3GPP TSG RAN WG2 Meeting #117-e R2-220xxxx

**Electronic meeting, 21 Feb- 3 March, 2022**

**Agenda item:** 8.11.1

**Source:** Intel Corporation

**Title:** Report of [AT117-e][604][POS] RAT-dependent positioning running CR to 38.305 (Intel)

**Document for:**  Discussion and decision

# Introduction

This is the report of following offline discussion:

* [AT117-e][604][POS] RAT-dependent positioning running CR to 38.305 (Intel)

      Scope: Review and update the CR in R2-2202490.

      Intended outcome: Endorsable CR

      Deadline:  Friday 2022-02-25 1000 UTC

Please provide your comments in the discussion report before Thursday 2022-02-24 1000 UTC, i.e. one day before the deadline, so we have time to update the CRs accordingly.

# Annex: companies’ point of contact

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| **Company** | **Point of contact** | **Email address** |
| Intel Corporation | Yi Guo | Yi.guo@intel.com |
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# Discussion

## 3.1 Proposals in RAN2#117

### 3.1.1 TEG

#### 3.1.1.1 FFS on TEG definition

R2-2202489 and R2-2203462 discussed how to update the open issue on TEG definition.

**Proposal 1**: RAN2 to discuss the following text proposals for definitions of timing errors, timing delays and different TEGs and capture the definitions in clause 3.1 in TS 38.305:

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| **Tx timing error**: Result of Tx time delay (defined below) involved in the transmission of a signal. It is the uncalibrated Tx time delay, or the remaining delay after the TRP/UE internal calibration/compensation of the Tx time delay, involved in the transmission of the DL PRS/UL SRS signals. The calibration/compensation may also include the calibration/compensation of the relative time delay between different RF chains in the same TRP/UE and may also possibly consider the offset of the Tx antenna phase centre to the physical antenna centre  **Tx time delay**: From a signal transmission perspective, the time delay from the time when the digital signal is generated at baseband to the time when the RF signal is transmitted from the Tx antenna  **Rx timing error**: Result of Rx time delay (defined below) involved in the reception of a signal before reporting measurements that are obtained from the signal. It is the uncalibrated Rx time delay, or the remaining delay after the UE/TRP internal calibration/compensation of the Rx time delay, involved in the reception of the DL PRS/UL SRS signals. The calibration/compensation may also include the calibration/compensation of the relative time delay between different RF chains in the same UE/TRP and may also possibly consider the offset of the Rx antenna phase centre to the physical antenna centre  **Rx time delay**: From a signal reception perspective, there will be a time delay from the time when the RF signal arrives at the Rx antenna to the time when the signal is digitized and time-stamped at the baseband  **UE Tx ‘timing error group’ (UE Tx TEG)**: Tx timing errors, associated with UE transmissions on one or more UL SRS resources for positioning purpose, that are within a certain margin  **UE Rx ‘timing error group’ (UE Rx TEG)**: Rx timing errors, associated with UE reporting of one or more DL measurements (RSTD), that are within a certain margin  **UE RxTx ‘timing error group’ (UE RxTx TEG)**: Rx timing errors and Tx timing errors, associated with UE reporting of one or more UE Rx-Tx time difference measurements and one or more UL SRS resources for positioning purpose, that are within a certain margin  **TRP Tx ‘timing error group’ (TRP Tx TEG)**: Tx timing errors, associated with TRP transmissions on one or more DL PRS resources, that are within a certain margin  **TRP Rx ‘timing error group’ (TRP Rx TEG)**: Rx timing errors, associated with TRP reporting of one or more UL measurements, that are within a certain margin  **TRP RxTx ‘timing error group’ (TRP RxTx TEG)**: Rx timing errors and Tx timing errors, associated with TRP reporting of one or more gNB Rx-Tx time difference measurements and one or more DL PRS resources, that are within a certain margin |

**Discussion point 3.1.1.1-1: Do companies agree to capture the TEG definition as above? i.e. capture RAN1 agreements directly in stage 2 CR.**

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| **Company’s name** | **Yes/No** | **Remark** |
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#### 3.1.1.2 FFS Description for information transfer gNB and UE is not needed. For example, previously we also have PosSRS configuration sent from gNB to the UE. But that is not captured here.

R2-2202489 mentioned that

*we only captured the general information between UE and LMF (for LPP protocol) and the information between gNB and LMF (for NRPPa protocol) in the table. We did not capture RRC related information in the table. Therefore the information between UE and gNB for TEG in 8.13.2.4 and 8.13.2.5 shall be deleted.*

And therefore proposed

**Proposal 5: Remove section 8.13.2.4 and 8.13.2.5 (the information between UE and gNB for TEG)**

**Discussion point 3.1.1.2-1: Do companies agree to Remove section 8.13.2.4 and 8.13.2.5 (the information between UE and gNB for TEG)?**

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| **Company’s name** | **Yes/No** | **Remark** |
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#### 3.1.1.3 Other changes

**R2-2202593 proposed**

**Proposal 3: to revise the stage-2 “Sequence of Procedure for UL-TDOA positioning” in TS 38.305 to include RRC message exchange to convey the UE Tx TEG association information to the gNB.**

The TP is shown as

Figure 8.13.3.4-1 shows the messaging between the LMF, the gNBs and the UE to perform UL-TDOA procedure.

1. 

Figure 8.13.3.4-1: UL-TDOA positioning procedure

0. The LMF may use the procedure in Figure 8.13.3.2.1-2 to obtain the TRP information required for UL-TDOA positioning.

1. The LMF may request the positioning capabilities of the target device using the LPP Capability Transfer procedure as described in clause 8.13.3.1.

2. The LMF sends a NRPPa POSITIONING INFORMATION REQUEST message to the serving gNB to request UL-SRS configuration information for the target device as described in Figure 8.13.3.2.1-1.

3. The serving gNB determines the resources available for UL-SRS and configures the target device with the UL-SRS resource sets at step 3a. If the gNB requests the UE TxTEG association information in step 3b, the target device reports it in step 3c (and upon the change in the association).

**Discussion point 3.1.1.3-1: Do companies agree the TP shown as above (proposed in R2-2202593)?**

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| **Company’s name** | **Yes/No** | **Remark** |
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### 3.1.2 On-Demand PRS

#### 3.1.2.1 premeeting discussion 608

2 comments were received in R2-2202236 as

*In 7.x.1, saying “LMF to request” is not correct. LMF does not request UE or any other entity. We propose the following text:*

*On-Demand PRS transmission procedure allows to control whether PRS is transmitted or not and to change the characteristics of an ongoing PRS transmission. The on-demand PRS transmission procedure can be initiated either by the UE or LMF.*

Rapporteur considers the suggestion is correct. But would like to check companies’ view on this.

**Discussion point 3.1.2.1-1: Do companies agree the change suggested on 7.x.1 as above (highlighted in yellow)?**

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| **Company’s name** | **Yes/No** | **Remark** |
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In 7.x.2:

***Change 1:*** *Step 1 and 2a both covers UE-initiated ODPRS. So, the figure needs to be updated to put both steps under one dotted box for UE-initiated ODPRS.*

*[Rapp] Looks ok.*

**Discussion point 3.1.2.1-2: Do companies agree the change 1 above ?**

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| **Company’s name** | **Yes/No** | **Remark** |
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***Change 2:*** *Step 2a: The last sentence about sending in MO-LR should be a NOTE as it is a caveat addressing a different procedure covered in LCS specification, i.e. put*

The LPP Request Assistance Data message for On-Demand PRS may also be sent in an MO-LR location service request message. As a Note:

Note: The LPP Request Assistance Data message for On-Demand PRS may also be sent in an MO-LR location service request message.

*[Rapp] No strong opinion.*

**Discussion point 3.1.2.1-3: Do companies agree the change 2 above ?**

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| **Company’s name** | **Yes/No** | **Remark** |
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***Change 3:*** *Step 2b: In the figure, it is shown as LMF-initiated ODPRS but it is not mentioned in the description of step 2b. Also, what is “available PRS configuration” mentioned in step 2b? How does that relate to step 1? Add “In case of LMF-initiated On-Demand PRS to step 2b and remove the text “or to provide available On-Demand PRS configurations to the UE”*

*[Rapp] Step 2b can be applied for both UE initiated and LMF initiated case. Therefore we should “remove LMF-Initiated On-Demand PRS and the dot box” instead of adding “LMF-initiated ODPRS ” in the procedure part; Agree to remove “available PRS configuration” since it has been covered by step 1*

**Discussion point 3.1.2.1-4: Do companies agree suggestion from Rapporteur highlighted in yellow as above ?**

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***Change 4:*** *Step 3: Change “or change to PRS transmission characteristics” to “or change to the transmission characteristics of an ongoing PRS transmission”*

*[Rapp] Looks ok.*

**Discussion point 3.1.2.1-5: Do companies agree the change 4 as above ?**

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| **Company’s name** | **Yes/No** | **Remark** |
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***Change 5:*** *Step 7 does not fit in this 38.305 call flow. The treatment of ODPRS request for assistance data via MO-LR and reference to SA2 specification can be put under a NOTE.*

That is, put

7. If the LPP Request Assistance Data for On-Demand DL-PRS at Step 2a was sent in an MO-LR location service request message, the LMF provides a MO-LR response as described in clause 7.3.3.

As a Note:

Note: If the LPP Request Assistance Data for On-Demand DL-PRS at Step 2a was sent in an MO-LR location service request message, the LMF provides a MO-LR response as described in clause 7.3.3.

**Discussion point 3.1.2.1-6: Do companies agree the change 5 as above ?**

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| **Company’s name** | **Yes/No** | **Remark** |
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***Change 6:*** *Editor’s Note with FFS to step 6 can be removed as I believe we concluded the response to a ODPRS request cannot be a posSIB.*

*[Rapp] We do not have conclusion yet. But there is clear majority [13/14] in Pre117-e608, see R2-2202236, Proposal 7: The posSI message cannot be the response for a UE’s On-Demand PRS request. Therefore would suggest to agree this, i.e. remove*

Editor's Note: Step 6, FFS on whether posSIB can be the response or not..

And remove “or posSI ” from step 6

6. LMF provides the updated PRS configuration used for PRS transmission via LPP Provide Assistance Data message or posSI to the UE.

**Discussion point 3.1.2.1-7: Do companies agree the change 6 as above ?**

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The suggestion

#### 3.1.2.2 Others

R2-2203361 proposed to capture in stage 2 “Proposal 7 LMF indicates indicate explicit on-demand PRS parameters (and the corresponding value ranges for each parameter) to the UE.”, i.e.

**Figure 7.x.2-1: Procedures to support On-Demand PRS transmission [1].**

0. The LMF may receive information on the possible On-Demand PRS configurations that the gNB can support during the TRP Configuration Information Exchange procedure.

1. In case of UE-initiated On-demand PRS, the LMF may configure the UE with pre-defined PRS configurations and/or indicate PRS parameters (together with value range) that can be explicitly requested via LPP Provide Assistance Data message or via posSI.

2a. In case of UE-initiated On-Demand PRS, the UE sends an On-Demand PRS request to the LMF via LPP Request Assistance Data message if the UE has pre-defined PRS configurations or configurable on-demand PRS parameter indication. The On-Demand PRS request may be a request for PRS transmission or change to the PRS transmission characteristics for positioning measurements.

**Discussion point 3.1.2.2-1: Do companies agree the TP shown as above?**

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### 3.1.3 Preconfigured MG

#### 3.1.3.1 FFS on whether we need to capture PPW, MG configuration procedure in stage 2 since we did not do that for posSRS and proposed

R2-2202489 discussed open issue that FFS on whether we need to capture PPW, MG configuration procedure in stage 2 since we did not do that for posSRS and proposed

**Proposal 3: add the procedure for MG as 7.y Procedures for Pre-configured Measurement Gap i.e.:**

## 7.y Procedures for Pre-configured Measurement Gap

### 7.y.1 General

The pre-configured measurement gap procedure is used by the network to provide measurement gap for NR DL-PRS measurements. The gNB may activate/deactivate the pre-configurated measurement gap upon receiving the request from a UE or LMF.

### 7.y.2 Pre-configured Measurement Gap procedures

Figure 7.y.2-1 shows the general positioning procedure for Pre-configured Measurement Gap.



Figure 7.y.2-1: Pre-configured measurement gap configuration procedure

1. Based on the assistance information from the LMF and the UE capability, the serving gNB provides pre-configured measurement gap configuration(s) with associated ID(s) to the UE by sending RRC Reconfiguration message specified in TS 38.331 [14];

2. The UE sends RRC Reconfiguration complete message to the gNB to confirm the reception of pre-configured measurement gap configuration;

3. If the UE requires measurement gaps for performing the requested location measurements while measurement gaps are either not configured or not sufficient, the UE sends UL MAC CE Activation/Deactivation Request to the gNB and indicates the requested measurement gap configuration based on the ID configured in step 1;

4. Based on the quest from the UE in step 3a or the request from the LMF in step 3b, the gNB may send DL MAC CE Activation/Deactivation command containing an ID to activate the associated measurement gap;

Editor's Note: FFS on details of MAC CE, NRPPa, RRC;.

**Proposal 4: add the procedure for PPW as 7.z Procedures for Pre-configured PRS processing window, i.e.:**

## 7.z Procedures for Pre-configured PRS processing window

### 7.z.1 General

The pre-configured PRS processing window procedure is used by the network to provide PRS processing window for NR DL-PRS measurements in the UE without measurement gap. The gNB may activate the pre-configurated PRS processing window upon receiving the request from LMF.

### 7.z.2 Pre-configured PRS processing window procedures

Figure 7.z.2-1 shows the general positioning procedure for Pre-configured PRS processing window.



Figure 7.z.2-1: Pre-configured PRS processing window configuration procedure

1. Based on the assistance information from the LMF and the UE capability, the serving gNB provides pre-configured PRS processing window configuration(s) with associated ID(s) to the UE by sending RRC Reconfiguration message specified in TS 38.331 [14];

2. The UE sends RRC Reconfiguration complete message to the gNB to confirm the reception of pre-configured PRS processing window configuration;

4. Based on the request from the LMF in step 3, the gNB sends DL MAC CE Activation/Deactivation command containing an ID to activate the associated PRS processing window;

Editor's Note: FFS on details of MAC CE, NRPPa, RRC;.

**Discussion point 3.1.3.1-1: Do companies agree the TP shown as above?**

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| **Company’s name** | **Yes/No** | **Remark** |
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#### 3.1.3.2 other changes

R2-2203181 proposed

***Proposal 4: A clarification note should be added in the stage 2 running CR 7.4.1.x that: if none of the pre-configured MGs satisfies UE’s need or there are no pre-configured measurement gaps provided to the UE, UE can trigger LocationMeasurementIndication procedure.***

7.4.1.x Pre-configured Measurement Gap

The pre-configured measurement gap procedure is used by the network to provide measurement gap for NR DL-PRS measurements. The gNB may activate/deactivate the pre-configurated measurement gap upon receiving the request from a UE or LMF.



Figure 7.4.1.x-1: Pre-configured measurement gap configuration procedure

1. Based on the assistance information from the LMF and the UE capability, the serving gNB provides pre-configured measurement gap configuration(s) with associated ID(s) to the UE by sending RRC Reconfiguration message specified in TS 38.331 [14];

2. The UE sends RRC Reconfiguration complete message to the gNB to confirm the reception of pre-configured measurement gap configuration;

3. If the UE requires measurement gaps for performing the requested location measurements, the UE sends UL MAC CE Activation/Deactivation Request to the gNB and indicates the requested measurement gap configuration based on the ID configured in step 1;

Note: if none of the pre-configured MGs satisfies UE’s need or there are no pre-configured measurement gaps provided to the UE, UE can trigger *LocationMeasurementIndication* procedure as specified in 7.4.1.1.

4. If UE transmits UL MAC CE containing pre-confgiured MG ID, based on the quest from the UE in step 3a or the request from the LMF in step 3b, the gNB may send DL MAC CE Activation/Deactivation command containing an ID to activate the associated measurement gap;

**Discussion point 3.1.3.2-1: Do companies agree the TP shown as above?**

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### 3.1.4 Strong UE LPP capability in AMF

R2-2202489 mentioned that

Currently storing capability in AMF is captured in section 5.4.4 as

The LMF may interact with the AMF to support the provision of UE positioning capability to the AMF as described in TS 23.273 [35].

It would be good to align with TS23.273, i.e. change it as

The LMF may interact with the AMF to support reception of stored UE Positioning Capability from AMF and providing updated UE Positioning Capability to AMF as described in TS 23.273 [35].

And therefore proposed

**Proposal 6: In section 5.4.4, change the description on storing UE capability in AMF from “The LMF may interact with the AMF to support the provision of UE positioning capability to the AMF as described in TS 23.273 [35].” to “The LMF may interact with the AMF to support reception of stored UE Positioning Capability from AMF and providing updated UE Positioning Capability to AMF as described in TS 23.273 [35]”**

**Discussion point 3.1.4-1: Do companies agree the proposal 6 shown as above?**

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### 3.1.5 Anything is missing?

**Discussion point 3.1.5-1: Companies are invited to indicate whether any stage 2 proposals are missing in the discussion?**

**Note: RRC\_INACTIVE is not included in this discussion since separate discussion is needed based on premeeting discussion.**

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| **Company’s name** | **Yes/No** | **Remark** |
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## 3.2 Positioning in RRC\_INACTIVE

RAN2 agreed

Proposal 1: Add clarification note (as below) in Stage 2 specification:

Note: Positioning may be performed when a UE is in RRC\_INACTIVE state. Any uplink LCS or LPP message can be transported in RRC\_INACTIVE. If the UE initiated data transmission using UL SDT, the network can send DL LCS, LPP message and RRC message (e.g. to configure SRS for positioning, if UL positioning is supported) to the UE.

Rapporteur would suggest to capture it as normative text in section 7.w as

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| 7.w Positioning in RRC\_INACTIVE Positioning may be performed when a UE is in RRC\_INACTIVE state. Any uplink LCS or LPP message can be transported in RRC\_INACTIVE. If the UE initiated data transmission using UL SDT, the network can send DL LCS, LPP message and RRC message (e.g. to configure SRS for positioning, if UL positioning is supported) to the UE. |

**Discussion point 3.2: Do companies agree the TP shown as above? If no, please indicate your preference.**

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| **Company’s name** | **Yes/No** | **Remark** |
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## 3.3 running CR in R2-2202490

**Discussion point 3.3: Companies are invited to provide view on running TS38.305 CR R2-2202490?**

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| **Company’s name** | **Section** | **Identified issues** | **Change suggestion** |
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# Summary report and proposals