# **[102-e-NR- 5G\_V2X\_NRSL-PHYprocedure-01] Email discussion/approval regarding the following aspects for HARQ operation**

[102-e-NR- 5G\_V2X\_NRSL-PHYprocedure-01] Email discussion/approval regarding the following aspects for HARQ operation

* Issue 3-1: Details of indicating groupcast HARQ feedback option
* Issue 3-2: Capturing PSFCH reception behavior in the specifications
* Issue 3-3: Exact location of PSFCH slots in the time domain

By 8/21, followed by potential TPs by 8/26 – Hanbyul (LGE)

**1. Details of indicating groupcast HARQ feedback option**

Q1: Do you support physical layer signaling to indicate groupcast with HARQ feedback Option 1 (i.e., NACK only) without distance-based feedback?

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| Company | Answer | Comment |
| NTT DOCOMO | Yes | RAN1 concluded in the last meeting that the operation is feasible from L1 signaling perspective.  RAN2 agreed that the operation is supported.  Based on the above two, RAN1 should support it. |
| Sharp | Yes | Same reason as NTT DOCOMO. |
| Ericsson | Yes | Due to RAN2 agreement. |
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Q2: If the answer to Q1 is yes, which option is used to indicate groupcast with HARQ feedback Option 1 (i.e., NACK only) without distance-based feedback?

* + Option 1: SCI format 2-A is used
    - Option 1-1: A value of Cast type indicator in SCI format 2-A is used to indicate groupcast HARQ feedback option 1 without distance-based feedback
    - Option 1-2: Additional 1-bit indicator in SCI format 2-A is introduced to indicate whether the distance-based feedback is applied or not.
  + Option 2: SCI format 2-B is used
    - Option 2-1: Communication range requirement field in SCI format 2-B is used to indicate distance-based HARQ-ACK feedback is disabled
  + Option 3: Others (please specify)

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| Company | Preferred option | Comment |
| NTT DOCOMO | Option 1-1 | 2-A is better since if 2-B is used, the unused overhead is not so small.  Cast type indicator has a reserved state. The state can be used. Meanwhile, additional bit degrades performance. |
| Sharp | Option 2-1 | It would be better to have the “Groupcast Option 1” support in one place. |
| Ericsson | Option 1-1 | We think, it is a straightforward approach to use cast type indicator in SCI format 2-A for this purpose which avoid extra overhead which is unnecessary. |
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**2. Capturing PSFCH reception behavior in the specifications**

Q3: Do you agree to capture UE behavior that physical layer reports HARQ-ACK information of the received PSFCH to higher layer?

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| Company | Answer | Comment |
| NTT DOCOMO | Yes | In LTE, UE receives HARQ-ACK on PHICH and it is reported to higher layer, which is captured in spec (36.213 – section 8.3).  We can follow the direction; i.e. capture UE behavior of HARQ-ACK report from PHY to higher layer.  In addition to Q4/Q5, report for PSFCH RX drop might be described as 16.5? |
| Sharp | Yes | In fact, we think this should be done along with restructuring the “PSFCH reception” as already captured for mode 1 in section 16.5 of 213.  There are three levels of UE behaviors pertaining to PSFCH reception: (1). Determine one value for each PSFCH time/frequency/code resource; (2). Perform (1) for all PSFCH resources associated with one PSSCH transmission. (3). For mode 1 only, depending on type of HARQ-ACK codebook, for one or more of the PSSCH transmissions granted by a DCI format, perform (2) to determine one or more values to report in UL.  In our view (1) and (2) are common to mode 1 and 2, and should be captured in one place (in section 16.3.1) so that a HARQ-ACK value can be determined for a PSSCH transmission, and reported to higher layers. (3) should be separately captured (i.e. in section 16.5) for mode 1).  (In comparison, in the current specs, (1),(2) and (3) are messed up and are captured for mode 1 only, in section 16.5 of TS 38.213.) |
| Ericsson | Yes | We are fine with capturing it. |
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Q4: If the answer to Q3 yes, what is the UE behavior when SL HARQ-ACK information includes NACK-only (i.e., groupcast option 1)?

* + Option 1: UE reports NACK if the UE determines NACK from the received PSFCH. It reports ACK, otherwise.
  + Option 2: Others (please specify)

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| Company | Preferred option | Comment |
| NTT DOCOMO | Option 2 | Reuse description of 16.5 with some update; i.e.  “if the UE receives a PSFCH associated with a SCI format 2-B  - report ACK when the UE determines absence of PSFCH reception for each PSFCH reception occasion from the number of PSFCH reception occasions; otherwise, report NACK” |
| Sharp | Option 1 | Wording can be resolved at TP phase. |
| Ericsson | Option 1 |  |
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Q5: If the answer to Q3 yes, what is the UE behavior when SL HARQ-ACK information includes ACK or NACK (unicast and groupcast option 2)?

* + Option 1: UE reports NACK if the UE determines NACK from the at least one received PSFCH. It reports ACK if the UE determines ACK from all the received PSFCH(s).
  + Option 2: UE report NACK if the UE determines NACK from the at least one received PSFCH. It reports ACK if the UE determines ACK from all the received PSFCH(s). DTX is reported otherwise.
  + Option 3: Others (please specify)

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| Company | Preferred option | Comment |
| NTT DOCOMO | Option 3 | Reuse description of 16.5 with some update; |
| Sharp | Option 1 | Wording can be resolved at TP phase. |
| Ericsson | Option 1 | We believe that we don’t have to capture DTX signaling. |
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**3. Exact location of PSFCH slots in the time domain**

Q6: Which options is used to define PSFCH slot location in a resource pool when PSFCH resource period is N,

* + Option 1: Logical slot index #0, #N, #2N, …. within 10240 ms period
  + Option 2: Logical slot index #N-1, #2N-1, #3N-1, … within 10240 ms period
  + Option 3: Logical slot index …, #M-2N, #M-N, #M within 10240 ms period, where logical slot #M is the last slot of a resource pool
  + Option 4: Others (please specify)

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| Company | Preferred option | Comment |
| NTT DOCOMO | Option 1, or  Option 2 |  |
| Sharp | Option 4 | No strong opinion on Option 1/2/3, but we think *MinTimeGapPSFCH* should also be taken into account. |
| Ericsson | Option 3 | In our view, option 1 and option 3 are similar in the sense that either the first slot (Option 1) or the last slot (Option 3) is always a PSFCH slot. However, Option 3 provides the following additional benefits compared to Option 1:   * Less wasteful of resources, because the PSFCH resources in first slot is useless since it cannot be used (due to *MinTimeGapPSFCH*.) * Option 3 always results in the least number of dangling/orphan slots at the end of the resource period/pool which cannot be used for HARQ feedback based transmissions. This is also an advantage compared to Option 2. * Option 3 does not require truncating the resource pool period to be a multiple of N.   The MinTimGapPSFCH can be further taken into account in Option 3 by skipping the PSFCH slot that has index smaller than MinTimeGap PSFCH. |
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Q7: Do you think the number of logical slots of a resource pool is always a multiple of N, the PSFCH resource period?

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| Company | Answer | Comment |
| NTT DOCOMO | Yes | Otherwise, some PSSCH resources would not be associated with PSFCH resources, according to Q6 and the current specification. To solve this issue, further discussion would be necessary, which is not good way in maintenance phase. |
| Sharp | Yes | If this is not the case, for a given resource pool, some of the PSSCH transmissions have associated PSFCH resources while others don’t have. Exceptions have to be identified and fixed one by one in the specs (including in RAN2 specs) e.g. for the cases where a selected/granted resource may not have associated PSFCH resource etc. |
| Ericsson | No | We don’t think that such restriction on the configuration is necessary. See also our response to Q6. |
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