**3GPP TSG-RAN WG2 Meeting #121bis-e *R2-230xxxx***

**e-Meeting, 17th April – 26th April 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **37.355** | **CR** |  | **rev** | **-** | **Current version:** | **17.4.0** |  |
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| *For* [***HELP***](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 capability for FGs27-13a,14a and 14-2 |
|  |  |
| ***Source to WG:*** | Intel Corporation |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_pos\_enh-Core  |  | ***Date:*** | 2023-04-07 |
|  |  |  |  |  |
| ***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 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)* *Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | 1 based on RAN4 updated UE feature list for NR in R2-2301997/R4-2300820, RAN4 has updated 14-2 as per band, and also removed M=1, 2, i.e. Capability of supporting reduced number of samples for PRS measurement in RRC\_inactive state since M=3 is also supported. RAN2 has changed it to per band in previous meeting, only field description needs to be updated. 2 RAN1 agreed ( R1-2302026)• Send an LS to RAN2 that UEs supporting Rel-16 FG 16-1 and Rel-17 FGs 27-13a/14a should support RSRPP reporting for K=1 or 2 additional paths. |
|  |  |
| ***Summary of change:*** | 1 Aligned with the description in RAN4 feature list for the field description of *supportedDL-PRS-ProcessingSamples-RRC-Inactive*2 Clarify that UEs supporting Rel-16 FG 16-1 and Rel-17 FGs 27-13a/14a shall support RSRPP reporting for K=1 or 2 additional paths.**Impact analysis:**Impacted functionality:- UE LPP capabilityInter-operability issues:- No issue has been identified. |
|  |  |
| ***Consequences if not approved:*** | 1 Not consistent with RAN4;2 Additional requirement on UEs supporting Rel-16 FG 16-1 and Rel-17 FGs 27-13a/14a is missing |
|  |  |
| ***Clauses affected:*** | 6.4.3, 6.5.10. 6a, 6.5.12. 6a |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ... |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Revision of R2-2302745 |

START OF CHANGE

### 6.4.3 Common NR Positioning Information Elements

/\*\*\*\*\*\*Skip unrelated parts\*\*\*\*\*\*\*/

*– 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-r16SEQUENCE (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,

 ...,

 [[

 scs15-v1690 ENUMERATED {n6, n12} OPTIONAL,

 scs30-v1690 ENUMERATED {n6, n12} OPTIONAL,

 scs60-v1690 ENUMERATED {n6, n12} OPTIONAL,

 scs120-v1690 ENUMERATED {n6, n12} 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-MeasurementWithoutMG-r17 ENUMERATED {cp, symbolDot25, symbolDot5,

 slotDot5} 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, 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 9. |
| ***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 1: 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*: Support of "st1" and "st3" defined in clause 5.1.6.5 of TS 38.214 [45].- *option2*: Support of "st1", "st2", and "st3" defined in clause 5.1.6.5 of TS 38.214 [45].- *option3*: Support of "st1" only defined in clause 5.1.6.5 of TS 38.214 [45].The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field.NOTE 2: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP.NOTE 2a: When the UE determines higher priority for other DL signals/channels over the DL-PRS measurement/processing, the UE is not expected to measure/process DL-PRS. |
| ***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 3: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP.NOTE 3a: When the UE determines higher priority for other DL signals/channels over the DL-PRS measurement/processing, the UE is not expected to measure/process DL-PRS. |
| ***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 4: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP.NOTE 4a: When the UE determines higher priority for other DL signals/channels over the DL-PRS measurement/processing, the UE is not expected to measure/process DL-PRS. |
| ***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 5: A UE that supports one of *prs-ProcessingWindowType1A*, *prs-ProcessingWindowType1B* or *prs-ProcessingWindowType2* shall always include the *prs-ProcessingCapabilityOutsideMGinPPW*.NOTE 6: The (N, T) UE capability in *ppw-durationOfPRS-Processing1* is interpreted as in NOTE 9, and the UE is expected to receive the DL-PRS within the PRS processing window but the processing of the received DL-PRS may be outside a DL-PRS processing window.NOTE 7: The (N2, T2) UE capability in *ppw-durationOfPRS-Processing2* is interpreted such that the UE is capable of measuring up to N2 ms DL-PRS within a PPW and is capable of completing the DL-PRS processing within the PPW, e.g., if the time duration from the last symbol of the measured DL-PRS resource(s) inside the PPW to the end of PPW is not smaller than T2 ms.NOTE 8: A UE which supports *prs-ProcessingCapabilityOutsideMGinPPW* shall support either *ppw-durationOfPRS-Processing1* or *ppw-durationOfPRS-Processing2*, but not both for each supported type in a band. |
| ***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 9. |
| ***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 reduced number of samples for PRS measurement 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. |
| ***prs-MeasurementWithoutMG***Indicates the UE capability for support of Rx timing difference between the serving cell and non-serving cell for PRS measurement within a PPW. Value '*cp*' indicates one CP length, value '*symbolDot25*' indicates 0.25 symbol length, value '*symbolDot5*' indicates 0.5 symbol length and value '*slotDot5*' indicates 0.5 slot length. |
| NOTE 9: When the target device provides the *durationOfPRS-Processing* capability (*N*, *T*) for any $P(\geq T)$ 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 $P$, if- $N\geq K$ 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]. |

NEXT CHANGE

6.5.10.6 NR DL-TDOA Capability Information

– *NR-DL-TDOA-ProvideCapabilities*

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

-- ASN1START

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

 nr-DL-TDOA-Mode-r16 PositioningModes,

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

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

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

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

 additionalPathsReport-r16 ENUMERATED { supported } OPTIONAL,

 periodicalReporting-r16 PositioningModes OPTIONAL,

 ...,

 [[

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

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

 beamInfoSup (1),

 rtdInfoSup (2),

 trpTEG-InfoSup (3)

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

 nr-los-nlos-AssistanceDataSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

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

 eAoA (1)

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

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

 nr-los-nlos-IndicatorSupport-r17 SEQUENCE {

 type-r17 LOS-NLOS-IndicatorType2-r17,

 granularity-r17 LOS-NLOS-IndicatorGranularity2-r17,

 ...

 } OPTIONAL,

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

 scheduledLocationRequestSupported-r17 ScheduledLocationTimeSupportPerMode-r17 OPTIONAL,

 nr-dl-prs-AssistanceDataValidity-r17 SEQUENCE {

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

 } OPTIONAL,

 multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL,

 mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL

 ]],

 [[

 posMeasGapSupport-r17 ENUMERATED { supported } OPTIONAL

 ]]

}

-- ASN1STOP

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

6.5.10.6a NR DL-TDOA Capability Information Elements

*– NR-DL-TDOA-MeasurementCapability*

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

-- ASN1START

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

 dl-RSTD-MeasurementPerPairOfTRP-FR1-r16 INTEGER (1..4),

 dl-RSTD-MeasurementPerPairOfTRP-FR2-r16 INTEGER (1..4),

 supportOfDL-PRS-RSRP-MeasFR1-r16 ENUMERATED { supported} OPTIONAL,

 supportOfDL-PRS-RSRP-MeasFR2-r16 ENUMERATED { supported} OPTIONAL,

 ...,

 [[

 nr-UE-TEG-Capability-r17 NR-UE-TEG-Capability-r17 OPTIONAL,

 dl-tdoa-MeasCapabilityBandList-r17 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

 DL-TDOA-MeasCapabilityPerBand-r17 OPTIONAL

 ]]

}

DL-TDOA-MeasCapabilityPerBand-r17 ::= SEQUENCE {

 freqBandIndicatorNR-r17 FreqBandIndicatorNR-r16,

 supportOfDL-PRS-FirstPathRSRP-r17 ENUMERATED { supported } OPTIONAL,

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

 ...

}

-- ASN1STOP

|  |
| --- |
| ***NR-DL-TDOA-MeasurementCapability* field descriptions** |
| ***dl-RSTD-MeasurementPerPairOfTRP-FR1***Indicates number of DL RSTD measurements per pair of TRPs on FR1. |
| ***dl-RSTD-MeasurementPerPairOfTRP-FR2***Indicates number of DL RSTD measurements per pair of TRPs on FR2. |
| ***supportOfDL-PRS-RSRP-MeasFR1***Indicates whether the UE supports DL-PRS RSRP measurement for DL-TDOA on FR1. |
| ***supportOfDL-PRS-RSRP-MeasFR2***Indicates whether the UE supports DL-PRS RSRP measurement for DL-TDOA on FR2. |
| ***nr-UE-TEG-Capability***Indicates the UE TEG capability. |
| ***supportOfDL-PRS-FirstPathRSRP***Indicates whether the target device supports DL-PRS RSRPP of first path measurement for DL-TDOA. The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field. The UE supporting *additionalPathsReport* and *supportOfDL-PRS-FirstPathRSRP* shall support RSRPP reporting for K=1 or 2 additional paths. |
| ***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-TDOA.NOTE 2: The capabilities *NR-DL-PRS-ResourcesCapability, dl-RSTD-MeasurementPerPairOfTRP-FR1, dl-RSTD-MeasurementPerPairOfTRP-FR2, supportOfDL-PRS-RSRP-MeasFR1, supportOfDL-PRS-RSRP-MeasFR2, simul-NR-DL-AoD-DL-TDOA* are the same in RRC\_INACTIVE state. |

NEXT CHANGE

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]. |

6.5.12.6a NR Multi-RTT Capability Information Elements

*– NR-Multi-RTT-MeasurementCapability*

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

-- ASN1START

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

 maxNrOfRx-TX-MeasFR1-r16 INTEGER (1..4) OPTIONAL,

 maxNrOfRx-TX-MeasFR2-r16 INTEGER (1..4) OPTIONAL,

 supportOfRSRP-MeasFR1-r16 ENUMERATED { supported } OPTIONAL,

 supportOfRSRP-MeasFR2-r16 ENUMERATED { supported } OPTIONAL,

 srs-AssocPRS-MultiLayersFR1-r16 ENUMERATED { supported } OPTIONAL,

 srs-AssocPRS-MultiLayersFR2-r16 ENUMERATED { supported } OPTIONAL,

 ...,

 [[

 nr-UE-TEG-Capability-r17 NR-UE-TEG-Capability-r17 OPTIONAL,

 multi-RTT-MeasCapabilityBandList-r17 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

 Multi-RTT-MeasCapabilityPerBand-r17

 OPTIONAL

 ]]

}

Multi-RTT-MeasCapabilityPerBand-r17 ::= SEQUENCE {

 freqBandIndicatorNR-r17 FreqBandIndicatorNR-r16,

 supportOfDL-PRS-FirstPathRSRP-r17 ENUMERATED { supported } OPTIONAL,

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

 ...

}

-- ASN1STOP

|  |
| --- |
| ***NR-Multi-RTT-MeasurementCapability* field descriptions** |
| ***maxNrOfRx-TX-MeasFR1***Indicates the maximum number of UE Rx–Tx time difference measurements corresponding to a single SRS resource/resource set for positioning with each measurement corresponding to a single DL-PRS resource/resource set on FR1. |
| ***maxNrOfRx-TX-MeasFR2***Indicates the maximum number of UE Rx–Tx time difference measurements corresponding to a single SRS resource/resource set for positioning with each measurement corresponding to a single DL-PRS resource/resource set on FR2. |
| ***srs-AssocPRS-MultiLayersFR1***Indicates whether the UE supports measurements derived on one or more DL-PRS resource/resource sets which may be in different positioning frequency layers for SRS transmitted in a single CC. PRS and SRS may be on different bands. This is for FR1 only. |
| ***srs-AssocPRS-MultiLayersFR2***Indicates whether the UE supports measurements derived on one or more DL-PRS resource/resource sets which may be in different positioning frequency layers for SRS transmitted in a single CC. PRS and SRS may be on different bands. This is for FR2 only. |
| ***supportOfRSRP-MeasFR1***Indicates whether the UE supports RSRP measurement for Multi-RTT on FR1. |
| ***supportOfRSRP-MeasFR2***Indicates whether the UE supports RSRP measurement for Multi-RTT on FR2. |
| ***nr-UE-TEG-Capability***Indicates the UE TEG capability. |
| ***supportOfDL-PRS-FirstPathRSRP***Indicates whether the target device supports DL-PRS RSRPP of first path measurement for Multi-RTT. The UE can include this field only if the UE supports *prs-ProcessingCapabilityBandList*. Otherwise, the UE does not include this field. The UE supporting *additionalPathsReport* and *supportOfDL-PRS-FirstPathRSRP* shall support RSRPP reporting for K=1 or 2 additional paths. |
| ***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: The capabilities *NR-DL-PRS-ResourcesCapability, maxNrOfRx-TX-MeasFR1, maxNrOfRx-TX-MeasFR2, supportOfRSRP-MeasFR1, supportOfRSRP-MeasFR2, srs-AssocPRS-MultiLayersFR1, srs-AssocPRS-MultiLayersFR2, simul-NR-DL-AoD-Multi-RTT* are the same in RRC\_INACTIVE state. |

END OF CHANGE