3GPP TSG RAN WG1 Meeting #110bis-e R1-220xxxx

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

**Source: Moderator (CATT)**

**Title: FL Summary for FL Summary for maintenance on accuracy improvements by mitigating UE Rx/Tx and/or gNB Rx/Tx timing delays**

**Agenda item: 8.5**

**Document for: Discussion and Decision**

# Introduction

This document provides a summary of the following email discussion:

[110bis-e-R17-ePos-03] Email discussion for maintenance on accuracy improvements by mitigating UE Rx/Tx and/or gNB Rx/Tx timing delays for issues 1-1, 1-2in R1-2210266 – Ren Da (CATT)

-          Check points: October 14, October 19

# UE Tx TEG Reporting

**Issue #1-1 in R1-2210266[1]**

Submitted Proposal and draft CR

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| Company | Proposals |
| ***CATT, R1-2208940 [2]*** | *Proposal 1: To align with RAN1's agreement, the UE periodic reporting of UE Tx TEG association information should be specified in TS 38.214* |
| ***CATT, R1-2208939 [3]*** | **3GPP TSG-RAN WG1 Meeting #110bis-eR1-2208939****e-Meeting, October 10th – 19th, 2022**

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| *CR-Form-v12.2* |
| **DRAFT CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Correction on UE Tx TEG association information reporting |
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| ***Source to WG:*** | CATT |
| ***Source to TSG:*** | TSG RAN WG1 |
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| ***Work item code:*** | NR\_pos\_enh-Core |  | ***Date:*** | 2022-09-14 |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | At RAN1#107-e meeting, the following agreement was achieved for updating of UE Tx TEGs in Rel-17 positioning enhancements: **Agreement*** For UL-TDOA, supporting the following for the serving gNB to request a UE to report the Tx TEG association information between UE Tx TEG IDs and SRS resources for positioning, subject to UE capability of supporting UE Tx TEG:
	+ Based on a configured periodicity, a UE may report the UE Tx TEG association for the SRS resources for positioning that have already been transmitted during the configured period
		- It is up to RAN2 to decide how to indicate the change of the Tx TEG association during the configured period (e.g., using the timestamps)
		- It is up to RAN4 to decide when the Tx TEG association is changed
	+ The values of the configurable periodicities are up to RAN2
	+ Note: Tx TEG association information reporting by single request/response mode is assumed already supported with the previous agreement.
* Send an LS to RAN2/RAN4 (cc: RAN3)
	+ to RAN2, including the following RAN1’s agreement related to the reporting of the UE Tx TEG, for RAN2 to work on the signaling
	+ to RAN4 for checking the agreement and work on how to decide when the Tx TEG association is changed

According to the above agreement, for UL-TDOA, subject to UE capability, based on a configured periodicity, a UE may report the UE Tx TEG association for the SRS resources for positioning that have already been transmitted during the configured period. However, the key characteristic of UE periodic reporting is not reflected in the current TS38.214. This key characteristic should be specified in TS 38.214 for a clear description on UE periodic reporting of UE Tx TEG association information. |
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| ***Summary of change:*** | Clarify that for UL-TDOA, subject to UE capability, based on a configured periodicity, a UE may report the UE Tx TEG association for the SRS resources for positioning that have already been transmitted during the configured period. |
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| ***Consequences if not approved:*** | The UE periodic reporting of UE Tx TEG association information is not clear. |
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| ***Clauses affected:*** | 6.2.1.4 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **N** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **N** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **N** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
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| ***This CR's revision history:*** |  |

6.2.1.4 UE sounding procedure for positioning purposes< Unchanged parts are omitted >The UE may be configured, subject to UE capability, to report UE Tx TEGs (Timing Error Group), where UE Tx TEG is associated with the transmissions of one or more UL SRS resources for the positioning purpose, which have the Tx timing error difference within a certain margin.The UE may be configured to report, via high layer parameter *nr-UE-RxTxTEG-Request or UE-TxTEG-RequestUL-TDOA-Config*, subcccject to UE capability, association information of the already transmitted SRS resource(s) configured by the higher layer parameter *SRS-PosResource* with UE Tx TEG(s) via higher layer parameter *nr-SRS-TxTEG-Set* or *ue-TxTEG-AssociationList* for one reporting or periodical reporting. If the UE reports a UE Tx TEG ID with a UE Rx-Tx time difference measurement, as defined in clause 5.1.6.5, the UE shall report the association information of the already transmitted SRS resources configured by the higher layer parameter *SRS-PosResource* with the UE Tx TEG ID.< Unchanged parts are omitted > |

FL Comments

The proposal and the draft CR attempt to capture RAN1’s agreement that UE *Tx TEG* can be reported in one single request/response mode and also periodica reporting, and also to match RAN1’s specification with RAN2’s specification. It seems the proposed CR can be adopted. Interested companies are encouraged to provide their views on the proposal in ***R1-2208940*** in and also the draft *CR (****R1-2208939).***

Initial Proposal

* *Adopt the draft CR in R1-2208939.*

Comments

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| **Company** | **Comments**  |
| **CATT** | Support |
| **Huawei, HiSilicon** | Do not support. The change is firstly not essential, as the request and the corresponding reporting behavior is out of RAN1 scope, and RAN2 already captured them in RRC and LPP.For example, for LPP ProvideLocationInformation, it supports one shot and periodic request and report, but it does not appear in RAN1 specification.Another point is that periodical reporting in phy means differently from that in higher layer. In physical layer, the periodical reporting strictly follows a slot-level periodicity, while in higher layer, some tolerance is needed. In this sense, the change is not correct in the context of RAN1 specification. |
| **ZTE** | Genarally OK, maybe we can delete “for one reporting or periodical reporting” if companies have concerns for the inconsistent definition of periodical report in RAN1 and RAN2.Also there is a typo:The UE may be configured to report, via high layer parameter *nr-UE-RxTxTEG-Request or UE-TxTEG-RequestUL-TDOA-Config*, sub~~ccc~~ject to UE capability, asso |
| **Nokia/NSB** | Don’t support. We agree with Huawei that the change is not essential. The spec when looked at together with RRC and LPP is crystal clear in our opinion.  |
| **Qualcomm**  | Do not support. It is clear in RRC and LPP.  |
| **CATT-2** | To Huawei, HiSilicon,We do not agree your comments. Firstly, RAN1 had discussed a lot on the issue of updating of UE Tx TEG and achieve a agreement on this issue after a long discussion during several meetings, you should respect the RAN1’s efforts on this issue and reflect RAN1’s efforts in RAN1’s specs. If you leave the specs like the current state as follows, what is the information can you obtain from it about the RAN1’s previouis agreement about the updating of UE Tx TEGs? Even the LPP have descriptions on “one shot or periodicReporting” of UE-TxTEG-RequestUL-TDOA-Config-r17 (we had mentioned LPP’s descriptions in our companion discussion paper), we should give some hints on the important feature of updating of UE Tx TEGs, in order to let the readers can recognize there are important difference between reporting of UE Tx TEG and other TEG.

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| The UE may be configured to report, subject to UE capability, association information of the already transmitted SRS resource(s) configured by the higher layer parameter *SRS-PosResource* with UE Tx TEG(s) via higher layer parameter *nr-SRS-TxTEG-Set* or *ue-TxTEG-AssociationList*. |

Secondly, we don’t think what you said about the periodically reporting is valid. For the periodica reporting, it surely includes the physical-layer periodical reporting and high-layer periodical reporting, but we had added the related high-layer signaling to indicate that such reporting is via high layer parameter(i.e., via high layer parameter *nr-UE-RxTxTEG-Request or UE-TxTEG-RequestUL-TDOA-Config*,), then it means that this reporting is high-layer reporting, so it has nothing with physical layer reporting. From this point, your understanding is not correct since the reporting here is definitely high-layer reporting and will not confused with physical layer reporting at all.

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| The UE may be configured to report, via high layer parameter *nr-UE-RxTxTEG-Request or UE-TxTEG-RequestUL-TDOA-Config*, subject to UE capability, association information of the already transmitted SRS resource(s) configured by the higher layer parameter *SRS-PosResource* with UE Tx TEG(s) via higher layer parameter *nr-SRS-TxTEG-Set* or *ue-TxTEG-AssociationList* for one reporting or periodical reporting.  |

To Nokia/NSB and Qualcomm,As we mentioned above, if you leave the specs like the current state, what is the information can you obtain from it about the RAN1’s previouis agreement about the updating of UE Tx TEGs? Even the LPP have descriptions on “one shot or periodicReporting” of UE-TxTEG-RequestUL-TDOA-Config-r17 (we had mentioned LPP’s descriptions in our companion discussion paper), we should give some hints on the important feature of updating of UE Tx TEGs, in order to let the readers can recognize there are important difference between reporting of UE Tx TEG and other TEG. In this perspective, this CR is needed to the changes will provide valuable information for the readers. |
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# Error margins for Rx/RxTx TEGs

**Issue #1-6 in** [**R1-2205097**](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2205097.zip)**.**

Submitted Proposal and draft CR

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| Company | Proposals |
| ***ZTE, R1-2209211 [4]*** | **3GPP TSG- Meeting #10bis-e9211****e-Meeting, October 10th –19th, 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **4** | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:***  | Draft CR on UE TEG framework |
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| ***Source to WG:*** | ZTE |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_pos\_enh-Core  |  | ***Date:*** | 0 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | 7 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | In RAN4#104e meeting, RAN4 discussed UE/TRP TEG framework and provided the following feedback:

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| **Issue #6: Questions on UE Rx/RxTx TEG margins**RAN4 feedback: * UE Rx/RxTx TEG margins are provided as LPP signalling parameters out of UE capability signaling.
* A single timing error margin value is provided per Rx TEG/RxTx TEG type per measurement instance in a single LPP message, if it has multiple measurement instances.
* The timing error margin values for an Rx TEG/RxTx TEG type in different LPP messages can be different.
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Also, the “Draft\_37355-h20” and “Draft\_38331-h20\_v3” provided by RAN2 captures TEG timing error margins. However, currently the report of UE Tx/Rx/RxTx TEG margin value is not included in RAN1’s spec. TS 38.214 should be updated accordingly. |
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| ***Summary of change:*** | Add description on UE Tx/Rx/RxTx TEG margin value according to RAN4’s agreement and “Draft\_37355-h20” and “Draft\_38331-h20\_v3” provided by RAN2. |
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| ***Consequences if not approved:*** | The framework to UE TEG is not completely captured in RAN1’s specification. TS 38.214 does not include the UE behavior on report of UE Tx/Rx/RxTx TEG margin value.  |
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| ***Clauses affected:*** | 5.1.6.5, 6.2.1.4 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** | **Isolated impact analysis:**There is no isolated impact. |
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| ***This CR's revision history:*** |  |

5.1.6.5 PRS reception procedure<Unrelated part omitted>Timing Error Group(s) (TEG(s)) at UE side are defined:*-* UE Rx TEG is associated with one or more DL measurements, which have the Rx timing error difference within a certain margin.*-* UE RxTx TEG is associated with one or more UE Rx-Tx time difference measurements, which have the 'Rx timing errors+Tx timing errors' difference within a certain margin.The UE may be configured to report, subject to UE capability, via high layer parameter *nr-UE-RxTEG-Request*, the association information of DL RSTD measurement(s) with UE Rx TEG(s) via higher layer parameter *nr-UE-Rx-TEG-ID* when the UE reports the DL RSTD measurement(s). The UE may report up to 4 RSTD measurements associated with different DL PRS resources per UE Rx TEG per *dl-PRS-ID*.The UE may report a UE Rx TEG ID via higher layer parameter *nr-UE-Rx-TEG-ID* for a RSTD reference time *dl-PRS-ReferenceInfo* and a UE Rx TEG ID for each DL RSTD measurement, where the DL RSTD can be DL RSTD measurement in *NR-DL-TDOA-MeasElement* and/or *NR-DL-TDOA-AdditionalMeasurementElement*. If the UE reports a UE Rx TEG ID with a DL RSTD measurement, the UE shall report a UE Rx TEG timing error margin value, via high layer parameter *nr-UE-RxTEG-TimingErrorMargin*, for all the UE Rx TEGs within one *NR-DL-TDOASignalMeasurementInformation*.The UE may be configured to measure and report, via high layer parameter *measureSameDL-PRS-ResourceWithDifferentRxTEGs* subject to UE capability, RSTD measurements on a PRS resource associated with a *dl-PRS-ID* using up to 8 different UE Rx TEGs with the same *dl-PRS-ReferenceInfo.* The higher layer parameter *measureSameDL-PRS-ResourceWithDifferentRxTEGs* applies to all DL PRS positioning frequency layers.The UE may be provided with association information of DL PRS resource(s) with Tx TEGs via higher layer parameter *dl-prs-trp-Tx-TEG-ID* for a *dl-PRS-ID*.The UE may be configured to report, via high layer parameter *nr-UE-RxTxTEG-Request*, subject to UE capability, the association information of UE Rx-Tx time difference measurement(s) with UE RxTx TEG(s) via higher layer parameter *nr-UE-RxTx-TEG-ID*. The UE may report up to 4 UE Rx-Tx time difference measurements associated with different DL PRS resources per UE RxTx TEG per *dl-PRS-ID*.If the UE reports a UE RxTx TEG ID with a UE Rx-Tx time difference measurement, the UE shall report a UE RxTx TEG timing error margin value, via high layer parameter *nr-UE-RxTxTEG-TimingErrorMargin*, for all the UE RxTx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*.The UE may be configured to report, via high layer parameter *nr-UE-RxTxTEG-Request*, subject to UE capability, the association information of UE Rx-Tx time difference measurement(s) with the UE Rx TEG(s) and UE Tx TEG(s) via the higher layer parameters of *nr-UE-Rx-TEG-ID*, and *nr-UE-Tx-TEG-Index*. The UE may report up to 4 UE Rx-Tx time difference measurements associated with different DL PRS resources per UE Rx TEG per *dl-PRS-ID*.If the UE reports a UE Rx TEG ID with a UE Rx-Tx time difference measurement, the UE shall report a UE Rx TEG timing error margin value, via high layer parameter *nr-UE-RxTEG-TimingErrorMargin*, for all the UE Rx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*.If the UE reports a UE Tx TEG ID with a UE Rx-Tx time difference measurement, the UE shall report a UE Tx TEG timing error margin value, via high layer parameter *nr-UE-TxTEG-TimingErrorMargin*, for all the UE Tx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*.The UE may be configured to measure and report, via high layer parameter *measureSameDL-PRS-ResourceWithDifferentRxTEGs* subject to UE capability, UE Rx-Tx time difference measurements on a PRS resource associated with a *dl-PRS-ID* using up to 8 different UE Rx TEGs. The high layer parameter *measureSameDL-PRS-ResourceWithDifferentRxTEGs* applies to all DL PRS positioning frequency layers.The UE may be configured to measure and report, via high layer parameter *measureSameDL-PRS-ResourceWithDifferentRxTxTEGs* subject to UE capability, UE Rx-Tx time difference measurements with the same UE Tx TEG using up to 8 different UE RxTx TEGs*.* The high layer parameter *measureSameDL-PRS-ResourceWithDifferentRxTxTEGs* applies to all DL PRS positioning frequency layers.<Unrelated part omitted>6.2.1.4 UE sounding procedure for positioning purposes<Unrelated part omitted>Timing Error Group (TEG) at UE side is defined: - UE Tx TEG is associated with the transmissions of one or more UL SRS resources for the positioning purpose, which have the Tx timing error difference within a certain margin.The UE may be configured to report, subject to UE capability, association information of the already transmitted SRS resource(s) configured by the higher layer parameter *SRS-PosResource* with UE Tx TEG(s) via higher layer parameter *nr-SRS-TxTEG-Set* or *ue-TxTEG-AssociationList*. The UE may be configured to report, via high layer parameter *ue-TxTEG-TimingErrorMarginValue*, the UE Tx TEG timing error margin value of all the UE Tx TEGs within one *UEPositioningAssistanceInfo*.If the UE reports a UE Tx TEG ID with a UE Rx-Tx time difference measurement, as defined in clause 5.1.6.5, the UE shall report the association information of the already transmitted SRS resources configured by the higher layer parameter *SRS-PosResource* with the UE Tx TEG ID.If the UE is configured with SRS resources configured by the higher layer parameter *SRS-PosResource* in multiple CCs, the UE should report the *carrierFreq or servCellId* of the SRS resources when it reports the UE Tx TEG associations.If the UE reports a UE RxTx TEG ID with a UE Rx-Tx time difference measurement, the UE may report a Tx TEG ID.<Unrelated part omitted> |

FL Comments

The draft CR proposes to add the description related to the reporint of the UE Tx/Rx/RxTx TEG margin value according to RAN4’s agreement and “Draft\_37355-h20” and “Draft\_38331-h20\_v3” provided by RAN2. Interested companies are encouraged to provide their views on the draft *CR****.***

*Note: The draft CR in R1-2209211 uses the CR-Form-v12.1. It is may need to be replaced with the latest one CR-Form-v12.2..*

Initial Proposal

*Adopt the draft CR in R1-2209211.*

Comments

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| **Company** | **Comments**  |
| CATT | Support. Maybe with some wording changes, e.g.,If the UE reports a UE RxTx TEG ID with a UE Rx-Tx time difference measurement, the UE shall report a UE RxTx TEG timing error margin value, via high layer parameter *nr-UE-RxTxTEG-TimingErrorMargin*, the margin value applies to all the UE RxTx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. |
| Huawei, HiSilicon | We do not support this.Look at the current LPP specification version for DL-TDOA, they even designed BC change for the UE only implementing h10 version.NR-DL-TDOA-SignalMeasurementInformation-r16 ::= SEQUENCE { dl-PRS-ReferenceInfo-r16 DL-PRS-ID-Info-r16, nr-DL-TDOA-MeasList-r16 NR-DL-TDOA-MeasList-r16, ..., [[ nr-UE-RxTEG-TimingErrorMargin-r17 TEG-TimingErrorMargin-r17 OPTIONAL -- Cond UERxTEG ]]}

| Conditional presence | Explanation |
| --- | --- |
| *UERxTEG* | The field is optionally present, need OP, if the field *nr-UE-Rx-TEG-ID* is present; otherwise it is not present. |

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| *NR-DL-TDOA-SignalMeasurementInformation* field descriptions |
| ***nr-UE-RxTEG-TimingErrorMargin***This field specifies the UE Rx TEG timing error margin value for all the UE Rx TEGs within one *NR-DL-TDOA-SignalMeasurementInformation*. If the *nr-UE-Rx-TEG-ID* is present and this field is absent, the receiver should consider the UE Rx TEG timing error margin value to be the maximum applicable value as defined in TS 38.133 [46]. |

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| ZTE | In our understanding, all UE procedure should be captured in TS 38.214. However, currently the report of UE Tx/Rx/RxTx TEG margin value is not included in RAN1’s spec.As HW indicated, since TEG margin value is optionally reported if the corresponding TEG ID is reported, we suggest the following revision(change “shall” to “may”):If the UE reports a UE Rx TEG ID with a DL RSTD measurement, the UE ~~shall~~ may report a UE Rx TEG timing error margin value, via high layer parameter *nr-UE-RxTEG-TimingErrorMargin*, for all the UE Rx TEGs within one *NR-DL-TDOASignalMeasurementInformation*.If the UE reports a UE RxTx TEG ID with a UE Rx-Tx time difference measurement, the UE ~~shall~~ may report a UE RxTx TEG timing error margin value, via high layer parameter *nr-UE-RxTxTEG-TimingErrorMargin*, for all the UE RxTx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*.If the UE reports a UE Rx TEG ID with a UE Rx-Tx time difference measurement, the UE ~~shall~~ may report a UE Rx TEG timing error margin value, via high layer parameter *nr-UE-RxTEG-TimingErrorMargin*, for all the UE Rx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*.If the UE reports a UE Tx TEG ID with a UE Rx-Tx time difference measurement, the UE ~~shall~~ may report a UE Tx TEG timing error margin value, via high layer parameter *nr-UE-TxTEG-TimingErrorMargin*, for all the UE Tx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. |
| Nokia/NSB | We don’t support this CR. We feel that the current specification is clearly sufficient and this additional text is not necessary.  |
| Qualcomm | We could be flexible and capture it also in 38.214 with the updated proposal from ZTE, but no strong views.  |
| vivo | We are okay to change ‘shall’ to ‘may’, but for UL, we wonder whether the yellow part is needed since there is no signaling to request the UE to report the margin.The UE may be configured to report, via high layer parameter *ue-TxTEG-TimingErrorMarginValue*, the UE Tx TEG timing error margin value of all the UE Tx TEGs within one *UEPositioningAssistanceInfo*. |
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# References

1. R1-2210266, Summary for preparation phase on maintenance of Rel-17 WI on NR positioning enhancements, Moderator (CATT)
2. R1-2208939 Correction on UE Tx TEG association information reporting CATT
3. R1-2208940 Discussion on UE Tx TEG association information reporting CATT
4. R1-2209211 Draft CR on UE TEG framework ZTE