**3GPP TSG RAN WG1 #103-e R1-200xxxx**

**e-Meeting, October 26th – November 13th, 2020**

Source: moderator (vivo)

Title: Summary of [103-e-NR-NRU-06] email discussion

Agenda Item: 7.2.2

Document for: Discussion and Decision

1. Introduction

Following email thread was agreed for discussion [1]

* Email thread 6: CG1+CG4+CG5+CG2

1. Issues for discussion
   1. Issue 1: clarification on HARQ-ACK multiplexing

**TP#1**

================== Start of TP for TS 38.213 ========================

9. UE procedure for reporting control information

===================== Unchanged Texts Omitted ========================

If a UE would multiplex HARQ-ACK information in a PUSCH transmission that is configured by a *ConfiguredGrantConfig*, and includes CG-UCI [5, TS 38.212], then

* ~~the UE multiplexes the HARQ-ACK information in the PUSCH transmission~~ if the UE is provided *cg-CG-UCI-Multiplexing,* the UE multiplexes the HARQ-ACK information in the PUSCH transmission;
* otherwise, the UE does not transmit the PUSCH and multiplexes the HARQ-ACK information in a PUCCH transmission or in another PUSCH transmission.

======================= Unchanged Texts Omitted ==========================

======================= End of TP for TS 38.213 =======================

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| Company | Comments |
| OPPO | The TP is correct, but not sure if the TP is necessary. Or a more concise TP could be as follows:  ~~If~~ When a UE would multiplex HARQ-ACK information in a PUSCH transmission that is configured by a *ConfiguredGrantConfig*, and includes CG-UCI [5, TS 38.212], the UE multiplexes the HARQ-ACK information in the PUSCH transmission if the UE is provided *cg-CG-UCI-Multiplexing*; otherwise, the UE does not transmit the PUSCH and multiplexes the HARQ-ACK information in a PUCCH transmission or in another PUSCH transmission. |
| Intel | The current TP is already clear, and the proposed TP represents in our view only a rephrasing of the same information. Therefore, we also think that this TP does not seem to be necessary. |
| vivo | We support the TP to make the spec clearer. |
| ZTE | We are fine with the TP. |
| Ericsson | We share the same view as intel |
| Samsung | We share the same view with Intel, but it is fine with OPPO’s suggestion which makes the spec more clearer. |
| Qualcomm | The TP may not be necessary |
| Sharp | OK with either TP#1 or OPPO’s suggestion to make the spec a bit clearer. |
| LG | We are fine with the TP. |
| Nokia, NSB | As discussed, in R1-2007903, the current spec text is ambiguous and can lead into two different interpretations, depending on which “if” the “otherwise” refers to. Therefore a change is needed. Our preference is to change is as in R1-2007903, but if companies prefer OPPO’s version, we are ok with that too. |

Observation: majority of companies view the TP is not necessary, two companies are fine with updated TP as proposed by OPPO.

Proposal1: agree on following TP.

------------------------TP#1----------------------

~~If~~ When a UE would multiplex HARQ-ACK information in a PUSCH transmission that is configured by a *ConfiguredGrantConfig*, and includes CG-UCI [5, TS 38.212], the UE multiplexes the HARQ-ACK information in the PUSCH transmission if the UE is provided *cg-CG-UCI-Multiplexing*; otherwise, the UE does not transmit the PUSCH and multiplexes the HARQ-ACK information in a PUCCH transmission or in another PUSCH transmission.

* 1. Issue 2: HARQ-ACK feedback in CG-DFI for dynamic grant PUSCH

**TP#2**

-------------------------**Text proposal #1 starts for TS 38.213** ----------------------------

10.5 HARQ-ACK information for PUSCH transmissions

================== Unchanged Texts Omitted ================

For an initial transmission by a UE of a transport block in a PUSCH configured by *ConfiguredGrantConfig*, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

(Option1) For a PUSCH transmission scheduled by a DCI format, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

(Option 2) For a PUSCH transmission scheduled for a slot by a DCI format, if a UE is provided *PUSCH-CodeBlockGroupTransmission* for a serving cell, a value of HARQ-ACK information for a transport block of a corresponding HARQ process number is ACK if at least 10% of all the CBGs of PUSCH(s) scheduled by any DCI format in the same slot was correctly decoded; otherwise, a value of HARQ-ACK information is NACK.

For a PUSCH transmission scheduled by a DCI format, HARQ-ACK information for a transport block of a corresponding HARQ process number is valid if a first symbol of the PDCCH reception is after a last symbol of the PUSCH transmission by a number of symbols provided by *cg-minDFIDelay-r16* or, if the PUSCH transmission is over multiple slots,

- after a last symbol of the PUSCH transmission in a first slot from the multiple slots by a number of symbols provided by *cg-minDFIDelay-r16*, if a value of the HARQ-ACK information is ACK.

- after a last symbol of the PUSCH transmission in a last slot from the multiple slots by a number of symbols provided by *cg-minDFIDelay-r16*, if a value of the HARQ-ACK information is NACK.

<Unchanged Text Omitted>

------------------------- **Text proposal #1 ends for TS 38.213** -------------------------------

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| Company | Comments |
| OPPO | We are fine with either option 1 or option 2, with a slight preference of option 2. |
| Intel | We are fine with either options, but we slight prefer option 1 since it seems a more clean and simple option to implement. |
| Vivo | option 1 is preferred |
| ZTE | Option 1 is preferred. |
| Ericsson | Option 1 is preferred. |
| Samsung | We are fine with either options, but if Option 2 is agreed it should be applied only for a DCI format with CRC scrambled with C-RNTI. Otherwise, a timer for CG-PUSCH (e.g., configuredGrantTimer) would be impacted. |
| Qualcomm | The A/N feedback in CG-DFI for scheduled PUSCH is only used for CW adjustment. In principle, we like the idea of option 2 to use CBG level A/N to adjust the contention window. However, the option 2 may not yet complete, and it is not clear to us why the CG-DFI A/N also capture the decoding result of other PUSCH in the same slot. We suggest to update the option 2 as follows:  (Option 2A) For a PUSCH transmission scheduled for ~~a slot~~ by a DCI format, if a UE is provided *PUSCH-CodeBlockGroupTransmission* for a serving cell, a value of HARQ-ACK information for a transport block of a corresponding HARQ process number is ACK if at least 10% of all the CBGs of PUSCH~~(s)~~ scheduled by ~~any~~ the DCI format ~~in the same slot~~ was correctly decoded; if a UE is not provided *PUSCH-CodeBlockGroupTransmission* for a serving cell, a value of HARQ-ACK information is ACK if the corresponding transport block was correctly decoded; otherwise, a value of HARQ-ACK information is NACK. |
| Sharp | Option 1 is preferred. |
| Lenovo, Motorola Mobility | Option 1 is preferred. |
| LG | We prefer Option 2 for the following reasons:  1) The CWS may increase excessively if the A/N of DG-PUSCH is configured with the same way as in CG-PUSCH.  2) According to CWS adjustment procedures for UL transmission scheduled/configured by gNB in Section 4.2.2.2 of 37.213, the CWS is reset if at least 10% of HARQ-ACK feedbacks is ‘ACK’ for PUSCH(s) with CBG based transmissions.  3) “At least 10% of HARQ-ACK feedback is ACK” referred in the specification is evaluated by accounting for the all the CBGs of PUSCH(s) in the same slot, and not over a single PUSCH transmission.  For the comments from Samsung, it can be resolved by specifying that the PUSCH in the TP is PUSCH scheduled by a DCI format with CRC scrambled with C-RNTI.  Regarding Qualcomm’s comments, there is a comment from Intel in RAN1#101-e that the % of ACK referred in the specification is evaluated by accounting for the whole CBG based feedbacks related to a reference burst, and not over a single PUSCH transmission. That is why the CG-DFI A/N also captures the decoding result of other PUSCH in the same slot. |
| Nokia, NSB | Ok with Option 1 |

Observation: there is slight majority of companies supporting option1 and 1 company proposed updated option 2. This issues has been discussed for past several meetings.

Proposal2: if there is no strong objection, agree on option 1 as above for TP#2.

* 1. Issue 4: clarification on min DFI delay

**TP#3**

------------start of TP for 38.213------------------------

10.5 HARQ-ACK information for PUSCH transmissions

A UE can be configured a number of search space sets to monitor PDCCH for detecting a DCI format 0\_1 with a DFI flag field and CRC scrambled with a CS-RNTI provided by *cs-RNTI*. The UE determines that the DCI format provides HARQ-ACK information for PUSCH transmissions based on an when a DFI flag field value is set to '1', if a PUSCH transmission is configured by *ConfiguredGrantConfig*.

The HARQ-ACK information corresponds to transport blocks in PUSCH transmissions for all HARQ processes for a serving cell of a PDCCH reception that provides DCI format 0\_1 or, if DCI format 0\_1 includes a carrier indicator field, for a serving cell indicated by a value of the carrier indicator field.

For a PUSCH transmission configured by *ConfiguredGrantConfig*, HARQ-ACK information for a transport block of a corresponding HARQ process ID is valid if a first symbol of the PDCCH reception is after a last symbol of the PUSCH transmission, or of any repetition of the PUSCH transmission, by a number of symbols provided by *cg-minDFIDelay-r16*.

For an initial transmission by a UE of a transport block in a PUSCH configured by *ConfiguredGrantConfig*, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

For a PUSCH transmission scheduled by a DCI format, HARQ-ACK information for a transport block of a corresponding HARQ process ID is valid if a first symbol of the PDCCH reception is after a last symbol of the PUSCH transmission by a number of symbols provided by *cg-minDFIDelay-r16*  or, if the PUSCH transmission is over multiple slots,

- after a last symbol of the PUSCH transmission in a first slot from the multiple slots by a number of symbols provided by *cg-minDFIDelay-r16*, if a value of the HARQ-ACK information is ACK.

- after a last symbol of the PUSCH transmission in a last slot from the multiple slots by a number of symbols provided by *cg-minDFIDelay-r16*, if a value of the HARQ-ACK information is NACK.

UE does not expect to be configured with different *cg-minDFIDelay-r16* among multiple *ConfiguredGrantConfig* in one BWP.

------------end of TP -------------------------------

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| Company | Comments |
| OPPO | Agree with the TP. |
| Intel | We are fine with the proposed clarification TP. |
| vivo | Agree with the TP. |
| ZTE | We are fine with the TP. |
| Ericsson | Fine with the proposal |
| Samsung | Agree with the TP |
| Qualcomm | Agree with the TP |
| Sharp | Fine with the TP. |
| Lenovo, Motorola Mobility | Option 1 is preferred. |
| LG | Agree with the TP. |
| Nokia, NSB | Ok with the TP |

Observation: all companies agree with the TP#3.

Proposal3: it is proposed to agree on TP#3

* 1. Issue 5: multi PUSCH related TPs

**TP#4**

----------------------------------------- TP for 38.213 10.2------------------------------------------------------

10.2 PDCCH validation for DL SPS and UL grant Type 2

A UE validates, for scheduling activation or scheduling release, a DL SPS assignment PDCCH or a configured UL grant Type 2 PDCCH if

- the CRC of a corresponding DCI format is scrambled with a CS-RNTI provided by *cs-RNTI*, and

- the new data indicator field in the DCI format for the enabled transport block is set to '0' or set to all ‘0’ when DCI includes NDIs for multiple PUSCHs, and

- the DFI flag field, if present, in the DCI format is set to '0', and

- if validation is for scheduling activation and if the PDSCH-to-HARQ\_feedback timing indicator field in the DCI format is present, the PDSCH-to-HARQ\_feedback timing indicator field does not provide an inapplicable value from dl-DataToUL-ACK.

<unchanged part omitted>

-------------------------------------------------END OF TP -----------------------------------------------------------

**TP#5**

----------------------------------------- TP for 38.214 6.1.2.3------------------------------------------------------

A set of allowed periodicities *P* are defined in [12, TS 38.331]. The higher layer parameter *cg-nrofSlots-r16*, provides the number of consecutive slots allocated within a configured grant period. The higher layer parameter *cg-nrofPUSCH-InSlot-r16* provides the number of consecutive PUSCH allocations within a slot, where the first PUSCH allocation follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI for Type 2 PUSCH transmissions, and the remaining PUSCH allocations have the same length and PUSCH mapping type, and are appended following the previous allocations without any gaps. The same combination of start symbol and length and PUSCH mapping type repeats over the consecutively allocated slots. If the PUSCH time domain resource allocation configuration is determined according to the Table 6.1.2.1.1-1A, and *pusch-Config* includes *pusch-TimeDomainAllocationList-ForMultiPUSCH,* the first PUSCH allocation follows the first SLIV in the indicated entry by the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or UL grant received on the DCI for Type 2 PUSCH transmissions.

<unchanged part omitted>

-------------------------------------------------END OF TP-----------------------------------------------------------

**TP#6**

----------------------------------------- TP for 38.214 6.1.2.3------------------------------------------------------

A set of allowed periodicities *P* are defined in [12, TS 38.331]. The higher layer parameter *cg-nrofSlots-r16*, provides the number of consecutive slots allocated within a configured grant period. The higher layer parameter *cg-nrofPUSCH-InSlot-r16* provides the number of consecutive PUSCH allocations within a slot, where the first PUSCH allocation follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI for Type 2 PUSCH transmissions, and the remaining PUSCH allocations have the same length and PUSCH mapping type, and are appended following the previous allocations without any gaps. The same combination of start symbol and length and PUSCH mapping type repeats over the consecutively allocated slots. For the PUSCH retransmission scheduled by a PDCCH with CRC scrambled by CS-RNTI, if the PUSCH time domain resource allocation configuration applies the Table 6.1.2.1.1-1A, and *pusch-Config* includes *pusch-TimeDomainAllocationList-ForMultiPUSCH,* the NDI = 0 indicatesthe corresponding SLIV is not applicable, and NDI=1 indicates retransmission with the corresponding indicated SLIV.

<unchanged part omitted>

-------------------------------------------------END OF TP-----------------------------------------------------------

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| Company | Comments |
| OPPO | TP#4 and TP#5 have been discussed in the last meeting and there was no consensus on the necessity for these TP. The network can perfectly handle it, e.g. only scheduling one PUSCH.  For TP#6, it seems an enhancement too, the network can schedule PUSCH retransmission individually. Moreover, according to the TP for invaliding SLIV, it should be clarified whether the UE does not perform any transmission in the corresponding PUSCH resource or not. Shall the UE expect if the non-valid SLIV should be placed at the end of the UL burst? |
| Intel | We share same view as OPPO: all the TPs are not necessary and the related issues could be handled through proper scheduling. |
| vivo | We support TP#4~TP#6. In last meeting, it is agreed that multi-PUSCH table will be used if configured even when DCI is scrambled by CS-RNTI. In this case, how to determine TDRA for type 1 CG-PUSCH, validate type 2 CG-PUSCH activation/deactivation and schedule re-transmission for CG-PUSCH is a missing part in spec. Regarding OPPO and Intel’s comment, it is not feasible to allow scheduling only one PUSCH when *pusch-TimeDomainAllocationList-ForMultiPUSCH* is configured in the above-mentioned cases for CG-PUSCH. First, the basic foundation of OPPO’s comment is to configure at least one single PUSCH entry in the multi-PUSCH table, which is not mandatory in spec currently and also need further discussion. Second, even if it is possible, scheduling flexibility would be greatly reduced since less entries can be used for CG PUSCH compared to NR-R15. For example, only 1 or 2 TDRA entries could be used for CG-PUSCH if multi-PUSCH table only includes 1 or 2 single PUSCH entry. Compared to typical 16 entries in NR R15, the limitation of scheduling flexibility for gNB is quite large. Third, for the questions raised by OPPO on TP#6, please see our answers below:  *“Moreover, according to the TP for invaliding SLIV, it should be clarified whether the UE does not perform any transmission in the corresponding PUSCH resource or not.”*  [vivo] Yes, UE will not transmit in the PUSCH resource indicated by invalid SLIV.  *“Shall the UE expect if the non-valid SLIV should be placed at the end of the UL burst?”*  [vivo] It could be up to gNB implementation but we are also open to have such limitation. |
| ZTE | We share the same view as OPPO and Intel that the issue can be handled by implementation, and thus TPs 4~6 are not necessary. |
| Ericsson | TPs 4,5,6 are not necessary, and can be handled by the gNB. |
| Samsung | We also share the same view that the issue could be handled by proper gNB implementation. |
| Qualcomm | The TPs 4/5/6 may not be necessary. On the other hand, it might be good to clarify that the Rel.16 CG-UL configuration or activation should not use multi-PUSCH TDRA |
| Sharp | We do not see the need of TPs #4,#5 and #6. |
| Lenovo, Motorola Mobility | We think all the proposed issues can be handled by gNB and TPs #4,#5 and #6 are not necessary. |
| LG | We also share the same view with Oppo and Intel. |
| vivo2 | We support the FL observation. We agree with QC’s view, it would be good to clarify that the Rel.16 CG-UL configuration or activation or retransmission should not use the multi-PUSCH TDRA entries. |
| Nokia, NSB | We agree that gNB implementation can handle this and no TPs are needed. |

Observation: majority of companies see no need for TP#4, #5, #6.

Proposal4: clarify that the Rel.16 CG-UL configuration or activation should not use multi-PUSCH TDRA

# References

[1] R1-2008888, “Preparation phase email discussion for NR-U”, RAN1#103-e