**[104b-e-NR-5GV2X-01] Email discussion on issue PP-2: Further clarification on reference RS used for pathloss derivation**

**Aspects on which serving cell is the reference cell for pathloss derivation**

**Aspects on beam failure case**

**till 4/15, with potential CRs till 4/19 – Hanbyul (LGE)**

## **1. 1st round discussion**

Q1: If a UE is configured with more than one cell, and if the UE is configured to monitor PDCCH for detection of DCI format 0\_0 in a serving cell where SL BWP is configured, which the RS resource that is used to derive DL pahtloss for SL power control?

* Option 1: The RS resource in a serving cell where SL BWP is configured
* Option 2: It is up to UE implementation that which serving cell is selected among the serving cells where the UE is configured to monitor PDCCH for detection of DCI format 0\_0
* Option 3: Others (Please specify it).

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| Company | Answer | Comment |
| LG | Option 1 |  |
| Vivo | Option 1 | Option1 is simple. If option2 is used, it means that gNB does not know which cell's DL pathloss is used for SL power control, and thus cannot coordinate the interference from SL to Uu. |
| Samsung |  | If a UE is configured with more than one cell, our understanding is that SL BWP can be configured only one of them. Is it correct understanding? If yes, we think that current spec is clear without further clarification. This means that the RS resource corresponds to cell where SL BWP is configured. |
| ASUSTeK | Option 1 |  |
| CATT, GOHIGH | Option 1 | Since only one SL BWP available, it is only associated with one serving cell. This is aligned with the agreement in RAN1#101e meeting. |
| Ericsson | Option 1 | It looks like the simple and straightforward solution. |
| Huawei,  HiSilicon | Option 2 | The reason to take the DL pathloss into account for controlling sidelink transmission power is to avoid interference on gNB. From this perspective, when SL BWP is configured in a shared carrier, neither Option 1 nor option 2 can avoid the interference completely, since relying on DL pathloss only, the power control is roughly, other parameters such as PHR for more precisely adjustment are not applicable for SL transmission.  On the other hand, SL BWP can be configured in the dedicated carrier, which is not related to a “serving cell”. Both cases should be considered uniformly on power control.  As it is late stage of Rel-16, any changes on spec need to be verified by necessity. Option 1 cannot handle the scenario quite properly, so option 2 is preferred considering without spec changes.  When there is one serving cell, the issue has been handled in 38.213, i.e., “*The RS resource is the one the UE uses for determining a power of a PUSCH transmission scheduled by a DCI format 0\_0 when the UE is configured to monitor PDCCH for detection of DCI format 0\_0*”.  When there is more than one serving cell, it is up to UE implementation to select one PL used for SL power control. |
| Intel | Option 1 | We don’t think that UE implementation is a good choice in this situation, since may potentially lead to uncontrolled level of interference in UL or adjacent carriers. |
| Qualcomm | Option 1 | As others mentioned, only one SL BWP is configured, therefore Option 1 is the simplest choice. We also share Samsung’s view that no spec change is needed. |
| Apple | Option 1 | This option is simple and straightforward. |
| OPPO | Option 1 | Agree with many companies comment that option 1 is simple way. |
| Sharp | Option 1 |  |
| ZTE, Sanechips | Option 1 |  |

Q2: If a UE is configured with more than one cell, and if the UE is not configured to monitor PDCCH for detection of DCI format 0\_0 in a serving cell where SL BWP is configured, which RS resource is used to derive DL pahtloss for SL power control?

* Option 1: The RS resource is the one the UE uses for determining a power of a PUSCH transmission scheduled by a DCI format 0\_0 in another serving cell when the UE is configured to monitor PDCCH for detection of DCI format 0\_0 in the serving cell.
* Option 2: The RS resource is the one corresponding to the SS/PBCH block the UE uses to obtain MIB when the UE is not configured to monitor PDCCH for detection of DCI format 0\_0
* Option 3: The RS resource is the one the UE uses for determining the power of a SRS transmission associated with the SRS resource set 0 on serving cell if the UE is configured with SRS resource set(s).
* Option 4: Others (Please specify it)

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| Company | Answer | Comment |
| LG | Option 4 | When SL BWP is configured in SCell, the UE could be configured to monitor PDCCH only for DCI format 0\_1 or DCI format 0\_2.  In this case, it can be considered that **the RS resource is the one the UE uses for determining a power of a PUSCH transmission scheduled by a DCI format 0\_1 or 0\_2 with assuming SRI field is not included** if the the UE is configured to monitor PDCCH for detection of DCI format 0\_1 or 0\_2 for the UL carrier where SL BWP is configured. |
| vivo | Option3 | If the SL BWP is configured on a Uu Scell without DCI format0-0, it means that the Scell must be cross-carrier scheduled by other cells and there is no control resource on that Scell. An example is given as the following figure    **Option1 still has the problem discussed in Q1** that there may be multiple cells configured with DCI format 0\_0 and it is still unclear which one to use.  **With option2**, SSB used for obtaining MIB is on Pcell which can be located on a band different from that of the Scell. It would be **difficult to provide appropriate SL power control** based on Pcell DL Pathloss on a different band.  Therefore, it is preferred to use an pathloss RS used by an UL transmission on the SL Scell for SL power control purposes. There are two cases  **Case1 If the Scell is an SRS only cell, i.e., no PUSCH TX on the Scell**  When the active DL bandwidth/BWP is larger than active UL bandwidth/BWP, the UE may only transmit PUSCH on active UL BWP of some cells, but it still needs to send SRS across the whole bandwidth/BWP for CSI measurement (SRS carrier switching). Although there are UL resources configured on the Scell for SL, the scell can be an SRS-only cell without PUSCH TX. In this case, **pathloss RS used for TX power determination of a SRS on the Scell with SL BWP is used for SL power control, option3 should be supported**.  **Case2 If the Scell allows PUSCH TX**  If PUSCH TX is allowed on the scell, in addition to the pathloss RS for SRS on the Scell, a RS used for power control of PUSCH scheduled by DCI format 0\_1 and DCI 0\_2 can be considered for SL power control, as commented by LG.  So, at least when handling the SL power of SL on an SRS only cell, option3 should be used, while for case2, we are open to either option3 or option4 proposed by LG. |
| Samsung |  | As we commented in Q1, at first we want to make clear that whether SL BWP can be configured for multiple cells at the same time or not. Our understanding is that it is not. If SL BWP can configured only one of cells, we think that current spec is clear without further clarification. |
| ASUSTeK | At least  Option 2 | There seems two scenarios in Q2:   * if UE is configured to monitor PDCCH for detection of DCI format, except DCI format 0\_0, for a serving cell where SL BWP is configured, option 2 shall be adopted as agreed in RAN1 #101-E. * if UE is not configured to monitor PDCCH for a serving cell where SL BWP is configured (as vivo’s Figure), option 3 or option 2 can be considered. |
| CATT, GOHIGH | Option 2 | Since there is only one SL BWP which is associated with one serving cell with MIB. We share the similar view as Samsung, the current spec is clear and aligned with RAN1#101e agreements. No need to further discuss this issue. |
| Ericsson | Option 2 | This option is the closest solution to the current agreements. |
| Huawei, HiSilicon | Option 4 | If a UE is indicated/configured for UL transmission, either DCI format 0\_0 or 0\_1 or 0\_2 is configured for monitoring. If DCI format 0\_0 is not configured, the RS resources for determining the power of a PUSCH scheduled by UL DCI format 0\_1/0\_2 is used. If no uplink grant would be scheduled, the RS resource corresponding to SSB is used. This is already clearly captured in TS38.213, section 16.2.1, where “c” is a serving cell, no other updates are needed.   |  | | --- | | as described in Clause 7.1.1 except that  - the RS resource is the one the UE uses for determining a power of a PUSCH transmission scheduled by a DCI format 0\_0 when the UE is configured to monitor PDCCH for detection of DCI format 0\_0  - the RS resource is the one corresponding to the SS/PBCH block the UE uses to obtain MIB when the UE is not configured to monitor PDCCH for detection of DCI format 0\_0 | |
| Intel | Option 2 | All the options could work, but we select the one which looks simpler |
| Qualcomm |  | This case is already captured in specifications and no change is necessary. |
| Apple | Option 2 | If the UE is not configured to monitor PDCCH for detection of DCI format 0\_0, then the RS resource corresponding to SSB is used. |
| OPPO | Option 2 | It is straight forward to use SSB to derive DL PL if the UE is not configured to monitor PDCCH for detection of DCI format 0\_0 in a serving cell where SL BWP is configured |
| Sharp | Option 2 |  |
| ZTE, Sanechips | Option 2 | A unified solution to accommodate various scenarios |

Q3: When Uu-interface beam failure recovery procedure or T310 is running, which RS resource is used to derive DL pahtloss for SL power control?

* Option 1: The RS resource is the one corresponding to the SS/PBCH block the UE uses to obtain MIB when the UE is not configured to monitor PDCCH for detection of DCI format 0\_0
* Option 2: The RS resource used for deriving DL pathloss is kept before T310 is running
* Option 3: Others (Please specify it)

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| Company | Answer | Comment |
| LG | Option 2 | In our understanding, the purpose of SL power control based on DL pathloss is to minimize interference to gNB.  Even though the RS resource is kept after beam failure, it would not further increase interference to gNB. |
| Samsung |  | If we consider Uu operation for link recovery procedures, RS resource for power control is defined only for PUCCH. Since SL power control follows the power of a PUSCH transmission, we think that we do not need to define RS resource for the case in Q3. We think that that this is aligned with Option 2 but further clarification of spec seems not necessary. |
| ASUSTeK | Option 1 | In case of Uu-interface L1 problems happens, DL pathloss derived from DL RS for DCI format 0\_0-based PUSCH will increase, which induces enlarged sidelink power upper bound. It would increase interference to gNB, e.g. interference via candidate beam. In Uu link recovery procedure, power control for recovery request is based on DL RS *qnew*, since UE transmission can convey to network via candidate beam. From our aspect, for a UE configured to monitor PDCCH for detection of DCI format 0\_0, simple way during Uu-interface L1 problems is fall back to use SS/PBCH block that the UE can use to obtain MIB. |
| Ericsson | Option 2 | This solution gives a more up-to-date result |
| Huawei,  HiSilicon | Option1 | When Uu-interface beam failure recovery procedure or T310 is running, the SS/PBCH block is still achievable for a UE, the UE can use the RS resource corresponding to SS/PBCH block. Just explained in Q2, the description has been specified in 38.213 section 16.2.1, i.e.,’ *the RS resource is the one corresponding to the SS/PBCH block the UE uses to obtain MIB when the UE is not configured to monitor PDCCH for detection of DCI format 0\_0*’.  Further discussion is not needed. |
| Intel | Option 1 | To align with Q2 option |
| Qualcomm |  | One option could optimize performance compared to another in some cases. However, we think that specification (Option 2) already covers this case and no change to optimize performance is needed at this stage. |
| Apple | Option 1 |  |
| OPPO | Option 1 | Derive DL PL based on SSB in some exceptional case can be seen as fallback solution. |
| Sharp | Option 1 |  |
| ZTE, Sanechips | Option 1 | Due to the answer to Q3 |
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Q4: Is there any other issue to discuss under the scope of this email thread?

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## **2. 2nd round discussion**

Q1: Do you agree following proposal?

Proposal 1:

* If a UE is configured with more than one serving cell, and
* if the UE is configured to monitor PDCCH for detection of DCI format 0\_0 in the serving cell where SL BWP is configured,
  + UE uses the RS resource in the serving cell where SL BWP is configured for DL pathloss derivation.

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| Company | Answer | Comment |
| LG | Yes | Among multiple aggregated cells with monitoring DCI format 0\_0, the UE can select one cell associated with the SL operation to derive DL pathloss. |
| ZTE, Sanechips | Yes |  |
| vivo | Fine in general | Q1 is to clarify on which cell a PL RS of a PUSCH scheduled by a DCI format 0-0 is used for SL power control, so this sub-bullet was intended to indicate the PL RS that is on the serving cell with SL and is used to determine DL pathloss for a PUSCH scheduled by DCI format 0-0 on that serving cell, right? if our understanding is correct, we would like to suggest a slight modification as follows.  Proposal 1:   * If a UE is configured with more than one serving cell, and * if the UE is configured to monitor PDCCH for detection of DCI format 0\_0 in the serving cell where SL BWP is configured,   + UE uses the RS resource that is in the serving cell where SL BWP is configured and is used for DL pathloss derivation for a PUSCH scheduled by a DCI format 0-0 on the same serving cell for DL pathloss derivation for SL power control purposes. |
| NTT DOCOMO | Yes |  |
| Huawei, HiSilicon | No | We understand the scenario that multiple serving cells can be configured to for monitoring DCI format 0\_0 and UE has to pick one to calculate DL pathloss based on the RS resource on that cell. Our concern is even the resources from the cell configured with SL BWP, the interference on Uu cannot be avoided completely. Thus, to let UE decide the RS resource from which serving cell are used can optimize the power control by UE implementation and also have no spec changes needed. |
| Apple | Yes |  |
| Qualcomm | Please see comment. | This proposal is already captured in specifications in our understanding and no change is needed. |
| Ericsson | Yes |  |
| OPPO | Yes |  |
| Sharp | Yes |  |
| Samsung |  | We share the view with QC. The current spec is clear to support the proposal in our understanding. |
| CATT, GOHIGH | Yes |  |
| NEC | Yes | Clarification on exact RS used is necessary |
| ASUSTeK | Yes |  |

Q2: Do you agree following proposal?

Proposal 2:

* If a UE is configured with more than one serving cell, and
* if the UE is not configured to monitor PDCCH for detection of DCI format 0\_0 in the serving cell where SL BWP is configured,
  + UE uses the RS resource corresponding to the SS/PBCH block the UE uses to obtain MIB.

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| Company | Answer | Comment |
| LG | Accept | Frankly speaking, when we consider inter-site CA or inter-FR CA, the DL pathloss estimated based on SS/PBCH in PCell may or may not be valid for SCell where SL BWP is configured. But, in the perspective of essential correction, we are fine with this kind of simple approach. |
| ZTE, Sanechips | Yes |  |
| vivo | disagree | The SSB used by UE to obtain MIB must be located on Pcell, while the cell configured with SL BWP can be either on Pcell or scell. if the SL BWP is on scell, using the SSB of Pcell will incur inaccurate SL power control;  We are fine to use SSB used for obtaining MIB for DL PL derivation if the SL BWP is configured on Pcell, **but for the case where SL is on a Scell, the above proposal will bring serious interference to Uu operation on Scell.** As option3 and option4 discussed in the first round input can avoid this issue, both options should be considered.  Proposal 2:   * If a UE is configured with more than one serving cell, and * if the UE is not configured to monitor PDCCH for detection of DCI format 0\_0 in the serving cell where SL BWP is configured,   + UE uses the RS resource corresponding to the SS/PBCH block the UE uses to obtain MIB if the serving cell is P(S)cell,   + otherwise     - option4 is considered if UE is configured to monitor DCI format 0-1/DCI format 0-2 for scheduling the serving cell, or option3 is considered |
| NTT DOCOMO | Accept | As some companies pointed out, this mechanism might be problematic in inter-site/inter-band/inter-FR CA. But considering current phase, this proposal will be OK. |
| Huawei | No | First of all, it is necessary to clarify whether the case will happen that multiple serving cells are configured to monitor DCI format 0\_0 and none of them are configured with SL BWP (i.e. SL transmission ouccur only on the dedicated carrier)? If this can happen, the RS resource on which cell are used for derive DL pathloss?  Second, in our understanding, if the UE is not configured to monitor PDCCH for detection of DCI format 0\_0, the UE also can be configured to monitor DCI format 0\_1 or 0\_2 for UL transmission. In this regard, the PL used for PUSCH transmission scheduled by other UL DCI formats can be still used for SL power control. If DCI format 0\_0 is not configured, the cells configured with DCI format 0\_1 or 0\_2 can be selected. |
| Apple | Yes | It is aligned with agreements in RAN1 #101-e meeting. |
| Qualcomm | Please see comment | This is already the case in 16.2 of 38.213 and no change is needed in our understanding.  - the RS resource is the one corresponding to the SS/PBCH block the UE uses to obtain MIB when the UE is not configured to monitor PDCCH for detection of DCI format 0\_0 |
| Ericsson | Yes |  |
| OPPO | Yes |  |
| Sharp | Yes |  |
| Samsung |  | We share the view with QC. The current spec is clear to support the proposal in our understanding. |
| CATT, GOHIGH | Yes |  |
| NEC | Yes |  |
| ASUSTeK | Yes |  |

Q3: Do you agree following proposal?

Proposal 3:

* if the UE is performing link recovery procedure or running T310 on the serving cell c where SL BWP is configured,
  + UE uses the RS resource corresponding to the SS/PBCH block the UE uses to obtain MIB.

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| Company | Answer | Comment |
| LG | No | First of all, it is not an essential correction part of the spec.  Second, in RAN1 specification perspective, it is very unclear the meaning of “T310 is running” where T310 is defined in RAN2 spec, and “UE is performing link recovery procedure”.  To be specific, in link recovery procedure, UE may test RS in failureDetectionResources and/or candidateBeamRSList. Or, a UE may monitor PDCCH in search space with recoverySearchSpaceId.  The UE may transmit PRACH for BFR. The UE may transmit PUCCH based on q\_new or BFR MAC CE on PUSCH.  If we really want to follow link recovery procedure, SL transmission may need to use q\_new rather than SS/PBCH in PCell to derive DL pathloss. In this case, we also need to update the above second proposal to use RS associated with PUSCH scheduled by non-fallback DCI (for both self-carrier and cross-carrier scheduling) rather than SS/PBCH in PCell. |
| ZTE, Sanechips | Yes |  |
| vivo | Not needed | UE may have left the beam of the SSB used to acquire the MIB in the access procedure when BF/RLF occurs, thus using DL pathloss based on this SSB may result in higher interference to Uu. It may be more appropriate to keep the RS used to derive the DL pathloss before the BF or RLF, or to use the new detected RS associated with BFR /RLF triggered RACH.  On the other hand, as mentioned by some companies, if the quality of the SSB used to obtain the MIB is still stable, then there is no harm to use the SSB.  Using the previously used DL RS or using SSB can be applicable for different situations and which method to use can be up to UE without modifying the specification. |
| NTT DOCOMO | Not needed | We do not think this is essential correction. Previous RS still can be used even in this case. |
| Huawei | Yes | It is feasible to use the RS resource corresponding to the SSBto measure the PL for SL power control. |
| Apple | Yes |  |
| Qualcomm | No | UE behavior is already defined in specifications. This change is an optimization to that process for a specific event and is not an essential correction. |
| Ericsson | No | In our view, having the RS used just before the RLF is probably the most up to date solution. Nevertheless, in some cases using the SSB used to gather the MIB could be also a feasible solution |
| OPPO | Yes |  |
| Sharp | Yes |  |
| Samsung | No | This is not a critical issue. We do not need to specify UE behavior for this case since Uu also does not specify the UE behavior for the PL for PUSCH and SRS power control for link recovery procedures |
| CATT, GOHIGH | No | We also think this is not a critical issue. |
| NEC | Yes |  |
| ASUSTeK | Yes | In case of such Uu-interface L1 problems, DL pathloss derived from DL RS for DCI format 0\_0-based PUSCH seems not feasible. Use SS/PBCH block is simple fallback solution, rather than other enhancements. |

## **3. 3rd round discussion**

Proposal 1:

* If a UE is configured with more than one serving cell, and
* if the UE is configured to monitor PDCCH for detection of DCI format 0\_0 in the serving cell where SL BWP is configured,
  + UE uses the RS resource in the serving cell where SL BWP is configured for DL pathloss derivation.

Proposal 2:

* If a UE is configured with more than one serving cell, and
* if the UE is not configured to monitor PDCCH for detection of DCI format 0\_0 in the serving cell where SL BWP is configured,
  + UE uses the RS resource corresponding to the SS/PBCH block the UE uses to obtain MIB.

Proposal 3:

* No spec update is needed for the UE behaviour in sidelink power control when the UE is performing link recovery procedure or running T310 on the serving cell c where SL BWP is configured.