**3GPP TSG-RAN WG2 Meeting #110-e R2-2005811**

**Online, 01 – 11 June 2020**

**Title:** LS on Detail MIMO MAC CE operations

**Response to:** -

**Release:** Release 16

**Work Item:** NR\_eMIMO-Core

**Source:** TSG RAN WG2

**To:** RAN1

**Cc:** -

**Contact Person:**

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**Attachments:** -

**1. Overall Description:**

**1) Issue 1: Restrictions on DCI format 1\_2**

According to RAN1 LS (R2-2006057\_ R1-2004808), RAN1 provided the answers for the RAN2’s questions regarding the applicability of DCI format 1\_2 for NR eMIMO features as below.

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| **5)** **DCI format 1\_2 applicability to features introduced in NR\_eMIMO WI**  The IE ControlResourceSet includes both tci-PresentInDCI and tci-PresentInDCI-ForDCI-Format1-2. Currently both parameters can be configured in all or some CORESETs of the UE and these CORESETs may be configured with CORESETPoolIndex (mPDCCH mTRP). Further, eMIMO WI introduced a new TCI state mapping MAC CE in TS 38.321 6.1.3.24 where two TCI states can be mapped to one DCI codepoint. Currently, there is no limitation which DCI format this new MAC CE in TS 38.321 6.1.3.24 applies to.  **Q5-1)** Can the UE be configured with both DCI format 1\_1 and DCI format 1\_2 with TCI field, either in the same or different CORESETs? And can the value of tci-PresentInDCI-ForDCI-Format1-2 be different in different CORESETs?  **[Answer]: Yes to both questions.**  **Q5-2)** Can the UE be configured with mPDCCH mTRP (have at least on CORESET with CORESETPoolIndex=1) and the parameter tci-PresentInDCI-ForDCI-Format1-2?  **[Answer]: Yes.**  **Q5-3)** Does the Enhanced TCI state MAC CE in TS 38.321 6.1.3.24 apply to DCI1\_2?  **[Answer]: Yes.** |

RAN2 understand that both DCI format 1\_1 and DCI format 1\_2 can be configured and used at the same CORESET. RAN2 was not sure if the handling/mapping of codepoints for activated TCI states which are indicated by MAC CE (i.e. TCI State Indication for UE-specific PDCCH MAC CE or Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE) to DCI format 1\_2 could follow the current RAN2 specification that the TCI codepoint to which the TCI States are mapped is determined by its ordinal position among all the TCI codepoints. RAN2 was not sure whether it is clear enough in RAN1 specifications when the number of codepoints in the TCI field of DCI format 1\_2 is less than the maximum number of codepoints in the TCI field of DCI format 1\_1. For example, if the number of bits for TCI in DCI format 1\_2 is configured to be 2, does codepoint “01” correspond to the codepoint “001” of DCI format 1\_1 (and so on)?

It should be further understood that the MAC CE has the TCI states corresponding to maximum amount of DCI codepoints regardless if UE is configured with DCI format 1\_2 with less DCI codepoints. RAN2 understanding is that UE ignores the signaled TCI states in the MAC CE which do not fit in the mapping for DCI format 1\_2 if that format is configured with less than maximum amount of TCI codepoints.

RAN2 believes that some restrictions on TCI states codepoints mapping when the number of codepoints in the TCI field of DCI format 1\_2 is less than the maximum number of codepoints in the TCI field of DCI format 1\_1 can be clarified in RAN1 specifications.

**Question 1:** Could RAN1 specify how the TCI state codepoints are mapped when the number of codepoints in the TCI field of DCI format 1\_2 is less than the maximum number of codepoints in the TCI field of DCI format 1\_1 taking into account that the MAC CE may signal TCI states corresponding to maximum amount of DCI codepoints.?

**2) Issue 2: Functionality of Serving cell set based SRS spatial relation indication MAC CE**

According to RAN1 LS (R2-2004251\_R1-2002798), RAN1 provided the answers for the RAN2’s questions regarding the functionality of Serving cell set based SRS spatial relation indication MAC CE as below.

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| **Question 4.** RAN2 would like to ask RAN1 whether the intention is to activate per SRS resource set or per SRS resource. Further, if per SRS resource, whether RAN1 sees any issues in indicating spatial relation, potentially different, for more than one resource in one MAC CE in order to save overhead.  **Answer 4.**  RAN1 understands that the intention of the agreement is to support activating the independent spatial relations for SRS resource(s) in an SRS resource set.  Furthermore, RAN1 see no issue in using one MAC CE (to save overhead) to activate/deactivate spatial relations for >1 SRS resources from an SRS resource set. |

RAN2 was confused whether this MAC CE should support activation/deactivation of **transmission of SRS resources(s)** and/or if this MAC CE indicates the **SRS spatial relations for SRS resource(s)** which are applied for all cells in the configured serving cell set. RAN2 understanding is that the intended functionality of this MAC CE is only to indicate the SRS spatial relations for SRS resource(s) which are applied for all configured cells in the serving cell set. This is why RAN2 determined not to add A/D field in this MAC CE.

**Question 2:** Is RAN2 understanding correct that the intended functionality of the Serving cell set based SRS spatial relation indication MAC CE is to only indicate the SRS spatial relations for SRS resource(s) which are applied for all configured serving cell set? (i.e. no need to activate/deactivate transmission of SRS resources(s) for all configured cells in the serving cell set)

In addition, RAN2 want to know whether the functionality of this MAC CE can be applied to SUL carrier as well. RAN2 assumed this MAC CE is also used to indicate the SRS spatial relations for SRS resources which are in SUL configuration because RAN1 didn’t provide the need of the restrictions in case of SUL configuration so the MAC CE contains a field that can be used to indicate that the MAC CE applies only for the SUL. In should be noted that the MAC CE applies for a set of serving cells, thus if the MAC CE has the SUL field, it should be clarified whether then all serving cells in the RRC configured list for simultaneous spatial relation update need to be configured with a SUL if the MAC CE has SUL field and has that flagged.

**Question 3:** Is RAN2 understanding correct that the Serving cell set based SRS spatial relation indication MAC CE can be used to indicate the SRS spatial relations in SUL configuration?

**2. Actions:**

**To RAN1.**

**ACTION:** RAN2 respectfully asks RAN1 to answer the above questions.

**3. Date of Next TSG-RAN WG2 Meetings:**

3GPP RAN2#111 24 – 28 August 2020 eMeeting