**3GPP TSG RAN WG1 Meeting #100bis                     R1-200xxxx**

**e-Meeting, April 20th – 30th, 2020**

**Agenda Item: 7.2.2.2.3**

**Source: Moderator (Huawei)**

**Title: TP for NR-U HARQ issue B10**

**Document for: Discussion and Decision**

# Introduction

The discussion at RAN1#100b-e on NR-U issue B10 is summarized in [2]. This document provides TP proposals on issue B10 based on proposal 1 and 2 in [2].

This document provides TP proposals on issue B10 based on the proposal in [2] and based on the proposal “DCI format 1\_1 should not simultaneously indicate a NNK1 value and request feedback of Type-3 HARQ-ACK codebook (one-shot HARQ-ACK request field with value 1)” in [3].

For issue B10, 7 companies think a clarification is necessary with TPs for sections 9.1 and 9.1.2, where the TP for 9.1 could be based on the last sentence from clause 9.1.4 to clarify collision handling between type3 CB and other codebook types. 3 companies consider that a TP is not needed. A common understanding of the current specification text has not yet been reached.

The intended behavior according to NR-U agreements is commonly understood:

* Type-3 CB can be triggered and reported when no DCI indicated a NNK1 value
* Type-3 CB can report HARQ-ACK information for a PDSCH scheduled with NNK1 when UE is configured with type-1 CB
* Type-1 CB cannot report HARQ-ACK information for a PDSCH scheduled with NNK1

Online session conclusion [3]: Prepare TP(s) for clarification to remove unintended limitations on Type-3 HARQ-ACK codebook usage (when no NNK1 value was received, when the UE is configured with semi-static codebook) until 4/29.

Proposal:

* TP for TS 38.213
	+ Reason for change: specifications are unclear on whether type-3 HARQ-ACK codebook can be triggered when no DCI indicate a NNK1 value, and whether type-3 HARQ-ACK codebook can be used to report PDSCH scheduled with NNK1 when UE is configured with type-1 HARQ-ACK codebook. Clarify the UE behavior if DCI format 1\_1 simultaneously indicates a NNK1 value and requests feedback of Type-3 HARQ-ACK codebook (one-shot HARQ-ACK request field with value 1).

--------------------------------- Start of Text Proposal for TS 38.213 ---------------------------------------

**9.1 HARQ-ACK codebook determination**

If a UE is provided *pdsch-HARQ-ACK-Codebook-*List, the UE can be indicated by *pdsch-HARQ-ACK-Codebook-List* to generate one or two HARQ-ACK codebooks. If the UE is indicated to generate two HARQ-ACK codebooks

- a first HARQ-ACK codebook is associated with a PUCCH of priority index 0 and a second HARQ-ACK codebook is associated with a PUCCH of priority index 1

- the UE is provided first and second for each of {*PUCCH-Config*, *UCI-OnPUSCH*, *PDSCH*-*codeBlockGroupTransmission*} by {*PUCCHConfigurationList*, *UCI-OnPUSCH-List*, *PDSCH-CodeBlockGroupTransmission-List*}, respectively, for use with the first and second HARQ-ACK codebooks, respectively

If a UE receives a PDSCH without receiving a corresponding PDCCH, or if the UE receives a PDCCH indicating a SPS PDSCH release, the UE generates one corresponding HARQ-ACK information bit. If the UE generates two HARQ-ACK codebooks, the UE is indicated by *harq-CodebookID*, per SPS PDSCH configuration, a HARQ-ACK codebook index for multiplexing the corresponding HARQ-ACK information bit.

If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16*, and the UE detects a DCI format in any PDCCH monitoring occasion that includes a One-shot HARQ-ACK request field with value 1 and a value of a PDSCH-to-HARQ\_feedback timing indicator field, the UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Subclause 9.1.4.

If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16*, and the UE detects a DCI format in any PDCCH monitoring occasion that includes a One-shot HARQ-ACK request field with value 1,

- the UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Subclause 9.1.4.

- the UE does not expect that the PDSCH-to-HARQ\_feedback timing indicator field of the DCI provides an inapplicable value from dl-DataToUL-ACK

~~If a UE is provided~~ *~~pdsch-HARQ-ACK-OneShotFeedback-r16~~*~~, and the UE detects a DCI format in any PDCCH monitoring occasion that includes a One-shot HARQ-ACK request field with value 1 and an applicable value of a PDSCH-to-HARQ\_feedback timing indicator field, the UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Subclause 9.1.4.~~

~~If a UE is provided~~ *~~pdsch-HARQ-ACK-OneShotFeedback-r16~~* ~~and the UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, the UE expects that the PDSCH-to-HARQ\_feedback timing indicator field provides an applicable value from dl-DataToUL-ACK.~~

\*\*\* Unchanged text is omitted \*\*\*

**9.1.2 Type-1 HARQ-ACK codebook determination**

This clause applies if the UE is configured with *pdsch-HARQ-ACK-Codebook = semi-static*.

A UE reports HARQ-ACK information for a corresponding PDSCH reception or SPS PDSCH release only in a HARQ-ACK codebook that the UE transmits in a slot indicated by a value of a PDSCH-to-HARQ\_feedback timing indicator field in a corresponding DCI format 1\_0 or DCI format 1\_1. The UE reports NACK value(s) for HARQ-ACK information bit(s) in a HARQ-ACK codebook that the UE transmits in a slot not indicated by a value of a PDSCH-to-HARQ\_feedback timing indicator field in a corresponding DCI format 1\_0 or DCI format 1\_1.

If a UE receives a first PDSCH scheduled by a first DCI format that the UE detects in a first PDCCH monitoring occasion and includes a PDSCH-to-HARQ\_feedback timing indicator field providing an inapplicable value from *dl-DataToUL-ACK*,

- if the UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16* andif the UE detects a second DCI format in any PDCCH monitoring occasion after the first one where the second DCI format includes a One-shot HARQ-ACK request field with value 1, the UE multiplexes the corresponding HARQ-ACK information in a PUCCH or PUSCH transmission in a slot that is indicated by the value of a PDSCH-to-HARQ\_feedback timing indicator field in the second DCI format. The UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Clause 9.1.4,

- otherwise, the UE does not multiplex the corresponding HARQ-ACK information in a PUCCH or PUSCH transmission.

\*\*\* Unchanged text is omitted \*\*\*

**9.1.4 Type-3 HARQ-ACK codebook determination**

If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16*, the UE determines a Type-3 HARQ-ACK codebook according to the following procedure.

\*\*\* Unchanged text is omitted \*\*\*

If a UE receives a SPS PDSCH, or a PDSCH that is scheduled by a DCI format 1\_0 for a serving cell $c$ and if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$, and *pdsch-HARQ-ACK-OneShotFeedbackCBG-r16* is provided, the UE repeats $N\_{HARQ-ACK,c}^{CBG/TB,max}$ times the HARQ-ACK information for the transport block in the PDSCH.

If the UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, the UE determines a PUCCH or a PUSCH to multiplex a Type-3 HARQ-ACK codebook for transmission in a slot as described in Clause 9.2.5. The UE multiplexes only the Type-3 HARQ-ACK codebook in the PUCCH or the PUSCH for transmission in the slot.

--------------------------------- End of Text Proposal for TS 38.213 ------------------------------------

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| **Company** | **Comments** |
| QC | For 9.1, we also prefer to capture it as error case and have one paragraph as below:If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16*, and the UE detects a DCI format in any PDCCH monitoring occasion that includes a One-shot HARQ-ACK request field with value 1,- the UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Subclause 9.1.4.- the UE does not expect that the PDSCH-to-HARQ\_feedback timing indicator field of the DCI provides an inapplicable value from dl-DataToUL-ACK |
| OPPO | In 9.1 there are now three TPs1. If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16*, and the UE detects a DCI format in any PDCCH monitoring occasion that includes a One-shot HARQ-ACK request field with value 1 and a value of a PDSCH-to-HARQ\_feedback timing indicator field, the UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Subclause 9.1.4.
2. If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16*, and the UE detects a DCI format in any PDCCH monitoring occasion that includes a One-shot HARQ-ACK request field with value 1 and an applicable value of a PDSCH-to-HARQ\_feedback timing indicator field, the UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Subclause 9.1.4.
3. If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16* and the UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, the UE expects that the PDSCH-to-HARQ\_feedback timing indicator field provides an applicable value from dl-DataToUL-ACK.

We think 1+3 is equal to 2. Therefore, we can either take 2 or 1+3. But not all. If we go with 1+3, QC’s amendment is better. For TP in 9.1.2If a UE receives a first PDSCH scheduled by a first DCI format that the UE detects in a first PDCCH monitoring occasion and includes a PDSCH-to-HARQ\_feedback timing indicator field providing an inapplicable value from *dl-DataToUL-ACK*, - if the UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16* andif the UE detects a second DCI format in any PDCCH monitoring occasion after the first one where the second DCI format includes a One-shot HARQ-ACK request field with value 1, the UE multiplexes the corresponding HARQ-ACK information in a PUCCH or PUSCH transmission in a slot that is indicated by the value of a PDSCH-to-HARQ\_feedback timing indicator field in the second DCI format. The UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Clause 9.1.4,- otherwise, the UE does not multiplex the corresponding HARQ-ACK information in a PUCCH or PUSCH transmission. It is clear that the first bullet is already covered by TP in 9.1. For the second bullet, as explained many times, there is no mechanism to report HARQ-ACK info for PDSCH with NNK1 in type1-CB. With this TP, the UE won’t report the HARQ-ACK in type1-CB, without this TP, the UE won’t report the HARQ-ACK in type1-CB either. Thus TP in 9.1.2 is not needed.  |
| Lenovo. Motorola Mobility | For 9.1, we think the first added paragraph are same thing. Some suggestions from our side are listed for reference:If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16*, and the UE detects a DCI format in any PDCCH monitoring occasion that includes a One-shot HARQ-ACK request field with value 1 and a value of a PDSCH-to-HARQ\_feedback timing indicator field, the UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Subclause 9.1.4.~~If a UE is provided~~ *~~pdsch-HARQ-ACK-OneShotFeedback-r16~~*~~, and the UE detects a DCI format in any PDCCH monitoring occasion that includes a One-shot HARQ-ACK request field with value 1,~~~~- the UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Subclause 9.1.4.~~- the UE does not expect that the PDSCH-to-HARQ\_feedback timing indicator field of the DCI provides an inapplicable value from dl-DataToUL-ACK |
| Nokia, NSB | Prepare TP(s) for clarification to remove unintended limitations on Type-3 HARQ-ACK codebook usage (when no NNK1 value was received, when the UE is configured with semi-static codebook) until 4/29In general we think nothing is needed in 9.1, but if companies insist, below can be added to 9.1.   The text in 9.1.2 we support. Applicable/inapplicable values is not in scope of this TP.If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback-r16*, and the UE detects a DCI format in any PDCCH monitoring occasion that includes a One-shot HARQ-ACK request field with value 1 and a value of a PDSCH-to-HARQ\_feedback timing indicator field, the UE includes the HARQ-ACK information in a Type-3 HARQ-ACK codebook, as described in Subclause 9.1.4. |

# References

1. R1-2002696 Feature lead summary#1 on NR-U HARQ, RAN1#100b-e
2. R1-2002922 Feature lead summary#1 on email discussion 100b-e-NR-unlic-NRU-HARQ-01 (Type-3 HARQ-ACK codebook)
3. R1-2002924 Feature lead summary#1 on email discussion 100b-e-NR-unlic-NRU-HARQ-03 (SPS)
4. Chairman's Notes RAN1#100b-e 7.2.2 v006, RAN1#100bis-e GTW session notes