**3GPP T****SG-RAN WG2 Meeting #125 R2-240xxxx**

**Athens, Greece: February 26 – March 1, 2024**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.306** | **CR** | **DRAFT** | **rev** | **-** | **Current version:** | **18.1.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **X** | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Update on IoT NTN UE capabilities | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Inc. | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IoT\_NTN\_enh-Core | | | | |  | ***Date:*** | | | 2024-03-07 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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)*  *Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Currently UE cannot indicate that it supports the HARQ and GNSS enhancements only in GSO scenario if it supports both GSO and NGSO scenarios. *ntn-HarqEnhNGSO-Support-r18* and *ntn-GNSS-EnhNGSO-Support-r18* need to be updated to allow UE to indicate support of enhancements ONLY on GEO scenario.  Currently there is only on UE capability indication to indicate support of uplink HARQ mode B applicable to both single TB and multiple TB scheduling. It is better to have separate capabilities for single TB and multiple TB cases.  Also some other editorial corrections can be done. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Change *ntn-HarqEnhNGSO-Support-r18* and *ntn-GNSS-EnhNGSO-Support-r18* from “ENUMERATED {supported}” to “ENUMERATED {ngso,gso}”.  Change the name *ntn-HarqEnhNGSO-Support-r18* and *ntn-GNSS-EnhNGSO-Support-r18* to *ntn-HarqEnhScenario-Support-r18* and *ntn-GNSS-EnhScenario-Support-r18*.  Introduce *ntn-UplinkHarq-ModeB-MultiTB-r18* for the support of HARQ mode B in multiple TB scheduling.  Other editorial corrections based on R2-2401238. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | UE capabilities for Rel-18 IoT NTN features will not be complete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.3.38 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **Y** |  | Other core specifications | | | | TS 36.331 CR xxxx | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS … CR … | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS … CR …  TS … CR … | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

START OF 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-r17* 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,* handling of *sr-ProhibitTimerOffset-r17* as specified in TS 36.331 [5];

- extending the length of the (UL) HARQ RTT timer as specified in TS 36.321 [4];

- 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 [22];

- for TA update in RRC\_CONNECTED state, support of combination of both open (i.e. UE specific TA estimation, and common TA calculation) and closed (i.e., received TA commands) control loops;

- frequency pre-compensation to counter shift the Doppler experienced on the service link;

- timing relationship enhancements using higher layer parameters *k-Offset-r17* and *k-Mac-r17* as specified in TS 36.213 [22];

- segmented UL transmission using higher layer parameters *prach-TxDuration-r17*, *nprach-TxDurationFmt01-r17, nprach-TxDurationFmt2-r17, pucch-TxDuration-r17* and *(n)pusch-TxDuration-r17* as specified in TS 36.331 [5] except for UEs indicating support of *ue-Category-NB* and *ntn-ScenarioSupport-r17* with value GSO.

A UE indicating support of *ce-ModeA-r13* and *ntn-Connectivity-EPC-r17* shall also indicate support of *standaloneGNSS-Location*. A UE indicating support for any *ue-Category-NB* and *ntn-Connectivity-EPC-r17* is assumed to have GNSS location capability*.*

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-TimerDelay-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-TimerDelay-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.*

4.3.38.4 *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 [22]. This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*.

4.3.38.5 *ntn-ScenarioSupport-r17*

This field indicates whether the UE supports NTN features in GSO or NGSO scenario. The UE indicating support of *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 features for both GSO and NGSO scenarios.

4.3.38.6 *ntn-SegmentedPrecompensationGaps-r17*

This field indicates the supported gap length between segments for PUSCH and PUCCH required by a UE supporting *ce-ModeA-r13* or for NPUSCH required by a UE supporting *ue-category-NB*, for TA pre-compensation. This feature is only applicable if the UE supports either *ue-category-NB* or *ce-ModeA-r13* and also supports *ntn-Connectivity-EPC-r17*. If a UE does not include this field but includes *ntn-Connectivity-EPC-r17*, in case of overlapped transmission between successive uplink segments, UE shall follow the procedure specified in TS 36.213 [22]. This field is not applicable for UEs indicating support of *ue-Category-NB* and *ntn-ScenarioSupport-r17* with value GSO.

4.3.38.7 *ntn-EventA4BasedCHO-r18*

This field indicates whether the UE supports Event A4-based conditional handover, i.e., *CondEvent A4* as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *cho-r16* and *ntn-Connectivity-EPC-r17.*

4.3.38.8 *ntn-LocationBasedCHO-EFC-r18*

This field indicates whether the UE supports location-based conditional handover for earth fixed cell, i.e., *CondEvent D1* as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *cho-r16* and *ntn-Connectivity-EPC-r17.*

4.3.38.9 *ntn-LocationBasedCHO-EMC-r18*

This field indicates whether the UE supports location-based conditional handover for earth moving cell, i.e., *CondEvent D1* as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *cho-r16* and *ntn-Connectivity-EPC-r17.*

4.3.38.10 *ntn-TimeBasedCHO-r18*

This field indicates whether the UE supports time-based conditional handover, i.e., *CondEvent T1* as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *cho-r16* and *ntn-Connectivity-EPC-r17.*

4.3.38.11 *ntn-LocationBasedMeasTrigger-EFC-r18*

This field indicates whether the UE supports location-based measurement trigger in RRC\_CONNECTED in earth fixed cell as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.12 *ntn-LocationBasedMeasTrigger-EMC-r18*

This field indicates whether the UE supports location-based measurement trigger in RRC\_CONNECTED in earth moving cell as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.13 *ntn-TimeBasedMeasTrigger-r18*

This field indicates whether the UE supports time-based measurement trigger in RRC\_CONNECTED as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.14 *ntn-RRC-HarqDisableSingleTB-r18*

This field indicates whether the UE supports HARQ feedback disabling per HARQ process for downlink transmission by RRC configuration. This feature is only applicable if the UE supports *ue-category-NB.* A UE supporting this feature shall also indicate the support of *ue-category-NB* and *ntn-Connectivity-EPC-r17*.

4.3.38.15 *ntn-OverriddenHarqDisableSingleTB-r18*

This field indicates whether the UE supports DCI-based HARQ feedback disabling for downlink transmission by overriding the RRC configuration. A UE supporting this feature shall also indicate the support of *ntn-RRC-HarqDisableSingleTB-r18*.

4.3.38.16 *ntn-DCI-HarqDisableSingleTB-r18*

This field indicates whether the UE supports DCI-based HARQ feedback disabling for downlink transmission when HARQ feedback disabling per HARQ process for downlink transmission is not configured by RRC. This feature is only applicable if the UE supports *ue-category-NB.* A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.17 *ntn-RRC-HarqDisableMultiTB-r18*

This field indicates whether the UE supports HARQ feedback disabling per HARQ process for downlink transmission by RRC configuration when scheduled with downlink transmission of multiple TBs. This feature is only applicable if the UE supports *ue-category-NB.* A UE supporting this feature shall also indicate the support of *npdsch-MultiTB-r16* and *ntn-Connectivity-EPC-r17*.

4.3.38.18 *ntn-OverriddenHarqDisableMultiTB-r18*

This field indicates whether the UE supports DCI-based HARQ feedback disabling for downlink transmission by overriding the RRC configuration when scheduled with downlink transmission of multiple TBs. A UE supporting this feature shall also indicate the support of *ntn-RRC-HarqDisableMultiTB-r18*.

4.3.38.19 *ntn-DCI-HarqDisableMultiTB-r18*

This field indicates whether the UE supports DCI-based HARQ feedback disabling for downlink transmission when HARQ feedback disabling per HARQ process for downlink transmission is not configured by RRC and when scheduled with downlink transmission of multiple TBs. This feature is only applicable if the UE supports *ue-category-NB.* A UE supporting this feature shall also indicate the support of *npdsch-MultiTB-r16* and *ntn-Connectivity-EPC-r17*.

4.3.38.20 *ntn-RRC-HarqDisableSingleTB-CE-ModeA-r18*

This field indicates whether the UE supports HARQ feedback disabling per HARQ process for downlink transmission by RRC configuration when operating in coverage enhancement mode A. This feature is only applicable if the UE supports *ce-ModeA-r13.* A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.21 *ntn-RRC-HarqDisableSingleTB-CE-ModeB-r18*

This field indicates whether the UE supports HARQ feedback disabling per HARQ process for downlink transmission by RRC configuration when operating in coverage enhancement mode B. This feature is only applicable if the UE supports *ce-ModeB-r13.* A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.22 *ntn-OverriddenHarqDisableSingleTB-CE-ModeB-r18*

This field indicates whether the UE supports DCI-based HARQ feedback disabling for downlink transmission by overriding the RRC configuration when operating in coverage enhancement mode B. A UE supporting this feature shall also indicate the support of *ntn-RRC-HarqDisableSingleTB-CE-ModeB-r18*.

4.3.38.23 *ntn-DCI-HarqDisableSingleTB-CE-ModeB-r18*

This field indicates whether the UE supports DCI-based HARQ feedback disabling for downlink transmission when HARQ feedback disabling per HARQ process for downlink transmission is not configured by RRC and operating in coverage enhancement mode B. This feature is only applicable if the UE supports *ce-ModeB-r13.* A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.24 *ntn-RRC-HarqDisableMultiTB-CE-ModeA-r18*

This field indicates whether the UE supports HARQ feedback disabling per HARQ process for downlink transmission by RRC configuration when operating in coverage enhancement mode A and when scheduled with downlink transmission of multiple TBs. A UE supporting this feature shall also indicate the support of *pdsch-MultiTB-CE-ModeA-r16* and *ntn-Connectivity-EPC-r17*.

4.3.38.25 *ntn-RRC-HarqDisableMultiTB-CE-ModeB-r18*

This field indicates whether the UE supports HARQ feedback disabling per HARQ process for downlink transmission by RRC configuration when operating in coverage enhancement mode B and when scheduled with downlink transmission of multiple TBs. A UE supporting this feature shall also indicate the support of *pdsch-MultiTB-CE-ModeB-r16* and *ntn-Connectivity-EPC-r17*.

4.3.38.26 *ntn-OverriddenHarqDisableMultiTB-CE-ModeB-r18*

This field indicates whether the UE supports DCI-based HARQ feedback disabling for downlink transmission by overriding the RRC configuration when operating in coverage enhancement mode B and when scheduled with downlink transmission of multiple TBs. A UE supporting this feature shall also indicate the support of *ntn-RRC-HarqDisableMultiTB-CE-ModeB-r18*.

4.3.38.27 *ntn-DCI-HarqDisableMultiTB-CE-ModeB-r18*

This field indicates whether the UE supports DCI-based HARQ feedback disabling for downlink transmission when HARQ feedback disabling per HARQ process for downlink transmission is not configured by RRC and operating in coverage enhancement mode B and when scheduled with downlink transmission of multiple TBs. A UE supporting this feature shall also indicate the support of *pdsch-MultiTB-CE-ModeB-r16* and *ntn-Connectivity-EPC-r17*.

4.3.38.28 *ntn-SemiStaticHarqDisableSPS-r18*

This field indicates whether the UE supports HARQ feedback transmission for the first SPS PDSCH transmission after activation when operating in coverage enhancement mode A. A UE supporting this feature shall also indicate the support of *ce-ModeA-r13* and *ntn-Connectivity-EPC-r17*.

4.3.38.29 *ntn-UplinkHarq-ModeB-r18*

This field indicates whether the UE supports HARQ Mode B. A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.xx *ntn-UplinkHarq-ModeB-MultiTB-r18*

This field indicates whether the UE supports HARQ Mode B when scheduled with uplink transmission of multiple TBs. A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17* and one of *npdsch-MultiTB-r16, pdsch-MultiTB-CE-ModeA-r16* and *pdsch-MultiTB-CE-ModeB-r16*. For a UE indicating support of *ce-ModeA-r13*, this field also indicates whether the UE supports the corresponding LCP restrictions for uplink transmission.

4.3.38.30 *ntn-HarqEnhScenario-Support-r18*

This field indicates whether the UL and DL HARQ process enhancements that are indicated as supported are applicable in GSO or NGSO scenarios for UE indicating support of GSO and NGSO scenarios. If this field is not included, the UL and DL HARQ process enhancements that are indicated as supported are applicable in both GSO and NGSO scenarios. This field is only applicable if the UE supports at least one of *ntn-RRC-HarqDisableSingleTB-r18*, *ntn-OverriddenHarqDisableSingleTB-r18*, *ntn-DCI-HarqDisableSingleTB-r18*, *ntn-RRC-HarqDisableMultiTB-r18*, *ntn-OverriddenHarqDisableMultiTB-r18*, *ntn-DCI-HarqDisableMultiTB-r18*, *ntn-RRC-HarqDisableSingleTB-CE-ModeA-r18*, *ntn-RRC-HarqDisableSingleTB-CE-ModeB-r18*, *ntn-OverriddenHarqDisableSingleTB-CE-ModeB-r18*, *ntn-DCI-HarqDisableSingleTB-CE-ModeB-r18*, *ntn-RRC-HarqDisableMultiTB-CE-ModeA-r18*, *ntn-RRC-HarqDisableMultiTB-CE-ModeB-r18*, *ntn-OverriddenHarqDisableMultiTB-CE-ModeB-r18*, *ntn-DCI-HarqDisableMultiTB-CE-ModeB-r18* and *ntn-UplinkHarq-ModeB-r18*.

4.3.38.31 *ntn-Triggered-GNSS-Fix-r18*

This field indicates whether the UE supports network triggered GNSS position fix in RRC\_CONNECTED as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*. If the UE indicates this capability, the UE shall support the following enhancements:

- UE reports GNSS position fix time duration for measurement in *RRCConnectionSetupComplete (-NB)*, *RRCConnectionResumeComplete (-NB)*, and *RRCConnectionReestablishmentComplete (-NB)* and *RRCConnectionReconfigurationComplete* messages;

- UE receives GNSS measurement trigger from eNB;

- UE re-acquires GNSS position fix within a configured gap;

- UE reports the remaining GNSS validity duration with MAC CE in RRC\_CONNECTED.

4.3.38.32 *ntn-Autonomous-GNSS-Fix-r18*

This field indicates whether the UE supports autonomous GNSS position fix in RRC\_CONNECTED as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*. If the UE indicates this capability, the UE shall support the following enhancements:

- UE reports GNSS position fix time duration for measurement in *RRCConnectionSetupComplete (-NB)*, *RRCConnectionResumeComplete (-NB)*, and *RRCConnectionReestablishmentComplete (-NB)* and *RRCConnectionReconfigurationComplete* messages;

- UE re-acquires GNSS autonomously (when configured by the network) if it does not receive eNB GNSS measurement trigger;

- UE reports the remaining GNSS validity duration with MAC CE in RRC\_CONNECTED.

4.3.38.33 *ntn-UplinkTxExtension-r18*

This field indicates whether the UE supports to perform UL transmission in a duration after original GNSS validity duration expires without GNSS re-acquisition as specified in TS 36.331 [5]. A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.34 *ntn-GNSS-EnhScenario-Support-r18*

This field indicates whether the GNSS measurement enhancements in RRC\_CONNECTED that are indicated as supported are applicable in GSO or NGSO scenarios for UE indicating support of GSO and NGSO scenarios. If this field is not included, the GNSS measurement enhancements in RRC\_CONNECTED that are indicated as supported are applicable in both GSO and NGSO scenarios. This field is only applicable if the UE supports at least one of *ntn-Triggered-GNSS-Fix-r18,* *ntn-Autonomous-GNSS-Fix-r18* and *ntn-UplinkTxExtension-r18*.

END OF CHANGE