3GPP TSG-RAN WG2 Meeting #121bis-e R2-230xxxx

Elbonia, 17 – 26 April 2023

**Agenda item: 6.7.1**

**Source: Nokia (Rapporteur)**

**Title: Offline [AT121bis-e][411] on Rel-17 Positioning Stage-2 CRs**

**WID/SID: NR\_pos\_enh-Core - Release 17**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report of the following email discussion:

* [AT121bis-e][411][POS] Rel-17 positioning stage 2 CRs (Nokia)

      Scope: Check the CRs from agenda item 6.7.1: R2-2302637 / R2-2302744 / R2-2302993 / R2-2304052 / R2-2304053 / R2-2304054.

      Intended outcome: Report and agreed CRs (without CB if possible)

      Deadline: Monday 2023-04-24 2359 UTC

Phase 1 deadline of Thursday 2023-04-20 12:00 PM UTC for all company comments.

Phase 2 deadline of Monday 2023-04-24 2359 UTC for final agreed CRs.

This offline email discussion covers the following Rel-17 positioning stage-2 CRs submitted to RAN2#121bis-e under agenda item 6.7.1:

1. R2-2302637 Miscellaneous corrections on 38.305 CATT CR Rel-17 38.305 17.4.0 0123 - F NR\_pos\_enh-Core
2. R2-2302744 Stage 2 procedure for deactivation of MG gap and PPW Intel Corporation draftCR Rel-17 38.305 17.4.0 F NR\_pos\_enh-Core
3. R2-2302993 Correction to UEPositioningAssistanceInformation Huawei, HiSilicon CR Rel-17 38.305 17.4.0 0124 - F NR\_pos\_enh-Core
4. R2-2304052 Update of information transfer from gNB to LMF Ericsson CR Rel-17 38.305 17.4.0 0125 - F NR\_pos\_enh-Core
5. R2-2304053 Measurements and Assistance Data Transfer Nokia, Nokia Shanghai Bell CR Rel-17 38.305 17.4.0 0126 - F NR\_pos\_enh-Core
6. R2-2304054 Protection Level and Target Integrity Risk Nokia, Nokia Shanghai Bell CR Rel-17 38.305 17.4.0 0127 - F NR\_pos\_enh-Core

# 2 Contact Points

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

|  |  |  |
| --- | --- | --- |
| Company | Name | Email Address |
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# 3 Discussion

CR in R2-2302637 [1] proposes two changes to TS 38.305:

1) A clarification that the UE can request the activation of pre-configured measurement gaps for DL-TDOA positioning, which is currently missing in the specification, and

2) An editorial correction to fix an incorrect figure number reference in clause 8.9.3.3.1.

The following shows the reason for change, summary of change and consequences if not approved from R2-2302637:

|  |  |
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| ***Reason for change:*** | 1. For DL-TDOA positioning, UE can request to activate pre-configured measurement gaps, which is missed in the current spec.2. Wrong figure number in section 8.9.3.3.1. |
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| ***Summary of change:*** | 1. Add the sentence “The UE may also request to activate pre-configured measurement gaps as described in clause 7.7.2.” in section 8.12.1.2. Modify the figure number 8.9.3.3-1 as 8.9.3.3.1-1. |
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| ***Consequences if not approved:*** | The stage 2 description is unclear. |

**Question 1**: Do you agree with the two changes in the CR in R2-2302637? Please indicate in the Technical Arguments column any comments you may have. If you only partially or conditionally agree with the CR, please elaborate.

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| --- |
| Answers to Question 1 |
| Company | Yes/No | Technical Arguments |
| Huawei, HiSilicon | Yes | OK to have, but not quite essential |
| ZTE | Yes | Multi-RTT and DL-AoD have the missing sentence, DL-TDOA should be same |
| OPPO | Yes |  |
| CATT(proponent) | Yes | The first correction makes the stage 2 description of DL-TDOA complete.The second one corrects a typo error. |
| vivo | Yes |  |
| Intel | Yes |  |
| Ericsson | Yes |  |
| Lenovo | Yes but | In clause 8.9.3.3.1 a further editorial issue can be fixed as well:In step (2) the digit “1” in “step 1” can be set in brackets, i.e. step “(1)”. |
| Xiaomi | Yes |  |
| Qualcomm | Yes | The proposed sentence (Change 1) is already there in 8.10.1 (mRTT) and 8.11.1 (DL-AoD) and has been forgotten in 8.12.1 (DL-TDOA), as noted by ZTE. Although, this sentence in general may not be essential, the current spec can be misleading.  |
| LG | Yes |  |
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**Summary 1**: TBD.

**Proposal 1**: TBD.

CR in R2-2302744 [2] introduces two new procedures in TS 38.305 viz. Deactivation of Pre-configured Measurement Gap procedure and Deactivation of PRS Processing Window procedure.

The following shows the reason for change, summary of change and consequences if not approved from R2-2302744:

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| ***Reason for change:*** | Currently for Pre-configured Measurement Gap (Clause 7.7) and Pre-configured PRS processing window (Clause 7.8), the procedure for deactivation is missing. In RAN2#121, RAN2 discussed whether a separate deactivation procedure should be added or we add deactivation together with activation procedure. Separate deactivation procedure is cleaner than combining the procedures. Therefore the CR is based on separate deactivation procedure.  |
|  |  |
| ***Summary of change:*** | 1 in 7.7 Add deactivation procedure for Pre-configured Measurement Gap. 2 in 7.8 Add deactivation procedure for PRS processing window.  |
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| ***Consequences if not approved:*** | Missing functional behaviour description in stage 2.  |

**Question 2**: Do you agree with the changes in the CR in R2-2302744? Please indicate in the Technical Arguments column any comments you may have. If you only partially or conditionally agree with the CR, please elaborate.

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| Answers to Question 2 |
| Company | Yes/No | Technical Arguments |
| Huawei, HiSIlicon | Yes | OK to add the description to make it complete |
| ZTE | Yes  | Agree with the baseline, step 0 in PPW deactivation has a typo:0. The PRS processing window has been activated as shown in Figure 7.8.2-1.[Intel] Ok to update.  |
| OPPO | Yes | It would be clearer to add separate deactivation procedures for pre-configured MG and PRS processing window. |
| CATT | Yes with comment | We support to add separate deactivation procedure for Pre-configured Measurement Gap and PRS processing window. But few comments on the corrections:* + - 1. The deactivation related part should be removed. Take step 5a for example,

5a. If the UE requires measurement gaps for performing the requested location measurements, and the triggering condition for UL MAC CE as specified in TS 38.331 [14] is met, the UE sends UL MAC CE Positioning Measurement Gap Activation/Deactivation Request to the serving gNB and indicates the requested measurement gap configuration based on the ID configured in step 2.[Intel] it is MAC CE name. Would be good to keep it as it is. TS38.321 used same way, e.g. *Upon the reception of the MAC CE for Positioning Measurement Gap Activation/Deactivation Command, the MAC entity shall:**1> if the Measurement Gap Activation/Deactivation Command MAC CE indicates the deactivation of a pre-configured positioning measurement gap:**2> deactivate the positioning measurement gap.**1> else if the Positioning Measurement Gap Activation/Deactivation Command MAC CE indicates the activation of a pre-configured measurement gap:**2> activate the positioning measurement gap and perform the procedure specified in clause 5.14.** + - 1. Activation related part should be removed in the added deactivation procedure for Pre-configured Measurement Gap and PRS processing window.

[Intel] it is to show, MG and PPW have been activated, and then network can deactivate it. Otherwise, it will be strange that network could deactivate it even it was not activated. * + - 1. The CR number is missed and the proposed change affects should include “Radio Access Network” in the coversheet.

[Intel] It is bis meeting, and therefore I used draft CR without CR number. The CR number will be added in next meeting when normal CR is required. Agree, “Radio Access Network” should be ticked.  |
| vivo | Yes with comments | For step 2 in 7.7.2, we suppose the serving cell will deactivate all the MG. 2. Based on the request from the UE in step 1a or the request from the LMF in step 1b, the serving gNB may send DL MAC CE Positioning Measurement Gap Activation/Deactivation Command to deactivate all the activated measurement gap(s) for positioning .[Intel] So far, only a Positioning MG ID is contained in activation/deactivation MAC CE command, that means the network can only deactivate an activated MG at a time.  |
| Intel | Yes | Added my response to comments from companies.  |
| Ericsson | Yes | Looks reasonable |
| Lenovo | See comments | Further improvements can be made:* To 1)
	+ Title of Figure 7.7.2-2 should say “Pre-configured measurement gap deactivation procedure”.
	+ In step 0: It should say “A measurement gap has been activated …” since only one measurement gap can be activated.
	+ In step 1a: Instead of saying “…deactivate all the activated measurement gap(s)” it should better say “…deactivate the activated measurement gap containing the ID associated with the measurement gap”.
	+ [Intel] thanks, will update accordingly.
* To 2)
	+ Title of Figure 7.8.2-2 should say “Pre-configured PRS processing window deactivation procedure”.
	+ In step 2 a typo should be fixed. It should say “Based on the request from the LMF in step 1 …” and not step 2.
	+ [Intel] thanks, will update accordingly.
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| Xiaomi | Yes |  |
| Qualcomm | Yes |  |
| LG | Yes |  |
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**Summary 2**: TBD.

**Proposal 2**: TBD.

CR in R2-2302993 [3] updates the UE Positioning Assistance Information procedure to clarify that the timing error margin value for UE Tx TEGs is also reported in the RRC UE Positioning Assistance Info message but only one timing error margin value is reported in each instance of the message.

The following shows the reason for change, summary of change and consequences if not approved from R2-2302993:

|  |  |
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| ***Reason for change:*** | Apart from the associate between the UL-SRS resources for positioning and the UE Tx TEG ID, the margin values can also be reported via Positioning Assitance Information message. This information should be added to clause 7.4.11.2 of TS 38.305.The reason is that the margin value for UE Tx TEG may affect the reporting of Positioning Assitance Information message. Since each message can only report a single margin value, multiple Positioning Assitance Information messages may be required for each reporting when there are different margin values for the UE Tx TEGs.  |
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| ***Summary of change:*** | Add in the UE Positioning Assistance Information procedure that the margin values for UE Tx TEGs can be reported, and each message can only report a single margin value.  |
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| ***Consequences if not approved:*** | The description for UEPositioningAssistanceInformation is incomplete. |

**Question 3**: Do you agree with the changes in the CR in R2-2302993? Please indicate in the Technical Arguments column any comments you may have. If you only partially or conditionally agree with the CR, please elaborate.

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| Answers to Question 3 |
| Company | Yes/No | Technical Arguments |
| Huawei, HiSilicon | Yes |  |
| ZTE | Yes |  |
| OPPO | Yes | OK to add the missing description. |
| CATT | Yes for the first correction | We are fine with the first correction, but the second change is not essential since it is clear in stage-3 RRC protocol. |
| vivo | Yes |  |
| Intel | Ok | the first “and” in the sentence should be deleted |
| Ericsson |  | The first and would be needed since it is association between two things; so and is needed there.[Intel] Aha, I see. Thx.  |
| Xiaomi | Yes |  |
| Qualcomm | O.K. | It seems there is a general trend to repeat almost everything in Stage 3 also in Stage 2… |
| LG | Yes |  |
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**Summary 3**: TBD.

**Proposal 3**: TBD.

CR in R2-2304052 [4] proposes two changes to TS 38.305:

1) Adds “SRS Transmission Status” to the table containing UE configuration data, that may be transferred from serving gNB to the LMF for Multi-RTT, UL-TDOA and UL-AoA positioning. This is to align TS 38.305 with TS 38.455.

2) Corrects the UL information Delivery operation from the serving gNB to the LMF, for Multi-RTT, UL-TDOA and UL-AoA positioning to show that the POSITIONING INFORMATION UPDATE message provides an update in SRS transmission status rather than an indication that the SRS configuration has been released.

The following shows the reason for change, summary of change and consequences if not approved from R2-2304052:

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| ***Reason for change:*** | Currently TS 38.305 mentions that gNB informs to LMF regarding the UE UL SRS configuration release. However, the stage3 TS 38.455 does not support such configuration release information from gNB to LMF. Hence, this needs to be corrected.However, TS 38.455 in v17.4.0 the below information has been added If the *SRS Transmission Status* IE is included in the POSITIONING INFORMATION UPDATE message and set to "stopped", the LMF shall consider that the SRS transmission has stopped.

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| --- | --- | --- | --- |
| SRS Transmission Status | O |  | ENUMERATED (stopped, ...) |

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| ***Summary of change:*** | The information transfer from gNB to LMF has been updated to include*SRS Transmission Status* and positioning information update from gNB to LMF has been corrected. |
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| ***Consequences if not approved:*** | Incomplete and Incorrect specification |

**Question 4**: Do you agree with the two changes in the CR in R2-2304052? Please indicate in the Technical Arguments column any comments you may have. If you only partially or conditionally agree with the CR, please elaborate.

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| Answers to Question 4 |
| Company | Yes/No | Technical Arguments |
| Huawei, HiSiicon | Yes | OK to have since R3 has already agreed on this |
| ZTE | Yes | Duplicate descriptions in section 8.13.3.2.1:(3) If a change has occurred in the UE SRS configuration during the UE SRS time duration requested at step 1, the gNB sends a POSITIONING INFORMATION UPDATE message to the LMF. This message contains, in the case of a change in UE SRS configuration parameters, the UE SRS configuration information for all cells with UE SRS configured, or an update in SRS transmission status. |
| OPPO | Yes with comment | OK to align with RAN3 spec. For the change in 8.13.3.2.1, it seems to wrongly add “update in SRS transmission status” twice. |
| CATT | Yes | An editorial error: it should be “End of Change” at the end. |
| vivo | Yes | Agree with ZTE on the duplication. |
| Intel | Yes | RAN3 related correction. Intention is ok. No strong opinion whether it should be corrected by RAN3.  |
| Ericsson | Yes(Proponent) | Since RAN2 is responsible for stage 2, it is reasonable for us to provide the correction too. |
| Xiaomi | Yes |  |
| Qualcomm | O.K. | …with the typo fixed, as mentioned by ZTE. |
| LG | Yes |  |
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**Summary 4**: TBD.

**Proposal 4**: TBD.

CR in R2-2304053 [5] proposes the following changes to TS 38.305:

1) Change 1: Clarifies that for UL-AoA positioning, either A-AoA or Z-AoA or both can be used.

2) Changes 2 and 3: Updates step 2 of the LMF-initiated Location Information Transfer procedure, for both DL-AoD and DL-TDOA positioning, and generalize the measurements used as DL-AoD measurements and DL-TDOA measurements, instead of listing all individual measurements that are used.

3) Change 4: Clarifies the Assistance Data Transfer procedure for Multi-RTT, DL-AoD and DL-TDOA positioning, the UE behaviour when the received TRP assistance data is not already stored in the UE.

The following shows the reason for change, summary of change and consequences if not approved from R2-2304053:

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| ***Reason for change:*** | **Measurements related:**1. For UL-AoA positioning, the measurements listed in Section 4.3.15 and Section 8.14.1 are not aligned. Also, in 4.3.15, it indicates that both A-AoA and Z-AoA must be used while in Table 8.14.2.2-1, azimuth and zenith (aka, elevation) angle of arrival is mentioned as an either or both possibilities.
2. For DL-AoD positioning, in step 2 of the LMF-initiated Location Information Transfer procedure in 8.11.3.1.3.1, only the DL-PRS-RSRP measurement is mentioned. DL-PRS-RSRPP measurement is also possible as shown in Table 8.11.2.2-1, but it is not mentioned. For ease of specification maintenance it is better to generalize the measurement used in the procedure section (and keep the list of measurements in the information transfer tables), as it is done for multi-RTT Location Information Transfer procedure.
3. For DL-TDOA positioning, in step 2 of the LMF-initiated Location Information Transfer procedure in 8.12.3.1.3.1, only DL RSTD and DL-PRS-RSRP measurements are mentioned but DL-PRS-RSRPP measurement is also possible as shown in Table 8.12.2.2-1, but it is not mentioned. For ease of specification maintenance it is better to generalize the measurement used in the procedure section (and keep the list of measurements in the information transfer tables), as it is done for multi-RTT Location Information Transfer procedure.

**Assistance Data Transfer for Multi-RTT, DL-AoD, DL-TDOA:**1. In the Assistance Data Transfer procedure for Multi-RTT, DL-AoD and DL-TDOA positioning, UE behaviour is unclear when it receives assistance data for a TRP for which the UE has no stored assistance data.
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| ***Summary of change:*** | 1. Section 4.3.15: Clarified that either A-AoA or Z-AoA or both can be used for UL-AoA positoning. Added UL-SRS-RSRP to align with Section 8.14.1. Clarified that zenith vertical angle is sometimes referred to as elevation.
2. Section 8.11.3.1.3.1: Updated step 2 to generalize the measurements as DL-AoD measurements (since Table 8.11.2.2-1 has the specific measurements listed in it).
3. Section 8.12.3.1.3.1: Updated step 2 to generalize the measurements as DL-TDOA measurements (since Table 8.12.2.2-1 has the specific measurements listed in it).
4. In Sections 8.10.3.1.2.1, 8.11.3.1.2 and 8.12.3.1.2 clarified that the UE stores the assistance data for the TRP for which it does not have stored information but continues to maintain the stored assistance data for other TRPs for which it already has information stored in the UE.
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| ***Consequences if not approved:*** | 1. Contradicting information remains in the specification about the angle measurement usage for UL-AoA positioning
2. Incomplete and contradicting information remains in the specification about the measurements to be used for DL-AoD positioning
3. Incomplete and contradicting information remains in the specification about the measurements to be used for DL-TDOA positioning
4. UE behaviour when it receives assistance data for a TRP for which the UE has no stored assistance data will remain ambiguous in the specification
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**Question 5**: Do you agree with the two changes in the CR in R2-2304053? Please indicate in the Technical Arguments column any comments you may have. If you only partially or conditionally agree with the CR, please elaborate.

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| Answers to Question 5 |
| Company | Yes/No | Technical Arguments |
| Huawei, HiSilicon | Yes, but | Not sure if there is definition of DL-AOD/DL-TDOA measurement.OK with the change on pre-configured PRS |
| ZTE | Yes |  |
| OPPO | Yes with comment | Similar to change 2/3, at least in clause 8.12.3.1.3.2, the optional measurements should also be removed to generalize the measurements as DL-TDOA measurements.(1) The UE sends an LPP Provide Location Information message to the LMF. The Provide Location Information message may include any UE DL-TDOA measurements already available at the UE.So it would better to find out whether there are another similar changes not found and change them together. |
| CATT | Support 1st and 2nd change | 3rd change: Prefer to keep as it since RSRP is required for DL-AoD, RSTD is required for DL-TDOA.4th change: it’s up to UE implementation. |
| vivo | Yes with comments | For the ‘, also called elevation angle’, the elevation angle in NRPPa is provided in TRP info rather than measurement. Thus this change is not needed.Refine the following change:it stores the assistance data for the TRP, but the UE continues to maintain… ->it stores the assistance data for the TRP and continues to maintain… |
| Intel | Yes |  |
| Ericsson | Yes with comments | If a UE receives assistance data for a TRP for which it has already stored assistance data, it overwrites the stored assistance data, whereas if a UE receives assistance data for a TRP for which it has not stored assistance data, it stores the assistance data for the TRP~~,~~ ~~but the UE continues to~~ and maintains ~~it’s~~ the already stored assistance data for other TRPs. |
| Xiaomi | No for the change 2 and 3 | The PRS-RSRP is required for DL-AoD and the RSTD is required for DL-TDOA. The DL-AoD and DL-TDOA measurements are not clear. |
| Qualcomm | Yes |  |
| LG | Yes |  |
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**Summary 5**: TBD.

**Proposal 5**: TBD.

CR in R2-2304054 [6] proposes the following changes to TS 38.305:

1) Updates the definition of Protection Level a) by using the Bound term instead of Alert Limit (AL), b) simplifies the definition by removing the equation from the definition and c) corrects an error in the NOTE 2.

2) Adds a definition for Target Integrity Risk (TIR).

The following shows the reason for change, summary of change and consequences if not approved from R2-2304054:

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| --- | --- |
| ***Reason for change:*** | 1. The definition for Protection Level (PL) references AL and TIR but there is no definition of AL or TIR in any normative specifications. AL can be described in terms of Bound which is a well defined term in 38.305. So, AL should be replaced by a generic text using the Bound terminology. There is also a sentence in the current definition of PL which says a specific equation for PL is not specified as it is implementation defined but the normative defintion of PL itself specifies an equation. The NOTE 2 needs a correction to say the PL, not the TIR, corresponds to the achievable TIR.
2. TIR is used in 37.355 and in the definition of PL and hence a definition for TIR must be added.
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| ***Summary of change:*** | 1. Removed reference to AL from the definition of PL and clarified the definition of PL by using the Bound terminology. Removed the equation from the definition of PL and removed the last sentence which talks about specific equation being implementation defined. NOTE 1 is removed for this reason and the NOTE 2 was renumbered and the error in the note was corrected.
2. Added a definition for TIR in the integrity principle of operation clause and described TIR using the terms ‘Error’, ‘Bound’, ‘DNU flag’ and ‘TTA’.
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| ***Consequences if not approved:*** | Definition of Protection Level will remain ambiguous. Lack of definition for Target Integrity Risk. |

**Question 6**: Do you agree with the two changes in the CR in R2-2304054? Please indicate in the Technical Arguments column any comments you may have. If you only partially or conditionally agree with the CR, please elaborate.

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| Answers to Question 6 |
| Company | Yes/No | Technical Arguments |
| Swift Navigation | No | **PL:** the proposed changes fundamentally misinterpret the Integrity Principle of Operation. Bounds and PL are different concepts - PL covers the overall positioning error; Bounds are for individual errors components (as defined in 8.1.1a). Equations/algorithms for quantifying the PL from the Bounds are implementation-defined. Furthermore, the PL (as defined in Stage 2) is an inequality showing the relationship between parameters, it is not an algorithm for solving the inequality. NOTE 1 clarifies how to interpret the PL inequality if no AL information is provided. PL inequality has been agreed ever since the study phase.**TIR:** In NOTE 2, this is mostly semantics. TIR and PL can be used interchangeably within the context of this NOTE but we prefer to use TIR for consistency with the field definition for *integrityInfo* in 37.355: OK to add the TIR definition but it needs to be per unit of time, i.e:**Target Integrity Risk (TIR):** The probability per unit of time that the Error exceeds the Bound without issuing a DNU flag within the TTA. |
| ZTE | Partially yes | Agree with the CR to change NOTE 2;Agree to add the TIR definition as Swift presents;Do not agree to delete the NOTE 1 since it is used to solve the issue raised in the past meetingsDo not agree to change the PL definition |
| CATT | See the comment | We have discussed the 1st issue before. But the Abbreviations of AL may be added.2nd change is not supported because TIR has been described in 37.355. |
| vivo | No | Agree with Swift. PL is defined for PE (Positioning Error), which is associated with a location process. While Bound is specifically defined for each error source. As suggested by Swift, how to obtain PL from all the error bounds is based on implementation. |
| Intel | Ok to add the TIR definition | Agree with Swift |
| Xiaomi | No  | Agree with Swift |
| Qualcomm | No | We prefer to keep the current text, since the text seems not wrong. The PL definition is an attempt to describe it in an implementation independent manner.  |
| LG | No  | Agree with Swift |
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**Summary 6**: TBD.

**Proposal 6**: TBD.

# 4 Conclusion

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