**3GPP TSG RAN WG1 Meeting #105-e R1-21xxxxx**

**E-meeting, May 10 – May 27, 2021**

**Agenda Item: 7.2.5**

**Source: Moderator (Huawei)**

**Title:** **Feature lead summary on PDCCH enhancements**

**Document for: Discussion and Decision**

# Introduction

This document summarizes the key issues for PDCCH enhancements discussed under agenda item 7.2.5 based on the views in [1][2][3][4][5][6][7][8][9][10][11], and aims to identify a set of critical issues for RAN1#105-e email discussion.

# Summary of issues raised for PDCCH enhancements

This section summarize the issues raised by companies on PDCCH enhancements, among which a set of issues can be identified for RAN1#105-e email discussions. Recommendation on the email threads and scope are given in section 2.1 and the summary of detailed issues are given in section 2.2.

## Recommendation for the scope of email threads

Based on the summary of issues in section 2.2, the following recommendation are made for the scope of email threads.

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**Email discussion #1**

Email discussion/approval on remaining issues on PDCCH enhancements:

* **Issue #2**: Correction on relative SLIV reference for Type 1 HARQ codebook
* **Issue #4**: Remove DCI format 1\_1 indicating SCell dormancy in case of 1-bit C-DAI
* **Issue #6**: Correction on the number of SRS resource set configuration
* **Issue #3** (editor CR): Correction on RRC parameter in DCI formats when two HARQ-ACK codebooks are configured
* **Issue #5** (editor CR): Editorial correction on

**Companies are encouraged to provide views on whether to include the following issues to the scope**.

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| Company | Issue #1 | Comments |
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##  Summary of detailed issues

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| **Issue**  | **Description** | **Source** | **Recommended handling**  |
| #1 | Correction of UE PDSCH processing time for DCI format 1\_2 | ZTE (R1-2104323)Spreadtrum (R1-2104410)OPPO (R1-2104799)Vivo (R1-2105465)Huawei, HiSilicon (R1-2105928) | Postpone to next meeting **Reason:***The rel-16 discussion depends on the outcome of the clarification of Rel-15 behavior. There is contribution submitted to Rel-15 maintenance section for the clarification of the Rel-15 behavior, therefore we can wait for the outcome there before starting to discuss Rel-16 behavior.*  |
| #2 | Correction on relative SLIV reference for Type 1 HARQ codebook | Ericsson (R1-2104215)Nokia (R1-2104312)CATT (R1-2104481)Samsung (R1-2105286)Vivo (R1-2105465)Huawei, HiSilicon (R1-2105928) | Included in the scope for email discussion **Reason:***Continue the discussion from last meeting and resolve the issue.*  |
| #3 | Correction on RRC parameter in DCI formats when two HARQ-ACK codebooks are configured | CATT (R1-2104481) | Included in the scope but go to editor CR. **Reason:***Correction on the RRC parameter and thus can go to editor CR following the rule in previous meeting. According the guidance from chairman, even editor CR needs to be agreed by the group first before providing to the editor.*  |
| #4 | Remove DCI format 1\_1 indicating SCell dormancy in case of 1-bit C-DAI | WILUS (R1-2105867) | Included in the scope for email discussion **Reason:***Critical correction, otherwise the spec is not correct* |
| #5 | Editorial correction on  | WILUS (R1-2105867) | Included in the scope but go to editor CR. **Reason:***Editorial correction which is caused by agreed alignment CR before. According the guidance from chairman, even editor CR needs to be agreed by the group first before providing to the editor.*  |
| #6 | Correction on the number of SRS resource set configuration  | Vivo (R1-2105468) | Included in the scope for email discussion **Reason:***Critical correction, otherwise the spec is not clear. Note that the paper was submitted to MIMO, and chairman brought it us since the issue originates from the introduction of DCI format 0\_2.* |

# Issue #1: Correction of UE PDSCH processing time for DCI format 1\_2

In RAN1#104b-e meeting, the issue (details as copied below) was discussed but was not concluded.

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| Issue #2: UE PDSCH processing time In Rel-15, PDSCH processing time for PDSCH processing capability 1 and capability 2 depends on whether additional DMRS is configured. However, new DMRS parameters *dmrs-DownlinkForPDSCH-MappingTypeA-DCI-1-2* and *dmrs-DownlinkForPDSCH-MappingTypeB-DCI-1-2* are introduced for DCI format 1\_2 in Rel-16, and it hasn’t been reflected in current Rel-16 specification. Note that, the legacy RRC parameter *dmrs-DownlinkForPDSCH-MappingTypeA and dmrs-DownlinkForPDSCH-MappingType* only apply to DCI format 1\_1. For DCI format 1\_0, our understanding is that UE will always use PDSCH processing capability 1 with a longer processing time (right column in Table 5.3-1) since *dmrs-AdditionalPosition* = 'pos2' is assumed for PDSCH scheduled by DCI format 1\_0.

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| **Table 5.3-1: PDSCH processing time for PDSCH processing capability 1**

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|  | PDSCH decoding time *N1* [symbols] |
| *dmrs-AdditionalPosition* = 'pos0' in *DMRS-DownlinkConfig* in both of *dmrs-DownlinkForPDSCH-MappingTypeA*, *dmrs-DownlinkForPDSCH-MappingTypeB* | *dmrs-AdditionalPosition* ≠ 'pos0' in *DMRS-DownlinkConfig* in either of *dmrs-DownlinkForPDSCH-MappingTypeA*, *dmrs-DownlinkForPDSCH-MappingTypeB* *or if the higher layer parameter is not configured*  |
| 0 | 8 | *N1,0* |
| 1 | 10 | 13 |
| 2 | 17 | 20 |
| 3 | 20 | 24 |

Table 5.3-2: PDSCH processing time for PDSCH processing capability 2

|  |  |
| --- | --- |
|  | PDSCH decoding time *N1* [symbols] |
| *dmrs-AdditionalPosition* = 'pos0' in *DMRS-DownlinkConfig* in both of *dmrs-DownlinkForPDSCH-MappingTypeA*, *dmrs-DownlinkForPDSCH-MappingTypeB*  |
| 0 | 3 |
| 1 | 4.5 |
| 2 | 9 for frequency range 1 |

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For PDSCH processing capability 1, there could be two options to include the new introduced RRC parameters for DCI format 1\_2. * Option 1: The PDSCH processing time is independent from DCI formats. That is, only when *dmrs-AdditionalPosition* = 'pos0' is configured in *DMRS-DownlinkConfig* in all of *dmrs-DownlinkForPDSCH-MappingTypeA*, *dmrs-DownlinkForPDSCH-MappingTypeB, dmrs-DownlinkForPDSCH-MappingTypeA-DCI-1-2* and *dmrs-DownlinkForPDSCH-MappingTypeB-DCI-1-2,* the PDSCH decoding time *N1* follows the shorter processing time (left column in Table 5.3-1). Otherwise it follows the longer processing time for PDSCH processing capability 1 (right column in Table 5.3-1). This would cause a larger processing time even when a PDSCH is scheduled without additional DMRS for PDSCH processing capability 1.
* Option 2: The PDSCH processing time is defined per DCI format. In other words, the PDSCH processing time can be different for PDSCH scheduled by DCI format DCI 1\_1 and DCI format 1\_2. This is more flexible while it requires UE can dynamically change the UE PDSCH processing time for different PDSCHs scheduled by different DCI formats. It seems not a big issue since the processing time for PDSCH scheduled by DCI format 1\_0 may also different from the PDSCH scheduled by DCI format 1\_1 in legacy Rel-15.
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In this meeting, several companies (i.e. *ZTE, OPPO, Vivo, Huawei, Spreadtrum and Ericsson*) share further views on the issue, including view on Rel-15 for DCI format 1\_0 and DCI format 1\_1, and view on Rel-16 for DCI format 1\_1 and DCI format 1\_2. Based on the views from the contribution, it is observed that there are still different views on the interpretation of Rel-15 behavior, and correspondingly different views on how to handle the Rel-16 case as well. **Note that Intel submitted one paper R1-2104885 on PDSCH processing time per capability 2 and DCI format 1\_0 under Rel-15 maintenance session**.

**Feature lead view**: Since the discussion for Rel-16 (i.e. for DCI format 1\_1 and DCI format 1\_2) will depend on the outcome of Rel-15 clarification for DCI format 1\_0 and DCI format 1\_1, it is recommended to delay the discussion for Rel-16 to next meeting. As to the clarification for Rel-15 behavior, it belongs to Rel-15 maintenance discussion.

# Issue #2: Correction on relative SLIV reference for Type 1 HARQ codebook

In RAN1#104b-e meeting, the issue (details as copied below) was discussed but was not concluded yet.

|  |  |
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| Based on the current specification text in 38.213, if the UE is configured with *referenceOfSLIVDCI-1-2*, then for each row index with *K0=*0and each PDCCH monitoring occasion with starting symbol , a new row index is added into the TDRA table.

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| *b) on a set of row indexes of a table that is associated with the active DL BWP and defining respective sets of slot offsets , start and length indicators SLIV, and PDSCH mapping types for PDSCH reception as described in [6, TS 38.214], where the row indexes of the table are provided by the union of row indexes of time domain resource allocation tables for DCI formats the UE is configured to monitor PDCCH for serving cell* *a) if the UE is provided referenceOfSLIVDCI-1-2, for each row index with slot offset and PDSCH mapping Type B in a set of row indexes of a table for DCI format 1\_2 [6, TS 38.214], for each PDCCH monitoring occasion in a set of PDCCH monitoring occasions with different starting symbols within a slot where the UE monitors PDCCH for DCI format 1\_2 and with starting symbol , if for normal cyclic prefix and for extended cyclic prefix, add a new row index in the set of row indexes of the table by replacing the starting symbol of the row index by*  |

Based on the discussion in RAN1#104b-e, two different interpretations as below of the above descriptions were discussed and it can be seen that most companies agree with interpretation 1. * **Interpretation 1:** The extended SLIV applies in every slot (i.e. even for the slot(s) with no PDCCH monitoring occasion with starting symbol ). Interpretation 1 ensures the same number of the set of row indexes of the TDRA tables for type-1 codebook construction for every slot.
	+ *Note: With this interpretation, there is no problem related to the Type 1 codebook size and at most some conclusion can be provided for clarification.*
	+ **Support:**  *ZTE, Ericsson, LG, Sharp, Huawei, HiSilicon, Qualcomm, Intel, CATT, NTT DCM, Vivo, OPPO*
* **Interpretation 2:** The extended SLIV is only applied to the slot(s) with PDCCH monitoring occasion with starting symbol . The candidate PDSCHs in a slot can be impacted by both PDCCH Mos and the number of PDSCH repetitions as discussed in Samsung paper.
	+ *Note: With this understanding, there is a problem with the Type-1 codebook size and further solutions need to be considered.*
	+ **Support:**  *LG, Samsung,*

 It was proposed to put some restriction as below on top of interpretation 1, for simplicity of the specification and possible to address the concern of increasing the HARQ-ACK codebook size. =============== If the UE is provided *referenceOfSLIVDCI-1-2*, the gNB configures Type-1 HARQ-ACK codebook only if the starting symbols of PDCCH monitoring occasions are configured the same in all slots.=============== Therefore, the following proposal A-7 was proposed from the feature lead in RAN1#104-e. However, there was some concern raised that with this restriction, the feature is not that useful. ***Proposal A-7****: It is recommended to conclude that,* * *If a UE is provided referenceOfSLIVDCI-1-2, R defined in section 9.1.2.1 of 38.213 is applicable for all slots, including the slot(s) with no PDCCH monitoring occasion with starting symbol .*
* *If a UE is provided referenceOfSLIVDCI-1-2, the gNB configures Type-1 HARQ-ACK codebook only if the starting symbols of PDCCH monitoring occasions are configured the same in all the slots with PDCCH monitoring occasion with starting symbol .*
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In this meeting, several companies (i.e. Ericsson, Nokia, CATT, Samsung, Vivo and Huawei) provide further views on this issue. The following three options was observed from the views:

* **Option 1**: **Go with interpretation 1 with restriction.**
	+ *If a UE is provided referenceOfSLIVDCI-1-2, R defined in section 9.1.2.1 of 38.213 is applicable for all slots, including the slot(s) with no PDCCH monitoring occasion with starting symbol .*
	+ *If a UE is provided referenceOfSLIVDCI-1-2, the gNB configures Type-1 HARQ-ACK codebook only if the starting symbols of PDCCH monitoring occasions are configured the same in all the slots with PDCCH monitoring occasion with starting symbol .*

***Potential TP***:

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---------------------------------Start of Text Proposal to TS 38.213 v16.5.0-----------------------

**9.1.2.1 Type-1 HARQ-ACK codebook in physical uplink control channel**

a) if the UE is provided *referenceOfSLIVDCI-1-2*, for each row index with slot offset and PDSCH mapping Type B in a set of row indexes of a table for DCI format 1\_2 [6, TS 38.214], for each PDCCH monitoring occasion in a set of PDCCH monitoring occasions with different starting symbols within a slot where the UE monitors PDCCH for DCI format 1\_2 and with starting symbol , if for normal cyclic prefix and for extended cyclic prefix, add a new row index in the set of row indexes of the table by replacing the starting symbol of the row index by . If the UE is provided with *referenceOfSLIVDCI-1-2*, the gNB configures Type-1 HARQ-ACK codebook only if the starting symbols of PDCCH monitoring occasions are configured the same in all slots.

--------------------------------- End of Text Proposal to TS 38.213 v16.5.0-----------------------

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* + ***Pros****: No increase of the HARQ-ACK codebook size compared to option 2.*
	+ ***Cons****: Restriction applied which will limit the applicable scenario of the feature. Due to the configuration of search space sets may vary much, it may be difficult to always ensure same starting symbol for PDCCH monitoring occasions.*
* **Option 2**:  **Go with interpretation 1 without restriction.**
	+ *If a UE is provided referenceOfSLIVDCI-1-2, R defined in section 9.1.2.1 of 38.213 is applicable for all slots, including the slot(s) with no PDCCH monitoring occasion with starting symbol .*
	+ *If the starting symbols of PDCCH monitoring occasions are configured different in different slots with PDCCH monitoring occasion with starting symbol , R is determined based on the union of PDCCH monitoring configurations in all the slots.*

***Potential TP***:

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------------------------------------ Start of TP 38.213 V16.5.0 section 9.1.2.1---------------------------------

<unchanged text omitted>

b) on a set of row indexes of a table that is associated with the active DL BWP and defining respective sets of slot offsets , start and length indicators *SLIV*, and PDSCH mapping types for PDSCH reception as described in [6, TS 38.214], where the row indexes of the table are provided by the union of row indexes of time domain resource allocation tables for DCI formats the UE is configured to monitor PDCCH for serving cell

a) if the UE is provided *referenceOfSLIVDCI-1-2*, for each row index with slot offset and PDSCH mapping Type B in a set of row indexes of a table for DCI format 1\_2 [6, TS 38.214], for ~~each~~any PDCCH monitoring occasion in any slot~~in a set of PDCCH monitoring occasions with different starting symbols within a slot~~ where the UE monitors PDCCH for DCI format 1\_2 and with starting symbol , if for normal cyclic prefix and for extended cyclic prefix, add a new row index in the set of row indexes of the table by replacing the starting symbol of the row index by

<unchanged text omitted>

------------------------------------ End of TP 38.213 V16.5.0 section 9.1.2.1---------------------------------

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* + ***Pros****: No restriction needed and meanwhile make the specification clearer, which will ensure more applicable scenarios for the new SLIV reference feature.*
	+ ***Cons****: The HARQ-ACK codebook size may be larger compared to option 1.*
* **Option 3**: **Slot boundary should be used as the reference of PDSCH SLIV if UE is configured with Type-1 HARQ-ACK codebook. Adopt the following TP#1 and TP#2.**

*TP #1*

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| TS 38.214 5.1.2.1 Resource allocation in time domainWhen the UE is scheduled to receive PDSCH by a DCI, the *Time domain resource assignment* field value *m* of the DCI provides a row index *m* + 1 to an allocation table. The determination of the used resource allocation table is defined in Clause 5.1.2.1.1. The indexed row defines the slot offset *K0*, the start and length indicator *SLIV*, or directly the start symbol *S* and the allocation length *L*, and the PDSCH mapping type to be assumed in the PDSCH reception.Given the parameter values of the indexed row:- The slot allocated for the PDSCH is *Ks*, where , if UE is configured with ca-SlotOffset for at least one of the scheduled and scheduling cell, and *Ks* = , otherwise, and where *n* is the slot with the scheduling DCI, and *K0* is based on the numerology of PDSCH, and  and are the subcarrier spacing configurations for PDSCH and PDCCH, respectively, and- and are the and the, respectively, which are determined by higher-layer configured ca-SlotOffset, for the cell receiving the PDCCH respectively, and are the and the, respectively, which are determined by higher-layer configured ca-SlotOffset for the cell receiving the PDSCH, as defined in clause 4.5 of [4, TS 38.211].- The reference point *S0* for starting symbol *S* is defined as: - if configured with *pdsch-HARQ-ACK-Codebook = dynamic* and configured with *referenceOfSLIVForDCI-Format1-2-r16*, and when receiving PDSCH scheduled by DCI format 1\_2 with CRC scrambled by C-RNTI, MCS-C-RNTI, CS-RNTI with *K0=0*, and PDSCH mapping Type B, the starting symbol *S* is relative to the starting symbol *S0* of the PDCCH monitoring occasion where DCI format 1\_2 is detected; - otherwise, the starting symbol *S* is relative to the start of the slot using *S0=0.*… |

*TP #2*

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| TS 38.213 9.1.2.1 Type-1 HARQ-ACK codebook in physical uplink control channelFor a serving cell , an active DL BWP, and an active UL BWP, as described in Clause 12, the UE determines a set of occasions for candidate PDSCH receptions for which the UE can transmit corresponding HARQ-ACK information in a PUCCH in slot . If serving cell is deactivated, the UE uses as the active DL BWP for determining the set of occasions for candidate PDSCH receptions a DL BWP provided by *firstActiveDownlinkBWP-Id*. The determination is based:a) on a set of slot timing values associated with the active UL BWPa) If the UE is configured to monitor PDCCH for DCI format 1\_0 and is not configured to monitor PDCCH for either DCI format 1\_1 or DCI format 1\_2 on serving cell , is provided by the slot timing values {1, 2, 3, 4, 5, 6, 7, 8} b) If the UE is configured to monitor PDCCH for DCI format 1\_1 and is not configured to monitor PDCCH for DCI format 1\_2 for serving cell , is provided by *dl-DataToUL-ACK* c) If the UE is configured to monitor PDCCH for DCI format 1\_2 and is not configured to monitor PDCCH for DCI format 1\_1 for serving cell ,  is provided by *dl-DataToUL-ACK-ForDCIFormat1\_2* d) If the UE is configured to monitor PDCCH for DCI format 1\_1 and DCI format 1\_2 for serving cell ,  is provided by the union of *dl-DataToUL-ACK* and *dl-DataToUL-ACK-ForDCIFormat1\_2*b) on a set of row indexes of a table that is associated with the active DL BWP and defining respective sets of slot offsets , start and length indicators *SLIV*, and PDSCH mapping types for PDSCH reception as described in [6, TS 38.214], where the row indexes of the table are provided by the union of row indexes of time domain resource allocation tables for DCI formats the UE is configured to monitor PDCCH for serving cell ~~a) if the UE is provided~~ *~~ReferenceofSLIV-ForDCIFormat1\_2~~*~~, for each row index with slot offset~~ ~~and PDSCH mapping Type B in a set of row indexes of a table for DCI format 1\_2 [6, TS 38.214], for each PDCCH monitoring occasion in a set of PDCCH monitoring occasions with different starting symbols within a slot where the UE monitors PDCCH for DCI format 1\_2 and with starting symbol , if for normal cyclic prefix and for extended cyclic prefix, add a new row index in the set of row indexes of the table by replacing the starting symbol of the row index by~~ … |

**Feature lead**: Before making any proposal, companies views on the above three options are needed first.

***Question 2-1*: *Which option (i.e. option 1, option 2 and option 3 above) do you prefer? If you have any suggestion on the TP for any of the option, please share also.***

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| *Company* | *View* |
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# Issue #3: Correction on RRC parameter in DCI formats when two HARQ-ACK codebooks are configured

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| CATT R1-2104481The RRC parameter *pdsch-HARQ-ACK-CodebookList-r16* was introduced in Rel-16 for URLLC to generate two HARQ-ACK codebooks. The descriptions for this parameter in TS38.331 is as follows

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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. |

According to the description, the HARQ-ACK codebook type is determined by *pdsch-HARQ-ACK-CodebookList* if configured, otherwise by field *pdsch-HARQ-ACK-Codebook*. However, only *pdsch-HARQ-ACK-Codebook* is considered for DCI formats in TS38.212 section 7.3.1. For example, for DCI format 1\_1, the number of bits of DAI field is determined by the RRC parameter *pdsch-HARQ-ACK-Codebook* as shown below, but if *pdsch-HARQ-ACK-CodebookList* is configured, the bit of DAI field should be determined by the RRC parameter *pdsch-HARQ-ACK-CodebookList.*To resolve the issue, it should be clarified that *pdsch-HARQ-ACK-Codebook* is replaced by *pdsch-HARQ-ACK-CodebookList-r16* when *pdsch-HARQ-ACK-CodebookList-r16* is configured in TS38.212.

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| 7.3.1.2.2 Format 1\_1……- Downlink assignment index – number of bits as defined in the following- 6 bits if more than one serving cell are configured in the DL and the higher layer parameter *nfi-TotalDAI-Included=true = enable*. The 4 MSB bits are the counter DAI and the total DAI for the scheduled PDSCH group, and the 2 LSB bits are the total DAI for the non-scheduled PDSCH group.- 4 bits if only one serving cell are configured in the DL and the higher layer parameter *nfi-TotalDAI-Included=true = enable.* The 2 MSB bits are the counter DAI for the scheduled PDSCH group, and the 2 LSB bits are the total DAI for the non-scheduled PDSCH group;- 4 bits if more than one serving cell are configured in the DL, the higher layer parameter *pdsch-HARQ-ACK-Codebook=dynamic* or *pdsch-HARQ-ACK-Codebook-r16= enhancedDynamic*, and *nfi-TotalDAI-Included=true* is not configured, where the 2 MSB bits are the counter DAI and the 2 LSB bits are the total DAI;- 4 bits if one serving cell is configured in the DL, and the higher layer parameter *pdsch-HARQ-ACK-Codebook=dynamic*, and the UE is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with value 0 for one or more first CORESETs and is provided *coresetPoolIndex* with value 1 for one or more second CORESETs, and is provided *ackNackFeedbackMode = joint*, where the 2 MSB bits are the counter DAI and the 2 LSB bits are the total DAI;- 2 bits if only one serving cell is configured in the DL, the higher layer parameter *pdsch-HARQ-ACK-Codebook=dynamic* or *pdsch-HARQ-ACK-Codebook-r16=enhancedDynamic*, and *nfi-TotalDAI-Included=true* is not configured, when the UE is not configured with *coresetPoolIndex* or the value of *coresetPoolIndex* is the same for all CORESETs if *coresetPoolIndex* is provided or the UE is not configured with *ackNackFeedbackMode = joint*, where the 2 bits are the counter DAI;- 0 bits otherwise.  |

**Proposal 2: Adopt the following TP for TS38.212 section 7.3.1.**-------------------------------------------------- Start of text proposal ------------------------------------------------------7.3.1 DCI formatsThe DCI formats defined in table 7.3.1-1 are supported.Table 7.3.1-1: DCI formats

|  |  |
| --- | --- |
| **DCI format** | **Usage** |
| 0\_0 | Scheduling of PUSCH in one cell |
| 0\_1 | Scheduling of one or multiple PUSCH in one cell, or indicating downlink feedback information for configured grant PUSCH (CG-DFI) |
| 0\_2 | Scheduling of PUSCH in one cell |
| 1\_0 | Scheduling of PDSCH in one cell |
| 1\_1 | Scheduling of PDSCH in one cell, and/or triggering one shot HARQ-ACK codebook feedback |
| 1\_2 | Scheduling of PDSCH in one cell |
| 2\_0 | Notifying a group of UEs of the slot format, available RB sets, COT duration and search space set group switching |
| 2\_1 | Notifying a group of UEs of the PRB(s) and OFDM symbol(s) where UE may assume no transmission is intended for the UE |
| 2\_2 | Transmission of TPC commands for PUCCH and PUSCH |
| 2\_3 | Transmission of a group of TPC commands for SRS transmissions by one or more UEs |
| 2\_4 | Notifying a group of UEs of the PRB(s) and OFDM symbol(s) where UE cancels the corresponding UL transmission from the UE |
| 2\_5 | Notifying the availability of soft resources as defined in Clause 9.3.1 of [10, TS 38.473] |
| 2\_6 | Notifying the power saving information outside DRX Active Time for one or more UEs |
| 3\_0 | Scheduling of NR sidelink in one cell |
| 3\_1 | Scheduling of LTE sidelink in one cell |

The fields defined in the DCI formats below are mapped to the information bits  to  as follows.Each field is mapped in the order in which it appears in the description, including the zero-padding bit(s), if any, with the first field mapped to the lowest order information bit  and each successive field mapped to higher order information bits. The most significant bit of each field is mapped to the lowest order information bit for that field, e.g. the most significant bit of the first field is mapped to .If the number of information bits in a DCI format is less than 12 bits, zeros shall be appended to the DCI format until the payload size equals 12.The size of each DCI format is determined by the configuration of the corresponding active bandwidth part of the scheduled cell and shall be adjusted as described in clause 7.3.1.0 if necessary.If a UE is configured with *pdsch-HARQ-ACK-CodebookList-r16*, *pdsch-HARQ-ACK-Codebook* is replaced by *pdsch-HARQ-ACK-CodebookList-r16* in this clause.-------------------------------------------------------- End of text proposal ------------------------------------------------------ |

**Feature lead view**: The issues is valid. The TP from R1-2104481 can be taken as the starting point. Based on the rule in previous meetings, it is recommended to provide to editor directly.

***Proposal 3-1****: Provide the text proposal below to TS 38.212 editor.*

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| ---------------------------------Start of Text Proposal to TS 38.212 v16.5.0-----------------------7.3.1 DCI formatsThe DCI formats defined in table 7.3.1-1 are supported.Table 7.3.1-1: DCI formats

|  |  |
| --- | --- |
| **DCI format** | **Usage** |
| 0\_0 | Scheduling of PUSCH in one cell |
| 0\_1 | Scheduling of one or multiple PUSCH in one cell, or indicating downlink feedback information for configured grant PUSCH (CG-DFI) |
| 0\_2 | Scheduling of PUSCH in one cell |
| 1\_0 | Scheduling of PDSCH in one cell |
| 1\_1 | Scheduling of PDSCH in one cell, and/or triggering one shot HARQ-ACK codebook feedback |
| 1\_2 | Scheduling of PDSCH in one cell |
| 2\_0 | Notifying a group of UEs of the slot format, available RB sets, COT duration and search space set group switching |
| 2\_1 | Notifying a group of UEs of the PRB(s) and OFDM symbol(s) where UE may assume no transmission is intended for the UE |
| 2\_2 | Transmission of TPC commands for PUCCH and PUSCH |
| 2\_3 | Transmission of a group of TPC commands for SRS transmissions by one or more UEs |
| 2\_4 | Notifying a group of UEs of the PRB(s) and OFDM symbol(s) where UE cancels the corresponding UL transmission from the UE |
| 2\_5 | Notifying the availability of soft resources as defined in Clause 9.3.1 of [10, TS 38.473] |
| 2\_6 | Notifying the power saving information outside DRX Active Time for one or more UEs |
| 3\_0 | Scheduling of NR sidelink in one cell |
| 3\_1 | Scheduling of LTE sidelink in one cell |

The fields defined in the DCI formats below are mapped to the information bits  to  as follows.Each field is mapped in the order in which it appears in the description, including the zero-padding bit(s), if any, with the first field mapped to the lowest order information bit  and each successive field mapped to higher order information bits. The most significant bit of each field is mapped to the lowest order information bit for that field, e.g. the most significant bit of the first field is mapped to .If the number of information bits in a DCI format is less than 12 bits, zeros shall be appended to the DCI format until the payload size equals 12.The size of each DCI format is determined by the configuration of the corresponding active bandwidth part of the scheduled cell and shall be adjusted as described in clause 7.3.1.0 if necessary.If a UE is configured with *pdsch-HARQ-ACK-CodebookList-r16*, *pdsch-HARQ-ACK-Codebook* is replaced by *pdsch-HARQ-ACK-CodebookList-r16* in this clause.…< Unchanged parts are omitted >--------------------------------- End of Text Proposal to TS 38.212 v16.5.0----------------------- |

# Issue #4: Remove DCI format 1\_1 indicating SCell dormancy in case of 1-bit C-DAI

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| WILUS R1-2105867Rel-16 URLLC supports the configuration of 1-bit or 2-bit counter DAI for DCI format 1\_2 if one serving cell is configured in the DL. However, there is no such a configuration for DCI format 1\_1 so that the DCI format 1\_1 always includes 2-bit counter DAI. As a reference, we copy the relevant texts from TS38.212 v16.5.0 below.

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| **TS38.212 v16.5.0 [1]**7.3.1.2.2 Format 1\_1<…>- Downlink assignment index – number of bits as defined in the following- 6 bits if more than one serving cell are configured in the DL and the higher layer parameter *nfi-TotalDAI-Included=true = enable*. The 4 MSB bits are the counter DAI and the total DAI for the scheduled PDSCH group, and the 2 LSB bits are the total DAI for the non-scheduled PDSCH group.- 4 bits if only one serving cell are configured in the DL and the higher layer parameter *nfi-TotalDAI-Included=true = enable.* The 2 MSB bits are the counter DAI for the scheduled PDSCH group, and the 2 LSB bits are the total DAI for the non-scheduled PDSCH group;- 4 bits if more than one serving cell are configured in the DL, the higher layer parameter *pdsch-HARQ-ACK-Codebook=dynamic* or *pdsch-HARQ-ACK-Codebook-r16= enhancedDynamic*, and *nfi-TotalDAI-Included=true* is not configured, where the 2 MSB bits are the counter DAI and the 2 LSB bits are the total DAI;- 4 bits if one serving cell is configured in the DL, and the higher layer parameter *pdsch-HARQ-ACK-Codebook=dynamic*, and the UE is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with value 0 for one or more first CORESETs and is provided *coresetPoolIndex* with value 1 for one or more second CORESETs, and is provided *ackNackFeedbackMode = joint*, where the 2 MSB bits are the counter DAI and the 2 LSB bits are the total DAI;- 2 bits if only one serving cell is configured in the DL, the higher layer parameter *pdsch-HARQ-ACK-Codebook=dynamic* or *pdsch-HARQ-ACK-Codebook-r16=enhancedDynamic*, and *nfi-TotalDAI-Included=true* is not configured, when the UE is not configured with *coresetPoolIndex* or the value of *coresetPoolIndex* is the same for all CORESETs if *coresetPoolIndex* is provided or the UE is not configured with *ackNackFeedbackMode = joint*, where the 2 bits are the counter DAI;- 0 bits otherwise. <…>7.3.1.2.3 Format 1\_2<…>- Downlink assignment index – 0, 1, 2 or 4 bits- 0 bit if the higher layer parameter *downlinkAssignmentIndexDCI-1-2* is not configured;- 1, 2 or 4 bits determined by higher layer parameter *downlinkAssignmentIndexDCI-1-2* otherwise,- 4 bits if more than one serving cell are configured in the DL and the higher layer parameter *pdsch-HARQ-ACK-Codebook=dynamic*, where the 2 MSB bits are the counter DAI and the 2 LSB bits are the total DAI- 4 bits if one serving cell are configured in the DL and the higher layer parameter *pdsch-HARQ-ACK-Codebook=dynamic*, and the UE is not provided *coresetPoolIndex* or is provided *coresetPoolIndex* with value 0 for one or more first CORESETs and is provided *coresetPoolIndex* with value 1 for one or more second CORESETs, and is provided *ackNackFeedbackMode = joint*, where the 2 MSB bits are the counter DAI and the 2 LSB bits are the total DAI.- 1 or 2 bits if only one serving cell is configured in the DL and the higher layer parameter *pdsch-HARQ-ACK-Codebook=dynamic*, when the UE is not configured with *coresetPoolIndex* or the value of *coresetPoolIndex* is the same for all CORESETs if *coresetPoolIndex* is provided or the UE is not configured with *ackNackFeedbackMode = joint,* where the 1 bit or 2 bits are the counter DAI.<…> |

Also, a UE does not multiplex with HARQ-ACK information of two DCI formats, where one DCI format has 2-bit counter DAI and another DCI format has 1-bit counter DAI based on the following highlighted text as yellow in TS38.213 v16.5.0 [2].

|  |
| --- |
| 9.1.3.1 Type-2 HARQ-ACK codebook in physical uplink control channel…Denote by the number of bits for the counter DAI and set . Denote by the value of the counter DAI in a DCI format scheduling PDSCH reception, SPS PDSCH release or SCell dormancy indication on serving cell in PDCCH monitoring occasion according to Table 9.1.3-1 or Table 9.1.3-1A. Denote by the value of the total DAI in a DCI format in PDCCH monitoring occasion according to Table 9.1.3-1. The UE assumes a same value of total DAI in all DCI formats that include a total DAI field in PDCCH monitoring occasion . A UE does not expect to multiplex, in a same Type-2 HARQ-ACK codebook, HARQ-ACK information that is in response to detection of DCI formats with different number of bits for the counter DAI field.… |

Therefore, the UE generates one Type-2 HARQ-ACK CB based on 2-bit counter DAI in DCI format 1\_0 and 1\_1 and another Type-2 HARQ-ACK CB based on 1-bit counter DAI in DCI format 1\_2 (if 1-bit counter DAI is configured). Also, the N-bit counter DAI only counts the number of {serving cell, PDCCH monitoring occasion}-pairs in DCI formats with the N-bit counter DAI. However, Table 9.1.3-1A, shown in below, says that the number of {serving cell, PDCCH monitoring occasion}-pair(s) in which ***DCI format 1\_1*** indicating SCell dormancy is also counted for the 1-bit counter DAI. Table 9.1.3-1A: Value of counter DAI for

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| **DAI** |  | **Number of {serving cell, PDCCH monitoring occasion}-pair(s) in which PDSCH transmission(s) associated with PDCCH or PDCCH indicating SPS PDSCH release or DCI format 1\_1 indicating SCell dormancy is present, denoted as and**  |
| 0 | 1 |  |
| 1 | 2 |  |

This is not aligned with the UE behavior “A UE does not expect to multiplex, in a same Type-2 HARQ-ACK codebook, HARQ-ACK information that is in response to detection of DCI formats with different number of bits for the counter DAI field.” So, we propose to adopt the following TP on the Clause 9.1.3.1 in TS38.213. * ***Proposal 1. Adopt the following TP for Clause 9.1.3.1 in TS38.213.***

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 9.1.3.1 Type-2 HARQ-ACK codebook in physical uplink control channel< Unchanged parts are omitted >Table 9.1.3-1A: Value of counter DAI for

|  |  |  |
| --- | --- | --- |
| **DAI** |  | **Number of {serving cell, PDCCH monitoring occasion}-pair(s) in which PDSCH transmission(s) associated with PDCCH or PDCCH indicating SPS PDSCH release ~~or DCI format 1\_1 indicating SCell dormancy~~ is present, denoted as and**  |
| 0 | 1 |  |
| 1 | 2 |  |

< Unchanged parts are omitted > |

 |

**Feature lead view**: The issues is valid. The TP from R1-2105867 can be taken as the starting point.

***Proposal 4-1****: Endorse the text proposal in R1-2xxxxxx for TS 38.213 Section 9.1.3.1.*

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| ---------------------------------Start of Text Proposal to TS 38.213 v16.5.0-----------------------9.1.3.1 Type-2 HARQ-ACK codebook in physical uplink control channel< Unchanged parts are omitted >Table 9.1.3-1A: Value of counter DAI for

|  |  |  |
| --- | --- | --- |
| **DAI** |  | **Number of {serving cell, PDCCH monitoring occasion}-pair(s) in which PDSCH transmission(s) associated with PDCCH or PDCCH indicating SPS PDSCH release ~~or DCI format 1\_1 indicating SCell dormancy~~ is present, denoted as and**  |
| 0 | 1 |  |
| 1 | 2 |  |

< Unchanged parts are omitted >--------------------------------- End of Text Proposal to TS 38.213 v16.5.0----------------------- |

# Issue #5: Editorial corrections on

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| WILUS R1-2105867Note that the following correction is not relevant to Rel-16 URLLC WI, but it is included in this contribution to facilitate the discussion. At the RAN1#103-e meeting, RAN1 endorsed the following alignment CR for TS38.213 (R1-2009742, CR0176) [3]. The alignment CR included editorial changes to improve readability and compatibility of equations. Among the editorial changes, the equation (highlighted as ‘yellow’) was changed from to . Due to this change, even though the UE does not detect any DCI format scheduling CBG-based transmission, *n*HARQ-ACK,CBG is not 0, which makes wrong UE behaviour for obtaining a PUCCH transmission power.

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| --- |
| **R1-2009742, CR0176 [3]**9.1.3.1 Type-2 HARQ-ACK codebook in physical uplink control channel<…><…> |

Therefore, we propose to adopt the following TP on the Clause 9.1.3.1 in TS38.213.* ***Proposal 2. Adopt the following TP for Clause 9.1.3.1 in TS38.213.***

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| --- |
| 9.1.3.1 Type-2 HARQ-ACK codebook in physical uplink control channel< Unchanged parts are omitted >If , the UE also determines for obtaining a PUCCH transmission power, as described in Clause 7.2.1, with  where- if , is the value of the counter DAI in the last DCI format scheduling CBG-based PDSCH reception for any serving cell that the UE detects within the PDCCH monitoring occasions - if ,, is the value of the total DAI in the last DCI format scheduling CBG-based PDSCH reception for any serving cell that the UE detects within the PDCCH monitoring occasions- , if the UE does not detect any DCI format scheduling CBG-based PDSCH reception for any serving cell in any of the PDCCH monitoring occasions - is the total number of DCI formats scheduling CBG-based PDSCH receptions that the UE detects within the PDCCH monitoring occasions for serving cell . if the UE does not detect any DCI format scheduling CBG-based PDSCH reception for serving cell in any of the PDCCH monitoring occasions- is the number of CBGs the UE receives in a PDSCH scheduled by a DCI format that supports CBG-based PDSCH reception that the UE detects in PDCCH monitoring occasion for serving cell and the UE reports corresponding HARQ-ACK information in the PUCCH < Unchanged parts are omitted > |

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**Feature lead view**: The issues is valid. The TP from R1-2105867 can be taken as the starting point. It seems the issue can be provided to editor directly.

***Proposal 3-1****: Provide the text proposal below to TS 38.213 editor.*

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| ---------------------------------Start of Text Proposal to TS 38.213 v16.5.0-----------------------9.1.3.1 Type-2 HARQ-ACK codebook in physical uplink control channel< Unchanged parts are omitted >If , the UE also determines for obtaining a PUCCH transmission power, as described in Clause 7.2.1, with  where- if , is the value of the counter DAI in the last DCI format scheduling CBG-based PDSCH reception for any serving cell that the UE detects within the PDCCH monitoring occasions - if ,, is the value of the total DAI in the last DCI format scheduling CBG-based PDSCH reception for any serving cell that the UE detects within the PDCCH monitoring occasions- , if the UE does not detect any DCI format scheduling CBG-based PDSCH reception for any serving cell in any of the PDCCH monitoring occasions - is the total number of DCI formats scheduling CBG-based PDSCH receptions that the UE detects within the PDCCH monitoring occasions for serving cell . if the UE does not detect any DCI format scheduling CBG-based PDSCH reception for serving cell in any of the PDCCH monitoring occasions- is the number of CBGs the UE receives in a PDSCH scheduled by a DCI format that supports CBG-based PDSCH reception that the UE detects in PDCCH monitoring occasion for serving cell and the UE reports corresponding HARQ-ACK information in the PUCCH < Unchanged parts are omitted >--------------------------------- End of Text Proposal to TS 38.213 v16.5.0----------------------- |

# Issue #6: Correction on the number of SRS resource set configuration

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| Vivo R1-2105468In Rel-15, only one SRS resource set can be configured with higher layer parameter usage in SRS-ResourceSet set to 'codebook' for codebook based transmission and only one SRS resource set to 'nonCodebook' for non-codebook based transmission.In Rel-16, two SRS resource sets can be configured, with each one of the sets used for PUSCH scheduled by DCI format 0\_1 and DCI format 0\_2 respectively. However, the text in spec current version of spec seems to restrict only one SRS resource set for both usage ‘codebook’ and ‘non-codebook’, which is ambiguous.Draft CR as below: 6.1.1.1 Codebook based UL transmissionFor codebook based transmission, PUSCH can be scheduled by DCI format 0\_0, DCI format 0\_1, DCI format 0\_2 or semi-statically configured to operate according to Clause 6.1.2.3. If this PUSCH is scheduled by DCI format 0\_1, DCI format 0\_2, or semi-statically configured to operate according to Clause 6.1.2.3, the UE determines its PUSCH transmission precoder based on SRI, TPMI and the transmission rank, where the SRI, TPMI and the transmission rank are given by DCI fields of SRS resource indicator and Precoding information and number of layers in clause 7.3.1.1.2 and 7.3.1.1.3 of [5, TS 38.212] for DCI format 0\_1 and 0\_2 or given by *srs-ResourceIndicator* and *precodingAndNumberOfLayers* according to clause 6.1.2.3. The *SRS-ResourceSet(s)* applicable for PUSCH scheduled by DCI format 0\_1 and DCI format 0\_2 are defined by the entries of the higher layer parameter *srs-ResourceSetToAddModList* and *srs-ResourceSetToAddModListDCI-0-2* in *SRS-config*, respectively. Only one SRS resource set can be configured in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* in *SRS-ResourceSet* set to 'codebook'. The TPMI is used to indicate the precoder to be applied over the layers {0…*ν*-1} and that corresponds to the SRS resource selected by the SRI when multiple SRS resources are configured, or if a single SRS resource is configured TPMI is used to indicate the precoder to be applied over the layers {0…*ν*-1} and that corresponds to the SRS resource. The transmission precoder is selected from the uplink codebook that has a number of antenna ports equal to higher layer parameter *nrofSRS-Ports* in SRS-Config, as defined in Clause 6.3.1.5 of [4, TS 38.211]. When the UE is configured with the higher layer parameter *txConfig* set to 'codebook', the UE is configured with at least one SRS resource. The indicated SRI in slot *n* is associated with the most recent transmission of SRS resource identified by the SRI, where the SRS resource is prior to the PDCCH carrying the SRI.For codebook based transmission, the UE determines its codebook subsets based on TPMI and upon the reception of higher layer parameter *codebookSubset* in *pusch-Config* for PUSCH associated with DCI format 0\_1 and *codebookSubsetDCI-0-2* in *pusch-Config* for PUSCH associated with DCI format 0\_2 which may be configured with *'*fullyAndPartialAndNonCoherent*'*, or *'*partialAndNonCoherent*'*, or 'nonCoherent' depending on the UE capability. When higher layer parameter ul-FullPowerTransmission is set to 'fullpowerMode2'and the higher layer parameter codebookSubset or the higher layer parameter codebookSubsetForDCI-Format0-2 is set to 'partialAndNonCoherent', and when the SRS-resourceSet with usage set to "codebook" includes at least one SRS resource with 4 ports and one SRS resource with 2 ports, the codebookSubset associated with the 2-port SRS resource is 'nonCoherent'. The maximum transmission rank may be configured by the higher layer parameter *maxRank* in *pusch-Config* for PUSCH scheduled with DCI format 0\_1 and *maxRank-ForDCIFormat0\_2* for PUSCH scheduled with DCI format 0\_2*.*A UE reporting its UE capability of 'partialAndNonCoherent' transmission shall not expect to be configured by either *codebookSubset* or *codebookSubsetForDCI-Format0-2* with 'fullyAndPartialAndNonCoherent*'*. A UE reporting its UE capability of 'nonCoherent' transmission shall not expect to be configured by either *codebookSubset* or *codebookSubsetForDCI-Format0-2* with *'*fullyAndPartialAndNonCoherent*'* or with *'*partialAndNonCoherent'.A UE shall not expect to be configured with the higher layer parameter *codebookSubset* or the higher layer parameter *codebookSubsetForDCI-Format0-2* set to *'*partialAndNonCoherent' when higher layer parameter *nrofSRS-Ports* in an *SRS-ResourceSet* with *usage* set to 'codebook' indicates that the maximum number of the configured SRS antenna ports in the *SRS-ResourceSet* is two.For codebook based transmission, ~~the UE may be configured with a single~~ *~~SRS-ResourceSet~~* ~~with~~ *~~usage~~* ~~set to 'codebook' and~~ only one SRS resource can be indicated based on the SRI from within the SRS resource set. Except when higher layer parameter *ul-FullPowerTransmission* is set to 'fullpowerMode2', the maximum number of configured SRS resources for codebook based transmission is 2. If aperiodic SRS is configured for a UE, the SRS request field in DCI triggers the transmission of aperiodic SRS resources. A UE shall not expect to be configured with higher layer parameter *ul-FullPowerTransmission* set to 'fullpowerMode1*'* and *codebookSubset* or *codebookSubsetDCI-0-2* set to *'*fullAndPartialAndNonCoherent*'* simultaneously.The UE shall transmit PUSCH using the same antenna port(s) as the SRS port(s) in the SRS resource indicated by the DCI format 0\_1 or 0\_2 or by *configuredGrantConfig* according to clause 6.1.2.3.The DM-RS antenna ports  in Clause 6.4.1.1.3 of [4, TS38.211] are determined according to the ordering of DM-RS port(s) given by Tables 7.3.1.1.2-6 to 7.3.1.1.2-23 in Clause 7.3.1.1.2 of [5, TS 38.212].Except when higher layer parameter *ul-FullPowerTransmission* is set to 'fullpowerMode2', when multiple SRS resources are configured by *SRS-ResourceSet* with *usage* set to 'codebook', the UE shall expect that higher layer parameters *nrofSRS-Ports* in *SRS-Resource* in *SRS-ResourceSet* shall be configured with the same value for all these SRS resources.When higher layer parameter *ul-FullPowerTransmission* is set to 'fullpowerMode2', - the UE can be configured with one SRS resource or multiple SRS resources with same or different number of SRS ports within an SRS resource set with *usage* set to 'codebook'.- up to 2 different spatial relations can be configured for all SRS resources in the SRS resource set with *usage* set to 'codebook' when multiple SRS resources are configured in the SRS resource set. - subject to UE capability, a maximum of 2 or 4 SRS resources are supported in an SRS resource set with *usage* set to 'codebook'.6.1.1.2 Non-Codebook based UL transmissionFor non-codebook based transmission, PUSCH can be scheduled by DCI format 0\_0, DCI format 0\_1, DCI format 0\_2 or semi-statically configured to operate according to Clause 6.1.2.3. If this PUSCH is scheduled by DCI format 0\_1, DCI format 0\_2, or semi-statically configured to operate according to Clause 6.1.2.3, the UE can determine its PUSCH precoder and transmission rank based on the SRI when multiple SRS resources are configured, where the SRI is given by the SRS resource indicator in DCI according to clause 7.3.1.1.2 and 7.3.1.1.3 of [5, 38.212] for DCI format 0\_1 and DCI format 0\_2, or the SRI is given by *srs-ResourceIndicator* according to clause 6.1.2.3. The *SRS-ResourceSet(s)* applicable for PUSCH scheduled by DCI format 0\_1 and DCI format 0\_2 are defined by the entries of the higher layer parameter *srs-ResourceSetToAddModList* and *srs-ResourceSetToAddModListDCI-0-2* in *SRS-config*, respectively. The UE shall use one or multiple SRS resources for SRS transmission, where, in a SRS resource set, the maximum number of SRS resources which can be configured to the UE for simultaneous transmission in the same symbol and the maximum number of SRS resources are UE capabilities. The SRS resources transmitted simultaneously occupy the same RBs. Only one SRS port for each SRS resource is configured. Only one SRS resource set can be configured in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* in *SRS-ResourceSet* set to 'nonCodebook'. The maximum number of SRS resources that can be configured for non-codebook based uplink transmission is 4. The indicated SRI in slot *n* is associated with the most recent transmission of SRS resource(s) identified by the SRI, where the SRS transmission is prior to the PDCCH carrying the SRI.For non-codebook based transmission, the UE can calculate the precoder used for the transmission of SRS based on measurement of an associated NZP CSI-RS resource. A UE can be configured with only one NZP CSI-RS resource for the SRS resource set with higher layer parameter usage in *SRS-ResourceSet* set to 'nonCodebook' if configured.- If aperiodic SRS resource set is configured, the associated NZP-CSI-RS is indicated via SRS request field in DCI format 0\_1 and 1\_1, as well as DCI format 0\_2 (if SRS request field is present) and DCI format 1\_2 (if SRS request field is present), where *AperiodicSRS-ResourceTrigger* and *AperiodicSRS-ResourceTriggerList* (indicating the association between aperiodic SRS triggering state(s) and SRS resource sets), triggered SRS resource(s) *srs-ResourceSetId*, *csi-RS* (indicating the associated *NZP-CSI-RS-ResourceId*) are higher layer configured in *SRS-ResourceSet*. The *SRS-ResourceSet(s)* associated with the SRS request by DCI format 0\_1 and 1\_1 are defined by the entries of the higher layer parameter *srs-ResourceSetToAddModList* and the *SRS-ResourceSet(s)* associated with the SRS request by DCI format 0\_2 and 1\_2 are defined by the entries of the higher layer parameter. A UE is not expected to update the SRS precoding information if the gap from the last symbol of the reception of the aperiodic NZP-CSI-RS resource and the first symbol of the aperiodic SRS transmission is less than 42 OFDM symbols. - If the UE configured with aperiodic SRS associated with aperiodic NZP CSI-RS resource, the presence of the associated CSI-RS is indicated by the SRS request field if the value of the SRS request field is not '00' as in Table 7.3.1.1.2-24 of [5, TS 38.212] and if the scheduling DCI is not used for cross carrier or cross bandwidth part scheduling. The CSI-RS is located in the same slot as the SRS request field. If the UE configured with aperiodic SRS associated with aperiodic NZP CSI-RS resource, any of the TCI states configured in the scheduled CC shall not be configured with *qcl-Type* set to 'typeD'.- If periodic or semi-persistent SRS resource set is configured, the *NZP-CSI-RS-ResourceId* for measurement is indicated via higher layer parameter *associatedCSI-RS* in *SRS-ResourceSet*.The UE shall perform one-to-one mapping from the indicated SRI(s) to the indicated DM-RS ports(s) and their corresponding PUSCH layers {0 … ν-1} given by DCI format 0\_1 or by *configuredGrantConfig* according to clause 6.1.2.3 in increasing order.The UE shall transmit PUSCH using the same antenna ports as the SRS port(s) in the SRS resource(s) indicated by SRI(s) given by DCI format 0\_1 or by *configuredGrantConfig* according to clause 6.1.2.3, where the SRS port in (*i*+1)-th SRS resource in the SRS resource set is indexed as . The DM-RS antenna ports  in Clause 6.4.1.1.3 of [4, TS 38.211] are determined according to the ordering of DM-RS port(s) given by Tables 7.3.1.1.2-6 to 7.3.1.1.2-23 in Clause 7.3.1.1.2 of [5, TS 38.212].For non-codebook based transmission, the UE does not expect to be configured with both *spatialRelationInfo* for SRS resource and *associatedCSI-RS* in *SRS-ResourceSet* for SRS resource set.For non-codebook based transmission, the UE can be scheduled with DCI format 0\_1 when at least one SRS resource is configured in *SRS-ResourceSet* with *usage* set to 'nonCodebook'. |

**Feature lead view**: The issues is valid. The TP from R1-2105468 can be taken as the starting point. Note that the paper was submitted to MIMO, and chairman brought it us since the issue originates from the introduction of DCI format 0\_2.

***Proposal 6-1****: Endorse the text proposal in R1-2xxxxxx for TS 38.214 Section 6.1.1.1 & 6.1.1.2.*

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| ---------------------------------Start of Text Proposal to TS 38.214 v16.5.0-----------------------6.1.1.1 Codebook based UL transmissionFor codebook based transmission, PUSCH can be scheduled by DCI format 0\_0, DCI format 0\_1, DCI format 0\_2 or semi-statically configured to operate according to Clause 6.1.2.3. If this PUSCH is scheduled by DCI format 0\_1, DCI format 0\_2, or semi-statically configured to operate according to Clause 6.1.2.3, the UE determines its PUSCH transmission precoder based on SRI, TPMI and the transmission rank, where the SRI, TPMI and the transmission rank are given by DCI fields of SRS resource indicator and Precoding information and number of layers in clause 7.3.1.1.2 and 7.3.1.1.3 of [5, TS 38.212] for DCI format 0\_1 and 0\_2 or given by *srs-ResourceIndicator* and *precodingAndNumberOfLayers* according to clause 6.1.2.3. The *SRS-ResourceSet(s)* applicable for PUSCH scheduled by DCI format 0\_1 and DCI format 0\_2 are defined by the entries of the higher layer parameter *srs-ResourceSetToAddModList* and *srs-ResourceSetToAddModListDCI-0-2* in *SRS-config*, respectively. Only one SRS resource set can be configured in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* in *SRS-ResourceSet* set to 'codebook'. The TPMI is used to indicate the precoder to be applied over the layers {0…*ν*-1} and that corresponds to the SRS resource selected by the SRI when multiple SRS resources are configured, or if a single SRS resource is configured TPMI is used to indicate the precoder to be applied over the layers {0…*ν*-1} and that corresponds to the SRS resource. The transmission precoder is selected from the uplink codebook that has a number of antenna ports equal to higher layer parameter *nrofSRS-Ports* in SRS-Config, as defined in Clause 6.3.1.5 of [4, TS 38.211]. When the UE is configured with the higher layer parameter *txConfig* set to 'codebook', the UE is configured with at least one SRS resource. The indicated SRI in slot *n* is associated with the most recent transmission of SRS resource identified by the SRI, where the SRS resource is prior to the PDCCH carrying the SRI.< Unchanged parts are omitted >For codebook based transmission, ~~the UE may be configured with a single~~ *~~SRS-ResourceSet~~* ~~with~~ *~~usage~~* ~~set to 'codebook' and~~ only one SRS resource can be indicated based on the SRI from within the SRS resource set. Except when higher layer parameter *ul-FullPowerTransmission* is set to 'fullpowerMode2', the maximum number of configured SRS resources for codebook based transmission is 2. If aperiodic SRS is configured for a UE, the SRS request field in DCI triggers the transmission of aperiodic SRS resources. < Unchanged parts are omitted >6.1.1.2 Non-Codebook based UL transmissionFor non-codebook based transmission, PUSCH can be scheduled by DCI format 0\_0, DCI format 0\_1, DCI format 0\_2 or semi-statically configured to operate according to Clause 6.1.2.3. If this PUSCH is scheduled by DCI format 0\_1, DCI format 0\_2, or semi-statically configured to operate according to Clause 6.1.2.3, the UE can determine its PUSCH precoder and transmission rank based on the SRI when multiple SRS resources are configured, where the SRI is given by the SRS resource indicator in DCI according to clause 7.3.1.1.2 and 7.3.1.1.3 of [5, 38.212] for DCI format 0\_1 and DCI format 0\_2, or the SRI is given by *srs-ResourceIndicator* according to clause 6.1.2.3. The *SRS-ResourceSet(s)* applicable for PUSCH scheduled by DCI format 0\_1 and DCI format 0\_2 are defined by the entries of the higher layer parameter *srs-ResourceSetToAddModList* and *srs-ResourceSetToAddModListDCI-0-2* in *SRS-config*, respectively. The UE shall use one or multiple SRS resources for SRS transmission, where, in a SRS resource set, the maximum number of SRS resources which can be configured to the UE for simultaneous transmission in the same symbol and the maximum number of SRS resources are UE capabilities. The SRS resources transmitted simultaneously occupy the same RBs. Only one SRS port for each SRS resource is configured. Only one SRS resource set can be configured in *srs-ResourceSetToAddModList* or *srs-ResourceSetToAddModListDCI-0-2* with higher layer parameter *usage* in *SRS-ResourceSet* set to 'nonCodebook'. The maximum number of SRS resources that can be configured for non-codebook based uplink transmission is 4. The indicated SRI in slot *n* is associated with the most recent transmission of SRS resource(s) identified by the SRI, where the SRS transmission is prior to the PDCCH carrying the SRI.< Unchanged parts are omitted >--------------------------------- End of Text Proposal to TS 38.213 v16.5.0----------------------- |

# References

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3. [R1-2104323](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_105-e/Docs/R1-2104323.zip) Discussion on PDSCH processing timeline for DCI format 1\_2 (ZTE)
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10. [R1-2105928](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_105-e/Docs/R1-2105928.zip) Remaining issues on PDCCH enhancements (Huawei, HiSilicon)
11. R1-2105468    [Draft] CR on the number of SRS resource set configuration           vivo