3GPP TSG RAN WG1 #101 R1- 200xxxx

**e-Meeting** **2, 25th May – 5th June 2020**

Source: Moderator (CATT)

Title: FL Summary of Remaining issues on NR Positioning Measurements

Agenda Item: 7.2.8.3

Document for: Discussion and Decision

# Introduction

This document provides a summary of the remaining issues and proposals for AI 7.2.8.3 related to UE and gNB measurements for NR Positioning based on the contributions submitted under this AI [1-9]. According to the guidance of RAN1 Chairman, the intention of this summary is to identiy a list of critical issues/proposals for further email discussion in RAN1#101. To facilitate the discussion, the issues/proposals from the submitted contributions and the FL views are presented in Section 2. The summary of the issues/proposals is provided in Section 3, where the feature lead has also provided his assessment on the critical issues/proposals. Interested companies are welcome to present their views on the priority of these issues.

Issues/proposals for UE/gNB measurements

## Additional path

Background

It was pointed out by vivo [1] that additional path for time-based measurement is agreed in RAN2 and captured in the IE ‘NR-DL-TDOA-MeasElement-r16’ and ‘NR-Multi-RTT-MeasElement-r16’ as below in the latest TS 37.355. However, no agreements related to *NR-AdditionalPath* have been achieved by RAN1 in Rel-16 WI..

|  |
| --- |
| NR-DL-TDOA-MeasElement-r16 ::= SEQUENCE { trp-ID-r16 TRP-ID-r16 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 INTEGER (0..ffs), -- FFS on the value range nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL, nr-TimingMeasQuality-r16 NR-TimingMeasQuality-r16, nr-PRS-RSRP-Result-r16 INTEGER (FFS) OPTIONAL, -- FFS, value range to be decided in RAN4. nr-DL-TDOA-AdditionalMeasurements-r16 NR-DL-TDOA-AdditionalMeasurements-r16, ...} |
| NR-Multi-RTT-MeasElement-r16 ::= SEQUENCE { trp-ID-r16 TRP-ID-r16 OPTIONAL, nr-DL-PRS-ResourceId-r16 NR-DL-PRS-ResourceId-r16 OPTIONAL, nr-DL-PRS-ResourceSetId-r16 NR-DL-PRS-ResourceSetId-r16 OPTIONAL, nr-UE-RxTxTimeDiff-r16 INTEGER (0..ffs) OPTIONAL, -- FFS on the value range to be decided in RAN4 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL, nr-TimeStamp-r16 NR-TimeStamp-r16, nr-TimingMeasQuality-r16 NR-TimingMeasQuality-r16, nr-PRS-RSRP-Result-r16 INTEGER (FFS) OPTIONAL, -- FFS, value range to be decided in RAN4. nr-Multi-RTT-AdditionalMeasurements-r16 NR-Multi-RTT-AdditionalMeasurements-r16, ...} |

Submitted Proposals

* (vivo) ***Proposal 1:***

***Capture the descriptions related to ‘NR-AdditionalPath’ into TS38.214.***

* (vivo) ***Proposal 2:***

***Capture UE capability of additional path report for NR DL-TDOA positioning and NR Multi-RTT positioning.***

* (vivo) ***Proposal 3:***

***Adopt the following text proposals into TS 38.214 for the description of additional path.***

|  |
| --- |
| *TS 38.214**5.1.6.5 PRS reception procedures*< Unchanged parts are omitted >The UE may be configured to measure and report, subject to UE capability, up to 4 DL RSTD measurements per pair of cells with each measurement between a different pair of DL PRS resources or DL PRS resource sets within the DL PRS configured for those cells. The up to 4 measurements being performed on the same pair of cells and all DL RSTD measurements in the same report use a single reference timing. The UE may be configured to measure and report, subject to UE capability, up to 8 DL PRS RSRP measurements on different DL PRS resources from the same cell. When the UE reports DL PRS RSRP measurements from one DL PRS resource set, the UE may indicate which DL PRS RSRP measurements have been performed using the same spatial domain filter for reception.The UE may be configured to measure and report, subject to UE capability, up to 4 UE Rx-Tx time difference measurements corresponding to a single configured SRS resource or resource set for positioning. Each measurement corresponds to a single received DL PRS resource or resource set which can be in different positioning frequency layers.The UE may be configured to measure and report, subject to UE capability, up to 2 additional detected path timing values relative to the path timing in association to each TOA measurement used to determine each RSTD measurement or RX-TX time difference measurement. The UE may also be configured to report quality metrics corresponding to each additional detected path.< Unchanged parts are omitted > |

FL Comments

Suggest having a discussion on the impact of RAN2’s decision of introducing *nr-AdditionalPath* in RSTD and Rx-Tx time difference measurements on RAN1’s specs. In addition, RAN2 is currently discussing the reference for additional path reporting, which may also have potential impact on RAN1’s work.

Comments from interested companies

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| --- | --- |
| **Company** | **Comments**  |
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## Reference of time stamp nr-TimeStamp-r16

Background

***Agreement (***RAN1#99]

*A UE measurement can be associated with a time stamp. For UE RSTD, DL PRS RSRP and UE Rx-Tx time difference measurement report, the time stamp can include the SFN, as well as the slot number for a subcarrier spacing. These values correspond to the reference provided by the DL-PRS-RstdReferenceInfo.*

Based on above agreement, it was proposed by ZTE [2] to make a clarification on the time reference *nr-TimeStamp-r16.*

Submitted Proposals

* (ZTE) ***Proposal 1:***

***To have a clear reference to determine time stamp, we propose to have following text changes.***

========================TS 38.214 clause 5.1.6.5 unchanged parts omitted======================

For the DL RSTD, DL PRS-RSRP, and UE Rx-Tx time difference measurements the UE can report an associated higher layer parameter *nr-TimeStamp-r16*. The *nr-TimeStamp-r16* can include the SFN and the slot number for a subcarrier spacing. These values correspond to the reference which is provided by *nr-DL-PRS-ReferenceInfo-r16* in *nr-DL-PRS-AssistanceData-r16* orreported *by nr-DL-PRS-ReferenceInfo-r16* in *nr-DL-TDOA-SignalMeasurementInformation-r16* if the UE chooses to use a different reference than indicated by the network.

================================unchanged parts omitted================================

FL Comments

*nr-DL-PRS-ReferenceInfo-r16* is an optional parameter in *nr-DL-PRS-AssistanceData-r16*. Thus, *nr-TimeStamp-r16* may not lways be based on *nr-DL-PRS-ReferenceInfo-r16.* On the other hand, *dl-PRS-ReferenceInfo-r16* is an mandadary parameter in in *nr-DL-TDOA-SignalMeasurementInformation-r16.*

Suggest having a discussion for this clarification.

Comments from interested companies

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| **Company** | **Comments**  |
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## UL RTOA reference time

Background

In RAN1#100bis, RAN1 sends an LS (R1-2003054) to RAN3 to evaluate the agreement made in RAN1 with respect to the RTOA reference time, and let RAN3 evaluate the feasibility and provide feedback on whether they plan to capture that definition in RAN3 spec.

Submitted Proposals

* (Huawei) ***Proposal 1:***
	+ *In case RAN3 decide that the RTOA reference time definition is feasible and that RAN3 are not planning to capture the definition in RAN3 specification, endorse the following TP to TS 38.215:*

|  |  |  |
| --- | --- | --- |
| ===================== Unchanged parts omitted ======================**2 References**===================== Unchanged parts omitted ======================[xx] 3GPP TS 38.455: "NG-RAN; NR Positioning Protocol A (NRPPa)"===================== Unchanged parts omitted ======================**5.2.2 UL Relative Time of Arrival (TUL-RTOA)**

|  |  |
| --- | --- |
| **Definition** | The UL Relative Time of Arrival (TUL-RTOA) is the beginning of subframe *i* containing SRS received in positioning node *j*, relative to the RTOA Reference Time.The UL RTOA reference time is defined as , where- is the nominal beginning time of SFN 0 provided by [yy] [xx, TS 38.455]- , where and are the system frame number and the subframe number of the SRS, respectively.Multiple SRS resources for positioning can be used to determine the beginning of one subframe containing SRS received at a positioning node.The reference point for TUL-RTOA shall be:- for type 1-C base station TS 38.104 [9]: the Rx antenna connector,- for type 1-O or 2-O base station TS 38.104 [9]: the Rx antenna (i.e. the centre location of the radiating region of the Rx antenna),- for type 1-H base station TS 38.104 [9]: the Rx Transceiver Array Boundary connector. |

 |

FL Comments

Suggest interested companies to check whether “RAN3 decide that the RTOA reference time definition is feasible and that RAN3 are not planning to capture the definition in RAN3 specification”. If that is the case, suggest resoving this issue in this RAN1 meeting.

Comments from interested companies

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| --- | --- |
| **Company** | **Comments**  |
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## Search window for SRS reception

Background

In LTE, E-SMLC may provide search window information to the LMU via the SLmAP (TS 36.459), which may be used by the LMU for configuring its receiver for performing UL RTOA measurements. Similarly, in NR LMF may provide search window information to the TRP.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Search Window Parameters | O |  |  |  |
| >Expected Propagation Delay | O |  | INTEGER (1..1200,…) | UL RTOA expected propagation delay as defined in TS 36.111 [9]. |
| >Delay Uncertainty | O |  | INTEGER (1..100,…) | The uncertainty of the propagation delay.Mapping is included in TS 36.111 [9]. |

Submitted Proposals

* (Huawei) ***Proposal 2:***

*Introduce the following new parameters to the higher layer parameter list.*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR\_pos-Core | NR UL Measurement Report Configuration | 　 | 　 | FFS in RAN3 WG | Expected Propagation Delay | Expected Propagation Delay | New | 　 | For providing an indication of when the SRS is expected to arrive in time at the gNB relative to the UL-RTOA reference time. | +/- 500usDetailed granularity: FFS in RAN4 WG |  |  |  | NRPPa 38.455 | Similar to expected propagation delay in SLmAP. |
| NR\_pos-Core | NR UL Measurement Report Configuration |  |  | FFS in RAN3 WG | Delay Uncertainty | Delay Uncertainty | New |  | For providing an indication of when the SRS is expected to arrive in time at the gNB with uncertainty (search window). | Maximum 32usDetailed granularity: FFS in RAN4 WG |  |  |  | NRPPa 38.455 | Similar to delay uncertainty in SLmAP. |

* (CATT) ***Proposal 3:***
* Support LMF to provide the estimated UE position and uncertainty associated with the estimated UE position to TRP for aiding the TRP to measure RTOA and AOA.
* Send an LS to RAN3 if the proposal is agreed
	+ Note: The details of the IE parameters can be determined by RAN3, e.g., expressed as an ellipsoid point with altitude and uncertainty as shown in the following table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| Latitude Sign | M |  | ENUMERATED (North, South) |  |
| Degrees Of Latitude | M |  | INTEGER(0..223-1) | The IE value (N) is derived by this formula:N223 X /90  N+1X being the latitude in degrees (0°.. 90°). |
| Degrees Of Longitude | M |  | INTEGER(-223..223-1) | The IE value (N) is derived by this formula:N224 X /360  N+1X being the longitude in degrees (-180°..+180°). |
| Direction of Altitude | M |  | ENUMERATED (Height, Depth) |  |
| Altitude | M |  | INTEGER(0..215-1) | The relation between the value (N) and the altitude (a) in meters it describes is N ≤ a < N+1, except for N=215-1 for which the range is extended to include all greater values of (a). |
| Uncertainty | M |  | INTEGER (0..127) | The maximum uncertainty expressed in metres is derived from the “uncertainty code” k, by:h=45x(1.025k-1). |

FL Comments

Given that similar functionality is supported in LTE, and the changes are associated with higher-layer parameters, suggest the issue be discussed in this meeting.

Comments from interested companies

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| --- | --- |
| **Company** | **Comments**  |
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## Positioning latency

Background

In R16 SI, the performance targets include “End to end latency < 1s” for commercial use cases. The shortest latency for LPP is 1s in the current LPP specification and there is no latency defined yet for NRPPa.

Submitted Proposals

* (Huawei) ***Proposal 3:***

*Add (new) requested response time in the measurement request message, e.g., RequestLocationInformation in LPP and MEASUREMENT REQUEST in NRPPa.*

* *The minimum time is 100ms.*
* *Send an LS to RAN2 and RAN3.*
* *Note: Network ensures that the normal report latency is complied with latency requirements defined in RAN4 to meet the performance requirement.*

FL Comments

In general, the requirements for UE measurement delays are defined by RAN4.

Comments from interested companies

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| --- | --- |
| **Company** | **Comments**  |
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## Clarification of ‘Positioning node’ in TS 38.215

Background

Submitted Proposals

* *(CATT)* ***Proposal 1****:*

*Replace the terminology ‘Positioning Node’ in TS 38.215 by ‘Transmission Point (TP)’ or ‘Reception Point (RP)’, or ‘Transmission and Reception Point (TRP)’ where applicable. The proposed TR is presented in Appendix A.*

* *(Nokia)* ***Proposal 1****:*

*RAN1 confirms necessity to define positioning nodes to avoid ambiguity on the measurement definitions.*

* *(Nokia)* ***Proposal 2****:*

*RAN1 either sends an LS to RAN3 informing them of the need to define positioning node, or defines a positioning node as described above in TS 38.215*

FL Comments

The issue has been brought up for a number of meetings. It seems to be a simple clarification. Suggest resolving it in this meeting.

Comments from interested companies

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| --- | --- |
| **Company** | **Comments**  |
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## Inter-frequency UE Rx – Tx time difference

Background

At RAN1#100b-e the issue of inter-frequency UE Rx-Tx time difference mesaurements was discussed. The outcome of that discussion include at least the following 3 options

* Option 1: Limit UE Rx – Tx time difference only to PRS and SRS in the same band.
* Option 2: If an SRS resource set ID is given in the UE Rx-Tx time difference measurement configuration, then TUE-TX is the UE transmit timing of uplink subframe #j that is closest in time to the subframe #i as estimated based on transmission timing of the SRS resource set with the given ID transmitted closest in time to the downlink subframe #i. TUE-TX shall be measured on the band on which the SRS Resource set is transmitted. If an SRS resource set ID is not given in the UE Rx-Tx time difference measurement configuration, then TUE-TX is the UE transmit timing of uplink subframe #j that is closest in time to the subframe #i received from the positioning node. TUE-RX and TUE-TX shall be measured on the same band.
* Option 3: For each UE Rx-Tx measurement, a UE may report, subject to UE capability, the band indices associated with the PRS and SRS that were used for the measurement, unless both the PRS and SRS were measured on the same band. If a UE is configured with SRS for positioning and PRS in a same band, the UE shall report in the nr-UE-RxTxTimeDiff IE the measurement derived with the SRS and PRS configured in this band; the UE can also report, subject to UE capability, in the nr-Multi-RTT-AdditionalMeasurements IE additional UE Rx-Tx measurements derived from SRS and PRS of different bands.

From that discussion QC proposed as a working assumption:

* *For each UE Rx-Tx measurement, a UE may report, subject to UE capability, the [band/serving cell] indices associated with the PRS and SRS that were used for the measurement, unless both the PRS and SRS were measured on the same [band/serving cell].*
* *If a UE is configured with SRS for positioning and PRS in a same [band/serving cell], the UE shall report in the nr-UE-RxTxTimeDiff IE the measurement derived with the SRS and PRS configured in this [band/serving cell]; the UE can also report, subject to UE capability, in the nr-Multi-RTT-AdditionalMeasurements IE additional UE Rx-Tx measurements derived from SRS and PRS of different [band/serving cell].*

Submitted Proposals

* (Nokia) ***Proposal 3:***

*Support the above working assumption as an agreement on UE Rx-Tx time difference inter-frequency measurements while also removing the brackets and reporting per band.*

* (CATT) ***Proposal 2:***

Whether a UE supports inter-band UE Rx-Tx measurements is subject to UE capability;

For inter-band UE Rx-Tx measurements, if a UE is configured for the reception of DL PRS from more than one band, the UE should report the band of the DL PRS, which is used for the inter-band UE Rx-Tx measurement; if a UE is configured for the transmission of SRS for positioning in more than one band, the UE should report the band of the transmission of SRS for positioning, which is used for the inter-band UE Rx-Tx measurement.

* (Ericsson) ***Proposal 1:***

For UE-RxTx measurement and reporting, the SRS resource set ID of an SRS resource set may be provided in UE Rx-Tx time difference measurement configuration. The UE shall measure and report UE-RxTx based on an SRS resource part of this SRS resource set.

* (Ericsson) ***Proposal 2:***

When no SRS resource set is provided in the UE Rx-Tx time difference measurement configuration, the UE uses an SRS in the same band as the PRS to measure the UE RxTx.

FL Comments

This issue was intensively discussed in the last meeting. Suggest resolving it in this meeting.

Comments from interested companies

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| **Company** | **Comments**  |
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## Maximum numbers related to UE measurement capability

Submitted Proposals

* (Samsung) ***Proposal 1:***
	+ *The following values for X1 to X7 should be supported.*

|  |  |  |
| --- | --- | --- |
| **Description** | **Maximum numbers for DL PRS resources** | **Values that can be signaled as part of UE Capability**  |
| Max number of frequency layers (X1) | X1=4 | Values = {1,4}No other values  |
| Max number of TRPs per frequency layer (X2) | X2=64 |  |
| Max number of PRS resource sets per TRP (X3) per frequency layer | X3=2 | Values = {1,2} |
| Max number of Resources per PRS resource set (X4) | X4=64 | Values = {64, 32, 16, 8 ,4, 2,1} |
| Max number of DL PRS Resources per UE (X5) | NA | Values = {16, 8, 4, 2 ,1} |
| Max number of TRPs for all frequency layers (X6) per UE | 256 | Values = {1,…,256} |
| Max number of Resources per frequency layer (X7) | NA | Values = {128, 64, 32, 16, 8 ,4, 2, 1} |

***Proposal 2****: There is no need to support FR1/FR2 differentiation for the values of X1 to X7.*

It has been agreed that UE can be configured to measure and report up to N=8 ~~(> 1)~~ DL PRS RSRP measurements on different DL PRS resources from the same TRP and the remaining issue is if N is a UE capability. In the table for the values of X1 to X7, we have defined those values as UE capability and the signaling overhead is already quite large. Therefore, there is no need to define N as UE capability.

***Proposal 3****: The number of reported DL PRS RSRP measurements N is not a UE capability*

FL Comments

The FFSs related to UE capability have been discussed in AI 7.2.11.8. No need to discuss this issue under this AI.

Comments from interested companies

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| --- | --- |
| **Company** | **Comments**  |
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## Measurement gap request in PRS reception

Background

It is undefined whether the UE can request a measurement gap if the UE is expected to measure the DL PRS resource with a numerology different from that of the active DL BWP, or on symbols that are indicated as UL symbol by the serving cell.

Submitted Proposal

* (OPPO): **Proposal 1**: TP for TS 38.214

|  |
| --- |
| 5.1.6.5 PRS reception procedure\*\*\* Unchanged text is omitted \*\*\*For the DL RSTD, DL PRS-RSRP, and UE Rx-Tx time difference measurements the UE can report an associated higher layer parameter *nr-TimeStamp-r16*. The *nr-TimeStamp-r16* can include the SFN and the slot number for a subcarrier spacing. These values correspond to the reference which is provided by *nr-DL-PRS-ReferenceInfo-r16*. The UE is expected to measure the DL PRS resource outside the active DL BWP or with a numerology different from the numerology of the active DL BWP if the measurement is made during a configured measurement gap. When not configured with a measurement gap, the UE is only required to measure DL PRS within the active DL BWP and with the same numerology as the active DL BWP. When the UE is expected to measure the DL PRS resource outside the active DL BWP or with a numerology different from the numerology of the active DL BWP or on any symbols indicated as UL symbol by the serving cell, it may request a measurement gap in higher layer parameter [*measGapConfig*]. \*\*\* Unchanged text is omitted \*\*\* |

FL Comments

The proposal is related to UE measurement procedure. Suggest to be discussed in AI 7.2.8.4.

Comments from interested companies

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| --- | --- |
| **Company** | **Comments**  |
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##  PathLoss estimate maintenance

Background

The following TP was agreed in RAN1#100bis:

|  |
| --- |
| The UE indicates a capability for a number of pathloss estimates that the UE can simultaneously maintain for all SRS resource sets provided by *SRS-PosResourceSet-r16* in addition to the up to four pathloss estimates that the UE maintains per serving cell for PUSCH/PUCCH/SRS transmissions. |

Submitted Proposal

* (Qualcomm): **Proposal 1**:

***With regards to “PathLoss estimate maintenance” capability:***

* ***Introduce the following 2 components :***
	+ ***Max number of pathloss estimates that the UE can simultaneously maintain for all the SRS resource sets for positioning across all cells in addition to the up to four pathloss estimates that the UE maintains per serving cell for the PUSCH/PUCCH/SRS transmissions. Values = {1,4,8,16}***
	+ ***Max number of pathloss estimates that the UE can simultaneously maintain for all the SRS resource sets for positioning per serving cell in addition to the up to four pathloss estimates that the UE maintains per serving cell for the PUSCH/PUCCH/SRS transmissions. Values = {1,4,8,16}***
* ***Agree on the following TP in 38.213 Section 7.3.1:***

|  |
| --- |
| The UE indicates capabilities for a number of pathloss estimates that the UE can simultaneously maintain for all SRS resource sets provided by *SRS-PosResourceSet-r16 per serving cell and across all serving cells* in addition to the up to four pathloss estimates that the UE maintains per serving cell for PUSCH/PUCCH/SRS transmissions. |

FL Comments

The proposal is related to UE measurement procedure. Suggest to be discussed in AI 7.2.8.4.

Comments from interested companies

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| **Company** | **Comments**  |
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# Summary

Table 1 summarizes the views of interested companies on the priority of the Issues/Proposals for the discussion in RAN1#101 e-meeting:

**Table 1 Summary on the Priority of the Issues/Proposals for RAN1#100 e-meeting discussion**

|  |  |
| --- | --- |
| Issues/Proposals | Companies |
| High Priority | Low Priority | No Need | Other comments |
| 1. Additional path
 | FL |  |  |  |
| 1. Reference of time stamp nr-TimeStamp-r16
 | FL |  |  |  |
| 1. UL RTOA reference
 | FL |  |  |  |
| 1. Search window for SRS reception
 | FL |  |  |  |
| 1. Positioning latency
 |  |  |  | FL: Suggest to be discussed in RAN4 |
| 1. Clarification of ‘Positioning node’ in TS 38.215
 | FL |  |  |  |
| 1. Inter-frequency UE Rx – Tx time difference
 | FL |  |  |  |
| 1. Maximum numbers related to UE measurement capability
 |  |  |  | FL: Already covered in AI 7.2.11.8 |
| 1. Measurement gap request in PRS reception
 |  |  |  | FL: Suggest to be discussed in AI 7.2.8.4 |
| 1. PathLoss estimate maintenance
 |  |  |  | FL: Suggest to be discussed in AI 7.2.8.4 |

**Notes:**

* High priority: Critical issues/Proposals need to be discussed and resolved in this AI in this meeting.
* Low priority: Issues/Proposals may be discussed in this meeting with low priority.
* No Need: Issues/Proposals may not necessarily be discussed in this AI.
* Other comments: Additional comments. For example, if there is a strong view on whether the issues/proposals should be included in, or excluded from this meeting.

References

1. R1-2003408 Discussion on remaining issues on UE and gNB measurements for NR positioning vivo

1. R1-2003474 Maintenance of UE and gNB measurements for NR positioning ZTE
2. [R1-2003523](file:///E%3A%5C1%20Meetings%5CRAN1%5C2020%2005_TSRR1_101-e%5CInbox%5CR1-2003523.doc) Finalizing NR positioning measurements Huawei, HiSilicon
3. [R1-2003634](file:///E%3A%5C1%20Meetings%5CRAN1%5C2020%2005_TSRR1_101-e%5CInbox%5CR1-2003634.doc) Remaining issues on NR Positioning Measurements CATT
4. [R1-2003717](file:///E%3A%5C1%20Meetings%5CRAN1%5C2020%2005_TSRR1_101-e%5CInbox%5CR1-2003717.doc) Maintenance on measurements for NR Positioning Nokia, Nokia Shanghai Bell
5. [R1-2003888](file:///E%3A%5C1%20Meetings%5CRAN1%5C2020%2005_TSRR1_101-e%5CInbox%5CR1-2003888.doc) UE and gNB measurements for NR Positioning Samsung
6. [R1-2004054](file:///E%3A%5C1%20Meetings%5CRAN1%5C2020%2005_TSRR1_101-e%5CInbox%5CR1-2004054.doc) Remaining Issues on Measurements for NR Positioning OPPO
7. [R1-2004471](file:///E%3A%5C1%20Meetings%5CRAN1%5C2020%2005_TSRR1_101-e%5CInbox%5CR1-2004471.doc) Maintenance on UE and gNB measurements for Positioning Qualcomm Incorporated
8. [R1-2004645](file:///E%3A%5C1%20Meetings%5CRAN1%5C2020%2005_TSRR1_101-e%5CInbox%5CR1-2004645.doc) Maintenance of UE and gNB measurements for NR Positioning Ericsson