**3GPP TSG-RAN/WG2 Meeting #119bis-e *R2-2211019***

**eMeeting, Oct 10 – Oct 19, 2022**

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| **CHANGE REQUEST** |
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|  | **36.321** | **CR** |  **XXXX** | **rev** | **-** | **Current version:** | **17.2.0** |  |
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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:***  | Corrections for Supporting Non-Terrestrial Network in NB-IoT and eMTC |
|  |  |
| ***Source to WG:*** | MediaTek |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | LTE\_NBIOT\_eMTC\_NTN |  | ***Date:*** | 2022-10-19 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***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 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-16 (Release 16)Rel-17 (Release 17)2#11803Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | Incorporate MAC Corrections in Release-17 to support IoT-NTN.  |
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| ***Summary of change:*** | This CR captures agreements in IoT-NTN Work Item of RAN2#119bis-e, based on the following offlines:“[offline-106] UP corrections”, which includes:* In NTN, the DRX Active Time starts after the first repetition within the bundle plus the UE-eNB RTT when repetitions within the bundle are being transmitted.
* Providing reference to RAN1 specs for Differential Koffset
* Providing unit of the field of Differential Koffset
* Add RTToffset to the UL HARQ RTT Timer for BL UEs and UEs in enhanced coverage
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| ***Consequences if not approved:*** | Support for Release-17 enhancements for NTN in IoT is not complete and incorrect. |
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| ***Clauses affected:*** |  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

Start of changes

## 5.7 Discontinuous Reception (DRX)

The MAC entity may be configured by RRC with a DRX functionality that controls the UE's PDCCH monitoring activity for the MAC entity's C-RNTI, TPC-PUCCH-RNTI, TPC-PUSCH-RNTI, Semi-Persistent Scheduling C-RNTI (if configured), UL Semi-Persistent Scheduling V-RNTI (if configured), eIMTA-RNTI (if configured), SL-RNTI (if configured), SL-V-RNTI (if configured), CC-RNTI (if configured), SRS-TPC-RNTI (if configured), and AUL C-RNTI (if configured). When in RRC\_CONNECTED, if DRX is configured, the MAC entity is allowed to monitor the PDCCH discontinuously using the DRX operation specified in this clause; otherwise the MAC entity monitors the PDCCH continuously. When using DRX operation, the MAC entity shall also monitor PDCCH according to requirements found in other clauses of this specification. RRC controls DRX operation by configuring the timers *onDurationTimer*, *drx-InactivityTimer*, *drx-RetransmissionTimer* (for HARQ processes scheduled using 1ms TTI, one per DL HARQ process except for the broadcast process), *drx-RetransmissionTimerShortTTI* (for HARQ processes scheduled using short TTI, one per DL HARQ process), *drx-ULRetransmissionTimer* (for HARQ processes scheduled using 1ms TTI, one per asynchronous UL HARQ process), *drx-ULRetransmissionTimerShortTTI* (for HARQ processes scheduled using short TTI, one per asynchronous UL HARQ process), the *longDRX-Cycle*, the value of the *drxStartOffset* and optionally the *drxShortCycleTimer* and *shortDRX-Cycle*. A HARQ RTT timer per DL HARQ process (except for the broadcast process) and UL HARQ RTT Timer per asynchronous UL HARQ process is also defined (see clause 7.7).

When a DRX cycle is configured, the Active Time includes the time while:

*- onDurationTimer* or *drx-InactivityTimer* or *drx-RetransmissionTimer* or *drx-RetransmissionTimerShortTTI* or *drx-ULRetransmissionTimer* or *drx-ULRetransmissionTimerShortTTI* or *mac-ContentionResolutionTimer* (as described in clause 5.1.5) is running; or

- a Scheduling Request is sent on PUCCH/SPUCCH and is pending (as described in clause 5.4.4). If this Serving Cell is part of a non-terrestrial network, the Active Time is started after the Scheduling Request transmission that is performed when the *SR\_COUNTER* is 0 for all the SR configurations with pending SR(s) plus the UE-eNB RTT; or

- an uplink grant for a pending HARQ retransmission can occur and there is data in the corresponding HARQ buffer for synchronous HARQ process; or

- a PDCCH indicating a new transmission addressed to the C-RNTI of the MAC entity has not been received after successful reception of a Random Access Response for the preamble not selected by the MAC entity (as described in clause 5.1.4) ; or

- *mpdcch-UL-HARQ-ACK-FeedbackConfig* is configured and repetitions within a bundle are being transmitted according to UL\_REPETITION\_NUMBER. If this Serving Cell is part of a non-terrestrial network, the Active Time starts after the first repetition within the bundle plus the UE-eNB RTT when repetitions within the bundle are being transmitted.

Next change

#### 6.1.3.20 Timing Advance Report MAC Control Element

The Timing Advance MAC CE is identified by MAC subheader with LCID as specified in Table 6.2.1-2.

It has a fixed size and consists of two octets defined as follows (Figure 6.1.3.20-1):

- R: Reserved bit, set to 0;

- Timing Advance: The Timing Advance field indicates the least integer number of subframes greater than or equal to the Timing Advance value (see TS 36.211 [7] clause 8.1). The length of the field is 14 bits.



Figure 6.1.3.20-1: Timing Advance MAC CE

#### 6.1.3.21 Differential Koffset MAC Control Element

The Differential Koffset MAC CE is identified by MAC subheader with LCID as specified in Table 6.2.1-1.

It has a fixed size and consists of a single octet defined as follows (Figure 6.1.3.21-1):

- R: Reserved bit, set to 0;

- Differential Koffset: This field indicates the differential Koffset in subframes (see TS 36.213 [2]). The length of the field is 6 bits.



Figure 6.1.3.21-1: Differential Koffset MAC CE

Next change

## 7.7 HARQ RTT Timers

For each serving cell, in case of FDD configuration not configured with *subframeAssignment-r15* and in case of Frame Structure Type 3 configuration on the serving cell which carries the HARQ feedback for this serving cell the HARQ RTT Timer is set to 8 subframes. For each serving cell, in case of TDD configuration or FDD with *subframeAssignment-r15* configured on the serving cell which carries the HARQ feedback for this serving cell the HARQ RTT Timer is set to k + 4 subframes, where k is the interval between the downlink transmission and the transmission of associated HARQ feedback, as indicated in clauses 10.1 and 10.2 of TS 36.213 [2], and for an RN configured with *rn-SubframeConfig*, as specified in TS 36.331 [8] and not suspended, as indicated in Table 7.5.1-1 of TS 36.216 [11].

For each serving cell, for HARQ processes scheduled using Short Processing Time (TS 36.331 [8]) the HARQ RTT Timer is set to 6 subframes for FDD and Frame Structure Type 3 and set to k + 3 subframes for TDD, where k is the interval between the downlink transmission and the transmission of associated HARQ feedback, as indicated in clauses 10.1 and 10.2 of TS 36.213 [2].

For each serving cell, for HARQ processes scheduled using short TTI (TS 36.331 [8]) the HARQ RTT Timer is set to 8 TTIs if the TTI length is one slot or if *proc-Timeline* is set to n+4 set1, to 12 TTIs if *proc-Timeline* is set to n+6 set1 or n+6 set2 and to 16 TTIs if *proc-Timeline* is set to n+8 set2 for FDD and Frame Structure Type 3.

For TDD short TTI the HARQ RTT Timer is set to k + 4 TTIs, where k is the interval between the downlink transmission and the transmission of associated HARQ feedback, as indicated in clauses 10.1 and 10.2 of TS 36.213 [2].

For BL UEs and UEs in enhanced coverage, when single TB is scheduled by PDCCH the HARQ RTT Timer corresponds to 7 + N + RTToffset, where N is the used PUCCH repetition factor, where only valid (configured) UL subframes as configured by upper layers in *fdd-UplinkSubframeBitmapBR* are counted for N. In case of TDD, HARQ RTT Timer corresponds to 3 + k + N + RTToffset, where k is the interval between the last repetition of downlink transmission and the first repetition of the transmission of associated HARQ feedback, and N is the used PUCCH repetition factor, where only valid UL subframes are counted for N as indicated in clauses 10.1 and 10.2 of TS 36.213 [2].

For BL UEs and UEs in enhanced coverage, when multiple TBs are scheduled by PDCCH and HARQ-ACK bundling is not configured, the HARQ RTT Timer corresponds to 7 + m \* N + RTToffset, where N is the used PUCCH repetition factor and m is the number of scheduled TBs as indicated in PDCCH, where only valid (configured) UL subframes as configured by upper layers in *fdd-UplinkSubframeBitmapBR* are counted for m \* N.

For BL UEs and UEs in enhanced coverage, when multiple TBs are scheduled by PDCCH and HARQ-ACK bundling is configured the HARQ RTT Timer corresponds to 7 + M \* N + RTToffset, where N is the used PUCCH repetition factor and M is the number of TB bundles as specified in clause 7.3 of TS 36.213 [2], where only valid (configured) UL subframes as configured by upper layers in *fdd-UplinkSubframeBitmapBR* are counted for M \* N.

For NB-IoT, when single TB is scheduled by PDCCH or when multiple TBs are scheduled for the interleaved case when HARQ-ACK bundling is configured the HARQ RTT Timer is set to k+3+N + RTToffset +deltaPDCCH subframes, where k is the interval between the last subframe of the downlink transmission and the first subframe of the associated HARQ feedback transmission and N is the transmission duration in subframes of the associated HARQ feedback, and deltaPDCCH is the interval starting from the subframe following the last subframe of the associated HARQ feedback transmission plus 3+ RTToffset subframes to the first subframe of the next PDCCH occasion.

For NB-IoT, when multiple TBs are scheduled by PDCCH for the non-interleaved case or for the interleaved case when HARQ-ACK bundling is not configured, the HARQ RTT Timer is set to k+2\*N+1 + RTToffset +deltaPDCCH subframes where k is the interval between the last subframe of the downlink transmission and the first subframe of the first HARQ feedback transmission and N is the transmission duration in subframes of the associated HARQ feedback, and deltaPDCCH is the interval starting from the subframe following the last subframe of the last HARQ feedback transmission plus 1 + RTToffset subframes to the first subframe of the next PDCCH occasion.

Except for NB-IoT and for HARQ processes scheduled using Short Processing Time and for short TTI, UL HARQ RTT Timer length is set to 4 + RTToffset subframes for FDD and Frame Structure Type 3, and set to kULHARQRTT + RTToffset subframes for TDD, where kULHARQRTT equals to the kPHICH value indicated in Table 9.1.2-1 of TS 36.213 [2] if the UE is not configured with upper layer parameter *symPUSCH-UpPts* for the serving cell, otherwise the kPHICH value is indicated in Table 9.1.2-3.

For NB-IoT, when single TB is scheduled by PDCCH the UL HARQ RTT timer length is set to 4 + RTToffset +deltaPDCCH subframes, where deltaPDCCH is the interval starting from the subframe following the last subframe of the PUSCH transmission plus 3 + RTToffset subframes to the first subframe of the next PDCCH occasion.

For NB-IoT, when multiple TBs are scheduled by PDCCH the UL HARQ RTT timer length is set to 1 + RTToffset +deltaPDCCH subframes, where deltaPDCCH is the interval starting from the subframe following the last subframe of the PUSCH transmission plus 1 + RTToffset subframes to the first subframe of the next PDCCH occasion.

For HARQ processes scheduled using Short Processing Time (TS 36.331 [8]), the UL HARQ RTT Timer length is set to 3 subframes for FDD and for Frame Structure Type 3, and set to kULHARQRTT subframes for TDD, where kULHARQRTT equals the value indicated in Table 7.7-1 and Table 7.7-2.

For HARQ processes scheduled using short TTI (TS 36.331 [8]), the UL HARQ RTT Timer length is set to 8 TTIs if the TTI length is one slot or if *proc-Timeline* is set to n+4 set1, to 12 TTIs if *proc-Timeline* is set to n+6 set1 or n+6 set2 and to 16 TTIs if *proc-Timeline* is set to n+8 set2 for FDD and Frame Structure Type 3. For TDD short TTI the UL HARQ RTT Timer is set to kULHARQRTT TTIs, where kULHARQRTT equals the value indicated in Table 7.7-3, Table 7.7-4 and Table 7.7-5.