**3GPP TSG RAN WG1 #104e-b R1-** **21xxxxx**

**April 12th – 20th, 2021**

**Agenda item:** 7.2.5

**Source:** Moderator (Qualcomm)

**Title:** Summary of [104b-e-NR-L1enh-URLLC-04] Email discussion/approval on remaining issues on Scheduling & HARQ enhancements

**Document for:** Discussion and Decision

# 1 Introduction

Based on the discussions during the preparation phase, it is agreed to discuss the following topics during the RAN1 #104e-b:

[104b-e-NR-L1enh-URLLC-04] Email discussion/approval on remaining issues on Scheduling & HARQ enhancements – Kianoush (Qualcomm):

* Issue#2: Clarification on cancellation of LP channels
* Issue #4: Timeline requirement for cancellation
* Issue #6: Correction for UE processing times for intra-UE prioritization
* Discussion/decision by April 15 and TP(s) by April 20

Please provide your comments by 12:00pm (PDT), Wednesday April 14th.

# 2 Issue #2

As shown in Figure 1, multiplexing HP PUCCH-1 and HP PUCCH-2 result in HP PUCCH-3, which overlaps with HP PUSCH and would multiplex with HP PUSCH. It is not clear whether the intermediate HP PUCCH-3 would cancel LP PUCCH according the specification.



Since UE may not know the HP PUCCH-3 would multiplex with HP PUSCH when UE begins to cancel the LP PUCCH, the LP PUCCH should be cancelled by intermediate high priority PUCCH resource(s). Hence, the following TP is proposed:

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| **9 UE procedure for reporting control information**  <Unchanged text omitted>  When a UE determines overlapping for PUCCH and/or PUSCH transmissions of different priority indexes other than PUCCH transmissions with SL HARQ-ACK reports, including repetitions if any, the UE first resolves the overlapping for PUCCH and/or PUSCH transmissions of smaller priority index as described in Clauses 9.2.5 and 9.2.6. Then,  - if a transmission of a first PUCCH of larger priority index scheduled by a DCI format in a PDCCH reception would overlap in time with a repetition of a transmission of a second PUSCH or a second PUCCH of smaller priority index, the UE cancels the repetition of a transmission of the second PUSCH or the second PUCCH before the first symbol that would overlap with the first PUCCH transmission  - if a transmission of a first PUSCH of larger priority index scheduled by a DCI format in a PDCCH reception would overlap in time with a repetition of the transmission of a second PUCCH of smaller priority index, the UE cancels the repetition of the transmission of the second PUCCH before the first symbol that would overlap with the first PUSCH transmission  where  - the overlapping is applicable before or after resolving overlapping among channels of larger priority index, and during the multiplexing among channels of larger priority index, if any, as described in Clauses 9.2.5 and 9.2.6; and the overlapping is applicable during PUCCH resource overriding procedure, if any, as described in Clauses 9.2.3  - any remaining PUCCH and/or PUSCH transmission after overlapping resolution is subjected to the limitations for UE transmission as described in Clause 11.1  - the UE expects that the transmission of the first PUCCH or the first PUSCH, respectively, would not start before after a last symbol of the corresponding PDCCH reception  - is the PUSCH preparation time for a corresponding UE processing capability assuming [6, TS 38.214], based on and as subsequently defined in this Clause, and is determined by a reported UE capability  ----------------------------------------------------- End of text proposal ------------------------------------------------------ |

**In the table below, please provide your comments on the proposed TP above:**

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| Company | Comments |
| HW/HiSi | The TP is not needed. The specification is already clear.  Also, it has been discussed before and we agree with Ericsson’s comment during the scope setting, that the conclusion made in RAN1#103 is sufficient:   |  | | --- | | **Conclusion (RAN1#103e)**  In the following clause from Section 9 of TS 38.213:  “where   * The overlapping is applicable before or after resolving overlapping among channels of larger priority index, if any, as described in Clause 9.2.5”   the meaning of “before or after” should be interpreted as follows: A UE checks the overlap between a HP channel and a low priority channel before multiplexing. If there is an overlap, the LP channel gets cancelled. If not, a UE performs multiplexing across the HP channels. If then there is an overlap with a LP channel, the LP channel gets cancelled. | |
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# 3 Issue #4

In [2], it is proposed that:

***Proposal: The SCS configuration of the PDSCH corresponding to the overlapping PUCCH should be considered in cancellation time.***

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| -------------------------------------------------- Start of text proposal ------------------------------------------------------  If a UE is scheduled by a DCI format in a first PDCCH reception to transmit a first PUCCH or a first PUSCH of larger priority index that overlaps with a second PUCCH or a second PUSCH transmission of smaller priority index that, if any, is scheduled by a DCI format in a second PDCCH  - is based on a value of corresponding to the smallest SCS configuration of the first PDCCH, the second PDCCHs, the PDSCHs corresponding to the first PUCCH, the PDSCHs corresponding to the second PUCCHs, the first PUCCH or the first PUSCH, and the second PUCCHs or the second PUSCHs  - if the overlapping group includes the first PUCCH  - if *processingType2Enabled* of *PDSCH-ServingCellConfig* is set to *enable* for the serving cell where the UE receives the first PDCCH and for all serving cells where the UE receives the PDSCHs corresponding to the second PUCCHs, and if *processingType2Enabled* of *PUSCH-ServingCellConfig* is set to *enable* for the serving cells with the second PUSCHs, is 5 for , 5.5 for  and 11 for  - else, is 10 for =0*,* 12 for , 23 for , and 36 for ;  - if the overlapping group includes the first PUSCH  - if *processingType2Enabled* of *PUSCH-ServingCellConfig* is set to *enable* for the serving cells with the first PUSCH and the second PUSCHs and if *processingType2Enabled* of *PDSCH-ServingCellConfig* is set to *enable* for all serving cells where the UE receives the PDSCHs corresponding to the second PUCCHs, is 5 for , 5.5 for  and 11 for  - else, is 10 for =0*,* 12 for , 23 for , and 36 for ;  ----------------------------------------------------- End of text proposal ------------------------------------------------------ |

**In the table below, please provide your comments on the proposed TP above:**

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| Company | Comments |
| HW/HiSi | We do not think that this TP is needed.  The cancellation timeline is applied for cancelling the low LP channel. When the UE detects the HP DCI, it gets aware of the overlap and starts to cancel the LP. This does not seem to have a relationship with the HP PDSCH. |
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# 4 Issue #6

The following TP is proposed in [3]:

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| 9 UE procedure for reporting control information **<Unchanged parts are omitted>**  When a UE determines overlapping for PUCCH and/or PUSCH transmissions of different priority indexes, including repetitions if any, the UE first resolves the overlapping for PUCCH and/or PUSCH transmissions of smaller priority index as described in Clauses 9.2.5 and 9.2.6. Then,  - if a transmission of a first PUCCH of larger priority index scheduled by a DCI format in a PDCCH reception would overlap in time with a repetition of a transmission of a second PUSCH or a second PUCCH of smaller priority index, the UE cancels the repetition of a transmission of the second PUSCH or the second PUCCH before the first symbol that would overlap with the first PUCCH transmission  - if a transmission of a first PUSCH of larger priority index scheduled by a DCI format in a PDCCH reception would overlap in time with a repetition of the transmission of a second PUCCH of smaller priority index, the UE cancels the repetition of the transmission of the second PUCCH before the first symbol that would overlap with the first PUSCH transmission  where  - the overlapping is applicable before or after resolving overlapping among channels of larger priority index, if any, as described in Clauses 9.2.5 and 9.2.6  - the UE expects that the transmission of the first PUCCH or the first PUSCH, respectively, would not start before after a last symbol of the corresponding PDCCH reception  - is the PUSCH preparation time for a corresponding UE processing capability assuming [6, TS 38.214], based on and as subsequently defined in this Clause, and is determined by a reported UE capability.  **<Unchanged parts are omitted>** |

**In the table below, please provide your comments on the proposed TP above:**

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| Company | Comments |
| HW/HiSi | We agree that the issue is valid.  For the TP, we are not sure if d2,1=d1 can be used since d2,1 also already is defined in 38.214, section 6.4: “If the first symbol of the PUSCH allocation consists of DM-RS only, then *d2,1* = 0*,* otherwise *d2,1* = 1”. That means in 38.214, d2,1 can be 1. The intention of d1 is to relax the Tproc,2 on top of d2,1. However based on this TP, it seems d2,1 is replaced by d1 irrespective of d2,1 in 38.214 as 0 or 1. We think this could be a contradiction. What is your view? |
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# 5 Summary of the Discussions

TBD

# 6 References

**[1] R1-2102371, “Remaining issues on scheduling and HARQ,” OPPO**

**[2] R1-2102593, “Remaining issues on scheduling and HARQ enhancements,” CATT**

**[3] R1-2103428, “Correction to UE processing times for intra-UE prioritization,” Intel Corp.**