**3GPP TSG RAN WG1#106bis R1-2110388**

**e-meeting, October 11th – 19th, 2021**

**Title: FL Summary for Rel-17 RRC parameters for positioning enhancement**

**Source: Moderator (CATT)**

**Agenda item: 8.5**

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

1. Introduction

This document provides a summary of the following email discussion for AI 8.5:

 [106bis-e-R17-RRC-NR-ePos] Email discussion on Rel-17 RRC parameters for positioning enhancement – Ren Da (CATT)

* 1st check point: October 14
* Final check point: October 19

The RRC parameters proposed for the 1st Round email discussion are based on the summary of the email discussion from the last meeting [1].

The recommendations for RAN1 RRC parameter preparation are provided in [2]. The suggested guidelines are copied in the following for convenience:

* Column E (RAN2 Parent IE): *Should be left empty*. Provide information on Parent IE in Column M, if needed.
* Column F (RAN2 ASN.1 name): *Should be left empty*.
* Column J (description): Should be suitable as “field description” for the RRC specification. i.e. it should clarify what the UE does when the NW sets the field. Should e.g., contain the unit of the numerical values. Short and concrete descriptions are preferred.
* Column M (per UE, cell, ...): May also *contain the name of a parent IE* that RAN1 considers appropriate.
* Column P (Comments): Should contain *background information* from RAN1 to RAN2 that helps RAN2 to understand the context and the feature.

Since Column E and F *should be left empty*, they will not be included in the tables of this document. In addition,

* For Column C (RAN1 specification) and Column D(Section): The understanding is that they can be left empty for now.
* Column I (Parameter name in the text): It is assumed it can be the same as Column G (Parameter name in the spec). So, we may leave Column I empty during email discussion, but will copy Column G to Column I when submitting the discussion summary.

Additional Notes:

1. Although the subject title says the email discussion is about Rel-17 RRC parameters, for Rel-17 ePOS, we will also need to include the parameters related to other protocols, namely, LPP/NRPPa, in this email discussion. We will basically follow the recommendation of the RRC parameter for the preparation of LPP/NRPPa parameters.
2. The parameters related to the maximum numbers (e.g., the maximum number of UE RX/Tx/RxTx TEGs) discussed in this document are the maximum numbers allowed in the specifications (e.g., TS 37.355, TS 38.455, TS 38.331). There will be a separate discussion related to the corresponding parameters related to UE capability. Obviously, the maximum numbers supported by a UE capability do not exceed the maximum numbers allowed in the specifications.
3. The word document is used for email discussion, which makes it easier to track the comments and changes. The final tables of the parameters after this email discussion will be copied into the companion spreadsheet, which will be submitted together with this word document.

2. Accuracy improvements by mitigating UE Rx/Tx and/or gNB Rx/Tx timing delays

(1st Round) Parameter Table

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| **B****Sub-feature group** | **C****RAN1 specification** | **D****Section** | **G****Parameter name in the spec** | **H****New or existing?** | **I****Parameter name in the text** | **J****Description** | **K****Value range** | **L****Default value aspect** | **M****Per (UE, cell, TRP, …)** | **N****UE-specific or Cell-specific** | **O****Specification** | **P****Comment** |
| Mitigation of UE Rx/Tx timing delays |   |   | ueRxTEG-ID |  New |  | The ID of a UE Rx timing error group, which is sent with RSTD measurements by UE to LMF. The UE includes one ueRxTEG-ID for the RSTD reference time and one ueRxTEG-ID for each DL RSTD measurement (including each additional DL RSTD measurement). |  FFS |   |  |  | FFS for RAN2 | Agreement:• Subject to UE capability, support a UE to include one UE Rx TEG ID for the RSTD reference time and one UE Rx TEG ID for each DL RSTD measurement (including each additional DL RSTD measurement), in a DL TDOA measurement report. These UE Rx TEG IDs can be the same or different.  |
| Mitigation of UE Rx/Tx timing delays |   |   | ueTxTEG | New |  | A UE Tx TEG is associated with the transmissions of one or more UL positioning SRS resources.ueTxTEG may be sent from UE to LMF for supporting UL-TDOA or multi-RTT. |  |   |  |  | FFS for RAN2/RAN3 | FFS: Whether the association information is sent directly from UE to LMF, or is first provided to gNB and then forwarded to LMF. |
| Mitigation of UE Rx/Tx timing delays |   |   | ueTxTEG-ID | New |  | The ID of a UE Tx timing error group.One UE Tx TEG ID can be associated with one or more UL positioning SRS resource IDs. |  FFS |   | “in ueTxTEG” |  | FFS for RAN2 |  |
| Mitigation of UE Rx/Tx timing delays |   |   | [srs-PosResourceSetId] |  Existing |  | FFS: whether there is a need to include the positioning SRS resource set ID in ueTxTEG  |    |   | “in ueTxTEG” |  | FFS for RAN2 |  |
| Mitigation of UE Rx/Tx timing delays |   |   | srs-PosResourceId |  Existing |  | Positioning SRS resource ID |    |   | “in ueTxTEG” |  | FFS for RAN2 | FFS: the maximum number of positioning SRS Resources |
| Mitigation of UE Rx/Tx timing delays |   |   | ueRxTxTEG-ID-group |  New |  | Up to UE capability, a UE may report an ueRxTxTEG-ID-group with a UE Rx-Tx measurement to LMF. The ueRxTxTEG-ID-group can include one of the following combinations of TEG IDs:* An UE RxTx TEG ID
* A pair of UE {RxTx TEG ID, TxTEG ID}
* A pair of UE {Rx TEG ID, TxTEG ID}
* A triplet of UE {RxTx TEG, Rx TEG ID, TxTEG ID}
 |  FFS |   |  |  | FFS for RAN2 | AgreementsFor mitigating UE Tx/Rx timing errors for DL+UL positioning, a UE may should support, up to UE capability, either one or both of the following options:• Option 1: Reporting of UE RxTx TEG ID• Option 2: Reporting of UE Rx TEG ID and UE Tx TEG ID.AgreementsIf a RxTx TEG ID is reported with a UE Rx-Tx time difference measurement, the UE may optionally also report a Tx TEG ID. |
| Mitigation of UE Rx/Tx timing delays |   |   | ueRxTxTEG-ID |  New |  | The ID of a UE RxTx timing error group. |  FFS |   |  “in ueRxTxTEG-ID-group” |  | FFS for RAN2 |  |
| Mitigation of UE Rx/Tx timing delays |   |   | ueTxTEG-ID |  New |  | The ID of a UE Tx timing error group. |  FFS |   |   “in ueRxTxTEG-ID-group” |  | FFS for RAN2 |  |
| Mitigation of UE Rx/Tx timing delays |   |   | ueRxTEG-ID |  New |  | The ID of a UE Rx timing error group. |  FFS |   |   “in ueRxTxTEG-ID-group” |  | FFS for RAN2 |  |
| Mitigation of UE Rx/Tx timing delays |   |   | [maxNumOfUE-RxTEG] |  New |  | The maximum number of UE-RxTEG per UE |  FFS |   |  [Per UE] |  | FFS for RAN2 |  |
| Mitigation of UE Rx/Tx timing delays |   |   | [maxNumOfUE-TxTEG] |  New |  | The maximum number of UE-TxTEG per UE |  FFS |   |  [Per UE] |  | FFS for RAN2 |  |
| Mitigation of UE Rx/Tx timing delays |   |   | [maxNumOfPosSRSResourcesPerTxTEG] | New |  | FFS: The maximum number of positioning SRS resources associated with one UE TxTEG | FFS |  |  |  | FFS for RAN2 |  |
| Mitigation of UE Rx/Tx timing delays |   |   | [maxNumOfUE-RxTxTEG] |  New |  | The Max number of UE-RxTxTEG per UE |  FFS |   |  [Per UE] |  | FFS for RAN2 |  |
| Mitigation of UE Rx/Tx timing delays |   |   | numOfUERxTEG-PerPRSResource | New |  | **The** number of  **different** UE Rx TEGs that the LMF request a UE to measure the **same** DL PRS resource of a TRP for RSTD. |  FFS |  |  |  | FFS for RAN2 | Agreement:support the LMF to request a UE to optionally measure the same DL PRS resource of a TRP with N different UE Rx TEGs and report the corresponding multiple RSTD measurements. |
|  |   |   |   |   |  |   |   |   |   |  |   |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | trpRxTEG-ID |   New |  | The ID of a TRP Rx timing error group, which is sent with RTOA measurements from gNB to LMF.  |  FFS |   |   |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | trpTxTEG |   New |  | A TRP Tx TEG is associated with the transmissions of one or more DL PRS resources. trpTxTEG may be sent from gNB to LMF for supporting DL-TDOA or multi-RTT. |   |   |   |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | trpTxTEG-ID |   New |  | The ID of a TRP Tx timing error group.One TRP Tx TEG ID can be associated with one or more DL PRS resources |  FFS |   |  “in trpTxTEG” |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | NR-DL-PRS-ResourceSetID |  Existing |  |  |   |   |  “in trpTxTEG” |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | NR-DL-PRS-ResourceID |  Existing |  |  |   |   |  “in trpTxTEG” |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |  |  | trpRxTxTEG-ID-group |  New |  | A gNB may report a trpRxTxTEG-ID-group with a TRP Rx-Tx measurement to LMF. The trpRxTxTEG-ID-group can be one of the following combinations of the TEG IDs:* An TRP RxTx TEG ID
* A pair of TRP {RxTx TEG ID, TxTEG ID}
* A pair of TRP {Rx TEG ID, TxTEG ID}

A triplet of TRP {RxTx TEG, Rx TEG ID, TxTEG ID} |  FFS |   |   |  | FS for RAN3 | Assuming the similar agreement as UE side will be made in the next meeting |
| Mitigation of TRP Rx/Tx timing delays |   |   | trpRxTxTEG-ID |   New |  | The ID of the TRP RxTx timing error group.  |  FFS |   | “in trpRxTxTEG-ID-group” |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | trpTxTEG-ID |  New |  | The ID of a TRP Tx timing error group. |  FFS |   | “in trpRxTxTEG-ID-group” |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | trpRxTEG-ID |  New |  | The ID of a TRP Rx timing error group. |  FFS |   | “in trpRxTxTEG-ID-group” |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |  |  | [srs-PosResourceSetId] | New |  | The ID of a positioning SRS resource set.FFS: whether there is a need to include positioning SRS resource set ID. | FFS |  |  |  | FFS for RAN3 | Agreement:• Support gNB to report the associated SRS resource ID/resource set ID of the RTOA measurement to LMF |
| Mitigation of TRP Rx/Tx timing delays |  |  | srs-PosResourceId | New |  | The ID of a positioning SRS resource reported with RTOA measurement | FFS |  |  |  | FFS for RAN3 | Agreement:• Support gNB to report the associated SRS resource ID/resource set ID of the RTOA measurement to LMF |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mitigation of TRP Rx/Tx timing delays |   |   | [maxNumOfTRPRxTEG] |   New |  | The maximum number of TRP-RxTEG per TRP |  FFS |   |  [per TRP] |  | FFS for RAN3 | maximum number allowed by spec, instead of UE capability |
| Mitigation of TRP Rx/Tx timing delays |   |   | [maxNumOfTRPTxTEG ] |   New |  | The maximum number of TRP-TxTEG per TRP |  FFS |   |   [per TRP] |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | [maxNumOfPRSResourcesPerTxTEG] |   New |  | The maximum number of PRS resources associated with one TRP TxTEG |  FFS |   |   [per TRP] |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | [maxNumOfTRPRxTxTEG] |   New |  | The Max number of TRP RxTxTEG per TRP |  FFS |   |   [per TRP] |  | FFS for RAN3 |   |
| Mitigation of TRP Rx/Tx timing delays |   |   | numOfTRPRxTEG-PerPRSResource |   New |  | **The** number of  **different** TRP Rx TEGs that the LMF requests a TRP to measure the **same U**L positioning SRS resource of a UE |  FFS |   |   |  | FFS for RAN3 | Agreement:Support the LMF to request a TRP to optionally measure the same SRS resource of a UE with M different TRP Rx TEGs and report the corresponding multiple RTOA measurements |
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## Comments

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| **Company** | **Comments**  |
| Huawei, HiSilicon | Comment #1:We prefer to group the hierarchical structure of field/IEs in a single row, e.g. it would be nice if the following fields are in a single row, with ueTxTEG-ID, srs-PosResourceID included either in description column or the comments column.

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| ueTxTEG |
| ueTxTEG-ID |
| [srs-PosResourceSetId] |
| srs-PosResourceId |

Comment #2:For ueRxTxTEG-ID-group, it would be nice to also adopt what is proposed in comment #1. In addition, we suggest to make the following change (by adding ID to RxTx TEG. Also it is preferred to have a space between “Tx” and “TEG” if not for the field name.

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| A gNB may report a trpRxTxTEG-ID-group with a TRP Rx-Tx measurement to LMF. The trpRxTxTEG-ID-group can be one of the following combinations of the TEG IDs:* An TRP RxTx TEG ID
* A pair of TRP {RxTx TEG ID, TxTEG ID}
* A pair of TRP {Rx TEG ID, TxTEG ID}
* A triplet of TRP {RxTx TEG ID, Rx TEG ID, TxTEG ID}
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Comment #3:Apart from the reporting, we believe there should be the parameter to request the associated TEG ID reporting. Is the FL intention to let RAN2 work out? |
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3. Accuracy improvements for UL-AoA positioning solutions

(1st Round) Parameter Table

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| **B****Sub-feature group** | **C****RAN1 specification** | **D****Section** | **G****Parameter name in the spec** | **H****New or existing?** | **I****Parameter name in the text** | **J****Description** | **K****Value range** | **L****Default value aspect** | **M****Per (UE, cell, TRP, …)** | **N****UE-specific or Cell-specific** | **O****Specification** | **P****Comment** |
| UL-AOA Enhancement |  |  | Expected UL Angle of Arrival |  New |  | Indication of expected AoA/ZoA value and uncertainty (of the expected AoA/ZoA value) range(s)IE names are already used by RAN3 in R3-214516 | FFS |  | FFS RAN3 |  | FFS RAN3 | Agreement:Granularity of 0.1 degrees is applied for the expected AoA (φAOA), expected ZoA (θZOA ) and the corresponding uncertainty values |
| UL-AOA Enhancement |  |  | Expected Azimuth AoA |  New |  |  | FFS |  | “In Expected UL Angle of Arrival” |  | FFS RAN3 |  |
| UL-AOA Enhancement |  |  | Expected Zenith AoA |  New |  |  | FFS |  | “In Expected UL Angle of Arrival” |  | FFS RAN3 |  |
| UL-AOA Enhancement |  |  | Expected Azimuth AoA Value |  New |  |  | FFS |  | “in Expected Azimuth AoA” |  | FFS RAN3 |  |
| UL-AOA Enhancement |  |  | Expected Azimuth AoA Uncertainty Range |  New |  |  | FFS |  | “in Expected Azimuth AoA” |  | FFS RAN3 |  |
| UL-AOA Enhancement |  |  | Expected Zenith AoA Value |  New |  | Uncertainty range for expected azimuth angle of arrival | FFS |  | “in Expected Zenith AoA” |  | FFS RAN3 |  |
| UL-AOA Enhancement |  |  | Expected Zenith AoA Uncertainty Range |  New |  | uncertainty range for expected zenith angle of arrival | FFS |  | “in Expected Zenith AoA” |  | FFS RAN3 |  |
| UL-AOA Enhancement |  |  | Zenith Angle of Arrival | New |  | This information element contains the Zenith Angle of Arrival, which can correspond to linear array measurement | FFS |  | “in TRP Measurement Result” |  | FFS RAN3 | Agreement:● The following option is supported to enhance signaling of UL-AOA measurement report in case of a linear array○ Option 2: The z-axis of LCS is defined along the linear array axis. gNB reports only the ZoA relative to z-axis in the LCS, and the LCS-to-GCS translation function is used to set up the specific z-axis direction |
| UL-AOA Enhancement |  |  | ULAoAOfFirstPathPerSRSResource |  New |  | The multiple UL-AOAs values (pair of AOA & ZOA values) can be reported per SRS resource for the first arrival path corresponding to the same timestamp. | FFS |   | FFS RAN3 |  |  FFS RAN3 | Agreement:Reporting of one UL-RTOA and multiple UL-AOAs measurements for the first arrival path per SRS resource for positioning and per SRS resource for MIMO in a single gNB report to LMF is supported• The above measurements are associated with SRS resource ID which is also reported to LMF• FFS: Reporting of RSRP for the first arrival path• Note: The use of SRS for MIMO resource is transparent to the UE• FFS: Reporting of gNB Rx-TxAgreement:Reporting of one gNB Rx-Tx time difference and multiple UL-AOAs measurements for the first arrival path per SRS resource for positioning in a single gNB report to LMF is supported • The above measurements are associated with SRS resource ID which is also reported to LMF• FFS: Reporting of RSRP for the first arrival path |
| UL-AOA Enhancement |  |  | firstPathAoA |  New |  | A pair of AOA & ZOA values to be reported per SRS resource |  FFS |   | “in ULAoAOfFirstPathPerSRSResource” |  |  FFS RAN3 |  |
| UL-AOA Enhancement |  |  | firstPathZoA |  New |  | A pair of AOA & ZOA values to be reported per SRS resource |  FFS |   | “in ULAoAOfFirstPathPerSRSResource” |  |  FFS RAN3 |  |
| UL-AOA Enhancement |  |  | maxNumOfULAoAOfFirstPathPerSRSResource  |  New |  | The maximum number of UL-AOAs values (pair of AOA & ZOA values) to be reported per SRS resource for the first arrival path corresponding to the same timestamp. |  8 |   | FFS RAN3 |  |  FFS RAN3 |  Agreement:The maximum number of UL-AOAs values (pair of AOA & ZOA values) to be reported per SRS resource for the first arrival path corresponding to the same timestamp is 8. |
| UL-AOA Enhancement |  |  | srs-PosResourceId | New |  | The ID of a positioning SRS resource reported with RTOA and multiple UL-AOAs measurements | FFS |  | FFS for RAN3 |  | FFS for RAN3 | Agreement:• Reporting of one UL-RTOA and multiple UL-AOAs measurements for the first arrival path per SRS resource for positioning and per SRS resource for MIMO in a single gNB report to LMF is supported• The above measurements are associated with SRS resource ID which is also reported to LMF |
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## Comments

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| **Company** | **Comments**  |
| **FL** | RAN3 had already implemented some of the requirements according to the RAN1’s LS to RAN3, and added some new NRPPa parameters accordingly. Some of the parameters in above table are actually copied from RAN3 CR R3-214516. During previous discussion, there was a comment on whether there is no need to copy the NRPPa parameters that RAN3 already implemented into RAN1’s list of these parameters, and then sent back to RAN3. I assume whether to include these NRPPa parameters may really depend on whether RAN3 considers it is necessary to do so. I will check with the Rapporteur for RAN3 work to see his opinion. |
| Huawei, HiSilicon | As presented in our paper R1-2108731, we consider it worthwhile to clarify that the value 0 of expected AoA uncertainty would mean that the expected AoA is accurate, which is suggested by Alexey to be discussed in the parameters list.***Proposal 3: RAN1 confirms that the expected AoA/ZoA uncertainty can take the value 0, in which case the expected AoA/ZoA is accurate.******Note: This can be used for receiving SRS for a PRU.*** |
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4. Accuracy improvements for DL-AoD positioning solutions

(1st Round) Parameter Table

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| **B****Sub-feature group** | **C****RAN1 specification** | **D****Section** | **G****Parameter name in the spec** | **H****New or existing?** | **I****Parameter name in the text** | **J****Description** | **K****Value range** | **L****Default value aspect** | **M****Per (UE, cell, TRP, …)** | **N****UE-specific or Cell-specific** | **O****Specification** | **P****Comment** |
| DL-AoD Enhancement |   |   |  TBD |  New |   | gNB beam/antenna informationreported from gNB to LMF for DL-AoD. |  FFS |   |   |   |  FFS RAN3 | Agreement:Regarding support of angle calculation enhancement for DL-AoD:• Support gNB providing the beam/antenna information to the LMF.o The gNB beam/antenna information can be provided to the UE for UE-based DL-AoD |
| DL-AoD Enhancement |   |   |  TBD |  New |   | gNB beam/antenna informationprovided to the UE for UE-based DL-AoD. |  FFS |   |   |   |  FFS RAN3 | Agreement:Regarding support of angle calculation enhancement for DL-AoD:• Support gNB providing the beam/antenna information to the LMF.o The gNB beam/antenna information can be provided to the UE for UE-based DL-AoD |
| DL-AoD Enhancement |   |   | requestFirstPathRSRP |  New  |  | The parameter is used for LMF to request a UE to report the RSRP of first arrival path. |  FFS |   |   |   |  FFS RAN2 | Agreement:For both UE-based and UE-assisted DL-AOD, the UE can be requested subject to UE capability to measure and report (for UE-assisted) the PRS RSRP of the first path |
| DL-AoD Enhancement |   |   | firstPathRSRP |  New  |  | The reported PRS RSRP of the first path from UE to LMF. |  FFS |   |   |   |  FFS RAN2 | Agreement:For both UE-based and UE-assisted DL-AOD, the UE can be requested subject to UE capability to measure and report (for UE-assisted) the PRS RSRP of the first path |
| DL-AoD Enhancement |   |   |  TBD |  New or existing |   | PRS assistance information for DL-AoD from LMF to UE |  FFS |   |   |   |  FFS RAN2 | Agreement:For UE-assisted DL-AOD positioning method, select one or more of the following to enhance the signaling to the UE for the purpose of PRS resource(s) measurement and reporting: |
| DL-AoD Enhancement |   |   | maxNumRSRPperTRP |  New |   | Maximum number of DL PRS RSRP measurements per TRP |  FFS |   |   |   |  FFS RAN2 |  Agreement:• For UE-A DL-AOD, support reporting more than 8 DL PRS RSRP measurements per TRP.• Note: Multiple RSRPs corresponding to same or different Rx Beam index should be able to be reported for a given PRS resource for different timestamps. • FFS: Limit the maximum number of DL PRS RSRP associated with the same Rx beam index |
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## Comments

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| **Company** | **Comments**  |
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5. Latency improvements for both DL and DL+UL positioning

(1st Round) Parameter Table

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| **B****Sub-feature group** | **C****RAN1 specification** | **D****Section** | **G****Parameter name in the spec** | **H****New or existing?** | **I****Parameter name in the text** | **J****Description** | **K****Value range** | **L****Default value aspect** | **M****Per (UE, cell, TRP, …)** | **N****UE-specific or Cell-specific** | **O****Specification** | **P****Comment** |
| Latency improvements |   |   | numOfSamples-perMeasurement |  new |  | LMF can explicitly request UE to report the measurement with M-samples from LM to UE. | [1, 4]FFS: others |   |   |   |  FFS: RAN2 | May need to change *perMeasurement* to *perMeasInstance* due to the agreement for supporting multiple measurement instances in one measurement report |
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## Comments

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| **Company** | **Comments**  |
| Huawei, HiSilicon | We think it should be useful to add the following parameters at least* [PRS-MeasurementIndication]: FFS NRPPa or UL MAC CE

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| Agreement:For the purpose of positioning latency reduction, with potential support of a new mechanism of MG request, consider the following options with a decision to be made in RAN1#106b.* Option. 1: by LMF (via a NRPPa message)
* Option. 2: by UE (via UCI or UL MAC CE)
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* [MeasurementGapActivation]: FFS DL MAC CE

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| Agreement:For the purpose of positioning latency reduction, with potential support a new MG activation and deactivation procedure, consider the following options with a decision to be made in RAN1#106b (and RAN4 to be informed about any decision made)* Option. 1: DCI
* Option. 2: DL MAC CE
* Option. 3: UE autonomously applies the MG

FFS whether deactivation can be implicit via configurable number of the MG occasions |

* [PRS-ProcessingWindow]: FFS RRC/MAC CE or LPP. FFS per CC/PFL/UE
* [PRS-PriorityIndictor]: FFS RRC/MAC CE or LPP. FFS per CC/PFL/UE
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6. Potential enhancements of information reporting from UE and gNB for multipath/NLOS mitigation

(1st Round) Parameter Table

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| **B****Sub-feature group** | **C****RAN1 specification** | **D****Section** | **G****Parameter name in the spec** | **H****New or existing?** | **I****Parameter name in the text** | **J****Description** | **K****Value range** | **L****Default value aspect** | **M****Per (UE, cell, TRP, …)** | **N****UE-specific or Cell-specific** | **O****Specification** | **P****Comment** |
| Multipath/NLOS mitigation |   |   | losNlosIndicator |  New |   | For LoS/NLoS indicators, a single-indicator can be reported and the supported values are a discrete set in the interval [0, 1].This parameter is used for UE to report LoS/NLoS information for UE measurements (including RSTD, RSRP and UE Rx-Tx time difference) from UE to LMF. | [0, ..,1]FFS: the discrete set of values between [0, 1]  |   |   |   | FFS: RAN2 | Agreement:• Support LoS/NLoS indicators which are reported to the LMF for DL and DL+UL positioning measurements taken at UE for UE-assisted positioning or UL and DL+UL measurements at the TRP for NG-RAN assisted positioning. o Reporting from UE is subject to UE capability. |
| Multipath/NLOS mitigation |   |   |  losNlosIndicator |  New |   | For LoS/NLoS indicators, a single-indicator can be reported and the supported values are a discrete set in the interval [0, 1].This parameter is used for gNB to report LoS/NLoS information for gNB measurements, including RTOA, UL RSRP, UL AOA, and gNB Rx-Tx time difference measurements for TRP from gNB to LMF. | [0, ..,1]FFS: the discrete set of values between [0, 1]  |   |   |   | FFS: RAN3 | Agreement:• Support LoS/NLoS indicators which are reported to the LMF for DL and DL+UL positioning measurements taken at UE for UE-assisted positioning or UL and DL+UL measurements at the TRP for NG-RAN assisted positioning. o Reporting from UE is subject to UE capability. |
| Multipath/NLOS mitigation |   |   |  losNlosIndicator |  New |   | For LoS/NLoS indicators, a single-indicator can be reported and the supported values are a discrete set in the interval [0, 1].This parameter is used for LMF to include LoS/NLoS information for for UE-based positioning.FFS: The LoS/NLoS information is associated with which measurements. | [0, ..,1]FFS: the discrete set of values between [0, 1]  |   |   |   | FFS: RAN2 | Agreement:• Positioning assistance data from LMF is enhanced for UE-based positioning by including LoS/NLoS indicators. |
| Multipath/NLOS mitigation |   |   | maxNumOfAdditionalPath |  New |   | The maximum number of reporting relative timing of additional path relative to the timing of the first detected path for UE timing measurement from UE to LMF.Note: In Rel-16, N is set to hard-coded to 2 inNR-AdditionalPathList-r16 in TS 37.355. |  FFS |   |   |   | FFS: RAN2 |  Agreement:• For up to N>2 additional paths, support reporting relative timing (to the first detected path) in the measurement reports from UE to LMF for at least DL-TDOA and multi-RTT |
| Multipath/NLOS mitigation |   |   | maxnopath |  existing |   | The maximum number of reporting relative timing of additional path relative to the timing of the first detected path for TRP timing measurement to be reported from gNB to LMF.Note: In Rel-16, *maxnopath* is 2 in TS 38.455. |  FFS |   |   |   | FFS: RAN3 |  Agreement:• For multipath reporting enhancements, support reporting from TRP to LMF, angle, timing, for up to additional N>2 paths for at least UL-TDOA and multi-RTT. |
| Multipath/NLOS mitigation |   |   | ULAoAOfAdditionalPathPerSRSResource |  New |   | UL-AoA values per SRS resource for the additional path to be reported from gNB to LMF. |  FFS |   |   |   |  FFS: RAN3 |  Agreement:Reporting multiple UL-AoA values per SRS resource for the additional path is supported for at least UL TDOA and multi-RTT.• FFS: maximum number of UL-AoA values per additional path. |
| Multipath/NLOS mitigation |   |   | maxNumOfULAoAOfAdditionalPathPerSRSResource |  New |   | The maximum number of UL-AOAs values (pair of AOA & ZOA values) per SRS resource for the additional arrival path to be reported from gNB to LMF. |  FFS |   |   |   |  FFS: RAN3 |  Agreement:Reporting multiple UL-AoA values per additional path is supported for at least UL TDOA and multi-RTT.• FFS: maximum number of UL-AoA values per additional path. |
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## Comments

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| **Company** | **Comments**  |
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7. On-demand transmission and reception of DL PRS

(1st Round) Parameter Table

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| **B****Sub-feature group** | **C****RAN1 specification** | **D****Section** | **G****Parameter name in the spec** | **H****New or existing?** | **I****Parameter name in the text** | **J****Description** | **K****Value range** | **L****Default value aspect** | **M****Per (UE, cell, TRP, …)** | **N****UE-specific or Cell-specific** | **O****Specification** | **P****Comment** |
| On-demand PRS |   |   | On-demand PRS information |  New |   | The IE name “On-demand PRS information” is already used by RAN3 in (R3-214516) |   |   |   |   |  FFS: RAN2/RAN3 |  Agreement:At least the following list of on-demand DL PRS parameters is supported for UE-initiated and LMF-initiated on-demand DL PRS requests1. DL PRS Periodicity2. DL PRS resource bandwidth3. DL PRS QCL information |
| On-demand PRS |   |   | NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset |  Existing |   |   |   |   | “in On-demand PRS information” |   |  FFS: RAN2/RAN3 |  |
| On-demand PRS |   |   | dl-PRS-ResourceBandwidth |  Existing |   |   |   |   | “in On-demand PRS information” |   |  FFS: RAN2/RAN3 |   |
| On-demand PRS |   |   | DL-PRS-QCL-Info |  Existing |   |   |   |   | “in On-demand PRS information” |   |  FFS: RAN2/RAN3 |   |
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## Comments

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| **Company** | **Comments**  |
| Huawei, HiSilicon | Comment #1For NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset, we only agreed periodicity, not offset. It should be clarified whether single value is included in On-demand PRS information, or multiple values each corresponding to a positioning frequency layer are included in On-demand PRS information. Since we do not have offset, this parameter should be a new parameter.Comment #2For DL-PRS-QCL-Info, we would like to discuss whether the value can be “requested” or be a specific SSB/PRS index. We have concern on the later one, since this could be PRS resource specific, which blows up the entire On-demand PRS information IE. So we suggest to change “existing” to “[Existing or New]” |
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8. Support of positioning for UEs in RRC\_ INACTIVE state

(1st Round) Parameter Table

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| **B****Sub-feature group** | **C****RAN1 specification** | **D****Section** | **G****Parameter name in the spec** | **H****New or existing?** | **I****Parameter name in the text** | **J****Description** | **K****Value range** | **L****Default value aspect** | **M****Per (UE, cell, TRP, …)** | **N****UE-specific or Cell-specific** | **O****Specification** | **P****Comment** |
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| **Company** | **Comments**  |
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9. Summary

TBD

10. References

1. R1-2108682 Summary of email discussion on RRC parameters for NR Positioning Enhancements, Moderator (CATT)
2. R1-2110415 Recommendations for RAN1 RRC Parameter Preparation, Moderator (Ericsson)
3. RAN1 Chair’s Notes#104e.
4. RAN1 Chair’s Notes#104bis-e.
5. RAN1 Chair’s Notes#105e.
6. RAN1 Chair’s Notes#106e.