPP TS 38.215: "NR; Physical layer measurements".

[37] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[xx] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3"

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## 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

MO-EDT Mobile Originated Early Data Transmission

MRO Mobility Robustness Optimisation

MT-EDT Mobile Terminated Early Data Transmission

MTSI Multimedia Telephony Service for IMS

MUST MultiUser Superposition Transmission

NAICS Network Assisted Interference Cancellation/Suppression

NB-IoT Narrow Band Internet of Things

OS OFDM Symbol

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

PUR Preconfigured Uplink Resource

PUSCH Physical Uplink Shared Channel

QoE Quality of Experience

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

SPT Short Processing Time

SR Scheduling Request

SSAC Service Specific Access Control

SSTD SFN and Subframe Timing Difference

STTI Short TTI

TDD Time Division Duplex

TTI Transmission Time Interval

UCI Uplink Control Information

UDC Uplink Data Compression

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

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#### 4.3.4.181 *srs-DCI7-TriggeringFS2-r15*

This field indicates whether the UE supports SRS triggerring via DCI format 7 for FS2.

#### 4.3.4.xa *ce-ModeA-PUSCH-MultiTB-r16*

This field indicates whether the UE supports multiple TB scheduling in the uplink as specified in TS 36.213 [22]. This feature is only applicable if the UE supports *ce-ModeA-r13*.

#### 4.3.4.xb *ce-ModeA-PDSCH-MultiTB-r16*

This field indicates whether the UE supports multiple TB scheduling in the downlink as specified in TS 36.213 [22]. This feature is only applicable if the UE supports *ce-ModeA-r13*.

#### 4.3.4.xc *ce-ModeB-PUSCH-MultiTB--r16*

This field indicates whether the UE supports multiple TB scheduling in the uplink in CE Mode B as specified in TS TS 36.213 [22]. This feature is only applicable if the UE supports *ce-ModeB-r13*.

#### 4.3.4.xd *ce-ModeB-PDSCH-MultiTB-r16*

This field indicates whether the UE supports multiple TB scheduling in the downlink in CE Mode B as specified in TS 36.213 [22]. This feature is only applicable if the UE supports *ce-ModeB-r13*.

4.3.4.xe *ce-ModeA-CSI-RS-Feedback-r16*

This field indicates whether the UE supports CSI-RS based feedback when the UE is operating in coverage enhancement mode A, as specified in TS 36.213 [22]. This feature is only applicable if the UE supports *ce-ModeA-r13* and a UE Category other than Category M1 and M2.

#### 4.3.4.xf *ce-RxInLTEControlRegion-r16*

This field indicates whether the UE supports PDSCH or MPDCCH reception in the LTE control channel region feedback when the UE is operating in coverage enhancement mode A or Bas specified in TS 36.211 [17]. This feature is only applicable if the UE supports *ce-ModeA-r13*.

#### 4.3.4.xg *ce-CRS-ChannelEstMPDCCH-r16*

This field defines whether the UE supports CRS for improving MPDCCH channel estimation, as specified in TS 36.211 [17]. This feature is only applicable if the UE supports *ce-ModeA-r13*.

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#### 4.3.6.36 *measGapPatterns-r15*

This field defines whether the UE that supports NR supports gap patterns 4 to 11 in LTE standalone as specified in TS 36.133 [16], and for independent measurement gap configuration on FR1 and per-UE gap in (NG)EN-DC as specified in TS38.133 [37].

#### 4.3.6.xa *dl-ChannelQualityReporting-r16*

This field defines whether the UE supports DL channel quality reporting of the serving cell or configured carrier for FDD in RRC\_CONNECTED, as specified in TS 36.331 [5]. This feature is only applicable if the UE supports *ce-ModeA-r13* or if the UE supports any *ue-Category-NB*.

Editor’s note: Whether to have a common or separate capability with NB-IoT, and how to name it if common.

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#### 4.3.8.7 *earlyData-UP-r15*

This field defines whether the UE supports MO-EDT for User Plane CIoT EPS optimizations for FDD, as defined in TS 24.301 [28]. This feature is only applicable if the UE supports *ce-ModeA-r13* or if the UE supports any *ue-Category-NB*.

#### 4.3.8.8 void

#### 4.3.8.9 *extendedNumberOfDRBs-r15*

This field defines whether the UE supports up to 15 DRBs. The UE shall support any combination of RLC AM and RLC UM entities for the configured DRBs. A UE that supports *extendedNumberOfDRBs-r15* shall also support the extended LCID as specified in TS 36.321 [4].

#### 4.3.8.10 *reducedCP-Latency-r15*

This field defines whether the UE supports reduced control plane latency as defined in TS 36.213 [22] and TS 36.331 [5].

#### 4.3.8.xa *pur-CP-EPC-r16*

This field indicates whether the UE supports Transmission using PUR for Control Plane CIoT EPS optimisation as specified TS 36.300 [30]. This feature is only applicable if the UE supports *ce-ModeA-r13,* or for FDD if the UE supports any *ue-Category-NB*.

#### 4.3.8.xb *pur-UP-EPC-r16*

This field indicates whether the UE supports Transmission using PUR for User Plane CIoT EPS optimisation as specified TS 36.300 [30]. This feature is only applicable if the UE supports *ce-ModeA-r13,* or for FDD if the UE supports any *ue-Category-NB*.

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#### 4.3.19.21 *eLCID-Support-r15*

This field indicates whether the UE supports LCID "10000" and MAC PDU subheader containing the eLCID field as specified in TS 36.321 [4].

#### 4.3.19.xa *rai-2bit-r16*

This field defines whether the UE supports 2 bit Release Assistance Indication (RAI) when connected to EPC as specified in TS 36.321 [4]. This feature is only applicable if the UE supports *ce-ModeA-r13* or if the UE supports any *ue-Category-NB*.

### 4.3.20 Dual Connectivity parameters

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#### 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*.

#### 4.3.29.xa *ce-ModeA-ETWS-CMAS-RxInConn-r16*

This field indicates whether the UE supports ETWS/CMAS indication reception in RRC\_CONNECTED state when the UE is operating in coverage enhancement mode A as specified in TS 36.331 [5]. This feature is only applicable if the UE supports *ce-ModeA-r13* except for Category M1 and Category M2 UEs.

#### 4.3.29.xb *ce-ModeB-ETWS-CMAS-RxInConn-r16*

This field indicates whether the UE supporting CE Mode B supports ETWS/CMAS indication reception in RRC CONNECTED state when the UE is operating in coverage enhancement mode B as specified in TS 36.331 [5]. This feature is only applicable if the UE supports *ce-ModeB-r13* and a UE Category other than Category M1 and M2.

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#### 4.3.36.8 *reflectiveQoS-r15*

This field indicates whether the UE supports AS reflective QoS.

#### 4.3.36.xa *ce-RRC-INACTIVE-r16*

This field indicates whether the UE supports RRC\_INACTIVE state with extended DRX cycles up to 10.24s without PTW when the UE is operating in coverage enhancement mode A or B as specified in TS 36.331 [5] . This feature is only applicable if the UE supports *ce-ModeA-r13*.

#### 4.3.36.xb *earlyData-UP-5GC-r16*

This field indicates whether the UE supports MO-EDT for User Plane CIoT 5GS optimisations, as defined in TS 24.501 [xx]. This feature is only applicable if the UE supports *ce-ModeA-r13,* or for FDD if the UE supportsany *ue-Category-NB*.

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### 6.8.4 MO-EDT for Control Plane CIoT EPS Optimization

It is optional for UE to support MO-EDT for Control Plane CIoT EPS optimizations for FDD, as defined in TS 24.301 [28]. This feature is only applicable if the UE supports *ce-ModeA-r13* or if the UE supports any *ue-Category-NB*.

Editor’s note: FFS if we should have the equivalent for 5GS in section 6.xy.

### 6.8.5 Void

### 6.8.6 Enhanced PHR

It is optional for UE to support enhanced PHR in MSG3 for FDD, as defined in TS 36.321 [4]. This feature is only applicable if the UE supports any *ue-Category-NB*.

### 6.8.7 void

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### 6.8.8 Resynchronization Signals

It is optional for UE to support resynchronization signals, as defined in TS 36.211 [17]. This feature is only applicable if the UE supports *ce-ModeA-r13*.

### 6.8.9 Measurement gaps for higher UE velocity

It is optional for UE to support measurement gaps for higher UE velocity, as defined in TS 36.331 [5] and TS 36.133[16]. This feature is only applicable if the UE supports *ce-ModeA-r13*.

### 6.8.xa MT-EDT for Control Plane CIoT EPS Optimisation

It is optional for UE to support MT-EDT for Control Plane CIoT EPS Optimisation, as defined in TS 24.301 [28]. If the UE supports ‘MT-EDT for Control Plane CIoT EPS Optimisation’ it shall support ‘MO-EDT for Control Plane CIoT EPS Optimisation’ as described in clause 6.8.4. This feature is only applicable if the UE supports *ce-ModeA-r13,* or for FDD if the UE supports any *ue-Category-NB*.

### 6.8.xb MT-EDT for User Plane CIoT EPS Optimisation

It is optional for UE to support MT-EDT for User Plane CIoT EPS Optimisation, as defined in TS 24.301 [28]. If the UE supports ‘MT-EDT for User Plane CIoT EPS Optimisation’ it shall support *earlyData-UP-r15* as described in clause 4.3.8.7. This feature is only applicable if the UE supports *ce-ModeA-r13,* or for FDD if the UE supports any *ue-Category-NB*.

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### 6.17.2 DL channel quality reporting in Msg3

It is optional for UE to support DL channel quality reporting of the serving cell for FDDin Msg3, as specified in TS 36.331 [5]. This feature is only applicable if the UE supports any *ue-Category-NB* or if the UE supports *ce-ModeA-r13*.

Editor’s note: Whether to have a common or separate capability with NB-IoT.

### 6.17.3 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*.

### 6.17.4 NSSS-Based RRM measurements

It is optional for UE to support NSSS-Based RRM measurements for FDD, as specified in TS 36.211 [17] and TS 36.214 [23]. This feature is only applicable if the UE supports any *ue-Category-NB*.

### 6.17.5 NPBCH-Based RRM measurements

It is optional for UE to support NPBCH-Based RRM measurements for the serving cell for FDD, as specified in TS 36.214 [23]. This feature is only applicable if the UE supports any *ue-Category-NB*.

## 6.xy E-UTRA/5GC Parameters

### 6.xy.a User Plane CIoT 5GS optimisations

It is optional for UE to support User Plane CIoT 5GS optimisations for FDD, as defined in TS 24.501 [xx]. This feature is only applicable if the UE supports any *ue-Category-NB* or if the UE supports *ce-ModeA-r13*.

### 6.xy.b Control Plane CIoT 5GS optimisations

It is optional for UE to support Control Plane CIoT 5GS optimisations for FDD, as defined in TS 24.501 [xx]. This feature is only applicable if the UE supports *ce-ModeA-r13*.

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| END OF CHANGES |