3GPP TSG-RAN WG2 Meeting #111e Tdoc draft R2-200xxxx

**17-28 August 2020**

**Source: Ericsson (Email discussion rapporteur)**

**Title: [POST111e][112][eMIMO] RRC Corrections (Ericsson)**

**Agenda Item: 6.13.2**

**Document for: Discussion**

# 1 Introduction

This discussion is for RRC corrections for eMIMO WI:

* [POST111e][112][eMIMO] RRC Corrections (Ericsson)

Scope: 1. Continue the discussion on the CRs to correct the number of CORESETs per BWP and check if a LS to RAN1 is needed. 2. Discuss the late incoming LS in [R2-2008609](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2008609.zip), attempt to draft a reply LS and check if a CR is needed in RAN2

Intended outcome: Agreeable CRs and (reply) LS(s) to RAN1

Deadline: 1-week

The discussion is organized as follows. In Section 2 Part 1 and in Section 3 Part 2.

# 2 Part 1: Number of coresets per UE

Rel-16 UE capabilities are currently discussed in [Post111-e][015][NR16] UE Capabilities (Intel, NTT Docomo), where the below is in the draft of R2-2008119 (TS 38.306) and draft of R2-2008118 (TS 38.331):

| **Definitions for parameters** | **Per** | **M** | **FDD-TDD****DIFF** | **FR1-FR2****DIFF** |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
| ***multiDCI-MultiTRP-r16***Indicates whether the UE supports multi-DCI based multi-TRP and support of fully/partially overlapping PDSCHs in time and non-overlapping in frequency. The capability signalling contains the following:* *maxNumberCORESET-r16* indicates maximum number of CORESETs configured per BWP per cell in addition to CORESET 0.
* *maxNumberCORESETPerPoolIndex-r16* indicates maximum number of CORESETs configured per CORESETPoolIndex per BWP per cell in addition to CORESET 0.
* *maxNumberUnicastPDSCH-PerPool-r16* indicates maximum number of unicast PDSCHs per CORESETPoolIndex per slot.

Note: A UE may assume that its maximum receive timing difference between the DL transmissions from two TRPs is within a CPNote: Processing capability 2 is not supported in any CC if at least one CC is configured with two values of CORESETPoolIndex | FSPC | No | N/A | N/A |

#### FeatureSetDownlinkPerCC

The IE *FeatureSetDownlinkPerCC* indicates a set of features that the UE supports on the corresponding carrier of one band entry of a band combination.

*FeatureSetDownlinkPerCC* information element

-- ASN1START

-- TAG-FEATURESETDOWNLINKPERCC-START

FeatureSetDownlinkPerCC ::= SEQUENCE {

 supportedSubcarrierSpacingDL SubcarrierSpacing,

 supportedBandwidthDL SupportedBandwidth,

 channelBW-90mhz ENUMERATED {supported} OPTIONAL,

 maxNumberMIMO-LayersPDSCH MIMO-LayersDL OPTIONAL,

 supportedModulationOrderDL ModulationOrder OPTIONAL

}

FeatureSetDownlinkPerCC-16xy ::= SEQUENCE {

 -- R1 16-2a: Mulit-DCI based multi-TRP

 multiDCI-MultiTRP-r16 MultiDCI-MultiTRP-r16 OPTIONAL,

 -- R1 16-2b-3: Support of single-DCI based FDMSchemeB

 supportFDM-SchemeB-r16 ENUMERATED {supported} OPTIONAL

}

MultiDCI-MultiTRP-r16 ::= SEQUENCE {

 maxNumberCORESET-r16 ENUMERATED {n2, n3, n4, n5} OPTIONAL,

 maxNumberCORESETPerPoolIndex-r16 INTEGER {1..3}, OPTIONAL,

 maxNumberUnicastPDSCH-PerPool-r16 SEQUENCE {

 scs-15kHz ENUMERATED {n1, n2, n3, n4, n7} OPTIONAL,

 scs-30kHz ENUMERATED {n1, n2, n3, n4, n7} OPTIONAL,

 scs-60kHz ENUMERATED {n1, n2, n3, n4, n7} OPTIONAL,

 scs-120kHz ENUMERATED {n1, n2, n3, n4, n7} OPTIONAL

 }

}

-- TAG-FEATURESETDOWNLINKPERCC-STOP

-- ASN1STOP

Points raised during the RAN2#111 discussions:

1)

The CORESET ID space in 6.1.3.15 TCI State Indication for UE-specific PDCCH MAC CE limits the total number of CORESETs to 16:

- CORESET ID: This field indicates a Control Resource Set identified with *ControlResourceSetId* as specified in TS 38.331 [5], for which the TCI State is being indicated. In case the value of the field is 0, the field refers to the Control Resource Set configured by *controlResourceSetZero* as specified in TS 38.331 [5]. The length of the field is 4 bits;

Thus the question raises that is there a need to state this limit in 38.331 or 38.306.

*Q1 How to limit the total number of CORESETs per UE as the MAC CE supports only 16 and 5 CORESETs per BWP can be up to 20 CORESET per UE?*

|  |  |
| --- | --- |
| Company | **Answer, also note if you suggest the change to be agreed now or discussed in next meeting** |
| Ericsson | ***multiDCI-MultiTRP-r16***Indicates whether the UE supports multi-DCI based multi-TRP and support of fully/partially overlapping PDSCHs in time and non-overlapping in frequency. The capability signalling contains the following:* *maxNumberCORESET-r16* indicates maximum number of CORESETs configured per BWP per cell in addition to CORESET 0. Total number of CORESETs per cell is 16.
* *maxNumberCORESETPerPoolIndex-r16* indicates maximum number of CORESETs configured per CORESETPoolIndex per BWP per cell in addition to CORESET 0.
* *maxNumberUnicastPDSCH-PerPool-r16* indicates maximum number of unicast PDSCHs per CORESETPoolIndex per slot.

Note: A UE may assume that its maximum receive timing difference between the DL transmissions from two TRPs is within a CPNote: Processing capability 2 is not supported in any CC if at least one CC is configured with two values of CORESETPoolIndexOk to agree now. |
| Huawei | We are not sure what the intention of this sentence is.The definition of ControlResourceSetId includes the following sentence: "The ID space is used across the BWPs of a Serving Cell." This implies that the value range of ControlResourceSetId already limits the number of CORESETs per serving cell. That value range is 0 t 11 in Rel-15 and 0 to 15 Rel-16, so there is a limit of 16 CORESETs per serving cell already in TS 38.331 and there is no need to replicate that limit in 38.306.So this sentence seems unnecessary, unless there is another motivation? |
| Samsung | We tend to agree the Huawei’s comment that the restriction of the maximum number of CORESETs is the area of configuration and it is already defined in the current specification. For capability aspect, this restriction seems not needed. |

2)

Whether the values in multiDCI-MultiTRP-r16 could apply to a BWP where multi DCI multi TRP transmission is not configured. However, in principle capability is what UE promises to support and we can explicitly tie that support to what is configured.

*Q2 Companies view on whether and how to limit the values in multiDCI-MultiTRP-r16 only to BWPs where mTRP is configured?*

|  |  |
| --- | --- |
| Company | **Answer, also note if you suggest the change to be agreed now or discussed in next meeting** |
| Ericsson | ***multiDCI-MultiTRP-r16***Indicates whether the UE supports multi-DCI based multi-TRP and support of fully/partially overlapping PDSCHs in time and non-overlapping in frequency. The capability signalling contains the following:* *maxNumberCORESET-r16* indicates maximum number of CORESETs configured per BWP per cell in addition to CORESET 0.
* *maxNumberCORESETPerPoolIndex-r16* indicates maximum number of CORESETs configured per CORESETPoolIndex per BWP per cell in addition to CORESET 0.
* *maxNumberUnicastPDSCH-PerPool-r16* indicates maximum number of unicast PDSCHs per CORESETPoolIndex per slot.

Note: A UE may assume that its maximum receive timing difference between the DL transmissions from two TRPs is within a CPNote: Processing capability 2 is not supported in any CC if at least one CC is configured with two values of CORESETPoolIndexNote: multiDCI-MultiTRP-r16 values apply only to BWPs where two values of CORESETPoolIndex is configured.Ok to agree now. |
| Huawei | Ok to agree now but remove "Note:" and change "is" to "are" |
| Samsung | We are fine for the intention of this change and suggested change by Huawei is also ok. |

3)

Whether there is any requirement for the UE in how to (not) include multipleCORESET and (the contents of) multiDCI-MultiTRP-r16.

*Q3 Companies view on whether and how to limit UE to not to include multipleCORESET and the multiDCI-MultiTRP-r16?*

|  |  |
| --- | --- |
| Company | **Answer, also note if you suggest the change to be agreed now or discussed in next meeting**. |
| Ericsson | ***multiDCI-MultiTRP-r16***Indicates whether the UE supports multi-DCI based multi-TRP and support of fully/partially overlapping PDSCHs in time and non-overlapping in frequency. The capability signalling contains the following:* *maxNumberCORESET-r16* indicates maximum number of CORESETs configured per BWP per cell in addition to CORESET 0.
* *maxNumberCORESETPerPoolIndex-r16* indicates maximum number of CORESETs configured per CORESETPoolIndex per BWP per cell in addition to CORESET 0.
* *maxNumberUnicastPDSCH-PerPool-r16* indicates maximum number of unicast PDSCHs per CORESETPoolIndex per slot.

UE does not report multipleCORESET if multiDCI-MultiTRP-r16 reported.Note: A UE may assume that its maximum receive timing difference between the DL transmissions from two TRPs is within a CPNote: Processing capability 2 is not supported in any CC if at least one CC is configured with two values of CORESETPoolIndexOk to agree now. |
| Huawei | Ericsson's proposal implies that a UE that supports multiDCI-MultiTRP-r16 can only be configured with a single CORESET when multi TRP transmission is not used, so support of this feature would degrade UE capability in a Rel-15 network. Of course we should not do that.We think that a UE which indicates a value of maxNumberCORESET-r16 greater than or equal to 3 should indicate support of multipleCORESET.Other than that, we don't see any constraint, the two capabilities are independent. |
| Samsung | We share the view from Huawei, this restriction seems not needed.How about change the code points of maxNumberCORESET-r16 as below? maxNumberCORESET-r16 ENUMERATED {~~n2, n3,~~ n4, n5} OPTIONAL,From our understanding the legacy Rel-15 capability (i.e. multipleCORESET) is intended to the signal the maximum number of CORESETs up to 3. Then we can jointly use these two capabilities in Rel-16.  |

4) It was pointed out that RAN1 is still discussing the below item:

 (C&P from RAN1 Session Notes of AI 7.2.11)

Note**:** RAN1 will continue discussing how the network will interpret the signaled maximum number of CORESETs in components (1) and (2) (i.e., candidate value 5 for component (1) and candidate value 3 for component (2)) of FG 16-2a, e.g., when CORESET #0 is not configured

To us this discussion point looks like it is limited to the case when CORESET #0 is not configured and that the case when CORESET#0 is configured is stable. Given the above, we would like to ask companies views on the wording for below TP.

-------------------------------------------------start TP 38.306------------------------------------------------------------------------------------------------------------

| multipleCORESETIndicates whether the UE supports configuration of up to three PDCCH CORESET per BWP in addition to the CORESET with CORESET-ID 0 in the BWP, see also TS 38.213 [13]. It is mandatory with capability signaling for FR2 and optional for FR1. | UE | CY | No | **Yes** |
| --- | --- | --- | --- | --- |

-------------------------------------------------end TP 38.306------------------------------------------------------------------------------------------------------------

*Q4 Companies view on the above TP for Rel 16 or for Rel 15 ?*

|  |  |
| --- | --- |
| Company | Answer |
| Ericsson | Ok to agree now with the above TP for both releases. |
| Huawei | The quoted discussion is for the new Rel-16 UE capability, it is unrelated to the legacy capability and it is not clear to us why any such change would be needed. |
| Samsung | The current text is not enough if we introduce Rel-16 capability (i.e. multiDCI-MultiTRP-r16), so it would be better to clarify the clear description on this capability. We are fine for the suggested change from Ericsson, this text can be applied all cases. |

5) LS to RAN1

*Q2 Is there a need for LS to RAN1 about the number discussion points of Part 1?*

|  |  |
| --- | --- |
| Company | Answer |
| Ericsson | Not identified so far |
| Huawei | If there are divergent opinions on Q2 and Q3, we may need to ask RAN1 for advice but let's what others say ☺ |
| Samsung | No need to send LS from our understanding. |

# 3 Part 2: Discuss the late incoming LS in [R2-2008609](file:///C%3A%5CData%5C3GPP%5CRAN2%5CInbox%5CR2-2008609.zip)

The LS in R2-2008609 contains the following question:

In RAN1#102-e meeting, RAN1 discussed on whether/how to support the feature of multi-CC simultaneous TCI activation for PDSCH with the two features specified for multi-TRP/panel transmission, i.e. single DCI based and multi-DCI based multi-TRP/panel transmission, respectively. In the case of multi-DCI, a sentence ‘Network should not configure serving cells that are configured with CORESETPoolID=1 in these lists.’ is found from *CellGroupConfig* IE in TS38.331 and made a following conclusion accordingly.

|  |
| --- |
| **Conclusion (RAN1#102-e)**- By RRC configuration, each CC list cannot include a CC/BWP in which two CORESET pools are configured. |

In the case of single DCI based multi-TRP/panel transmission, companies think that clarification from RAN2 is needed on whether/how this can be operated together with the feature of multi-CC simultaneous TCI activation. Switching between single DCI based multi-TRP/panel and single TRP/panel is controlled by MAC-CE, not by RRC. From RRC configuration perspective, therefore, it seems possible to include a CC/BWP being operated with single DCI based multi-TRP/panel in the CC list, and it seems that the new MAC-CE introduced for supporting single DCI based multi-TRP/panel, i.e. Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE, applies to one specific CC/BWP even in the case when the CC/BWP is included in the CC list by RRC configuration.

**Question:** Is the following understanding is correct?

* By current RAN2 specification, it is not precluded to enable single DCI based multi-TRP/panel operation in one or more CC(s)/BWP(s) included in *simultaneousTCI-UpdateList1* or *simultaneousTCI-UpdateList2* by using Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE.

The LS refers to these lists:

|  |
| --- |
| ***simultaneousTCI-UpdateList1, simultaneousTCI-UpdateList2***List of serving cells which can be updated simultaneously for TCI relation with a MAC CE. The *simultaneousTCI-UpdateList1* and *simultaneousTCI-UpdateList2* shall not contain same serving cells. Network should not configure serving cells that are configured with CORESETPoolID=1 in these lists. |
| ***simultaneousSpatial-UpdatedList1, simultaneousSpatial-UpdatedList2***List of serving cells which can be updated simultaneously for spatial relation with a MAC CE. The *simultaneousSpatial-UpdatedList1* and *simultaneousSpatial-UpdatedList2* shall not contain same serving cells. Network should not configure serving cells that are configured with CORESETPoolID=1 in these lists. |

In RAN2#109 RAN2 concluded:

Agreements:

1. UE is configured with CORESETPoolIndex only if it support (assumed) mPDCCH mTRP capability
2. rephrase the existing condition into  "If the field is absent, the UE applies the value 0." in the CORESETPoolIndex field description
3. Agree on the TP in Appendix A for the dmrs-Downlink and dmrs-Uplink field descriptions
4. lte-CRS-PatternList-r16 and lte-CRS-PatternListSecond-r16 should be placed under ServingCellConfig
5. Agree with the proposed change

      a) Change the signalling of maxNrofPorts from ENUMERATED {n2} to ENUMERATED {n1,  n2}

      b) add the condition when n2 can be selected in the field description: 2 PT-RS ports can only be configured for single-PDCCH based multi-TRP operation.

1. Agree with the proposed change for slotBased: "Configures UE with slot-based repetition scheme. Network always configures this field when the parameter repetitionNumber is present in IE PDSCH-TimeDomainResourceAllocationList"
2. If nrofReportedRSForSINR is used only with quantityConfig-r16, RAN2 to agree as baseline the REVISED TP in Appendix A for the nrofReportedRS-ForSINR in CSI-ReportConfig.
3. Agree proposals 9 and10 in the report (i.e. not to change anything based on the issues raised)

However, seems RAN1 specified in 38.213 that CORESETPoolIndex can be configured for mTRP sPDCCH and to have mTRP mPDCCH the CORESETPoolIndex should have two different values

For each DL BWP configured to a UE in a serving cell, the UE can be provided by higher layer signalling with

-    $P\leq 3$ CORESETs if *CORESETPoolIndex* is not provided, or if a value of *CORESETPoolIndex* is same for all CORESETs if *CORESETPoolIndex* is provided

-    $P\leq 5$ CORESETs if *CORESETPoolIndex* is not provided for a first CORESET, or is provided and has a value 0 for a first CORESET, and is provided and has a value 1 for a second CORESET

As RAN2 would follow RAN1 intention for these lists of serving cell it is suggested to change the wording according to below TP and to inform RAN1 about the change.

-------------------------------------------------start TP 38.331------------------------------------------------------------------------------------------------------------

|  |
| --- |
| ***simultaneousTCI-UpdateList1, simultaneousTCI-UpdateList2***List of serving cells which can be updated simultaneously for TCI relation with a MAC CE. The *simultaneousTCI-UpdateList1* and *simultaneousTCI-UpdateList2* shall not contain same serving cells. Network should not configure serving cells that are configured with a BWP with two different values for the CORESETPoolID in these lists. |
| ***simultaneousSpatial-UpdatedList1, simultaneousSpatial-UpdatedList2***List of serving cells which can be updated simultaneously for spatial relation with a MAC CE. The *simultaneousSpatial-UpdatedList1* and *simultaneousSpatial-UpdatedList2* shall not contain same serving cells. Network should not configure serving cells that are configured with a BWP with two different values for the CORESETPoolID in these lists. |

-------------------------------------------------end TP 38.331------------------------------------------------------------------------------------------------------------

**Proposal 1 Agree to refer to above TP and reply RAN1 with the change made and that with the change, TS38.331 seems aligned with RAN1 conclusions.**

*Q6 Please indicate if you support proposal1*

|  |  |
| --- | --- |
| Company | Answer |
| Ericsson | yes |
| Huawei | The proposed change is desirable to align 38.331 with 38.213 with respect to characterization of multi-DCI multi-TRP transmission but does not address the point raised by RAN1.In our understanding, the switch between single DCI based multi-TRP/panel and single TRP/panel is not directly controlled by MAC CE, it is controlled by the DCI Transmission Configuration Indication field, whose values may correspond to either one TCI state or two TCI states.Update of the mapping of 1 or 2 TCI states with each value of the DCI Transmission Configuration Indication field (for which 38.321 uses the pedantic word "codepoint") can only be done using the "Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE" for which simultaneousTCI-UpdateList1/2 is not applicable according to 38.321 clauses 5.8.14 and 6.1.3.24.If a cell for which that MAC CE is used is listed in simultaneousTCI-UpdateList1/2, receiving the "TCI States Activation/Deactivation for UE-specific PDSCH MAC CE" addressed to the first serving cell in the same list will map all values of the DCI Transmission Configuration Indication field to a single DCI field, i.e. the transmission can only be single TRP from then on.Then, if the network wishes to use multi TRP transmission again, it needs to use the "Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE" for that cell, and also for any cell that wants to use multi-TRP transmission, in order to map certain values of the DCI Transmission Configuration Indication field to 2 TCI states.In that sense, it is indeed not precluded to use the "Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE" for a cell included in simultaneousTCI-UpdateList1/2.A sentence such as "The Enhanced TCI States Activation/Deactivation for UE-specific PDSCH MAC CE can be used with cells included in simultaneousTCI-UpdateList1/2" could be added but it seems to fit better in 38.321, e.g. clause 5.8.14 or 6.1.3.24. |
| Samsung | We also think the main question from RAN1 is whether the current specification supports simultaneous CC activation in case of single-PDCCH based mTRP. However, RAN2 has not discussed this issue and it is not supported now according to the current specification.The easiest way is adding the sentence in 38.321 e.g. clause 5.8.4 or 6.1.3.24 as Huawei suggested. |

# Summary

TBA