**3GPP TSG-RAN2 Meeting #118e *R2-220XXXX***

**Online, May 9 –May 20 2022**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.306** | **CR** | **-** | **rev** | **-** | **Current version:** | **17.0.0** |  |
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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 IoT-NTN UE Capabilities | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | LTE\_NBIOT\_eMTC\_NTN | | | | |  | ***Date:*** | | | 2022-05-25 |
|  |  | | | |  | |  | | |  |
| ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | Introduction of Rel-17 IoT-NTN Features | | | | | | | | |
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| ***Summary of change:*** | | * Inclusion of physical layer capabilities associated with NTN connectivity * New parameter to indicate the support for NTN scenario * Introduce support for discontinuous coverage as optional feature without capability reporting | | | | | | | | |
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| ***Consequences if not approved:*** | | UE capabilities for IoT-NTN are not defined. | | | | | | | | |
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| ***Clauses affected:*** | | 4, 4.3.X and 6.Y. | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **x** |  | Other core specifications | | | | TS/TR 36.331 CR4798 | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | R2-2200XXX – Initial version | | | | | | | | |

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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)

- *npdsch-16QAM-r17* (clause 4.3.4.222)

- *npusch-16QAM-r17* (clause 4.3.4.223)

- *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)

- *connModeMeasIntraFreq-r17* (clause 4.3.6.49)

- *connModeMeasInterFreq-r17* (clause 4.3.6.50)

- *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 4.3.8.16)

- *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)

- *ntn-Connectivity-EPC-r17* (clause 4.3.38.1)

- *ntn-TA-Report-r17* (clause 4.3.38.2)

- *ntn-PUR-TimerDelay-r17* (clause 4.3.38.3)

*- ntn-OffsetTimingEnh-r17* (clause 4.3.38.x)

*- ntn-ScenarioSupport-r17(clause 4.3.38.y)*

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

The following optional features without UE radio access capability parameters specified in clause 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)

- Carrier specific NRSRP thresholds for NPRACH resource selection (clause 6.8.15)

- 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)

- Cell Reselection Measurements Triggering based on Service Time (clause 6.19.1)

- Discontinuous coverage (clause 6.19.x).

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

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| NEXT CHANGE |

### 4.3.38 IoT NTN parameters

#### 4.3.38.1 *ntn-Connectivity-EPC-r17*

This field indicates whether the UE supports NTN access. This field is only applicable if the UE supports *ce-ModeA-r13* or any *ue-Category-NB*. If the UE indicates this capability the UE shall support the following enhancements:

- General:

- handling of *cellBarred-NTN-r17* and *trackingAreaList-v17*  in *SystemInformationBlockType1*(*-NB*) as specified in TS 36.331 [5];

- reception of *SystemInformationBlockType31*(*-NB*) as specified in TS 36.331 [5];

- derivation of its position based on its GNSS measurements.

- reporting of the remaining GNSS validity duration as specified in TS 36.331 [5];

- PDCP:

- if the UE supports *ce-ModeA-r13, discardTimerExt-r17* as specified in TS 36.331 [5];

- RLC:

- *t-ReorderingExt-r17* as specified in TS 36.331 [5];

- MAC:

- estimation of UE-gNB RTT as specified in TS 36.321 [4];

- delaying the start of the RA response window as specified in TS 36.321 [4];

*-* delaying the start of the *mac-ContentionResolutionTimer* as specified in TS 36.321 [4];

- if the UE supports *ce-ModeA-r13* orif the UE supports any *ue-Category-NB* and supports *sr-WithoutHARQ-ACK-r15, sr-ProhibitTimerExt-r17* as specified in TS 36.331 [5];

- Physical layer:

- calculation of the UE specific TA in RRC\_IDLE and RRC\_CONNECTED state based on its GNSS-acquired position and the serving satellite ephemeris as specified in TS 36.211 [17];

- calculation of the common TA in RRC\_IDLE and RRC\_CONNECTED as specified in TS 36.213 [17];

- frequency pre-compensation using *k-Offset-r17* and *k-Mac-17* as specified in TS 36.213 [17];

- timing relationship enhancements using higher layer parameters *k-Offset-r17* and *k-Mac-17* as specified in TS 36.213 [17];

- segmented UL transmission using higher layer parameters *(n)prach-TxDuration-r17*, *pucch-TxDuration-r17* and *(n)pusch-TxDuration-r17* as specified in TS 36.331 [5];

A UE indicating support of *ce-ModeA-r13* and *ntn-Connectivity-EPC-r17* shall also indicate support of *standaloneGNSS-Location*.

#### 4.3.38.2 *ntn-TA-Report-r17*

This field indicates whether the UE supports Timing advance reporting in NTN cell as specified in TS 36.321 [4]. This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*.

#### 4.3.38.3 *ntn-PUR-Delay-r17*

This field indicates whether the UE supports delaying the start of the *pur-ResponseWindowTimer* for NTN operation as specified in TS36.321 [4]. This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*. A UE indicating support of *ntn-PUR-TimerEnhancement-r17* shall also indicate support of *pur-CP-EPC-CE-ModeA-r16* or *pur-UP-EPC-CE-ModeA-r16* or *pur-CP-EPC-r16* or *pur-UP-EPC-r16.*

4.3.38.x ntn-OffsetTimingEnh-r17

This field indicates whether the UE supports timing relationship enhancements using Differential Koffset as specified in TS 36.321 [4] and TS 36.213 [17]. This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*.

4.3.38.y ntn-ScenarioSupport-r17

This field indicates whether UE supports NTN features in GSO or NGSO scenario. The UE indicating *ntn-ScenarioSupport-r17* shall also indicate support of *ntn-Connectivity-EPC-r17*. If a UE does not include this field but includes *ntn-Connectivity-EPC-r17*, the UE supports the NTN essential features for both GSO and NGSO scenarios, and also supports mobility between GSO and NGSO scenarios.

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| NEXT CHANGE |

6.19 IoT NTN Features

6.19.1 Cell reselection measurements triggering based on service time

It is optional for UE camped on NTN cell to support triggering of early cell reselection measurements based on the service time broadcasted by the cell as specified in TS36.304 [14]. This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*.

6.19.x Discontinuous coverage

It is optional for a UE camped on NTN cell to support discontinuous coverage as specified in TS 36.304 [14]. This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*.

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| END OF CHANGES |