**3GPP TSG RAN WG1 #104-e R1-210xxxx**

**e-Meeting, Jan. 25th – Feb. 5th, 2021**

**Agenda Item:** 7.2.5

**Source:** Moderator (LG Electronics)

**Title:** Summary of [104-e-NR-L1enh-URLLC-05]

**Document for:** Discussion and decision

# Introduction

According to discussion at the preparation phase, the following email thread is allocated by Chairman for further discussion:

[104-e-NR-L1enh-URLLC-05] Email discussion/approval on remaining issues on SPS enhancements – Duckhyun (LG) by Feb 3

* Issue 3: SPS PDSCH release and SPS receptions with slot aggregation
* Issue 4: PUCCH resource for SPS PDSCH HARQ-ACK and SR

To address the identified issues of the above email thread, suggestions and questions for the issues are provided in Section 2. In section 3-4, the outcome from [104-e-NR-L1enh-URLLC-05] are provided including all the agreements and all the endorsed TPs.

Other submitted issues are listed up in the summary in preparation phase [4]. It would be appreciated that companies can provide input/feedback in the next meeting in order to facilitate the discussion.

# Issues in RAN1#104-e

* 1. Issue #3 SPS PDSCH release and SPS receptions with slot aggregation

In [1][2], TP and CR is provided for the case of SPS PDSCH release and SPS repetitions. According to [2], When a SPS PDSCH is configured with aggregation factor, some of the SPS PDSCH occasions within the repetition may end before the end of the release PDCCH while some others may end after the end of the release PDCCH, as shown below. In this regard, the figure may be effectively considered as a SPS PDSCH which ends in slot nD=3 and should be supported.



**1st TP from [2]:**

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| 9.1 HARQ-ACK codebook determination\*\*\* Unchanged text is omitted \*\*\*If a UE is configured to receive SPS PDSCHs in a slot for SPS configurations that are indicated to be released by a DCI format, and if the UE receives the PDCCH providing the DCI format in the slot where the end of a last symbol of the PDCCH reception is not after the end of a last symbol of any of the last occasions of SPS PDSCH receptions, if the last occasion is in the slot, and if HARQ-ACK information for the SPS PDSCH release and the SPS PDSCH receptions would be multiplexed in a same PUCCH, the UE does not expect to receive the SPS PDSCHs, does not generate HARQ-ACK information for the SPS PDSCH receptions, and generates a HARQ-ACK information bit for the SPS PDSCH release.\*\*\* Unchanged text is omitted \*\*\* |

According to [1], current specification doesn’t care about slot aggregation so that restrict SPS PDSCH reception even when there is no HARQ-ACK bit collision in the type-1 HARQ-ACK codebook. To solve this problem, [1] propose following TP:

**2nd TP from [1]:**

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| 9.1 HARQ-ACK codebook determination\*\*\* Unchanged text is omitted \*\*\*If a UE is configured to receive SPS PDSCHs in a slot for SPS configurations that are indicated to be released by a DCI format, and if the UE receives the PDCCH providing the DCI format in the slot where the end of a last symbol of the PDCCH reception is not after the end of a last symbol of any of the SPS PDSCH receptions, and if HARQ-ACK information for the SPS PDSCH release and the SPS PDSCH receptions would be multiplexed with same value of $b\_{r,k,n\_{D}}$ in a same PUCCH, the UE does not expect to receive the SPS PDSCHs, does not generate HARQ-ACK information for the SPS PDSCH receptions, and generates a HARQ-ACK information bit for the SPS PDSCH release.\*\*\* Unchanged text is omitted \*\*\* |

**From FL:**

As mention in the previous meeting, what makes problem is that the SPS PDSCH and SPS release are mapped to same UCI bit in the same PUCCH. In the figure brought by [3], if they are mapped to same PUCCH, those HARQ-ACK are mapped to different UCI bits due to different K1 value. Though the specification changes may be necessary to clarify previous agreement, but it is not clear whether to consider the last occasion of SPS PDSCH.

This issue is related to previous CR. We defined the problem “HARQ-ACK bit overlapping between SPS PDSCH and SPS release” and dropped SPS PDSCH HARQ-ACK to solve the problem. Though current text had make a problem with slot aggregation, however, the principle still valid with slot aggregation. Thus, I would recommend to clarify and reflect our principle into specification text.

Meanwhile, since current text already four if statement, I wouldn’t like to recommend to add more conditioning text. If both text proposal are in the light of our previous principle and work, I suggest to adopt second text proposal.

**FL recommendation: Adopt following TP for TS 38.214 Clause 9.1**

**Proposed text proposal:**

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| 9.1 HARQ-ACK codebook determination\*\*\* Unchanged text is omitted \*\*\*If a UE is configured to receive SPS PDSCHs in a slot for SPS configurations that are indicated to be released by a DCI format, and if the UE receives the PDCCH providing the DCI format in the slot where the end of a last symbol of the PDCCH reception is not after the end of a last symbol of any of the SPS PDSCH receptions, and if HARQ-ACK information for the SPS PDSCH release and the SPS PDSCH receptions would be multiplexed into same value of $b\_{r,k,n\_{D}}$ in a same PUCCH, the UE does not expect to receive the SPS PDSCHs, does not generate HARQ-ACK information for the SPS PDSCH receptions, and generates a HARQ-ACK information bit for the SPS PDSCH release.\*\*\* Unchanged text is omitted \*\*\* |

**Comment:**

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* 1. Issue #4 PUCCH resource for SPS PDSCH HARQ-ACK and SR

According [2], when a SPS PDSCH HARQ-ACK PUCCH overlaps with a SR PUCCH, the SPS PDSCH HARQ-ACK PUCCH is used as the result PUCCH in general. However, in the current spec, PUCCH resource determination of *SPS-PUCCH-AN-List* only includes case of SPS PDSCH HARQ-ACK, the case of SPS PDSCH HARQ-ACK and SR is not included.

**Proposed changes from [2]:**

***Proposal 1: The UCI should include SPS PDSCH HARQ-ACK and SR, if any, when determining a PUCCH resource in SPS-PUCCH-AN-List. The following TP should be adopted.***

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| If the UE is provided *SPS-PUCCH-AN-List* and transmits $O\_{UCI}$ UCI information bits that include only HARQ-ACK information bits in response to one or more SPS PDSCH receptions and SR, if any, the UE determines a PUCCH resource to be - a PUCCH resource provided by *sps-PUCCH-AN-ResourceID* obtained from the first entry in *sps-PUCCH-AN-List* if $O\_{UCI}\leq 2$, or- a PUCCH resource provided by *sps-PUCCH-AN-ResourceID* obtained from the second entry in *sps-PUCCH-AN-List*, if provided, if $2<O\_{UCI}\leq N\_{1,SPS}$ where $N\_{1,SPS}$ is either provided by *maxPayloadSize* obtained from the second entry in *sps-PUCCH-AN-List* or is otherwise equal to 1706, or- a PUCCH resource provided by *sps-PUCCH-AN-ResourceID* obtained from the third entry in *sps-PUCCH-AN-List*, if provided, if $N\_{1,SPS}<O\_{UCI}\leq N\_{2,SPS}$ where $N\_{2,SPS}$ is either provided by *maxPayloadSize* obtained from the third entry in *sps-PUCCH-AN-List* or is otherwise equal to 1706, or- a PUCCH resource provided by *sps-PUCCH-AN-ResourceID* obtained from the fourth entry in *sps-PUCCH-AN-List*, if provided, if $N\_{2,SPS}<O\_{UCI}\leq N\_{3,SPS}$ where $N\_{3,SPS}$ is equal to 1706. |

**From FL:**

For my understanding, it is true that PUCCH for SPS can carry SR if they overlap in time. Adding “and SR, if any” would be simple solution for this problem.

**FL recommendation: Adopt above TP for TS 38.213 Clause 9.2.1**

**Comment:**

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# Final outcome from [102-e-NR-L1enh-URLLC-IIoTenh-01]

# Text proposals

From the discussion in the email thread, following has been agreed:

# References

1. R1-2100899 Remaining issues of other aspects for URLLC/IIOT LG Electronics
2. R1-2101178 Maintanence on SPS PDSCH Samsung
3. R1-2101179 Draft CR on SPS release for PDSCH with aggregation Samsung
4. R1-210xxxx, Summary on Others for URLLC and IIOT, Moderator (LG Electronics)