3GPP TSG-RAN WG2 Meeting #114-e R2-210xxxx

Online Meeting, May 19th – 27th 2021

**Agenda item: 6.3.3**

**Source: Ericsson**

**Title: [AT114-e][614][POS] Remaining issues on LPP (Ericsson)**

**Document for: Discussion and Agreement**

# 1 Introduction

This document is to kick off the following email discussion:

* [AT114-e][614][POS] Remaining issues on LPP (Ericsson)

 Scope: Discuss P1, P2, and P3 of R2-2106465. For P5, determine if UE behaviour for handling of expected RSTD in the broadcast case should be captured.

 Intended outcome: Agreed CRs and report in R2-2106584

 Deadline: Thursday 2021-05-27 0000 UTC

The below papers are part of this email discussion

R2-2104842 37.355 Draft CR on timestamp reference in NR positioning measurement report vivo draftCR Rel-16 37.355 16.4.0 NR\_pos-Core

R2-2105054 Correction to PRS-only TP Huawei, HiSilicon CR Rel-16 37.355 16.4.0 0305 - F NR\_pos-Core

R2-2105056 Correction to NR-ARFCN of the TRP Huawei, HiSilicon CR Rel-16 37.355 16.4.0 0306 - F NR\_pos-Core

R2-2105963 Correction of Expected RSTD to reflect Optional Presence for Broadcast Ericsson, Fraunhofer IIS, Fraunhofer HHI CR Rel-16 37.355 16.4.0 0308 - F NR\_pos-Core

To recap; the Proposals that were discussed during online and part of this email discussion are:

Proposal 1 RAN2 to agree to convert draft CR R2-2104842 to normal CR and clarify that the timestamp in measurement reporting is associated with *nr-DL-PRS-ReferenceInfo*.

Proposal 2 RAN2 to discuss CR R2-2105054 and decide if PRS-only TP applicability explicitly needs to be clarified in LPP specification.

Proposal 3 RAN2 to discuss if update of field description of nr-ARFCN and corresponding reference is needed or not.

Proposal 5 RAN2 to discuss whether expectedRSTD and expectedRSTD-Uncertainty is OPTIONAL for broadcast and NBC change is to be done or not.

# 2 Contact Information

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| --- | --- |
| Company | Contact: Name (E-mail) |
| Nokia | mani.thyagarajan@nokia.com |
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# 3 Discussion

## 3.1 on timestamp reference in NR positioning measurement report

Based upon online discussion; the change is suggested as below.

***nr-TimeStamp***

This field specifies the time instance at which the TOA and DL PRS-RSRP (if included) measurement is performed and the time instance is derived corresponding to *nr-DL-PRS-ReferenceInfo*. Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff.*

 **Input#1 Required for**: Please provide comments below on the suggested change.

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| --- | --- | --- |
| Company | Change is fine Yes/No | Comments |
| vivo | Yes | We agree with the modification of Rapporteur. |
| Qualcomm |  | The proposed changes are still confusing. I suggest:The *nr-SFN* and *nr-Slot* in IE *NR-TimeStamp* correspond to the TRP provided in *dl-PRS-ReferenceInfo*. |
| Nokia | No | As we mentioned online, in the last meeting R2-2102786 was marked as “Not pursued” and there is no other disposition documented in the last meeting minutes about coming back to this in this meeting. We are also not sure why this is only a DL-TDOA measurement reporting issue. Time stamp is included for DL-AoD and multi-RTT also.  |
| Intel | Yes with comments | We can also refer to RAN1 spec on this.  |
| CATT | Yes | Agree with Qualcomm’s modification. |
| **Ericsson** | Yes | We are fine with QC suggestion also.***nr-TimeStamp***This field specifies the time instance at which the TOA and DL PRS-RSRP (if included) measurement is performed. The *nr-SFN* and *nr-Slot* in IE *NR-TimeStamp* correspond to the TRP provided in *nr-DL-PRS-ReferenceInfo* [see TS 38.214].Note, the TOA measurement refers to the TOA of this neighbour TRP or the reference TRP, as applicable, used to determine the *nr-RSTD* or *nr-RSTD-ResultDiff* |
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**Summary 1**: 6 companies have responded. 5 companies suggest aligning with RAN1 specification.

1. The field description of nr-TimeStamp is clarified that the timing is associated with reference TRP to align with RAN1 specification

## 3.2 Correction to PRS-only TP

As discussed online, TS 38.305 states:

**PRS-only TP**: A TP which only transmits PRS signals and is not associated with a cell.

Hence, it is clear that PRS-Only TP will not have any attributes that is associated with a cell such as PCI, CGI, ARFCN.

Further, if any specific classification is needed to flag PRS-Only-TP; an ASN.1 change as below would be needed

prs-only-tp-v16xy ENUMERATED { true } OPTIONAL

The current structure in LPP already allows Optionality for PCI. CGI, ARFCN. This would indicate that the TRP is not associated to any cell.

NR-DL-PRS-AssistanceDataPerTRP-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-DL-PRS-SFN0-Offset-r16 NR-DL-PRS-SFN0-Offset-r16,

 nr-DL-PRS-ExpectedRSTD-r16 INTEGER (-3841..3841),

 nr-DL-PRS-ExpectedRSTD-Uncertainty-r16

 INTEGER (0..246),

 nr-DL-PRS-Info-r16 NR-DL-PRS-Info-r16,

 ...

}

Hence it is already possible to have an implicit PRS-Only TP to be indicated. RAN2 need to decide if any explicit indication is needed.

**Input#2 Required for**: Companies are requested to provide their input if any explicit changes are needed to designate PRS-Only TP. If yes, please provide details.

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| --- | --- | --- |
| Company | Change is required Yes/No | Comments |
| Qualcomm | Yes | The Cell-IDs are currently Need ON, and would need to be changed to Need OP in the case absence should mean "PRS-only TP". However, this looks like too much overhead if the Cell-IDs would always have to be present for normal cells. A simple flag (as in LTE) would be more efficient which could be added backwards compatible. |
| Nokia | Yes | Due to Need ON that is defined for the NR PCI, NCGI and NR ARFCN it is NOT possible to have the interpretation that absence of these fields mean it is a PRS-only TP. As Qualcomm pointed out we could go for an explicit prs-only-tp flag like the one we have for LTE OTDOA. But one question we have is, with no other cell ID or ARFCN to qualify the PRS ID, is the PRS ID range of 0 to 255 sufficient to identify all PRS-only TPs in the network? |
| Huawei, HiSilicon | No | We don’t prefer to add an additional field to the LPP signaling unless there is absolute necessity at this stage and prefer our original correction. It does not mandate a cell that transmits PRS to signal the CGI. The CR R2-2105054 readsIf neither *nr-PhysCellID* nor *nr-CellGlobalID* is provided, UE may assume that the TRP is not associated with any cell.So for cell that transmits PRS, providing PCI only is also sufficient to differentiate from PRS-only TP.Also, there is no need to read the system information from the neighboring cell as commented during online. The UE only needs to carry NCGI to differentiate between measurements of different PRSs according to the provided AD. |
| Intel | No | It is already clear based on the following definition**PRS-only TP**: A TP which only transmits PRS signals for PRS-based TBS positioning and is not associated with a cell.In addition, the ASN.1 fields are optional, and absence can be inferred as PRS only TP. And therefore explicit bit is not needed.  |
| CATT | Yes | One of the reason why NR PCI, NCGI and NR ARFCN may be needed is that PRS ID range of 0 to 255 sufficiently is identified. So even though there is no real associated cell for PRS-only TPs, NCGI/PCI is still recommended to identify PRS ID when there may be conflict of PRS ID. |
| ZTE | No | We share the similar view with Intel. The definition is clear enough and the ASN.1 fields are optional. We do not need extra explicit bit. |
| Ericsson | No | Agree with Intel. And agree with question from Nokia also.  |
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**Summary 2**: 7 companies have replied, and it is split; 3 companies want to indicate the PRS-only TP in LPP explicitly with a flag. 3 companies do not want any change and one company want to indicate it via field description. For explicit indication with flag, there is question if current dl-PRS-ID of up to 256 would be enough. There is also possibility to change the field description from Need ON to Need OP and then add the clarification upon absence “If neither *nr-PhysCellID* nor *nr-CellGlobalID* is provided, UE may assume that the TRP is not associated with any cell.

”

From the comments received so far, this appears that more checking would be required. Hence moderator’s view is to comeback to next meeting.

1. PRS-Only TP indication is postponed to next meeting to allow companies to check if the change is essential and if yes how to address it; (example either via changing Need code and field description or flag in LPP ASN.1 with new range of PRS IDs)

## 3.3 Correction to NR-ARFCN of the TRP

As discussed online, this field NR-ARFCN should be the frequency of the CD-SSB which is indicated in 38.300.

Further; for PRS-Only TP; the definition of PRS-Only TP says that there is no association of cell and hence it is clear NR-ARFCN is not applicable. No further clarification as such is required for this.

Potentially a clarification as below can be added for nr-ARFCN.

***nr-ARFCN***

This field specifies the frequencyof the CD-SSB as indicatedin TS 38.300 [xx].

**Input#3 Required for**: In light of above, companies are requested to provide their input if any change as above is needed or not OR pls provide the necessary changes in the comments

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| Company | Change is fine Yes/No | Comments |
| Qualcomm | Yes | This is an essential correction, since the current text is indeed rather unclear. I think the link to the PCI should be mentioned as well. E.g.:This field specifies the NR-ARFCN of the TRP's CD-SSB corresponding to *nr‑PhysCellID*. |
| Nokia | Yes | We are fine with the changes proposed by the rapporteur. |
| Intel |  | Should not the meaning of nr-ARFCN of the cell/TRP is clear from other specification, .e.g 38.300, 38.331?For example, 331 currently says "The IE *ARFCN-ValueNR* is used to indicate the ARFCN applicable for a downlink, " - so we should continue to use NR-AFRCN rather than change it to frequency.  |
| CATT | Yes |  |
| ZTE | Yes |  |
| Ericsson |  | Agree with Intel. |
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**Summary 3**: 6 companies have replied; 4 companies think a clarification for nr-ARFCN is needed.

1. Provide the clarification of the field description of nr-ARFCN by adding “CD-SSB corresponding to nr-PhysCellID”

## 3.4 ExpectedRSTD for Broadcast

ExpectedRSTD is defined as below.

***nr-DL-PRS-ExpectedRSTD***

*This field indicates the RSTD value that the target device is expected to measure between this TRP and the assistance data reference TRP. The nr-DL-PRS-ExpectedRSTD field takes into account the expected propagation time difference as well as transmit time difference of PRS positioning occasions between the two TRPs. The resolution is 4×Ts, with Ts=1/(15000\*2048) seconds*

The view expressed online by the proponent companies was that propagation time difference is based upon pathloss measurements or indicated by RSRP measurements. This would depend upon cell size and where the UE is located in a cell. This part is UE specific rather than cell specific.

Hence, for broadcast; it should be clarified that

***nr-DL-PRS-ExpectedRSTD***

*This field indicates the RSTD value that the target device is expected to measure between this TRP and the assistance data reference TRP. The nr-DL-PRS-ExpectedRSTD field takes into account the expected propagation time difference as well as transmit time difference of PRS positioning occasions between the two TRPs. The resolution is 4×Ts, with Ts=1/(15000\*2048) seconds. In case of broadcast, the nr-DL-PRS-ExpectedRSTD indicates only the time difference of PRS positioning occasions between the two TRPs.*

And a clarification that:

***nr-DL-PRS-ExpectedRSTD-Uncertainty***

*This field indicates the uncertainty in nr-DL-PRS-ExpectedRSTD value.**The uncertainty is related to the location server′s a‑priori estimate of the target device location. The nr-DL-PRS-ExpectedRSTD and nr-DL-PRS-ExpectedRSTD-Uncertainty together define the search window for the target device. In case of broadcast, the nr-DL-PRS-ExpectedRSTD-Uncertainty is expected to be high. UE may also consider IE NR-RTD-Info, if available, to determine the search window.*

Comment1/Note1: NR-RTD-Info may have more frequent broadcast than the DL-PRS-AD containing expectedRSTD

Comment2/Note2: Of-course once the change is agreed for NR; the corresponding any applicable change can also be done for LTE OTDOA.

**Input#4 Required for**: In light of above, companies are requested to provide their input if they see the above change is justifiable and provide their feedback.

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| Company | Change is fine Yes/No | Comments |
| Qualcomm | No | There is nothing wrong with the current specification. The search window for broadcast may be larger in some cases compared to p-to-p, but a larger search window is still better than no search window. This is not different compared to e.g., LTE OTDOA or GNSS. There is no different UE behavior/interpretation required for broadcast. The server can determine the expectedRSTD for a UE located at the center of the cell. I assume this is also the typical server behavior for p-to-p. There is a tradeoff between "small search window" and "guarantee that the signal can be found within the search window". Using Cell-ID position as a-priori UE location would typically result in a conservative search window, but in a high probability that the signal can indeed be found within the search window.  |
| Nokia | No | We are not sure if a different handling for nr-DL-PRS-ExpectedRSTD and nr-DL-PRS-ExpectedRSTD-Uncertainty fields needs to be specified when they are signaled using a broadcast message. If such clarification is necessary, we would like to confirm this with RAN1 before agreeing to the proposed changes. |
| Huawei, HiSSilicon | No |  |
| Intel | No | For the first change on “***nr-DL-PRS-ExpectedRSTD***”, we agree the intention that for broadcast signalling, it is calcuated on the time difference between the two TRPs. However, the UE handling on “***nr-DL-PRS-ExpectedRSTD***” received via broadcast siganlling, should be same as the parameters received via dedicated signalling. No sure whether this clarification will change anything. For second change “***nr-DL-PRS-ExpectedRSTD-Uncertainty***”, do not see the need since anyway the UE will consider IE NR-RTD-Info, if available. |
| CATT | No |  |
| ZTE | No |  |
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**Summary 4**: 6 companies have replied, and none want to introduce any clarification.

1. For broadcast, the parameter *nr-DL-PRS-ExpectedRSTD* is mandatory as currently specified. No change is needed.

# 4 Conclusion

# Conclusion

Based on the discussion in the previous sections we propose the following:

[Proposal 1 The field description of nr-TimeStamp is clarified that the timing is associated with reference TRP to align with RAN1 specification](#_Toc72831580)

[Proposal 2 PRS-Only TP indication is postponed to next meeting to allow companies to check if the change is essential and if yes how to address it; (example either via changing Need code and field description or flag in LPP ASN.1 with new range of PRS IDs)](#_Toc72831581)

[Proposal 3 Provide the clarification of the field description of nr-ARFCN by adding “CD-SSB corresponding to nr-PhysCellID”](#_Toc72831582)

[*Proposal 4* For broadcast, the parameter *nr-DL-PRS-ExpectedRSTD* is mandatory as currently specified. No change is needed.](#_Toc72831583)