**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 B1**

**Document for: Discussion and Decision**

# Introduction

The discussion at RAN1#100b-e on NR-U issue B1 is summarized in [2] where proposals 2 and 3 are stable but still pending formal approval. This document provides TP proposals for issue B1.

**Issue B1: remaining details on triggering Type-3 HARQ-ACK codebook feedback with a DCI that does not schedule a PDSCH:**

* + **Issue 1: to determine the value of the FDRA field, avoiding ambiguities with dormancy non-scheduling PDCCH and with validation for SPS release**
  + **Issue 2: to define reference slot corresponding to K1=0 when no PDSCH is scheduled**
  + **Issue 3: to determine the UE processing time applied for the one-shot HARQ-ACK feedback triggered by the PDSCH-less DCI**

The agreements below were made in GTW session and declared by emails, and copied here for completeness.

Agreement:

* No new DCI field is introduced for requesting Type-3 HARQ-ACK feedback without scheduling a PDSCH
* For DCI Format 1\_1:
  + To signal Type-3 HARQ-ACK codebook request without scheduling PDSCH with one-shot HARQ-ACK request field with value 1 in DCI Format 1\_1 with CRC scrambled by C-RNTI or MCS-C-RNTI, use all ‘0’ FDRA for resourceAllocationType0 and all ‘1’ FDRA for resourceAllocationType 1 if resourceAllocation = dynamicSwitch is not provided, or use all “0” or all “1” FDRA if resourceAllocation = dynamicSwitch is provided. In this case, the UE does not consider the DCI format as indicating an active DL BWP provided by dormant-BWP or by first-non-dormant-BWP-ID-for-DCI-inside-active-time, if any.
  + FFS: When DCI Format 1\_1 is scrambled by CS-RNTI

TP(s) according to the agreement above will be discussed until 4/29.

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

Agreement:

* The slot where the PDCCH/DCI is transmitted/received is taken as a reference for K1

Draft TPs for TS 38.213 Clause 9.2.3 based on TP draft in FL summary until 4/29

Agreement:

* For a DCI requesting one-shot HARQ-ACK feedback without scheduling PDSCH, reuse the minimum processing latency for SPS release DCI
  + FFS: whether to specify the processing time for 120 kHz SCS, considering NR-U UE feature groups discussion and possible extension of type-3 HARQ-ACK codebook to licensed bands operation (FR1 or FR2 or both).

Develop TP for TS 38.213 Clause 9.1.4 until 4/29, starting from the draft below or an equivalent TP using a reference to the SPS release.

**Corresponding TP(s) are proposed as follows:**

* + TP#1 for 38.212 clause 7.3.1.2.2 (DCI format 1\_1)
    - Clarify condition in which SCell dormancy indication is not indicated by the fields in the DCI
  + TP#2 for 38.213
    - Clause 9.1.4: clarify condition in which DL-SCH is not transmitted using a reference to the SPS release.
    - Clause 9.2.3 to be developed as follows
    - Clause 10.3: clarify which signaling values don’t apply for a DCI indicating SCell dormancy

# Text proposals for B1

**TP#1 (TS 38.212 v16.1.0)**

|  |  |
| --- | --- |
| Reason for change | Correction of interaction between Type-3 HARQ-ACK codebook triggering DCI fields and Scell dormancy indication DCI fields. |
| Summary of changes | Clarification that SCell dormancy is indicated only if If one-shot HARQ-ACK request is not present or set to ‘0’ in DCI format 1\_1 |
| Specs/Sections impacted | TS 38.212 v16.1.0 section 7.3.1.2.2 |
| Consequences if not approved | Unclear UE behavior if the gNB indicates field values in DCI that are relevant for both Type-3 HARQ-ACK codebook request and SCell dormancy indication. |

================== Beginning of text proposal ===================

***7.3.1.2.2 Format 1\_1***

DCI format 1\_1 is used for the scheduling of PDSCH in one cell.

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

- Scell dormancy indication – 0 bit if higher layer parameter *Scell-groups-for-dormancy-within-active-time* is not configured; otherwise 1, 2, 3, 4 or 5 bits bitmap determined according to higher layer parameter *Scell-groups-for-dormancy-within-active-time,* where each bit corresponds to one of the Scell group(s) configured by higher layers parameter *Scell-groups-for-dormancy-within-active-time,* with MSB to LSB of the bitmap corresponding to the first to last configured Scell group. The field is only present when this format is carried by PDCCH on the primary cell within DRX Active Time and the UE is configured with at least two DL BWPs for an Scell.

If one-shot HARQ-ACK request is not present or set to ‘0’, and all bits of frequency domain resource assignment are set to 0 for resource allocation type 0 or set to 1 for resource allocation type 1, this field is reserved and the following fields among the fields above are used for Scell dormany indication, where each bit corresponds to one of the configured Scell(s), with MSB to LSB of the following fields concatenated in the order below corresponding to the Scell with lowest to highest Scell index

- Modulation and coding scheme of transport block 1

- New data indicator of transport block 1

- Redundancy version of transport block 1

- HARQ process number

- Antenna port(s)

[- DMRS sequence initialization]

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

================== End of text proposal ===================

**TP#2 (TS 38.213 v16.1.0)**

|  |  |
| --- | --- |
| Reason for change | Introduction of the agreed feature for NR-U Type-3 HARQ-ACK codebook request in DCI format 1\_1 without scheduling a PDSCH using reserved FDRA field values.  Introduction of reference timing for HARQ-ACK feedback and processing time for the agreed feature for NR-U Type-3 HARQ-ACK codebook request in DCI format 1\_1 without scheduling a PDSCH using reserved FDRA field values |
| Summary of changes | Introduction of the agreed feature for NR-U Type-3 HARQ-ACK codebook request in DCI format 1\_1 without scheduling a PDSCH using reserved FDRA field values.  Introduction of reference timing for HARQ-ACK feedback and processing time for the agreed feature for NR-U Type-3 HARQ-ACK codebook request in DCI format 1\_1 without scheduling a PDSCH using reserved FDRA field values |
| Specs/Sections impacted | TS 38.213 v16.1.0 sections 9.1.4, 9.2.3, 10.3 |
| Consequences if not approved | The gNB cannot request a Type-3 HARQ-ACK codebook without scheduling a PDSCH. |

================== Beginning of text proposal ===================

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

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

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 9.2.3 or Clause 9.2.5, respectively. The UE multiplexes only the Type-3 HARQ-ACK codebook in the PUCCH or the PUSCH for transmission in the slot.

If the UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, and if

- the CRC of the DCI is scrambled by a [CS-RNTI], C-RNTI or a MCS-C-RNTI, and if

- *resourceAllocation* = *resourceAllocationType0* and all bits of the frequency domain resource assignment field in DCI format are equal to 0, or

- *resourceAllocation* = *resourceAllocationType1* and all bits of the frequency domain resource assignment field in DCI format are equal to 1

- *resourceAllocation = dynamicSwitch* and all bits of the frequency domain resource assignment field in DCI format 1\_1 are equal to 0 or 1

the DCI format does not schedule PDSCH and requests Type-3 HARQ-ACK codebook.

A UE is expected to provide HARQ-ACK information in response to a type-3 HARQ-ACK codebook request without scheduling PDSCH after *N* symbols from the last symbol of a PDCCH providing the type-3 HARQ-ACK codebook request without scheduling PDSCH, where the value of *N* for μ= 0, 1, 2, [3] is determined as in clause 10.2 except that the PDCCH providing the type-3 HARQ-ACK codebook request is used instead of the PDCCH providing the SPS PDSCH release.

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

**9.2.3 UE procedure for reporting HARQ-ACK**

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

With reference to slots for PUCCH transmissions, if the UE detects a DCI format scheduling a PDSCH reception ending in slot  or if the UE detects a DCI format indicating a SPS PDSCH release through a PDCCH reception ending in slot *n*, or if the UE detects a DCI format that does not schedule PDSCH and only requests Type-3 HARQ-Ack codebook as described in Clause 9.1.4 through a PDCCH reception ending in slot *n*, the UE provides corresponding HARQ-ACK information in a PUCCH transmission within slot , where  is a number of slots and is indicated by the PDSCH-to-HARQ\_feedback timing indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, or by *dl-DataToUL-ACKForDCIFormat1\_2* for DCI format 1\_2.  corresponds to the last slot of the PUCCH transmission that overlaps with the PDSCH reception or with the PDCCH reception in case of SPS PDSCH release or in case of requesting Type-3 HARQ-ACK without scheduling a PDSCH.

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

**10.3 PDCCH monitoring indication and dormancy/non-dormancy behaviour for SCells**

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

If a UE is provided search space sets to monitor PDCCH for detection of DCI format 1\_1, and if

- the CRC of DCI format 1\_1 is scrambled by a C-RNTI or a MCS-C-RNTI, and if

- one-shot HARQ-ACK request is not present or set to ‘0’, and if

- *resourceAllocation* = *resourceAllocationType0* and all bits of the frequency domain resource assignment field in DCI format 1\_1 are equal to 0, or

- *resourceAllocation* = *resourceAllocationType1* and all bits of the frequency domain resource assignment field in DCI format 1\_1 are equal to 1

- *resourceAllocation = dynamicSwitch* and all bits of the frequency domain resource assignment field in DCI format 1\_1 are equal to 0 or 1

the UE considers the DCI format 1\_1 as indicating SCell dormancy, not scheduling a PDSCH reception or indicating a SPS PDSCH release, and for transport block 1 interprets the sequence of fields of

- modulation and coding scheme

- new data indicator

- redundancy version

and of

- HARQ process number

- antenna port(s)

- DMRS sequence initialization

as providing a bitmap to each configured SCell, in an ascending order of the SCell index, where

- a '0' value for a bit of the bitmap indicates an active DL BWP, provided by *dormant-BWP*, for the UE for a corresponding activated SCell

- a '1' value for a bit of the bitmap indicates

- an active DL BWP, provided by *first-non-dormant-BWP-ID-for-DCI-inside-active-time*, for the UE for a corresponding activated SCell, if a current active DL BWP is the dormant DL BWP

- a current active DL BWP, for the UE for a corresponding activated SCell, if the current active DL BWP is not the dormant DL BWP

- the UE sets the active DL BWP to the indicated active DL BWP

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

================== End of text proposal ===================

# Companies comments

|  |  |
| --- | --- |
| **Company** | **Comments** |
| QC | Regarding TP#2: Given the agreement is for C-RNTI/MCS-C-RNTI (and CS-RNTI is FFS), we prefer to capture it as below:  If the UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, and if  - the CRC of the DCI is scrambled by a C-RNTI or a MCS-C-RNTI, and if  - *resourceAllocation* = *resourceAllocationType0* and all bits of the frequency domain resource assignment field in DCI format are equal to 0, or  - *resourceAllocation* = *resourceAllocationType1* and all bits of the frequency domain resource assignment field in DCI format are equal to 1  - *resourceAllocation = dynamicSwitch* and all bits of the frequency domain resource assignment field in DCI format 1\_1 are equal to 0 or 1  Regarding the timeline, we prefer second alternative, and we do not see any reason why this should be excluded for 120KHZ SCS as the feature is not conditioned on “shared spectrum” in the specification. |
| Nokia, NSB | B1:  if we should go with QC suggestion then  we should indeed capture all FFS we have  If the UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, and if  -  the CRC of the DCI is scrambled by a [CS-RNTI], C-RNTI or a MCS-C-RNTI,  and if |
| Ericsson | TP#2   * Clause 9.1.4:   It would be good to fix the references. Clause 9.2.5 is about UCI multiplexing where it is used when PUCCH with HARQ-ACK would overlap with PUSCH and A/N would be multiplexed on PUSCH. Clause 9.2.3 is about transmission of A/N on PUCCH. So, the proper referencing is as follows:  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 9.2.3 or 9.2.5, respectively. The UE multiplexes only the Type-3 HARQ-ACK codebook in the PUCCH or the PUSCH for transmission in the slot.   * Clause 10.3:   For the following sub-bullet:  - one-shot HARQ-ACK request field value, if any, is set to 0, and if  The condition is intended to be true if either one-shot HARQ-ACK request field is absent, or it is present but with value 0.  But the way it reads, wouldn’t be that ” one-shot HARQ-ACK request field value, if any” in case of absence of the field, would be “false”, where it was expected to be “true”?  Maybe the text similar to TP#1 could be used?  - one-shot HARQ-ACK request is not present or set to ‘0’, and if |

# 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. Chairman's Notes RAN1#100b-e 7.2.2 v006