**3GPP TSG RAN WG1 #101 R1-2003395**

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

Source: Summary of enhanced UL configured grant transmission

Title: Moderator (vivo)

Agenda Item: 7.2.5.6

**Document for:** **Discussion and Decision**

# **Introduction**

In this document, contributions submitted in AI 7.2.5.6 are summarized. In section 2, the remaining issues are listed, and each of them is indicated as High, Low and Editorial from feature lead perspective.

Below are the chairman’s guideline regarding to the summary process and timeline for the preparation phase:

**May 18th -22nd: Preparation phase**:

* May 18th – 19th: FLs to prepare summary
* May 20th – 22nd: FLs to lead the discussion identifying the set of email threads
* **Note:** PLEASE KEEP THE EMAIL DISCUSSION **SCOPE** PER EMAIL THREAD **REASONABLE!**

**May 25th – June 5th: e-Meeting**

Therefore, by the end of May 22, once all critical issues have been identified and the group agrees the topics to be discussed over email, a revised feature lead summary will be submitted.

# **Overview on Issues**

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| Issue # | Description  | Priority and Recommendation |
| 1 | PHR handling for multiple CG configurations(section 3.1) | MediumReason: the issue seems not valid; more company input is welcome to decide whether to have email discussion or not.  |

Any comments?

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| Company | View |
| ZTE | We suggest clarifying this issue in this e-meeting. Please see detailed reasoning in section 3.1.  |
| Huawei, HiSilicon | We share a similar view with the FL. Current spec can work well for PHR report and no issue is observed. |
| Nokia, NSB | Agree with FL here. Only the one that is transmitted should be used for PHR, and this should be clear already.  |
| Samsung | Low. Current specification is clear.  |
| CATT | Agree with FL’s comment and current spec on PHR report for CG scenario is clear. |
| OPPO | Low. Current specification is clear. |
| Sony | Low. Agree with CATT’s observation in Section 3.1 |
| Ericsson | Current specification is sufficient.  |

# **Issues Details**

# **PHR handling for multiple CG configurations**

* **Issue:**
	+ [[R1-2003322](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003322.zip), ZTE] considers following case may have issue for PHR reporting when a later high priority CG is prioritized over an earlier low priority CG.
		- An example is given in Figure 1, where the PHR is determined by MAC entry to be transmitted on the DG PUSCH#1 in serving cell #1, and the MAC CE in PUSCH#1 indicates actual PH reporting for CG PUSCH in serving cell #2. For the case that a low priority data is assigned by MAC to PHR at t1, while a high priority data arrives later and is assigned to PHY at t2. If the UE indicates actual PHR is reported, the PHR will be calculated based on the first CG PUSCH#1 based on current spec. However, the first CG PUSCH#1 would be canceled at PHY layer. In such case, it is more reasonable to report PHR based on the high priority CG PUSCH#2.



Figure 1 PHR calculation in case of multiple CGs with different priorities.

* [R1-2004033, LG] identified there may be issue for gNB to figure out the exact power headroom without knowing which CG resource is used for the PHR for the case where multiple overlapped CGs are configured in Cell A and there is neither CG transmission among those configurations nor DG transmission in Cell A, while a PUSCH in Cell B carries PHR for CG in Cell A.
* [R1-2003624, CATT] discussed the issue mentioned in [R1-2004033, LG]. For above case, UE can report virtual Type 1 PHR to gNB based on a reference PUSCH transmission although there is no real PUSCH transmission among the multiple CGs. As specified in TS 38.213 below, all the parameters used for the virtual PH calculation are the same regardless of CG configurations. Therefore, there is no ambiguity on PHR calculation between the gNB and UE.

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| 7.7.1 Type 1 PH reportIf the UE determines that a Type 1 power headroom report for an activated serving cell is based on a reference PUSCH transmission then, for PUSCH transmission occasion  on active UL BWP  of carrier  of serving cell , the UE computes the Type 1 power headroom report as  [dB]where  is computed assuming MPR=0 dB, A-MPR=0 dB, P-MPR=0 dB. TC = 0 dB. MPR, A-MPR, P-MPR and TC are defined in [8-1, TS 38.101-1], [8-2, TS38.101-2] and [8-3, TS 38.101-3]. The remaining parameters are defined in Clause 7.1.1 where  and  are obtained using  and *p0-PUSCH-AlphaSetId* *=* 0,  is obtained using *pusch-PathlossReferenceRS-Id =* 0, and . |

* **FL’s view:**
	+ For the issue mentioned by ZTE, followings are not clear
		- For CG PUSCH#1 with low priority and CG PUSCH#2 with high priority, depends on how prioritization is done by MAC layer, it is possible to only deliver the CG PUSCH#2 with high priority;
		- Even if both CG PUSCH#1 and CG PUSCH#2 are delivered from MAC, further discussion is necessary on whether/how to define the explicit/accurate timeline for high-priority CG PUSCH#2 to cancel the low CG PUSCH#1.
		- Irrespective above two unclear points, based on the timeline for PH calculation defined in 38.213 section 7.7 and 7.7.1, if the PHR is carried by DG since the PHR is triggered, the calculation time for PH should probably starts at t3, while both t1 for low CG PUSCH#1 and t2 for high priority CG PUSCH#2 are earlier than t3, there is no issue for UE to calculate the PH based on the high priority CG PUSCH#2.

**FL suggestion:**

* It is observed that for the case that multiple overlapped CGs are configured in Cell A and there is neither CG transmission among those configurations nor DG transmission in Cell A, and a PUSCH in Cell B carries PHR for CG in Cell A, there is no PH ambiguity for which CG is used for PH calculation since the PH calculation for the CG is based on a reference format.
* Check the PH issue further after the CG vs. CG collision handling is decided.

Any comments?

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| Company | View |
| ZTE | We agree that there is no ambiguity if virtual PH is reported. What we are trying to clarify is about actual PH calculation. Regarding FL’s view, our understanding is follows* It should be clear that MAC cannot avoid/solve all collisions, and that’s why we have been discussing collision handling in PHY.
* No mater whether or how to define the timeline, the CG PUSCH transmission with low priority will be not transmitted at least on the overlapping symbols and high priority CG will be transmitted. In such case, it needs to clarify which CG is selected for actual PHR calculation. Otherwise, gNB will not know the actual power headroom.
* For the example shown in Figure 1, we agree that UE is able to calculate the PH based on the high priority CG PUSCH#2 . However, it’s our understanding that current spec specifies another way, i.e., the PH is based on the first overlapping PUSCH, i.e., CG PUSCH#1. In addition, what if the high priority data arrives later than t3? UE behavior in such cases should be clarified.

*‘‘If a UE is configured with multiple cells for PUSCH transmissions, where a same SCS configuration on active UL BWP  of carrier  of serving cell  and active UL BWP  of carrier  of serving cell , and if the UE provides a Type 1 power headroom report in a PUSCH transmission in a slot on active UL BWP  , the UE provides a Type 1 power headroom report for the first PUSCH, if any, on the slot on active UL BWP  that overlaps with the slot on active UL BWP .’’* |
| LG | As FL commented, PH is calculated depending on PUSCH carrying PHR. So, there should be no ambiguity at t3. If I borrow ZTE’s example, depending on t1 and t2, UE behavior can be changed. In below example, UE prepare PHR for CG PUSCH #1, but CG PUSCH#2 will be transmitted.What we are proposing is, to make UE determine a PUSCH resource for PHR calculation in irrespective of intra-UE prioritization of PHY/MAC. Current specification which ZTE mentioned is specifying the case of different UL BWP. Due to URLLC, now we have overlapped multiple CG PUSCH in a UL BWP. Similar to multiple BWP case, it should be addressed in specification which PUSCH are used for PHR calculation to remove ambiguity.  |
| Huawei, HiSilicon | We share a similar view with the FL. Current spec can work well for PHR report and there is no ambiguity on determining which CG PUSCH to be used for PH calculation. |
| Nokia, NSB | Agree with FL here. Only the one that is transmitted should be used for PHR, and this should be clear already.  |
| Samsung | Same view with FL/CATT. No need to specify PHR for multiple CG. We have same understanding with CATT regarding actual transmission or a reference format (a.k.a. virtual transmission) for PHR reporting. In single carrier, there is no issue for PHR ambiguity, UE will transmit PHR reporting according to selected CGs to transmit PUSCH and corresponding CG configuration. In multi-carrier, for example, considering that there are two CGs on a serving cell : CG 1 and CG 2, we can consider 3 cases. (case 1) PUSCH on CG 1, (case 2) PUSCH on CG 2 and (case 3) no PUSCH on CG1/2. Since it is highly likely that gNB know which CG used for PUSCH transmission, PHR could be calculated based detected PUCSH. That is, actual PHR of CG 1 for case 1, actual PHR of CG 2 for case 2, and virtual PHR for case 3. As vivo commented, reference format (virtual PHR) doesn’t consider which CG is used for PHR calculation because the calculation uses predetermined values (p0, alpha, … ) regardless of CG configurations. Hence, if most companies have same understanding with above procedures or gNB can handle this issue without any specification impact, it is unnecessary to discuss in next week. Having said that, our preference is not to discuss this issue since current specification can work with multiple CGs. Regarding an example by ZTE, gNB is highly likely to know which CG is selected for PHR calculation based on CG PUSCH transmission if actual PHR is considered for CG configuration. So, there is no ambiguity between gNB and UE.  |
| CATT | Agree with FL’s comment and clarification on multiple CG isn’t required. |
| OPPO | Current specification is clear. |
| Sony | Agree with FL, i.e. current specs is sufficient. |
| Ericsson | Current specification is sufficient.  |
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# **Agreement not yet captured in the PHY spec**

* **Issue:** isn’t required
	+ [R1-2003392, vivo] identified following agreement made for UL CG has not been captured in the specification.

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| Agreement@ RAN1 #AH 1901 meeting:* In Rel-16, for both Type 1 and Type 2 configured grant and when multiple active configurations are configured in a BWP, transmission of a TB based on the configured grant is associated with a single active configuration, even if the transmission is repeated
 |

* + [R1-2003624, CATT] identified following NOTE was captured in section 5.4.1 of current MAC spec in 38.321, which implies the transmission of a TB based on the configured grant is associated with a single active configuration, even if the transmission is repeated”

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| * NOTE 5: A HARQ process is not shared between different configured grant configurations.
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* **FL suggestion:**
	+ Since MAC Spec captures the intention of RAN1 agreements, it is not necessary to capture the agreements in RAN1 spec.

Any comments?

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| Company | View |
| ZTE | Agree with CATT, and fine with FL suggestion.  |
| LG | Even if HARQ processes is shared, there is no specified way to utilize multiple CG configuration for a TB. We are fine with FL suggestion. |
| Huawei, HiSilicon | We are ok with the FL suggestion. |
| Nokia, NSB | We agree with FL suggestion |
| Samsung | Agree |
| CATT | We are fine with FL’s comment |
| OPPO | Agree with FL suggestion |
| Sony | Agree with CATT & FL’s observation that it has already been captured in other specs. |
| Ericsson | Agree with FL suggestion |

# **Per PUSCH Repetition Cancellation**

* **Issue:** [R1-2004119, OPPO] proposed the cancellation should be handled per repetition. So, it is proposed for Rel-15 PUSCH repetition and PUSCH repetition type A, the overlapping handling per slot; for PUSCH repetition type B, the overlapping handling per actual repetition. Following TP was proposed for 38.214:

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| 6.1 UE procedure for transmitting the physical uplink shared channel**<**Unchanged text is omitted>A UE is not expected to be scheduled by a PDCCH ending in symbol $i$ to transmit a PUSCH on a given serving cell overlapping in time with a transmission occasion, where the UE is allowed to transmit a PUSCH or a PUSCH repetition for PUSCH repetition type A or an actual PUSCH repetition for PUSCH repetition type B with configured grant according to [10, TS38.321], starting in a symbol $j$ on the same serving cell if the end of symbol $i$ is not at least $N\_{2}$ symbols before the beginning of symbol $j$. The value $N\_{2}$ in symbols is determined according to the UE processing capability defined in Clause 6.4, and $N\_{2} $and the symbol duration are based on the minimum of the subcarrier spacing corresponding to the PUSCH with configured grant and the subcarrier spacing of the PDCCH scheduling the PUSCH**<**Unchanged text is omitted> |

* **FL’s view:**
	+ To my understanding, above DG prioritized over CG is for Rel.15 UEs and Rel.16 UEs not capable of intra-UE prioritization. When collision happens between CG and DG and the above timeline for DG overrides CG is satisfied, the CG PUSCH including the first and remaining repetitions in one bundle will not start transmit at all. Therefore, if above TP is adopted, it will cause backward compatibility issue.
	+ For Rel.16 UEs capable of intra-UE prioritization, following is temporally captured in 38.214 and from the highlighted text, it can be seen the collision is handled per repetition

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| 6.1 UE procedure for transmitting the physical uplink shared channel<Irrelevant text is omitted>[If [a UE reports the capability of intra-UE prioritization], and if a PUSCH corresponding to a configured grant and a PUSCH scheduled by a PDCCH on a serving cell are partially or fully overlapping in time,*-* If the PUSCH corresponding to the configured grant has *priority* in *configuredGrantConfig* set to 1 (i.e., high priority), and the PUSCH scheduled by the PDCCH is indicated as low priority by having the [priority indicator] field in the scheduling DCI set to 0 or by not having the [priority indicator] field present in the scheduling DCI, the UE is expected to transmit the PUSCH corresponding to the configured grant, and cancel the PUSCH transmission scheduled by the PDCCH at latest starting at the first symbol of the PUSCH corresponding to the configured grant.*-* Otherwise, the UE shall cancel the PUSCH transmission corresponding to the configured grant at latest starting *M* symbols after the end of the last symbol of the PDCCH carrying the DCI scheduling the PUSCH, and transmit the PUSCH scheduled by the PDCCH, where- *M = Tproc,2 +d1, where Tproc,2* is given by clause 6.4 for the corresponding PUSCH timing capability assuming *d2,1*= 0 and *d1* is determined by the reported UE capability [XXXXX],- In this case, the UE is not expected to be scheduled for the PUSCH by the PDCCH where the PUSCH starts earlier than *N* symbols after the end of the last symbol of the PDCCH, where- *N = Tproc,2* + *d2*, where *Tproc,2* is the PUSCH preparation time of the PUSCH scheduled by the PDCCH using the associated PUSCH timing capability according to clause 6.4 and *d2* is determined by the reported UE capability [YYYYY].*-* In case of PUSCH repetitions, the overlapping handling is performed for each PUSCH repetition separately.*-* The UE is not expected to be scheduled for another PUSCH by a PDCCH where this PUSCH starts no earlier than the end of the prioritized transmitted PUSCH and before the end of the time domain allocation of the cancelled PUSCH.] |

* **FL’s suggestion:**
	+ Do not adopt above TP for Rel.15 UEs and Rel.16 UEs not capable of intra-UE prioritization.
	+ For Rel.16 UEs capable of intra-UE prioritization, FFS the overlapping handling is performed per actual or per nominal repetition in AI 7.2.5.7 covering the intra-UE prioritization topic.

Any comments?

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| Company | View |
| ZTE | Support FL suggestion.  |
| LG | We are fine with FL suggestion. |
| Huawei, HiSilicon | We are ok with the FL’s suggestion. |
| Nokia, NSB | We agree with FL suggestion |
| Samsung | Agree. Current specification is clear.  |
| CATT | We are fine with FL’s comment |
| OPPO | For Rel.15, there is ambiguity on collision handling for DG and CG with repetition>1. Explanation 1: Collision handling for DG and CG with repetition>1 is **per PUSCH repetition**. In addition, collision-handling timeline is determined by the starting symbol of the earliest overlapped PUSCH repetition.Explanation 2: Collision handling for DG and CG with repetition>1 is **per PUSCH repetition bundle**. In addition, collision-handling timeline is determined by the starting symbol of 1st PUSCH repetition within a bundle.So, we suggest to clarify explanation to achieve common understanding at least. For Rel.16, we agree with FL’ suggestion to be determined based on outcome of intra-UE prioritization topic.  |
| Sony | Agree with FL’s comment.  |
| Ericsson | Agree with FL suggestion.Regarding OPPO’s concern, we do not see the ambiguity. Please note that 38.321 section 5.4.2.1 “HARQ Entity” has the following sentence, which also echos the 38.214 sentence cited by FL:“Within a bundle, HARQ retransmissions are triggered without waiting for feedback from previous transmission according to *pusch-AggregationFactor* for a dynamic grant and *repK* for a configured uplink grant, respectively. Each transmission within a bundle is a separate uplink grant after the initial uplink grant within a bundle is delivered to the HARQ entity.” |

# **Priority provided by higher layer for SPS and CG**

* **Issue:**
	+ [R1-2003444, Ericsson] proposed to change following text to “UE determines a priority index from higher layer parameter priority”, reflecting the that the parameter comes from higher layers

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| 9     UE procedure for reporting control information<Unchanged text is omitted>A PUSCH or a PUCCH, including repetitions if any, can be of priority index 0 or of priority index 1. If a priority index is not provided for a PUSCH or a PUCCH, the priority index is 0. For a configured grant PUSCH the priority index is determined based on the higher layer parameter *priority*, if provided. The priority of a PUCCH carrying HARQ-ACK feedback corresponding to SPS PDSCH reception or SPS PDSCH release is determined based on higher layer parameter *harq-CodebookID*, if provided. If in an active DL BWP a UE monitors PDCCH either for detection of DCI format 0\_1 and DCI format 1\_1 or for detection of DCI format 0\_2 and DCI format 1\_2, a priority index can be provided by a priority indicator field. If a UE indicates a capability to monitor, in an active DL BWP, PDCCH for detection of DCI format 0\_1 and DCI format 1\_1 and for detection of DCI format 0\_2 and DCI format 1\_2, a DCI format 0\_1 or a DCI format 0\_2 can schedule a PUSCH transmission of any priority and a DCI format 1\_1 or a DCI format 1\_2 can schedule a PDSCH reception and trigger a PUCCH transmission with corresponding HARQ-ACK information of any priority.**<**Unchanged text is omitted> |

* + [R1-2004119, OPPO] clarified that multiple configured grant configurations to be released by the joint release DCI could have different priorities.
* **FL’s views:**
	+ Current text is already clear that the priority for CG is provided by higher layer, unnecessary to further optimize the wording to align with the description in TS 38.213.
	+ In current spec, it is not precluded that multiple configured grant configurations to be released by the joint release DCI could have different priorities. So, no specification correction is needed.

Any comments?

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| Company | View |
| ZTE | Agree with FL’s views.  |
| LG | Share FL’s view.  |
| Huawei, HiSilicon | We support the FL’s views. |
| Nokia, NSB | We agree with FL suggestion |
| Samsung | Agree.  |
| CATT | We are fine with FL’s comment |
| OPPO | Agree with FL suggestion |
| Sony | Agree that the additional clarification is not needed. |
| Ericsson | We have no issue with the TP cited above by FL. What we point out is, the 38.213 editor CR omitted “higher layer parameter” when capturing the agreed TP. While this is not a problem for “*harq-CodebookID*”, we are concerned that this is confusing for ‘*priority*’, since the DCI activating CG has ‘priority indicator’ field. It’s better to bring back “higher layer parameter” in the agreed TP for ‘*priority*’ to avoid confusion. That is:

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| 9 UE procedure for reporting control information\*\*\* Unchanged text is omitted \*\*\*A PUSCH or a PUCCH transmission, including repetitions if any, can be of priority index 0 or of priority index 1. For a configured grant PUSCH transmission, a UE determines a priority index from higher layer parameter *priority*, if provided. For a PUCCH transmission with HARQ-ACK information corresponding to a SPS PDSCH reception or a SPS PDSCH release, a UE determines a priority index for *harq-CodebookID*, if provided. If a priority index is not provided to a UE for a PUSCH |

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# **Time domain resource determination for CG with PUSCH repetition Type B**

* **Issue:**
	+ [R1-2003526, Huawei] proposed to clarify the determination of the time domain resource allocation for configured grant with PUSCH repetition Type B in the spec and proposed following:

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| Text proposal for Clause 6.1.2.3.2 in TS 38.214 v16.1.0------------------------------------------ Start of Text Proposal -------------------------------------------< Unchanged parts are omitted >6.1.2.3.2 Transport Block repetition for uplink transmissions of PUSCH repetition Type B with a configured grantThe procedures described in this Clause apply to PUSCH transmissions of PUSCH repetition type B with a Type 1 or Type 2 configured grant.For PUSCH transmissions with a Type 1 or Type 2 configured grant, the nominal repetitions and the actual repetitions are determined according to the procedures for PUSCH repetition Type B defined in Clause 6.1.2.1, and the starting slot as well as the starting symbol for each repetition bundle are determined according to Clause 5.8.2 of [10, TS 38.321]. The higher layer configured parameters *repK-RV* defines the redundancy version pattern to be applied to the repetitions. If the parameter *repK-RV* is not provided in the *configuredGrantConfig*, the redundancy version for each actual repetition with a configured grant shall be set to 0. Otherwise, for the *n*th transmission occasion among all the actual repetitions (including the actual repetitions that are omitted) of the *K* nominal repetitions, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. If a configured grant configuration is configured with *startingFromRV0* set to *'off'*, the initial transmission of a transport block may only start at the first transmission occasion of the actual repetitions. Otherwise, the initial transmission of a transport block may start at < Unchanged parts are omitted >--------------------------------------------- End of Text Proposal ----------------------------------------- |

* **FL suggestions:** Discuss whether the correction is necessary.

Any comments?

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| Company | View |
| ZTE | For Type 2 PUSCH, the spec on time domain RA is already clear as specified by the following in TS 38.214. For Type 1, the only difference is a row from TDRA table is configured by RRC, and there would be no ambiguity either. *- For Type 2 PUSCH transmissions with a configured grant: the resource allocation follows the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI.* *- The PUSCH repetition type and the time domain resource allocation table are determined by the PUSCH repetition type and the time domain resource allocation table associated with the UL grant received on the DCI, respectively, as defined in Clause 6.1.2.1.* |
| LG | Between repetition Type A and Type B, there is no difference in the MAC perspective. Since there hasn’t been such description for repetition type A, it seems not necessary. If necessary, we should change both Type A and B.  |
| Huawei, HiSilicon | We propose to adopt the above TP. The reason is that, for configured grant, the K nominal repetitions occur periodically and the determination of the starting slot as well as the starting symbol for each repetition bundle is different from that for dynamic grant, therefore, the UE actually cannot determine the time domain resource for every K nominal repetitions by simply referring to the procedure and the formulas specified for dynamic grant. Regarding ZTE’s comments, TS 38.321 only defines the starting slot and the starting symbol for each repetition bundle, which is not enough for UE to determine each of the K nominal repetitions in a bundle.Regarding LG’s comment, we agree that there is no difference in the MAC perspective between repetition Type A and repetition Type B. However, the time domain resource determination in PHY is quite different for the two schemes, and that is also the reason why we have corresponding procedures and formulas defined in Clause 6.1.2.1 in TS 38.214 for repetition Type B. |
| Nokia, NSB | We agree with FL suggestionPlease note that a similar issue is there in Rel-15 already. Moreover, if this would need to be clarified (as suggested by HW/HiSi above) then we should clarify this also for PUSCH repetition Type A (in 6.1.2.3.1) |
| Samsung | It is not necessary to do correction since current specification describe time domain resource allocation generally in section 6.1.2.3.  |
| CATT | Actually start point determination of the Nth uplink grant is charged by MAC layer. And start point determination of the Nth uplink grant refers to PHY layer parameter S as below in section 5.8.2 of 38.321.initialise or re-initialise the configured uplink grant to start in the symbol according to *timeDomainOffset* and *S* (derived from *SLIV* as specified in TS 38.214 [7]), and to reoccur with *periodicity*.Start point determination for each repetition bundle is clear based on MAC spec. So we needn’t repeat description of start point determination for each repetition bundle in PHY layer. |
| Ericsson | No need of specification change. As pointed out by ZTE and CATT, MAC spec is sufficient. |

# **Clarify the invalid symbol application for Type 1 CG**

* **Issue: [R1-2003526, Huawei]** discussed that the current statement in clause 6.1.2.1 in TS 38.214 seems not clear to reflect following agreements on how to apply the invalid symbol pattern for Type 1 CG. Therefore, it is proposed to to add some sentences in Clause 6.1.2.1 to make it more clear.

**Agreements:**

* For Type 1 CG PUSCH with repetition Type B, regardless of whether dynamic SFI is configured or not, if InvalidSymbolPattern is configured, the configured pattern is applied (that is, segmentation occurs around semi-static DL symbols and invalid symbols indicated by InvalidSymbolPattern).

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| 6.1.2.1 Resource allocation in time domain< Unchanged parts are omitted >For PUSCH repetition Type B, the UE determines invalid symbol(s) for PUSCH ~~repetition Type B~~ transmission scheduled by DCI format 0\_1, or scheduled by DCI format 0\_2, or corresponding to a configured grant as follows:- A symbol that is indicated as downlink by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated* is considered as an invalid symbol for PUSCH repetition Type B transmission.- The UE may be configured with the higher layer parameter *InvalidSymbolPattern*, which provides a symbol level bitmap spanning one or two slots (higher layer parameter *symbols* given by *InvalidSymbolPattern*). A bit value equal to 1 in the symbol level bitmap *symbols* indicates that the corresponding symbol is an invalid symbol for PUSCH repetition Type B transmission. The UE may be additionally configured with a time-domain pattern (higher layer parameter *periodicityAndPattern* given by *InvalidSymbolPattern*), where each bit of *periodicityAndPattern* corresponds to a unit equal to a duration of the symbol level bitmap *symbols*, and a bit value equal to 1 indicates that the symbol level bitmap *symbols* is present in the unit. The *periodicityAndPattern* can be {1, 2, 4, 5, 8, 10, 20 or 40} units long, but maximum of 40ms. The first symbol of *periodicityAndPattern* every 40ms/P periods is a first symbol in frame 𝑛𝑓 mod 4 = 0, where P is the duration of *periodicityAndPattern* in units of ms. When *periodicityAndPattern* is not configured, for a symbol level bitmap spanning two slots, the bits of the first and second slots correspond respectively to even and odd slots of a radio frame, and for a symbol level bitmap spanning one slot, the bits of the slot correspond to every slot of a radio frame. If *InvalidSymbolPattern* is configured, when the UE applies the invalid symbol pattern is determined as follows:- if the PUSCH is scheduled by DCI format 0\_1, or corresponds to a Type 2 configured grant activated by DCI format 0\_1, and if *InvalidSymbolPatternIndicator-ForDCIFormat0\_1* is configured,- if invalid symbol pattern indicator field is set 1, the UE applies the invalid symbol pattern;- otherwise, the UE does not apply the invalid symbol pattern;- if the PUSCH is scheduled by DCI format 0\_2, or corresponds to a Type 2 configured grant activated by DCI format 0\_2, and if *InvalidSymbolPatternIndicator-ForDCIFormat0\_2* is configured,- if invalid symbol pattern indicator field is set 1, the UE applies the invalid symbol pattern;- otherwise, the UE does not apply the invalid symbol pattern;- otherwise, the UE applies the invalid symbol pattern.< Unchanged parts are omitted > |

* **FL suggestion:**

Not necessary to have the correction, the first sentence in current spec is simpler and including the DG and CG in general. In addition, following highlight “otherwise” include the case for Type 1.

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| 6.1.2.1 Resource allocation in time domainFor PUSCH repetition Type B, the UE determines invalid symbol(s) for PUSCH repetition Type B transmission as follows:< Unchanged parts are omitted > If *InvalidSymbolPattern* is configured, when the UE applies the invalid symbol pattern is determined as follows:-     if the PUSCH is scheduled by DCI format 0\_1, or corresponds to a Type 2 configured grant activated by DCI format 0\_1, and if *InvalidSymbolPatternIndicator-ForDCIFormat0\_1* is configured,-     if invalid symbol pattern indicator field is set 1, the UE applies the invalid symbol pattern;-     otherwise, the UE does not apply the invalid symbol pattern;-     if the PUSCH is scheduled by DCI format 0\_2, or corresponds to a Type 2 configured grant activated by DCI format 0\_2, and if *InvalidSymbolPatternIndicator-ForDCIFormat0\_2* is configured,-     if invalid symbol pattern indicator field is set 1, the UE applies the invalid symbol pattern;-     otherwise, the UE does not apply the invalid symbol pattern;- otherwise, the UE applies the invalid symbol pattern.< Unchanged parts are omitted > |

Any comments?

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| --- | --- |
| Company | View |
| ZTE | Agree with FL suggestion. |
| LG | We also think the TP is not necessary. |
| Huawei, HiSilicon | If all other companies think that the current spec is clear enough, we are also ok with the FL’s suggestion.  |
| Nokia, NSB | We agree with FL suggestionWe don’t see a need to be more specific, as anyhow DCI format 0\_1 cannot schedule PUSCH repetition Type B, so no need for this.  |
| Samsung | Agree with FL’s view |
| CATT | We are fine with FL’s comment |
| OPPO | Agree with FL suggestion. |
| Sony | Doesn’t “*PUSCH repetition Type B*” means that it can be “*scheduled by DCI format 0\_1, or scheduled by DCI format 0\_2, or corresponding to a configured grant*?” Hence we agree with FL that this is not needed. |
| Ericsson | Agree with FL suggestion |

# **Clarify the use of *codebookSubset* and *maxRank* for PUSCH transmission with a Type 1 CG**

* **Issue:**
	+ **[R1-2003526, Huawei] proposed following Text proposal for Clause 6.1.1.1 in TS 38.214 v16.0.0**

|  |
| --- |
| Text proposal for Clause 6.1.1.1 in TS 38.214 v16.1.0--------------------------------------- Start of Text Proposal ----------------------------------------------6.1.1.1 Codebook based UL transmission< Unchanged parts are omitted >For codebook based transmission, the UE determines its codebook subsets based on TPMI and upon the reception of higher layer parameter *codebookSubset* in *pusch-Config* for PUSCH corresponding to a Type 1 configured grant or associated with DCI format 0\_1, and *codebookSubset-ForDCIFormat0\_2* in *pusch-Config* for PUSCH associated with DCI format 0\_2 which may be configured with *'*fullyAndPartialAndNonCoherent*'*, or *'*partialAndNonCoherent*'*, or 'nonCoherent' depending on the UE capability. The maximum transmission rank may be configured by the higher layer parameter *maxRank* in *pusch-Config* for PUSCH corresponding to a Type 1 configured grant or associated with DCI format 0\_1, and *maxRank-ForDCIFormat0\_2* for PUSCH associated with DCI format 0\_2*.*< Unchanged parts are omitted >--------------------------------------------- End of Text Proposal ----------------------------------------- |

* **FL suggestions:**
	+ Since TS 38.214 section 6.1 already specifies the *codebookSubset* and *maxRank* for PUSCH transmission with a Type 1 CG should use the ones provided by *pusch-Config,* see below, the above text proposal is for better integrity. In addition, it seems more appropriate to be corrected in Rel.15. Therefore, the discussion priority for this issue can be low.

“For the PUSCH transmission corresponding to a Type 1 configured grant or a Type 2 configured grant activated by DCI format 0\_0 or 0\_1, the parameters applied for the transmission are provided by *configuredGrantConfig* except for *dataScramblingIdentityPUSCH*, *txConfig*, *codebookSubset*, *maxRank*, *scaling* of *UCI-OnPUSCH,* which are provided by *pusch-Config*.”

Any comments?

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| --- | --- |
| Company | View |
| ZTE | Agree with FL suggestion. |
| LG | Fine with the suggestion.  |
| Huawei, HiSilicon | We propose to adopt the TP. As we have explained in our contribution, this issue doesn’t exist in Rel-15, as in Rel-15 there is no DCI format 0\_2 which uses a different parameter (i.e. *codebookSubsetForDCI-Format0-2*) to determine the codebook subsets, and the current spec in Rel-15 (copied below) is quite clear without mentioning DCI format 0\_1.

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| For codebook based transmission, the UE determines its codebook subsets based on TPMI and upon the reception of higher layer parameter *codebookSubset* in *pusch-Config* which may be configured with *'*fullyAndPartialAndNonCoherent*'*, or *'*partialAndNonCoherent*'*, or 'nonCoherent' depending on the UE capability. The maximum transmission rank may be configured by the higher layer parameter *maxRank* in *pusch-Config.* |

 |
| Nokia, NSB | We agree with FL suggestion |
| Samsung | Agree with FL.  |
| CATT | We are fine with FL’s comment |
| OPPO | Agree with FL suggestion. |
| Ericsson | Agree with FL suggestion |

# **Interruption time for intra-UE prioritization**

* **Issue:**
	+ [R1-2004226, apple] made following proposals:
* **If configured grants are configured on both SUL/UL, an interruption time includes a switching time prior to the CG transmission occasion, the CG transmission occasion itself, and a switching time after the CG transmission occasion, otherwise the interruption time includes the CG transmission occasion;**
* **The UE does not expect a DG PUSCH overlapping with a CG’s interruption time if the PDCCH scheduling the DG PUSCH is less than N2 symbols away from start of the interruption time of the CG;**
* **When the PDCCH scheduling a DG transmission comes at least N2 symbols before the start of the CG interruption time:**
	+ **for a high priority DG overlapping with the CG transmission occasion’s interruption time, the DG transmission is prioritized;**
	+ **for a low priority DG overlapping with a low priority CG transmission occasion’s interruption time, the low priority DG is prioritized;**
	+ **for a low priority DG overlapping with a high priority CG transmission occasion’s interruption time, the low priority DG is dropped.**
* **FL’s views:**
	+ From my understanding, above interruption time does not specifically for CG configured in SUL/UL. It happens for any UL transmissions e.g. PUCCH, DG-PUSCH, SRS alternating in normal UL (NUL) and SUL. If the interrupting time is necessary to be defined considering the SUL, it should be first addressed in Rel.15. Usually, the SUL and NUL is inter band, hence, the impacts caused by interruption time seems small.
* **FL’s suggestion:**
	+ Above issue is low priority and not necessary to be handled in eCG session.

Any comments?

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| --- | --- | --- |
| **Company** | **Issue description**  | **Solution** |
| LG | As mentioned in R1-2004226 and by FL, the issue is common thing for UL transmissions in UL/SUL. For my understanding, gNB need to ensure the interruption time whenever the interruption time is needed. I think it is not necessary to specialize CG-DG case.  |  |
| Nokia, NSB | We agree with FL suggestionThis SUL/UL switching is nothing new and not specific toCG operation.  |  |
| Ericsson | Agree with FL suggestion |  |

# **Contributions and Proposals**

## [R1-2003322](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003322.zip) Remaining issues on enhancements for UL configured grant transmission ZTE

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| ***Proposal 1: In case of multiple overlapping CGs with different priorities, actual PHR calculation is based on the one with higher priority.***  |

## [R1-2003392](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003392.zip) Enhanced UL configured grant transmissions for URLLC vivo

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| **Proposal: adopt the following TP in 38.214.**

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| 6.1.2.3 Resource allocation for uplink transmission with configured grant<Unchanged parts are omitted>For PUSCH transmissions with a Type 1 or Type 2 configured grant, the number of (nominal) repetitions *K* to be applied to the transmitted transport block is provided by the indexed row in the time domain resource allocation table if *numberofrepetitions* is present in the table; otherwise *K* is provided by the higher layer configured parameters *repK.*If a UE is provided with more than one configuration for Type 1 and/or Type 2 configured grant, for a PUSCH transmissions with a configured grant configuration, when K ≥ 1, the UE shall transmit the TB across the transmission occasion candidates within the same configured grant configuration.<Unchanged parts are omitted> |

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## [R1-2003444](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003444.zip) Remaining Issue of Enhancements to UL Configured Grant Transmission for NR URLLC Ericsson

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| Proposal 1 Following previous agreement, change text to “UE determines a priority index from higher layer parameter priority”, reflecting the that the parameter comes from higher layers. |

## [R1-2003526](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003526.zip) Corrections on configured grant transmission Huawei, HiSilicon

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| ***Proposal 1: The procedure on the determination of time domain resource allocation for configured grant with PUSCH repetition Type B should be further clarified in the spec.******Proposal 2: The procedure on the determination of invalid symbol(s) for Type 1 configured grant with PUSCH repetition Type B should be further clarified in the spec.******Proposal 3: The use of higher layer parameter codebookSubset and maxRank for PUSCH transmission with a Type 1 configured grant should be clarified in the spec.***  |

## [R1-2003624](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2003624.zip) Remaining issues on enhanced UL configured grant transmission CATT

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| **Proposal 1: We needn’t capture any TP in RAN1 Spec on the agreement “In Rel-16, for both Type 1 and Type 2 configured grant and when multiple active configurations are configured in a BWP, transmission of a TB based on the configured grant is associated with a single active configuration, even if the transmission is repeated”****Proposal2: We needn’t capture any TP related to PHR for multiple CGs scenarios because current spec is clear to determine PHR for no CG transmission among multiple CG configurations.** |

## [R1-2004033](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2004033.zip) Remaining issues of Enhanced UL configured grant transmission for NR URLLC LG Electronics

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| Proposal 1: For PHR calculation, if multiple CGs are overlapped each other and UE has no scheduled UL transmission by DCI, UE choose one CG configuration by one or more following rule for PHR calculation:* UE chooses higher priority CG for PHR calculation if multiple CGs have different priorities.
* UE chooses CG has largest value of PUSCH power offset (P0-PUSCH-AlphaSet) if multiple CGs with the same priority have different open-loop power control parameter.
* UE chooses CG has lowest configuration index.
 |

## [R1-2004119](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2004119.zip) Configured grant enhancements for URLLC OPPO

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| **Proposal 1: Multiple configured grant configurations to be released by the joint release DCI could have different priorities.****Proposal 2: If initial transmission is cancelled due to overlapping, both initial transmission and related retransmission are cancelled. UE transmits data starting from next initial transmission. If retransmission is cancelled due to overlapping, only the overlapped retransmission is cancelled.****Proposal 3: Overlapping handling is per actual repetition.****Proposal 4: Cancellation timeline refers to the starting symbol of the earliest overlapped PUSCH repetition.** Figure 1 Overlapping handling for overlapping initial transmission  Figure 2 Overlapping handling for overlapping retransmission |

## [R1-2004226](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_101%5CDocs%5CR1-2004226.zip) Remaining Issues in Enhanced Configured Grant Transmission Apple

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| **Proposal:*** **If configured grants are configured on both SUL/UL, an interruption time includes a switching time prior to the CG transmission occasion, the CG transmission occasion itself, and a switching time after the CG transmission occasion, otherwise the interruption time includes the CG transmission occasion;**
* **The UE does not expect a DG PUSCH overlapping with a CG’s interruption time if the PDCCH scheduling the DG PUSCH is less than N2 symbols away from start of the interruption time of the CG;**
* **When the PDCCH scheduling a DG transmission comes at least N2 symbols before the start of the CG interruption time:**
	+ **for a high priority DG overlapping with the CG transmission occasion’s interruption time, the DG transmission is prioritized;**
	+ **for a low priority DG overlapping with a low priority CG transmission occasion’s interruption time, the low priority DG is prioritized;**
	+ **for a low priority DG overlapping with a high priority CG transmission occasion’s interruption time, the low priority DG is dropped.**

A screenshot of a cell phone  Description automatically generatedFigure 3 CG transmission with 2 switching times |

6-23 Incapability motivated by impacts of PA phase discontinuity with overlapping transmissions with non-aligned starting or ending times or hop boundaries across carriers for intra-band EN-DC, intra-band CA, and FDM based ULSUP

SUL usually it is inter-band bw NUL and SUL, so no problem