**3GPP TSG-RAN WG2 Meeting #117R2-220xxxx**

**Electronic February 2022**

**Title: DRAFT**LS on further questions on feMIMO RRC parameters

**Response to: -**

**Release:** Rel-17

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

**Source:** ERICSSON to be replaced by 3GPP TSG-RAN WG2

**To:** 3GPP TSG-RAN WG1

**Contact Person:**

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**Attachments:** None

**1. Overall Description:**

[RAN2 agreed question:]

**1. Inter-“cell” operation for BM and mTRP**

RAN2 has further discussed the implementation of L1 parameters based on R1-2112976. One of the parameters is “*[AdditionalPCIInfo…]* ” (row 52) under Inter-cell mTRP with description “*to support inter-cell mTRP operation, to associate SSB from the cell having different PCI than serving cell.*” Further the excel has under Inter-cell mTRP [NumberOfAdditionalPCI] (row 53) on maximum number of these additional SSB/PCIs to be configured. Additionally, under MultiBeam there is row 12 which advices “*A CSI-SSB-ResourceSet configured for L1-RSRP measurement/reporting includes at least a set of SSB indices where PCI indices are associated with the set of SSB indices, respectively. The PCI indices refer to PCIs within the set of PCIs configured for inter-cell beam management or inter-cell multi-TRP.*”

There is also consensus that the additional SSB/PCI used for inter-“cell” operation for both BM and mTRP share the IE introducing the additional SSB/PCI configuration.

In current RRC running CR, IE SSB-MTCAdditionalPCI-r17 giving the added physical cell identification, timing information, information on which SSB beams are present, and transmission power(to be added) is introduced. Using this IE, a list(depending on [NumberOfAdditionalPCI]) of these added SSB/PCIs configured for the UE under IE ServingCellConfig. Then, using index AdditionalPCIIndex the added SSB/PCI is linked to the following IE.

* QCL-Info for inter-cell BM (DL-only/Joint TCI state) and inter-cell mTRP(implementation of row 52)
* UL-TCIState-r17 for inter-cell BM (UL-only TCI state)
* CSI-SSB-ResourceSet (implementation of row 12)
* PUCCH-SpatialRelationInfoExt-r16 for inter-cell mTRP (implementation of row 52)

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***Question 1.*** RAN2 would like to ask whether additional PCI is needed in PUCCH-SpatialRelationInfo for inter-cell mTRP operation, or in any other place to support BM and mTRP inter-“cell” operation?

[Other suggested questions:]

**2. Reference CC/BWP for TCI state list configurations**

RAN2 further discussed row 18 of the excel that advices “PDSCH configuration for each CC/BWP. The reference CC/BWP includes the Rel-17 TCI state pool (a list of TCI states) for PDSCH”. This is understood as signalling optimization for DL or joint TCI state list configuration when UE is configured with unified TCI state operation.

***Question 2.1.*** RAN2 would like to ask whether the UL BWP configuration (in which a Rel-17 UL TCI state list can be configured) can have a similar configuration, i.e. a reference CC/BWP parameter, where the indicated reference CC/BWP includes the Rel-17 UL TCI state pool (a list of TCI states) for this UL BWP ? Or, whether same reference CC/BWP is to be assumed for UL, or whether this was only designed for DL?

***Question 2.2:*** RAN2 assume that reference BWP/CC information is needed when Rel-17 unified TCI state list is absent for the corresponding cell/BWP. RAN2 assume that either reference BWP/CC information or a Rel17 unified TCI state will be configured for Rel17 unified TCI state operation i.e. not both simultaneously. Please confirm it.

**3. BFR for inter-cell mTRP and BM**

RAN2 discussed about BFR and would like to ask the following questions:

***Question 3.1:*** Is BFR per TRP operation applicable for both mTRP and BM? That is, to be used with either Release 15/16 TCI state configuration or Release-17 unified TCI state configuration?

***Question 3.2:*** If the response to Q3.1 is yes: should the new BFR mechanism (new BFR MAC CE, two BFD RS sets) be supported for inter-“cell” (IE SSB-MTCAdditionalPCI-r17 ) BM too? If yes, please explain how it works e.g. if there is any relation between a BFD RS set and a PCI (e.g. one set associated with RS of this serving cell and another associated with RS associated with an additional PCI) or is there any impact to BFD/BFR with two BFD sets if switching towards beams associated with different PCI occurs.

***Question 3.3:*** When a serving cell is configured with inter-“cell” operation (IE SSB-MTCAdditionalPCI-r17 )and includes a single BFD RS set, can the BFD RS set include RS of the serving cell and RS associated with an additional PCI?

***Question 3.4:*** When a serving cell use inter-cell mTRP, can the UE be configured with two BFD RS sets? If yes, please explain if there is any relation between a BFD RS set and a PCI (e.g. one set associated with RS of this serving cell and another associated with RS associated with an additional PCI).

**4. Simultaneous TCI state update/common TCI state update**

RAN2 understands that Rel-16 simultaneous TCI state update (based on simultaneousTCI-UpdateList1-r16 and simultaneousTCI-UpdateList2-r16) should be applied for Rel-17 unified TCI state update as well as common TCI state update (based on reference BWP/CC information).

***Question 4.1:*** Is it correct understanding that Rel-16 simultaneous TCI state update scheme (based on simultaneousTCI-UpdateList1-r16 and simultaneousTCI-UpdateList2-r16) should be applied for Rel-17 TCI state update i.e. common TCI state update (based on reference BWP/CC information)?

In RAN2 meeting, it was proposed to use different RRC parameter (e.g. simultaneousTCI-UpdateList1-r17 and simultaneousTCI-UpdateList2-r17. The main motivation is to apply simultaneous TCI state update when Rel-16 TCI state and Rel-17 unified TCI state is configured for different serving cells. For example, Rel-17 unified TCI state list is configured in serving cell #1- #4, while Rel-16 TCI state list is configured in serving cell #5-#8. In this case, simultaneousTCI-UpdateList1-r17 and simultaneousTCI-UpdateList2-r17 are used to group serving cell #1-#4, while simultaneousTCI-UpdateList1-r16 and simultaneousTCI-UpdateList2-r16 are used to group serving cell #5-8 for simultaneous TCI state update.

***Question 4.2:*** Do we need to introduce different RRC parameter (e.g. simultaneousTCI-UpdateList1-r17 and simultaneousTCI-UpdateList2-r17?

***Question 4.3:*** Is there any restriction in configuring Rel-16 simultaneous TCI state update and Rel-17 common TCI state update (based on reference BWP/CC information) in the unified TCI state framework?

***Question 4.4*** Is it correct understanding that the Rel-17 common TCI state update applies for UL-TCI State too?

**2. Actions:**

**To RAN1 group:**

**ACTION:** RAN2 respectfully asks RAN1 to provide responses to above questions.

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

ASN1 review April 2022 Electronic

TSG-RAN WG1 Meeting #118-e 16 – 27 May 2022 Electronic

TSG-RAN WG1 Meeting #119-e August 2022 Electronic