3GPP TSG-RAN WG2 Meeting #119bis-e***R2-22xxxx***

Electronic, October 10 – 19, 2022

**Agenda item:** 6.11.2.3

**Source:** Qualcomm Incorporated

**Title:** Summary of AI 6.11.2.3: LPP corrections

**Document for:**  Discussion

# 1. Introduction

This document summarizes the following contributions submitted for Agenda Item "6.11.2.3 LPP corrections".

[1] R2-2209430, "Correction to UE capability for DL-AoD" , Huawei, HiSilicon.

[2] R2-2209431, "Correction to TEG margin reporting", Huawei, HiSilicon.

[3] R2-2209434, "Corrections on the timing error margins", CATT.

[4] R2-2209435, "Change Request of missing UE capabilities", CATT.

[5] R2-2209436, "Corrections on the LPP capabilities", CATT.

[6] R2-2209683, "NR-DL-AoD-SignalMeasurementInformation corrections", Nokia, Nokia Shanghai Bell.

[7] R2-2210199, "Correction on the maximum number of SRS and TxTEG association", ZTE, Sanechips.

[8] R2-2210606, "Discussion on the provision of AL for achievable TIR calculation" , vivo.

# 2. UE Capabilities

## 2.1 *NR-DL-AoD-ProvideCapabilities*

|  |  |  |
| --- | --- | --- |
| [**R2-2209430**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209430.zip) | Correction to UE capability for DL-AoD | Huawei, HiSilicon |

In [1], it has been observed that the capabilities:

 nr-DL-PRS-BeamInfoSup-r17 ENUMERATED { sameSet, differentSet, sameOrDifferentSet }

 OPTIONAL,

 dl-PRS-ResourcePrioritySubset-Sup-r17 ENUMERATED { supported } OPTIONAL,

have been swapped.

*nr-DL-PRS-BeamInfoSup-r17* should define the capability for 27-21 "PRS boresight direction for UE-assisted DL-AoD" with indication 'supported' or 'not supported';

and

*dl-PRS-ResourcePrioritySubset-Sup-r17* should define the capability for 27-20 "PRS subset association for UE assisted DL-AoD" with indication {sameSet, DifferentSet, sameOrDifferentSet}.

Therefore, the following correction is proposed in [1]:



Rapporteur's Comment:

- Seems a mistake in the current specification and should be corrected as proposed in [1].

- The order of the field description rows '*nr-DL-PRS-BeamInfoSup'* and '*dl-PRS-ResourcePrioritySubset-Sup'* should also be swapped.

- Spaces before '-r17' suffix should be deleted and formatting corrected.

**Proposal 1:** The CR in 'R2-2209430, "Correction to UE capability for DL-AoD", Huawei, HiSilicon' is an essential correction. Agree a revision of the CR with the editorial issues fixed.

## 2.2 Missing UE Capabilities

|  |  |  |
| --- | --- | --- |
| [**R2-2209435**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209435.zip) | Change Request of missing UE capabilities | CATT |

According to [4], two UE capabilities seem missing in LPP:

|  |  |  |
| --- | --- | --- |
| Index | Feature group | Components |
| 27-22  | PRS beam pattern for UE-based DL-AoD  | Support of PRS beam pattern for DL-AoD  |
| 27-23 | Support of more than one activated PRS processing windows across all active DL BWPs | 1. Number of supported activated PRS processing windows |

These missing capabilities are added in the CR [4].

Rapporteur's Comment:

- 27-22 is not missing in LPP. It is defined in

nr-PosCalcAssistanceSupport-r17 BIT STRING { trpLocSup (0),

 beamInfoSup (1),

 rtdInfoSup (2),

 beamAntInfoSup (3)

 } (SIZE (1..8)) OPTIONAL,

|  |
| --- |
| ***nr-PosCalcAssistanceSupport***This field indicates the Position Calculation Assistance Data supported by the target device for UE-based DL-AoD. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is supported; a zero‑value means not supported.- bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is supported or not;- bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is supported or not;- bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is supported or not. The UE can indicate this bit only if the UE supports *prs-ProcessingCapabilityBandList* and any of *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer*, *maxNrOfTRP-AcrossFreqs*, *maxNrOfPosLayer*, *maxNrOfDL-PRS-ResourcesPerResourceSet* and *maxNrOfDL-PRS-ResourcesPerPositioningFrequencylayer*. Otherwise, the UE does not include this field;- bit 3 indicates whether the field *nr-TRP-BeamAntennaInfo* in IE *NR-PositionCalculationAssistance* is supported or not. |

- According to R2-2209117(R1-2207925), 27-23 is only needed at gNB, not LMF:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | **Need for the gNB to know if the feature is supported** |  |  |
| 27-23 | Support of more than one activated PRS processing windows across all active DL BWPs | 1. Number of supported activated PRS processing windows | Yes | Candidate values:{2, 3, 4} | Optional with capability signaling |

 According to TS 38.455, a LMF can not activate MGs and PPWs separately, and can not activate a specific PPW or a specific number of PPWs. Hence, no need for the location server to know this capability.

**Proposal 2:** The CR in 'R2-2209435, "Change Request of missing UE capabilities", CATT ' is not an essential correction.

## 2.3 Missing UE Capability Descriptions

|  |  |  |
| --- | --- | --- |
| [**R2-2209436**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209436.zip) | Corrections on the LPP capabilities | CATT |

According to [5], the following is missing in LPP:

|  |  |  |  |
| --- | --- | --- | --- |
| Index | Feature group | Components | Reasons |
| 27-3-3 | DL PRS measurement outside MG and in a PRS processing window | Note 4: A UE shall declare PRS processing capabilities of each of the supported Type-1A, Type-1B, Type-2” capabilities in case it supports multiple types in a band | The Note 4 is missing. |
| 27-12 | LOS/NLOS indicator for UE-based positioning assistance data | Support reception of the assistance data containing the LOS/NLOS indicator.1. LOS/NLOS indicator type2. LOS/NLOS indicator granularity | This IE is not for Multi-RTT. |
| 27-4-1 | LOS/NLOS Indicator for UE-assisted positioning | 1. Support reporting LoS/NLoS indicator type to LMF 2. LOS/NLOS indicator granularity | Add the note for the IE.Note: a single value is reported when both multi-RTT and DL-TDOA are supported |
| 27-20 | PRS subset association for UE assisted DL-AoD | 1. Support of assistance data enhancement to indicate a subset of PRS resources for each PRS resource for the purpose of prioritization of DL-AoD reporting.2. Supported resource set relationship for the target PRS resource and the associated subset | There is no ENUMERATED value in *dl-PRS-ResourcePrioritySubset-Sup* and *nr-DL-PRS-BeamInfoSup* doesn’tfollow the description in feature list. |

Rapporteur's Comment:

- 23-3-3: The Note 4 is implicit in the ASN.1 and seems not essential to be captured in the description as well. However, it can be considered as "editorial" correction/clarification, which may be useful.

- 27-12: Seems a mistake in the current specification and should be corrected as proposed in [5].

- 27-4-1: Seems a mistake in the current specification and should be corrected. The Note has been mistakenly added to 27-12. However, the Note should not be added to the *NR-DL-AoD-ProvideCapabilities* field descriptions (it is only for multi-RTT and DL-TDOA).

- 27-20 has also been corrected in [1] (see section 2.1) by changing the field names in the ASN.1 (which have been swapped). If the correction proposed in [5] would be adopted, no capability for the IE *NR-DL-PRS-InfoSupport* (*nr-DL-PRS-BeamInfoSup-r17*) can be provided:

|  |
| --- |
| ***nr-DL-PRS-BeamInfoSup***This field, if present, indicates the supported resource set relationship for the target DL-PRS Resource and the associated subset in IE *NR-DL-PRS-Info*. |
| ***dl-PRS-ResourcePrioritySubset-Sup***This field, if present, indicates that the target device supports the *DL-PRS-ResourcePrioritySubset* in IE *NR-DL-PRS-Info.*  |

 I.e., both capabilities above would indicate the same (related to 'resource set relationship').

**Proposal 3:** The changes related to capability indices 23-3-3, 27-12, and 27-4-1 in 'R2-2209436, "Corrections on the LPP capabilities", CATT ' are essential corrections. Agree a revision of the CR with the change for 27-20 removed, and with the Note for 27-4-1 removed from DL-AoD.

# 3 TEG Margins

## 3.1 Applicable Values

|  |  |  |
| --- | --- | --- |
| [**R2-2209431**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209431.zip) | Correction to TEG margin reporting | Huawei, HiSilicon |
| [**R2-2209434**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209434.zip) | Corrections on the timing error margins | CATT |

On the TEG Margins issue, the RAN4 LS in R2-2209168 (R4-2214493) notes the following:

|  |
| --- |
| **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.
 |

According to [2]:

 "This needs to be captured in the LPP spec for the TOA measurement for DL-TDOA when the UE chooses the timing error margin, i.e., it needs to choose a reasonable margin within the minimum requirement defined by the legacy spec.".

According to [3]:

 "In fact, there is neither maximum applicable value for RxTEG-TimingErrorMargin nor maximum applicable value for nr-UE-RxTxTEG-TimingErrorMargin defined in TS 38.133. Considering RAN4 sent the LS on the applicability of timing error margin of Rx TEG to RAN2, the statement is supposed to be captured clearly in LPP. So the clarification on the applicable value for RSTD in DL-TDOA in LPP should be added."

In [2], the following field description is added to *NR-DL-TDOA-SignalMeasurementInformation* and *NR-Multi-RTT-SignalMeasurementInformation*:

| ***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]. 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 in clause 10.1.23.2 in TS 38.133 [46]. |

| ***NR-Multi-RTT-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-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case3* 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]. 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 in clause 10.1.23.2 in TS 38.133 [46]. |

In [3], a similar field description is proposed, but only for *NR-DL-TDOA-SignalMeasurementInformation*:

|  |
| --- |
| *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. The value is the sum of the Rel-16 group delay margin (dependent on PRS/SRS BW) and frequency drift margin in TS 38.133 [46]. |

Rapporteur's Comment:

- Both CRs [2],[3] essentially propose adding the RAN4 LS text to LPP.

- However, from the RAN4 LS in R2-2209168 (R4-2214493) "Reply LS on the UE/TRP TEG framework" there is no corresponding action for RAN2 (other than "take the information into account").

- Indeed, the above LS is a Reply LS to RAN1 questions (LS R4-2211503(R1-2205382)).

- In Rapporteur's understanding, the applicable timing error margins are UE requirements, which are in the scope of RAN4/TS 38.133.

- However, Rapporteur was not able to identify a corresponding specification/requirement in the September version of TS 38.133.

- 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*?

**Proposal 4a:** RAN2 to discuss 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.
If yes, discuss whether the specification is applicable to both, *NR-DL-TDOA-SignalMeasurementInformation* and *NR-Multi-RTT-SignalMeasurementInformation* [2]or only applicable to *NR-DL-TDOA-SignalMeasurementInformation* [3].

**Proposal 4b:** 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.

## 3.2 Presence of TEG Margin Values

|  |  |  |
| --- | --- | --- |
| [**R2-2209434**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209434.zip) | Corrections on the timing error margins | CATT |

On the TEG Margins issue, the RAN4 LS in R2-2209168 (R4-2214493) notes the following:

|  |
| --- |
| **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 signalling.
 |

According to [3], the above implies that a "UE which supports Rx/RxTx TEG should also provide the UE Rx/RxTx TEG margins together" and proposes the following additional field description:

|  |
| --- |
| *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]. In this version of the specification, the field is mandatory present, if the field *nr-UE-Rx-TEG-ID* is present. |

|  |
| --- |
| *NR-Multi-RTT-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-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case3* 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]. |
| ***nr-UE-TxTEG-TimingErrorMargin***This field specifies the UE Tx TEG timing error margin value for all the UE Tx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case2* or *case3* and this field is absent, the receiver should consider the UE Tx TEG timing error margin value to be the maximum value available in IE *TEG-TimingErrorMargin*. In this version of the specification, the field is mandatory present, if the IE *NR-UE-RxTx-TEG-Info* is provided for choice *case3*. |
| ***nr-UE-RxTxTEG-TimingErrorMargin***This field specifies the UE RxTx TEG timing error margin value for all the UE RxTx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case1* or *case2* and this field is absent, the receiver should consider the UE RxTx TEG timing error margin value to be the maximum applicable value as defined in TS 38.133 [46]. In this version of the specification, the field is mandatory present, if the IE *NR-UE-RxTx-TEG-Info* is provided for choice *case1* and *case2*. |

Rapporteur's Comment:

- It is Rapporteur's understanding that the TEG margins (as currently specified) are essentially mandatory since absence means 'maximum value' (the UE requirements for setting the margins are supposed to be specified in RAN4/TS 38.133). This applies to all TEG margins, and not just to the Tx and RxTx TEG margins as proposed in [4] (e.g., also to the Rx TEG).

- Therefore, the proposed text in [4] seems conflicting: Absence means maximum applicable value, and at the same time the field "field is mandatory present".

**Proposal 5:** RAN2 to discuss whether the additional text proposed in [4]:
"In this version of the specification, the field is mandatory present…"
for the field *nr-UE-RxTEG-TimingErrorMargin* in IE *NR-DL-TDOA-SignalMeasurementInformation*, and for the fields *nr-UE-TxTEG-TimingErrorMargin* and *nr-UE-RxTxTEG-TimingErrorMargin* in IE *NR-Multi-RTT-SignalMeasurementInformation* is an essential correction or not.

# 4. *NR-DL-AoD-SignalMeasurementInformation*

[6] proposes several clarifications/corrections to the IE *NR-DL-AoD-SignalMeasurementInformation:*

- *nr-DL-PRS-RxBeamIndex:*

 (**1.)** Release 17 introduced RSRPP, which is not reflected as a measurement option in the definition of *nr-DL-PRS-RxBeamIndex*.

 (**3.)** *nr-DL-PRS-RxBeamIndex* indication is used for DL-PRS measurements only when additional DL-PRS measurements are also included and all these DL-PRS measurements are associated with a single TRP (up to 8 measurements in Rel-16 or 24 measurements in Rel-17).

 The following corrections are proposed:

|  |
| --- |
| ***nr-DL-PRS-RxBeamIndex***This field provides an index of the target device receive beam used for DL-PRS measurements associated with a single TRP in *nr-DL-AoD-MeasList-r16* when additional DL-PRS measurements are also included in either *nr-DL-AoD-AdditionalMeasurements-r16* or *nr-DL-AoD-AdditionalMeasurementsExt-r17*. If the value of the receive beam index for two or more DL-PRS measurements is the same, it indicates that the target device receive beam for the two or more DL-PRS measurements associated with a TRP were made with the same RX beam. The field is mandatory present if at least two DL-PRS RSRP measurements and/or DL-PRS RSRPP measurements from the same DL-PRS Resource Set associated with a TRP have been made with the same RX beam by the target device; otherwise it is not present. |

- Presence of RSRP and/or RSRPP in the *NR-DL-AoD-AdditionalMeasurementElement-r17*:

 (**2.)** Release 17 introduced RSRPP, which necessitated the addition of *nr-DL-PRS-FirstPathRSRP-Result-Diff-r17* in *NR-DL-AoD-AdditionalMeasurementElement-r17*. The fields *nr-Dl-PRS-RSRP-ResultDiff-r17* and *nr-Dl-PRS-FirstPathRSRP-ResultDiff-r17* are optional, conditional on the presence of the other. Because the release 16 specification does not define RSRPP, the conditional presence explanations are vague with regard to *NR-DL-AoD-AdditionalMeasurementElement-r16*, where *nr-DL-PRS-RSRP-ResultDiff-r16* is mandatory.

 The following corrections are proposed:

| Conditional presence | Explanation |
| --- | --- |
| *rsrp* | The field is mandatory present if the field *nr-DL-PRS-FirstPathRSRP-ResultDiff-r17* is absent; otherwise it is optionally present, need ON. |
| *rsrpp* | The field is mandatory present if the field *nr-DL-PRS-RSRP-ResultDiff-r17* is absent; otherwise it is optionally present, need ON. |

- Presence of *nr-DL-AoD-AdditionalMeasurements*:

 (**4.)** According to 38.214 v17.3.0, section 5.1.6.5
"The UE may be configured to measure and report, subject to UE capability, up to 24 DL PRS-RSRP measurements on DL PRS resources associated with the same dl-PRS-ID. <…>. The UE may be configured to measure and optionally report, subject to UE capability, up to 24 DL PRS RSRPP for the first detected path on DL PRS resources associated with the same dl-PRS-ID". This means both the *nr-DL-AoD-AdditionalMeasurements-r16* and *nr-DL-AoD-AdditionalMeasurementsExt-r17* fields cannot be included by the UE at the same time because the total reported measurements would exceed 24 in Rel-17.

 The following additional field description is proposed:

|  |
| --- |
| ***nr-DL-AoD-AdditionalMeasurements***This field specifies a list of additional DL-PRS RSRP measurements of different DL-PRS resources for the same TRP. If this field is present, the field *nr-DL-AoD-AdditionalMeasurementsExt* should not be present. |

Rapporteur's Comment:

- On change (1.), the *nr-DL-PRS-RxBeamIndex* applies also to the RSRPP. Therefore, the proposed change seems essential.

- On change (3.), Rapporteur believes that this is clear from the ASN.1, since the *nr-DL-PRS-RxBeamIndex* is only present in the *NR-DL-AoD-AdditionalMeasurementElement-16/-r17* and there is no separate TRP-ID in these additional measurement elements. However, it may be helpful to clarify this also in the field description.

- On change (2.), since we use the same field names for the *nr-DL-PRS-RSRP-ResultDiff* in the -r16 and -r17 additional measurements, adding the -r17 suffix to the conditional presence statements appears essential.

- On change (4.), the analogous field description for the *nr-DL-AoD-AdditionalMeasurements****Ext*** has been added to V17.2.2. Therefore, adding the description for the Rel-16 element (*nr-DL-AoD-AdditionalMeasurements*) appears essential.

**Proposal 6:** The CR in 'R2-2209683, "NR-DL-AoD-SignalMeasurementInformation corrections", Nokia, Nokia Shanghai Bell' is an essential correction. Revise the CR using the latest version of the specification.

# 5. Maximum Number of SRS and TxTEG Association

[7] observes that the current maximum number for the SRS-TxTEG associations is not in agreement with RAN1:

maxTxTEG-Sets-r17 INTEGER ::= 256

As noted in [7], the correct number should be 64 (8×8) and the following correction is proposed:

maxTxTEG-Sets-r17 INTEGER ::= 64

Rapporteur's Comment:

- The current number 256 was used as a placeholder but has not been updated.

- The proposed change is not backwards compatible. The applicable maximum value should be defined as an ASN.1 comment.

- "Isolated Impact" statement is missing on the cover sheet.

**Proposal 7:** The CR in 'R2-2210199, "Correction on the maximum number of SRS and TxTEG association", ZTE, Sanechips' is an essential correction. Convert the CR into a backwards compatible change by clarifying in an ASN.1 comment that the applicable value is 64. Add the "Isolated Impact" statement to the CR cover sheet.

# 6. 'Achievable TIR' Calculation

[8] discusses the *achievableTargetIntegrityRisk*, which may be provided by the UE in the *IntegrityInfo* in *CommonIEsProvideLocationInformation*. The following Observations and Proposals are made.

Observation 1 [8]: The value of PL is obtained by the knowledge of TIR and the error probability distribution modelled by UE implementation.

Observation 2 [8]: UE would not intend to tune its implementation for other KPIs without the prior knowledge about the availability of positioning system (the relationship of AL and PL in terms of value).

Proposal [8]: Alert Limit (AL) should be provided to UE in GNSS positioning integrity, in order to optionally obtain the achievable TIR.

Rapporteur's Comment:

- The meaning/purpose of the *achievableTargetIntegrityRisk* in the *IntegrityInfo* in *CommonIEsProvideLocationInformation* is unclear. It is also unclear when the UE is allowed to report a PL with a different TIR than requested.

- The Protection Level (PL) is a measure of the integrity that allows the receiver to operate without knowing the Alert Limit (AL). Therefore, a UE should always be able to report the PL for the TIR requested.

- [8] observes that the UE would need to know an AL to report an 'achievable TIR'. The discussion in [8] is not quite clear, but based on [8]/Proposal, Rapporteur's understanding is as follows:

- The current specification allows an application (recipient) to evaluate the UE reported PL relative to its own requirements (e.g., to determine positioning system availability).

- Assuming all required assistance data are available, a UE should always be able to report a PL for the TIR requested. Therefore, the *achievableTargetIntegrityRisk* as currently defined is unclear/seems not needed.

- However, the *achievableTargetIntegrityRisk* may address the following situation:

- The UE may calculate the PL for the requested TIR (as normal). If the AL from the application is available at the UE, the UE could check whether the determined PL satisfies the AL requirement. If not, the UE may adjust the TIR in such a way that the determined PL satisfies the AL, and then reports the PL together with the 'new' TIR (*achievableTargetIntegrityRisk).*
For example, the UE calculates a PL for the requested TIR of 10E-7. The UE then determines that this PL does not satisfy the required AL. The UE may then adjust the TIR until the computed PL satisfies the AL (e.g., a TIR of 10E-4 may satisfy the AL requirement). The UE then reports the PL with the *achievableTargetIntegrityRisk* of 10E-4.

- If the above is the intention, Rapporteur believes that an AL is required at the UE (as proposed in [8]).

- However, the above appears to be new UE functionality which may also require a UE capability. The presence of an AL in the *CommonIEsRequestLocationInformation* could then be interpreted that the UE is requested to provide an *achievableTargetIntegrityRisk* if the requested TIR can not satisfy the AL.

- However, it then also needs to be specified what "satisfying AL requirements" mean. E.g., is PL = AL satisfying the requirements, or PL < AL? If the latter, "how much less" would satisfy the requirement, given that the calculated PL is based on estimated statistics?

- However, the use case for the above is not quite clear to the Rapporteur. If an application requires a PL for the TIR requested, the application may still want to have this PL available for the requested TIR. The PL for the *achievableTargetIntegrityRisk* may be additional information for the application, but it is unclear why it should replace the original information requested. It appears the UE "corrects" a location server request.

**Proposal 8:** RAN2 to discuss whether the following Proposal in 'R2-2210606, "Discussion on the provision of AL for achievable TIR calculation", vivo.' is an essential correction or not:
"Alert Limit (AL) should be provided to the UE to optionally obtain the achievable TIR."

# 7. Summary

**Proposal 1:** The CR in 'R2-2209430, "Correction to UE capability for DL-AoD", Huawei, HiSilicon' is an essential correction. Agree a revision of the CR with the editorial issues fixed.

**Proposal 2:** The CR in 'R2-2209435, "Change Request of missing UE capabilities", CATT ' is not an essential correction.

**Proposal 3:** The changes related to capability indices 23-3-3, 27-12, and 27-4-1 in 'R2-2209436, "Corrections on the LPP capabilities", CATT ' are essential corrections. Agree a revision of the CR with the change for 27-20 removed, and with the Note for 27-4-1 removed from DL-AoD.

**Proposal 4a:** RAN2 to discuss 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.
If yes, discuss whether the specification is applicable to both, *NR-DL-TDOA-SignalMeasurementInformation* and *NR-Multi-RTT-SignalMeasurementInformation* [2]or only applicable to *NR-DL-TDOA-SignalMeasurementInformation* [3].

**Proposal 4b:** 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.

**Proposal 5:** RAN2 to discuss whether the additional text proposed in [4]:
"In this version of the specification, the field is mandatory present…"
for the field *nr-UE-RxTEG-TimingErrorMargin* in IE *NR-DL-TDOA-SignalMeasurementInformation*, and for the fields *nr-UE-TxTEG-TimingErrorMargin* and *nr-UE-RxTxTEG-TimingErrorMargin* in IE *NR-Multi-RTT-SignalMeasurementInformation* is an essential correction or not.

**Proposal 6:** The CR in 'R2-2209683, "NR-DL-AoD-SignalMeasurementInformation corrections", Nokia, Nokia Shanghai Bell' is an essential correction. Revise the CR using the latest version of the specification.

**Proposal 7:** The CR in 'R2-2210199, "Correction on the maximum number of SRS and TxTEG association", ZTE, Sanechips' is an essential correction. Convert the CR into a backwards compatible change by clarifying in an ASN.1 comment that the applicable value is 64. Add the "Isolated Impact" statement to the CR cover sheet.

**Proposal 8:** RAN2 to discuss whether the following Proposal in 'R2-2210606, "Discussion on the provision of AL for achievable TIR calculation", vivo.' is an essential correction or not:
"Alert Limit (AL) should be provided to the UE to optionally obtain the achievable TIR."