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Elbonia, 10 – 19 October 2022

**Agenda item: 8.2.3**

**Source: Samsung**

**Title: [Pre119bis-e][405] Summary of AI 8.2.3 on RAT-dependent integrity (Samsung)**

**WID/SID: FS\_NR\_pos\_enh2**

**Document for: Discussion and Decision**

# 1 Introduction

As one of objective to the R18 positioning SI, RAT-dependent integrity was setup and discussed in last R2#119-e meeting. This paper is aimed at summarizing the most popular aspects raised in the papers submitted to agenda item 8.2.3 at RAN2#119bis meeting.

# 2 Discussion

## 2.1 Modification of the legacy integrity principle

The following proposals are considered in this section.

|  |  |  |
| --- | --- | --- |
| Category | Related proposals | Companies |
| DNU flag | Proposal 1: For RAT-dependent integrity, RAN2 to agree the principle that  - DNU is not introduced if the assistance data of integrity is one-shot.  - DNU can be introduced if the assistance data is periodic or associated with a validity time.  Proposal 2: RAN2 to ask RAN1 whether the integrity assistance date on error source is one-shot or periodic or with a validity time. | CATT(9403) |
| Proposal 2: Support to reuse DNU in RAT-dependent positioning integrity. Study the following DNU flag configurations:   * DNU flags can be configured in the assistance data * DNU flags can be reported in the UE measurement report * DNU flags can be reported in the TRP measurement report | ZTE |
| Don’t use DNU | HW(9426), Intel(9608) |
| Study the usage of DNU | IDC, |
| Legacy equation | Proposal 1: Reuse Equation 8.1.1a-1 as a baseline to evaluate if the error can be identified as a source for RAT-dependent positioning integrity. (Vivo) | Vivo(9561), QC |
| **Proposal 1**: RAN2 to confirm the integrity principle of operation defined in the section 8.1.1a of TS38.305, including integrity definition (Error, Bound, Time to Alert, DNU, Residual Risk, irMinimum, irMaximum and Correlation Times), Equations for the GNSS integrity are reused for RAT dependent positioning methods. | QC |
| New definition of parameters | Proposal 2: RAN2 to discuss the definition of Error and Bound for RAT-dependent integrity.  -Error: Error is the difference between the true value of a parameter and its value as measured or estimated by the corresponding entity.  -Bound: Integrity Bounds provide the statistical distribution of the errors associated with the measurements and the assistance information provided by the corresponding entity.  Proposal 3: RAN2 to discuss the definition of the validity time for integrity bound.  - Validity Time: The validity time is a period during which the corresponding integrity bound is viewed to be valid for integrity operation.  Proposal 4: RAN2 to discuss the definition of DNU flag for RAT-dependent integrity.  - DNU: The DNU flag(s) indicate if the particular parameter can be used to evaluate the positioning integrity. When multiple DNU flags are specified, the DNU condition in Equation 8.1.1a-1 is present when any of the flags are true (logical OR of the flags). | Vivo(9561) |
| Proposal 5: Reuse the definition of TTA, Residual Risk, irMinimum and irMaximum, whereas no need to apply the definition of correlation times for RAT-dependent integrity. | Vivo(9561) |
| Legacy mapping table | Reuse the principle of legacy error source mapping table by adding R1’s interim error source result as in TP | QC |
| Study mapping of error sources and related integrity definitions per POS method | HW(9426) |
| Wait for R1 to conclude the models for error sources of different positioning methods | Eric |

**Discussion** : There are several sub-issues in this category, DNU flag, legacy integrity equation and table.

Regarding DNU, there are clear three parties as we already know i.e., don’t use (HW, Intel), reuse (QC) and others who mainly want to study (IDC) and use it conditionally on the AD characteristics (CATT) and on the specific purpose (ZTE), and reuse with redefinition (vivo). In the legacy, DNU was used for indicating the validity of the given AD upon integrity calculation. Even the exact legacy meaning of DNU might not necessary to the R18 RAT-dependent cases, another meaning of DNU could be necessary for the RAT-dependent case, and there are already some examples to be used for that purpose in the company contributions, thus the following proposal can be made:

**Proposal 1-1. RAN2 discuss and conclude that DNU flag is to be reused for assistance information in RAT-dependent positioning integrity.**

**Proposal 1-2. RAN2 study the usage of DNU flag for the RAT-dependent positioning integrity.**

Regarding legacy integrity equation, two companies explicitly propose to reuse the equation 8.1.1a of integrity principle in 38.305.

**Proposal 2-1. RAN2 agree to reuse the integrity principle Equation 8.1.1a in 38.305 for the R18 RAT-dependent integrity case.**

However, even reusing the equation might not mean that the reuse of the same definition of the parameters in the equation. Vivo wants to redefine some of parameters in the equation, i.e., Error, Bound, validity time, and DNU. And HW also wants to redefine if necessary the parameters of each error sources per positioning method, while Ericsson want to wait for further R1 input on this mapping. Since those terms are specific to the RAT-independent case and rapporteur sees the validity to discuss on this, has made the proposal.

**Proposal 2-2. RAN2 discuss on the definition of each parameters used in the agreed Equation of the integrity principle 8.1.1a in 38.305, and redefine them if necessary per positioning method.**

For error source mapping table, assuming that majority has the same understanding that the principle of integrity we have in R17 is vastly reused for R18 RAT-dependent cases, structure of the table is still useful and good to have. Thus, we can reuse them with further updating the contents based on R1’s input.

**Proposal 3. RAN2 agree to reuse the mapping of integrity parameters with further updating the contents based on RAN1 input.**

## 2.2 Support of entity-based integrity mode: UE-/LMF-based integrity

The following proposals are covered.

|  |  |  |
| --- | --- | --- |
| Category | Related proposals | Companies |
| Allowable Integrity mode | Prioritize UE-based mode of integrity, and consider LMF-based mode of integrity if time permits. | IDC, SS |
| Study both UE-based and LMF-based integrity | CATT(9403), HW(9426) Vivo(9561) Intel(9608)  Lenovo, spreadtrum, ZTE, Xiaomi, CMCC, Eric |
| The entity calculating location estimate should calculate the PL. | CATT(9403) Vivo(9561) OPPO, Eric |

**Discussion:** One of the main issue to be tackled in this meeting is which integrity mode can be supported. Of course baseline would be UE-based integrity mode. It is necessary to discuss and conclude the LMF-based integrity mode is necessary too for RAT-dependent integrity cases. Based on the contribution, IDC and Samsung want to prioritize UE-based mode of integrity and consider the LMF-based on if timer permits. About 10 companies want to study the both integrity mode. As accompanying proposal, the argument that the entity calculating location estimate should calculate the PL / integrity result from 4 companies. This argument seems straightforward thus it is proposed to directly discuss and conclude the mode for integrity allowable in RAT-dep cases.

**Proposal 4. RAN2 discuss and conclude to study the both UE-based and LMF-based integrity for RAT-dependent cases.**

## 2.3 Integrity result reporting mode

The following proposals are covered.

|  |  |  |
| --- | --- | --- |
| Category | Related proposals | Companies |
| Reporting mode | Support both Mode1 and 2 | IDC, SS, spreadtrum |
| Support mode 1 FFS on Mode2 | Lenovo |
| Support mode 2 | Xiaomi |

**Discussion** : How to report the integrity result also need to be decided. Mode 1: report the PL value to the integrity calculating entity and Mode 2: report the system availability flag to the integrity calculating entity. In R17, mode 1 was specified. There is some voices from companies, so anyway need to discuss on this.

**Proposal 5. RAN2 discuss and conclude to support mode 1 and/or mode 2 for integrity result reporting.**

## 2.4 Signalling aspects for each integrity mode

The following proposals were covered.

|  |  |  |  |
| --- | --- | --- | --- |
| 1st category | 2nd Category | Related proposals (some are simplified) | Company |
| DL-POS | Signaling for **UE-based integrity** | LMF should provide error source originated from RAN node (TRP-location, HW/vivo) and required TIR to UE (CATT), TRP-location and inter-TRP synch along with TRP info (OPPO), for general UEB, assistance info (Lenovo), for general UEB, mean and deviation of each error source (spreadtrum), error bounds for TRP location and inter-TRP synch should be associated with each TRP in DL AD (ZTE) | CATT(9403), HW(9426)  Vivo(9561), OPPO(9725), Spreadtrum, ZTE |
| Dedicated and broadcast signaling are used for the signaling | CATT(9403) |
| TRP related info error source via NRPPa between LMF and gNB/TRP | Vivo(9561) |
| Procedure for UEB in legacy can be used as baseline for RAT-dependent one including: LPP cap transfer procedure, AD from LMF to UE, integrity requirement i.e., TIR from LMF to UE, integrity result to LMF. | IDC, OPPO |
| For UEB pos integrity, LPP provideAssistance Information msg, LPP requestLocationInformation, LPP provideLocationInformation msg can be used for providing error sources, target TIR or given AL, PL or positionin integrity alarm respectively. | Xiaomi |
| Signaling for **UE-assisted** integrity | UE should provide the error source originated from UE to LMF (CATT) / RSTD meas. for DL-TDOA (HW) / for general LMF-based, assistance info (Lenovo)/ for general UEA, mean and deviation of each error source and meas error source (spreadtrum) | CATT(9403) HW(9426), spreadtrum |
| RAN node provide the error source originated from RAN node to LMF | CATT(9403) |
| For RSTD, support to associate the error bound with each NR-DL-TDOA-ProvideLocatoinInformation, / For UE Rx-Tx time difference, support to associate error bound with each NR-Multi-RTT-ProvideLocationInformation 🡪 This also applies to below UE-assisted case. | ZTE |
| UL-POS | Signaling for **LMF-based** | UE provide the error source to RAN node, and the serving RAN node provides those error sources to LMF (CATT) | CATT(9403) |
| RAN node provides RAN node originated error source to LMF (CATT), error bounds of ARP location and inter-TRP synch can be configured per TRP information in NRPPa spec. (ZTE) , RTOA meas for UL-TDOA, AoA/AoZ for UL-AoA via NRPPa (HW),  RTOA meas, gNB Rx-Tx time difference meas. and AoA meas, the error bound for each error source should be associated with each Measurement Response msg or Measurement Report msg in NRPPa sepc. (ZTE) | CATT(9403), ZTE, HW |
| DL&UL POS | Signaling for **LMF-based** | UE provides the UE oriented error source to LMF (CATT) / UE Rx-Tx time difference for Multi-RTT (HW) / along with measurement result (OPPO) | CATT(9403) HW(9426) OPPO(9725) |
| RAN node provides the RAN node oriented error source to LMF / gNB Rx-Tx time difference for Multi-RTT (HW) / along with gNB measurement results in NRPPa (OPPO) | CATT(9403) HW(9426)  OPPO |
| Error bounds of TRP location and inter-TRP synch should be associated with each TRP in DL AD. | ZTE |
| **LMF-based** common |  | LPP enhanced for new integrity capa, AD, location information transfer , NRPPa enhanced for TRP-related information error source in TRP information transfer and TRP measurement error sources in measurement transfer | Vivo(9561) |
| For LMF-based, error sources from UE and GNB should be sent to LMF, and gNB provides the error source to LMF for UL and UL+DL pos by NRPPa msg, UE provides the error source to LMF for DL pos by LPP provideLocationInformation | Xiaomi |
| UE capa general |  | Define UE pos integrity capabilities for each positioning method, which includes error source receiving, error source reporting, and supported model of integrity result reporting (Xiaomi), define UE cap and signaling required to send error source model during WI to support LMF-based and UE based | Xiaomi, Eric |

**Discussion:** Once the support of integrity mode between UE-based/LMF-based one is determined, the signaling in each mode needs to be discussed. RAN1 agreed some of the error source and related positioning method / integrity mode. IDC showed the table on relationship between positioning integrity mode applicable on each RAT-dependent positioning method as below. This is based on the assumption that the entity calculating location estimate should calculate the PL/integrity results. Assuming that majority companies has the same figure in mine, it is necessary to make a proposal for the starting point.

Table 1: Relationship between positioning integrity mode for RAT dependent positioning methods

|  |  |  |
| --- | --- | --- |
|  | **UE-based positioning integrity mode** | **LMF-based positioning integrity mode** |
| UE-based DL-TDOA | Applicable | Not applicable |
| UE-assisted DL-TDOA | Not applicable | Applicable |
| UE-based DL-AoD | Applicable | Not applicable |
| UE-assisted DL-AoD | Not applicable | Applicable |
| Multi-RTT | Not applicable | Applicable |
| UL-TDOA | Not applicable | Applicable |
| UL-AoA | Not applicable | Applicable |

DL-positioning method can be applicable to both UE-based and LMF-based (UE-assisted) integrity mode while others like UL positioning and DL+UL positioning is only applicable to LMF-based integrity mode. Moreover, DL positioning method is also split into the UE-based positioning or UE-assisted, and applicable to either of both integrity mode.

**Proposal 6. RAN2 agree that UE-based DL-TDOA and UE-based DL-AoD only applicable to UE-based integrity mode, and remaining method i.e., UE-assisted DL-TDOA, UE-assisted DL-AoD, Multi-RTT, UL-TDOA, and UL-AoA are applicable to LMF-based integrity mode.**

Then error source mapping on each positioning method can be associated with integrity mode and error category (e.g., error from UE/gNB/assistance data etc.) This association is also well illustrated in the below table from HW for the discussion. This is the same as Vivo’s table.

|  |  |  |  |
| --- | --- | --- | --- |
| **Positioning mode** | **Positioning method** | **Error sources** | **Category of error sources** |
| LMF-based positioning | DL-TDOA | RSTD measurement | Timing related measurement  FFS: Model of the error source (e.g., distribution, mean and/or standard deviation for integrity overbounding model, range) |
| UL-TDOA | RTOA measurement | Timing related measurement |
| inter-TRP synchronization | Assistance data  FFS: Specification impact of inter-TRP synchronization as an error source for UL-TDOA |
| Multi-RTT | UE Rx-Tx time difference measurement  gNB Rx-Tx time difference measurement | Timing related measurement |
| UL-AoA | Angle of arrival measurement (e.g., AoA/ZoA) | Angle related measurement |
| ARP location (e.g., ARPLocationInformation) | Assistance data  FFS: Whether the error statistics of ARP location is available at the gNB |
| UE-based positioning | DL-TDOA | TRP location (e.g., NR-TRP-LocationInfo)  Inter-TRP synchronization (e.g., NR-RTD-Info) | Assistance data  FFS: Applicability of the error sources to LMF-based positioning integrity mode |
| DL-AoD | TRP location (e.g., NR-TRP-LocationInfo)  FFS: boresight direction of DL-PRS (e.g., NR-DL-PRS-BeamInfo)  FFS: beam information of DL-PRS (e.g., NR-TRP-BeamAntennaInfo) |

For **UE-based integrity mode,** legacy R17 UE-based integrity mode signaling would be the baseline which also proposed explicitly from IDC and Oppo.

**Proposal 7. RAN2 agree that R17 UE-based integrity mode signaling can be used as baseline with the following aspects:**

* **UE sends capability info to LMF on integrity for UE-based mode using LPP capability transfer procedure**
* **LMF sends the assistance data for integrity calculation to UE for integrity of UE-based mode**
* **LMF sends integrity requirement e.g., TIR to UE in LPP provide assistance data message for integrity of UE-based mode**
* **UE sends integrity result to LMF using LPP location information Transfer message**

Based on above categorization in the figure, UE-based integrity mode will have the signaling in which LMF provides the error source information originated from RAN node to UE. This is supported by companies (CATT, HW, Vivo, Oppo, Spreadtrum, ZTE). But there are some detail variations on the carried information and its field to carry. For the baseline, we can have the following proposal.

**Proposal 8-1. RAN2 agree LMF should, in assistance data, provide the information of error source originated from RAN node to UE for UE-based integrity mode.**

**Proposal 8-2. RAN2 discuss and agree on further items below about the carried contents and carrying field/msg aspects:**

* **The information of error source originated from RAN node could be TRP-location and/or inter-TRP synchronization**
* **Above information is carried with TRP info field in the NR-PositionCalculationAssitance IE in the LPP ProvideAssistanceData msg**
* **Above information could be mean and deviation of error source (i.e., TRP-location, inter-TRP synchronization)**
* **Above information could be error bounds for the error source (i.e., TRP-location, inter-TRP synchronization) and is associated with each TRP.**
* **Dedicated and broadcast signaling are used for the signaling**

Regarding NRPPa enhancement from Vivo on introducing the signaling between LMF and gNB/TRP on TRP related information error source would be further considered. in RAN3 remit. So we can further inform R3 after agreeing on the baseline procedure.

**Proposal 8-3. RAN 2 consider the NRPPa enhancement on introducing signaling between LMF and gNB/TRP on TRP related information error source for UE-based integrity mode.**

For **LMF-based integrity mode**, some companies disclosed their view on UE sending its originated error source information to LMF, and RAN node also sending its originated error source information to LMF. However, UL positioning and DL&UL positioning has slight difference on signaling. For UL pos, only CATT propose the UE providing error source information to RAN node, and the serving RAN node provides those error sources to LMF. So no enhancement on LPP for UL positioning. On the contrary, additionally Xiaomi, CATT, HW, OPPO and Vivo seem to have the same view that i.e., for DL&UL positioning, LPP and NRPPa has enhancement proposed to send the error source to LMF from UE and RAN node respectively. This is the most essential part to be introduced newly compared to the legacy. In any cases of UL or DL&UL, RAN node indicates its own error source to LMF. So we made the list of proposals on this.

**Proposal 9-1. RAN2 discuss and agree that UE provide its originated error source to RAN node, and the serving RAN node provides those error source information to LMF for UL positioning LMF-based integrity mode.**

**Proposal 9-2. RAN2 agree that UE provide the UE originated error source to LMF via LPP message for DL&UL positioning LMF-based integrity mode.**

**Proposal 9-3. RAN2 agree that RAN node provides RAN node originated error source to LMF via NRPPa signaling in both UL and DL&UL positioning LMF-based integrity mode.**

Remaining part is to discuss on the details of the carried information in NRPPa for UL and DL&UL positioning LMF-based integrity mode.

**Proposal 9-4. RAN2 further discuss and agree the followings on the error source contents carried from serving RAN node to LMF via NRPPa for LMF-based integrity mode.**

* **Contents would be the error of RTOA measurement for UL-TDOA, and the error of AoA/ZoA for UL-AoA, error of gNB Rx-Tx time difference measurement for Multi-RTT**
* **RTOA meas, gNB Rx-Tx time difference meas. and AoA meas, the error bound for each error source should be associated with each Measurement Response msg or Measurement Report msg in NRPPa sepc.**
* **The error source contents is provided along with gNB measurement result.**

Inter-TRP synchronization, TRP location and ARP location are not captured for DL&UL positioning error contents in RAN1 yet. So let’s discuss them after further RAN1 input.

And also need to discuss on the details of the carried information in LPP for DL&UL positioning LMF-based integrity mode.

**Proposal 9-5. RAN2 agree that UE oriented error source to be sent from UE to LMF via LPP for DL&UL positioning LMF-based integrity mode would be the error of UE Rx-Tx time difference for Multi-RTT**

Regarding UE capability signalling in general, Ericsson and Xiaomi suggested to introduce the integrity capability related to error source receiving/reporting, and supported result reporting mode etc. However, as Ericsson proposed, this new capability signalling can be defined only after the details of LMF-/UE-based integrity mode are fully exposed. Therefore, rapporteur propose the following as Ericsson’s proposal:

**Proposal 10. RAN2 define UE capability and its signalling required to send/receive error source model during WI phase.**

## 2.5 Miscellaneous issue

The following proposals are covered.

|  |  |  |
| --- | --- | --- |
| Category | Related proposals | Companies |
| Integrity alert reporting | UE transmitting integrity alerts to LMF when detecting integrity related events and error sources. | IDC, Lenovo |
| Recovery from failure | Recovering from failure events detectable at UE for ensuring integrity | IDC |
| Compatibility between RAT-dep/indep | Study how RAT independent and RAT dependent positioning methods can be made to be compatible with each other for improving integrity. | IDC |
| Feared event report at UE | Study which signaling msg to send the feared events due to the UE faults/ low performance to LMF for LMF-based integrity. | OPPO |
| Quality flag/indicator | A quality flag/indicator is introduced and transmitted algon with each RAT-dependent positioning integrity assistance information (kind of DNU ?) | Lenovo |
|  | Consider max predefined time window for modelling measurement error source. | Sony |
|  | Multiple positioning measurements in which the important/ prioritized measurement data should be reported | Sony |
|  | RAT-independent integrity KPIs/results be available for adapting the RAT-dependent positioning method and integrity reporting | Sony |
| Categorizing error source | Categorize the error sources into static, semi-static and dynamic attributes, and capture in TR | Eric |
|  | Time stamp is provided when ECID measurement were taken | Eric |

**Discussion** : These proposals are regarded as miscellaneous items. These are thought to be discussed and agreed only after the baseline of each integrity mode are finalized, therefore, rapporteur suggests to keep these items to be discussed in the next turn of the meeting or WI phase.

# 3 Conclusion

This paper summarized the proposals covering holistic aspects of the RAT-dependent integrity objectives. Similar subjects are coupled using hyphen ‘-‘ in the proposal numbering. Below proposals are the conclusion of this discussion.

**Proposal 1-1. RAN2 discuss and conclude that DNU flag is to be reused for assistance information in RAT-dependent positioning integrity.**

**Proposal 1-2. RAN2 study the usage of DNU flag for the RAT-dependent positioning integrity.**

**Proposal 2-1. RAN2 agree to reuse the integrity principle Equation 8.1.1a in 38.305 for the R18 RAT-dependent integrity case.**

**Proposal 2-2. RAN2 discuss on the definition of each parameters used in the agreed Equation of the integrity principle 8.1.1a in 38.305, and redefine them if necessary per positioning method.**

**Proposal 3. RAN2 agree to reuse the mapping of integrity parameters with further updating the contents based on RAN1 input.**

**Proposal 4. RAN2 discuss and conclude to study the both UE-based and LMF-based integrity for RAT-dependent cases.**

**Proposal 5. RAN2 discuss and conclude to support mode 1 and/or mode 2 for integrity result reporting.**

**Proposal 6. RAN2 agree that UE-based DL-TDOA and UE-based DL-AoD only applicable to UE-based integrity mode, and remaining method i.e., UE-assisted DL-TDOA, UE-assisted DL-AoD, Multi-RTT, UL-TDOA, and UL-AoA are applicable to LMF-based integrity mode.**

**Proposal 7. RAN2 agree that R17 UE-based integrity mode signaling can be used as baseline with the following aspects:**

* **UE sends capability info to LMF on integrity for UE-based mode using LPP capability transfer procedure**
* **LMF sends the assistance data for integrity calculation to UE for integrity of UE-based mode**
* **LMF sends integrity requirement e.g., TIR to UE in LPP provide assistance data message for integrity of UE-based mode**
* **UE sends integrity result to LMF using LPP location information Transfer message**

**Proposal 8-1. RAN2 agree LMF should, in assistance data, provide the information of error source originated from RAN node to UE for UE-based integrity mode.**

**Proposal 8-2. RAN2 discuss and agree on further items below about the carried contents and carrying field/msg aspects:**

* **The information of error source originated from RAN node could be TRP-location and/or inter-TRP synchronization**
* **Above information is carried with TRP info field in the NR-PositionCalculationAssitance IE in the LPP ProvideAssistanceData msg**
* **Above information could be mean and deviation of error source (i.e., TRP-location, inter-TRP synchronization)**
* **Above information could be error bounds for the error source (i.e., TRP-location, inter-TRP synchronization) and is associated with each TRP.**
* **Dedicated and broadcast signaling are used for the signaling**
* **Proposal 8-3. RAN 2 consider the NRPPa enhancement on introducing signaling between LMF and gNB/TRP on TRP related information error source for UE-based integrity mode.**

**Proposal 9-1. RAN2 discuss and agree that UE provide its originated error source to RAN node, and the serving RAN node provides those error source information to LMF for UL positioning LMF-based integrity mode.**

**Proposal 9-2. RAN2 agree that UE provide the UE originated error source to LMF via LPP message for DL&UL positioning LMF-based integrity mode.**

**Proposal 9-3. RAN2 agree that RAN node provides RAN node originated error source to LMF via NRPPa signaling in both UL and DL&UL positioning LMF-based integrity mode.**

**Proposal 9-4. RAN2 further discuss and agree the followings on the error source contents carried from serving RAN node to LMF via NRPPa for LMF-based integrity mode.**

* **Contents would be the error of RTOA measurement for UL-TDOA, and the error of AoA/ZoA for UL-AoA, error of gNB Rx-Tx time difference measurement for Multi-RTT**
* **RTOA meas, gNB Rx-Tx time difference meas. and AoA meas, the error bound for each error source should be associated with each Measurement Response msg or Measurement Report msg in NRPPa sepc.**
* **The error source contents is provided along with gNB measurement result.**

**Proposal 9-5. RAN2 agree that UE oriented error source to be sent from UE to LMF via LPP for DL&UL positioning LMF-based integrity mode would be the error of UE Rx-Tx time difference for Multi-RTT**

**Proposal 10. RAN2 define UE capability and its signalling required to send/receive error source model during WI phase.**

# References

|  |  |  |  |
| --- | --- | --- | --- |
| [CATT] | [**R2-2209403**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209403.zip) | Discussion on RAT dependent integrity | CATT |
| [HW] | [**R2-2209426**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209426.zip) | Discussion on RAT-dependent integrity | Huawei, HiSilicon |
| [Vivo] | [**R2-2209561**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209561.zip) | Discussion on RAT-dependent integrity | vivo |
| [Intel] | [**R2-2209608**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209608.zip) | Integrity for RAT dependent positioning methods | Intel Corporation |
| [IDC] | [**R2-2209694**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209694.zip) | Discussion on RAT-dependent Integrity | InterDigital, Inc. |
| [OPPO] | [**R2-2209725**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209725.zip) | Consideration on RAT-dependent integrity | OPPO |
| [Lenovo] | [**R2-2209961**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209961.zip) | Discussion on RAT-dependent positioning integrity | Lenovo |
| [Spreadtrum] | [**R2-2209980**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209980.zip) | Discussion on solutions for integrity of RAT-dependent positioning techniques | Spreadtrum Communications |
| [ZTE] | [**R2-2210084**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210084.zip) | Discussion on RAT-dependent methods positioning integrity | ZTE, Sanechips |
| [Xiaomi] | [**R2-2210116**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210116.zip) | Discussion on RAT-dependent positioning integrity | Xiaomi |
| [CMCC] | [**R2-2210140**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210140.zip) | Discussion on RAT-dependent integrity | CMCC |
| [Sony] | [**R2-2210211**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210211.zip) | Considerations on solution for integrity of RAT dependent positioning | Sony |
| [Eric] | [**R2-2210317**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210317.zip) | RAT-dependent integrity and TP for TR | Ericsson |
| [QC] | [**R2-2210364**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210364.zip) | Integrity of NR Positioning Technologies | Qualcomm Incorporated |
| [SS] | [**R2-2210547**](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210547.zip) | Discussion on integrity of RAT dependent positioning techniques | Samsung R&D Institute UK |