3GPP TSG-RAN WG2 Meeting #121bis-e***R2-23xxxxx***

Online, April 17 – 26, 2023

**Agenda item:** 6.7.3

**Source:** Qualcomm Incorporated

**Title:** Summary of [AT121bis-e][427][POS] Rel-17 LPP CRs

**Document for:**  Discussion

# 0. Introduction

This document summarizes the following email discussion:

* [AT121bis-e][427][POS] Rel-17 LPP CRs (Qualcomm)

 Scope: Check the CRs in agenda item 6.7.3 and R2-2302745.

 Intended outcome: Report and agreed CRs (without CB if possible)

 Deadline: Monday 2023-04-24 2359 UTC

The following Change Requests were submitted for Agenda Item 6.7.3/6.7.5:

[1] R2-2302639, "Corrections on applicability of timing error margin of RxTEG in NR-Multi-RTT-SignalMeasurementInformation field descriptions", CATT.

[2] R2-2302884, "Miscellaneous corrections on LPP", Lenovo.

[3] R2-2302987, "Correction to PRS validity area", Huawei, HiSilicon.

[4] R2-2304050, "Missing LPP support for sub 1s location information reporting periodicity", Ericsson.

[5] R2-2304051, "Missing finer periodicities than 1s", Ericsson.

[6] R2-2304056, "LOS-NLOS-Indicator Types", Nokia, Nokia Shanghai Bell.

[7] R2-2304139, "Use of nr-DL-PRS-ExpectedAoD-or-AoA assistance by UE", Nokia, Nokia Shanghai Bell.

[8] R2-2302745, "LPP capability for FGs27-13a,14a and 14-2 ", Intel Corporation.

# 1. Rx TEG field description

R2-2302639 Corrections on applicability of timing error margin of RxTEG in NR-Multi-RTT-SignalMeasurementInformation field descriptions CATT CR Rel-17 37.355 17.4.0 0431 - F NR\_pos\_enh-Core

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| ***Reason for change:*** | According to the LS from RAN4: R2-2301999 Reply LS on applicability of timing error margin of Rx TEG (R4-2303244; contact: CATT), the applicability of timing error margin for Rx TEG applies to RSTD measurement only, not for the Rx TEG in multiRTT.**RAN4 feedback: The applicability of timing error margin for Rx TEG applies to RSTD measurement only.** So the description of applicability of timing error margin for Rx TEG in *NR-Multi-RTT-SignalMeasurementInformation* which refers to TS38.133 should be deleted because applicability of timing error margin for Rx TEG does not apply to UE Rx-Tx timing difference in TS 38.133. |
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| ***Summary of change:*** | LMF should consider the UE Rx TEG timing error margin value in *NR-Multi-RTT-SignalMeasurementInformation* to be the maximum value available in IE *TEG-TimingErrorMargin,* if the IE *NR-UE-RxTx-TEG-Info* is present with choice case3 and *nr-UE-RxTEG-TimingErrorMargin* is absent. |
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| ***Consequences if not approved:*** | The description of applicability of timing error margin for Rx TEG in *NR-Multi-RTT-SignalMeasurementInformation* is not correct and not aligned with TS 38.133. |

Rapporteur's Comment:

- This CR is related to incoming LS from RAN4 in [R2-2301999](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_121/LSin/R2-2301999.zip), received after RAN2#121 (and re-submitted to RAN2#121bis in [R2-2302429](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_121bis-e/LSin/R2-2302429.zip)). In this LS, RAN4 provided various responses to RAN2 questions, including:

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| Question 3: Does the applicability of timing error margin of Rx TEG in the LS (R4-2214493) apply for UE Rx-Tx timing difference? **RAN4 feedback: The applicability of timing error margin for Rx TEG applies to RSTD measurement only.**  |

- "Timing Error Margins" are defined in TS 38.133 for the actual measurements only; i.e., RSTD and UE Rx-Tx Time Difference.

- Therefore, the reference to a "maximum applicable value in TS 38.133" should be deleted from the field description for *nr-UE-RxTEG-TimingErrorMargin* in *NR-Multi-RTT-SignalMeasurementInformation*, as proposed in the CR [1]:

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| ***nr-UE-RxTEG-TimingErrorMargin***This field specifies the UE Rx TEG timing error margin value for all the UE Rx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case3* and this field is absent, the receiver should consider the UE Rx TEG timing error margin value to be the maximum value available in IE *TEG-TimingErrorMargin*. |
| ***nr-UE-TxTEG-TimingErrorMargin***This field specifies the UE Tx TEG timing error margin value for all the UE Tx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case2* or *case3* and this field is absent, the receiver should consider the UE Tx TEG timing error margin value to be the maximum value available in IE *TEG-TimingErrorMargin*. |
| ***nr-UE-RxTxTEG-TimingErrorMargin***This field specifies the UE RxTx TEG timing error margin value for all the UE RxTx TEGs within one *NR-Multi-RTT-SignalMeasurementInformation*. If the IE *NR-UE-RxTx-TEG-Info* is present with choice *case1* or *case2* and this field is absent, the receiver should consider the UE RxTx TEG timing error margin value to be the maximum applicable value as defined in TS 38.133 [46]. |

**Question 1:** Do you agree that the CR in
"R2-2302639, "Corrections on applicability of timing error margin of *RxTEG* in *NR-Multi-RTT-SignalMeasurementInformation* field descriptions", CATT"
is an essential correction?

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| Company | Yes/No | Comments |
| Huawei, HiSIlicon | Yes |  |
| CATT(Proponent) | Yes | According to the LS from RAN4: R2-2301999, the applicability of timing error margin for Rx TEG applies to RSTD measurement only, not for the Rx TEG in multiRTT. |
| ZTE | Yes |  |
| OPPO | Yes |  |
| Ericsson | Yes |  |
| Intel | Yes |  |
| Samsung | Yes |  |
| vivo | Yes |  |
| LG | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes | It is a bit confusing when rapporteur says “Timing Error Margins" are defined in TS 38.133 for the actual measurements only; i.e., RSTD **and UE Rx-Tx Time Difference**” while the RAN4 LS says it applies only to RSTD measurement. But, we are fine with the change as it aligns with the RAN4 LS. |
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# 2. PPW Capability

R2-2302884 Miscellaneous corrections on LPP Lenovo CR Rel-17 37.355 17.4.0 0432 - F NR\_pos\_enh-Core

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| ***Reason for change:*** | 1. New capability *prs-MeasurementWithoutMG-r17* (R4 FG 14-3) has been introduced in IE *NR-DL-PRS-ProcessingCapability* by CR0416 (R2-2302131, RAN2#121). However, referring to the RAN4 Rel-17 NR features list R4-2215143 the support of FG 14-3 is condition to the support of FG 27-3-2 as defined in the RAN1 Rel-17 NR features list R1-2212895.

RAN4 Rel-17 NR features list R4-2215143:

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| 14. NR\_pos\_enh | 14-3 | PRS measurement without MG | Capability for the threshold used to be compared against with the Rx timing difference to determine whether the PRS from the non-serving cell satisfy the condition of PRS measurement outside MG. | 27-3-2 |

RAN1 Rel-17 NR features list R1-2212895:

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| 27. NR\_pos\_enh | 27-3-2 | DL PRS measurement outside MG and in a PRS processing window | 1. Supported PRS processing types subject to the UE determining that DL PRS to be higher priority for PRS measurement outside MG and in a PRS processing window2. Support of priority handing options of PRS: Option1, Option2 or Option3* + 1. Option 1: Support of “st1” and “st3” defined in clause 5.1.6.5 of TS 38.214
		2. Option 2: Support of “st1”, “st2”, and “st3” defined in clause 5.1.6.5 of TS 38.214
		3. Option 3: Support of “st1” only defined in clause 5.1.6.5 of TS 38.214
 |

That means the condition "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." is missing in the description.1. Miscellaneous editorial issues should be fixed (incorrect IE names in field descriptions, redundant space).
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| ***Summary of change:*** | 1. In the description of the capability *prs-MeasurementWithoutMG-r17* the missing condition acc. to RAN4 Rel-17 NR features list has been added.
2. Miscellaneous editorial issues have been fixed.
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| ***Consequences if not approved:*** | * To change 1) The support of the capability *prs-MeasurementWithoutMG-r17* is not aligned with the RAN4 Rel-17 NR features list.
* To change 2) Miscellaneous editorial issues remain in the specification.
 |

Rapporteur's Comment:

- As mentioned in the Reason for Change above, the RAN4 "threshold" capability for the "Rx timing difference" requires support for PPW in the first place.

- Usually, these prerequisites are also captured in LPP but is missing for this capability (although, the prerequisite appears rather obvious in this case). Therefore, the CR proposes [2]:

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| ***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. 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. |

- The CR [2] also fixes a couple of typos in field/IE names.

**Question 2:** Do you agree that the CR in
 "R2-2302884, "Miscellaneous corrections on LPP", Lenovo"
 is an essential correction?

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| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes | Aligned with the R1 feature list table |
| CATT | Yes |  |
| ZTE | Yes |  |
| OPPO | Yes |  |
| Ericsson | Yes |  |
| Intel | Yes |  |
| Samsung | Yes |  |
| vivo | Yes |  |
| LG | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes |  |
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# 3. PRS validity area

R2-2302987 Correction to PRS validity area Huawei, HiSilicon CR Rel-17 37.355 17.4.0 0433 - F NR\_pos\_enh-Core

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| ***Reason for change:*** | Issue1: within the LPP spec for repcetion for LPP provide assistance data, there is UE procedure “indicate the related assistance data” to the lower layer. Should clarify that the when PRS validity area is configured, the “related assistance data” should be those correpsonding to the current cell the UE camps on.  |
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| ***Summary of change:*** | 1/ When PRS validity area is configured, specify the condition when the PRS config will be delivered to the lower layer |
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| ***Consequences if not approved:*** | Incomplete funcitonality for PRS configuration with validity area |

Rapporteur's Comment:

- The LPP procedure description usually captures only very high-level functionality and is usually applicable to all positioning methods.

- For a Provide Assistance Data message, the target device (simply) delivers the received assistance data to "upper layers".

- The CR [3] proposes to add an informative Note as follows:

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| 5.2.4 Reception of LPP Provide Assistance DataUpon receiving a *ProvideAssistanceData* message, the target device shall:1> for each positioning method contained in the message:2> deliver the related assistance data to upper layers.NOTE: If the field *assistanceDataValidityArea* is configured along with the field *nr-DL-PRS-AssistanceData*, the "related assistance data" above are the assistance information that corresponds to the cell where the UE currently camps on according to TS 38.331 [35]. |

- The *assistanceDataValidityArea* is a field withing the *NR-DL-TDOA-ProvideAssistanceData*, *NR-DL-AoD-ProvideAssistanceData*, and *NR-Multi-RTT-ProvideAssistanceData*.

- Multiple areas/instances are provided in multiple *ProvideAssistanceData* messages. Each *ProvideAssistanceData* message for DL-TDOA, DL-AoD, and Multi-RTT may include the *assistanceDataValidityArea*.

- It seems the determination of the applicable area/instance is proposed to be perfomed by the "receiving/decoding" entity, and only the assistance data message (instance) for the applicable area (i.e., corresponding to the cell where the UE currently camps on) are provided to "upper layers".

- If so, it seems the "receiving/decoding" entity need to store/buffer all instances (*ProvideAssistanceData* messages) and monitor the applicable assistance data area, and if a new area is detected, provide the applicable assistance data message/instance to upper layer (independent on any onpoing positioning/LPP session).

- This seems then new functionality (although, informative), whose benefit/purpose is not quite clear to the Rapporteur.

- Rapporteur can not see the "Incomplete functionality for PRS configuration with validity area" if this CR is not approved.

**Question 3:** Do you agree that the CR in
"R2-2302987, "Correction to PRS validity area", Huawei, HiSilicon."
is an essential correction?

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| Company | Yes/No | Comments |
| Huawei, HiSilicon | Yes | Proponent |
| CATT | No | The "related assistance data" above may not correspond to the cell where the UE currently camps on. The DL-PRS which is configured with *assistanceDataValidityArea* can be irrelative with the camped cell. |
| ZTE | No | The issue is, whether UE is allowed to measure neighbor cell’s PRS when validity area is configured. It seems no clear restriction on this. So it may be better to let UE deliver the (part or whole) AD to upper layers by implementation. |
| OPPO | No | The proposed restriction on the UE behaviour is not necessary.  |
| Ericsson | No | We agree with rapporteur that it is unclear as what is the purpose of this. We do not see “Incomplete functionality for PRS configuration with validity area” and hence we do not agree to the CR. |
| Intel | No | do not understand why AS layer need to check validity area before deliver the assistance data to upper layer.  |
| Lenovo | No | We have the same understanding as CATT. |
| Samsung | No | Same view with Intel. |
| vivo | No | Same view with Intel. |
| LG | No | No need to check relationship between validity area and camping cell. One and more assistance data can be provisioned to UE by LMF. UE can store them and use certain configuration when it is available.  |
| Xiaomi | No | Same view with CATT. |
| Nokia | No | The NOTE is confusing and not aligned with the definition of ‘*assistanceDataValidityArea*’ which says “it specifies the network area for which this assistance data is valid”. The NOTE makes it sound like it applies only to the camped cell. |
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# 4. Periodic Reporting Criteria

R2-2304050 Missing LPP support for sub 1s location information reporting periodicity Ericsson discussion Rel-17

R2-2304051 Missing finer periodicities than 1s Ericsson CR Rel-17 37.355 17.4.0 0441 - F NR\_pos\_enh-Core

The document in R2-2304050 [4] discusses missing LPP periodic reporting intervals with resolution less than 1 second. The following observations were made:

Observation 1 In LPP common request location information, there is a mismatch in resolution between the scheduled location time and the periodic location information reporting interval, where the former can be configured down to milliseconds and the latter down to seconds

Observation 2 In LPP common request location information, there is a mismatch in resolution between the response time and the periodic location information reporting interval, where the former can be configured down to tens of milliseconds and the latter down to seconds.

Observation 3 In LPP common request location information and NRPPa, there is a mismatch in resolution between the LPP periodic location information reporting interval and the NRPPa periodic reporting interval, where the former can be configured down seconds the latter down to sub seconds.

The LPP CR in R2-2304051 [5] then proposes the following:

- A new *PeriodicalReportingCriteriaExt-r17* is added to *CommonIEsRequestLocationInformation*

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| PeriodicalReportingCriteriaExt-r17 ::= SEQUENCE { reportingAmount ENUMERATED { ra1, ra2, ra4, ra8, ra16, ra32, ra64, ra-Infinity } DEFAULT ra-Infinity, reportingIntervalMs INTEGER (1..999), ...} |

|  |
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| ***periodicalReportingExt***This IE indicates that extended periodic reporting is requested and comprises the below subfields. If this field is present, the field *periodicalReporting* is absent.- ***reportingAmount*** indicates the number of periodic location information reports requested. Enumerated values correspond to 1, 2, 4, 8, 16, 32, 64, or infinite/indefinite number of reports. If the *reportingAmount* is '*infinite/indefinite'*, the target device should continue periodic reporting until an LPP *Abort* message is received. The value '*ra1*' shall not be used by a sender.- ***reportingIntervalMs*** indicates the interval between location information reports and the response time requirement for the first location information report in milliseconds.  |

- Corresponding capability is added to all LPP positioning methods.

- The capability can indicate whether 1, 10, or 100 ms granularity is supported.

- Justification for the CR is as follows.

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| ***Reason for change:*** | The industrial IoT use cases adressed in Rel 17 brought more specific time requirements on location information. This has partly been reflected by the introduction of the fine scheduled location time and response time, as well as a fine timestamp, but requested periodicities finer than 1s is missing. NRPPa already supports measurement report periodicity finer than 1s. |
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| ***Summary of change:*** | Adding the possibility to request location information at a periodicity finer than 1s. |
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| ***Consequences if not approved:*** | Rel 17 requirements on finer location information in time is not complete |

Rapporteur's Comment:

- Regarding Observation 1, the relationship between "scheduled location time" and LPP "periodic reporting" is unclear. The "scheduled location time" requests a target device to obtain location measurements or location estimate valid at the *scheduledLocationTime.* The *scheduledLocationTime* can be indicated in various time bases (UTC, GNSS time, network time (SFN/slot), or relative time).
LPP "periodic reporting" can request from a target device multiple (periodic) reports with a required reporting interval which is similar to the "response time" (i.e., the first report is expected when the reporting interval expires, and subsequent reports are expected each reporting interval. Therefore, "scheduled location time" and LPP "periodic reporting" are different features.

- Regarding Observation 2, the LPP "response time" can be requested in 10-ms granularity, 10 ms, 20 ms, 30 ms, …1.28 seconds. The LPP periodic reporting interval can be requested for 1, 2, 4, 8, 10, 16, 20, 32, and 64 seconds. Therefore, Observation 2 seems correct regarding the mismatch. However, it is unclear whether this mismatch is intentional or not.

- Regarding Observation 3, the NRPPa measurement periodicity can take the values 160, 320, 640, 1280, 2560, 5120, 61440, 81920, 10240, 20480, 40960, 368640, 737280, 1843200 ms. Therefore, Observation 3 seems correct regarding the mismatch. However, it is unclear whether this mismatch is intentional or not.

- The proposed CR adds periodic reporting intervals with 1-ms granularity, ranging from 1…999 ms. This seems neither aligned with LPP Response Time (Observation 2) nor with NRPPa reporting (Observation 3). It seems also not aligned with DL-PRS or SRS periodicities. Therefore, the motivation for this change/value range is unclear.

- The proposed CR adds the finer periodic granularity to all LPP positioning methods. However, the 10-ms Response Time granularity is only applicable for NR E-CID Positioning, NR DL-TDOA Positioning, NR DL-AoD Positioning, and NR Multi-RTT Positioning. E.g., it is not clear if a e.g., 1-ms reporting is feasible for GNSS, sensors, WLAN, OTDOA, etc.

**Question 4:** Do you agree that the CR in
 "R2-2304051, "Missing finer periodicities than 1s", Ericsson."
 is an essential correction?

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| Company | Yes/No | Comments |
| Huawei, HiSilicon | No | First of all, this is more like introduction of a new feature rather than a correction |
| CATT | No | This is a NBC CR. And it seems a new feature which can be discussed in TEI18. |
| ZTE | Partially yes | Agree with rapporteur that the value range of newly added reporting intervals is unclear.Agree with rapporteur that the added finer reporting interval should be only applied to NR E-CID Positioning, NR DL-TDOA Positioning, NR DL-AoD Positioning, and NR Multi-RTT Positioning |
| OPPO | No |  |
| Ericsson | Yes | There are several aspects here that makes this a correction, which is backward compatible:* Rel 16 introduced Multi-RTT and Rel 17 introduced low latency requirements. The uplink part supports sub 1s UL measurement reporting to LMF, while the downlink part does not support 1s DL measurements, indicating this misalignment
* The connection between scheduled location time and periodicity is established in for example 23.273:

4.1c Scheduled Location TimeA scheduled location time allows an external LCS Client, AF or the UE to specify a time in the future at which a current location of the UE is to be obtained. A scheduled location time can be used with a 5GC-MT-LR, 5GC-MO-LR or deferred 5GC-MT-LR for periodic or triggered location events.It is thus established that the scheduled location time and the periodic reporting are related even if they are different attributes and it is reasonable that both should be possible to configured at a similar time scale* The connection between response time and reporting interval are established in the definition of the reporting interval:

***reportingInterval*** indicates the interval between location information reports and the response time requirement for the first location information report.The response time resolution was refined during Rel 17, while the report interval was not.* The refined report interval was suggested to be down to 1 ms combined with a reporting capability that can set a minimum value from the device side in order to be flexible. For UE-assisted, it is natural that LMF adapts the periodicity to configured PRS and SRS, so the configurable freedom of the refined reporting interval will be naturally used accordingly. For UE-based, a tracking/navigating device is typically operating a sensor fusion algorithm split in measurement updates (when new input information e.g. measurements arrives) and time updates (can be run just before a measurement but could also be run at arbitrary time instants). Therefore, a device can be more flexible about reporting intervals for positioning estimates. In the provided CR, it has been suggested that a device can indicate its supported minimum reporting interval and this is the same for UE-based and UE-assisted positioning. Typically, this minimum is set according to the device processing capabilities.
* With a new optional capability for the refined report interval, the correction is backward compatible.
* Also, with the proposed capability per positioning method it is possible for the device to indicate per positioning method its capability regarding the refined report interval. HA-GNSS components on the market for example are able to report position estimates much more frequently than 1s, some targeting the IoT segment with a reporting interval of 10ms etc.

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| Intel | No |  |
| Samsung | Partially yes | * For the relationship with scheduled location time, we share the view with rapporteur and can’t see the motivation of aligning the time scale.
* For the relationship with response time, the UE is required to transmit the first *ProvideLocationInformation* within the response time and continue the periodic reporting with *reportingInterval*. Thus, we can not see the need of sub 1sec periodicity values.
* For the relationship with NRPPa periodic reporting interval, we share the view with Ericsson that the mismatch between DL measurement report interval (in LPP) and UL measurement report interval (in NRPPa) can be a problem in Multi-RTT. Thus, we need to check whether the mismatch is intended or not (with RAN1/3 if needed).
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| vivo | Partially yes | We agree with Ericsson about the mismatch for Observation 2/3. But considering signalling overhead, we think that the *reportingIntervalMs* field can be ENUMERATED type instead of INTEGER. |
| LG | Partially yes | We share same view with Samsung. |
| Ericsson | Yes | Regarding the relation between scheduled location time, response time and report interval and the need to refine the resolution of the report intervalWe try to illustrate relation with the picture below, where we have signalling exchange between LMF and the UE and we also have DL-PRS configured in NG-RAN. The DL-PRSs can be configured with very short periodicities based on the *NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16* IE. A UE can be asked to provide measurements on DL-PRS and report periodically back. These reports should be aligned to the DL-PRS occasions, and each report can based on one or several DL-PRS occasions. In order to support low latency, the report should be aligned to a DL-PRS occasion.The scheduled location time is aligned with one DL-PRS occasion to configure the first report, and in a similar manner, the report interval needs to be aligned with ither the next DL-PRS occasion or a number of DL-PRS occasions later. A smallest report interval of 1s is too blunt to accomplish this alignment so a much finer reporting interval resolution is needed.The *reportingIntervalMs* could be an ENUMERATED instead of INTEGER (10 bits in current CR), as suggested by Vivo, but it can be OK with 10 bits for this field in order to be flexible, and it is only signalled once per periodic reporting session. Given the many possible DL-PRS occasion periodicity options for the *NR-DL-PRS-Periodicity-and-ResourceSetSlotOffset-r16* IE it seems reasonable to use an INTEGER. |
| Rapporteur |  | Just to clarify.Regarding Ericsson's comment on "scheduled location time". A scheduled location time can be used with a deferred 5GC-MT-LR for periodic or triggered location events, as noted. However, this has no impacts to LPP periodic reporting. LPP periodic reporting is a legacy from UMTS and not supported in the core network. See TS 23.273.  |
| Xiaomi | No | We agree with Ericsson that the measurement reports should be aligned to the DL-PRS occasions to reduce low latency, but we didn’t make any agreements for this, so it seems that the CR is to introduce a new feature. |
| Vodafone | Yes, With comments | I think we should discuss the feature as such and decide after in which release it might be introduced, but in general we see it beneficial as long it is done with an extra optional capability.  |
| Nokia |  | This seems to be a mix of correction and enhancement. We are open to discussing in the next meeting how to correct the misalignments in the defined times (observation 2 and observation 3) but we do not see the dependency between the periodic reporting and scheduled location time (observation 1). |
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# 5. LOS-NLOS-Indicator Types

R2-2304056 LOS-NLOS-Indicator Types Nokia, Nokia Shanghai Bell CR Rel-17 37.355 17.4.0 0442 - F NR\_pos\_enh-Core

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| ***Reason for change:*** | 1. LOS-NLOS-Indicator IE description and field description for the field ‘indicator-r17’ are not accurate. This indicator provides two pieces of information: i) whether the propagation path between source and receiver is Line-of-Sight (LOS) or Non-Line-of-Sight and ii) the likelihood of a Line-of-Sight (LOS) propagation path from the source to the receiver, but this is not very clear from the current descriptions.
2. The two IEs, LOS-NLOS-IndicatorType1 and LOS-NLOS-IndicatorType2 have the same description and it is not clear why two similar IEs with same description is defined with different values. With LOS-NLOS-IndicatorType2 value of ‘hardAndsoftvalue, without searching all ASN.1 text, it is not readily obvious how it would be possible to report both hard and soft values when the UE can only report either hard or soft value.
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| ***Summary of change:*** | 1. Clarified the descriptions for LOS-NLOS-Indicator IE and indicator-r17 field.
2. Clarified that LOS-NLOS-IndicatorType1 is the type of information that can be requested by location server and LOS-NLOS-IndicatorType2 is the type of information that can be supported by target device.
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| ***Consequences if not approved:*** | Lack of clarity in the specification on how the different LOS-NLOS indicator types are used. |

Rapporteur's Comment:

- The *LOS-NLOS-Indicator* provides information on a LOS or NLOS path between source and receiver. This information can be provided as either a "soft value" or a "hard value":

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| --- |
| LOS-NLOS-Indicator-r17 ::= SEQUENCE { indicator-r17 CHOICE { soft-r17 INTEGER (0..10), hard-r17 BOOLEAN }, ...} |

- The CR in R2-2304056 [6] proposes the following clarification in the introduction and field description:

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| --- | --- | --- |
| – *LOS-NLOS-Indicator*The IE *LOS-NLOS-Indicator* provides information on whether the propagation path between source and receiver is Line-of-Sight (LOS) or Non-Line-of-Sight and the likelihood of a Line-of-Sight (LOS) propagation path from the source to the receiver.[…]

| *LOS-NLOS-Indicator* field descriptions |
| --- |
| ***indicator***This field provides information on whether the propagation path between source and receiver is LOS or NLOS and the likelihood of a Line-of-Sight propagation path from the source to the receiver and has the following choices:- ***soft***: This field specifies the likelihood of a LOS propagation path in the range between 0 and 1 with 0.1 steps resolution. Value '0' indicates NLOS and values '1' through '10' indicates LOS and provide an estimate of the propability for a LOS propagation path between source and receiver.Scale factor 0.1; range 0 to 1.- ***hard***: This field specifies whether the propagation path between source and receiver is estimated to be LOS (true) or NLOS (false). |

 |

- In Rapporteur's understanding, both CHOICEs provide "information on the likelihood of a Line-of-Sight (LOS) propagation path from the source to the receiver". The CHOICE 'soft' provides the probability in granularity of 0.1, the CHOICE 'hard' provides the probability in granularity of 1.

- Therefore, in Rapporteur's understanding, the existing text is correct. The new text "whether the propagation path between source and receiver is Line-of-Sight (LOS) or Non-Line-of-Sight"
is the same as the existing text
"the likelihood of a Line-of-Sight (LOS) propagation path from the source to the receiver." and therefore, would be confusing if the new text is added.

- Rapporteur also believes that the change to the 'soft' value description is not correct: It is proposed to indicate that any value >0 means LOS. However, the value indicates the probability for a LOS path. This does not mean that, e.g., 0.1 indicates LOS.

- The 2nd proposed change clarifies at which places in the specification the IEs *LOS-NLOS-IndicatorType1* and *LOS-NLOS-IndicatorType2* are used, which may be useful to the reader of the specification but does not look like an essential correction:

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| – *LOS-NLOS-IndicatorType1*The IE *LOS-NLOS-IndicatorType1* provides information on the *LOS-NLOS-Indicator* type that is requested by the location server.– *LOS-NLOS-IndicatorType2*The IE *LOS-NLOS-IndicatorType2* provides information on the *LOS-NLOS-Indicator* type that is supported by the target device. |

- It is then also not clear why the corresponding clarification in IE *LOS-NLOS-IndicatorGranularity1* and *LOS-NLOS-IndicatorGranularity2* is not needed.

**Question 5:** Do you agree that the CR in
 R2-2304056, "LOS-NLOS-Indicator Types", Nokia, Nokia Shanghai Bell.
 is an essential correction?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| CATT |  | 1st change is not essential since the spec is clear enough.2nd change is supported because it is useful for the reader. |
| ZTE | Partially Yes | Since the ‘likelihood’ can include ‘impossible’ and ‘possible and probability’, we think the ‘whether the propagation path between source and receiver is LOS or NLOS and’ is not needed;The ‘indicates LOS and’ is ok to us, SOFT has a value range of 0-10, in which 0 indicates NLOS, we think value {1,2,...10} indicate LOS. In addition, value 0.1 may indicate it is very unlikely to be a LOS (i.e., value 0.1 may be assumed as NLOS by the receiver)2nd change is supported because it is useful for the reader. |
| OPPO |  | 1st change is not needed. 2rd change is OK. |
| Ericsson | Yes | The changes look reasonable and needed; however correct interpretation should be “OR” rather then “and” as it is choice:The IE *LOS-NLOS-Indicator* provides information on whether the propagation path between source and receiver is Line-of-Sight (LOS) or Non-Line-of-Sight, or ~~and~~ the likelihood of a Line-of-Sight (LOS) propagation path from the source to the receiver.***indicator***This field provides information on whether the propagation path between source and receiver is LOS or NLOS, or ~~and~~ the likelihood of a Line-of-Sight propagation path from the source to the receiver and has the following choices: |
| INTEL |  | not clear why it is needed.  |
| Samsung |  | Same view with CATT and OPPO. |
| vivo | No | Agree with rapporteur that two changes are not essential.  |
| LG | No but | Both are not essential. For 1st change, current spec is clear enough. 2nd change is not essential (because each type is used in different message i.e. request or provide, there is no confusion between two types), but change would be helpful for read specification.  |
| Xiaomi | Yes | It makes the spec clearer. |
| Nokia | Yes (Proponent) | The rapporteur’s explanation that “the CHOICE 'hard' provides the probability in granularity of 1” made us look at the definition from a different perspective. Value 0 means likelihood 0 which means the propagation path is definitely not a LoS path (which means it is definitely a NLoS path) and value 10 means likelihood 1 which means the propagation path is definitely a LoS path. Intermediate values for e.g., 2, means likelihood 0.2 which means the propagation path is 20% likely a LoS path. So, we will think of an alternate TP to make this field description better by describing it in terms of likelihood of LOS path.We prefer to include the 2nd change also to improve the specification readability especially since the LOS-NLOS-IndicatorType2 has an ENUMERATED value of handAndsoftvalue while the LOS-NLOS-Indicator has a CHOICE between soft or hard and a casual reader wonders why. An explicit clarification avoids confusions. We did not see such issues when looking at the Granularity1 and Granularity2 fields ENUMERATED values.  |
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# 6. Expected AoD/AoA

R2-2304139 Use of nr-DL-PRS-ExpectedAoD-or-AoA assistance by UE Nokia, Nokia Shanghai Bell CR Rel-17 37.355 17.4.0 0443 - F NR\_pos\_enh-Core

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| --- | --- |
| ***Reason for change:*** | expectedAoA is one possible choice of assistance information that can be provided to the UE for DL-AoD positioning (in the nr-DL-PRS-ExpectedAoD-or-AoA field in the NR-DL-PRS-AssistanceData). Currently, the specification is not clear why the ‘Expected AoA’ assistance is needed for the UE when there is no DL-AoA UE measurement specified (only UL-AoA measurement by gNB is specified in TS 38.215). Also, the use of this angle-based assistance information for timing methods like DL-TDOA and multi-RTT positioning also, is not clear. It is out understanding that according to RAN1 it is up to UE implementation how the UE uses this ‘Expected AoA’ assistance (same applies to the ‘Expected AoD’ assistance also) and there are no requirements or restrictions imposed for UE measurements. Nevertheless, it is good to clarify the usage of expectedAoA and expectedAoD assistance with some examples so that implementation has some idea of why this assistance data is signalled to the UE. One common usage for both DL-AoD and timing based positioning methods DL-TDOA and multi-RTT is for determination of LOS/NLOS of the propagation path used for the measurement. |
|  |  |
| ***Summary of change:*** | Clarified the field description for nr-DL-PRS-ExpectedAoD-or-AoA listing some example usage of the expectedAoA and expectedAoD assistance information. |
|  |  |
| ***Consequences if not approved:*** | Lack of information in specification about the usage of ‘Expected AoA’ and ‘Expected AoD’ assistance information. |

Rapporteur's Comment:

- The CR clarifies that the use of the *nr-DL-PRS-ExpectedAoD-or-AoA* in IE *NR-DL-PRS-AssistanceData* is up to UE implementation and provides some examples:

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| ***nr-DL-PRS-ExpectedAoD-or-AoA***This field specifies the expected AoD or expected AoA in the Global Coordinate System (GCS) at the target device location together with uncertainty. The expected AoD or expected AoA is used as assistance information for UE measurement processing, but the actual usage of this assistance information is up to UE implementation e.g., for determination of LOS/NLOS propagation path of the measurement, for relative comparison of angle measurement across different DL PRS resources etc.- ***expectedDL-AzimuthAoD***: This field specifies the expected azimuth angle of departure.Scale factor 1 degree; range 0 to 359 degrees.- ***expectedDL-AzimuthAoD-Unc***: This field specifies the (single-sided) uncertainty of the expected azimuth angle of departure. If this field is absent, it indicates maximum uncertainty (60 degrees).Scale factor 1 degree; range 0 to 60 degrees.- ***expectedDL-ZenithAoD***: This field specifies the expected elevation angle of departure.Scale factor 1 degree; range 0 to 180 degrees.- ***expectedDL-ZenithAoD-Unc***: This field specifies the (single-sided) uncertainty of the expected elevation angle of departure. If this field is absent, it indicates maximum uncertainty (30 degrees).Scale factor 1 degree; range 0 to 30 degrees.- ***expectedDL-AzimuthAoA***: This field specifies the expected azimuth angle of arrival. Scale factor 1 degree; range 0 to 359 degrees.- ***expectedDL-AzimuthAoA-Unc***: This field specifies the (single-sided) uncertainty of the expected azimuth angle of arrival. If this field is absent, it indicates maximum uncertainty (60 degrees).Scale factor 1 degree; range 0 to 60 degrees.- ***expectedDL-ZenithAoA***: This field specifies the expected elevation angle of arrival. Scale factor 1 degree; range 0 to 180 degrees.- ***expectedDL-ZenithAoA-Unc***: This field specifies the (single-sided) uncertainty of the expected elevation angle of arrival. If this field is absent, it indicates maximum uncertainty (30 degrees).Scale factor 1 degree; range 0 to 30 degrees. |

- The actual usage of many (if not all) assistance information is up to UE implementation and is usually not explicitly specified.

- Rapporteur believes that the examples given (determination of LOS/NLOS propagation path, relative comparison of angle measurement across different DL‑PRS resources) may not be typical use cases.

- The RAN1 specification (38.214) only notes:

 "The UE may request to be provided with either expected DL-AoD/ZoD and uncertainty range(s) of expected DL-AoD/ZoD, or expected DL-AoA/ZoA and uncertainty range(s) of the expected DL-AoA/ZoA. The UE may be provided with expected DL-AoD/ZoD and uncertainty range(s) of the expected DL-AoD/ZoD. The UE may be provided with expected DL-AoA/ZoA and uncertainty range(s) of the expected DL-AoA/ZoA. The uncertainty range(s) of the expected DL-AoD/DL-AoA may be configured within [0, 60]. The uncertainty range(s) of expected DL-ZoD/DL-ZoA may be configured within [0, 30]."

and is not giving any use case examples either.

- The consequences if not approved indicate a "lack of information in specification about the usage of ‘Expected AoA’ and ‘Expected AoD’ assistance information.". However, the current specification seems not flawed.

**Question 6:** Do you agree that the CR in
 "R2-2304139, "Use of nr-DL-PRS-ExpectedAoD-or-AoA assistance by UE", Nokia, Nokia Shanghai Bell"
 is an essential correction?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSIlicon | No | It is up to the UE how to use this AD and there is no need to reflect this in the spec |
| CATT | No | Usually, an example of UE implementation is not supposed in spec. |
| ZTE | No |  |
| OPPO | No |  |
| Ericsson | NO | Agree with Huawei and CATT |
| Intel | No | do not need to provide example.  |
| Samsung | No |  |
| vivo | No | It is up to UE implementation. No spec change is needed. |
| LG | No |  |
| Xiaomi | No |  |
| Nokia | Yes (Proponent) | The RAN1 specification 38.214 or the RAN2 specification 38.305 or 37.355 not providing any clues as to the use of AoA related information at the UE, which until recently was only an UL concept, is the source of the confusion. We thought we could add some clues about the use of expectedAoA in the field description rather than add a stage-2 description. |
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# 7. LPP capability for FGs27-13a,14a and 14-2

R2-2302745 LPP capability for FGs27-13a,14a and 14-2 Intel Corporation draftCR Rel-17 37.355 17.4.0 F NR\_pos\_enh-Core

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| --- | --- |
| ***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 Added M=3 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 should support RSRPP reporting for K=1 or 2 additional paths. |
|  |  |
| ***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 |

Rapporteur's Comment:

- According to latest RAN4 feature list in R2-2301997:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 14-2 | PRS measurement for reduced sample in RRC\_inactive state | Capability of supporting reduced number of samples for PRS measurement in RRC\_inactive state | [27-17] | The reduced number of samples for PRS measurement in RRC\_inactive state cannot be supported. The UE is assumed to support M=4 only. | Per band |

- Per RAN4 agreements, the "reduced samples" capability is not limited M=1 or M=2 in RRC\_INACTIVE state. Therefore, the proposed change seems correct:

|  |
| --- |
| ***supportedDL-PRS-ProcessingSamples-RRC-Inactive***Indicates the UE capability for support of measurements based on measuring M=1, M=2 or M=3 samples (instances) of a DL-PRS Resource Set in RRC\_INACTIVE state. The UE can include this field only if the UE supports *prs-ProcessingRRC-Inactive* defined in TS 38.331 [35]. Otherwise, the UE does not include this field. |

- According to R2-2302454 (R1-2302026), RAN1 agreed the following:

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| --- |
| Agreement:* 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.
* From RAN1 perspective, no ASN.1 impact is foreseen.
 |

 Therefore, the proposed change seems correct:

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| --- |
| ***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* should support RSRPP reporting for K=1 or 2 additional paths. |

**Question 7:** Do you agree that the CR in
 "R2-2302745, "LPP capability for FGs27-13a,14a and 14-2 ", Intel Corporation."
 is an essential correction?

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Huawei, HiSIlicon | Yes | This is aligned with the R1 LS |
| CATT | Yes |  |
| ZTE | No for 14-2 | M can not be 3 according to RAN4’s spec. Deleting M=1,2 is just because M=1 or 2 should not be determined by UE capability, it should be determined according to the criteria defined by RAN4 in 38.133. but M can only be 1 or 2 [Intel] thanks for spotting this. Agree no M=3. And the UE should determine whether 1 or 2 will be used based on the criteria defined by RAN4. Therefore, the simple way for us is to use sentence from RAN4 feature list in the field description, i.e. ***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. |
| OPPO | OK for second change | It is better the field description referred to the RAN4 ‘s spec regarding the M value.  |
| Ericsson | Yes |  |
| Intel | Yes with suggested changes | Added response on ZTE’s comments.  |
| Lenovo | Comment to 2nd change | In the description of “supportOfDL-PRS-FirstPathRSRP” we wonder about the “*should support*”. It comes from RAN1 LS but we wonder whether it should better say “shall support” since “should” is just a recommendation and we normally don’t use a recommendation in the context of UE capabilities.The UE supporting *additionalPathsReport* and *supportOfDL-PRS-FirstPathRSRP* should support RSRPP reporting for K=1 or 2 additional paths.[Intel] agree with Lenovo, “shall” is the right word here.  |
| Samsung | Yes | Ok for the first change with the revision by Intel.Ok for the second change with the update by Lenovo.  |
| vivo | Yes | Same view with Samsung. |
| LG | Yes | Same view with Samsung. |
| Xiaomi |  |  |
| Nokia | Yes | The changes proposed by Intel in response to ZTE looks good to us. With that clarification, we are OK with the CR. |
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