**3GPP TSG-RAN WG2 Meeting #128 *DRAFT*\_R2-24xxxx**

**Orlando, USA, Nov. 18th – 22nd, 2024**

**Agenda Item: 6.1.2.1**

**Source: CATT**

**Title: Report of [AT128][006][UP] NTN and one shot feedback (CATT)**

**Document for: Discussion and Decision**

1. Introduction

This contribution reports the progress of the following offline discussion:

* **[AT128][006][UP] NTN and on shot feedback (CATT)**

Intended outcome: discuss how to capture it in a BC way and agree to CR (if agreable)

Deadline: Thursday

1. Discussion

## 2.1 Disc Point 1: Which MAC change alternative is preferred?

Currently, there are four alternative ways for the MAC change on the table, regarding the handling of *HARQ-RTT-TimerDL-NTN*.

* **Alternative A** (proposed by Qualcomm during online discussion)

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| When DRX is configured, the MAC entity shall:  [...]  1> if a DRX group is in Active Time:  2> monitor the PDCCH on the Serving Cells in this DRX group as specified in TS 38.213 [6];  2> if the PDCCH indicates a DL transmission; or  2> if the PDCCH indicates a one-shot HARQ feedback as specified in clause 9.1.4 of TS 38.213 [6]; or  2> if the PDCCH indicates a retransmission of HARQ feedback as specified in clause 9.1.5 of TS 38.213 [6]:  3> if this Serving Cell is configured with *downlinkHARQ-FeedbackDisabled*:  4> if at least one of the corresponding HARQ process(es) is configured with HARQ feedback enabled:  5> set *HARQ-RTT-TimerDL-NTN* for the corresponding HARQ process equal to *drx-HARQ-RTT-TimerDL* plus the latest available UE-gNB RTT value;  5> if the PDCCH indicates a one-shot HARQ feedback:  6> start or restart the *HARQ-RTT-TimerDL-NTN* for the corresponding HARQ process(es) whose HARQ feedback is enabled and reported in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback.  5> else:  6> start the *HARQ-RTT-TimerDL-NTN* for the corresponding HARQ process in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback.  3> else:  4> start or restart the *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process(es) whose HARQ feedback is reported in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback.  NOTE 3: When HARQ feedback is postponed by PDSCH-to-HARQ\_feedback timing indicating an inapplicable k1 value, as specified in TS 38.213 [6], the corresponding transmission opportunity to send the DL HARQ feedback is indicated in a later PDCCH requesting the HARQ-ACK feedback.  [...] |

* **Alternative B** (proposed by CATT in R2-2409605 [1])

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| When DRX is configured, the MAC entity shall:  [...]  1> if a DRX group is in Active Time:  2> monitor the PDCCH on the Serving Cells in this DRX group as specified in TS 38.213 [6];  2> if the PDCCH indicates a DL transmission; or  2> if the PDCCH indicates a one-shot HARQ feedback as specified in clause 9.1.4 of TS 38.213 [6]; or  2> if the PDCCH indicates a retransmission of HARQ feedback as specified in clause 9.1.5 of TS 38.213 [6]:  3> if this Serving Cell is configured with *downlinkHARQ-FeedbackDisabled*:  4> if at least one of the corresponding HARQ process(es) is configured with HARQ feedback enabled:  5> set *HARQ-RTT-TimerDL-NTN* for the corresponding HARQ process equal to *drx-HARQ-RTT-TimerDL* plus the latest available UE-gNB RTT value;  5> start or restart the *HARQ-RTT-TimerDL-NTN* for the corresponding HARQ process(es) whose HARQ feedback is enabled and reported in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback.  3> else:  4> start or restart the *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process(es) whose HARQ feedback is reported in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback.  NOTE 3: When HARQ feedback is postponed by PDSCH-to-HARQ\_feedback timing indicating an inapplicable k1 value, as specified in TS 38.213 [6], the corresponding transmission opportunity to send the DL HARQ feedback is indicated in a later PDCCH requesting the HARQ-ACK feedback.  [...] |

* **Alternative C** (proposed by LG in R2-2410720/R2-2410721 [2][3])

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| When DRX is configured, the MAC entity shall:  [...]  1> if a DRX group is in Active Time:  2> monitor the PDCCH on the Serving Cells in this DRX group as specified in TS 38.213 [6];  2> if the PDCCH indicates a DL transmission; or  2> if the PDCCH indicates a one-shot HARQ feedback as specified in clause 9.1.4 of TS 38.213 [6]; or  2> if the PDCCH indicates a retransmission of HARQ feedback as specified in clause 9.1.5 of TS 38.213 [6]:  3> if this Serving Cell is configured with *downlinkHARQ-FeedbackDisabled*:  4> if the corresponding HARQ process(es) is configured with HARQ feedback enabled:  5> set *HARQ-RTT-TimerDL-NTN* for the corresponding HARQ process(es) equal to *drx-HARQ-RTT-TimerDL* plus the latest available UE-gNB RTT value;  5> start or restart the *HARQ-RTT-TimerDL-NTN* for the corresponding HARQ process(es) whose HARQ feedback is reported in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback.  3> else:  4> start or restart the *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process(es) whose HARQ feedback is reported in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback.  NOTE 3: When HARQ feedback is postponed by PDSCH-to-HARQ\_feedback timing indicating an inapplicable k1 value, as specified in TS 38.213 [6], the corresponding transmission opportunity to send the DL HARQ feedback is indicated in a later PDCCH requesting the HARQ-ACK feedback.  [...] |

* **Alternative D** (proposed by Sharp in R2-2410879 [4])

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| When DRX is configured, the MAC entity shall:  [...]  1> if a DRX group is in Active Time:  2> monitor the PDCCH on the Serving Cells in this DRX group as specified in TS 38.213 [6];  2> if the PDCCH indicates a DL transmission; or  2> if the PDCCH indicates a one-shot HARQ feedback as specified in clause 9.1.4 of TS 38.213 [6]; or  2> if the PDCCH indicates a retransmission of HARQ feedback as specified in clause 9.1.5 of TS 38.213 [6]:  3> if this Serving Cell is configured with *downlinkHARQ-FeedbackDisabled*:  4> if the corresponding HARQ process(es) whose HARQ feedback is reported is configured with HARQ feedback enabled:  5> set *HARQ-RTT-TimerDL-NTN* for the corresponding HARQ process(es) equal to *drx-HARQ-RTT-TimerDL* plus the latest available UE-gNB RTT value;  5> start or restart the *HARQ-RTT-TimerDL-NTN* for the corresponding HARQ process(es) whose HARQ feedback is reported in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback.  3> else:  4> start or restart the *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process(es) whose HARQ feedback is reported in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback.  NOTE 3: When HARQ feedback is postponed by PDSCH-to-HARQ\_feedback timing indicating an inapplicable k1 value, as specified in TS 38.213 [6], the corresponding transmission opportunity to send the DL HARQ feedback is indicated in a later PDCCH requesting the HARQ-ACK feedback.  [...] |

Note that during the online discussion, Qualcomm suggested to separate the handling of *HARQ-RTT-TimerDL-NTN* for the one-shot HARQ feedback case and for the other cases into difference branches, so as to avoid the impacts on the existing *HARQ-RTT-TimerDL-NTN* operation procedure for the cases other than one-shot HARQ feedback. This is how the Alternative A above comes.

Rapporteur thinks the suggestion from Qualcomm is decent, and thus Alternative A can be followed. So Rapporteur suggests to go with Alternative A.

### **[Question 1]** Can companies accept Alternative A above for the MAC Spec change?

DISCUSSION

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## 2.2 Disc Point 2: How to make the change BC?

Strictly speaking, the existing procedure for *HARQ-RTT-TimerDL-NTN* handling is not correct in the case of one-shot HARQ Feedback, meaning that the UE implementation based on the current MAC spec (if any) cannot behave correctly in this case.

Then after we introduce the MAC correction, there is the backward compatible issue that the new gNB implemented based on the CR including this MAC correction may configure and indicate one-shot HARQ feedback to an “old” UE implemented based on the existing MAC spec., in which case the UE behaves mistakenly for the *HARQ-RTT-TimerDL-NTN* handling. This makes the change functional NBC.

The way to avoid such functional NBC issue that Rapporteur can think of is to introduce a new UE capability, for the new gNB to distinguish whether a UE is a new UE implementing this MAC change, or an old UE not implementing this MAC change, so as to determine whether to configure/indicate the UE to perform one-shot HARQ feedback and corresponding *HARQ-RTT-TimerDL-NTN* handling in NR NTN.

### **[Question 2]** Are companies OK to introduce a new UE capability, to make the MAC change BC? Or any other suggestion to make the change BC?

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### **[Question 2a]** If companies agree with a new UE capability, do companies agree that this UE capability indicates “whether the UE supports *HARQ-RTT-TimerDL-NTN* handling when one-shot HARQ feedback is indicated in NR NTN”?

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## 2.3 Disc Point 3: From which release to change?

Some companies want to start the change from Rel-18, but some others think it should be started from Rel-17. Note that from which release to change may also have something to do with the BC aspects discussed above, especially whether companies want to introduce a new UE capability additionally or to have the MAC change only.

### **[Question 3]** Based on companies’ input to above questions, should the changes (i.e. MAC change and UE capability change, if agreed) be introduced from Rel-17 or Rel-18?

DISCUSSION

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3. Conclusion

Coming soon...

4. Reference

1. R2-2409605 Discussion on remaining issues for one-shot HARQ Feedback in NR NTN CATT.
2. R2-2410720 Correction on drx HARQ RTT timer in NTN LG Electronics Inc.
3. R2-2410722 Correction on drx HARQ RTT timer in NTN LG Electronics Inc.
4. R2-2410879 NTN DRX Timer Handling and URLLC One-Shot HARQ Feedback Sharp