**3GPP TSG RAN WG1 Meeting #102-E R1-2009239**

**E-meeting, October 26th – November 13th, 2020**

**Source: Moderator (Ericsson)**

**Title: Output #1 for email discussion [103-e-NR-Pos-02]**

**Agenda item: 7.2.8**

**Document for: Discussion and Decision**

Introduction

This contribution documents the output of email discussion [103-e-NR-Pos-02] triggered by the following Chairman’s decision:

[103-e-NR-Pos-02] Email discussion/approval on UL SRS and procedures on aspects 6, 8, 11, 12, 15, 17 in the FL summary until 10/29 with potential CRs by 11/5 – Florent (Ericsson)

The aspects discussed can be found in the moderator summary R1-2009239[16]:

* Aspect #6: Configuration of the spatial relation for SRS for positioning
* Aspect #8: SRS power split
* Aspect #11: Replacement of “cell” on “dl-PRS-ID-r16”
* Aspect #12: Simultaneous SRS-MIMO and SRS-Pos Transmission
* Aspect #15: Alignment of Parameter Names and Reference Correction in TS 38.214
* Aspect #17: DL PRS QCL and SSB/PBCH Block Index

List of Remaining Opens on NR Positioning

Aspect #6: Configuration of the spatial relation for SRS for positioning

### Feature Lead Summary and response

In [CATT, [4]], it is noticed that DL PRS and SSB of a non-serving cell are configured by two different higher layer parameters. In order to avoid ambiguity and make the configuration of DL PRS and SSB of a non-serving cell more clear the following TP is suggested:

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| **Proposed TP-A**  *-----------------------------------------------Start of Text Proposal for 38.214---------------------------------------------* **6.2.1 UE sounding procedure** ---------------------------------------------------- Unchanged part omitted ------------------------------------------------  - The configuration of the spatial relation between a reference RS and the target SRS, where the higher layer parameter *spatialRelationInfo* or *spatialRelationInfoPos-r16*, if configured, contains the ID of the reference RS. The reference RS may be an SS/PBCH block, CSI-RS configured on serving cell indicated by higher layer parameter *servingCellId* if present, same serving cell as the target SRS otherwise, or an SRS configured on uplink BWP indicated by the higher layer parameter *uplinkBWP*, and serving cell indicated by the higher layer parameter *servingCellId* if present, same serving cell as the target SRS otherwise. When the target SRS is configured by the higher layer parameter *SRS-PosResourceSet-r16*, the reference RS may also be a DL PRS configured on a serving cell or a non-serving cell indicated by the higher layer parameter *dl-PRS-r16*, or an SS/PBCH block of a non-serving cell indicated by the higher layer parameter *ssb-Ncell-r16*.  *------------------------------------------------* Unchanged part omitted *-----------------------------------------------------*  *-----------------------------------------------End of Text Proposal -----------------------------------------------------------* |

**Feature Lead Response**

* It seems useful clarification. Further RAN WG1 discussion is needed whether to adopt it.

### first round of comments

Companies are encouraged to provide their view on the TP in the table below

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Aspect #8: SRS power split

### Feature Lead Summary and response

In [CATT, [5]], it is proposed to adopt the following text proposal for linear value of SRS Power split by UE (in section 7.3 of 38.213) with a reasoning that statement is applicable for SRS-MIMO only

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| **Proposed TP-A**  *-----------------------------------------------Start of Text Proposal for 38.213--------------------------------------------------*  **7.3 Sounding reference signals**  For SRS configured by the higher parameter *SRS-Resource*,a UE splits a linear value  of the transmit power  on active UL BWP  of carrier  of serving cell  equally across the configured antenna ports for SRS.  *-----------------------------------------------------* Unchanged part omitted *----------------------------------------------- -----------------------------------------------------End of Text Proposal ----------------------------------------------------------* |

**Feature Lead Response**

* Given that SRS for positioning has only single port the proposed change is not needed technically, however, it is worthwhile to clarify the specification to avoid potential future inconsistencies.

### first round of comments

Companies are encouraged to provide their view on the TP in the table below

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Aspect #11: Replacement of “cell” on “*dl-PRS-ID-r16*”

### Feature Lead Summary and response

In [OPPO,[8]]. the following gives the corresponding text proposal to change “cell” on “*dl-PRS-ID-r16*”.

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| **In TS 38.214 Section 5.1.6.5**  **5.1.6.5 PRS reception procedure**  *<omitted text>*  The UE may be configured to measure and report, subject to UE capability, up to 4 DL RSTD measurements per pair of ~~cells~~ *dl-PRS-ID-r16* with each measurement between a different pair of DL PRS resources or DL PRS resource sets within the DL PRS configured for those cells. The up to 4 measurements being performed on the same pair of ~~cells~~ *dl-PRS-ID-r16* and all DL RSTD measurements in the same report use a single reference timing.  The UE may be configured to measure and report, subject to UE capability, up to 8 DL PRS RSRP measurements on different DL PRS resources ~~from the same cell~~ associated with the same *dl-PRS-ID-r16*. When the UE reports DL PRS RSRP measurements from one DL PRS resource set, the UE may indicate which DL PRS RSRP measurements associated with the same higher layer parameter *nr-DL-PRS-RxBeamIndex* have been performed using the same spatial domain filter for reception if for each *nr-DL-PRS-RxBeamIndex* reported there are at least 2 DL PRS-RSRP measurements associated with it within the DL PRS resource set..  The UE may be configured to measure and report, subject to UE capability, up to 4 UE Rx-Tx time difference measurements corresponding to a single configured SRS resource or resource set for positioning. Each measurement corresponds to a single received DL PRS resource or resource set which can be in different positioning frequency layers.  The UE may be configured to measure and report, subject to UE capability, the timing and the quality metrics of up to 2 additional detected paths that are associated with each RSTD or UE Rx – Tx time difference. The timing of each additional path is reported relative to the path timing used for determining *nr-RSTD-r16* or *nr-UE-RxTxTimeDiff-r16*.  If the UE is configured with *dl-PRS-QCL-Info-r16* and the QCL relation is between two DL PRS resources, then the UE assumes those DL PRS resources are ~~from the same cell~~ associated with the same *dl-PRS-ID-r16*. If *dl-PRS-QCL-Info-r16* is configured to the UE with 'QCL-Type-D' with a source DL-PRS-Resource then the *nr-DL-PRS-ResourceSetId-r16* and the *nr-DL-PRS-ResourceId-r16* of the source DL PRS resource are expected to be indicated to the UE.  UE is not expected to process DL PRS without configuration of measurement gap.  *<omitted text>* |

**Feature Lead Response**

* It is recommended to agree on TP to avoid confusion

### first round of comments

Companies are encouraged to provide their view on the TP in the table below

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Aspect #12: Simultaneous SRS-MIMO and SRS-Pos Transmission

### Feature Lead Summary and response

In [LGE, [9]] it is proposed that SRS transmission configured by *SRS-Resource* has high priority than SRS transmission configured by *SRS-PosResource-r16*, given that in the previous meeting, a new UE capability for the simultaneous transmission of SRS for MIMO and SRS for positioning was introduced.

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| Agreements:   * A new UE capability of simultaneous positioning SRS and MIMO SRS transmission across multiple CCs within a band is introduced. With the candidate value {2}. * A new UE capability of simultaneous positioning SRS and MIMO SRS transmission for a given BC is introduced. With the candidate value {2}. |

The following TP on Section 7.5 of TS 38.213 is proposed:

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| **7.5 Prioritizations for transmission power reductions**  *---- Unchanged parts omitted ----*  The total UE transmit power in a symbol of a slot is defined as the sum of the linear values of UE transmit powers for PUSCH, PUCCH, PRACH, and SRS in the symbol of the slot.  - PRACH transmission on the Pcell  - PUCCH or PUSCH transmissions with higher priority index according to Clause 9  - For PUCCH or PUSCH transmissions with same priority index  - PUCCH transmission with HARQ-ACK information, and/or SR, and/or LRR, or PUSCH transmission with HARQ-ACK information  - PUCCH transmission with CSI or PUSCH transmission with CSI  - PUSCH transmission without HARQ-ACK information or CSI and, for Type-2 random access procedure, PUSCH transmission on the PCell  - SRS transmission, with aperiodic SRS having higher priority than semi-persistent and/or periodic SRS, or PRACH transmission on a serving cell other than the PCell  - SRS transmission, with SRS resource configured by *SRS-Resource* having higher priority than SRS resource configured by *SRS-PosResource-r16* where both SRS resources have the same *resourceType*  *---- Unchanged parts omitted ----* |

**Feature Lead Response**

* It is recommended to discuss and decide on the proposed TP.

### first round of comments

Companies are encouraged to provide their view on the TP in the table below

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Aspect #15: Alignment of Parameter Names and Reference Correction in TS 38.214

### Feature Lead Summary and response

In [14], it is stated that there is misalignment between TS 37.355 and TS 38.214 when it comes to the fields present in positioniong frequency layer, DL PRS resource set, and DL PRS resource.

The following changes are proposed:

* The fields *dl-PRS-CombSizeN-r16, dl-PRS-ResourceBandwidth-r16,* and *dl-PRS-StartPRB-r16* are moved to positioning frequency layer to align with TS 37.355.
* The field *dl-PRS-ResourceList-r16* is moved to DL PRS resource set to align with TS 37.355.
* Reference clause numbers related to TS 38.211 are corrected
* Reference clause numbers related to TS 37.355 are corrected

The following TP is proposed:

**Text Proposal #1**

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| 5.1.6.5 PRS reception procedure -------------------------------------- unchanged parts omitted -----------------------------------------------  The UE assumes that the following parameters for each DL PRS resource(s) are configured via higher layer parameters *nr-DL-PRS-PositioningFrequencyLayer-r16, nr-DL-PRS-ResourceSet-r16* and *nr-DL-PRS-Resource-r16* defined by Clause 6.4.3 [17, TS 37.355].  A positioning frequency layer consists of one or more DL PRS resource sets and it is defined by Clause 6.4.3 [17, TS 37.355]:  *- dl-PRS-SubcarrierSpacing-r16* defines the subcarrier spacing for the DL PRS resource. All DL PRS resources and DL PRS resource sets in the same DL PRS positioning frequency layer have the same value of *dl-PRS-SubcarrierSpacing-r16*. The supported values of *dl-PRS-SubcarrierSpacing-r16* are given in Table 4.2-1 of [4, TS38.211].  *- dL-PRS-CyclicPrefix* defines the cyclic prefix for the DL PRS resource. All DL PRS Resources and DL PRS Resource sets in the same DL PRS positioning frequency layer have the same value of *DL-PRS-CyclicPrefix.* The supported values of *DL-PRS-CyclicPrefix* are given in Table 4.2-1 of [4, TS38.211].  *- dl-PRS-PointA-r16* defines the absolute frequency of the reference resource block. Its lowest subcarrier is also known as Point A. All DL PRS resources belonging to the same DL PRS resource set have common Point A and all DL PRS resource sets belonging to the same DL PRS positioning frequency layer have a common Point A.  34,  ------------------------------------unchanged parts omitted---------------------------------------------------  *- nr-DL-PRS-SFN0-Offset-r16* defines the time offset of the SFN0 slot 0 for the transmitting cell with respect to SFN0 slot 0 of reference cell.    A DL PRS resource is defined by:  ------------------------------------ unchanged parts omitted -------------------------------------------------  *- dl-PRS-NumSymbols-r16* defines the number of symbols of the DL PRS resource within a slot where the allowable values are given in Clause 7.4.1.7.3 of [4, TS38.211].  ------------------------------------ unchanged parts omitted ------------------------------------------------- |

In [OPPO,[8]], it was also proposed that fields *dl-PRS-CombSizeN-r16, dl-PRS-ResourceBandwidth-r16,* and *dl-PRS-StartPRB-r16* are moved to positioning frequency layer to align with TS 37.355.

In the same contribution [OPPO,[8]], it is proposed to rearrange *dl-PRS-ResourceList-r16* which is consistent with a change proposed above i.e. capture it under DL PRS resource set paragraph.

In [LGE, [11]], the similar opens were discussed and corresponding editorial corrections provided as in the text proposal below:

**Text Proposal #2**

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| **5.1.6.5 PRS reception procedure**  *---- Unchanged parts omitted ----*  A positioning frequency layer consists of one or more DL PRS resource sets and it is defined by Clause 6.4.2.1 [17, TS 37.355]:  *- dl-PRS-SubcarrierSpacing-r16* defines the subcarrier spacing for the DL PRS resource. All DL PRS resources and DL PRS resource sets in the same DL PRS positioning frequency layer have the same value of *dl-PRS-SubcarrierSpacing-r16*. The supported values of *dl-PRS-SubcarrierSpacing-r16* are given in Table 4.2-1 of [4, TS38.211].  *- DL-PRS-CyclicPrefix* defines the cyclic prefix for the DL PRS resource. All DL PRS Resources and DL PRS Resource sets in the same ~~DL-PRS-PositioningFrequencyLayer~~ DL PRS positioning frequency layer have the same value of *DL-PRS-CyclicPrefix.* The supported values of *DL-PRS-CyclicPrefix* are given in Table 4.2-1 of [4, TS38.211].  *- dl-PRS-PointA-r16* defines the absolute frequency of the reference resource block. Its lowest subcarrier is also known as Point A. All DL PRS resources belonging to the same DL PRS resource set have common Point A and all DL PRS resources sets belonging to the same DL PRS positioning frequency layer have a common Point A.  *---- Unchanged parts omitted ----*  A DL PRS resource is defined by:  *- dl-PRS-ResourceList-r16* determines the DL PRS resources that are contained within one DL PRS resource set.  *- nr-DL-PRS-ResourceId-r16* determines the DL PRS resource configuration identity. All DL PRS resource IDs are locally defined within a DL PRS resource set.  *- dl-PRS-SequenceId-r16* is used to initialize cinit value used in pseudo random generator [4, TS38.211, 7.4.1.7.2] for generation of DL PRS sequence for a given DL PRS resource.  *- ~~dl-PRS-CombSizeN-and-ReOffset-r16~~ dl-PRS-CombSizeN-AndReOffset-r16* defines the starting RE offset of the first symbol within a DL PRS resource in frequency. The relative RE offsets of the remaining symbols within a DL PRS resource are defined based on the initial offset and the rule described in Clause 7.4.1.7.3 of [4, TS38.211].  *---- Unchanged parts omitted ----*  The UE may be indicated by the network that ~~a~~ DL PRS resource(s) can be used as the reference for the DL RSTD, DL PRS-RSRP, and UE Rx-Tx time difference measurements in a higher layer parameter *nr-DL-PRS-ReferenceInfo-r16*.  *---- Unchanged parts omitted ----*  For DL UE positioning measurement reporting in higher layer parameters *NR-DL-TDOA-SignalMeasurementInformation* or *NR-Multi-RTT-SignalMeasurementInformation* the UE can be configured to report the DL PRS resource ID(s) or the DL PRS resource set ID(s) associated with the DL PRS resource(s) or the DL PRS resource set(s) which are used in determining the UE measurements DL RSTD, UE ~~Tx-Rx~~ Rx-Tx time difference.  *---- Unchanged parts omitted ----*  The UE may be configured to measure and report, subject to UE capability, up to 8 DL PRS RSRP measurements on different DL PRS resources from the same cell. When the UE reports DL PRS RSRP measurements from one DL PRS resource set, the UE may indicate which DL PRS RSRP measurements associated with the same higher layer parameter *nr-DL-PRS-RxBeamIndex-r16* have been performed using the same spatial domain filter for reception if for each *nr-DL-PRS-RxBeamIndex-r16* reported there are at least 2 DL PRS-RSRP measurements associated with it within the DL PRS resource set..  *---- Unchanged parts omitted ----* |

**Feature Lead Response**

* Agree with proposed changes of parameter names in both TPs and correction to references
  + Regarding the rearrangement of parameters to frequency layers, strictly speaking it is not necessary since parameters characterize properties of DL PRS resources and are common within DL PRS Resource Sets and DL PRS frequency layer.
* Merge provided TPs into a single TP and present it for discussion /endorsement.

### first round of comments

Companies are encouraged to provide their view on the TP in the table below

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Aspect #17: DL PRS QCL and SSB/PBCH Block Index

### Feature Lead Summary and response

In [OPPO, [8]], it is proposed to change the text on SSB/PBCH block index when DL PRS is configured as both 'QCL-Type-C' and 'QCL-Type-D'. The following reasoning is provided:

“If the DL PRS is configured as both 'QCL-Type-C' and 'QCL-Type-D' with SS/PBCH Block, the SS/PBCH block should be the same one. However, the same value of SS/PBCH block index cannot ensure the same SSB/PBCH block since the SS/PBCH blocks from different cells may have the same SS/PBCH block index.

In order to ensure the same SS/PBCH block, we propose the following text proposal”

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| **In TS 38.214 Section 5.1.6.5**  *<omitted text>*  A DL PRS resource is defined by:  *- dl-PRS-ResourceList-r16* determines the DL PRS resources that are contained within one DL PRS resource set.  *<omitted text>*  *- dl-PRS-QCL-Info-r16* defines any quasi-colocation information of the DL PRS resource with other reference signals. The DL PRS may be configured to be 'QCL-Type-D' with a DL PRS or SS/PBCH Block from a serving cell or a non-serving cell. The DL PRS may be configured to be 'QCL-Type-C' with a SS/PBCH Block from a serving or non-serving cell. If the DL PRS is configured as both 'QCL-Type-C' and 'QCL-Type-D' with a SS/PBCH Block then the SSB index indicated should be the same and should be from the same cell.  *<omitted text>* |

**Feature Lead Response**

* Some clarification may be useful however proposed revision may need to be updated since the cell wording may be confusing.
* It is recommended to discuss provided TP and decide on correction.

### first round of comments

Companies are encouraged to provide their view on the TP in the table below

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conclusions

TBD

References

1. R1-2007574 Rel-16 positioning corrections Huawei, HiSilicon
2. R1-2007751 Draft CR on measurement gap configuration for DL PRS reception ZTE
3. R1-2007752 Draft CR on the definition of nr-DL-PRS-expectedRSTD-r16 ZTE
4. R1-2007822 Discussion on configuration parameters related to SRS-Pos CATT
5. R1-2007823 Discussion on linear value of SRS power split by UE CATT
6. R1-2007999 Remaining issues on DL PRS CMCC
7. R1-2008214 Text Proposals on NR Positioning Procedure OPPO
8. R1-2008215 Text Proposals on RS for Positioning OPPO
9. R1-2008414 Discussions on remaining issues on Rel-16 NR positioning LG Electronics
10. R1-2008580 Editorial Corrections on Rel-16 NR positioning LG Electronics
11. R1-2008678 Remaining issues on prioritization of positioning assistance data vivo
12. R1-2008679 Remaining issues on TRP ID for NR positioning vivo
13. R1-2008760 Corrections to 38.211 for NR positioning Ericsson
14. R1-2008761 Corrections to 38.214 for NR positioning Ericsson
15. R1-2008789 Correction to PRS duration calculation for PRS processing Huawei, HiSilicon
16. R1-2009239 Feature Lead Summary for NR Positioning Maintenance AI 7.2.8 Moderator (Intel Corporation, CATT, Ericsson, Qualcomm)