**3GPP TSG-RAN WG2 Meeting #118-e *draft* R2-2206259**

**Electronic meeting, May 9th – May 20th, 2022**

**Agenda item: 6**.11.2.6

**Source:** CATT

**Title:** [AT118-e][638][POS] Tx TEG and LOS/NLOS aspects (CATT)

**Document for:** Discussion and Agreement

# 1 Introduction

This is the report of following offline discussion:

* [AT118-e][638][POS] Tx TEG and LOS/NLOS aspects (CATT)

Scope: Discuss P1a-P1e and P3a/P3b of R2-2206333.

Intended outcome: Report to CB session in R2-2206259

Deadline: Tuesday 2022-05-17 1800 UTC

The discussion will continue to discuss the remaining proposals P1a-P1e and P3a/P3b of R2-2206333:

R2-2206333 [Pre118-e][607][POS] Summary of AI 6.11.2.6 on accuracy (CATT) CATT discussion Rel-17

* TxTEG report mechanism in RRC aspect: P1a/ P1b;
* TxTEG report of asn.1 issues in RRC and LPP: P1c/P1d;
* Failure report mechanism of Tx/Rx TEG in RRC and LPP: P1e;
* LOS/NLOS related enhancement: P3a/P3b.

# 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 |
| Apple | Sasha Sirotkin <ssirotkin@apple.com> |
| InterDigital | jaya.rao@interdigital.com, fumihiro.hasegawa@interdigital.com |
| Jianxiang Li | lijianxiang@catt.cn |
| ZTE | pan.yu24@zte.com.cn |
| vivo | panxiang@vivo.com |
| Xiaomi | lixiaolong1@xiaomi.com |
| Intel | Yi.guo@intel.com |
|  |  |
|  |  |
|  |  |
|  |  |

# 3 Discussion

## 3.1 TxTEG report mechanism in RRC aspect

Event-triggered report or periodic report were discussed in[Pre117-e][611][POS] Open issues on positioning accuracy enhancements (CATT) but the periodic report gets more support. LMF actually may update the periodicRreporting Interval if there is no TxTEG change during the reporting, so there is no big signalling issue observed in the existing periodic reporting.

However two companies still suggested supporting event-triggered report in R2-2205654 and R2-2205730. Apple proposed to remove the periodic UE Tx TEG association reporting and to introduce change-triggered reporting instead. The proposal 1a in R2-2206333 says:

**Proposal 1a: RAN2 to agree configuring event triggered reporting for UL-TDOA to enable reporting of the association between UE TxTEG ID and SRSp resources when a change in the association is identified.**

|  |  |
| --- | --- |
| Apple  R2-2205654 | Observation 1: periodic UE Tx TEG association reporting signalling design is extremely inefficient.  Observation 1: in their LS [1], RAN1 have confirmed that there is no need for periodic UE Tx TEG association reporting.  Proposal 1: to remove the periodic UE Tx TEG association reporting and to introduce change-triggered reporting instead.  Proposal 2: to remove timestamp from the UE Tx TEG association report. |
| InterDigital  R2-2205730 | Observation 1: By allowing the UE to report the association between UE Tx TEG and SRSp resources only when an event associated with the change of Tx TEG association is identified, signalling overhead can be reduced significantly  Proposal 1: Support configuring event triggered reporting for UL-TDOA to enable reporting of the association between UE Tx TEG ID and SRSp resources when a change in the association is identified  Proposal 2: Support configuring of reportAmount of 1 and infinity for event triggered reporting of UE Tx TEG association  Observation 2: For event-triggered reporting, it is possible that the UE may report the Tx TEG association too frequently (e.g. due to frequent movement/changes at UE), which may result in difficulty at network for controlling the resources for reportingProposal 3: Support configuring reportInterval for event-triggered reporting of UE Tx TEG association.  Proposal 4: The configurable reportInterval values for event-triggered reporting are reused from periodic reporting (e.g. ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240) |

**Q1: Do companies agree that configuring event triggered reporting for UL-TDOA to enable reporting of the association between UE Tx TEG ID and SRSp resources when a change in the association is identified, and remove periodic reporting in the existing RRC protocol? Please provide also a brief justification for your answer.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | periodic reporting with timestamp is enough or oneshot reporting. if event-triggered is indeed needed, need R1 to decide |
| Qualcomm | See comment | This was discussed at previous meetings, and in general we agree that event triggered reporting would have been the correct approach. However, given that we made the periodic agreements at previous meetings, it may be too late to change now. |
| Apple | Yes | We would like to stress that it is not just “a company proposal”, but it is based on the new information we received from RAN1 in R2-2204420, which clarified that “RAN1’s decision to support periodicity reporting of UE Tx TEG association for the SRS resources for positioning was made mainly based on the consideration of the signalling simplicity. In RAN1’s view, further signalling optimization is up to RAN2.”  In other words, the decision to support periodic signalling was made based on the wrong assumption that RAN1 had technical motivation to ask for it, which as we can now clearly see was not the case.  Therefore, the decision to support periodic (and not event triggered) signalling was a mistake which should be corrected. |
| InterDigital | Yes | In R2-2204420, it states that further signalling optimization is up to RAN2. From our perspective, at least reportAmount of 1 should be event triggered reporting of UE Tx TEG association.  Our proposal is also motivated by the inefficiency associated with periodic reporting, as we do not see the need for the UE to report the association between  UE Tx TEG ID and SRSp resources periodically when a change is not identified in the association. In this regard, we believe a correction for event triggered reporting is justified. |
| CATT | No | The periodical report only reports the changes of TxTEG in the existing RRC protocol. It will bring disaster to network if all devices in one cell report TxTEG only with event-trigger.  RAN4 doesn't conclude the changes of TxTEG mentioned in R2-2202165: The UE Tx TEG association between UE Tx TEG IDs and SRS resources for positioning is up to UE implementation, so it is not necessary nor practical to define the condition when the TEG association is changed.  So it is not acceptable for the management of all devices from network’s perspective with this proposal. |
| ZTE | No | Agree with CATT that RAN4 thinks specify the change is not practical. Since NW can configure UE with different reporting periodicity, it is ok to keep the current version |
| vivo | Yes | Agree with Apple that RAN2 shall fix the misunderstanding based on the new RAN1 LS.  To the concern of CATT, the UE shall generate the TEG association no matter event triggered solution is introduced or not, the only difference is whether the UE shall report the same info for continuous periods. |
| Xiaomi | No | The current periodic report can meet the RAN1 requirements, and RAN1 didn’t agree the event triggered reporting, |
| Intel | No | Periodic reporting is sufficient . |
| Ericsson | No | It is too late to introduce new mechanisms now. What we have is adequate. This has to be decided by RAN1. |
| Nokia | No | RAN1 should have just agreed on the concepts and provided the requirements to RAN2 and let RAN2 address the signalling support but unfortunately, they made some signalling decisions. At this point, RAN2 does not have to do any optimizations (which is what RAN1 views event reporting as). We would like to minimize new functionality at this stage and consider optimization in the next release. Just make sure future extensions are possible to introduce even reporting in a later release. |
|  |  |  |
|  |  |  |

Summary

11 companies provided feedback. 7/11 companies answered ‘No’ for “event triggered reporting”, 3/11 company answered ‘Yes’ for “event triggered reporting”, 1/11 company think the periodic agreements was made at previous meetings and too late to change now. It seems slight majority who do not support “event triggered reporting”, so rapporteur proposes:

**Proposal 1: RAN2 to agree no event triggered reporting for UL-TDOA to enable reporting of the association between UE Tx TEG ID and SRSp resources when a change in the association is identified (7/11).**

Furthermore, InterDigital observed it is possible that the UE may report the Tx TEG association too frequently (e.g. due to frequent movement/changes at UE), which may result in difficulty at network for controlling the resources for reporting. They proposed the configurable reportInterval values for event-triggered reporting are reused from periodic reporting (e.g. ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240).

**Q2: Do companies agree to update the asn.1 of *UE-TxTEG-RequestUL-TDOA-Config-r17* as event triggered reporting in RRC below? Please provide also a brief justification for your answer.**

EventTriggerConfig-r17::= SEQUENCE {

reportInterval-r7 ENUMERATED {ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240}

reportAmount-r17 ENUMERATED {1, infinity},

...

}

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | In terms of future extensibility it is better. but needs to have restriction in reportInterval that it is only present when the value of report Amount is set to infinity |
| Qualcomm |  | See comment in our reply to Question 1. |
| Apple | See comments | We acknowledge the issue raised by InterDigital, but the proper way to solve it is to define event triggered signalling, not “play” with periodicities (which are arbitrary anyway). |
| InterDigital | Yes | The reportAmount value set to infinity is intended to handle the issue where the gNB is unable to predict the changes in UE Tx TEG and SRSp resource association at UE. In this case, the gNB can configure the reporting interval to control the number of reporting occasions while ensuring accurate association info available at gNB. Since the reportInterval values were previously discussed for periodic reporting with the similar reasoning (e.g. to control number of reporting occasions), we think they are applicable for event triggered reporting. |
| CATT | No | The existing periodical report already supports the request from RAN1. No need to update it. |
| ZTE | No | We do not see the difference between one shot reporting and the reportamount =1. As mentioned in Q1, if Tx TEG and SRS association varies slowly, NW can configure a large periodicity to reduce signaling. We do not see the necessity of enhancing this especially at this late stage |
| vivo | Yes | The new version is fundamentally the same as the original one but only revise the IE name to support event triggered report.  UE-TxTEG-RequestUL-TDOA-Config-r17 ::= CHOICE {  oneShot-r17 NULL,  periodicReporting-r17 ENUMERATED {ms120, ms240, ms480, ms640, ms1024, ms2048, ms5120, ms10240}  } |
| Xiaomi | No | The event triggered reporting is not needed. |
| Intel | No | See comment in Question 1. |
| Ericsson | No | If any change is needed later; it can be captured via field description also. We do not see the need to have fwd compatibity now.  In field description it can be said; the trigger is also for event based. |
| Nokia | No | See our comments to Question 1. |
|  |  |  |
|  |  |  |

Summary

11 companies provided feedback. 7/11 companies answered ‘No’ for “updating the asn.1 of UE-TxTEG-RequestUL-TDOA-Config-r17 as event triggered”, 3/11 company answered ‘Yes’ for the update, 1/11 company don't support the update but think event-trigger is enough. It seems no majority on the update of asn.1, so rapporteur proposes:

**Proposal 2: RAN2 to agree to keep the** **current asn.1 of UE-TxTEG-RequestUL-TDOA-Config-r17 in RRC (7/11).**

## 3.2 TxTEG report of asn.1 issues in RRC and LPP

There are few issues of asn.1 in RRC and LPP are observed in R2-2204706, R2-2204707 and R2-2204708. Most of these issues are captured in the RRC update in R2-2205859 and R2-2205829:

* R2-2205859 Correction based upon Positioning RILs Ericsson CR Rel-17 38.331 17.0.0 3121 - F NR\_pos\_enh-Core Late
* R2-2205829 LPP Updates Qualcomm Incorporated draftCR Rel-17 37.355 17.0.0 F NR\_pos\_enh-Core

**Issue #1:**

The maximum number reported UE TxTEG ID which is defined in *UE-TxTEG-AssociationList-r17* in RRC means that how many changes of TxTEG-ID will be reported in one RRC message.

* The maxi number reported UE TxTEG ID in the existing LPP is 64, but it is 8 in the existing RRC.
* The maximum numbers of TxTEG-IDs in one change is 8 according to RAN1 LS.

It seems that the volume of reported TxTEG-IDs in one RRC message is not proper if it is only 8.

Existing RRC in R2-2205859 is 8:

maxNrOfTEG-ID-r17 INTEGER ::= 8 -- Maximum number of UE Tx Timing Error Group ID

Existing LPP in R2-2205829 is 64:

maxTxTEG-Sets-r17 INTEGER ::= 64 -- FFS 8 TxTEGs and max 8 time stamps

So CATT propose to update the volume of UE TxTEG IDs report in RRC as 64 which is aligned with LPP, because 64 is well considered based on the possible times of the change and the number of TxTEG IDs in one change.

UE-TxTEG-AssociationList-r17 ::= SEQUENCE (SIZE (1.. maxNrOfTEG-ID-r17)) OF UE-TxTEG-Association-r17

maxNrOfTEG-ID-r17 INTEGER ::= 64 -- Maximum reported number of UE Tx Timing Error Group ID

Considering the *maxNrOfTEG-ID-r17* in LPP is still FFS, companies may discuss the maximum numbers of reported UE TxTEG IDs in both LPP and RRC here. Since RAN4 doesn't conclude the changes of TxTEG mentioned in R2-2202165, it is necessary to send RAN2 agreement on the volume of changes of TxTEG-IDs in one report to RAN1 and RAN4 for confirming.

* R[2-2202165](file:///E:\WORK\1%203GPP\Meeting\RAN2%20117-e\2%20During\Docs\R2-2202165.zip) Reply LS on reporting of the Tx TEG association information (R4-2202685; contact: Huawei) RAN4 LS in Rel-17 To:RAN1, RAN2 Cc:RAN3

|  |
| --- |
| The UE Tx TEG association between UE Tx TEG IDs and SRS resources for positioning is up to UE implementation, so it is not necessary nor practical to define the condition when the TEG association is changed. |

**Q3: Do companies agree that the maximum numbers of reported TxTEG-IDs in one RRC message and *maxTxTEG-Sets-r17* in LPP message is 64? If No, please provide your preferred value of the max numbers.** **Please provide also a brief justification for your answer.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes/No for RRC** | **Yes/No**  **for LPP** | **Comments** |
| Huawei, HiSilicon | Yes | Yes | OK with 8 timestamps.  but the name is a bit ambiguous. prefer to change the name to something like maxTEG-ReportsPerPeriod |
| Qualcomm | Not sure | Yes | For RRC, my understanding from previous discussions is that the UE reports the last SRS/TEG association when the (periodic) report is triggered. SRS/TEG changes between periodic reports seem not supported with the current RRC signalling structure. |
| Apple | No | Yes | If event triggered reporting is agreed, the number of “changes” reported in one message would be small and therefore 64 is not needed. |
| InterDigital | No | Yes | Same understanding with Apple. Changing the max number of SRSp-TxTEG association reports per reporting occasion to 64 in RRC is not needed. |
| CATT | Yes | Yes | To Qualcomm, RAN1 requires to report all the changes of TxTEG in the report period because:   1. RAN1 says “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)” 2. RAN1 says “RAN1’s decision to support periodicity reporting of UE Tx TEG association for the SRS resources for positioning was made mainly based on the consideration of the signalling simplicity. In RAN1’s view, further signalling optimization is up to RAN2.”   My understanding on the changes of TxTEG in RRC is that:   1. UE doesn’t know when SRS is measured by gNB associated with some TxTEG ID, so all changed TxTEG association should be reported; 2. LMF will pick up the proper TxTEG association with timestamp when RSTD is measured by gNB to mitigate the UE Tx timing delays.   So it is assumed that 8 time stamp in one RRC report.  If there is doubt, an LS to RAN1 is required. |
| ZTE | Yes | Not sure | RAN1 is discussing about the maximum number of SRS-Tx TEG association per M-RTT report. We should consider their progress |
| vivo | Yes | Yes | I think the notion of event triggered reporting shall be clarified:  For each configured periodicity, the UE shall record the initial TEG association and the TEG change with timestamp; For the adjacent periodicities, if the TEG association does not changed during the latter periodicity, then the UE does not need to send the next TEG reporting.  If the above understanding is correct, then the 64 is needed even we support event triggered reporting. |
| Xiaomi | Not sure | Yes | Suggest to ask RAN1 to clarify it. |
| Intel | Yes | Yes | Agree the analysis from CATT. |
| Ericsson | Ok |  | Ok; if companies want RRC to align with LPP; otherwise the UE may only report the last association rather than with 8 different time stamps. |
| Nokia | Not sure | Yes | The analysis is not very clear. If in doubt about RRC signalling requirement, we should check with RAN1. |
|  |  |  |  |
|  |  |  |  |

**Q4: Do companies agree to send the agreement to RAN1 and RAN4 for conforming if there is? Please provide also a brief justification for your answer.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | depends | If we can not resolve the issues in RAN2, asking RAN1/4 for guidance would be required. TEG turned out to be rather confusing, and the RAN1 input is often not that clear as it could be. However, we need then consider that a response from RAN1/4 may not be received before the next meeting. |
| CATT | Depends | If we do not conclude the TxTEG report in RAN2, an LS is required. |
| ZTE | Yes |  |
| vivo | Depends | Agree with QC and CATT. |
| Xiaomi | Yes |  |
| Intel | Depends | We should not leave any FFS in ASN.1 after this meeting, i.e. value/value range have to be resolved in this meeting. If there is no conclusion in RAN2, and LS is needed, then we have to either remove the field or set the value large enough. |
| Ericsson | Depends | Agree with QC and others who prefer to resolve in RAN2. |
| Nokia | Yes | The piecemeal approach to looking at RAN1 and RAN4 agreements over multiple LS is very confusing. I cannot figure out the RRC impacts from the LS text from RAN1 that was quoted by CATT in Q3. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Summary

11 companies provided feedback on Q3. 10/11 companies support ‘64’ as maxTxTEG-Sets-r17 in LPP.

5/11 companies support ‘64’ as “maximum numbers of reported TxTEG-IDs in RRC”, 1/11 company is ok with ‘64’ in RRC, 3/11 companies not sure and 2/11 companies don't support ‘64’. It seems majority support ’64’ in LPP which is as in the current LPP, but no clear majority on the value of maximum numbers of reported TxTEG-IDs in RRC.

8 companies provided feedback on Q4. 3/8 companies support to send LS to RAN1. 5/8 companies support depending on the results in RAN2. There is no conclusion on the value of maximum number of reported TxTEG-IDs in RRC. So rapporteur proposes for RAN2 to send the questions to RAN1 directly:

**Proposal 3: RAN2 to agree to send an LS to RAN1 on the maximum number of reported TxTEG-IDs in one RRC and LPP message with below questions (8/8):**

* **How many Tx TEG/SRS association changes in a single NR-Multi-RTT-SignalMeasurementInformation-r16 instance? 8 timestamps with 8 TEGs per time stamp is the current number in LPP, resulting in 64 elements.**
* **How many Tx TEG/SRS association changes in a single RRC message report?**

**Issue #2: the usage of nr-SRS-TxTEG-Set-r17**

CATT believes that the TxTEG-IDs from UE to LMF are not only for UE Rx-Tx measurement in LMF, but also for gNB Rx-Tx measurement in LMF. So this IE *nr-SRS-TxTEG-Set-r17* should not be reported only within Cond Case2-3. The IE *nr-SRS-TxTEG-Set-r17* is something like the UE TxTEG report via RRC in UL-TDOA.

So CATT proposed to delete the condition of TxTEG as below. Similarly the time stamp in *NR-SRS-TxTEG-Element-r17* is needed here to help LMF figure out which UE-TxTEG-ID is selected for the gNB Rx-Tx measurement in LMF. However the LPP rapporteur has difference understanding, i.e. for case-1, no Tx TEG is needed. In case of doubt, RAN2 may need to ask RAN1 on the usage of nr-SRS-TxTEG-Set-r17 in Multi-RTT report.

nr-SRS-TxTEG-Set-r17 SEQUENCE (SIZE(1..maxTxTEG-Sets-r17)) OF

NR-SRS-TxTEG-Element-r17 OPTIONAL

]]

**Q5: Do companies agree to delete the condition of TxTEG report in Multi-RTT? Do company agree to send the doubt to RAN1 that if TxTEG IDs are still required when TxTEG is not required in case 2-3 in *NR-UE-RxTx-TEG-Info-r17*? Please provide also a brief justification for your answer.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes/No**  **(to delete the condition)** | **Yes/No (LS to RAN1)** | **Comments** |
| Huawei, HiSilicon | No | No | This condition is just for restricting when the field can be configured and when it cannot be configured, i.e., it is only needed when case2-3 report is sent to the LMF. it is not a restriction on how it should be used. |
| Qualcomm | No | See Q4 | Tx TEG and RxTx TEG are different concepts. There is no Tx TEG involved in RxTx TEG (in my understanding, this is the advantage of the definition of a RxTx TEG) and the RAN4 LS cited before Question 3 mentions only Tx TEG association change. |
| Apple | No | No | Agree with Huawei |
| InterDigital | No | No |  |
| CATT(proponent) | Yes | Yes | UE Tx TEG report is for the relationship between UE Tx TEG ID and SRS resources.  TxTEG in multi-RTT always is required to report to LMF even without case2-3 because SRS is sent by UE. If we don't conclude in RAN2, an LS to RAN1 is required. |
| ZTE | No | No | If only RxTx TEG reported to LMF, then no need to report SRS and Tx TEG association. So the condition is correct and no need to change |
| vivo | No | No |  |
| Xiaomi | No | No |  |
| Intel | No | No | Agree with Huawei, QC. |
| CATT | No | No | TxTEG is not required when only RxTX TEG is reported because UE combines RxTx together for RxTxTEG. Update the previous comments. |
| Nokia | No | No |  |

Summary

All companies agree not to change the condition of TxTEG report in Multi-RTT in current LPP. So there is no proposal here.

The updated LPP in R2-2205829 is FFS on CHOICE in NR-UE-RxTx-TEG-Info-r17 as below:

NR-UE-RxTx-TEG-Info-r17 ::= CHOICE { -- FFS if the CHOICE structure is needed

case1-r17 SEQUENCE {

nr-UE-RxTx-TEG-ID-r17 INTEGER (0..maxNumOfRxTxTEGs-1-r17)

},

case2-r17 SEQUENCE {

nr-UE-RxTx-TEG-ID-r17 INTEGER (0..maxNumOfRxTxTEGs-1-r17),

nr-UE-Tx-TEG-Index-r17 INTEGER (1..maxTxTEG-Sets-r17)

},

case3-r17 SEQUENCE {

nr-UE-Rx-TEG-ID-r17 INTEGER (0..maxNumOfRxTEGs-1-r17),

nr-UE-Tx-TEG-Index-r17 INTEGER (1..maxTxTEG-Sets-r17)

},

...

} -- FFS the nr-UE-Tx-TEG-ID-r17 in case2 and case3 (pending RAN1)

CATT proposed to change the structure of *NR-UE-RxTx-TEG-Info-r17* from choice to sequence which is more flexible in the LPP as below:

NR-UE-RxTx-TEG-Info-r17 ::= SEQUENCE {

nr-UE-RxTx-TEG-ID-r17 INTEGER (0..maxNumOfRxTxTEGs-1-r17) OPTIONAL,

nr-UE-Tx-TEG-Index-r17 INTEGER (0..maxNumOfTxTEGs-1-r17) OPTIONAL,

nr-UE-Rx-TEG-ID-r17 INTEGER (0..maxNumOfRxTEGs-1-r17) OPTIONAL, ...

}

**Q6: Do companies agree to modify the IE *NR-UE-RxTx-TEG-Info-r17* from CHOICE to SEQUENCE? Please provide also a brief justification for your answer.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | CHOICE is clear from the readability point of view. from signalling overhead point of view, it also seems to be more or less the same. |
| Qualcomm | No | The SEQUENCE definition would allow all possible combinations between the 3 fields, which however, seems not the RAN1 intention. I.e., only the current 3 CHOICEs are supported by RAN1. The proposal would also make the corresponding request and capability definition more difficult. I.e., the *nr-UE-RxTxTEG-Request* and *nr-UE-RxTx-TEG-ID-ReportingSupport* can simply refer to the 3 choices. With the removal of the CHOICE, more field description would be needed on which combinations are allowed/supported/requested (without any functional difference).  However, the additional SEQUENCE for *case-1* above is not needed. |
| Apple | No | CHOICE is aligned with the agreements |
| InterDigital | No |  |
| CATT(proponent) | Yes | Sequence is more flexible to be extended in the future. But we are fine to keep the CHOICE if majority prefers. |
| ZTE | No | CHOICE better reflects RAN1’s agreements. RAN1 does not agree on all the combinations |
| vivo | No |  |
| Xiaomi | No |  |
| Intel | No | Agree with others, choice is more clear and align with agreements. |
| Nokia | No | Agree with other that CHOICE is better and avoids adding detailed field description to document any restrictions if SEQUENCE construct is used. |
|  |  |  |
|  |  |  |

Summary

A clear majority company (9/10) prefer not to modify the IE *NR-UE-RxTx-TEG-Info-r17* in current LPP. So there is no proposal here.

## 3.3 Failure report mechanism Tx/Rx TEG in RRC and LPP

Ericsson introduces the failure report mechanism on the corresponding Rx/Tx TEG association in LPP and RRC.

Currently there is no provision for failure handling for the above reports, if UE is unable to report the TEG association how should that be handled. UE should be able to handle the failure; i.e provide failure report on the TEG association report and continue transmitting UL-SRS.

|  |  |
| --- | --- |
| Ericsson  R2-2205806 | Proposal 1 Failure to provide (periodic) Rx/Tx TEG association does not result in termination of UL SRS Tx or DL-PRS Measurements  Proposal 2 UE provides the failure report on the corresponding Rx/Tx TEG association and continue with the positioning procedure  Proposal 3 Below TP on ASN.1 for RRC and LPP is agreed for TEG failure Reporting  failureIndication-r17 ENUMERATED {state-transition, lowpowerstate, unknown, spare1} OPTIONAL, |

So Ericsson proposed to support the failure report in both LPP and RRC as below.

- LPP

NR-SRS-TxTEG-Element-r17 ::= SEQUENCE {

nr-TimeStamp-r17 NR-TimeStamp-r16 OPTIONAL, -- Need OP

nr-UE-Tx-TEG-ID-r17 INTEGER (0..maxNumOfTxTEGs-1-r17),

srs-PosResourceList-r17 SEQUENCE (SIZE (1..maxNumOfSRS-PosResourceSets-r17)) OF

SRS-PosResources-r17,

...,

[[

tegTxReportingfailureIndication-r17 ENUMERATED {state-transition, lowpowerstate, unknown, spare1} OPTIONAL

]]

NR-UE-RxTx-TEG-Info-r17 ::= CHOICE {

case1-r17 SEQUENCE {

nr-UE-RxTx-TEG-ID-r17 INTEGER (0..maxNumOfRxTxTEGs-1-r17)

},

case2-r17 SEQUENCE {

nr-UE-RxTx-TEG-ID-r17 INTEGER (0..maxNumOfRxTxTEGs-1-r17),

nr-UE-Tx-TEG-Index-r17 INTEGER (1..maxTxTEG-Sets-r17)

},

case3-r17 SEQUENCE {

nr-UE-Rx-TEG-ID-r17 INTEGER (0..maxNumOfRxTEGs-1-r17),

nr-UE-Tx-TEG-Index-r17 INTEGER (1..maxTxTEG-Sets-r17)

},

...,

failureCase-r17 ENUMERATED {state-transition, lowpowerstate, unknown, spare1} OPTIONAL,

}

- RRC

UEPositioningAssistanceInfo-IEs-r17 ::= SEQUENCE {

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

failureIndication-r17 ENUMERATED {state-transition, lowpowerstate, unknown, spare1} OPTIONAL,

lateNonCriticalExtension OCTET STRING OPTIONAL,

nonCriticalExtension SEQUENCE {} OPTIONAL

}

**Q7: Do companies agree the TP of Failure report mechanism of Tx/Rx TEG in RRC and LPP? Please provide also a brief justification for your answer.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes/No**  **(TP on RRC)** | **Yes/No**  **(TP on LPP)** | **Comments** |
| Huawei, HiSIlicon | No | No | Justification is not clear from R2’s perspective. Why the UE may fail to provide TEG association at certain times?  This needs to be discussed in R1 if needed |
| Qualcomm | No | No | If TEG is requested, but absent in the report, it obviously means that the TEG is not available. This is not different compared to any other "failure handling" in e.g. LPP (e.g., RSRP etc.). In addition, the proposed failure cases seem all unrelated to TEG. |
| Apple | No | No | Agree with QC |
| InterDigital | No | No | Same understanding with QC |
| CATT | No | No | The capability indicates whether UE can report TEG or not. If UE plans to support lowpower then it should not support TEG capability to network. |
| ZTE | No | No | any other new feature introduced in R17 does not have such a failure report. Why does this needed? |
| vivo | No | No |  |
| Xiaomi | No | No |  |
| Intel | No | No | Agree with QC. |
| Ericsson | Yes |  | For RRC; it is periodic configuration and if UE is unable to report; it should send failure reason. |
| Nokia | No | No |  |
|  |  |  |  |

Summary

11 companies provided feedback. 10/11 companies do not support the TP of Failure report mechanism of Tx/Rx TEG in RRC and LPP. 1/11 company supports it as below reason: If UE is unable to report in RRC periodic report; it should send failure reason. There is an overwhelming majority, so rapporteur proposes:

**Proposal 4: RAN2 not to support Failure report mechanism of Tx/Rx TEG in RRC and LPP (10/11).**

## 3.4 LOS/NLOS related enhancement

Two companies believe that the current field cannot differentiate whether the report is per TRP or per resource for the main measurement. There are two candidate options on the update:

* #Option 1: Huawei suggest updating to indicate whether the LOS-NLOS report is per TRP or per resource in R2-2205004.

[[

nr-LOS-NLOS-Indicator-r17 CHOICE {

perTRP LOS-NLOS-Indicator-r17,

perResource LOS-NLOS-Indicator-r17

} OPTIONAL,

* #Option 2: ZTE propose to modify the indicator as below:

– *LOS-NLOS-Indicator*

The IE *LOS-NLOS-Indicator* provides information on the likelihood of a Line-of-Sight (LOS) propagation path from the source to the receiver.

LOS-NLOS-Indicator-r17 ::= CHOICE{

per-trp-r17 Indicator-r17,

per-resource-r17 SEQUENCE (SIZE (1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF

LOS-NLOS-Indicator-PerResource-r17,

...

},

LOS-NLOS-Indicator-PerResource-r17 ::=

SEQUENCE (SIZE (1..nrMaxResourcesPerSet-r16)) OF

Indicator-r17

Indicator-r17 CHOICE {

soft-r17 INTEGER (0..10),

hard-r17 BOOLEAN,

...

},

-- ASN1STOP

| *LOS-NLOS-Indicator* field descriptions |
| --- |
| ***LOS-NLOS-Indicator***  This field indicates whether the LOS or NLOS indicator is provided per TRP or per PRS resource. |

**Q8-1: Do companies agree to modify the *nr-LOS-NLOS-Indicator-r17* to choice of per TRP or per resource? Please provide also a brief justification for your answer.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | the current LPP CR already handles this. |
| Qualcomm | Yes | Seems according to RAN1 parameter. The CHOICE is simpler, otherwise significant additional field description would be required. |
| Apple | Yes |  |
| InterDigital | Yes |  |
| CATT | Yes |  |
| vivo | Yes |  |
| Xiaomi | Yes |  |
| Intel | Yes |  |
| Nokia | Yes | Agree that CHOICE construct is more clear. |
|  |  |  |
|  |  |  |
|  |  |  |

**Q8-2: If yes, which TP do you prefer? Please provide also a brief justification for your answer.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option 1/2** | **Comments** |
| Qualcomm | Option 1 | Option 2 is unclear. Seems only applicable to the *NR-DL-PRS-ExpectedLOS-NLOS-Assistance*, where the CHOICE is already supported anyhow. |
| Apple | Option 1 |  |
| InterDigital | Option 1 |  |
| CATT | Option 1 |  |
| ZTE | Option 2 | The TP is provided together with changes in *NR-DL-PRS-ExpectedLOS-NLOS-Assistance.*  Option 2 provides a unified design of *LOS-NLOS-Indicator-r17* to be embedded in AD and reporting. It is more readable and no other field description is needed. |
| vivo | Option 1 |  |
| Xiaomi | Option 1 |  |
| Intel | Option 1 |  |
| Nokia | Option 1 |  |
|  |  |  |
|  |  |  |
|  |  |  |

Summary

9 companies provided feedback. 8/9 companies agree to modify the nr-LOS-NLOS-Indicator-r17 to choice of per TRP or per resource. 8/9 companies prefer TP in R2-2205004 as below:

[[

nr-LOS-NLOS-Indicator-r17 CHOICE {

perTRP LOS-NLOS-Indicator-r17,

perResource LOS-NLOS-Indicator-r17

} OPTIONAL,

There is an overwhelming majority, so rapporteur proposes:

**Proposal 5: RAN2 to update the TP of nr-LOS-NLOS-Indicator-r17 in LPP (8/9).**

[[

nr-LOS-NLOS-Indicator-r17 CHOICE {

perTRP LOS-NLOS-Indicator-r17,

perResource LOS-NLOS-Indicator-r17

} OPTIONAL,

Furthermore, Huawei proposed several corrections to LOS-NLOS indication in R2-2205004 according the RIL:

[H027] UE should be allowed to choose its own reporting mode of per TRP or pre resource report and does not have to follow the LMF’s request. This should be also clarified in the field descritpion or IE description.

[H029]Change the name to nr-LOS-NLOS-IndicatorPerResource to differentiate it with the per TRP/perResource Indication

[H030] Is it possible that the UE chooses a NLOS reference TRP? If that is the case, all the LOS-NLOS indicator will be NLOS and signaling can be optimized. If not, this indication is only for the neighbour TRP indicated by the PRS ID.

**Correction[R2-2205004] #2** / Add in the field description that in spite of the request from the network in RLI, the UE can choose its LOS-NLOS reporting by TRP or by resource.

***nr-los-nlos-Indicator***

This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the TRP or resource. Note, the TOA measurement refers to the TOA of this neighbour TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*. In spite of the request from the network in *requestLocationInformation*, the UE can choose its resourcetype and ganularity for LOS-NLOS reporting.

**Correction [R2-2205004] #3/** Change the name to nr-LOS-NLOS-IndicatorPerResource to differentiate it with the per TRP/perResource Indication

nr-los-nlos-IndicatorPerResource-r17

LOS-NLOS-Indicator-r17 OPTIONAL,

***nr-LOS-NLOS-IndicatorPerResource***

This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the resource. The field is only present when the field *nr-LOS-NLOS-Indicator* adopts the field *perResource*.

**Correction[R2-2205004] #4/** Remove the reference TRP in the field description. If clarification is needed from R1, send an LS.

***nr-los-nlos-Indicator***

This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the TRP or resource. Note, the TOA measurement refers to the TOA of this neighbour TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*.

However it seems that correction #4 is not essential because the agreement in RAN1 parameter [R1-2202759] says:

• For DL-TDOA one LoS/NLoS indicator can be associated with each RSTD measurement performed with a target TRP and one LoS/NLoS indicator is associated with the RSTD measurement performed with a reference TRP

• For DL-TDOA one LoS/NLoS indicator can be associated with each target TRP and one LoS/NLoS indicator can be associated with the reference TRP in the measurement report

So companies will review these corrections #2, #3, #4 in R2-2205004 one by one.

**Q9: Which correction #2/#3/#4/None do you agree? Please provide also a brief justification for your answer.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Modification #2/ #3/ #4/ None** | **Comments** |
| Huawei, HiSilicon | Yes | OK, but these issues seem to have already been captured by the LPP CR. |
| Qualcomm | #2 / #3 | #2 depends on the current UE situation/location and the request may not always be possible to fulfil.  #3 needs to go together with Question 8/Option1, otherwise it will be inconsistent.  #4 seems not correct, since the indicator is per TOA measurement, not per RSTD. |
| Apple | 2 and 3 |  |
| InterDigital | #2, #3 |  |
| CATT | #2, #3 |  |
| ZTE | #2, #3 |  |
| vivo | #2, #3 |  |
| Xiaomi | #2, #3 |  |
| Intel | #2, #3 |  |
|  |  |  |
|  |  |  |
|  |  |  |

Summary

9 companies provided feedback. 9/9 companies agree the #2 and #3 modifications in R2-2205004.

There is an overwhelming majority, so rapporteur proposes:

**Proposal 6: RAN2 to agree the #2 and #3 corrections on LoS/NLoS indicator in LPP (9/9).**

**Correction #2**/ Add in the field description that in spite of the request from the network in RLI, the UE can choose its LOS-NLOS reporting by TRP or by resource.

***nr-los-nlos-Indicator***

This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the TRP or resource. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*. In spite of the request from the network in *requestLocationInformation*, the UE can choose its resourcetype and ganularity for LOS-NLOS reporting.

**Correction #3/** Change the name to nr-LOS-NLOS-IndicatorPerResource to differentiate it with the per TRP/perResource Indication

nr-los-nlos-IndicatorPerResource-r17

LOS-NLOS-Indicator-r17 OPTIONAL,

***nr-LOS-NLOS-IndicatorPerResource***

This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the resource. The field is only present when the field *nr-LOS-NLOS-Indicator* adopts the field *perResource*.

# 4 Conclusion

**Easy to agree**

**Proposal 5: RAN2 to update the TP of nr-LOS-NLOS-Indicator-r17 in LPP (8/9).**

[[

nr-LOS-NLOS-Indicator-r17 CHOICE {

perTRP LOS-NLOS-Indicator-r17,

perResource LOS-NLOS-Indicator-r17

} OPTIONAL,

**Proposal 6: RAN2 to agree the #2 and #3 corrections on LoS/NLoS indicator in LPP (9/9).**

-----------------------------TP of corrections------------------------------------------------------------------------------------------

**Correction #2**/ Add in the field description that in spite of the request from the network in RLI, the UE can choose its LOS-NLOS reporting by TRP or by resource.

***nr-los-nlos-Indicator***

This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the TRP or resource. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*. In spite of the request from the network in *requestLocationInformation*, the UE can choose its resourcetype and ganularity for LOS-NLOS reporting.

**Correction #3/** Change the name to nr-LOS-NLOS-IndicatorPerResource to differentiate it with the per TRP/perResource Indication

nr-los-nlos-IndicatorPerResource-r17

LOS-NLOS-Indicator-r17 OPTIONAL,

***nr-LOS-NLOS-IndicatorPerResource***

This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the resource. The field is only present when the field *nr-LOS-NLOS-Indicator* adopts the field *perResource*.

-----------------------------TP of corrections------------------------------------------------------------------------------------------

**Proposal 3: RAN2 to agree to send an LS to RAN1 on the maximum number of reported TxTEG-IDs in one RRC and LPP message with below questions (8/8):**

* **How many Tx TEG/SRS association changes in a single NR-Multi-RTT-SignalMeasurementInformation-r16 instance? 8 timestamps with 8 TEGs per time stamp is the current number in LPP, resulting in 64 elements.**
* **How many Tx TEG/SRS association changes in a single RRC message report?**

**Proposal 4: RAN2 not to support Failure report mechanism of Tx/Rx TEG in RRC and LPP (9/10).**

**Need further discussion:**

**Proposal 1: RAN2 to agree no event triggered reporting for UL-TDOA to enable reporting of the association between UE Tx TEG ID and SRSp resources when a change in the association is identified (7/11).**

**Proposal 2: RAN2 to agree to keep the** **current asn.1 of UE-TxTEG-RequestUL-TDOA-Config-r17 in RRC (7/11).**

# 5 Reference

1. R2-2206333 [Pre118-e][607][POS] Summary of AI 6.11.2.6 on accuracy (CATT) CATT discussion Rel-17
2. R2-2205654 On periodic UE Tx TEG reporting Apple discussion Rel-17 NR\_pos\_enh-Core
3. R2-2205730 Discussion on UE TX TEG association reporting InterDigital, Inc. discussion Rel-17
4. R2-2205859 Correction based upon Positioning RILs Ericsson CR Rel-17 38.331 17.0.0 3121 - F NR\_pos\_enh-Core Late
5. R2-2205829 LPP Updates Qualcomm Incorporated draftCR Rel-17 37.355 17.0.0 F NR\_pos\_enh-Core
6. R2-2204706 Discussion on the left issues on UE TxTEG report in RRC and LPP protocols CATT discussion
7. R2-2204707 [C243] Correction on the UE TxTEG report in TS 38.331 CATT CR Rel-17 38.331 17.0.0 2994 - F NR\_pos\_enh-Core
8. R2-2204708 [C013][C014][C015][C016][C017]Corrections on the UE TxTEG report in TS 37.355 CATT CR Rel-17 37.355 17.0.0 0335 - F NR\_pos\_enh-Core
9. R2-2202165 Reply LS on reporting of the Tx TEG association information (R4-2202685; contact: Huawei) RAN4 LS in Rel-17 To:RAN1, RAN2 Cc:RAN3
10. R2-2205004 [H026][H027][H029][H030] Correction to LOS-NLOS indication Huawei, HiSilicon CR Rel-17 37.355 17.0.0 0339 - F NR\_pos\_enh-Core
11. R2-2205806 Remaining Issues on TEG reporting; failure Handling Ericsson discussion Rel-17