**3GPP TSG RAN WG1 Meeting #108-e R1-22XXXX**

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

**Source: Moderator (ZTE)**

**Title: Email Discussion Summary of [108-e-R17-MIMO-01] Response to RAN3 LS R1-2200861**

**Agenda item: 8.1.1**

**Document for:** **Discussion/Decision**

# Introduction

In RAN1#108-e, LS R3-216234 on TCI State Update for L1/L2-Centric Inter-Cell Mobility is received. Based on the preparation phase discussion, we have the following Mr Chair’s guidance.

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| **R1-2200861 Reply LS Reply on TCI State Update for L1L2-Centric Inter-Cell Mobility to RAN3 RAN3, ZTE**  **To be discussed as part of email discussion in [108-e-R17-MIMO-01] under agenda item 8.1.1.** |

On behalf of Eko (Samsung), this summary is drafted for trying to collect/summarize companies’ input and drawing reply LS to RAN3 based on companies’ input.

# Discussion

In the LS, RAN3 had provided corresponding questions as follows.

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| RAN3 thanks RAN1 and RAN4 for LS on on Clarification on TCI State Update for L1/L2-Centric Inter-Cell Mobility. RAN3 is aware that the term “non-serving cell” is not used in RAN1/2. However, from the RAN4 LS (R3-214702/R4-2115357), RAN3 understands that a non-serving cell is a neighbour cell with a different PCI from serving cell and that a UE can be scheduled data on both serving and non-serving cells. RAN3 would like to clarify that the understanding derived from the reply LS from RAN4 is correct also for RAN1. Meanwhile, RAN3 would use the term “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” in inter-cell beam management. It is also noted that RAN3 has two meetings left in Rel-17 and has no TU allocated for this feature.  RAN3 kindly asks RAN1 to take the above information into consideration and provide the clarification on the understanding of RAN4’s reply LS and terminology used in RAN3. |

In [2]-[9], several companies provide the draft reply LS(s), and it seems that all companies’ views are aligned in general. The only difference may be relevant to details on clarification description. Based on the companies’ input, the draft reply from the moderator is provided as follows:

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| RAN1 confirms that a non-serving cell is a neighbour cell with a different PCI from serving cell. With inter-cell beam management, the scheduled data in the serving cell can be QCLed to CSI-RS in the serving cell which is further QCLed to SSB from either ‘a TRP associated with the same PCI as the serving cell’ or ‘a TRP associated with a PCI different from that of the serving cell’. RAN1 agrees with RAN3 using the terminology “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” in inter-cell beam management, and RAN1 does not use the term of ‘TRP’ in RAN1 specs. |

Please provide company’s view in the table below.

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| **Company** | **Comment** |
| vivo | Editorial as below:  And ~~Then~~, RAN1 agrees with RAN3 to use the terminology “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” in inter-cell beam management.  [Mod]: Thank you. Let’s try Ericsson’s version. |
| Ericsson | Propose to shorten the reply:  RAN1 confirms that a non-serving cell is a neighbour cell with a different PCI from serving cell and that a UE can be scheduled data on both serving and non-serving cells.   * ~~In case of inter-cell beam management, a UE can’t receive data from two cells (TRPs) with different PCIs at the same time.~~ * ~~In case of inter-cell multi-TRP operation, a UE can receive data simultaneously from two cells (TRPs) with different PCIs.~~   ~~Then,~~ RAN1 agrees with RAN3 using ~~to use~~ the terminology “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” in inter-cell beam management.  [Mod]: Okay. The intention of the sub-bullets is just to clarify the details of data reception. Looks good to remove it from reply LS perspective. |
| Huawei, HiSilicon | Disagree with draft reply above. From UE perspective, UE receives data from serving cell only, and does not receive data from non-serving cell. As the UE cannot be scheduled on non-serving cells, the draft reply above is inappropriate. For both inter-cell beam management and inter-cell multi-TRP operation, from UE perspective, the data is always transmitted from the serving cell, while an SSB with PCI different from the serving cell is merely used as QCL assistance.  [Mod]: Good point. Please review my update based on your comments, and let’s use the preferred terminologies. |
| Samsung | We support the moderator’s reply. Regarding, the comment from vivo, it might be better to say:  “~~Then~~ Hence, RAN1 agrees with RAN3 to use the terminology “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” in inter-cell beam management.”  We are also fine with the update from Ericsson.  [Mod]: Thank you. Let’s try Ericsson’s version. |
| Apple | We support Ericsson’s revision.  [Mod]: Thank you. Let’s try Ericsson’s version. |
| Mod\_v06 | Thanks for input. Please review the update before the table.   * Update #1: per vivo, Ericsson, Samsung and Apple’s comments, polish and shorten the reply; * Update #2: per Huawei’s comments, let’s use the preferred terminologies (receiving data from non-serving cell may be controversial). |
| LG | Fine with the latest version in general. We prefer to keep the two bullets for better clarity or modify the wording something like: ‘and a UE can be scheduled data on either/both ‘a TRP associated with the same PCI as the serving cell’ and ‘a TRP associated with a PCI different from that of the serving cell’ to explain both ICBM and inter-cell mTRP operations. Another possibility is to further simplify the answer, i.e. removing ‘~~and a UE can be scheduled data on both ‘a TRP associated with the same PCI as the serving cell’ and ‘a TRP associated with a PCI different from that of the serving cell~~’.  [Mod]: Thank you. Based on the current situation, let’s go with your last suggestion. Short but sufficient. |
| CMCC | Support the lastest version. Agree with LG’s refinement: ‘and a UE can be scheduled data on either/both ‘a TRP associated with the same PCI as the serving cell’ and ‘a TRP associated with a PCI different from that of the serving cell’.  [Mod]: Thank you. Let’s go with LG’s last suggestion. |
| OPPO | We are supportive to the revision provided in above table in Mod\_v06.  Since RAN3 refers the case of ICBM only according to the LS, we are hesitated to provide additional information on inter-cell mTRP.  [Mod]: Okay, thank you. |
| DOCOMO | Support the latest version, and also fine with LG/CMCC’s refinement.  [Mod]: Okay, thank you. |
| Lenovo | We can support the latest version.  But we share the similar view with OPPO that we may only need to reply to the ICBM case.  [Mod]: Okay, thank you. |
| CATT | Support LG/CMCC’s refinement.  [Mod]: Okay, thank you. |
| Spreadtrum | The terminologies used by RAN4 and RAN1 are slightly different, maybe we should first confirm that the two terminologies are the same.  We also agree with OPPO and Lenovo that no need to mention inter-cell mTRP case.  Therefore, we propose the following modification,  RAN1 confirms that ‘a non-serving cell’ is ‘a neighbour cell with a different PCI from serving cell’ which is the same as ‘a TRP associated with a PCI different from that of the serving cell’, and that a UE can be scheduled data on either ‘a TRP associated with the same PCI as the serving cell’ and ~~non-serving cells~~ ‘a TRP associated with a PCI different from that of the serving cell’.  [Mod]: Let’s try another direction as LG suggested. And, considering the last sentence we had, it seems that duplicated description may not be needed. Thank you. |
| Mod\_v14 | Thanks for input. Please review the update before the table.   * Although all companies are on the same page about UE behaviour for data reception in inter-cell beam management and inter-cell mTRP operation, there are two different preferences on providing clarification for inter-cell beam management only or both, when replying to RAN3 LS. * Based on that, it seems that we can directly go with LG’s last suggestion of further simplifying the answer. |
| Nokia | We are fine with the latest (simplified) version!  [Mod]: Thank you. |
| Qualcomm | Fine with the FL’s latest version  [Mod]: Thank you. |
| Futurewei | We are fine with moderator’s latest version.  [Mod]: Thank you. |
| Huawei, HiSilicon | 1. The LS from RAN3 is on L1/L2-centric inter-cell mobility, which has been reduced to inter-cell beam management in R17. So the question is not related to inter-cell multi-TRP. To avoid further confusion, this should be mentioned in the reply LS. 2. With the latest suggestion from LG, i.e., removing “and a UE can be scheduled data on both ‘a TRP associated with the same PCI as the serving cell’ and ‘a TRP associated with a PCI different from that of the serving cell”, RAN1 will not clarify the understanding of RAN3, which is requested by RAN3. 3. As mentioned above, from UE perspective, scheduling is performed by the serving cell, which remains unchanged for inter-cell beam management (as mentioned listed in WID) - not by TRP with PCI different from that of the serving cell. 4. RAN1 does not use the term of TRP in RAN1 specs, and this should be mentioned to RAN3 for their reference.   We suggest the following update:   * RAN1 confirms that ‘a non-serving cell’ is ‘a neighbour cell with a different PCI from serving cell’.   [Mod]: Already there.   * With inter-cell beam management, the scheduled data in the serving cell can be QCLed to CSI-RS in the serving cell which is further QCLed to SSB from either ‘a TRP associated with the same PCI as the serving cell’ and ‘a TRP associated with a PCI different from that of the serving cell’.   [Mod]: Let’s try it (it seems that a typo ‘and’ -> ‘or’), in order to cover all RAN3’s request. But, if some companies still raise some concerns about details, we may leave this issue open, rather than Ping-Pong again.   * RAN1 does not use the term of ‘TRP’ in RAN1 specs, and it is up to RAN3 on whether to use to use the terminology of “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” for inter-cell beam management in RAN3 specs.   [Mod]: I think that we do not need to tell RAN3 how to draft their spec, and by default the reply LS is for the discussion purpose. But, we can clarify the exact situation in RAN1, i.e., ‘RAN1 does not use the term of ‘TRP’ in RAN1 specs’. |
| Mod\_V19 | Thanks for input. Please review the update before the table.   * Although nearly all companies seem fine with previous (simplified) version, Huawei/HiSi provides some suggestion for clarification. The first intention from my side is to provide brief reply, but it should be good if all requests from RAN3 can be replied well. BTW, if there are still concerns on clarification part in red from other companies, we have to leave it and provide what we can do for now. |
| Samsung | The updated reply is fine. Just some minor changes for better clarity  RAN1 confirms that a non-serving cell is a neighbour cell with a different PCI from serving cell. With inter-cell beam management, the scheduled data in the serving cell can be QCLed to a CSI-RS ~~in the serving cell~~ which is further QCLed to SSB transmitted from either ‘a TRP associated with the same PCI as the serving cell’ or ‘a TRP associated with a PCI different from that of the serving cell’. RAN1 agrees with RAN3 using the terminology “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” in inter-cell beam management, and RAN1 does not use the term ~~of~~ ‘TRP’ in RAN1 specs.  It is confusing to say that the CSI-RS is “in the serving cell” when it is transmitted for the TPR of a cell having a PCI different from that of the serving cell. Hence the first deletion. |
| Apple | It seems we need some overhead reduction for the response. RAN3 just asked for our confirmation without additional information required. Too much information would confuse RAN3. We suggest we simplify the reply with the following change.  RAN1 confirms that a non-serving cell is a neighbour cell with a different PCI from serving cell. ~~With inter-cell beam management, the scheduled data in the serving cell can be QCLed to CSI-RS in the serving cell which is further QCLed to SSB from either ‘a TRP associated with the same PCI as the serving cell’ or ‘a TRP associated with a PCI different from that of the serving cell’.~~ RAN1 agrees with RAN3 using the terminology “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” in inter-cell beam management~~, and RAN1 does not use the term of ‘TRP’ in RAN1 specs~~. |
| LG | If our understanding is correct, the intention of the added red part seems to clarify the RAN3’s understanding that ‘a UE can be scheduled data on both serving and non-serving cells’. Although we are not convinced that we need to provide such details, but if the group think that it is needed, the current answer seems to be a bit complicated to explain QCL chain and may not explain UL scheduling case since UL data cannot be QCLed with CSI-RS. How about the following version? We are also ok with previous version (as suggested by Apple).  RAN1 confirms that a non-serving cell is a neighbour cell with a different PCI from serving cell. RAN1 agrees with RAN3 using the terminology “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” in inter-cell beam management. With inter-cell beam management, a UE can be scheduled data from either ‘a TRP associated with the same PCI as the serving cell’ or ‘a TRP associated with a PCI different from that of the serving cell’. Since RAN1 does not use the term of ‘TRP’ in RAN1 specs, UE may determine whether the data is scheduled by ‘a TRP associated with the same PCI as the serving cell’ or ‘a TRP associated with a PCI different from that of the serving cell’ by the PCI of the TCI state for the data. |
| OPPO | In our understanding, it may not be helpful for RAN3 to be told the QCL chain information from RAN1, since the confirmation focuses on cell/TRP-level, rather than RS-level. As companies said, if we go deeper than RAN3 expected on QCL chain rule, it would confuse RAN3 and trigger more unnecessary questions. Moreover, the QCL chain rule may still be arguable in RAN1. One example can be that CSI-RS in serving cell doesn’t always have to be QCLed with SSB from ‘a TRP associated with the same PCI as the serving cell’. The CSI-RS itself could be the source of a QCL chain.  It is obvious that in RAN1 the term TRP is only for discussion purpose from Rel-16, but it’s not RAN3’s question or concern. In our view, whether the term TRP is used in RAN3’s spec is up to RAN3. Hence we suggest not to mention it.  To provide brief and concise response to RAN3, we suggest following revision based on latest update from moderator.  RAN1 confirms that a non-serving cell is a neighbour cell with a different PCI from serving cell. With inter-cell beam management, a UE can be scheduled data either on a serving or non-serving cell. ~~the scheduled data in the serving cell can be QCLed to CSI-RS in the serving cell which is further QCLed to SSB from either ‘a TRP associated with the same PCI as the serving cell’ or ‘a TRP associated with a PCI different from that of the serving cell’.~~ RAN1 agrees with RAN3 using the terminology “a TRP associated with a PCI different from that of the serving cell” instead of “non-serving cell” in inter-cell beam management~~, and RAN1 does not use the term of ‘TRP’ in RAN1 specs.~~ |

# Summary

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# Reference

[1] R1-2200861, Reply LS Reply on TCI State Update for L1L2-Centric Inter-Cell Mobility to RAN3, RAN3(ZTE)

[2] R1-2201042, Draft Reply LS on TCI State Update for L1/L2-Centric Inter-Cell Mobility to RAN3, vivo

[3] R1-2201203, Draft reply LS to RAN3 on TCI State Update for L1/L2-Centric Inter-Cell Mobility, ZTE

[4] R1-2201235, Discussion on LS on TCI State Update for L1L2-Centric Inter-Cell Mobility to RAN3, OPPO

[5] R1-2201452, [Draft] Reply LS TCI State Update for L1L2-Centric Inter-Cell Mobility to RAN3, Lenovo, Motorola Mobility

[6] R1-2201836, Discussion on RAN3 LS on TCI state update for L1L2-centric inter-Cell mobility, CMCC

[7] R1-2201977, Draft Reply LS on TCI State Update for L1L2-Centric Inter-Cell Mobility to RAN3, Samsung

[8] R1-2202312, Draft LS reply on TCI State Update for L1L2-Centric Inter-Cell Mobility to RAN3, Nokia, Nokia Shanghai Bell

[9] R1-2202467, Views on TCI State Update for L1L2-Centric Inter-Cell Mobility, Huawei, HiSilicon