**3GPP TSG RAN WG1 #107-e R1-21XXXXX**

**e-Meeting, November 11th – 19th, 2021**

**Source: Moderator (vivo)**

**Title: Summary of [107-e-NR-5G\_V2X-05] Clarification on SL HARQ-ACK reporting (R1-2110984)**

**Agenda Item: 7.2.4**

**Document for: Discussion and Decision**

**Introduction**

The document is to collect companies’ inputs and provide a summary for the email discussion thread [107-e-NR-5G\_V2X-05] Clarification on SL HARQ-ACK reporting (R1-2110984) by Nov 16 – Siqi (vivo)

Since we need to finish the discussion by Nov 16, it would be highly appreciated if you can provide your inputs before the checkpoint

* **1st checkpoint: 12th Nov 11:59 AM UTC**

**Discussion Round1**

For a PUCCH at within slot $n+k$ corresponding to PSFCH reception occasions ending in slot $n$, $k$ can be indicated:

1. by PSFCH-to-HARQ\_feedback timing indicator field in a DCI format 3\_0 when the number of entries $N\_{fb\\_timing}$ in *sl-PSFCH-ToPUCCH* is larger than 1, or
2. by *sl-PSFCH-ToPUCCH* for a transmission scheduled by a DCI format 3\_0 or for a SL configured grant type 2 when the PSFCH-to-HARQ\_feedback timing indicator field does not exist and the number of entries $N\_{fb\\_timing}$ in *sl-PSFCH-ToPUCCH* is 1, or
3. by *sl-PSFCH-ToPUCCH-CG-Type1* for a SL configured grant type 1.

However, in the following procedures, the case where the PSFCH-to-HARQ feedback timing indicator does not exist in a DCI format 3\_0 is missing, which leads to ambiguity.

1. Determining the PUCCH for SL HARQ-ACK reporting in clauses 16.5 and 16.5.1
2. Whether to multiplex SL HARQ-ACK in a PUSCH in clause 16.5.1.2
3. Generation of Type2 SL HARQ-ACK codebook in clause 16.5.2.1

[1] proposed to correct the above procedures by adding the missing case. The proposed changes are as follows. Without the following correction, the procedure to determine PUCCH for SL HARQ-ACK reporting, the procedure to determine whether to multiplex SL HARQ-ACK in a PUSCH, and the procedure to generate Type2 CB are not correctly implemented in the specifications. It can lead to a misunderstanding that the above procedures are not applied when the PSFCH-to-HARQ feedback timing indicator does not exist.

***============proposed change start=============***

16.5 UE procedure for reporting HARQ-ACK on uplink

===omitted===

For a PUCCH transmission with HARQ-ACK information, a UE determines a PUCCH resource after determining a set of PUCCH resources from up to four PUCCH resource sets provided by *sl-PUCCH-Config*, for $O\_{UCI}$ HARQ-ACK information bits, as described in clause 9.2.1. The PUCCH resource determination is based on a PUCCH resource indicator field [5, TS 38.212] in a last DCI format 3\_0, among the DCI formats 3\_0 that have a value of a PSFCH-to-HARQ\_feedback timing indicator field, if present, or a value of *sl-PSFCH-ToPUCCH*, indicating a same slot for the PUCCH transmission, that the UE detects and for which the UE transmits corresponding HARQ-ACK information in the PUCCH where, for PUCCH resource determination, detected DCI formats are indexed in an ascending order across PDCCH monitoring occasion indexes.

===omitted===

16.5.1 Type-1 HARQ-ACK codebook determination

This clause applies if the UE is configured with *pdsch-HARQ-ACK-Codebook = semi-static*.

If a UE is configured a SL configured grant Type 1, and the UE is configured a SL configured grant Type 2 or to monitor PDCCH for detection of DCI format 3\_0 with CRC scrambled by SL-RNTI or SL-CS-RNTI, and the UE is provided a set of slot timing values $K\_{1}$ associated with a SL BWP by *sl-PSFCH-ToPUCCH* and *sl-PSFCH-ToPUCCH-CG-Type1*, the *sl-PSFCH-ToPUCCH-CG-Type1* is one of *sl-PSFCH-ToPUCCH*.

A UE reports HARQ-ACK information for PSSCH transmissions with corresponding PSFCH reception occasions in slot $n$ only in a HARQ-ACK codebook that the UE includes in a PUCCH or PUSCH transmission in slot $n+k$, where $k$ is a number of slots indicated by the PSFCH-to-HARQ\_feedback timing indicator field in a DCI format 3\_0 scheduling the PSSCH transmissions, if present, or by a value of PSFCH-to-HARQ feedback timing indicator field in a DCI format 3\_0 activating a SL configured grant Type-2 transmission, if present, or by a value of *sl-PSFCH-ToPUCCH* for DCI format 3\_0, or by a value of *sl-PSFCH-ToPUCCH* for a SL configured grant Type-1. If the UE reports HARQ-ACK information for the PSSCH transmissions with corresponding PSFCH reception occasions in a slot other than slot $n+k$, the UE sets a value for each corresponding HARQ-ACK information bit to NACK.

If a UE reports HARQ-ACK information in a PUCCH only for

- PSFCH reception occasions associated with PSSCH transmissions scheduled by a DCI format 3\_0 with counter SAI field value of 1, or

- PSFCH reception occasions associated with PSSCH transmissions corresponding to a SL configured grant

within a set $M\_{A}$ of occasions for candidate PSSCH transmissions with corresponding PSFCH reception occasions as determined in clause 16.5.1.1, the UE determines a HARQ-ACK codebook only for the PSFCH reception occasion associated with PSSCH transmissions scheduled by DCI format 3\_0 or only for the PSFCH reception occasion associated with PSSCH transmissions corresponding to a SL configured grant according to corresponding set $M\_{A}$ of occasions, where a value of a counter SAI in DCI format 3\_0 is according to Table 16.5.2.1-1. Otherwise, the procedures in clause 16.5.1.1 and in clause 16.5.1.2 for a HARQ-ACK codebook determination apply.

===omitted===

16.5.1.2 Type-1 HARQ-ACK codebook in physical uplink shared channel

If a UE would multiplex HARQ-ACK information in a PUSCH transmission that is not scheduled by a DCI format or is scheduled by a DCI format without an SAI field, then

- if the UE

- has not received any PDCCH with a DCI format 3\_0 scheduling PSSCH transmissions with corresponding PSFCH reception occasions that the UE transmits corresponding HARQ-ACK information in the PUSCH, based on a value of a respective PSFCH-to-HARQ\_feedback timing indicator field in a DCI format scheduling the PSSCH transmissions, if present, or on the value of PSFCH-to-HARQ feedback timing indicator field in a DCI format 3\_0 activating a SL configured grant Type 2 transmission, if present, or on the value of *sl-PSFCH-ToPUCCH* for DCI format 3\_0, or

- has not been provided PSSCH resources with corresponding PSFCH reception occasions that the UE transmits corresponding HARQ-ACK information based on the value of *sl-PSFCH-ToPUCCH-CG-Type1* for a SL configured grant Type 1, in any of the set $M\_{A}$ of occasions for candidate PSSCH transmissions with corresponding PSFCH reception occasions, as described in clause 16.5.1.1,

the UE does not multiplex HARQ-ACK information in the PUSCH transmission;

===omitted===

16.5.2.1 Type-2 HARQ-ACK codebook in physical uplink control channel

A UE determines monitoring occasions for PDCCH with DCI format 3\_0 for scheduling PSSCH transmissions with associated PSFCH reception occasions on an active DL BWP of a serving cell $c$, as described in clause 10.1, and for which the UE transmits HARQ-ACK information in a same PUCCH in slot $n$ based on

- PSFCH-to-HARQ\_feedback timing indicator field values in a DCI format 3\_0, if present, or a value provided by *sl-PSFCH-ToPUCCH*, or a value provided by *sl-PSFCH-ToPUCCH-CG-Type1*, for PUCCH transmission with HARQ-ACK information in slot $n$ in response to PSFCH receptions;

- time gap field in DCI format 3\_0 for scheduling PSSCH transmissions with associated PSFCH receptions;

- time resource assignment in DCI format 3\_0 for scheduling PSSCH transmissions with associated PSFCH receptions;

- a configured sidelink resource pool bitmap;

- a value of a period of PSFCH resources provided in *sl-PSFCH-Period*;

- a value of a minimum time gap provided in *sl-MinTimeGapPSFCH*.

===omitted===

***============proposed change end=============***

## Company views

### Question 1: Do you agree with the issue identified in R1-2110984? If no, please provide the reasons and your suggestions.

|  |  |  |
| --- | --- | --- |
| Company | Reply(Yes or no) |  Comment |
| ZTE, Sanechips | No | As commented in the previous round, the following has already been captured in TS38.213 section 16.5, thus is should be clear that the offset should be either case indicated - it seems there is no need to duplicate the explanation.*With reference to slots for PUCCH transmissions and for a number of PSFCH reception occasions ending in slot C:\Users\10217598\AppData\Local\Temp\ksohtml2184\wps1.jpg, the UE provides the generated HARQ-ACK information in a PUCCH transmission within slot C:\Users\10217598\AppData\Local\Temp\ksohtml2184\wps2.jpg, subject to the overlapping conditions in clause 9.2.5, where C:\Users\10217598\AppData\Local\Temp\ksohtml2184\wps3.jpg is a number of slots indicated by a PSFCH-to-HARQ\_feedback timing indicator field, if present, in a DCI format indicating a slot for PUCCH transmission to report the HARQ-ACK information, or C:\Users\10217598\AppData\Local\Temp\ksohtml2184\wps4.jpg is provided by sl-PSFCH-ToPUCCH for a transmission scheduled by a DCI format or for a SL configured grant type 2, or by sl-PSFCH-ToPUCCH-CG-Type1 for a SL configured grant type 1. C:\Users\10217598\AppData\Local\Temp\ksohtml2184\wps5.jpg corresponds to a last slot for a PUCCH transmission that would overlap with the last PSFCH reception occasion assuming that the start of the sidelink frame is same as the start of the downlink frame [4, TS 38.211].* |
| Intel | Rather no | Although we considered this issue as valid during the preparation phase, we found that there are similar examples in specification which do not handle the 0-bit DCI field size explicitly.In particular, in Rel-16, compact DCI formats 0\_2 and 1\_2 were introduced. Many fields in these DCI formats can have 0-bit size when a single choise of the parameters is configured by RRC. But we don’t find that all these cases are explicitly clarified for every DCI field that may have zero size.Having the above examples already in spec, we think such clarification is unnecessary. Otherwise, it is questionable whether we need to go back and correct all similar cases for other fields / DCI formats.  |
| NTT DOCOMO | Yes | We can see the similar text for every part of 9.1/9.2.3 of 213. Although 16.5 has one text as ZTE pointed out, other part of 16.5 should have the text similarly to 9.2.3. We do not understand why the same way as Uu HARQ-ACK report is not used. |
| Apple | No | We share the similar view as Intel. Although it is clear to clarify the existence of a field in DCI, there are several places in the specifications with the similar situation (i.e., 0-bit field while no explicit condition is added).  |
| LGE | No | We think Intel’s observation is valid and the proposed spec update doesn’t seem essential.  |
| Sharp | No | We think the proposed changes do improve readability of the spec but we also share other companies’ view that this is not an essential correction and will not cause any problem for UE implementation. |
| CATT, GOHIGH | Yes | We think the changes can make the spec more clear.  |
| Qualcomm | Yes | We prefer to adopt the change to clarify specifications and follow DL HARQ wording. |
| Huawei, HiSilicon | Prefer no CR, conclusion in Chair’s note can be considered | We can understand the motivation to have this CR, but we think in technical the handling of indicator field absence is clear. If there is no such a feedback timing indicator field in DCI format 3\_0, a value configured by RRC parameter is used. This is captured by clause 16.5 of TS38.213 and also explained by ZTE. So the question becomes whether the spec needs to explicitly capture the explanation on “0-bit” size to every case that the timing indicator applied to. In our understanding, it does not. The details for timing indicator is specified in one place (16.5) of the spec, and in other places (such as 16.5.1, 16.5.1.2, 16.5.2.1) the definiation can be used directly, which keeps spec clean and concise. We prefer not to have a CR, otherwise, many cases should be reconsidered as commented by others. If majority think clarification is needed, we think a general conculsion in Chair’s note is enough. |
| Samsung | No | We understand the motivation to clarify zero bit case, but considering the similar zero-bit case in Uu DCIs, we think current specification is clear enough and has better readability. We think the suggestion from HW to make conclusion in chair’s note is good compromise to clarify this issue with less specification change. |
| Nokia, NSB | No | I don’t see how the specification could possibly be misinterpreted. There is a single entry in the list, so 0 bits are needed to indicate that entry. That seems completely natural.Moreover, the proposed change disrupts the flow of reading the specification. If a clarification was needed (and I don’t think it is), then that could be done in 38.212 where the field is defined. |
| Ericsson | Yes | In our view, there is value in adding a clarification on the specification text for this case. |
| OPPO | Yes | We prefer to adopt the clarification to at least address the ambituity in SL HARQ reporting |

### Question 2: Do you agree with the proposed changes in R1-2110984? If no, please provide the reasons and your suggestions.

|  |  |  |
| --- | --- | --- |
| Company | Reply(Yes or no) |  Comment |
| NTT DOCOMO | Yes |  |
| CATT, GOHIGH | Yes |  |
| Qualcomm | Yes |  |
| Huawei, HiSilicon |  | As comment in Q1, if needed, a conclusion in Chair’s note is sufficient. No further CR is necessary. |
| Nokia, NSB | No | See response to Question 1. |
| Ericsson | Yes |  |
| OPPO | Yes |  |

## Summary of Round1

[TBD]

**Conclusion**

**Reference**

1. R1-2110984, Clarification on SL HARQ-ACK reporting, vivo