**3GPP TSG-RAN WG2 Meeting #125bisR2-24XXXX**

**Changsha, China, April 15th-19th, 2024**

**Agenda Item: 7.6.4**

**Source: MediaTek Inc.**

**Title: Discussion on the IoT NTN MAC CR**

**Document for: Discussion and Decision**

# Introduction

This document aims to collect companies’ views to complete the MAC correction CR on IoT NTN.

* [Post125bis][304][IoT-NTN Enh] 36.321 CR (Mediatek)

Scope: draft a MAC CR with meeting agreements

Intended outcome: Agreed CR

Deadline for agreed CR (in R2-2403775): short

# 2. Contact information

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| --- | --- |
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# Discussion

## 3.1 Text proposal 1

In RAN2#125bis, the following agreements have been made for Rel-18 IoT NTN HARQ feedback disabling:

**RAN2 Agreement**

1. For single TB scheduled by DCI, for a HARQ process configured as HARQ feedback disabled by RRC and further reversed to HARQ feedback enabled by DCI, NB-IoT UE behaviour on DRX follows the case when HARQ feedback is disabled (clarification of a previous agreement)
2. For multiple TBs scheduled by DCI, for a HARQ process configured as HARQ feedback disabled by RRC and further reversed to HARQ feedback enabled by DCI, NB-IoT UE behaviour on DRX follows the ase when HARQ feedback is enabled.

The corresponding text proposal is provided as follows:

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| 5.7 Discontinuous Reception (DRX) <Skip>  - during the Active Time, for a PDCCH-subframe, if the subframe is not required for uplink transmission for half-duplex FDD UE operation, and if the subframe is not a half-duplex guard subframe, as specified in TS 36.211 [7], and if the subframe is not part of a configured measurement gap and if the subframe is not part of a configured Sidelink Discovery Gap for Reception, and for NB-IoT if the subframe is not required for uplink transmission or downlink reception other than on PDCCH; or  - during the Active Time, for a subframe other than a PDCCH-subframe and for a UE capable of simultaneous reception and transmission in the aggregated cells, if the subframe is a downlink subframe indicated by a valid eIMTA L1 signalling for at least one serving cell not configured with *schedulingCellId*, as specified in TS 36.331 [8] and if the subframe is not part of a configured measurement gap and if the subframe is not part of a configured Sidelink Discovery Gap for Reception; or  - during the Active Time, for a subframe other than a PDCCH-subframe and for a UE not capable of simultaneous reception and transmission in the aggregated cells, if the subframe is a downlink subframe indicated by a valid eIMTA L1 signalling for the SpCell and if the subframe is not part of a configured measurement gap and if the subframe is not part of a configured Sidelink Discovery Gap for Reception:  - monitor the PDCCH;  - if the PDCCH indicates a DL transmission or if a DL assignment has been configured for this subframe:  - if the UE is an NB-IoT UE, a BL UE or a UE in enhanced coverage:  - if the HARQ feedback is disabled by lower layers when *downlinkHARQ-FeedbackDisabled* is not configured for the corresponding HARQ process; or  - if the HARQ feedback is disabled by *downlinkHARQ-FeedbackDisabled* for the corresponding HARQ process except the HARQ feedback is further reversed to enabled by lower layers and lower layers have indicated scheduling of transmission of multiple TBs; or  - if the HARQ feedback is enabled by downlinkHARQ-FeedbackDisabled for the corresponding HARQ process and further reversed to disabled by lower layers:  *-* if NB-IoT:  - if the UE is configured with a single DL and UL HARQ process:  - start or restart *drx-InactivityTimer* in the subframe containing the last repetition of the corresponding PDSCH reception + 12 subframes + deltaPDCCH, where deltaPDCCH is the interval starting from the subframe containing the last repetition of the corresponding PDSCH reception plus 12 subframes to the first subframe of the next PDCCH occasion.  - if lower layers have indicated scheduling of transmission of multiple TBs:  - start or restart *drx-InactivityTimer* in the subframe containing the last repetition of the PDSCH reception corresponding to the last scheduled TB + 12 subframes + deltaPDCCH, where deltaPDCCH is the interval starting from the subframe containing the last repetition PDSCH reception corresponding to the last scheduled TB plus 12 subframes to the first subframe of the next PDCCH occasion.  - else if the HARQ feedback is enabled for the corresponding HARQ process:  - if lower layers have indicated scheduling of transmission of multiple TBs:  - start the HARQ RTT Timers for all HARQ processes which the HARQ feedback are enabled corresponding to the scheduled TBs in the subframe containing the last repetition of the PDSCH corresponding to the last scheduled TB;  - else:  - start the HARQ RTT Timer for the corresponding HARQ process in the subframe containing the last repetition of the corresponding PDSCH reception; |

**Q1: Do companies agree on the above text proposal?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | “Except” here is not very clear. Suggestion:  - if the UE is an NB-IoT UE, a BL UE or a UE in enhanced coverage:  - if the HARQ feedback is disabled by lower layers when *downlinkHARQ-FeedbackDisabledBitmap(-NB)* is not configured for the corresponding HARQ process; or  - except for the HARQ feedback enabled by lower layers when lower layers have indicated scheduling of transmission of multiple TBs, if the HARQ feedback is disabled by *downlinkHARQ-FeedbackDisabledBitmap(-NB)* for the corresponding HARQ process; or  - if the HARQ feedback is enabled by downlinkHARQ-FeedbackDisabledBitmap(-NB) for the corresponding HARQ process and further reversed to disabled by lower layers: |
| OPPO | Yes |  |
| Ericsson | Yes | We also agree to the QC observation for *downlinkHARQ-FeedbackDisabled*. Simplest fix for that may be to change:  5.3.2.1 HARQ Entity  “A retransmission of a bundle is also a bundle. HARQ feedback may be disabled per HARQ process by configuring *downlinkHARQ-FeedbackDisabled* and/or by indication from lower layers.”  To  “A retransmission of a bundle is also a bundle. HARQ feedback may be disabled per HARQ process by configuring *downlinkHARQ-FeedbackDisabledBitmap(-NB)* and/or by indication from lower layers when *downlinkHARQ-FeedbackDisabledDCI* is configured.”.  And in 5.7:  - if the HARQ feedback is disabled by lower layers when *downlinkHARQ-FeedbackDisabledBitmap(-NB)* is not configured for the corresponding HARQ process; or  - if the HARQ feedback is disabled by *downlinkHARQ-FeedbackDisabledBitmap(-NB)* for the corresponding HARQ process; or  - if the HARQ feedback is enabled by downlinkHARQ-FeedbackDisabledBitmap(-NB) for the corresponding HARQ process and further reversed to disabled by lower layers: |
| vivo | Yes | Agree with Qualcomm and Ericsson. |
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**Rapporteur Summary**

## Text proposal 2

We find that in the current specification, when UL HARQ mode B and multiple TBs are scheduled, the condition of HARQ mode B is missing.

The corresponding text proposal is provided as follows:

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| 5.7 Discontinuous Reception (DRX) <Skip>  - if the PDCCH indicates an UL transmission for an asynchronous HARQ process or if an UL grant has been configured for an asynchronous HARQ process for this subframe, or if the PDCCH indicates an UL transmission for an autonomous HARQ process or;  - if the uplink grant is a configured grant for the MAC entity's AUL C-RNTI and if the corresponding PUSCH transmission has been performed in this subframe:  - if *mpdcch-UL-HARQ-ACK-FeedbackConfig* is not configured; and  - if the corresponding HARQ process is not configured with HARQ mode B:  - if lower layers have indicated scheduling of transmission of multiple TBs:  - start the UL HARQ RTT Timers for all scheduled HARQ processes which are not configured with HARQ mode B in the subframe containing the last repetition of the PUSCH corresponding to the last scheduled TB;  - else:  - start the UL HARQ RTT Timer for the corresponding HARQ process in the subframe containing the last repetition of the corresponding PUSCH transmission;  - stop the *drx-ULRetransmissionTimer* or *drx-ULRetransmissionTimerShortTTI* for the corresponding HARQ process;  - if *mpdcch-UL-HARQ-ACK-FeedbackConfig* is configured and an UL HARQ-ACK feedback has not been received on PDCCH until the last repetition of the corresponding PUSCH transmission:  - if the corresponding HARQ process is not configured with HARQ mode B:  - start or restart the *drx-ULRetransmissionTimer* for the corresponding HARQ process in the subframe containing the last repetition of the corresponding PUSCH transmission;  *-* if NB-IoT:  - if the UE is configured with single UL and DL HARQ process and if the corresponding HARQ process is configured with HARQ mode B:  - start or restart *drx-InactivityTimer* in the subframe containing the last repetition of the corresponding PUSCH transmission + 1 subframe + deltaPDCCH, where deltaPDCCH is the interval starting from the subframe containing the last repetition of the corresponding PUSCH transmission plus 1 subframes to the first subframe of the next PDCCH occasion.  - if lower layers have indicated scheduling of transmission of multiple TBs and one or both of HARQ processes are configured with HARQ mode B:  - start or restart *drx-InactivityTimer* in the subframe containing the last repetition of the PUSCH transmission corresponding to the last scheduled TB + 1 subframe + deltaPDCCH, where deltaPDCCH is the interval starting from the subframe containing the last repetition of the PUSCH transmission corresponding to the last scheduled TB plus 1 subframes to the first subframe of the next PDCCH occasion.  - if NB-IoT, stop *drx-RetransmissionTimer* for all DL HARQ processes. |

**Q2: Do companies agree on the above text proposal?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | Suggestion:  if lower layers have indicated scheduling of transmission of multiple TBs and if a HARQ process is configured with HARQ mode B: |
| OPPO | Yes |  |
| Ericsson | Yes |  |
| vivo | Yes |  |
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**Rapporteur Summary**

## Text proposal 3

We find that for DL HARQ feedback disabling and UL HARQ mode B, there are two clauses, one is "*if the UE is configured with a single DL and UL HARQ process*”, the other is “*if lower layers have indicated scheduling of transmission of multiple TBs*”. There are two cases that are not covered yet. The first case is that **two HARQ processes is configured but multiple TBs is not configured**; the other is that **multiple TBs is configured but single TB is scheduled**. To cover these two cases, the corresponding text proposal is provided as follows:

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| 5.7 Discontinuous Reception (DRX) <Skip>  - during the Active Time, for a PDCCH-subframe, if the subframe is not required for uplink transmission for half-duplex FDD UE operation, and if the subframe is not a half-duplex guard subframe, as specified in TS 36.211 [7], and if the subframe is not part of a configured measurement gap and if the subframe is not part of a configured Sidelink Discovery Gap for Reception, and for NB-IoT if the subframe is not required for uplink transmission or downlink reception other than on PDCCH; or  - during the Active Time, for a subframe other than a PDCCH-subframe and for a UE capable of simultaneous reception and transmission in the aggregated cells, if the subframe is a downlink subframe indicated by a valid eIMTA L1 signalling for at least one serving cell not configured with *schedulingCellId*, as specified in TS 36.331 [8] and if the subframe is not part of a configured measurement gap and if the subframe is not part of a configured Sidelink Discovery Gap for Reception; or  - during the Active Time, for a subframe other than a PDCCH-subframe and for a UE not capable of simultaneous reception and transmission in the aggregated cells, if the subframe is a downlink subframe indicated by a valid eIMTA L1 signalling for the SpCell and if the subframe is not part of a configured measurement gap and if the subframe is not part of a configured Sidelink Discovery Gap for Reception:  - monitor the PDCCH;  - if the PDCCH indicates a DL transmission or if a DL assignment has been configured for this subframe:  - if the UE is an NB-IoT UE, a BL UE or a UE in enhanced coverage:  - if the HARQ feedback is disabled by lower layers when *downlinkHARQ-FeedbackDisabled* is not configured for the corresponding HARQ process; or  - if the HARQ feedback is disabled by *downlinkHARQ-FeedbackDisabled* for the corresponding HARQ process; or  - if the HARQ feedback is enabled by downlinkHARQ-FeedbackDisabled for the corresponding HARQ process and further reversed to disabled by lower layers:  *-* if NB-IoT:  - if lower layers have indicated scheduling of transmission of multiple TBs:  - start or restart *drx-InactivityTimer* in the subframe containing the last repetition of the PDSCH reception corresponding to the last scheduled TB + 12 subframes + deltaPDCCH, where deltaPDCCH is the interval starting from the subframe containing the last repetition PDSCH reception corresponding to the last scheduled TB plus 12 subframes to the first subframe of the next PDCCH occasion.  - else:  - start or restart *drx-InactivityTimer* in the subframe containing the last repetition of the corresponding PDSCH reception + 12 subframes + deltaPDCCH, where deltaPDCCH is the interval starting from the subframe containing the last repetition of the corresponding PDSCH reception plus 12 subframes to the first subframe of the next PDCCH occasion.- else if the HARQ feedback is enabled for the corresponding HARQ process:  - if lower layers have indicated scheduling of transmission of multiple TBs:  - start the HARQ RTT Timers for all HARQ processes which the HARQ feedback are enabled corresponding to the scheduled TBs in the subframe containing the last repetition of the PDSCH corresponding to the last scheduled TB;  - else:  - start the HARQ RTT Timer for the corresponding HARQ process in the subframe containing the last repetition of the corresponding PDSCH reception;  - else:  - start the HARQ RTT Timer for the corresponding HARQ process;  - stop the *drx-RetransmissionTimer* or *drx-RetransmissionTimerShortTTI* for the corresponding HARQ process.  - if NB-IoT, stop *drx-ULRetransmissionTimer* for all UL HARQ processes.  - if the PDCCH indicates an UL transmission for an asynchronous HARQ process or if an UL grant has been configured for an asynchronous HARQ process for this subframe, or if the PDCCH indicates an UL transmission for an autonomous HARQ process or;  - if the uplink grant is a configured grant for the MAC entity's AUL C-RNTI and if the corresponding PUSCH transmission has been performed in this subframe:  - if *mpdcch-UL-HARQ-ACK-FeedbackConfig* is not configured; and  - if the corresponding HARQ process is not configured with HARQ mode B:  - if lower layers have indicated scheduling of transmission of multiple TBs:  - start the UL HARQ RTT Timers for all scheduled HARQ processes which are not configured with HARQ mode B in the subframe containing the last repetition of the PUSCH corresponding to the last scheduled TB;  - else:  - start the UL HARQ RTT Timer for the corresponding HARQ process in the subframe containing the last repetition of the corresponding PUSCH transmission;  - stop the *drx-ULRetransmissionTimer* or *drx-ULRetransmissionTimerShortTTI* for the corresponding HARQ process;  - if *mpdcch-UL-HARQ-ACK-FeedbackConfig* is configured and an UL HARQ-ACK feedback has not been received on PDCCH until the last repetition of the corresponding PUSCH transmission:  - if the corresponding HARQ process is not configured with HARQ mode B:  - start or restart the *drx-ULRetransmissionTimer* for the corresponding HARQ process in the subframe containing the last repetition of the corresponding PUSCH transmission;  *-* if NB-IoT:  - if lower layers have indicated scheduling of transmission of single TB and if the corresponding HARQ process is configured with HARQ mode B:  - start or restart *drx-InactivityTimer* in the subframe containing the last repetition of the corresponding PUSCH transmission + 1 subframe + deltaPDCCH, where deltaPDCCH is the interval starting from the subframe containing the last repetition of the corresponding PUSCH transmission plus 1 subframes to the first subframe of the next PDCCH occasion.  - if lower layers have indicated scheduling of transmission of multiple TBs:  - start or restart *drx-InactivityTimer* in the subframe containing the last repetition of the PUSCH transmission corresponding to the last scheduled TB + 1 subframe + deltaPDCCH, where deltaPDCCH is the interval starting from the subframe containing the last repetition of the PUSCH transmission corresponding to the last scheduled TB plus 1 subframes to the first subframe of the next PDCCH occasion.  - if NB-IoT, stop *drx-RetransmissionTimer* for all DL HARQ processes. |

**Q3: Do companies agree on the above text proposal?**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | No | The first change should not be applicable to two HARQ process.  Not clear why we need second change. |
| OPPO | No | For the case of single TB scheduling for NB-IoT UEs configured with two HARQ processes, RAN2 has made the following agreements in RAN2#123bis:  Agreements:   1. For NB-IoT UEs configured with two HARQ processes and at least one of them is configured with HARQ feedback disabled, RAN2 does not change the operation on drx-InactivityTimer for single-TB scheduling case. 2. For NB-IoT UE configured with two HARQ processes and at least one of them is configured with HARQ mode B, RAN2 does no change to the operation on drx-InactivityTimer for single TB scheduling case.   The current spec is aligned with the RAN2 agreements, while the text proposal is not. |
| Ericsson | No |  |
| vivo | No | Agree with OPPO that we don’t need to change the operation on drx-InactivityTimer for single-TB scheduling case (i.e., it is sufficient to capture the 12 subframes PDCCH monitor restriction in RAN1 spec), as per the previous agreement. |
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**Rapporteur Summary**

# 4. Summary and Proposals

This section summarizes the main proposals:

# 5. References