**3GPP TSG RAN WG1 #110-bis-e R1-22abcd**

**e-Meeting, October 10th – October 19th, 2022**

**Source: Moderator (Nokia)**

**Title: Feature Lead Summary #1 for Maintenance of multipath/NLOS mitigation**

**Agenda item:** **8.5**

**Document for:**  **Discussion and Decision**

# Introduction

In the WID, [1], for ePos the following objective was added at RAN#91 and was completed:

* Study and specify, if agreed, the enhancements of information reporting from UE and gNB for multipath/NLOS mitigation [RAN1, RAN2, RAN3]

In this contribution, we provide a summary of the maintenance for information reporting from UE and gNB for multipath/NLOS mitigation proposed by companies in contributions [2]-[5] and summarized in [6]. We also make some initial proposals to facilitate RAN1 discussion. This document also provides the summary of the following email discussion in RAN1#110-bis-e:

[110bis-e-R17-ePos-05] Email discussion for maintenance on enhancements of information reporting from UE and gNB for multipath/NLOS mitigation for issues 4-2, and for issues 4-1 and 4-3 as recommendation for editor’s alignment CR, in R1-2210266 – Ryan (Nokia)

* Check points: October 14, October 19

Issues for discussion

## Issue #4-2: RSRPP and RSTD measurement

The issue and proposals raised in [4] are:

* **Proposal 1**: When, as part of DL-TDOA, the UE reports both RSTD and RSRPP measurements it should use the same detected paths for both measurements in the reporting.
* **Proposal 2**: When, as part of Multi-RTT, the UE reports both UE Rx-Tx time difference and RSRPP measurements it should use the same detected paths for both measurements in the reporting.
* **Proposal 3**: Agree to the CR in R1-2208732.

As such it may be easiest to discuss the draft CR to TS 38.214 from [3] directly which is copied here:

<omitted text>

#### 5.1.6.5 PRS reception procedure

<omitted text>

The UE may be configured to measure and report, subject to UE capability, up to 24 DL PRS-RSRP measurements on different DL PRS resources associated with the same *dl-PRS-ID*. When the UE reports DL PRS-RSRP measurements from one DL PRS resource set, the UE may indicate which DL PRS-RSRP measurements associated with the same higher layer parameter *nr-DL-PRS-RxBeamIndex* [17, TS 37.355] have been performed using the same spatial domain filter for reception if for each *nr-DL-PRS-RxBeamIndex* reported there are at least 2 DL PRS-RSRP measurements associated with it within the DL PRS resource set. The UE may be configured to measure and optionally report via higher layer signaling *nr-DL-PRS-FirstPathRSRP-Result*, subject to UE capability, up to 24 DL PRS RSRPP for the first detected path on different DL PRS resources associated with the same *dl-PRS-ID*.

When the UE is configured to report both PRS RSTD and PRS RSRPP measurements as part of the same higher layer parameter *NR-DL-TDOA-SignalMeasurementInformation* the same detected paths for both PRS RSTD and PRS RSRPP measurements should be used in the reporting.

When the UE is configured to report both UE Rx-Tx and PRS RSRPP measurements as part of the same higher layer parameter *NR-Multi-RTT-SignalMeasurementInformation*, the same detected paths for both UE Rx-Tx and PRS RSRPP measurements should be used in the reporting.

<omitted text>

### Round #1 Discussion

**Proposal 4.2-A**

Endorse the draft CR in R1-2208732.

Companies views:

|  |  |
| --- | --- |
| Company Name | Comments |
| Qualcomm | We don’t see there is really a confusion.  37.355 in the description of the nr-DL-PRS-RSRPP it says:  ***nr-DL-PRS-RSRPP***  This field specifies the DL PRS reference signal received path power (DL PRS-RSRPP) of the *NR-AdditionalPath* reported, as defined in TS 38.215 [36]. The mapping of the quantity is defined as in TS 38.133 [46].  Also, the same timestamp is used for both the reported timing measurement (e.g. nr-RelativeTimeDifference-r16) and the RSRPP. |
| Nokia/NSB | We support the CR and feel it is essential.  To QC, The spec text in LPP that you refer to points to the definition of the measurement where nothing implies that the paths needs to be selected the same for RSTD and RSRPP. In fact there is nothing in the RSTD measurement which says “first path”.  In addition, taking DL-TDOA as an example for the first path there is nothing to clarify that the first path should be the same for both RSTD and RSRPP:  NR-DL-TDOA-MeasElement-r16 ::= SEQUENCE {  dl-PRS-ID-r16 INTEGER (0..255),  nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL,  nr-CellGlobalID-r16 NCGI-r15 OPTIONAL,  nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL,  nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16 OPTIONAL,  nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,  nr-TimeStamp-r16 NR-TimeStamp-r16,  nr-RSTD-r16 CHOICE {  k0-r16 INTEGER (0..1970049),  k1-r16 INTEGER (0..985025),  k2-r16 INTEGER (0..492513),  k3-r16 INTEGER (0..246257),  k4-r16 INTEGER (0..123129),  k5-r16 INTEGER (0..61565),  ...  },  nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,  nr-TimingQuality-r16 NR-TimingQuality-r16,  nr-DL-PRS-RSRP-Result-r16 INTEGER (0..126) OPTIONAL,  nr-DL-TDOA-AdditionalMeasurements-r16  NR-DL-TDOA-AdditionalMeasurements-r16 OPTIONAL,  ...,  [[  nr-UE-Rx-TEG-ID-r17 INTEGER (0..maxNumOfRxTEGs-1-r17) OPTIONAL,  nr-DL-PRS-FirstPathRSRP-Result-r17 INTEGER (0..126) OPTIONAL,  nr-los-nlos-Indicator-r17 LOS-NLOS-Indicator-r17 OPTIONAL,  nr-AdditionalPathListExt-r17 NR-AdditionalPathListExt-r17 OPTIONAL,  nr-DL-TDOA-AdditionalMeasurementsExt-r17  NR-DL-TDOA-AdditionalMeasurementsExt-r17 OPTIONAL  ]]  We feel that a good UE implementation will align the paths between the measurements but there is nothing specified that says they must. So the LMF can’t trust that all UEs will follow this decision so that is why we propose this CR. |
| Huawei, HiSilicon | We have a similar feeling to Qualcomm. The attempt to clarify this would imply an alternative interpretation, which does not exist to our understanding.  For the main measurement, according to TS 38.215, timing and power corresponds to the “first path”, and based on LPP, those measurement of the first path is from a DL PRS associated with a UE Rx TEG. Is there any possibility that this “first path” will be a different path on timing and power? Can Nokia provide some example?  For the additional measurement, timing and power corresponds to the “first path” measured from a different PRS or associated with the different UE Rx TEG than the first measurement. Is there any possibility that they can be different paths?  For the addition path measurement for both main measurement and additional measurement, as Qualcomm explained, it should be common understanding that the power and timing will be associated with the same path.  In the RSRPP definition from TS 38.215, the path delay is anyway needed, with the ToA information already mandatorily reported (obtained for RSTD/UE Rx – Tx time difference) for the first path and additional paths for DL-TDOA and Multi-RTT, we still feel the likelihood that UE will use a different ToA for the RSRPP calculation than the ToA used for RSTD/UE Rx – Tx time difference measurement. |
| vivo | We share the same understanding with Qualcomm and Huawei |

## Editorial Issue #4-1: LOS/NLOS Indicator Details

In [2] the issue of LOS/NLOS indicators is discussed and it is proposed that there is a current misunderstanding of the higher layer parameters parameter *nr-los-nlos-IndicatorRequest* and *LOS-NLOS-Indicator* in 38.214.

The draft CR is copied here:

#### 5.1.6.5 PRS reception procedure

**<Unchanged parts omitted>**

The UE may be requested via higher layer parameter *nr-los-nlos-IndicatorRequest*, subject to UE capability, to report LoS/NLoS indicator(s). The UE can report LoS/NLoS indicator(s) via higher layer parameter *nr-los-nlos-Indicator* associated with each DL RSTD, DL PRS-RSRP, and UE Rx-Tx time difference measurements. The UE can report LoS/NLoS indicator(s) via higher layer parameter *nr-los-nlos-Indicator* associated with each *dl-PRS-ID* in a measurement report. For the LoS/NLoS indicator(s) associated with DL RSTD, the UE may report one indicator associated with the *dl-PRS-ID* indicated by higher layer parameter *dl-PRS-ReferenceInfo* and one indicator associated with the *dl-PRS-ID* of the DL RSTD measurement. A UE may be provided with LoS/NLoS indicator(s) via higher layer parameter *nr-los-nlos-Indicator*, and it may be associated with each DL PRS resource of each configured *dl-PRS-ID* or may be associated with each configured *dl-PRS-ID*. The value of the higher layer parameter *LOS-NLOS-Indicator* may be one of soft values (0, 0.1, …, 0.9, 1) or one of hard values (0, 1) with the values corresponding to the likelihood of LoS, with a value of 1 corresponding to LoS and a value of 0 corresponding to NLoS.

**<Unchanged parts omitted>**

### Round #1 Discussion

**Proposal 4.1-A**

Endorse in principle the draft CR in R1-2208603 as an editorial CR.

Companies views:

|  |  |
| --- | --- |
| Company Name | Comments |
| Qualcomm | OK for editorial CR |
| Nokia/NSB | We don’t support this as we don’t feel it is essential or really needed as editorial. |
| Huawei, HiSilicon | We do not see any confusion in the spec.  For the first change, there should be no mistake to interpret the parameter wrongly, because the following text is explaining another parameter for the report.  For the remaining changes, it should be common understanding that only one value from the list will be provided. |
| vivo | We agree with the editor CR, it is no harm to make it more align with our common understanding especially consider other readers. |

## Editorial Issue #4-3: Alginment on RSRPP parameters

In [5] it is noted that some higher layer parameters are still bracketed in the latest version of the spec. It is proposed to remove those brackets as shown in the draft CR below.

#### 5.1.6.5 PRS reception procedure

<Unrelated part omitted>

The UE may be configured to optionally report a differential DL RSRPP for a PRS resource with reference to *nr-DL-PRS-FirstPathRSRP-Result* and/or a differential DL PRS RSRP with reference to *nr-DL-PRS-RSRP-Result* via higher layer parameter *NR-DL-AoD-AdditionalMeasurementElement*.

<Unrelated part omitted>

### Round #1 Discussion

**Proposal 4.3-A**

Endorse in principle the draft CR in R1-2209458 and send to the editor as part of alignment CR.

Companies views:

|  |  |
| --- | --- |
| Company Name | Comments |
| Qualcomm | OK |
| Nokia/NSB | Support |
| Huawei, HiSilicon | Support. |
| vivo | Support |

Conclusion

In this contribution, we provided a review of the submitted contributions for NR Positioning on maintenance of information reporting from UE and gNB for multipath/NLOS mitigation and prepared an initial set of proposals to facilitate further discussion/decision by RAN1 during the RAN1#110-bis–e meeting.

Outcome (if any):

To be updated

References

1. RP-210903, Revised WID on NR Positioning Enhancements, CATT, Intel Corporation, Ericsson.
2. R1-2208603, Correction on description of LoS/NLoS indicator, vivo.
3. R1-2208732 , Correction on PRS RSTD and PRS RSRPP reporting, Nokia, Nokia Shanghai Bell.
4. R1-2208731, Maintenance of NR Positioning Enhancements, Nokia, Nokia Shanghai Bell.
5. R1-2209458, Alignment CR on positioning for 38.214, ZTE.
6. R1-2210266, Summary for preparation phase on maintenance of Rel-17 WI on NR positioning enhancements, Moderator (CATT).