**3GPP TSG-RAN WG2 Meeting #123bisR2-23xxxxx**

**Xiamen, China, Oct 9-13, 2023**

**Agenda item: 7.2.1**

**Source: CATT**

**Title: [Post123bis][408][POS] Rel-18 LPP running CRs (CATT)**

**Document for: Discussion and Decision**

# Introduction

This is to check and update the Rel-18 positioning CRs to 37.355, and provide an open issue list for next meeting.

* [Post123bis][408][POS] Rel-18 LPP running CRs (CATT)

 Scope: Review the running CRs and develop open issue lists.

 Intended outcome: Draft CRs and open issue list for next meeting

 Deadline: Medium (2 weeks)

# Discussion on LPP running CR for RAT-dependent integrity

Based on the comments raised in the [AT123bis][403][POS] LPP CRs, the data structure of RAT-dependent integrity should be clarified and agreed at first. Hence, in this offline the data structure will be discussed firstly to achieve consistent generally.

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| **Proposal 1: The data structure of NR integrity can be grouped as below, following the GNSS integrity:*** NR-PositionCalculationAssistance
	+ nr-IntegrityServiceParameters-r18
		- irMinimum-r18
		- irMaximum-r18
	+ nr-IntegrityServiceAlertInfo [256]
		- rtd-ErrorDoNotUse-r18
		- trp-LocationErrorDoNotUse-r18
* NR-RTD-Info
	+ rtd-IntegrityParameters
		- probOnsetRTDFault-r18
		- meanRTDFaultDuration-r18
		- rtdErrorCorrelationTime-r18
	+ integrityReferenceRTD-InfoBounds
	+ RTD-InfoList[256]
		- dl-PRS-ID
		- IntegrityRTD-InfoBounds
			* RTDInfoError-r18
			* stdDevRTDInfoError-r18
				+ value-r18
				+ resolution-r18

 * NR-TRP-LocationInfo
	+ location-IntegrityParameters
		- trpErrorCorrelationTime-r18
		- probOnsetTRPFault-r18
		- [FFS]meanTRPFaultDuration-r18
	+ integrityReferencePointLocationBounds
		- EllipsoidPointWithAltitudeBounds
		- HighAccuracyEllipsoidPointWithAltitudeBounds
	+ trp-LocationInfoList[256]
		- dl-PRS-ID
		- integrityTRP-LocationBounds
		- trp-DL-PRS-ResourceSets[2]
			* integrityDL-PRS-ResourceSet-ARP-LocationBounds
			* dl-PRS-Resource-ARP-List[64]
				+ integrityDL-PRS-Resource-ARP-LocationBounds-r18
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**Question 1: Companies are invited to provide their comments on the above data structure of RAT-dependent integrity.**

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| **Company** | **Comments** |
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**Summary**

**Question 2: Companies are invited to provide their comments on the LPP running CR for RAT-dependent integrity in the following table.**

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| **Company** | **Excerpted spec with issues** | **Comments** |
| Lenovo |

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

 | Similar with the description in GNSS-Integrity-ServiceParameters, the NR-Integrity-ServiceParameters field descriptions can be revised as:irMinimum: This field specifies the Minimum Integrity Risk (IR) which is the minimum IR for which ~~the error bounds~~ the error bounds provided in the IEs *IntegrityRTD-InfoBounds*, and *IntegrityLocationBounds* are valid.irMaximum: This field specifies the Maximum Integrity Risk (IR) which is the maximum IR for which ~~the error bounds~~ the error bounds provided in the IEs *IntegrityRTD-InfoBounds*, and *IntegrityLocationBounds* are valid |
| Lenovo | ***nr-PosCalcAssistanceRequest***This field indicates the Position Calculation Assistance Data requested. This is represented by a bit string, with a one‑value at the bit position means the particular assistance data is requested; a zero‑value means not requested.- bit 0 indicates whether the field *nr-TRP-LocationInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 1 indicates whether the field *nr-DL-PRS-BeamInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 2 indicates whether the field *nr-RTD-Info* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 3 indicates whether the field *nr-TRP-BeamAntennaInfo* in IE *NR-PositionCalculationAssistance* is requested or not;- bit 4 indicates whether the field *nr-DL-PRS-Expected-LOS-NLOS-Assistance* in IE *NR-PositionCalculationAssistance* is requested or not.- bit 5 indicates whether the parameters the service parameters for integrity, the TRP/ARP location error is requested. | To capture the agreed beam related error sources.The description of “ bit 5 indicates whether the parameters the service parameters for integrity, the TRP/ARP location error is requested.” may miss the beam-related error, hence, it is suggested to be changed as “ bit 5 indicates whether the parameters the service parameters for integrity, the TRP/ARP location error, beam-related error is requested.” |
| Lenovo | LocationIntegrityParameters-r18 ::= SEQUENCE { trpErrorCorrelationTime-r18 ENUMERATED { Infinity, c1, c2, c3, ...} DEFAULT Infinity, probOnsetTRPFault-r18          INTEGER(0..255), meanTRPFaultDuration-r18       INTEGER(1..3600)//FFS ...} | Value “Infinity” should start with lowercase letter. |
| Lenovo | EllipsoidPointWithAltitudeBounds ::= SEQUENCE { meanLatitude-r18 ENUMERATED {0, ...} DEFAULT 0, meanLongitude-r18 ENUMERATED {0, ...} DEFAULT 0, meanaltitude-r18 ENUMERATED {0, ...} DEFAULT 0, stdDevSemiMajor-r18 INTEGER (0..127), stdDevSemiMinor-r18 INTEGER (0..127), stdDevAltitude-r18 INTEGER (0..127),...}HighAccuracyEllipsoidPointWithAltitudeBounds ::= SEQUENCE { meanLatitude-r18 ENUMERATED {0, ...} DEFAULT 0, meanLongitude-r18 ENUMERATED {0, ...} DEFAULT 0, meanAtitude-r18 ENUMERATED {0, ...} DEFAULT 0, stdDevSemiMajor-r18 INTEGER (0..255), stdDevSemiMinor-r18 INTEGER (0..255), stdDevAltitude-r18 INTEGER (0..255),...} | Suffix “-r18” missing for IE EllipsoidPointWithAltitudeBounds and HighAccuracyEllipsoidPointWithAltitudeBounds. |
| Lenovo |

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| *RealLocation* | The field is present when the reference point is a real location; otherwise it is not present, need OR. |

 | We assume it should say “mandatory present”. Furthermore, “need OR” can be removed. |
| Huawei, HiSilicon | – NR-IntegrityServiceAlertInfoThe IE *NR-IntegrityServiceAlertInfo* is used by the location server to indicate whether the corresponding error sources related assistance data can be used for integrity related applications.-- ASN1STARTNR-IntegrityServiceAlertInfo-r18 ::= SEQUENCE (SIZE (1..nrMaxFreqLayers-r16)) OF NR-TRP-IntegrityServiceAlertInfoPerFreqLayer-r18NR-TRP-IntegrityServiceAlertInfoPerFreqLayer-r18 ::= SEQUENCE { trp-IntegrityServiceAlertInfoList-r18 SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF TRP-IntegrityServiceAlertInfoElement-r18, ...}TRP-IntegrityServiceAlertInfoElement-r18 ::= SEQUENCE { dl-PRS-ID-r16 INTEGER (0..255), nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON nr-IntegrityServiceAlert-r18 NR-IntegrityServiceAlert-r18 OPTIONAL -- Need ON...}NR-IntegrityServiceAlert-r18 ::= SEQUENCE { rtd-ErrorDoNotUse-r18 BOOLEAN OPTIONAL, -- Need ON trp-LocationErrorDoNotUse-r18 BOOLEAN OPTIONAL, -- Need ON ...} | 1/ In the IE description for NR-IntegrityServiceAlertInfo, Need to clarify that the service alert is for RTD and TRP info2/ for NR-IntegerityServiceAlert, Can be included directly in the RTD info assistance and TRP location assistance. No need to send the service aleat info separately.As this will create a lot of additional signalling overheads |
| Huawei, HiSilicon |  [[  integrityReferenceRTD-InfoBounds-r18 IntegrityRTD-InfoBounds-r18 OPTIONAL -- Need OR ]] | Not sure if it is needed?If it is needed, it should be the integrity info bounds for the RTD ref instead of the RTD. But there seems to be no agreement that there is error sources defined for RTD ref. WE have only agreed on RTD error source??? |
|  | StdDevRTDInfoError-r18 ::= SEQUENCE { value-r18 INTEGER (0..31), resolution-r18 ENUMERATED {mdot1, m1, m10, m30, ...}, ... | Field descriptions are missing |
|  |  [[ integrityTRP-LocationBounds-r18  IntegrityRelativeLocationBounds-r18 OPTIONAL -- Need OR ]] | The location bounds should be per ARP?This field may not be needed. Error bounds only need to be defined for agreed error sources. The agreed error sources here is only the TRP location. Not TRP relative location or the antenna connector location. |
|  |  | Not needed if added together with the ADNot sure why this should be separate posSIB for service alert. It is different from GNSS troposphetic and ionospheric errors |
| Qualcomm | LPP Version | The latest Version is 17.6.0 |
| Qualcomm | DL-PRS-BeamInfoElement-r16 ::= SEQUENCE { dl-PRS-Azimuth-r16 INTEGER (0..359), dl-PRS-Azimuth-fine-r16 INTEGER (0..9) OPTIONAL, -- Need ON dl-PRS-Elevation-r16 INTEGER (0..180) OPTIONAL, -- Need ON dl-PRS-Elevation-fine-r16 INTEGER (0..9) OPTIONAL, -- Need ON ..., [[ integrityBeamInfoBounds-r18 IntegrityBeamInfoBounds-r18 OPTIONAL -- Need OR ]]} | I think we could make this "-- Cond NotSameAsPrev"I.e., it may be present for the 1st list element, and if absent in the next list elements, the same values as previous entries apply.(similar to e.g., NR-TRP-LocationInfo-r16) |
| Qualcomm | – NR-IntegrityServiceAlertInfoThe IE *NR-IntegrityServiceAlertInfo* is used by the location server to indicate whether the corresponding error sources related assistance data can be used for integrity related applications. | Could be improved. Its not the "error sources". The actual assistance data for which the integrity info is provided; e.g., RTD etc. can not be used for integrity related applications. See GNSS description:The IE GNSS-Integrity-ServiceAlert is used by the location server to indicate whether the corresponding assistance data can be used for integrity related applications.I think we can use the same description (but with IE NR-IntegrityServiceAlertInfo.The "Info" suffix can also be deleted, since its just an alert (no info). |
| Qualcomm | TRP-IntegrityServiceAlertInfoElement-r18 ::= SEQUENCE { dl-PRS-ID-r18 INTEGER (0..255), nr-PhysCellID-r18 NR-PhysCellID-r16 OPTIONAL, -- Need ON nr-CellGlobalID-r18 NCGI-r15 OPTIONAL, -- Need ON nr-ARFCN-r18 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON nr-IntegrityServiceAlert-r18 NR-IntegrityServiceAlert-r18 OPTIONAL -- Need ON...}NR-IntegrityServiceAlert-r18 ::= SEQUENCE { rtd-ErrorDoNotUse-r18 BOOLEAN OPTIONAL, -- Need ON trp-LocationErrorDoNotUse-r18 BOOLEAN OPTIONAL, -- Need ON ...} | Why OPTIONAL? Should always be present.NR-IntegrityServiceAlert-r18 can be included directly in TRP-IntegrityServiceAlertInfoElement-r18.  |
| Qualcomm | NR-IntegrityServiceAlert-r18 ::= SEQUENCE { rtd-ErrorDoNotUse-r18 BOOLEAN, OPTIONAL, -- Need ON trp-LocationErrorDoNotUse-r18 BOOLEAN OPTIONAL, -- Need ON ...} | This should be "TRP DNU". I.e., related to the Probability of Onset of TRP fault, not onset of "Location Error Fault" (at least, I don't understand what this trp-LocationErrorDoNotUse-r18 is supposed to indicate).This should be rtd-DNU (we do not use errors anyhow)DL-PRS Boresight Direction DNU and DL-PRS Beam Information DNU are missing. |
| Qulcomm |  nr-IntegrityServiceParameters-r18 NR-IntegrityServiceParameters-r18 OPTIONAL, -- Need ON nr-IntegrityServiceAlertInfo-r18 NR-IntegrityServiceAlertInfo-r18 OPTIONAL, -- Need ON location-IntegrityParameters-r18 LocationIntegrityParameters-r18 OPTIONAL, -- Need OR nr-IntegrityParameters-DL-PRS-BeamInfo-r18 NR-IntegrityParameters-DL-PRS-BeamInfo-r18 OPTIONAL, -- Cond Integrity1 nr-IntegrityParameters-TRP-BeamAntennaInfo-r18 NR-IntegrityParameters-TRP-BeamAntennaInfo-r18 OPTIONAL -- Cond Integrity2 ]] | The IE names should be somewhat aligned...E.g., NR-IntegrityParameters-TRP-LocationInfoShould also be conditional presentWhat about the RTD info? |
| Qualcomm | LocationIntegrityParameters-r18 ::= SEQUENCE { trpErrorCorrelationTime-r18 ENUMERATED { c1-Infinity, c1, c2, c3, ...} DEFAULT c1-Infinity, probOnsetTRPFault-r18          INTEGER(0..255), meanTRPFaultDuration-r18       INTEGER(1..3600) ...} | What is an infinite correlation time?All the correlation times should be OPTIONAL present. No default is needed. Either provided or not. |
| Qualcomm | NR-PositionCalculationAssistance field descriptions | Field descriptions are missing. |
| Qualcomm | NR-RTD-Info-r16 ::= SEQUENCE { referenceTRP-RTD-Info-r16 ReferenceTRP-RTD-Info-r16, rtd-InfoList-r16 RTD-InfoList-r16, ..., [[ rtd-IntegrityParameters-r18 RTD-IntegrityParameters-r18 OPTIONAL -- Need OR ]]} | It would be cleaner if this is also included in the NR-PositionCalculationAssistance |
| Qualcomm | ReferenceTRP-RTD-Info-r16 ::= SEQUENCE { dl-PRS-ID-Ref-r16 INTEGER (0..255), nr-PhysCellID-Ref-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON nr-CellGlobalID-Ref-r16 NCGI-r15 OPTIONAL, -- Need ON nr-ARFCN-Ref-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON refTime-r16 CHOICE { systemFrameNumber-r16 BIT STRING (SIZE (10)), utc-r16 UTCTime, ... }, rtd-RefQuality-r16 NR-TimingQuality-r16 OPTIONAL, -- Need ON ..., [[  integrityReferenceRTD-InfoBounds-r18 IntegrityRTD-InfoBounds-r18 OPTIONAL -- Need OR ]]} | This should not be needed. I.e., integrityRTD-InfoBounds-r18 should be enough.(The quality of the reference for the RTD goes into the WLS weighting matrix, but I can't see what the bound for the reference RTD should be) |
| Qualcomm | IntegrityRTD-InfoBounds-r18 ::= SEQUENCE { meanRTDInfoError-r18 ENUMERATED {z0, ...} DEFAULT z0, stdDevRTDInfoError-r18 StdDevRTDInfoError-r18, ...} | Similar to above. Why do we need a default? It would be more efficient to make the mean OPTIONAL present, with absence meaning 0.(Note, the "mean" is the mean for paired overbounding model to address for any distribution anomalies, and trying to make the overbounding less conservative (compared to single overbounding)). It is not a mean error (which should be zero).The field description is not really correct/complete (see GNSS examples) |
| Qualcomm | BeamPowerElement-r17 ::= SEQUENCE { nr-dl-prs-ResourceSetID-r17 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, -- Need OP nr-dl-prs-ResourceID-r17 NR-DL-PRS-ResourceID-r16, nr-dl-prs-RelativePower-r17 INTEGER (0..30), nr-dl-prs-RelativePowerFine-r17 INTEGER (0..9) OPTIONAL, -- Need ON ..., [[ integrityBeamPowerBounds-r18 IntegrityBeamPowerBounds-r18 OPTIONAL -- Need OR ]]} | Same as above. We can make this "--CondNotSameAsPrev" |
| Qualcomm |  ..., [[ integrityReferencePointLocationBounds-r18 IntegrityReferencePointBounds-r18 OPTIONAL -- Cond RealLocationNeed OR ]]} | Also needed if not a real location. |
| Qualcomm | TRP-LocationInfoElement-r16 ::= SEQUENCE { dl-PRS-ID-r16 INTEGER (0..255), nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON associated-DL-PRS-ID-r16 INTEGER (0..255) OPTIONAL, -- Need OP trp-Location-r16 RelativeLocation-r16 OPTIONAL, -- Need OP trp-DL-PRS-ResourceSets-r16 SEQUENCE (SIZE(1..nrMaxSetsPerTrpPerFreqLayer-r16)) OF DL-PRS-ResourceSets-TRP-Element-r16 OPTIONAL, -- Need OP ..., [[ integrityTRP-LocationBounds-r18 IntegrityRelativeLocationBounds-r18 OPTIONAL -- Need OR ]]} | We can make all this "--CondNotSameAsPrev". I wouldn't expect much variation in the values. |
| Qualcomm | IntegrityReferencePointBounds-r18 ::= SEQUENCE { referencePointGeographicLocationBounds-r18 CHOICE { location3D-Bounds-r18 EllipsoidPointWithAltitudeBounds-r18, ha-location3D-Bounds-r18 HighAccuracyEllipsoidPointWithAltitudeBounds-r18, ... },EllipsoidPointWithAltitudeBounds ::= SEQUENCE { meanLatitude-r18 ENUMERATED {z0, ...} DEFAULT z0, meanLongitude-r18 ENUMERATED {z0, ...} DEFAULT z0, meanaltitude-r18 ENUMERATED {z0, ...} DEFAULT z0, stdDevSemiMajor-r18 INTEGER (0..127), stdDevSemiMinor-r18 INTEGER (0..127), stdDevAltitude-r18 INTEGER (0..127),...}HighAccuracyEllipsoidPointWithAltitudeBounds ::= SEQUENCE { meanLatitude-r18 ENUMERATED {z0, ...} DEFAULT z0, meanLongitude-r18 ENUMERATED {z0, ...} DEFAULT z0, meanAtitude-r18 ENUMERATED {z0, ...} DEFAULT z0, stdDevSemiMajor-r18 INTEGER (0..255), stdDevSemiMinor-r18 INTEGER (0..255), stdDevAltitude-r18 INTEGER (0..255),...} | We don't need bounds on the uncertainty shape…just on lat/long/alt |
| Qualcomm | EllipsoidPointWithAltitudeBounds ::= SEQUENCE { meanLatitude-r18 ENUMERATED {0, ...} DEFAULT 0, meanLongitude-r18 ENUMERATED {0, ...} DEFAULT 0, meanaltitude-r18 ENUMERATED {0, ...} DEFAULT 0, stdDevSemiMajor-r18 INTEGER (0..127), stdDevSemiMinor-r18 INTEGER (0..127), stdDevAltitude-r18 INTEGER (0..127),...} | Similar to above and at all other places: Should be an INTEGER range which can be OPTIONA L present.See GNSS field descriptions. |
| Qualcomm |  nr-PosCalcAssistanceSupport-r17 BIT STRING { trpLocSup (0), beamInfoSup (1), rtdInfoSup (2), trpTEG-InfoSup (3), integritySup-r18 (4) } (SIZE (1..8)) OPTIONAL, | I thought we handle all capabilities separately?(But to me it makes more sense to include them in the "core CR" --- it's easier to review items which belong together). |
| Nokia | Editor notes: FFS on whether and how to capture the bound, alerts, residual risks, correlation time of beam related error sources.  | We proposed in our paper R2-2310996 the following:For Beam Antenna Information error source, add the integrity bounds parameters (mean and stddev) to NR-TRP-BeamAntennaInfoPerTRP-r17.For Beam Bore-Sight Direction error source, add the integrity bounds parameters (mean and stddev) to NR-DL-PRS-BeamInfoPerTRP-r16 |
| Nokia | NR-IntegrityServiceAlert-r18 ::= SEQUENCE { rtd-ErrorDoNotUse-r18 BOOLEAN OPTIONAL, -- Need ON trp-LocationErrorDoNotUse-r18 BOOLEAN OPTIONAL, -- Need ON ...} | Missing DNU flag for NR-TRP-BeamAntennaInfoAnd NR-DL-PRS-BeamInfo. |
| Nokia | IntegrityRelativeLocationBounds-r18 ::= SEQUENCE { milli-arc-second-units-r16 ENUMERATED { mas0-003, mas0-03, mas0-3, mas3, ...}, height-units-r16 ENUMERATED {mm, cm, m, ...}, meanDeltaLatitude-r18 ENUMERATED {0, ...} DEFAULT 0, meanDeltaLongitude-r18 ENUMERATED {0, ...} DEFAULT 0, meanDeltaheight-r18 ENUMERATED {0, ...} DEFAULT 0, stdDevHorizontal-r18 INTEGER (0..255), stdDevVertical-r18 INTEGER (0..255) ...} | Not clear why we have milli-arc-second-units and height-units in this IE! |

**Summary**

In view of LPP, the following is the analyzation on the leftover issues of RAT-dependent integrity.

1. FFS on whether and how to capture the bound, alerts, residual risks, correlation time of beam related error sources.
2. In *NR-TRP-LocationInfo( on TRP Location Error)*:
3. *meanTRPFaultDuration* is FFS because it may not be needed for TRP locationinfo.
4. *trpErrorCorrelationTime* is FFS. For a stationary TRP, the correlation time of TRP positioning errors can be seen as Infinity by default.
5. Mean values of *ReferencePointBounds* and *RelativeLocationBounds* are FFS. They can be considered to be zeros by default. According to RAN1 LS: From RAN1’s perspective, zero is a valid possible option for the mean value for the overbound Gaussian distribution for the error sources listed in Table 6.1.1-2 in TR 38.859.
6. Value rangs of stdDev of ReferencePointBounds and RelativeLocationBounds are FFS. They may be determined by the value ranges of existing fields corresponding to quality information (e.g., nr-TimingQuality, rtd-Quality-r16) and uncertainty information (e.g., LocationUncertainty-r16) can be reused as a reference to derive the value ranges for the parameters (e.g., standard deviation) for the overbound Gaussian distribution for the error sources listed in Table 6.1.1-2 in TR 38.859.

**Question 3: Companies are invited to provide their comments on the open issue for LPP spec for RAT-dependent integrity in the following table.**

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| **Company** | **Comments** |
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**Summary**

# Discussion on LPP running CR for Carrier Phase Positioning

**Question 1: Companies are invited to provide their comments on the LPP running CR for Carrier Phase Positioning in the following table.**

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| **Company** | **Excerpted spec with issues** | **Comments** |
| Xiaomi | NR-PRU-DL-MeasElement-r18 ::= SEQUENCE { dl-PRS-ID-r18 INTEGER (0..255), nr-PhysCellID-r18 NR-PhysCellID-r16 OPTIONAL, nr-CellGlobalID-r18 NCGI-r15 OPTIONAL, nr-ARFCN-r18 ARFCN-ValueNR-r15 OPTIONAL, nr-DL-PRS-ResourceID-RSCPD-r18 NR-DL-PRS-ResourceID-r16 OPTIONAL, nr-DL-PRS-ResourceSetID-RSCPD-r18 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, nr-PRU-DL-RSCPD-Info-r18 NR-PRU-DL-RSCPD-Info-r18 OPTIONAL, nr-PRU-LocationInfo-r18 LocationCoordinates OPTIONAL, -- Need ON ...} | In the running CR, only NR-PRU-DL-RSCPD-Info-r18 is included, we think the RSCP is needed as well according to the RAN1 agreements. |
| Lenovo | NR-Multi-RTT-ReportConfig-r16 ::= SEQUENCE { maxDL-PRS-RxTxTimeDiffMeasPerTRP-r16 INTEGER (1..4) OPTIONAL, -- Need ON timingReportingGranularityFactor-r16 INTEGER (0..5) OPTIONAL -- Need ON [[ indicatedResourceSetandTimeWindow-r18 IndicatedResourceSetandTimeWindow-r18 OPTIONAL -- Need ON ]] | To align with NR-DL-TDOA-RequestLocationInformation[[ nr-indicatedResourceSetandTimeWindow-r18 NR-IndicatedResourceSetandTimeWindow-r18 OPTIONAL -- Need ON ]] |
| Lenovo |

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| ***NR-IndicatedResourceSetandTimeWindow field descriptions*** |
| ***NR-IndicatedResourceSetTimeWindow*** This field specifies the indicated DL-PRS resource set(s) for performing measurements time window of start time, duration and the numbers of the time window for performing measurements on indicated DL PRS resource set(s) and comprises the following subfields:- ***nr-IndicatedResourceSetID*** specifies the indicated the DL-PRS resource set(s) for performing measurements- ***nr-StartSFN-TimeWindow*** This field specifies the start of the time window in system frame number.- ***nr-periodicityandSlotOffsetTimeWindow*** This field specifies the periodicity of the time window in slots configured per DL-PRS Resource Set and the slot offset with respect to SFN #0 slot #0 for a TRP where the DL-PRS Resource Set is configured.***- nr-SymbolOffsetTimeWindow*** This field specifies the symbol offset with respect to the slot offset.- ***nr-PRS-durationTimeWindow*** specifies the desired duration of a time window for the indicated DL-PRS resource set(s). It indicates the time in units of slots. Enumerated values ‘n1’ correspond to 1 slot, n2 to 2 slots, n4 to 4 slots and so on.- ***nr-PRS-numberTimeWindow*** specifies the number of the indicated time windows. Enumerated values ‘n1’ correspond to 1, n2 to 2, n4 to 4 and n8 to 8. |

 | To be aligned with ASN.1:* In “nr-periodicityandSlotOffsetTimeWindow” the letter “p” should be set in uppercase letter;
* In “nr-PRS-durationTimeWindow” the part “PRS-“ can be removed;

Description of “nr-PRS-numberTimeWindow” can be removed. |
| Lenovo | IE NR-PRU-DL-Info-r18:NR-PRU-DL-MeasElement-r18 ::= SEQUENCE { dl-PRS-ID-r18 INTEGER (0..255), nr-PhysCellID-r18 NR-PhysCellID-r16 OPTIONAL, nr-CellGlobalID-r18 NCGI-r15 OPTIONAL, nr-ARFCN-r18 ARFCN-ValueNR-r15 OPTIONAL, nr-DL-PRS-ResourceID-RSCPD-r18 NR-DL-PRS-ResourceID-r16 OPTIONAL, nr-DL-PRS-ResourceSetID-RSCPD-r18 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, nr-PRU-DL-RSCPD-Info-r18 NR-PRU-DL-RSCPD-Info-r18 OPTIONAL, nr-PRU-LocationInfo-r18 LocationCoordinates OPTIONAL, -- Need ON ...}NR-PRU-DL-RSCPD-Info-r18 ::= SEQUENCE (SIZE(1..4)) OF NR-PRU-DL-RSCPD-Element-r18 NR-PRU-DL-RSCPD-Element-r18 ::= SEQUENCE { nr-TimeStampRSCPD-r18 NR-TimeStamp-r16, nr-RSCPD-r18 INTEGER (0..61565) OPTIONAL,  nr-PhaseQualityRSCPD-r18 NR-PhaseQuality-r18 OPTIONAL, ...} | Need codes missing for most of the optional fields. |
| Lenovo | NR-TimeStamp-r16 ::= SEQUENCE { dl-PRS-ID-r16 INTEGER (0..255), nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON nr-SFN-r16 INTEGER (0..1023), nr-Slot-r16 CHOICE { scs15-r16 INTEGER (0..9), scs30-r16 INTEGER (0..19), scs60-r16 INTEGER (0..39), scs120-r16 INTEGER (0..79) }, ..., nr-SymbolIndex-r18 INTEGER (0..13) OPTIONAL} | New field nr-SymbolIndex-r18 should be added using an EAG ("[[ … ]]"). Furthermore, need code is missing for the field. |
| Lenovo | NR-Multi-RTT-CarrierPhaseMeasurementElement-r18 ::= SEQUENCE {{ nr-TimeStamp-RSCP-r18 NR-TimeStamp-r16, nr-RSCP-r18 INTEGER (0..3600), nr-PhaseQuality-r18 NR-PhaseQuality-r18 OPTIONAL, ...} | Redundant opening bracket can be removed. |
| Lenovo | NR-Multi-RTT-ReportConfig-r16 ::= SEQUENCE { maxDL-PRS-RxTxTimeDiffMeasPerTRP-r16 INTEGER (1..4) OPTIONAL, -- Need ON timingReportingGranularityFactor-r16 INTEGER (0..5) OPTIONAL -- Need ON [[ indicatedResourceSetandTimeWindow-r18 IndicatedResourceSetandTimeWindow-r18 OPTIONAL -- Need ON ]]} | The direct addition of indicatedResourceSet-and-TimeWindow-r18 is not possible since there is no extension marker defined in NR-Multi-RTT-ReportConfig-r16. To add the new field a R18 NCE of NR-Multi-RTT-ReportConfig-r16 should be used. |
| Lenovo |

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| NR DL-TDOA/DL-AoD Assistance Data (clauses 6.4.3, 7.4.2) | *posSibType6-1* | *NR-DL-PRS-AssistanceData* |
| *posSibType6-2* | *NR-UEB-TRP-LocationData* |
| *posSibType6-3* | *NR-UEB-TRP-RTD-Info* |
| *posSibType6-4* | *NR-TRP-BeamAntennaInfo* |
| *posSibType6-5* | *NR-DL-PRS-TRP-TEG-Info* |
| *posSibType6-6* | *NR-PRU-DL-Info* |
| On-demand DL-PRS Configurations (clause 6.4.3) | *posSibType6-6* | *NR-On-Demand-DL-PRS-Configurations* |

 | posSibType6-6 is duplicated since it is already defined for NR-On-Demand-DL-PRS-Configurations. |
| Huawei, HiSIlicon | NR-PRU-DL-InfoThe IE *NR-PRU-DL-Info* is used by the location server to provide DL carrier phase measurement information reported by a PRU, with additional information of this PRU to a target UE. Editor Notes: FFS all PRU measurements are required, or just the carrier phase.Wait for RAN1 reply LS.-- ASN1STARTNR-PRU-DL-Info-r18 ::= SEQUENCE (SIZE (1..maxMeasInstances-r17)) OF NR-PRU-DL-MeasurementInformation-r18NR-PRU-DL-MeasurementInformation-r18 ::= SEQUENCE { dl-PRS-ReferenceInfo-r16 DL-PRS-ID-Info-r16, nr-PRU-DL-MeasList-r18 NR-PRU-DL-MeasList-r18, ... }NR-PRU-DL-MeasList-r18 ::= SEQUENCE (SIZE(1..FFS)) OF NR-PRU-DL-MeasElement-r18 NR-PRU-DL-MeasElement-r18 ::= SEQUENCE { dl-PRS-ID-r18 INTEGER (0..255), nr-PhysCellID-r18 NR-PhysCellID-r16 OPTIONAL, nr-CellGlobalID-r18 NCGI-r15 OPTIONAL, nr-ARFCN-r18 ARFCN-ValueNR-r15 OPTIONAL, nr-DL-PRS-ResourceID-RSCPD-r18 NR-DL-PRS-ResourceID-r16 OPTIONAL, nr-DL-PRS-ResourceSetID-RSCPD-r18 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, nr-PRU-DL-RSCPD-Info-r18 NR-PRU-DL-RSCPD-Info-r18 OPTIONAL, nr-PRU-LocationInfo-r18 LocationCoordinates OPTIONAL, -- Need ON ...}NR-PRU-DL-RSCPD-Info-r18 ::= SEQUENCE (SIZE(1..4)) OF NR-PRU-DL-RSCPD-Element-r18 NR-PRU-DL-RSCPD-Element-r18 ::= SEQUENCE { nr-TimeStampRSCPD-r18 NR-TimeStamp-r16, nr-RSCPD-r18 INTEGER (0..61565) OPTIONAL,  nr-PhaseQualityRSCPD-r18 NR-PhaseQuality-r18 OPTIONAL, nr-pru-relativelocation-r18 RelativeLocation-r16 OPTIONAL, ...}Editor Notes: 1. additional PRU information, e.g. the AoD of PRU to each TRP, etc. wait for RAN1 progress.2. The nr-pru-relativelocation is FFS, considering the movement of PRU.3. The maxinum number TRP for measurement list from PRU is FFS. | Still in yellow color in R1-2310695 and should not be implemented in current stage |
| ZTE | – NR-IndicatedResourceSetandTimeWindowThe IE *NR-IndicatedResourceSetandTimeWindow* provides a set of indicated DL PRS resource set(s) occurring within indicated time window(s) which is configured from server to target UE to perform carrier phase measurements.Editor Notes: FFS all measurements are performed in the window or just carrier phase based on the reply LS from RAN1.-- ASN1STARTNR-IndicatedResourceSetandTimeWindow-r18 ::= SEQUENCE { nr-DL-PRS-IndicatedList-r18  NR-DL-PRS-IndicatedPerFreq-r18,...}NR-DL-PRS-IndicatedPerFreq-r18 SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF NR-IndicatedResourceSetandTimeWindowList-r18,NR-IndicatedResourceSetandTimeWindowList-r18 ::= SEQUENCE{ dl-PRS-ID-r16 INTEGER (0..255), nr-PhysCellID-r16 NR-PhysCellID-r16 OPTIONAL, -- Need ON nr-CellGlobalID-r16 NCGI-r15 OPTIONAL, -- Need ON nr-ARFCN-r16 ARFCN-ValueNR-r15 OPTIONAL, -- Need ON nr-DL-PRS-IndicatedResourceSetList-r18 SEQUENCE (SIZE (1.. nrMaxSetsPerTrpPerFreqLayer-r16)) OF NR-IndicatedResourceSetTimeWindow-r18 OPTIONAL -- Need ON...}NR-IndicatedResourceSetTimeWindow-r18 ::= SEQUENCE { nr-IndicatedResourceSetID-r18 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, -- Need ON nr-StartSFN-TimeWindow-r18 INTEGER (0..1023) OPTIONAL, -- Need ON nr-PeriodicityandSlotOffsetTimeWindow-r18 NR-DL-PRS-PeriodicityandSlotOffset-r16 OPTIONAL, -- Need ON nr-SymbolOffsetTimeWindow-r18 INTEGER (0..12) OPTIONAL, -- Need ON nr-durationTimeWindow-r18 ENUMERATED { n1, n2, n4, n6, n8, n12, n16, ... } OPTIONAL, -- Need ON...}Editor Notes:1. FFS there are multiple time windows associated with one resourceSetID or only one time window assocaited with resourceSetID. Wait for RAN1 reply LS.-- ASN1STOP | The window configuration is not correct.Regarding the window, R1’s agreement is:

|  |
| --- |
| When an LMF requests the UEs, including target UE and PRU(s), to perform measurements on indicated DL PRS resource set(s) occurring within indicated time window(s)The duration of a time window can be configured as follows:o{1, 2, 4, 6, 8, 12, 16} slots.the number of the time windows can be:o{1, 2}the number of the indicated DL PRS resource set(s) per TRP within a time window can be {1, 2}:oDL PRS resource sets across all TRPs are in one DL PFL |

 It means the up to 2 window is per UE configured, not per TRP configured. One UE can have up to 2 window, each window configuration can contain multiple TRPs, and for each TRP, up to 2 PRS resource sets of the TRP can be configured in the window. The correct signaling structure should be:* Window1
* Window time config
* Associated multiple TRPs
* Up to 2 PRS resource sets of each TRP
* Window2
* Window time config
* Associated multiple TRPs
* Up to 2 PRS resource sets of each TRP
 |
| Qualcomm | LPP Version | Latest Version is 17.6.0 |
| Qualcomm | NR-IndicatedResourceSetandTimeWindow-r18 ::= SEQUENCE { nr-DL-PRS-IndicatedList-r18  NR-DL-PRS-IndicatedList-r18,...} | Needs to indicate which PFL. |
| Qualcomm | NR-DL-PRS-IndicatedResourceSet-r18 ::= SEQUENCE { nr-IndicatedResourceSetID-r18 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, -- Need ON nr-StartSFN-TimeWindow-r18 INTEGER (0..1023) OPTIONAL, -- Need ON nr-PeriodicityandSlotOffsetTimeWindow-r18 NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16 OPTIONAL, -- Need ON nr-SymbolOffsetTimeWindow-r18 INTEGER (0..12) OPTIONAL, -- Need ON nr-DurationTimeWindow-r18 ENUMERATED { n1, n2, n4, n6, n8, n12, n16, ... } OPTIONAL, -- Need ON...} | Seems not needed, since the nr-DL-PRS-IndicatedResourceSetList-r18 corresponds to the assistance data list |
| Qualcomm | NR-PRU-DL-MeasList-r18 ::= SEQUENCE (SIZE (1..nrMaxTRPsperPRU-r18)) OF NR-PRU-DL-MeasElement-r18  | Should be nrMaxTRPs-r16. |
| Qualcomm | NR-PRU-DL-MeasElement-r18 ::= SEQUENCE { dl-PRS-ID-r18 INTEGER (0..255), nr-PhysCellID-r18 NR-PhysCellID-r16 OPTIONAL, nr-CellGlobalID-r18 NCGI-r15 OPTIONAL, nr-ARFCN-r18 ARFCN-ValueNR-r15 OPTIONAL, nr-PRU-DL-RSCPD-Info-r18 NR-PRU-DL-RSCPD-Info-r18 OPTIONAL, ...} | What is the PRU Location? The ARP locations should be needed for each DL-PRS Resource. |
| Qualcomm | NR-PRU-DL-RSCPD-Element-r18 ::= SEQUENCE { nr-TimeStampRSCPD-r18 NR-TimeStamp-r16, nr-RSCPD-r18 INTEGER (0..61565) OPTIONAL,  nr-PhaseQualityRSCPD-r18 NR-PhaseQuality-r18 OPTIONAL, nr-PRU-relativelocation-r18 RelativeLocation-r16 OPTIONAL, ...} | This should be the ARP location of the measured DL-PRS Resources (CP is supposed to achieve cm-level accuracy).  |
| Qualcomm |  [[ symbolTimeStampSupport-r18 ENUMERATED { supported } OPTIONAL ]] | Why only this capability? E.g., what about the capability to support the CP measurements? |
| Qualcomm |  ]], [[ nr-UE-RSCP-Request-r18 ENUMERATED { requested } OPTIONAL, -- Need ON indicatedResourceSetandTimeWindow-r18 IndicatedResourceSetandTimeWindow-r18 OPTIONAL -- Need ON ]]} | Does not exist. Should be NR-IndicatedResourceSetandTimeWindow-r18 |
| Nokia | NR-IndicatedResourceSetandTimeWindow-r18 ::= SEQUENCE { nr-DL-PRS-IndicatedList-r18 NR-DL-PRS-IndicatedPerFreq-r18,... | If only one PFL is involved, NR-DL-PRS-IndicatedPerFreq-r18 IE is not needed. You can directly define nr-DL-PRS-IndicatedList-r18 as SEQUENCE (SIZE (1..nrMaxTRPsPerFreq-r16)) OF NR-IndicatedResourceSetandTimeWindowList-r18. Also, the naming of fields and IEs needs to be revisited to make it more intuitive. NR-IndicatedResourceSetandTimeWindowList-r18 is actually an element of a list and so should be called NR-IndicatedResourceSetandTimeWindowElement-r18 or simply NR-IndicatedResourceSetandTimeWindow-r18 |
| Nokia | ***NR-IndicatedResourceSetTimeWindow*** This field specifies the indicated DL-PRS resource set(s) for performing measurements time window of start time, duration and the numbers of the time window for performing measurements on indicated DL PRS resource set(s) and comprises the following subfields: | This is an IE but here we should provide a description for a field. So, we should provide a description for nr-DL-PRS-IndicatedResourceSetList.Also, use of plural as in DL-PRS resource set(s) is OK for a list of resource sets but if an IE is described, the IE only represents one instance of resource set and it’s time window configuration. |
| Nokia | - ***nr-periodicityandSlotOffsetTimeWindow*** This field specifies the periodicity of the time window in slots configured per DL-PRS Resource Set and the slot offset with respect to SFN #0 slot #0 for a TRP where the DL-PRS Resource Set is configured. | Slot offset is not clear. StartSFN is signalled. So, is this the slot offset relative to the StartSFN for the start of time window? |
| Nokia | ***nr-SymbolOffsetTimeWindow*** This field specifies the symbol offset with respect to the slot offset | Is this the symbol offset relative to a slot in the StartSFN for the start of time window? |
| Nokia | NR-PRU-DL-Info-r18 ::= SEQUENCE (SIZE (1..maxMeasInstances-r17)) OF NR-PRU-DL-MeasurementInformation-r18 | Is this supposed to be max measurement instances or max TRPs? Or is this max measurement instances per TRP? |
| Nokia | NR-PRU-DL-MeasList-r18 ::= SEQUENCE (SIZE(1..FFS)) OF NR-PRU-DL-MeasElement-r18  | What is this max value? Max resource sets per TRP or max Resources? Based on field descriptions below it looks like this is maxResources! |
| Nokia | NR-PRU-DL-MeasElement-r18 ::= SEQUENCE { dl-PRS-ID-r18 INTEGER (0..255), nr-PhysCellID-r18 NR-PhysCellID-r16 OPTIONAL, nr-CellGlobalID-r18 NCGI-r15 OPTIONAL, nr-ARFCN-r18 ARFCN-ValueNR-r15 OPTIONAL, nr-DL-PRS-ResourceID-RSCPD-r18 NR-DL-PRS-ResourceID-r16 OPTIONAL, nr-DL-PRS-ResourceSetID-RSCPD-r18 NR-DL-PRS-ResourceSetID-r16 OPTIONAL, nr-PRU-DL-RSCPD-Info-r18 NR-PRU-DL-RSCPD-Info-r18 OPTIONAL, nr-PRU-LocationInfo-r18 LocationCoordinates OPTIONAL, -- Need ON ...} | You only need to provide the PRU location once right? Why is the PRU location reported per measurement instance/per resource used for the measurement? NR-PRU-DL-Info is PRU info for one PRU. |
| Nokia |  nr-SymbolIndex-r18 INTEGER (0..13) OPTIONAL | Change field name to nr-Symbol but the field description can still describe it as an index. |
| Nokia | – NR-PhaseQualityThe IE *NR-PhaseQuality* defines the quality of the phase for RSCP/RSCPD measurements. | Change to “defines the quality of the RSCP/RSCPD measurement”. |
| Nokia |  nr-TimeStampRSCPD-r18 NR-TimeStamp-r16, | Can we not reuse the nr-Timestamp field in NR-DL-TDOA-MeasElement-r16 IE for RSCPD measurement also and updated the field description for nr-Timestamp to take into account RSCPD measurement also? |
| Nokia | ***nr-PhaseQuality***This field specifies the target device′s best estimate of the quality of the measurement. | Update to say: “quality of the RSCPD measurement” |
| Nokia |  [[  nr-UE-RSCPD-Request-r18 ENUMERATED { requested } OPTIONAL -- Need ON ]] | Remove UE from the field name. How about calling it nr-DL-PRS-RSCPD-Request? Wondering why we cannot use another bit in nr-RequestedMeasurements-r16? |
| Nokia | ***nr-UE-RSCPD-Request***This field, if present, indicates that the target device is requested to provide the*nr-RSCPD*in IE *NR-DL-TDOA-SignalMeasurementInformation* together with DL-PRS RSTD measurements. | The request can also be sent to PRU.I understand the green highlighted text is following similar wording used for other measurements in this specification but wondering why not just describe the measurement instead of referring to the measurement field in the IE where it appears? i.e., write it as “provide the RSCPD measurement together with DL-PRS RSTD measurement”?Should be singular i.e RSTD measurement instead of RSTD measurements. |
| Nokia | ***nr-IndicatedResourceSetandTimeWindow*** This field specifies the indicated DL-PRS resource set(s) for performing measurements time window(s) of start time, and duration for performing measurements on indicated DL PRS resource set(s). | Change description to something along this line: “This field indicates DL-PRS resource set(s) occurring within time window(s) for performing measurements where the time window is indicated by a start time, and duration …” |
| Nokia | ***SymbolTimeStampSupport***This field, if present, indicates that the target device supports to provide an OFDM symbol index in the timestamp. | Field name should start with lower case.Proposed text: “This field, if present, indicates that the target device supports reporting timestamp in terms of radio frame timing down to OFDM symbol level” |
| Nokia | nr-Multi-RTT-CarrierPhaseMeasurements-r18 in NR-Multi-RTT-AdditionalMeasurementElement-r16 | My understanding is, RSCP measurement is not reported in additional measurements. |
| Nokia | ***nr-RSCP***This field specifies the NR DL reference carrier phase measurement, as defined in TS 38.215 [36]. Mapping of the measured quantity is defined as in TS 38.133 [46]. | Should be Reference signal carrier phase measurement. |
| Nokia | ***nr-PhaseQuality***This field specifies the target device′s best estimate of the quality of the measurement. | Update as: quality of the RSCP measurement |
| Nokia | ***nr-UE-RSCP-Request***This field, if present, indicates that the target device is requested to provide the DL RSCP measurementin IE *NR-Multi-RTT-SignalMeasurementInformation* together with *nr-UE-RxTxTimeDiff.* | The request can also be sent to a PRU. Not just target device. PRU is not the target device for the positioning estimation. |
| Nokia | ***symbolTimeStampSupport***This field, if present, indicates that the target device supports to provide an OFDM symbol index in the timestamp. | Proposed description text: This field, if present, indicates that the target device supports reporting timestamp in terms of radio frame timing down to OFDM symbol level. |
| Nokia | *posSibType6-6* | Applies only to DL-TDOA but the first column also mentioned DL-AoD. We could update the first column to say NR DL-TDOA or DL-AoD Assistance Data? |

**Summary**

TBD

In view of LPP, the following is the analyzation on the leftover issues of Carrier Phase Positioning.

1. PRU related issues:
2. FFS all PRU measurements are required, or just the carrier phase. Wait for RAN1 reply LS.
3. The nr-pru-relativelocation is FFS, considering the movement of PRU.
4. The maxinum number TRP for measurement list from PRU is FFS.
5. Indicated DL-PRS time window aspect:
6. FFS all measurements are performed in the window or just carrier phase based on the reply LS from RAN1.
7. FFS there are multiple time windows associated with one resourceSetID or only one time window assocaited with resourceSetID. Wait for RAN1 reply LS.
8. The measurement report aspect:
9. the value of PhaseQuality is FFS, waiting for the further input from RAN1 and RAN4.

The number of report CarrierPhaseMeasurementElement is no more FFS, according to RAN1 further agreement.

Agreement

Subject to UE’s capability, if a UE Rx-Tx time difference/DL RSTD measurement is obtained with Nsample (=2, 4) samples, as defined in TS 38.133, the UE Rx-Tx time difference/DL RSTD measurement can be associated with (i.e., reported together with) up to Nsample RSCP/RSCPD measurements.

**Question 2: Companies are invited to provide their comments on the open issue for LPP spec for Carrier Phase Positioning in the following table.**

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| --- | --- |
| **Company** | **Comments** |
| Xiaomi | Regarding the nr-pru-relativelocation, we think it is not needed since there is a nr-PRU-LocationInfo-r18 associated with each measurement, even if the PRU is moving, the nr-PRU-LocationInfo-r18 could be different for different measurement.For other open issues, we suggest wait the response from RAN1. |
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**Summary**

# Discussion on LPP running CR for bandwidth aggregation

**Question 1: Companies are invited to provide their comments on the LPP running CR for bandwidth aggregation in the following table.**

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| --- | --- | --- |
| **Company** | **Excerpted spec with issues** | **Comments** |
| ZTE | ***nr-DL-PRS-AggregationInfo***NOTE: The linked DL-PRS Resource Sets from two or three Positioning Frequency Layers in a *nr-linked-DL-PRS-ResourceSetIDList-PrsAggregation* messageare from the same TRP. | Yellow highlight should be added |
| ZTE | on-demand-dl-prs-aggregation-list-r18 SEQUENCE (SIZE (1..maxOD-DL-PRS-Configs-r17)) OF  On-Demand-DL-PRS-Aggregation-Info-r18 OPTIONAL | Yellow part equals to 8. We do not have agreement saying that LMF can only provide up to 8 aggregation combinations to the UE. Suggest to replace this yellow part to a new value with suffix ‘-r18’.Same comments for the on-demand PRS UE reporting. |
| ZTE | – *NR-DL-TDOA-SignalMeasurementInformation*nr-aggregated-DL-PRS-ResourceSetIDList-r18 SEQUENCE (SIZE (1.. nrMaxNumDL-PRS-ResourceSetsPerTRP-r18)) OF NR-DL-PRS-ResourceSetID-r16 OPTIONAL, nr-aggregated-DL-PRS-ResourceIDList-r18 SEQUENCE (SIZE (1.. nrMaxNumDL-PRS-ResourceSetsPerTRP-r18)) OF NR-DL-PRS-ResourceID-r16 OPTIONAL | There is no yellow value in the current running CR. Is it ‘–r16’ or ‘–r18’?If it is –r16, the number is 8, however for a RSTD, there should be additional 1 or 2 PRS resource sets to be aggregated with the reported PRS resource set ID in the NR-DL-TDOA-MeasElement-r16, or, there should be 2 or 3 PRS resource sets to be indicated. So the yellow part is not correct anyway.[R1: PRS Resource Set IDs Note: A single PRS resource Set ID indicates no aggregation.]And in the measurement report, only resource set aggregation should be indicated. Resources within the aggregated resource sets are considered as one-to-one aggregated already.Same comment for RTT. |
| ZTE | ***In NR-DL-TDOA-SignalMeasurementInformation* field description:*****nr-RSTD-BasedOnAggregatedResources***This field indicates whether the measurement is based on aggregation across PFLs for Multi-RTT. | Should be ‘for DL-TDOA’ |
| ZTE | nr-DL-PRS-JointMeasurementRequested-r18 INTEGER (1..nrMaxNumPRSBandWidthAggregation-r18)OPTIONAL -- Need ON | in request location information, R1’s parameter list says to use ‘nr-linked-DL-FreqLayerIndexList-PrsAggregation’, and ‘Up to three [DL-PRS-FreqLayerIndex] (potential new parameter, up to RAN2) values, each from INTEGER (0..nrMaxFreqLayers-1-r16)]’.We think RAN2 spec should follow the parameter list and explicitly indicate 2 or 3 PFL index in the request location information.Same comment for RTT[Samsung] Agree with ZTE. In addition, the PFL-index list can be optionally present if *jointMeasurementsReq-r18* is set in *nr-RequestedMeasurements-r16*. Otherwise, it is absent. |
| Xiaomi |  on-demand-dl-prs-aggregation-list-r18 SEQUENCE (SIZE (1..maxOD-DL-PRS-Configs-r17)) OF  On-Demand-DL-PRS-Aggregation-Info-r18 OPTIONAL | We understand the max number of on-demand-dl-prs-aggregation-list-r18 is the half of maxOD-DL-PRS-Configs-r17. |
| Xiaomi |  dl-prs-aggregation-id-PrefList-r18 SEQUENCE (SIZE (1..maxOD-DL-PRS-Configs-r17)) OF  INTEGER (1..maxOD-DL-PRS-Configs-r17) OPTIONAL, nr-on-demand-DL-PRS-Aggregation-ReqList-r18 SEQUENCE (SIZE (1..maxOD-DL-PRS-Configs-r17)) OF NR-On-Demand-DL-PRS-Aggregation-ReqElement OPTIONAL | NR-On-Demand-DL-PRS-Aggregation-ReqElement should be NR-On-Demand-DL-PRS-Aggregation-ReqElement-r18.And the max number of nr-on-demand-DL-PRS-Aggregation-ReqList-r18 is the half of maxOD-DL-PRS-Configs-r17. |
|  |  |  |
| Xiaomi |

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| ***dl-prs-aggregation-id-PrefList***This field specifies the on-demand DL-PRS aggregated configuration associated with *on-demand-dl-prs-aggregation-list* in IE *NR-On-Demand-DL-PRS-Configurations* the target device wishes to obtain in the order of preference. The first integer value in the list is the most preferred aggregated configuration, the second integer value in the list is the second most preferred, etc. The integer value corresponds to the entry in the field *on-demand-dl-prs-aggregation-list* in IE *NR-On-Demand-DL-PRS-Configurations*. |
| ***nr-on-demand-DL-PRS-Aggregation-ReqList***This field specifies the aggregated on-demand DL-PRS configuration information requested by the target device in the order of preference. The first *NR-On-Demand-DL-PRS-Aggregation-ReqElement* in the list is the most preferred aggregated configuration, the second element in the list is the second most preferred, etc. The integer value in *NR-On-Demand-DL-PRS-Aggregation-ReqElement* corresponds to the entry in the IE *NR-On-Demand-DL-PRS-Information*. |

 | According to the filed description, it seems that UE only can request the prs aggregation when the *on-demand-dl-prs-aggregation-list* is configured, however, we didn’t make the agreements on this, suggest further discuss whether UE can request PRS aggregation if the on-demand PRS aggregation list is not configured. |
| Lenovo | ***on-demand-dl-prs-aggregation-list***This field indicates the 2 or 3 *DL-PRS-Configuration-ID*'s whose corresponding *On-Demand-DL-PRS-Configuration's* are available for DL-PRS aggregation.***dl-prs-aggregation-id-PrefList***This field specifies the on-demand DL-PRS aggregated configuration associated with *on-demand-dl-prs-aggregation-list* in IE *NR-On-Demand-DL-PRS-Configurations* the target device wishes to obtain in the order of preference. The first integer value in the list is the most preferred aggregated configuration, the second integer value in the list is the second most preferred, etc. The integer value corresponds to the entry in the field *on-demand-dl-prs-aggregation-list* in IE *NR-On-Demand-DL-PRS-Configurations*.***nr-on-demand-DL-PRS-Aggregation-ReqList***This field specifies the aggregated on-demand DL-PRS configuration information requested by the target device in the order of preference. The first *NR-On-Demand-DL-PRS-Aggregation-ReqElement* in the list is the most preferred aggregated configuration, the second element in the list is the second most preferred, etc. The integer value in *NR-On-Demand-DL-PRS-Aggregation-ReqElement* corresponds to the entry in the IE *NR-On-Demand-DL-PRS-Information*. | Suggest keeping the descriptions of on-demand PRS bandwidth aggregation as FFS.The specific design for on-demand PRS aggregation design have not been discussed and determined in RAN2 yet. How to capture the PRS bandwidth aggregation in pre-configured on-demand PRS and on-demand PRS request from UE are still open.  |
| Lenovo | IE NR-DL-TDOA-SignalMeasurementInformation:[[ nr-RSTD-BasedOnAggregatedResources-r18 BOOLEAN OPTIONAL, nr-aggregated-DL-PRS-ResourceSetIDList-r18 SEQUENCE (SIZE (1.. nrMaxNumDL-PRS-ResourceSetsPerTRP-r18)) OF NR-DL-PRS-ResourceSetID-r16 OPTIONAL, nr-aggregated-DL-PRS-ResourceIDList-r18 SEQUENCE (SIZE (1.. nrMaxNumDL-PRS-ResourceSetsPerTRP-r18)) OF NR-DL-PRS-ResourceID-r16 OPTIONAL ]] | Definition of new constant nrMaxNumDL-PRS-ResourceSetsPerTRP-r18 is missing in clause 6.6. |
| Lenovo | IE NR-Multi-RTT-RequestLocationInformation-r16:[[ nr-Multi-RTT-ReportConfig-Ext-r18 NR-Multi-RTT-ReportConfig-Ext-r18 OPTIONAL, -- Need ON  nr-DL-PRS-JointMeasurementRequested-r18 INTEGER (1..nrMaxNumPRSBandWidthAggregation-r18)OPTIONAL -- Need ON ]]NR-Multi-RTT-ReportConfig-Ext-r18 ::= SEQUENCE { timingReportingGranularityFactor-Ext-r18 INTEGER (6..7) OPTIONAL -- Need ON} | New field timingReportingGranularityFactor-Ext-r18 can be introduced by using R18 NCE of nr-Multi-RTT-ReportConfig-r16 / NR-Multi-RTT-ReportConfig-r16. |
| Huawei, HiSilicon |  [[ on-demand-dl-prs-aggregation-list-r18 SEQUENCE (SIZE (1..maxOD-DL-PRS-Configs-r17)) OF  On-Demand-DL-PRS-Aggregation-Info-r18 OPTIONAL ]] | What is the RAN1/RAN2 agreement for support on-demand PRS and PRS aggregation?? |
|  |  k-1-r18 INTEGER (0..16381), k-2-r18 INTEGER (0..32761) | The previous agreement was to leave the parameter range of the field to RAN4 parameter list |
| Qualcomm |  ..., k-1-r18 INTEGER(0..32701), k-2-r18 INTEGER(0..65401) | This is confusing. Usually we express the "-" in words. E.g.,kMinus1-r18 or k-minus1-r18 |
| Qualcomm | NR-DL-PRS-AggregationInfo-r18 ::= SEQUENCE (SIZE (1..nrMaxNumPRSBandWidthAggregation-r18)) OF  NR-linked-DL-PRS-ResourceSetIDList-PRS-Aggregation-r18 | Should be 256128 sets per TRP. 256 covers 2, 3 and 2+2 PFLs[Samsung] Not sure about the number ‘256’ since NR-DL-PRS-AggregationInfo-r18 field is not per TRP. (i.e., it can include the sets of aggregated DL-PRS-ResourceSets from multiple TRP).Maybe we need to ask the maximum number of aggregations per TRP to RAN1.Unnecessary long field name. "linked" and "aggregation" seems the same.  |
| Qualcomm | Editor note: it is assumed that multiple combinations of the PRS bandwidth aggregation configurations can be provided, FFS the values.  | Up to 2:AgreementConfiguring up to two PFL combinations is supported (e.g. PFL1 aggregated with PFL2 and PFL3 aggregated with PFL4). · Send an LS to RAN4 (CC to RAN2 and RAN3) to inform them with the above agreement and specify corre-sponding requirements.· Note: more than one combinations are measured in TDMed manner(hence, 256 elements above) |
| Qualcomm | ***onDemand-DL-PRS-Aggregationlist***This field indicates the 2 or 3 *DL-PRS-Configuration-ID*'s whose corresponding *On-Demand-DL-PRS-Configuration*'s are available for DL-PRS aggregation. | General (applies to all CRs):Most descriptions do not use the correct styles; i.e., mainly Normal Style seems used. However, Tables should use TAL, indentations B1, B2, etc., Table Notes should use TAN, etc. |
| Qualcomm |  ]], [[ nr-RSTD-BasedOnAggregatedResources-r18 BOOLEAN OPTIONAL, nr-Aggregated-DL-PRS-ResourceSetIDList-r18 SEQUENCE (SIZE (1.. nrMaxNumAggregatedDL-PRS-ResourceSetsPerTRP-r18)) OF NR-DL-PRS-ResourceSetID-r16 OPTIONAL, nr-Aggregated-DL-PRS-ResourceIDList-r18 SEQUENCE (SIZE (1.. nrMaxNumAggregatedDL-PRS-ResourcesPerResourceSet-r18)) OF NR-DL-PRS-ResourceID-r16 OPTIONAL ]]} | This is not agreed in RAN1.(see also 38.214)**Agreement**For PRS bandwidth aggregation across PFLs, in a measurement report element, support* Single RSRP or single RSRPP
	+ FFS: the single RSRP/RSRPP is based on aggregated PRS resources across aggregated PFLs
* The aggregated reference RSTD
* The used PRS resource set IDs for the aggregated measurement which are shared for RSRP/RSRPP and/or timing measurement results
 |
| Qualcomm |  nr-RSTD-BasedOnAggregatedResources-r18 BOOLEAN OPTIONAL, | Should be ENUMERATED {true} |
| Qualcomm |  nr-Aggregated-DL-PRS-ResourceSetIDList-r18 SEQUENCE (SIZE (1.. nrMaxNumAggregatedDL-PRS-ResourceSetsPerTRP-r18)) OF NR-DL-PRS-ResourceSetID-r16 OPTIONAL,nrMaxNumAggregatedDL-PRS-ResourceSetsPerTRP-r18 INTEGER ::= 2  | One measurement can have 2 or 3 aggregated PFLs |
| Qualcomm | Editor notes: From rapporteur’s aspect, since anway UE need to report the aggregated resource set/resource information to LMF for joint measurements, the indication that whether the measurements is joint measurements may be not needed | The Resource Set IDs are optional reported (same as legacy). Hence, the flag is needed. |
| Qualcomm | ***nr-Aggregated-DL-PRS-ResourceIDList***This field provides the PRS resource IDs for the aggregated measurement which are used for RSRP/RSRPP and/or timing measurement results. The list has the same number of entries of the *nr-aggregated-DL-PRS-ResourceSetIDList*, and the the resource ID belongs to the resource set in the same position of the list *nr-aggregated-DL-PRS-ResourceSetIDList*. | It hasn’t yet been agreed in RAN1 that RSRP/RSRPP is based on the aggregated PRS resources. **Agreement**For PRS bandwidth aggregation across PFLs, in a measurement report element, support· Single RSRP or single RSRPP o FFS: the single RSRP/RSRPP is based on aggregated PRS resources across aggregated PFLs· The aggregated reference RSTD · The used PRS resource set IDs for the aggregated measurement which are shared for RSRP/RSRPP and/or timing measurement results |
| Qualcomm | prsrsrpReq (0), firstPathRsrpReq-r17 (1), jointMeasurementsReq-r18 (2) | This has no explanation."Joint Measurements" is also somewhat confusing. It's a single measurement, but using aggregated PFLs. |
| Qualcomm |  nr-DL-PRS-JointMeasurementRequested-r18 INTEGER (1..nrMaxNumPRSBandWidthAggregation-r18)OPTIONAL -- Need O | How can this indicate which PFLs should be used? E.g., 2+2 |
| Qualcomm |  timingReportingGranularityFactor-Ext-r18 INTEGER (6..7) OPTIONAL -- Need ON | Why not INTEGER(-2..-1)? |
| Qualcomm | and value (6..7) corresponds to (k-1..k-2) | Corresponds to k=-1 and k=-2 |
| Qualcomm | ***nr-DL-PRS-JointMeasurementRequested***This field indicates Request from the LMF to the UE indicating which two or three PFLs to be used for performing joint measurement. | I think it will be useful to add a description clarification here based on this RAN1 agreement:AgreementWhen the LMF requests aggregated measurements, the following existing requested fields can also be applicable:· A request for reduced sample processing for aggregated measuremento Reuse the existing field: reducedDL-PRS-ProcessingSamples-r17· A request for lower Rx beam sweeping factor for FR2 that is applicable for aggregated measurementso Reuse the existing field: lowerRxBeamSweepingFactor-FR2· A request for the maximum number of aggregated UE-Rx-Tx / RSTD measurements for different DL-PRS Resources or DL-PRS Resource Sets per TRPo Reuse the existing field: maxDL-PRS-RSTD-MeasurementsPerTRPPair |
| Qualcomm |  ]], [[ finerReportingGranularitySupport-r18 ENUMERATED { supported } OPTIONAL ]]} | What about the capability of supporting DL-PRS aggregation? If capabilities are handled in a separate CR, why is this one mentioned here? |
| Qualcomm | ***finerReportingGranularitySupport***This field, if present, indicates that the target device supports finer measurement reporting granularity for RSTD measurement for k-1 and k-2 as in clause 6.5.12.4. | ? Should refer to 38.133. |
| Samsung |  nr-RSTD-BasedOnAggregatedResources-r18 BOOLEAN OPTIONAL, nr-Aggregated-DL-PRS-ResourceSetIDList-r18 SEQUENCE (SIZE (1.. nrMaxNumAggregatedDL-PRS-ResourceSetsPerTRP-r18)) OF NR-DL-PRS-ResourceSetID-r16 OPTIONAL, nr-Aggregated-DL-PRS-ResourceIDList-r18 SEQUENCE (SIZE (1.. nrMaxNumAggregatedDL-PRS-ResourcesPerResourceSet-r18)) OF NR-DL-PRS-ResourceID-r16 OPTIONAL | These fields can be optionally present if *RequestedMeasurements-r16* has been received from the location server with bit 1 (*jointMeasurementsReq*) set to value 1. Otherwise, it is absent. |
| Intel | The field/IE name is not aligned with name convention, e.g. NR-linked-DL-PRS-ResourceSetIDList-PRS-Aggregation-r18 should be NR-LinkedDL-PRS-ResourceSetIDListPRS-Aggregation-r18 onDemand-DL-PRS-AggregationList-r18 should be onDemandDL-PRS-AggregationList-r18***nr-UE-RxTxTimeDiff-BasedOnAggregatedResources should be nr-UE-RxTxTimeDiffBasedOnAggregatedResources***timingReportingGranularityFactor-Ext-r18 should be timingReportingGranularityFactorExt-r18 |  |
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**Summary**

In view of LPP, the following is the analyzation on the leftover issues of bandwidth aggregation.

1. FFS if multiple combinations of bandwidth aggregation configurations can be provided to UE by LMF?
2. FFS the maximum number of PRS bandwidth aggregation configurations that LMF can provide to UE.
3. FFS whether UE needs to indicate the PRS resource index uses for joint measurements.
4. FFS whether the indication that whether the measurements are joint measurements is needed, since anyway UE need to report the aggregated resource set/resource information to LMF for joint measurements.

**Question 2: Companies are invited to provide their comments on the open issue for LPP spec for bandwidth aggregation in the following table.**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Xiaomi | a), it seems that it has already supported by RAN1. RAN1 agreement: *Configuring up to two PFL combinations is supported (e.g. PFL1 aggregated with PFL2 and PFL3 aggregated with PFL4).* b) and c): suggest ask RAN1 for clarification.d): the additional indication is not needed. |
| Lenovo | FFS on how to capture the LPP procedures to support PRS bandwidth aggregation in RRC\_INACTIVE/IDLE state.  |
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**Summary**

# Discussion on LPP running CR for LPHAP and Redcap Positioning

**Question 1: Companies are invited to provide their comments on the LPP running CR for LPHAP in the following table.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Excerpted spec with issues** | **Comments** |
| Qualcomm | Not based on the latest version of the spec.(may apply to the other CRs as well?) |  |
| Qualcomm |  n5120-r16 INTEGER (0..5119), n10240-r16 INTEGER (0..10239), ..., n20480-r18 INTEGER (0..20479) }, | Should not be put into the spec yet. There is no RAN1 parameter/agreement for this. |
| Qualcomm | ***nr-DL-PRS-RxHoppingRequest***This field, if present, indicates that the target device is requested to perform DL PRS measurements based on receiving multiple hops of DL PRS. | Unclear wording. DL-PRS is not hopping. |
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**Summary**

**Question 2: Companies are invited to provide their comments on the LPP running CR for Redcap Positioning in the following table.**

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| --- | --- | --- |
| **Company** | **Excerpted spec with issues** | **Comments** |
| Xiaomi | NR-DL-TDOA-MeasElement-r16 nr-FrequencyHopping-Indicator-r18 ENUMERATED {singlehop, multiplehops, ...} OPTIONAL  | According to the RAN1 agreements:*A single measurement based on receiving multiple hops of the DL PRS or UL SRS for positioning.* *One measurements where a measurement is associated with one received hop.*Therefore, if PRS Rx frequency hopping is configured, the UE may report multiple measurements and each measurement is associated with one received hop, but currently there is a single measurement for a TRP if we don’t consider the additional measurement, thus the measurement for each hop should be introduced (only an indicator is not sufficient).  |
| Xiaomi |  nr-DL-PRS-RxHopping-Request-r18 ENUMERATED { requested } OPTIONAL -- Need ON | Agreement*For DL PRS Rx hopping, support the LMF to include an explicit request for DL PRS Rx hopping measurements and reporting in the location request signaling.* *The location information request can also optionally include the total bandwidth of all hops.*According to the RAN1 agreement, the total bandwidth of all hops should be optionally included. |
| Huawei, HiSilicon | ***dl-PRS-Periodicity-and-ResourceSetSlotOffset***This field specifies the periodicity of DL-PRS allocation in slots configured per DL-PRS Resource Set and slot offset. For periodicity not larger than 10240ms, the slot offset with respect to SFN #0 slot #0 for a TRP where the DL-PRS Resource Set is configured (i.e. slot where the first DL-PRS Resource of DL-PRS Resource Set occurs). For periodicity larger than 10240ms, the slot offset with respect to H-SFN #0 SFN #0 slot #0 for a TRP where the DL-PRS Resource Set is configured (i.e. slot where the first DL-PRS Resource of DL-PRS Resource Set occurs). | The same change should also be made for ***nr-DL-PRS-SFN0-Offset***. Since they are based on the same reference=> the reference TRP’s SFN#0 |
|  | NR-On-Demand-DL-PRS-PerFreqLayer-r17 ::= SEQUENCE { dl-prs-FrequencyRangeReq-r17 ENUMERATED { fr1, fr2, ...}, dl-prs-ResourceSetPeriodicityReq-r17 ENUMERATED { p4, p5, p8, p10, p16, p20, p32, p40, p64, p80, p160, p320, p640, p1280, p2560, p5120, p10240, p20480, p40960, p81920, ...} | The new periodicity can also be supported in on-demand SI request? this can be discussed in the open issue list. If supported, The 163740 value seems to be missing |
|  | Need further agreement from RAN1. FFS: indication of how many received hops / which received hops where used in the measurement report. | The agreement is already there. Can wait for the L1 parameter listAgreement (RAN1#114bis.)For DL PRS Rx hopping, support the LMF to include an explicit request for DL PRS Rx hopping measurements and reporting in the location request signaling. The location information request can also optionally include the total bandwidth of all hops. |
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**Summary**

In view of LPP, the following is the analyzation on the leftover issues of LPHAP and Redcap positioning.

1. LPHAP
2. Extended PRS periodicity: In RAN2#123bis, an LS on the extended PRS/SRS periodicity was sent to RAN1. We will enhance the signalling based on the parameter list from RAN1. The possible impacts on LPP spec may include the value range of the extended PRS periodicity, the impact on the search window.
3. Alignment of the PRS configuration to the fixed (e)DRX configuration: The possible impacts need more progress in RAN2.
4. Redcap Positioning
5. Need further agreement from RAN1. FFS: indication of how many received hops / which received hops where used in the measurement report.

**Question 3: Companies are invited to provide their comments on the open issue for LPP spec for LPHAP and Redcap Positioning in the following table.**

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| --- | --- | --- |
| **Company** | **LPHAP** | **Redcap Positioning** |
| Xiaomi |  | A general question for PRS Tx frequency hopping, How does UE perform PRS Rx frequency hopping based on the R17 PRS configuration since the DL PRS assistance data is not enhanced in the running CR. |
| Huawei | It should be clarified that periodicity longer than 10240ms is not applicable for PRS-only TP..On the above LPHAP open issue 1 a). There should be no impacts. The search window represents the LMF’s rough estimation of the UE’s location before the positioning measurement and should be intendent of how long the PRS periodicity isWhether on-demand SI request should be supported for the new periodicity |  |
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**Summary**

# Summary

After the email discussion, we propose that:

TBD

# Participants

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| **Company Name** | **Participant name/contact** |
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