3GPP TSG-RAN WG3 #116 [R3-224994](file:///C:\Users\ezlyamo\AppData\Local\Temp\Temp1_RAN3_116-e_agenda_20220502.zip\Inbox\R3-223711.zip)

15th – 24th August 2022

Online

Agenda Item: 9.2.6

Source: Ericsson (moderator)

Title: Summary of offline discussion on Rel-17 positioning corrections on Inactive Positioning and PPW(CB#19)

Document for: Approval

# Introduction

**CB: # 19\_R17Positioning\_Inactive\_PPW**

**- Corrections for SRS configuration for inactive positioning? LS to RAN2?**

**- Any corrections for PPW and MG configuration needed?**

**- Capture agreements and provide CRs if agreeable**

(E/// - moderator)

# For the Chairman’s Notes

<TBD>

# Discussion - Second round (if any)

<TBD>

# Discussion - First round

In this CB, we have the following contributions for consideration:

* one LS from RAN2 on container for SRS configuration for positioning [6]
* A set of contributions from Intel Corp. [1-3] on Rel-17 ePos correction for the missing support of SRS-PosRRC-InactiveConfig-r17 configuration.
* A set of contributions from Huawei *et al.* on Positioning SRS configuration transfer for RRC inactive [4-5]
* A set of contributions from Ericsson on correction of PPW/MG procedures and support of PPW continuity during Xn mobility [7-9].
* A set of contributions form Google on correction to the positioning gap configuration with two alternatives [10-11]
* One response paper from Xiaomi to [1] in [12]

## Support of SRS configuration for positioning

One main RAN3 correction to address in Rel-17 Positioning Enh. is the introduction of the F1AP container to support SRS configuration for positioning in RRC\_INACTIVE state. Currently this functionality is missing from the specification.

The LS in [6] states that RAN2 have discussed the ASN.1 structure for positioning SRS configuration, and made following agreements:

Agreement:

RAN2 assumes that DU can set the configuration associated to SRS-PosRRC-InactiveConfig-r17 and should be provided in a container as part of the corresponding ASN.1. Details to be confirmed in the RRC CR discussion, with the TP from section 4.1 of the Annex of R2-2206384 as a baseline.

Then RAN2 asks RAN3 to take the above into account in their future work.

The proposals in CRs [2] and [5] of this CB propose to add the missing container in F1AP, but there are differences in the signalling aspects:

* [2] proposes to add the *SRS-PosRRC-InactiveConfig* IE referring to SRS-PosRRC-InactiveConfig-r17 in TS 38.331, in the F1 **POSITIONING INFORMATION RESPONSE** message,
* while [5] porposes to add the *SRS-PosRRC-Inactive* IE, referring to SRS-PosRRC-Inactive-r17 in TS 38.331 in ***DU to CU RRC Information* IE**.

Moderator notes that RAN3 is expecting another LS from RAN2 as reply on RAN3’s previous question in LS R3-223955 regarding which RRC IE (contained or container IE in TS 38.331) for SRS Positioning configuration in RRC\_INACTIVE state should be used as reference in F1AP:

* SRS-PosRRC-Inactive-r17 ::= OCTET STRING (CONTAINING SRS-PosRRC-InactiveConfig-r17)

**Question 1: Which of the following proposals from CRs [2] and [5] do companies agree with?**

1. Add the IE container for *SRS-PosRRC-InactiveConfig-r17* (i.e. *SRS-PosRRC-InactiveConfig* IE) into the POSITIONING INFORMATION RESPONSE message,
2. Add the IE container for *SRS-PosRRC-Inactive-r17* (i.e., *SRS-PosRRC-Inactive* IE) in *DU to CU RRC Information* IE within the UE CONTEXT MODIFICATION REQUIRED message.
3. Other, wait for RAN2 reply LS, explaining why

|  |  |  |
| --- | --- | --- |
| **Company** | **Agreeable proposals (P1, P2 or P3)** | **Comment** |
| Huawei | P2 | We prefer P2 to have same handlings as current operation, i.e.,   * the CU just include the received RRC IE in the DU to CU RRC Information, so that the CU can easily include it in the RRC message * the CU just forward the received information in the Positioning Information Response message to the LMF.   Now for P1, it means two IEs (SRS config. & *SRS-PosRRC-Inactive*) will need to be included in the same message, and the CU need to extract different part information to send to the LMF and the UE respectively.  In addition, P2 has the benefits that the DU can have almost the same handling for the SRS configuration for inactive, and the SRS configuration for connected UE.   * For connected UE, the DU can include the SRS configuration POSITIONING INFORAMTION RESPONSE message, and include the SRS configuration in the *CellGroupConfig* in the UE CONTEXT MODIFICATION REQUIRED message; * For inactive UE, the DU can include the SRS configuration POSITIONING INFORAMTION RESPONSE message, and include the *SRS-PosRRC-Inactive-r17* the UE CONTEXT MODIFICATION REQUIRED message.   About the exact IE container, we can monitor the RAN2 progress of the reply LS during the meeting. |
| Xiaomi | P1 | RAN3 already agreed in RAN3 116e meeting, using positioning information exchange procedure to transmit inactive SRS configuration, no need repeat the discussion.   * **In order for CU to configure SRS-PosRRC-InactiveConfig-r17 to the UE (via RRCRelease), the enhancement on the F1AP Positioning Information Exchange procedure is necessary, so that DU can generate the SRS configuration taking into the Requested SRS Transmission Characteristics IE account in the POSITIONING INFORMATION REQUEST message.** |
| CATT | P1 | Contained IE *SRS-PosRRC-InactiveConfig-r17* should be ok, just like the existing IEs in DU to CU RRC Information, like *CellGroupConfig*, *MeasGapConfig*. |
| Google | P1 | We submitted a tdoc to RAN2 in R2-2208596 for RAN2 discussion. Anyway, RAN2 will discuss the RAN3 LS and conclude which RRC IEs should be referred to in the RAN3 specification. |
| Qualcomm | P1 | Same view as Google |
| ZTE | P1 | Samiliar view as Xiaomi. |
| Ericsson | P1 | Same view as Xiaomi. The IE name depends on the RAN2 reply LS. |
| Nokia | P1 | P3 is also fine – since we asked RAN2 the question, we can wait for their response (although this seems like a RAN3 matter). |

On another note, the proponents in [1] explained the motivation why an explicit querying mechanism from CU is needed to retrieve the SRS Positioning configuration in RRC\_INACTIVE state from DU. The issue from the proponent’s view is that there can be a UE RRC state mismatch between DU and CU, where, e.g., DU has provided SRS for Inactive but CU decides to move the UE to connected, rendering the SRS inactive configuration useless. It is proposed by [1] to send an LS [3] to RAN2 to provide answers.

Similarly, the proponents in [4] propose that CU sends the SRS query Indicator for RRC inactive to the DU, so that the DU can report the SRS configuration for inactive UE to the CU.

However, the response paper in [12] explain their different understandings on the scenarios. Firstly, during positioning a UE in RRC\_INACTIVE state, if there is positioning task when UE is in RRC\_CONNECTED state, gNB will not send UE to RRC\_INACTIVE state until the positioning task is finished. Also the scenarios need confirmation by RAN2/SA2 and specs impacts to SA2.

It is also explained that it is not possible for the gNB to send UE to RRC\_CONNECTED state during SDT procedure, if the serving gNB don’t want to serve the UE when it’s in RRC\_INACTIVE state. The scenario that sending UE to RRC\_CONNECTED state during SDT is not discussed in SDT WI and not supported in current specifications. So it is suggested that RAN3 agrees that there’s no need to introduce additional query indication for INACTIVE SRS configuration unless new scenario is confirmed and proved.

The moderator believes that this is a RAN3 problem and that if it can be resolved in RAN3, there is no need to send an LS to RAN2.

**Question 2: taking into account t[1] and the response paper [12] Do companies agree with the following observation and proposal?**

Observation 1: Except in the scenario of SDT without anchor relocation, the serving gNB can decide to move the UE into any RRC state. Hence, there can be a UE state mismatch where e.g., CU releases the UE early to Inactive; or DU has provided SRS config for Inactive but CU decides to move the UE to connected state, rendering the SRS inactive configuration useless.

1. Add the *SRS Positioning INACTIVE Query* Indication IE into the POSITIONING INFORMATION REQUEST message to enable CU to retrieve the SRS INACTIVE Configuration from DU.

Note that the message in which this information will be transmitted depends on the answers to question 1.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Huawei | Yes | We agree with the moderator that this issue can be solved within RAN3 (if consensus can be made).  We acknowledge the two scenarios discussed in [1]. The CU can decide when to transit the UE from inactive to connected, or vice versa. It is much clear that the CU can give clear indication to the DU when to report the SRS configuration for connected state, when to report for inactive state. |
| Xiaomi | No | According to the specification in SA2 (TS 23.273) and LS send from RAN2 to SA2 (R2-2203949), the positioning in RRC\_INACTIVE state is Positioning a UE when it’s already in RRC\_INACTIVE, which relies on SDT, and DU is aware of SDT, DU can take the proper action to include the inactive SRS configuration in positioning information response message without any query indication.  Regarding the additional scenarios raised in [1], we have different understandings and submitted one response paper [R3-225005.zip](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_117-e/Docs/R3-225005.zip) to share our understanding.  For scenario 1, gNB-CU decides to send UE from RRC\_CONNECTED state to RRC\_INACTIVE state after receiving a positioning request from LMF. In our understanding, if there is positioning task when UE is in RRC\_CONNECTED state, gNB will not send UE to RRC\_INACTIVE state until the positioning task is finished.  For scenario 2, gNB-CU may send UE to RRC\_CONNECTED state during SDT procedure, we don’t think this scenario had been discussed and specified in SDT WI. If gNB-CU want to serve the UE in RRC\_CONNECTED state, it will not let the UE use SDT at the beginning by not indicating SDT in SI, even though companies still think this scenario exists, gNB-CU can send UE to RRC\_CONNCETED state before it sends Positioning information request to DU, then there will be no problem. |
| CATT | No | Similar view with Xiaomi, *SRS Positioning INACTIVE Query* *Indication* IE into the POSITIONING INFORMATION REQUEST message is not needed. |
| Google | Yes | We agree the scenarios described in [1] may happen, so we prefer to have this query indication in the POSITIONING INFORMATION REQUEST message. |
| Qualcomm | No | Similar view as Xiaomi |
| ZTE | No | Agree with the secenarios mentioned by Xiaomi. |
| Ericsson | No | Agree with Xiaomi. |
| Nokia | No | Similar view as Xiaomi. |

In addition, the proponents in [4] has the following proposal.

*RAN3 can further discuss whether to include SRS Query Indicator for RRC inactive IE in the UE CONTEXT MODIFICATION REQUEST message.*

The scenario is given as follows.

|  |
| --- |
| There is another scenario that when the gNB has already configured SRS transmission for the UE in RRC\_Connected, and then the gNB decided to release the UE into RRC\_Inactive afterwards. In this case, the CU may only need a single indication to the DU to request to update the SRS configurations for the UE in RRC\_Inactive. The simple way is to allow the CU to use the CU-initiated UE context modification procedure to request the DU to update the SRS configuration. Thus, it is proposed to also consider to include the *SRS Query Indicator for RRC inactive* IE in the UE CONTEXT MODIFICATION REQUEST message |

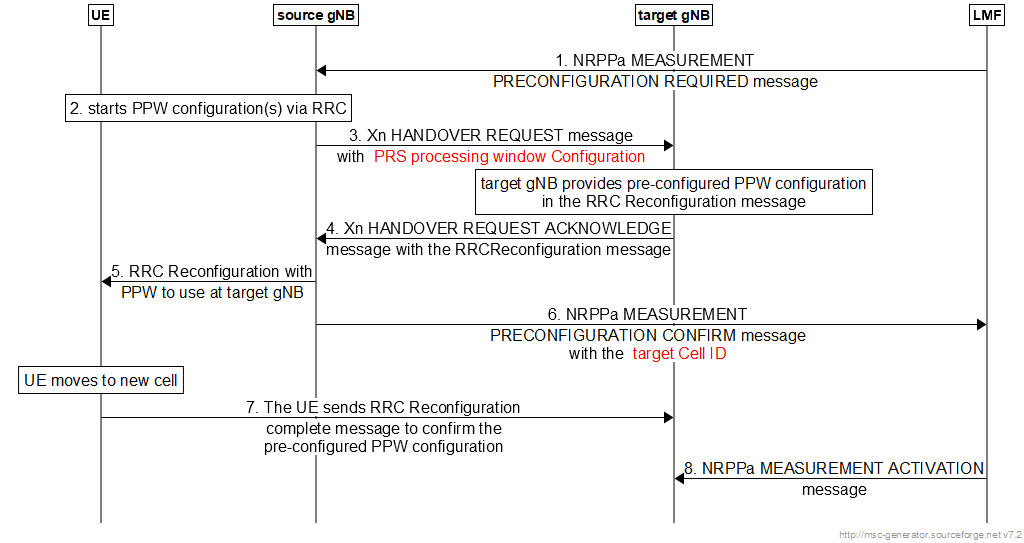
P4a. Add *SRS Query Indicator for RRC inactive* IE into the UE CONTEXT MODIFICATION REQUEST message to enable CU to retrieve the SRS INACTIVE Configuration from DU.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Huawei | Yes | We see some benefits to this proposal, in addition to the P4 mentioned above, at least this can avoid the procedure interactions.  In the scenario above, the CU may also need to acquire the CG-config for SDT as well before releasing the UE to be inactive. Then the CU has requirements of CG-config and SRS-PosRRC\_Inactive. In this case, the CU can use single message to request the two kinds of configurations. This avoids that CU need to use POSITIONING INFORMATION REQUEST to request SRS config and use UE CONTEXT MODIFICATION REQUEST to request CG-config for SDT. |
| Xiaomi | No | Our understanding is if there’s on-going positioning task (i.e. SRS for connected state is configured), the gNB-CU will not send the UE to RRC\_INACITVE until the positioning finish.  The above two proposals are based on the general scenario that positioning can be done during RRC state change, we should carefully define new scenario, which may lead to other new issues. |
| CATT | No | Similar view with Xiaomi, the two scenarios on state change during the Positioning task is not discussed in RAN2, RAN3 and SA2. No extra enhancement on the scenarios are expected. |
| Google | No | It is sufficient to add the query indication in the POSITIONING INFORMATION REQUEST message. |
| Qualcomm | No | Similar view as Xiaomi |
| ZTE | No | Simiar view as Xiaomi. |
| Ericsson | No | Similar view as Xiaomi |
| Nokia | No | Similar view as Xiaomi. |

## Correction of MG/PPW procedures

The proponents in [7] think that when the serving gNB preconfigures the PPW but the UE decides to move to another gNB, it is unclear how to handle the PPW pre-configuration in case of Xn mobility.

To address such issue the proponents, propose that during Xn mobility, the PPW (pre)configuration is sent to new gNB for continuity and faster configuration of PPW by the new NG-RAN node. After the handover confirmation by the target, the source gNB indicates in the MEASUREMENT PRECONFIGURATION CONFIRM message the serving cell ID (*NR CGI* IE) to the LMF, so that LMF can send the MEASUREMENT ACTIVATION message to the target node. The proponents also propose to add the *PRS processing window Configuration* IE in the *Positioning Information* IE present in the RETRIEVE UE CONTEXT RESPONSE message in XnAP to support PPW during mobility in RRC\_INACTIVE mode.



**Signalling flow for Xn mobility in connected state with PPW continuity, from [7]**

**Question 3: Do companies agree with the raised issue and the following proposals from [7]? If not explain why?**

1. A new IE *PRS processing window configuration* IE is added in the Xn HANDOVER REQUEST message to support Xn mobility.
2. A *NR CGI* IE is added in the MEASUREMENT PRECONFIGURATION CONFIRM message to LMF.
3. A new IE *PRS processing window Configuration* IE is added in the *Positioning Information* IE present in the RETRIEVE UE CONTEXT RESPONSE message in XnAP

|  |  |  |
| --- | --- | --- |
| **Company** | **Agreeable proposals** | **Comment** |
| Huawei | Seems not needed | The scenario seems not a common case to us, where the handover happens during the NRPPa Measurement pre-configuration procedure. We understand the positioning support during connected mobility can addressed at later releases. |
| Xiaomi | See comments | P1, we understand the intension but positioning continuity during connected mobility had not been supported by current specifications, if we want to support the continuity support positioning continuity during connected mobility, it’s not only the PPW should be considered, the SRS configuration should also be considered, so the question is whether we need to support positioning continuity during connected mobility and define a general mechanism for positioning continuity during connected mobility.  P2, if we agree to support positioning continuity during connected mobility, we think both target gNB and source gNB can notify the cell change, details can be further discussed  P3, currently, positioning continuity during RRC\_INACTIVE state is somehow supported by the spec, so the enhancement for PPW seems ok. |
| CATT | No | The PPW configuration is an optimization for R17 positioning method, and R17 Positioning measurement does not support Xn mobility. Therefore, the PPW pre-configuration issue in case of Xn mobility should not be considered in R17 |
| Google | No | Agree with Huawei and CATT |
| Qualcomm | NO | Mobility during PPW positioning is not supported in R17. Agree with HW and CATT. In addition, RRC\_INACTIVE state is confusing. PPW is not applicable to RRC\_INACTIVE (no active BWP). |
| ZTE | No | Agree with HW. In the previous meeting, it is acknowledged that positioning during connected mobility is not supported in R17. |
| Ericsson | Yes but, | We should revisit these proposals in Rel-18 |
| Nokia | No | RAN3 previously concluded that positioning during connected mobility is not in the scope of Rel-17 WID. |

[7] also lists a separate issue that is related to the scenario of unsuccessful pre-configuration of PPW and MG. In such scenario the proponent stipulates that the gNB must/will send the MEASUREMENT PRECONFIGURATION REFUSE message, as sending the *Pre-configuration Result* IE in the MEASUREMENT PRECONFIGURATION CONFIRM message with all bits set to "0" does not provide any explanation to LMF for the PPW/MG pre-configuration failure. [7] then states the scenario that when PPW is preconfigured, but the UE decides to go for MG activation because it is unable to use gapless PRS measurements, the gNB can release the PPW resources and inform the LMF that neither of the MG/PPW are preconfigured. But at the same time there is a MG for the UE. It is therefore proposed by [7] that when the UE requests for a MG, the gNB indicates this via a new *Result Cause* IE to the LMF in the MEASUREMENT PRECONFIGURATION CONFIRM message, conditionally present when the *Pre-configuration Result* IE all set to "0".

**Question 4: Do companies agree with the following observation and proposal with accompanying CR in [9]?**

Observation 2: Signalling only the *Pre-configuration* *Resul*t IE in the MEASUREMENT PRECONFIGURATION CONFIRM message with all bits set to "0" does not provide any explanation to LMF for the PPW/MG pre-configuration failure.

1. Add a new *Result cause* IE in the MEASUREMENT PRECONFIGURATION CONFIRM message, ENUMERATED (other MG in use,…), conditionally present when the *Preconfiguration Result* IE bits are all set to the value "0"

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Huawei | Seems not | In this case, the MEASUREMENT PRECONFIGURATION REFUSE can be used instead, with an approximate cause value, e.g., Requested Item not Supported on Time |
| Xiaomi | See comments | We understand the intension and acknowledge the issue, either include new *Result cause* IE in the MEASUREMENT PRECONFIGURATION CONFIRM message or introduce a new cause value as suggested by HW is fine for us. If the latter one is chosen, it should be stated clearly in MEASUREMENT PRECONFIGURATION CONFIRM message that all the bits are set to “0” is impossible. |
| CATT | No | It seems a rare case. Besides, the R17 signalling itself is an optimization, and the positioning measurement can be done even if the pre-configuration procedure fails. |
| Google | No | Agree with Huawei |
| Qualcomm | No | Agree with HW |
| ZTE | No | Agree with HW |
| Ericsson | Yes but | We can take Huawei’s and Xiaomi’s comments into account and revise as follows:  Add new cause value for when another MG is in use and PPW preconfiguration failed.  Semantics (or abnormal condition) text for the MEASUREMENT PRECONFIGURATION CONFIRM message describing that all bits set to “0” in the *Pre-configuration Result* IE is not used (is an abnormal condition) |
| Nokia | No | It is already clear from the procedural text in 8.2.12.3 that gNB shall not send all 0s (“If the NG-RAN node cannot configure any of the measurement gap or PRS processing window, the NG-RAN node shall respond with a MEASUREMENT PRECONFIGURATION REFUSE message.”). |

## Correction to positioning gap configuration

[10-11] observe that PosMeasGapPreConfigToReleaseList-r17 is defined in 38.331 v17.1.0 instead of PosMeasGapPreConfigToRemoveList-r17.

In the current semantics description for PosMeasGapPreConfigList, PosMeasGapPreConfigToAddModList-r17 and PosMeasGapPreConfigToReleaseList-r17 can be included in PosMeasGapPreConfigList. However, the CU cannot identify that the PosMeasGapPreConfigList contains only one or both of the two IEs in accordance with 38.331.

|  |
| --- |
| MeasGapConfig ::= SEQUENCE {  gapFR2 SetupRelease { GapConfig } OPTIONAL, -- Need M  ...,  [[  gapFR1 SetupRelease { GapConfig } OPTIONAL, -- Need M  gapUE SetupRelease { GapConfig } OPTIONAL -- Need M  ]],  [[  gapToAddModList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF GapConfig-r17 OPTIONAL, -- Need N  gapToReleaseList-r17 SEQUENCE (SIZE (1..maxNrofGapId-r17)) OF MeasGapId-r17 OPTIONAL, -- Need N  posMeasGapPreConfigToAddModList-r17 PosMeasGapPreConfigToAddModList-r17 OPTIONAL, -- Need N  posMeasGapPreConfigToReleaseList-r17 PosMeasGapPreConfigToReleaseList-r17 OPTIONAL -- Need N  ]]  } |
|  |

The proponents propose two alternatives to correct the positioning gap configuration in F1AP:

1. Correct PosMeasGapPreConfigToRemoveList-r17 with PosMeasGapPreConfigToReleaseList-r17. And temove the “and” in the semantics description [11].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PosMeasGapPreConfigList | O |  | OCTET STRING | Either *PosMeasGapPreConfigToAddModList-r17* or *PosMeasGapPreConfigToReleaseList-r17* as defined in TS 38.331 [8]. |

1. MeasGapConfig is referred instead of PosMeasGapPreConfigToAddModList-r17 and PosMeasGapPreConfigToReleaseList-r17 [11].

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PosMeasGapPreConfigList | O |  | OCTET STRING | *MeasGapConfig* as defined in TS 38.331 [8]. |

**Question 5: Companies are asked to indicate whether they recognise the problem and which solution they prefer to solve it, if any? - Alternative 1 or 2**

|  |  |  |
| --- | --- | --- |
| **Company** | **Alt 1 / Alt2** | **Comment** |
| Huawei | Neither | We understand both are not optimal way.  Based on the Monday’s discussion, we understand that NBC change is allowed for essential corrections for this meeting. We may suggest to remove the existing one, and add two IEs as OCTET STRING instead. |
| Xiaomi | Prefer alt1 but not removing the “and” | In our understanding, the add/mod configuration and release configuration can be performed for different items identified by different preConfigGapIDs in a same IE, CU can be aware of that, so we’d better keep the “and”, just correct name of the IE referred to TS38.331.  *PosMeasGapPreConfigToAddModList-r17* and/or *PosMeasGapPreConfigToReleaseList-r17* as defined in TS 38.331 [8]. |
| CATT | Alt 2 | *MeasGapConfig* IE should be generated and maintained by gNB-DU, so there is no need to distinguish IE details over F1AP. |
| Google | Alt 2 (preferred)  Alt 1 (acceptable) | Proponent  *MeasGapConfig* IE contains the addition/modification list and release list, so it is the most flexible. We prefer Alt 2 but can accept Alt 1. |
| Qualcomm |  | Agree with HW |
| ZTE | Alt 2 | If majority companies agree with NBC change, the correction proposed by HW can be accepted. |
| Ericsson |  | No strong view, either HW version or Alt2 |
| Nokia | Neither | Similar to Huawei’s comment, perhaps the current IE can be replaced by an IE that contains a sequence of two optional IEs. |

# Conclusion, Recommendations

**Moderator’s conclusion**

<TBD>

# References

1. R3-224782, Support and way forward for SRS-PosRRC-InactiveConfig-r17 configuration in a CU-DU split architecture (Intel Corporation)
2. R3-224783, Rel-17 ePos correction for the missing support of SRS-PosRRC-InactiveConfig-r17 configuration (Intel Corporation)
3. R3-224784, [Draft] LS on SRS-PosRRC-InactiveConfig configuration signalling (Intel Corporation), LS out To: RAN2
4. R3-224870, Positioning SRS configuration transfer for RRC inactive and other aspects in LSs (Huawei, CMCC, China Unicom)
5. R3-224871, Positioning SRS configuration transfer for RRC inactive (Huawei, CMCC, China Unicom)
6. R3-224214, LS to RAN3 on container for SRS configuration for positioning (RAN2)
7. R3-224809, Correction of PPW/MG procedures (Ericsson)
8. R3-224810, Support of PPW pre-configuration continuity during Xn mobility (Ericsson)
9. R3-224811, Correction to the PRS Measurement configuration procedures (Ericsson)
10. R3-224935, Correction to positioning gap configuration – alt. 1 (Google Inc.)
11. R3-224941, Correction to positioning gap configuration – alt. 2 (Google Inc.)
12. R3-225005, Response to R3-224782, Xiaomi