**3GPP TSG-RAN WG2 Meeting #131 *R2-250xxxx***

**Bangaluru, India, 25th – 29th August 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.306** | **CR** | **XXX** | **rev** | **-** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *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 capabilities for IoT NTN TDD | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IOT\_NTN\_TDD-Core | | | | |  | ***Date:*** | | | 2025-08-09 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduction of a capabilities for IoT NTN TDD | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introducing capabilities for IoT NTN TDD:   * Conditionally mandatory feature for IoT NTN TDD mode based on RAN1 feature list in R1-2504676 and features agreed in RAN2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | IoT NTN TDD mode is not supported | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4, 7.10.X (New) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS/TR 36.331 CR XXX  TS/TR 36.321 CR XXX  TS/TR 36.300 CR XXX | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | ... | | | | | | | | |

*NEXT 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)

- *locationInfo-r16* (clause 4.3.12.5)

- *logicalChannelSR-ProhibitTimer* (clause 4.3.19.2)

- *dataInactMon-r14* (clause 4.3.19.9)

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

- *earlyContentionResolution-r14* (clause 4.3.19.14)

- *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 4.3.38.4)

*-* *ntn-ScenarioSupport-r17* (clause 4.3.38.5)

*-* *ntn-SegmentedPrecompensationGaps-r17* (clause 4.3.38.6)

*-* *ntn-LocationBasedMeasTrigger-EFC-r18* (clause 4.3.38.11)

*-* *ntn-LocationBasedMeasTrigger-EMC-r18* (clause 4.3.38.12)

*-* *ntn-TimeBasedMeasTrigger-r18* (clause 4.3.38.13)

*-* *ntn-RRC-HarqDisableSingleTB-r18* (clause 4.3.38.14)

*-* *ntn-OverriddenHarqDisableSingleTB-r18* (clause 4.3.38.15)

*-* *ntn-DCI-HarqDisableSingleTB-r18* (clause 4.3.38.16)

*-* *ntn-RRC-HarqDisableMultiTB-r18* (clause 4.3.38.17)

*-* *ntn-OverriddenHarqDisableMultiTB-r18* (clause 4.3.38.18)

*-* *ntn-DCI-HarqDisableMultiTB-r18* (clause 4.3.38.19)

*-* *ntn-UplinkHarq-ModeB-SingleTB-r18* (clause 4.3.38.29)

*-* *ntn-HarqEnhScenarioSupport-r18* (clause 4.3.38.30)

*-* *ntn-Triggered-GNSS-Fix-r18* (clause 4.3.38.31)

*-* *ntn-Autonomous-GNSS-Fix-r18* (clause 4.3.38.32)

*-* *ntn-UplinkTxExtension-r18* (clause 4.3.38.33)

*-* *ntn-GNSS-EnhScenarioSupport-r18* (clause 4.3.38.34)

*-* *ntn-UplinkHarq-ModeB-MultiTB-r18* (clause 4.3.38.35)

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 6.19.2).

- Early RLF triggering based on service time (clause 6.19.3).

- Neighbour cell measurements based on service start time of the neighbour cell (clause 6.19.4).

- UE autonomous release based on service time (clause 6.19.5).

- Cell reselection measurements triggering based on location for (quasi-)fixed cell (clause 6.19.6).

- Cell reselection measurements triggering based on location for earth moving cell (clause 6.19.7).

- GNSS measurements during inactive time (clause 6.19.8).

- SystemInformationBlockType33(-NB) reception in a TN cell (clause 6.19.9).

- Inband operation with NR NTN (6.19.10).

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

The following conditionally mandatory features specified in clause 7 are applicable in NB-IoT:

- IoT NTN TDD operation (7.10.X).

The conditionally mandatory specified in clause 7 are not applicable in NB-IoT, unless they are listed above.

*NEXT CHANGE*

# 7 Conditionally Mandatory features

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## 7.10 Other features

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

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

### 7.10.2 Support of extended reporting of WLAN measurements

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

### 7.10.3 wlan-ReportAnyWLAN-r14

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

### 7.10.4 *wlan-PeriodicMeas-r14*

This parameter indicates whether the UE supports periodic reporting of WLAN measurements. It is mandatory to support periodic reporting of WLAN measurements for UEs which are supporting WLAN measurements as specified in TS 36.331 [5].

### 7.10.5TA Reporting during Initial Access for NTN

It is mandatory to support TA report during initial access for UEs which support *ntn-TA-Report-r17* as specified in TS 36.321 [4].

### 7.10.X IoT NTN TDD mode

It is mandatory to support IoT NTN TDD mode for UEs which indicate support of band n249, see TS 36.102 [43]. For the UE supporting IoT NTN TDD mode, the UE shall support the following components:

- Frame Structure Type-1, where the uplink and downlink transmissions are separated in the time domain and consist of a set of D=8 non-overlapping usable contiguous DL subframes and a set of U=8 non-overlapping usable contiguous UL subframes separate by a fixed guard period of 50 ms between the end of the D=8 subframes to the beginning of U=8 subframes at the Uplink Synchronization Reference Point. The pattern is repeated every N=9 radio frames;

- DL subframes of pattern fixed to subframes [3 4 5 6 7 8 9 0] across two consecutive radio frames;

- non-U NB-IoT subframes not being considered by the UE as “NB-IoT UL subframes”;

- non-D NB-IoT subframes not being considered by the UE as “NB-IoT DL subframes”;

- NPSS/NSSS/NPBCH/SIB1-NB transmissions dropped in non-D NB-IoT subframes;

- postponement of NPRACH, PUR and UL SPS transmissions in non-U NB-IoT subframes until the next U NB-IoT subframe(s);

- postponement of SI-message reception in non-D NB-IoT subframes to the next D NB-IoT subframe(s);

- NPRACH periodicities of 90ms and 180ms;

- extended *k-Mac*.

This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17* and any *ue-Category-NB*.

Editors’s Note: FFS whether the capability is a Conditionally Mandatory feature under section 7 or an Optional feature without UE radio access capability under section 6.

# Agreements in IoT NTN TDD

## RAN2#129

Agreements:

1. RAN2 will continue studying paging aspects based, on RAN1 progress
2. RAN2 assumes Kmac has to be extended (or a new parameter with higher range introduced) to address the case where the number of hops exceeds a certain limit. We continue the discussion in the next meeting to investigate if there are any other implications and in case of any decisions we send an LS to other groups if needed.
3. RAN2 confirms that idle mode eDRX is supported in IoT-NTN TDD network.
4. RAN2 thinks that a change of H-SFN duration (Option 1-1) and/or H-SFN total number (option 2-2) will impact RAN2 and SA2 specification regarding the support of idle mode eDRX in IoT-NTN TDD network and the impact should be evaluated.
5. RAN2 assumes that legacy coverage enhancement techniques (i.e. transmission with repetitions) are supported in IoT-NTN TDD system.
6. RAN2 can continue the discussion also on RAR window
7. Legacy barring bit will be used (FFS is cellBarred or cellBarred-NTN)

## RAN2#129bis

Agreements:

1. Regarding paging occasion determination, legacy NB-IoT PO determination mechanism is used. When the determined paging subframe is not a valid downlink subframe, the Paging monitoring is postponed to the nearest valid downlink subframe.

2. In IoT-NTN TDD mode, existing cell barring mechanism using the IE cellBarred-r13 and cellBarred-NTN-r17 in SIB1 is sufficient to control access to the IoT-NTN TDD cell.

3. Existing value ranges of timers in unit of PDCCH periods are reused for IoT NTN TDD (FFS on the possible clarification to take into account the impact of invalid subframes

4. When PUR resource start subframe does not align with the UL subframes in the H-SFN, UE postpones the PUR resource start subframe to the next valid UL subframe

5. When the UL SPS overlaps with non-U NB-IoT subframes UE postpones the UL SPS resource to the next valid UL subframe

6. For IoT NTN TDD mode, support k-Mac with a value range up to 1023 ms (add corresponding a restriction in the field description)

## RAN2#130

Agreements:

1. The SI-message transmission can be postponed to the next valid D frame within the SI-Window

2. It is up to NW implementation to avoid SI-window overlap

3. SI repetitions will not overlap (in case of collision the subsequent SI repetition is postponed)

4. In IoT-NTN TDD mode, the RA-RNTI should be calculated based on the SFN of the first radio frame in which the Random-Access Preamble is transmitted (i.e. no spec change)

5. For the timer of ra-ResponseWindowSize and mac-ContentionResolutionTimer, the absolute value limitation for FDD (i.e., 10.24s) is used for IoT NTN TDD.

6. In IoT-NTN TDD mode the same formula as for RA-RNTI calculation for FDD is reused

7. No extension is needed on the value range of timer in unit of ms or s for IoT NTN TDD

8. The remaining paging repetitions falling on the invalid DL SFNs are postponed to the next valid DL SFNs.

9. It is up to network to configure the gap between two POs (i.e., parameter NB) to be sufficiently long such that it includes enough number of valid DL subframes for NumRepetitionPaging-r13 (no spec impact)

10. Introduce the following definition for IoT-NTN TDD mode in the impacted RAN2 specifications:  
IoT-NTN TDD mode: allows use of NB-IoT channels with TDD mode for NTN with fixed values of D non-overlapping usable contiguous DL subframes and set of U usable contiguous UL subframes separated by fixed guard period (can revisit this based on the TP being prepared by RAN1)

11. In Rel19, RAN2 will not work on any specific enhancements to ensure that the features being specified in IoT\_NTN\_Ph3-Core will also work for IoT NTN TDD mode

12. In IoT\_NTN\_Ph3-Core, RAN2 will not work on any specific enhancements to ensure that the features being specified in IoT\_NTN\_Ph3-Core will also work for IoT NTN TDD mode. RAN2 understands that, as part of the IoT\_NTN\_TDD WI, we can discuss on a case by case basis whether minor specific enhancements – not affecting other WGs - can be supported to ensure that (some of) the features being specified in IoT\_NTN\_Ph3-Core will also work for IoT NTN TDD mode