**3GPP TSG RAN WG2 Meeting #111-e R2-200xxxx**

**Electronic meeting, August 17th - 28th, 2020**

**Source: Huawei, HiSilicon**

**Title: [AT111-e][609][POS] Checking of R2-2007831, R2-2007828, and R2-2006841 (Huawei)**

**Agenda item: 6.6.1**

**Document for:** **Discussion and Decision**

Introduction

During RAN2#111-e, the following email discussion is agreed during online

* [AT111-e][609][POS] Checking of R2-2007831, R2-2007828, and R2-2006841 (Huawei)

Scope: Confirm the changes in R2-2007831, R2-2007828, and R2-2006841 taking into account RAN3 progress where relevant. For R2-2006841, step 5 of the flow should be updated but no new procedure is introduced.

Intended outcome: Agreed CRs

Deadline: Thursday 2020-08-27 1200 UTC

In this offline discussion, we continue the discussion based on the prescribed scope agreed during online. The tdocs under this discussion are:

[R2-2007831](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202008%20-%20RAN2_111-e,%20Online\Extracts\R2-2007831%20Miscellaneous%20correction%20to%20stage2%20specification.doc) Miscellaneous correction to stage2 specification Huawei, HiSilicon CR Rel-16 38.305 16.1.0 0032 - F NR\_pos-Core

[R2-2007828](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202008%20-%20RAN2_111-e,%20Online\Extracts\R2-2007828%20Correction%20to%20Stage-2%20for%20gNB%20and%20LMF%20information%20transfer.docx) DraftCR to Stage-2 for gNB and LMF information transfer Huawei, HiSilicon CR Rel-16 38.305 16.1.0 0029 - F NR\_pos-Core

[R2-2006841](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202008%20-%20RAN2_111-e,%20Online\Extracts\R2-2006841%20UL%20SRS%20Configurations.docx) Signalling sequence for UL SRS Configuration Ericsson discussion Rel-16 38.305

# Discussion

Miscellaneous corrections to stage2

The following proposals have been excerpted from R2-2007831 in the stage2 summary provided by CATT in R2-2008098 and discussed during online

**Proposal 2: Adopt the corrections proposals in R2-2007831:**

* **Addition of definition for “SRS-only RP”**

**Furthermore, RAN2 can discuss if the definition of “PRS-only TP” should be updated because it is limited to “for PRS-based TBS positioning” in stage 2. However the new introduced definition of “SRS-only RP” is “for UL-only positioning”.**

* **Changing of the definition for A-AoA and citing the abbreviation for A-AoA and Z-AoA accordingly**
* **Addition of explanation for abbreviations posSI and RSRQ**
* **Correction of the typos and action sequence of the role of gNB;**
* **Addition of location measurement indication for NR DL-PRS measurements**
* **Addition of NG-RAN measurement of AoA to E-CID**
* **Change the interface name from NLs to NL1 in 6.1.5**

During the online discussion, the following agreement has been made while the others need further discussion.

* **Changing of the definition for A-AoA and citing the abbreviation for A-AoA and Z-AoA accordingly**
* OK to have this change with the correction to “angle”.

=============================CHANGE BEGINS====================================

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

As used in this document, the suffixes "-based" and "-assisted" refer respectively to the node that is responsible for making the positioning calculation (and which may also provide measurements) and a node that provides measurements (but which does not make the positioning calculation). Thus, an operation in which measurements are provided by the UE to the LMF to be used in the computation of a position estimate is described as "UE-assisted" (and could also be called "LMF-based"), while one in which the UE computes its own position is described as "UE-based".

**Transmission Point (TP)**: A set of geographically co-located transmit antennas (e.g. antenna array (with one or more antenna elements)) for one cell, part of one cell or one DL PRS-only TP. Transmission Points can include base station (ng-eNB or gNB) antennas, remote radio heads, a remote antenna of a base station, an antenna of a DL PRS-only TP, etc. One cell can include one or multiple transmission points. For a homogeneous deployment, each transmission point may correspond to one cell.

**Reception Point (RP)**: A set of geographically co-located receive antennas (e.g. antenna array (with one or more antenna elements)) for one cell, part of one cell or one UL SRS-only RP. Reception Points can include base station (ng-eNB or gNB) antennas, remote radio heads, a remote antenna of a base station, an antenna of a UL SRS-only RP, etc. One cell can include one or multiple reception points. For a homogeneous deployment, each reception point may correspond to one cell.

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

**Transmission-Reception Point (TRP)**: A set of geographically co-located antennas (e.g. antenna array (with one or more antenna elements)) supporting TP and/or RP functionality.

**SRS-only RP**: An RP which only receives SRS signals for UL-only positioning and is not associated with a cell.

================================CHAGNE ENDS===================================

The reason for the change above is that

- UL RSR-only RP is already used in the spec

- PRS-only TP is already defined so it is strange if we don’t have a definition for SRS-only RP

***Q1a: Do companies agree with the above change?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| Intel | Y | Ok to have considering we already used the term in stage2. |
| CATT | Y |  |
| Qualcomm | Y |  |
| Nokia | Y |  |
| vivo | Y |  |
| Ericsson | N | The only reference in stage 2 is  *A gNB may serve several TRPs, including for example remote radio heads, and UL-SRS only RPs and DL-PRS-only TPs.*  It is part of gNB definition. Hence, the motivation to have separate definition is not justified.  Further, if SRS-only RP is defined that one need to define also the DL-PRS-only TPs or change the definition of PRS-only TP |
| Huawei, HiSilicon | Y |  |
| Apple | Y |  |
| Samsung | Y |  |

Furthermore, in the summary, it mentioned that “RAN2 can discuss if the definition of “PRS-only TP” should be updated because it is limited to “for PRS-based TBS positioning” in stage 2. From our understanding, this definition does seem obsolete and needs to be updated accordingly.

***Q1b: Do company think an update for the definition of PRS-only TP is needed? If so, what is the proposed definition?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments/Proposed update** |
| Intel | N | Current definition is  **PRS-only TP**: A TP which **only transmits PRS signals** for PRS-based TBS positioning and is not associated with a cell.  We may have PRS only TP to transfer PRS signals. It can be used for DL TDOA, DL AoD and Multi-RTT which PRS is needed.  And other TRP supports UL measurement can be used to measure the UL SRS for Multi-RTT. Therefore current definition can work.  To align PRS only TP and SRS only TP, we may change SRS only TP as  **SRS-only RP**: An RP which only receives SRS signals for **SRS-based** positioning and is not associated with a cell. |
| CATT | Y | There are two options to update it:  Option1: **PRS-only TP**: A TP which only transmits PRS signals for PRS-based TBS positioning or other PRS-based positioning and is not associated with a cell.  Option2: **PRS-only TP**: A TP which only transmits PRS signals for PRS-based positioning and is not associated with a cell. |
| Qualcomm | N | Current text seems still O.K. |
| Nokia | Y | We could remove mention of purpose of the signal in the definitions since anyway this is obvious from different positioning methods as to which ones could use such TP/RP. So, the definitions could be:  **PRS-only TP**: A TP which **only transmits PRS signals** and is not associated with a cell.  **SRS-only RP**: An RP which **only receives SRS signals** and is not associated with a cell. |
| vivo | N | Agree with Intel, it can work without change of PRS-only TP definition. |
| Ericsson | Depends | If we agree to have SRS-only RP then agree with Nokia. |
| Huawei, HiSilicon | Y | Could follow the TP provided by Nokia |
| Apple | Y | Agree with Nokia |
| Samsung | Y | Agree with Nokia’s. |

=============================CHANGE BEGINS====================================

posSI Positioning System Information

posSIB Positioning SIB

PPP Precise Point Positioning

PPP-RTK Precise Point Positioning – Real-Time Kinematic

PRS Positioning Reference Signal (for E-UTRA)

QZSS Quasi-Zenith Satellite System

RP Reception Point

RRM Radio Resource Management

RSRP Reference Signal Received Power

RSRQ Reference Signal Received Quality

RSSI Received Signal Strength Indicator

RSTD Reference Signal Time Difference

=============================CHANGE ENDS====================================

The reason why for the above change is that posSI is used in the main text but is un-defined. The same reason also goes for RSRQ.

***Q2: Do companies agree with the above change?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| Intel | Y | Ok to have. |
| CATT | N for posSI | There is no term of posSI because the SI may include posSIB(s) and other SIB(s).  The context of posSI in 7.5.1 General should be updated as “posSIB(s)” which is aligned with TS 38.331.  The UE may request posSIBs by means of on-demand SI request in RRC\_IDLE/RRC\_INACTIVE and also request posSIBs by means of on-demand SI request in RRC\_CONNECTED as described in TS 38.331 [14]. |
| Qualcomm | Y | posSI is used in the specification. Therefore, adding it to the Abbreviations seems O.K. |
| Nokia | N for posSI | Agree with CATT. The term posSI is not used in 38.331. Also, there is only one instance of posSI used in 38.305 in Section 7.5.1 which is not quite accurate. In idle/inactive the UE can request SI messages containing posSIB(s) and in connected the UE can request a specific posSIB(s). So, updating Section 7.5.1 seems appropriate to us without using the term posSI. However, our suggested text proposal is as follows:  The UE may request SI messages containing posSIBs by means of on-demand SI request in RRC\_IDLE/RRC\_INACTIVE. Also, the UE may request specific posSIBs by means of on-demand SI request in RRC\_CONNECTED as described in TS 38.331 [14]. |
| Vivo | Y | OK to have. |
| Ericsson | N for posSI | Agree with Nokia and CATT |
| Huawei, HiSIlicon | Y | Agree with QC |
| Apple | Y |  |
| Samsung | N for posSI | Same reason as Nokia, CATT |

=============================CHANGE BEGINS====================================

### 4.3.1 Introduction

The standard positioning methods supported for NG-RAN access are:

- network-assisted GNSS methods;

- observed time difference of arrival (OTDOA) positioning based on LTE signals;

- enhanced cell ID methods based on LTE signals;

- WLAN positioning;

- Bluetooth positioning;

- terrestrial beacon system (TBS) positioning;

- sensor based methods:

- barometric Pressure Sensor;

- motion sensor;

- NR enhanced cell ID methods (NR E-CID) based on NR signals;

- Multi-Round Trip Time Positioning (Multi-RTT based on NR signals);

- Downlink Angle-of-Departure (DL-AoD) based on NR signals;

- Downlink Time Difference of Arrival (DL-TDOA) based on NR signals;

- Uplink Time Difference of Arrival (UL-TDOA) based on NR signals;

- Uplink Angle of Arrival (UL-AoA), including A-AoA and Z-AoA based on NR signals.

Hybrid positioning using multiple methods from the list of positioning methods above is also supported.

Standalone mode (e.g. autonomous, without network assistance) using one or more methods from the list of positioning methods above is also supported.

These positioning methods may be supported in UE-based, UE-assisted/LMF-based, and NG-RAN node assisted versions. Table 4.3.1-1 indicates which of these versions are supported in this version of the specification for the standardised positioning methods.

Table 4.3.1-1: Supported versions of UE positioning methods

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Method | UE-based | UE-assisted, LMF-based | NG-RAN node assisted | SUPL |
| A-GNSS | Yes | Yes | No | Yes (UE-based and UE-assisted) |
| OTDOA Note1, Note 2 | No | Yes | No | Yes (UE-assisted) |
| E-CID Note 4 | No | Yes | Yes | Yes for E-UTRA (UE-assisted) |
| Sensor | Yes | Yes | No | No |
| WLAN | Yes | Yes | No | Yes |
| Bluetooth | No | Yes | No | No |
| TBS Note 5 | Yes | Yes | No | Yes (MBS) |
| DL-TDOA | Yes | Yes | No | No |
| DL-AoD | Yes | Yes | No | No |
| Multi-RTT | No | Yes | Yes | No |
| NR E-CID | No | Yes | FFS | No |
| UL-TDOA | No | No | Yes | No |
| UL-AoA | No | No | Yes | No |
| NOTE 1: This includes TBS positioning based on PRS signals.  NOTE 2: In this version of the specification only OTDOA based on LTE signals is supported.  NOTE 3: Void.  NOTE 4: This includes Cell-ID for NR method.  NOTE 5: In this version of the specification only for TBS positioning based on MBS signals.  NOTE 6: Void | | | | |

Sensor, WLAN, Bluetooth, and TBS positioning methods based on MBS signals are also supported in standalone mode, as described in the corresponding clauses.

=============================CHANGE ENDS====================================

In the above text, originally, the wording the Azimuth/Zenith of Arrival is used. But actually, we have already defined A-AoA and Z-AoA. It is preferred to use the abbreviation directly.

***Q3: Do companies agree with the above change?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| Intel | Y | Editorial. |
| CATT | Y but | It seems that the wording may follow the same rule as Downlink Angle-of-Departure (DL-AoD) based on NR signals;  - Uplink Angle-of-Arrival (UL-AoA), including A-AoA and Z-AoA based on NR signals. |
| Qualcomm | Y |  |
| Nokia | Y |  |
| vivo | Y |  |
| Ericsson | Y |  |
| Huawei, HiSilicon | Y |  |
| Apple | Y |  |
| Samsung | Y |  |

==================================CHANGE BEGINS==============================

### 5.4.2 gNB

The gNB is a network element of NG-RAN that may provide measurement information for a target UE and communicates this information to an LMF.

To support NR RAT-Dependent positioning, the gNB may make measurements of radio signals for a target UE, provide measurement results for position estimation, and communicate these measurements to an LMF. A gNB may serve several TRPs, including for example remote radio heads, and UL-SRS only RPs and DL-PRS-only TPs.

A gNB may broadcast assistance data information, received from an LMF, in positioning System Information messages.

=============================CHANGE ENDS====================================

The above change is purely editorial that we think it is more logical if we say gNB makes the measurements first and then provides the measurement results and then sends these measurements to LMF.

***Q4: Do companies agree with the above change?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| Intel | Y | Editorial. |
| CATT | Y |  |
| Qualcomm | Y |  |
| Nokia | Y | Provide measurement results for position estimation and communicate measurements to an LMF are redundant. You can change it as follows:  To support NR RAT-Dependent positioning, the gNB may make measurements of radio signals for a target UE and provide measurement results for position estimation to an LMF |
| vivo | Y |  |
| Ericsson | Y |  |
| Huawei, HiSilicon | Y |  |
| Apple | Y |  |
| Samsung | Y | We also ok to Nokia’s further revision. |

=============================CHANGE BEGINS====================================

#### 7.4.1.1 Location Measurement Indication

The location measurement indication procedure is used by the UE to request measurement gaps for OTDOA RSTD measurements, for subframe and slot timing detection for inter-RAT E-UTRA RSTD measurements, or for NR DL-PRS measurements.



Figure 7.4.1.1-1: Location measurement indication procedure

**Precondition:** The UE served by a gNB has received a LPP message from an LMF requesting inter-RAT RSTD measurements for OTDOA positioning or NR DL-PRS measurements.

1. If the UE requires measurement gaps for performing the requested location measurements while measurement gaps are either not configured or not sufficient, or if the UE needs gaps to acquire the subframe and slot timing of the target E-UTRA system before requesting measurement gaps for the inter-RAT RSTD measurements (see TS 38.133 [32], the UE sends an RRC Location Measurement Indication message to the serving gNB. The message indicates that the UE is going to start location measurements, or that the UE is going to acquire subframe and slot timing of the target E-UTRA system, and includes information required for the gNB to configure the appropriate measurement gaps. When the gNB has configured the required measurement gaps the UE performs the location measurements or timing acquisition procedures.

2. When the UE has completed the location procedures which required measurement gaps, the UE sends another RRC Location Measurement Indication message to the serving gNB. The message indicates that the UE has completed the location measurements or timing acquisition procedures.

=============================CHANGE ENDS====================================

IN the last meeting, it is agreed that for all UE measurement on DL PRS, UE needs measurement gap to perform the measurement. Changes have been made to the stage3 specs while in stage2, we seem to have ignored it. The above change is to capture the corresponding changes in stage2 spec.

***Q5: Do companies agree with the above change?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| Intel | Y | I think we forgot stage 2 in last meeting. |
| CATT | Y |  |
| Qualcomm | Y |  |
| Nokia | Y |  |
| vivo | Y |  |
| Ericsson | Y |  |
| Huawei, HiSilicon | Y |  |
| Apple | Y |  |
| Samsung | Y |  |

=============================CHANGE BEGINS====================================

## 8.9 NR Enhanced cell ID positioning methods

### 8.9.1 General

NR Enhanced Cell ID (NR E-CID) positioning refers to techniques which use UE and/or NR radio resource related measurements to improve the UE location estimate.

NOTE: For NR E-CID positioning methods the UE reports only the measurements that it has available rather than being required to take additional measurement actions. Therefore, the measurement gap request procedure described in clause 7.4.1.1 is not applicable for NR E-CID positioning methods.

NR E-CID measurements may include:

UE measurements (TS 38.215 [37]):

- SS Reference signal received power (SS-RSRP);

- SS Reference Signal Received Quality (SS-RSRQ);

- CSI Reference signal received power (CSI-RSRP);

- CSI Reference Signal Received Quality (CSI-RSRQ).

NG-RAN measurements (TS 38.215 [37])

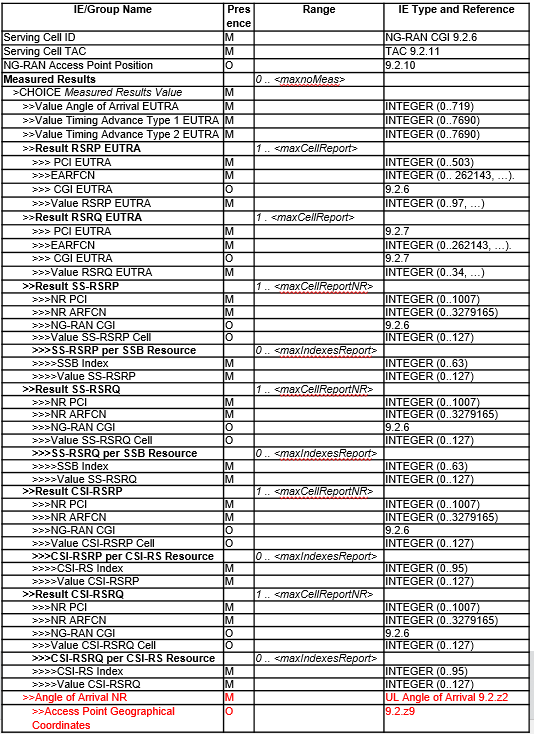
- UL Angle of Arrival (UL AoA);

The UE measurements above may be aggregated at cell level, or measured per SSB or CSI-RS resource.

Various techniques exist to use these measurements to estimate the location of the UE. The specific techniques are beyond the scope of this specification.

=============================CHANGE ENDS====================================

For the above measurement, in NRPPa, it has already been captured in the E-CID MEASUREMENT REPORT



Hence, in stage 2, we need to make corresponding change regarding this.

***Q6: Do companies agree with the above change?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| Intel | Y | But if we follow the logic in question 3, here should be UL-AoA? i.e. without mentioning UL Angle of Arrival . In addition “-“ is missing for UL-AoA. |
| CATT | Y but | The wording may follow Downlink Angle-of-Departure (DL-AoD):  - UL Angle-of-Arrival (UL-AoA); |
| Qualcomm | N | There is currently no UL-ECID described in Stage 2, so this part alone is not enough.  I understand there will be a RAN3 CR to introduce UL-ECID, which also includes the above change. Latest RAN3 baseline in [R3-204626](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_109-e/Docs/R3-204626.zip).  Prefer to keep all UL-ECID changes in a single CR, not part of "miscellaneous" corrections. |
| Nokia | Y | I think spelling out the measurement name is better here as shown in the proposal above. The use of hyphen in UL-AoA could be confused to imply the positioning method name. Anyway, there is still some inconsistency in the way the method name vs measurement name is used in this specification. |
| vivo | Y | Agree with Intel. |
| Ericsson | Y |  |
| Huawei, HiSilicon | Y |  |
| Apple | N | Agree with Qualcomm. We need add NR UL E-CID altogether in a CR instead of piece-by-piece specification. |
| Samsung | Y |  |

=============================CHANGE BEGINS====================================

## 5.1 Architecture

Figure 5.1-1 shows the architecture in 5GS applicable to positioning of a UE with NR or E-UTRA access.

The AMF receives a request for some location service associated with a particular target UE from another entity (e.g., GMLC or UE) or the AMF itself decides to initiate some location service on behalf of a particular target UE (e.g., for an IMS emergency call from the UE) as described in TS 23.502 [26] and TS 23.273 [35]. The AMF then sends a location services request to an LMF. The LMF processes the location services request which may include transferring assistance data to the target UE to assist with UE-based and/or UE-assisted positioning and/or may include positioning of the target UE. The LMF then returns the result of the location service back to the AMF (e.g., a position estimate for the UE. In the case of a location service requested by an entity other than the AMF (e.g., a GMLC or UE), the AMF returns the location service result to this entity.

An NG-RAN node may control several TRPs/TPs, such as remote radio heads, or DL-PRS-only TPs for support of PRS-based TBS.

An LMF may have a signalling connection to an E-SMLC which may enable an LMF to access information from E‑UTRAN (e.g. to support the OTDOA for E-UTRA positioning method using downlink measurements obtained by a target UE of signals from eNBs and/or PRS-only TPs in E-UTRAN). Details of the signalling interaction between an LMF and E-SMLC are outside the scope of this specification.

An LMF may have a signalling connection to an SLP. The SLP is the SUPL entity responsible for positioning over the user plane. Further details of user-plane positioning are provided in [15][16].

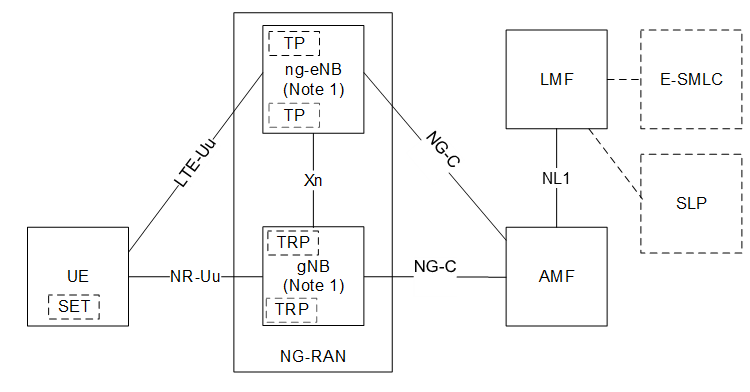


Figure 5.1-1: UE Positioning Architecture applicable to NG-RAN

NOTE 1: The gNB and ng-eNB may not always both be present.

NOTE 2: Void

=============================CHANGE ENDS====================================

=============================CHANGE BEGINS====================================

### 6.1.5 NL1 interface

The NL1 interface, between the LMF and the AMF, is transparent to all UE related, gNB related and ng-eNB related positioning procedures. It is used only as a transport link for the LTE Positioning Protocols LPP and NR Positioning Protocol A NRPPa.

=============================CHANGE ENDS====================================

The above two changes are due to the definition of the interface between AMF and LMF, for which SA2 has already defined as NL1.

***Q7: Do companies agree with the above change?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| Intel | Y | Ok. |
| CATT | Y |  |
| Qualcomm | Y | Note, the Figure 5.1-1 above is not from version 16.1.0 of the spec. |
| Nokia | Y | I thought we had seen a similar update in the past. Did we miss it in the CR implementation somehow? |
| Vivo | Y |  |
| Ericsson | Y |  |
| Apple | Y |  |
| Samsung | Y |  |

NRPPa info for UL Positioning methods

The following changes have been proposed for the gNB and LMF information transfer for UL Positioning methods in [3].

It is mentioned that the agreement in RAN3 #108-e meeting would better be captured in stage2 protocols and should be aligned with NRPPa protocol in [3]:

* Introduce the SSB T/F configuration in the respective NRPPa POSITIONING INFORMATION REQUEST message in RAN3.
* introduce the number of SRS resources/resource sets in POSITIONING INFORMATION REQUEST message in RAN3
* The describetion of the Geographical coordinate of the TRPs served by the gNB is not aligned with the NRPPa.
* To avoid the ambiguity of timing information with RAN3.
* TRP measurement request information is not aligned with NRPPa

Hence, based on the above proposals, proposal3 has been summarized and discussed durng RAN2#111e.

**Proposal 3: Adopt the corrections proposals in R2-2007828:**

**1. Assistance data that may be transferred from gNB to the LMF:**

* **Change the “Timing information” to “SFN Initialization Time”**
* **Change description of Geographical coordinates of TRP**

**2. Requested UL-SRS transmission characteristics**

* **Add the number of requested SRS resources and SRS resource sets in the message between LMF and gNB.**

**3. TRP Measurement request information**

* **Delete the PCI, CGI of the TRP;**
* **Update the the timing informatin of TRPs**
* **Delete the start time, and dureation of the measurements.**
* **Add the Measurement quantities.**

While during online discussion the above proposal was discussed and some companies think it is out of the scope of RAN2 to disucss on the above. In the mean time, RAN3 had the following discussion during RAN3 discusion:

|  |  |  |
| --- | --- | --- |
| [R3-204967](file:///E:\WORK\1%203GPP\Meeting\RAN2%20111-e\2%20During\Drafts\R3-204967.zip) | (TP for BL CR for TS 38.305) Correction on gNB and LMF information transfer (Huawei, Ericsson, Intel) | discussion  QC: HW had the same CR in RAN2; revise cleanups in tables  HW: seemed to belong to RAN3; propose to capture everything in RAN2  Nok: CR is OK, but related to global coord., but don’t need details on st2 (remove “expressed either by… or by…”)  E///: not a st3 detail; prefer to keep this in; we can push this to RAN2  noted |

While, during an offline in RAN3, the following content for the CR is proposed, for which we can check here. We summarize the following issues in the current stage2 spec that needs to be changed:

* In RAN3#108, RAN3 agreed to introduce the number of SRS resources/resource sets in POSITIONING INFORMATION REQUEST message, so as to provide assistance information from LMF in order to facilitate gNB to configure SRS resource. It is better that stage-2 captures such information.
* The describetion of the Geographical coordinate of the TRPs served by the gNB is not aligned with the NRPPa. The location is per TRP rather than per DL-PRS Resource ID. Addtionally, RAN3#108 aggreed the Cartesian coordinations and the corresponding describtion in stage-2 should be revised.
* The NRPPa includes both “SFN Initialization Time” and “Timing inforamtion” in the TRP inforamtion IE. But the Timing information IE is not used and the SFN Initializationg Time is used instead. It is better to change the “Timing information” to “SFN Initialization Time” to avioid the ambiguity of timing information in RAN3.
* TRP measurement request information includes information that is not aligned with NRPPa. and has been updated.

=============================NEXT CHANGE ====================================

#### 8.10.2.3 Information that may be transferred from the gNB to LMF

The assistance data that may be transferred from gNB to the LMF is listed in Table 8.10.2.3-1.

Table 8.10.2.3-1: Assistance data that may be transferred from gNB to the LMF

|  |
| --- |
| Information |
| PCI, GCI, and TRP IDs of the TRPs served by the gNB |
| Timing information of TRPs served by the gNB |
| DL-PRS configuration of the TRPs served by the gNB |
| SSB information of the TRPs (the time/frequency occupancy of SSBs) |
| Spatial direction information of the DL-PRS Resources of the TRPs served by the gNB |
| Geographical coordinates information of the TRPs served by the gNB |

=============================NEXT CHANGE ====================================

#### 8.10.2.4 Information that may be transferred from the LMF to gNBs

The requested UL-SRS transmission characteristics information that may be signalled from the LMF to the gNB is listed in Table 8.10.2.4-1.

Table 8.10.2.4-1: Requested UL-SRS transmission characteristics information that may be transferred from LMF to gNB.

|  |
| --- |
| Information |
| Number Of Transmissions/duration for which the UL-SRS is requested |
| Bandwidth |
| Resource type (periodic, semi-persistent) |
| Number of requested SRS resource sets and SRS resources per set |
| Pathloss reference:  - PCI, SSB Index  - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |
| Spatial relation info  - PCI, SSB Index  - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |

The TRP measurement request information that may be signalled from the LMF to the gNBs is listed in Table 8.10.2.4-2.

Table 8.10.2.4-2: TRP Measurement request information that may be transferred from LMF to gNBs.

|  |
| --- |
| Information |
| TRP ID of the TRP to receive UL-SRS |
| UE-SRS configuration |
| UL timing information together with timing uncertainty, for reception of SRS by candidate TRPs |
| Report characteristics for the measurements |
| Measurement Quantities |

=============================NEXT CHANGE ====================================

#### 8.11.2.3 Information that may be transferred from the gNB to LMF

The assistance data that may be transferred from gNB to the LMF is listed in table 8.11.2.3-1.

Table 8.11.2.3-1: Assistance data that may be transferred from gNB to the LMF

|  |
| --- |
| Information |
| PCI, GCI, and TRP IDs of the TRPs served by the gNB |
| Timing information of TRPs served by the gNB |
| DL-PRS configuration of the TRPs served by the gNB |
| SSB information of the TRPs (the time/frequency occupancy of SSBs) |
| Spatial direction information of the DL-PRS Resources of the TRPs served by the gNB |
| Geographical coordinates information of the TRPs served by the gNB |

=============================NEXT CHANGE ====================================

#### 8.12.2.3 Information that may be transferred from the gNB to LMF

The assistance data that may be transferred from gNB to the LMF is listed in Table 8.12.2.3-1.

Table 8.12.2.3-1: Assistance data that may be transferred from gNB to the LMF

|  |
| --- |
| Information |
| PCI, GCI, and TRP IDs of the TRPs served by the gNB |
| Timing information of TRPs served by the gNB |
| DL-PRS configuration of the TRPs served by the gNB |
| SSB information of the TRPs (the time/frequency occupancy of SSBs) |
| Spatial direction information of the DL-PRS Resources of the TRPs served by the gNB |
| Geographical coordinates information of the TRPs served by the gNB |

=============================NEXT CHANGE ====================================

#### 8.13.2.3 Information that may be transferred from the LMF to gNBs

The requested UL-SRS transmission characteristics information that may be signalled from the LMF to the gNB is listed in Table 8.13.2.3-1.

Table 8.13.2.3-1: Requested UL-SRS transmission characteristics information that may be transferred from LMF to gNB.

|  |
| --- |
| Information |
| Number Of Transmissions/duration for which the UL-SRS is requested |
| Bandwidth |
| Resource type (periodic, semi-persistent) |
| Pathloss reference:  - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs)  - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |
| Spatial relation info  - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs)  - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |

The TRP measurement request information that may be signalled from the LMF to the gNB is listed in table 8.13.2.3-2.

Table 8.13.2.3-2: TRP Measurement request information that may be transferred from LMF to gNB.

|  |
| --- |
| Information |
| TRP ID of the TRP to receive UL-SRS |
| UE-SRS configuration |
| UL timing information together with timing uncertainty, for reception of SRS by candidate TRPs |
| Report characteristics for the measurements |
| Measurement Quantities |

=============================NEXT CHANGE ====================================

#### 8.14.2.3 Information that may be transferred from the LMF to gNB

The requested UL-SRS transmission characteristics information that may be signalled from the LMF to the gNB is listed in Table 8.14.2.3-1.

Table 8.14.2.3-1: Requested UL-SRS transmission characteristics information that may be transferred from LMF to gNB.

|  |
| --- |
| Information |
| Number Of Transmissions/duration for which the UL-SRS is requested |
| Bandwidth |
| Resource type (periodic, semi-persistent) |
| Number of requested SRS resource sets and SRS resources per set |
| Pathloss reference:  - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs)  - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |
| Spatial relation info  - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs)  - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |

The TRP measurement request information that may be signalled from the LMF to the gNB is listed in table 8.14.2.3-2.

Table 8.14.2.3-2: TRP Measurement request information that may be transferred from LMF to gNB.

|  |
| --- |
| Information |
| TRP ID of the TRP to receive UL-SRS |
| UE-SRS configuration |
| UL timing information together with timing uncertainty, for reception of SRS by candidate TRPs |
| Report characteristics for the measurements |
| Measurement Quantities |

=============================CHANGE ENDS====================================

Companies are encouraged to provide feedback on the above chagnes

***Q8: Do companies have any comments on the above change?***

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Intel | The new changes looks ok. |
| CATT | The changes look good. |
| Qualcomm | Corresponding updates for Tables 8.13.2.0-1, 8.13.2.3-1, 8.14.2.0-1 seems missing.  Prefer to align the "Geographical coordinates" row with the "spatial direction" row (which is also closer to the existing text):   |  | | --- | | Information | | PCI, GCI, and TRP IDs of the TRPs served by the gNB | | Timing information of TRPs served by the gNB | | DL-PRS configuration of the TRPs served by the gNB | | SSB information of the TRPs (the time/frequency occupancy of SSBs) | | Spatial direction information of the DL-PRS Resources of the TRPs served by the gNB | | Geographical coordinates information of the DL-PRS Resources of the TRPs served by the gNB | |
| Nokia | This seems to be aligned with the CR distributed offline by Huawei RAN3 delegate. We are fine with it. |
| vivo | No strong view. It is ok to have it in stage2. |
| Ericsson | Ok. |
| Huawei, HiSilicon | OK with the proposal from QC based on the latest CR in RAN3 |
| Apple | It is ok to go with what QC suggests |
| Samsung | OK |

Signalling sequence for UL SRS Configuration

R[2-2006841](file:///E:\WORK\1%203GPP\Meeting\RAN2%20111-e\2%20During\Docs\R2-2006841.zip) observes the current signalling sequence diagram for UL SRS configuration is not valid for periodic UL SRS configuration. An update is required to clarify the signalling sequence in section 8.10.4 Sequence of Procedure for Multi-RTT positioning.

It is mentioned in R[2-2006841](file:///E:\WORK\1%203GPP\Meeting\RAN2%20111-e\2%20During\Docs\R2-2006841.zip) that for periodic SRS configuration, gNB provides the configuration to UE and UE starts transmission after receiving the SRS configuration (UE would transmit after step 3; rather than after step 5). The problem is that LMF has not yet received the configuration and thus the listening nodes are not yet ready but UE has already started the transmission.

So, R[2-2006841](file:///E:\WORK\1%203GPP\Meeting\RAN2%20111-e\2%20During\Docs\R2-2006841.zip) thinks the current signalling sequence diagram for UL SRS configuration is not valid for periodic UL SRS configuration. An update is required to clarify the signalling sequence. Proposed RAN2 to clarify the signalling sequence for periodic SRS configuration either via a new signalling sequence or via a NOTE.

Hence, in the summary discussed online, the following was discussed.

**Proposal 6: RAN2 can discuss if it is necessary to clarify the signalling sequence for periodic SRS configuration. And RAN2 can discuss that either via a new signalling sequence or via a NOTE for the Sequence of Procedure for Multi-RTT positioning in Figure 8.10.4-1 can be adopted in R2-2006841.**

During online discussion in RAN2#111e, the following was agreed:

* Step 5 can be updated; CR to be revised offline.

Based on the above agreement, we propose the following tentative change to the spec.

================================CHANGE BEGINS==========================================

****

0. The LMF may use the procedure described in clause 8.10.3.1.2.1 to obtain the DL information required for Multi-RTT positioning.

1. The LMF may request the positioning capabilities of the target device using the LPP Capability Transfer procedure described in clause 8.10.3.1.1.

2. The LMF sends a NRPPa POSITIONING INFORMATION REQUEST message to the serving gNB to request UL information for the target device with a recommendation for activation time as described in clause 8.10.3.2.

3. The serving gNB determines the resources available for UL SRS and decides the activation time.

4. The serving gNB provides the UL SRS configuration activation timeto the LMF in a NRPPa POSITIONING INFORMATION RESPONSE message.

NOTE: It is up to implementation on whether SRS configuration is provided earlier than PRS configuration.

5. The gNB provides the UE SRS configuration. The target device begins the UL SRS transmission according to the time domain behavior of UL SRS resource configuration. The LMF provides the UL information to the selected gNBs in a NRPPa MEASUREMENT REQUEST message as described in clause 8.10.3.2.

6. In step 6a, the LMF may request full configuration in a NRPPa POSITIONING INFORMATION REQUEST message and in step 6b the serving gNB provides the complete UL SRS configuration information to the LMF in a NRPPa POSITIONING INFORMATION RESPONSE message.

================================CHANGE ENDS===========================================

During the online discussion in RAN2#111e, the following conclusion has been made:

* Step 5 can be updated; CR to be revised offline.

Hence, in this discussion, we need to discuss whether to adopt the following change in step 5

|  |
| --- |
| 5. The gNB provides the UE SRS configuration. The target device begins the UL SRS transmission according to the time domain behavior of UL SRS resource configuration. The LMF provides the UL information to the selected gNBs in a NRPPa MEASUREMENT REQUEST message as described in clause 8.10.3.2. |

***Q9: Do companies agree with the above change in step 5?***

|  |  |  |
| --- | --- | --- |
| **Company** | **Y/N** | **Comments** |
| Intel | N | Our understanding is, the majority/conclusion in the meeting is we can update the description of the step 5 instead of change the procedure. But the suggested by offline discussion Rapporteur is in the opposite way. |
| CATT | N | The modification of step 5 is enough as below.  5. The gNB provides the UE SRS configuration. The target device begins the UL SRS transmission according to the time domain behavior of UL SRS resource configuration.  So no need to clarify step5a according to the meeting agreement. |
| Qualcomm | N | The current message sequence seem correct. However, step 5 is not needed for periodic SRS. Therefore, the change could be:  5. In the case of semi-persistent or aperiodic SRS, he LMF may request activation of UE SRS transmission and sends a NRPPa SRS Activation Request message to the serving gNB of the target device as described in subclause 8.13.3.3a. |
| Nokia | N | Agree with Intel. The agreement from on-line discussions is:   * Step 5 can be updated; CR to be revised offline.   So, what we need to clarify is the point that activation is not applicable for periodic SRS transmissions. The clarification suggested by Qualcomm seem to address this. We can just update step 5 text as suggested by Qualcomm. |
| Vivo | N | Per my understanding, in the online meeting we agree to update the step5 instead of change the procedure. |
| Ericsson |  | We are fine with Qualcomm suggestion. However, it should be understood that for periodic SRS configuration, it is still incomplete or unclear as when gNB provides the configuration to UE. |
| Huawei, HiSilicon | Y | Fine with QC suggestion. |
| Apple | N | Agree with Qualcomm |
| Samsung | N | Agree with QC proposal. |

Conclusions

In this contribution, we have an offline discussion based on the discussion in RAN2#111e and propose to agree on the following CRs:

**Proposal 1:**