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

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

Source: moderator (vivo)

Title: Feature lead summary NRU-CG-02

Agenda Item: 7.2.2.2.4

Document for: Discussion and Decision

1. Introduction

Following email thread is assigned:

[100b-e-NR-unlic-NRU-CG-02] Email discussion/approval on following issues by 4/24; if necessary, followed by endorsing the corresponding TPs by 4/29 – Rakesh (Vivo)

* PUSCH repetition transmission related issues for NRU configured grant
* RV determination for CG repetition

1. Discussion on topic#2
   1. Issue 2: The PUSCH repetition transmission related issues for NRU configured grant

### 2.2.1 TP1

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===================TP for 38.214 6.1.2.3.1================

6.1.2.3.1 Transport Block repetition for uplink transmissions of PUSCH repetition Type A with a configured grant

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

For both Type 1 and Type 2 PUSCH transmissions with a configured grant, when the UE is configured with *repK >* 1*,* the UE shall repeat the TB across the *repK* consecutive slots applying the same symbol allocation in each slot, except if the UE is provided with higher layer parameters *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16*, in which case the UE repeats the TB in the *repK* earliest consecutive transmission occasion candidates within the same configuration. For operation with shared spectrum channel access, where the UE is provided with higher layer parameters *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16*  and *repK>1,* the UE shall perform the transmission of the first repetition in the earliest transmission occasion for which the related channel procedure described in 37.213 is successful.A Type 1 or Type 2 PUSCH transmission with a configured grant in a slot is omitted according to the conditions in Subclause 11.1 of [6, TS38.213].

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

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### 2.2.2 TP2

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For both Type 1 and Type 2 PUSCH transmissions with a configured grant, when *K >* 1*,* the UE shall repeat the TB across the *K* consecutive slots applying the same symbol allocation in each slot, except if the UE is provided with higher layer parameters *cg-nrofSlots-r16* and or *cg-nrofPUSCH-InSlot-r16*, in which case the UE repeats the TB in the *repK* earliest consecutive transmission occasion candidates within the same configuration if the *repK* earliest consecutive transmission occasion candidates are within the same configuration period. If the *repK* earliest consecutive transmission occasion candidates are not within the same configuration period, the UE repeats the TB at least in the consecutive transmission occasion candidates within the same configuration period. A Type 1 or Type 2 PUSCH transmission with a configured grant in a slot is omitted according to the conditions in Subclause 11.1 of [6, TS38.213].

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### 2.2.3 TP3

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The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions. For operation without shared spectrum channel access, ~~I~~if the parameter *repK-RV* is not provided in the *configuredGrantConfig*, the redundancy version for uplink transmissions with a configured grant shall be set to 0. Otherwise, for the *n*th transmission occasion among *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. If a configured grant configuration is configured with *Configuredgrantconfig-StartingfromRV0* set to *‘off’*, the initial transmission of a transport block may only start at the first transmission occasion of the *K* repetitions. Otherwise, the initial transmission of a transport block may start at

- the first transmission occasion of the *K* repetitions if the configured RV sequence is {0,2,3,1},

- any of the transmission occasions of the *K* repetitions that are associated with RV=0 if the configured RV sequence is {0,3,0,3},

- any of the transmission occasions of the *K* repetitions if the configured RV sequence is {0,0,0,0}, except the last transmission occasion when *K≥8*.

For operation with shared spectrum channel access, the initial transmission of a transport block may start at any transmission occasion of the *K* repetitions with RV=0. If the parameter *repK-RV* is not provided in the *configuredGrantConfig*, the redundancy version for uplink transmission with a configured grant is determined by the UE. Otherwise, for the *n*th transmission among at most *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence.

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TP1, TP2, TP3 are discussing similar issues, thus they are discussed together. Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | Comments |
| ZTE | We think TP1 is sufficient and we support it.  We do not see the need of TP2.  TP3 should be discussed together with Issue 12. And we prefer to adopt the TP in section 2.2 rather than this one. |
| Intel | 1. TP1: given that along the specification there is no specific text defining the way how the UE should map or handle the transmissions of multiple repetitions in case of LBT failure, we see the need of this text. 2. TP2: we think the current specification text is already quite clear. However, we believe that the “and”, should be replaced by “or” between parameters *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16* as proposed in this TP:   For both Type 1 and Type 2 PUSCH transmissions with a configured grant, when *K >* 1*,* the UE shall repeat the TB across the *K* consecutive slots applying the same symbol allocation in each slot, except if the UE is provided with higher layer parameters *cg-nrofSlots-r16* or *cg-nrofPUSCH-InSlot-r16*, in which case the UE repeats the TB in the *repK* earliest consecutive transmission occasion candidates within the same configuration.   1. TP3: We do not support this text. Also we believe that this TP lies in the same topic as that threated in Sec. 2.2, and we prefer the text in that section.   [Intel 2]: We would like to highlight that the intention of TP1 is to clarify in which order the UE should perform LBT and map the CG repetitions over the configured resources, and whether the second should be performed after the LBT is performed. According with the order followed by the UE in performing the two operations, this will lead to two different behaviors. For example, let’s consider the case when 8 consecutive PUSCHs are configured by a CG configuration and repK=4. By using Rel.15 mapping, the repetitions should be mapped as illustrated in Fig. 1. However, if the LBT fails for the first two PUSCH occasions, it is unclear on whether the UE will flash-out from its buffer the PUSCH repetition configured to be transmitted on the PUSCH occasion for which the LBT has failed (option 1), or it will postpone that transmission to the first available PUSCH occasion, and eventually transmit the last two PUSCH repetitions in later resources within the same CG configuration (option 2).    Regardless of which operation will be chosen, it would be good to clarify whether the mapping of the repetitions will follow Rel.15 or not, and in the latter the mapping will be performed after the LBT operation.  As for comments from E/// and QC related to TP1:   1. According to E//’s comments this is already covered in 37.213, and it will be very appreciated if they could share or point out the exact text they are referring to. From our perspective, 37.213 does not capture this essential behavior. 2. As for QC’s comment, our intention is to clarify the order of occurrence of the two operations (e.g., LBT procedure and mapping of the repetitions). In particular, we would like to clarify that the CG PUSCH repetitions will be mapped on resources for which the LBT has succeeded. If it is clarified, we can leaven up to the UE’s implementation on how and when to transmit the last PUSCHs if these do not fit within the consecutive CG resources over which the transmission burst was initiated. |
| NTT DOCOMO | OK with TPs 1 and 2. TP3 should be discussed together with Issue #12. |
| LG | TP1 can be adopted to clarify the UE behavior for PUSCH repetition by CG resource but TP2 seems not necessary. We think that TP3 can be treated in section 2.2. |
| Huawei, HiSilicon | TP1: It is important to capture the channel access behavior with multiple transmission occasions, preferably in ‘TS37.213 consecutive UL’. Nevertheless, the conditions for the desired behavior in TP1 have been restated, i.e., “For operation with shared spectrum channel access, where the UE is provided with higher layer parameters *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16*  and *repK>1,* …”. It might lead to ambiguity as to whether or not the previous behavior “the UE repeats the TB in the *repK* earliest consecutive transmission occasion candidates within the same configuration.” applies to “operation with shared spectrum access”. Some modification to the wording can be considered if agreed.  TP2: It targets a different behavior (termination) and could be adopted if the understanding of the group is that the following statement in a preceding paragraph of the same subclause 6.1.2.3.1 is not sufficient:  “For any RV sequence, the repetitions shall be terminated after transmitting *K* repetitions, or at the last transmission occasion among the *K* repetitions within the period *P*, or from the starting symbol of the repetition that overlaps with a PUSCH with the same HARQ process scheduled by DCI format 0\_0, 0\_1 or 0\_2, whichever is reached first.”  TP3: We think that it belongs to Issue 12 in Section 2.2 |
| Sony | We think TP1 is OK but TP2 is not necessary. TP3 should be discussed together with Issue #12. |
| Samsung | We are fine with TP1, but TP2 is unnecessary since the current specification is clear. We think TP3 should be discussed in Section 2.2. |
| Lenovo,  Motorola Mobility | TP1 is fine with us.  TP2: not needed.  TP3: Agree to discuss in Issue 12. |
| Nokia, NSB | TP1: this looks ok (need to clarify other repetitions)  TP2: this does not seem necessary  TP3: We agree this can be discussed together with Issue 12. |
| OPPO | TP1: We are fine to support this TP if the following modification is considered:  For operation with shared spectrum channel access, where the UE is provided with higher layer parameters *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16* and *repK>1,* the UE shall perform the transmission of the first repetition with RV=0 in the earliest transmission occasion for which the related channel procedure described in 37.213 is successful.  TP2: If we have modified TP1, TP2 is not needed.  TP3: It can be discussed in Issue 12. |
| Ericsson | TP1: We disagree with this TP. The key word in the current text is “earliest”. Please note that the PUSCH transmission, like SR, on a configured resource is up to UE. That include also whether the UE succeeds with LBT or not. Furthermore, we have to look at all the specifications together. What it is suggested here, is covered in 37.213 and we should not repeat the same operation here as well.  TP2: TP is not needed. The current spec, clearly states that when a repetition of a TP starts, it would be confined within the same configuration based on agreement. The TP introduces some new rules that are not agreed to our understanding.  TP3: This TP should be considered with other TPS in section 2.2. |
| Qualcomm | TP1. Not sure we need this. Isn’t this UE implementation (transmit as early as possible when the channel access passes)?  TP2. This is simply to implement the agreement in RAN1 #99 that UE may drop repetition falls into the next configuration period. What HW identified in 6.1.2.3.1 is another candidate location to capture this. A possible TP is  “For any RV sequence, the repetitions shall be terminated after transmitting *K* repetitions, or at the last transmission occasion ~~among the~~ *~~K~~* ~~repetitions~~ within the period *P*, or from the starting symbol of the repetition that overlaps with a PUSCH with the same HARQ process scheduled by DCI format 0\_0, 0\_1 or 0\_2, whichever is reached first.”  Additionally, in TP2, we need to change “*cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16*” to “*cg-nrofSlots-r16* or *cg-nrofPUSCH-InSlot-r16*” consider this two RRC parameters are not always both configured.  TP3. Agree we can discuss with issue 12. |
| vivo | TP1, we are OK.  TP2, we don’t see the need.  TP3, we can discuss with issue 12. |

**Observation1:**

According to the comments from companies, majority of companies are supportive of TP 1, 2 companies commented whether it is needed and similar text has been captured in 37.213. Almost all companies commented that TP2 is not needed. All companies agreed that TP3 is to be discussed together with issue 12 in section 2.2

**Proposal1:**

* Do not consider the following TP as there is no consensus among the group on the necessity of introducing the TP

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===================TP for 38.214 6.1.2.3.1================

6.1.2.3.1 Transport Block repetition for uplink transmissions of PUSCH repetition Type A with a configured grant

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

For both Type 1 and Type 2 PUSCH transmissions with a configured grant, when the UE is configured with *repK >* 1*,* the UE shall repeat the TB across the *repK* consecutive slots applying the same symbol allocation in each slot, except if the UE is provided with higher layer parameters *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16*, in which case the UE repeats the TB in the *repK* earliest consecutive transmission occasion candidates within the same configuration. For operation with shared spectrum channel access, where the UE is provided with higher layer parameters *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16*  and *repK>1,* the UE shall perform the transmission of the first repetition in the earliest transmission occasion for which the related channel procedure described in 37.213 is successful.A Type 1 or Type 2 PUSCH transmission with a configured grant in a slot is omitted according to the conditions in Subclause 11.1 of [6, TS38.213].

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

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Reason for change: the specification is not clear on the UE behavior on transmission occasions for multiple repetition in the case of LBT failure.

Summary of change: clarify in the specification that the UE transmits first repetition in the earliest occasion where LBT is successful.

Consequences if not approved: the UE behavior for transmission repetition is unclear

Clauses affected: 38.214, section 6.1.2.3.1

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| --- | --- |
| Company/organization | Comments |
| OPPO | We propose the following modification on the TP.  For operation with shared spectrum channel access, where the UE is provided with higher layer parameters *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16*  and *repK>1,* the UE shall perform the transmission of the first repetition with RV=0 in the earliest transmission occasion for which the related channel procedure described in 37.213 is successful.  The reason for this proposal is that we think the first repetition should start with RV=0. The benefit is that the gNB can start to decode from the first repetition and if the gNB successfully decodes it, the gNB can send the DFI to terminate the repetition as earlier as possible.  If the UE does not select the RV=0 as the first repetition, we feel it is contradicting to the design of CG-PUSCH repetition early termination that we have been discussing for a couple of meetings. |
| Huawei, HiSilicon | Agree with the Proposal. Exact wording can be discussed |
| Intel | Agree with the proposal. As for adding additional text to specify RV=0 for the initial transmission, this may not be needed. For a CG UE, we already agreed that the choice of the RV would be purely up to UE’s implementation, and a smart UE will always pick anyway RV=0 for the initial transmission. |
| LG | We agree with the proposal and the comments from Intel. |
| vivo | We agree with the proposal and the comments from Intel. |
| Ericsson | We commented during prep phase that this TP is not needed.  I repeat our previous comments.  TP1: We disagree with this TP. The key word in the current text is “earliest”. Please note that the PUSCH transmission, like SR, on a configured resource is up to UE. That include also whether the UE succeeds with LBT or not. Furthermore, we have to look at all the specifications together. What it is suggested here, is covered in 37.213 and we should not repeat the same operation here as well. |

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Proposal:

* UE terminates the repetitions if an explicit feedback indicating ACK in the DFI is received for the HARQ process not only for CG-PUSCH but also for DG-PUSCH.

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Please provide your views/comments in the table below

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| --- | --- |
| Company/organization | Comments |
| ZTE | The proposal itself is not that clear.  By reading the contribution [2435], we understanding the intention is to terminate the slot aggregation for DG-PUSCH if the DFI includes an ACK indication for that HARQ process.  As DFI is introduced mainly for CG-PUSCH, We are not sure if this optimization for DG-PUSCH is necessary. |
| Intel | We do not support this TP, and we believe this is an optimization which is not needed for the essential operation of the design. Also this type of operation would require additional discussions to distinguish the case when a GB-PUSCH is TB or per CBG based, given that the DFI provides feedback information at the TB level. |
| NTT DOCOMO | As the timeline (i.e., minimum duration, D) between DG-PUSCH repetitions and valid ACK/NACK in CG-DFI has been agreed as well as CG-PUSCH repetitions, we think the termination of DG-PUSCH repetitions by CG-DFI should be supported as well as CG-PUSCH. We proposed corresponding TP in our contribution (R1-2002435) as below:  TS38.214  == Start ==  6.1.2.1 Resource allocation in time domain  <omitted text>  For PUSCH repetition Type A, in case *K>1,* the same symbol allocation is applied across the *K* consecutive slots and the PUSCH is limited to a single transmission layer. The UE shall repeat the TB across the *K* consecutive slots applying the same symbol allocation in each slot. The redundancy version to be applied on the *n*th transmission occasion of the TB, where n = 0, 1, … *K*-1, is determined according to table 6.1.2.1-2. The UE shall terminate the repetition of a transport block in a PUSCH transmission if the UE receives a DCI format 0\_1 with DFI flag provided and set to '1', and if in this DCI the UE detects ACK for the HARQ process corresponding to that transport block.  <omitted text>  For PUSCH repetition Type B, after determining the invalid symbol(s) for PUSCH repetition type B transmission for each of the *K* nominal repetitions, the remaining symbols are considered as potentially valid symbols for PUSCH repetition Type B transmission. If the number of potentially valid symbols for PUSCH repetition type B transmission is greater than zero for a nominal repetition, the nominal repetition consists of one or more actual repetitions, where each actual repetition consists of a consecutive set of potentially valid symbols that can be used for PUSCH repetition Type B transmission within a slot. An actual repetition with a single symbol is omitted except for the case of *L*=1. An actual repetition is omitted according to the conditions in Clause 11.1 of [6, TS38.213]. The redundancy version to be applied on the *n*th actual repetition (with the counting including the actual repetitions that are omitted) is determined according to table 6.1.2.1-2. The UE shall terminate the repetition of a transport block in a PUSCH transmission if the UE receives a DCI format 0\_1 with DFI flag provided and set to '1', and if in this DCI the UE detects ACK for the HARQ process corresponding to that transport block.  <omitted text>  == End ==  Even if this is not supported, Section 6.1 in 38.214 as shown below should be modified so that an ACK/NACK in CG-DFI is used to terminate a TB repetition in a CG-PUSCH only.  If a UE receives an ACK for a given HARQ process in CG-DFI in a PDCCH ending in symbol *i* to terminate a transport block repetition in a PUSCH transmission on a given serving cell with the same HARQ process after symbol *i*, the UE is expected to terminate the repetition of the transport block in a PUSCH transmission starting from a symbol *j* if the gap between the end of PDCCH of symbol *i* and the start of the PUSCH transmission in symbol *j* is equal to or more than *N2* symbols. The value *N2* in symbols is determined according to the UE processing capability defined in Clause 6.4, and *N2* and the symbol duration are based on the minimum of the subcarrier spacing corresponding to the PUSCH and the subcarrier spacing of the PDCCH indicating CG-DFI. |
| LG | The proposal is not necessary. Because the purpose of HARQ-ACK for DG-PUSCH in CG-DFI is mainly the UL CWS adjustment, it seems an optimization issue rather than essential. |
| Huawei, HiSilicon | Agree with LG. Furthermore, unlike the CG repetitions which may be transmitted on non-contiguous consecutive transmission occasions, the slot-aggregated PUSCHs are always contiguous in time. Given the requirement of cg-minDFIdelay-r16 symbols from the end of the PUSCH before determining a valid ACK, such an early termination enhancement for slot aggregation is not a priority.  For the spec quoted by NTT DOCOMO from Section 6.1 in 38.214, if the understanding of the group is that it applies to both CG-PUSCH and DG-PUSCH, then the proposed enhancement is already supported. |
| Sony | We think this proposal is not necessary since it seems optimization. |
| Samsung | As commented by other companies, it is an optimization functionality, so we don’t think this proposal is necessary. |
| Nokia, NSB | The functionality does not seem crucial |
| OPPO | Agree with LG |
| Ericsson | We don’t see the need for this functionality. |
| Qualcomm | Agree with LG |
| vivo | Agree with LG. |

**Observation2:**

According to the comments from companies, almost all companies agree that this proposal is not needed. With this agreement, a TP might be need to clarify that the termination only applies to CG-PUSCH.

**Proposal2:**

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If a UE receives an ACK for a given HARQ process in CG-DFI in a PDCCH ending in symbol *i* to terminate a transport block repetition in a PUSCH transmission with a configured grant on a given serving cell with the same HARQ process after symbol *i*, the UE is expected to terminate the repetition of the transport block in a PUSCH transmission starting from a symbol *j* if the gap between the end of PDCCH of symbol *i* and the start of the PUSCH transmission in symbol *j* is equal to or more than *N2* symbols. The value *N2* in symbols is determined according to the UE processing capability defined in Clause 6.4, and *N2* and the symbol duration are based on the minimum of the subcarrier spacing corresponding to the PUSCH and the subcarrier spacing of the PDCCH indicating CG-DFI.

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Reason for change: during the email discussion in RAN1#100b-e, it is agreed that when a UE receives an ACK for a given HARQ process in CG-DFI in a PDCCH ending in a symbol i to terminate a transport block repetition in a PUSCH transmission is only applicable for CG-PUSCH.

Summary of change: clarify in the specification that termination of transport block repetition in a PUSCH transmission is only applicable for configured grant PUSCH.

Consequences if not approved: the UE behavior of termination of transport block repetition is unclear.

Clauses affected: 38.214, section 6.1

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| --- | --- |
| Company/organization | Comments |
| OPPO | OK |
| Huawei, HiSilicon | Agree with the proposal |
| Intel | We are supportive of the above proposal and TP. |
| LG | We agree with the proposal. |
| vivo | Ok with the proposal |
| Ericsson | OK with proposal |

* 1. Issue 12: RV determination for CG repetition (Editorial/clarification)

### 2.12.1 TP1

TP for 38.214

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6.1.2.3.1 Transport Block repetition for uplink transmissions of PUSCH repetition Type A with a configured grant

The procedures described in this clause apply to PUSCH transmissions of PUSCH repetition Type A with a Type 1 or Type 2 configured grant.

The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions. If the parameter *repK-RV* is not provided in the *configuredGrantConfig* and cg-RetransmissionTimer is not provided, the redundancy version for uplink transmissions with a configured grant shall be set to 0. If cg-RetransmissionTimer is provided, the redundancy version for uplink transmission with a configured grant is determined by the UE. If the parameter repK-RV is provided in the configuredGrantConfig and cg-RetransmissionTimer is not provided. ~~Otherwise~~, for the *n*th transmission occasion among *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. If a configured grant configuration is configured with *Configuredgrantconfig-StartingfromRV0* set to *'off'*, the initial transmission of a transport block may only start at the first transmission occasion of the *K* repetitions. Otherwise, the initial transmission of a transport block may start at

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Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | We think the three TPs are with the same meaning, and we are fine to adopt either of them.  For TP1, there is an extra full stop which should be removed, i.e. “is not provided~~.~~” |
| Intel | All the three TPs within this section are equivalent, and we have a slight preference in supporting TP2, but any of them would work OK. |
| NTT DOCOMO | OK with either of TPs 1,2,3 |
| LG | Since all three TPs address the same issue, we are fine with any of them, but TP2 is slightly preferred. |
| Huawei, HiSilicon | TP1, TP2 and TP3 in this section aim at capturing the same RV behavior which is important to be captured. However, it is not clear why all of the 3 TPs rely on providing the parameter *cg-RetransmissionTimer* to distinguish the NR-U case whereas the same subclause has already used other NR-U parameters such as *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16* to make such a distinction, which actually seem to be more relevant in that context than the *cg-RetransmissionTimer.* Why is it necessary to introduce such inconsistency in the same subclause?  It is also worth noting that TP3 in Section 2.1 of this summary captures the same behavior without inserting multiple if statements conditioned upon any the above parameters. |
| Sony | Although all three TPs can work, TP2 is preferable. |
| Samsung | We are fine with TP1, TP2, and TP3 since they clarify the same issue well. But, we have similar view with Huawei regarding *cg-RetransmissionTimer*. We hope to be clarified why the *cg-RetransmissionTimer* is used for these TPs. |
| Lenovo,  Motorola Mobility | Yes, we share same concern with Huawei. Relying on cg-Retransmission Timer is not clear to us. |
| Nokia, NSB | All TPs are somewhat similar. TP2 is slight preferred due to clarity. |
| OPPO | TP1, TP2 and TP3 in this section address RV behavior in NR-U. In our view, the RV determination behavior in unlicensed spectrum is different from licensed spectrum, so we prefer to address RV determination behavior separately.  For CG repetition transmission in NR-U, generally the parameter *repK-RV* is not expected to be configured and the RV can be determined by UE. However, if the UE is configured with the parameter *repK-RV*, it is preferred that the UE shall follow the configuration to determine RV for repetition transmissions. So we have the following proposal:  For operation with shared spectrum channel access, if the parameter *repK-RV* is not provided in the *configuredGrantConfig*, the redundancy version for uplink transmission with a configured grant is determined by the UE. Otherwise, for the *n*th transmission among at most *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. |
| Ericsson | We prefer either TP1 or TP2 here over TP3 in section 2.2.3 (which we don’t prefer).  We have slight preference towards TP1 since it reads better. In TP2, the sentence “The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions.”, seems to be hanging in the middle. |
| Qualcomm | We prefer TP2 |
| vivo | We prefer TP1 or TP2. |

### 2.12.2 TP2

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The procedures described in this clause apply to PUSCH transmissions of PUSCH repetition Type A with a Type 1 or Type 2 configured grant.

If *cg-RetransmissionTimer* is provided, the redundancy version for uplink transmission with a configured grant is determined by the UE.

The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions. If the parameter *repK-RV* is not provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, the redundancy version for uplink transmissions with a configured grant shall be set to 0. ~~Otherwise~~ If the parameter *repK-RV* is provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, for the *n*th transmission occasion among *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. If a configured grant configuration is configured with *Configuredgrantconfig-StartingfromRV0* set to *‘off’*, the initial transmission of a transport block may only start at the first transmission occasion of the *K* repetitions. Otherwise, the initial transmission of a transport block may start at

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Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | We think the three TPs are with the same meaning, and we are fine to adopt either of them. |
| Intel | All the three TPs within this section are equivalent, and we have a slight preference in supporting TP2, but any of them would work OK. |
| NTT DOCOMO | OK with either of TPs 1,2,3 |
| LG | Since all three TPs address the same issue, we are fine with any of them, but TP2 is slightly preferred. |
| Huawei, HiSilicon | TP1, TP2 and TP3 in this section aim at capturing the same RV behavior which is important to be captured. However, it is not clear why all of the 3 TPs rely on providing the parameter *cg-RetransmissionTimer* to distinguish the NR-U case whereas the same subclause has already used other NR-U parameters such as *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16* to make such a distinction, which actually seem to be more relevant in that context than the *cg-RetransmissionTimer.* Why is it necessary to introduce such inconsistency in the same subclause?  It is also worth noting that TP3 in Section 2.1 of this summary captures the same behavior without inserting multiple if statements conditioned upon any the above parameters. |
| Sony | Although all three TPs can work, TP2 is preferable. |
| Samsung | We are fine with TP1, TP2, and TP3 since they clarify the same issue well. But, we have similar view with Huawei regarding *cg-RetransmissionTimer*. We hope to be clarified why the *cg-RetransmissionTimer* is used for these TPs. |
| Lenovo,  Motorola Mobility | Yes, we share same concern with Huawei. Relying on cg-Retransmission Timer is not clear to us. |
| Nokia, NSB | All TPs are somewhat similar. TP2 is slight preferred due to clarity. |
| OPPO | TP1, TP2 and TP3 in this section address RV behavior in NR-U. In our view, the RV determination behavior in unlicensed spectrum is different from licensed spectrum, so we prefer to address RV determination behavior separately.  For CG repetition transmission in NR-U, generally the parameter *repK-RV* is not expected to be configured and the RV can be determined by UE. However, if the UE is configured with the parameter *repK-RV*, it is preferred that the UE shall follow the configuration to determine RV for repetition transmissions. So we have the following proposal:  For operation with shared spectrum channel access, if the parameter *repK-RV* is not provided in the *configuredGrantConfig*, the redundancy version for uplink transmission with a configured grant is determined by the UE. Otherwise, for the *n*th transmission among at most *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. |
| Ericsson | We prefer either TP1 or TP2 here over either of TP3 (both in in section 2.2.3 and here).  TP1 and TP2 are more aligned with the rest of the specification.  We have slight preference towards TP1 since it reads better. In TP2, the sentence “The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions.”, seems to be hanging in the middle. |
| Qualcomm | We prefer TP2 |
| vivo | We prefer TP1 or TP2. |

### 2.12.3 TP3

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The procedures described in this clause apply to PUSCH transmissions of PUSCH repetition Type A with a Type 1 or Type 2 configured grant.

If *cg-RetransmissionTimer* is provided, the redundancy version for uplink transmission with a configured grant is determined by the UE. Otherwise, the higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions when the *cg-RetransmissionTimer* is not configured, for the *n*th transmission occasion among *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. If the parameter repK-RV is not provided in the configuredGrantConfig and cg-RetransmissionTimer is not provided, the redundancy version for uplink transmissions with a configured grant shall be set to 0. If a configured grant configuration is configured with *Configuredgrantconfig-StartingfromRV0* set to *'off'*, the initial transmission of a transport block may only start at the first transmission occasion of the *K* repetitions. Otherwise, the initial transmission of a transport block may start at

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Please provide your views/comments in the table below

|  |  |
| --- | --- |
| Company/organization | comments |
| ZTE | We think the three TPs are with the same meaning, and we are fine to adopt either of them. |
| Intel | All the three TPs within this section are equivalent, and we have a slight preference in supporting TP2, but any of them would work OK. |
| NTT DOCOMO | OK with either of TPs 1,2,3 |
| LG | Since all three TPs address the same issue, we are fine with any of them, but TP2 is slightly preferred. |
| Huawei, HiSilicon | TP1, TP2 and TP3 in this section aim at capturing the same RV behavior which is important to be captured. However, it is not clear why all of the 3 TPs rely on providing the parameter *cg-RetransmissionTimer* to distinguish the NR-U case whereas the same subclause has already used other NR-U parameters such as *cg-nrofSlots-r16* and *cg-nrofPUSCH-InSlot-r16* to make such a distinction, which actually seem to be more relevant in that context than the *cg-RetransmissionTimer.* Why is it necessary to introduce such inconsistency in the same subclause?  It is also worth noting that TP3 in Section 2.1 of this summary captures the same behavior without inserting multiple if statements conditioned upon any the above parameters. |
| Sony | Although all three TPs can work, TP2 is preferable. |
| Samsung | We are fine with TP1, TP2, and TP3 since they clarify the same issue well. But, we have similar view with Huawei regarding *cg-RetransmissionTimer*. We hope to be clarified why the *cg-RetransmissionTimer* is used for these TPs. |
| Lenovo,  Motorola Mobility | Yes, we share same concern with Huawei. Relying on cg-Retransmission Timer is not clear to us. |
| Nokia, NSB | All TPs are somewhat similar. TP2 is slight preferred due to clarity. |
| OPPO | TP1, TP2 and TP3 in this section address RV behavior in NR-U. In our view, the RV determination behavior in unlicensed spectrum is different from licensed spectrum, so we prefer to address RV determination behavior separately.  For CG repetition transmission in NR-U, generally the parameter *repK-RV* is not expected to be configured and the RV can be determined by UE. However, if the UE is configured with the parameter *repK-RV*, it is preferred that the UE shall follow the configuration to determine RV for repetition transmissions. So we have the following proposal:  For operation with shared spectrum channel access, if the parameter *repK-RV* is not provided in the *configuredGrantConfig*, the redundancy version for uplink transmission with a configured grant is determined by the UE. Otherwise, for the *n*th transmission among at most *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. |
| Ericsson | We prefer either TP1 or TP2 here over either of TP3 (both in in section 2.2.3 and here).  TP1 and TP2 are more aligned with the rest of the specification.  We have slight preference towards TP1 since it reads better. In TP2, the sentence “The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions.”, seems to be hanging in the middle. |
| Qualcomm | We prefer TP2 |
| vivo | We prefer TP1 or TP2. |

**Observation3:**

All companies agree that TP3 in section 2.2.3 in this summary is addressing same issue thus discussed together. According to the comments from companies it seems TP2 in above seems agreeable to all.

**Proposal3:**

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The procedures described in this clause apply to PUSCH transmissions of PUSCH repetition Type A with a Type 1 or Type 2 configured grant.

The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions. If *cg-RetransmissionTimer* is provided, the redundancy version for uplink transmission with a configured grant is determined by the UE, except for the redundancy version of the first repetition that is set to 0 . If the parameter *repK-RV* is not provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, the redundancy version for uplink transmissions with a configured grant shall be set to 0. ~~Otherwise~~ If the parameter *repK-RV* is provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, for the *n*th transmission occasion among *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. If a configured grant configuration is configured with *Configuredgrantconfig-StartingfromRV0* set to *‘off’*, the initial transmission of a transport block may only start at the first transmission occasion of the *K* repetitions. Otherwise, the initial transmission of a transport block may start at

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Reason for change: the RV determination behavior in unlicensed spectrum is different from licensed spectrum, thus differentiation of behaviors in the specification is necessary.

Summary of change: clarify in the specification that the UE determines redundancy version in unlicensed spectrum, and the higher layer configured redundancy version is applicable for licensed spectrum.

Consequences if not approved: the UE behavior for determination of redundancy version in unlicensed spectrum is unclear

Clauses affected: 38.214, section 6.1.2.3.1

|  |  |
| --- | --- |
| Company/organization | Comments |
| OPPO | We think the UE is supposed to transmit RV=0 for the initial transmission, otherwise, it does not seem to make sense. Therefore, we propose the following changes.  -------------------------------------------------------------  The procedures described in this clause apply to PUSCH transmissions of PUSCH repetition Type A with a Type 1 or Type 2 configured grant.  If *cg-RetransmissionTimer* is provided, the redundancy version for uplink transmission with a configured grant is set to 0 in case of initial transmission, or determined by the UE, otherwise.  ----------------------------------------------------------------- |
| Huawei, HiSilicon | In Observation3, “TP2 in above seems agreeable to all”, our understanding is that the RV determination behavior for the NR-U case seems to be agreeable.  However, some companies including us are concerned about consistency/confusion relying on the *cg-RetransmissionTimer* in the same subclause wherein other NR-U parameters are used to distinguish the NR-U case. |
| Intel | We are OK with the above proposal and TP.  As for the dispute related to the use of the *cg-RetransmissionTimer* as a mean to indicate that a UE would be operating in the unlicensed spectrum, RAN2 has recently made an agreement (R2-2003804) indicating that the retransmission timer is configured only for configured grant operation in unlicensed spectrum. For convenience, find the agreement in the following:  From RAN2 point of view, retransmission timer for configured grant is used for only NR operation with shared spectrum channel access.  Also our understanding is that the parameter *cg-RetransmissionTimer* has been already used in the spec in other occasions in order to distinguish between the licensed and unlicensed spectrum operation. One example is for instance in Sec. 5.4.1 of 38.321, where the parameter *cg-RetransmissionTimer* is used in order to reflect how the UE choses HARQ-IDs when this operates in the unlicensed spectrum:  For configured uplink grants neither configured with *harq-ProcID-Offset2* nor with *cg-RetransmissionTimer*, the HARQ Process ID associated with the first symbol of a UL transmission is derived from the following equation:  HARQ Process ID = [floor(CURRENT\_symbol/*periodicity*)] modulo *nrofHARQ-Processes*  For configured uplink grants with *harq-ProcID-Offset2*, the HARQ Process ID associated with the first symbol of a UL transmission is derived from the following equation:  HARQ Process ID = [floor(CURRENT\_symbol / *periodicity*)] modulo *nrofHARQ-Processes* + *harq-ProcID-Offset2*  where CURRENT\_symbol = (SFN × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot* + slot number in the frame × *numberOfSymbolsPerSlot* + symbol number in the slot), and *numberOfSlotsPerFrame* and *numberOfSymbolsPerSlot* refer to the number of consecutive slots per frame and the number of consecutive symbols per slot, respectively as specified in TS 38.211 [8].  For configured uplink grants configured with *cg-RetransmissionTimer*, the UE implementation select an HARQ Process ID among the HARQ process IDs available for the configured grant configuration  Therefore, from our perspective, as mentioned above we are OK with the FL TP, and it is OK to use in this case the parameter *cg-RetransmissionTimer* to distinguish between operation in licensed and unlicensed spectrum. |
| LG | We are Ok with the proposal and agree with Intel. |
| OPPO | Respond to Intel’s comment. I checked with our RAN2 colleagues, it seems that the common understanding is RAN2 is that so far the features designed in NRU can only be used for NRU. But whether or not these features can be extended should leave for further discussion. I also quote the agreement below for your convenience.   |  | | --- | | Agreement from RAN2:  As a baseline, NR-U features are applied to unlicensed operation. Whether the NR-U specific features can be applied to licensed operation has to be discussed on a case-by-case basis (likely in the main session). |   But we would suggest that we won’t further dispute on this. There is a simple solution: if Intel’s understanding turns out to be true, 38.331 should implement this agreement by capturing that cgRetxTimer should not be used other than NR-U. Therefore, I would propose that in RAN1, we use  For operation with shared spectrum, if *cg-RetransmissionTimer* is provided, the redundancy version ….  If 38.331 remains as is, the above statement is unbiased. But if 38.331 is changed to implement the new agreement pointed by Intel, we can remove ‘for operation with shared spectrum’ as there won’t be any ambiguity. How does it sound?  Secondly, as in our previous comment explains, the RV is determined by UE should be only for the case of retransmission. For initial transmission only RV=0 is used. This was also agreed in RAN2, thus RAN1 should write the spec in a consistent way with RAN2, quote 38.321 Clause 5.4.2.1.1   |  | | --- | | For configured uplink grants configured with *cg-RetransmissionTimer*, the redundancy version zero is used for initial transmissions and UE implementation selects redundancy version for retransmissions. |   In summary, our proposed TP is  For operation with shared spectrum, if *cg-RetransmissionTimer* is provided, the redundancy version for uplink transmission with a configured grant is set to 0 in case of initial transmission, or determined by the UE, otherwise. |
| vivo | We are in principle, a revision is provided below.  ------------------------------------------------------------------------------------------------  The procedures described in this clause apply to PUSCH transmissions of PUSCH repetition Type A with a Type 1 or Type 2 configured grant.  The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions. If *cg-RetransmissionTimer* is provided, the redundancy version for the first repetition for uplink transmission with a configured grant is determined by the UE. If the parameter *repK-RV* is not provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, the redundancy version for uplink transmissions with a configured grant shall be set to 0. ~~Otherwise~~ If the parameter *repK-RV* is provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, for the *n*th transmission occasion among *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. If a configured grant configuration is configured with *Configuredgrantconfig-StartingfromRV0* set to *‘off’*, the initial transmission of a transport block may only start at the first transmission occasion of the *K* repetitions. Otherwise, the initial transmission of a transport block may start at  ------------------------------------------------------------------------------------------------ |
| Ericsson | We support the revision above proposed by vivo. It has a better flow. We see problem in the proposed TP2 as we said earlier.  In TP2, the sentence “The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions.”, seems to be hanging in the middle.  Also, it is not clear if the first sentence is at the same level than the next paragraph. If it is not, the style of specification is not respected.  However, revision by VIVO, has addressed the concerns we had and we are OK wit hthat. |
| Lenovo, Motorola Mobility | Since RV0 includes most system bits of a TB, anyway, for the initial transmission, RV0 should be transmitted instead of other RVs. So we think the limitation on initial transmission should be added. Then for retransmission, the UE can autonomously determine to retransmit RV0, RV2 or RV3.  So we prefer below modification:  For operation on shared spectrum, if *cg-RetransmissionTimer* is provided for a configured grant transmission, the redundancy version 0 of a TB is transmitted for initial transmission and other redundancy versions of the TB for retransmission is determined by the UE. |

# References

[1] R1-2002737, Feature lead summary#2 on NRU configured grant enhancement, RAN1#100b-e

[2] R1-2002745, Summary of prep email discussion on NRU-CG, RAN1#100b-e