# **[100b-e-NR-5G\_V2X\_NRSL-SL\_PHY\_Procedure-02] SL/UL prioritization and UL/SL power sharing**

[100b-e-NR-5G\_V2X\_NRSL-PHY-Procedure-02] Email discussion/approval regarding SL/UL prioritization and UL/SL power sharing

* Prioritization in the cases mentioned in RAN2 LS ([R1-2000161](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_100b\Docs\R1-2000161.zip)), i.e., “how to handle all other physical channels in UL/SL prioritization”
* Prioritization between UL TX and SL TX in case of simultaneous TXs of UL and SL across difference carriers

till 4/23, with potential TPs by 4/28 (Hanbyul, LGE)

**1. SL/UL prioritization for dropping**

Q1 (PSFCH): When PSFCH TX overlaps with UL TX, what is the prioritization rule for dropping?

- Option 1: Use the prioritization rule for UL SCH and SL SCH collision (i.e., the SL transmission is prioritized if the highest priority value of UL LCH(s) with available data is larger than the UL priority threshold and the highest priority value of SL LCH(s) with available data is lower than the SL priority threshold. Otherwise the UL transmission is prioritized.)

- Option 2: Use the LTE rule (i.e., UL TX is down-prioritized if SL-TX is higher than SL-threshold, otherwise prioritized)

- Option 3: Others (please specify it)

Q1-1: Which option do you prefer when PSFCH TX overlaps with UL TX assigned with UL SCH priority by the RAN2 agreements in R1-2000161? Feature lead understands that UL TX in this case includes UL data and UL-triggered SR.

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| Company | Preferred option | Comments |
| NTT DOCOMO | Option 1 | Following collision handling for SL data seems to be reasonable. NR-Uu supports URLLC data. In some cases, UL TX should be prioritized even when SL TX is higher than SL-threshold. |
| Apple | URLLC uplink transmission is prioritized;  Otherwise, Option 2 | If uplink data is URLLC transmission, which is indicated by high “priority field” in DCI, then uplink transmission is prioritized.  Otherwise, LTE rule is applied, where the priority of PSFCH is the same as the corresponding PSSCH data. |
| ZTE, Sanechips | Option 3 | The “i.e. part” of Option 1 says “the SL transmission is prioritized if the highest *priority value of UL LCH(s)* with available data is …”, however, physical layer, which is responsible for dropping of PSFCH-UL overlapping, does not know the priority value of UL LCH. So we prefer to a modified option 1 (we call it option 3) as following:  *The SL transmission is prioritized if the priority index of UL TX is 0 and the highest priority value of SL Tx is lower than the SL priority threshold. Otherwise the UL transmission is prioritized.* |
| Huawei, HiSicon | Option 3 | In NR Uu, the PHY of the UE cannot realize the priority of UL-SCH, because it is a logical channel priority held in MAC. However, non-fallback DCI formats in Rel-16 have a priority indicator for a PUSCH or a PUCCH in dynamic grants, and a similar field is provided in configured grants. This priority indicator indicates whether the priority of the PUCCH/PUSCH is high (e.g., URLLC) or low (e.g. eMBB) in PHY prioritization/multiplexing handling procedure.  We think that any UL TX indicated as “high priority” should be prioritized over SL TX. Otherwise, LTE solution can be reused.  **The proposed scheme for option 3:** UL TX is prioritized if the value of priority index of the PUCCH or PUSCH as indicated by the “Priority indicator” field in the associated DCI or provided by the associated configured grant is 1 (if provided); Otherwise, LTE rule is used.  The same rules of prioritization are also applied to collision between UL Tx and SL Tx including PSSCH or PSSCH + PSFCH. |
| Intel | Option 1 | The RAN2 option based on two thresholds seems most flexible and covers URLLC data cases. PSFCH related thresholds may need to be separately configured, if the priority is not directly comparable to logical channel priorities. |
| OPPO | Option 1 | The priority of PSFCH can be equal as the associated PSSCH. |
| vivo | Option 1 | Maximumly reuse the same framework for all cases |
| CATT | Option 1 | Reuse the same design principle in RNA2. |
| LG | Option 1 | Since the logical channel priority of UL-SCH is available in this case, it would be desirable to consider it for the prioritization between UL and SL.  Currently, gNB could not know the priority of SL at least for Mode 2, so it is not desirable to always prioritize URLLC UL especially when the requirement of SL TX is comparable with that of URLLC UL. Depending on the priority provided by the logical channel priority of URLLC UL-SCH and SL-SCH, the UE can decide whether URLLC UL is prioritized or SL TX with tight requirement is prioritized.  Furthermore, considering that the priority of PSFCH is given by the logical channel priority of the associated SL-SCH, it would be consistent behavior with RAN2 decision. To be specific, according to RAN2 decision, the prioritization between UL-SCH and SL-SCH does not consider “Priority index” in DCI. Instead, the logical channel priority of UL-SCH and SL-SCH are used for the prioritization rule. |
| Lenovo/MoTM | Option 1 | For PSFCH the corresponding priority indicated in SCI for PSSCH is taken into consideration |
| CMCC | Option 1 | Same design principle with RAN2. |
| Panasonic | Option 1 | Same as UL SCH and SL SCH collision would be simplest option. |
| Samsung | Option 1/2 depending URLLC or eMBB | If the UL TX is eMBB, option 2 is used, i.e., LTE rule is reused.  If the UL TX is URLLC, option 1 is used. |
| Spreadtrum | Option 1 | The priority value of PSFCH should be clarified. |
| Ericsson | URLLC uplink transmission is prioritized.  Otherwise, Option 1 | In general, we are ok with reusing the prioritization principle. However, in case of URLLC data (i.e. indicated by priority indication in DCI), UL traffic should always be prioritized. |
| Qualcomm | Option 2 |  |
| Nokia, NSB | Option 2 | RAN2 has this agreement on the prioritization (R2-1916468):  2: For prioritization between SL-TX and UL-TX (only for PUSCH), for UL MAC CE, rely on LTE solution, i.e., they are treated as if of priority lower than the UL-threshold, so down-prioritized if SL-TX is higher than SL-threshold, otherwise prioritized.  We shall follow RAN2’s agreement on this. |
| Futurewei | Option 1 | With the proposal of Q1-3 |
| InterDigital | Option 1 | Same rule applies as UL data vs SL data as PSFCH priority is based on associated SL data priority |

**Observation:**

* **Prioritization between PSFCH and UL TX assigned with UL SCH priority**
  + **Option 1: DOCOMO, Intel, OPPO, vivo, CATT, LG, Lenovo, CMCC, Panasonic, Samsung, Spreadtrum, Ericsson, Futurewei, InterDigital (14)**
  + **Option 2: Apple, ZTE, Huawei, Samsung, Qualcomm, Nokia, (6)**
* **Handling URLLC UL** 
  + **Always prioritized: Apple, ZTE, Huawei, Ericsson, (4)**
  + **Based on UL priority: DOCOMO, Intel, vivo, CATT, LG, CMCC, Panasonic, InterDigital (8)**

Q1-2: Which option do you prefer when PSFCH TX overlaps with UL TX NOT assigned with UL SCH priority by the RAN2 agreements in R1-2000161? Feature lead understands that UL TX in this case includes PUCCH with HARQ feedback for DL, CSI, LRR, PUSCH without UL-SCH, and SRS. Note that PUCCH carrying SL HARQ reporting will be discussed in a separate question Q3.

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| Company | Preferred option | Comments |
| NTT DOCOMO | Option 3 | Option 2 is applied for CSI report, LRR, PUSCH without UL-SCH, SRS.  For PUCCH with HARQ feedback for DL, the highest priority value of DL LCH(s) corresponding to the HARQ-ACK bits should be used as option 1. Otherwise, HARQ-ACK for URLLC DL data would be dropped. It is undesirable. |
| Apple | URLLC uplink transmission is prioritized;  Otherwise, Option 2 | If PUCCH is associated with URLLC transmissions (e.g., DL HARQ feedback), which is indicated by high “priority field” in DCI, then uplink transmission is prioritized.  Otherwise, LTE rule is applied.  Here, we assume PUSCH also does NOT carry SL HARQ reporting. |
| ZTE, Sanechips | Option 3 | Same as in Q1-1 |
| Huawei, HiSilicon | Option 3 | As in Q1-1, we think that any UL TX associated with the “high priority” indication in DCI or CG should be prioritized over SL TX. These include HARQ feedback for DL, CSI, and LRR. Otherwise, LTE solution can be reused. |
| Intel | Extended Option 2 | Configure two SL priority thresholds: one for regular UL TX priority, the other is for “high” UL TX priority (introduced in eURLLC) |
| OPPO | Option 2 | If UE cannot decode PDSCH correctly (NACK), it cannot determine the priority or service type based on DCI only, and accordingly it cannot determine the priority of the corresponding PUCCH. A unified principle/rule should be applied here no matter UE can or cannot decode PDSCH. In that case, we think option 2 is reasonable. |
| vivo | Option 1 | As commented at Q1-1, we prefer to reuse the same framework as defined by RAN2 for all cases, i.e., separated thresholds for UL and SL transmission. However, the priority of above-mentioned PHY control signaling may be not available, we think it can simply set the priority of UCI, CSI… higher/lower than the UL threshold.  Moreover, In the question, FL mentioned ‘PUCCH with HARQ feedback for DL, CSI, …’, then how about ‘PUSCH with HARQ feedback for DL, CSI, …’ |
| CATT | Reuse option 1 as much as possible | The priority level of these UL Tx can be (pre-)configured. |
| LG | Modified Option 2 | Since the priority of UCI is not defined, for simplicity, it can be considered to reuse the LTE rule.  Meanwhile, SL threshold can be separately (pre)configured for eMBB UL and URLLC UL to handle those cases differently. Since error and latency requirements for NR sidelink could be comparable or more tightened compared to URLLC UL depending on the service type, it is not preferable to always prioritize URLLC UL over NR sidelink. |
| Lenovo/MoTM | Option 1/Option 3 | For PSFCH, the corresponding priority indicated in SCI for PSSCH is taken into consideration  For PUCCH reporting HARQ-ACK feedback: Corresponding priority of the DL data should be considered  For PUCCH reporting HARQ-NACK feedback: Since the data was not decoded, UE doesn’t need to report NACK to gNB and in this case PSFCH is prioritized.  PUCCH carrying CSI report is always down prioritized compared to PSFCH  PUSCH carrying only UCI: Same as above, corresponding priority of the data is taken into consideration  For PSFCH and PUCCH/PUSCH transmitting UCI only: Aggregated/bundled HARQ report is prioritized over single HARQ reporting. Because dropping aggregated/bundled HARQ report is not resource efficient.  PSFCH Vs SRS: PSFCH is prioritized  PSFCH Vs RACH transmitted on Pcell: RACH is prioritized  PSFCH Vs RACH transmitted on Scell: PSFCH is prioritized |
| CMCC | Extended Option 2 | Similar view with Intel. Considering that UL/SL have both URLLC traffic and eMBB traffic, thus two SL priority thresholds are configured: one is for UL TX priority 0 and the other is for UL TX priority 1. |
| Panasonic | URLLC uplink transmission is prioritized;  Otherwise, Option 2 | We have same view as Apple. HARQ-ACK for URLLC (priority 1) is prioritized. Otherwise, LTE rule is applied (Option 2). |
| Samsung | Option 1/2 depending URLLC or eMBB | If the UL TX is eMBB, option 2 is used, i.e., LTE rule is reused.  If the UL TX is URLLC, option 1 is used. |
| Spreadtrum | Option 3 | 1)For PUCCH with HARQ feedback for DL or PUSCH without UL-SCH but with HARQ feedback, the SL transmission is prioritized if the priority index of DL grant associated with HARQ feedback is 0 and the highest priority value of SL Tx is lower than the SL priority threshold. Otherwise the UL transmission is prioritized.  2)For PUCCH with no HARQ feedback for DL, but with CSI, LRR, or PUSCH without UL-SCH and HARQ feedback for DL, but with CSI , go for option 2.  3)For SRS, SL Tx is always prioritized. |
| Ericsson | Option 2 | In this case, we believe LTE procedure can be reused. |
| Qualcomm | Option 2 |  |
| Nokia, NSB | Option 2 | Reuse LTE procedure |
| Futurewei | Option 2 | Option 1 could be used as well, but would require defining a set of priorities |
| InterDigital | Option 2 | Also fine with having exception rule for URLLC case |

**Observation:**

* **Prioritization between PSFCH and UL TX NOT assigned with UL SCH priority**
  + **Option 1: vivo, CATT, Lenovo, Samsung, (4)**
  + **Option 2: DOCOMO, Apple, ZTE, Huawei, Intel, OPPO, LG, CMCC, Panasonic, Samsung, Spreadtrum, Ericsson, Qualcomm, Nokia, Futurewei, InterDigital (16)**
  + **Option 3 (Priority of DL-SCH is used): DOCOMO, Lenovo, (2)**
* **Handling URLLC UL**
  + **Always prioritized: Apple, ZTE, Huawei, Panasonic, Spredtrum, (5)**
  + **Based on UL priority: CATT, vivo, (2)**
  + **Different threshold is used: Intel, LG, CMCC, (3)**

Q1-3: At least Option 1 and Option 2 require a priority of PSFCH TX. Do you agree that the priority of PSFCH TX is the highest priority of the associated PSCCH/PSSCH?

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| Company | Answer |
| NTT DOCOMO | OK |
| Apple | Agree |
| ZTE, Sanechips | Agree. |
| Huawei, HiSilicon | Yes |
| Intel | Agree |
| OPPO | Agree |
| vivo | Agree |
| CATT | Agree |
| LG | Yes, we think that the priority of PSFCH TX is the same as the priority of the associated PSCCH/PSSCH. For more than one PSFCH TXs, the highest priority of PSFCH TXs will be used for UL/SL prioritization. |
| Lenovo/MoTM | Yes |
| CMCC | Agree |
| Panasonic | Agree |
| Samsung | Agree |
| Spreadtrum | Agree |
| Ericsson | OK |
| Qualcomm | Agree |
| Nokia, NSB | Yes. |
| Futurewei | Yes |
| InterDigital | Agree |

**Observation:**

* **Consensus on the priority of PSFCH TX is the highest priority of the associated PSCCH/PSSCH.**

Q2 (S-SSB): When S-SSB TX overlaps with UL TX, what is the prioritization rule for dropping?

- Option 1: Use the prioritization rule for UL SCH and SL SCH collision (i.e., the SL transmission is prioritized if the highest priority value of UL LCH(s) with available data is larger than the UL priority threshold and the highest priority value of SL LCH(s) with available data is lower than the SL priority threshold. Otherwise the UL transmission is prioritized.)

- Option 2: Use the LTE rule (i.e., UL TX is down-prioritized if SL-TX is higher than SL-threshold, otherwise prioritized)

- Option 3: Others (please specify it)

Q2-1: Which option do you prefer when S-SSB TX overlaps with UL TX assigned with UL SCH priority by the RAN2 agreements in R1-2000161? Feature lead understands that UL TX in this case includes UL data and UL-triggered SR.

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| Company | Preferred option | Comments |
| NTT DOCOMO | Option 1 | Reason is the same as that for above. URLLC UL data should be prioritized. |
| Apple | URLLC uplink transmission is prioritized;  Otherwise, Option 2 | If UL is associated with URLLC transmissions (e.g., URLLC uplink data), which is indicated by high “priority field” in DCI, then UL is prioritized.  Otherwise, LTE rule is applied. |
| ZTE, Sanechips | Option 3 | Same concern as in Q1-1: PHY layer does not know the priority of UL LCH. Our preferred Option 3 is described as following:  *The SL transmission is prioritized if the priority index of UL TX is 0 and the highest priority value of SL Tx is lower than the SL priority threshold. Otherwise the UL transmission is prioritized. The SL priority in case of S-SSB transmission is configured by higher layer.* |
| Huawei, HiSilicon | Option 3 | Since S-SSB TX is not an emergency, UL TX should be always prioritized over S-SSB TX.  This is also equivalent to taking option 2, and defining that S-SSB priority is always higher than SL-threshold. |
| Intel | Same as PSFCH TX | Same handling as PSFCH, but with S-SSB priority derived differently |
| OPPO | Option 2 | While the priority of S-SSB can be set to the largest value, i.e., priority of S-SSB is 7, corresponding to lowest priority.  S-SSB is transmitted in SFN mode. If the UE does not transmit S-SSB because of collision, there is possible other UEs do transmit S-SSB. |
| vivo | Option 1 | As commented for Q1-1 |
| CATT | Option 1 | Same as for Q1-1 |
| LG | Option 1 | Considering output of in-device coexistence, the priority of S-SSB is (pre)configured for prioritization between LTE SL and NR SL. This priority could be reused for applying SL/UL prioritization.  As mentioned in Q1-1, it would be beneficial to consider both the priority of UL TX and the priority of SL TX for the prioritization between UL and SL. |
| Lenovo/MoTM | option 3 | UE implementation. S-SSB transmission is not high priority, If the UE drops many of the SSB transmission in a period then it can prioritize the following S-SSB transmission compared to UL. |
| CMCC | Option 1 | Same design principle with RAN2. |
| Panasonic | Option 1 | Same as UL SCH and SL SCH collision would be simplest option. |
| Samsung | Option 2 | LTE rule can be reused. |
| Spreadtrum | Option 1 | The priority value of S-SSB should be clarified. |
| Ericsson | URLLC uplink transmission is prioritized.  Otherwise, Option 1 | In general, we are ok with reusing the prioritization principle. However, in case of URLLC data (i.e. indicated by priority indication in DCI), UL traffic should always be prioritized. |
| Qualcomm | Option 2 | The priority value of S-SSB is configured |
| Nokia, NSB | Option 2 | Reuse LTE rule. |
| Futurewei | Option 1 | Same as Q1-1 |

**Observation:**

* **Prioritization between S-SSB and UL TX assigned with UL SCH priority**
  + **Option 1: DOCOMO, Intel, vivo, CATT, LG, CMCC, Panasonic, Spreadtrum, Ericsson, Futurewei, (10)**
  + **Option 2: Apple, ZTE, Samsung, Qualcomm, Nokia, (5)**
  + **Option 3(S-SSB is deprioritized): Huawei, OPPO, (2)**
  + **Option 4(Up to UE implementation): Lenovo,**
* **Handling URLLC UL** 
  + **Always prioritized: DOCOMO, Apple, ZTE, Ericsson, (4)**
  + **Based on UL priority: Intel, vivo, CATT, LG, CMCC, Panasonic (6)**

Q2-2: Which option do you prefer when S-SSB TX overlaps with UL TX NOT assigned with UL SCH priority by the RAN2 agreements in R1-2000161? Feature lead understands that UL TX in this case includes PUCCH with HARQ feedback for DL, CSI, LRR, PUSCH without UL-SCH, and SRS. Note that PUCCH carrying SL HARQ reporting will be discussed in a separate question Q3.

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| Company | Preferred option | Comments |
| NTT DOCOMO | Option 3 | Similarly to Q1-2, Option 2 is applied for CSI report, LRR, PUSCH without UL-SCH, SRS.  For PUCCH with HARQ feedback for DL, the highest priority value of DL LCH(s) corresponding to the HARQ-ACK bits should be used as option 1. Otherwise, HARQ-ACK for URLLC DL data would be dropped. It is undesirable. |
| Apple | URLLC uplink transmission is prioritized;  Otherwise, Option 2 | If UL is associated with URLLC transmissions (e.g., URLLC DL HARQ), which is indicated by high “priority field” in DCI, then UL is prioritized.  Otherwise, LTE rule is applied.  In this case, we assume PUSCH also does NOT carry SL HARQ reporting. |
| ZTE, Sanechips | Option 3 | Same as for Q2-1. |
| Huawei, HiSilicon | Option 3 | See comments in Q2-1. |
| Intel | Extended Option 2 | Configure two SL priority thresholds: one for regular UL TX priority, the other is for “high” UL TX priority (introduced in eURLLC) |
| OPPO | Option 2 | Same as for Q2-1. |
| vivo | Option 1 | As commented in Q1-2 |
| CATT | Reuse option 1 as much as possible | Same as for Q1-2 |
| LG | Modified Option 2 | In a similar manner of the answer in Q1-2, we are supportive of reusing the LTE rule with separately (pre)configured SL threshold for eMBB UL and URLLC UL. |
| Lenovo/MoTM | option 3 | UE implementation. S-SSB transmission is not high priority, If the UE drops many of the SSB transmission in a period then it can prioritize the following S-SSB transmission compared to UL. |
| CMCC | Extended Option 2 | Similar view with Intel. Considering that UL/SL have both URLLC traffic and eMBB traffic, thus two SL priority thresholds are configured: one is for UL TX priority 0 and the other is for UL TX priority 1. |
| Panasonic | URLLC uplink transmission is prioritized;  Otherwise, Option 2 | Same as for Q1-2. |
| Samsung | Option 2 | LTE rule can be reused. |
| Spreadtrum | Option 3 | The answer is the same as for Q2-1. |
| Ericsson | Option 2 | In this case, LTE procedure is reused. |
| Qualcomm | Option 2 | The priority value of S-SSB is configured |
| Nokia, NSB | Option 2 | Reuse LTE rule. |
| Futurewei | Option 2 | See Q1-2 |

**Observation:**

* **Prioritization between PSFCH and UL TX NOT assigned with UL SCH priority**
  + **Option 1: vivo, CATT, (2)**
  + **Option 2: DOCOMO, Apple, ZTE, Intel, LG, CMCC, Panasonic, Samsung, Spreadtrum, Ericsson, Qualcomm, Nokia, Futurewei, (13)**
  + **Option 3 (Priority of DL-SCH is used): DOCOMO,**
  + **Option 4(S-SSB is deprioritized): Huawei, OPPO, (2)**
  + **Option 5 (Up to UE implementation): Lenovo,**
* **Handling URLLC UL**
  + **Always prioritized: Apple, ZTE, Panasonic, Spredtrum, (4)**
  + **Based on UL priority: vivo, CATT, (2)**
  + **Different threshold is used: Intel, LG, CMCC, (3)**

Q2-3: At least Option 1 and Option 2 require a priority of S-SSB TX. How is the priority of S-SSB determined?

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| Company | Answer |
| NTT DOCOMO | (Pre-)configured.  Flexibility to set priority for S-SSB is preferred since priority of SL operation and that of UL operation are up to scenarios/services/etc. |
| Apple | By (pre)configuration |
| ZTE, Sanechips | (pre-)configured. |
| Huawei, HiSilicon | UL TX is always prioritized over S-SSB TX i.e. the priority value of S-SS/PSBCH block or LTE SLSS/PSBCH should be always larger than the SL priority threshold. |
| Intel | Same pre-configuration mechanism as for in-device co-existence |
| OPPO | (pre-)configured to largest value, i.e., priority of S-SSB is 7, corresponding to lowest priority. |
| vivo | (pre-)configured, reuse what we have specified in co-existence AI |
| CATT | (Pre-)configured |
| LG | As in in-device coexistence, the priority of S-SSB could be (pre)configured. |
| Lenovo/MoTM | UE implementation |
| CMCC | (Pre-)configured |
| Panasonic | It is the highest priority in SL channels. |
| Samsung | (Pre-)configured |
| Spreadtrum | (pre-)configured |
| Ericsson | (Pre-)configured, similar to the agreement the In-device coexistence AI in RAN1#98b. |
| Qualcomm | The priority value of S-SSB is configured |
| Nokia, NSB | (Pre-)configured |
| Futurewei | (Pre-)configured |

**Observation:**

* **A priority of S-SSB TX**
  + **(Pre)configured: DOCOMO, Apple, ZTE, Intel, vivo, CATT, LG, CMCC, Samsung, Spreadtrum, Ericsson, Qualcomm, Nokia, Futurewei, (14)**
  + **Deprioritized over UL TX: Huawei, OPPO, Panasonic, (3)**
  + **UE implantation: Lenovo,**

Q3 (PUCCH carrying SL HARQ reporting): Do you agree that the priority of PUCCH carrying SL HARQ reporting is the highest priority of the associated PSFCH?

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| Company | Answer |
| NTT DOCOMO | Not support for collision with UL.  OK for collision with SL.  The priority should be known to gNB. Otherwise, gNB needs blind decoding for many UL channels since the PUCCH may be dropped or UL channel other than the PUCCH may be dropped. In addition, UL TX for URLLC-type could be dropped due to the PUCCH for SL HARQ report. The collision is unpredictable at gNB and unavoidable. |
| Apple | Agree |
| ZTE, Sanechips | Ok, but only for collision with SL. |
| Huawei, HiSilicon | Yes. |
| Intel | Prefer not to assign specific priority value associated with PSSCH/PSCCH to PUCCH carrying SL HARQ report. Similar to NTT DOCOMO, our preference is to avoid PUCCH dropping decisions at a UE which can be unknown to gNB, since in general the SL priority operated by a UE may be uncertain to gNB, unless heavily restricted by gNB. |
| OPPO | Agree |
| CATT | Agree |
| LG | Yes, when multiple HARQ-ACK feedbacks are multiplex in a PUCCH, the highest priority of the associated PSFCH can be used for the priority of the PUCCH. |
| Lenovo/MoTM | Yes |
| CMCC | Agree |
| Panasonic | Agree |
| Samsung | Agree |
| Spreadtrum | Agree |
| Ericsson | Ok for collision with SL transmission. |
| Qualcomm | This is not need, we can treat this as normal UL transmission. |
| Nokia, NSB | Only for PUCCH/SL collision case. |
| Futurewei | Agree |
| InterDigital | Yes |

**Observation:**

* **The priority of PUCCH carrying SL HARQ reporting is the highest priority of the associated PSFCH**
  + **Support: DOCOMO, Apple, Huawei, OPPO, CATT, LG, Lenovo, CMCC, Panasonic, Samsung, Spreadtrum, Ericsson, Qualcomm, Nokia, Futurewei, InterDigital (16)**
    - **Only for collision with SL TX: DOCOMO, ZTE, Ericsson, Nokia**
  + **Not necessary: Intel, Qualcomm (2)**

Q3-1: If answer to Q3 is yes, when PUCCH carrying SL HARQ reporting overlaps with SL TX, do you agree that the one with a higher priority is transmitted?

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| Company | Answer |
| NTT DOCOMO | OK. |
| Apple | Agree. For PUCCH carrying SL HARQ reporting, direct priority comparison between SL HARQ reporting (equal to priority of the associated PSSCH data) and SL TX is applied. The one with a high priority is prioritized.  We think we should also consider the case where PUSCH carrying SL HARQ reporting. This case is a little bit different since PUSCH also contains uplink data, together with SL HARQ reporting. Our proposal is  1. If URLLC uplink data is transmitted, then uplink transmission is prioritized.  2. Otherwise, direct priority comparison between SL HARQ reporting and SL TX:  If SL HARQ reporting has a higher priority than SL TX, then PUSCH is prioritized over SL TX.  If SL HARQ reporting has a lower priority than SL TX, then LTE rule is applied (since we also have uplink data). In other words, if SL TX priority above a threshold, then SL TX is prioritized. Otherwise, uplink transmission is prioritized. |
| ZTE, Sanechips | Agree. |
| Huawei, HiSilicon | Yes. It shall be based on direct comparison. |
| OPPO | Agree |
| CATT | Agree |
| LG | Yes. Since this UL transmission has the priority of SL, it needs to directly compare with the priority of SL transmission. According to SL/UL prioritization made in RAN2, for the case of a PUCCH carrying SR for SL, the UE directly compares the priority of SL SR with the priority of other SL transmission. |
| Lenovo/MoTM | Yes |
| CMCC | Agree |
| Panasonic | Agree |
| Samsung | Agree |
| Spreadtrum | Agree |
| Ericsson | Agree |
| Qualcomm | No |
| Nokia, NSB | yes |
| Futurewei | Agree |
| InterDigital | Agree |

**Observation:**

* **If the priority of PUCCH carrying SL HARQ reporting is defined, either PUCCH carrying SL HARQ reporting or the overlapping SL TX is transmitted based on the priority**
  + **Support: DOCOMO, Apple, ZTE, Huawei, OPPO, CATT, LG, Lenovo, CMCC, Panasonic, Samsung, Spreadtrum, Ericsson, Nokia, Futurewei, InterDigital, (16)**
  + **Not support: Qualcomm,**

Q3-2: If answer to Q3 is yes, when PUCCH carrying SL HARQ reporting overlaps with UL TX, do you agree that the rule of UL/SL prioritization applies by treating PUCCH carrying SL HARQ reporting as SL TX?

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| --- | --- |
| Company | Answer |
| Apple | If UL TX is URLLC UCI, then URLLC UCI is prioritized.  Otherwise, LTE rule is used. In other words, if the SL HARQ reporting has priority higher than a threshold, then SL HARQ reporting is prioritized. Otherwise, Uu UCI is prioritized.  We think we should also consider the case where PUSCH carrying SL HARQ reporting. Our proposals are:  1. If UL TX is URLLC uplink data, then URLLC uplink data is prioritized. (No piggyback as in NR Uu, no eMBB related UCI is piggybacked on URLLC uplink data)  2. Otherwise, SL HARQ reporting is piggybacked on PUSCH. |
| ZTE, Sanechips | No. PUCCH carrying SL HARQ reporting is treated as UL TX. Otherwise,   * In case there is other UL Tx overlapping, the gNB may have much smaller chance to know whether the PUCCH is transmitted or not. * In case the PUCCH is the only overlapping channel on UL, both PUCCH and PSFCH have the same priority and both are treated as SL transmission. This is a new scenario for multiple PSFCH transmission if the whole situation is not handled by UL/SL prioritization. |
| Huawei, HiSilicon | Different cases of UL Tx should be considered separately. For the case PUCCH carrying SL HARQ overlaps with PUCCH or PUSCH without UL-SCH, rule of UL/SL prioritization is applied. For the one PUCCH including SL HARQ overlaps with PUSCH with UL-SCH, the SL HARQ should be multiplexed on the PUSCH.  Another case PUSCH with SL HARQ overlaps with SL Tx should be also discussed |
| OPPO | * If PUCCH carrying SL HARQ reporting overlaps with PUSCH, we can follow option 1 in Q1; * If PUCCH carrying SL HARQ reporting overlaps with PUCCH, we can follow option 2 in Q1.   + If UE cannot decode PDSCH correctly (NACK), it cannot determine the priority or service type based on DCI only, and accordingly it cannot determine the priority of the corresponding PUCCH. A unified principle/rule should be applied here no matter UE can or cannot decode PDSCH correctly. In that case, we think option 2 is reasonable |
| CATT | Agree |
| LG | Yes. The priority of the PUCCH will be directly compared with the priority of other SL priority. |
| Lenovo/MoTM | Yes, priority of the PUCCH carrying SL HARQ report can be derived from the corresponding PSSCH |
| CMCC | Agree if extended option 2 is applied as in Q1-2. Considering that UL/SL have both URLLC traffic and eMBB traffic, thus two SL priority thresholds are configured: one is for UL TX priority 0 and the other is for UL TX priority 1. |
| Panasonic | Agree |
| Samsung | UL Tx should be further split into detailed cases e.g. PUCCH or PUSCH, with/without UL-SCH. For the case UE cannot multiple PUCCH carrying SL HARQ on PUSCH, UL/SL prioritization rule is used. |
| Spreadtrum | For PUCCH carrying SL HARQ reporting and UL TX in different carriers, agree. |
| Ericsson | No. |
| Qualcomm | No |
| Nokia, NSB | No, cannot agree that “treating PUCCH carrying SL HARQ reporting as SL TX”. Treat the PUCCH carrying SL HARQ reporting as UL Tx. |
| Futurewei | Given that the gNB is in charge of scheduling, this case should not happen. Not sure RAN1 needs to address it, it could be an error case not handled by the spec |
| InterDigital | Agree |

**Observation:**

* **If the priority of PUCCH carrying SL HARQ reporting is defined, the priority of PUCCH carrying SL HARQ reporting is used to directly compare with the priority of SL TX or SL threshold.**
  + **Support: Apple, Huawei, OPPO, CATT, LG, Lenovo, CMCC, Panasonic, Samsung, Spreadtrum, InterDigital, (11)**
* **If PUCCH carrying SL HARQ reporting is prioritized, the UE determines that UL TX is prioritized.**
  + **Support: ZTE, Huawei, [Ericsson,] [Qualcomm,] Nokia, [Futurewei,] (6)**

Q3-3: If answer to Q3 is no, what is the prioritization rule when PUCCH carrying SL HARQ reporting overlaps with SL TX and when overlaps with another UL TX?

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| Company | Answer |
| NTT DOCOMO | For collision with SL TX, our answer to Q3 is yes.  For collision with UL TX, DCI format 3\_0 includes priority indication field as DL assignment/UL grant. Based on the priority value, which transmission is prioritized is determined. |
| ZTE, Sanechips | First, the overlapping rules on Uu apply among PUCCH and another UL Tx; the winner(s) on Uu would use the highest priority of winner(s) to compete with SL Tx according to UL-SL overlapping rules. |
| Intel | Semi-static configuration per Uu priority level (“regular” or “high”) should be used to control whether Uu UCI is prioritized over SL UCI |
| CMCC | Considering that UL/SL have both URLLC traffic and eMBB traffic, thus two SL priority thresholds are configured: one is for UL TX priority 0 and the other is for UL TX priority 1. |
| Ericsson | We assume that this case will not happen and gNB will schedule PUCCH resources accordingly. In this regard, we propose to agree that "UE is not expected to have PUCCH resources for UL TX and SL HARQ reporting at the same time". |
| Qualcomm | When overlap with UL TX, normal Uu prioritization mechanism applies. When overlapping with SL, LTE mechanism applies, treating UL carrying SL HARQ reporting as normal UL. |
| Nokia, NSB | This is a corner case that can be avoided through gNB scheduling and/or configuration. |

**Observation:**

* **If the priority of PUCCH carrying SL HARQ reporting is not defined, for PUCCH carrying SL HARQ reporting,**
  + **Which UCI is prioritized is semi-statically configured: Intel,**
  + **Reuse normal Uu prioritization rule: Qualcomm,**
  + **Collision between PUCCH carrying SL HARQ reporting and other UL TX is not supported: DOCOMO, Ericsson, Nokia (3)**

Q4: For handling the case where more than one SL and UL transmissions overlap, do you agree the following proposal?

* Proposal
  + 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.

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| Company | Answer |
| NTT DOCOMO | Direction is OK.  One comment is, the proposal should be clarified that the assumed case is collision between SL TX and UL TX, where at least either TX or RX is more than one.  Question is saying that, while proposal does not. We believe that other case does not use the above rule. |
| Apple | Agree |
| ZTE, Sanechips | Agree. |
| Huawei, HiSilicon | Yes |
| Intel | OK |
| OPPO | Agree |
| vivo | Agree |
| CATT | Agree |
| LG | Yes.  The first case can happen when the UE transmits more than one PSFCH in a PSFCH TX occasion. Another example is that a PUSCH can be overlapped with both PSCCH/PSSCH and PSFCH in a slot.  The second case can happen when PUSCH and PUCCH are TDMed in a slot, and these UL TXs are overlapped with a single PSSCH.  To protect transmission with the highest priority, it needs to use the highest priority among the overlapped transmission for the prioritization. |
| Lenovo/MoTM | Yes |
| CMCC | Agree |
| Samsung | Agree |
| Spreadtrum | agree |
| Ericsson | Agree |
| Qualcomm | For more than one SL transmissions overlapping with a UL transmission, the highest priority of SL transmissions is used for the prioritization following LTE mechanism (e.g. compare with the configured threshold) |
| Nokia, NSB | Ok. |
| Futurewei | Agree |
| InterDigital | Agree |

**Observation: Consensus on the following proposal:**

* **Proposal: For handling the case where more than one SL and UL transmissions overlap**
  + **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.**

**2. Prioritization between UL TX and SL TX in case of simultaneous TXs of UL and SL across difference carriers**

Q5: Do you agree that the prioritization rule between UL TX and SL TX for power sharing reuses the prioritization rule for dropping?

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| --- | --- |
| Company | Answer |
| NTT DOCOMO | Support. |
| Apple | Agree |
| ZTE, Sanechips | Agree. |
| Huawei, HiSilicon | We agree to the extent that this is how the relative priorities are determined, e.g. to know when SL or UL (or which among each) has the higher priority. The specific power sharing behaviors are up to UE. |
| Intel | Support |
| OPPO | Agree |
| vivo | Agree |
| CATT | Agree |
| LG | Yes. There is no reason to have different prioritization rule for power sharing. |
| Lenovo/MoTM | Yes |
| CMCC | Agree |
| Samsung | Agree |
| Spreadtrum | Agree |
| Ericsson | No. We are not sure how the dropping rule will be applicable in this case. We believe in this case, option 2 (LTE procedure) should be used i.e. only those SL transmissions are considered which has priority value less than the (pre-)configured threshold. |
| Qualcomm | Agree, but it should also be clarified that this only applies to UEs that perform power sharing and does not apply to UEs that do not perform power sharing. For LTE V2X, no power cap is applied in the case SL Tx and UL TX overlap. We should at least support that case for NR V2X. |
| Nokia, NSB | In general, we agree. |
| Futurewei | Agree |

**Observation:**

* **The prioritization rule between UL TX and SL TX for power sharing reuses the prioritization rule for dropping**
  + **Support: DOCOMO, Apple, ZTE, Huawei, Intel, OPPO, vivo, CATT, LG, Lenovo, CMCC, Samsung, Spreadtrum, Qualcomm, Nokia, Futurewei, (16)**
  + **Not support: Ericsson (1)**

Q5-1: If the answer to Q5 is yes, do you think the prioritization behavior for power sharing needs to be captured in the physical layer specifications for the cases where RAN2 made agreements for dropping (e.g., UL SCH and SL SCH)?

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| --- | --- |
| Company | Answer |
| NTT DOCOMO | Should be captured. |
| Apple | Agree |
| ZTE, Sanechips | Agree. |
| Huawei | No, the LS from RAN2 does not ask us to specify their agreements. RAN1 needs to specify behaviors for the cases that RAN2 did not cover. |
| OPPO | Agree |
| vivo | OK |
| CATT | Yes, we think the power sharing is for the simultaneous UL and SL transmission in different carrier case. |
| LG | We think that it needs to be captured in the physical layer specification.  At least, logical channel priority of UL-SCH needs to be available in physical layer in addition to the logical channel priority of SL-SCH which is provided by “Priority filed’ in SCI. How to describe it in details can be discussed in TP preparing phase. |
| Lenovo/MoTM | Yes |
| CMCC | Yes |
| Samsung | Agree |
| Spreadtrum | Agree |
| Ericsson | Although we do not fully agree to Q5, we think, the power sharing needs to be captured. |
| Qualcomm | No impact to RAN1 spec, share Huawei’s view of only replying to LS |
| Nokia, NSB | Agree. |
| Futurewei | Agree |

**Observation:**

* **The prioritization behavior for power sharing needs to be captured in the physical layer specifications**
  + **Support: DOCOMO, Apple, ZTE, OPPO, vivo, CATT, LG, Lenovo, CMCC, Samsung, Spreadtrum, Ericsson, Nokia, Futurewei, (14)**
  + **Not necessary: Huawei, Qualcomm, (2)**

Q5-2: If the answer to Q5 is no, what is the prioritization rule for power sharing?

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| Company | Answer |
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**Proposal 2-1: For prioritization between PSFCH and UL TX,**

* **The priority of PSFCH TX is the highest priority of the associated PSCCH/PSSCH**
* **When the overlapping UL TX is assigned with UL SCH priority (i.e., PUSCH with UL SCH or UL-triggered SR)**
  + **(Working assumption) Use the prioritization rule for UL SCH and SL SCH collision (i.e., the SL transmission is prioritized if the highest priority value of UL LCH(s) with available data is larger than the UL priority threshold and the highest priority value of SL LCH(s) with available data is lower than the SL priority threshold. Otherwise the UL transmission is prioritized.)**
* **When the overlapping UL TX is PUCCH with HARQ feedback for DL, CSI, LRR, PUSCH without UL-SCH, or SRS**
  + **At least when the UL TX is not associated with a DCI indicating “high” in “priority field” (i.e., non-URLLC case)**
    - **Use the LTE rule (i.e., UL TX is down-prioritized if SL-TX is higher than SL-threshold, otherwise prioritized)**
  + **Down-select one of the following when UL TX is associated with a DCI indicating “high” in “priority field” (i.e., URLLC case)**
    - **Alt 1: UL TX is always prioritized**
    - **Alt 2: Another SL-threshold is configured and LTE rule is used**
    - **Alt 3: LTE rule is used with the same SL-threshold as the non-URLLC case**

// FL’s note

* In 2nd bullet, I think it is reasonable to follow the rule applied to SL LCH if we agree that PSFCH priority is from that of SL LCH as mentioned by several companies. Also it is my understanding that more companies supported this direction.
* Some other companies commented that PHY does not know LCH priority, but I think MAC can provide necessary information via UE internal process, e.g., by informing what SL priorities can be prioritized over a given UL TX. So my proposal is to take this as a working assumption and revisit it if RAN2 has concerns.
* In 3rd bullet, no clear majority view was observed. I invite companies input and the proposal can be updated accordingly.

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| Company | Comments |
| NTT DOCOMO | We support the proposal and Alt 1+Alt 2 is preferred for the last part.  If another SL-threshold is configured, Alt 2 is applied; otherwise, Alt 1 is applied. Whether UL TX should always prioritized or not is dependent on use case. |
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**Proposal 2-2: For prioritization between S-SSB and UL TX,**

* **The priority of S-SSB is (pre-)configured**
* **When the overlapping UL TX is assigned with UL SCH priority (i.e., PUSCH with UL SCH and UL-triggered SR)**
  + **(Working assumption) Use the prioritization rule for UL SCH and SL SCH collision (i.e., the SL transmission is prioritized if the highest priority value of UL LCH(s) with available data is larger than the UL priority threshold and the highest priority value of SL LCH(s) with available data is lower than the SL priority threshold. Otherwise the UL transmission is prioritized.)**
* **When the overlapping UL TX is PUCCH with HARQ feedback for DL, CSI, LRR, PUSCH without UL-SCH, and SRS**
  + **At least when the UL TX is not associated with a DCI indicating “high” in “priority field” (i.e., non-URLLC case)**
    - **Use the LTE rule (i.e., UL TX is down-prioritized if SL-TX is higher than SL-threshold, otherwise prioritized)**
  + **Down-select one of the following when UL TX is associated with a DCI indicating “high” in “priority field” (i.e., URLLC case)**
    - **Alt 1: UL TX is always prioritized**
    - **Alt 2: Another SL-threshold is configured and LTE rule is used**
    - **Alt 3: LTE rule is used with the same SL-threshold as the non-URLLC case**

// FL’s note

* 2nd and 3rd bullets are the same as those in Proposal 2-1.

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| Company | Comments |
| NTT DOCOMO | We support the proposal and Alt 1+Alt 2 is preferred for the last part.  If another SL-threshold is configured, Alt 2 is applied; otherwise, Alt 1 is applied. Whether UL TX should always prioritized or not is dependent on use case. |
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**Proposal 2-3:**

* **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**

// FL’s note

* Based on the comments, it was unclear to me whether RAN1 needs to solve the case where PUCCH carrying SL HARQ reporting overlaps with another UL TX, especially considering that SL HARQ reporting can be multiplexed when the UL TX is PUSCH and there are several rules for the collision of multiple UL TX. I propose to consider this case in the next meeting if necessary.

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| Company | Comments |
| NTT DOCOMO | Support the proposal.  Not support the FL’s recommendation.  RAN1 should discuss overlapping case between PUCCH with SL HARQ-ACK and another UL. The reason is that the issue would have RAN2 impact.  This overlapping case is not corner case and unavoidable by gNB scheduler, at least when either TX is URLLC-related TX. |
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**Proposal 2-4:**

* **For handling the case where more than one SL and UL transmissions overlap,**
  + **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.**

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| Company | Comments |
| NTT DOCOMO | Support |
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**Proposal 2-5:**

* **The prioritization rule between UL TX and SL TX for power sharing reuses the prioritization rule for dropping.**

// FL’s note

* As the current agreements on the power sharing assumes that one of UL TX and SL TX is prioritized, a common rule can be used to determine the prioritization. Once one TX is prioritized over the other, the agreed power sharing applies.
* In my view, RAN1 spec doesn’t need to write the full MAC prioritization procedure again. But some information needs to be provided from MAC, e.g., when UL SCH and SL SCH share the TX power and Proposal 2-5 is agreed. In this case, MAC can inform, for example, what SL priorities can be prioritized over a given UL TX as I said above.

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| Company | Comments |
| NTT DOCOMO | Support |
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**Proposal 2-6:**

* **Send a reply LS to RAN2 to inform the agreements on the prioritization and power sharing.**
  + **Ask RAN2 to feedback on the working assumption in Proposal 2-1 and 2-2**

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| Company | Comments |
| NTT DOCOMO | Support |
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