**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 |

**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** |
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**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. |
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**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 |
| 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. |
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| Xiaomi | |  | | --- | | ***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. |

**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.**

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| **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. |
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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.**

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