**3GPP TSG RAN WG1 #101 R1-200xxxx**

**e-Meeting, May 25th – June 5th, 2020**

**Agenda item:** 7.2.6.3.

**Source:** Moderator (LG Electronics)

**Title:** Summary of email thread [101-e-NR-eMIMO-MB1-02]

**Document for:** Discussion and Decision

# Introduction

This contribution summaries discussion in email thread [101-e-NR-eMIMO-MB1-02]

# Discussion

# Correct/align description for Tx beam determination for the default spatial relation

Motivation: When the default spatial relation is enabled, for PUSCH, it is described as “the UE shall transmit PUSCH according to the spatial relation, if applicable, with a reference to the RS with ‘QCL-TypeD’ corresponding to the QCL assumption of the CORESET with the lowest ID ...” but for SRS, it is described as “the UE shall transmit the target SRS resource with the same spatial domain transmission filter used for the reception of the CORESET...”

***TP from ZTE: {****38.214: 6.2.1 UE sounding procedure}*

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| When the higher layer parameter *enableDefaultBeamPlForSRS* is set ‘enabled’, and if the higher layer parameter *spatialRelationInfo* for the SRS resource, except for the SRS resource with the higher layer parameter *usage* in SRS-ResourceSet set to 'beamManagement' or for the SRS resource with the higher layer parameter *usage* in SRS-ResourceSet set to ‘nonCodebook’ with configuration of *associatedCSI-RS* or for the SRS resource configured by the higher layer parameter [SRS-for-positioning], is not configured in FR2 and if the UE is not configured with higher layer parameter(s) *pathlossReferenceRS*, and if the UE is not configured with different values of *CORESETPoolIndex* in *ControlResourceSets*, and is not provided at least one TCI codepoint mapped with two TCI states, the UE shall transmit the target SRS resource in an active UL BWP of a CC- according to the spatial relation, if applicable, with a reference to the RS with ‘QCL-TypeD’ corresponding to the QCL assumption of the CORESET with the lowest *controlResourceSetId* in the active DL BWP in the CC.- according to the spatial relation, if applicable, with a reference to the RS with ‘QCL-TypeD’ in the activated TCI state with the lowest ID applicable to PDSCH in the active DL BWP of the CC if the UE is not configured with any CORESET in the active DL BWP of the CC |

**Companies’ view (to be updated)**

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| Company name | View |
| Apple | We are not sure whether this change is necessary. There seems to be no ambiguity without this change. |
| Ericsson | Not needed. There is no problem to understand the original text. |
| Intel | Strictly speaking not needed, but as editorial change should be OK to unify the language of the spec. |
| ZTE | Support. From the perspective of the QCL assumption, whether Rx beam for QCL-D RS for CORESET is the exactly same as the CORESET Rx beam is up to UE implementation. QCL assumption is only to provide the information of the physical channel property before UE Rx-antenna units based on the following definition. The UE can do some Rx beam refinement if required. Consequently, the current paragraphs should be revised to align with the highlighted parts in the already agreements.**Agreement**The following working assumption is confirmed with revision in redThe default spatial relation for dedicated-PUCCH/SRS for a CC in FR2, at least when no pathloss RSs are configured by RRC is determined by* ~~Default TCI state or QCL assumption of PDSCH, i.e.,~~
* in case when CORESET(s) are configured on the CC, the TCI state / QCL assumption of the CORESET with the lowest ID, or
	+ The PL RS to be used is the QCL-TypeD RS of the same TCI state / QCL assumption of the CORESET with the lowest ID
	+ Note: The PL RS should be periodic RS
* in case when any CORESETs are not configured on the CC, the activated TCI state with the lowest ID applicable to PDSCH in the active DL-BWP of the CC
* Above applies at least for UEs supporting beam correspondence
* Above applies at least for the single TRP case
* ~~FFS: Details on UE behavior in the absence of the activated TCI state~~
* ~~FFS: Details on default spatial relation in multicarrier scenario~~

~~FFS: Details on which RS to use for pathloss measurement~~ |
| CATT | Functional wise, we don’t think this CR is that critical. The spec doesn’t seem broken without the clarification.However we do not mind accepting it for added clarity.  |
| Sony | Support. As mentioned by ZTE, the UE behavior on determining the default spatial relation of SRS is somehow relaxed according to the agreement above.  |
| Nokia/NSB | SupportWe agree on ZTE’s concern in principle. RAN1 did not make agreements that UE’s rx spatial filter should be the same with tx spatial filter. |
| MediaTek | SupportWe also think that this wording can relax the UE implementation. |
| Qualcomm | To our understanding, this CR has different meaning from the agreement. The agreement says default UL beam is determined by TCI state or QCL assumption of the CORESET. This means default UL beam is identical to the CORESET Rx beam. The CR says default UL beam is determined by Rx beam of QCL-TypeD RS of the CORESET, which can be different from the CORESET Rx beam. We prefer the original spec text, which is identical to the agreement and, more importantly, it achieves the common beam operation in DL/UL, i.e. same spatial filter for CORESET and UL beam. |
| Samsung | The TP is a bit more reader friendly but not essential. |
| OPPO | Do not see strong motivation to change the wording here.The original wording is good enough and do not see any ambiguity here. |
| vivo | We also don’t see strong motivation for this TP. Spatial domain transmission filter is used across the whole spec. |
| DOCOMO | The update of “in an active UL BWP of a CC” is good for clarification.For other parts, we don’t have strong motivation to update. |
| Lenovo/MOT | We don’t think this CR is necessary. The original wording is clear enough. |
| LG | The original description seems sufficient but there’s no strong concern on the TP for clarity. |

# Editorial correction on simultaneous multi-CC TCI update

Motivation: For the sake of presentation, the “the indicated CCs” are unclear, especially considering that there is a description of “indicated CC” before that.

***TP from ZTE: {****38.214: 5.1.5 Antenna ports quasi co-location}*

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| The UE receives an activation command, as described in clause 6.1.3.14 of [10, TS 38.321], used to map up to 8 TCI states to the codepoints of the DCI field *'Transmission Configuration Indication'* in one CC/DL BWP or in a set of CCs/DL BWPs, respectively. When a set of TCI state IDs are activated for a set of CCs/DL BWPs, where the applicable list of CCs is determined by indicated CC in the activation command, the same set of TCI state IDs are applied for all DL BWPs in the applicable list of CCs.  |

**Companies’ view (to be updated)**

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| Company name | View |
| Apple | We are not sure whether this change is necessary. There seems to be no ambiguity without this change. |
| Ericsson | Not needed. There is no problem to understand the original text. |
| Intel | Strictly speaking not needed, but as editorial change should be OK to improve the language of the spec. |
| ZTE | Support. For the sake of presentation, the “the indicated CCs” are unclear, especially considering that there is a description of “indicated CC” before that. |
| CATT | Functional wise, the spec is not broken. However we don’t mind accepting the CR for added clarity.  |
| Sony | It seems that we have no problem in understanding what the original text “indicated CCs” means. But for better clarity, we are also okay with “applicable list” which appears in the paragraph once. |
| Nokia/NSB | Not support. Current text looks fine. |
| MediaTek | Support because it is more precise description.  |
| Qualcomm | Original text has no ambiguity.  |
| Samsung | The TP is good to have but not essential. |
| OPPO | Seems not necessary. The current text is clear. |
| DOCOMO | Not essential, but fine with the TP. |
| Lenovo/MOT | The original wording is clear enough. |
| LG | While it seems not essential, the TP is fine for clarity. |

# Capture that the feature of simultaneous TCI/spatial relation update is applicable only for single TRP case

Motivation: For simultaneous beam update across multiple CCs, it was agreed that this feature is at least applied to single TRP case. However, this condition is not captured in current spec.

**Proposal from Qualcomm: Clarify that simultaneous beam update for multiple CCs is only applicable to single TRP case.**

The corresponding TP for PDSCH

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| 38.214->5.1.5 Antenna ports quasi co-location[…]The UE receives an activation command, as described in clause 6.1.3.14 of [10, TS 38.321] or in clause [6.1.3.x] of [10, TS 38.321], used to map up to 8 TCI states to the codepoints of the DCI field *'Transmission Configuration Indication'* in one CC/DL BWP or in a set of CCs/DL BWPs, respectively. When a set of TCI state IDs are activated for a set of CCs/DL BWPs, where the applicable list of CCs is determined by indicated CC in the activation command, the same set of TCI state IDs are applied for all DL BWPs in the indicated CCs. A set of TCI state IDs can be activated for a set of CCs/DL BWPs only if UE is not provided different values of CORESETPoolIndex in ControlResourceSets, and is not provided at least one TCI codepoint mapped with two TCI states.[…] |

The corresponding TP for PDCCH

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| 38.213->10.1 UE procedure for determining physical downlink control channel assignment[…]if the UE is provided by simultaneousTCI-CellList a number of up to two lists of cells for simultaneous TCI state activation by simultaneousTCI-UpdateList-r16 and/or simultaneousTCI-UpdateListSecond-r16, the UE applies the antenna port quasi co-location provided by TCI-States with same activated tci-StateID value to CORESETs with index 𝑝 in all configured DL BWPs of all configured cells in a list determined from a serving cell index provided by a MAC CE command. The simultaneousTCI-CellList can be provided for simultaneous TCI state activation only if UE is not provided different values of CORESETPoolIndex in ControlResourceSets, and is not provided at least one TCI codepoint mapped with two TCI states.[…] |

The corresponding TP for SP/AP SRS

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| 38.214-> 6.2.1 UE sounding procedure[…]When a spatialRelationInfo is activated/updated for a semi-persistent or aperiodic SRS resource configured by the higher layer parameter SRS-Resource by a MAC CE for a set of CCs/BWPs, where the applicable list of CCs is indicated by higher layer parameter simultaneousSpatial-UpdatedList-r16 or simultaneousSpatial-UpdatedListSecond-r16, the spatialRelationInfo is applied for the semi-persistent or aperiodic SRS resource(s) with the same SRS resource ID for all the BWPs in the indicated CCs. A spatialRelationInfo can be activated/updated for a semi-persistent or aperiodic SRS resource configured by the higher layer parameter SRS-Resource by a MAC CE for a set of CCs/BWPs only if UE is not provided different values of CORESETPoolIndex in ControlResourceSets, and is not provided at least one TCI codepoint mapped with two TCI states.[…] |

**Companies’ view (to be updated)**

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| Company name | View |
| Apple | If one CC is configured with sTRP, another is configured with mTRP, after receiving the MAC CE to update beams for the two CCs, should UE ignore this MAC CE or only update the beam for the first CC? |
| Ericsson | Is there a technical motivation for the proposed restriction? |
| Intel | Unnecessarily restriction.  |
| ZTE | Support in principle, if we can not have a further agreement about applying this approach to mTRP case. |
| CATT | This restriction does not seem necessary to us.  |
| Sony | Support in principle. According to previous Agreements, there is always a note saying “Note: This at least applies to single TRP case.”So we think with respect to Agreements, it is necessary to have above TPs to avoid NW mistakenly update TCI-states/Spatial Relation among TRPs. |
| Nokia/NSB | We don’t see a necessity of such restriction.  |
| Qualcomm | Mixed mTRP and sTRP is involved. If a MAC-CE activates TCI state 1 & 2 as TCI code point 1 on CC 1, should they be applied to CC2 with sTRP? If a MAC-CE activates TCI states only for CORESET pool ID 1 on CC 1, should they be applied to CC 2 with sTRP? Our understanding is NO for both. So we prefer to capture the agreement, i.e. TCI state update is only among CCs with sTRP. Additional clarification may be needed for mixed mTRP and sTRP, and people need to agree on that. Before that let’s stick to the agreement. |
| Samsung | Do not see a strong motivation. |
| OPPO | Support the TPs on PDSCH and PDCCH.We agree with the concerns raised by Qualcomm.  |
| vivo | Support all the three TPs. |
| DOCOMO | We are generally fine to restrict for S-TRP. For the TPs, we have two comments:1. For TP of PDCCH, “simultaneousTCI-CellList” is configured by RRC, and “TCI codepoint mapped with two TCI states” is activated by MAC CE. So, the TP says RRC can be configured if condition of MAC CE. On the other hand, there is a case that after configuration of “simultaneousTCI-CellList”, UE receives MAC CE to activate two TCI states for a DCI codepoint in the indicated CCs. We think this case is more typical, and we suggest to add:

The simultaneousTCI-CellList can be provided for simultaneous TCI state activation only if UE is not provided different values of CORESETPoolIndex in ControlResourceSets, and is not provided at least one TCI codepoint mapped with two TCI states. UE is not expected to receive activation command to activate two TCI-state on at least one TCI codepoint in any of the indicated CCs.1. For TP of SRS, it is not clear either of “any of all CCs in the indicated CCs” or “the CC to receive the MAC CE” should be S-TRP. We suggest to clarify as:

A spatialRelationInfo can be activated/updated for a semi-persistent or aperiodic SRS resource configured by the higher layer parameter SRS-Resource by a MAC CE for a set of CCs/BWPs only if UE is not provided different values of CORESETPoolIndex in ControlResourceSets, and is not provided at least one TCI codepoint mapped with two TCI states, in any of the indicated CCs. |
| LG | Do not support the TPs that we don’t see a strong necessity on such restriction and for a forward compatibility. |

# Capture that UE expects to be configured with *sri-PUSCH-PowerControl* when the MAC-CE based PL RS update is enabled for PUSCH that does not include a SRI field

Motivation: The last sentence of the captured agreement is not captured in current specification.

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| **Agreement in RAN1#99**When *enablePLRSupdateForPUSCHSRS* is configured, if a grant-based or grant-free PUSCH transmission is scheduled/activated by DCI format 0\_1 that does not include a SRI field, the RS resource index *qd* corresponding to the *PUSCH-PathlossReferenceRS-Id* mapped with *sri-PUSCH-PowerControlId* = 0 is used for path-loss measurement of PUSCH transmission. In this case, UE expects to be configured with *sri-PUSCH-PowerControl* |

**Proposal from CATT**: *Capture RAN1#99 agreement that UE expects to be configured with sri-PUSCH-PowerControl to determine RS resource index qd which will be used for path-loss measurement of PUSCH transmission. When enablePLRSupdateForPUSCHSRS is configured and if a grant-based or grant-free PUSCH transmission is scheduled/activated by DCI format 0\_1 that does not include a SRI field.*

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| TS38.213: 7.1.1 UE behavior-----Start TP------ For a PUSCH transmission scheduled by a DCI format that does not include a SRI field, or for a PUSCH transmission configured by *ConfiguredGrantConfig* and activated, as described in Clause 10.2, by a DCI format that does not include a SRI field, a RS resource index  is determined from the *PUSCH-PathlossReferenceRS-Id* mapped to *sri-PUSCH-PowerControlId* = 0. The UE expects to be configured with *sri-PUSCH-PowerControl.*-----End TP----- |

**Companies’ view (to be updated)**

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| Company name | View |
| Apple | Support this TP. |
| Ericsson | Support this TP |
| Intel | OK |
| ZTE | Support |
| CATT | Support |
| Sony | Support |
| Nokia/NSB | Support |
| Qualcomm | Support |
| Samsung | If we see the RRC structure copied below, it seems that the gNB should configure *sri-PUSCH-PowerControl* to utilize the relationship clarified as “a RS resource index  is determined from the *PUSCH-PathlossReferenceRS-Id* mapped to *sri-PUSCH-PowerControlId* = 0.”. Therefore, the TP is not needed.SRI-PUSCH-PowerControl ::= SEQUENCE { sri-PUSCH-PowerControlId SRI-PUSCH-PowerControlId, sri-PUSCH-PathlossReferenceRS-Id PUSCH-PathlossReferenceRS-Id, sri-P0-PUSCH-AlphaSetId P0-PUSCH-AlphaSetId, sri-PUSCH-ClosedLoopIndex ENUMERATED { i0, i1 }} |
| OPPO | Support. |
| vivo | Share similar view as Samsung. |
| DOCOMO | Support the TP. |
| Lenovo/MOT | Support the TP. |
| LG | Do not support the TP aligned with Samsung’s view. |

# Conclusion (to be updated)

From the email discussion [101-e-NR-eMIMO-MB1-02], xxx

# References

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| --- | --- | --- |
| **TDoc** | **Title** | **Source** |
| [**R1-2003470**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003470.zip) | Maintenance of multi-beam operation | ZTE |
| [**R1-2003628**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2003628.zip) | Remaining issues on multi-beam operation enhancement | CATT |
| [**R1-2004464**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004464.zip) | Enhancements on Multi-beam Operation | Qualcomm Incorporated |