**3GPP TSG RAN WG1#105 R1-2nnnnnn**

**e-Meeting, May 10th – 27th, 2021**

**Agenda Item: 7.2.2**

**Source: Moderator (Lenovo)**

**Title: Feature lead summary for NR-U DL Signals and Channels**

**Document for: Discussion, Decision**

# Topic DL-A: PDCCH Monitoring

## Issue DL-A1 (R1-2105071): Correction on joint search space set group switching across multiple cells

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| Background:  On the joint search space set group switching (i.e. FG 10-9c), the UE can be configured with up to 4 cell groups. The UE behaviour is defined in sub-clause 10.4, such that “the following procedures apply to all serving cells within each group”, when the list of cell groups (i.e. *cellGroupsForSwitchList*) is provided via RRC. Nontheless, it is not clear which cell group is the target to which search space set group switching is applied, upon detecting DCI format 2\_0. According to TS 38.331, a serving cell can belong to **only one** *CellGroupForSwitch*. It can be implied that the UE is able to learn the target cell group, hinging on the serving cell where a DCI format 2\_0 is detected. If so, the intended UE behavour should be clarified in the specification. |
| Proposal: 10.4 Search space set group switching A UE can be provided a group index for a respective Type3-PDCCH CSS set or USS set by *searchSpaceGroupIdList* for PDCCH monitoring on a serving cell. If the UE is not provided *searchSpaceGroupIdList* for a search space set, the following procedures are not applicable for PDCCH monitoring according to the search space set.  If a UE is provided *cellGroupsForSwitchList*, indicating one or more groups of serving cells, and if the UE detects a DCI format 2\_0 on the serving cell which is associated with one of the indicated groups, the following procedures apply to all serving cells within the group where the DCI format 2\_0 is detected; otherwise, the following procedures apply only to a serving cell for which the UE is provided *searchSpaceGroupIdList*. |

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# Topic DL-B: CSI Measurement, Report

## Issue DL-B1 (R1-2104272): Action time when UE receive MAC CE for (de)activation of Scell/CSI-RS/TCI state/SRS

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| Background:  It could be observed from current spec of TS 38.213 and TS 38.214 that the application time for MAC CE command is bundled by the HARQ-ACK transmission time for the corresponding PDSCH carrying the MAC CE. For instance, when UE receives in a PDSCH a SCell activation command in slot n, the corresponding actions shall be applied in slot n+k, where k is  and K1 is the number of slots for a PUCCH transmission with HARQ-ACK indicated by PDSCH-to-HARQ\_feedback timing indicator field in the DCI format scheduling the PDSCH. The inapplicable value (k1=-1) for HARQ-ACK feedback is introduced in NR-U, which indicate UE the PUCCH resource for HARQ feedback is not allocated and will be provided in the following DCI. The action time when an inapplicable value is provided in the DCI scheduling the PDSCH carrying the MAC CE is not clear now. Based on the current spec, the exact action time when an inapplicable K1 is provided is not clear. It does not make sense by using k1=-1 when calculating the action time because it will reduce the processing time shorter than UE capability. In another example, when a UE receives an activation command for an SRS resource, and when the UE would transmit a PUCCH with HARQ-ACK information in slot *n* corresponding to the PDSCH carrying the activation command is transmitted in slot *n*, the UE assumptions on SRS transmission corresponding to the configured SRS resource set shall be applied starting from the first slot that is after slot where is the SCS configuration for the PUCCH. If gNB indicate K1=-1 for such case, the transmission of SRS resource might be unnecessarily deferred until UE get a valid K1 for HARQ-ACK feedback.  The issue was proposed in RAN1#104bis-e [1]. During the preparation phase, one company express that gNB should avoid to configure K1=-1 for the PDSCH carrying MAC CE and show the concern that it may have big standard impact in the late NR-U maintenance phase. We think disallowing the K1 indication with inapplicable value for the PDSCH carrying MAC CE can solve the issue with less standard impact. However, it should be clearly reflected in the spec. Otherwise, UE is still possible to receive DCI scheduling PDSCH carrying a MAC CE and indication K1=-1 at the same time. |
| Proposal:  ***UE is not expected to receive a DCI format providing inapplicable K1 value and scheduling the PDSCH carrying the MAC-CEs. The changes required in TS38.213 and TS38.214 are in TP#1 and TP#2 in the appendix.*** |

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## Issue DL-B2 (various): Measurement during SCell activation

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| In RAN1#104-e and RAN1#104bis-e, the LS from RAN4 was discussed. There was consensus on Question 1 and a reply LS [6] was sent to RAN4 clarifying the understanding from RAN1.  For the other 3 questions:  **Question by RAN4** (1) When none of the RRC parameters *CO-DurationPerCell-r16*, *SlotFormatIndicator*, and *CSI-RS-ValidationWith-DCI-r16* is configured for a UE on the being-activated SCell,   1. What is the expected UE behaviour for this P/SP CSI-RS measurement and report on the being-activated SCell?   **Reply by RAN1:** As in Rel-15, the UE is expected to receive the P/SP CSI-RS.  **Question 2:** When RRC parameters *CSI-RS-ValidationWith-DCI-r16* is configured, but *SlotFormatIndicator* and *CO-DurationPerCell-r16* are not configured for the being-activated SCell, what is the expected UE behavior for this P/SP CSI-RS measurement and report on the being-activated SCell? Does UE need to decode a DCI format from other active serving cell (indicating an aperiodic CSI-RS reception or scheduling a PDSCH reception in the set of symbols of the slot) for this being-activated SCell to validate this P/SP CSI-RS?  **Question 3:** When RRC parameters *CO-DurationPerCell-r16* is configured but *SlotFormatIndicator* is not configured for the being-activated SCell, what is the expected UE behavior for this P/SP CSI-RS measurement and report on the being-activated SCell? Does UE need to decode a DCI format 2\_0 (indicating remaining channel occupancy duration) from other active serving cell for this being-activated SCell to validate the CSI-RS?  **Question 4:** When RRC parameters *CO-DurationPerCell-r16* is not configured but *SlotFormatIndicator* is configured for the being-activated SCell, what is the expected UE behavior for this P/SP CSI-RS measurement and report on the being-activated SCell? Does UE need to detect a DCI format 2\_0 (indicating the starting point of CO duration and the slot format) from other active serving cell for this being-activated SCell to validate the CSI-RS? |
| R1-2104272:  ***Observation 1: The behavior whether UE is able to acquire CSI request in DCI format 0-1, SFI or COT duration in DCI format 2-0 transmitted on the activated cell for the being activated cell should be clarified either in RAN1 or RAN2 before further discussing P/SP CSI-RS validation.***  R1-2104831:  **Observation 1: For being-activated SCell, UE maintains the same PDCCH monitoring behavior as defined for the deactivated SCell in TS 38.321, i.e. “not monitor the PDCCH on/for the SCell”.**  **Proposal 1: Alt 1 is a more appropriate understanding on “2> not monitor the PDCCH for the SCell;” for deactivated and being-activated SCell.**   * **Alt 1: UE can monitor the PDCCHs sent by other active cells. And for Alt 1, there may be two kinds of understanding as follows:** * **Understanding #1: UE expects that all detected PDCCHs sent by other active cells do not contain information for being-activated SCell.** * **Understanding #12: UE ignores information for being-activated SCell if the detected PDCCHs sent by other active cells contain information for being-activated SCell, such as ap-CSI-RS or SFI.**   **Proposal 2: RAN1 can send a LS to RAN2 for confirming whether RAN1 has a correct understanding and whether RAN2 has other understandings on “2> not monitor the PDCCH for the SCell;”.**  **Proposal 3: On whether section 11 in TS 38.213 is also applicable to a being-activated SCell, the following two options can be considered. Among them, Opt 2 is preferred as UE will not monitor any PDCCH for the SCell or use any information indicated in PDCCHs for the SCell during SCell activation.**   * **Opt 1: Section 11 in TS 38.213 is applied for a active cell and a being activated SCell** * **Opt 2: Section 11 in TS 38.213 is only applied for a active cell**   **Proposal 4: If RAN1 can reach a consensus on Alt 1 and Opt 2, the same answer can be adopted for answering Q1~Q4 from RAN4, that is, UE proceeds with the p/sp-CSI-RS measurement in the set of symbols of the slot during SCell activation as in Rel-15.**  R1-2105416:  **Proposal #1: For a UE on a being-activated SCell, before the SCell is activated,**   * **The UE does not monitor any DCI on the SCell.** * **The UE does not monitor a DCI on other activated cell (e.g., PCell) that can schedule PDSCH on the being-activated SCell.** * **The UE is not required to use information of the being-activated SCell in DCI format 2\_0 that is transmitted on other activated cell.** * **The UE is not required to use information of the being-activated SCell in UL grant that is transmitted on other activated cell and that can trigger aperiodic CSI-RS on the being-activated SCell.**   **Proposal #2: When RRC parameter *csi-RS-ValidationWithDCI-r16* is configured, but *CO-DurationsPerCell* and *SlotFormatCombinationsPerCell* are not configured for a UE on a being-activated SCell, before the SCell is activated, UE is not required to receive P/SP-CSI-RS for the being-activated SCell.**  **Proposal #3: When one of *CO-DurationsPerCell* and *SlotFormatCombinationsPerCell* is configured for a UE on a being-activated SCell, before the SCell is activated, UE is not required to receive P/SP-CSI-RS for the being-activated SCell.** |
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# Topic DL-C: DMRS for PDSCH mapping type B

## Issue DL-C1 (R1-2104272): Front-loaded/Additional DMRS symbols for PDSCH mapping type B when collide with CORESET

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| Background:  For PDSCH mapping type B with durations larger than 6, the restriction on DMRS shifting is enough considering it does not pose additional requirement on UE processing timeline than Rel-15 considering such restriction already exists for and . However for , it does not help when DMRS is shifted as shown in Figure 1 below. With no DMRS shift, the UE can start channel estimation immediately after the first symbol and then the subsequent demodulation and decoding in the following Tproc,1 plus 4 symbols. If DMRS is shifted, the channel estimation operation and the subsequent demodulation/decoding will be delayed by at most 3 symbols (only 1 symbol left before the end of PDSCH) and UE processing time budget would be reduced to Tproc,1 plus 1 symbol. For capability 2 UEs, the Tproc,1 is only 3 symbols for 15kHz SCS and UE processing time budget will be reduced by as much as 43%. UE is not able to finish the PDSCH decoding and HARQ-ACK preparation in such a short time. In order to overcome the above mentioned problems, the processing time for should be relaxed when DMRS is shifted. The simple relaxation is to add the number of shifted symbols into Tproc,1 calculation to provide enough time for the UE processing.    Figure 1 the timeline with vs without DMRS shift for 5 symbols PDSCH with *dmrs-AdditionalPosition = 'pos0'* |
| Proposal:  ***In order to address the issue of a reduced UE processing time budget in case of DMRS shift, relaxation of the UE processing time requirement i.e. add the number of shifted symbols to Tproc,1****,* ***is supported at least for 5 symbols PDSCH. The corresponding text proposal is in the TP#3 in the appendix.*** |

FL NOTE: Proposal was submitted already to RAN1#104bis-e, but not discussed.

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