**3GPP TSG-RAN WG2 Meeting #119bis-e *R2-2210904***

**Electronic, October 10 – 19, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **37.355** | **CR** | **0386** | **rev** | **-** | **Current version:** |  |  |
|  | | | | | | | | |
| *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:*** | Various LPP Corrections | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorporated (Rapporteur) | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh-Core | | | | |  | ***Date:*** | | | 2022-10-14 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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 can be 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. A UE should declare PRS processing capabilities for each of the supported PPW Type (Type-1A, Type-1B, Type-2) in the case the UE supports multiple PPW types in a band. 2. The Note "A single value is reported when both Multi-RTT and DL-TDOA are supported." for the *nr-los-nlos-IndicatorSupport* is missing in *NR-DL-TDOA-ProvideCapabilities* and *NR-Multi-RTT-ProvideCapabilities.* 3. The Note "A single value is reported when both Multi-RTT and DL-TDOA are supported." in the field description for *nr-los-nlos-AssistanceDataSupport* in *NR-DL-TDOA-ProvideCapabilities, NR-DL-AoD-ProvideCapabilities,* and *NR-Multi-RTT-ProvideCapabilities* is not correct, since UE-based mode is not supported for Multi-RTT and the Note is only applicable to DL-TDOA and Multi-RTT. 4. Release 17 introduced RSRPP, which is not reflected as a measurement option in the definition of *nr-DL-PRS-RxBeamIndex*. 5. Release 17 introduced RSRPP, which necessitated the addition of *nr-DL-PRS-FirstPathRSRP-Result-Diff-r17* in *NR-DL-AoD-AdditionalMeasurementElement-r17*. The fields *nr-Dl-PRS-RSRP-ResultDiff-r17* and *nr-Dl-PRS-FirstPathRSRP-ResultDiff-r17* are optional, conditional on the presence of the other. Because the release 16 specification does not define RSRPP, the conditional presence explanations are vague with regard to *NR-DL-AoD-AdditionalMeasurementElement-r16*, where *nr-DL-PRS-RSRP-ResultDiff-r16* is mandatory. 6. *nr-DL-PRS-RxBeamIndex* indication is used for DL-PRS measurements only when additional DL-PRS measurements are also included and all these DL-PRS measurements are associated with a single TRP (up to 8 measurements in Rel-16 or 24 measurements in Rel-17). 7. According to 38.214 v17.3.0, section 5.1.6.5   *"The UE may be configured to measure and report, subject to UE capability, up to 24 DL PRS-RSRP measurements on DL PRS resources associated with the same dl-PRS-ID”. <…>. The UE may be configured to measure and optionally report, subject to UE capability, up to 24 DL PRS RSRPP for the first detected path on DL PRS resources associated with the same dl-PRS-ID"*.  This means both the *nr-DL-AoD-AdditionalMeasurements-r16* and *nr-DL-AoD-AdditionalMeasurementsExt-r17* fields cannot be included by the UE at the same time because the total reported measurements would exceed 24 in Rel-17.   1. RAN1 has made the agreement on the maximum number of SRS and TEG association reports in a measurement instance:   *Agreement in RAN1#109-e:*  *Include the following in the reply LS to RAN4, RAN2, RAN3:*  *In RAN1’s understanding, each measurement instance may allow up to 8 reports (or changes) of the TEG-SRS association information for each TEG ID.*  Therefore, the maximum number of TEG-SRS association information per measurement instance can be up to 8\*8=64. However, *maxTxTEG-Sets-r17* has the value 256. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. It is clarified in the field description for *prs-ProcessingCapabilityOutsideMGinPPW* that the DL-PRS Processing Capability outside MG is provided for each supported PPW Type. 2. The Note "A single value is reported when both Multi-RTT and DL-TDOA are supported." is added to the field description for the *nr-los-nlos-IndicatorSupport* in *NR-DL-TDOA-ProvideCapabilities* and *NR-Multi-RTT-ProvideCapabilities.* 3. The Note "A single value is reported when both Multi-RTT and DL-TDOA are supported." in the field description for *nr-los-nlos-AssistanceDataSupport* in *NR-DL-TDOA-ProvideCapabilities, NR-DL-AoD-ProvideCapabilities,* and *NR-Multi-RTT-ProvideCapabilities* is deleted. 4. In 6.5.11.4, *NR-DL-AoD-SignalMeasurementInformation* field descriptions, add DL-PRS RSRPP measurements to the types of measurements that, exceeding 2, require the *nr-DL-PRS-RxBeamIndex* field to be present. 5. In 6.5.11.4, *NR-DL-AoD-SignalMeasurementInformation*, conditional presence explanations, the fields *nr-DL-PRS-FirstPathRSRP-ResultDiff* and *nr-DL-PRS-RSRP-Result* diff should be appended with -r17 to increase clarity of the conditions. 6. In 6.5.11.4, *NR-DL-AoD-SignalMeasurementInformation*, clarify the field description for *nr-DL-PRS-RxBeamIndex* that it is used for DL-PRS measurements only when additional DL-PRS measurements are also included and all DL-PRS measurements are associated with a single TRP. 7. In 6.5.11.4, *NR-DL-AoD-SignalMeasurementInformation*, add field descriptions for *nr-DL-AoD-AdditionalMeasurements-r16* and clarify that only one of *nr-DL-AoD-AdditionalMeasurements-r16* or *nr-DL-AoD-AdditionalMeasurementsExt-r17* field can be included by the UE in the measurement report. 8. It is clarified in the field description for *nr-SRS-TxTEG-Set* in *NR-Multi-RTT-SignalMeasurementInformation* that the maximum value is 64.   It is clarified in the ASN that the max. applicable value for *maxTxTEG-Sets* is 64.   1. Misc. editorial corrections   **Impact analysis**  **1.-3.**  **Impacted functionality:**  UE Capability Reporting  **Inter-operability:**  If the network is implemented according to the CR and the UE is not, there are no interoperability problems.  If the UE is implemented according to the CR and the network is not, there are no interoperability problems.  **4.-7. Impacted functionality:**  NR DL-AOD Measurement Reporting  **Inter-operability:**  If the network is implemented according to the CR and the UE is not, an error might occur when the UE neglects to send the *nr-DL-PRS-RxBeamIndex-r17* when sending two or more RSRPP measurements.  If the UE is implemented according to the CR and the network is not, an error might occur if the UE sends an unsolicited *nr-DL-PRS-RxBeamIndex-r17* when sending two or more RSRPP measurements.  **8.**  **Impacted functionality:**  Number of SRS and TEG association reports  **Inter-operability:**  If the network is implemented according to the CR and the UE is not, an error might occur if the UE sends more than 64 SRS-TEG associations.  If the UE is implemented according to the CR and the network is not, there are no interoperability problems. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | 1.-3. The description is not aligned with RAN1 feature list.  4.-7. Specification is ambiguous about the usage of n*r-DL-PRS-RxBeamIndex* and *nr-DL-AoD-AdditionalMeasurements-r16* fields.  Without clarification to the conditional presence definitions, the definitions are in conflict with the -r16 message.  8. Applicable number for *nr-SRS-TxTEG-Set* is unclear/not aligned with RAN1 agreement. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.4.3, 6.5.10.6, 6.5.11.4, 6.5.11.6, 6.5.11.6a, 6.5.12.4, 6.5.12.6, 6.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

### 6.4.3 Common NR Positioning Information Elements

#### *– NR-DL-PRS-ProcessingCapability*

The IE *NR-DL-PRS-ProcessingCapability* defines the common DL-PRS Processing capability. In the case of capabilities for multiple NR positioning methods are provided, the IE *NR-DL-PRS-ProcessingCapability* applies across the NR positioning methods and the target device shall indicate the same values for the capabilities in IEs *NR-DL-TDOA-ProvideCapabilities*, *NR-DL-AoD-ProvideCapabilities*, and *NR-Multi-RTT-ProvideCapabilities*.

The *PRS-ProcessingCapabilityPerBand* is defined for a single positioning frequency layer on a certain band (i.e., a target device supporting multiple positioning frequency layers is expected to process one frequency layer at a time).

-- ASN1START

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

prs-ProcessingCapabilityBandList-r16 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

PRS-ProcessingCapabilityPerBand-r16,

maxSupportedFreqLayers-r16 INTEGER (1..4),

simulLTE-NR-PRS-r16 ENUMERATED { supported } OPTIONAL,

...,

[[

dummy ENUMERATED { m1, m2, ... } OPTIONAL

]]

}

PRS-ProcessingCapabilityPerBand-r16 ::= SEQUENCE {

freqBandIndicatorNR-r16 FreqBandIndicatorNR-r16,

supportedBandwidthPRS-r16 CHOICE {

fr1 ENUMERATED {mhz5, mhz10, mhz20, mhz40,

mhz50, mhz80, mhz100},

fr2 ENUMERATED {mhz50, mhz100, mhz200, mhz400},

...

},

dl-PRS-BufferType-r16 ENUMERATED {type1, type2, ...},

durationOfPRS-Processing-r16 SEQUENCE {

durationOfPRS-ProcessingSymbols-r16 ENUMERATED {nDot125, nDot25, nDot5, n1,

n2, n4, n6, n8, n12, n16, n20, n25,

n30, n32, n35, n40, n45, n50},

durationOfPRS-ProcessingSymbolsInEveryTms-r16

ENUMERATED {n8, n16, n20, n30, n40, n80,

n160,n320, n640, n1280},

...

},

maxNumOfDL-PRS-ResProcessedPerSlot-r16 SEQUENCE {

scs15-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

scs30-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

scs60-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

scs120-r16 ENUMERATED {n1, n2, n4, n8, n16, n24, n32,

n48, n64} OPTIONAL,

...

},

...,

[[

supportedDL-PRS-ProcessingSamples-RRC-CONNECTED-r17 ENUMERATED { supported } OPTIONAL,

prs-ProcessingWindowType1A-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

prs-ProcessingWindowType1B-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

prs-ProcessingWindowType2-r17 ENUMERATED { option1, option2, option3} OPTIONAL,

prs-ProcessingCapabilityOutsideMGinPPW-r17

SEQUENCE (SIZE(1..3)) OF

PRS-ProcessingCapabilityOutsideMGinPPWperType-r17

OPTIONAL,

dl-PRS-BufferType-RRC-Inactive-r17 ENUMERATED { type1, type2, ... } OPTIONAL,

durationOfPRS-Processing-RRC-Inactive-r17 SEQUENCE {

durationOfPRS-ProcessingSymbols-r17 ENUMERATED {nDot125, nDot25, nDot5, n1,

n2, n4, n6, n8, n12, n16, n20, n25,

n30, n32, n35, n40, n45, n50},

durationOfPRS-ProcessingSymbolsInEveryTms-r17

ENUMERATED {n8, n16, n20, n30, n40, n80,

n160,n320, n640, n1280},

...

} OPTIONAL,

maxNumOfDL-PRS-ResProcessedPerSlot-RRC-Inactive-r17 SEQUENCE {

scs15-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs30-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs60-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

scs120-r17 ENUMERATED {n1, n2, n4, n6, n8, n12, n16, n24,

n32, n48, n64} OPTIONAL,

...

} OPTIONAL,

supportedLowerRxBeamSweepingFactor-FR2-r17 ENUMERATED { n1, n2, n4, n6 } OPTIONAL

]],

[[

supportedDL-PRS-ProcessingSamples-RRC-Inactive-r17 ENUMERATED { supported } OPTIONAL

]]

}

PRS-ProcessingCapabilityOutsideMGinPPWperType-r17 ::= SEQUENCE {

prsProcessingType-r17 ENUMERATED { type1A, type1B, type2 },

ppw-dl-PRS-BufferType-r17 ENUMERATED { type1, type2, ... },

ppw-durationOfPRS-Processing1-r17 SEQUENCE {

ppw-durationOfPRS-ProcessingSymbolsN-r17

ENUMERATED { msDot125, msDot25, msDot5, ms1, ms2, ms4,

ms6, ms8, ms12, ms16, ms20, ms25, ms30, ms32, ms35,

ms40, ms45, ms50 },

ppw-durationOfPRS-ProcessingSymbolsT-r17

ENUMERATED { ms1, ms2, ms4, ms8, ms16, ms20, ms30, ms40, ms80,

ms160, ms320, ms640, ms1280 }

} OPTIONAL,

ppw-durationOfPRS-Processing2-r17 SEQUENCE {

ppw-durationOfPRS-ProcessingSymbolsN2-r17

ENUMERATED { msDot125, msDot25, msDot5, ms1, ms2, ms3, ms4, ms5,

ms6, ms8, ms12 },

ppw-durationOfPRS-ProcessingSymbolsT2-r17

ENUMERATED { ms4, ms5, ms6, ms8 }

} OPTIONAL,

ppw-maxNumOfDL-PRS-ResProcessedPerSlot-r17 SEQUENCE {

scs15-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 }

OPTIONAL,

scs30-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 }

OPTIONAL,

scs60-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 }

OPTIONAL,

scs120-r17 ENUMERATED {n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 }

OPTIONAL,

...

},

...,

[[

ppw-maxNumOfDL-Bandwidth-r17 CHOICE {

fr1 ENUMERATED {mhz5, mhz10, mhz20, mhz40,

mhz50, mhz80, mhz100},

fr2 ENUMERATED {mhz50, mhz100, mhz200, mhz400}

} OPTIONAL

]]

}

-- ASN1STOP

| *NR-DL-PRS-ProcessingCapability* field descriptions |
| --- |
| ***maxSupportedFreqLayers***  Indicates the maximum number of positioning frequency layers supported by UE. |
| ***simulLTE-NR-PRS***  Indicates whether the UE supports parallel processing of LTE PRS and NR PRS. |
| ***dummy***  This field is not used in the specification. If received it shall be ignored by the receiver. |
| ***supportedBandwidthPRS***  Indicates the maximum number of DL-PRS bandwidth in MHz, which is supported and reported by UE. |
| ***dl-PRS-BufferType***  IndicatesDL-PRS buffering capability. Value *type1* indicates sub-slot/symbol level buffering and value *type2* indicates slot level buffering. |
| ***durationOfPRS-Processing***  Indicates the duration *N* of DL-PRS symbols in units of ms a UE can process every T ms assuming maximum DL-PRS bandwidth provided in *supportedBandwidthPRS* and comprises the following subfields:  - ***durationOfPRS-ProcessingSymbols***: This field specifies the values for *N*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 4, 8, 12, 16, 20, 25, 30, 35, 40, 45, 50 ms.  - ***durationOfPRS-ProcessingSymbolsInEveryTms***: This field specifies the values for *T*. Enumerated values indicate 8, 16, 20, 30, 40, 80, 160, 320, 640, 1280 ms.  See NOTE. |
| ***maxNumOfDL-PRS-ResProcessedPerSlot***  Indicates the maximum number of DL-PRS resources that UE can process in a slot. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands. |
| ***supportedDL-PRS-ProcessingSamples-RRC-CONNECTED***  Indicates the UE capability for support of measurements based on measuring M=1 or M=2 (instances) of a DL-PRS Resource Set. The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field.  NOTE: This feature is supported for both UE-assisted and UE based positioning. |
| ***prs-ProcessingWindowType1A***  Indicates the supported DL-PRS processing types subject to the UE determining that DL-PRS to be higher priority for DL-PRS measurement outside MG and in a DL-PRS Processing Window.  Type 1A refers to the determination of prioritization between DL-PRS and other DL signals/channels in all OFDM symbols within the PRS Processing Window. The DL signals/channels from all DL CCs (per UE) are affected across LTE and NR. Enumerated value indicates supported priority handing options of DL-PRS:  - *option1*: UE indicates support of two priority states.  - State 1: DL-PRS is higher priority than all PDCCH/PDSCH/CSI-RS  - State 2: DL-PRS is lower priority than all PDCCH/PDSCH/CSI-RS  - *option2*: UE indicates support of three priority states  - State 1: DL-PRS is higher priority than all PDCCH/PDSCH/CSI-RS  - State 2: DL-PRS is lower priority than PDCCH and URLLC PDSCH and higher priority than other PDSCH/CSI-RS  Note: The URLLC channel corresponds a dynamically scheduled PDSCH whose PUCCH resource for carrying ACK/NAK is marked as high-priority.  - State 3: DL-PRS is lower priority than all PDCCH/PDSCH/CSI-RS  - *option3*: UE indicates support of single priority state  - State 1: DL-PRS is higher priority than all PDCCH/PDSCH/CSI-RS  The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field.  NOTE: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP. |
| ***prs-ProcessingWindowType1B***  Indicates the supported DL-PRS processing types subject to the UE determining that DL-PRS to be higher priority for DL-PRS measurement outside MG and in a DL-PRS Processing Window.  Type 1B refers to the determination of prioritization between DL-PRS and other DL signals/channels in all OFDM symbols within the PRS processing window. The DL signals/channels from a certain band are affected. Enumerated value indicates supported priority handing options of DL-PRS (see *prs-ProcessingWindowType1A*).  The UE can include this field only if the UE supports prs-ProcessingCapabilityBandList. Otherwise, the UE does not include this field.  NOTE: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP. |
| ***prs-ProcessingWindowType2***  Indicates the supported DL-PRS processing types subject to the UE determining that DL-PRS to be higher priority for DL-PRS measurement outside MG and in a DL-PRS Processing Window.  Type 2 refers to the determination of prioritization between DL-PRS and other DL signals/channels only in DL-PRS symbols within the PRS processing window. Enumerated value indicates supported priority handing options of DL-PRS (see *prs-ProcessingWindowType1A*).  The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field.  NOTE: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP. |
| ***prs-ProcessingCapabilityOutsideMGinPPW***  Indicates the DL-PRS Processing Capability outside MG of each of the supported PPW Type in the case the UE supports multiple PPW Types in a band and comprises the following subfields:  - ***prsProcessingType***: Indicates the DL-PRS Processing Window Type for which the *prs-ProcessingCapabilityOutsideMGinPPW* are provided.  - ***ppw-dl-PRS-BufferType***: Indicates DL-PRS buffering capability. Value '*type1'* indicates sub-slot/symbol level buffering and value '*type2'* indicates slot level buffering.  - ***ppw-durationOfPRS-Processing1***: Indicates the duration of DL-PRS symbols N in units of ms a UE can process every T ms assuming maximum DL-PRS bandwidth provided in *ppw-maxNumOfDL-Bandwidth* and comprises the following subfields:  - ***ppw-durationOfPRS-ProcessingSymbolsN***: This field specifies the values for *N*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, 25, 30, 32, 35, 40, 45, 50 ms.  - ***ppw-durationOfPRS-ProcessingSymbolsT***: This field specifies the values for *T*. Enumerated values indicate 1, 2, 4, 8, 16, 20, 30, 40, 80, 160, 320, 640, 1280 ms.  - ***ppw-durationOfPRS-Processing2***: Indicates the duration of DL-PRS symbols N2 in units of ms a UE can process inT2 ms assuming maximum DL-PRS bandwidth provided in *ppw-maxNumOfDL-Bandwidth* and comprises the following subfields:  - ***ppw-durationOfPRS-ProcessingSymbolsN2***: This field specifies the values for *N2*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 3, 4, 5, 6, 8, 12 ms.  - ***ppw-durationOfPRS-ProcessingSymbolsT2***: This field specifies the values for *T2*. Enumerated values indicate 4, 5, 6, 8 ms.  - ***ppw-maxNumOfDL-PRS-ResProcessedPerSlot:*** Indicates the maximum number of DL-PRS resources that UE can process in a slot. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands.  - ***ppw-maxNumOfDL-Bandwidth:*** Indicates the maximum number of DL PRS bandwidth in MHz, which is supported and reported by UE for PRS measurement outside MG within the PPW.  The UE can include this field only if the UE supports one of *prs-ProcessingWindowType1A*, *prs-ProcessingWindowType1B* and *prs-ProcessingWindowType2*. Otherwise, the UE does not include this field.  NOTE: A UE that supports one of *prs-ProcessingWindowType1*, *prs-ProcessingWindowType1B* or *prs-ProcessingWindowType2* defined in TS 38.331 [35] shall always support *ppw-dl-PRS-BufferType*, *ppw-durationOfPRS-Processing1*, *ppw-durationOfPRS-Processing2*, *ppw-maxNumOfDL-PRS-ResProcessedPerSlot,* and *ppw-maxNumOfDL-BandwidthFR1* or *ppw-maxNumOfDL-BandwidthFR2*. |
| ***dl-PRS-BufferType-RRC-Inactive***  IndicatesDL-PRS buffering capability in RRC\_INACTIVE state. Value '*type1'* indicates sub-slot/symbol level buffering and value '*type2'* indicates slot level buffering. |
| ***durationOfPRS-Processing-RRC-Inactive***  Indicates the duration *N* of DL-PRS symbols in units of ms a UE can process every *T* ms in RRC\_INACTIVE state assuming maximum DL-PRS bandwidth provided in *supportedBandwidthPRS* and comprises the following subfields:  - ***durationOfPRS-ProcessingSymbols***: This field specifies the values for *N*. Enumerated values indicate 0.125, 0.25, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, 25, 30, 32, 35, 40, 45, 50 ms.  - ***durationOfPRS-ProcessingSymbolsInEveryTms***: This field specifies the values for *T*. Enumerated values indicate 8, 16, 20, 30, 40, 80, 160, 320, 640, 1280 ms.  See NOTE. |
| ***maxNumOfDL-PRS-ResProcessedPerSlot-RRC-Inactive***  Indicates the maximum number of DL-PRS resources a UE can process in a slot in RRC\_INACTIVE state. SCS: 15 kHz, 30 kHz, 60 kHz are applicable for FR1 bands. SCS: 60 kHz, 120 kHz are applicable for FR2 bands. |
| ***supportedLowerRxBeamSweepingFactor-FR2***  Indicates support of the lower Rx beam sweeping factor than 8 for FR2. Enumerated value indicates the number of Rx beam sweeping factors supported. |
| ***supportedDL-PRS-ProcessingSamples-RRC-Inactive***  Indicates the UE capability for support of measurements based on measuring M=1 or M=2 samples (instances) of a DL-PRS Resource Set in RRC\_INACTIVE state. The UE can include this field only if the UE supports *prs-ProcessingRRC-Inactive* defined in TS 38.331 [35]. Otherwise, the UE does not include this field. |

NOTE: When the target device provides the *durationOfPRS-Processing* capability (*N*, *T*) for any time window defined in TS 38. 214 [45] clause 5.1.6.5, the target device should be capable of processing all DL-PRS resources within , if

- where K is defined in the TS 38.214 [45] clause 5.1.6.5, and

- the number of DL-PRS Resources in each slot does not exceed the *maxNumOfDL-PRS-ResProcessedPerSlot*, and

- the configured measurement gap and a maximum ratio of measurement gap length (MGL) / measurement gap repetition period (MGRP) is as specified in TS 38.133 [46].

#### 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)

} (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

]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-TDOA-ProvideCapabilities* field descriptions |
| ***nr-DL-TDOA-Mode***  This field specifies the NR DL-TDOA mode(s) supported by the target device. |
| ***periodicalReporting***  This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***ten-ms-unit-ResponseTime***  This field, if present, specifies the positioning modes for which the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one‑value at the bit position means '*ten-milli-seconds'* response time unit for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support '*ten-milli-seconds'* response time unitin *CommonIEsRequestLocationInformation*. |
| ***nr-PosCalcAssistanceSupport***  This field indicates the Position Calculation Assistance Data supported by the target device for UE-based DL-TDOA. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is supported; a zero‑value means not supported.  - bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 3 indicates whether the field *nr-DL-PRS-TRP-TEG-Info* in IE *NR-PositionCalculationAssistance* is supported or not. The UE can indicate this bit only if the UE supports *prs-ProcessingCapabilityBandList* and any of *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer*, *maxNrOfTRP-AcrossFreqs*, *maxNrOfPosLayer*, *maxNrOfDL-PRS-ResourcesPerResourceSet* and *maxNrOfDL-PRS-ResourcesPerPositioningFrequencylayer*. Otherwise, the UE does not include this field. |
| ***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 low latency measurement gap activation 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]. |

#### 6.5.11.4 NR DL-AoD Location Information Elements

#### – *NR-DL-AoD-SignalMeasurementInformation*

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

-- ASN1START

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

nr-DL-AoD-MeasList-r16 NR-DL-AoD-MeasList-r16,

...

}

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

NR-DL-AoD-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-DL-PRS-RSRP-Result-r16 INTEGER (0..126),

nr-DL-PRS-RxBeamIndex-r16 INTEGER (1..8) OPTIONAL,

nr-DL-AoD-AdditionalMeasurements-r16

NR-DL-AoD-AdditionalMeasurements-r16 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-DL-AoD-AdditionalMeasurementsExt-r17

NR-DL-AoD-AdditionalMeasurementsExt-r17 OPTIONAL

]]

}

NR-DL-AoD-AdditionalMeasurements-r16 ::= SEQUENCE (SIZE (1..7)) OF

NR-DL-AoD-AdditionalMeasurementElement-r16

NR-DL-AoD-AdditionalMeasurementsExt-r17 ::= SEQUENCE (SIZE (1..maxAddMeasAoD-r17)) OF

NR-DL-AoD-AdditionalMeasurementElement-r17

NR-DL-AoD-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-DL-PRS-RSRP-ResultDiff-r16 INTEGER (0..30),

nr-DL-PRS-RxBeamIndex-r16 INTEGER (1..8) OPTIONAL,

...

}

NR-DL-AoD-AdditionalMeasurementElement-r17 ::= SEQUENCE {

nr-DL-PRS-ResourceID-r17 NR-DL-PRS-ResourceID-r16 OPTIONAL,

nr-DL-PRS-ResourceSetID-r17 NR-DL-PRS-ResourceSetID-r16 OPTIONAL,

nr-TimeStamp-r17 NR-TimeStamp-r16,

nr-DL-PRS-RSRP-ResultDiff-r17 INTEGER (0..30) OPTIONAL, -- Cond rsrp

nr-DL-PRS-RxBeamIndex-r17 INTEGER (1..8) OPTIONAL,

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

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

...

}

-- ASN1STOP

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

|  |
| --- |
| *NR-DL-AoD-SignalMeasurementInformation* field descriptions |
| ***dl-PRS-ID***  This field is used along with a DL-PRS Resource Set ID and a DL-PRS Resource 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 measurement is performed. |
| ***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 measured quantity is defined as in TS 38.133 [46]. |
| ***nr-DL-PRS-RxBeamIndex***  This field provides an index of the target device receive beam used for DL-PRS measurements associated with a single TRP in *nr-DL-AoD-MeasList-r16* when additional DL-PRS measurements are also included in either *nr-DL-AoD-AdditionalMeasurements-r16* or *nr-DL-AoD-AdditionalMeasurementsExt-r17*. If the value of the receive beam index for two or more DL-PRS measurements is the same, it indicates that the target device receive beam for the two or more DL-PRS measurements associated with a TRP were made with the same RX beam. The field is mandatory present if at least two DL-PRS RSRP measurements and/or DL-PRS RSRPP measurements from the same DL-PRS Resource Set associated with a TRP have been made with the same RX beam by the target device; otherwise it is not present. |
| ***nr-DL-AoD-AdditionalMeasurements***  This field specifies a list of additional DL-PRS RSRP measurements of different DL-PRS resources for the same TRP. If this field is present, the field *nr-DL-AoD-AdditionalMeasurementsExt* should not be present. |
| ***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 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-DL-AoD-AdditionalMeasurementsExt***  This field specifies a list of additional DL-PRS RSRP and/or DL-PRS RSRPP measurements of different DL-PRS resources for the same TRP. If this field is present, the field *nr-DL-AoD-AdditionalMeasurements* should not be present. |
| ***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 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*. |

#### 6.5.11.6 NR DL-AoD Capability Information

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

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

-- ASN1START

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

nr-DL-AoD-Mode-r16 PositioningModes,

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

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

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

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

periodicalReporting-r16 PositioningModes OPTIONAL,

...,

[[

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

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

beamInfoSup (1),

rtdInfoSup (2),

beamAntInfoSup (3)

} (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-PRS-BeamInfoSup-r17 ENUMERATED { sameSet, differentSet, sameOrDifferentSet }

OPTIONAL,

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

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

nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

type-r17 LOS-NLOS-IndicatorType2-r17,

granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

...

} OPTIONAL,

scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17

OPTIONAL,

nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

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

...

} OPTIONAL,

multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-AoD-ProvideCapabilities* field descriptions |
| ***nr-DL-AoD-Mode***  This field specifies the NR DL-AoD mode(s) supported by the target device. |
| ***periodicalReporting***  This field, if present, specifies the positioning modes for which the target device supports *periodicalReporting.* This is represented by a bit string, with a one‑value at the bit position means *periodicalReporting* for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support *periodicalReporting* in *CommonIEsRequestLocationInformation*. |
| ***ten-ms-unit-ResponseTime***  This field, if present, specifies the positioning modes for which the target device supports the enumerated value '*ten-milli-seconds*' in the IE *ResponseTime* in IE *CommonIEsRequestLocationInformation*. This is represented by a bit string, with a one‑value at the bit position means '*ten-milli-seconds'* response time unit for the positioning mode is supported; a zero‑value means not supported. If this field is absent, the target device does not support '*ten-milli-seconds'* response time unitin *CommonIEsRequestLocationInformation*. |
| ***nr-PosCalcAssistanceSupport***  This field indicates the Position Calculation Assistance Data supported by the target device for UE-based DL-AoD. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is supported; a zero‑value means not supported.  - bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is supported or not;  - bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is supported or not. The UE can indicate this bit only if the UE supports *prs-ProcessingCapabilityBandList* and any of *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer*, *maxNrOfTRP-AcrossFreqs*, *maxNrOfPosLayer*, *maxNrOfDL-PRS-ResourcesPerResourceSet* and *maxNrOfDL-PRS-ResourcesPerPositioningFrequencylayer*. Otherwise, the UE does not include this field;  - bit 3 indicates whether the field *nr-TRP-BeamAntennaInfo* in IE *NR-PositionCalculationAssistance* is supported or not. |
| ***nr-los-nlos-AssistanceDataSupport***  This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedLOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance*:  - *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in *LOS-NLOS-Indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistance*.  - *granularity* indicates whether the target device supports *nr-los-nlos-indicator* in IE *NR-DL-PRS-ExpectedLOS-NLOS-Assistanc*e 'per-trp', '*per-resource*', or both.  The UE can include this field only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1*, *maxDL-PRS-RSRP-MeasurementFR2,dl-RSTD-MeasurementPerPairOfTRP-FR1, dl-RSTD-MeasurementPerPairOfTRP-FR2, maxNrOfRx-TX-MeasFR1, maxNrOfRx-TX-MeasFR2, supportOfRSRP-MeasFR1* and *supportOfRSRP-MeasFR2* . Otherwise, the UE does not include this field. |
| ***nr-DL-PRS-ExpectedAoD-or-AoA-Sup***  This field, if present, indicates that the target device supports the *NR-DL-PRS-ExpectedAoD-or-AoA* in *NR-DL-PRS-AssistanceData.* |
| ***nr-DL-PRS-BeamInfoSup***  This field, if present, indicates that the target device supports the *NR-DL-PRS-BeamInfo* in IE *NR-DL-AoD-ProvideAssistanceData.* |
| ***dl-PRS-ResourcePrioritySubset-Sup***  This field, if present, indicates that the target device supports the *DL-PRS-ResourcePrioritySubset* in IE *NR-DL-PRS-Info.* Enumerated value indicates the supported resource set relationship for the target DL-PRS Resource and the associated subset. |
| ***nr-DL-AoD-On-Demand-DL-PRS-Support***  This field, if present, indicates that the target device supports on-demand DL-PRS requests. |
| ***nr-los-nlos-IndicatorSupport***  This field, if present, indicates that the target device supports *nr-los-nlos-Indicator* reporting in IE *NR-DL-AoD-SignalMeasurementInformation*.  - *type* indicates whether the target device supports '*hard*' value or '*hard*' and '*soft*' value in IE *LOS-NLOS-Indicator.*  - *granularit*y indicates whether the target device supports *LOS-NLOS-Indicator* reporting per TRP, per DL-PRS Resource, or both. |
| ***scheduledLocationRequestSupported***  This field, if present, specifies the positioning modes for which the target device supports scheduled location requests – i.e., supports the IE *ScheduledLocationTime* in IE *CommonIEsRequestLocationInformation* – and the time base(s) supported for the scheduled location time for each positioning mode. If this field is absent, the target device does not support scheduled location requests. |
| ***nr-dl-prs-AssistanceDataValidity***  This field, if present, indicates that the target device supports validity conditions for pre-configured assistance data and comprises the following subfields:  - ***area-validity*** indicates that the target device supports pre-configured assistance data with area validity. The integer number indicates the maximum number of areas the target device supports. |
| ***multiMeasInSameMeasReport***  This field, if present, indicates that the target device supports multiple measurement instances in a single measurement report. |
| ***mg-ActivationRequest***  This field, if present, indicates that the target device supports low latency measurement gap activation 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]. |

#### 6.5.11.6a NR DL-AoD Capability Information Elements

#### *– NR-DL-AoD-MeasurementCapability*

The IE *NR-DL-AoD-MeasurementCapability* defines the DL-AoD measurement capability. The UE can include this IE only if the UE supports *NR-DL-PRS-ResourcesCapability* for DL-AoD. Otherwise, the UE does not include this IE;

-- ASN1START

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

maxDL-PRS-RSRP-MeasurementFR1-r16 INTEGER (1..8),

maxDL-PRS-RSRP-MeasurementFR2-r16 INTEGER (1..8),

dl-AoD-MeasCapabilityBandList-r16 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

DL-AoD-MeasCapabilityPerBand-r16,

...,

[[

maxDL-PRS-RSRP-MeasurementFR1-r17 ENUMERATED { n16, n24 } OPTIONAL,

maxDL-PRS-RSRP-MeasurementFR2-r17 ENUMERATED { n16, n24 } OPTIONAL

]]

}

DL-AoD-MeasCapabilityPerBand-r16 ::= SEQUENCE {

freqBandIndicatorNR-r16 FreqBandIndicatorNR-r16,

simul-NR-DL-AoD-DL-TDOA-r16 ENUMERATED { supported} OPTIONAL,

simul-NR-DL-AoD-Multi-RTT-r16 ENUMERATED { supported} OPTIONAL,

...,

[[

maxDL-PRS-FirstPathRSRP-MeasPerTRP-r17 ENUMERATED { n1, n2, n4, n8, n16, n24 } OPTIONAL,

dl-PRS-MeasRRC-Inactive-r17 ENUMERATED { supported } OPTIONAL

]]

}

-- ASN1STOP

|  |
| --- |
| *NR-DL-AoD-MeasurementCapability* field descriptions |
| ***maxDL-PRS-RSRP-MeasurementFR1***  Indicates the maximum number of DL-PRS RSRP measurements on different PRS resources from the same TRP supported by the UE on FR1. If this field with -r17 suffix is present, the target device should set the field with -r16 suffix to value '8'. The UE can include *maxDL-PRS-RSRP-MeasurementFR1* only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1* and *maxDL-PRS-RSRP-MeasurementFR2*. Otherwise, the UE does not include this field. |
| ***maxDL-PRS-RSRP-MeasurementFR2***  Indicates the maximum number of DL-PRS RSRP measurements on different PRS resources from the same TRP supported by the UE on FR2. If this field with -r17 suffix is present, the target device should set the field with -r16 suffix to value '8'. The UE can include *maxDL-PRS-RSRP-MeasurementFR2* only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1* and *maxDL-PRS-RSRP-MeasurementFR2*. Otherwise, the UE does not include this field. |
| ***simul-NR-DL-AoD-DL-TDOA***  Indicates whether the UE supports simultaneous processing for DL-AoD and DL-TDOA measurements. The UE can include this field only if the UE supports DL-TDOA and DL-AoD. Otherwise, the UE does not include this field. |
| ***simul-NR-DL-AoD-Multi-RTT***  Indicates whether the UE supports simultaneous processing for DL-AoD and UE Multi-RTT measurements. The UE can include this field only if the UE supports Multi-RTT and DL-AoD. Otherwise, the UE does not include this field. |
| ***maxDL-PRS-FirstPathRSRP-MeasPerTRP***  This field, if present, indicates that the target device supports measuring and reporting the PRS RSRPP of the first path. The enumerated value indicates the maximum number of RSRPP of first path per TRP supported. The UE can include this field only if the UE supports one of *maxDL-PRS-RSRP-MeasurementFR1* and *maxDL-PRS-RSRP-MeasurementFR2*. Otherwise, the UE does not include this field.  NOTE 1: The maximum number of first path PRS RSRP per TRP should be less than or equal to the maximum number of PRS RSRP defined in *maxDL-PRS-RSRP-MeasurementFR1* and *maxDL-PRS-RSRP-MeasurementFR2*. |
| ***dl-PRS-MeasRRC-Inactive***  This field, if present, indicates that the target device supports DL-PRS measurement in RRC\_INACTIVE state. The UE can include this field only if the UE supports *maxNrOfDL-PRS-ResourceSetPerTrpPerFrequencyLayer, maxNrOfTRP-AcrossFreqs, maxNrOfPosLayer* and *dl-PRS-BufferType-RRC-Inactive*. Otherwise, the UE does not include this field.  NOTE 1: This capability is applicable to both, UE-assisted and UE-based DL-AoD.  NOTE 2: The capabilities *NR-DL-PRS-ResourcesCapability, simul-NR-DL-AoD-DL-TDOA* are the same in RRC\_INACTIVE state. |

#### 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-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)

},

...

}

-- 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 applicable value as defined in TS 38.133 [46]. |
| ***nr-UE-TxTEG-TimingErrorMargin***  This field specifies the UE Tx TEG timing error margin value for all the UE Tx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case2* or *case3* and this field is absent, the receiver should consider the UE Tx TEG timing error margin value to be the maximum value available in IE *TEG-TimingErrorMargin*. |
| ***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]. |
| ***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-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* should not be present. |
| ***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*. |

#### 6.5.12.6 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

]]

}

-- 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 low latency measurement gap activation 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]. |

## 6.6 Multiplicity and type constraint values

#### *– Multiplicity and type constraint definitions*

-- ASN1START

maxEARFCN INTEGER ::= 65535 -- Maximum value of EUTRA carrier frequency

maxEARFCN-Plus1 INTEGER ::= 65536 -- Lowest value extended EARFCN range

maxEARFCN2 INTEGER ::= 262143 -- Highest value extended EARFCN range

maxMBS-r14 INTEGER ::= 64

maxWLAN-AP-r13 INTEGER ::= 64

maxKnownAPs-r14 INTEGER ::= 2048

maxVisibleAPs-r14 INTEGER ::= 32

maxWLAN-AP-r14 INTEGER ::= 128

maxWLAN-DataSets-r14 INTEGER ::= 8

maxBT-Beacon-r13 INTEGER ::= 32

nrMaxBands-r16 INTEGER ::= 1024 -- Maximum number of supported bands in

-- UE capability.

nrMaxFreqLayers-r16 INTEGER ::= 4 -- Max freq layers

nrMaxFreqLayers-1-r16 INTEGER ::= 3

nrMaxNumDL-PRS-ResourcesPerSet-1-r16 INTEGER ::= 63

nrMaxNumDL-PRS-ResourceSetsPerTRP-1-r16 INTEGER ::= 7

nrMaxResourceIDs-r16 INTEGER ::= 64 -- Max Resource IDs

nrMaxResourceOffsetValue-1-r16 INTEGER ::= 511

nrMaxResourcesPerSet-r16 INTEGER ::= 64 -- Maximum resources for one set

nrMaxSetsPerTrpPerFreqLayer-r16 INTEGER ::= 2 -- Maximum resource sets for one TRP

nrMaxSetsPerTrpPerFreqLayer-1-r16 INTEGER ::= 1

nrMaxTRPs-r16 INTEGER ::= 256 -- Max TRPs per UE

nrMaxTRPsPerFreq-r16 INTEGER ::= 64 -- Max TRPs per freq layers

nrMaxTRPsPerFreq-1-r16 INTEGER ::= 63

maxSimultaneousBands-r16 INTEGER ::= 4 -- Maximum number of simultaneously

-- measured bands

maxBandComb-r16 INTEGER ::= 1024

nrMaxConfiguredBands-r16 INTEGER ::= 16

maxNumOfRxTEGs-r17 INTEGER ::= 32

maxNumOfRxTEGs-1-r17 INTEGER ::= 31

maxNumOfTxTEGs-1-r17 INTEGER ::= 7

maxTxTEG-Sets-r17 INTEGER ::= 256 -- Maximum applicable number is 64

maxNumOfRxTxTEGs-1-r17 INTEGER ::= 255

maxNumOfTRP-TxTEGs-1-r17 INTEGER ::= 7

maxNumOfSRS-PosResources-r17 INTEGER ::= 64

maxNumOfSRS-PosResources-1-r17 INTEGER ::= 63

maxNumResourcesPerAngle-r17 INTEGER ::= 24

maxNumPrioResources-r17 INTEGER ::= 24

maxAddMeasTDOA-r17 INTEGER ::= 31

maxAddMeasAoD-r17 INTEGER ::= 23

maxAddMeasRTT-r17 INTEGER ::= 31

maxOD-DL-PRS-Configs-r17 INTEGER ::= 8

maxCellIDsPerArea-r17 INTEGER ::= 256

maxNrOfAreas-r17 INTEGER ::= 16

maxMeasInstances-r17 INTEGER ::= 32

-- ASN1STOP