3GPP TSG-RAN WG2 Meeting #109-e R2-2001936

Online, 24 February – 6 March 2020

**Agenda item: 6.8.2.1**

**Source: Huawei, HiSilicon**

**Title: [Offline-612][POS] Summary on spatial relationship configuration**

**Document for: Discussion and Decision**

# 1 Introduction

This document provide the collection of summary for the following offline discussion.

* [AT109e][612][POS] Spatial relationship configuration (Huawei)

Intended outcome: Summary of agreements on how the spatial relationship is determined for UL-involved cases and how SSB configuration is signalled. Summary in R2-2001936.

Deadline: Wednesday 2020-03-04 1300 CET

This discussion focus on the following two aspects per online agreements:

- How the spatial relation for SRS is determined

- How SSB is signalled and how the signalling can be optimized

# 2 Discussion

## 2.1 Spatial relation for SRS

### Discussion#1: Spatial relation determination for SRS

During the e-meeting, companies provided their views on this, we observed the following three options

* Option 1: Spatial relation is determined by the serving gNB without LMF involvement.
  + Additional supporting procedure may be needed, e.g. Xn exchange of PRS configuration, gNB to retrieve measurement from UE
* Option 2: Spatial relation is determined by the LMF
  + Additional information may be needed in the NRPPa message (e.g. POSITIONING INFORMATION REQUEST)
* Option 3: Spatial relation is recommended by the LMF and determined by gNB
  + Additional information may be needed in the NRPPa message (e.g. POSITIONING INFORMATION REQUEST)

***Companies are encouraged to provide their view on the options or provide other options***

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***Summary:***

***Proposal:***

### Discussion#2: Supporting procedure for spatial relation configuration for SRS

In [R2-2001237, R2-2000290], it has also been proposed that gNB should be allowed to retrieve RRM measurements from the UE to help setup the spatial relation information for the neighbouring cells.

**This is a new issue, related to RRC specification. It is not aligned with current procedure, based on this, the procedure will be:**

Step 1: the LMF needs to configure PRS first;

Step 2: the LMF asks the serving gNB to configure SRS;

Step 3: the gNB get PRS-RSRP via RRC;

Step 3: the gNB selects DL-PRS, and informs the SRS configuration +  spatial relationship reference to UE;

Step 4: the gNB forwards the configured SRS to the LMF;

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| But, the DL-PRS can’t support to report the measurement result to gNB. It may lead problem when the DL-PRS are configured for the spatial relation reference signal. Especially, the SSB can’t satisfy the requirement of positioning, such as, the hearability of SSB is worse because the neighbouring cell is so far, or the beam width of SSB can’t satisfy the requirement of beam selecting.  Furthermore, it didn’t need any other measurement if the measurement of DL PRS is essential for RTT, OTDOA.  Observation 3: The measurement of DL-PRS is essential for RTT and OTDOA.  So, we proposal supporting the measurement report RSRP of DL-PRS to gNB for beam selecting when the DL-PRS are configured as the spatial relationship reference signal of SRS.  **Proposal 2: Report the RSRP of DL-PRS to gNB by RRC when the DL-PRS are configured as the spatial relationship reference signal of SRS.** |

***Companies are encouraged to provide their view on the above issue whether it is necessary to report the RSRP of DL-PRS in the RRM measurement***

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***Summary:***

***Proposal:***

## 2.2 SSB configuration signaling

The following options are observed based on the summary of LPP [1].

* Option 1 (R2-2000290): all configuration of T/F occupancy of the SSBs only by RRC.
* Option 2: all configurations of T/F occupancy of the SSBs only by LPP.
* Option 3 (R2-2000290): Parameters of T/F occupancy of the SSBs are configured when the UE requested
* Option 4 (R2-2000991): SSB in LPP and index in RRC (for multi-RTT).
* Option 5 (current CR): Duplication is allowed.

For multi-RTT positioning, we agreed that T/F occupancy for SSB will be grouped in a single IE, and use the pointer to reference the required information

3 The time/frequency occupancy of the SSBs required in both, DL-PRS and UL-PRS is grouped in a single IE, and a pointer/index is used to reference the required information.

In the following, we have separate questions dealing with DL-only, UL-only, and multi-RTT positioning, respectively.

### Discussion#3: SSB configuration for DL-only positioning

In the current running CR, the SSB configuration is under the DL PRS assistance data in the LPP message.

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| *– NR-SSB-Config* The IE *NR-SSB-Config* defines SSB configuration.  -- ASN1START  NR-SSB-Config-r16 ::= SEQUENCE {    trp-ID-r16 TRP-ID-r16,  ss-PBCH-BlockPower-r16 INTEGER (-60..50),  halfFrameIndex-r16 INTEGER (0..1),  SSB-periodicity-r16 ENUMERATED { ms5, ms10, ms20, ms40, ms80, ms160, ...},  ssb-PositionsInBurst-r16 CHOICE {  shortBitmap-r16 BIT STRING (SIZE (4)),  mediumBitmap-r16 BIT STRING (SIZE (8)),  longBitmap-r16 BIT STRING (SIZE (64))  } OPTIONAL, --Need OR  ssbSubcarrierSpacing-r16 ENUMERATED {kHz15, kHz30, kHz60, kHz120, kHz240, ...},  sfn-SSB-Offset-r16 INTEGER (0..15),  smtc-r16 SEQUENCE {  periodicityAndOffset-r16 CHOICE {  sf5 INTEGER (0..4),  sf10 INTEGER (0..9),  sf20 INTEGER (0..19),  sf40 INTEGER (0..39),  sf80 INTEGER (0..79),  sf160 INTEGER (0..159)  },  duration-r16 ENUMERATED { sf1, sf2, sf3, sf4, sf5, ... }  }  }  -- ASN1STOP – *NR-DL-PRS-AssistanceData* The IE *NR-DL-PRS-AssistanceData* is used by the location server to provide DL-PRS assistance data.  -- ASN1START  NR-DL-PRS-AssistanceData-r16 ::= SEQUENCE {  nr-DL-PRS-ReferenceInfo-r16 DL-PRS-IdInfo-r16 OPTIONAL, -- Need ON  nr-DL-PRS-AssistanceDataList-r16 SEQUENCE (SIZE (1..nrMaxFreqLayers)) OF NR-DL-PRS-AssistanceDataPerFreq-r16,  nr-SSB-Config-r16 SEQUENCE (SIZE (0..255)) OF NR-SSB-Config-r16, ...  } |

***Companies are encouraged to provide their views.***

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### Discussion#4: SSB configuration for UL-only positioning

In the current running CR, the SSB configuration for SRS for positioning is provided in SRS-Config under RRC configuration.

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| SRS-Type2-ResourceSet-r16 ::= SEQUENCE {  srs-Type2-ResourceSetId-r16 SRS-Type2-ResourceSetId-r16,  srs-Type2-ResourceIdList-r16 SEQUENCE (SIZE(1..maxNrofSRS-ResourcesPerSet)) OF SRS-Type2-ResourceId-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  slotOffset-r16 INTEGER (1..32) OPTIONAL, -- Need S  ...  },  semi-persistent-r16 SEQUENCE {  ...  },  Periodic-r16 SEQUENCE {  ...  }  },  alpha-r16 Alpha OPTIONAL, -- Need S  p0-r16 INTEGER (-202..24) OPTIONAL, -- Cond Setup  pathlossReferenceRS-r16 CHOICE {  ssb-Index-16 SSB-Index,  csi-RS-Index-r16 NZP-CSI-RS-ResourceId,  ssb-r16 SSB-InfoNcell-r16,  dl-PRS-r16 DL-PRS-Info-r16  } OPTIONAL, -- Need M  ...  }  SRS-ResourceSetId ::= INTEGER (0..maxNrofSRS-ResourceSets-1)  SRS-Type2-ResourceSetId-r16 ::= INTEGER (0..maxNrofSRS-ResourceSets-1)  SRS-Type2-Resource-r16::= SEQUENCE {  srs-Type2-ResourceId-r16 SRS-Type2-ResourceId-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 },  resourceType-r16 CHOICE {  aperiodic-r16 SEQUENCE {  ...  },  semi-persistent-r16 SEQUENCE {  periodicityAndOffset-sp-r16 SRS-PeriodicityAndOffset-v16xy, // Editor’s Note: Aperiodic and semi-persisetnt are FFS ...  },  periodic-r16 SEQUENCE {  periodicityAndOffset-p-r16 SRS-PeriodicityAndOffset-v16xy,  ...  }  },  sequenceId-r16 INTEGER (0..65535),  spatialRelation-r16 SRS-SpatialRelationInfo-r16 OPTIONAL, -- Need R  ...  }  SRS-SpatialRelationInfo ::= SEQUENCE {  servingCellId ServCellIndex OPTIONAL, -- Need S  referenceSignal CHOICE {  ssb-Index SSB-Index,  csi-RS-Index NZP-CSI-RS-ResourceId,  srs SEQUENCE {  resourceId SRS-ResourceId,  uplinkBWP BWP-Id  }  }  }  SRS-SpatialRelationInfo-r16 ::= 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-16 SEQUENCE {  resourceSelection-r16 CHOICE {  type1-r16 SRS-ResourceID  type2-r16 SRS-Type2-ResourceID-r16  }    uplinkBWP-r16 BWP-Id  },  ssbNcell-r16 SSB-InfoNcell-r16,    dl-PRS-r16 DL-PRS-Info-r16  }  }  SSB-Configuration-r16 ::= SEQUENCE {  carrierFreq-r16 ARFCN-ValueNR,  halfFrameIndex ENUMERATED {zero, one},  ssbSubcarrierSpacing-r16 SubcarrierSpacing,  ssb-periodicity-r16 ENUMERATED { ms5, ms10, ms20, ms40, ms80, ms160, spare2,spare1 } OPTIONAL, -- Need S  smtc-r16 SSB-MTC OPTIONAL, -- Need S  sfn-Offset-r16 INTEGER (0..maxNumFFS),  sfn-SSB-Offset-r16 INTEGER (0..15),  ss-PBCH-BlockPower-r16 INTEGER (-60..50) OPTIONAL –- Cond Pathloss  }  SSB-InfoNcell-r16 ::= SEQUENCE {  physicalCellId-r16 PhysCellId,  ssb-IndexNcell-r16 SSB-Index,  ssb-Configuration-r16 SSB-Configuration-r16 OPTIONAL    } |

***Companies are encouraged to provide their views on the signaling above in the current UL-only positioning for SSB configuration***

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### Discussion#5: SSB configuration for multi-RTT positioning

As mentioned, we have made the agreement that, for multi-RTT positioning, the reference for UL and DL should be grouped in one IE and for UL and DL component, reference to the resource is given.

***Companies are encouraged to provide their views on the above issue.***

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***Proposal 2:***

# 3 Conclusions

TBD

# 4 References

1. R2-2001173 Summary on LPP for aganda 6.8.2.3 Intel Corporation discussion Rel-16 NR\_pos-Core