**3GPP TSG-RAN WG2 Meeting #123bis *R2-23xxxxx***

**Xiamen, China, Oct 9th – 13th, 2023**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **37.355** | **CR** | **draft** | **rev** | **-** | **Current version:** | **17.5.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

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|  |
| ***Title:***  | LPP running CR for RAT-dependent integrity |
|  |  |
| ***Source to WG:*** | CATT |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_pos\_enh2 |  | ***Date:*** | 2023-10-19 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | Introduction of RAT-dependent integrity |
|  |  |
| ***Summary of change:*** | Introduction agreement of RAT-dependent integrity. RAN2#119

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| --- |
| Agreements:Proposal 1: RAN2 to confirm the integrity principle of operation defined in the section 8.1.1a of TS38.305, including integrity definition (e.g., Error, Bound, Time to Alert, DNU, Residual Risk, irMinimum, irMaximum and Correlation Times; FFS if all parameters are needed in the RAT-dependent case), Equations for the GNSS integrity are reused for RAT dependent positioning methods. Proposal 2 (modified): RAN2 may add the mapping between Integrity definition/Fields (Integrity Alerts, error bounds (mean, StdDev), Residual Risks, Integrity correlation times ) and Error sources/assistance data for RAT-dependent positioning methods later once RAN1 identifies new error sources.  |

RAN2#119bise

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| Agreement:Proposal 1-2. RAN2 study the usage of DNU flag for the RAT-dependent positioning integrity (assuming RAN1 agree to leave it to RAN2) and conclude on whether to indicate the DNU presence in the integrity principle equation. Proposal 4. RAN2 will study the both UE-based and LMF-based integrity for RAT-dependent cases.Proposal 7 (modified). 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 request location information message for integrity of UE-based mode- UE sends integrity result to LMF using LPP location information Transfer messageLMF provides, in assistance data, the information of error sources (e.g., originated from RAN node) to UE for integrity in UE-based mode. |

RAN2#120

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| Agreement:Proposal 1 (modified): Use DNU flag for RAT-dependent integrity, with the meaning that the concerned assistance data cannot be used for integrity calculation but may be usable for positioning. Signalling details and relation to error sources can be determined in normative work. FFS which positioning methods are affected based on the progress in RAN1.Replace “error sources” with “results related to integrity” in the fourth bullet and the last note.Replace “assistance data” with “results related to integrity” in bullets 2 and 3.TP in R2-2213143 is endorsed to be merged into the main TP to 38.859, with these changes. |

RAN2#121

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| Agreements:RAN2 anticipate that the error sources are overbounded by a Gaussian distribution.LS to RAN1 to check this view and ask about the parameters for the overbound distributions.TRP related error source bounds can be provided to UE via dedicated LPP providing assistance message or posSIB.Any interaction between the LMF and NG-RAN to support determination of error sources is in RAN3 scope. Other aspects of determining the TRP error sources are left to deployment and implementation.For UE-based RAT-dependent integrity, the PL and/or its corresponding TIR are provided to LMF as legacy, using the existing common LPP signalling from Rel-17. |

RAN2#121bise

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| Agreement:LS to RAN1 to include a request for confirmation that the beam-related information (Beam Bore-Sight Direction and Beam Antenna Information) are error sources for DL-AoD positioning.LS to RAN1 to include the question of whether RAN1 identify a need for a DNU flag for measurements.For RAT-dependent integrity, the PL calculation is performed by the entity which also performs the position calculation for a location process.For UE-based integrity, the integrity parameters of error sources for RAT-dependent integrity are included in assistance data.LPP Request/Provide Assistance Data are reused for retrieving the integrity parameters to the UE from the LMF. The request is per positioning method (as in legacy operation) and the provided integrity parameters are as appropriate for the selected positioning method.Use of posSIBs for integrity parameters is not excluded.Indicate the WA above in the LS to RAN1 to allow them to register any concern.Capture the stage 2 impact for RAT-dependent integrity in section 7 of 38.305. Initial running CR to be seen at next meeting, using R2-2302504 and R2-2303682 as baseline.Working assumption:For LMF-based integrity, no integrity KPI (TTA, TIR, and AL) and integrity results transfer in LPP message.It is left to LMF implementation to decide the measurement error source bound distribution based on the measurement results from UE and/or NG-RAN. |

RAN2#122

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| Agreement:For stage2 description of RAT-dependent integrity, move the section of “Integrity Principle of Operation” to a generic section that is not specific to positioning methods.Represent the TRP and ARP location errors by a Gaussian paired over-bounding.Represent the RTD errors by a Gaussian paired over-bounding. |

RAN2#123

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| Agreements:The DNU flags are provided per TRP and per error contribution (e.g., TRP location, RTD, beam information, etc.) in a new IE NR-Integrity-ServiceAlert.DNU flags for TRP/UE positioning measurements are not needed.The 'Integrity Correlation Times', defining the minimum time interval beyond which two sets of assistance data parameters for a given error can be considered to be independent from one another, can optionally be provided for the integrity assistance data.It is left to LMF implementation to decide the measurement error source bound distribution based on the measurement results provided to the LMF from UE and/or NG-RAN.The beam related information (Beam Bore-Sight Direction/Beam Antenna Information) are error sources for DL-AoD positioning. FFS if RAN2 support signalling this information.For LMF-based integrity, no integrity KPI (TTA, TIR, and AL) and integrity results transfer in LPP message. |

RAN2#123bis

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| Agreements:The identified signalling used for integrity information transmission can be reused for the beam related error source for DL-AOD positioning. Details can be discussed in CR drafting. |

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| ***Consequences if not approved:*** |  RAT-dependent integrity is not supported in NR. |
|  |  |
| ***Clauses affected:*** | 6.4.3, 6.5.10, 6.5.11, 7.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Revision of R2-2311396. |

*START OF CHANGE*

# 6 Information Element Abstract Syntax Definition

## 6.4 Common IEs

Common IEs comprise IEs that are applicable to more than one LPP positioning method.

### 6.4.3 Common NR Positioning Information Elements

#### – *NR-DL-PRS-BeamInfo*

The IE *NR-DL-PRS-BeamInfo* is used by the location server to provide spatial direction information of the DL-PRS Resources together with integrity information.

-- ASN1START

NR-DL-PRS-BeamInfo-r16 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-DL-PRS-BeamInfoPerFreqLayer-r16

NR-DL-PRS-BeamInfoPerFreqLayer-r16 ::= SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 NR-DL-PRS-BeamInfoPerTRP-r16

NR-DL-PRS-BeamInfoPerTRP-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 associated-DL-PRS-ID-r16 INTEGER (0..255) OPTIONAL, -- Need OP

 lcs-GCS-TranslationParameter-r16 LCS-GCS-TranslationParameter-r16

 OPTIONAL, -- Need OP

 dl-PRS-BeamInfoSet-r16 DL-PRS-BeamInfoSet-r16 OPTIONAL, -- Need OP

 ...

}

DL-PRS-BeamInfoSet-r16 ::= SEQUENCE (SIZE(1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF

 DL-PRS-BeamInfoResourceSet-r16

DL-PRS-BeamInfoResourceSet-r16 ::= SEQUENCE (SIZE(1..nrMaxResourcesPerSet-r16)) OF

 DL-PRS-BeamInfoElement-r16

DL-PRS-BeamInfoElement-r16 ::= SEQUENCE {

 dl-PRS-Azimuth-r16 INTEGER (0..359),

 dl-PRS-Azimuth-fine-r16 INTEGER (0..9) OPTIONAL, -- Need ON

 dl-PRS-Elevation-r16 INTEGER (0..180) OPTIONAL, -- Need ON

 dl-PRS-Elevation-fine-r16 INTEGER (0..9) OPTIONAL, -- Need ON

 ...,

 [[

 integrityBeamInfoBounds-r18 IntegrityBeamInfoBounds-r18 OPTIONAL -- Need OR

 ]]

}

IntegrityBeamInfoBounds-r18 ::= SEQUENCE {

 meanAzimuth-r18 INTEGER (0..128),

 stdDevAzimuth-r18 INTEGER (0..255),

 meanElevation-r18 INTEGER (0..128),

 stdDevElevation-r18 INTEGER (0..255),

 ...

}

Editor notes: FFS how to capture the bound, alerts, residual risks, correlation time of beam related error sources.

-- ASN1STOP

| *NR-DL-PRS-BeamInfo* field descriptions |
| --- |
| ***dl-PRS-ID***This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource. This ID can be associated with multiple DL-PRS Resource Sets associated with a single TRP.Each TRP should only be associated with one such ID. |
| ***nr-PhysCellID***This field specifies the physical cell identity of the associated TRP, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by *nr-PhysCellID*. |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*. |
| ***associated-DL-PRS-ID***This field specifies the *dl-PRS-ID* of the associated TRP from which the beam information is obtained. See the field descriptions of *dl-PRS-BeamInfoSet* and *lcs-GCS-TranslationParameter*. |
| ***lcs-GCS-TranslationParameter***This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [44]. If this field and the field *associated-DL-PRS-ID* are absent, the *dl-PRS-Azimuth* and *dl-PRS-Elevation* are provided in a GCS. If this field is absent and the *associated-DL-PRS-ID field* is present, then the *lcs-GCS-TranslationParameter* for this TRP is obtained from the *lcs-GCS-TranslationParameter* of the associated TRP. |
| ***dl-PRS-BeamInfoSet***This field provides the DL-PRS beam information for each DL-PRS Resource of the DL-PRS Resource Set associated with this TRP. If this field is absent and the field *associated-DL-PRS-ID* is present, the *dl-PRS-BeamInfoSet* for this TRP are obtained from the *dl-PRS-BeamInfoSet* of the associated TRP. |
| ***dl-PRS-Azimuth***This field specifies the azimuth angle of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.For a Global Coordinate System (GCS), the azimuth angle is measured counter-clockwise from geographical North.For a Local Coordinate System (LCS), the azimuth angle is measured measured counter-clockwise from the x-axis of the LCS.Scale factor 1 degree; range 0 to 359 degrees. |
| ***dl-PRS-Azimuth-fine***This field provides finer granularity for the *dl-PRS-Azimuth*.The total azimuth angle of the boresight direction is given by *dl-PRS-Azimuth* + *dl-PRS-Azimuth-fine.*Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***dl-PRS-Elevation***This field specifies the elevation angle of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.For a Global Coordinate System (GCS), the elevation angle is measured relative to zenith and positive to the horizontal direction (elevation 0 deg. points to zenith, 90 deg to the horizon).For a Local Coordinate System (LCS), the elevation angle is measured relative to the z-axis of the LCS (elevation 0 deg. points to the z-axis, 90 deg to the x-y plane).Scale factor 1 degree; range 0 to 180 degrees. |
| ***dl-PRS-Elevation-fine***This field provides finer granularity for the *dl-PRS-Elevation*.The total elevation angle of the boresight direction is given by *dl-PRS-Elevation* + *dl-PRS-Elevation-fine.*Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
|  |
|  |
|  |
| ***meanAzimuth***This field specifies the Mean Azimuth Error bound which is the mean value for an overbounding model that bounds the azimuth angle error of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.The bound is *meanAzimuth* + K \* *stdDevAzimuth* and shall be so that the probability of it to be exceeded shall be lower than IRallocation for *irMinimum* < IRallocation < *irMaximum*, where K = normInv(IRallocation / 2) and *irMinimum*, *irMaximum* as provided in IE *NR-Integrity-ServiceParameters*.This IRallocation is a fraction of the Target Integrity Risk that represents the integrity risk budget available. |
| Scale factor 0.1 degrees; range 0-12.8 degrees.***stdDevAzimuth***This field specifies the Standard Deviation Azimuth Error bound which is the standard deviation for an overbounding model that bounds the Azimuth error of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.Scale factor 0.1 degrees; range 0-25.5 degrees. |
| ***meanElevation***This field specifies the Mean Elevation Error bound which is the mean value for an overbounding model that bounds the elevation angle error of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.The bound is *meanElevation* + K \* *stdDevElevation* and shall be so that the probability of it to be exceeded shall be lower than IRallocation for *irMinimum* < IRallocation < *irMaximum*, where K = normInv(IRallocation / 2) and *irMinimum*, *irMaximum* as provided in IE *NR-Integrity-ServiceParameters*.This IRallocation is a fraction of the Target Integrity Risk that represents the integrity risk budget available.Scale factor 0.1 degrees; range 0-12.8 degrees. |
| ***stdDevElevation***This field specifies the Standard Deviation Elevation Error bound which is the standard deviation for an overbounding model that bounds the Elevation error of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.Scale factor 0.1 degrees; range 0-25.5 degrees. |

*NEXT CHANGE*

#### – *NR-IntegrityServiceAlertInfo*

The IE *NR-IntegrityServiceAlertInfo* is used by the location server to indicate whether the corresponding error sources related assistance data can be used for integrity related applications.

-- ASN1START

NR-IntegrityServiceAlertInfo-r18 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-TRP-IntegrityServiceAlertInfoPerFreqLayer-r18

NR-TRP-IntegrityServiceAlertInfoPerFreqLayer-r18 ::= SEQUENCE {

 trp-IntegrityServiceAlertInfoList-r18 SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 TRP-IntegrityServiceAlertInfoElement-r18,

 ...

}

TRP-IntegrityServiceAlertInfoElement-r18 ::= SEQUENCE {

 dl-PRS-ID-r18 INTEGER (0..255),

 nr-PhysCellID-r18 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r18 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r18 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 nr-IntegrityServiceAlert-r18 NR-IntegrityServiceAlert-r18 OPTIONAL -- Need ON

...

}

NR-IntegrityServiceAlert-r18 ::= SEQUENCE {

 rtd-ErrorDoNotUse-r18 BOOLEAN OPTIONAL, -- Need ON

 trp-LocationErrorDoNotUse-r18 BOOLEAN OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

#### – *NR-IntegrityServiceParameters*

The IE *NR-IntegrityServiceParameters* is used by the location server to provide the range of Integrity Risk (IR) for which the integrity assistance data are valid.

-- ASN1START

NR-IntegrityServiceParameters-r18 ::= SEQUENCE {

 irMinimum-r18 INTEGER (0..255),

 irMaximum-r18 INTEGER (0..255),

 ...

}

-- ASN1STOP

|  |
| --- |
| *NR-Integrity-ServiceParameters* field descriptions |
| ***irMinimum***This field specifies the Minimum Integrity Risk (IR) which is the minimum IR for which the error bounds are valid.The IR is calculated by $P=10^{-0.04n}$ where n is the value of *irMinimum* and the range is 10-10.2 to 1. |
| ***irMaximum***This field specifies the Maximum Integrity Risk (IR) which is the maximum IR for which the error bounds are valid.The IR is calculated by $P=10^{-0.04n}$ where n is the value of *irMaximum* and the range is 10-10.2 to 1. |

*NEXT CHANGE*

#### *– NR-PositionCalculationAssistance*

The IE *NR-PositionCalculationAssistance* is used by the location server to provide assistance data to enable UE‑based downlink positioning .

-- ASN1START

NR-PositionCalculationAssistance-r16 ::= SEQUENCE {

 nr-TRP-LocationInfo-r16 NR-TRP-LocationInfo-r16 OPTIONAL, -- Need ON

 nr-DL-PRS-BeamInfo-r16 NR-DL-PRS-BeamInfo-r16 OPTIONAL, -- Need ON

 nr-RTD-Info-r16 NR-RTD-Info-r16 OPTIONAL, -- Need ON

 ...,

 [[

 nr-TRP-BeamAntennaInfo-r17 NR-TRP-BeamAntennaInfo-r17 OPTIONAL, -- Need ON

 nr-DL-PRS-Expected-LOS-NLOS-Assistance-r17

 NR-DL-PRS-ExpectedLOS-NLOS-Assistance-r17

 OPTIONAL, -- Need ON

 nr-DL-PRS-TRP-TEG-Info-r17 NR-DL-PRS-TRP-TEG-Info-r17 OPTIONAL -- Need ON

 ]],

 [[

 nr-IntegrityServiceParameters-r18 NR-IntegrityServiceParameters-r18 OPTIONAL, -- Need ON

 nr-IntegrityServiceAlertInfo-r18 NR-IntegrityServiceAlertInfo-r18 OPTIONAL, -- Need ON

 location-IntegrityParameters-r18 LocationIntegrityParameters-r18 OPTIONAL, -- Need OR nr-IntegrityParameters-DL-PRS-BeamInfo-r18

 NR-IntegrityParameters-DL-PRS-BeamInfo-r18

 OPTIONAL, -- Cond Integrity1

 nr-IntegrityParameters-TRP-BeamAntennaInfo-r18

 NR-IntegrityParameters-TRP-BeamAntennaInfo-r18

 OPTIONAL -- Cond Integrity2

 ]]

}

LocationIntegrityParameters-r18 ::= SEQUENCE {

 trpErrorCorrelationTime-r18 ENUMERATED { c1-Infinity, c1, c2, c3, ...} DEFAULT c1-Infinity,

 probOnsetTRPFault-r18          INTEGER(0..255),

 meanTRPFaultDuration-r18       INTEGER(1..3600)

 ...

}

NR-IntegrityParameters-DL-PRS-BeamInfo-r18 ::= SEQUENCE {

 dl-PRS-BeamInfoErrorCorrelationTime-r18 INTEGER (0..255),

 ...

}

NR-IntegrityParameters-TRP-BeamAntennaInfo-r18 ::= SEQUENCE {

 trp-BeamAntennaInfoErrorCorrelationTime-r18 INTEGER (0..255),

 ...

}

Editor notes:

1. meanTRPFaultDuration is FFS. It may not be needed for TRP locationinfo.

2. trpErrorCorrelationTime is FFS. For a stationary TRP, the correltion time of TRP positioning errors can be seen as Infinity by default.

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *Integrity1* | The field is optional present, need OR, if *NR-DL-PRS-BeamInfo* is present and *IntegrityBeamInfoBounds* is present in IE *NR-DL-PRS-BeamInfo;* otherwise it is not present. |
| *Integrity2* | The field is optional present, need OR, if *NR-TRP-BeamAntennaInfo* is present and *IntegrityBeamPowerBounds* is present in IE *NR-TRP-BeamAntennaInfo;* otherwise it is not present. |

| *NR-PositionCalculationAssistance* field descriptions |
| --- |
| ***nr-TRP-LocationInfo***This field provides the location coordinates of the TRPs and location coordinates of antenna reference points for DL-PRS Resource Set(s) and DL-PRS Resources of the TRPs. |
| ***nr-DL-PRS-BeamInfo***This field provides the spatial directions of DL-PRS Resources for TRPs. |
| ***nr-RTD-Info***This field provides the time synchronization information between the reference TRP and neighbour TRPs.  |
| ***nr-TRP-BeamAntennaInfo***This field provides the relative DL-PRS Resource power between PRS resources per angle per TRP. |
| ***nr-DL-PRS-ExpectedLOS-NLOS-Assistance***This field provides the expected likelihood of a LOS propagation path from a TRP to the target device. The information is provided per TRP or per DL-PRS Resource. |
| ***nr-DL-PRS-TRP-TEG-Info***This field provides the TRP Tx TEG ID associated with the transmission of each DL-PRS Resource of the TRP. |
|  |
| ***nr-IntegrityServiceParameters***This field specifiesthe range of Integrity Risk (IR) for which the integrity assistance data are valid. |
| ***nr-IntegrityServiceAlertInfo***This field indicates whether the corresponding assistance data can be used for integrity related applications. |
| ***dl-PRS-BeamInfoErrorCorrelationTime***This field specifies the Beam Boresight Direction Angle Error Correlation Time which is the upper bound of the correlation time of the DL-PRS Resource angle error. The time is calculated using:$$t=\left\{\begin{array}{c}10i, \&i\leq 180\\1800+100(i-180), 180<\&i\leq 234 \\7200+1000\left(i-234\right), \&i>234\end{array} [s]\right.$$Range is 1-28,200 s. |

#### – *NR-RTD-Info*

The IE *NR-RTD-Info* is used by the location server to provide time synchronization information between a reference TRP and a list of neighbour TRPs.

-- ASN1START

NR-RTD-Info-r16 ::= SEQUENCE {

 referenceTRP-RTD-Info-r16 ReferenceTRP-RTD-Info-r16,

 rtd-InfoList-r16 RTD-InfoList-r16,

 ...,

 [[

 rtd-IntegrityParameters-r18 RTD-IntegrityParameters-r18 OPTIONAL -- Need OR

 ]]

}

ReferenceTRP-RTD-Info-r16 ::= SEQUENCE {

 dl-PRS-ID-Ref-r16 INTEGER (0..255),

 nr-PhysCellID-Ref-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-Ref-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-Ref-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 refTime-r16 CHOICE {

 systemFrameNumber-r16 BIT STRING (SIZE (10)),

 utc-r16 UTCTime,

 ...

 },

 rtd-RefQuality-r16 NR-TimingQuality-r16 OPTIONAL, -- Need ON

 ...,

 [[

 integrityReferenceRTD-InfoBounds-r18 IntegrityRTD-InfoBounds-r18 OPTIONAL -- Need OR

 ]]

}

RTD-InfoList-r16 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF RTD-InfoListPerFreqLayer-r16

RTD-InfoListPerFreqLayer-r16 ::= SEQUENCE (SIZE(1..nrMaxTRPsPerFreq-r16)) OF RTD-InfoElement-r16

RTD-InfoElement-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 subframeOffset-r16 INTEGER (0..1966079),

 rtd-Quality-r16 NR-TimingQuality-r16,

 ...,

 [[

 integrityRTD-InfoBounds-r18 IntegrityRTD-InfoBounds-r18 OPTIONAL -- Need OR

 ]]

}

z

RTD-IntegrityParameters-r18::= SEQUENCE {

 probOnsetRTDFault-r18 INTEGER (0..255),

 meanRTDFaultDuration-r18 INTEGER (1..3600),

 rtdErrorCorrelationTime-r18 INTEGER (0..255) OPTIONAL, -- Need OR

 ...

}

IntegrityRTD-InfoBounds-r18 ::= SEQUENCE {

 meanRTDInfoError-r18 ENUMERATED {z0, ...} DEFAULT z0,

 stdDevRTDInfoError-r18 StdDevRTDInfoError-r18,

 ...

}

StdDevRTDInfoError-r18 ::= SEQUENCE {

 value-r18 INTEGER (0..31),

 resolution-r18 ENUMERATED {mdot1, m1, m10, m30, ...},

 ...

}

Editor notes:

1.It is assumed that the integrity parameters for RTD can be defined by following the existing IE for the integrity parameters for A-GNSS.

2. The defult value of meanRTDInfoError is set to zero according to RAN1 LS, which says: “From RAN1’s perspective, zero is a valid possible option for the mean value for the overbound Gaussian distribution for the error sources listed in Table 6.1.1-2 in TR 38.859.”

-- ASN1STOP

| *NR-RTD-Info* field descriptions |
| --- |
| ***referenceTRP-RTD-Info***This field defines the reference TRP for the RTD and comprises the following sub-fields:- ***dl-PRS-ID-Ref***: This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource, and is associated to the reference TRP.- ***nr-PhysCellId-Ref***: This field specifies the physical cell identity of the reference TRP.- ***nr-CellGlobalId-Ref***: This field specifies the NCGI, the globally unique identity of a cell in NR, of the reference TRP.- ***nr-ARFCN-Ref***: This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*.- ***refTime***: This field specifies the reference time at which the *rtd-InfoList* is valid. The *systemFrameNumber* choice refers to the SFN of the reference TRP.- ***rtd-RefQuality***: This field specifies the quality of the timing of reference TRP, used to determine the RTD values provided in *rtd-InfoList*.- ***integrityReferenceRTD-InfoBounds***: This field specifies the reference TRP overbounding model that bounds the synchronization error of the reference TRP. This field comprises the following sub-fields:- ***meanRTDInfoError***: This field specifies the mean value of the synchronization error of the overbounding model.- ***stdDevRTDInfoError***: This field specifies the standard deviation of synchronization error of the overbounding model. |
| ***dl-PRS-ID***This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource. This ID can be associated with multiple DL-PRS Resource Sets associated with a single TRP for which the *RTD-InfoElement* is applicable. |
| ***nr-PhysCellID***This field specifies the physical cell identity of the associated TRP for which the *RTD-InfoElement* is applicable, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP for which the *RTD-InfoElement* is applicable, as defined in TS 38.331 [35]. The server should include this field if it considers that it is needed to resolve ambiguity in the TRP indicated by *nr-PhysCellID*. |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID* for which the *RTD-InfoElement* is applicable. |
| ***subframeOffset***This field specifies the subframe boundary offset at the TRP antenna location between the reference TRP and this neighbour TRP in time units  where $Δf\_{max}=480∙10^{3}$ Hz and  (TS 38.211 [41]).The offset is counted from the beginning of a subframe #0 of the reference TRP to the beginning of the closest subsequent subframe of this neighbour TRP.Scale factor 1 Tc. |
| ***rtd-Quality***This field specifies the quality of the RTD. |
| ***probOnsetRTDFault***This field specifies the onset probability that the residual inter-TRP synchronization error exceeds a bound created using the minimum allowed inflation factor *Kmin*, and bounding parameters as *mean* + *Kmin* \* *stdDev* where *Kmin* = *normInv*(*irMaximum* / 2), with *irMaximum* as provided in IE *nr-IntegrityServiceParameters*.The probability is calculated by *P*=10-0.04*n* [hour-1] where *n* is the value of *probOnsetRTDFault* and the range is 10-10.2 to 1 per hour. |
| ***meanRTDFaultDuration***This field specifies the mean of inter-TRP synchronization fault duration which is defined as the duration when an inter-TRP synchronization fault occurs.Scale factor 1 s; range 1-3600 s. |
| ***rtdErrorCorrelationTime***This field specifies the correlation time of the inter-TRP synchronization error between the reference TRP and this TRP. The correlation time is calculated using:$$t=\left\{\begin{array}{c}10i, 1\leq \&i\leq 180\\1800+100(i-180), 180<\&i\leq 234 \\7200+1000\left(i-234\right), 234<i \end{array} [s]\right.$$Where *i* is the value given by *rtdErrorCorrelationTime*. Range is 1-28,200 s. |
| ***integrityRTD-InfoBounds***This field specifies overbounding model that bounds the inter-TRP synchronization error between reference TRP and this TRP. This field comprises the following sub-fields:- ***meanRTDInfoError***: This field specifies the mean value of the inter-TRP synchronization error bound of the overbounding model.- ***stdDevRTDInfoError***: This field specifies the standard deviation of the inter-TRP synchronization error bound of the overbounding model. . |

*NEXT CHANGE*

#### – *NR-TRP-BeamAntennaInfo*

The IE *NR-TRP-BeamAntennaInfo* is used by the location server to provide beam antenna information of the TRP together with integrity information.

-- ASN1START

NR-TRP-BeamAntennaInfo-r17 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-TRP-BeamAntennaInfoPerFreqLayer-r17

NR-TRP-BeamAntennaInfoPerFreqLayer-r17 ::= SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 NR-TRP-BeamAntennaInfoPerTRP-r17

NR-TRP-BeamAntennaInfoPerTRP-r17 ::= SEQUENCE {

 dl-PRS-ID-r17 INTEGER (0..255),

 nr-PhysCellID-r17 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r17 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r17 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 associated-DL-PRS-ID-r17 INTEGER (0..255) OPTIONAL, -- Need OP

 lcs-GCS-TranslationParameter-r17 LCS-GCS-TranslationParameter-r16 OPTIONAL, -- Need OP

 nr-TRP-BeamAntennaAngles-r17 NR-TRP-BeamAntennaAngles-r17 OPTIONAL, -- Need OP

 ...

}

NR-TRP-BeamAntennaAngles-r17 ::= SEQUENCE (SIZE(1..3600)) OF

 NR-TRP-BeamAntennaInfoAzimuthElevation-r17

NR-TRP-BeamAntennaInfoAzimuthElevation-r17 ::= SEQUENCE {

 azimuth-r17 INTEGER (0..359) OPTIONAL, -- Cond Az

 azimuth-fine-r17 INTEGER (0..9) OPTIONAL, -- Cond AzOpt

 elevationList-r17 SEQUENCE (SIZE(1..1801)) OF ElevationElement-R17,

 ...

}

ElevationElement-R17 ::= SEQUENCE {

 elevation-r17 INTEGER (0..180) OPTIONAL, -- Cond El

 elevation-fine-r17 INTEGER (0..9) OPTIONAL, -- Cond ElOpt

 beamPowerList-r17 SEQUENCE (SIZE (2..maxNumResourcesPerAngle-r17)) OF

 BeamPowerElement-r17,

 ...

}

BeamPowerElement-r17 ::= SEQUENCE {

 nr-dl-prs-ResourceSetID-r17 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, -- Need OP

 nr-dl-prs-ResourceID-r17 NR-DL-PRS-ResourceID-r16,

 nr-dl-prs-RelativePower-r17 INTEGER (0..30),

 nr-dl-prs-RelativePowerFine-r17 INTEGER (0..9) OPTIONAL, -- Need ON

 ...,

 [[

 integrityBeamPowerBounds-r18 IntegrityBeamPowerBounds-r18 OPTIONAL -- Need OR

 ]]

}

IntegrityBeamPowerBounds-r18 ::= SEQUENCE {

 meanBeamPower-r18 INTEGER (0..128),

 stdDevBeamPower-r18 INTEGER (0..128),

 ...

}

Editor notes: FFS how to capture the bound, alerts, residual risks, correlation time of beam related error sources.

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *Az* | The field is mandatory present if the field *elevation* is absent; otherwise it is optionally present, need ON. |
| *AzOpt* | The field is optionally present, need ON, when *azimuth* is present; otherwise it is not present. |
| *El* | The field is mandatory present if the field *azimuth* is absent; otherwise it is optionally present, need ON. |
| *ElOpt* | The field is optionally present, need ON, when *elevation* is present; otherwise it is not present. |

| *NR-TRP-BeamAntennaInfo* field descriptions |
| --- |
| ***dl-PRS-ID***This field specifies the DL-PRS ID of the TRP for which the Beam Antenna Information is provided. |
| ***nr-PhysCellID***This field specifies the physical Cell-ID of the TRP for which the Beam Antenna Information is provided, as defined in TS 38.331 [35]. |
| ***nr-CellGlobalID***This field specifies the NCGI, the globally unique identity of a cell in NR, of the TRP for which the Beam Antenna Information is provided, as defined in TS 38.331 [35].  |
| ***nr-ARFCN***This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*. |
| ***associated-DL-PRS-ID***This field specifies the *dl-PRS-ID* of the associated TRP from which the beam antenna information is obtained. See the field descriptions for *nr-TRP-BeamAntennaAngles* and *lcs-GCS-TranslationParameter*. |
| ***lcs-GCS-TranslationParameter***This field provides the angles α (bearing angle), β (downtilt angle) and γ (slant angle) for the translation of a Local Coordinate System (LCS) to a Global Coordinate System (GCS) as defined in TR 38.901 [44]. If this field and the *associated-DL-PRS-ID* field are both absent, the *azimuth* and *elevation* are provided in a GCS. If this field is absent and the *associated-DL-PRS-ID* field is present, then the *lcs-GCS-TranslationParameter* for this TRP is obtained from the *lcs-GCS-TranslationParameter* of the associated TRP. |
| ***nr-TRP-BeamAntennaAngles***This field provides the relative power between DL-PRS Resources per angle per TRP. If this field is absent and the field *associated-DL-PRS-ID* is present, the *nr-TRP-BeamAntennaAngles* for this TRP are obtained from the *nr-TRP-BeamAntennaAngles* of the associated TRP. |
| ***Azimuth***This field specifies the azimuth angle for which the relative power between DL-PRS Resources is provided.For a Global Coordinate System (GCS), the azimuth angle is measured counter-clockwise from geographical North.For a Local Coordinate System (LCS), the azimuth angle is measured counter-clockwise from the x-axis of the LCS.Scale factor 1 degree; range 0 to 359 degrees. |
| ***azimuth-fine***This field provides finer granularity for the *azimuth*.The total azimuth angle is given by *azimuth* + *azimuth-fine.*Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***Elevation***This field specifies the elevation angle for which the relative power between DL-PRS Resources is provided for the given *azimuth*.For a Global Coordinate System (GCS), the elevation angle is measured relative to zenith and positive to the horizontal direction (elevation 0 deg. points to zenith, 90 deg to the horizon).For a Local Coordinate System (LCS), the elevation angle is measured relative to the z-axis of the LCS (elevation 0 deg. points to the z-axis, 90 deg to the x-y plane).Scale factor 1 degree; range 0 to 180 degrees. |
| ***elevation-fine***This field provides finer granularity for the *elevation*.The total elevation angle is given by *elevation* + *elevation-fine.*Scale factor 0.1 degrees; range 0 to 0.9 degrees. |
| ***beamPowerList***This field provides the relative power between DL-PRS Resources for the angle given by *azimuth* and *elevation*.The first *BeamPowerElement* in this list provides the peak power for this angle and is defined as 0dB power; i.e., the first value is set to '0' by the location server. All the remaining *BeamPowerElement*'s in this list provide the relative DL-PRS Resource power relative to this first element in the list. |
| ***nr-dl-prs-ResourceSetID***This field specifies the DL-PRS Resource Set ID of the DL-PRS Resource for which the *nr-dl-prs-RelativePower* is provided. If this field is absent, the DL-PRS Resource Set ID for this instance of the *beamPowerList* is the same as the DL-PRS Resource Set ID of the previous instance in the *beamPowerList*. This field shall be included at least in the first instance of the *beamPowerList*. |
| ***nr-dl-prs-ResourceID***This field specifies the DL-PRS Resource for which the *nr-dl-prs-RelativePower* is provided. |
| ***nr-dl-prs-RelativePower***Except for the first element in *beamPowerList*, this field provides the relative power of the DL-PRS Resource, relative to the first element in the *beamPowerList*.For the first element in *beamPowerList*, this field provides the peak power for this angle normalised to 0 dB.Scale factor 1 dB; range 0..30 dB. |
| ***nr-dl-prs-RelativePowerFine***This field provides finer granularity for the *nr-dl-prs-RelativePower*.The total relative power of the DL-PRS Resource is given by *nr-dl-prs-RelativePower* + *nr-dl-prs-RelativePowerFine.*Scale factor 0.1 dB; range 0 to 0.9 dB.NOTE: For the first element in *beamPowerList*, this field is not needed. |
|  |
|  |
|  |
| ***meanBeamPower*** This field specifies the Mean Beam Power Error bound which is the mean value for an overbounding model that bounds the beam power error of the DL-PRS Resources.The bound is *meanBeamPower* + K \* *stdDevBeamPower* and shall be so that the probability of it to be exceeded shall be lower than IRallocation for *irMinimum* < IRallocation < *irMaximum*, where K = normInv(IRallocation / 2) and *irMinimum*, *irMaximum* as provided in IE *NR-Integrity-ServiceParameters*.This IRallocation is a fraction of the Target Integrity Risk that represents the integrity risk budget available.Scale factor 0.1 dB; range 0-12.8 dB. |
| ***stdDevBeamPower***This field specifies the Standard Deviation Beam Power Error bound which is the standard deviation for an overbounding model that bounds the beam power error of the DL-PRS Resources.Scale factor 0.1 degrees; range 0-12.8 dB. |

*NEXT CHANGE*

#### *–* *NR-TRP-LocationInfo*

The IE *NR-TRP-LocationInfo* is used by the location server to provide the coordinates of the antenna reference points for a set of TRPs. For each TRP, the ARP location can be provided for each associated PRS Resource ID per PRS Resource Set.

-- ASN1START

NR-TRP-LocationInfo-r16 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-TRP-LocationInfoPerFreqLayer-r16

NR-TRP-LocationInfoPerFreqLayer-r16 ::= SEQUENCE {

 referencePoint-r16 ReferencePoint-r16 OPTIONAL, -- Cond NotSameAsPrev

 trp-LocationInfoList-r16 SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 TRP-LocationInfoElement-r16,

 ...,

 [[

 integrityReferencePointLocationBounds-r18 IntegrityReferencePointBounds-r18 OPTIONAL -- Cond RealLocation

 ]]

}

TRP-LocationInfoElement-r16 ::= SEQUENCE {

 dl-PRS-ID-r16 INTEGER (0..255),

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON

 nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON

 associated-DL-PRS-ID-r16 INTEGER (0..255) OPTIONAL, -- Need OP

 trp-Location-r16 RelativeLocation-r16 OPTIONAL, -- Need OP

 trp-DL-PRS-ResourceSets-r16 SEQUENCE (SIZE(1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF

 DL-PRS-ResourceSets-TRP-Element-r16 OPTIONAL, -- Need OP

 ...,

 [[

 integrityTRP-LocationBounds-r18  IntegrityRelativeLocationBounds-r18 OPTIONAL -- Need OR

 ]]

}

DL-PRS-ResourceSets-TRP-Element-r16 ::= SEQUENCE {

 dl-PRS-ResourceSetARP-r16 RelativeLocation-r16 OPTIONAL, -- Need OP

 dl-PRS-Resource-ARP-List-r16 SEQUENCE (SIZE(1..nrMaxResourcesPerSet-r16)) OF

 DL-PRS-Resource-ARP-Element-r16 OPTIONAL, -- Need OP

 ...,

 [[

 integrityDL-PRS-ResourceSet-ARP-LocationBounds-r18 IntegrityRelativeLocationBounds-r18 OPTIONAL -- Need OR

 ]]

}

DL-PRS-Resource-ARP-Element-r16 ::= SEQUENCE {

 dl-PRS-Resource-ARP-location-r16 RelativeLocation-r16 OPTIONAL, -- Need OP

 ...,

 [[

 integrityDL-PRS-Resource-ARP-LocationBounds-r18 IntegrityRelativeLocationBounds-r18 OPTIONAL -- Need OR

 ]]

}

IntegrityReferencePointBounds-r18 ::= SEQUENCE {

 referencePointGeographicLocationBounds-r18 CHOICE {

 location3D-Bounds-r18 EllipsoidPointWithAltitudeBounds-r18,

 ha-location3D-Bounds-r18 HighAccuracyEllipsoidPointWithAltitudeBounds-r18,

 ...

 },

 ...

}

EllipsoidPointWithAltitudeBounds ::= SEQUENCE {

 meanLatitude-r18 ENUMERATED {z0, ...} DEFAULT z0,

 meanLongitude-r18 ENUMERATED {z0, ...} DEFAULT z0,

 meanaltitude-r18 ENUMERATED {z0, ...} DEFAULT z0,

 stdDevSemiMajor-r18 INTEGER (0..127),

 stdDevSemiMinor-r18 INTEGER (0..127),

 stdDevAltitude-r18 INTEGER (0..127),

...

}

HighAccuracyEllipsoidPointWithAltitudeBounds ::= SEQUENCE {

 meanLatitude-r18 ENUMERATED {z0, ...} DEFAULT z0,

 meanLongitude-r18 ENUMERATED {z0, ...} DEFAULT z0,

 meanAtitude-r18 ENUMERATED {z0, ...} DEFAULT z0,

 stdDevSemiMajor-r18 INTEGER (0..255),

 stdDevSemiMinor-r18 INTEGER (0..255),

 stdDevAltitude-r18 INTEGER (0..255),

...

}

IntegrityRelativeLocationBounds-r18 ::= SEQUENCE {

 milli-arc-second-units-r18 ENUMERATED { mas0-003, mas0-03, mas0-3, mas3, ...},

 height-units-r18 ENUMERATED {mm, cm, m, ...}, meanDeltaLatitude-r18 ENUMERATED {z0, ...} DEFAULT z0,

 meanDeltaLongitude-r18 ENUMERATED {z0, ...} DEFAULT z0,

 meanDeltaheight-r18 ENUMERATED {z0, ...} DEFAULT z0,

 stdDevHorizontal-r18 INTEGER (0..255),

 stdDevVertical-r18 INTEGER (0..255)

 ...

}

Editor notes:

1. Mean values of ReferencePointBounds and RelativeLocationBounds are FFS. They can be considered to be zeros by default. According to RAN1 LS: From RAN1’s perspective, zero is a valid possible option for the mean value for the overbound Gaussian distribution for the error sources listed in Table 6.1.1-2 in TR 38.859.

2. Value rangs of stdDev of ReferencePointBounds and RelativeLocationBounds are FFS. They may be determined by the value ranges of existing fields corresponding to quality information (e.g., nr-TimingQuality, rtd-Quality-r16) and uncertainty information (e.g., LocationUncertainty-r16) can be reused as a reference to derive the value ranges for the parameters (e.g., standard deviation) for the overbound Gaussian distribution for the error sources listed in Table 6.1.1-2 in TR 38.859.

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *NotSameAsPrev* | The field is mandatory present in the first entry of the *NR-TRP-LocationInfoPerFreqLayer* list; otherwise it is optionally present, need OP. |
| *RealLocation* | The field is present when the reference point is a real location; otherwise it is not present, need OR. |

| *NR-TRP-LocationInfo* field descriptions |
| --- |
| ***referencePoint***This field specifies the reference point used to define the TRP location in the *trp-LocationInfoList*. If this field is absent, the reference point is the same as in the previous entry of the *NR-TRP-LocationInfoPerFreqLayer* list. |
|  |
| ***integrityReferencePointLocationBounds***This field specifies the mean and the standard deviation of the reference point error bound of the overbounding model that bounds the reference point location error. The field can be provided by NW only when the reference point is a real location, |
| ***trp-LocationInfoList***This field provides the antenna reference point locations of the DL-PRS Resources for the TRPs and comprises the following sub-fields:- ***dl-PRS-ID***: This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resources ID to uniquely identify a DL-PRS Resource, and is associated to a single TRP.- ***nr-PhysCellID***: This field specifies the physical cell identity of the associated TRP.- ***nr-CellGlobalID***: This field specifies the NCGI, the globally unique identity of a cell in NR, of the associated TRP.- ***nr-ARFCN***: This field specifies the NR-ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID*.- ***associated-DL-PRS-ID***: This field, if present, specifies the *dl-PRS-ID* of the associated TRP from which the *trp-location* information is adopted. If the field is present, the field *trp-Location* shall be absent.- ***trp-Location***: This field provides the location of the TRP relative to the *referencePoint* location. If this field is absent the TRP location coincides with the *referencePoint* location, unless the field *associated-dl-PRS-ID*is present, in which case the *trp-Location* is adopted from the associated TRP indicated by *associated-dl-PRS-ID*.- ***trp-DL-PRS-ResourceSets***: This field provides the antenna reference point location(s) of the DL-PRS Resource Set(s) associated with this TRP. If this field is absent, the antenna reference point location(s) of the DL-PRS Resource Set(s) coincides with the *trp-Location* location. This field comprises the following sub-fields:- ***dl-PRS-ResourceSetARP***: This field provides the antenna reference point location of the DL-PRS Resource Set relative to the *trp-Location* location. If this field is absent, the antenna reference point location of this DL-PRS Resource Set coincides with the *trp-Location* location.- ***integrityDL-PRS-ResourceSet-ARP-LocationBounds***: This field specifies the mean and the Standard Deviation ARP location error bound for an overbounding model that bounds the ARP location error of the associated with the *dl-PRS-Resource-ARP-location*.- ***dl-PRS-Resource-ARP-List***: This field provides the antenna reference point location(s) of the DL-PRS Resource(s) associated with this Resource Set of the TRP. If this field is absent, the antenna reference point location(s) of the DL-PRS Resources coincides with the *dl-PRS-ResourceSetARP* location. This field comprises the following sub-fields:- ***dl-PRS-Resource-ARP-location***: This field provides the antenna reference point location of the DL-PRS Resource associated with the DL-PRS Resource Set of the TRP relative to the *dl-PRS-ResourceSetARP* location. If this field is absent, the antenna reference point location of this DL-PRS Resource coincides with the *dl-PRS-ResourceSetARP* location.- ***integrityDL-PRS-Resource-ARP-LocationBounds***: This field specifies the mean and the Standard Deviation ARP location error bound for an overbounding model that bounds the ARP location error of the DL-PRS Resource associated with the DL-PRS Resource Set of the TRP relative to the *dl-PRS-ResourceSetARP* location.- ***integrityTRP-LocationBounds***: This field specifies the mean and the Standard Deviation TRP location error bound for an overbounding model that bounds the TRP location error. This field comprises the following sub-fields: |
| ***trpErrorCorrelationTime***This field specifies the upper bound of the correlation time of the residual range error due to TRP location.Scale factor 100s, range is 1 - 25,500 s. |
| ***probOnsetTRPFault***This field specifies the Probability of Onset of the TRP Fault per Time Unit where a fault is This field specifies the onset probability that the residual error exceeds a bound created using the minimum allowed inflation factor *Kmin*, and bounding parameters as *mean* + *Kmin* \* *stdDev* where *Kmin* = *normInv*(*irMaximum* / 2), with *irMaximum* as provided in IE *nr-IntegrityServiceParameters*.The probability shall be between 0 and 1.Scale factor 0.01, range is 0 - 1. |
| ***meanTRPFaultDuration***FFS the description. It may not be needed for TRP locationinfo |
| ***integrityDL-PRS-ResourceSet-ARP-LocationBounds***This field specifies the mean and the standard deviation of the location error bound of the overbounding model that bounds the point location error. |
| ***integrityDL-PRS-Resource-ARP-LocationBounds***This field specifies the mean and the standard deviation of the location error bound of the overbounding model that bounds the point location error. |

*NEXT CHANGE*

## 6.5 Positioning Method IEs

### 6.5.10 NR DL-TDOA Positioning

This clause defines the information elements for NR downlink TDOA positioning (TS 38.305 [40]).

#### 6.5.10.1 NR DL-TDOA Assistance Data

#### – *NR-DL-TDOA-ProvideAssistanceData*

The IE *NR-DL-TDOA-ProvideAssistanceData* is used by the location server to provide assistance data to enable UE‑assisted and UE-based NR DL-TDOA. It may also be used to provide NR DL-TDOA positioning specific error reason.

-- ASN1START

NR-DL-TDOA-ProvideAssistanceData-r16 ::= SEQUENCE {

 nr-DL-PRS-AssistanceData-r16 NR-DL-PRS-AssistanceData-r16 OPTIONAL, -- Need ON

 nr-SelectedDL-PRS-IndexList-r16 NR-SelectedDL-PRS-IndexList-r16 OPTIONAL, -- Need ON

 nr-PositionCalculationAssistance-r16

 NR-PositionCalculationAssistance-r16

 OPTIONAL, -- Cond UEB

 nr-DL-TDOA-Error-r16 NR-DL-TDOA-Error-r16 OPTIONAL, -- Need ON

 ...,

 [[

 nr-On-Demand-DL-PRS-Configurations-r17

 NR-On-Demand-DL-PRS-Configurations-r17

 OPTIONAL, -- Need ON

 nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17

 NR-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17 OPTIONAL, -- Need ON

 assistanceDataValidityArea-r17 AreaID-CellList-r17 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *UEB* | The field is optionally present, need ON, for UE based NR DL-TDOA; otherwise it is not present. |

|  |
| --- |
| *NR-DL-TDOA-ProvideAssistanceData* field descriptions |
| ***nr-DL-PRS-AssistanceData***This field specifies the assistance data reference and neighbour TRPs and provides the DL-PRS configuration for the TRPs.Note, if this field is absent but the *nr-SelectedDL-PRS-IndexList* field is present, the *nr-DL-PRS-AssistanceData* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-AoD-ProvideAssistanceData*. |
| ***nr-SelectedDL-PRS-IndexList***This field specifies the DL-PRS Resources which are applicable for this *NR-DL-TDOA-ProvideAssistanceData* message.  |
| ***nr-PositionCalculationAssistance***This field provides position calculation assistance data for UE-based mode. |
| ***nr-DL-TDOA-Error***This field provides DL-TDOA error reasons. |
| ***nr-On-Demand-DL-PRS-Configurations***This field provides a set of available DL-PRS configurations which can be requested by the target device on-demand.NOTE 1: VoidNOTE 2: If this field is absent but the *nr-On-Demand-DL-PRS-Configurations-Selected-IndexList* is present, the *nr-On-Demand-DL-PRS-Configurations* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-AoD-ProvideAssistanceData*. |
| ***nr-On-Demand-DL-PRS-Configurations-Selected-IndexList***This field specifies the selected available on-demand DL-PRS configurations which are applicable for this *NR-DL-TDOA-ProvideAssistanceData message*. |
| ***assistanceDataValidityArea***This field specifies the network area for which this *NR-DL-TDOA-ProvideAssistanceData* is valid. |
|  |

#### 6.5.10.2 NR DL-TDOA Assistance Data Request

#### – *NR-DL-TDOA-RequestAssistanceData*

The IE *NR-DL-TDOA-RequestAssistanceData* is used by the target device to request assistance data from a location server.

-- ASN1START

NR-DL-TDOA-RequestAssistanceData-r16 ::= SEQUENCE {

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL,

 nr-AdType-r16 BIT STRING { dl-prs (0),

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

 ...,

 [[

 nr-PosCalcAssistanceRequest-r17 BIT STRING { trpLoc (0),

 beamInfo (1),

 rtdInfo (2),

 losNlosInfo (3),

 trpTEG-Info (4),

 integrityParameters-r18 (5)

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

 nr-on-demand-DL-PRS-Request-r17 NR-On-Demand-DL-PRS-Request-r17 OPTIONAL,

 nr-DL-PRS-ExpectedAoD-or-AoA-Request-r17

 ENUMERATED { eAoD, eAoA } OPTIONAL,

 pre-configured-AssistanceDataRequest-r17

 ENUMERATED { true } OPTIONAL

 ]]

}

Editor notes: It is assumed to follow the integrity parameters from LMF to UE in A-GNSS for NR integrity in running CR.

-- ASN1STOP

|  |
| --- |
| *NR-DL-TDOA-RequestAssistanceData* field descriptions |
| ***nr-PhysCellID***This field specifies the NR physical cell identity of the current primary cell of the target device. |
| ***nr-AdType***This field indicates the requested assistance data. *dl-prs* means requested assistance data is *nr-DL-PRS-AssistanceData*, *posCalc* means requested assistance data is *nr-PositionCalculationAssistance* for UE based positioning. |
| ***nr-PosCalcAssistanceRequest***This field indicates the Position Calculation Assistance Data requested. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is requested; a zero‑value means not requested.- bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 3 indicates whether the field *nr-DL-PRS-Expected-LOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 4 indicates whether the field *nr-DL-PRS-TRP-TEG-Info* in IE *NR-PositionCalculationAssistance* is requested or not.- bit 5 indicates whether integrity parameters, the service parameters for integrity, and bounds paramters for inter-TRP synchronization error and the TRP/ARP location error is requested.This field may only be present if the '*posCalc*' bit in *nr-AdType* is set to value '1'. |
| ***nr-on-demand-DL-PRS-Request***This field indicates the on-demand DL-PRS requested for DL-TDOA. This field may be included when the *dl-prs* bit in *nr-AdType* is set to value '1'. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Request***This field, if present, indicates that the IE *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData* is requested. Enumerated value '*eAoD*' indicates that expected AoD information is requested; value '*eAoA*' indicates that expected AoA information is requested.This field may only be present if the '*dl-prs*' bit in *nr-AdType* is set to value '1'. |
| ***pre-configured-AssistanceDataRequest***This field, if present, indicates that the target device requests pre-configured assistance data with area validity. |

*NEXT CHANGE*

#### 6.5.10.6 NR DL-TDOA Capability Information

#### – *NR-DL-TDOA-ProvideCapabilities*

The IE *NR-DL-TDOA-ProvideCapabilities* is used by the target device to indicate its capability to support NR DL-TDOA and to provide its NR DL-TDOA positioning capabilities to the location server.

-- ASN1START

NR-DL-TDOA-ProvideCapabilities-r16 ::= SEQUENCE {

 nr-DL-TDOA-Mode-r16 PositioningModes,

 nr-DL-TDOA-PRS-Capability-r16 NR-DL-PRS-ResourcesCapability-r16,

 nr-DL-TDOA-MeasurementCapability-r16 NR-DL-TDOA-MeasurementCapability-r16,

 nr-DL-PRS-QCL-ProcessingCapability-r16 NR-DL-PRS-QCL-ProcessingCapability-r16,

 nr-DL-PRS-ProcessingCapability-r16 NR-DL-PRS-ProcessingCapability-r16,

 additionalPathsReport-r16 ENUMERATED { supported } OPTIONAL,

 periodicalReporting-r16 PositioningModes OPTIONAL,

 ...,

 [[

 ten-ms-unit-ResponseTime-r17 PositioningModes OPTIONAL,

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

 beamInfoSup (1),

 rtdInfoSup (2),

 trpTEG-InfoSup (3),

 integritySup-r18 (4)

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

 nr-los-nlos-AssistanceDataSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

 nr-DL-PRS-ExpectedAoD-or-AoA-Sup-r17 BIT STRING { eAoD (0),

 eAoA (1)

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

 nr-DL-TDOA-On-Demand-DL-PRS-Support-r17 NR-On-Demand-DL-PRS-Support-r17 OPTIONAL,

 nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

 additionalPathsExtSupport-r17 ENUMERATED { n4, n6, n8 } OPTIONAL,

 scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17 OPTIONAL,

 nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

 area-validity-r17 INTEGER (1..maxNrOfAreas-r17) OPTIONAL, ...

 } OPTIONAL,

 multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

 mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 posMeasGapSupport-r17 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-TDOA-ProvideCapabilities* field descriptions |
| ***nr-DL-TDOA-Mode***This field specifies the NR DL-TDOA mode(s) supported by the target device. |
| ***periodicalReporting***This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***ten-ms-unit-ResponseTime***This field, if present, specifies the positioning modes for which the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one‑value at the bit position means '*ten-milli-seconds'* response time unit for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support '*ten-milli-seconds'* response time unitin *CommonIEsRequestLocationInformation*. |
| ***nr-PosCalcAssistanceSupport***This field indicates the Position Calculation Assistance Data supported by the target device for UE-based DL-TDOA. 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;- bit 3 indicates whether the field *nr-DL-PRS-TRP-TEG-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 4 indicates whether the target service supports the range of integrity risk (IR) for which the integrity assiststance data are valid. |
| ***nr-los-nlos-AssistanceDataSupport***This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance*:- *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in *LOS-NLOS-Indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance*.- *granularity* indicates whether the target device supports *nr-los-nlos-indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* '*per-trp*', '*per-resource*', or both.The UE can include this field only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1*, *maxDL-PRS-RSRP-MeasurementFR2*, *dl-RSTD-MeasurementPerPairOfTRP-FR1*, *dl-RSTD-MeasurementPerPairOfTRP-FR*2, *maxNrOfRx-TX-MeasFR1*, *maxNrOfRx-TX-MeasFR2*, *supportOfRSRP-MeasFR1* and *supportOfRSRP-MeasFR2*. Otherwise, the UE does not include this field. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Sup***This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData.* |
| ***nr-DL-TDOA-On-Demand-DL-PRS-Support***This field, if present, indicates that the target device supports on-demand DL-PRS requests.  |
| ***nr-los-nlos-IndicatorSupport***This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-DL-TDOA-SignalMeasurementInformation*.- *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in IE *LOS-NLOS-Indicator.*- *granularity* indicates whether the target device supports *LOS-NLOS-Indicator* reporting per TRP, per DL-PRS Resource, or both.NOTE: A single value is reported when both Multi-RTT and DL-TDOA are supported. |
| ***additionalPathsExtSupport***This field, if present, indicates that the target device supports the *nr-AdditionalPathListExt* reporting in IE *NR-DL-TDOA-SignalMeasurementInformation*. The enumerated value indicates the number of additional paths supported by the target device.NOTE: The *supportOfDL-PRS-FirstPathRSRP* in IE *NR-DL-TDOA-MeasurementCapability* also applies to the additional paths. |
| ***scheduledLocationRequestSupported***This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***nr-dl-prs-AssistanceDataValidity***This field, if present, indicates that the target device supports validity conditions for pre-configured assistance data and comprises the following subfields:- ***area-validity*** indicates that the target device supports pre-configured assistance data with area validity. The integer number indicates the maximum number of areas the target device supports*.* |
| ***multiMeasInSameMeasReport***This field, if present, indicates that the target device supports multiple measurement instances in a single measurement report. |
| ***mg-ActivationRequest***This field, if present, indicates that the target device supports UL MAC CE for positioning measurement gap activation/deactivation request for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationRequestPRS-Meas* and *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***posMeasGapSupport***This field, if present, indicates that the target device supports pre-configured positioning measurement gap for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |

*NEXT CHANGE*

### 6.5.11 NR DL-AoD Positioning

This clause defines the information elements for NR downlink AoD positioning (TS 38.305 [40]).

#### 6.5.11.1 NR DL-AoD Assistance Data

#### – *NR-DL-AoD-ProvideAssistanceData*

The IE *NR-DL-AoD-ProvideAssistanceData* is used by the location server to provide assistance data to enable UE‑assisted and UE-based NR DL-AoD. It may also be used to provide NR DL-AoD positioning specific error reason.

-- ASN1START

NR-DL-AoD-ProvideAssistanceData-r16 ::= SEQUENCE {

 nr-DL-PRS-AssistanceData-r16 NR-DL-PRS-AssistanceData-r16 OPTIONAL, -- Need ON

 nr-SelectedDL-PRS-IndexList-r16 NR-SelectedDL-PRS-IndexList-r16 OPTIONAL, -- Need ON

 nr-PositionCalculationAssistance-r16

 NR-PositionCalculationAssistance-r16

 OPTIONAL, -- Cond UEB

 nr-DL-AoD-Error-r16 NR-DL-AoD-Error-r16 OPTIONAL, -- Need ON

 ...,

 [[

 nr-DL-PRS-BeamInfo-r17 NR-DL-PRS-BeamInfo-r16 OPTIONAL, -- Cond UEA

 nr-On-Demand-DL-PRS-Configurations-r17

 NR-On-Demand-DL-PRS-Configurations-r17

 OPTIONAL, -- Need ON

 nr-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17

 NR-On-Demand-DL-PRS-Configurations-Selected-IndexList-r17

 OPTIONAL, -- Need ON

 assistanceDataValidityArea-r17 AreaID-CellList-r17 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *UEB* | The field is optionally present, need ON, for UE based NR DL-AoD; otherwise it is not present. |
| *UEA* | The field is optionally present, need ON, for UE-assisted NR DL-AoD; otherwise it is not present. |

|  |
| --- |
| *NR-DL-AoD-ProvideAssistanceData* field descriptions |
| ***nr-DL-PRS-AssistanceData***This field specifies the assistance data reference and neighbour TRPs and provides the DL-PRS configuration for the TRPs.Note, if this field is absent but the *nr-SelectedDL-PRS-IndexList* field is present, the *nr-DL-PRS-AssistanceData* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-TDOA-ProvideAssistanceData*. |
| ***nr-SelectedDL-PRS-IndexList***This field specifies the DL-PRS Resources which are applicable for this *NR-DL-AoD-ProvideAssistanceData* message. |
| ***nr-PositionCalculationAssistance***This field provides position calculation assistance data for UE-based mode. |
| ***nr-DL-AoD-Error***This field provides DL-AoD error reasons. |
| ***nr-DL-PRS-BeamInfo***This field provides spatial direction information of the DL-PRS Resources included in *nr-DL-PRS-AssistanceData* or indicated by *nr-SelectedDL-PRS-IndexList.* |
| ***nr-On-Demand-DL-PRS-Configurations***This field provides a set of available DL-PRS configurations which can be requested by the target device on-demand.NOTE 1: Void.NOTE 2: If this field is absent but the *nr-On-Demand-DL-PRS-Configurations-Selected-IndexList* is present, the *nr-On-Demand-DL-PRS-Configurations* may be provided in IE *NR-Multi-RTT-ProvideAssistanceData* or *NR-DL-TDOA-ProvideAssistanceData*. |
| ***nr-On-Demand-DL-PRS-Configurations-Selected-IndexList***This field specifies the selected available on-demand DL-PRS configurations which are applicable for this *NR-DL-AoD-ProvideAssistanceData message*. |
| ***assistanceDataValidityArea***This field specifies the network area for which this *NR-DL-AoD-ProvideAssistanceData* is valid. |
|  |

#### 6.5.11.2 NR DL-AoD Assistance Data Request

#### – *NR-DL-AoD-RequestAssistanceData*

The IE *NR-DL-AoD-RequestAssistanceData* is used by the target device to request assistance data from a location server.

-- ASN1START

NR-DL-AoD-RequestAssistanceData-r16 ::= SEQUENCE {

 nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL,

 nr-AdType-r16 BIT STRING { dl-prs (0),

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

 ...,

 [[

 nr-PosCalcAssistanceRequest-r17 BIT STRING { trpLoc (0),

 beamInfo (1),

 rtdInfo (2),

 beamAntInfo (3),

 losNlosInfo (4),

 integrityParameters-r18 (5)

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

 nr-DL-PRS-ExpectedAoD-or-AoA-Request-r17 ENUMERATED { eAoD, eAoA } OPTIONAL,

 nr-DL-PRS-BeamInfoRequest-r17 ENUMERATED { requested } OPTIONAL,

 nr-on-demand-DL-PRS-Request-r17 NR-On-Demand-DL-PRS-Request-r17 OPTIONAL,

 pre-configured-AssistanceDataRequest-r17 ENUMERATED { true } OPTIONAL

 ]]

}

Editor notes: It is assumed to follow the integrity parameters from LMF to UE in A-GNSS for NR integrity in running CR.

-- ASN1STOP

|  |
| --- |
| *NR-DL-AoD-RequestAssistanceData* field descriptions |
| ***nr-PhysCellID***This field specifies the NR physical cell identity of the current primary cell of the target device. |
| ***nr-AdType***This field indicates the requested assistance data. *dl-prs* means requested assistance data is *nr-DL-PRS-AssistanceData*, *posCalc* means requested assistance data is *nr-PositionCalculationAssistance* for UE based positioning. |
| ***nr-PosCalcAssistanceRequest***This field indicates the Position Calculation Assistance Data requested. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is requested; a zero‑value means not requested.- bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 3 indicates whether the field *nr-TRP-BeamAntennaInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 4 indicates whether the field *nr-DL-PRS-Expected-LOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance* is requested or not.- bit 5 indicates whether the parameters the service parameters for integrity, the TRP/ARP location error is requested.This field may only be present if the '*posCalc*' bit in *nr-AdType* is set to value '1'. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Request***This field, if present, indicates that the IE *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData* is requested. Enumerated value '*eAoD*' indicates that expected AoD information is requested; value 'eAoA' indicates that expected AoA information is requested.This field may only be present if the '*dl-prs*' bit in *nr-AdType* is set to value '1'. |
| ***nr-DL-PRS-BeamInfoRequest***This field, if present, indicates that the IE *NR-DL-PRS-BeamInfo* is requested. |
| ***nr-on-demand-DL-PRS-Request***This field indicates the on-demand DL-PRS requested for DL-AoD. This field may be included when the *dl-prs* bit in *nr-AdType* is set to value '1'. |
| ***pre-configured-AssistanceDataRequest***This field, if present, indicates that the target device requests pre-configured assistance data with area validity. |

*NEXT CHANGE*

#### 6.5.11.6 NR DL-AoD Capability Information

#### – *NR-DL-AoD-ProvideCapabilities*

The IE *NR-DL-AoD-ProvideCapabilities* is used by the target device to indicate its capability to support NR DL-AoD and to provide its NR DL-AoD positioning capabilities to the location server.

-- ASN1START

NR-DL-AoD-ProvideCapabilities-r16 ::= SEQUENCE {

 nr-DL-AoD-Mode-r16 PositioningModes,

 nr-DL-AoD-PRS-Capability-r16 NR-DL-PRS-ResourcesCapability-r16,

 nr-DL-AoD-MeasurementCapability-r16 NR-DL-AoD-MeasurementCapability-r16,

 nr-DL-PRS-QCL-ProcessingCapability-r16 NR-DL-PRS-QCL-ProcessingCapability-r16,

 nr-DL-PRS-ProcessingCapability-r16 NR-DL-PRS-ProcessingCapability-r16,

 periodicalReporting-r16 PositioningModes OPTIONAL,

 ...,

 [[

 ten-ms-unit-ResponseTime-r17 PositioningModes OPTIONAL,

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

 beamInfoSup (1),

 rtdInfoSup (2),

 beamAntInfoSup (3),

 integritySup-r18 (4)

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

 nr-los-nlos-AssistanceDataSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

 nr-DL-PRS-ExpectedAoD-or-AoA-Sup-r17 BIT STRING { eAoD (0),

 eAoA (1)

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

 dl-PRS-ResourcePrioritySubset-Sup-r17 ENUMERATED { sameSet, differentSet, sameOrDifferentSet }

 OPTIONAL,

 nr-DL-PRS-BeamInfoSup-r17 ENUMERATED { supported } OPTIONAL,

 nr-DL-AoD-On-Demand-DL-PRS-Support-r17 NR-On-Demand-DL-PRS-Support-r17 OPTIONAL,

 nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

 scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17

 OPTIONAL,

 nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

 area-validity-r17 INTEGER (1..maxNrOfAreas-r17) OPTIONAL,

 ...

 } OPTIONAL,

 multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

 mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 posMeasGapSupport-r17 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-AoD-ProvideCapabilities* field descriptions |
| ***nr-DL-AoD-Mode***This field specifies the NR DL-AoD mode(s) supported by the target device. |
| ***periodicalReporting***This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***ten-ms-unit-ResponseTime***This field, if present, specifies the positioning modes for which the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one‑value at the bit position means '*ten-milli-seconds'* response time unit for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support '*ten-milli-seconds'* response time unitin *CommonIEsRequestLocationInformation*. |
| ***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.- bit 4 indicates whether the target service supports the range of integrity risk (IR) for which the integrity assiststance data are valid.  |
| ***nr-los-nlos-AssistanceDataSupport***This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance*:- *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in *LOS-NLOS-Indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance*.- *granularity* indicates whether the target device supports *nr-los-nlos-indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistanc*e 'per-trp', '*per-resource*', or both.The UE can include this field only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1*, *maxDL-PRS-RSRP-MeasurementFR2,dl-RSTD-MeasurementPerPairOfTRP-FR1, dl-RSTD-MeasurementPerPairOfTRP-FR2, maxNrOfRx-TX-MeasFR1, maxNrOfRx-TX-MeasFR2, supportOfRSRP-MeasFR1* and *supportOfRSRP-MeasFR2* . Otherwise, the UE does not include this field. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Sup***This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData.*  |
| ***dl-PRS-ResourcePrioritySubset-Sup***This field, if present, indicates that the target device supports the *DL-PRS-ResourcePrioritySubset* in IE *NR-DL-PRS-Info.* Enumerated value indicates the supported resource set relationship for the target DL-PRS Resource and the associated subset. |
| ***nr-DL-PRS-BeamInfoSup***This field, if present, indicates that the target device supports the *NR-DL-PRS-BeamInfo* in IE *NR-DL-AoD-ProvideAssistanceData.* |
| ***nr-DL-AoD-On-Demand-DL-PRS-Support***This field, if present, indicates that the target device supports on-demand DL-PRS requests. |
| ***nr-los-nlos-IndicatorSupport***This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-DL-AoD-SignalMeasurementInformation*.- *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in IE *LOS-NLOS-Indicator.*- *granularit*y indicates whether the target device supports *LOS-NLOS-Indicator* reporting per TRP, per DL-PRS Resource, or both. |
| ***scheduledLocationRequestSupported***This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***nr-dl-prs-AssistanceDataValidity***This field, if present, indicates that the target device supports validity conditions for pre-configured assistance data and comprises the following subfields:- ***area-validity*** indicates that the target device supports pre-configured assistance data with area validity. The integer number indicates the maximum number of areas the target device supports. |
| ***multiMeasInSameMeasReport***This field, if present, indicates that the target device supports multiple measurement instances in a single measurement report. |
| ***mg-ActivationRequest***This field, if present, indicates that the target device supports UL MAC CE for positioning measurement gap activation/deactivation request for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationRequestPRS-Meas* and *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |
| ***posMeasGapSupport***This field, if present, indicates that the target device supports pre-configured positioning measurement gap for DL-PRS measurements. The UE can include this field only if the UE supports *mg-ActivationCommPRS-Meas* defined in TS 38.331 [35]. |

*NEXT CHANGE*

# 7 Broadcast of assistance data

## 7.2 Mapping of *posSibType* to assistance data element

The supported *posSibType*'s are specified in Table 7.2-1. The GNSS Common and Generic Assistance Data IEs are defined in clause 6.5.2.2. The OTDOA Assistance Data IEs and NR DL-TDOA/DL-AoD Assistance Data IEs are defined in clause 7.4.2. The Barometric Assistance Data IEs are defined in clause 6.5.5.8. The TBS (based on MBS signals) Assistance Data IEs are defined in clause 6.5.4.8.

Table 7.2-1: Mapping of posSibType to assistanceDataElement

|  |  |  |
| --- | --- | --- |
|  | *posSibType* | *assistanceDataElement* |
| GNSS Common Assistance Data (clause 6.5.2.2) | *posSibType1-1* | *GNSS-ReferenceTime* |
| *posSibType1-2* | *GNSS-ReferenceLocation* |
| *posSibType1-3* | *GNSS-IonosphericModel* |
| *posSibType1-4* | *GNSS-EarthOrientationParameters* |
| *posSibType1-5* | *GNSS-RTK-ReferenceStationInfo* |
| *posSibType1-6* | *GNSS-RTK-CommonObservationInfo* |
| *posSibType1-7* | *GNSS-RTK-AuxiliaryStationData* |
| *posSibType1-8* | *GNSS-SSR-CorrectionPoints* |
| *posSibType1-9* | *GNSS-Integrity-ServiceParameters* |
| *posSibType1-10* | *GNSS-Integrity-ServiceAlert* |
| GNSS Generic Assistance Data (clause 6.5.2.2) | *posSibType2-1* | *GNSS-TimeModelList* |
| *posSibType2-2* | *GNSS-DifferentialCorrections* |
| *posSibType2-3* | *GNSS-NavigationModel* |
| *posSibType2-4* | *GNSS-RealTimeIntegrity* |
| *posSibType2-5* | *GNSS-DataBitAssistance* |
| *posSibType2-6* | *GNSS-AcquisitionAssistance* |
| *posSibType2-7* | *GNSS-Almanac* |
| *posSibType2-8* | *GNSS-UTC-Model* |
| *posSibType2-9* | *GNSS-AuxiliaryInformation* |
| *posSibType2-10* | *BDS-DifferentialCorrections* |
| *posSibType2-11* | *BDS-GridModelParameter* |
| *posSibType2-12* | *GNSS-RTK-Observations* |
| *posSibType2-13* | *GLO-RTK-BiasInformation* |
| *posSibType2-14* | *GNSS-RTK-MAC-CorrectionDifferences* |
| *posSibType2-15* | *GNSS-RTK-Residuals* |
| *posSibType2-16* | *GNSS-RTK-FKP-Gradients* |
| *posSibType2-17* | *GNSS-SSR-OrbitCorrections* |
| *posSibType2-18* | *GNSS-SSR-ClockCorrections* |
| *posSibType2-19* | *GNSS-SSR-CodeBias* |
| *posSibType2-20* | *GNSS-SSR-URA* |
| *posSibType2-21* | *GNSS-SSR-PhaseBias* |
| *posSibType2-22* | *GNSS-SSR-STEC-Correction* |
| *posSibType2-23* | *GNSS-SSR-GriddedCorrection* |
| *posSibType2-24* | *NavIC-DifferentialCorrections* |
| *posSibType2-25* | *NavIC-GridModelParameter* |
| OTDOA Assistance Data (clause 7.4.2) | *posSibType3-1* | *OTDOA-UE-Assisted* |
| Barometric Assistance Data(clause 6.5.5.8) | *posSibType4-1* | *Sensor-AssistanceDataList* |
| TBS Assistance Data(clause 6.5.4.8) | *posSibType5-1* | *TBS-AssistanceDataList* |
| NR DL-TDOA/DL-AoD Assistance Data (clauses 6.4.3, 7.4.2) | *posSibType6-1* | *NR-DL-PRS-AssistanceData* |
| *posSibType6-2* | *NR-UEB-TRP-LocationData* |
| *posSibType6-3* | *NR-UEB-TRP-RTD-Info* |
| *posSibType6-4* | *NR-TRP-BeamAntennaInfo* |
| *posSibType6-5* | *NR-DL-PRS-TRP-TEG-Info* |
| On-demand DL-PRS Configurations (clause 6.4.3) | *posSibType6-6* | *NR-On-Demand-DL-PRS-Configurations* |
| Integrity Assistance Data for NR Positioning Methods  | *posSibType6-x* | *NR-IntegrityServiceParameters* |
| *posSibType6-y* | *NR-IntegrityServiceAlertInfo* |
| *posSibType6-z* | *NR-IntegrityParameters* |

#### – *NR-IntegrityParameters*

The IE *NR-IntegrityParameters* is used in the *assistanceDataElement* if the *posSibType* in IE *PosSIB-Type* defined in TS 38.331 [35] indicates '*posSibType6-z*'.

-- ASN1START

NR-IntegrityParameters-r18 ::= SEQUENCE {

 nr-IntegrityParameters-DL-PRS-BeamInfo-r18

 NR-IntegrityParameters-DL-PRS-BeamInfo-r18 OPTIONAL,

 nr-IntegrityParameters-TRP-BeamAntennaInfo-r18

 NR-IntegrityParameters-TRP-BeamAntennaInfo-r18 OPTIONAL,

 location-IntegrityParameters-r18 LocationIntegrityParameters-r18 OPTIONAL,

...

}

-- ASN1STOP

| *NR-IntegrityParameters* field descriptions |
| --- |
| ***nr-IntegrityParameters-DL-PRS-BeamInfo***LPP IE *NR-IntegrityParameters-DL-PRS-BeamInfo* as defined in IE *NR-PositionCalculationAssistance* in clause 6.4.3. |
| ***nr-IntegrityParameters-TRP-BeamAntennaInfo***LPP IE *NR-IntegrityParameters-TRP-BeamAntennaInfo* as defined in IE *NR-PositionCalculationAssistance* in clause 6.4.3. |
| ***location-IntegrityParameters***LPP IE *LocationIntegrityParameters* as defined in IE *NR-PositionCalculationAssistance* in clause 6.4.3. |

*END OF CHANGE*