**3GPP TSG RAN WG1 #101 R1-200xxxx**

**e-Meeting, May 25th – June 5th, 2020**

Source: moderator (vivo)

Title: Feature lead summary on [101-e-NR-unlic-NRU-CG-01]

Agenda Item: 7.2.2.2.4

Document for: Discussion and Decision

1. Introduction

Per guidance from Mr. Chairman, please provide your views on the issues below.

[101-e-NR-unlic-NRU-CG-01] Email discussion/approval on issues 2, 3, 6, 8 and 13 from [R1-2003375](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_101\Docs\R1-2003375.zip) until 5/28; if necessary, endorse any associated TPs by 6/3 – Rakesh (Vivo)

1. Remaining issues
   1. Issue 2: values range of cg-COT-sharinglist (Huawei)
2. Considering MCOT=10ms for p=3 and p=4, i.e., =40 slots for μ=2, and accounting for the maximum number of (O, D) combination per CAP as , the value range for the parameter cg-COT-SharingList-r16 should be changed as follows:

* cg-COT-SharingList-r16 SEQUENCE (SIZE (1..1709)) OF CG-COT-Sharing-r16

1. cg-StartingFullBW-InsideCOT-r16 SEQUENCE (SIZE (1..ffsValue)) OF INTEGER (0..6)
2. cg-StartingFullBW-OutsideCOT-r16 SEQUENCE (SIZE (1..ffsValue)) OF INTEGER (0..6)
3. cg-COT-SharingOffset-r16 INTEGER (1..ffsValue)

(following was greed in RAN1#100b-e where the step size is in square bracket.)

* For the value of X, follow the same value range as for O and D with the step size of [14] symbols

**Note: if there is any impact on range of other parameters due to agreement on above, it should be discussed here as well.**

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| Company | Comments |
| Intel | As for 1), we are OK with upper bounding the index values of *cg-COT-SharingList-r16* to 1709, and we are OK with Huawei and ZTE’s calculations:  *cg-COT-SharingList-r16 SEQUENCE (SIZE (1..1709)) OF CG-COT-Sharing-r16*  As for 2) and 3), the maximum sequence size should be equal to 7 in order to give to the gNB fully flexibility, and allow a UE to choose among the full set of starting positions so that to reduce when needed the likelihood of mutual blocking:  cg-StartingFullBW-InsideCOT-r16 SEQUENCE (SIZE (1..7)) OF INTEGER (0..6)  cg-StartingFullBW-OutsideCOT-r16 SEQUENCE (SIZE (1..7)) OF INTEGER (0..6)  As for 4), in light of the following agreements, and prior discussions:  Agreement (Proposal 3):  Value ranges for cg-minDFIDelay-r16 in symbols with the step size of [14] symbols except for the first two values for different SCS are {[7], [14], [28], …, M} where M is as follows:   * 1 \*4 \* 14 = 56 (symbols)} for 15 kHz SCS * 2 \* 4 \* 14 = 112 (symbols)} for 30 kHz SCS * 4 \* 4 \* 14 = 224 (symbols) for 60 kHz SCS   Agreement:  For sharing of channel occupancy from UL to DL   * For the value of X, follow the same value range as for O and D with the step size of [14] symbols * The maximum value of O and D is 39 slots * “no COT sharing” is indicated by a specific row in the table, e.g. index 0   We think that 14 symbols step size is acceptable, but as discussed previously a minimum of 7 symbols should be also included in the set of values that cg-minDFIDelay-r16 can assume. Therefore, the maximum value range for this RRC parameter should be 40 including the initial possible value of 7 symbols:  cg-COT-SharingOffset-r16 INTEGER (1..40) |
| Huawei, HiSilicon | 1. We think that the proposed calculation method of the maximum size of the list is straightforward assuming that the value range for both O and D range is 1… where is the number of slots in the MCOT for μ and CAPC p. We note that the actual number of rows configured is what determines the bitwidth of the COT Sharing information in the CG-UCI. 2. In the previous meeting we had agreed to achieve the same starting offsets of FeLAA. Earlier, we also had the following agreement to take FeLAA AUL approach as the baseline. Therefore, the first two indexes corresponding to the offsets 16us and 25us should be excluded for InsideCOT parameters whereas all 7 indexes could potentially be used for OutsideCOT parameters. Thus we think the corrections for InsideCOT should be:  * cg-StartingFullBW-InsideCOT-r16 SEQUENCE (SIZE (1..~~ffsValue~~5)) OF INTEGER (~~0~~2..6) * cg-StartingPartialBW-InsideCOT-r16 INTEGER (~~0~~2..6)  RAN1 #AH-1901, Jan 2019 Agreement:   * Support multiple UE starting time offsets with sub-symbol granularity with FeLAA AUL approach as the baseline   + FFS: Enhancements specific to NRU      1. Similarly, the corrections for OutsideCOT should be:  * cg-StartingFullBW-OutsideCOT-r16 SEQUENCE (SIZE (1..~~ffsValue~~7)) OF INTEGER (0..6) * cg-StartingPartialBW-OutsideCOT-r16 INTEGER (0..6)  1. For the cg-COT-SharingOffset-r16, it was agreed in the previous meeting that its value range will account for 39 slots as in O and D. As for the step size [14], we are OK with it. However, we think this should be captured in the description field in TS38.331 since the current format INTEGER (1..ffsValue) captures only the min and max values. As such, X values can be calculated based on the index of the nth slot wherein DL is transmitted as X=1+(n-1)\*14 symbols, 1≤n≤39. The correction therefore should be   cg-COT-SharingOffset-r16 INTEGER (1..~~ffsValue~~533) |
| ZTE | 1) Support the proposed max value  2) We think 5 can be adopted similar as that for AUL;  3) We think 7 can be adopted similar as that for AUL;  4) We are fine to remove the squared brackets for the step size of 14 symbols. |
| LG | 1) We are ok with the upper bound value proposed by Huawei.  2) 3) We think that reuse of the values from AUL (i.e., 5 for InsideCOT, 7 for OutisideCOT) is enough.  4) Considering the agreement that the value of X follow the same value range as for O and D, and the granularity of O and D, the maximum value of X should be 39. |
| Lenovo, Motorola Mobility | (1) the max value of 1709 is fine with us.  (2) We propose to ruse the values from Rel-15 LTE FeLAA, i.e., 5 values for inside of COT.  (3) We propose to ruse the values from Rel-15 LTE FeLAA, i.e., 7 values for outside of COT.  (4) The step size of 14 symbols seems reasonable to us. It is note that the value of X should be kept 39. |

* 1. Issue 3: maximum number of PUSCH in a slot

***Proposal 3: The maximum configurable value for cg-nrofPUSCH-InSlot-r16 can be set as 7.***

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| Company | Comments |
| Intel | Considering that the minimum number of symbols for a CG-PUSCH is 2 symbols (i.e., one symbol for DMRS and one symbol for CG-UCI and UL-SCH), and considering that it would be beneficial from a channel access perspective to avoid any gaps between transmissions occurring over consecutive slots, the maximum configurable value of CG-PUSCH should be equal to 7. |
| Huawei, HiSilicon | Although we don’t think a PUSCH duration of 2 OSs is practical due to the DMRS, CG-UCI and Type 2 FDRA, it is OK to set the max as 7 if there is consensus in the group |
| ZTE | We support the proposal |
| LG | We are ok with the value of 7 for the same reason as Intel. |
| Lenovo, Motorola Mobility | We are fine with 7 CG-PUSCHs in one slot with two symbol length for each. |

* 1. Issue 6: COT sharing related (Vivo)
* it is necessary to clarify if the COT sharing information can be updated by subsequent CG-UCI.
* the gap should be ensured by UE if the CG-UCI indicates that the COT sharing information available, otherwise, the COT sharing information should be indicated as not available.
* The CG-UCI indication carried by different PUSCHs indicates the COT sharing information independently, which means COT sharing information carried in later CG-PUSCH will not override the information in the earlier ones.

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| Company | Comments |
| Intel | Our understanding is that the COT sharing information is indeed updated within the CG-UCIs carried in consecutive CG-PUSCH transmissions. However, it is left up to UE’s implementation to make sure that the information carried would be always updated and not conflicting with any prior information provided. As for the minimum gap between UL and DL, our understanding is that it is up to gNB on whether to utilize the remaining COT or not, and it is also up to gNB to establish implicitly the minimum gap between the UL and DL through a proper value of the offset. With that said, we believe that the specification describes already quite exhaustively this behavior, and there is no need for additional text. |
| Huawei, HiSilicon | For the 1st and 3rd proposals, we agree with COT sharing information in subsequent CG-UCIs being consistent, i.e., indicating the same DL transmission opportunity without override. This simply means D remains the same while O is updated in each slot.  For the 2nd proposal, we think that a UE configured with COT sharing parameters would indicate ‘COT sharing not available’ whenever it cannot share the CO for any reason. Not achieving the UL-DL gap is just one reason. Other reasons could include one or more of  - UE intends to transmit into the last slot of the MCOT  -NO CORESET configured for monitoring PDCCH in the remaining slots  -UE used the default EDT to acquire the CO  We do not think we need to capture all these reasons in the spec |
| ZTE | For the first and third bullets, it seems the proposals are not clear enough in terms of how the information is “updated”. There could be different understandings as follows:  Case 1) COT sharing information in the CG-UCIs carried by consecutive CG-PUSCH transmissions are consistent, as mentioned by HW as above.  Case 2) CG-UCIs carried by different PUSCHs could indicate totally different COT sharing, e.g. O and D can be any value.  We think case 1 should be the common understanding, and if so it can be guaranteed by UE implementation and we do not need to specifically mention the first and third bullets in the spec. If the motivation is to enable case 2, then we do not support the proposal as we do not see the motivation and use case to change the COT sharing dynamically.  The second bullet seems ok. |
| LG | We think that the COT sharing information can be updated by subsequent CG-UCI only for the offset not for the duration. In addition, this information should not conflict with any prior information provided. For example, if the COT sharing information with O=2 and D=2 is included in the first CG-UCI, the subsequent CG-UCI in the next slot will includes O=1 and D=2 consistent with the previous one. |
| Lenovo, Motorola Mobility | (1) we agree that COT sharing information can be updated by subsequent CG-UCI. However, we think only the offset information for COT sharing can be updated. Other info like HARQ process number, RV, NDI, and duration for shared COT should not be changed.  (2) Proposal 2 seems pure UE implementation issue. NO specification change is needed.  (3) CG-UCI in multiple PUSCHs for same COT sharing should indicate consistent COT sharing information. More important thing is only the offset information can be updated in subsequent CG-UCI while other information field can’t be changed. |

* 1. Issue 8: HARQ-ACK for CBG based PUSCH (Samsung)

TP#1

================= Start of TP#1 for TS 38.213 ====================

10.5 HARQ-ACK information for PUSCH transmissions

< Unchanged Texts Omitted >

For a PUSCH transmission scheduled 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 one of CBGs for the PUSCH is ACK; otherwise, a value of HARQ-ACK information is NACK

For a PUSCH transmission configured by *ConfiguredGrantConfig*, 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 all of CBGs for the PUSCH are ACK; 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 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 Texts Omitted >

========================== End of TP#1 for TS 38.213 =========================

TP#2

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

10.5 HARQ-ACK information for PUSCH transmissions

< Unchanged Texts Omitted >

For a PUSCH transmission scheduled 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 all of CBGs for the PUSCH are ACK; 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 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 Texts Omitted >

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

TP#3

=================== Start of TP for TS 37.213 =======================

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

#### 4.2.2.2 Contention window adjustment procedures for UL transmissions scheduled/configured by gNB

If a UE transmits transmissions using Type 1 channel access procedures that are associated with channel access priority class on a channel, the UE maintains the contention window value and adjusts for those transmissions before step 1 of the procedure described in subclause 4.2.1.1, using the following steps:

1) For every priority class , set ;

2) If HARQ-ACK feedback is available after the last update of , go to step 3. Otherwise, if the UE transmission after procedure described in subclause 4.2.1.1 does not include a retransmission or is transmitted within a duration from the end of the *reference duration* corresponding to the earliest UL transmission burst after the last update of transmitted after the procedures described in subclause 4.1.1, go to step 5; otherwise go to step 4.

3) The HARQ-ACK feedback(s) corresponding to PUSCH(s) in the *reference duration* for the latest UL transmission burst for which HARQ-ACK feedback is available is used as follows:

a. If at least one HARQ-ACK feedback is 'ACK' for PUSCH(s) with transport block (TB) based feedback or at least 10% of HARQ-ACK feedbacks is 'ACK' for PUSCH(s) with code block group (CBG) based feedback go to step 1; otherwise go to step 4.

4) Increase for every priority class to the next higher allowed value;

5) For every priority class , maintain as it is; go to step 2.

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

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| Company | Comments |
| Intel | To begin with, we would like to highlight that we have already agreed that for CG-PUSCH only TB based transmissions are supported. Therefore, the second sentence of TP1 is not relevant.  As for the issue related to when scheduled transmissions are configured per CBG and the feedback information is provided within a DFI, we acknowledge that some additional text is needed in the specification, since it is not clear how the CWS adjustment should be done in this case, and how the feedback information should be treated. From our perspective, this issue could be directly solved into 37.213 with very little spec impact as detailed in TP 3. The intention of TP 3 is the same as TP2: by changing the CWS procedure to account for TB/CBG based feedbacks rather than transmissions, in case one or more scheduled transmissions occurring within the reference burst are configured per CBG, and their feedback is provided within a DFI, these HARQ-ACK information will be counted per TB, and the CWS will be reset only if all CBGs for a given scheduled PUSCH are ACKs. |
| Huawei, HiSilicon | -Agree with TP#2  -Agree with TP#3  -TP#1: Agree with Intel regarding CG-PUSCH. As for the CBG-based DG-PUSCH in, further clarification is needed as we think the proposal would conflict with UL CWS adjustment spec for CBG-based PUSCH as follows:  3) The HARQ-ACK feedback(s) corresponding to PUSCH(s) in the *reference duration* for the latest UL transmission burst for which HARQ-ACK feedback is available is used as follows:  a. If at least one HARQ-ACK feedback is 'ACK' for PUSCH(s) with transport block (TB) based transmissions or at least 10% of HARQ-ACK feedbacks is 'ACK' for PUSCH(s) with code block group (CBG) based transmissions go to step 1; otherwise go to step 4.  Wouldn’t assuming a virtual TB-level ACK if there is at least one CBG is ACK renders this 10% criteria useless?  - HARQ-ACK feedback for PUSCH(s) transmissions are expected to be provided to UE(s) explicitly or implicitly where implicit HARQ-ACK feedback for the purpose of contention window adjustment in this clause, is determined based on the indication for a new transmission or retransmission in the DCI scheduling PUSCH(s) as follows:  - If a new transmission is indicated, 'ACK' is assumed for the transport blocks or code block groups in the corresponding PUSCH(s) for the TB-based and CBG-based transmission, respectively.  - If a retransmission is indicated for TB-based transmissions, 'NACK' is assumed for the transport blocks in the corresponding PUSCH(s).  - If a retransmission is indicated for CBG-based transmissions, if a bit value in the code block group transmission information (CBGTI) field is '0' or '1' as described in clause 5.1.7.2 in [8], 'ACK' or 'NACK' is assumed for the corresponding CBG in the corresponding PUSCH(s), respectively.  Above, individual CBG ACK/NACK are considered from CBGTI |
| ZTE | We are fine with TP#2 and TP#3.  For TP#1, we share the same view as Intel that the second paragraph is not relevant for CG-PUSCH. |
| LG | If a UE is configured by *ConfiguredGrantConfig* and provided *PUSCH-CodeBlockGroupTransmission* for a serving cell, the CBG-based PUSCH can be transmitted using the configured grant resource. If any of CBG(s) in the CG-PUSCH is identified as “NACK”, the gNB can indicate the retransmission only for NACKed CBG by using UL grant or induce the retransmission of the whole TB by generating 1-bit “NACK” for a corresponding HARQ process ID in the CG-DFI. The second sentence of TP1 is necessary in the latter case.  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. Therefore, considering the maximum configurable number of CBG is up to 8, the CWS is reset if one of the CBGs constituting TB are ‘ACK’ and the CWS is increased to the next higher allowed value if all of the CBGs constituting TB are ‘NACK’ for the CBG-based DG-PUSCH. It is also aligned with Section 4.2.2.1 of 37.213 that the spatial bundling of HARQ-ACK for the scheduled UL configured with TM2 and AUL with TM1 in the AUL-DFI (refer to R1-1807502). |
| Lenovo, Motorola Mobility | For TP1, share same view with Intel.  TP2 is fine with us.  For TP3, we think either PUSCH with CBG-based transmission or PUSCH with CBG-based feedback does not bring any ambiguity. Either is ok to us. |

* 1. Issue 13: Editorial

38.214

6.1 UE procedure for transmitting the physical uplink shared channel

< Unchanged parts are omitted >

For the licensed spectrum, a UE is not expected to be scheduled by a PDCCH ending in symbol to transmit a PUSCH on a given serving cell for a given HARQ process, if there is a transmission occasion where the UE is

< End of text proposal >

or

<Unchanged part omitted>

Except for operation with shared spectrum channel access, a ~~A~~ UE is not expected to be scheduled by a PDCCH

< End of text proposal >

**Note: we first discuss whether the proposed correction is needed or not, if there is consensus to have this change, exact wording is to be discussed further.**

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| Company | Comments |
| Intel | We are OK with the second TP.  In this regards, we would like to point out that for operation in the unlicensed spectrum, the gNB has already the flexibility to select the set of HARQ-IDs that the CG-UE can pick from and make sure the scheduled and configured grant UEs/transmissions have orthogonal HARQ-IDs, if it wishes. The main purpose of allowing a GC-PUSCH to use same HARQ-ACK ID as a scheduled PUSCH is to cope with LBT failures, and allow a device to use an HARQ-ID which in case of LBT failure would remain unused. Also in order to solve the ambiguity between gNB and transmitting CG-UE, the CG-UCI contains information related to the HARQ-ACK ID used. |
| Huawei, HiSilicon | In principle, we are fine with the change. We prefer the second TP though for consistency. |
| ZTE | We support the correction, and either TP is fine with us. |
| LG | We are ok both for the first and second TPs. |
| Lenovo, Motorola Mobility | Both TPs are fine with us. |

# References

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| --- | --- | --- |
| [R1-2003373](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003373.zip) | Remaining issues on the enhancements to configured grant | vivo |
| [R1-2003453](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003453.zip) | Remaining issues on the configured grant for NR-U | ZTE, Sanechips |
| [R1-2003515](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003515.zip) | Maintenance on the configured grant procedures | Huawei, HiSilicon |
| [R1-2003731](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003731.zip) | Enhancements to configured grants for NR-unlicensed | Intel Corporation |
| [R1-2003824](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003824.zip) | Text proposals for configured grant enhancement for NR-U | Lenovo, Motorola Mobility |
| [R1-2003846](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003846.zip) | Configured grant enhancement | Ericsson |
| [R1-2003863](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003863.zip) | Configured grant enhancement for NR-U | Samsung |
| [R1-2004016](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004016.zip) | Remaining issues of configured grant for NR-U | LG Electronics |
| [R1-2004088](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004088.zip) | Discussion on the remaining issues of configured grant enhancements | OPPO |
| [R1-2004446](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004446.zip) | TP for Enhancements to configured grants for NR-U | Qualcomm Incorporated |