**3GPP TSG-RAN WG2 Meeting #118-e darft*R2-2208794***

**Electronic Meeting, Aug 17th – 26th, 2022**

**Agenda item:** 6.11.2.6

**Source:** CATT

**Title:** [Pre119-e][402] Summary of agenda item 6.11.2.6 on positioning accuracy enhancements (CATT)

**Document for:**  Discussion

# 0. Introduction

This document provides a summary of contributions [1] – [22] submitted to AI 6.11.2.6 "Accuracy enhancements".

1. R[2-2207099](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207099.zip) Corrections on the RxTEG,TxTEG and RxTxTEG report in TS 37.355 CATT CR Rel-17 37.355 17.1.0 0352 - F NR\_pos\_enh-Core
2. R[2-2207100](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207100.zip) Corrections on the UE TxTEG report in TS 38.331 CATT CR Rel-17 38.331 17.1.0 3217 - F NR\_pos\_enh-Core
3. R[2-2207087](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207087.zip) 37.355 CR for clarification of number of UE Rx TEGs OPPO CR Rel-17 37.355 17.1.0 0350 - F NR\_pos\_enh-Core
4. R[2-2207088](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207088.zip) 37.355 CR for introduction of UE Rx TEG error margin and Tx TEG error margin OPPO CR Rel-17 37.355 17.1.0 0351 - F NR\_pos\_enh-Core
5. R[2-2207102](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207102.zip) Corrections on the accuracy enhancements in TS 37.355 CATT CR Rel-17 37.355 17.1.0 0354 - F NR\_pos\_enh-Core
6. R[2-2207578](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207578.zip) Correction on additional measurements in 37.355 ZTE, Sanechips CR Rel-17 37.355 17.1.0 0361 - F NR\_pos\_enh-Core
7. R[2-2207581](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207581.zip) Correction on UE Rx Tx RxTx TEG and TRP Tx TEG timing error margin in 37.355 ZTE, Sanechips CR Rel-17 37.355 17.1.0 0364 - B NR\_pos\_enh-Core
8. R[2-2207582](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207582.zip) Correction on UE Tx TEG timing error margin in 38.331 ZTE, Sanechips CR Rel-17 38.331 17.1.0 3286 - B NR\_pos\_enh-Core
9. R[2-2207583](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207583.zip) Discussion on the framework of TEG timing error margin ZTE, Sanechips discussion Rel-17 NR\_pos\_enh-Core
10. R[2-2207882](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207882.zip) Correction to measurment with mutliple TEGs Huawei, HiSilicon, VIVO CR Rel-17 37.355 17.1.0 0369 - F NR\_pos\_enh-Core
11. R[2-2207884](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2207884.zip) Correction to DL-AoD measurement report Huawei, HiSilicon CR Rel-17 37.355 17.1.0 0370 - F NR\_pos\_enh-Core
12. R[2-2208073](file:///E%3A%5CWORK%5C1%203GPP%5CMeeting%5CRAN2%20119-e%5C2%20During%5CDocs%5CR2-2208073.zip) On Mitigation of UE/TRP Rx/Tx timing delays Ericsson discussion Rel-17

The topics in this summary are organized as follows:

1. Corrections on timing error margin value of reported UE TxTEG in RRC
2. Corrections on timing error margin value of reported TEG in LPP
3. Corrections on DL-AoD report in LPP
4. Corrections on additional measurements in LPP
5. Correction on other issues in LPP
6. Correction on other issues in RRC

# 1. Corrections on timing error margin value of reported UE TxTEG in RRC

RAN4 sends an LS on Tx TEG framework in R2-2206946. The timing error margins of UE/TRP Tx/Rx/RxTx TEG should be reported. RAN1 sends LS “Reply LS on the UE/TRP TEG framework” in R2-2206914 to further clarify the UE/TRP Tx/ Rx/RxTx TEG framework. So CRs on the timing error margin value of reported UE TxTEG in RRC are summarized here.

|  |  |
| --- | --- |
| CATTR2-2207100  | The timing error margin value of reported UE TxTEG ID is also reported to follow the agreement in RAN4 and RAN1. 1/ The timing error margin value of the UE Tx TEG ID is added in the description of UE Positioning Assistance Information procedure. 2/ The timing error margin value of *ue-TxTEG-ID* is added to the *UE-TxTEG-AssociationList*.Note: This is a non-backward compatible CR. |
| ZTE, Sanechips R2-2207582 | 1. Add UE Tx TEG timing error margin report in procedure description in section 5.7.14.3;
2. Add UE Tx TEG timing error margin in RRC signaling UEPositioningAssistanceInfo, and the corresponding field description.
 |

Summary:

Impact in RRC:

* 5.7.14 UE Positioning Assistance Information
* *UEPositioningAssistanceInfo*

There is no extension design in *UE-TxTEG-Association-r17*, so there are two ways to report the value.

* CATT suggests an NBC which doesn’t extend *nonCriticalExtension* in *UEPositioningAssistanceInfo-r17-IEs*.

UE-TxTEG-Association-r17 ::= SEQUENCE {

 ue-TxTEG-ID-r17 INTEGER (0..maxNrOfTxTEG-ID-1-r17),

 nr-TimeStamp-r17 NR-TimeStamp-r17,

 associatedSRS-PosResourceIdList-r17 SEQUENCE (SIZE(1..maxNrofSRS-PosResources-r16)) OF SRS-PosResourceId-r16,

 servCellId-r17 ServCellIndex OPTIONAL,

 ue-TxTEG-Value-r17 ENUMERATED { tc0, tc2, tc4, tc6, tc8, tc12, tc16, tc20, tc24, tc32, tc40, tc48, tc56, tc64, tc72, tc80} OPTIONAL,

 ...

}

* ZTE suggests an extension: *nonCriticalExtension UE-TxTEG-TimingErrorMargin-v17xx-IEs OPTIONAL*

UEPositioningAssistanceInfo-r17-IEs ::= SEQUENCE {

 ue-TxTEG-AssociationList-r17 UE-TxTEG-AssociationList-r17 OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension UE-TxTEG-TimingErrorMargin-v17xx-IEs OPTIONAL

}

UE-TxTEG-TimingErrorMargin-v17xx-IEs ::= SEQUENCE {

UE-TxTEG-TimingErrorMarginValue-v17xx-IEs ENUMERATED {tc0, tc2, tc4, tc6, tc8, tc12, tc16, tc20, tc24, tc32, tc40, tc48, tc56, tc64, tc72, tc80} OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL,

}

**Proposals for discussion:**

**Proposal 1: RAN2 to discuss if an NBC is allowed or not, and to merge these two CRs [R2-2207100, R2-2207582] on RRC via offline.**

# 2. Correction on other issues in RRC

|  |  |
| --- | --- |
| EricssonR2-2208073 | The only specification impact of RAN1 agreement would be to add this information in RRC:5.7.14 UE Positioning Assistance Information5.7.14.1 GeneralThe UE Positioning Assistance Information procedure is used by UE to report the UE Positioning Assistance Information. The UE reports the association between UL-SRS resources for positioning and the UE Tx TEG ID. For each UE Tx TEG ID, there may be up to 8 reports for each measurement instance, and a maximum of up to 32 measurement instances in a single measurement report is supported. |

Rapporteur’s comments:

UE Positioning Assistance Information is not ‘a single measurement report’ in RRC which is different from the measurement report in LPP.

So rapporteurs suggest updating the description as: ‘There may be up to 8 reports of the TEG-SRS association information for each UE Tx TEG ID.’ And do not capture the up to 32 measurement instances in RRC.

**Proposals for discussion:**

**Proposal 2: RAN2 to discuss if the description ‘**and a maximum of up to 32 measurement instances in a single measurement report is supported.**’ is essential and merge the modifications in R2-2208073 into RRC CR (proposal 1) via offline.**

# 3. Corrections on timing error margin value of reported TEG in LPP

RAN4 sends LS on Tx TEG framework in R2-2206946. The timing error margins of UE/TRP Tx/Rx/RxTx TEG should be reported. RAN1 sends LS “Reply LS on the UE/TRP TEG framework” in R2-2206914 to further clarify the UE/TRP Tx/ Rx/RxTx TEG framework. CRs on the timing error margin value of reported UE Tx/Rx/RxTxTEG in LPP are summarized here.

|  |  |
| --- | --- |
| CATTR2-2207099 | The timing error margin value of reported TEG ID is also reported to follow the agreements in RAN4 and RAN1.1/ For UE-based positioning, the selected Tx-TEG margin for TRP is added in NR-DL-PRS-TRP-TEG-Info;2/ For UE-assisted positioning, (a) for DL-TDOA, the timing error margin value of Rx-TEG-ID is added to the measurement report (b) for multi-RTT, the timing error margin value of RX-TEG-ID and RxTx-TEG-ID is added to the measurement report body; the timing error margin value of Tx-TEG-ID is added to the Tx-TEG list. |
| ZTE, Sanechips R2-2207581, R2-2207583 | 1. Add a new IE to define the timing error margin value of TEG(s).
2. Add TRP Tx TEG timing error margin in LPP signaling NR-DL-PRS-TRP-TEG-Info, and the corresponding field description.
3. Add UE Rx TEG timing error margin in LPP signaling NR-DL-TDOA-SignalMeasurementInformation, and the corresponding condition and field description.
4. Add UE Rx/Tx/RxTx TEG timing error margin in LPP signaling NR-Multi-RTT-SignalMeasurementInformation, and the corresponding condition and field description.
 |
| OPPO R2-2207088 | 1. The IE ***nr-UE-Rx-TEG-ErrorMargin*** and the corresponding field description are captured in the section 6.5.10.4 ***NR*** ***DL-TDOA-SignalMeasurementInformation***.
2. The IE ***nr-UE-Tx-TEG-ErrorMargin*** and the corresponding field description are captured in the section 6.5.12.4 ***NR Multi-RTT Location Information Elements***.
3. The IE ***nr-UE-Rx-TEG-ErrorMargin*** and the corresponding field description are captured in 6.5.12.4 ***NR Multi-RTT Location Information Elements***.
 |

Summary:

- TRP TxTEG in *NR-DL-PRS-TRP-TEG-Info*: companies proposed the similar corrections.

- 6.5.10.4 NR DL-TDOA Location Information Elements

CATT and OPPO proposed to report timing error margin value of each Rx-TEG-ID with one timestamp.

ZTE proposed to report timing error margin value in one instance.

- 6.5.12.4 NR Multi-RTT Location Information Elements

CATT and OPPO proposed to report timing error margin value of each Rx-TEG-ID with one timestamp.

ZTE proposed to report timing error margin value in one instance.

Rapporteur’s comments:

- There are timestamps in one instance report, so each measurement report is associated one timestamp in existing report. There will be multiple timing error margins in one instance because of different timestamp reported, rather than only one timing error margin in one instance report.

**Proposals for discussion:**

**Proposal 3: RAN2 to agree for UE-based positioning, the selected Tx-TEG margin for TRP is added in NR-DL-PRS-TRP-TEG-Info.**

**Proposal 4: RAN2 to discuss if timing error margin is associated with each RxTEG/RxTxTEG ID with its own timestamp, and take the CR [R2-2207099] or [R2-2207581] as a baseline to capture timing error margin values for further polishing via offline.**

# 4. Corrections on DL-AoD report in LPP

|  |  |
| --- | --- |
| Huawei, HiSiliconR2-2207884 | 1/ Modify the condition of Rx beam index reporting so that RSRPP reporting is considered and the number of RSRP/RSRPP are counted across multiple resource sets.2/ remove the condition presence tag and need code for nr-DL-PRS-RSRP-ResultDiff and nr-DL-PRS-FirstPathRSRP-ResultDiff |

Summary:

* The current description on condition when the Rx beam index is allowed to be indicated is too restrictive in that Rx beam reporting is only allowed when two DL-PRS RSRP measurements are from the same DL-PRS resource set. It becomes problematic for the following enhancements introduced in Rel-17.
* Another issue with the current spec is that conditional presence tag and need code has been added for an uplink message. But in uplink LPP message, need code and conditional presence tags are not needed.

**Proposals for discussion:**

**Proposal 5: RAN2 to agree removing the condition presence tag and need code for nr-DL-PRS-RSRP-ResultDiff and nr-DL-PRS-FirstPathRSRP-ResultDiff in CR [R2-2207884].**

**Proposal 6: RAN2 to discuss if it is an essential correction: modify the condition of Rx beam index reporting so that RSRPP reporting is considered and the number of RSRP/RSRPP are counted across multiple resource sets in CR[R2-2207884].**

# 5. Corrections on additional measurements in LPP

|  |  |
| --- | --- |
| ZTE, Sanechips R2-2207578 | There is no field description of the Rel-17 additional measurements and no restrictions on they should not be reported together.Add the field description of NR-DL-TDOA-AdditionalMeasurementsExt-r17, NR-DL-AoD-AdditionalMeasurementsExt-r17 and NR-Multi-RTT-AdditionalMeasurementsExt-r17, to indicate if -r17 IE is reported, -r16 IE should be absent. |
| Huawei, HiSilicon, VIVOR2-2207882 | Add conditions for the number of possible per TEG configurations and the total number of TEGs to the field descriptions for the measurement of DL-TDOA and multi-RTT when the field for additional measurement introduced in R17 is present, the R16 field for additional measurement should be absent. |

Summary:

- *NR-DL-TDOA-SignalMeasurementInformation*: Both of CRs propose to add description for *NR-DL-TDOA-AdditionalMeasurementsExt*

***NR-DL-TDOA-AdditionalMeasurementsExt***

This field specifies a list of additional RSTD measurements of different PRS resources for the same neighbour TRP and reference TRP pair. If this field is present, the *field NR-DL-TDOA-AdditionalMeasurements* shall be absent.

***nr-DL-TDOA-AdditionalMeasurementsExt***

This field, in addition to the measurement provided in *NR-DL-TDOA-MeasElement*, provides TOA measurement of up to 4 DL-PRS Resources of a TRP with different UE Rx TEGs. For a certain DL-PRS Resource, there can be up to 8 TOA measurement results with respect to different Rx TEGs.

If this field is present, the field *nr-DL-TDOA-AdditionalMeasurements* should not be present.

- *NR-Multi-RTT-SignalMeasurementInformation:* Both of CRs propose to add description for *NR-Multi-RTT-AdditionalMeasurementsExt*

***NR-Multi-RTT-AdditionalMeasurementsExt***

This field specifies a list of additional Rx-Tx time difference measurements of different PRS resources for the same TRP. If this field is present, the field *NR-Multi-RTT-AdditionalMeasurements* shall be absent.

***nr-Multi-RTT-AdditionalMeasurementsExt***

This field, in addition to the measurement provided in *NR-Multi-RTT-MeasElement*, provides UE Rx-Tx time difference measurement of up to 4 DL-PRS Resources of a TRP with different UE RxTx TEGs. For a certain DL-PRS Resource, there can be up to 8 measurment results with respect to different UE RxTx TEGs.

If this field is present, the field *nr-Multi-RTT-AdditionalMeasurements* should not be present.

- *NR-DL-AoD-SignalMeasurementInformation:* ZTE propose to add description for *NR-Multi-RTT-AdditionalMeasurementsExt*

***NR-DL-AoD-AdditionalMeasurementsExt***

This field specifies a list of additional PRS RSRP measurements of different PRS resources for the same TRP. If this field is present, the field *NR-DL-AoD-AdditionalMeasurements* shall be absent.

**Proposals for discussion:**

**Proposal 7: RAN2 to agree to take CR [R2-2207882] as a baseline and merge CR [R2-2207578] via offline.**

# 6. Correction on other issues in LPP

|  |  |
| --- | --- |
| OPPO R2-2207087 | *In the* ***NR-Multi-RTT-RequestLocationInformation*** msg and ***NR-DL-TDOA-RequestLocationInformation*** msg, the field descprition of the IE, ***measureSameDL-PRS-ResourceWithDifferentRxTEGs***, is updated:“This field, if present, indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with up to N different UE Rx TEGs. Enumerated value 'n0' indicates that the number N of different UE Rx TEGs to measure the same DL PRS Resource can be determined by the target device, value 'n2' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with up to 2 different UE Rx TEGs, value 'n3' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with up to 3 different UE Rx TEGs, and so on. |
| CATTR2-2207102 | 1/ Thedescriptionof *NR-AdditionalPathList* is updated as RSTD or UE Rx – Tx time difference, instead of TOA measurement, to align with TS 38.214. 2/ delete the “Need OP” in UL IE *NR-SRS-TxTEG-Element-r17*. |
| EricssonR2-2208073 | For each UE Tx TEG ID, there may be up to 8 reports for each measurement instance and a maximum of up to 32 measurement instances in a single measurement report is supported |

Summary:

OPPO R2-2207087:

***measureSameDL-PRS-ResourceWithDifferentRxTEGs***

This field, if present, indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with up to *N* different UE Rx TEGs. Enumerated value '*n0*' indicates that the number *N* of different UE Rx TEGs to measure the same DL PRS Resource can be determined by the target device, value '*n2*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with up to 2 different UE Rx TEGs, value '*n3*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with up to 3 different UE Rx TEGs, and so on.

If this field is present, the field *nr-UE-TxTEG-Request* should also be present.

CATT R2-2207102:

#### *– NR-AdditionalPathList*

The IE *NR-AdditionalPathList* is used by the target device to provide information about additional paths in association with each RSTD or UE Rx – Tx time difference measurements associated to NR positioning in the form of a relative time difference and a quality value.

Ericsson R2-2208073: *NR-Multi-RTT-SignalMeasurementInformation* field descriptions

***nr-SRS-TxTEG-Set***

This field provides the SRS for Positioning Resources associated with a particular UE Tx TEG and comprises the following subfields:

 - ***nr-TimeStamp*** specifies the start time for which the *NR-SRS-TxTEG-Element* is valid. If this field is absent, the *nr-TimeStamp* of this instance of the *NR-SRS-TxTEG-Element* of the *nr-SRS-TxTEG-Set* is the same as the *nr-TimeStamp* of the previous instance of the *NR-SRS-TxTEG-Element*. If this field is also absent in the first *NR-SRS-TxTEG-Element* of the *nr-SRS-TxTEG-Set*, all *NR-SRS-TxTEG-Element*'s provided are valid for the measurement period of the *NR-Multi-RTT-SignalMeasurementInformation.*

 - ***nr-UE-Tx-TEG-ID*** specifies the ID of this UE Tx TEG.

 - ***carrierFreq*** specifies the frequency of the SRS for positioning resources.

 - ***srs-PosResourceList*** specifies the SRS for Positioning Resources belonging to this UE Tx TEG.

For each UE Tx TEG ID, there may be up to 8 reports for each measurement instance and a maximum of up to 32 measurement instances in a single measurement report is supported

Rapporteur’s comments:

Part of the correction in the description of *NR-Multi-RTT-SignalMeasurementInformation* inR2-2208073 is not essential:‘a maximum of up to 32 measurement instances in a single measurement report is supported’ is redundant because the IE *nr-SRS-TxTEG-Set* belongs to the list of up to 32 instances as below.

 nr-Multi-RTT-SignalMeasurementInstances-r17

 SEQUENCE (SIZE (1..maxMeasInstances-r17)) OF

 NR-Multi-RTT-SignalMeasurementInformation-r16

 OPTIONAL

 So rapporteurs suggest updating the description as: ‘there may be up to 8 reports of the SRS association information for each UE Tx TEG ID.’

**Proposals for discussion:**

**Proposal 8: RAN2 to** **agree CR [R2-2207087] and CR [R2-2207102] separately.**

**Proposal 9: RAN2 to** **agree the proposed description without ‘and a maximum of up to 32 measurement instances in a single measurement report is supported.’ in R2-2208073, and merge the modification into CR [R2-2207087].**

# 7. Summary

*Corrections on timing error margin value of reported UE TxTEG in RRC:*

**Proposal 1: RAN2 to discuss if an NBC is allowed or not, and to merge these two CRs [R2-2207100, R2-2207582] on RRC via offline.**

*Correction on other issues in RRC:*

**Proposal 2: RAN2 to discuss if the description ‘**and a maximum of up to 32 measurement instances in a single measurement report is supported.**’ is essential and merge the modifications in R2-2208073 into RRC CR (proposal 1) via offline.**

*Corrections on timing error margin value of reported TEG in LPP:*

**Proposal 3: RAN2 to agree for UE-based positioning, the selected Tx-TEG margin for TRP is added in NR-DL-PRS-TRP-TEG-Info.**

**Proposal 4: RAN2 to discuss if timing error margin is associated with each RxTEG/RxTxTEG ID with its own timestamp, and take the CR [R2-2207099] or [R2-2207581] as a baseline to capture timing error margin values for further polishing via offline.**

*Corrections on DL-AoD report in LPP:*

**Proposal 5: RAN2 to agree removing the condition presence tag and need code for nr-DL-PRS-RSRP-ResultDiff and nr-DL-PRS-FirstPathRSRP-ResultDiff in CR [R2-2207884].**

**Proposal 6: RAN2 to discuss if it is an essential correction: modify the condition of Rx beam index reporting so that RSRPP reporting is considered and the number of RSRP/RSRPP are counted across multiple resource sets in CR[R2-2207884].**

*Corrections on additional measurements in LPP:*

**Proposal 7: RAN2 to agree to take CR [R2-2207882] as a baseline and merge CR [R2-2207578] via offline.**

*Correction on other issues in LPP:*

**Proposal 8: RAN2 to** **agree CR [R2-2207087] and CR [R2-2207102] separately.**

**Proposal 9: RAN2 to** **agree the proposed description without ‘and a maximum of up to 32 measurement instances in a single measurement report is supported.’ in R2-2208073, and merge the modification into CR [R2-2207087].**