# **[101-e-NR-5G\_V2X\_NRSL-SL\_PHY\_Procedure-02] Email discussion/approval regarding prioritization**

[101-e-NR-5G\_V2X\_NRSL-SL\_PHY\_Procedure-02] Email discussion/approval regarding prioritization

* + Issue 2-1: Remaining issues on prioritization for SL HARQ reporting on PUCCH or PUSCH
  + Issue 2-3: UL/SL prioritization for the case when multiple UL TX and multiple SL TX overlap in time

Till 5/29, with potential TPs by 6/4 – Hanbyul (LGE)

**1. Remaining issues on prioritization for SL HARQ reporting on PUCCH or PUSCH**

In applying the following agreement, there are several cases where the priority of “PUCCH carrying SL HARQ reporting” is not defined as there is no “priority of the associated PSFCH.” Q1 – Q4 ask how to determine the priority of PUCCH carrying SL HARQ reporting in these cases.

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| * *When PUCCH carrying SL HARQ reporting overlaps with SL TX,*   + *The one with a higher priority is transmitted.*     - *The priority of PUCCH carrying SL HARQ reporting is the highest priority of the associated PSFCH* |

Q1: For configured grant, the TX UE reports ACK to gNB in case no PSCCH/PSSCH is transmitted in a set of resources. In this case, the priority of “PUCCH carrying SL HARQ reporting” is defined as

* Option 1-1: The smallest priority value among the possible values for the grant
* Option 1-2: The largest priority value among the possible values for the grant
* Option 1-3: A (pre-)configured priority value
* Option 1-4: Others (please specify)

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| Company | Preferred option | Comment |
| Intel | 1-2  (i.e. least important) | Since this ACK information to gNB in this situation is less important than other information, because missed ACK may result on excessively scheduled retransmission, it is preferred to assign the lowest priority, i.e. largest priority value (least important). |
| LG | Option 1-1 | The purpose of this SL HARQ reporting is to prevent that the gNB schedules retransmission unnecessarily. In that point of view, it needs to be prioritized. |
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Q2: The TX UE reports NACK to gNB in the following cases:

* When it does not transmit the corresponding PSCCH/PSSCH due to intra-UE prioritization.
* When it does not receive the corresponding PSFCH due to intra-UE prioritization.

In this case, do you agree that the priority of “PUCCH carrying SL HARQ reporting” is defined as the priority value of the dropped PSSCH or PSFCH?

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| Company | Answer | Comment |
| Intel | Yes | There is an associated priority, and it is straightforward to use |
| LG | Yes. | Even though the PSSCH or PSFCH will be dropped, the TX UE know the priority of the PSSCH to be transmitted or the PSFCH to be received. |
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Q3: If the SL transmission does not use SL HARQ feedback (if supported by RAN2), the UE reports NACK to request further resources for blind retransmission and ACK otherwise. In this case, the priority of “PUCCH carrying SL HARQ reporting” is defined as

* Option 3-1: The smallest priority value among the possible values for the grant
* Option 3-2: The largest priority value among the possible values for the grant
* Option 3-3: A (pre-)configured priority value
* Option 3-4: The priority value of the associated PSSCH
* Option 3-5: Others (please specify)

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| Company | Preferred option | Comment |
| Intel | 3-4 | Since a UE has PSSCH for transmission, the rule to assign it to the corresponding PUCCH can be applied |
| LG | Option 3-4 | For simplicity, the priority of the associated PSSCH can be used considering that the priority of PSFCH is determined by the priority of the corresponding PSSCH. |
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Q4: If the maximum number of HARQ re-transmissions is reached for a TB, the UE sends one bit on the UL resources for SL HARQ-ACK reporting. In this case, the priority of “PUCCH carrying SL HARQ reporting” is defined as

* Option 3-1: The smallest priority value among the possible values for the grant
* Option 3-2: The largest priority value among the possible values for the grant
* Option 3-3: A (pre-)configured priority value
* Option 3-4: The priority value of the associated PSSCH
* Option 3-5: Others (please specify)

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| Company | Preferred option | Comment |
| Intel | 3-4 | Same as Q3 |
| LG | Option 3-4 | For simplicity, the priority of the associated PSSCH can be used. |
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Q5: When PUCCH carrying SL HARQ reporting overlaps with PUSCH without UCI, do you agree the following proposal?

Proposal:

* SL HARQ reporting is piggybacked in the PUSCH transmission.

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| Company | Answer | Comment |
| Intel | Yes, but | Is not already agreed, and HARQ CB for UCI on PUSCH is being prepared in Mode-1 AI? |
| LG | Yes | For clarification, we think that this PUSCH is shown to the UE after Uu multiplexing/cancellation. |
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Q6: When PUCCH carrying SL HARQ reporting overlaps with another UL TX other than PUSCH without UCI, do you agree the following proposal?

Proposal:

* Reuse UL/SL prioritization rule agreed for PSFCH and UL TX other than PUCCH carrying SL HARQ reporting by replacing PSFCH with PUCCH carrying SL HARQ reporting, i.e.,
  + when UL TX is associated with a DCI indicating “high” in “priority field” or configured with “high priority” by higher layers (i.e., URLLC case)
    - If SL-threshold for URLLC case is configured, LTE rule is used (i.e., UL TX is down-prioritized if the priority value of PUCCH carrying SL HARQ reporting is smaller than SL-threshold, otherwise prioritized)
    - Otherwise, UL TX is prioritized
  + Otherwise, LTE rule is used with another SL-threshold configured for non-URLLC case
  + Additionally, PRACH and PUSCH scheduled by RAR UL grant are always prioritized.

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| Company | Answer | Comment |
| Intel | Disagree | Our understanding, that in case both channels are subject to reception at gNB, the prioritization result should be known to gNB in the moment of scheduling.  Since the above proposal results in prioritization of different channels depending on SL priority, which is in general unknown to gNB, the above assumption/understanding of prioritization determinism is violated.  To solve this, PUCCH carrying SL HARQ reporting in this scenario should be assigned with a semi-static priority: (1) lower than “regular” and “high” Uu, (2) higher than “regular”, lower than “high” Uu, (3) higher than “regular” and “high” Uu |
| LG | Yes | Even for the case when PUCCH carrying SL HARQ reporting overlaps with PUSCH with UCI and UL-SCH, either PUCCH carrying SL HARQ reporting or PUSCH with UCI and UL-SCH will be prioritized. Considering processing time budget, it would not be desirable to replace UCI with SL HARQ reporting for PUSCH transmission. |
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Q7: When PUSCH carrying SL HARQ reporting overlaps with another UL TX,

* Option 7-1: Rule for PUSCH without SL HARQ reporting is reused (i.e. UL transmission associated with a DCI indicating “high” in “priority field” or configured with “high priority” by higher layers is prioritized)
* Option 7-2: PUSCH carrying SL HARQ reporting is prioritized
  + if the SL HARQ reporting is prioritized over the overlapping UL TX, or
  + if the PUSCH carrying SL HARQ reporting is associated with a DCI indicating “high” in “priority field” or configured with “high priority” by higher layers and the overlapping UL TX is not associated with a DCI indicating “high” in “priority field” or configured with “high priority” by higher layers
* Option 7-3: Others (please specify)

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| Company | Preferred option | Comment |
| Intel | 7-2 |  |
| LG | Option 7-1 | If the PUSCH used for piggyback of SL HARQ reporting is shown to the UE after Uu multiplexing/cancellation, this prioritization rule would not be needed.  If the prioritization rule is needed for this case, we prefer to use Option 7-1 for simplicity. |
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**2. UL/SL prioritization for the case when multiple UL TX and multiple SL TX overlap in time**

Q8: Regarding whether to confirm the following working assumption,

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| ***Agreements:***   * ***(Working assumption) For handling the case where more than one SL and UL transmissions overlap, adopt the following principle***   + ***For more than one SL transmissions overlapping with a UL transmission, the highest priority of SL transmissions is used for the prioritization.***   + ***For more than one UL transmissions overlapping with a SL transmission, the highest priority of UL transmissions is used for the prioritization.*** * ***FFS details*** |

* Option 8-1: Working assumption is confirmed and details are up to UE implementation.
* Option 8-2: Working assumption is confirmed and look-ahead operation is assumed in the details.
  + To decide whether SL TX in slot i is prioritized, the priority of SL TX in slot i+1 can be used. To decide whether UL TX in slot n is prioritized, the priority of UL TX in slot n+1 can be used.
* Option 8-3: Working assumption is confirmed and look-ahead operation is NOT assumed in the details
  + To decide whether SL TX in slot i is prioritized, the priority of SL TX in slot i+1 is not used, and to decide whether UL TX in slot n is prioritized, the priority of UL TX in slot n+1 is not used.
* Option 8-4: Others (please specify)

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| Company | Preferred option | Comment (including elaboration of the specification impact of the preferred option) |
| Intel | 8-3 | Make prioritization on slot-by-slot basis without considering other slots during prioritization in a given slot |
| LG | Option 8-3  Option 8-1 | Considering specification effort, look-ahead operation needs to take into account processing time, numerology of UL and SL, and so on. In this case, for simplicity, the priority rule could be performed without consideration of look-ahead operation. Alternatively, it can be considered to leave it UE implementation. |
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