**3GPP TSG RAN WG1 Meeting #104b-e R1-210xxxx**

e-Meeting, April 12-20, 2021

**Agenda Item: 7.2.2**

**Source: Moderator (Huawei)**

**Title: Feature lead summary#1 on NR-U HARQ maintenance**

**Document for: Discussion and Decision**

# Introduction

Corrections on NR-U HARQ have been submitted at RAN1#104b e-meeting. This first summary asks for companies’ views on the criticality of the proposed corrections during the preparation phase (April 8th – 9th). The corrections proposed to solve 3 issues at RAN1#104b are summarized in the table below.

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| **Issue #** | **Issue summary** | **Contributions** |
| Type3CB#1 | **Type-3 HARQ-ACK codebook ambiguity** **R1-2102325*****Observation***: in the pseudo-code of section 9.1.4 of TS38.213v16.5.0, in case NDI reporting is not configured for Type-3 HARQ-ACK codebook, if the UE has not yet obtained HARQ-ACK information for a TB corresponding to a scheduled PDSCH reception and the UE has detected a DCI format scheduling a PDSCH reception for the TB, the UE shall not include a bit for the corresponding TB and HARQ process in the Type-3 HARQ-ACK codebook.Whether the UE reports a bit impacts the Type-3 HARQ-ACK codebook size, so if any UE is implemented based on a different understanding than in the observation above, then codebook mismatch will occur when the gNB interpretation is consistent with the observation above, and vice-versa. A safer (and more robust) approach would be to define/reserve a bit to report.***Proposal 1***: in case NDI reporting is not configured for Type-3 HARQ-ACK codebook, if the UE has not yet obtained HARQ-ACK information for a TB corresponding to a scheduled PDSCH reception and the UE has detected a DCI format scheduling a PDSCH reception for the TB, the UE shall report NACK for the corresponding TB and HARQ process in the Type-3 HARQ-ACK codebook. (TP provided in R1-2102325)**R1-2102367*****Observation 1***: Type-3 HARQ-ACK codebook is also applicable to frequency band that does not require shared spectrum access. gNB cannot avoid a SPS PDSCH is transmitted before a type 3 CB without enough processing time when multiple SPS PDSCH configurations or SPS PDSCH configuration with short periodicity is configured to a UE.***Observation 2***: The size of Type-3 HARQ-ACK codebook will be changed when the UE has not obtained HARQ-ACK information for a HARQ process.***Proposal 1***: For a given HARQ process, if the UE has not obtained HARQ-ACK information,  should be reserved in the Type-3 HARQ-ACK codebook. (TP1 provided in R1-2102367) | R1-2102325 R1-2102367  |
| Type3CB#2 | **Correction on multiplexing timeline definition for Type-3 HARQ-ACK codebook*****Reason for change***: In current specification of multiplexing timeline definition in Clause 9.2.5, DCI format 1\_1 indicating a request for a Type-3 HARQ-ACK codebook report without scheduling PDSCH is missing for $T\_{proc,2}^{mux}$ calculation.***Summary of change***: Add the DCI format 1\_1 providing the indication of a request for a Type-3 HARQ-ACK codebook report without scheduling PDSCH in the paragraphs of $T\_{proc,2}^{mux}$ calculation in Clause 9.2.5.**Refer to R1-2102587 for the detailed CR.** | R1-2102587  |
| Type2CB#3 | **Assumption on NFI value for a PDSCH group not received at UE side when the UL DAI indicates a value not equal to 4 for that group*****Proposal #2***: For the case when a PDSCH group is not received at UE side and the UL DAI in UL grant DCI corresponding to the PDSCH group indicates a value not equal to 4, the following behavior is applied.* NFI value for the PDSCH group is assumed to be non-toggled from the latest value.
	+ Payload size of the HARQ-ACK on PUSCH is determined by the indicated UL DAI itself without accumulating the HARQ-ACKs in the previous PUCCH occasion (similarly as for the case when UE only receives DL fallback DCI and the UE would transmit HARQ-ACK on PUCCH).

**FL note: Discussed as issue A9 in the past** | R1-2103336  |

# Recommendation from preparation phase

Recommendation from the preparation phase email discussion is to discuss the following issues at RAN1#104b: TBD

# References

[R1-2102325](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104b%5CDocs%5CR1-2102325.zip) Maintenance on channel access and HARQ procedures for NR Unlicensed Huawei, HiSilicon

[R1-2102367](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104b%5CDocs%5CR1-2102367.zip) Discussion on the remaining issues of HARQ enhancements OPPO

[R1-2102587](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104b%5CDocs%5CR1-2102587.zip) Correction on multiplexing timeline definition for Type-3 HARQ-ACK codebook CATT, Huawei, HiSilicon, OPPO

[R1-2103336](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_104b%5CDocs%5CR1-2103336.zip) Remaining issues of UL channels and HARQ procedure for NR-U LG Electronics