**3GPP TSG RAN WG # 109-e R1-2205298**

**E-Meeting, May 9th – 20th, 2022**

**Agenda Item:** **7.2.4**

**Source: Moderator (NEC)**

**Title: Summary of email discussion on [109-e-R16-V2X-01] Clarification on reporting SL HARQ-ACK on uplink for SL CG Type 2**

**Document for: Discussion/Decision**

# Introduction

This document is to summarize the discussion of the following email thread:

* [109-e-R16-V2X-01] Clarification on reporting SL HARQ-ACK on uplink for SL CG Type 2 by May 13 – Jin (NEC)
* Discuss R1-2203503, R1-2203671
* Round #1 checkpoint: **May 11th, 10:00 AM UTC**
* Round #2 checkpoint: **May 12th, 11:59 AM UTC**

# Discussion

* 1. **Issue description**

An issue related to sidelink HARQ-ACK reporting on uplink is presented in [1] and [2], which is derived from the discussion of [108-e-NR-CRs-02] and relevant CR agreed in [3].

In [3], it discussed and clarified the implementation of the HARQ-ACK associated with the first SPS PDSCH that is activated by an activation DCI, and the relevant PUCCH resource determining and Type-2 HARQ-ACK codebook generation. **In detail, the 1st SPS PDSCH with a corresponding activation DCI is handled in the same way as SPS PDSCH without a corresponding PDCCH, and the DAI field of the DL SPS activation DCI is to be ignored.**

Accordingly, as sidelink HARQ-ACK reporting on uplink is designed based on the relevant scheme of Uu, i.e., the HARQ-ACK feedback of PDSCH on PUCCH, the handling of the sidelink HARQ-ACK associated with the 1st SPS PSSCH transmission activated by a DCI format 3\_0 should be discussed and clarified.

Two alternatives for the issue are proposed in [1] and [2] respectively as follows:

* **Alt 1:** To clarify the operation for sidelink HARQ-ACK reporting on uplink as:
  + The 1st SPS PSSCH(s) associated with a corresponding activation DCI should be treated as dynamic scheduled PSSCH(s) with corresponding DCI;
  + SAI field in the activation DCI for the sidelink SPS PSSCH should be taken into account in Type-2 HARQ-ACK codebook determination for sidelink;
* **Alt 2:** To align sidelink operation with Uu scheme:
  + The 1st SPS PSSCH(s) associated with a corresponding activation DCI should be handled in the same way as SPS PSSCH transmissions without corresponding DCI;
  + SAI field in the activation DCI for the sidelink SPS PSSCH should be ignored;
  1. **Round #1**
* Which alternative for the issue is preferred? Or if having other views or comments, please provide details in the table below.

|  |  |  |
| --- | --- | --- |
| **Company** | **Alt 1 or Alt 2,**  **or other views** | **Comment** |
| NEC | Alt 2 | As mentioned in relevant CR R1-2202898:  *“It is not clear whether the 1st PDSCH the SPS-PDSCH activation DCI points to is considered an SPS-PDSCH or dynamically granted PDSCH. This leads to different understandings in how the HARQ-ACK for the 1st PDSCH is to be transmitted”.* and,  *“The CR is for Rel-16. Rel-15 UE/gNB may also implement the same change.”*  It means that the operation of how to handle the HARQ-ACK of the 1st PDSCH of SPS-PDSCH is not clearly defined in Uu (even for Rel-15), and CR R1-2202898 clarified the relevant specification of the issue.  Accordingly, a similar issue of SL HARQ-ACK reporting on uplink needs to be discussed and clarified in the specification.  For an issue that how to handle HARQ-ACK of the 1st PSSCH of SL CG transmissions activated by DCI format 3\_0, Alt 1 and Alt 2 give different schemes. Alt 2 takes it in the same way as agreed CR in Uu, i.e., taking it as CG PSSCH without DCI. With the general assumption of sidelink discussion, it should be designed by using relevant Uu schemes as the baseline.  Based on the above consideration, we prefer to adopt Alt 2 to clarify the process of reporting SL HARQ-ACK on uplink. |
| vivo | See comment | We proposed alt1 because there is one agreement saying that the multiplexing of SL HARQ-ACK should reuse the mechanism of Rel-15 DL HARQ-ACK, but we are open to alt2 if the majority prefers alt2.  We also have few comments regarding the TP proposed in [2]: 1) as there can be multiple PSSCH transmission in a first period after the activation DCI for a SL CG, we suggest replace the wording ‘the first PSSCH transmission’ by ‘the PSSCH transmission(s) associated with the corresponding activation DCI format 3\_0. 2)Additional change to 16.5 to reflect that activation DCI is excluded from the last DCI to determine the PUCCH for SL HARQ-ACK reporting is needed if the SAI of the activation DCI is to be ignored. |
| ZTE, Sanechips | Prefer Alt 2 | In current CR stage, we think the CR for sidelink is better to align with the latest Uu spec, i.e. Rel -16/17. So Alt 2 is preferred. The draft CR for Alt 2 can be checked later. |
| CATT, GOHIGH | Alt 2 | We think it would be better to align with the Uu’ change |
| Sharp | Alt 2 |  |
| OPPO | Alt 2 | It should be aligned with the mechanism in Uu design.  The agreements in R16 V2X is made based on R15 Uu design because that there is no R16 Uu agreements at that moment. In last RAN1 meeting, Uu has agreed the CR for R16 design on SPS PDSCH, and with logically design, the corresponding R15 design on SPS PDSCH in Uu should also be changed for alignment. |
| Intel | Alt 2 | We might need to think how to prevent this problem similar to the problem of code duplication in the context of the SL specification in the future. |
| Ericsson | Alt 2 | Our preference is to align with the Uu behavior, as captured in the agreements |
| Samsung | Alt 2 | We prefer to align with Uu design and not introduce new behaviour in the late stage. |
| Huawei, HiSilicon | Alt 2 | We think it would be better to align with the Uu change. How to modify the spec can be further discussed. |
| NTT DOCOMO | Alt 2 | Same mechanism as Uu is preferable (while the update of Uu mechanism was not preferred for us). |
| Nokia, Nokia Shanghai Bell | Alt 2 |  |
| LGE | Alt 2 | Following the same principle in Uu is preferred. |
| Qualcomm | Prefer Alt 1, ok with Alt 2 | Like vivo, we prefer to follow the sidelink agreement on reusing Rel-15 procedure. However, we are also ok to take the majority view of Alt 2. |

* **Summary for round #1**

According to the email discussion in round #1, Alt 2 is supported.

* 1. **Round #2**

Based on Alt 2, the following TP is proposed:

## 16.5 UE procedure for reporting HARQ-ACK on uplink

**<Unchanged parts omitted>**

With reference to slots for PUCCH transmissions and for a number of PSFCH reception occasions ending in slot , the UE provides the generated HARQ-ACK information in a PUCCH transmission within slot , subject to the overlapping conditions in clause 9.2.5, where 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 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. 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].

For a PSSCH transmission by a UE that is scheduled by a DCI format, or for a SL configured grant Type 2 PSSCH transmission activated by a DCI format, the DCI format indicates to the UE that a PUCCH resource is not provided when a value of the PUCCH resource indicator field is zero and a value of PSFCH-to-HARQ feedback timing indicator field, if present, is zero. For a SL configured grant Type 2 PSSCH transmission without a corresponding PDCCH, the DCI format activating the SL configured grant Type 2 indicates to the UE that a PUCCH resource is not provided when a value of the PUCCH resource indicator field is zero and a value of PSFCH-to-HARQ feedback timing indicator field, if present, is zero. For a SL configured grant Type 1 PSSCH transmission, a PUCCH resource can be provided by sl-N1PUCCH-AN and sl-PSFCH-ToPUCCH-CG-Type1. For transmission of HARQ-ACK information corresponding only to a SL configured grant Type 2 PSSCH transmission ~~without a corresponding PDCCH~~, including the first PSSCH transmission associated with the corresponding activation DCI format 3\_0, a UE can be provided a PUCCH resource by sl-N1PUCCH-AN-Type2. If a PUCCH resource is not provided, the UE does not transmit a PUCCH with generated HARQ-ACK information from PSFCH reception occasions.

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 𝑂𝑈𝐶𝐼 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, excluding DCI format 3\_0 for the SL configured grant Type 2 activation, among the DCI formats 3\_0 that have a value of a PSFCH-to-HARQ\_feedback timing indicator field 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.

**<Unchanged parts omitted>**

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

**<Unchanged parts omitted>**

The set of PDCCH monitoring occasions for DCI format 3\_0 for scheduling PSSCH transmissions with associated PSFCH reception occasions is defined as the PDCCH monitoring occasions in the active DL BWP of the configured serving cell, indexed in ascending order of start time of the associated search space sets. The cardinality of the set of PDCCH monitoring occasions defines a total number of PDCCH monitoring occasions.

A value of a counter sidelink assignment indicator (SAI) field in DCI format 3\_0 denotes an accumulative number of PDCCH monitoring occasions where PSSCH transmissions with associated PSFCH receptions are scheduled, excluding DCI format 3\_0 for the SL configured grant Type 2 activation, up to a current PDCCH monitoring occasion, in ascending order of PDCCH monitoring occasion index , where .

Denote by the value of the counter SAI in DCI format 3\_0 in PDCCH monitoring occasion according to Table 16.5.2.1-1.

If the UE transmits HARQ-ACK information in a PUCCH in slot , the UE determines the , for a total number of HARQ-ACK information bits, according to the following pseudo-code:

Set – PDCCH with DCI format 3\_0 monitoring occasion index: lower index corresponds to earlier PDCCH with DCI format 3\_0 monitoring occasion

Set

Set

Set

Set to the number of PDCCH monitoring occasions

while

if PDCCH monitoring occasion is before an active UL BWP change on the PCell

;

else

if there is a PSFCH reception occasion associated with a PSSCH transmission scheduled by a DCI format in PDCCH monitoring occasion

if

;

end if

= HARQ-ACK information bit

end if

end if

;

end while

for any

if a SL configured grant Type 1 is configured for a UE, or a SL configured grant Type 2 is configured and activated for a UE, including the ones associated with the corresponding activation DCI format 3\_0, and the SL configured grant provides a grant for PSSCH transmissions with PSFCH reception occasions in a slot , where is the PSFCH-to-HARQ-feedback timing value for the SL configured grant

;

= HARQ-ACK information bit associated with the PSFCH reception occasions associated with the PSSCH transmissions scheduled by the SL configured grant

end if

**<Unchanged parts omitted>**

* Do you agree with the above TP? If any comments, please provide it in the table below.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or Not** | **Comment** |
| NEC | Agree |  |
| OPPO | Agree |  |
| ZTE, Sanechips | Agree with comments | Regarding change 1, “ including the first PSSCH transmission associated with the corresponding activation DCI format 3\_0”, we are not sure why only the first PSSCH transmission is included but excluded the other possible PSSCH transmission(s) associated with the same DCI format 3\_0?  Regarding change 4, “including the ones associated with the corresponding activation DCI format 3\_0”, what does “the ones” refer to? It is not clear to us. |
| LGE | Comment | Regarding 1st comment from ZTE, we think that it needs to apply the same behavior as defined for Uu, which is aligned with Alt 2. It would be better that FL clarifies the exact operation of Uu referred to here. |
| NEC |  | Further clarification:  #1 change:  For transmission of HARQ-ACK information corresponding only to a SL configured grant Type 2 PSSCH transmission ~~without a corresponding PDCCH~~, including the ~~first~~ PSSCH transmission(s) associated with the corresponding activation DCI format 3\_0,  # 4 change:  including the ~~ones~~ PSSCH transmission(s) associated with the corresponding activation DCI format 3\_0, |
| Ericsson | Agree |  |
| DCM | OK | Same update as Uu should be used. Thus, we do not support NEC’s update. Not aligned with Uu update. |
| Vivo | ok |  |
| Sharp | See comments | * First change in TP: OK. * Second change in TP: OK. (the word “the” should preferably be removed, but fine to keep it) * Third change in TP: we think the inserted text should be moved to right after “indicator (SAI) field in DCI format 3\_0”, i.e.  |  | | --- | | A value of a counter sidelink assignment indicator (SAI) field in DCI format 3\_0, excluding DCI format 3\_0 for SL configured grant Type 2 activation, denotes an accumulative number of PDCCH monitoring occasions … |  * Fourth change in TP: we think the inserted text should be moved to right after “… provides a grant for PSSCH transmissions”, i.e.  |  | | --- | | if a SL configured grant Type 1 is configured for a UE, or a SL configured grant Type 2 is configured and activated for a UE, and the SL configured grant provides a grant for PSSCH transmissions, including the ones associated with the corresponding activation DCI format 3\_0, with PSFCH reception occasions in a slot … | |
| Nokia, Nokia Shanghai Bell | Comment | First change: The original TP is ok, no need to remove the word “first” and add plural to the word “transmission(s)”  The modifications to the third and fourth change proposed by Sharp are ok for us. |
| Samsung | OK | We slightly prefer the original TP but current version is also fine for us. |

# Summary

According to the inputs of companies, the updated TP is proposed as follows:

## 16.5 UE procedure for reporting HARQ-ACK on uplink

**<Unchanged parts omitted>**

With reference to slots for PUCCH transmissions and for a number of PSFCH reception occasions ending in slot , the UE provides the generated HARQ-ACK information in a PUCCH transmission within slot , subject to the overlapping conditions in clause 9.2.5, where 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 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. 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].

For a PSSCH transmission by a UE that is scheduled by a DCI format, or for a SL configured grant Type 2 PSSCH transmission activated by a DCI format, the DCI format indicates to the UE that a PUCCH resource is not provided when a value of the PUCCH resource indicator field is zero and a value of PSFCH-to-HARQ feedback timing indicator field, if present, is zero. For a SL configured grant Type 2 PSSCH transmission without a corresponding PDCCH, the DCI format activating the SL configured grant Type 2 indicates to the UE that a PUCCH resource is not provided when a value of the PUCCH resource indicator field is zero and a value of PSFCH-to-HARQ feedback timing indicator field, if present, is zero. For a SL configured grant Type 1 PSSCH transmission, a PUCCH resource can be provided by sl-N1PUCCH-AN and sl-PSFCH-ToPUCCH-CG-Type1. For transmission of HARQ-ACK information corresponding only to a SL configured grant Type 2 PSSCH transmission ~~without a corresponding PDCCH~~, including the PSSCH transmission(s) associated with the corresponding activation DCI format 3\_0, a UE can be provided a PUCCH resource by sl-N1PUCCH-AN-Type2. If a PUCCH resource is not provided, the UE does not transmit a PUCCH with generated HARQ-ACK information from PSFCH reception occasions.

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 𝑂𝑈𝐶𝐼 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, excluding DCI format 3\_0 for the SL configured grant Type 2 activation, among the DCI formats 3\_0 that have a value of a PSFCH-to-HARQ\_feedback timing indicator field 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.

**<Unchanged parts omitted>**

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

**<Unchanged parts omitted>**

The set of PDCCH monitoring occasions for DCI format 3\_0 for scheduling PSSCH transmissions with associated PSFCH reception occasions is defined as the PDCCH monitoring occasions in the active DL BWP of the configured serving cell, indexed in ascending order of start time of the associated search space sets. The cardinality of the set of PDCCH monitoring occasions defines a total number of PDCCH monitoring occasions.

A value of a counter sidelink assignment indicator (SAI) field in DCI format 3\_0, excluding DCI format 3\_0 for the SL configured grant Type 2 activation, denotes an accumulative number of PDCCH monitoring occasions where PSSCH transmissions with associated PSFCH receptions are scheduled, up to a current PDCCH monitoring occasion, in ascending order of PDCCH monitoring occasion index , where .

Denote by the value of the counter SAI in DCI format 3\_0 in PDCCH monitoring occasion according to Table 16.5.2.1-1.

If the UE transmits HARQ-ACK information in a PUCCH in slot , the UE determines the , for a total number of HARQ-ACK information bits, according to the following pseudo-code:

Set – PDCCH with DCI format 3\_0 monitoring occasion index: lower index corresponds to earlier PDCCH with DCI format 3\_0 monitoring occasion

Set

Set

Set

Set to the number of PDCCH monitoring occasions

while

if PDCCH monitoring occasion is before an active UL BWP change on the PCell

;

else

if there is a PSFCH reception occasion associated with a PSSCH transmission scheduled by a DCI format in PDCCH monitoring occasion

if

;

end if

= HARQ-ACK information bit

end if

end if

;

end while

for any

if a SL configured grant Type 1 is configured for a UE, or a SL configured grant Type 2 is configured and activated for a UE, and the SL configured grant provides a grant for PSSCH transmissions, including the PSSCH transmission(s) associated with the corresponding activation DCI format 3\_0, with PSFCH reception occasions in a slot , where is the PSFCH-to-HARQ-feedback timing value for the SL configured grant

;

= HARQ-ACK information bit associated with the PSFCH reception occasions associated with the PSSCH transmissions scheduled by the SL configured grant

end if

**<Unchanged parts omitted>**

# Reference

1. R1-2203503, Clarification on reporting SL HARQ-ACK on uplink, Vivo
2. R1-2203671, Draft CR on reporting sidelink HARQ-ACK on uplink for SL CG Type 2 PSSCH transmission, NEC
3. R1-2202898, 38213 CR 0286 (Rel-16, F) DL-SPS HARQ-ACK

# Appendix

* 1. **Proposed CR with Alt 1 in [1]:**

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| --- |
| 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 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, including activation DCI for a SL configured grant type2, that have a value of a PSFCH-to-HARQ\_feedback timing indicator field 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== 16.5.1.2 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 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, 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 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;  - else the UE generates the HARQ-ACK codebook as described in clause 16.5.1.1, unless the UE generates HARQ-ACK information only for  - PSFCH reception occasions associated with PSSCH transmissions corresponding to a SL configured grant, or  - PSFCH reception occasions associated with PSSCH transmissions that are scheduled by DCI format 3\_0 with a counter SAI field value of 1 in the set of occasions for candidate PSSCH transmissions with corresponding PSFCH reception occasions,  in which case the UE generates HARQ-ACK information only for the PSFCH reception occasions as described in clause 16.5.1.  A UE sets to NACK value in the HARQ-ACK codebook any HARQ-ACK information corresponding to PSFCH reception occasions associated with PSSCH transmissions scheduled by a DCI format 3\_0, including DCI format 3\_0 activating a SL configured grant Type2, that the UE detects in a PDCCH monitoring occasion that starts after a PDCCH monitoring occasion where the UE detects a DCI format scheduling the PUSCH transmission.  If a UE multiplexes HARQ-ACK information in a PUSCH transmission that is scheduled by a DCI format that includes a SAI field, the UE generates the HARQ-ACK codebook as described in clause 16.5.1.1 when a value of the SAI field in the DCI format is . The UE does not generate a HARQ-ACK codebook for multiplexing in the PUSCH transmission when unless the UE generates HARQ-ACK information only for  - PSFCH reception occasions associated with PSSCH transmissions corresponding to a SL configured grant, or  - PSFCH reception occasions associated with PSSCH transmissions that are scheduled by a DCI format 3\_0, including DCI format 3\_0 activating a SL configured grant Type2, with a counter SAI field value of 1 in the set of occasions for candidate PSSCH transmissions with corresponding PSFCH reception occasions as described in clause 16.5.1.  if the SAI field in the DCI format is set to '0'; otherwise, . 16.5.2 Type-2 HARQ-ACK codebook determination This clause applies if the UE is configured with *pdsch-HARQ-ACK-Codebook = dynamic*. 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, including PDCCH with DCI format 3\_0 activating a SL configured grant Type2, for scheduling PSSCH transmissions with associated PSFCH reception occasions on an active DL BWP of a serving cell , as described in clause 10.1, and for which the UE transmits HARQ-ACK information in a same PUCCH in slot based on  - PSFCH-to-HARQ\_feedback timing indicator field values, or a value provided by *sl-PSFCH-ToPUCCH-CG-Type1*, for PUCCH transmission with HARQ-ACK information in slot 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*.  The set of PDCCH monitoring occasions for DCI format 3\_0, including DCI format 3\_0 activating a SL configured grant Type2, for scheduling PSSCH transmissions with associated PSFCH reception occasions is defined as the PDCCH monitoring occasions in the active DL BWP of the configured serving cell, indexed in ascending order of start time of the associated search space sets. The cardinality of the set of PDCCH monitoring occasions defines a total number of PDCCH monitoring occasions.  A value of a counter sidelink assignment indicator (SAI) field in DCI format 3\_0, including DCI format 3\_0 activating a SL configured grant Type2, denotes an accumulative number of PDCCH monitoring occasions where PSSCH transmissions with associated PSFCH receptions are scheduled, up to a current PDCCH monitoring occasion, in ascending order of PDCCH monitoring occasion index , where .  Denote by the value of the counter SAI in DCI format 3\_0 in PDCCH monitoring occasion according to Table 16.5.2.1-1.  If the UE transmits HARQ-ACK information in a PUCCH in slot , the UE determines the , for a total number of HARQ-ACK information bits, according to the following pseudo-code:  Set – PDCCH with DCI format 3\_0 monitoring occasion index: lower index corresponds to earlier PDCCH with DCI format 3\_0 monitoring occasion  Set  Set  Set  Set to the number of PDCCH monitoring occasions  while  if PDCCH monitoring occasion is before an active UL BWP change on the PCell  ;  else  if there is a PSFCH reception occasion associated with a PSSCH transmission scheduled by a DCI format, including a PSFCH reception occasion associated with a SL configured grant Type 2 PSSCH transmission with a corresponding PDCCH, in PDCCH monitoring occasion  if  ;  end if    = HARQ-ACK information bit    end if  end if  ;  end while    for any  if a SL configured grant Type 1 is configured for a UE, or a SL configured grant Type 2 is configured and activated for a UE, and the SL configured grant provides a grant for PSSCH transmissions with PSFCH reception occasions in a slot without a corresponding PDCCH, where is the PSFCH-to-HARQ-feedback timing value for the SL configured grant  ;  = HARQ-ACK information bit associated with the PSFCH reception occasions associated with the PSSCH transmissions scheduled by the SL configured grant without a corresponding PDCCH  end if  If , the UE determines a number of HARQ-ACK information bits for obtaining a transmission power for a PUCCH, as described in clause 7.2.1, as  where  - is a value of a counter SAI field in a last DCI format 3\_0, including DCI format 3\_0 activating a SL configured grant Type2, scheduling PSSCH transmissions associated with PSFCH reception occasions that the UE detects within the PDCCH monitoring occasions  - if the UE does not detect any DCI format 3\_0, including DCI format 3\_0 activating a SL configured grant Type2, scheduling PSSCH transmissions associated with PSFCH reception occasions in any of the PDCCH monitoring occasions  - is a total number of DCI format 3\_0, including DCI format 3\_0 activating a SL configured grant Type2, scheduling PSSCH transmissions associated with PSFCH reception occasions, that the UE detects within the PDCCH monitoring occasions. if the UE does not detect any DCI format 3\_0 scheduling PSSCH transmissions with associated PSFCH reception occasions in any of the PDCCH monitoring occasions  - is a number of DCI format 3\_0, including DCI format 3\_0 activating a SL configured grant Type2, scheduling PSSCH transmissions with associated PSFCH reception occasions that the UE detects in PDCCH monitoring occasion  - is a number of SL configured grants without a corresponding PDCCH for which the UE transmits corresponding HARQ-ACK information in a same PUCCH as for HARQ-ACK information corresponding to PSFCH reception occasions within the PDCCH monitoring occasions |

* 1. **Proposed CR with Alt 2 in [2]:**

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| 16.5 UE procedure for reporting HARQ-ACK on uplink **<Unchanged parts omitted>**  With reference to slots for PUCCH transmissions and for a number of PSFCH reception occasions ending in slot , the UE provides the generated HARQ-ACK information in a PUCCH transmission within slot , subject to the overlapping conditions in clause 9.2.5, where 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 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. 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].  For a PSSCH transmission by a UE that is scheduled by a DCI format, or for a SL configured grant Type 2 PSSCH transmission activated by a DCI format, the DCI format indicates to the UE that a PUCCH resource is not provided when a value of the PUCCH resource indicator field is zero and a value of PSFCH-to-HARQ feedback timing indicator field, if present, is zero. For a SL configured grant Type 2 PSSCH transmission without a corresponding PDCCH, the DCI format activating the SL configured grant Type 2 indicates to the UE that a PUCCH resource is not provided when a value of the PUCCH resource indicator field is zero and a value of PSFCH-to-HARQ feedback timing indicator field, if present, is zero. For a SL configured grant Type 1 PSSCH transmission, a PUCCH resource can be provided by sl-N1PUCCH-AN and sl-PSFCH-ToPUCCH-CG-Type1. For transmission of HARQ-ACK information corresponding only to a SL configured grant Type 2 PSSCH transmission without a corresponding PDCCH, including the first PSSCH transmission associated with the corresponding activation DCI format 3\_0, a UE can be provided a PUCCH resource by sl-N1PUCCH-AN-Type2. If a PUCCH resource is not provided, the UE does not transmit a PUCCH with generated HARQ-ACK information from PSFCH reception occasions.  **<Unchanged parts omitted>** 16.5.2.1 Type-2 HARQ-ACK codebook in physical uplink control channel **<Unchanged parts omitted>**  The set of PDCCH monitoring occasions for DCI format 3\_0 for scheduling PSSCH transmissions with associated PSFCH reception occasions is defined as the PDCCH monitoring occasions in the active DL BWP of the configured serving cell, indexed in ascending order of start time of the associated search space sets. The cardinality of the set of PDCCH monitoring occasions defines a total number of PDCCH monitoring occasions.  A value of a counter sidelink assignment indicator (SAI) field in DCI format 3\_0 denotes an accumulative number of PDCCH monitoring occasions where PSSCH transmissions with associated PSFCH receptions are scheduled, excluding DCI format 3\_0 for the SL configured grant Type 2 activation, up to a current PDCCH monitoring occasion, in ascending order of PDCCH monitoring occasion index , where .  Denote by the value of the counter SAI in DCI format 3\_0 in PDCCH monitoring occasion according to Table 16.5.2.1-1.  If the UE transmits HARQ-ACK information in a PUCCH in slot , the UE determines the , for a total number of HARQ-ACK information bits, according to the following pseudo-code:  Set – PDCCH with DCI format 3\_0 monitoring occasion index: lower index corresponds to earlier PDCCH with DCI format 3\_0 monitoring occasion  Set  Set  Set  Set to the number of PDCCH monitoring occasions  while  if PDCCH monitoring occasion is before an active UL BWP change on the PCell  ;  else  if there is a PSFCH reception occasion associated with a PSSCH transmission scheduled by a DCI format in PDCCH monitoring occasion  if  ;  end if    = HARQ-ACK information bit    end if  end if  ;  end while    for any  if a SL configured grant Type 1 is configured for a UE, or a SL configured grant Type 2 is configured and activated for a UE, including the ones associated with the corresponding activation DCI format 3\_0, and the SL configured grant provides a grant for PSSCH transmissions with PSFCH reception occasions in a slot , where is the PSFCH-to-HARQ-feedback timing value for the SL configured grant  ;  = HARQ-ACK information bit associated with the PSFCH reception occasions associated with the PSSCH transmissions scheduled by the SL configured grant  end if  **<Unchanged parts omitted>** |