3GPP TSG-RAN WG3 Meeting #115-e R3-222435

Online, 21 February – 03 March 2022

**Agenda item: 19.2.3**

**Source: Nokia (moderator)**

**Title: Summary of offline: On-demand PRS transmission**

**Document for: Discussion and Decision**

# 1 Introduction

This paper summarizes the following email discussion:

**CB: # 1904\_Pos\_OnDemandPRS**

**- PRS configuration:**

**- Can the NG-AP CR in R3-221873 be endorsed?**

**- is there a need to introduce new parameters as part of the PRS configuration, e.g. PRS Resource start time and duration?**

**- Is there a need to introduce a “PRS configuration on/off” indication from the LMF or just a “PRS configuration off indication?**

**- Any pending aspect of TRP Information?**

**- Capture agreements and provide TPs**

(Nok - moderator)

Summary of offline disc [R3-222435](file:///C:\Users\z00274494\Downloads\Inbox\R3-222435.zip)

# 2 For the Chair’s Notes

TBD

# 3 Discussion (Round 1)

Please provide your Round 1 views (5 questions) by **13:00 UTC Thursday February 24th**.

## 3.1 NRPPa open issues

Related papers in [1] and [4].

There are three main open issues to discuss for NRPPa:

1) **Start/end time of DL PRS transmission** (either per resource set per positioning frequency layer or per UE)

2) **ON/OFF indicator** (either per resource, or per resource set, or per UE)

3) **On-demand PRS TRP Information**

For **start/end time**, there can be various ways to encode. In [1], it is proposed to encode Start Time as the *Relative Time 1900* IE, and the End Time as a duration like in LPP. In [2], the encoding is FFS.

**Proposal 1:** Introduce a *Start Time* IE (encoded as the existing *Relative Time 1900* IE) and *Duration* IE (INTEGER type in seconds with max value 90060 in alignment with LPP) within the *Requested DL PRS Transmission Characteristics* IE at the TRP level and at the PRS Resource Set level.

A TP capturing proposal 1 is in [1] sections 9.2.x1 and 9.2.x1c.

**Question 1: Can Proposal 1 for start/end time be agreed? Please also provide any comments regarding the related TP in [1].**

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| **Company** | **Comments** |
| HW | Yes |
| Nokia | Yes, we are fine with the encoding in the REQUEST. However, it is unclear how the gNB should respond given the current signalling framework where RESPONSE contains a mandatory PRS Configuration IE (which does not include Start Time or Duration) and there is no class 2 Positioning Configuration Update procedure defined.  Example: gNB receives PRS CONFIGURATION REQUEST (at time ‘t0’) which includes different “PRS Resource Set level” start times for TRP-X (e.g. t1 and t2 for two different PRS Resource Sets). What should be included in the PRS CONFIGURATION RESPONSE?  In our understanding, there is just one option based on the current signalling framework: the gNB sends RESPONSE including the “fullest” PRS Configuration (i.e. the union of all the PRS transmissions it will start). Then LMF must determine which parts of the configuration start/end at what times, based on the original request that was sent.  Otherwise, if we expect that the RESPONSE contains only the configuration of PRS being transmitted (which seems simplest), then we would need to introduce an UPDATE message to enable the gNB to send RESPONSE (empty?) at t0, and send UPDATE at time t1 and t2? |
| CATT | We are fine with the P1.  To Nokia：  In our understanding, the response message had best only reflect the configuration information of the request message, so that the design is simple, and can ensure that the LMF and gNB is always aligned, for example, even if there is no configuration take effect immediately, but the successful response information will make LMF and gNB know what will inevitably happen at the specified time point, so the configured resources are also aligned. However, even if the resource does not take effect at the specified point time, it is an abnormal case and can be reported to O&M as the result of system performance. |
| Ericsson | Yes |
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| Moderator Summary:   * TBD | |

For “**OFF” indicator**, two different options have been proposed:

Option 1: Introduce a *PRS Configuration Request Type* IE in the PRS CONFIGURATION REQUEST, encoded as ENUMERATED type with two values (configure, off, …). For the “off” request type, introduce a *PRS Transmission Off Information* IE in the PRS CONFIGURATION REQUEST which includes a choice of TRP, PRS resource sets, or PRS resources to be turned off. See TP in [1] sections 9.1.1.a1 and 9.2.x1d.

Option 2: Introduce a “Deactivation Indicator” per PRS Resource Set ID or PRS Resource ID in the *Requested DL PRS Transmission Characteristics* IE. See TP in [4] section 9.2.x1.

**Question 2: Please indicate your preference between Option 1 and Option 2. Also, please provide any comments on the TP for your preferred option.**

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| **Company** | **Comments** |
| HW | Option 1. Additional comments: the “PRS Resource Set Off Indication”and“PRS Resource Off Indication”within the *PRS Transmission Off Information* IE may be no longer needed. |
| Nokia | Option 1. Regarding Huawei’s comment, indeed these IEs are not strictly needed if *PRS Transmission Off Information* is used only for “off” indicators (and not expanded to allow “on” indicators, see question 3). |
| CATT | Option 1 can’t send one message to gNB containing both configurations and they need to be sent to the gNB separately, the signaling efficiency of option 1 is low. Moreover, according to RAN1's conclusion, there is no OFF indicator per TRP granularity.  For option 2, as Huawei proposed, it can also not carry special indicator in TP of [4], so that the signaling will be simpler and more efficient. Therefore, we prefer the way of option 2.  Note: if the option 2 can be agreed, we can update the corresponding TP. |
| Ericsson | Option 1, agree with HW comments |
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| Moderator Summary:   * TBD | |

For “**ON” indicator**, two different options have been proposed:

Option 1: Nothing more is needed to support “on”, since the *Requested DL PRS Transmission Characteristics* IE is essentially an “on” request. The *Requested DL PRS Transmission Characteristics* IE is included in the PRS CONFIGURATION REQUEST when the value of the *PRS Configuration Request Type* IE is “configure”.

Option 2: Introduce the following parameters into the *Requested DL-PRS Resource List* IE as optional: Sequence ID, RE Offset, Resource Slot Offset, Resource Symbol Offset. See TP in [4] section 9.2.x1b.

**Question 3: Please indicate your preference between Option 1 and Option 2. Also, please provide any comments on the TP for your preferred option.**

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| **Company** | **Comments** |
| HW | We are OK with Option 1.  If we need to support a switch on of the previously requested (or switched off) resource (set) list. The *PRS Transmission Off Information* IE in [1] & [2] can be updated to support indicating the list for both “off” and “on”; and also update PRS Configuration Request Type to include “ON”. |
| Nokia | Option 1.  It seems unnecessarily complex to enable the LMF to “add” additional PRS resources that were not part of the original PRS configuration (which seems implied by Option 2). We could perhaps consider support for turning “on” a PRS resource that was previously turned “off” (using the same resource ID), but it does not seem very useful (signalling optimization?). |
| CATT | As Nokia said, option 2 does have signaling optimization consideration. For the PRS resource released by LMF, they may need rapid reactivation. Considering that the on demand request via LPP is signaled to LMF per UE, so there may be more dynamic and flexible configuration cases, so it is also a clear agreement of RAN1. Therefore, RAN3 should support such case.  For Huawei’s proposal, there may be an issue of how PRS resource ID is released, and which was also mentioned in our last meeting contribution [R3-220719] , but considering the signalling simplicity, we propose in this meeting that these PRS resources to be reactivated only are included in the *Requested DL-PRS Resource Set Item* IE from LMF as optional IE, and the LMF can determines which parameters need to inform gNB besides the PRS resource ID. |
| Ericsson | Option 1, agree with HW and Nokia’s comments |
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| Moderator Summary:   * TBD | |

For **On-demand PRS TRP Information**:

- It is proposed in [1] that the gNB may not allow all nine of the on-demand DL PRS parameters agreed by RAN1 to be requested by the LMF. Therefore, the gNB should be able to indicate (using a BIT STRING) which parameters are allowed to be included/requested by the LMF in a PRS CONFIGURATION REQUEST message.

- In [4], it is proposed that the gNB may not allow all possible values of a particular on-demand DL PRS parameter (e.g. Periodicity, Repetition Factor, Comb Size, and Number of Symbols) to be requested by the LMF. Therefore, the gNB should be able to indicate (using a BIT STRING) which values of the parameter are allowed to be included/requested by the LMF in a PRS CONFIGURATION REQUEST message.

The above essentially enables the gNB to indicate support for on-demand PRS at two levels of granularity: parameter level, and parameter value level.

**Proposal 2:** The gNB can indicate via the TRP Information Exchange procedure whether a particular on-demand PRS transmission parameter is allowed to be requested by the LMF.

A TP capturing proposal 2 is in [1] section 9.2.x3.

**Question 4: Can Proposal 2 be agreed? Please also provide any comments regarding the related TP in [1].**

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| **Company** | **Comments** |
| HW | Ok. |
| Nokia | Yes. |
| CATT | Yes |
| Ericsson | Yes |
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**Proposal 3:** For at least some on-demand PRS transmission parameters (e.g. Periodicity, Repetition Factor, Comb Size, and Number of Symbols), the gNB can indicate via the TRP Information Exchange procedure whether particular values are allowed to be requested by the LMF.

A TP capturing proposal 3 is in [4] section 9.2.x3.

**Question 5: Can Proposal 3 be agreed? Please also provide any comments regarding the related TP in [4], e.g., which on-demand DL PRS parameters should the “value level of granularity” be applied to.**

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| **Company** | **Comments** |
| HW | Ok for the value level. The following parameters:   * per resource set per positioning frequency layer per FR   1. DL PRS Periodicity   2. DL PRS Resource Bandwidth   3. DL PRS Resource Repetition Factor   4. Number of DL PRS Resource Symbols per DL PRS Resource   5. DL-PRS CombSizeN |
| Nokia | No strong view. It could be applied to (at least) Periodicity and Bandwidth. |
| CATT | We support to include the value level of the above 5 parameters, and it is also aligned with RAN1 agreement. |
| Ericsson | OK for the encoding proposed in [1]-[2] |
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Finally, there may be miscellaneous corrections needed to support on-demand PRS. For example, according to [4] the frequency related information is currently missing from the *Requested DL-PRS Resource Set Item* IE, so the *Start PRB* and *Point A* IEs should be introduced into the *Requested DL-PRS Resource Set Item* IE.

**Proposal 4:** Introduce the *Start PRB* IE and *Point A* IE into the *Requested DL-PRS Resource Set Item* IE.

A TP capturing proposal 4 is in [4] section 9.2.x1.

**Question 6: Can Proposal 4 be agreed? Please also provide any comments regarding the related TP in [4], or if any other miscellaneous parameters are missing for on-demand PRS.**

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| **Company** | **Comments** |
| HW | Maybe no need. The frequency information is not listed in the RAN1 LS. The RAN1 LS only include the number of frequency layers. We need to follow RAN1 LS. |
| Nokia | Does not seem needed, based on RAN1 agreements. |
| CATT | We agree to keep the alignment with RAN1. |
| Ericsson | No need |
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| Moderator Summary:   * TBD | |

## 3.2 NGAP

An NGAP CR is provided in [3], proposing to update the NRPPa Transport procedure description to include the new Rel-17 NR positioning functions (currently Measurement Preconfiguration Information Transfer and PRS Information Transfer).

**Question 7: Can [3] be endorsed as baseline CR for NGAP?**

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| **Company** | **Comments** |
| HW | OK |
| Nokia | Yes. The function names can be updated, if needed, based on the outcome of other CBs (e.g. CB #1906) |
| CATT | OK |
| Ericsson | Ok |
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# 4 Discussion (Round 2)

TBD

# 5 Conclusions, Recommendations

TBD

# References

1. R3-221871, (TP for NR\_pos\_enh BL CR for TS 38.455) Resolution of open issues for on-demand PRS (Nokia, Nokia Shanghai Bell, Ericsson, Huawei)
2. R3-221872, (TP for NR\_pos\_enh BL CR for TS 38.473) Resolution of open issues for on-demand PRS (Nokia, Nokia Shanghai Bell, Ericsson, Huawei)
3. R3-221873, Introduction of NR positioning enhancements to NGAP (Nokia, Nokia Shanghai Bell, Ericsson, Huawei)
4. R3-221894, (TP for Positioning BLCRs) Further Consideration on On-Demand PRS (CATT)