3GPP TSG-RAN WG2 Meeting #119bis Electronic R2-22xxxxx

Online Meeting, Oct 10th – 19th, 2022

**Agenda item: 6.11.1**

**Source: CATT**

**Title:**  **[AT119bis-e][409][POS] LS on TEG framework (CATT)**

**WID/SID: NR\_pos\_enh-Core**

**Document for: Discussion and Agreement**

# 1 Introduction

This document is to kick off the following email discussion:

* [AT119bis-e][409][POS] LS on TEG framework (CATT)

      Scope: Discuss the LS in R2-2209342 and related contributions in R2-2209432 and R2-2209433, and draft a reply.

      Intended outcome: Report and approvable LS

      Deadline: Friday 2022-10-14 1000 UTC

This email discussion will discuss the LS on Applicability of timing error margin of Rx TEG and conclude an agreeable reply LS to RAN4 agreement.

# 2 Contact Information

Respondents to the email discussion are kindly asked to fill in the following table.

|  |  |
| --- | --- |
| Company | Contact: Name (E-mail) |
| Huawei, HiSIlicon | yinghaoguo@huawei.com |
| ZTE | pan.yu24@zte.com.cn |
| Intel | Yi.guo@intel.com |
| CATT | Lijianxiang@catt.cn |
| Apple | ssirotkin@apple.com |
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# 3 References

1. R2-2209342 Reply LS on the UE/TRP TEG framework (R4-2214493; contact: CATT) RAN4 LS in Rel-17 NR\_pos\_enh-Core To:RAN1, RAN2, RAN3
2. R2-2209432 Discussion on the “Reply LS on the UE/TRP TEG framework” from RAN4 (R4-2214493) CATT discussion Rel-17 NR\_pos\_enh-Core
3. R2-2209433 [DRAFT] Reply LS on applicability of timing error margin of Rx TEG CATT LS out Rel-17 NR\_pos\_enh-Core To:RAN4 Cc:RAN1, RAN3
4. R2-2209431 Correction to TEG margin reporting Huawei, HiSilicon
5. R2-2209434 Corrections on the timing error margins CATT
6. R2-2210784 Summary of AI 6.11.2.3: LPP corrections Qualcomm Incorporated

# 4 Discussion

RAN4 sent “Reply LS on the UE/TRP TEG framework” to RAN1/2/3 in R2-2209168 (R4-2214493). This email discussion will discuss the questions on the Applicability of timing error margin in the reply LS, the impact to RAN2 and try to conclude the reply LS to RAN4.

---------------------------Start of Original LS from RAN4------------------------------------------------------------------------------

RAN4 thanks RAN1 for the LS R4-2211503(R1-2205382) on UE/TRP TEG framework. In RAN4#104e meeting, RAN4 discussed the LS and provided the following feedbacks:

|  |
| --- |
| **Issue #2: Applicability of an Rx/RxTx TEG**RAN4 feedback: RAN1’s understanding on applicability of reported TEG (issue #2) is correct. **Issue #5: Maximum number of changes of reports (or changes) of the TEG-SRS association** RAN4 feedback: RAN4 has the same understanding on the maximum number of changes of reports (or changes) of the TEG-SRS association (issue #5). **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.

**Issue #7: Difference of timing error margin values for Rx TEG and RxTx TEG**RAN4 feedback: RAN4 confirm that RAN1’s understanding is correct.  |

In addition, RAN4 reached the following agreements on TEG:

|  |
| --- |
| **Applicability of timing error margin of Rx TEG:** * For Rx TEG, the applicable timing error margin values that can be selected by the UE are the pre-defined values that are not larger than the sum of the Rel-16 group delay margin (dependent on PRS/SRS BW) and frequency drift margin.

**Candidate timing error margin for RxTx TEG:** * (16 values): ½ Tc, 1 Tc, 2 Tc, 4 Tc, 8 Tc, 12 Tc, 16 Tc, 20 Tc, 24 Tc, 32 Tc, 40 Tc, 48 Tc, 64 Tc, 80 Tc, 96 Tc, 128 Tc.
 |

RAN4 kindly asks RAN1/2/3 to take the above information into account in the following work on NR positioning enhancements.

---------------------------End of Original LS from RAN4 ------------------------------------------------------------------------------

## 4.1 Question on Rx TEG/ Tx TEG/ RxTxTEG

RAN4 reached the following agreements on TEG in their LS:

**Applicability of timing error margin of Rx TEG:**

* For Rx TEG, the applicable timing error margin values that can be selected by the UE are the pre-defined values that are not larger than the sum of the Rel-16 group delay margin (dependent on PRS/SRS BW) and frequency drift margin.

**Observed issue:** There is only clarification on the applicable timing error margin values on Rx TEG in RAN4 LS, however there is no clear statement that if there will be Applicability of timing error margin of Tx TEG and/or of RxTxTEG.

**The impact to specifications in RAN2:** there will be impacts on RxTx TEG and Tx TEG in Multi-RTT and impacts on RRC for UL-TDOA accordingly, if there is applicability of timing error margin also for Tx TEG and/or for RxTx TEG from RAN4. But now it is not clear for RAN2 yet.

Ask a question to RAN4: Will there be applicability of timing error margin also for Tx TEG and/or for RxTx TEG?

**Question 1: Do you agree to ask the question to RAN4: Will there be applicability of timing error margin for Tx TEG and/or for RxTx TEG? Please also provide views in the table.**

|  |  |  |
| --- | --- | --- |
| Company |  Yes/ No | Comments |
| Huawei, HiSilicon | Yes |  |
| ZTE | Yes |  |
| Intel | Yes |  |
| Qualcomm | Yes |  |
| CATT | Yes |  |
| vivo | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes |  |
| Ericsson | Yes |  |
| Apple | Yes |  |
| Samsung | Yes |  |

**Summary:**

11 companies participated in the discussion. 11/11 companies agree to ask the question to RAN4: Will there be applicability of timing error margin for Tx TEG and/or for RxTx TEG?

The agreement has been captured in the reply LS, so there is no more proposal here.

## 4.2 Question on the definition of group delay margin and frequency drift margin

Considering RAN4 sends the LS on the applicability of timing error margin of Rx TEG to RAN2, the statement of applicability is supposed to be captured clearly in LPP which was proposed by two CRs (R2-2209431, R2-2209434). However there is no definition of Rel-16 group delay margin and frequency drift margin either in TS37.355 or TS 38.133.

However RAN2 would like to learn from RAN4 that what can be referred to for the Rel-16 group delay margin (dependent on PRS/SRS BW) and frequency drift margin when these margins are captured in TS 37.355. Group delay margin perhaps could be mapped to clause 10.1.23.2 table 10.1.23.2-5 and 10.1.23.2-6 for RSTD, clause 10.1.25.2 table 10.1.25.2-5 and 10.1.25.2-6 for UE Rx-Tx in TS 38.133, Frequency drift margin could be concluded as definition of Y in clause 10.1.23.2 for RSTD in TS 38.133 in rapporteur’s view.

**Observed issue:** The Summary of AI 6.11.2.3: LPP corrections discussed this issue as well. “It is unclear to the Rapporteur how this maps to a Rx TEG margin (for a single TOA).”

- The clause 10.1.23.2 in TS 38.133 (referenced in the CR [2]) specifies margins for the RSTD measurement accuracy (Tables 10.1.23.2-5/-6). It is unclear to the Rapporteur how this maps to a Rx TEG margin (for a single TOA). Some Margin Values in Table 10.1.23.2-5/-6 do not fit into the available signalling values in IE *TEG-TimingErrorMargin.* E.g., values 120, 36 in Tables 10.1.23.2-5/-6 (38.133) are not supported in the signalling.

- For Multi-RTT, the CR [2] references the same clause 10.1.23.2 in TS 38.133 (RSTD Measurements). However, the margins for UE Rx-Tx time difference measurement are in clause 10.1.25.2 of TS 38.133 (UE Rx-Tx Time Difference Measurements) and the same issue as for the RSTD margins apply: Are the “measurement accuracy requirements margins” identical to the TEG margins? And if yes, why do the values in the Table 10.1.25.2-5/-6 not match the available signalling values in *nr-UE-RxTEG-TimingErrorMargin*?

There is a Proposal 4b in the summary: Ask RAN4 whether the “Applicability of timing error margin of Rx TEG” as included in the RAN4 LS R2-2209168 (R4-2214493) needs to be specified in LPP.

**Question 2: Do you agree to ask the question to RAN4: Is the Applicability of timing error margin of Rx TEG” as included in the RAN4 LS R2-2209168 (R4-2214493) supposed to be specified in LPP? Please also provide views in the table.**

|  |  |  |
| --- | --- | --- |
| Company |  Yes/ No | Comments |
| Huawei, HiSilicon | Yes | We can also ask R4, if it is specified in LPP, how the R4 spec should be referred. As pointed out above, it is unclear how R4 spec is referred and the question can trigger R4 to clarify in their spec |
| ZTE | Yes |  |
| Intel | Yes | Agree the additional question from Huawei.  |
| Qualcomm | Yes | O.K. to ask, however, if this is indeed “supposed to be captured clearly in LPP” as stated in the introduction above, RAN4 would/should have included such an action to RAN2 (this LS is primarily a response to RAN1 questions). LPP may just need a reference to TS 38.133, which is already there in LPP. However, this reference seems to have no corresponding specification in TS 38.133 currently. |
| CATT | Yes | The additional question from Huawei was captured in the draft LS in Q5. |
| Vivo | Yes |  |
| Xiaomi | Yes |  |
| Nokia | See comments | What is captured in LPP specification is RAN2 business. We just need to fully understand the applicability of TEG margin to different measurements/positioning methods and have a clear understanding of the definitions for group delay margin and frequency drift margin as viewed by RAN4. So, we should ask RAN4, questions to help us understand the TEG margin usage and related definitions. No need to ask RAN4 if something needs to be captured in LPP specification. |
| Ericsson | yes |  |
| Apple | Yes |  |
| Samsung |  | Same view with Nokia.  |

**Summary:**

11 companies participated in the discussion. 9/11 companies agree to ask the question to RAN4: “Is the Applicability of timing error margin of Rx TEG” as included in the RAN4 LS R2-2209168 (R4-2214493) supposed to be specified in LPP?” 2 companies prefer to ask RAN4 the additional question which has been captured in Q3.

The agreement has been captured in the reply LS, so there is no more proposal here.

**The impact to specifications in RAN2:** RAN2 would like to learn from RAN4 that what can be referred to for the Rel-16 group delay margin (dependent on PRS/SRS BW) and frequency drift margin when these margins are captured in TS 37.355.

**Question 3: Do you agree to ask for further clarification on the applicability: May RAN4 clarify the definition of Rel-16 group delay margin and frequency drift margin either in TS 38.133 or in TS 37.355? Please also provide views in the table.**

|  |  |  |
| --- | --- | --- |
| Company |  Yes/ No | Comments |
| Huawei, HiSilicon | Yes | They are mentioned in the LS  |
| ZTE | Yes |  |
| Intel | Yes |  |
| Qualcomm | Yes | O.K. to ask, but LPP does not look appropriate to specify group delays or frequency drift margins. |
| CATT | Yes |  |
| vivo | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes | But just phrase the question asking for information what the RAN4 definition of group delay margin and frequency drift margin is. |
| Ericsson | Yes |  |
| Apple | Yes |  |
| Samsung | Yes | We should ask their understanding on the relation between the TEG margin in LPP and the group delay margin/frequency drift margin in RAN4 spec. |

**Summary:**

11 companies participated in the discussion. 11/11 companies agree to ask the question to RAN4: “May RAN4 clarify the definition of Rel-16 group delay margin and frequency drift margin either in TS 38.133 or in TS 37.355?”

The agreement has been captured in the reply LS, so there is no more proposal here.

## 4.3 Question on UE Rx-Tx timing difference

Additionally, there are timing error margin of Rx TEG for RSTD in DL-TDOA report and for UE Rx-Tx timing difference in Multi-RTT report.

Group delay margin could be concluded according to clause 10.1.23.2 table 10.1.23.2-5 and 10.1.23.2-6 for RSTD, clause 10.1.25.2 table 10.1.25.2-5 and 10.1.25.2-6 for UE Rx-Tx in TS 38.133, Frequency drift margin could be concluded as definition of Y in clause 10.1.23.2 for RSTD in TS 38.133.

**Observed issue:** However there is no frequency drift margin for UE Rx-Tx timing difference in Multi-RTT in TS 38.133.

It is confused that if the applicable timing error margin values in the LS also work for the Rx TEG of UE Rx-Tx timing difference or not. A further clarification on the Applicability of timing error margin of Rx TEG for UE Rx-Tx timing difference is required.

**The impact to specifications in RAN2:** RAN2 doesn’t know how to map the applicability for UE Rx-Tx timing difference in Multi-RTT.

**Question 4: Do you agree to ask the question to RAN4: Does the Applicability of timing error margin of Rx TEG in the LS (R4-2214493) apply for UE Rx-Tx timing difference? Please also provide views in the table.**

|  |  |  |
| --- | --- | --- |
| Company |  Yes/ No | Comments |
| Huawei, HiSilicon | Yes | Can be asked together with Q1 |
| ZTE | Yes |  |
| Intel | Yes | Agree with Huawei |
| Qualcomm | Yes | O.K. to ask, but Rx TEG is different to RxTx TEG (see Definition section in LPP). |
| CATT | Yes | Understand QC’s comment and the question on the applicability of RxTx TEG (for UE Rx-Tx timing difference) is asked in Q1. |
| Vivo | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes | Looks like a redundant question. Already covered by Q1?[Rapporteur]: Q1 asks about the Tx TEG / RxTx TEG not only for UL-TDOA, but also for Multi-RTT, and this Q4 ask about the RxTEG for UE Rx-Tx timing difference (Multi-RTT). |
| Ericsson | Yes |  |
| Apple | Yes |  |
| Samsung | Yes |  |

**Summary:**

11 companies participated in the discussion. 11/11 companies agree to ask the question to RAN4: “Does the Applicability of timing error margin of Rx TEG in the LS (R4-2214493) apply for UE Rx-Tx timing difference?”

The agreement has been captured in the reply LS, so there is no more proposal here.

## 4.4 draft LS to RAN4

Based on the discussions in section, rapporteur proposes RAN2 will send our questions to RAN4. Based on this, rapporteur propose a draft LS as the following.

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| --- |
| **3GPP TSG-RAN WG2 Meeting #119bis electronicR2-22xxxxx****Electronic, 10th – 19th Oct, 2022****Title:** [Draft] **Reply LS to RAN4 on applicability of timing error margin of Rx TEG****Response to: R2-2209168 (R4-2214493)****Release:** Rel-17**Work Item:** NR\_pos\_enh-Core**Source:** CATT (to be RAN2)**To:** RAN4**Cc:** RAN1, RAN3**Contact Person:**          **Name:** Jianxiang Li**E-mail Address:**   **lijianxiang@catt.cn****Attachments:** None1. Overall Description:RAN2 thanks RAN4 for the Reply LS on the UE/TRP TEG framework (R4-2214493). RAN2 discussed the LS and related questions on the applicability of timing error margin of Rx TEG at RAN2#119bis-e meeting and would like to ask RAN4 the following questions (TBC, it will be updated based on agreements made after the online discussion):Question 1: Will there also be definition of applicable values of timing error margin for Tx TEG and/or for RxTx TEG, similar to that for Rx TEG?Question 2: Is the “applicability of timing error margin of Rx TEG” as included in the RAN4 LS (R4-2214493) supposed to be specified in LPP?Question 3: Does the applicability of timing error margin of Rx TEG in the LS (R4-2214493) apply for UE Rx-Tx timing difference? RAN2 found there is no definition of Rel-16 group delay margin and frequency drift margin. So RAN2 kindly asks RAN4 to provide the definition of Rel-16 group delay margin and frequency drift margin for the applicability of timing error margin of Rx TEG,.**2. Actions:****To RAN4****ACTION:** RAN2 kindly asks RAN4 to provide the answers to above questions and RAN4’s view on where/how to capture these definitions.**3. Date of Next TSG-RAN2 Meetings:**TSG RAN WG2 Meeting #120 14 – 18 Nov 2022 Toulouse, FRTSG RAN WG2 Meeting #121 27 Feb – 3 March 2023 Athens, GR |

**Question 5: Do companies agree with the draft LS to RAN4? Please specify the reasons and comments on the draft LS as well.**

|  |  |  |
| --- | --- | --- |
| Company |  Yes/ No | Comments |
| Huawei, HiSIlicon | Yes | Some editorials per above |
| ZTE | Yes |  |
| Intel | Yes |  |
| Qualcomm | Yes |  |
| CATT | Yes | Fine with the corrections by Huawei. |
| Vivo | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes | Yes, with some changes as proposed in the draft LS text above. |
| Ericsson | Yes |  |
| Apple | Yes |  |
| Samsung | Yes |  |

**Summary:**

11 companies participated in the discussion. 11/11 companies agree to send the reply LS to RAN4 with these questions.

**Proposal 1: RAN2 to send the reply LS to RAN4.**

# 5 Conclusion

Based on companies’ feedback, the following is proposed:

**Proposal 1: RAN2 to agree to send the reply LS to RAN4.**