**3GPP TSG-RAN2 Meeting #117-e *R2-220xxxx***

**Online, 21st Feb 2022 - 3rd Mar 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.306** | **CR** | **1841** | **rev** | **1** | **Current version:** | **16.7.0** |  |
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| *For* [***HELP***](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 NB-IoT and eMTC | | | | | | | | | |
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| ***Source to WG:*** | ZTE Corporation, Sanechips | | | | | | | | | |
| ***Source to TSG:*** | RAN2 | | | | | | | | | |
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| ***Work item code:*** | NB\_IOTenh4\_LTE\_eMTC6-Core | | | | |  | ***Date:*** | | | 2022-03-xx |
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| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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 can be 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | Introduction of additional enhancements for NB-IoT and eMTC in Rel-17 | | | | | | | | |
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| ***Summary of change:*** | | The following capabilities have been captured in this CR for the corresponding features:  **NB-IoT neighbour cell measurements and corresponding measurement triggering before RLF**   * *connectedModeMeas-IntraFreq-r17* * *connectedModeMeas-InterFreq-r17*   **NB-IoT carrier selection based on the coverage level, and associated carrier specific configuration**   * *coverageBasedPaging-r17*   **NB-IoT 16-QAM for unicast in UL and DL**   * New downlink physical layer TBS value of 4968 bits, soft channel bits of 12800 bits and total layer 2 buffer size of 12000 bytes are introduced. * *npusch-16QAM-r17* * *npdsch-16QAM-r17*   **LTE-MTC 14 HARQ processes in DL for HD-FDD Cat M1 UEs**   * *ce-PDSCH-14HARQProcesses-r17* * *ce-PDSCH-14HARQProcesses-Alt2-r17*   **LTE-MTC Max DL TBS of 1736 bits for HD-FDD Cat. M1 UEs in CE mode A only**   * New downlink physical layer TBS value of 1736 bits and soft channel bits of 43008 bits are introduced. * *ce-PDSCH-NB-MaxTBS-r17* | | | | | | | | |
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| ***Consequences if not approved:*** | | Rel-17 enhancements for NB-IoT and eMTC are not supported. | | | | | | | | |
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| ***Clauses affected:*** | | 4, 4.1A, 4.1C, 4.3.4, 4.3.6, 4.3.8 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **x** |  | Other core specifications | | | | TS 36.331 CR 4760  TS 36.300 CR 1354  TS 36.302 CR 1211  TS 36.304 CR 0844  TS 36.321 CR xxxx | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | R2-2200029 – Initial version  R2-2201792 – update version after RAN2#116bise  [R2-2202743](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2202743.zip" \o "https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2202743.zip) – update version submitted to RAN2#117e | | | | | | | | |

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| FIRST CHANGE |

# 4 UE radio access capability parameters

The following clauses 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.

Unless otherwise stated, the requirements on the maximum number of transport block bits are applicable for a TTI length of 1 ms. For other TTI lengths, the requirements shall be scaled according to clause 7.1.7 or 11.1 in TS 36.213 [22] in order to get the corresponding requirement.

The following UE radio access capability parameters specified in clause 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)

- *rlc-UM-r15 (*clause *4.3.2.5)*

- *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)

- *wakeUpSignal-r15* (clause 4.3.4.113)

- *wakeUpSignalMinGap-eDRX-r15* (clause 4.3.4.114)

- *mixedOperationMode-r15* (clause 4.3.4.115)

- *sr-WithHARQ-ACK-r15* (clause 4.3.4.117)

- *sr-WithoutHARQ-ACK-r15* (clause 4.3.4.118)

- *nprach-Format2-r15* (clause 4.3.4.119)

- *multiCarrierPagingTDD-r15* (clause 4.3.4.134)

- *additionalTransmissionSIB1-r15* (clause 4.3.4.137)

- *npusch-3dot75kHz-SCS-TDD-r15* (clause 4.3.4.177)

- *npusch-MultiTB-r16* (clause 4.3.4.182)

- *npdsch-MultiTB-r16* (clause 4.3.4.183)

- *npusch-MultiTB-Interleaving-r16* (clause 4.3.4.192)

- *npdsch-MultiTB-Interleaving-r16* (clause 4.3.4.193)

- *multiTB-HARQ-AckBundling-r16* (clause 4.3.4.194)

- *groupWakeUpSignal-r16* (clause 4.3.4.195)

- *groupWakeUpSignalAlternation-r16* (clause 4.3.4.196)

- *subframeResourceResvUL-r16* (clause 4.3.4.197)

- *subframeResourceResvDL-r16* (clause 4.3.4.198)

- *slotSymbolResourceResvUL-r16* (clause 4.3.4.199)

- *slotSymbolResourceResvDL-r16* (clause 4.3.4.200)

- *npusch-16QAM-r17* (clause 4.3.4.xxa)

- *npdsch-16QAM-r17* (clause 4.3.4.xxb)

- *ce-PDSCH-14HARQProcesses-r17* (clause 4.3.4.xxd)

- *ce-PDSCH-14HARQProcesses-Alt2-r17* (clause 4.3.4.xxe)

- *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)

- *dl*-*ChannelQualityReporting-r16* (clause 4.3.6.37)

- *connectedModeMeas-IntraFreq-r17* (clause 4.3.6.xa)

- *connectedModeMeas-InterFreq-r17* (clause 4.3.6.xb)

- *accessStratumRelease-r13* (clause 4.3.8.1A)

- *multipleDRB-r13* (clause 4.3.8.5)

- *earlyData-UP-r15* (clause 4.3.8.7)

- *earlySecurityReactivation-r16* (clause 4.3.8.11)

- *coverageBasedPaging-r17* (clause 4.3.8.xa)

- *anr-Report-r16* (clause 4.3.12.2)

- *rach-Report-r16* (clause 4.3.12.3)

- *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 4.3.19.14)

- *sr-SPS-BSR-r15* (clause 4.3.19.15)

- *rai-SupportEnh-r16* (clause 4.3.19.22)

- *earlyData-UP-5GC-r16* (clause 4.3.36.9)

- *pur-CP-EPC-r16* (clause 4.3.37.1)

- *pur-UP-EPC-r16* (clause 4.3.37.2)

- *pur-CP-5GC-r16* (clause 4.3.37.3)

- *pur-UP-5GC-r16* (clause 4.3.37.4)

- *pur-CP-L1Ack-r16* (clause 4.3.37.5)

- *pur-NRSRP-Validation-r16* (clause 4.3.37.6)

The UE radio access capabilities specified in Chapter 4 are not applicable in NB-IoT, unless they are listed above.

The following optional features without UE radio access capability parameters specified in Chapter 6 are applicable in NB-IoT:

- RRC Connection Re-establishment for the Control Plane CIoT EPS Optimization (clause 6.7.5)

- System Information Block Type 16 (clause 6.8.1)

- Enhanced random access power control (clause 6.8.3)

- MT-EDT for Control Plane CIoT EPS Optimisation (clause 6.8.10)

- MT-EDT for User Plane CIoT EPS Optimisation (clause 6.8.11)

- EDT for Control Plane CIoT EPS Optimization (clause 6.8.4)

- Enhanced PHR (clause 6.8.6)

- Radio Link Failure Report for NB-IoT (clause 6.10.2)

- SC-PTM in Idle mode (clause 6.16.1)

- Multiple TB scheduling for SC-PTM in Idle mode for NB-IoT (clause 6.16.2)

- Relaxed monitoring (clause 6.17.1)

- DL channel quality reporting in Msg3 for the anchor carrier (clause 6.17.2)

- Serving cell idle mode measurements reporting (clause 6.17.3)

- NSSS-Based RRM measurements (clause 6.17.4)

- NPBCH-Based RRM measurements (clause 6.17.5)

- RRM measurements on non-anchor paging carriers (clause 6.17.6)

- NRS presence on non-anchor paging carriers (clause 6.17.7)

- DL channel quality reporting in Msg3 for non-anchor carrier (clause 6.17.8)

- Assistance information for inter-RAT cell selection to/from NB-IoT (clause 6.17.9)

- RRC Connection Re-establishment for the Control Plane CIoT 5GS Optimisation (clause 6.18.3)

- NB-IoT/5GC (clause 6.18.4)

- MO-EDT for Control Plane CIoT 5GS Optimisation (clause 6.18.5)

- AS RAI (clause 6.18.6)

The optional features without UE radio access capability parameters specified in Chapter 6 are not applicable in NB-IoT, unless they are listed above.

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| NEXT CHANGE |

## 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 clause 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. For a BL UE, Table 4.1A-7 defines the only combinations for UE UL and DL Categories that are allowed to be signalled with *ue-CategoryDL* and *ue-CategoryUL*, and 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*

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| 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  (Note 4) | 1000 or 1736 | 1000 or 1736 | 25344 or 43008 | 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),  502624 (8 layers, 1024QAM)  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)  251640 (4 layers, 1024QAM)  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)  125808 (2 layers, 1024QAM) | 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 |
| DL Category 22 | 2349504 – 2562784 | 299856 (8 layers, 64QAM)  391656 (8 layers, 256QAM)  502624 (8 layers, 1024QAM)  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)  251640 (4 layers, 1024QAM)  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)  125808 (2 layers, 1024QAM) | 29233152 | 2 or 4 or 8 |
| DL Category 23 | 2695968 – 2869920 | 299856 (8 layers, 64QAM)  391656 (8 layers, 256QAM)  502624 (8 layers, 1024QAM)  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)  251640 (4 layers, 1024QAM)  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)  125808 (2 layers, 1024QAM) | 34105344 | 2 or 4 or 8 |
| DL Category 24 | 2936880 – 3028608 | 299856 (8 layers, 64QAM)  391656 (8 layers, 256QAM)  502624 (8 layers, 1024QAM)  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)  251640 (4 layers, 1024QAM)  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)  125808 (2 layers, 1024QAM) | 36541440 | 2 or 4 or 8 |
| DL Category 25 | 3132672 – 3316544 | 299856 (8 layers, 64QAM)  391656 (8 layers, 256QAM)  502624 (8 layers, 1024QAM)  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)  251640 (4 layers, 1024QAM)  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)  125808 (2 layers, 1024QAM) | 38977536 | 2 or 4 or 8 |
| DL Category 26 | 3422400– 3531888 | 299856 (8 layers, 64QAM)  391656 (8 layers, 256QAM)  502624 (8 layers, 1024QAM)  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)  251640 (4 layers, 1024QAM)  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)  125808 (2 layers, 1024QAM) | 42631680 | 2 or 4 or 8 |
| 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.  NOTE 4: The UE supports "Maximum number of DL-SCH transport block bits received within a TTI" and "Maximum number of bits of a DL-SCH transport block received within a TTI" of 1736 bits and "Total number of soft channel bits" of 43008 bits if the UE indicates support of *ce-PDSCH-NB-MaxTBS-r17*. Otherwise the UE supports "Maximum number of DL-SCH transport block bits received within a TTI" and "Maximum number of bits of a DL-SCH transport block received within a TTI" of 1000 bits and "Total number of soft channel bits" of 25344 bits. | | | | |

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| NEXT CHANGE |

## 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 clause 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  (Note 1) | 2536 or 4968 | 2536 or 4968 | 6400 or 12800 |
| NOTE 1: The UE supports " Maximum number of DL-SCH transport block bits received within a TTI" and " Maximum number of bits of a DL-SCH transport block received within a TTI" of 4968 bits and "Total number of soft channel bits" of 12800 bits if the UE indicates support of *npdsch-16QAM-r17*. Otherwise the UE supports " Maximum number of DL-SCH transport block bits received within a TTI" and " Maximum number of bits of a DL-SCH transport block received within a TTI" of 2536 bits and "Total number of soft channel bits" of 6400 bits. | | | |

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  (Note 1) | 8000 or 12000 |
| NOTE 1: The UE supports "Total layer 2 buffer size" of 12000 bytes if the UE indicates support of *npdsch-16QAM-r17*. Otherwise the UE supports 8000 bytes. | |

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 |

|  |
| --- |
| NEXT CHANGE |

### 4.3.4 Physical layer parameters

//skip the unrelated part//

#### 4.3.4.221 *addSRS-r16*

Presence of this field indicates the UE supports the additional SRS symbol(s) within the normal UL subframes in TDD as described in TS 36.213 [23].

##### 4.3.4.221.1 *addSRS-1T2R-r16*

Indicates whether the UE supports selecting one antenna among two antennas to transmit additional SRS symbol(s) for the corresponding band of the band combination as described in TS 36.213 [23]. This field can be included only if *addSRS-r16* is included.

##### 4.3.4.221.2 *addSRS-1T4R-r16*

Indicates whether the UE supports selecting one antenna among four antennas to transmit additional SRS symbol(s) for the corresponding band of the band combination as described in TS 36.213 [23]. This field can be included only if *addSRS-r16* is included.

##### 4.3.4.221.3 *addSRS-2T4R-2Pairs-r16*

Indicates whether the UE supports selecting one antenna pair between two antenna pairs to transmit additional SRS symbol(s) simultaneously for the corresponding band of the band combination as described in TS 36.213 [23]. This field can be included only if *addSRS-r16* is included.

##### 4.3.4.221.4 *addSRS-2T4R-3Pairs-r16*

Indicates whether the UE supports selecting one antenna pair among three antenna pairs to transmit additional SRS symbol(s) simultaneously for the corresponding band of the band combination as described in TS 36.213 [23]. This field can be included only if *addSRS-r16* is included.

##### 4.3.4.221.5 *addSRS-AntennaSwitching-r16*

Indicates the antenna switching capabilities for additional SRS symbol(s). This field can be included only if *addSRS-r16* is included.

#### 4.3.4.xxa *npusch-16QAM-r17*

This field indicates whether the UE supports 16QAM for UL unicast, as specified in TS 36.211 [17], TS 36.212 [26] and TS 36.213 [22]. This feature is only applicable if the UE supports category NB2.

#### 4.3.4.xxb *npdsch-16QAM-r17*

This field indicates whether the UE supports 16QAM for DL unicast, as specified in TS 36.211 [17], TS 36.212 [26] and TS 36.213 [22]. This feature is only applicable if the UE supports category NB2.

#### 4.3.4.xxc *ce-PDSCH -MaxTBS-r17*

This field indicates whether the UE supports the maximum DL TBS size of 1736 bits in 1.4 MHz when operating in coverage enhancement mode A as specified in TS 36.213 [22]. A UE indicating support of *ce-PDSCH -MaxTBS-r17* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.4.xxd *ce-PDSCH-14HARQProcesses-r17*

This field indicates whether the UE supports 14 DL HARQ processes with HARQ-ACK delay solution Alt-1 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-14HARQProcesses-r17* shall also indicate support of *ce-ModeA-r13*.

#### 4.3.4.xxe *ce-PDSCH-14HARQProcesses-Alt2-r17*

This field indicates whether the UE supports 14 DL HARQ processes with HARQ-ACK delay solution Alt-2 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-14HARQProcesses-Alt2-r17* shall also indicate support of *ce-PDSCH-14HARQProcesses-r17.*

|  |
| --- |
| NEXT CHANGE |

### 4.3.6 Measurement parameters

//skip the unrelated part//

4.3.6.47 *nr-IdleInactiveBeamMeasFR2-r16*

This field defines whether the UE supports performing eNB-configured SSB-based beam level RRM measurements for configured NR FR2 carrier(s) in RRC\_IDLE and in RRC\_INACTIVE (if the UE also indicates support of *inactiveState-r15*), including reporting them when requested by the eNB while resuming from RRC\_IDLE/RRC\_INACTIVE or in RRC\_CONNECTED, as specified in TS 36.331 [5].

A UE that supports this feature shall also support *nr-IdleInactiveMeasFR2-r16*.

#### 4.3.6.xa *connModeMeasIntraFreq-r17*

This field defines whether the UE supports intra-frequency neighbour cell measurements in RRC\_CONNECTED, as specified in TS 36.133 [16] and TS 36.331 [5]. This field is only applicable for UEs of any *ue-Category-NB*.

#### 4.3.6.xb *connModeMeasInterFreq-r17*

This field defines whether the UE supports inter-frequency neighbour cell measurements in RRC\_CONNECTED, as specified in TS 36.133 [16] and TS 36.331 [5]. This field is only applicable for UEs of any *ue-Category-NB*.

|  |
| --- |
| NEXT CHANGE |

### 4.3.8 General parameters

//skip the unrelated part//

#### 4.3.8.15 *altFreqPriority-r16*

This field defines whether the UE supports alternative cell reselection priority as defined in TS 36.331 [5].

#### 4.3.8.xa *coverageBasedPaging-r17*

This field defines whether the UE supports coverage based paging carrier selection as specified in TS 36.304 [14]. A UE indicating support of *coverageBasedPaging-r17* shall also indicate *multiCarrierPaging-r14* or *multiCarrierPagingTDD-r15*. This field is only applicableif the UE supports any *ue-Category-NB*.