**3GPP TSG RAN WG1 Meeting #102-E R1-** **2009419**

**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

|  |  |
| --- | --- |
| Company | Comment |
| Nokia/NSB | Seems in line with current LPP so we support this TP. |
| vivo | Support |
| Qualcomm | Support |
| Huawei/HiSilicon | We do not see a strong necessity. Does spec really need to be so specific, and if so, why do not we mention “ssb-IndexServing-r16”/“csi-RS-IndexServing-r16”/“srs-SpatialRelation” in the description? |
| OPPO | We do not see strong necessarity for this TP too. It is not necessary to mention the name of higher layer parameters everywhere as long as the specification is clear. |
| ZTE | No strong view. We can accept the changes if other companies think it is necessary. |
| CATT | Support.  In the current specs, there is no specific higher layer parameter name mentioned here, and in fact DL PRS and SSB of a non-serving cell are configured by two different higher layer parameters, so we prefer to update it to make the configuration of DL PRS and SSB of a non-serving cell clearer. And we are open to update the names of parameters as Huawei’s comments. |
| LG | Support. It seems more clear description than the current version. |
| Apple | Agree with TP |
| CATT-2 | We had updated the TP as follows to address Huawei’ comments, hope it can be accepted by companies.  **Updated 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 indicated by the higher layer parameter *ssb-Index or ssb-IndexServing-r16*, CSI-RS indicated by the higher layer parameter *csi-RS-Index* or *csi-RS-IndexServing-r16* configured on serving cell indicated by higher layer parameter *servingCellId* if present, same serving cell as the target SRS otherwise, or an SRS indicated by the higher layer parameter *srs* or *srs-SpatialRelation-r16* 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 proposal on aspect #6

**Feature lead response to comments:**

There are 8 companies either neutral or supportive of the TP, with two companies saying the TP is not necessary. Based on the comments, it seem that there is no strong concerns on the TP but rather questions on the usefulness of it. Therefore we propose to go with the majority view and endorse the TP, using CATT’s updated version which address Huawei’s comments.

**Proposal for offline consensus: TP2.1.3 is endorsed for 38.214:**

Specification: TS 38.214

Clauses affected: 6.2.1

Reason for Change: clarification regarding the Spatial relation target reference signals for SRS for positioning.

Summary of Change: the correction clarifies that the spatial relation between a reference RS and the target SRS, including the names of the higher laye parameters used to configure the relation.

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| --- |
| **TP2.1.3**  *------------------------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 indicated by the higher layer parameter *ssb-Index or ssb-IndexServing-r16*, CSI-RS indicated by the higher layer parameter *csi-RS-Index* or *csi-RS-IndexServing-r16* configured on serving cell indicated by higher layer parameter *servingCellId* if present, same serving cell as the target SRS otherwise, or an SRS indicated by the higher layer parameter *srs* or *srs-SpatialRelation-r16* 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 --------------------------------------* |

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

|  |  |
| --- | --- |
| Company | Comment |
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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

|  |
| --- |
| **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

|  |  |
| --- | --- |
| Company | Comment |
| Nokia/NSB | Since we only have single port SRS-Pos we think that this change is not needed. The spec will be the same if this change is not made. |
| vivo | Same understanding as Nokia. No need. |
| Qualcomm | Not needed |
| Huawei/HiSilicon | Not needed. It has been discussed if I remember it correctly. |
| OPPO | Not needed. SRS for positioning is single-port. There is no issue of power split. |
| ZTE | Not need. |
| CATT | Support.  It is true SRS-Pos only support single port in Rel-16. However, if we decided that SRS-Pos can support multiple ports in Rel-17, the above descriptions should be clarified only be applicable to SRS-MIMO. |
| LG | Not needed |
| Apple | Not needed. We share a similar view as Nokia/NSB |

### feature lead proposal on aspect #8

**Feature lead response to comments:**

There are 8 companies either not supportive of the TP, with one company saying the TP may become necessary. Based on the comments, the overall majority does not support the TP

**Proposal for offline consensus: TP in 2.2.1 is not endorsed.**

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*”.

|  |
| --- |
| **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

|  |  |
| --- | --- |
| Company | Comment |
| Nokia/NSB | We are okay with the TP. The word “cells” at the end of the first sentence should also be updated to reflect the intended change. |
| vivo | OK |
| Qualcomm | OK |
| Huawei/HiSilicon | Agree with Nokia that there are remaining instances of “cell”.  Note that the TP in Aspect #6 also contains a instance of “cell” when it comes to PRS. |
| OPPO | Ok |
| ZTE | OK |
| CATT | Support.  There is another “cell” need to be updated, as pointed out by Nokia and Huawei. |
| LG | OK and agree with the comment from Nokia. |
| Apple | Support |

### feature lead proposal on aspect #11

**Feature lead response to comments:**

All 9 companies commenting are supportive of the TP. The proposed change by nokia is supported by 4 companies and is added to the TP.

**Proposal for offline consensus: TP2.3.3 is endorsed for 38.214:**

Specification: TS 38.214

Clauses affected: 5.1.6.5

Reason for Change: clarification regarding PRS resource association to TRPs.

Summary of Change: the correction clarifies that the PRS resources from the same cell are in the same TRP denoted by the parameter dl-PRS-ID-r16.

|  |
| --- |
| **TP2.3.3**  **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~~ *dl-PRS-ID-r16*. 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>* |

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

|  |  |
| --- | --- |
| Company | Comment |
|  |  |
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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.

|  |
| --- |
| 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

|  |  |
| --- | --- |
| Company | Comment |
| vivo | Priorities for SRS for positioning and other signals/channels have been discussed multiple times. At this stage, we don’t think this is essential correction for Rel-16. |
| Qualcomm | Not essential, lets discuss it in rel-17 |
| Huawei/HiSilicon | Not needed. It has been discussed. |
| OPPO | Not needed. It is a further optimization and it has been discussed in previous meeting. |
| ZTE | Not essential. |
| CATT | We prefer to discuss this issue as one of the enhancements for Rel-17 NR positioning. |
| LG | Support. We understand the majority view that would like to discuss this issue in Rel-17. Still, we would like to mention that the Rel-16 UE can simultaneously transmit the MIMO SRS resource and the positioning SRS resource, which is closely related to the Rel-16. |
| Apple | We prefer to discuss under Rel-17 |

### feature lead proposal on aspect #8

**Feature lead response to comments:**

There are 8 companies not supportive of the TP, with one company saying the TP clarifies the UE behaviour. Based on the comments, the overall majority does not support the TP

**Proposal for offline consensus: TP in 2.4.2 is not endorsed.**

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

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| Company | Comment |
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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**

|  |
| --- |
| 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.  *- dl-PRS-CombSizeN-r16* defines the comb size of a DL PRS resource where the allowable values are given in Clause 7.4.1.7.3 of [4, TS38.211]. All DL PRS resource sets belonging to the same positioning frequency layer have the same value of *dl-PRS-CombSizeN-r16*.  *- dl-PRS-ResourceBandwidth-r16* defines the number of resource blocks configured for DL PRS transmission. The parameter has a granularity of 4 PRBs with a minimum of 24 PRBs and a maximum of 272 PRBs. All DL PRS resource sets within a positioning frequency layer have the same value of *dl-PRS-ResourceBandwidth-r16*.  *- dl-PRS-StartPRB-r16* defines the starting PRB index of the DL PRS resource with respect to reference Point A, where reference Point A is given by the higher-layer parameter *dl-PRS-PointA-r16*. The starting PRB index has a granularity of one PRB with a minimum value of 0 and a maximum value of 2176 PRBs. All DL PRS resource sets belonging to the same positioning frequency layer have the same value of *dl-PRS-StartPRB-r16*.  ------------------------------------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.  *- dl-PRS-ResourceList-r16* determines the DL PRS resources that are contained within one DL PRS resource set.  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**

|  |
| --- |
| **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

|  |  |
| --- | --- |
| Company | Comment |
| Nokia/NSB | Alignment CRs are also being discussed in a different email thread at RAN1#103-e. Suggest not to duplicate the work and to make a new TP here which handles the other issues that are not parameter name related. |
| Vivo | We’re OK with moving the description of dl-PRS-ResourceList-r16 to DL PRS resource set in TP#1.  We don’t think moving the descriptions of *dl-PRS-CombSizeN-r16, dl-PRS-ResourceBandwidth-r16,* and *dl-PRS-StartPRB-r16* in TP#1 is necessary.  OK with other editorial changes in TP#1 and TP#2. |
| Qualcomm | No need to move the descriptions in TP#1. OK with the editorial changes. |
| Huawei/HiSilicon | OK with the changes except for the following change in TP#1 as “L” should be lower case.  *dL-PRS-CyclicPrefix* |
| OPPO | Ok with TP 1 and 2.  About TP1, we think it is good to move the descriptions because current RAN1 specification text might cause some confusion to the understanding of higher layer configurations for DL PRS. |
| ZTE | OK with TPs. Agree with Huawei. |
| CATT | We share the same view with Nokia that it had better not to discuss the issue of alignment of parameter names here. |
| LG | OK with editorial changes suggested in TP#1 and TP#2. |
| Apple | OK with TPs (with note from Huawei/HiSilicon) |

### feature lead proposal on aspect #15

**Feature lead response to comments:**

7 companies support the editorial changes. 2 companies do not support the moving of text in TP#1. It is proposed to endorse the TPs editorial changes

**Proposal for offline consensus: TP2.5.3a and TP2.3.3b is endorsed for 38.214:**

Specification: TS 38.214

Clauses affected: 5.1.6.5

Reason for Change: editorial changes.

Summary of Change: the correction aligns the parameter names and correct typographical errors.

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| TP 2.5.3a5.1.6.5 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].  *- dlL-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.------------------------------------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.  *- dl-PRS-ResourceList-r16* determines the DL PRS resources that are contained within one DL PRS resource set.  *- dl-PRS-CombSizeN-r16* defines the comb size of a DL PRS resource where the allowable values are given in Clause 7.4.1.7.1 of [TS38.211]. All DL PRS resource sets belonging to the same positioning frequency layer have the same value of *dl-PRS-CombSizeN-r16*.  *- dl-PRS-ResourceBandwidth-r16* defines the number of resource blocks configured for DL PRS transmission. The parameter has a granularity of 4 PRBs with a minimum of 24 PRBs and a maximum of 272 PRBs. All DL PRS resources sets within a positioning frequency layer have the same value of *dl-PRS-ResourceBandwidth-r16*.  *- dl-PRS-StartPRB-r16* defines the starting PRB index of the DL PRS resource with respect to reference Point A, where reference Point A is given by the higher-layer parameter *dl-PRS-PointA-r16*. The starting PRB index has a granularity of one PRB with a minimum value of 0 and a maximum value of 2176 PRBs. All DL PRS resource sets belonging to the same positioning frequency layer have the same value of *dl-PRS-StartPRB-r16*.  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 ------------------------------------------------- |

Specification: TS 38.214

Clauses affected: 5.1.6.5

Reason for Change: editorial changes.

Summary of Change: the correction aligns the parameter names and correct typographical errors.

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| **TP2.5.3b**  **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 ----* |

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

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| Company | Comment |
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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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| Company | Comment |
| Nokia/NSB | We don’t see the change as needed. It seems obvious from the current wording that SSB index would be the same. |
| vivo | OK |
| Qualcomm | OK |
| Huawei/HiSilicon | We do not see it needed. There is no way in the current LPP ASN.1 that SSB as the QCL-C source and as the QCL-D source could be from different cells.  DL-PRS-QCL-Info-r16 ::= CHOICE {  ssb-r16 SEQUENCE {  pci-r16 NR-PhysCellID-r16,  ssb-Index-r16 INTEGER (0..63),  rs-Type-r16 ENUMERATED {typeC, typeD, typeC-plus-typeD}  },  dl-PRS-r16 SEQUENCE {  qcl-DL-PRS-ResourceID-r16 NR-DL-PRS-ResourceID-r16,  qcl-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16  }  } |
| OPPO | We think it is a useful clarification in RAN1 spec. |
| ZTE | Not need. As quoted by Huawei, the parameter pci-r16 and ssb-Index-r16 are configured for both typeC and typeD, it’s naturally that typeC and typeD share the same QCL source. |
| CATT | We prefer to not change the current specs, as the issue looks like not exist. |
| LG | We do not see strong need to change the current spec, since the current spec is still clear. |
| Apple | Support TP, as it adds more clarity. |
| Huawei/HiSilicon | This is to notify that we provided additional comments to the editor CR on parameter name alignment, with the following comments and change suggestions.   1. We do not have *qcl-Type* in LPP ASN.1, which makes the following description not aligned with higher layer parameters.  |  | | --- | | *-        dl-PRS-QCL-Info-r16* defines any quasi co-location information of the DL PRS resource with other reference signals. The DL PRS may be configured with *qcl-Type* set to 'typeD' with a DL PRS or SS/PBCH Block from a serving cell or a non-serving cell. The DL PRS may be configured with *qcl-Type* set to to be 'typeC' with a SS/PBCH Block from a serving or non-serving cell. If the DL PRS is configured with *qcl-Type* set to both 'typeC' and 'typeD' with a SS/PBCH Block then the indicated SSB index should be the same. |   See the following LPP ASN.1  DL-PRS-QCL-Info-r16 ::= CHOICE {      ssb-r16                   SEQUENCE {         pci-r16                      NR-PhysCellID-r16,         ssb-Index-r16                INTEGER (0..63),         rs-Type-r16                      ENUMERATED {typeC, typeD, typeC-plus-typeD}      },      dl-PRS-r16                SEQUENCE {         qcl-DL-PRS-ResourceID-r16    NR-DL-PRS-ResourceID-r16,         qcl-DL-PRS-ResourceSetID-r16 NR-DL-PRS-ResourceSetID-r16      }  }  Our suggestion is as follows   |  | | --- | | *- dl-PRS-QCL-Info-r16* defines any quasi co-location information of the DL PRS resource with other reference signals. The DL PRS may be configured with QCL 'typeD' with a DL PRS from a serving cell or a non-serving cell, or with *rs-Type-r16* to be 'typeC', 'typeD', or 'typeC-plus-typeD' with a SS/PBCH Block from a serving or non-serving cell. | |
| LG2 | The modified TP from Huawei is OK to us in order to align the higher layer parameter in LPP with RAN1 spec. In addition, it seems that removing the last sentence “If the PRS is configured … should be the same” is reasonable. Then we think this issue (aspect #17) can be simply addressed. |

### feature lead proposal on aspect #17

**Feature lead response to comments:**

There are 5 companies not supportive of the TP, with 4 company saying the TP is agreeable. There is a modified TP proposed by Huawei, with only 1 company commenting so far. The update from Huawei is proposed to check if a consensus can be reached.

**Proposal for offline consensus: TP 2.6.3 is endorsed for 38.214**

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| **TP2.6.3**  **38.214**  **5.1.6.5 PRS reception procedure**  *- dl-PRS-QCL-Info-r16* defines any quasi co-location information of the DL PRS resource with other reference signals. The DL PRS may be configured with QCL 'typeD' with a DL PRS from a serving cell or a non-serving cell, or with *rs-Type-r16* to be 'typeC', 'typeD', or 'typeC-plus-typeD' with a SS/PBCH Block from a serving or non-serving cell. |

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

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| Company | Comment |
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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)