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

**e-Meeting, Feb 21st – Mar 3rd, 2022**

Agenda Item: 5

Source: Moderator (Apple)

Title: Summary on [108-e-AI5-LS-03]

Document for: Discussion/Decision

# Introduction

In this contribution, we provide some discussion on email thread [108-e-AI5-LS-03].

# Original LS R1-2200896

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| **1. Overall Description:**RAN4 has been discussing the PL-RS configuration used for PUCCH transmission on target being-activated SCell during the activation procedure. RAN4 understand PL-RS assumption of PUCCH transmission for the active DL BWP of the carrier of the primary cell is specified RAN1 TS38.213 section 7.2.1; however, RAN4 is not sure whether or not such assumption could be applied for target being-activated PUCCH SCell during activation procedure, and what the UE behavior is to determine the PL-RS for PUCCH of target being activation SCell.Thus, RAN4 has made following working assumption and would like to kindly ask RAN1 to confirm/clarify:**Working assumption:*** RAN4 to agree that PL-RS assumptions defined in TS38.213 section 7.2.1 can be applied for the PUCCH of target being-activated SCell during the activation procedure. In FR2 if UE is not provided *pathlossReferenceRSs* but provided *PUCCH-SpatialRelationInfo* before receiving the PUCCH SCell activation command, as UE may not obtain MIB during activation procedure, UE shall use the associated DL-RS in *PUCCH-SpatialRelationInfo* as PL-RS.

[Question to RAN1]: Is the above working assumption in line with RAN1’s understanding? * + If the answer to above question is NO, how could UE determine the PL-RS for PUCCH of target being-activated SCell during the activation procedure for the following scenarios respectively:
		- if the UE is not provided *pathlossReferenceRSs* and is provided *PUCCH-SpatialRelationInfo* before receiving the PUCCH SCell activation command
		- If the UE is not provided *pathlossReferenceRSs*, and is not provided *PUCCH-SpatialRelationInfo* before receiving the PUCCH SCell activation command
		- If the UE is provided *pathlossReferenceRSs* and *PUCCH-SpatialRelationInfo* before receiving the PUCCH SCell activation command
		- If the UE is provided *pathlossReferenceRSs* and is not provided *PUCCH-SpatialRelationInfo* before receiving the PUCCH SCell activation command
		- If any case is missing in above combinations for PL-RS determination for PUCCH of target being-activated SCell during the activation procedure, please RAN1 indicates and explains the UE behavior of PL-RS determination for the missing case(s).

**2. Actions:****To: RAN1****ACTION:** RAN4 respectfully asks RAN1 to confirm RAN4 working assumption and answer the corresponding questions if needed. |

# Discussion

According to moderator’s understanding, it seems there is no problem to derive pathloss based on DL RS configured in spatial relation info when pathloss reference signal is not provided, as agreed by RAN4.

Moderator’s proposal response:

***RAN1 has not identified any issue on the working assumption agreed by RAN4.***

Companies’ view and comments (According to the question to RAN4, if the answer is no, please clarify the details on how to identify pathloss reference signal)

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| Company | View |
| LG | Support the proposed response. |
| CATT | We are OK with the proposed reply. |
| Nokia, NSB | Support the proposed response |
| ZTE | We don’t support this proposal.First, we don’t think the mentioned scenario that UE is not provided *pathlossReferenceRSs* but provided *PUCCH-SpatialRelationInfo* exists. Based on the 38.331 below, if *PUCCH-SpatialRelationInfo* is configured, *pathlossReferenceRSs* must be configured since it is not optional parameter. -- ASN1START-- TAG-PUCCH-SPATIALRELATIONINFO-STARTPUCCH-SpatialRelationInfo ::= SEQUENCE { pucch-SpatialRelationInfoId PUCCH-SpatialRelationInfoId, servingCellId ServCellIndex OPTIONAL, -- Need S referenceSignal CHOICE { ssb-Index SSB-Index, csi-RS-Index NZP-CSI-RS-ResourceId, srs PUCCH-SRS }, pucch-PathlossReferenceRS-Id PUCCH-PathlossReferenceRS-Id, p0-PUCCH-Id P0-PUCCH-Id, closedLoopIndex ENUMERATED { i0, i1 }}PUCCH-SpatialRelationInfoExt-r16 ::= SEQUENCE { pucch-SpatialRelationInfoId-v1610 PUCCH-SpatialRelationInfoId-v1610 OPTIONAL, -- Need S pucch-PathlossReferenceRS-Id-v1610 PUCCH-PathlossReferenceRS-Id-v1610 OPTIONAL, --Need R ...}PUCCH-SRS ::= SEQUENCE { resource SRS-ResourceId, uplinkBWP BWP-Id}-- TAG-PUCCH-SPATIALRELATIONINFO-STOP-- ASN1STOPFor the other mentioned scenarios, the UE behaviors are shown blow according to 38.213.* If the UE is not provided *pathlossReferenceRSs*, and is not provided *PUCCH-SpatialRelationInfo*, PL-RS is obtained from an SS/PBCH block with same SS/PBCH block index as the one the UE uses to obtain MIB.
* If the UE is provided *pathlossReferenceRSs* and *PUCCH-SpatialRelationInfo*, the DL RS indicated by the *PUCCH-PathlossReferenceRS* with RS ID configured in the *PUCCH-SpatialRelationInfo* is used.
* If the UE is provided *pathlossReferenceRS*s and is not provided *PUCCH-SpatialRelationInfo*, the DL RS indicated by the *PUCCH-PathlossReferenceRS* with reference RS ID 0 is used.
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| Samsung | Given the discussion, we tend to share a view with ZTE that "if *PUCCH-SpatialRelationInfo* is configured, *pathlossReferenceRSs* must be configured since it is not optional parameter”. In our view, one possible option is to send LS to RAN2 and then double-check to RAN2 about whether or not the concerned scenario from RAN4 exists in RAN2 signaling perspective. |
| DOCOMO | We have a different understanding from ZTE. The issue raised by RAN4 would be related to the case when *pathlossReferenceRSs* in *PUCCH-PowerControl* is not configured but *PUCCH-SpatialRelationInfo* is configured. In *PUCCH-SpatialRelationInfo*, pucch-PathlossReferenceRS-Id refers to the corresponding *PUCCH-PathlossReferenceRS*, the set of which is configured as *pathlossReferenceRSs* in *PUCCH-PowerControl*. It is actually optional as follows: PUCCH-PowerControl ::= SEQUENCE { deltaF-PUCCH-f0 INTEGER (-16..15) OPTIONAL, -- Need R deltaF-PUCCH-f1 INTEGER (-16..15) OPTIONAL, -- Need R deltaF-PUCCH-f2 INTEGER (-16..15) OPTIONAL, -- Need R deltaF-PUCCH-f3 INTEGER (-16..15) OPTIONAL, -- Need R deltaF-PUCCH-f4 INTEGER (-16..15) OPTIONAL, -- Need R p0-Set SEQUENCE (SIZE (1..maxNrofPUCCH-P0-PerSet)) OF P0-PUCCH OPTIONAL, -- Need M pathlossReferenceRSs SEQUENCE (SIZE (1..maxNrofPUCCH-PathlossReferenceRSs)) OF PUCCH-PathlossReferenceRS OPTIONAL, -- Need M twoPUCCH-PC-AdjustmentStates ENUMERATED {twoStates} OPTIONAL, -- Need S ..., [[ pathlossReferenceRSs-v1610 SetupRelease { PathlossReferenceRSs-v1610 } OPTIONAL -- Need M ]]}Therefore, our understanding is that the mentioned scenario that UE is not provided *pathlossReferenceRSs* but provided *PUCCH-SpatialRelationInfo* may exist from RRC perspective. And that case is indeed not captured in 213 currently. In 331, “when  *pathlossReferenceRSs*  is not configured” is also specified already as follows:

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| ***pathlossReferenceRSs, pathlossReferenceRSs-v1610***A set of Reference Signals (e.g. a CSI-RS config or a SS block) to be used for PUCCH pathloss estimation. Up to *maxNrofPUCCH-PathlossReference-RSs* may be configured. If the field is not configured, the UE uses the SSB as reference signal (see TS 38.213 [13], clause 7.2). The set includes References Signals indicated in pathlossReferenceRSs (without suffix) and in pathlossReferenceRSs-v1610. |

In our understanding, the part highlighted in yellow corresponds to the following in 213: - If the UE is not provided *pathlossReferenceRSs* or before the UE is provided dedicated higher layer parameters, the UE calculates $PL\_{b,f,c}(q\_{d})$ using a RS resource obtained from an SS/PBCH block with same SS/PBCH block index as the one the UE uses to obtain *MIB*The text above may bring up additional question: whether MIB is always obtained even in PUCCH Scell (to be activated)? On this, our understanding would be:* If MIB is always available, it seems in RAN1 spec, “SSB the UE uses to obtain MIB” is specified to be used as PL-RS.
* If MIB is not always available, then RAN1 has not specified PL-RS for PUCCH on being-acticated Scell, which is the situation mentioned by RAN4. In this case, we think RAN4 WA would be workable since *referenceSignal* in  *PUCCH-SpatialRelationInfo* is always available as long as  *PUCCH-SpatialRelationInfo* is configured .

In our understanding, MIB may not always be available in SCell. Therefore, the second bullet above may need to be considered. We believe we can respond to RAN4 that their WA has no issue in this case (i.e. moderator’s proposal). On the other hand, above has somehow RAN2-dependent issue (e.g. MIB is always available in SCell or not?). Thus, we think it might also be good idea to ask RAN2 for such question.  |
| Huawei, HiSilicon | The RAN4 working assumption is incorrect. In our contribution paper R1-2202430, detailed analysis has been provided.Firstly, we share similar view with DOCOMO on the underlying issue, i.e. “UE may not obtain MIB during activation procedure” in RAN4 LS, however, the RAN1 spec only links the PL-RS to the SSB obtaining MIB by the UE if *pathlossReferenceRS* is not configured.

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| - If the UE is not provided *pathlossReferenceRSs* or before the UE is provided dedicated higher layer parameters, the UE calculates  using a RS resource obtained from the SS/PBCH block that the UE uses to obtain *MIB* |

Secondly, the same issue is also applied to PUSCH/SRS power control. Unified RAN1 solution should be taken for both PUSCH and PUCCH. The RAN4 working assumption does not resolve any PUSCH/SRS issue.Thirdly, the RAN4 working assumption cannot be well extended to FR1 cases. Usually, the PUCCH-SpatialRelationInfo may not be configured in FR1. A unified RAN1 solution is preferred for both FR1 and FR2.Fourthly, the background to have the sentence “the UE uses to obtain *MIB”* in RAN1 spec is provided in our paper, as recapped in the following.*In the RAN1#92 meeting, an agreement for NR UL power control – non-CA aspects is achieved as follows:*

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| *Agreement:**At least for the case of initial access** *UE will use the SSB identified during the initial access as the DL RS/SSB for pathloss estimation for PUSCH(including MSG3) before DL RS(s) is explicitly configured for pathloss measurement.*
* *UE will use the SSB identified during the initial access as the DL RS/SSB for pathloss estimation for PUCCH before DL RS(s) is explicitly configured for pathloss measurement.*
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*the agreement is captured in current specification TS38.213 7.1.1/7.2/1/7.3.1 for PUSCH/PUCCH/SRS power control and does not distinguish between CA and non-CA.* Therefore, as requested by RAN4 LS, the UE behaviors in case of SCell should be clarified. A simple solution to capture the RAN1 agreement for SCell case is preferred, e.g. if the UE is not provided *pathlossReferenceRSs* for SCell, the UE calculates $PL\_{b,f,c}(q\_{b})$ using a RS resource obtained from an SS/PBCH block used for SCell activation. We propose,***Proposal:*** *To determine a PUSCH/PUCCH/SRS transmission power for SCell, clarifications are proposed as follows:** *When determine a PUSCH transmission power, if the UE is not provided PUSCH-PathlossReferenceRS for SCell, UE calculates* $PL\_{b,f,c}(q\_{b})$ *using a RS resource obtained from an SS/PBCH block used for SCell activation.*
* *When determine a PUCCH transmission power, if the UE is not provided pathlossReferenceRSs for SCell, UE calculates* $PL\_{b,f,c}(q\_{b})$ *using a RS resource obtained from an SS/PBCH block used for SCell activation.*
* *When determine a SRS transmission power, if the UE is not provided* *pathlossReferenceRS* or *SRS-PathlossReferenceRS-Id*, *UE calculates* $PL\_{b,f,c}(q\_{b})$ *using a RS resource obtained from an SS/PBCH block used for SCell activation.*

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| Nokia, NSB2 | Picking up on the ZTE, DCM and Huawei’s point. Indeed, the RAN1 spec formulation where it mentions the MIB is unfortunate.If the UE is not provided *pathlossReferenceRSs* or before the UE is provided dedicated higher layer parameters, the UE calculates  using a RS resource obtained from the SS/PBCH block that the UE uses to obtain *MIB*As pointed out by Huawei, this actually has nothing to do with MIB acquisition, but all to do with somehow identifying the SS/PBCH block to use as the PL reference. So we would support the general idea of revising this part of the 38.213 so that it doesn’t reference the MIB acquisition when identifying the SS/PBCH to use as the PL reference. |
| Samsung2 | Regarding the MIB and also the agreement quoted by HW, our understanding is that “that the UE uses to obtain *MIB*” in spec. may be related to “*identified during the initial access*” in the quoted agreement. So, we don’t see any issue in the current spec.In addition, regarding whether or not the MIB is obtained on PUCCH Scell, our understanding is that UE does not try to read the MIB on any Scells including PUCCH Scell which may require RAN2 confirmation, as NTT DOCOMO said. So, our interpretation of “the SS/PBCH block that the UE uses to obtain *MIB*” for PUCCH Scell is that if the UE is not provided *pathlossReferenceRSs* for PUCCH SCell, PL-RS is obtained from an SS/PBCH block that the UE uses to obtain MIB on primary cell not PUCCH Scell. |
| CATT | This issue was discussed in Rel-15 power control. The PUCCH power control in NR is designed to be dynamically adapted to different beams based on *PUCCH-SpatialRelationInfo*. If the *pathlossReferenceRS* is configured, there is no dynamic adaptation to different beam. Thus, *pathlossReferenceRS* is an optional parameter and is not configured most of time. Current spec uses the RS to obtain MIB is the default RS when UE detect the cell before the dedicated RS configuration to the UE. We agree with RAN4’s assumption.  |