**3GPP TSG-RAN WG2 Meeting 110-e R2-2005903**

**Online, 1st – 12th Jun, 2020**

Agenda Item: 6.8.2.2

Source: Huawei, HiSilicon

Title: [AT110-e][615][POS] Remaining positioning RRC issues (Huawei)

Document for: Discussion, Decision

# Introduction

In RAN2#110-e, the following summary have been provided for the tdocs submitted under agenda item 6.8.2.2

[R2-2005714](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202006%20-%20RAN2_110-e%2C%20Online%5CExtracts%5CR2-2005714.docx) Summary for RRC Corrections for Positioning Ericsson discussion Rel-16 NR\_pos-Core Late

With the following conclusions:

Agreements:

 Remove the CSI-RS pathloss reference for SRS for positioning.

 The LocationMeasurementIndication is extended to support NR inter-frequency measurements.

 Re-organise (Separate table) the field description for trp-ID, dl-PRS-ResourceSetID and dl-RRS-ResourceId-r16 in DL-PRS-Info-R16.

 If SSB-InfoNcell-r16 is used to configure spatial relation, ssb-IndexNcell-r16 in SSB-InfoNcell-r16 is optional and Need R.

 Change the SFN offset in SSB-Configuration according to the LPP spec.

 Add missing field description for SSB-Configuration IE for SRS for Positioning configuration.

 Align the SSB timing with RAN1 agreement not to have the SMTC configuration.

However, the following issues within the summary are still not resolved

Proposal 1 RAN2 to review the changes suggested in R2-2004637 and provide the opinion in an email discussion during RAN2#110.

Proposal 4 RAN2 to agree on the changes and review R2-2005091 and R2-2005394 to capture the needed change in an email discussion during RAN2#110.

Proposal 11 RAN2 to review and discuss if there is no need to configure the resource type under SRS resource.

• Change the choice structure to configuration of periodicityAndOffset and slotOffset

• Add a conditional presence tag that the field periodicityAndOffset is mandatory present for semi-persistent and periodic SRS. For Aperiodic SRS, it is absent.

• Add a conditional presence tag that the field slotOffset is optional present for aperiodic SRS, need S; otherwise it is absent.

And a way-forward with an email discussion was agreed:

* [AT110-e][615][POS] Remaining positioning RRC issues (Huawei)

 Scope: Discuss and conclude on proposals 1, 4, and 11 from R2-2005714.

 Intended outcome: Agreeable TP in R2-2005903

 Deadline: Wednesday 2020-06-10 1000 UTC

In this email discussion, we progress based on the agreement online.

# Discussions

## ServingCellId within SRS-SpatialRelationInfoPos

In RAN2#109bis the following change has been made by the

Furthermore, in RAN2#110-e R2-2004637, the following change was proposed

SRS-SpatialRelationInfoPos-r16 ::= SEQUENCE {

 ,

 referenceSignal-r16 CHOICE {

 servingCell SEQUNECE {

 servingCellId-r16 ServCellIndex OPTIONAL, --Need R

 ssb-IndexServing-r16 SSB-Index OPTIONAL, --Need R

 csi-RS-IndexServing-r16 NZP-CSI-RS-ResourceId OPTIONAL, --Need R

 srs-SpatialRelation-r16 SEQUENCE {

 resourceSelection-r16 CHOICE {

 srs-ResourceId SRS-ResourceId,

 srs-PosResourceId SRS-PosResourceId-r16

 },

 uplinkBWP-r16 BWP-Id

 }, }

 ssbNcell-r16 SSB-InfoNcell-r16,

 dl-PRS-r16 DL-PRS-Info-r16

 }

}

|  |
| --- |
| ***servingCell***Reference signal configuration using serving cell resource. |
| ***servingCellId***The serving Cell ID of the source SSB, CSI-RS, or SRS for the spatial relation of the target SRS resource.  |

|  |  |
| --- | --- |
| Conditional Presence | Explanation |
| *Setup* | This field is mandatory present upon configuration of *SRS-ResourceSet* or *SRS-Resource* and optionally present, Need M, otherwise. |
| *NonCodebook* | This field is optionally present, Need M, in case of non-codebook based transmission, otherwise the field is absent. |
| *Pathloss* | The field is mandatory present if the IE *SSB-InfoNcell* is included in *pathlossReferenceRS-Pos*; otherwise it is optionally present, Need R |
|  |  |

Companies are invited to provide opinions on the above change

Q1: Do companies think the above change is reasonable?

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| Qualcomm | Yes | Why should the -r16 suffix get removed? |
| Spreadtrum | No | The suggested struct in R2-2004637 does not reflect that one reference signal among 3 is chosen for a serving cell. So we propose to use the following struct.SRS-SpatialRelationInfoPos-r16 ::= CHOICE { referenceSignalServingCell SEQUENCE { servingCellId-r16 ServCellIndex OPTIONAL, -- Need S referenceSignal-r16 CHOICE { ssb-IndexServing-r16 SSB-Index, csi-RS-IndexServing-r16 NZP-CSI-RS-ResourceId, srs-SpatialRelation-r16 SEQUENCE { resourceSelection-r16 CHOICE { srs-ResourceId-r16 SRS-ResourceId, srs-PosResourceId-r16 SRS-PosResourceId-r16 }, uplinkBWP-r16 BWP-Id } } ssbNcell-r16 SSB-InfoNcell-r16, dl-PRS-r16 DL-PRS-Info-r16} |
| Ericsson | Yes | It seems inside choice one should not use the -r16. |
| vivo | No | There’s a problem in the ASN.1. ssb-IndexServing-r16, csi-RS-IndexServing-r16 and srs-SpatialRelation-r16 should be a choice of referenceSignal-r16. But servingCellId-r16 should be sequenced with one of ssb-IndexServing-r16, csi-RS-IndexServing-r16 and srs-SpatialRelation-r16 other than sequenced with all of the three signals. |
| Nokia | No | These proposed changes are more confusing than what we already had in the specification. - servingCell name is confusing. May be servingCellRS is better than servingCell. Also, do we expect all 3 RS (SSB, CSI-RS and SRS) to be provided for the serving cell or just one of them? Then a choice structure for servingCellRS is better.- We have the servingCellId field in both the Rel-15 SRS spatial relation info and Rel-16 SRS for positioning spatial relation info. In the Rel-15 IE it is optional Need S while in Rel-16 IE it is optional Need R (your proposed change). However, we have a common field description for servingCellid which is difficult to describe with two different need codes. |
| Huawei, HiSilicon | Yes, but some changes are needed | There are still some issues with the current change* r16 should still be there
* The CHOICE can be on the level of SRS-SpatialRelationInfoSRS instead of using SQEUCENCE +CHOCIE but there is only one element under SEQUENCE
 |
| CATT |  | We also prefer to use CHOICE to reflect choose 1in 3 options. |
| OPPO | No  | We share same view with vivo and prefer to keep the structure as in Rel-15. |

## Location Measurement indication

During RAN2#110-e, the following agreement has been made in RAN4 about the inter-frequency measurement:

Agreement

* Do not define intra/inter-frequency definition for PRS-RSTD
	+ Note: Accuracy may be different depending whether the measurements are done on the same positioning frequency layer or not.
* Do not define intra/inter-frequency definition for PRS-RSRP
	+ Note: Classification of accuracy requirements is FFS (e.g. whether to define different accuracy for measurements on different frequencies)
* Do not define intra/inter-frequency definition for UE Rx-Tx timing difference
	+ Note: Classification of accuracy requirements is FFS (e.g. whether to define different accuracy for measurements on different frequencies)

Based on the above agreement, there will be no intra/inter-frequency PRS measurement definition in 3GPP spec. However, from the rapporteur’s understanding, the UE still needs measurement gap to perform PRS measurement. Thus, this UE procedure of location measurement indication is still needed.

Q2: Do companies agree with the rapporteur’s understanding that, despite the RAN4 agreement that no definition is defined for PRS-RSTD/RSRP/UE Rx-Tx Timing Difference, the UE would still need *LocationMeasurementIndication* to request for measurement gap for PRS measurement?

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| Qualcomm | Yes |  |
| Spreadtrum | Yes |  |
| vivo | Yes |  |
| Nokia | Yes | If in doubt, we can send a LS to RAN4 to confirm our understanding. |
| Huawei, HiSilicon | Yes | RAN1 has made the following agreement in this meeting:Agreement:* UE is not expected to process DL PRS without configuration of measurement gap in Rel-16
* RAN1 assumes that no RAN4 requirements are to be defined for the case w/o configured measurement gap in Release 16
* Inform RAN4 about this agreement
 |
| CATT | Yes |  |
| OPPO | Yes  |  |

If the above answer is yes, we can progress based on our previous proposed CR for location measurement indication. In RAN2#110-e, the following two contributions have been provided on location measurement indication:

[R2-2005394](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202006%20-%20RAN2_110-e%2C%20Online%5CExtracts%5CR2-2005394%20LocationMeasurementIndication.docx) [N043] Location Measurement Indication updates for NR inter-frequency RSTD Nokia, Nokia Shanghai Bell discussion Rel-16 NR\_pos-Core

[R2-2005091](file:///C%3A%5CUsers%5Cmtk16923%5CDocuments%5C3GPP%20Meetings%5C202006%20-%20RAN2_110-e%2C%20Online%5CExtracts%5CR2-2005091%20DraftCR%20for%2038.331%20on%20location%20measurement%20indication-v2.docx) DraftCR for 38.331 on location measurement indication Huawei, HiSilicon discussion Rel-16 NR\_pos-Core

Comparing the above two tdocs, the main difference is that R2-2005394 thinks that the change is needs for RSTD; while R2-2005091 thinks that the change is needed for all the PRS measurements.

Companies are invited to provide opinions on the above issue

Q3: Do company agree that location mesurement indication is needed for all PRS measurement?

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| Qualcomm | Yes |  |
| Spreadtrum | Yes |  |
| vivo | Yes |  |
| Nokia | Yes | If in doubt, we can send a LS to RAN4 to confirm our understanding. |
| Huawei, HiSIlicon | Yes | See the above RAN1 agreement |
| CATT | Yes |  |
| OPPO | Yes  |  |

If the answer to the above question yes, the change in R2-2005091 can serve as the baseline, which is attached as follows:

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

### 5.5.6 Location measurement indication

#### 5.5.6.1 General



Figure 5.5.5.1-1: Location measurement indication

The purpose of this procedure is to indicate to the network that the UE is going to start/stop location related measurements (*eutra-RSTD, nr-RSTD, nr-UE-RxTxTimeDiff, nr-PRS-RSRP*) towards to E-UTRA or NR which require measurement gaps or start/stop subframe and slot timing detection towards E-UTRA (*eutra-FineTimingDetection)* which requires measurement gaps. UE shall initiate this procedure only after successful AS security activation.

NOTE: It is a network decision to configure the measurement gap.

#### 5.5.6.2 Initiation

The UE shall:

1> if and only if upper layers indicate to start performing location measurements towards to E-UTRA or NR or start subframe and slot timing detection towards E-UTRA, and the UE requires measurement gaps for these operations while measurement gaps are either not configured or not sufficient:

2> initiate the procedure to indicate start;

NOTE 1: The UE verifies the measurement gap situation only upon receiving the indication from upper layers. If at this point in time sufficient gaps are available, the UE does not initiate the procedure. Unless it receives a new indication from upper layers, the UE is only allowed to further repeat the procedure in the same PCell once per frequency of the target RAT if the provided measurement gaps are insufficient.

1> if and only if upper layers indicate to stop performing location measurements towards to E-UTRA or NR or stop subframe and slot timing detection towards E-UTRA:

2> initiate the procedure to indicate stop.

NOTE 2: The UE may initiate the procedure to indicate stop even if it did not previously initiate the procedure to indicate start.

#### 5.5.6.3 Actions related to transmission of *LocationMeasurementIndication* message

The UE shall set the contents of *LocationMeasurementIndication* message as follows:

1> if the procedure is initiated to indicate start of location related measurements:

2> if the procedure is initiated for RSTD measurements towards E-UTRA:

3> set the *measurementIndication* to the *eutra-RSTD* according to the information received from upper layers;

2> else if the procedure is initiated for positionting measurement towards NR:

3> set the the *measurementIndication* to the *nr-PRS-measurment* according to the information received from upper layers;

1> else if the procedure is initiated to indicate stop of location related measurements:

2> set the *measurementIndication* to the value *release*;

1> if the procedure is initiated to indicate start of subframe and slot timing detection towards E-UTRA:

2> set the *measurementIndication* to the value *eutra-FineTimingDetection*;

1> else if the procedure is initiated to indicate stop of subframe and slot timing detection towards E-UTRA:

2> set the *measurementIndication* to the value *release*;

1> submit the *LocationMeasurementIndication* message to lower layers for transmission, upon which the procedure ends.

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

#### – *LocationMeasurementInfo*

The IE *LocationMeasurementInfo* defines the information sent by the UE to the network to assist with the configuration of measurement gaps for location related measurements.

*LocationMeasurementInfo* information element

-- ASN1START

-- TAG-LOCATIONMEASUREMENTINFO-START

LocationMeasurementInfo ::= CHOICE {

 eutra-RSTD EUTRA-RSTD-InfoList, ...,

 eutra-FineTimingDetection NULL,

 nr-PRS-measurment-r16 NR-PRS-measurement-InfoList-r16

}

EUTRA-RSTD-InfoList ::= SEQUENCE (SIZE (1..maxInterRAT-RSTD-Freq)) OF EUTRA-RSTD-Info

EUTRA-RSTD-Info ::= SEQUENCE {

 carrierFreq ARFCN-ValueEUTRA,

 measPRS-Offset INTEGER (0..39),

 ...

}

NR-PRS-measurement-InfoList-r16 ::= SEQUENCE (SIZE (1..maxInterRAT-RSTD-Freq)) OF NR-PRS-measurement-Info

NR-PRS-measurement-Info-r16 ::= SEQUENCE {

 nr-carrierFreq ARFCN-ValueNR,

nr-measPRS-Offset INTEGER (0..FFS),

nr-measPRS-length ENUMERATED {ms1dot5, ms3, ms3dot5, ms4, ms5dot5, ms6, FFS},

nr-measPRS-repetition ENUMERATED {ms20, ms40, ms80, ms160, FFS},

 ...

}

-- TAG-LOCATIONMEASUREMENTINFO-STOP

-- ASN1STOP

| *LocationMeasurementInfo* field descriptions |
| --- |
| ***carrierFreq***The EARFCN value of the carrier received from upper layers for which the UE needs to perform the inter-RAT RSTD measurements. |
| ***measPRS-Offset***Indicates the requested gap offset for performing RSTD measurements towards E-UTRA. It is the smallest subframe offset from the beginning of subframe 0 of SFN=0 of the serving cell of the requested gap for measuring PRS positioning occasions in the carrier frequency *carrierFreq* for which the UE needs to perform the inter-RAT RSTD measurements. The PRS positioning occasion information is received from upper layers. The value of *measPRS-Offset* is obtained by mapping the starting subframe of the PRS positioning occasion in the measured cell onto the corresponding subframe in the serving cell and is calculated as the serving cell's number of subframes from SFN=0 mod 40.The UE shall take into account any additional time required by the UE to start PRS measurements on the other carrier when it does this mapping for determining the *measPRS-Offset*.NOTE: Figure 6.2.2-1 in TS 36.331[10] illustrates the *measPRS-Offset* field. |
| ***nr-carrierFreq***The ARFCN value of the carrier received from upper layers for which the UE needs to perform the NR DL PRS measurements. |
| ***nr-measPRS-Offset***Indicates the gap offset of requested measurement gap for performing NR DL PRS measurements. |
| ***nr-measPRS-length***Indicates measurement gap length in ms of the requsted measurement gap for performing NR DL PRS measurements. |
| ***nr-measPRS-repetition****Indicates* measurement gap repetition period in (ms) of the requested measurement gap for performing NR DL PRS measurements. |

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

Companies are encouraged to provide inputs on the above change for location measurement indication.

Q4: Is there any issue for the change above for location measurement indication?

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| Qualcomm |  | The *nr-carrierFreq* needs some clarification (which is provided by upper layer). The *dl-PRS-PointA* together with *dl-PRS-StartPRB* may not map to an ARFCN value. Also, some companies think the ARFCN in the LPP *TRP-ID* is not needed. Therefore, which upper layer parameter is meant?I think the *nr-measPRS-Offset* should be a CHOICE and could be combined with *nr-measPRS-repetition*. E.g.:nr-measPRS-Offset ::= CHOICE { ms20 INTEGER (0..19), ms40 INTEGER (0..39), ms80 INTEGER (0..79), ms160 INTEGER (0..159), ...} |
| Spreadtrum | No |  |
| Ericsson |  | We can have some generic namenr-LocationMeasurements-r16 instead of nr-PRS-measurment-r16  |
| Nokia |  | OK to use R2-2005091 as baseline. It is in principle OK but try to minimize the text changes and make the text more generic. No need to list all measurements in the procedure text. Why gap length and repetition are present for NR RSTD measurement but not for LTE RSTD measurement? See other comments in-line above. |
| Huawei, HiSilicon | Yes | In the LS from RAN4 R2-2006136The current text has the following issues:* the field name should be nr-PRS-Measurement
* the name for maximum number of frequency layer should be max-PRS-FreqLayer
* nr-CarrierFreq can be replaced with the name dl-PRS-PointA
* The FFS in the spec should be removed according to guidance from chair
* offset and repetition can be jointly configured as suggested by Qualcomm
* mgl should be configured with two spare bits in the range of values, spare1 and spare2
 |
| CATT |  | The signalling optimization for nr-measPRS-Offset proposed by Qualcomm is ok for us. |
| Qualcomm |  | Is the nr-CarrierFreq really the dl-PRS-PointA? For inter-RAT/inter-Frequ the meaning is quite clear. The dl-PRS-PointA may in principle also be the ”normal” PointA. If the starting carrier for DL-PRS is needed, it should be dl-PRS-PointA + DL-PRS Start PRB. However, it’s not quite clear why the gNB would need to know this for configuring measurement gaps. I.e., why does this have any impact on the measurement gap pattern? I actually think the nr-CarrierFreq is not needed. |

## Periodicity and offset configuration in SRS config

In R2-2005100, a correction for the periodicity and offset configuration for semi-persistent and periodic positioning SRS is proposed:

SRS-PosResource-r16::= SEQUENCE {

 srs-PosResourceId-r16 SRS-PosResourceId-r16,

 transmissionComb-r16 CHOICE {

 n2-r16 SEQUENCE {

 combOffset-n2-r16 INTEGER (0..1),

 cyclicShift-n2-r16 INTEGER (0..7)

 },

 n4-r16 SEQUENCE {

 combOffset-n4-16 INTEGER (0..3),

 cyclicShift-n4-r16 INTEGER (0..11)

 },

 n8-r16 SEQUENCE {

 combOffset-n8-r16 INTEGER (0..7),

 cyclicShift-n8-r16 INTEGER (0..5)

 },

 ...

 },

 resourceMapping-r16 SEQUENCE {

 startPosition-r16 INTEGER (0..13),

 nrofSymbols-r16 ENUMERATED {n1, n2, n4, n8, n12}

 },

 freqDomainShift-r16 INTEGER (0..268),

 freqHopping-r16 SEQUENCE {

 c-SRS-r16 INTEGER (0..63),

 ...

 },

 groupOrSequenceHopping-r16 ENUMERATED { neither, groupHopping, sequenceHopping },

slotOffset-r16 INTEGER (1..32) OPTIONAL, -- Cond AP-SRS

 SEQUENCE {

 periodicityAndOffset-r16 SRS-PeriodicityAndOffset-r16 OPTIONAL, -- Cond SPandP-SRS

 sequenceId-r16 INTEGER (0..65535),

 spatialRelationInfoPos-r16 SRS-SpatialRelationInfoPos-r16 OPTIONAL, -- Need R

 ...

}

The reason for the change is that the time domain characteristics have already been configured under SRS-ResourceSet and all the SRS resources under the same SRS resource set have the same characteristics.

SRS-PosResourceSet-r16 ::= SEQUENCE {

 srs-PosResourceSetId-r16 SRS-PosResourceSetId-r16,

 srs-PosResourceIdList-r16 SEQUENCE (SIZE(1..maxNrofSRS-ResourcesPerSet)) OF SRS-PosResourceId-r16

 OPTIONAL, -- Cond Setup

 resourceType-r16 CHOICE {

 aperiodic-r16 SEQUENCE {

 aperiodicSRS-ResourceTriggerList-r16 SEQUENCE (SIZE(1..maxNrofSRS-TriggerStates-1))

 OF INTEGER (1..maxNrofSRS-TriggerStates-1) OPTIONAL, -- Need M

 ...

 },

 semi-persistent-r16 SEQUENCE {

 ...

 },

 periodic-r16 SEQUENCE {

 ...

 }

 },

 alpha-r16 Alpha OPTIONAL, -- Need S

 p0-r16 INTEGER (-202..24) OPTIONAL, -- Cond Setup

 pathlossReferenceRS-Pos-r16 CHOICE {

 ssb-IndexServing-r16 SSB-Index,

 csi-RS-Index-r16 NZP-CSI-RS-ResourceId,

 ssb-Ncell-r16 SSB-InfoNcell-r16,

 dl-PRS-r16 DL-PRS-Info-r16

 } OPTIONAL, -- Need M

 ...

}

There is no need to configure the resource type again under SRS resource. The field slotOffset is only present for AP and the periodicityAndOffset only present for SP and P SRS.

Companies are invited to provide opinions for the above change

Q5: Do companies think the above change is reasonable?

|  |  |  |
| --- | --- | --- |
| Company | Opinion | Comments |
| Qualcomm |  | No strong opinion. But the proposed change would be O.K. |
| Spreadtrum | Yes |  |
| Ericsson | No | It does not appear we are saving any bits. The current structure is same as legacy and it is choice based and allows easy extension for future needs.It appears the intent here is now instead of choice ASN.1 structure, we want to capture everything in field description with conditionality. In general, this should be avoided and simple ASN.1 structure free of conditionality like this should be provided. |
| vivo | No | No strong benefit to do so. |
| Nokia | No | Signalling optimizations. I prefer the existing structure. |
| Huawei, HiSilicon | Yes |  |
| CATT | Yes |  |
| OPPO | No  | We see no strong necessity to optimize the signalling structure.  |

# Conclusion

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

# Text Proposal