**3GPP TSG-RAN WG2 Meeting 110-e R2-2005889**

**Online, 1st – 12th Jun, 2020**

Agenda Item: 6.8.2.1

Source: Huawei, HiSilicon

Title: [AT110-e][610][POS] Stage 2 proposals (Huawei)

Document for: Discussion, Decision

# Introduction

In RAN2#110-e, the following tdocs have been submitted under the agenda 6.8.2.1.

1. R2-2004517 Missing SIB for positioning Nokia (Rapporteur)
2. R2-2004638 Text Proposal for on demand system information procedure Ericsson
3. R2-2005094 Corrections to stage-2 spec Huawei, HiSilicon
4. R2-2005210 Corrections to NR Positioning Qualcomm Incorporated
5. R2-2005700 SUL support for Rel-16 positioning purpose Samsung R&D Institute UK

In R2-2005103, we summarize the issues contained in the tdocs submitted under the stage2 discussion on the following aspects. Note that the changes are discussed based on the baseline CR provided in [4]:

* posSIB description in 38.300
* Description for on-demand posSIB request in 38.305
* Change to the description in RRC/MAC protocol
* Change to the general description for NRPPa procedure
* chagne to NR E-CID, DL-AOD
* Change to Location measurement indication
* Discussion on positioning SI request and SUL

During online discussion in R2#110-e, R2-2005103 was discussed and the following agreements are made, along with a way forward with an email discussion for resolving the remaining issues.

Agreements:

- Change the “UL positioning measurement” to “NG-RAN measurements for NR positioning” in the description for RRC and MAC protocols.

- Remove “Quality of each measurement” that may be transferred from UE to the LMF for NR DL AoD positioning in clause 8.11.2.2

* [AT110-e][610][POS] Stage 2 proposals (Huawei)

Scope: Conclude on proposals related to the update of 38.305:

* Updates for request of posSI in different RRC states
* Determine where the ARFCN needs to be added to the information transferred between UE and LMF
* Whether to include the “same Rx beam indication” in the information transferred from UE to LMF for DL-AoD

Intended outcome: Agreeable TP to be merged into the stage 2 running CR, in R2-2005889

Deadline: Wednesday 2020-06-10 1000 UTC

In this discussion, we progress based on the agreements online

# Discussions

## Description for on-demand posSIB request in 38.305

In [2], several changes to the positioning stage2 spec has been proposed.

* Explain in 7.5.1 that UE can request SI in different RRC states
* A new chapter capturing the procedure for on-demand SI request in IDLE/INACTIVE and CONNECTED

In [2], the following change to the general description is proposed

|  |
| --- |
| Positioning assistance data can be included in positioning System Information Blocks (posSIBs) as described in TS 36.331 [13], TS 38.331 [14] and TS 36.355 [19]. The posSIBs are carried in RRC System Information (SI) messages. UE may also request posSIBs by means of on demand SI request in RRC Idle/Inactivate states and using on demand connected mode procedure while in connected mode as described in TS 38.331 [14]. The mapping of posSIBs (assistance data) to SI messages is flexibly configurable and provided to the UE in SIB1 for NG-RAN node TS 36.331 [13], TS 38.331 [14]. |

Q1: Do companies think the above change is reasonable? If the answer is yes, is there any issue with the above text?

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| vivo | yes |  |
| Qualcomm | Yes, in principle | We should probably distinguish posSIBs and posSI. E.g.,  UE may also request posSI by means of on demand SI request in RRC Idle/Inactivate states and posSIBs using on demand connected mode procedure while in connected mode as described in TS 38.331 [14]. |
| CATT | Yes, in principle | More comments based on Qualcomm’s version:  UE may request posSI by means of on demand SI request in RRC Idle/Inactivate states and also request posSIBs by means of on demand SI request in RRC\_CONNECTED mode as described in TS 38.331 [14].  Reasons on the modification above: Following the structure of 5.2.2.3 Acquisition of System Information in TS 38.331:  5.2.2.3.3 Request for on demand system information  5.2.2.3.5 Request for on demand system information in RRC\_CONNECTED  One more comment as below:  Positioning assistance data can be included in positioning System Information Blocks (posSIBs) as described in TS 36.331 [13], TS 38.331 [14] and TS 37.355 [XX]. |
| Nokia |  | Just a brief introduction under section 7.5.1 of the possibility of on-demand SI in different RRC states for positioning assistance data is enough.  Text could be simplified as follows:  “UE may also request positioning assistance data by means of on demand SI request in RRC\_IDLE/RRC\_INACTIVE/RRC\_CONNECTED states as described in TS 38.331 [14].”  We could even avoid RRC states reference in LPP specification and keep the text very high level and generic by removing “in RRC\_IDLE/RRC\_INACTIVE/RRC\_CONNECTED states” part  If RRC states are mentioned then RRC states must be in upper case.  No need for the new Section 7.5.x. This discussion is best handled if we can review the text in an actual draft CR instead of an email discussion like this. |
| Huawei, HiSilicon | Yes | Would slightly prefer the TP from CATT and QC that the UE can request posSIB in CONNECTED or posSI in IDLE or INACTIVE, since in this paragraph we are discussing the broadcast of positioning system information instead of just positioning assistance data. |

***Proposal1: Add the following paragraph in the Clause 7.5.1 for on-demand SI request for system information for positioning assistance data: “UE may request posSI by means of on-demand SI request in RRC IDLE/INACTIVE and also request posSIBs by means of on-demand SI request in RRC\_CONNECTED as described in TS 38.331 [14]”.***

Furthermore, a new Clause is added in the section for procedure for broadcast of assistance data

|  |
| --- |
| 7.5.X On demand System Information Procedures UE in RRC Idle or RRC Inactive state may request positioning SI message(s) by sending msg1 (specific preambles) configured by NW for SI request or using msg3 *RRCSystemInfoRequest* asdescribed in TS 38.331 [14]*.*  UE in RRC connected mode may request posSIB(s) by sending an UL message (*DedicatedSIBRequest*) as described in TS 38.331 [14]*.* The NG-RAN Node provides the posSIB(s) using *RRCReconfiguration* message as described in TS 38.331 [14].    Figure 7.5.2-2: Procedures to support On demand delivery of assistance data.  The steps are same as described in section 7.5.2. The only change is for step 2 or subsequent step 6 as below.2a. The NG-RAN node includes the received System Information groups in RRC System Information Messages and corresponding scheduling information in SIB1 as described in TS 38.331 [14]. The UE checks the *posSI-SchedulingInformation* TS 38.331 [14] for deciding whether on demand request is to be made.  2b. The UE requests either positioning SI(s) in RRC Idle/Inactive state or posSIB(s) while in RRC Connected state.  2c. The NG-RAN Node provides the positioning SI via broadcast for the request made in RRC Idle/Inactive state. The NG-RAN provides the requested posSIB(s) either via broadcast or unicast for the requet made in RRC Connected state.  6. The NG-RAN node replaces the previously stored System Information groups with the new information received at Step 5 and includes the new System Information groups in RRC System Information Messages to be provided by means of broadcast or on demand system information procedure. |

Q2: Do companies think it is necessary to add a new Clause for on-demand SI procedure? If yes, is there any issue with the existing text?

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| vivo | No | I think it is discussed in the meeting, only precise description is needed without a new clause in the spec. |
| Qualcomm | No | I think the addition under Q1 is sufficient. |
| CATT | No | The procedure can be merged into 7.5.2 Broadcast Procedures.  More comments on the TP:   1. About 2b and 6 in the picture: the SI request procedure in RRC Idle/Inactivate states and in RRC\_CONNECTED mode should be shown in the picture separately, following the context in Q1. 2. About 2c in the picture: There is an exception delivery by gNB when there is no CSS. It’s up to the rapporteur who decides whether to add this exception in stage2 protocol. |
| Nokia | No | Just a brief introduction under section 7.5.1 of the possibility of using on-demand SI for obtaining positioning assistance data is enough. |
| Huawei, HiSilicon | No |  |

Based on the views above, most of the companies think that there is no need to add a new clause for on-demand SI procedure and the description in 7.5.1 is sufficient

***Proposal2: There is no need to add another clause for the description of on-demand SI procedure in the stage2 spec.***

## NR E-CID

For measurement reporting for E-CID, frequency information also needs to be sent from UE to LMF. This is reflected in the current LPP. Within the current TRP-ID, the ARFCN needs to be included.

NR-ECID-SignalMeasurementInformation-r16 ::= SEQUENCE {

nr-PrimaryCellMeasuredResults-r16 NR-MeasuredResultsElement-r16,

nr-MeasuredResultsList-r16 NR-MeasuredResultsList-r16 OPTIONAL,

...

}

NR-MeasuredResultsList-r16 ::= SEQUENCE (SIZE(1..32)) OF MeasuredResultsElement-r16

NR-MeasuredResultsElement-r16 ::= SEQUENCE {

systemFrameNumber BIT STRING (SIZE (10)),

trp-ID-r16 TRP-ID-r16 OPTIONAL,

measResultNR-r16 SEQUENCE {

cellResults-r16 SEQUENCE{

resultsSSB-Cell-r16 MeasQuantityResults-r16 OPTIONAL,

resultsCSI-RS-Cell-r16 MeasQuantityResults-r16 OPTIONAL

},

rsIndexResults-r16 SEQUENCE{

resultsSSB-Indexes-r16 ResultsPerSSB-IndexList-r16 OPTIONAL,

resultsCSI-RS-Indexes-r16 ResultsPerCSI-RS-IndexList-r16 OPTIONAL

} OPTIONAL

},

...

}

Based on the above, [3] has proposed the following:

***Add ARFCN to the information that may be transferred from UE to the LMF for NR E-CID positioning in Table 8.9.2.2-1***

The reason is that the UE needs to let the LMF know based on which CSI-RS or SSB the measurement is performed.

Q3: Do companies think it is necessary to add *ARFCN to the information that may be transferred from UE to the LMF for NR E-CID positioning in Table 8.9.2.2-1?*

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| vivo | Yes | ARFCN has already captured in the current LPP, it is reasonable to add it in stage 2 as well. |
| Qualcomm |  | No strong opinion. Typically, our Stage 2 “Information Tables” have not that level of granularity. E.g., also for LTE E-CID this information is transferred but not listed in the Tables. But if added, we need to be consistent and add it to other applicable Tables as well. |
| CATT |  | Shared the same view with Qualcomm.  One more comment:  Cell Portion ID should not be reported by UE to LMF in Table 8.9.2.2-1. This IE should be deleted in the table. |
| Nokia | No | In stage 2, it is enough to add some key information that are exchanged but not every information that are signalled. Such details can remain in stage 3. |
| Huawei, HiSilicon | Yes | AFRCN information needs to be send to the LMF such that LMF can know the UE measures the SSB/CSI-RS on which frequency |

Based on the above, companies’ view are divided in this issue.

***Proposal3: RAN2 to discuss whether to include ARFCN for the information that can be transferred from UE to LMF for NR E-CID.***

While during the online discussion, companies have wondered whether the ARFCN needs to be transferred from the UE to LMF for all the positioning methods.

Q4: Do companies think it is necessary to add *ARFCN to the information that may be transferred from UE to the LMF for positioning methods other than NR E-CID?*

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| vivo | No | Only E-CID is preferred. |
| Qualcomm |  | As mentioned above, if we add it to E-CID, we should add it to all applicable Tables. At the moment, we list only the PCI. It could be changed to PCI/ARFCN or {PCI,ARFCN} set. |
| CATT |  | Shared the same view as Qualcomm. |
| Nokia | No | In stage 2, it is enough to add some key information that are exchanged but not every information that are signalled. Such details can remain in stage 3. |
| Huawei, HiSIlicon | No | For the DL positioning methods or multi-RTT, the DL measurement is based on the PRS and and PRS identifier (PRS id + resource set id +resource id) is sufficient. |

***Proposal4: There is no need to add ARFCN to the information that may be transferred from UE to the LMF for positioning methods other than NR E-CID***

## DL-AOD

Furthermore, for DL-AoD, there is no quality reporting for DL PRS-RSRP. Therefore, we suggest to remove quality from Table 8.11.2.2-1. This has been agreed during online discussion.

Another issue is on the same Rx beam indication for DL-AoD. we have a specific indication on whether the PRS-RSRPs are measured under the same Rx beam, which should be added.

We also notice that RAN1 has made the following agreement

|  |
| --- |
| Agreement:   * When the UE reports DL PRS-RSRP measurement on DL PRS resources from one DL PRS resource set, the UE may report the *nr-DL-PRS-RxBeamIndex* to associate with each of the RSRP measurement in the report if for each *nr-DL-PRS-RxBeamIndex* reported there are at least 2 RSRP measurements associated with it within the DL PRS resource set. * The DL PRS-RSRP measurements for a TRP reported with the same *nr-DL-PRS-RxBeamIndex* have been received using the same Rx beam. * Note: In the current LPP spec, *nr-DL-PRS-RxbeamIndex* is only reported for DL-AoD measurement. |

Q5: Do companies agree to add “Same Rx beam indication” that may be transferred from UE to the LMF for NR DL AoD positioning in clause 8.11.2.2?

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| vivo | No | nr-DL-PRS-RxBeamIndex-r16 is able to indicate same Rx beam indication in NR-DL-AoD-MeasElement-r16 |
| Qualcomm | Yes | In my understanding, this is an essential parameter for DL-AoD positioning and should be captured in the Stage 2 Table as well. |
| CATT | No | Prefer to add “Rx beam indication” from UE to the LMF for NR DL AoD positioning in clause 8.11.2.2, instead of ”Same Rx beam indication”.  Just like vivo mentioned, Rx beam index can indicate the same Rx beam indication which RAN1 agrees. |
| Nokia | No | Agree with CATT. In stage 2 just mention Rx beam index and leave the finer details of Rx beam index and optionality of this field (as per latest RAN1 agreements) to stage 3 details. As we mentioned in email discussion [606] for issue 21, having accurate field description capturing UE behaviour as to when it includes or not includes the Rx beam index is more important than capturing more details in stage 2. |
| Huawei, HiSilicon | Yes | Can add the receive beam index for the information from UE to LMF |

With some clarification from Nokia, the answer seems to be Yes from Nokia’s side.

***Proposal5: “Receive beam index” should be added to the information that may be transferred from UE to LMF for NR DL-AOD positioning.***

# Conclusion

In this contribution, we progress based on the result of the online discussion during R2#110-e and propose the following:

***Proposal1: Add the following paragraph in the Clause 7.5.1 for on-demand SI request for system information for positioning assistance data: “UE may request posSI by means of on-demand SI request in RRC IDLE/INACTIVE and also request posSIBs by means of on-demand SI request in RRC\_CONNECTED as described in TS 38.331 [14]”.***

***Proposal2: There is no need to add another clause for the description of on-demand SI procedure in the stage2 spec.***

***Proposal3: RAN2 to discuss whether to include ARFCN for the information that can be transferred from UE to LMF for NR E-CID.***

***Proposal4: There is no need to add ARFCN to the information that may be transferred from UE to the LMF for positioning methods other than NR E-CID***

***Proposal5: “Receive beam index” should be added to the information that may be transferred from UE to LMF for NR DL-AOD positioning.***

# Text Proposal

============================FIRST CHANGE=========================================

7.5.1 General

Positioning assistance data can be included in positioning System Information Blocks (posSIBs) as described in TS 36.331 [13], TS 38.331 [14] and TS 36.355 [19]. The posSIBs are carried in RRC System Information (SI) messages. UE may request posSI by means of on-demand SI request in RRC IDLE/INACTIVE and also request posSIBs by means of on-demand SI request in RRC\_CONNECTED as described in TS 38.331 [14] The mapping of posSIBs (assistance data) to SI messages is flexibly configurable and provided to the UE in SIB1 for NG-RAN node TS 36.331 [13], TS 38.331 [14].

For each assistance data element, a separate posSIB-type is defined in TS 36.355 [19]. Each posSIB may be ciphered by the LMF using the 128-bit Advanced Encryption Standard (AES) algorithm (with counter mode) as described in TS 36.355 [19], either with the same or different ciphering key. The posSIBs which exceed the maximum size limit defined in TS 36.331 [13], TS 38.331 [14] shall be segmented by the LMF.

===========================SECOND CHANGE========================================

#### 8.11.2.2 Information that may be transferred from the UE to LMF

The information that may be signalled from UE to the LMF is listed in Table 8.11.2.2-1. The individual UE measurements are defined in TS 38.215 [37].

Table 8.11.2.2-1: Information that may be transferred from UE to the LMF

|  |  |  |
| --- | --- | --- |
| Information | UE‑assisted | UE‑based |
| Latitude/Longitude/Altitude, together with uncertainty shape | No | Yes |
| PCI, GCI, and TRP ID for each measurement | Yes | No |
| DL PRS RSRP measurement | Yes | No |
| Time stamp of the measurement | Yes | No |
| Quality for each measurement | Yes | No |
| DL PRS receive beam index | Yes | No |

==========================END OF CHANGES=========================================