**3GPP TSG-RAN WG2 Meeting #123bis *draft R2-231xxxx***

**Chicago, USA, 13th - 17th November 2023**

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| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **37.355** | **CR** | Draft | **rev** | **-** | **Current version:** | **17.6.0** |  |
|  |
| *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 Carrier Phase Positioning |
|  |  |
| ***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 Carrier Phase Positioning method |
|  |  |
| ***Summary of change:*** | Enable Carrier Phase Positioning based on the agreement in RAN1RAN1#112

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| Agreements:For NR DL reference signal carrier phase difference (RSCPD) measurement for NR CPP, the RSCPD is defined as the difference of RSCPs measured from the DL PRS signals from target TRP and reference TRP.AgreementFor NR carrier phase positioning, at least support the following approach: enable a UE/TRP to report carrier phase measurements together with the legacy positioning measurements to LMFAgreementRel-17 LOS/NLOS indication (when indicated) applies for the carrier phase measurement(s) in the same report. |

RAN1#112bis

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| AgreementTo enable simultaneous measurements on same DL PRS by a target UE and a PRU, support the following enhancements: Enabling LMF to request the UEs, including target UE and PRU(s), to perform measurements on [indicated] DL PRS resources occurring within indicated time window(s). |

RAN1#113

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| Agreements:Working assumptionTo enable LMF to optionally request the serving gNB of a UE to configure the transmission of the UL positioning SRS resources from the UE within indicated time window(s), support:Option 1D: Each of the time windows is defined with the following parameters: The start of the time window, which is indicated by a combination of subframe number, slot offset and symbol index with respect to the SFN initialization time The duration of the time window, which is given by a number of consecutive slots/symbols FFS: the number of the consecutive slots/symbols (Optional) The periodicity of the time window, which is defined similar to IE PeriodicitySRS in “Requested SRS Transmission Characteristics” in TS 38.455.FFS: the maximum number of the windowsAgreementFor UE-based carrier phase positioning, support enabling LMF to forward the DL carrier phase measurement reported by a PRU, with additional information of the same PRU to a target UE for UE-based carrier phase positioning in the positioning assistance data. Note: Whether the forwarded DL carrier phase measurement is DL RSCP and/or DL RSCPD depends at least on which of them is (are) supported by UE capability. additional information of the same PRU includes at least PRU location.  FFS: additional PRU information, e.g. the AoD of PRU to each TRP, etc.AgreementTo enable LMF to request the UEs, including target UE and PRU(s), to perform measurements on indicated DL PRS resource set(s) occurring within indicated time window(s), each time window is defined with the following parameters: The start of the time window, which is indicated by a combination of subframe number, slot offset and symbol index The duration of the time window, which is given by a number of consecutive slots/symbols FFS: the number of consecutive slots/symbols (Optional) The periodicity of the time window, which is defined similar to IE NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset in TS 37.355.FFS: the maximum number of the windows |

RAN1#114

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| Agreements:When an LMF requests the UEs, including target UE and PRU(s), to perform measurements on indicated DL PRS resource set(s) occurring within indicated time window(s)The duration of a time window can be configured as follows: {1, 2, 4, 6, 8, 12, 16} slots.the number of the time windows can be: {1, 2} FFS: {4, 8}AgreementFor UE-based carrier phase positioning, when LMF forwards the DL carrier phase measurement reported by a PRU to a target UE, the timestamp associated with the PRU carrier phase measurements should also be forwarded in positioning assistance data.AgreementFor the timestamp associated with a reported RSCP/RSCPD measurement, NR-TimeStamp, with the granularity of a slot, currently defined in TS 37.355, can be reused as the timestamp.  Subject to UE capability, a UE may optionally provide an OFDM symbol index in the timestamp. Note: It is up to RAN2/RAN3 how to signal the timestampAgreementWhen an LMF requests the UEs, including target UE and PRU(s), to perform measurements on indicated DL PRS resource set(s) occurring within indicated time window(s)The duration of a time window can be configured as follows: {1, 2, 4, 6, 8, 12, 16} slots.the number of the time windows can be: {1, 2} FFS: {4, 8} |

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|  |  |
| ***Consequences if not approved:*** | CPP is not supported in NR. |
|  |  |
| ***Clauses affected:*** | 3.2, 6.4.2, 6.4.3, 6.5.10.2, 6.5.10.4, 6.5.10.5, 6.5.10.6, 6.5.12.4, 6.5.12.5, 6.5.12.6, 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:*** | Revison of R2-2311397  |

*START OF CHANGE*

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply.

ADR Accumulated Delta-Range

A‑GNSS Assisted‑GNSS

AoA Angle-of-Arrival

AoD Angle-of-Departure

AP Access Point

ARFCN Absolute Radio Frequency Channel Number

ARP Antenna Reference Point

BDS BeiDou Navigation Satellite System

BIPM Bureau International des Poids et Mesures (International Bureau of Weights and Measures)

BSSID Basic Service Set Identifier

BTS Base Transceiver Station (GERAN)

CID Cell-ID (positioning method)

CNAV Civil Navigation

CRS Cell-specific Reference Signals

DL-AoD Downlink Angle-of-Departure

DL-TDOA Downlink Time Difference Of Arrival

ECEF Earth-Centered, Earth-Fixed

ECGI Evolved Cell Global Identifier

ECI Earth-Centered-Inertial

E‑CID Enhanced Cell-ID (positioning method)

EGNOS European Geostationary Navigation Overlay Service

E-SMLC Enhanced Serving Mobile Location Centre

E-UTRA Evolved Universal Terrestrial Radio Access

E-UTRAN Evolved Universal Terrestrial Radio Access Network

EOP Earth Orientation Parameters

EPDU External Protocol Data Unit

FDMA Frequency Division Multiple Access

FEC Forward Error Correction

FKP (German) Flächen-Korrektur-Parameter (area correction parameter)

FTA Fine Time Assistance

GAGAN GPS Aided Geo Augmented Navigation

GLONASS GLObal'naya NAvigatsionnaya Sputnikovaya Sistema (Engl.: Global Navigation Satellite System)

GNSS Global Navigation Satellite System

GPS Global Positioning System

HA GNSS High-Accuracy GNSS (RTK, PPP)

HPL Horizontal Protection Level

ICD Interface Control Document

IGS International GNSS Service

IOD Issue of Data

IRNSS Indian Regional Navigation Satellite System

IS Interface Specification

LLA Latitude Longitude Altitude

LMF Location Management Function

LOS Line-of-Sight

LPP LTE Positioning Protocol

LPPa LTE Positioning Protocol Annex

LSB Least Significant Bit

MAC Master Auxiliary Concept

MBS Metropolitan Beacon System

MG Measurement Gap

MO-LR Mobile Originated Location Request

MSAS Multi-functional Satellite Augmentation System

MSB Most Significant Bit

msd mean solar day

MT-LR Mobile Terminated Location Request

Multi-RTT Multiple-Round Trip Time

NAV Navigation

NavIC NAVigation with Indian Constellation

NB-IoT NarrowBand Internet of Things

NCGI NR Cell Global Identifier

NICT National Institute of Information and Communications Technology

NI-LR Network Induced Location Request

NLOS Non-Line-of-Sight

NPRS Narrowband Positioning Reference Signals

NR NR Radio Access

NRSRP Narrowband Reference Signal Received Power

NRSRQ Narrowband Reference Signal Received Quality

NTSC National Time Service Center of Chinese Academy of Sciences

OSR Observation Space Representation

OTDOA Observed Time Difference Of Arrival

PBCH Physical Broadcast Channel

PDU Protocol Data Unit

PL Protection Level

PPP Precise Point Positioning

PPW PRS Processing Window

PRB Physical Resource Block

PRC Pseudo‑Range Correction

PRS Positioning Reference Signals

posSIB Positioning System Information Block

PZ-90 Parametry Zemli 1990 Goda – Parameters of the Earth Year 1990

QZS Quasi Zenith Satellite

QZSS Quasi-Zenith Satellite System

QZST Quasi-Zenith System Time

RF Radio Frequency

RP Reception Point

RRC Range‑Rate Correction

Radio Resource Control

RSCP Reference Signal Carrier Phase

RSCPD Reference Signal Carrier Phase Difference

RSRP Reference Signal Received Power

RSRPP Reference Signal Received Path Power

RSRQ Reference Signal Received Quality

RSTD Reference Signal Time Difference

RTK Real-Time Kinematic

RTT Round Trip Time

RU Russia

SBAS Space Based Augmentation System

SET SUPL Enabled Terminal

SFN System Frame Number

SLP SUPL Location Platform

SRS Sounding Reference Signal

SS Synchronization Signal

SSB Synchronization Signal Block, SS/PBCH Block

SSID Service Set Identifier

SSR State Space Representation

STEC Slant TEC

SUPL Secure User Plane Location

SV Space Vehicle

TB Terrestrial Beacon

TBS Terrestrial Beacon System

TEC Total Electron Content

TECU TEC Units

TEG Timing Error Group

TIR Target Integrity Risk

TLM Telemetry

TOA Time Of Arrival

TOD Time Of Day

TOW Time Of Week

TP Transmission Point

TRP Transmission-Reception Point

UDRE User Differential Range Error

ULP User Plane Location Protocol

URA User Range Accuracy

USNO US Naval Observatory

UT1 Universal Time No.1

UTC Coordinated Universal Time

VPL Vertical Protection Level

WAAS Wide Area Augmentation System

WGS‑84 World Geodetic System 1984

WLAN Wireless Local Area Network

*NEXT CHANGE*

### 6.4.2 Common Positioning

– *CommonIEsProvideCapabilities*

The *CommonIEsProvideCapabilities* carries common IEs for a Provide Capabilities LPP message Type.

-- ASN1START

CommonIEsProvideCapabilities ::= SEQUENCE {

 ...,

 [[

 segmentationInfo-r14 SegmentationInfo-r14 OPTIONAL, -- Cond Segmentation

 lpp-message-segmentation-r14 BIT STRING { serverToTarget (0),

 targetToServer (1) } OPTIONAL

 ]],

 [[

 locationEstimateAndMeasurementReporting-r18 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

| **Conditional presence** | **Explanation** |
| --- | --- |
| *Segmentation* | This field is optionally present, need OP, if *lpp-message-segmentation-req* has been received from the location server with bit 1 (*targetToServer*) set to value 1. The field shall be omitted if *lpp‑message‑segmentation-req* has not been received in this location session, or has been received with bit 1 (*targetToServer*) set to value 0. |

| ***CommonIEsProvideCapabilities* field descriptions** |
| --- |
| ***segmentationInfo***This field indicates whether this *ProvideCapabilities* message is one of many segments, as specified in clause 4.3.5. |
| ***lpp-message-segmentation***This field, if present, indicates the target device's LPP message segmentation capabilities. If bit 0 is set to value 1, it indicates that the target device supports receiving segmented LPP messages; if bit 0 is set to value 0 it indicates that the target device does not support receiving segmented LPP messages.If bit 1 is set to value 1, it indicates that the target device supports sending segmented LPP messages; if bit 1 is set to value 0 it indicates that the target device does not support sending segmented LPP messages. |
| ***locationEstimateAndMeasurementReporting***This field, if present, indicates that the target device supports *locationEstimateAndMeasurementsRequired* in *LocationInformationType*. |

*NEXT CHANGE*

– *CommonIEsRequestLocationInformation*

The *CommonIEsRequestLocationInformation* carries common IEs for a Request Location Information LPP message Type.

-- ASN1START

CommonIEsRequestLocationInformation ::= SEQUENCE {

 locationInformationType LocationInformationType,

 triggeredReporting TriggeredReportingCriteria OPTIONAL, -- Cond ECID

 periodicalReporting PeriodicalReportingCriteria OPTIONAL, -- Need ON

 additionalInformation AdditionalInformation OPTIONAL, -- Need ON

 qos QoS OPTIONAL, -- Need ON

 environment Environment OPTIONAL, -- Need ON

 locationCoordinateTypes LocationCoordinateTypes OPTIONAL, -- Need ON

 velocityTypes VelocityTypes OPTIONAL, -- Need ON

 ...,

 [[

 messageSizeLimitNB-r14 MessageSizeLimitNB-r14 OPTIONAL -- Need ON

 ]],

 [[

 segmentationInfo-r14 SegmentationInfo-r14 OPTIONAL -- Need ON

 ]]

}

LocationInformationType ::= ENUMERATED {

 locationEstimateRequired,

 locationMeasurementsRequired,

 locationEstimatePreferred,

 locationMeasurementsPreferred,

 ...,

 [[

 locationEstimateAndMeasurementsRequired-r18

 ]]

}

PeriodicalReportingCriteria ::= SEQUENCE {

 reportingAmount ENUMERATED {

 ra1, ra2, ra4, ra8, ra16, ra32,

 ra64, ra-Infinity

 } DEFAULT ra-Infinity,

 reportingInterval ENUMERATED {

 noPeriodicalReporting, ri0-25,

 ri0-5, ri1, ri2, ri4, ri8, ri16, ri32, ri64

 }

}

TriggeredReportingCriteria ::= SEQUENCE {

 cellChange BOOLEAN,

 reportingDuration ReportingDuration,

 ...

}

ReportingDuration ::= INTEGER (0..255)

AdditionalInformation ::= ENUMERATED {

 onlyReturnInformationRequested,

 mayReturnAditionalInformation,

 ...

}

QoS ::= SEQUENCE {

 horizontalAccuracy HorizontalAccuracy OPTIONAL, -- Need ON

 verticalCoordinateRequest BOOLEAN,

 verticalAccuracy VerticalAccuracy OPTIONAL, -- Need ON

 responseTime ResponseTime OPTIONAL, -- Need ON

 velocityRequest BOOLEAN,

 ...,

 [[ responseTimeNB-r14 ResponseTimeNB-r14 OPTIONAL -- Need ON

 ]],

 [[ horizontalAccuracyExt-r15 HorizontalAccuracyExt-r15 OPTIONAL, -- Need ON

 verticalAccuracyExt-r15 VerticalAccuracyExt-r15 OPTIONAL -- Need ON

 ]]

}

HorizontalAccuracy ::= SEQUENCE {

 accuracy INTEGER(0..127),

 confidence INTEGER(0..100),

 ...

}

VerticalAccuracy ::= SEQUENCE {

 accuracy INTEGER(0..127),

 confidence INTEGER(0..100),

 ...

}

HorizontalAccuracyExt-r15 ::= SEQUENCE {

 accuracyExt-r15 INTEGER(0..255),

 confidence-r15 INTEGER(0..100),

 ...

}

VerticalAccuracyExt-r15 ::= SEQUENCE {

 accuracyExt-r15 INTEGER(0..255),

 confidence-r15 INTEGER(0..100),

 ...

}

ResponseTime ::= SEQUENCE {

 time INTEGER (1..128),

 ...,

 [[ responseTimeEarlyFix-r12 INTEGER (1..128) OPTIONAL -- Need ON

 ]],

 [[ unit-r15 ENUMERATED { ten-seconds, ... } OPTIONAL -- Need ON

 ]]

}

ResponseTimeNB-r14 ::= SEQUENCE {

 timeNB-r14 INTEGER (1..512),

 responseTimeEarlyFixNB-r14 INTEGER (1..512) OPTIONAL, -- Need ON

 ...,

 [[ unitNB-r15 ENUMERATED { ten-seconds, ... } OPTIONAL -- Need ON

 ]]

}

Environment ::= ENUMERATED {

 badArea,

 notBadArea,

 mixedArea,

 ...

}

MessageSizeLimitNB-r14 ::= SEQUENCE {

 measurementLimit-r14 INTEGER (1..512) OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

Editor Notes:

FFS exact IE structure of the request for location+measurements in the agreement of RAN2#123bis.

| **Conditional presence** | **Explanation** |
| --- | --- |
| *ECID* | The field is optionally present, need ON, if E-CID or NR E-CID is requested. Otherwise it is not present. |

| ***CommonIEsRequestLocationInformation* field descriptions** |
| --- |
| ***locationInformationType***This IE indicates whether the server requires a location estimate or measurements. For '*locationEstimateRequired*', the target device shall return a location estimate if possible, or indicate a location error if not possible. For '*locationMeasurementsRequired*', the target device shall return measurements if possible, or indicate a location error if not possible. For '*locationEstimatePreferred*', the target device shall return a location estimate if possible, but may also or instead return measurements for any requested position methods for which a location estimate is not possible. For '*locationMeasurementsPreferred*', the target device shall return location measurements if possible, but may also or instead return a location estimate for any requested position methods for which return of location measurements is not possible. For ' *locationEstimateAndMeasurementRequired* ', the target device shall return both location estimate and measurements if possible, or indicate a location error if not possible.Note, for PRU, if PRU is requested to return both location estimate and measurements, the location information is determined independently of the reported measurements. |
| ***triggeredReporting***This IE indicates that triggered reporting is requested and comprises the following subfields:- ***cellChange***: If this field is set to TRUE, the target device provides requested location information each time the primary cell has changed.- ***reportingDuration***: Maximum duration of triggered reporting in seconds. A value of zero is interpreted to mean an unlimited (i.e. "infinite") duration. The target device should continue triggered reporting for the *reportingDuration* or until an LPP *Abort* or *LPP Error* message is received.The *triggeredReporting* field should not be included by the location server and shall be ignored by the target device if the *periodicalReporting* IE or *responseTime* IE or *responseTimeNB* IE is included in *CommonIEsRequestLocationInformation.* |
| ***periodicalReporting***This IE indicates that periodic reporting is requested and comprises the following subfields:- ***reportingAmount*** indicates the number of periodic location information reports requested. Enumerated values correspond to 1, 2, 4, 8, 16, 32, 64, or infinite/indefinite number of reports. If the *reportingAmount* is '*infinite/indefinite'*, the target device shou-ld continue periodic reporting until an LPP *Abort* message is received. The value '*ra1*' shall not be used by a sender.- ***reportingInterval*** indicates the interval between location information reports and the response time requirement for the first location information report. Enumerated values ri0-25, ri0-5, ri1, ri2, ri4, ri8, ri16, ri32, ri64 correspond to reporting intervals of 1, 2, 4, 8, 10, 16, 20, 32, and 64 seconds, respectively. Measurement reports containing no measurements or no location estimate are required when a *reportingInterval* expires before a target device is able to obtain new measurements or obtain a new location estimate. The value '*noPeriodicalReporting*' shall not be used by a sender. |
| ***additionalInformation***This IE indicates whether a target device is allowed to return additional information to that requested. If this IE indicates '*onlyReturnInformationRequested'* then the target device shall not return any additional information to that requested by the server. If this IE indicates '*mayReturnAdditionalInformation'* then the target device may return additional information to that requested by the server. If a location estimate is returned, any additional information is restricted to that associated with a location estimate (e.g. might include velocity if velocity was not requested but cannot include measurements). If measurements are returned, any additional information is restricted to additional measurements (e.g. might include E-CID measurements if A-GNSS measurements were requested but not E-CID measurements). |
| ***qos***This IE indicates the quality of service and comprises a number of sub-fields. In the case of measurements, some of the sub-fields apply to the location estimate that could be obtained by the server from the measurements provided by the target device assuming that the measurements are the only sources of error. Fields are as follows:- ***horizontalAccuracy*** indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '*accuracy*' corresponds to the encoded uncertainty as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15].- ***verticalCoordinateRequest*** indicates whether a vertical coordinate is required (TRUE) or not (FALSE)- ***verticalAccuracy*** indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '*accuracy*' corresponds to the encoded uncertainty altitude as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15].- ***responseTime***- ***time*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation*. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 128. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 1280 seconds. If the *periodicalReporting* IE is included in *CommonIEsRequestLocationInformation*, this field should not be included by the location server and shall be ignored by the target device (if included).- ***responseTimeEarlyFix*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation* containing early location measurements or an early location estimate. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 128. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 1280 seconds. When this IE is included, a target should send a *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing early location information according to the *responseTimeEarlyFix* IE and a subsequent *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing final location information according to the *time* IE. A target shallomit sending a *ProvideLocationInformation* if the early location information is not available at the expiration of the time value in the *responseTimeEarlyFix* IE. A server should set the *responseTimeEarlyFix* IE to a value less than that for the *time* IE. A target shall ignore the *responseTimeEarlyFix* IE if its value is not less than that for the *time* IE.- ***unit*** indicates the unit of the *time* and *responseTimeEarlyFix* fields. Enumerated value '*ten-seconds*' corresponds to a resolution of 10 seconds. If this field is absent, the unit/resolution is 1 second.- ***velocityRequest*** indicates whether velocity (or measurements related to velocity) is requested (TRUE) or not (FALSE).- ***responseTimeNB***If the *periodicalReporting* IE or *responseTime* IE is included in *CommonIEsRequestLocationInformation*, this field should not be included by the location server and shall be ignored by the target device (if included).- ***timeNB*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation*. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 512. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 5120 seconds.- ***responseTimeEarlyFixNB*** indicates the maximum response time as measured between receipt of the *RequestLocationInformation* and transmission of a *ProvideLocationInformation* containing early location measurements or an early location estimate. If the *unit* field is absent, this is given as an integer number of seconds between 1 and 512. If the *unit* field is present, the maximum response time is given in units of 10-seconds, between 10 and 5120 seconds. When this IE is included, a target should send a *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing early location information according to the *responseTimeEarlyFixNB* IE and a subsequent *ProvideLocationInformation* (or more than one *ProvideLocationInformation* if location information will not fit into a single message) containing final location information according to the *timeNB* IE. A target shall omit sending a *ProvideLocationInformation* if the early location information is not available at the expiration of the time value in the *responseTimeEarlyFixNB* IE. A server should set the *responseTimeEarlyFixNB* IE to a value less than that for the *timeNB* IE. A target shall ignore the *responseTimeEarlyFixNB* IE if its value is not less than that for the *timeNB* IE.- ***unitNB*** indicates the unit of the *timeNB* and *responseTimeEarlyFixNB* fields. Enumerated value '*ten-second*' corresponds to a resolution of 10 seconds. If this field is absent, the unit/resolution is 1 second.- ***horizontalAccuracyExt*** indicates the maximum horizontal error in the location estimate at an indicated confidence level. The '*accuracyExt*' corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and 'confidence' corresponds to confidence as defined in TS 23.032 [15]. This field should not be included by the location server and shall be ignored by the target device if the *horizontalAccuracy* field is included in QoS.- ***verticalAccuracyExt*** indicates the maximum vertical error in the location estimate at an indicated confidence level and is only applicable when a vertical coordinate is requested. The '*accuracyExt*' corresponds to the encoded high accuracy uncertainty as defined in TS 23.032 [15] and '*confidence*' corresponds to confidence as defined in TS 23.032 [15]. This field should not be included by the location server and shall be ignored by the target device if the *verticalAccuracy* field is included in QoS.All QoS requirements shall be obtained by the target device to the degree possible but it is permitted to return a response that does not fulfill all QoS requirements if some were not attainable. The single exception is *time* and *timeNB* which shall always be fulfilled – even if that means not fulfilling other QoS requirements.A target device supporting NB-IoT access shall support the *responseTimeNB* IE*.*A target device supporting HA GNSS shall support the *HorizontalAccuracyExt*, *VerticalAccuracyEx*, and *unit* fields.A target device supporting NB-IoT access and HA GNSS shall support the *unitNB* field. |
| ***environment***This field provides the target device with information about expected multipath and non line of sight (NLOS) in the current area. The following values are defined:- badArea: possibly heavy multipath and NLOS conditions (e.g. bad urban or urban).- notBadArea: no or light multipath and usually LOS conditions (e.g. suburban or rural).- mixedArea: environment that is mixed or not defined.If this field is absent, a default value of 'mixedArea' applies. |
| ***locationCoordinateTypes***This field provides a list of the types of location estimate that the target device may return when a location estimate is obtained by the target. |
| ***velocityTypes***This fields provides a list of the types of velocity estimate that the target device may return when a velocity estimate is obtained by the target. |
| ***messageSizeLimitNB***This field provides an octet limit on the amount of location information a target device can return.- ***measurementLimit*** indicates the maximum amount of location information the target device should return in response to the *RequestLocationInformation* message received from the location server.The limit applies to the overall size of the LPP message at LPP level (LPP Provide Location Information), and is specified in steps of 100 octets. The message size limit is then given by the value provided in *measurementLimit* times 100 octets. |
| ***segmentationInfo***This field indicates whether this *RequestLocationInformation* message is one of many segments, as specified in clause 4.3.5 |

*NEXT CHANGE*

### 6.4.3 Common NR Positioning Information Elements

#### – *NR-DL-PRS-TRP-TEG-Info*

The IE *NR-DL-PRS-TRP-TEG-Info* is used by the location server to provide the association information of DL-PRS Resources with TRP Tx TEGs.

-- ASN1START

NR-DL-PRS-TRP-TEG-Info-r17 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF

 NR-DL-PRS-TRP-TEG-InfoPerFreqLayer-r17

NR-DL-PRS-TRP-TEG-InfoPerFreqLayer-r17 ::= SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 NR-DL-PRS-TRP-TEG-InfoPerTRP-r17

NR-DL-PRS-TRP-TEG-InfoPerTRP-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

 dl-PRS-TEG-InfoSet-r17 SEQUENCE (SIZE(1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF

 DL-PRS-TEG-InfoPerResourceSet-r17,

 ...,

 [[

 nr-TRP-TxTEG-TimingErrorMargin-r17 TEG-TimingErrorMargin-r17 OPTIONAL -- Need ON

 ]]

}

DL-PRS-TEG-InfoPerResourceSet-r17 ::= SEQUENCE (SIZE(1..nrMaxResourcesPerSet-r16)) OF

 DL-PRS-TEG-InfoElement-r17

DL-PRS-TEG-InfoElement-r17 ::= SEQUENCE {

 dl-prs-trp-Tx-TEG-ID-r17 INTEGER (0..maxNumOfTRP-TxTEGs-1-r17),

 ...

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-PRS-TRP-TEG-Info* field descriptions |
| ***dl-PRS-ID***This field specifies the DL-PRS ID of the TRP for which the TRP Tx TEG information is provided. |
| ***nr-PhysCellID***This field specifies the physical Cell-ID of the TRP for which the TRP Tx TEG 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 TRP Tx TEG 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*. |
| ***dl-PRS-TEG-InfoSet***This field specifies the TRP Tx TEG ID associated with the transmissions of each DL-PRS Resource of the TRP. The *dl-prs-trp-Tx-TEG-ID* in *dl-PRS-TEG-InfoSet* is associated with the *nr-DL-PRS-ResourceID* of *NR-DL-PRS-Info* using the same structure and order. |
| ***nr-TRP-TxTEG-TimingErrorMargin***This field specifies the timing error margin value for all the TRP Tx TEGs contained within one *NR-DL-PRS-TRP-TEG-InfoPerTRP*. |

#### *–* *NR-IndicatedResourceSetAndTimeWindow*

The IE *NR-IndicatedResourceSetAndTimeWindow* provides a set of indicated DL-PRS resource set(s) occurring within indicated time window(s) which is configured from server to target UE to perform carrier phase measurements.

Editor Notes: FFS all measurements are performed in the window or just carrier phase based on the reply LS from RAN1.

-- ASN1START

NR-IndicatedResourceSetAndTimeWindow-r18 ::= SEQUENCE { nr-IndicatedDL-PRS-FrequencyLayerIndex-r18 INTEGER (0..nrMaxFreqLayers-1-r16),

 nr-IndicatedDL-PRS-IndexListPerFreq-r18 SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF

 NR-IndicatedDL-PRS-IndexPerTRP-r18

 OPTIONAL --Need OP

}

NR-IndicatedDL-PRS-IndexPerTRP-r18 ::= SEQUENCE{

 nr-IndicatedTRP-Index-r18 INTEGER (0..nrMaxTRPsPerFreq-1-r16), nr-DL-PRS-IndicatedResourceSetIndexList-r18 SEQUENCE (SIZE (1.. nrMaxSetsPerTrpPerFreqLayer-r16)) OF NR-DL-PRS-IndicatedResourceSetIndex-r18 OPTIONAL, -- Need OP

 ...

}

NR-DL-PRS-IndicatedResourceSetIndex-r18 ::= SEQUENCE { nr-DL-IndicatedPRS-ResourceSetIndex-r18 INTEGER (0..nrMaxSetsPerTrpPerFreqLayer-1-r16),

 nr-StartSFN-TimeWindow-r18 INTEGER (0..1023) OPTIONAL, -- Need ON

 nr-PeriodicityAndSlotOffsetTimeWindow-r18 NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16 OPTIONAL, -- Need ON

 nr-SymbolOffsetTimeWindow-r18 INTEGER (0..12) OPTIONAL, -- Need ON

 nr-DurationTimeWindow-r18 ENUMERATED { n1, n2, n4, n6, n8, n12, n16, ... } OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

Editor Notes:

1. FFS there are multiple time windows associated with one resourceSetID or only one time window assocaited with resourceSetID. Wait for RAN1 reply LS.

|  |
| --- |
| ***NR-IndicatedResourceSetAndTimeWindow field descriptions*** |
| ***nr-IndicatedDL-PRS-FrequencyLayerIndex*** This field indicates the frequency layer provided in IE *NR-DL-PRS-AssistanceData*. Value 0 corresponds to the first frequency layer provided in *nr-DL-PRS-AssistanceDataList* in IE *NR-DL-PRS-AssistanceData*, value 1 to the second frequency layer in *nr-DL-PRS-AssistanceDataList*, and so on. |
| ***nr-IndicatedDL-PRS-IndexListPerFreq*** This field provides the list of addressed TRPs of the selected frequency layer. If this field is absent, all DL-PRS Resources of all TRPs of the indicated frequency layer are addressed. |
| ***nr-IndicatedTRP-Index***This field indicates the addressed TRP of the selected frequency layer. Value 0 corresponds to the first entry in *nr-DL-PRS-AssistanceDataPerFreq* provided in IE *NR-DL-PRS-AssistanceData*, value 1 corresponds to the second entry in *nr-DL-PRS-AssistanceDataPerFreq*, and so on. |
| ***nr-DL-PRS-IndicatedResourceSetIndexList*** This field provides the list of addressed DL-PRS Resource Sets of the selected TRPs of the selected frequency layer. If this field is absent, all DL-PRS Resource Sets and Resources of the indicated TRP are addressed. |
| ***nr-DL-IndicatedPRS-ResourceSetIndex*** This field indicates the addressed DL-PRS Resource Set of the selected TRP of the selected frequency layer. Value 0 corresponds to the first entry in *nr-DL-PRS-ResourceSetList* in IE *NR-DL-PRS-Info* provided in IE *NR-DL-PRS-AssistanceData*. Value 1 corresponds to the second entry in the *nr-DL-PRS-ResourceSetList* in IE *NR-DL-PRS-Info*. |
| ***nr-StartSFN-TimeWindow***This field specifies the start of the time window in system frame number. |
| ***nr-PeriodicityAndSlotOffsetTimeWindow***This field specifies the periodicity of the time window in slots configured per DL-PRS Resource Set and the slot offset with respect to the sfn in IE *nr-StartSFN-TimeWindow* slot #0 for the TRP where the DL-PRS Resource Set is configured. |
| ***nr-SymbolOffsetTimeWindow***This field specifies the symbol offset with respect to the slot offset in *nr-PeriodicityAndSlotOffsetTimeWindow*. |
| ***nr-DurationTimeWindow***This field specifies the desired duration of a time window for the indicated DL-PRS resource set. It indicates the time in units of slots. Enumerated values ‘n1’ correspond to 1 slot, n2 to 2 slots, n4 to 4 slots and so on. |

*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-PRU-DL-Info-r18 NR-PRU-DL-Info-r18 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

| *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-PRU-DL-Info***This field provides the DL carrier phase measurement reported by a PRU to the target UE, with additional information of the same PRU to a target UE. |

#### – *NR-PRU-DL-Info*

The IE *NR-PRU-DL-Info* is used by the location server to provide DL carrier phase measurement information reported by a PRU, with additional information of this PRU to a target UE.

Editor Notes: FFS all PRU measurements are required, or just the carrier phase. Wait for RAN1 reply LS.

-- ASN1START

NR-PRU-DL-Info-r18 ::= SEQUENCE {

 nr-PRU-LocationInfo-r18 LocationCoordinates OPTIONAL, -- Need ON

 nr-PRU-DL-Info-r18 SEQUENCE (SIZE (1..maxMeasInstances-r17)) OF

 NR-PRU-DL-InfoPerInstance-r18,

 ...

}

NR-PRU-DL-InfoPerInstance-r18 ::= SEQUENCE {

 dl-PRS-ReferenceInfo-r18 DL-PRS-ID-Info-r16 OPTIONAL, -- Cond NotSameAsPrev

 nr-PRU-DL-InfoList-r18 SEQUENCE (SIZE (1..nrMaxTRPs-r16)) OF

 NR-PRU-DL-InfoElement-r18,

 ...

}

NR-PRU-DL-InfoElement-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-DL-PRS-ResourceID-RSCPD-r18 NR-DL-PRS-ResourceID-r16 OPTIONAL, -- Need OR

 nr-DL-PRS-ResourceSetID-RSCPD-r18 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, -- Need ON nr-PRU-DL-RSCPD-Info-r18 SEQUENCE (SIZE(1..4)) OF

 NR-PRU-DL-RSCPD-Element-r18 OPTIONAL, -- Need ON

 ...

}

NR-PRU-DL-RSCPD-Element-r18 ::= SEQUENCE {

 nr-TimeStampRSCPD-r18 NR-TimeStamp-r16,

 nr-RSCPD-r18 INTEGER (0..61565) OPTIONAL, -- Need ON

 nr-PhaseQualityRSCPD-r18 NR-PhaseQuality-r18 OPTIONAL, -- Need ON

 ...

}

-- ASN1STOP

Editor Notes:

1. additional PRU information, e.g. the AoD of PRU to each TRP, etc. wait for RAN1 progress.

| Conditional presence | Explanation |
| --- | --- |
| *NotSameAsPrev* | The field is mandatory present in the first entry of the *NR-PRU-DL-MeasInfoPerInstance* in the *NR-PRU-DL-Info* list; otherwise it is optionally present, need OP. |

| *NR-PRU-DL-Info* field descriptions |
| --- |
| ***nr-PRU-LocationInfo***This field provides the location coordinates of the PRU. |
| ***dl-PRS-ReferenceInfo***This field specifies the ID of the reference TRP measured by this PRU. |
| ***nr-PRU-DL-InfoList***This field provides the list of measurement information on each TRP measured by the PRU. |
| ***nr-DL-PRS-ResourceID-RSCPD, nr-DL-PRS-ResourceSetID-RSCPD***This field uniquely identifies a DL-PRS Resource which is associated to the *nr-PRU-DL-RSCPD-Info* of this PRU. |
| ***nr-PRU-DL-RSCPD-Info*** This field defines the RSCPD measurement of PRU and comprises the following sub-fields:- ***nr-TimeStampRSCPD***: This field specifies the time instance at which the RSCPD measurement is performed. The reference TRP for RSCPD is the same as the reference TRP of RSTD.- ***nr-RSCPD***: This field specifies the NR DL reference carrier phase difference measurement, as defined in TS 38.215 [36]. Mapping of the measured quantity is defined as in TS 38.133 [46]. The target and the reference TRP are in the same PFL.- ***nr-PhaseQualityRSCPD***: This field specifies the PRU′s best estimate of the quality of the measurement. |

*NEXT CHANGE*

#### *– NR-TimeStamp*

The IE *NR-TimeStamp* defines the UE measurement associated time stamp.

-- ASN1START

NR-TimeStamp-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

 nr-SFN-r16 INTEGER (0..1023),

 nr-Slot-r16 CHOICE {

 scs15-r16 INTEGER (0..9),

 scs30-r16 INTEGER (0..19),

 scs60-r16 INTEGER (0..39),

 scs120-r16 INTEGER (0..79)

 },

 ...,

 [[

 nr-Symbol-r18 INTEGER (0..13) OPTIONAL -- Need OR

 ]]}

-- ASN1STOP

| *NR-TimeStamp* field descriptions |
| --- |
| ***dl-PRS-ID***This field specifies the DL-PRS ID of the TRP for which the *nr-SFN* is applicable. |
| ***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].  |
| ***nr-ARFCN***This field specifies the ARFCN of the TRP's CD-SSB (as defined in TS 38.300 [47]) corresponding to *nr-PhysCellID* associated with the *dl-PRS-ID*. |
| ***nr-SFN***This field specifies the NR system frame number for the time stamp. |
| ***nr-Slot***This field specifies the NR slot number within the NR system frame number indicated by *nr-SFN* for the time stamp. |
| ***nr-Symbol***This field specifies the NR symbol index within the NR slot number indicated by *nr-Slot* for the time stamp. |

*NEXT CHANGE*

#### *– NR-UL-SRS-Capability*

The IE *NR-UL-SRS-Capability* defines the UE uplink SRS capability.

\*\*\*\*\*\*\*\*\*\*skip the unchanged part\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#### *– NR-PhaseQuality*

The IE *NR-PhaseQuality* defines the quality of the RSCP/RSCPD measurement.

Editor Notes: the value of PhaseQuality is FFS, waiting for the further input from RAN1 and RAN4.

-- ASN1START

NR-PhaseQuality-r18 ::= SEQUENCE {

 phaseQualityValue-r18 INTEGER (0..31),

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

 ...

}

-- ASN1STOP

| *NR-PhaseQuality* field descriptions |
| --- |
| ***phaseQualityValue***This field provides an estimate of uncertainty of the phase value for which the IE *NR-PhaseQuality* is provided in units of metres(FFS). |
| ***phaseQualityResolution***This field provides the resolution used in the *phaseQualityValue* field. Enumerated values *mdot1*, *m1*, *m10*, *m30* correspond to 0.1, 1, 10, 30 metres, respectively. |

*NEXT CHANGE*

## 6.5 Positioning Method IEs

#### 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),

 pru-Info-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

 ]]

}

-- 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 the field *nr-PRU-DL-Info* in IE *NR-PositionCalculationAssistance* is requested or not.This field may only be present if the '*posCalc*' bit in *nr-AdType* is set to value '1'. |

*NEXT CHANGE*

#### 6.5.10.4 NR DL-TDOA Location Information Elements

#### – *NR-DL-TDOA-SignalMeasurementInformation*

The IE *NR-DL-TDOA-SignalMeasurementInformation* is used by the target device to provide NR DL-TDOA measurements to the location server.

NOTE 1: The *dl-PRS-ReferenceInfo* defines the "RSTD reference" TRP. The *nr-RSTD's* and *nr-RSTD-ResultDiff*'s in *nr-DL-TDOA-MeasList* are provided relative to the "RSTD reference" TRP.

NOTE 2: The "RSTD reference" TRP may or may not be the same as the "assistance data reference" TRP provided by *nr-DL-PRS-ReferenceInfo* in IE *NR-DL-PRS-AssistanceData.*

NOTE 3: The target device includes a value of zero for the *nr-RSTD* and *nr-RSTD-ResultDiff* of the "RSTD reference" TRP in *nr-DL-TDOA-MeasList*.

-- ASN1START

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

 dl-PRS-ReferenceInfo-r16 DL-PRS-ID-Info-r16,

 nr-DL-TDOA-MeasList-r16 NR-DL-TDOA-MeasList-r16,

 ...,

 [[

 nr-UE-RxTEG-TimingErrorMargin-r17 TEG-TimingErrorMargin-r17 OPTIONAL -- Cond UERxTEG

 ]]

}

NR-DL-TDOA-MeasList-r16 ::= SEQUENCE (SIZE(1..nrMaxTRPs-r16)) OF NR-DL-TDOA-MeasElement-r16

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

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

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

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL,

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

 nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 nr-RSTD-r16 CHOICE {

 k0-r16 INTEGER (0..1970049),

 k1-r16 INTEGER (0..985025),

 k2-r16 INTEGER (0..492513),

 k3-r16 INTEGER (0..246257),

 k4-r16 INTEGER (0..123129),

 k5-r16 INTEGER (0..61565),

 ...

 },

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 nr-TimingQuality-r16 NR-TimingQuality-r16,

 nr-DL-PRS-RSRP-Result-r16 INTEGER (0..126) OPTIONAL,

 nr-DL-TDOA-AdditionalMeasurements-r16

 NR-DL-TDOA-AdditionalMeasurements-r16 OPTIONAL,

 ...,

 [[

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

 nr-DL-PRS-FirstPathRSRP-Result-r17 INTEGER (0..126) OPTIONAL,

 nr-los-nlos-Indicator-r17 CHOICE {

 perTRP-r17 LOS-NLOS-Indicator-r17,

 perResource-r17 LOS-NLOS-Indicator-r17

 } OPTIONAL,

 nr-AdditionalPathListExt-r17 NR-AdditionalPathListExt-r17 OPTIONAL,

 nr-DL-TDOA-AdditionalMeasurementsExt-r17

 NR-DL-TDOA-AdditionalMeasurementsExt-r17 OPTIONAL

 ]],

 [[

 nr-DL-TDOA-CarrierPhaseMeasurements-r18

 NR-DL-TDOA-CarrierPhaseMeasurements-r18 OPTIONAL ]]

}

NR-DL-TDOA-CarrierPhaseMeasurements-r18::= SEQUENCE (SIZE (1..4)) OF

 NR-DL-TDOA-CarrierPhaseMeasurementElement-r18

NR-DL-TDOA-CarrierPhaseMeasurementElement-r18 ::= SEQUENCE {

 nr-RSCPD-r18 INTEGER (0..61565),

 nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL,

 ...

}

NR-DL-TDOA-AdditionalMeasurements-r16 ::= SEQUENCE (SIZE (1..3)) OF

 NR-DL-TDOA-AdditionalMeasurementElement-r16

NR-DL-TDOA-AdditionalMeasurementsExt-r17 ::= SEQUENCE (SIZE (1..maxAddMeasTDOA-r17)) OF

 NR-DL-TDOA-AdditionalMeasurementElement-r16

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

 nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 nr-RSTD-ResultDiff-r16 CHOICE {

 k0-r16 INTEGER (0..8191),

 k1-r16 INTEGER (0..4095),

 k2-r16 INTEGER (0..2047),

 k3-r16 INTEGER (0..1023),

 k4-r16 INTEGER (0..511),

 k5-r16 INTEGER (0..255),

 ...

 },

 nr-TimingQuality-r16 NR-TimingQuality-r16,

 nr-DL-PRS-RSRP-ResultDiff-r16 INTEGER (0..61) OPTIONAL,

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 ...,

 [[

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

 nr-DL-PRS-FirstPathRSRP-ResultDiff-r17

 INTEGER (0..61) OPTIONAL,

 nr-los-nlos-IndicatorPerResource-r17

 LOS-NLOS-Indicator-r17 OPTIONAL,

 nr-AdditionalPathListExt-r17 NR-AdditionalPathListExt-r17 OPTIONAL

 ]]

}

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *UERxTEG* | The field is optionally present, need OP, if the field *nr-UE-Rx-TEG-ID* is present; otherwise it is not present. |

|  |
| --- |
| *NR-DL-TDOA-SignalMeasurementInformation* field descriptions |
| ***nr-UE-RxTEG-TimingErrorMargin***This field specifies the UE Rx TEG timing error margin value for all the UE Rx TEGs within one *NR-DL-TDOA-SignalMeasurementInformation*. If the *nr-UE-Rx-TEG-ID* is present and this field is absent, the receiver should consider the UE Rx TEG timing error margin value to be the maximum applicable value as defined in TS 38.133 [46]. |
| ***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]. |
| ***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*. |
| ***nr-TimeStamp***This field specifies the time instance at which the TOA , RSCP (if included) and DL PRS-RSRP/RSRPP (if included) measurement is performed. The *nr-SFN* , *nr-Slot* and *nr-Symbol* (if inlcuded) in IE *NR-TimeStamp* correspond to the TRP provided in *dl-PRS-ReferenceInfo* as specified in TS 38.214 [45]. Note, the TOA and RSCP (if inlcuded) measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*. |
| ***nr-RSTD***This field specifies the relative timing difference between this neighbour TRP and the PRS reference TRP, as defined in TS 38.215 [36]. Mapping of the measured quantity is defined as in TS 38.133 [46]. |
| ***nr-AdditionalPathList***This field specifies one or more additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-RSTD* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. If this field is present, the field *nr-AdditionalPathListExt* shall be absent. |
| ***nr-TimingQuality***This field specifies the target device′s best estimate of the quality of the TOA measurement. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*. |
| ***nr-DL-PRS-RSRP-Result***This field specifies the NR DL-PRS reference signal received power (DL PRS-RSRP) measurement, as defined in TS 38.215 [36]. The mapping of the quantity is defined as in TS 38.133 [46]. |
| ***nr-DL-TDOA-AdditionalMeasurements***This field provides up to 3 additional RSTD measurements per pair of TRPs, with each measurement between a different pair of DL-PRS Resources or DL-PRS Resource Sets of the DL-PRS for those TRPs [45].If this field is present, the field *nr-DL-TDOA-AdditionalMeasurementsExt* shall be absent. |
| ***nr-UE-Rx-TEG-ID***This field provides the ID of the UE Rx TEG associated with the TOA measurement. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*. When different UE Rx TEGs for RSTD measurements are requested, the maximum number of reported RSTD measurements associated with different DL-PRS Resources per UE Rx TEG per target TRP is 4. |
| ***nr-DL-PRS-FirstPathRSRP-Result***This field specifies the NR DL-PRS reference signal received path power (DL PRS-RSRPP) of the first detected path in time, as defined in TS 38.215 [36]. The mapping of the measured quantity is defined as in TS 38.133 [46]. |
| ***nr-los-nlos-Indicator***This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the TRP or resource. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*.This field also applies to specify the target device's best estimate of the LOS or NLOS of the RSCP measurement for the TRP or resource. Note, the RSCP measurement refers to the RSCP of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSCPD*.NOTE: If the requested type or granularity in *nr-los-nlos-IndicatorRequest* is not possible, the target device may provide a different type and granularity for the estimated *LOS-NLOS-Indicator.* |
| ***nr-AdditionalPathListExt***This field provides up to 8 additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-RSTD* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. If this field is present, the field *nr-AdditionalPathList* shall be absent. |
| ***nr-DL-TDOA-AdditionalMeasurementsExt***This field, in addition to the measurements provided in *NR-DL-TDOA-MeasElement*, provides TOA measurements of up to 4 DL-PRS Resources of a TRP with different UE Rx TEGs. For a certain DL-PRS Resource, there can be up to 8 TOA measurement results with respect to different Rx TEGs.If this field is present, the field *nr-DL-TDOA-AdditionalMeasurements* shall be absent. |
| ***nr-RSCPD***This field specifies the NR DL reference signal carrier phase difference measurement, as defined in TS 38.215 [36]. Mapping of the measured quantity is defined as in TS 38.133 [46]. The target and the reference TRP are in the same PFL. |
| ***nr-PhaseQuality***This field specifies the target device′s best estimate of the quality of the RSCPD measurement. |
| ***nr-RSTD-ResultDiff***This field provides the additional DL RSTD measurement result relative to *nr-RSTD.* The RSTD value of this measurement is obtained by adding the value of this field to the value of the *nr-RSTD* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-DL-PRS-RSRP-ResultDiff***This field provides the additional DL-PRS RSRP measurement result relative to *nr-DL-PRS-RSRP-Result.* The DL-PRS RSRP value of this measurement is obtained by adding the value of this field to the value of the *nr-DL-PRS-RSRP-Result* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-DL-PRS-FirstPathRSRP-ResultDiff***This field specifies the additional NR DL PRS reference signal received path power (DL PRS-RSRPP) of the first detected path in time relative to *nr-DL-PRS-FirstPathRSRP-Result*. The DL-PRS RSRPP of first path value of this measurement is obtained by adding the value of this field to the value of the *nr-DL-PRS-FirstPathRSRP-Result* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-los-nlos-IndicatorPerResource***This field specifies the target device's best estimate of the LOS or NLOS of the TOA measurement for the resource. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff*.This field may only be present if the field *nr-LOS-NLOS-Indicator* choice indicates *perResource*. |

#### 6.5.10.5 NR DL-TDOA Location Information Request

#### – *NR-DL-TDOA-RequestLocationInformation*

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

-- ASN1START

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

 nr-DL-PRS-RstdMeasurementInfoRequest-r16 ENUMERATED { true } OPTIONAL,-- Need ON

 nr-RequestedMeasurements-r16 BIT STRING { prsrsrpReq (0),

 firstPathRsrpReq-r17 (1)

 } (SIZE(1..8)),

 nr-AssistanceAvailability-r16 BOOLEAN,

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

 additionalPaths-r16 ENUMERATED { requested } OPTIONAL, -- Need ON

 ...,

 [[

 nr-UE-RxTEG-Request-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 nr-los-nlos-IndicatorRequest-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType1-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity1-r17,

 ...

 } OPTIONAL, -- Need ON

 additionalPathsExt-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 additionalPathsDL-PRS-RSRP-Request-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 multiMeasInSameReport-r17 ENUMERATED { requested } OPTIONAL -- Need ON

 ]],

 [[

 nr-DL-PRS-RSCPD-Request-r18 ENUMERATED { requested } OPTIONAL -- Need ON

 ]]

}

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

 maxDL-PRS-RSTD-MeasurementsPerTRP-Pair-r16 INTEGER (1..4) OPTIONAL, -- Need ON

 timingReportingGranularityFactor-r16 INTEGER (0..5) OPTIONAL, -- Need ON

 ...,

 [[

 measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17

 ENUMERATED { n0, n2, n3, n4, n6, n8, ... }

 OPTIONAL, -- Need ON

 reducedDL-PRS-ProcessingSamples-r17 ENUMERATED { requested, ... } OPTIONAL, -- Need ON

 lowerRxBeamSweepingFactor-FR2-r17 ENUMERATED { requested } OPTIONAL -- Need ON

 ]],

 [[

 nr-indicatedResourceSetAndTimeWindow-r18 NR-IndicatedResourceSetAndTimeWindow-r18 OPTIONAL -- Need ON

 ]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-TDOA-RequestLocationInformation* field descriptions |
| ***nr-DL-PRS-RstdMeasurementInfoRequest***This field indicates whether the target device is requested to report DL-PRS Resource ID(s) or DL-PRS Resource Set ID(s) used for determining the timing of each TRP in RSTD measurements. |
| ***nr-RequestedMeasurements***This field specifies the NR DL-TDOA measurements requested. This is represented by a bit string, with a one‑value at the bit position means the particular measurement is requested; a zero‑value means not requested. |
| ***nr-AssistanceAvailability***This field indicates whether the target device may request additional PRS assistance data from the server. TRUE means allowed and FALSE means not allowed. |
| ***additionalPaths***This field, if present, indicates that the target device is requested to provide the *nr-AdditionalPathList* in IE *NR-DL-TDOA-SignalMeasurementInformation*. If this field is present, the field *additionalPathsExt* shall be absent. |
| ***nr-UE-RxTEG-Request***This field, if present, indicates that the target device is requested to provide the *nr-UE-Rx-TEG-ID* in IE *NR-DL-TDOA-SignalMeasurementInformation.* |
| ***nr-los-nlos-IndicatorRequest***This field, if present, indicates that the target device is requested to provide the indicated type and granularity of the estimated *LOS-NLOS-Indicator* in the *NR-DL-TDOA-SignalMeasurementInformation*. |
| ***additionalPathsExt***This field, if present, indicates that the target device is requested to provide the *nr-AdditionalPathListExt* in IE *NR-DL-TDOA-SignalMeasurementInformation*. If this field is present, the field *additionalPaths* shall be absent. |
| ***additionalPathsDL-PRS-RSRP-Request***This field, if present, indicates that the target device is requested to provide the *nr-DL-PRS-RSRPP* for the additional paths in fields *nr-AdditionalPathList* or *nr-AdditionalPathListExt*. |
| ***multiMeasInSameReport***This field, if present, indicates that the target device is requested to provide multiple measurement instances in a single measurement report; i.e., include the *nr-DL-TDOA-SignalMeasurementInstances* (in the case of UE-assisted mode is requested) or *nr-DL-TDOA-LocationInformationInstances* (in the case of UE-based mode is requested) in IE *NR-DL-TDOA-ProvideLocationInformation.* |
| ***nr-DL-PRS-RSCPD-Request***This field, if present, indicates that the target device is requested to provide theRSCPD measurement together with DL-PRS RSTD measurement. |
| ***maxDL-PRS-RSTD-MeasurementsPerTRP-Pair***This field specifies the maximum number of DL-PRS RSTD measurements per pair of TRPs. The maximum number is defined across all Positioning Frequency Layers. |
| ***timingReportingGranularityFactor***This field specifies the recommended reporting granularity for the DL RSTD measurements. Value (0..5) corresponds to (*k0*..*k5*) used for *nr-RSTD* and *nr-RSTD-ResultDiff* in *NR-DL-TDOA-MeasElement*. The UE may select a different granularity value for *nr-RSTD* and *nr-RSTD-ResultDiff*. |
| ***measureSameDL-PRS-ResourceWithDifferentRxTEGs***This field, if present, indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with *N* different UE Rx TEGs. Enumerated value '*n0*' indicates that the number *N* of different UE Rx TEGs to measure the same DL PRS Resource can be determined by the target device, value '*n2*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 2 different UE Rx TEGs, value '*n3*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 3 different UE Rx TEGs, and so on.If this field is present, the field *nr-UE-RxTEG-Request* should also be present. |
| ***reducedDL-PRS-ProcessingSamples***This field, if present and set to '*requested*', indicates that the target device is requested to perform the requested measurements with reduced number of samples (M=1 or M=2) as specified in TS 38.133 [46]. |
| ***lowerRxBeamSweepingFactor-FR2***This field, if present, indicates that the target device is requested to use a lower Rx beam sweeping factor than 8 for FR2 according to UE's capability. |
| ***nr-IndicatedResourceSetAndTimeWindow*** This field indicates DL-PRS resource set(s) occurring within time window(s) for performing measurements where the time window is indicated by a start time, periodicity, offset and duration. |

#### 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),

 pru-Info-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

 ]],

 [[

 symbolTimeStampSupport-r18 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. - bit 4 indicates whether the field *nr-PRU-DL-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. |
| ***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]. |
| ***symbolTimeStampSupport***This field, if present, indicates that the target device supports reporting timestamp in terms of radio frame timing down to OFDM symbol level. |

*NEXT CHANGE*

#### 6.5.12.4 NR Multi-RTT Location Information Elements

#### – *NR-Multi-RTT-SignalMeasurementInformation*

The IE *NR-Multi-RTT-SignalMeasurementInformation* is used by the target device to provide NR Multi-RTT measurements to the location server.

-- ASN1START

NR-Multi-RTT-SignalMeasurementInformation-r16 ::= SEQUENCE {

 nr-Multi-RTT-MeasList-r16 NR-Multi-RTT-MeasList-r16,

 nr-NTA-Offset-r16 ENUMERATED { nTA1, nTA2, nTA3, nTA4, ... } OPTIONAL,

 ...,

 [[

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

 NR-SRS-TxTEG-Element-r17 OPTIONAL

 -- Cond Case2-3

 ]],

 [[

 nr-UE-RxTEG-TimingErrorMargin-r17 TEG-TimingErrorMargin-r17 OPTIONAL,-- Cond TEGCase3

 nr-UE-TxTEG-TimingErrorMargin-r17 TEG-TimingErrorMargin-r17 OPTIONAL,-- Cond TEGCase2-3

 nr-UE-RxTxTEG-TimingErrorMargin-r17 RxTxTEG-TimingErrorMargin-r17 OPTIONAL -- Cond TEGCase1-2

 ]]

}

NR-Multi-RTT-MeasList-r16 ::= SEQUENCE (SIZE(1..nrMaxTRPs-r16)) OF NR-Multi-RTT-MeasElement-r16

NR-Multi-RTT-MeasElement-r16 ::= SEQUENCE {

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

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

 nr-CellGlobalID-r16 NCGI-r15 OPTIONAL,

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

 nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,

 nr-UE-RxTxTimeDiff-r16 CHOICE {

 k0-r16 INTEGER (0..1970049),

 k1-r16 INTEGER (0..985025),

 k2-r16 INTEGER (0..492513),

 k3-r16 INTEGER (0..246257),

 k4-r16 INTEGER (0..123129),

 k5-r16 INTEGER (0..61565),

 ...

 },

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 nr-TimingQuality-r16 NR-TimingQuality-r16,

 nr-DL-PRS-RSRP-Result-r16 INTEGER (0..126) OPTIONAL,

 nr-Multi-RTT-AdditionalMeasurements-r16

 NR-Multi-RTT-AdditionalMeasurements-r16 OPTIONAL,

 ...,

 [[

 nr-UE-RxTx-TEG-Info-r17 NR-UE-RxTx-TEG-Info-r17 OPTIONAL,

 nr-DL-PRS-FirstPathRSRP-Result-r17 INTEGER (0..126) OPTIONAL,

 nr-los-nlos-Indicator-r17 CHOICE {

 perTRP-r17 LOS-NLOS-Indicator-r17,

 perResource-r17 LOS-NLOS-Indicator-r17

 } OPTIONAL,

 nr-AdditionalPathListExt-r17 NR-AdditionalPathListExt-r17 OPTIONAL,

 nr-Multi-RTT-AdditionalMeasurementsExt-r17

 NR-Multi-RTT-AdditionalMeasurementsExt-r17 OPTIONAL

 ]],

 [[

 nr-Multi-RTT-CarrierPhaseMeasurements-r18

 NR-Multi-RTT-CarrierPhaseMeasurements-r18 OPTIONAL ]]

}

NR-Multi-RTT-AdditionalMeasurements-r16 ::= SEQUENCE (SIZE (1..3)) OF

 NR-Multi-RTT-AdditionalMeasurementElement-r16

NR-Multi-RTT-AdditionalMeasurementsExt-r17 ::= SEQUENCE (SIZE (1..maxAddMeasRTT-r17)) OF

 NR-Multi-RTT-AdditionalMeasurementElement-r16

NR-Multi-RTT-AdditionalMeasurementElement-r16 ::= SEQUENCE {

 nr-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,

 nr-DL-PRS-RSRP-ResultDiff-r16 INTEGER (0..61) OPTIONAL,

 nr-UE-RxTxTimeDiffAdditional-r16 CHOICE {

 k0-r16 INTEGER (0..8191),

 k1-r16 INTEGER (0..4095),

 k2-r16 INTEGER (0..2047),

 k3-r16 INTEGER (0..1023),

 k4-r16 INTEGER (0..511),

 k5-r16 INTEGER (0..255),

 ...

 },

 nr-TimingQuality-r16 NR-TimingQuality-r16,

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 ...,

 [[

 nr-UE-RxTx-TEG-Info-r17 NR-UE-RxTx-TEG-Info-r17 OPTIONAL,

 nr-DL-PRS-FirstPathRSRP-ResultDiff-r17 INTEGER (0..61) OPTIONAL,

 nr-los-nlos-IndicatorPerResource-r17 LOS-NLOS-Indicator-r17 OPTIONAL,

 nr-AdditionalPathListExt-r17 NR-AdditionalPathListExt-r17 OPTIONAL

 ]]

}

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

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

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

 carrierFreq-r17 SEQUENCE {

 absoluteFrequencyPointA-r17 ARFCN-ValueNR-r15,

 offsetToPointA-r17 INTEGER (0..2199)

 } OPTIONAL,

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

 INTEGER (0..maxNumOfSRS-PosResources-1-r17),

 ...

}

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

 case1-r17 SEQUENCE {

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

 },

 case2-r17 SEQUENCE {

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

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

 },

 case3-r17 SEQUENCE {

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

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

 },

 ...

}

NR-Multi-RTT-CarrierPhaseMeasurements-r18::= SEQUENCE (SIZE (1..4)) OF

 NR-Multi-RTT-CarrierPhaseMeasurementElement-r18

NR-Multi-RTT-CarrierPhaseMeasurementElement-r18 ::= SEQUENCE {

 nr-TimeStampRSCP-r18 NR-TimeStamp-r16,

 nr-RSCP-r18 INTEGER (0..3600),

 nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL,

 ...

}

-- Editor Notes:

-- 1.the number of report CarrierPhaseMeasurementElement is no more FFS, agreement from RAN1 indicates 4.

-- 2.the additional measurements including RSCP is FFS, waiting for RAN1 reply LS.

-- ASN1STOP

| Conditional presence | Explanation |
| --- | --- |
| *Case2-3* | The field is mandatory present if the IE *NR-UE-RxTx-TEG-Info* is provided for choice's *case2* and *case3*. Otherwise it is not present. |
| *TEGCase3* | The field is optionally present, need OP, if the IE *NR-UE-RxTx-TEG-Info* is provided for choice *case3*. Otherwise it is not present. |
| *TEGCase2-3* | The field is optionally present, need OP, if the IE *NR-UE-RxTx-TEG-Info* is provided for choice's *case2* and *case3*. Otherwise it is not present. |
| *TEGCase1-2* | The field is optionally present, need OP, if the IE *NR-UE-RxTx-TEG-Info* is provided for choice's *case1* and *case2*. Otherwise it is not present. |

|  |
| --- |
| *NR-Multi-RTT-SignalMeasurementInformation* field descriptions |
| ***nr-NTA-Offset***This field provides the *NTAoffset* used by the target device as specified in TS 38.133 [46], Table 7.1.2-2. Enumerated values nTA1, nTA2, nTA3, and nTA4 correspond to *NTAoffset* of 25600 Tc, 0 Tc, 39936 Tc, and 13792 Tc, respectively. |
| ***nr-SRS-TxTEG-Set***This field provides the SRS for Positioning Resources associated with a particular UE Tx TEG and comprises the following subfields:- ***nr-TimeStamp*** specifies the start time for which the *NR-SRS-TxTEG-Element* is valid. If this field is absent, the *nr-TimeStamp* of this instance of the *NR-SRS-TxTEG-Element* of the *nr-SRS-TxTEG-Set* is the same as the *nr-TimeStamp* of the previous instance of the *NR-SRS-TxTEG-Element*. If this field is also absent in the first *NR-SRS-TxTEG-Element* of the *nr-SRS-TxTEG-Set*, all *NR-SRS-TxTEG-Element*'s provided are valid for the measurement period of the *NR-Multi-RTT-SignalMeasurementInformation.*- ***nr-UE-Tx-TEG-ID*** specifies the ID of this UE Tx TEG.- ***carrierFreq*** specifies the frequency of the SRS for positioning resources.- ***srs-PosResourceList*** specifies the SRS for Positioning Resources belonging to this UE Tx TEG.For each UE Tx TEG, there may be up to 8 changes (different *nr-TimeStamp*) of the TEG-SRS association information provided in *nr-SRS-TxTEG-Set*, i.e., the maximum value for *maxTxTEG-Sets* is 64. |
| ***nr-UE-RxTEG-TimingErrorMargin***This field specifies the UE Rx TEG timing error margin value for all the UE Rx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case3* and this field is absent, the receiver should consider the UE Rx TEG timing error margin value to be the maximum value available in IE *TEG-TimingErrorMargin*. |
| ***nr-UE-TxTEG-TimingErrorMargin***This field specifies the UE Tx TEG timing error margin value for all the UE Tx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case2* or *case3* and this field is absent, the receiver should consider the UE Tx TEG timing error margin value to be the maximum value available in IE *TEG-TimingErrorMargin*. |
| ***nr-UE-RxTxTEG-TimingErrorMargin***This field specifies the UE RxTx TEG timing error margin value for all the UE RxTx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case1* or *case2* and this field is absent, the receiver should consider the UE RxTx TEG timing error margin value to be the maximum applicable value as defined in TS 38.133 [46]. |
| ***nr-TimeStampRSCP***This field specifies the time instance at which the RSCP measurement is performed. |
| ***nr-RSCP***This field specifies the NR DL reference signal carrier phase measurement, as defined in TS 38.215 [36]. Mapping of the measured quantity is defined as in TS 38.133 [46]. |
| ***nr-PhaseQuality***This field specifies the target device′s best estimate of the quality of the RSCP measurement. |
| ***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]. |
| ***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*. |
| ***nr-UE-RxTxTimeDiff***This field specifies the UE Rx–Tx time difference measurement, as defined in TS 38.215 [36].  |
| ***nr-AdditionalPathList***This field specifies one or more additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-UE-RxTxTimeDiff* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. If this field is present, the field *nr-AdditionalPathListExt* shall be absent. |
| ***nr-TimeStamp***This field specifies the time instance for which the measurement is performed. |
| ***nr-TimingQuality***This field specifies the target device′s best estimate of the quality of the measurement. |
| ***nr-DL-PRS-RSRP-Result***This field specifies the NR DL-PRS reference signal received power (DL PRS-RSRP) measurement, as defined in TS 38.215 [36]. The mapping of the quantity is defined as in TS 38.133 [46]. |
| ***nr-Multi-RTT-AdditionalMeasurements***This field provides up to 3 additional UE Rx-Tx time difference measurements corresponding to a single configured SRS Resource or Resource Set for positioning. Each measurement corresponds to a single received DL-PRS Resource or DL-PRS Resource Set [45].If this field is present, the field *nr-Multi-RTT-AdditionalMeasurementsExt* shall be absent. |
| ***nr-UE-RxTx-TEG-Info***This field provides the ID(s) of the UE TEG associated with the *nr-UE-RxTxTimeDiff* or*nr-UE-RxTxTimeDiffAdditional* measurement. One of the following combinations of TEG IDs can be provided:- ***case1*** provides the UE RxTx TEG ID;- ***case2*** provides the UE RxTx TEG ID together with the UE Tx TEG ID. The *nr-UE-Tx-TEG-Index* provides the index to the *nr-SRS-TxTEG-Set* field for the applicable UE Tx TEG ID, where value '1' indicates the first *NR-SRS-TxTEG-Element* in *nr-SRS-TxTEG-Set*, value '2' indicates the second *NR-SRS-TxTEG-Element* in *nr-SRS-TxTEG-Set*, and so on;- ***case3*** provides the UE Rx TEG ID together with the UE Tx TEG ID. The *nr-UE-Tx-TEG-Index* provides the index to the *nr-SRS-TxTEG-Set* field for the applicable UE Tx TEG ID, where value '1' indicates the first *NR-SRS-TxTEG-Element* in *nr-SRS-TxTEG-Set*, value '2' indicates the second *NR-SRS-TxTEG-Element* in *nr-SRS-TxTEG-Set*, and so on. |
| ***nr-DL-PRS-FirstPathRSRP-Result***This field specifies the NR DL PRS reference signal received path power (DL PRS-RSRPP) of the first detected path in time, as defined in TS 38.215 [36]. The mapping of the measured quantity is defined as in TS 38.133 [46]. |
| ***nr-los-nlos-Indicator***This field specifies the target device's best estimate of the LOS or NLOS of the UE Rx-Tx Time Difference, RSRP or RSRPP of first path measurement for the TRP or resource.NOTE: If the requested type or granularity in *nr-los-nlos-IndicatorRequest* is not possible, the target device may provide a different type and granularity for the estimated *LOS-NLOS-Indicator.* |
| ***nr-AdditionalPathListExt***This field provides up to 8 additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-UE-RxTxTimeDiff* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. If this field is present, the field *nr-AdditionalPathList* shall be absent. |
| ***nr-Multi-RTT-AdditionalMeasurementsExt***This field, in addition to the measurements provided in *NR-Multi-RTT-MeasElement*, provides UE Rx-Tx time difference measurements of up to 4 DL-PRS Resources of a TRP with different UE RxTx or UE Rx TEGs. For a certain DL-PRS Resource, there can be up to 8 measurement results with respect to different UE RxTx or UE Rx TEGs. If this field is present, the field *nr-Multi-RTT-AdditionalMeasurements* shall be absent. |
| ***nr-DL-PRS-RSRP-ResultDiff***This field provides the additional DL-PRS RSRP measurement result relative to *nr-DL-PRS-RSRP-Result.* The DL-PRS RSRP value of this measurement is obtained by adding the value of this field to the value of the *nr-DL-PRS-RSRP-Result*. The mapping of this field is defined as in TS 38.133 [46]. |
| ***nr-UE-RxTxTimeDiffAdditional***This field provides the additional UE Rx-Tx Difference measurement result relative to *nr-UE-RxTxTimeDiff.* The UE Rx-Tx Difference value of this measurement is obtained by adding the value of this field to the value of the *nr-UE-RxTxTimeDiff* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-DL-PRS-FirstPathRSRP-ResultDiff***This field specifies the additional NR DL-PRS reference signal received path power (DL PRS-RSRPP) of the first detected path in time relative to *nr-DL-PRS-FirstPathRSRP-Result*. The DL-PRS RSRPP of first path value of this measurement is obtained by adding the value of this field to the value of the *nr-DL-PRS-FirstPathRSRP-Result* field. The mapping of the field is defined in TS 38.133 [46]. |
| ***nr-los-nlos-IndicatorPerResource***This field specifies the target device's best estimate of the LOS or NLOS of the UE Rx-Tx Time Difference, RSRP or RSRPP of first path measurement for the resource.This field may only be present if the field *nr-LOS-NLOS-Indicator* choice indicates *perResource*. |

#### 6.5.12.5 NR Multi-RTT Location Information Request

#### – *NR-Multi-RTT-RequestLocationInformation*

The IE *NR-Multi-RTT-RequestLocationInformation* is used by the location server to request NR Multi-RTT location measurements from a target device.

-- ASN1START

NR-Multi-RTT-RequestLocationInformation-r16 ::= SEQUENCE {

 nr-UE-RxTxTimeDiffMeasurementInfoRequest-r16

 ENUMERATED { true } OPTIONAL, -- Need ON

 nr-RequestedMeasurements-r16 BIT STRING { prsrsrpReq (0),

 firstPathRsrpReq-r17 (1) } (SIZE(1..8)),

 nr-AssistanceAvailability-r16 BOOLEAN,

 nr-Multi-RTT-ReportConfig-r16 NR-Multi-RTT-ReportConfig-r16,

 additionalPaths-r16 ENUMERATED { requested } OPTIONAL, -- Need ON

 ...,

 [[

 nr-UE-RxTxTEG-Request-r17 ENUMERATED { case1, case2, case3, ... }

 OPTIONAL, -- Need ON

 measureSameDL-PRS-ResourceWithDifferentRxTxTEGs-r17

 ENUMERATED { n0, n2, n3, n4, n6, n8, ... }

 OPTIONAL, -- Need ON

 measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17

 ENUMERATED { n0, n2, n3, n4, n6, n8, ... }

 OPTIONAL, -- Need ON

 reducedDL-PRS-ProcessingSamples-r17

 ENUMERATED { requested, ... } OPTIONAL, -- Need ON

 nr-los-nlos-IndicatorRequest-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType1-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity1-r17,

 ...

 } OPTIONAL, -- Need ON

 additionalPathsExt-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 additionalPathsDL-PRS-RSRP-Request-r17

 ENUMERATED { requested } OPTIONAL, -- Need ON

 multiMeasInSameReport-r17 ENUMERATED { requested } OPTIONAL, -- Need ON

 lowerRxBeamSweepingFactor-FR2-r17 ENUMERATED { requested } OPTIONAL -- Need ON

 ]],

 [[

 nr-UE-RSCP-Request-r18 ENUMERATED { requested } OPTIONAL, -- Need ON

 nr-IndicatedResourceSetAndTimeWindow-r18 NR-IndicatedResourceSetAndTimeWindow-r18 OPTIONAL -- Need ON

 ]]

}

NR-Multi-RTT-ReportConfig-r16 ::= SEQUENCE {

 maxDL-PRS-RxTxTimeDiffMeasPerTRP-r16 INTEGER (1..4) OPTIONAL, -- Need ON

 timingReportingGranularityFactor-r16 INTEGER (0..5) OPTIONAL -- Need ON

}

-- ASN1STOP

|  |
| --- |
| *NR-Multi-RTT-RequestLocationInformation* field descriptions |
| ***nr-UE-RxTxTimeDiffMeasurementInfoRequest***This field, if present, indicates that the target device is requested to report the DL-PRS Resource ID(s) or DL-PRS Resource Set ID(s) associated with the DL-PRS Resources(s) or the DL-PRS Resource Set(s) which are used in determining the UE Rx-Tx time difference measurements. |
| ***nr-AssistanceAvailability***This field indicates whether the target device may request additional PRS assistance data from the server. TRUE means allowed and FALSE means not allowed. |
| ***maxDL-PRS-RxTxTimeDiffMeasPerTRP***This field specifies the maximum number of UE-Rx-Tx time difference measurements for different DL-PRS Resources or DL-PRS Resource Sets per TRP.  |
| ***timingReportingGranularityFactor***This field specifies the recommended reporting granularity for the UE Rx-Tx time difference measurements. Value (0..5) corresponds to (*k0*..*k5*) used for *nr-UE-RxTxTimeDiff* and *nr-UE-RxTxTimeDiffAdditional* in *NR-Multi-RTT-MeasElement*. The UE may select a different granularity value for *nr-UE-RxTxTimeDiff* and *nr-UE-RxTxTimeDiffAdditional*. |
| ***additionalPaths***This field, if present, indicates that the target device is requested to provide the *nr-AdditionalPathList* in IE *NR-Multi-RTT-SignalMeasurementInformation*. If this field is present, the field *additionalPathsExt* shall be absent. |
| ***nr-UE-RxTxTEG-Request***This field, if present, indicates that the target device is requested to provide the *NR-UE-RxTx-TEG-Info* in IE *NR-Multi-RTT-SignalMeasurementInformation.* Enumerated value '*case1*' indicates that the target device is requested to provide the *case1* choice in *NR-UE-RxTx-TEG-Info*, enumerated value '*case2*' indicates that the target device is requested to provide the *case2* choice in *NR-UE-RxTx-TEG-Info*, and so on. |
| ***measureSameDL-PRS-ResourceWithDifferentRxTxTEGs***This field, if present, indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with *N* different UE RxTx TEGs and with the same UE Tx TEG. Enumerated value '*n0*' indicates that the number *N* of different UE RxTx TEGs to measure the same DL PRS Resource can be determined by the target device, value '*n2*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 2 different UE RxTx TEGs, value '*n3*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 3 different UE RxTx TEGs, and so on.If this field is present, the field *nr-UE-RxTxTEG-Request* should also be present.If this field is present, the field *measureSameDL-PRS-ResourceWithDifferentRxTEGs* should not be present. |
| ***measureSameDL-PRS-ResourceWithDifferentRxTEGs***This field, if present, indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with *N* different UE Rx TEGs. Enumerated value '*n0*' indicates that the number *N* of different UE Rx TEGs to measure the same DL PRS Resource can be determined by the target device, value '*n2*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 2 different UE Rx TEGs, value '*n3*' indicates that the target device is requested to measure the same DL-PRS Resource of a TRP with 3 different UE Rx TEGs, and so on.If this field is present, the field *nr-UE-RxTxTEG-Request* should also be present.If this field is present, the field *measureSameDL-PRS-ResourceWithDifferentRxTxTEGs* should not be present. |
| ***reducedDL-PRS-ProcessingSamples***This field, if present and set to '*requested*', indicates that the target device is requested to perform the requested measurements with reduced number of samples (M=1 or M=2) as specified in TS 38.133 [46]. |
| ***nr-los-nlos-IndicatorRequest***This field, if present, indicates that the target device is requested to provide the indicated type and granularity of the estimated *LOS-NLOS-Indicator* in the *NR-Multi-RTT-SignalMeasurementInformation*.  |
| ***additionalPathsExt***This field, if present, indicates that the target device is requested to provide the *nr-AdditionalPathListExt* in IE *NR-Multi-RTT-SignalMeasurementInformation*. If this field is present, the field *additionalPaths* shall be absent. |
| ***additionalPathsDL-PRS-RSRP-Request***This field, if present, indicates that the target device is requested to provide the *nr-DL-PRS-RSRPP* for the additional paths in the field *nr-AdditionalPathList* or *nr-AdditionalPathListExt*.  |
| ***multiMeasInSameReport***This field, if present, indicates that the target device is requested to provide multiple measurement instances in a single measurement report; i.e., include the *nr-Multi-RTT-SignalMeasurementInstances* in IE *NR-Multi-RTT-ProvideLocationInformation.* |
| ***lowerRxBeamSweepingFactor-FR2***This field, if present, indicates that the target device is requested to use a lower Rx beam sweeping factor than 8 for FR2 according to UE's capability. |
| ***nr-UE-RSCP-Request***This field, if present, indicates that the device is requested to provide the DL RSCP measurementin IE *NR-Multi-RTT-SignalMeasurementInformation* together with *nr-UE-RxTxTimeDiff.* |

#### 6.5.12.6 NR Multi-RTT Capability Information

#### – *NR-Multi-RTT-ProvideCapabilities*

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

-- ASN1START

NR-Multi-RTT-ProvideCapabilities-r16 ::= SEQUENCE {

 nr-Multi-RTT-PRS-Capability-r16 NR-DL-PRS-ResourcesCapability-r16,

 nr-Multi-RTT-MeasurementCapability-r16 NR-Multi-RTT-MeasurementCapability-r16,

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

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

 nr-UL-SRS-Capability-r16 NR-UL-SRS-Capability-r16,

 additionalPathsReport-r16 ENUMERATED { supported } OPTIONAL,

 periodicalReporting-r16 ENUMERATED { supported } OPTIONAL,

 ...,

 [[

 ten-ms-unit-ResponseTime-r17 ENUMERATED { supported } OPTIONAL,

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

 eAoA (1)

 } (SIZE (1..8)) OPTIONAL, nr-Multi-RTT-On-Demand-DL-PRS-Support-r17

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

 nr-UE-RxTx-TEG-ID-ReportingSupport-r17 BIT STRING { case1 (0),

 case2 (1),

 case3 (2)

 } (SIZE (1..8)) 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 ScheduledLocationTimeSupport-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

 ]],

 [[

 symbolTimeStampSupport-r18 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

| *NR-Multi-RTT-ProvideCapabilities* field descriptions |
| --- |
| ***ten-ms-unit-ResponseTime***This field, if present, indicates that the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. |
| ***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-Multi-RTT-On-Demand-DL-PRS-Support***This field, if present, indicates that the target device supports on-demand DL-PRS requests. |
| ***nr-UE-RxTx-TEG-ID-ReportingSupport***This field, if present, indicates that the target device supports *nr-UE-RxTx-TEG-Info* reporting in IE *NR-Multi-RTT-SignalMeasurementInformation.* This is represented by a bit string, with a one‑value at the bit position means the particular case is supported; a zero‑value means not supported:- bit 0indicates that the target device supports the '*case1*' choice in *NR-UE-RxTx-TEG-Info*.- bit 1 indicates that the target device supports the '*case2*' choice in *NR-UE-RxTx-TEG-Info*.- bit 2 indicates that the target device supports the '*case3*' choice in *NR-UE-RxTx-TEG-Info*.  |
| ***nr-los-nlos-IndicatorSupport***This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-Multi-RTT-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-Multi-RTT-SignalMeasurementInformation*. The enumerated value indicates the number of additional paths supported by the target device.NOTE: The *supportOfDL-PRS-FirstPathRSRP* in IE *NR-Multi-RTT-MeasurementCapability* also applies to the additional paths. |
| ***scheduledLocationRequestSupported***This field, if present, indicates that 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. |
| ***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]. |
| ***symbolTimeStampSupport***This field, if present, indicates that the target device supports reporting timestamp in terms of radio frame timing down to OFDM symbol level. |

*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* |
| *posSibType6-x* | *NR-PRU-DL-Info* |
| On-demand DL-PRS Configurations (clause 6.4.3) | *posSibType6-6* | *NR-On-Demand-DL-PRS-Configurations* |

*END OF CHANGE*