**3GPP TSG-RAN WG1 Meeting #108-e R1-220xxxx**

**e-Meeting, February 21st – March 3rd, 2022**

**Agenda item:** 8.1

**Source:** Moderator (Ericsson)

**Title:** Moderator summary for LS reply to RAN2 on feMIMO RRC parameters

**Document for:** Discussion and Decision

## Introduction

This summary includes the discussion of LS reply to the LSs from RAN2 R1-2202756 LS on further questions feMIMO RRC parameters.

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.

Some companies were claiming in RAN2 that mTRP would not support inter-cell operation for UL, but it was not clear to RAN2 if this is really what RAN1 has agreed. Specifically, 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)

***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?

Table 1 Companies’ inputs on the proposed LS answer to Question 1

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| **Company** | **Input** |
| Question | 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??  |
| Mod V0 proposal for reply answer | On PUCCH-SpatialRelationInfoExt-r16 there’s no RAN1 agreement that additional PCI is needed for that IE.Remaining issues that might need additional PCI is inter-cell BFR, SSB associated with additional PCI can be configured as NBI-RS. |
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1. 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”. However, it is not clear if this "TCI state pool" signalling indicated by the reference CC/BWP applies only to DL/joint TCI states, or also to UL TCI states.

**Question 2.1.** RAN2 would like to ask whether the concept of ‘reference CC/BWP’ applies only for DL TCI states (when separate UL and DL TCI states are used), or whether it can also apply to UL only TCI states and it can also apply for joint TCI states (when join TCI states are used). Also, can there be separate configurations of reference CC/BWP for DL and UL TCI states, respectively)?

**Question 2.2:** RAN2 assumes that reference BWP/CC information can be configured instead of explicit unified TCI state list for signaling optimization. That is, if the explicit Rel-17 TCI state list is absent in the corresponding cell/BWP, RAN2 assumes that a reference BWP/CC needs to be configured to UE RAN2 would like RAN1 to confirm whether this is correct assumption?

Table 2 Companies’ inputs on the proposed LS answer to Question 2.1

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| --- | --- |
| **Company** | **Input** |
| Question | RAN2 would like to ask whether the concept of ‘reference CC/BWP’ applies only for DL TCI states (when separate UL and DL TCI states are used), or whether it can also apply to UL only TCI states and it can also apply for joint TCI states (when join TCI states are used). Also, can there be separate configurations of reference CC/BWP for DL and UL TCI states, respectively)?  |
| Mod V0 proposal for reply answer | RAN1 has only agreed this for DL TCI states (when separate UL and DL states are used) and for joint TCI states. There is no RAN1 agreement for UL TCI states. Hence, the concept of a reference CC/BWP is only applicable for DL and joint TCI states. |
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Table 3 Companies’ inputs on the proposed LS answer to Question 2.2

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| **Company** | **Input** |
| Question | RAN2 assumes that reference BWP/CC information can be configured instead of explicit unified TCI state list for signaling optimization. That is, if the explicit Rel-17 TCI state list is absent in the corresponding cell/BWP, RAN2 assumes that a reference BWP/CC needs to be configured to UE RAN2 would like RAN1 to confirm whether this is correct assumption?  |
| Mod V0 proposal for reply answer | RAN1 confirms this. |
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1. BFR for inter-cell mTRP and BM

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

Question 3.1: Is the new per-TRP BFR per TRP operation applicable for inter-cell BM? If yes, please explain how it works e.g.

* Is 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 the additional PCI)?
* Is there any impact to BFD/BFR with two BFD sets if switching towards beams associated with different PCI occurs?

Question 3.2: When a serving cell is configured with inter-cell BM operation (i.e. UE is configured with an additional PCI ) and includes only a single BFD RS set, can the BFD RS set include both 1) RS of the serving cell and 2) RS associated with the additional PCI?

Question 3.3: 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).

Table 4 Companies’ inputs on the proposed LS answer to Question 3.1

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| **Company** | **Input** |
| Question | Is the new per-TRP BFR per TRP operation applicable for inter-cell BM? If yes, please explain how it works e.g. * Is 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 the additional PCI)?
* Is there any impact to BFD/BFR with two BFD sets if switching towards beams associated with different PCI occurs
 |
| Mod V0 proposal for reply answer | RAN1 is still discussing whether per-TRP BFR is applicable for inter-cell BM.  |
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Table 5 Companies’ inputs on the proposed LS answer to Question 3.2

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| **Company** | **Input** |
| Question | When a serving cell is configured with inter-cell BM operation (i.e. UE is configured with an additional PCI ) and includes only a single BFD RS set, can the BFD RS set include both 1) RS of the serving cell and 2) RS associated with the additional PCI? |
| Mod V0 proposal for reply answer | RAN1 does not see any need to introduce any restrictions in this regard. The single BFD RS set may include RS of the serving cell and RS associated with additional PCI. |
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Table 6 Companies’ inputs on the proposed LS answer to Question 3.3

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| **Company** | **Input** |
| Question | 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). |
| Mod V0 proposal for reply answer | RAN1 is still discussing whether per-TRP BFR is applicable for inter-cell BM.  |
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1. Common TCI state ID update

RAN2 understands that RAN1 has made an agreement to introduce new RRC parameter(s) to configure the CC list(s) for simultaneous update of CCs that have been configured with Release-17 unified TCI state. RAN2 current understanding is that only these new RRC parameters can be used for serving cells configured with Release-17 unified TCI state and that these serving cells cannot be included in simultaneousTCI-UpdateList1-r16. Further, RAN2 understanding is that Release-17 CC list can only include cells that have been configured with Release-17 Unified TCI state.

Question 4.1: RAN2 would like to ask whether the above understanding is correct?

Table 7 Companies’ inputs on the proposed LS answer to Question 4.1

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| **Company** | **Input** |
| Question | RAN2 would like to ask whether the above understanding is correct? |
| Mod V0 proposal for reply answer | This is the correct understanding. |
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## Submitted tdocs

The following input Tdocs were submitted:

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| [**R1-2200887**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2200887.zip) | LS on feMIMO RRC parameters | RAN2, Ericsson |
| [**R1-2201050**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201050.zip) | Draft LS reply on feMIMO RRC parameters | vivo |
| [**R1-2201204**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201204.zip) | Draft reply LS on feMIMO RRC parameters | ZTE |
| [**R1-2201237**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201237.zip) | Discussion on LS on feMIMO RRC parameters | OPPO |
| [**R1-2201306**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201306.zip) | Draft reply LS on feMIMO RRC parameters | CATT |
| [**R1-2201307**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201307.zip) | Discussion on feMIMO RRC parameters | CATT |
| [**R1-2201455**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201455.zip) | [Draft] Reply LS on feMIMO RRC parameters | Lenovo, Motorola Mobility |
| [**R1-2201565**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201565.zip) | Draft reply LS on feMIMO RRC parameters | LG Electronics |
| [**R1-2201628**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201628.zip) | Draft reply LS on feMIMO RRC parameters | Ericsson |
| [**R1-2201629**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201629.zip) | Discussion related to LS on feMIMO RRC parameters | Ericsson |
| [**R1-2201676**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201676.zip) | Discussion on LS reply on RRC parameters for feMIMO | Intel Corporation |
| [**R1-2201748**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201748.zip) | Draft reply LS on FeMIMO RRC Parameters | Apple |
| [**R1-2201833**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201833.zip) | Discussion on RAN2 LS on feMIMO RRC parameters | CMCC |
| [**R1-2201980**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2201980.zip) | Draft Reply LS on feMIMO RRC parameters | Samsung |
| [**R1-2202056**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2202056.zip) | Discussion on RAN2 LS on feMIMO RRC parameters (MultiBeam) | MediaTek Inc. |
| [**R1-2202096**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2202096.zip) | Draft Reply LS to RAN2 on feMIMO RRC parameters | Qualcomm Incorporated |
| [**R1-2202309**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2202309.zip) | Draft LS reply on feMIMO RRC parameters | Nokia, Nokia Shanghai Bell |
| [**R1-2202470**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2202470.zip) | Views on feMIMO RRC parameters | Huawei, HiSilicon |