**[104-e-NR-5G\_V2X-05]: Remaining UL/SL prioritization rule, till 1/28, with potential CRs till 2/2 – Hanbyul (LGE)**

* **PP-1-1: How SL HARQ-ACK report is piggybacked on PUSCH**
* **PP-1-3: Further consideration on prioritization rule between PUCCH for the response of MsgB and SL TX**
* **PP-1-4: Further consideration on prioritization rule between SL reception and PUCCH carrying SL HARQ-ACK report**

**PP-1-1: How SL HARQ-ACK report is piggybacked on PUSCH**

Q1: Whether or when SL HARQ-ACK report can be piggybacked on PUSCH of priority index 1 (i.e. URLLC PUSCH)

* Option 1: SL HARQ-ACK report can be piggybacked on only PUSCH of priority index 0 (No spec change).
* Option 2: when the priority value of SL PUCCH is smaller than sl-PriorityThreshold.
* Option 3: when sl-PriorityThreshold-UL-URLLC is provided.
* Option 4: when the priority value of SL PUCCH is smaller than sl-PriorityThreshold-UL-URLLC.
* Option 5: Others (Please specify it).

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| Company | Answer | Comment |
| Sharp | Option 1 | We don’t think any further optimization on this should be introduced at this late stage of Rel-16. |
| ZTE, Sanechips | Option 1 | Potential SL HARQ report and uRLLC PUSCH collision could be avoided by implementation in lieu of being handled by additional specific change. Priority based solutions(option 2-4) would incur additional blind detection for gNB to sort out whether multiplexing exists given it has no knowledge of SL priority level. |
| NTT DOCOMO | Option 5 | In my understanding, current spec. does not include any text for condition of SL HARQ-ACK mux on PUSCH. It means, someone could misunderstand that SL HARQ-ACK can be multiplexed on any PUSCH (with any priority). Even if option 1 is taken, no spec change will not work as intended.  Dropping deprioritized on should be specified. |
| LG | Option 4 | According to the current specification, if SL HARQ-ACK reports can be piggybacked on only PUSCH of priority index 0, when the UL channel carrying the SL HARQ-ACK is collided with PUSCH of priority index 1, then the SL HARQ-ACK report could be dropped even though the priority value of the SL HARQ-ACK report is sufficiently small.  At least when the SL HARQ-ACK report is prioritized over URLLC Uu UCI, it needs to allow the case when the SL HARQ-ACK report is piggybacked on URLLC PUSCH. To do this, it can be considered that the UE assumes that the priority index of the SL HARQ-ACK report is 1 when the priority value of SL PUCCH is smaller than sl-PriorityThreshold-UL-URLLC. |
| Apple | Option 5 | In case SL HARQ-ACK report cannot be piggybacked on URLLC PUSCH (i.e., Option 1), we may need to specify the dropping rule. Maybe we could say SL HARQ-ACK report is dropped when it has overlap with URLLC PUSCH. This has the minimum spec. impact at the late stage of Rel-16 maintenance. |
| Huawei, HiSilicon | Option 1 | Recall the design for UCI multiplexing on PUSCH in NR Uu of Rel-15, there is no additional conditions for multiplexing except the resource overlapping between PUCCH and PUSCH. As there is no priority indicator in DCI format 3\_0, it can be seen as priority 0 following Rel-16 spec and a UE can multiplex UCIs only with same priority index in a PUSCH. So the option-1 should be adopted without any spec changes.  TS38.213 Clause 9.   |  | | --- | | A PUSCH or a PUCCH transmission, including repetitions if any, can be of priority index 0 or of priority index 1. For a configured grant PUSCH transmission, a UE determines a priority index from *phy-PriorityIndex*, if provided. For a PUCCH transmission with HARQ-ACK information corresponding to a SPS PDSCH reception or a SPS PDSCH release, a UE determines a priority index from *harq-CodebookID*, if provided. For a PUCCH transmission with SR, a UE determines the corresponding priority as described in Clause 9.2.4. For a PUSCH transmission with semi-persistent CSI report, a UE determines a priority index from a priority indicator field, if provided, in a DCI format that activates the semi-persistent CSI report. If a priority index is not provided to a UE for a PUSCH or a PUCCH transmission, the priority index is 0. | |
| QC | Option 5 | In the current specification, SL HARQ-ACK is always multiplexed with UL PUSCH, regardless of PUSCH priority index. So we think that is the simplest option.  Second preferred option will be option 4. It’s a bit more optimized at the expense of gNB additional blind detection. |
| Ericsson | Option 1 | We don’t think any optimization based on priority level is necessary at this point in time. |
| OPPO | Option 1 | Conflict between SL HARQ-ACK and priority 1 PUSCH can be minimized by network implementation, even it happens, the network can simply assign one more resource for re-transmission of the SL. |
| Samsung | Option 1 | We also think that gNB scheduling could minimize potential collision between SL HARQ-ACK report and URLLC PUSCH. Therefore, additional specification change seems less necessary. |
| Intel | Option 1 | Since gNB may not be fully aware of actual SL priority, solutions relying on SL priority are not preferred.  In this case Option 1 is the way forward. |
| vivo | Option 2 or option 4 | If option 1 is adopted, it means SL priority is always lower than UL priority, i.e., SL is always regarded as EMBB.  Option 1 is basically breaking the rule to design SL/UL prioritization. We should not deny what has been designed by us. |
| Nokia, NSB | Option 5 or Option 4 | SL HARQ-ACK shall be piggybacked on PUSCH, no matter of PUSCH priority index 0 or priority 1. If PUSCH priority index 1 is a factor, we would support Option 4. |

Q2: Do you agree following proposal?

Proposal:

*For prioritization between PUCCH carrying SL HARQ-ACK reports and PUSCH without UL-SCH,*

* *When the priority index of the PUSCH is 1,* 
  + *if sl-PriorityThreshold-UL-URLLC is provided*
    - *the PUCCH has higher priority than the PUSCH if the priority value of the SL HARQ-ACK reports is smaller than sl-PriorityThreshold-UL-URLLC; otherwise, the PUCCH has higher priority than the PUCCH*
  + *else*
    - *the PUSCH has higher priority than the PUCCH*
* *else*
  + *the SL transmission or reception has higher priority than the UL transmission if the priority value of the SL transmission(s) or reception is smaller than sl-PriorityThreshold; otherwise, the UL transmission has higher priority than the SL transmission or reception*

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| Company | Answer | Comment |
| Sharp | No | See our comments for Q1. |
| ZTE,Sanechips | No | We prefer to resolve this by implementation. |
| NTT DOCOMO | Yes | This case seems to be included in the mentioned case of section 16.2.4.3.1 of 38.213: ‘For prioritization between SL transmission or …’, so no spec update is assumed, right? |
| LGE | Yes | In our understanding, the PUSCH without UL-SCH would be the case when PUSCH carries aperiodic CSI or SP-CSI only. In this case, the prioritization between SL TX and PUCCH carrying Uu UCI can be reused. |
| Apple | Yes | Overall, this case can be handled in a similar way as PUCCH carrying SL HARQ-ACK vs. PUCCH carrying UCI (i.e., Section 9.2.5.0 in 38.213). One typo in the proposal is  *“otherwise, the PU~~C~~SCH has higher priority than the PUCCH”* |
| Huawei, HiSilicon | Yes | It looks straightforward to reuse the principle to address the overlapping between PUCCHs with SL-HARQ and Uu UCI defined in subclause 9.2.5.0 of TS 38.213, but at such a late CR stage of Rel-16, any case captured should be considered carefully. |
| QC | Other | OK in principle. The wording of the else part   * + “*the SL transmission or reception has higher priority than the UL transmission if the priority value of the SL transmission(s) or reception is smaller than sl-PriorityThreshold; otherwise, the UL transmission has higher priority than the SL transmission or reception*”   is unclear and seems disconnect with the remaining of the proposal. |
| Ericsson | No | This case can be avoided by implementation. |
| OPPO | No | It is an optimization, and the network can avoid the issue. |
| Samsung | No | It can also be avoided by gNB implementation, and we are negative to introduce additional prioritization rule that leading to gNB blind detection in late stage. |
| vivo | No | We share view as NTT DCM, the case has been included in 16.2.4.3.1. why to add a new section? |
| Nokia, NSB | No | Further optimization is not necessary. |

Q3: Whether or how to handle the case when a PUSCH with no UCI overlaps with two non-overlapping PUCCHs each of which contains SL HARQ-ACK and Uu UCI



[R1-2101583]

* Option 1: UE does not expect the above collision case
  + Option 1-1: No spec change
  + Option 1-2: Add a sentence in the specification
* Option 2: Apply prioritization rule for overlapping PUCCH to the case of non-overlapping PUCCH which collided with a PUSCH.
* Option 3: Others (Please specify it).

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| Company | Answer | Comment |
| Sharp | Option 1-1, or  Option 1-2 | We don’t think any further optimization on this should be introduced at this late stage of Rel-16. On the other hand, maybe it is OK to add a sentence in the specification to clarify that such a case is not expected. |
| ZTE, Sanechips | 1-1 | We prefer to resolve this by implementation. Even if some high level guidance were needed, this could be implemented by a RAN1 conclusion. |
| NTT DOCOMO | Option 2 | In the current spec, PUSCH is scheduled after DL assignment/SL grant so that UL DAI/SAI works well and the corresponding HARQ-ACK can be multiplexed on the PUSCH. In that sense, Option 1 is too restrictive for PUSCH scheduling.  In addition, we think that the collision between PUCCH with SL HARQ-ACK and PUSCH with A/SP-CSI should be discussed to conclude how to handle this case. Note that the current spec allows multiplexing the SL HARQ-ACK on the PUSCH. |
| LGE | Option 1-1 | When at least one of non-overlapping PUCCHs and overlapping PUSCH is scheduled by gNB, gNB could ensure that such collision case does not happen.  Even for the case when PUCCHs and PUSCH are configured by gNB, the network can ensure such collision does not happen. One simple way is that the SL PUCCH and Uu PUCCH are always overlapping at least for the case when they are configured by gNB. |
| Apple | Option 1-2 | Maybe one sentence of explanation that “this case is not expected by UE” is fine. |
| Huawei, HiSilicon | Option 1-1 | It is not wise to introduce prioritization of two un-overlapped channels we (RAN1) never touched. In PHY layer design, not only in SL, comparisons are generally applied based on the resource collision. No enhancements on this scenario. |
| QC | Option 1-2 | A clarification sentence is needed for spec clarity |
| Ericsson | Option 1-1 | This can be done by implementation, so no specification changes are needed. |
| OPPO | Option 1-1 | The issue can be avoided by network. |
| Samsung | Option 1-1 | We don’t think this is a common case and RAN1 should not spend much effort on it. It can be solved by implementation. |
| Intel |  | We think this case should be already handled in specification for other UCI types. Prefer to align with those cases. |
| vivo | Option 1-1/1-2 | none |
| Nokia, NSB | Option 1-1 | No change is needed. |

**PP-1-3: Further consideration on prioritization rule between PUCCH for the response of MsgB and SL TX**

Q4: Do you agree following proposal?

Proposal:

* *PUCCH transmission for the response of MsgB is prioritized over SL transmission(s).*

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| Company | Answer | Comment |
| Sharp | No | We don’t think any further optimization on this should be introduced at this late stage of Rel-16. |
| ZTE, Sanechips | Yes |  |
| NTT DOCOMO | No | Current spec does not prioritize PUCCH for response of Msg4. We think the same prioritization among them is better. |
| LGE | Yes | If this is not agreed, it would be necessary to newly define UE behavior when the UE drops the PUCCH for the response of the received MsgB. |
| Apple | Yes | As a part of initial access, PUCCH for response of MsgB should have higher priority over sidelink. |
| Huawei, HiSilicon | Yes | Same as MsgA, the priority of UL transmission relative to PRACH can be prioritized. |
| QC | No | Agree with Sharp and DOCOMO. |
| Ericsson | Yes |  |
| OPPO | NO | Share the view as DCM. |
| Samsung | Yes | The prioritization rule for MsgA can be reused for MsgB. |
| Intel | Yes |  |
| vivo | Yes |  |
| Nokia, NSB | Yes | PRACH messages shall have higher priority than SL. |

**PP-1-4: Further consideration on prioritization rule between SL reception and PUCCH carrying SL HARQ-ACK report**

Q5: Do you agree following proposal?

Proposal:

*For prioritization between SL RX and PUCCH carrying SL HARQ reporting,*

* *The PUCCH transmission has higher priority than a SL transmission if a priority value of the PUCCH is smaller than a priority value of the SL reception.*
* *If the priority value of the PUCCH transmission is larger than the priority value of the SL reception, the SL reception has higher priority.*

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| Company | Answer | Comment |
| Sharp | Yes | (“SL transmission” => “SL reception” in the first bullet?)  In our understanding this is something missing in the spec. |
| ZTE, Sanechips | No | We prefer to discuss PSFCH/S-SSB Rx only, whose priority level is fully known to UE. The preferred change looks like.  *For prioritization between SL PSFCH or S-SSB Rx and PUCCH carrying SL HARQ reporting,*   * *The PUCCH transmission has higher priority than a SL PSFCH or S-SSB Rx if a priority value of the PUCCH is smaller than a priority value of the SL PSFCH or S-SSB Rx.* * *If the priority value of the PUCCH transmission is larger than the priority value of the SL PSFCH or S-SSB reception, the SL reception has higher priority.* |
| NTT DOCOMO | Yes | Common solution with SL transmission.  ZTE’s update seems feasible. |
| LGE | Yes |  |
| Apple | Yes | SL reception has the same prioritization rule as SL transmission in this case. |
| Huawei, HiSilicon | Yes | Agree with Sharp that the “SL transmission” should be “SL reception” in the first bullet.  Prioritization rule for PUCCH carrying SL HARQ-ACK reporting and SL transmission is specified in TS38.213 section 16.2.4.3.1. Similar rules can be reused. |
| QC | Yes | It should be clarify that the rule only applies when sidelink transmission priority is known, in which case timeline needed to be defined. |
| Ericsson | Yes |  |
| OPPO | Yes |  |
| Samsung | Yes |  |
| Intel | Yes |  |
| vivo | See comment | Both of the 2 components for comparison have SL related priority. we list all the cases for comparison of 2 SL components. The highlighted parts as below has no prioritization rule. If further optimization is going to be made, all the cases should be treated equally.   * PSSCH TX and PSSCH RX * PSFCH TX and PSFCH RX * PSSCH TX and UL TX * PSFCH TX and UL TX * PSSCH RX and UL TX   PSFCH RX and UL TX |
| Nokia, NSB | Yes | Agree with Sharp’s comment on “SL reception”. |

**FL proposal set #1**

Proposal 1:

* SL HARQ-ACK report can be piggybacked on only PUSCH of priority index 0 (No spec change).
  + Note that the priority index of PUCCH carrying SL HARQ-ACK report is 0 and NR Uu prioritization rule between UL channel of priority index 0 and UL channel of priority index 1 is reused.

Proposal 2:

* In Rel-16 NR sidelink, prioritization between PUCCH carrying SL HARQ-ACK reports and PUSCH without UL-SCH is not specified.

Proposal 3:

* UE does not expect the case when a PUSCH with no UCI overlaps with two non-overlapping PUCCHs each of which contains SL HARQ-ACK and Uu UCI.
  + No spec change is needed.

Proposal 4:

* PUCCH transmission for the response of MsgB is prioritized over SL transmission(s).

Proposal 5:

* For prioritization between SL PSFCH or S-SSB reception and PUCCH carrying SL HARQ reporting,
  + The PUCCH transmission has higher priority than a SL PSFCH or S-SSB reception if a priority value of the PUCCH is smaller than a priority value of the SL PSFCH or S-SSB reception.
  + If the priority value of the PUCCH transmission is larger than the priority value of the SL PSFCH or S-SSB reception, the SL PSFCH or S-SSB reception has higher priority.