**3GPP TSG RAN WG1 Meeting #103-e R1-20xxxxx**

**E-meeting, October 26 - November 13, 2020**

**Agenda Item: 7.2.5**

**Source: Moderator (Huawei)**

**Title: Email discussion on preparation phase for Rel-16 URLLC/IIoT**

**Document for: Discussion and Decision**

# Introduction

The paper summarizes the preparation phase email discussion for contribution submitted to 7.2.5 on Rel-16 URLLC/IIoT.

# Recommendation for the scope of email threads

Per the guidance from Chairman, we will only have 4 email threads for Rel-16 URLLC/I-IoT for RAN1#103-e. Note that one additional email thread (i.e. out of the 4 email thread budget) will be treated under 7.2.5 on the LS R2-2008599 on Intra UE Prioritization Scenario per the guidance from Chairman.

## Draft recommendation for the scope of email threads

Based on discussion among feature leads, we made the draft recommendation on the issues to be discussed for this meeting as below. Note that once the issues to be discussed are set, we will further discuss among feature leads to see how to divide the issues to 4 email threads.

**Recommended issues to be discussed in RAN1#103-e**

PDCCH enhancements:

* **Issue B-1**: Time variation of “aligned” status for PDCCH spans across DL cells
* **Issue B-2**: Whether to apply M-TRP on the Rel-15 cells for case 3
* **Issue A-1**: Type2 HARQ-ACK codebook construction related to DAI bit width

UCI enhancements:

* **Issue 2**: Intra-UE prioritization for PUCCH repetition

PUSCH enhancements:

* **Issue 2**: Maximum data rate in a slot for PUSCH repetition Type B

Scheduling & HARQ:

* **Issue 1:** CBG-Based Retransmission (if any specification impact needed based on discussion under UE feature)
* **Issue 4**: Intra-UE prioritization and multiplexing order
* **Issue 5:** Order of multiplexing and prioritization due to conflicts with semi-static DL and SSB symbols

Inter-UE multiplexing:

* **Issue 1**: Impact to PHR calculation due to UL CI in UL CA
* **Issue 2:** Impact to UE power scaling due to UL CI in UL CA

**Companies are encouraged to indicate the priority (high or medium or low) of the remaining issues for this meeting. If the priority is high, please provide your reasons why it has to be discussed in this meeting, and also indicate whether any of the issue in the current list above can be removed.**

* Remaining issues for PDCCH enhancements

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| Company | Issue A-2 | Issue A-3 | Issue A-4 | Comments |
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* Remaining issues for UCI enhancements

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| Company | Issue #1 | Issue #3 | Issue #4 | Comments |
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| Company | Issue #5 | Issue #6 |  | Comments |
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* Remaining issues for PUSCH enhancements

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| Company | Issue #2 | Comments |
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* Remaining issues for scheduling & HARQ

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| Company | Issue #2 | Issue #3 | Issue #6 | Comments |
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| Company | Issue #7 | Issue #8 |  | Comments |
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* Remaining issues for Inter-UE multiplexing

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| Company | Issue #3 | Comments |
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* Remaining issues for eCG enhancements

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| Company | Issue #1 | Issue #2 | Issue #3 | Comments |
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| Company | Issue #4 | Issue #5 | Issue #6 | Comments |
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* Remaining issues for others (e.g. SPS enhancements and others)

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| Company | Issue #1 | Issue #2 | Issue #3 | Comments |
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| Company | Issue #4 | Issue #5 | Issue #6 | Comments |
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| Company | Issue #7 | Issue #8 | Issue #9 | Comments |
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# Summary of detailed issues

A brief summary of the issues are given in the following tables. Details can be found in the feature lead summaries uploaded to the draft folder.

**Table 1 Summary of issues for PDCCH enhancements**

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| --- | --- | --- | --- |
| **Issue #** | **Description** | **Source** | **Recommended handling** |
| A-1 | Type2 HARQ-ACK codebook construction related to DAI bit width | Huawei/HiSilicon  WILUS  Samsung  CATT  Vivo | Included in email discussion #1  **Reason:**   1. *Critical correction, otherwise the spec is not correct* |
| A-2 | Correction on missing case of PUSCH release for search space sharing | Sharp | Included under email discussion #1 *unless there is other issue identified as higher priority*  **Reason:**   1. *Issue is valid. It was postponed to this meeting due to the workload in RAN1#102-e.* |
| A-3 | Correction on Transmission configuration indication in DCI format 1\_2 | ASUSTeK | Included under email discussion #1 *unless there is other issue identified as higher priority*  **Reason:**  *Issue is valid. It was postponed to this meeting due to the workload in RAN1#102-e.* |
| A-4 | Ambiguity of subselection indication for DCI format 0\_1 and DCI format 0\_2 | Sharp | More inputs from companies on whether to include or not. If agreed then will be included under email discussion #2.  **Reason:**  *The issue is valid, but some companies doubt the necessity* |
| B-1 | Time variation of “aligned” status for PDCCH spans across DL cells | Apple  Quectel  Intel  Ericsson,  Vivo  Huawei/HiSilicon | Included in email discussion #1  **Reason:**   1. *Remaining issues from RAN1#102-e* |
| B-3 | Whether to apply M-TRP on the Rel-15 cells for case 3 (i.e. both cell(s) with Rel-15 monitoring capability and cell(s) with Rel-16 monitoring capability are configured) | Samsung  ZTE  Quectel  Huawei/HiSilicon | Included in email discussion #1  **Reason:**   1. *Essential correction otherwise the specification is not complete* |

**Table 2 Summary of issues for UCI enhancements**

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| **Issue #1:** Limitation on the number of PUCCHs carrying HARQ-ACK in a slot/subslot | OPPO (R1-2008276)  Apple (R1-2008432)   DOCOMO (R1-2008534) |
| **Issue #2:** Intra-UE prioritization for PUCCH repetition | CATT (R1-2007815)  Nokia (R1-2008297)  Qualcomm (R1-2008608) |
| **Issue #3:** Type-1 codebook for sub-slot based HARQ-ACK | CATT (R1-2007815)  Nokia (R1-2008297)  Qualcomm (R1-2008608) |
| **Issue #4:** Timing for secondary cell activation / deactivation | CATT (R1-2007815)  Nokia (R1-2008297)  vivo (R1-2008671)  Fujitsu (R1-2007782) |
| **Issue #5:** HARQ-ACK codebook type with different priorities for secondary PUCCH group | DOCOMO (R1-2008534) |
| **Issue #6:** Miscellaneous corrections/clarifications | **Issue 6-1**: HARQ-ACK for a PDSCH reception in case of repetition (E///, R1-2007704)  **Issue 6-2**: Number of PRI bits and DCI format for low-priority PUCCH/PUSCH (ZTE, R1-2007733)  **Issue 6-3**: Correction for sub-slot based PUCCH (CATT, R1-2007815) (vivo, R1-2008671)  **Issue 6-4**: PUCCH resource for CSI and SR If ome PUCCH-Config is provided (CATT, R1-2007815) (DOCOMO, R1-2008534)  **Issue 6-5**: Type-1 HARQ-ACK codebook for SPS PDSCH with PDSCH aggregation (CATT, R1-2007815)  **Issue 6-6**: RRC parameter impact when two HARQ-ACK codebooks are configured (CATT, R1-2007815)  **Issue 6-7**: Missing description to the introduction to DCI format 0\_2/1\_2 (ETRI, R1-2007988)  **Issue 6-8**: Maintanence on PDCCH as PDSCH SLIV reference (Samsung, R1-2008135)  **Issue 6-9**: Clarification of the maximum number of PUCCH resource sets (DOCOMO, R1-2008534)  **Issue 6-10**: Correction on sub-slot partition (Huawei/HiSilicon, R1-2008772)  **Issue 6-11**: A remaining issue on the reference of spatial relation for a PUSCH scheduled by DCI format 0\_0 (Fujitsu, R1-2007781)  **Issue 6-12**: Remaining issue on the HARQ-ACK/PUSCH priority (ITRI, R1-2008562) |

**Table 3 Summary of issues for PUSCH enhancements**

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| **Issue #1:** Maximum data rate in a slot for PUSCH repetition Type B | Apple (R1-2008432)  Qualcomm (R1-2008609) |
| **Issue #2:** Clarification on the Number of Repetitions for PUSCH Repetition Type B | Ericsson (R1-2007705) |

**Table 4 Summary of issues for scheduling & HARQ**

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| **Issue #1:** CBG-Based Retransmission | HW/HiSi (R1-2007635), Nokia/NSB (R1-2008304) |
| **Issue #2:** Partial cancellation in Rel-15 and Rel-16 | HW/HiSi (R1-02007635) |
| **Issue #3:** DMRS shift and impact on UE processing | HW/HiSi (R1-02007635) |
| **Issue #4:** Intra-UE prioritization and multiplexing order | Ericsson (R1-2007705), OPPO (R1-2008277), DCM (R1-2008535) |
| **Issue #5:** Order of multiplexing and prioritization due to conflicts with semi-static DL and SSB symbols | ZTE (R1-2007734), Spreadtrum (R1-2008109), Qualcomm (R1-2008607), vivo (R1-2008672), Nokia/NSB (R1-2008303) |
| **Issue #6:** PUSCH preparation procedure time | ZTE (R1-2007734) |
| **Issue #7:** Modification to intra-UE cancellation timeline | OPPO (R1-2008277) |
| **Issue #8:** Active duration of CSI-RS resources in case of cancellation | Qualcomm (R1-2008607) |
| **Issue #9:** Handling overlapping between high priority PUSCH without UL-SCH and SR | Nokia/NSB (R1-2008303) |

**Table 5 Summary of issues for Inter-UE multiplexing**

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| **Issue #1:** Impact to PHR calculation due to UL CI in UL CA | Apple (R1-2008433)  Qualcomm (R1-2008607 )  ZTE (R1-2007735 )  CATT (R1-2007814)  LG (R1-2008056)  Nokia (R1-2008304)  Vivo (R1-2008673)  Huawei ([R1-2007635](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_103\Docs\R1-2007635.zip)) |
| **Issue #2:** Impact to UE power scaling due to UL CI in UL CA | ZTE (R1-2007735 )  Nokia (R1-2008304)  Vivo (R1-2008673)  Huawei ([R1-2007635](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_103\Docs\R1-2007635.zip))  Apple (R1-2008433)  Qualcomm (R1-2008607 ) |
| **Issue 3:** Exclusion of idle period from DL pre-emption and UL cancellation reference regions | Ericsson (R1-2007706) |

**Table 6 Summary of issues for eCG**

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| **Issue #1**: Case 1: CG PUSCH with repetition type A and DG PUSCH (section 3.1.1) | CATT (R1-2007817) |
| **Issue #2**: Case 2: Low priority (LP) DG PUSCH with repetitions and High priority (HP) CG PUSCH (section 3.1.2) | CATT (R1-2007817)  Apple (R1-2008434) |
| **Issue #3**: Multiple CGs (section 3.1.3) | Apple (R1-2008434) |
| **Issue #4**: Limitations for the nested transmissions (section 3.2) | Apple (R1-2008434) |
| **Issue #5**: HP CG blocking issue (section 3.3) | CATT (R1-2007817) |
| **Issue #6**: PUSCHs overlapping with UCI piggyback | CATT (R1-2007817) |

**Table 7 Summary of issues for others**

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| **Issues** | **Source** | **Feature lead view** |
| **Issue #1**: SPS PDSCH release and SPS receptions with different PUCCH case | R1-2007636  Huawei, HiSilicon  R1-2008278  OPPO | This issue was discussed in the last meeting and has been concluded by chairman in GTW session as non-essential |
| **Issue #2**: SPS PDSCH release and SPS receptions with repetitions | R1-2008138  Samsung | Can be discussed but it could be editorial. |
| **Issue #3** Processing timeline for SPS PDSCH release | R1-2008278  OPPO | No specification changes are needed |
| **Issue #4** PDSCH aggregation when multiple repetition factor are configured | R1-2007636  Huawei, HiSilicon  R1-2007815  CATT | It seems necessary to specify UE behavior when UE is configured with both RepNumR16 and pdsch-aggregation factor in SPS-config. However, it is not clear whether to discuss this issue in this AI or MIMO AI. |
| **Issue #5** Dynamic grant PDSCH overriding SPS PDSCH repetition | R1-2008137  Samsung | No specification changes are needed |
| **Issue #6** PUCCH power control for HARQ-ACK codebook of multiple SPS PDSCH receptions | R1-2008137  Samsung | No specification changes are needed |
| **Issue #7** Whether to use UL slot or DL slot for description on PDSCH repetition | R1-2007704  Ericsson | The issue is valid, but it is recommended to treat this issue in NR Rel-15 maintenance AI in the last meeting. It is highly encouraged for proponents to submit CR to the NR Rel-15 maintenance AI as well. |
| **Issue #8** An ambiguity for type-1 HARQ-ACK codebook determination | R1-2008636  ASUSTeK | No specification changes are needed |
| **Issue #9** HARQ-ACK bit position for SPS release PDCCH on Type-1 HARQ-ACK Codebook | R1-2008725  WILUS Inc. | No specification changes are needed |

# References

1. R1-20xxxxx Feature lead summary on PDCCH enhancements Huawei, HiSilicon
2. R1-20xxxxx Summary of eURLLC PUSCH enh 7.2.5 Apple
3. R1-20xxxxx Feature lead summary on URLLC HARQ and Scheduling Qualcomm
4. R1-20xxxxx Summary of Remaining issues on inter-UE prioritization Vivo
5. R1-20xxxxx Feature lead summary on eCG for eURLLC Vivo
6. R1-20xxxxx Summary on Others for URLLC and IIOT LG