3GPP TSG-RAN WG1 Meeting #104bis-e Tdoc R1-20xxxxx

e-Meeting, April 12th – 20th, 2021

Agenda Item: 7.2.4

Source: Moderator (Ericsson)

Title: Feature lead summary#2 on Resource allocation for NR sidelink Mode 1

Document for: Discussion, Decision

# Summary of issues listed in the contributions

The FL has grouped the corrections discussed in the contributions in the following way.

**Group 1 – DCI-related aspects**

1. *dci-FormatsExt* vs *dci-FormatsSL* (see Nokia+NSB (P2, P3), vivo (P2, P3), LGE (P1))
	* FL assessment: discussion is necessary. Nokia+NSB claim it is editorial but vivo and LGE have longer discussions.
2. Value of n\_CI (see vivo (TP1))
	* FL assessment: views from other companies required.
3. For size alignment, include DCI formats for other purposes (see vivo (TP2))
	* FL assessment: almost editorial

**Group 2 – Codebook construction**

1. For Type 1, the number of PSSCH slots associated with the same PSFCH slot could be smaller than the PSFCH resource period (see LGE (P1), vivo (TP4), ZTE+Sanechips (P1))
	* FL assessment: needs correction
2. How to operate with multiple resource pools with different PSFCH periods (see ASUSTeK (TP1), ZTE+Sanechips (P2))
	* FL assessment: views from other companies required.
3. TX power – vivo (TP7)
	* FL assessment: views from other companies required.

**Group 3 – SL HARQ-ACK reports to gNB**

1. Change RRC parameter values (see OPPO (P1))
	* FL assessment: ASN.1 impact, not necessary, can be addressed by RAN2 if necessary.
2. SL HARQ-ACK reporting in UL when the SL transmission (scheduled by DG/CG) does not use SL HARQ feedback (see OPPO (P2, P3))
	* FL assessment: RAN1 has already made agreements already captured in the agreements on the topic. This change has been discussed in the past without reaching consensus.
3. Report ACK when DG is not used (see Fujitsu (P1), DCM (TP1))
	* FL assessment: This change has been discussed in the past without reaching consensus.
4. Slot offset between PSFCH and HARQ-ACK reporting (i.e., k>0 always) (see Sharp (TP5))
	* FL assessment: Not a critical correction.
5. Some companies discuss actions for a potential reply by RAN2 to LS R1-2102176. In all cases, they suggest waiting for a reply LS (See Nokia+NSB, DCM)
	* FL assessment: Wait until a reply LS is received

A few contributions discuss issues related to priorities (see vivo (TP5), Sharp (TP3), Fujitsu (P1)). The FL suggestion is that, as done earlier, they are treated by the FL of PHY procedures, if necessary.

In addition, the FL has identified proposals to make the following editorial corrections.

**Group 4 – Editorial**

* TS 38.211
	+ 8.4.1.2.2: See OPPO
* TS 38.212
	+ 7.3.1.4.1: DCI format 3\_0 clarification that the configuration index is reserved for DG scheduling a retransmission for CG (see ASUSTeK (TP5), Sharp (TP2))
		- FL assessment: reasonable correction
* TS 38.213
	+ 10.1:
		- Remove ‘a SL-RNTI, a SL-CS-RNTI, or a SL-L-CS-RNTI’ (see Sharp (TP4-1 and TP4-2))
			* FL assessment: reasonable correction. Take the simpler proposal, which requires no new agreement.
		- Other editorial (see Sharp (TP1-1))
	+ 16.5:
		- Clarify that the UE does not expect to multiplex SL HARQ and Uu UCI on PUCCH or PUSCH (see vivo (P9))
			* FL assessment: reasonable clarification
		- “One bit” (see Sharp (TP6))
			* FL assessment: this was brought up last meeting but there was no consensus.
		- Other editorial (see Sharp (TP1-1))
* TS 38.214
	+ 8.1.2:
		- Clause number (see ASUSTeK (TP3), Sharp (TP1-2))
	+ 8.1.2.1:
		- 2xTypo (see vivo (P5))
		- RRC parameter name (see ASUSTeK (TP3))
	+ 8.1.4: ASUSTeK (TP3)
		- FL Assessment: the misalignment of priority values (0-7 vs 1-8) was also an issue in LTE. It would be good to discuss whether this is the case here too.
	+ 8.2.1: See OPPO

After a round of discussion, it was agreed to have the following discussion:

[104b-e-NR-5G\_V2X-02] Email discussion/approval on issue M1-1-1: dci-FormatsExt vs dci-FormatsSL till 4/15, with potential CRs till 4/19 – Ricardo (Ericson)

#  Issue M1-1-1: dci-FormatsExt vs dci-FormatsSL

[104b-e-NR-5G\_V2X-02] Email discussion/approval on issue M1-1-1: dci-FormatsExt vs dci-FormatsSL till 4/15, with potential CRs till 4/19 – Ricardo (Ericson)

At least three contributions (Nokia+NSB (P2, P3), vivo (P2, P3), LGE (P1)) have identified issues with the configuration of the search space.

Currently TS 38.331 defines (excerpt):

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| – *SearchSpace*The IE *SearchSpace* defines how/where to search for PDCCH candidates. Each search space is associated with one *ControlResourceSet*. For a scheduled cell in the case of cross carrier scheduling, except for *nrofCandidates*, all the optional fields are absent (regardless of their presence conditions).***SearchSpace* information element**-- ASN1START-- TAG-SEARCHSPACE-STARTSearchSpace ::= SEQUENCE { searchSpaceId SearchSpaceId, controlResourceSetId ControlResourceSetId OPTIONAL, -- Cond SetupOnlyPARTS OMMITTED ue-Specific SEQUENCE { dci-Formats ENUMERATED {formats0-0-And-1-0, formats0-1-And-1-1}, ..., [[ dci-Formats-MT-r16 ENUMERATED {formats2-5} OPTIONAL, -- Need R dci-FormatsSL-r16 ENUMERATED {formats0-0-And-1-0, formats0-1-And-1-1, formats3-0, formats3-1, formats3-0-And-3-1} OPTIONAL, -- Need R dci-FormatsExt-r16 ENUMERATED {formats0-2-And-1-2, formats0-1-And-1-1And-0-2-And-1-2} OPTIONAL -- Need R ]] } } OPTIONAL -- Cond Setup2}PARTS OMMITTED

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| --- |
| ***SearchSpace* field descriptions (excerpt)** |
| ***dci-Formats***Indicates whether the UE monitors in this USS for DCI formats 0-0 and 1-0 or for formats 0-1 and 1-1. |
| ***dci-FormatsExt***If this field is present, the field *dci-Formats* is ignored and *dci-FormatsExt* is used instead to indicate whether the UE monitors in this USS for DCI format 0\_2 and 1\_2 or formats 0\_1 and 1\_1 and 0\_2 and 1\_2 (see TS 38.212 [17], clause 7.3.1 and TS 38.213 [13], clause 10.1). |
| ***dci-FormatsSL***Indicates whether the UE monitors in this USS for DCI formats 0-0 and 1-0 or for formats 0-1 and 1-1 or for format 3-0 or for format 3-1 or for formats 3-0 and 3-1.* *dci-FormatsSL* is used to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or for DCI format 3\_0, or for DCI format 3\_1, or for DCI format 3\_0 and DCI format 3\_1.
 |
| ***ue-Specific***Configures this search space as UE specific search space (USS). The UE monitors the DCI format with CRC scrambled by C-RNTI, CS-RNTI (if configured), and SP-CSI-RNTI (if configured) |

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While TS 38.213 states:

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| For each DL BWP configured to a UE in a serving cell, the UE is provided by higher layers with $S\leq 10$ search space sets where, for each search space set from the $S$ search space sets, the UE is provided the following by *SearchSpace*: PARTS OMMITTED- if search space set $s$ is a USS set, an indication by *dci-Formats* to monitor PDCCH candidates either for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or an indication by *dci-FormatsExt* to monitor PDCCH candidates for DCI format 0\_2 and DCI format 1\_2, or for DCI format 0\_1, DCI format 1\_1, DCI format 0\_2, and DCI format 1\_2, or for DCI format 3\_0, or for DCI format 3\_1, or for DCI format 3\_0 and DCI format 3\_1 PARTS OMMITTED |

The following problems about the current specification have been described:

* TS 38.213 does not mention *dci-FormatsSL*.
* It is not clear how to handle the potential cases that:
	+ Both *dci-Format* and *dci-FormatsSL* are configured.
	+ Both *dci-FormatsSL* and *dci-FormatsExt* are configured.

To solve these issues:

* Proposal 3 in R1-2103764 addresses the first bullet and consists of modifying TS 38.213 so that it states that *dci-FormatsSL* is used to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or for DCI format 3\_0, or for DCI format 3\_1, or for DCI format 3\_0 and DCI format 3\_1.
* Proposals 2 and 3 in R1-2102940 consists of specifying the following behavior:
	+ If *dci-FormatsSL* is configured in a USS with *dci-Format*, it overrides *dci-Format*.
	+ It is not expected to configure *dci-FormatsSL* and *dci-FormatsExt* in a same USS.
* Proposal 1 R1-2103376 discusses the interaction *dci-Format* and *dci-FormatsSL* for dedicated ITS-dedicated carriers. The proposed change is:
	+ When Mode 1 SL TX is cross-carrier scheduled on ITS-dedicated carrier, the UE ignores dci-Formats and monitors only dci-FormatsSL-r16 in the relevant search space configuration on the scheduling licensed carrier.

This proposal is like Proposal 2 in R1-2102940 but restricted to ITS-dedicated carriers.

Based on this, the FL makes the following proposal.

**Proposal**:

* *dci-FormatsSL* is used to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or for DCI format 3\_0, or for DCI format 3\_1, or for DCI format 3\_0 and DCI format 3\_1.
* If *dci-FormatsSL* is configured in a USS with *dci-Format*, it overrides *dci-Format*.
* The UE does not expect to be configured with *dci-FormatsSL* and *dci-FormatsExt* in a same USS.

FL comments after round 1 (13/4/2021):

* The proposal is in general acceptable to everyone, with only some relatively small comments about it.
* In some of the comments, there was a discussion on whether the agreements would be reflected in RAN1 and/or RAN2 specifications. This will be discussed during the CR phase. My understanding is that we will draft CR(s) for the RAN1 specification(s) and send an LS to RAN2 for their specifications, if applicable.
* There is one request to clarify that the above proposal does not change the blind decoding budget

Taking all this into account, I have kept the proposal as it was and added one note about the blind decoding budget.

**Proposal**:

* *dci-FormatsSL* is used to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or for DCI format 3\_0, or for DCI format 3\_1, or for DCI format 3\_0 and DCI format 3\_1.
* If *dci-FormatsSL* is configured in a USS with *dci-Format*, it overrides *dci-Format*.
* The UE does not expect to be configured with *dci-FormatsSL* and *dci-FormatsExt* in a same USS.

NOTE: no changes to the blind decoding budget are introduced

Please use the following table to express your views:

**Company views**

|  |  |
| --- | --- |
| **Company** | **View** |
| Vivo | **We support the proposal.** And we think the first bullet can be supported only when the second bullet is approved.If the second bullet is not approved, there will be the following issues:* According to the searchspace IE shown above, gNB can set dci-Formats set to fallback Uu DCI (format 0-0-And-1-0) and set dci-FormatsSL to non-fallback Uu DCI (format 0-1-And-1-1), or vice versa. **In this case, UE needs to monitor both fallback Uu DCI and non-fallback Uu DCI on the same USS.** **Such behavior violates the R15 IE design principle** that a USS can be configured with either fallback DCI or non-fallback DCI but cannot be configured with both at the same time. It should be noted that R16 URLLC also follows this design principle, **specifically by overriding dci-Formats with dci-FormatsExt if dci-FormatsExt is configured**. On the other hand, allowing monitoring both fallback Uu DCI and non-fallback Uu DCI in the same searchspace does bring benefits either, but rather increases complexity of blind detection.
* In some cases, e.g., when SL is configured on ITS band, **there is no need to monitor any Uu DCI**. In some other cases where SL is configured on an SRS-only cell without PUSCH TX, **there is no need to monitor Uu DCI format 0-X scheduling PUSCH**. However, if the second bullet is not approved, according to the cross-carrier scheduling framework and above IEs, the searchspace used to schedule the SL resources **must be associated with SL DCI format(s), a Uu DCI format 0-X and a Uu DCI format 1-X, thus** **UE must monitor all these associated DCI formats for the scheduled cell although the monitoring of some of them is not needed for the scheduled cell.**
* Coupling SL DCI and Uu DCI in the same searchspace imposes great limitations on Uu scheduling.

The second bullet is a simple way to address the above issues and should be supported. With regard to the configuration of dci-FormatsExt, the 3rd bullet is supported to avoid impacts on the new formats 2-X introduced in other AI,[vivo-2] 14/4/21We support the proposal. But this note seems unnecessary because the BD budget has nothing to do with the DCI format setting and it would not be impacted by the proposal |
| NTT DOCOMO | Support the proposal. |
| Intel | We think the direction is correct. To support the second bullet, it seems interaction with RAN2 is needed to mention the overriding in RRC spec similar to how dci-FormatsExt replaces dci-Formats.FL reply 13/4/21:We will discuss that during the CR phase. |
| Qualcomm | We agree with the proposal. |
| Apple | Support the proposal. |
| OPPO | Support the proposal, while the 1st bullet is not necessary which have been captured in 38.331.FL reply 13/4/21:My impression is that the change to TS 38.213 is necessary too. From the replies by the different companies, it seems that they agree with that. |
| Sharp | Support the proposal. |
| CATT | OK with the proposal. |
| Huawei, HiSilicon | We support the proposal in principle, but it should be clarified that the proposal does not increase the blind decoding budget which already agreed in RAN1 #99.FL reply 13/4/21:I captured a clarification.[vivo-2] 14/4/21Thank you for your comments. In my understanding, BD budget is the maximum number of PDCCH candidate/CCEs that can be monitored for **all search spaces configured in a slot/span for** a (scheduling cell SCS, scheduled cell) pair, it is independent of how the Uu/SL DCI format is configured and whether the dci-FormatSL will override dci-Format, and will not be impacted by the proposal. I'm not quite sure why Huawei thinks this note is needed, could you please elaborate more?[Huawei, HiSilicon 2] 04/14Thanks for clarification. We do not say the proposal will increase the blind budget definitely, on the contrary, we make it clear it will not. The BD budget counts the number of PDCCH candidates associated with search space set per span/slot, multiple DCI formats can be configured for a search space set, however, if the sizes of DCI formats are different, that will impact the BD budget. That is why RAN1 had agreement how to align the size of DCI format 3\_0 with others. The note just reiterates the original principle, and I agree with FL that it is not harmful to have. |
| ZTE, Sanechips | We understand the motivation of the second bullet - to support the case when only 3-0/3-1 and/or the combination is needed while 0-1/0-0 is not. Yet this rule shall eliminate the case when the UE is supposed to monitor (DCI format 0\_0 and DCI format 1\_0) and (DCI format 3\_0, and/or for DCI format 3\_1). Thus a change of the 331 spec of the signalling of dci-FormatsSL-r16 is needed together with this rule to ensure no new issue arises. A triggering LS may also be needed.FL reply 13/4/21:I am not sure I understood your concern. In any case, any clarification can be addressed during the CR phase, when we would write such an LS to RAN2.[ZTE, Sanechips] Thank you for the reply. For further clarification, we provide such an example.In case the UE is supposed to monitor both (DCI format 0\_0 and DCI format 1\_0) and (DCI format 3\_0, and/or for DCI format 3\_1), configuring both dci-FormatsSL and dci-Formats could make it happen by configuring both dci-formatSL and dci-format without the second bullet. Now that we introduced the second bullet, this case shall be precluded unless we introduce the aforementioned combination into the dci-formatSL signalling component. In order not to introduce a new issue with the second bullet, we believe this needs to be discussed and an LS to revise 331 signalling is needed.dci-FormatsSL-r16                    ENUMERATED {formats0-0-And-1-0, formats0-1-And-1-1, formats3-0, formats3-1,                                                             formats3-0-And-3-1}                      dci-Formats                                 ENUMERATED {formats0-0-And-1-0, formats0-1-And-1-1},[vivo-2] 14/4/21In our understanding, if UE is expected to monitor both (DCI format 0\_0 and DCI format 1\_0) and (DCI format 3\_0, and/or DCI format 3\_1) for the same cell, it can be achieved by gnb configuration by setting the dci-FormatSL of one search space to (DCI format 3\_0, and/or DCI format 3\_1) and setting the dci-Formats of another search space to (DCI format 0\_0 and DCI format 1\_0), **this combination mentioned above is not excluded with the proposal.**On the other hand, if the majority opinion is to still allow some flexibility in enabling the monitoring of certain Uu DCI format and SL DCI format in the same search space, we are not against to have a discussion on whether and how to change some codepoints of dci-FormatsSL, for example, **replacing the codepoint format 0-1-And-1-1 by format 0-1-And-1-1-And-3-0**, to allow monitoring DCI format x-1 and SL DCI format in the same search space, but we would like to avoid combinations of fallback Uu DCI format and UE-specific SL DCI format in the same search space. Moreover, even with the modified codepoint interpretations, the second bullet is still needed. As we commented in the first round, one purpose of the second bullet is to avoid the case where UE is required monitor both fallback DCI and non-fallback DCI within a same search space. However, without the second bullet, when dci-Formats is set to fallback DCIs (e.g. 0-0And0-1) and dci-FormatsSL includes non-fallback DCIs and SL DCI(e.g. 0-1And1-1And3-0), UE still needs to monitor fallback DCI and non-fallback DCI in the same SS simultaneously. |
| Nokia, NSB | We support the proposal. |
| LG Electronics | We are fine with FL’s proposal[LG2] Considering ZTE’s concern, we think that the following part marked with yellow can be added in Proposal 1 (with keeping other proposals). From our perspective, this modification would not be controversial. * *dci-FormatsSL is used to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or for DCI format 3\_0, or for DCI format 3\_1, or for DCI format 3\_0 and DCI format 3\_1, or for DCI format 0\_1, DCI format 1\_1 and DCI format 3\_0, or for DCI format 0\_1, DCI format 1\_1 and DCI format 3\_1, or for DCI format 0\_1, DCI format 1\_1, DCI format 3\_0 and DCI format 3\_1.*
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| Samsung | Support the proposal. |
| NEC | Agree |
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# Editorial changes

The TPs for TS 38.213 with editorial changes were included in the contribtions:

## TP1

In R1-2102940 (TP6), the following clarificaction is propsoed

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| 16.5 UE procedure for reporting HARQ-ACK on uplinkA UE can be provided PUCCH resources or PUSCH resources [12, TS 38.331] to report HARQ-ACK information that the UE generates based on HARQ-ACK information that the UE obtains from PSFCH receptions, or from absence of PSFCH receptions. The UE reports HARQ-ACK information on the primary cell of the PUCCH group, as described in Clause 9, of the cell where the UE monitors PDCCH for detection of DCI format 3\_0.A UE does not expect to multiplex HARQ-ACK information that is generated based on PSFCH receptions or the absence of PSFCH receptions and UCI including DL HARQ-ACK or CSI or SR in a PUSCH transmission or in a PUCCH transmission. |

## TP2

In R1-2103467 (TP4-1), the following correction is proposed

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| 10.1 UE procedure for determining physical downlink control channel assignment < Unchanged parts are omitted >If a UE is provided - one or more search space sets by corresponding one or more of *searchSpaceZero, searchSpaceSIB1*, *searchSpaceOtherSystemInformation*, *pagingSearchSpace*, *ra-SearchSpace*, and - a C-RNTI, an MCS-C-RNTI, or a CS-RNTIthe UE monitors PDCCH candidates for DCI format 0\_0 and DCI format 1\_0 with CRC scrambled by the C-RNTI, the MCS-C-RNTI, or the CS-RNTI in the one or more search space sets in a slot where the UE monitors PDCCH candidates for at least a DCI format 0\_0 or a DCI format 1\_0 with CRC scrambled by SI-RNTI, RA-RNTI, MsgB-RNTI, or P-RNTI. |

## TP3

In R1-2103467 (TP1-2), the following TP with corrections for 38.213 is proposed.

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| 8.1.2 Resource allocationIn sidelink resource allocation mode 1:- for PSSCH and PSCCH transmission, dynamic grant, configured grant type 1 and configured grant type 2 are supported. The configured grant Type 2 sidelink transmission is semi-persistently scheduled by a SL grant in a valid activation DCI according to Clause 10.2A of [6, TS 38.213].< Unchanged parts are omitted > |

## TP4

In R1-2103467 (TP1-1), the following TP with corrections for 38.213 is proposed. (Note: the original TP contained changes for 10.1 as well, but they have been removed here as the FL’s understanding is that these have been covered in a separate discussion.).

The FL’s impression is that the only necessary changes are those that clarify that $M\_{A}$ is a set of occassions (in multiple places). The remaining changes, while correct, are not necessary.

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| 16.5 UE procedure for reporting HARQ-ACK on uplink< Unchanged parts are omitted >For SL configured grant Type 1 or Type 2 PSSCH transmissions by a UE within a time period provided by *sl-PeriodCG*, the UE generates, in response to the PSFCH receptions, one HARQ-ACK information bit to multiplex in a PUCCH transmission occasion that is after a last time resource, in a set of time resources. < Unchanged parts are 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, 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, 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 grantwithin 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 a 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.16.5.1.1 Type-1 HARQ-ACK codebook in physical uplink control channelFor a SL BWP on a serving cell $c$ and an active UL BWP on the primary cell, as described in Clause 12, a UE determines a set $M\_{A}$ of occasions for candidate PSSCH transmissions with corresponding PSFCH reception occasions for which the UE can multiplex corresponding HARQ-ACK information in a PUCCH transmission in slot $n\_{U}$. The determination is based on:a) a set of slot timing values $K\_{1}$ associated with the SL BWP where $K\_{1}$ is provided by *sl-PSFCH-ToPUCCH* for DCI format 3\_0 or by *sl-PSFCH-ToPUCCH-CG-Type1*b) the ratio $2^{μ\_{SL}-μ\_{UL}}$ between the sidelink SCS configuration $μ\_{SL}$ and the uplink SCS configuration $μ\_{UL}$ provided by *subcarrierSpacing* in *BWP-Sidelink* and *BWP-Uplink* for the SL BWP and the active UL BWP, respectivelyc) a set of sidelink resource pool bitmapsd) a value of a period of PSFCH transmission occasion resources for each sidelink resource pool provided by a respective *sl-PSFCH-Period*For the set of slot timing values$K\_{1}$, the UE determines a set $M\_{A}$ of occasions for candidate PSSCH transmissions with corresponding PSFCH reception occasions according to the following pseudo-code. < Unchanged parts are omitted >The cardinality of the set $M\_{A}$ defines a total number $M$ of occasions for candidate PSSCH transmissions with corresponding PSFCH reception occasions corresponding to the HARQ-ACK information bits. A UE determines $\tilde{o}\_{0}^{ACK},\tilde{o}\_{1}^{ACK},…,\tilde{o}\_{O^{ACK}-1}^{ACK}$ HARQ-ACK information bits, for a total number of $O\_{ACK}$ HARQ-ACK information bits as $\tilde{o}\_{j}^{ACK}$ = HARQ-ACK information bit for candidate PSSCH transmission with index $j$ with corresponding PSFCH reception, for $0 \leq j<M$, as described in Clause 16.5. If the UE does not transmit a PSSCH in an occasion for candidate PSSCH transmission with corresponding PSFCH reception occasion, due to the UE not detecting a corresponding DCI format 3\_0, the UE generates a NACK value for the occasion for candidate PSSCH transmission with corresponding PSFCH reception occasion. If $O\_{ACK}\leq 11$, the UE determines a number of HARQ-ACK information bits $n\_{HARQ-ACK}$ for obtaining a transmission power for a PUCCH, as described in Clause 7.2.1, as $n\_{HARQ-ACK}=\sum\_{m=0}^{M-1}N\_{m}^{received}$ where $N\_{m}^{received}$ is a number of HARQ-ACK information bits determined for corresponding PSSCH transmissions with corresponding PSFCH reception occasions in PSFCH reception occasion $m$.16.5.1.2 Type-1 HARQ-ACK codebook in physical uplink shared channelIf a UE would multiplex HARQ-ACK information in a PUSCH transmission that is not scheduled by a DCI format or is scheduled by DCI format 0\_0, 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 $M\_{A}$ 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;- 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 $M\_{A}$ 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 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 $V\_{T-SAI}^{UL}=1$. The UE does not generate a HARQ-ACK codebook for multiplexing in the PUSCH transmission when $V\_{T-SAI}^{UL}=0$ 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 with a counter SAI field value of 1 in the set $M\_{A}$ of occasions for candidate PSSCH transmissions with corresponding PSFCH reception occasions as described in Clause 16.5.1. $V\_{T-SAI}^{UL}=0$ if the SAI field in the DCI format is set to '0'; otherwise, $V\_{T-SAI}^{UL}=1$.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 channelA 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, 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 set of configured sidelink resource pool bitmaps- 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 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 $M$ of PDCCH monitoring occasions.< Unchanged parts are omitted >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 $n-K\_{1}$, where $K\_{1}$ is the PSFCH-to-HARQ-feedback timing value for the SL configured grant$O^{ACK}=O^{ACK}+1$;$o\_{O^{ACK}-1}^{ACK}$= HARQ-ACK information bit associated with the PSFCH reception occasions associated with the PSSCH transmissions scheduled by the SL configured grantend if |

**Company views**

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# List of identified contributions

R1-2102368 Remaining open issues and corrections for mode 1 RA OPPO

R1-2102710 A remaining issue on Mode-1 resource allocation for NR sidelink Fujitsu

R1-2102940 Maintenance on NR sidelink mode-1 resource allocation mechanism vivo

R1-2103376 Discussion on essential corrections in resource allocation procedure LG Electronics

R1-2103467 Remaining issues on resource allocation for NR sidelink Sharp

R1-2103499 Remaining issues on mode1 ZTE, Sanechips

R1-2103555 Maintenance for resource allocation mechanism mode 1 NTT DOCOMO, INC.

R1-2103672 Remaining issues on resource allocation mode-1 and sidelink procedure ASUSTeK

R1-2103764 Maintenance for Resource allocation for sidelink - Mode 1 Nokia, Nokia Shanghai Bell