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

**E-meeting, April 12 – April 20, 2021**

**Agenda Item: 7.2.5**

**Source: Moderator (Huawei)**

**Title: Preparation phase email discussion for Rel-16 eURLLC**

**Document for: Discussion and Decision**

# Introduction

The paper summarizes the issues for preparation phase 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 5 email threads for Rel-16 URLLC/I-IoT for RAN1#104b-e.

## 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 5 email threads.

**Draft recommended issues to be discussed in RAN1#104b-e**

PDCCH enhancements:

* **Issue A-1**: Correction on RRC parameters for DMRS reception procedure for DCI format 1\_2
* **Issue A-2**: Correction on UE PDSCH processing time for DCI format 1\_2
* **Issue A-3**: Correction on the upper limit of the number of PDCCHs to receive for PDSCH and PUSCH for Rel-16 PDCCH monitoring capability
* **Issue A-4**: Correction on RRC parameter *UE-NR-Capability-v16* for receiving control information
* **Issue A-5**: Corrections on parameter of MCS table set to qam256
* **Issue A-7**: Correction/clarification on new SLIV reference for Type 1 HARQ codebook

UCI enhancements:

* **Issue #1**: Correction for sub-slot based PUCCH
* **Issue #2**: Conflict between the first PUCCH repetition and semi-static configuration
* **Issue #3**: Clarification of the configuration for one PUCCH-Config with *subslotLengthForPUCCH-r16*
* **Issue #6**: Msg3 or MsgA PUSCH overlapping with a high-priority PUCCH

PUSCH enhancements:

* **Issue #1:** Channel inference assumption for a PUSCH transmission with repetition Type B
* **Issue #3:** Processing order of UL cancellation by SFI/DG and UL multiplexing

Scheduling & HARQ:

* **Issue#2:** Clarification on cancellation of LP channels
* **Issue #4:** Timeline requirement for cancellation

SPS enhancements:

* **Issue #1**: SPS PDSCH release and SPS receptions with slot aggregation
* **Issue #2**: PUCCH resource for SPS PDSCH HARQ-ACK and CSI
* **Issue #3**: *CSI-PUCCH-ResourceList* where SPS HARQ-ACK multiplexed

**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.**

* Remaining issues for PDCCH enhancements

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| Company | Issue A-6 | Comments |
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* Remaining issues for UCI enhancements

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| Company | Issue #4 | Issue #5 | Comments |
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| Company | Issue #7 | Issue #8 | Comments |
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| Company | Issue #9 | Issue #10 | 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 #1 | Issue #5 | Comments |
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* Remaining issues for Inter-UE multiplexing

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| Company | Issue #1 | Issue #2 | Issue #3 | Issue #4 | Issue #5 | Comments |
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* Remaining issues for eCG enhancements and intra-UE multiplexing

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| Company | Issue #1 | Issue #2 | 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 | Correction on RRC parameters for DMRS reception procedure for DCI format 1\_2 | ZTE (R1-2102488) | Included in the scope for email discussion **Reason:***Critical correction, otherwise the spec is not correct* |
| A-2 | Correction on UE PDSCH processing time for DCI format 1\_2 | ZTE (R1-2102488) | Included in the scope for email discussion **Reason:***Critical correction, otherwise the spec is not correct* |
| A-3 | Correction on the upper limit of the number of PDCCHs to receive for PDSCH and PUSCH for Rel-16 PDCCH monitoring capability | Ericssion (R1-2102742) | Included in the scope for email discussion **Reason:***Critical correction, otherwise the spec is not complete* |
| A-4 | Correction on RRC parameter *UE-NR-Capability-v16* for receiving control information | Ericssion (R1-2102742) | Included in the scope for email discussion **Reason:***Critical correction, otherwise the spec is not correct* |
| A-5 | Corrections on parameter of MCS table set to qam256 | Vivo (R1-2102944) | Included in the scope for email discussion **Reason:***Critical correction, otherwise the spec is not complete* |
| A-6 | Correction to VRB-to-PRB in DCI Format 1\_2 | Apple (R1-2103082) | Not included in the email scope **Reason:***Issue is not essential since if only resource allocation type 0 is configured then the higher layer parameter vrb-ToPRB-InterleaverDCI-1-2 won’t not be configured* |
| A-7 | Correction/clarification on new SLIV reference for Type 1 HARQ codebook | Samsung (R1-2103215); Huawei/Hisilicon (R1-2103397) | Included in the scope for email discussion **Reason:***To align the common understanding in RAN1* |

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

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| **Issue#1** | Correction for sub-slot based PUCCH | OPPO[1], CATT[2], Nokia[3] , vivo[5] |
| **Issue#2** | Conflict between the first PUCCH repetition and semi-static configuration  | CATT[2], Nokia[3] |
| **Issue#3** | Clarification of the configuration for one PUCCH-Config with *subslotLengthForPUCCH-r16* | CATT[2], Nokia[3], DCM[7] |
| **Issue#4** | Clarification that Type 1 CB is not supported for sub-slot HARQ-ACK | CATT[2], Nokia[3] |
| **Issue#5** | Number of PUCCH resource sets per *PUCCH-config* | Nokia[3] , DCM[7] |
| **Issue#6** | Discussion on Msg3 or MsgA PUSCH overlapping with a high-priority PUCCH | Nokia[4] |
| **Issue#7** | Sub-slot-based HARQ-ACK feedback and Multi-DCI based M-TRP | Apple[6] |
| **Issue#8** | Two HARQ-ACK codebooks and Multi-DCI based M-TRP | Apple[6] |
| **Issue#9** | Clarification of the overlapping handling of PUCCH/PUSCH transmissions with/without repetitions and with different priorities | DCM[7] |
| **Issue#10** | Editorial clarifications related to DCI format 1\_2 | CATT[2] |

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

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| **Issue #1:** Channel inference assumption for a PUSCH transmission with repetition Type B | Sharp (R1-2103469) |
| **Issue #2:** Clarification on the same TB across repetitions for PUSCH repetition Type B | NTT DCM (R1-2103558) |
| **Issue #3:** Processing order of UL cancellation by SFI/DG and UL multiplexing | CATT (R1-2102593) |

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

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| **Topic** | **Companies supporting the discussion in RAN1 #104b-e** | **FL Comment** |
| **Issue #1:** Intra-UE prioritization  | OPPO (R1-2102371) | Proposal is unclear  |
| **Issue#2:** Clarification on cancellation of LP channels | CATT (R1-2102593) | Discuss |
| **Issue #3:** Processing order of UL cancellation by SFI/DG and UL multiplexing  | CATT (R1-2102593) | Discuss under PUSCH AI. Not related to HARQ and scheduling AI.  |
| **Issue #4:** Timeline requirement for cancellation | CATT (R1-2102593) | Discuss |
| **Issue #5:** PDSCH and PUSCH processing time  | CATT (R1-2102593) | This is largely a Rel. 15 issue. My suggestion is to discuss it under Rel. 15 CRs. If any change then is needed for intra-UE prioritization, it can be discussed.  |

**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 | Nokia (R1-2102824)  |
| **Issue #2:** Impact to PHR calculation due to UL skipping in UL CA | Nokia (R1-2102824)  |
| **Issue #3:** Impact to UE power scaling due to UL CI in UL CA | Nokia (R1-2102824)  |
| **Issue #4:** Impact to UE power scaling due to UL skipping in UL CA | Nokia (R1-2102824)  |
| **Issue #5:** The maximum number of configurable candidates for DCI format 2\_4 | ZTE (R1-2102486)  |

**Table 6 Summary of issues for eCG and intra-UE multiplexing**

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|  | **Topic** | **FL Comment** |
| **Issue #1:** Intra-UE prioritization/multiplexing * Continue the same discussion in the last meeting regarding to the inter-action between LCH-based prioritization and UL skipping rule.
 | R1-2102350, R1- 2102370, R1-2102487, R1-2102592, R1-2102741, R1-2103083, R1-2103144, R1- 2103214  | Would like collect companies’ views on whether to continue the discussion before receiving any Reply LS from RAN2.  |
| **Issue#2:** PHR for multiple CGs in one serving cell.* Discuss which CG should be used for PH calculation if multiple CG PUSCHs with same starting symbol in one cell overlap with a PUSCH carrying the PHR in the other cell.
 | R1-2103337 | This issue was proposed for several meetings, check with companies whether it is OK to discuss. |

**Table 7 Summary of issues for others**

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| **Topic** | **Companies supporting the discussion in RAN1 #104b-e** | **FL recommendation** |
| **Issue #1**: SPS PDSCH release and SPS receptions with slot aggregation | R1-2102349 (Huawei), R1-2102743 (Ericsson), R1-2102823 (Nokia), R1-2102945 (Vivo), R1-2103338 (LG) | To be discussed in RAN1#104b-e |
| **Issue #2**: PUCCH resource for SPS PDSCH HARQ-ACK and CSI | R1-2103216 (Samsung) , R1-2102945 (Vivo) | To be discussed in RAN1#104b-e |
| **Issue #3**: CSI-PUCCH-ResourceList where SPS HARQ-ACK multiplexed | R1-2103216 (Samsung) | To be discussed in RAN1#104b-e |

# References

1. R1-21xxxxx Feature lead summary on PDCCH enhancements Huawei, HiSilicon
2. R1-21xxxxx Summary of eURLLC PUSCH enh in 7.2.5 Apple
3. R1-21xxxxx Feature lead summary on URLLC HARQ and Scheduling Qualcomm
4. R1-21xxxxx Summary of the Remaining Issues on intra-UE prioritization/multiplexing and eCG Vivo
5. R1-21xxxxx Feature lead summary on other aspects for URLLC and IIoT LG
6. R1-21xxxxx Feature lead summary for R16 UCI enhancements OPPO