**3GPP TSG RAN WG1 #106-e R1-210xxxx**

**e-Meeting, August 16th – 27th, 2021**

**Agenda item:** 7.2.11

**Source:** Moderator (NTT DOCOMO, INC.)

**Title:** Summary on [106-e-NR-UEFeature-Positioning-01]

**Document for:** Discussion and Decision

1. Introduction

This contribution summarizes the following email discussion/approval at RAN1#106-e meeting.

[106-e-NR-UEFeature-Positioning-01] Email discussion/approval on UE features for NR positioning by August 20 – Hiroki (DOCOMO)

* Add the value 96 for component 1 in FG13-2b, FG13-3b, and FG13-4b to align with the TS 37.355
* Adopt either one of the following alternatives for including PRS-only TP in FG13-7a, 13-9b and 13-10e (only after RAN2 made some progress on this issue)
  + Alt.1: Adding a Note to include PRS-only TP in the related FGs for the purpose of UE feature list (TR 38.822) maintenance
  + Alt.2: Adding a second component to include PRS-only TP in the related FGs for the purpose of UE feature list (TR 38.822) maintenance

1. Discussion on UE features for NR positioning
   1. Add the value 96 for component 1 in FG13-2b, FG13-3b, and FG13-4b to align with the TS 37.355

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|  | 13-2b | DL PRS Resources for DL AoD on a band combination | 1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1-only.  Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR1 only BC.  2. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2-only.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR2 only BC  3. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1 in FR1/FR2 mixed operation.  Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands  4. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2 in FR1/FR2 mixed operation.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands | 13-1 | *1 fr1-Only-r16*  *2 fr2-Only-r16*  *3 fr1-r16/ fr1-FR2Mix-r16*  *4 fr2-r16/ fr1-FR2Mix-r16* | *maxNrOfDL-PRS-ResourcesAcrossAllFL-TRP-ResourceSet-r16/*  *DL-PRS-ResourcesBandCombination-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  the reported value is the total number across all bands in the corresponding BC  Note: if the UE does not indicate this capability for a band or band combination, the UE does not support this positioning method in this band or band combination. | Optional with capability signaling |
|  | 13-3b | DL PRS Resources for DL-TDOA on a band combination | 1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1-only.  Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR1 only BC.  2. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2-only.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR2 only BC  3. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1 in FR1/FR2 mixed operation.  Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands  4. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2 in FR1/FR2 mixed operation.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands | 13-1 | *1 fr1-Only-r16*  *2 fr2-Only-r16*  *3 fr1-r16/ fr1-FR2Mix-r16*  *4 fr2-r16/ fr1-FR2Mix-r16* | *maxNrOfDL-PRS-ResourcesAcrossAllFL-TRP-ResourceSet-r16/*  *DL-PRS-ResourcesBandCombination-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  the reported value is the total number across all bands in the corresponding BC  Note: if the UE does not indicate this capability for a band or band combination, the UE does not support this positioning method in this band or band combination. | Optional with capability signaling |
|  | 13-4b | DL PRS Resources for Multi-RTT on a band combination | 1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1-only.  Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR1 only BC.  2. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2-only.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR2 only BC  3. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1 in FR1/FR2 mixed operation.  Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands  4. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2 in FR1/FR2 mixed operation.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands | 13-1 | *1 fr1-Only-r16*  *2 fr2-Only-r16*  *3 fr1-r16/ fr1-FR2Mix-r16*  *4 fr2-r16/ fr1-FR2Mix-r16* | *maxNrOfDL-PRS-ResourcesAcrossAllFL-TRP-ResourceSet-r16/*  *DL-PRS-ResourcesBandCombination-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  the reported value is the total number across all bands in the corresponding BC  Note: if the UE does not indicate this capability for a band or band combination, the UE does not support this positioning method in this band or band combination. | Optional with capability signaling |

Following proposal is made in a contribution.

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| [1] | UE PRS resource capability Another problem is on the misalignment between TS 37.355 and the UE capability spreadsheet/TR 38.822 on the number of PRS resources that UE can processing for FR1 in a band combination involving both FR1 and FR2.  The value range of the field *fr1-r16* in *maxNrOfDL-PRS-ResourcesAcrossAllFL-TRP-ResourceSet-r16* of TS 37.355 [4], includes the n96:  DL-PRS-ResourcesBandCombination-r16 ::= SEQUENCE {  bandList-r16 SEQUENCE (SIZE (1..maxSimultaneousBands-r16)) OF  FreqBandIndicatorNR-r16,  maxNrOfDL-PRS-ResourcesAcrossAllFL-TRP-ResourceSet-r16  CHOICE {  fr1-Only-r16 ENUMERATED {n6, n24, n64, n128, n192,  n256, n512, n1024, n2048},  fr2-Only-r16 ENUMERATED {n24, n64, n96, n128, n192,  n256, n512, n1024, n2048},  fr1-FR2Mix-r16 SEQUENCE {  fr1-r16 ENUMERATED {n6, n24, n64, n96, n128,  n192, n256, n512, n1024, n2048},  fr2-r16 ENUMERATED {n24, n64, n96, n128, n192,  n256, n512, n1024, n2048},  ...  },  ...  },  ...  }  However, the value n96 does not exist in TR 38.822. We do not think changing TS 37.355 is needed, and thus propose that the existing UE capability value be updated. The impacted FGs include [2]:   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | 13-2b | DL PRS Resources for DL AoD on a band combination | 1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1-only.  Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR1 only BC.  2. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2-only.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR2 only BC  3. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1 in FR1/FR2 mixed operation.  Values = {6, 24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands  4. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2 in FR1/FR2 mixed operation.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands | 13-1 | *1 fr1-Only-r16*  *2 fr2-Only-r16*  *3 fr1-r16/ fr1-FR2Mix-r16*  *4 fr2-r16/ fr1-FR2Mix-r16* | *maxNrOfDL-PRS-ResourcesAcrossAllFL-TRP-ResourceSet-r16/*  *DL-PRS-ResourcesBandCombination-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  the reported value is the total number across all bands in the corresponding BC  Note: if the UE does not indicate this capability for a band or band combination, the UE does not support this positioning method in this band or band combination. | Optional with capability signaling | |  | 13-3b | DL PRS Resources for DL-TDOA on a band combination | 1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1-only.  Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR1 only BC.  2. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2-only.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR2 only BC  3. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1 in FR1/FR2 mixed operation.  Values = {6, 24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands  4. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2 in FR1/FR2 mixed operation.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands | 13-1 | *1 fr1-Only-r16*  *2 fr2-Only-r16*  *3 fr1-r16/ fr1-FR2Mix-r16*  *4 fr2-r16/ fr1-FR2Mix-r16* | *maxNrOfDL-PRS-ResourcesAcrossAllFL-TRP-ResourceSet-r16/*  *DL-PRS-ResourcesBandCombination-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  the reported value is the total number across all bands in the corresponding BC  Note: if the UE does not indicate this capability for a band or band combination, the UE does not support this positioning method in this band or band combination. | Optional with capability signaling | |  | 13-4b | DL PRS Resources for Multi-RTT on a band combination | 1. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1-only.  Values = {6, 24, 64, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR1 only BC.  2. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2-only.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for FR2 only BC  3. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR1 in FR1/FR2 mixed operation.  Values = {6, 24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands  4. Max number of DL PRS Resources supported by UE across all frequency layers, TRPs and DL PRS Resource Sets for FR2 in FR1/FR2 mixed operation.  Values = {24, 64, 96, 128, 192, 256, 512, 1024, 2048}  Note this is reported for BC containing FR1 and FR2 bands | 13-1 | *1 fr1-Only-r16*  *2 fr2-Only-r16*  *3 fr1-r16/ fr1-FR2Mix-r16*  *4 fr2-r16/ fr1-FR2Mix-r16* | *maxNrOfDL-PRS-ResourcesAcrossAllFL-TRP-ResourceSet-r16/*  *DL-PRS-ResourcesBandCombination-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  the reported value is the total number across all bands in the corresponding BC  Note: if the UE does not indicate this capability for a band or band combination, the UE does not support this positioning method in this band or band combination. | Optional with capability signaling |  Conclusion  * ***Proposal 2: Add the value 96 in FG13-2b, FG13-3b, and FG13-4b to align with the TS 37.355.*** |

During the preparation phase email discussion, following comments are provided.

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| ZTE | For the second issue, we support to revise UE capability. |
| Nokia, NSB | On the second issue (value 96) it is OK to discuss it this week, as we need to align the capabilities. By the way, in order to make an informed decision it would be useful to understand why the value 96 was added to 37.355 in the first place. |
| Ericsson | For the second bullet, we are fine with the revision of component 1 with the added value. |

Based on the above, following proposal can be discussed in RAN1#106-e meeting.

**FL proposal #1**

* **Add the value 96 for component 1 in FG13-2b, FG13-3b, and FG13-4b to align with the TS 37.355**

Companies are encouraged to check above FL proposal and to provide feedback if any in below. If you cannot accept the FL proposal, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

Cannot accept the proposal:

|  |  |
| --- | --- |
| Company | Comment |
| Huawei, HiSilicon | Support.  In reponse to Nokia’s question, I believe it was an unintentional mistake.  We do not think it is needed to ask RAN2 to do the NBC change to fix that, since no agreed number is missing. |
| Qualcomm | OK, but it would be good to clarify: Add this value in the spreadsheet (aka, TR 38.822) since the TS 37.355 already has those values. |
| Nokia, NSB | We are fine in principle, as we don’t see a justification to introduce and NBC change due to this issue. |
| CATT | We are fine with adding the value 96 in TR 38.822, since TS 37.355 have this value but it does not exist in TR 38.822. |
| OPPO | Support to add the value of 96 to the spreadsheet and TR 38.822 |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!  According to the suggestion for clarification, we can update the wording of the proposal as below. **Updated FL proposal #1**  * **Add the value 96 for component 1 in FG13-2b, FG13-3b, and FG13-4b in RAN1 NR UE features list, to align with the TS 37.355**   Based on the RAN plenary guideline for TR38.822 update below, it is RAN2 work to update 38.822 based on RAN1 LS with updated RAN1 UE features list.  So same as previous procedure, we can send updated RAN1 UE features list with LS to RAN2 with clarifying our intention (although it might be an unintentional mistake, RAN1 think no need to do NBC change to fix it. Just adding value 96 in TR38.822 to align with TS 37.355 is ok for RAN1).  ---  Endorse the following guidelines on updating the TR for Rel-16 features:   * For 38822, updates to RAN1 and RAN4 features shall be initiated in the respective group and communicated to RAN2 by LS (as today) * For the RAN2 work: 38822 is updated following agreed changes to 38306, and received LSes with updates to RAN1 and RAN4 feature lists. CR for such updates are only initiated by the rapporteur. Any other CRs should be limited (up to RAN2 chair on how this is done) to not cause workload in RAN2. |

**Updated FL proposal #1**

* **Add the value 96 for component 1 in FG13-2b, FG13-3b, and FG13-4b in RAN1 NR UE features list, to align with the TS 37.355**

Companies are encouraged to check above FL proposal and to provide feedback if any in below. If you cannot accept the FL proposal, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

Cannot accept the proposal:

|  |  |
| --- | --- |
| Company | Comment |
| Nokia, NSB | We support the proposal in order to align the capability with the RRC spec. |
| CATT | Support the proposal. |
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Based on the discussion, following agreement was made.

**Agreement:**

* **Add the value 96 for component 1 in FG13-2b, FG13-3b, and FG13-4b in RAN1 NR UE features list, to align with the TS 37.355**
  1. Add PRS-only TP in FG13-7a, 13-9b and 13-10e

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|  | 13-7a | Support of DL PRS from serving/neighbor cell as QCL source of a DL PRS | 1. Support of DL PRS from serving/neighbor cell as QCL source of a DL PRS  Note: Refers to Type-D support for FR2 | 13-1 | *prs-FromServNeighCellAsQCL-r16* | *DL-PRS-QCL-ProcessingCapabilityPerBand-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  DL PRSs are in the same band | Optional with capability signaling |
|  | 13-9b | OLPC for SRS for positioning based on PRS from the neighbouring cells | 1. OLPC for SRS for positioning based on PRS from the neighbouring cells in the same band | 13-9 | *LPP*  *olpc-SRS-PosBasedOnPRS-Neigh-r16*  *RRC*  *olpc-SRS-PosBasedOnPRS-Neigh-r16* | *LPP*  *OLPC-SRS-Pos-r16*  *RRC*  *OLPC-SRS-Pos-r16* | n/a | n/a | RAN1 kindly requests RAN2 to decide on the necessity for location server to know if the feature is supported | Optional with capability signaling |
|  | 13-10e | Spatial relation for SRS for positioning based on PRS from the neighbouring cell | 1. Spatial relation for SRS for positioning based on PRS from the neighbouring cell in the same band | 13-10b | *LPP*  *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16*  *RRC*  *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16* | *LPP*  *SpatialRelationsSRS-Pos-r16*  *RRC*  *SpatialRelationsSRS-Pos-r16* | n/a | n/a (FR2 only) | Need for location server to know if the feature is supported. | Optional with capability signaling |

Following proposal is made in a contribution.

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| [1] | Introduction In RAN2#114-e, the discussion on the support PRS-only TP in LPP was noted below, with the indication of PRS-only TP postponed to the next meeting [1].   |  | | --- | | [R2-2106465](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202105%20-%20RAN2_114-e,%20Online\Extracts\R2-2106465%20LPP.docx) Summary for LPP Corrections for Positioning Ericsson discussion Rel-16 NR\_pos-Core  Proposal 2 RAN2 to discuss CR R2-2105054 and decide if PRS-only TP applicability explicitly needs to be clarified in LPP specification.  Discussion:  P2:  Ericsson think we have already captured what the TP is in stage 2 and NRPPa, so this may not be needed.  Qualcomm think the clarification for PRS-only TP is useful to have, but we should do it in the same way as LTE. The CR as written makes the PCI mandatory in the cell ID in the assistance data; it can be done with a simple flag. They also think the requirement on the UE to include the cell ID does not work since the UE does not routinely decode SIB1 for neighbour cells, and copying the CGI from the assistance data does not work to disambiguate the report.  Nokia point out the fields are Need ON and so no UE behaviour may be needed. They understand that we have a definition of PRS-only TP in the definitions.  Qualcomm clarify that the indication to the UE that the AD is for a PRS-only TP is useful. We have this flag in LTE and it would be similarly useful in NR.  Huawei confirm that the definition is there in stage 2, but they think it is needed also from the stage 3 perspective. On Qualcomm’s comment about copying the CGI, they think this can be done since the CGI is used to differentiate cells. Qualcomm understand that there is no value in copying it from the assistance data and it would make sense to include the DL-PRS-Id or an index into the AD list. Huawei think the UE could obtain CGI from the SI of the reported cell.  Intel understand that the intention of the CR is for the PRS-only TP, and the reporting of CGI is separate from this; the CGI appears also outside the timestamp IE. Their understanding is that the UE can report the CGI if available, otherwise PCI+ARFCN, and the UE implementation can determine what is available.  Ericsson think an ASN.1 change can be avoided and the PRS-only TP is already clear from the options in the cell ID.   * Email   [R2-2106584](file:///C:\Users\mtk16923\Documents\3GPP%20Meetings\202105%20-%20RAN2_114-e,%20Online\Extracts\R2-2106584%20LPP.docx) [AT114-e][614][POS] Remaining issues on LPP (Ericsson) Ericsson discussion Rel-16 NR\_pos-Core  Proposal 2 PRS-Only TP indication is postponed to next meeting to allow companies to check if the change is essential and if yes how to address it; (example either via changing Need code and field description or flag in LPP ASN.1 with new range of PRS IDs)  [I.e. R2-2105054 is postponed]  => The above proposals are agreed |   During the discussion, it was clarified that RAN2 intended to introduce PRS-only TP, which was clearly defined in TS 38.305 [3] as below.   |  | | --- | | **Transmission Point (TP)**: A set of geographically co-located transmit antennas (e.g. antenna array (with one or more antenna elements)) for one cell, part of one cell or one DL-PRS-only TP. Transmission Points can include base station (ng-eNB or gNB) antennas, remote radio heads, a remote antenna of a base station, an antenna of a DL-PRS-only TP, etc. One cell can include one or multiple transmission points. For a homogeneous deployment, each transmission point may correspond to one cell.  **PRS-only TP**: A TP which only transmits PRS signals and is not associated with a cell. |  DiscussionUE features for PRS-only TP Given that PRS-only TP may exist in NR systems, the current UE capabilities may require additional change to accommodate it. The impacted FGs include [2]   * FG13-7a (PRS-PRS QCL capability) * FG13-9b (SRS open loop power control via PRS) * FG13-10e (SRS spatial relation via PRS)  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | 13-7a | Support of DL PRS from serving/neighbor cell as QCL source of a DL PRS | 1. Support of DL PRS from serving/neighbor cell as QCL source of a DL PRS  Note: Refers to Type-D support for FR2 | 13-1 | *prs-FromServNeighCellAsQCL-r16* | *DL-PRS-QCL-ProcessingCapabilityPerBand-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  DL PRSs are in the same band | Optional with capability signaling | |  | 13-9b | OLPC for SRS for positioning based on PRS from the neighbouring cells | 1. OLPC for SRS for positioning based on PRS from the neighbouring cells in the same band | 13-9 | *LPP*  *olpc-SRS-PosBasedOnPRS-Neigh-r16*  *RRC*  *olpc-SRS-PosBasedOnPRS-Neigh-r16* | *LPP*  *OLPC-SRS-Pos-r16*  *RRC*  *OLPC-SRS-Pos-r16* | n/a | n/a | RAN1 kindly requests RAN2 to decide on the necessity for location server to know if the feature is supported | Optional with capability signaling | |  | 13-10e | Spatial relation for SRS for positioning based on PRS from the neighbouring cell | 1. Spatial relation for SRS for positioning based on PRS from the neighbouring cell in the same band | 13-10b | *LPP*  *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16*  *RRC*  *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16* | *LPP*  *SpatialRelationsSRS-Pos-r16*  *RRC*  *SpatialRelationsSRS-Pos-r16* | n/a | n/a (FR2 only) | Need for location server to know if the feature is supported. | Optional with capability signaling |   In our view, there is no such need to differentiate PRS from a non-serving cell and PRS from a PRS-only TP, since the measurement towards such type of PRS (not from the serving cell) should be the same for the UE.  The corresponding change may take either one of the following two alternatives.   * Alt.1 Adding a Note in the related FGs for the purpose of UE feature list (TR 38.822) maintenance.  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | 13-7a | Support of DL PRS from serving/neighbor cell as QCL source of a DL PRS | 1. Support of DL PRS from serving/neighbor cell as QCL source of a DL PRS  Note: Refers to Type-D support for FR2  Note: This also includes PRS from a PRS-only TP as QCL source. | 13-1 | *prs-FromServNeighCellAsQCL-r16* | *DL-PRS-QCL-ProcessingCapabilityPerBand-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  DL PRSs are in the same band | Optional with capability signaling | |  | 13-9b | OLPC for SRS for positioning based on PRS from the neighbouring cells | 1. OLPC for SRS for positioning based on PRS from the neighbouring cells in the same band  Note: This also includes OLPC for SRS for positioning based on PRS from a PRS-only TP. | 13-9 | *LPP*  *olpc-SRS-PosBasedOnPRS-Neigh-r16*  *RRC*  *olpc-SRS-PosBasedOnPRS-Neigh-r16* | *LPP*  *OLPC-SRS-Pos-r16*  *RRC*  *OLPC-SRS-Pos-r16* | n/a | n/a | RAN1 kindly requests RAN2 to decide on the necessity for location server to know if the feature is supported | Optional with capability signaling | |  | 13-10e | Spatial relation for SRS for positioning based on PRS from the neighbouring cell | 1. Spatial relation for SRS for positioning based on PRS from the neighbouring cell in the same band  Note: This also includes spatial relation for SRS for positioning based on PRS from a PRS-only TP. | 13-10b | *LPP*  *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16*  *RRC*  *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16* | *LPP*  *SpatialRelationsSRS-Pos-r16*  *RRC*  *SpatialRelationsSRS-Pos-r16* | n/a | n/a (FR2 only) | Need for location server to know if the feature is supported. | Optional with capability signaling |  * Alt.2 Adding a second component in the related FGs for the purpose of UE feature list (TR 38.822) maintenance.  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | |  | 13-7a | Support of DL PRS from serving/neighbor cell as QCL source of a DL PRS | 1. Support of DL PRS from serving/neighbor cell as QCL source of a DL PRS  2. Support of DL PRS from a PRS-only TP as QCL source of a DL PRS  Note: Refers to Type-D support for FR2 | 13-1 | *prs-FromServNeighCellAsQCL-r16* | *DL-PRS-QCL-ProcessingCapabilityPerBand-r16*  *LPP* | n/a | n/a | Need for location server to know if the feature is supported.  DL PRSs are in the same band | Optional with capability signaling | |  | 13-9b | OLPC for SRS for positioning based on PRS from the neighbouring cells | 1. OLPC for SRS for positioning based on PRS from the neighbouring cells in the same band  2. OLPC for SRS for positioning based on PRS from a PRS-only TP in the same band | 13-9 | *LPP*  *olpc-SRS-PosBasedOnPRS-Neigh-r16*  *RRC*  *olpc-SRS-PosBasedOnPRS-Neigh-r16* | *LPP*  *OLPC-SRS-Pos-r16*  *RRC*  *OLPC-SRS-Pos-r16* | n/a | n/a | RAN1 kindly requests RAN2 to decide on the necessity for location server to know if the feature is supported | Optional with capability signaling | |  | 13-10e | Spatial relation for SRS for positioning based on PRS from the neighbouring cell | 1. Spatial relation for SRS for positioning based on PRS from the neighbouring cell in the same band  2. Spatial relation for SRS for positioning based on PRS from a PRS-only TP in the same band | 13-10b | *LPP*  *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16*  *RRC*  *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16* | *LPP*  *SpatialRelationsSRS-Pos-r16*  *RRC*  *SpatialRelationsSRS-Pos-r16* | n/a | n/a (FR2 only) | Need for location server to know if the feature is supported. | Optional with capability signaling |   We do not see a strong need to update the name for the FG, since the changes in the components should be sufficient.  The Stage-3 change in LPP and RRC capturing the related change can be up to RAN2. Conclusion In this contribution, we have the following observations and proposals to correct the UE feature for NR positioning.  ***Observation 1: PRS-only TP is supported by RAN2 specification.***  ***Observation 2: No need to differentiate between PRS from a PRS-only TP and PRS from a non-serving cell.***  ***Observation 3: No need to update the name of the FG.***   * ***Proposal 1: Adopt either one of the following alternatives for including PRS-only TP in FG13-7a, FG13-9b, and FG13-10e.*** * ***Alt.1 Adding a Note to include PRS-only TP in the related FGs for the purpose of UE feature list (TR 38.822) maintenance.*** * ***Alt.2 Adding a second component to include PRS-only TP in the related FGs for the purpose of UE feature list (TR 38.822) maintenance.*** |

During the preparation phase email discussion, following comments are provided.

|  |  |
| --- | --- |
| ZTE | For the first issue, we slightly prefer Alt.1 for simplicity. |
| Nokia, NSB | For the first issue (PRS-only) we think it is premature to have a discussion on UE capabilities this meeting. The topic is still being debated in RAN2, and if needed we can address it after the situation becomes clearer in that group. Another aspect regarding the issue itself is that in principle it is not clear if there is any RAN1 impact that would justify changes to RAN1 UE features, but perhaps that will become clear once the topic is resolved in RAN2. |
| OPPO | Support the discussion and we prefer Alt.1 |
| Qualcomm | OK to discuss both issues. For first issue, Alt.2 is really not needed. In principle, we should be OK with Alt. 1 .  We also tend to agree with Nokia that RAN1 behaviors does not really change, but our understanding is that RAN2 will receive an LS with the updated spreadsheet and add the new notes in the description of those fields in 37.355. |
| Ericsson | For the first bullet, the PRS-only TP discussion has not converged in RAN2, therefore we prefer to delay the discussion on the issue until RAN2 is finished with the discussion. |
| CATT | Support to discuss the first issue and down-select from the two alternatives. |

Based on the above, following proposed Alt.1 can be discussed in RAN1#106-e meeting once RAN2 made some progress on this issue.

### **FL proposal #2**

* **Adopt the following for including PRS-only TP in** **FG13-7a, 13-9b and 13-10e**
  + **Adding a Note to include PRS-only TP in the related FGs for the purpose of UE feature list (TR 38.822) maintenance**

Companies are encouraged to check above FL proposal and to provide feedback if any in below. If you cannot accept the FL proposal, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

Cannot accept the proposal:

|  |  |
| --- | --- |
| Company | Comment |
| Moderator (NTT DOCOMO) | Please provide inputs only after RAN2 made some progress on the issue. |
| Nokia, NSB | We don’t see any need for the note in the capability. The UE capability indicates that the UE can do these things with PRS, and there is no need to make a list of the node types the PRS can transmitted in the UE capability on as long as there is no need to differentiate the different nodes in different capabilities. |
| Huawei | I checked the RAN2 discussion, and it seems RAN2 already agreed to introduce PRS-only TP flag so that UE is aware that there should be no cell/SSB associated with the TP. In the meantime, RAN2 will continue to discuss other matters, including cell ID signaling for PRS-only TP, and tp-ID signaling. I am not sure whether we should proceed on proposal 2 now. Appreciate the clarification from you and other companies. |
| Moderator (NTT DOCOMO) | Thanks for the feedbacks!  Based on the RAN2 situation reported by Huawei above, introducing PRS-only TP is already agreed in RAN2 and hence we can also start discussion on FL proposal #2.  Please provide your feedback on FL proposal #2 if any before entering quiet period. |
| CATT | Support the FL proposal, and we think adding a note is needed. |
| Huawei, HiSIlicon | Support the Note.  Reply to Nokia/NSB, we have separate capabilities for the serving and non-serving cell at least for SRS related capabilities, and the Note simply expands the capability on the neighbouring cell to PRS-only TPs.  Without it, it could misinterpreted that PRS from a PRS-only cannot be the spatial relation or pathloss reference RS for a positioning SRS, and of course the QCL source of another PRS. |
| Nokia, NSB | @Huawei,the serving cell and neigbour cell PRS as QCL source have different L1 properties and the OLPC for SRS and spatial relation for SRS capabilities differentiate serving and non-serving so they need to be differentiated. As long as the PRS-only TP is just seen as a PRS as a QCL source, and the SRS related behaviour is the same for PRS-only TP and a regular gNB, there is no need to differentiate the two in the capability any more than there is e.g. a need to differentiate an IAB node. |
| Moderator (NTT DOCOMO) | Thank you very much for further discussion.  Based on the discussion, the proposal to clarify that PRS-only TP can also be one type of non-serving cell in terms of FG 13-7a/9b/10e in RAN1 UE features list (38.822) may or may not be necessary although it is common understanding among all companies participating this discussion.  One possible alternative may be to share the RAN1’s common understanding with RAN2 to be described in LS body text (not in UE features list) so that RAN2 can decide whether it should be clarified in 38.822 or not.   * *For FG 13-7a/9b/10e, it is RAN1 understanding that PRS from a PRS-only TP can be treated as same as PRS from a non-serving cell. It is up to RAN2 to clarify it by adding a note for these FGs in TR38.822.*   I’d like to ask companies to provide feedback on above alternative proposal, or to continue discussing on necessity of having a note in UE features list (if either side can convince another side). |
| Huawei, HiSilicon | Reply to Nokia: Reply to Nokia, I believe there may be difference between PRS-only TP and non-cell serving, based on RAN2 discussion. For PRS from a neighbouring cell, it is possible that in order to receive PRS from a non-serving cell, the UE may attempt to receive other signals (e.g SSB, SIB1) from the non-serving cell. Anyway, this is part of the RAN2 discussion.  In addition to the potential update of TR 38.822, RAN2 may also need to consider whether the changes to 38.306/37.355 are needed, so we are generally fine with the moderator’s proposal and let RAN2 be aware of the RAN1 understanding and let them make their decisions to their spec. |
| Qualcomm | We are OK with the alternative proposal from the moderator |
| CATT | We are fine with the alternative which share the RAN1’s common understanding with RAN2, since the changes may impact not only 38.822, but also 37.355 and others. |
| Nokia, NSB | We are generally fine with the intention of the oderator proposal, but would like to suggest a small edit as now it seems to be asking RAN2 to go ahead and decide what sort of change to make rather than decide whether a change is necessary. Something like this (not sure if the no consensus statement is necessary, but it does seem to reflect the status of the discussion):   * *For FG 13-7a/9b/10e, it is RAN1 understanding that PRS from a PRS-only TP can be treated as same as PRS from a non-serving cell and no differentiation between the two is needed. It is up to RAN2 to determine if the UE PRS capabilities should explicitly mention PRS-only TP in ~~clarify it by adding~~ a note for these FGs in TR38.822. There was no consensus in RAN1 on whether a note is needed or not.*   Reply to Huawei: It is OK to differentiate PRS-only TP in a configuration to the UE if that is necessary, but as long as there is no difference in the capability between PRS support for regular gNB PRS and PRS-only (or IAB PRS or future smart repeater PRS), there is no reason to list the possible transmitters of the PRS in the capability. |

1. Conclusion

Based on the email discussion, following agreement was made.

**Agreement:**

* **Add the value 96 for component 1 in FG13-2b, FG13-3b, and FG13-4b in RAN1 NR UE features list, to align with the TS 37.355**

Reference

[1] R1-2106502 Discussion on positioning UE features Huawei, HiSilicon

[2] R1-2107997 Update to NR-DC Power sharing UE capabilities Ericsson

[3] R1-2108196 On Rel-16 UE Features Nokia, Nokia Shanghai Bell

[4] R1-2106158 Summary on [105-e-NR-UEFeature-MRDCCA-01] Moderator (NTT DOCOMO, INC.)

[5] R1-2108147 Removal of power sharing for FR2-FR2 dual connectivity from Rel-16 Nokia, Nokia Shanghai Bell

[6] 3GPP TR38.822 v16.0.0

[7] 3GPP TS38.306 v16.5.0