**3GPP TSG-RAN WG2 Meeting #113bis-e**

 ***R2-210xxxx***

**Electronic, 12th April – 20th April, 2021**

**Agenda item: 6.4.1**

**Source: Huawei (Rapporteur)**

**Title: Summary of [POST113-e][706][V2XSL] RRC impacts from the latest RAN1 decisions**

**Document for: Discussion and decision**

# Introduction

This is the trigger of the following email discussion:

* [POST113-e][706][V2X/SL] RRC impacts from the latest RAN1 decisions (Huawei)

 **Scope:** Discuss RRC impacts from the latest RAN1 decisions.

 **Intended outcome:** Discussion summary, corresponding CRs and response LS (if needed)

 **Deadline:** Long email discussion

Companies are requested to provide their views on the issues listed in this document.

# Clarification on *sl-N1PUCCH-AN-r16*

In RAN1#104 meeting, RAN1 send LS in R1-2102176 to request RAN2 to clarify whether *sl-N1PUCCH-AN-r16* is configurable for SL CG type 2 in the current specification.

Agreements:

* Send an LS to RAN2 describing that:
	+ Per RAN1 agreements, the parameter *sl-N1PUCCH-AN-r16* should be used for SL CG Type 2 (only for PSCCH/PSSCH transmissions without a corresponding PDCCH).
	+ In RAN1’s understanding, the parameter cannot be configured for SL CG type-2 and asking RAN2 whether they can provide a solution that would be compatible with the existing RAN1 agreements.

According to RAN1#98bis agreement, they agreed to reuse the Rel-15 procedure and signalling used for DL HARQ-ACK reporting includes using the higher-layer parameter *sl-N1PUCCH-AN-r16* for determining the PUCCH resource used for SL HARQ-ACK reporting for SL CG type 2 (but only for PSCCH/PSSCH transmissions without a corresponding PDCCH). However, this RAN1 agreements was not reflected in current RRC specification.

| *SL-ConfiguredGrantConfig* field descriptions |
| --- |
| ***sl-N1PUCCH-AN***This field indicates the HARQ resource for PUCCH for sidelink configured grant type 1. The actual PUCCH-Resource is configured in sl-PUCCH-Config and referred to by its ID. |

Rapporteur agrees with the RAN1 concern that based on current RRC specification, *sl-N1PUCCH-AN-r16* can only be configured for sidelink configured grant type 1 and some clarification is needed to align with the RAN1 agreement. Rapporteur think there are 2 options can be considered as listed below.

**Option 1**: some clarification in the field description as shown below based on the assumption that *rrc-ConfiguredSidelinkGrant-r16* is allowed to be configured for sidelink configured grant type 2 (there is no clear restriction in the specification to restrict *rrc-ConfiguredSidelinkGrant-r16* is for sidelink configured type 1 only)

| *SL-ConfiguredGrantConfig* field descriptions |
| --- |
| ***sl-N1PUCCH-AN***This field indicates the HARQ resource for PUCCH for sidelink configured grant type 1 and PSCCH/PSSCH transmissions without a corresponding PDCCH on sidelink configured grant type 2. The actual PUCCH-Resource is configured in sl-PUCCH-Config and referred to by its ID. |

**Option 2**: Extend *sl-N1PUCCH-AN-r16* for SL HARQ-ACK reporting for SL CG type 2 as shown below.

***SL-ConfiguredGrantConfig* information element**

-- ASN1START

-- TAG-SL-CONFIGUREDGRANTCONFIG-START

SL-ConfiguredGrantConfig-r16 ::= SEQUENCE {

 sl-ConfigIndexCG-r16 SL-ConfigIndexCG-r16,

 sl-PeriodCG-r16 SL-PeriodCG-r16 OPTIONAL, -- Need M

 sl-NrOfHARQ-Processes-r16 INTEGER (1..16) OPTIONAL, -- Need M

 sl-HARQ-ProcID-offset-r16 INTEGER (1..16) OPTIONAL, -- Need M

 sl-CG-MaxTransNumList-r16 SL-CG-MaxTransNumList-r16 OPTIONAL, -- Need M

 rrc-ConfiguredSidelinkGrant-r16 SEQUENCE {

 sl-TimeResourceCG-Type1-r16 INTEGER (0..496) OPTIONAL, -- Need M

 sl-StartSubchannelCG-Type1-r16 INTEGER (0..26) OPTIONAL, -- Need M

 sl-FreqResourceCG-Type1-r16 INTEGER (0..6929) OPTIONAL, -- Need M

 sl-TimeOffsetCG-Type1-r16 INTEGER (0..7999) OPTIONAL, -- Need R

 sl-N1PUCCH-AN-r16 PUCCH-ResourceId OPTIONAL, -- Need M

 sl-PSFCH-ToPUCCH-CG-Type1-r16 INTEGER (0..15) OPTIONAL, -- Need M

 sl-ResourcePoolID-r16 SL-ResourcePoolID-r16 OPTIONAL, -- Need M

 sl-TimeReferenceSFN-Type1-r16 ENUMERATED {sfn512} OPTIONAL -- Need S

 } OPTIONAL, -- Need M

...,

[[

sl-N1PUCCH-AN-v16xy PUCCH-ResourceId OPTIONAL -- Need M

]]

}

-- TAG-SL-CONFIGUREDGRANTCONFIG-STOP

-- ASN1STOP

| *SL-ConfiguredGrantConfig* field descriptions |
| --- |
| ***sl-N1PUCCH-AN***This field indicates the HARQ resource for PUCCH for sidelink configured grant type 1. *sl-N1PUCCH-AN-v16xy* indicates the HARQ resource for PUCCH for PSCCH/PSSCH transmissions without a corresponding PDCCH on sidelink configured grant type 2. The actual PUCCH-Resource is configured in sl-PUCCH-Config and referred to by its ID. |

Note that Option 2 are NBC changes with new signalling to be introduced. As for option 1, it can avoid introducing new signalling; however, it is still a functional change by adding something not supported by the current Spec. As another thing to be noted, although the parameter *rrc-ConfiguredSidelinkGrant-r16* is intended specifically for configured sidelink grant type 1, such restriction has not been specified in the current MAC spec (which is different from configured uplink grant case in Uu). With such information provided, Rapporteur would like to check companies’ views on with which way to go.

Question A: For the clarification on *sl-N1PUCCH-AN-r16*, on which option do you agree?

* A1: Option 1
* A2: Option 2
* A3: Others (please provide other options with detailed TP)

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| Company | Yes/No | Comment |
| OPPO(Bingxue) | Option 1 | As stated by rapporteur the functional NBC issue (if one believes there is) exists for both option-1 and 2, and we slightly prefer Option 1 which is sufficient for clarifying and option-2 may create any issue that whether the PUCCH configuration can be different for the type-1 and for type-2 (since there are two IEs). |
| Ericsson (Tony) | Option 2 with comment | We think there is some confusion what is BC and what is not. First, Option 2 is BC since it uses the extension marker present in the ASN.1 and thus UEs that use the previous version of the ASN.1 do not need to modify their implementation to be “standard compliant”.On the contrary, Option 1 is NBC since we are modify the meaning of an existing field by extending is usage to also type grant 2.One can argue that introducing a new feature is NBC itself, but it not what we refer too when we say that a change is NBC.Having said this, we believe Option 2 is much more clean, even if we propose the following changes:[[sl-N1PUCCH-AN-Mode2-r16 PUCCH-ResourceId OPTIONAL -- Need M]]If we go for extending the field, we will need to clarify in the spec when one field is used and when the old one is used. Further, the “new” field is not just an extension since it simply the same field that is also used for type grant 2.Of course, a new field description is needed for the new field. |
| ZTE | Option1 | Option 1 is more simpler than option2 and it is sufficient for clarifying the issue. |
| Qualcomm | Option 2 |  |
| MediaTek (Nathan) | Option 1 | We agree that both options are *functionally* NBC (not ASN.1 NBC; neither one of them breaks the transfer syntax), and option 1 has lower spec impact.We understand Ericsson’s argument that option 2 looks less NBC since it uses the extension mechanism, but this doesn’t make a functional difference. With either option, a UE that does not implement the CR will not know to interpret the existing field as applying to the PDCCHless type 2 case, and it will not be able to identify a HARQ resource for use in this case. |
| Intel | Option 1 | We agree with OPPO that option 1 seems a bit simpler for clarifying and seems preferrable |
| vivo(Boubacar) | Option 2 | We think both options bring NBC issues and prefer Option 2 as a more straightforward solution. |

# Clarification on *pdsch-HARQ-ACK-Codebook*

In RAN1#104 meeting, the following agreement has been made:

|  |
| --- |
| Agreements:The parameter *pdsch-HARQ-ACK-Codebook* is always used for reporting SL HARQ-ACK information. |

RAN1 send LS in R1-2102176 to request RAN2 to capture the agreed behaviour in our specification.

Rapporteur thinks that additional clarifications need to be done on top of the current field description of *pdsch-HARQ-ACK-CodebookList*, in order to embody the related RAN1 agreement. Specifically, it should be clarified that, unlike Uu it is always the *pdsch-HARQ-ACK-Codebook* that is used for SL HARQ-ACK reporting, even though the *pdsch-HARQ-ACK-CodebookList* is configured, as above agreed by RAN1. Specific changes are shown below:

| *PhysicalCellGroupConfig* field descriptions |
| --- |
| ***pdsch-HARQ-ACK-Codebook***The PDSCH HARQ-ACK codebook is either semi-static or dynamic. This is applicable to both CA and none CA operation (see TS 38.213 [13], clauses 9.1.2 and 9.1.3). If *pdsch-HARQ-ACK-Codebook-r16* is signalled, UE shall ignore the *pdsch-HARQ-ACK-Codebook* (without suffix). If the field *pdsch-HARQ-ACK-Codebook-secondaryPUCCHgroup* is present, *pdsch-HARQ-ACK-Codebook* is applied to primary PUCCH group. Otherwise, this field is applied to the cell group (i.e. for all the cells within the cell group). |
| ***pdsch-HARQ-ACK-CodebookList***A list of configuration for at least two simultaneously constructed HARQ-ACK codebooks. Each configuration in the list is defined in the same way as *pdsch-HARQ-ACK-Codebook* (see TS 38.212 [17], clause 7.3.1.2.2 and TS 38.213 [13], clauses 7.2.1, 9.1.2, 9.1.3 and 9.2.1). If this field is present, the field *pdsch-HARQ-ACK-Codebook* is ignored for the case at least two HARQ-ACK codebooks are simultaneously constructed, except for SL HARQ-ACK reporting which still uses *pdsch-HARQ-ACK-Codebook* even if this field is present. |

Question B: For the clarification on *pdsch-HARQ-ACK-Codebook*, do you agree with the proposed change?

* Yes
* No (please provide other options with detailed TP)

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| --- | --- | --- |
| Company | Yes/No | Comment |
| OPPO (Bingxue) | Yes with comments | Besides *pdsch-HARQ-ACK-CodebookList* the same clarification should be also applied to *pdsch-HARQ-ACK-Codebook-r16* and *pdsch-HARQ-ACK-Codebook-secondaryPUCCHgroup*, i.e., the field description of ***pdsch-HARQ-ACK-Codebook*** should be changed as follows:The PDSCH HARQ-ACK codebook is either semi-static or dynamic. This is applicable to both CA and none CA operation (see TS 38.213 [13], clauses 9.1.2 and 9.1.3). If *pdsch-HARQ-ACK-Codebook-r16* is signalled, UE shall ignore the *pdsch-HARQ-ACK-Codebook* (without suffix) except for SL HARQ-ACK reporting which still uses *pdsch-HARQ-ACK-Codebook* even if this field is present. If the field *pdsch-HARQ-ACK-Codebook-secondaryPUCCHgroup* is present, *pdsch-HARQ-ACK-Codebook* is applied to primary PUCCH group, except for SL HARQ-ACK reporting which uses *pdsch-HARQ-ACK-Codebook* for both primary and secondary PUCCH group even if this field is present. Otherwise, this field is applied to the cell group (i.e. for all the cells within the cell group). |
| Ericsson | NO | First, the proposed change is going to modify the behaviour also for Uu and this is not acceptable for us. This is because there is no notion of “SL HARQ-ACK” in RRC and thus the change may be misleading.Further, if we look at the field description of **pdsch-HARQ-ACK-CodebookList**, we have the following:Each configuration in the list is defined in the same way as *pdsch-HARQ-ACK-Codebook*Therefore, our understanding is that current specification already captured correctly the agreement made by RAN1 as the UE will indeed use, anyway, the value signaled in *pdsch-HARQ-ACK-Codebook*. |
| ZTE | Yes with comments | Since the IE of *pdsch-HARQ-ACK-CodebookList* will not be used for sidelink, so we think it is better to add the description like this: ‘ the field *pdsch-HARQ-ACK-CodebookList* is ignored for the SL HARQ-ACK reporting’. |
| Qualcomm | Yes | For simplicity and consistency with RAN1’s recommendation, suggest reusing the wording proposed in the RAN1 LS,

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| --- |
| ***pdsch-HARQ-ACK-CodebookList***A list of configuration for at least two simultaneously constructed HARQ-ACK codebooks. Each configuration in the list is defined in the same way as *pdsch-HARQ-ACK-Codebook* (see TS 38.212 [17], clause 7.3.1.2.2 and TS 38.213 [13], clauses 7.2.1, 9.1.2, 9.1.3 and 9.2.1). If this field is present, the field *pdsch-HARQ-ACK-Codebook* is ignored for the case at least two HARQ-ACK codebooks are simultaneously constructed. The parameter *pdsch-HARQ-ACK-Codebook* is always used for reporting SL HARQ-ACK information. |

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| --- |
| ***pdsch-HARQ-ACK-Codebook***The PDSCH HARQ-ACK codebook is either semi-static or dynamic. This is applicable to both CA and none CA operation (see TS 38.213 [13], clauses 9.1.2 and 9.1.3). If *pdsch-HARQ-ACK-Codebook-r16* is signalled, UE shall ignore the *pdsch-HARQ-ACK-Codebook* (without suffix). If the field *pdsch-HARQ-ACK-CodebooksecondaryPUCCHgroup.* is present, *pdsch-HARQ-ACK-Codebook* is applied to primary PUCCH group. Otherwise, this field is applied to the cell group (i.e. for all the cells within the cell group). The parameter *pdsch-HARQ-ACK-Codebook* is always used for reporting SL HARQ-ACK information. |

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| MediaTek | Yes | We agree with OPPO’s comment about applying this change also to the additional fields *pdsch-HARQ-ACK-Codebook-r16* and *pdsch-HARQ-ACK-Codebook-secondaryPUCCHgroup*. |
| Intel | Yes | We share the view with OPPO and MediaTek |
| vivo | Yes | Agree with OPPO‘s TP. proposal |

# Per table MCS range for mode 2

During RAN2#112 meeting, per table MCS range for mode 2 was discussed and companies agreed to send LS to RAN1 to consult about this. RAN1 replied LS in R1-2102017.

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| --- |
| RAN1 thank RAN2’s LS in R2-2010933 and would like to provide our response to the following question.**Q1**: Should the MCS ranges for mode-2 operation (i.e., in the PSSCH transmission parameter table based on UE speed and synchronization source, and the PSSCH transmission parameter table based on CBR and priority) be defined per MCS table?**Answer**: There is no consensus in RAN1 for this issue, although there is a majority view that the MCS ranges for mode-2 operation should be defined per MCS table. RAN1 would like to leave the decision to RAN2 to make any update or not. |

Technically, it seems logical to have each MCS table configured with an associated MCS range, which enables the flexibility for NW configuration of the MCS ranges. On the other hand, rapporteur wonders whether, even with a common MCS range configured for all MCS table, the current Spec can still work. Specifically, if one MCS range is configured for all MCS tables, then regardless of which MCS table the UE chooses to use, the UE will choose a specific MCS value from this common MCS range (associated with current CBR or speed). Somebody may say that a common MCS range may include an MCS index which corresponds to a non-reserved value in one MCS table but a reserved value in another MCS table, so that it does not work if the UE selects a reserved MCS value from the common MCS range, when it selects to use an MCS table containing this MCS value as reserved. However, in the MAC Spec, it is true that the UE shall select an MCS value from the corresponding MCS range, but which specific MCS value the UE selects from the range is up to UE implementation. Therefore, even if the UE selects an MCS table that includes a reserved value in the corresponding MCS range, it can still avoid selecting the reserved value via proper implementation. Thus, it seems the current Spec, though not perfect, can still work, and considering the big ASN.1 change, it is not that clear whether the proposed change is indispensable at this stage. Rapporteur, however, understands that this is at the cost of configuration flexibility.

Question C1: Do you agree that common MCS range configured for all MCS tables for mode 2 (as in the current Spec) can still work?

* Yes
* No

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| --- | --- | --- |
| Company | Yes/No | Comment |
| OPPO | No | The problem is **not** the “Somebody may say that a common MCS range may include an MCS index which corresponds to a non-reserved value in one MCS table but a reserved value in another MCS table, so that it does not work if the UE selects a reserved MCS value from the common MCS range, when it selects to use an MCS table containing this MCS value as reserved.”Instead, the problem is that a same MCS index may have different meaning in different MCS tables, e.g., according to one table (e.g., table of low-SE). MCS index 14 points to QPSK, but according to another table (e.g., table of 256qam), MCS index 14 points to 64QAM. So for a same congestion/speed level, UE may select different MCS scheme simply due to applying different MCS tables, then the mechanism which is designed to restrict MCS range to adapt with congestion level / speed just cannot achieve the expected effect. |
| Ericsson | Maybe | In principle, common MCS range can work for all MCS table for mode 2, but whether this is very efficiency from a performance point of view is very questionable. Therefore, not because in principle can work it means that there are no problems. Further, our understanding is that RAN1 already assumed in the previous meeting that a specific MCS range for a MCS table for range 2 was supported.Agreements:* Congestion control can restrict the values of at least the following PSSCH/PSCCH TX parameters per resource pool:
	+ Range of MCS **for a given MCS table**supported within the resource pool
	+ Range of number of sub-channels
	+ Upper bound of number of (re)transmissions – already agreed in mode 2 AI
	+ Upper bound of TX power (including zero TX power)
* Congestion control can set an upper bound on channel occupancy ratio (CR), CRlimit.
* Ranges/bounds of the transmission parameters and CRlimit are functions of QoS and CBR.

Agreement:* In addition to congestion control (in use or not in use), the following PSSCH/PSCCH TX parameters per resource pool can be restricted by reusing the same mechanism as in LTE:
	+ Range of MCS **for a given MCS table** supported within the resource pool
	+ Range of number of sub-channels
	+ Upper bound of number of (re)transmissions
 |
| ZTE | No | It is reasonable to use the same MCS ranges operation for the mode 1 and mode 2. |
| MediaTek | Sort of | We understand that the current spec does not produce any inconsistent results, i.e. the UE shall select a valid MCS value from the corresponding range according to the selected table. However, we also agree with OPPO’s analysis that the common range may have different meanings when applied to different tables. So the current spec works in the sense that the system does not completely break, but it doesn’t work in the sense that the MCS range mechanism doesn’t function as intended. |
| Intel | See comment | We can somewhat see the concern from OPPO but at the same time, the current specification can work as is and it does not seem very critical to change. So, we have no strong view on this and are ok to go with the majority on this |
| vivo | Yes | Agree with Rapporteur. The current specification can work without the introduction of per table MCS range for mode 2.  |

Question C2: Do you agree that the introduction of per table MCS range for mode 2 is functional NBC (even though it can be done via ASN.1 BC ways w/o ASN.1 encoding/decoding errors)?

* Yes
* No

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| --- | --- | --- |
| Company | Yes/No | Comment |
| OPPO | No | It is not a functional NBC.* If UE does not implement the CR but the network implements, the UE can still behave based on the current spec – but the problem remains, i.e., a single MCS range is applied to all MCS tables
* If the UE implement the CR but the network does not, the UE can still behave based on the current spec – but the problem remains, i.e., a single MCS range is applied to all MCS tables

So the proposal is just to provide the flexibility for UE and network who implement the CR to fix this issue, but not to mandate the legacy UE / network to do a functional NBC. |
| Ericsson  | No | We want to remark what we already said in our previous comment on the first issue.NBC is not referred to introduction of new functionalities but rather on the impact that those functionalities have on the ASN.1If the introduced functionaly uses e.g., the extension marker present in the ASN.1 and thus UEs that use the previous version of the ASN.1 do not need to modify their implementation to be “standard compliant”, then this is still a BC change.On the contrary, if the new functionality modify the meaning of an existing field of brake/mnodify the previous version of the ASN.1, then this is a NBC change. |
| ZTE | No |  |
| Qualcomm  | No |  |
| MediaTek | No | If the UE does not implement the CR, it may select an MCS scheme that is allowed according to the common range, but not allowed according to the per-table range that should be applied; however, this shouldn’t bother the recipient, which just sees a particular MCS and isn’t responsible for checking the selected MCS against the range. So we don’t see that there is a functional NBC issue here. |
| Intel | No |  |
| vivo | See comments | We have different understanding from above analysis. * If UE does not implement the CR but the network implements, the UE may not work properly as the network may configure new table MCS range which cannot be interpreted correctly by the UE. The UE has to avoid this issue by implementation, e.g., only select from the common MCS table.
* If the UE implement the CR but the network does not, there is no problem in current specification.
 |

Question C3: Do you agree to introduce per table MCS range for mode 2?

* Yes, please detail the consequence if not introducing it.
* No

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| Company | Yes/No | Comment |
| OPPO | Yes | In summary:* RAN1 has majority view on supporting this;
* The problem is obvious valid (as answered to C1);
* There is no NBC issue (as answered to C2);

we believe this change is necessary and motivated. |
| Ericsson | Yes (no strong view) | We are fine to implement the signaling for allowing a specific MCS range for a MCS table for mode 2. However, we can go with majority. |
| ZTE | Yes | Agree with OPPO |
| Qualcomm | Yes |  |
| MediaTek | Yes | Agree with OPPO: The problem is real, the solution is not an NBC change, and the correction is motivated. |
| Intel | Yes wit comment | Ok to go with the majority if we want to go with the per table MCS range way |
| vivo | No | Introducing new table MCS range at this late stage is not preferred. Especially considering that it is possible that some UE with earlier version may not implement this change and, if only a uncertain number of the UEs implement the new feature, the performance of congestion control may still become unpredictable and the overall system performance worse. |