**3GPP TSG RAN WG1 Meeting #109-e R1-22xxxxx**

**e-Meeting, May 9th- 20th, 2022**

**Agenda Item: 7.1**

**Source: Moderator (Huawei)**

**Title: draft Summary of email discussion [109-e-NR-CRs-02] PL-RS configuration of SCells**

**Document for: Discussion and Decision**

# Introduction

Two issues are discussed in this documents.

An issue is identified in [1][2][3] that

**Issue#1**:

* A UE is not required to obtain MIB of SCell. However, to determine PUSCH/PUCCH/SRS transmission power, in current TS 38.213, the RS resource for PL calculation is derived from a SS/PBCH block which is linked to obtaining MIB of the serving cell if the *pathlossReferenceRS* is not configured. Therefore, a clarification for this case is needed. For example,

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| **7.1.1 for PUSCH (TS38.213 v15.14.0):**- is a downlink pathloss estimate in dB calculated by the UE using reference signal (RS) index  for the active DL BWP, as described in Clause 12, of carrier  of serving cell - If the UE is not provided *PUSCH-PathlossReferenceRS* or before the UE is provided dedicated higher layer parameters, the UE calculates  using a RS resource from the SS/PBCH block that the UE uses to obtain *MIB*[Notes: Similar texts can be found in 7.2.1 and 7.3.1 for PUCCH and SRS, respectively.] |

Another issue is raised in [3] that,

**Issue#2**:

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| 38.213 defines in the beginning of clause 7 that

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| A UE does not expect to simultaneously maintain more than four pathloss estimates per serving cell for all PUSCH/PUCCH/SRS transmissions as described in Clauses 7.1.1, 7.2.1, and 7.3.1. |

It appears that the lack of definition for what “maintain” in this context means and when a patloss estimate can be considered as being maintained has been a cause of some debate in RAN4. This discussion has relevance in making sure that the SCell activation delay is not unnecessarily prolonged when e.g. one can assume that a PL estimate is not maintained for a deactivated SCell and additional delays might arise from PL estimation when an SCell with UL configuration is being activated. From RAN1 perspective it should be clear that as long as at most 4 pathloss estimates have been configured to the UE, any of the configured pathloss estimates that is relevant for a particular UL transmission at the time of transmitting it is considered maintained if at least one of the pathloss estimate RS has been transmitted after the UE has applied the new configuration. **Proposal 2: Clarify that as long as the maximum number of path loss estimates is not exceeded, a pathloss estimate relevant for an uplink transmission can always be considered as maintained at the time the UL transmission takes place.****Proposal 3: Indicate to RAN4 that for an SCell with UL configuration, the pathloss estimate is obtained during the cell synchronization procedure and it does not add to the SCell activation delay.**  |

As per chair’s guidance, these issues are discussed and the discussion is expected to complete by May 13.

[109-e-NR-CRs-02] PL-RS configuration of SCells by May 13 – Frank (Huawei)

* Relevant tdocs: [R1-2203112](file:///D%3A%5CDocuments%5C3GPP%20documents%5CRAN1%5CTSGR1_109-e%5CDocs%5CR1-2203112.zip), [R1-2203113](file:///D%3A%5CDocuments%5C3GPP%20documents%5CRAN1%5CTSGR1_109-e%5CDocs%5CR1-2203113.zip) and also consider [R1-2204821](file:///D%3A%5CDocuments%5C3GPP%20documents%5CRAN1%5CTSGR1_109-e%5CDocs%5CR1-2204821.zip) under agenda item 5.

# Phase I of Discussions

## Issue#1: The RS resource for SCell pathloss calculation

### Q1: Regarding the UE behavior for determination of RS resource for Scell pathloss calculation if RRC parameter *pathlossreference* is not configured for the SCell, which alternative below is correct?

**Alt 1-1:** There is no difference between PCell and SCell, i.e. “the UE calculates pathloss  using a RS resource from the SS/PBCH block that the UE uses to obtain MIB” as in current TS 38.213. As a result, **the UE is required to obtain MIB for SCell in this case**.

**Alt 1-2:** It is different between PCell and SCell where in SCell the UE is **NOT** required to obtain MIB and can take one SS/PBCH block that is **NOT** linked to any MIB acquisition for pathloss calculation.

Companies’ views are welcome.

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| *Company* | *View* |
| Apple | The whole discussion is unnecessary and redundant, since RAN4 already agreed to use beam indication RS configured in PUCCH-spatialRelationInfo.  |
| vivo | We believe that not configuring pathlossReferenceRSs but configuring SpatialRelationInfo is a corner case, if allowed. We prefer to make a conclusion that pathlossReferenceRSs are expected to be configured for SCell, so that no additional UE behavior needs to be defined. |
| Nokia, NSB | **Alt1-1** in the sense that there is no difference between PCell and SCell. The PCell PL-RS reference is not really having anything to do with MIB-reading, MIB reading is just a convenient way to point to the SSB the UE is synched to**Alt1-2** in the sense that the UE is not required to obtain MIB |
| CATT | This does not need to be discussed. RAN4’s conclusion is consistent with what we discussed and agreed in Rel-15 Power control session.  |
| Samsung | We slightly prefer Alt 1-2. UE calculates SCell pathloss from ‘associated’ SSB, but it should not mean UE always acquires MIB for SCell. |

### Q2: Assuming Alt 1-2 for Q1, which alternative below is correct for the changes of a CR?

**Alt 2-1:** The RS resource used for SCell pathloss calculation is associated with SCell activation, which seems in line with the spirit of RAN1#92 agreement below. As examples, two CRs to reflect this can be found in [2] and [3], as copied below.

**Alt 2-2:** The RS resource used for SCell pathloss calculation is **NOT** associated with SCell activation nor with any time and frequency synchronization for the SCell. If any company prefers this, please provide your solution and its changes in details.

If Alt 1-1 is correct for Q1, then a CR is necessary to clarify the concerned UE behavior. If Alt 1-2 is correct for Q1, then no CR is needed and a conclusion seems sufficient. Here, Alt 1-1 is assumed, what exact spec changes to capture it are discussed.

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| The concerned specification text is sourced from the following RAN1#92 agreement.*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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In [2], a CR for Alt 2-1 (for PUSCH, PUCCH and SRS, respectively) is,

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| 7.1.1 UE behavior*====Unchanged parts====*- is a downlink pathloss estimate in dB calculated by the UE using reference signal (RS) index  for the active DL BWP, as described in Clause 12, of carrier  of serving cell - If the UE is not provided *PUSCH-PathlossReferenceRS* or before the UE is provided dedicated higher layer parameters, the UE calculates  using a RS resource from the SS/PBCH block that the UE uses to obtain *MIB* when the serving cell is PCell or PSCell and using a RS resource obtained from an SS/PBCH block that the UE uses for SCell activation when the serving cell is SCell*====Unchanged parts====*7.2.1 UE behaviour*====Unchanged parts====*- is a downlink pathloss estimate in dB calculated by the UE using RS resource index  as described in Clause 7.1.1 for the active DL BWP  of carrier  of the primary cell  as described in Clause 12- 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* when the serving cell is PCell or PSCell and using a RS resource obtained from an SS/PBCH block that the UE uses for SCell activation when the serving cell is SCell*====Unchanged parts====*7.3.1 UE behaviour*====Unchanged parts====*-  is a downlink pathloss estimate in dB calculated by the UE using RS resource index  as described in Clause 7.1.1 for the active DL BWP of serving cell  and SRS resource set  [6, TS 38.214]. The RS resource index  is provided by *pathlossReferenceRS* associated with the SRS resource set  and is either a *ssb-Index* providing a SS/PBCH block index or a *csi-RS-Index* providing a CSI-RS resource index- If the UE is not provided *pathlossReferenceRS* 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* when the serving cell is PCell or PSCell and using a RS resource obtained from an SS/PBCH block that the UE uses for SCell activation when the serving cell is SCell- If the UE is provided *pathlossReferenceLinking*, the RS resource is on a serving cell indicated by a value of *pathlossReferenceLinking* *====Unchanged parts====* |

In [3], a CR for Alt 2-1 is,

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| **7.1.1 for PUSCH:**- is a downlink pathloss estimate in dB calculated by the UE using reference signal (RS) index $q\_{d}$ for the active DL BWP, as described in clause 12, of carrier $f$ of serving cell $c$- If the UE is not provided *PUSCH-PathlossReferenceRS* and *enableDefaultBeamPL-ForSRS*,or before the UE is provided dedicated higher layer parameters, the UE calculates  using a RS resource from an SS/PBCH block with same SS/PBCH block index as the one the UE uses to obtain *MIB*, or for a secondary cell where the UE does not obtain a *MIB*, using the SS/PBCH block the UE acquired the time and frequency synchronization for that cell.**7.2.1 for PUCCH:**- is a downlink pathloss estimate in dB calculated by the UE using RS resource index  as described in clause 7.1.1 for the active DL BWP  of carrier  of the primary cell  as described in clause 12- 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 an SS/PBCH block with same SS/PBCH block index as the one the UE uses to obtain *MIB*, or for a secondary cell where the UE does not obtain a *MIB*, using the SS/PBCH block the UE acquired the time and frequency synchronization for that cell. |

Companies’ views are welcome.

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| *Company* | *View* |
| Apple | Do not support any CR above |
| vivo | We don’t see the needs to change current spec. |
| Nokia, NSB | Alt 2-1. To us the two CRs are equivalent and we’d be OK with either of the two |
| CATT | We don’t support the CR.  |
| Samsung | For the clarification, we might need TP when Alt 1-2 is selected, not Alt 1-1. Among two TPs above, we slightly prefer later one which captures Scell UE operation only. |

### Q3: If Alt 2-1 for Q2 is to be captured in specification, which alternative CR below is preferred?

**Alt 3-1:** The CR in [2]. Any revisions are welcome.

**Alt 3-2:** The CR in [3]. Any revisions are welcome.

Companies’ views are welcome.

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| *Company* | *View* |
| Apple | No CR is needed |
| vivo | Neither is supported. |
| Nokia, NSB | We are OK with either one. |
| CATT | No CR is needed. |
| Samsung | Alt 3-2 as mentioned above |

### Q4: From which release is such change in Q3 applied?

**Alt 4-1:** from Rel-15

**Alt 4-2:** from Rel-16

**Alt 4-3:** fromother release

During the preparation phase, one company suggested that the CR was applied since Rel-16 rather than Rel-15.

Companies’ views are welcome.

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| *Company* | *View* |
| Apple | No CR is needed |
| vivo | None of them are supported. |
| Nokia, NSB | Technically this is a Rel-15 issue, but we’d be OK with any release, but initially thought that this issue is perhaps best addressed under the Rel-17 WI that allows for deactivating the SCG. |
| CATT | No CR is needed. |

## Issue#2: The association between SCell activation delay and the limited number of pathloss estimation for a UE.

### Q1: Whether the Proposal 2 in [3] is agreeable?

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| **Proposal 2: Clarify that as long as the maximum number of path loss estimates is not exceeded, a pathloss estimate relevant for an uplink transmission can always be considered as maintained at the time the UL transmission takes place.** |

Companies’ views are welcome.

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| *Company* | *View* |
| Apple | We do not know why this needs to be discussed. |
| vivo | We do not see the needs to discuss this issue, since how to maintain or estimate path loss is the UE implementation behavior. |
| Nokia, NSB | The issue is that RAN1 just says a path loss estimate is maintained, and now RAN4 is debating what “maintained” means, and when is a PL estimate considered as maintained. This underlines the need for this discussion when even other WGs in the same TSG debate the meaning of the specification. |
| CATT | This does not need to discuss again.  |
| Samsung | We do not think current spec requires UE to always track PL-RS on inactive SCell. But in our point of view, it’s no critical issue. The uncertainty in spec dose not bring a critical issue. Hence, we have a small concern on Proposal 2. |

### Q2: Whether the Proposal 3 in [3] is agreeable?

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| **Proposal 3: Indicate to RAN4 that for an SCell with UL configuration, the pathloss estimate is obtained during the cell synchronization procedure and it does not add to the SCell activation delay.** |

Companies’ views are welcome.

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| *Company* | *View* |
| Apple | No |
| vivo | We do not see the needs to discuss this issue. |
| Nokia, NSB | This is of course related to Q1 of issue#, and if nothing can be agreed, then LS is not needed. And conversely if we can agree to something, communicating this to RAN4 would be helpful. |
| CATT | No |
| Samsung | Similar view as the above for Q1. |

## Other Issues

Issues or comments that do not fit in any of the previous sections of this document can be provided here.

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# Phase II of Discussions

TBD

## [TBD] Draft CR for TS 38.213

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## [TBD] A LS to other WGs, if any

TBD

# Conclusions

TBD

# References

1. R1-2203112 Discussion on PL-RS configuration of SCells, Huawei, HiSilicon
2. R1-2203113 Corrections on PL-RS configuration, Huawei, HiSilicon
3. R1-2204821 On the PL-RS configuration of PUCCH SCell to be activated, Nokia, Nokia Shanghai Bell

# Appendix: