**3GPP T****SG-RAN WG2 Meeting #123bis R2-231xxxx**

**Xiamen, China: October 9-13, 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **36.306** | **CR** | **Draft** | **rev** | **-** | **Current version:** | **17.4.0** |  |
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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:***  | Running CR for TS 36.306 for Rel-18 IoT NTN |
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| ***Source to WG:*** | Qualcomm Inc. |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | IoT\_NTN\_enh-Core |  | ***Date:*** | 2023-09-29 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***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 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* *Rel-19 (Release 19)* |
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| ***Reason for change:*** | To add new UE feature and capabilities based on Rel-18 IoT NTN agreements. |
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| ***Summary of change:*** | UE capability information on the following features are captured:* Event A4 for CHO for eMTC
* Location-based CHO for eMTC
* Time-based CHO for eMTC
* HARQ feedback enable/disable
* GNSS fix in connected mode
* UL HARQ mode B
* Location-based measurement initiation in IDLE mode
* Time and location based measureemnt trigger in connected mode
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| ***Consequences if not approved:*** | UE capabilities for Rel-18 IoT NTN features will not be captured.  |
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| ***Clauses affected:*** | 4.3.38, 6.19 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS 36.331 CR xxxx |
| ***affected:*** |  | **x** |  Test specifications | TS/TR 36.304 CR xxxx  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR 36.321 CR xxxx  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Revision of R2-2307625 |

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.x *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.x *ntn-LocationBasedCHO-r18*

This field indicates whether the UE supports location based conditional handover, 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.x *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.x *ntn-LocationBasedMeasTrigger-r18*

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

4.3.38.x *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 *ntn-Connectivity-EPC-r17*.

Editor’s note: FFS if UE capabilities for CHO enhancements and measurement trigger are per UE or per band.

Editor’s note: FFS if same parameter for time and location based measurement trigger in connected mode is applicable to both eMTC and NB-IoT.

4.3.38.x *ntn-SemiStaticHarqFeedbackDisabled-r18*

This field indicates whether the UE supports HARQ feedback disabling for downlink transmission. 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*.

Editor’s note: Based on further discussion and RAN1 feature list, the parameter names and description for semi-static and dynamic HARQ disabling capabilities for NB-IoT, eMTC in CE mode A and CE mode B will be updated.

Editor’s note: FFS on GSO and NGSO differentiation and per UE/per band signaling. For example, there is no need to support HARQ disabling in LEO but it may need to be supported in GEO.Editor’s note: Based on new RAN1 feature list, the separate capabilities for single TB and multiple TB will be defined.

4.3.38.x *ntn-DynamicHarqFeedbackDisabled-r18*

This field indicates whether the UE supports HARQ feedback disabling for downlink transmission. 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.x *ntn-SemiStaticHarqFeedbackDisabled-CE-ModeA-r18*

This field indicates whether the UE supports HARQ feedback disabling for downlink transmission 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.x *ntn-DynamicHarqFeedbackDisabled-CE-ModeA-r18*

This field indicates whether the UE supports HARQ feedback disabling for downlink transmission 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.x *ntn-SemiStaticHarqFeedbackDisabled-CE-ModeB-r18*

This field indicates whether the UE supports HARQ feedback disabling for downlink transmission 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.x *ntn-DynamicHarqFeedbackDisabled-CE-ModeB-r18*

This field indicates whether the UE supports HARQ feedback disabling for downlink transmission 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.x *ntn-UplinkHarq-ModeB-r18*

This field indicates whether the UE supports HARQ Mode B. For a UE indicating support of *ce-ModeA-r13*, this field also indicates whether the UE supports the corresponding LCP restrictions for uplink transmission. A UE supporting this feature shall also indicate the support of *ntn-Connectivity-EPC-r17*.

4.3.38.x *ntn-Triggered-GNSS-Fix-r18*

This field indicates whether the UE supports network triggered GNSS fix in RRC\_CONNECTED. This field is only applicable if the UE supports *ce-ModeA-r13* or any *ue-Category-NB*. 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 during the initial access stage

- 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.x *ntn-Autonomous-GNSS-Fix-r18*

This field indicates whether the UE supports autonomous GNSS fix in RRC\_CONNECTED. This field is only applicable if the UE supports *ce-ModeA-r13* or any *ue-Category-NB*. 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 during the initial access stage

- 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.

5 Void

6 Optional features without UE radio access capability parameters

Unchanged part skipped

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 TS 36.304 [14]. This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*.

Editor’s note: FFS whether to add trigger based on neighbor satellite start time.

6.19.2 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*.

6.19.x Cell reselection measurements triggering based on location

It is optional for UE camped on NTN cell to support triggering of early cell reselection measurements based on the reference location broadcasted by the cell as specified in TS 36.304 [14]. This feature is only applicable if the UE supports *ntn-Connectivity-EPC-r17*.

Editor’s note: FFS on wording to differentiate fixed vs moving cell scenarios and GSO.

END OF CHANGE