3GPP TSG RAN WG2 Meeting #117-e R2-220xxxx

**Electronic meeting, 21 Feb- 3 March, 2022**

**Agenda item:** 8.11.2.7

**Source:** Intel Corporation

**Title:** Report of [Pre117-e][612][POS] Open issues on positioning UE capabilities (Intel)

**Document for:**  Discussion and decision

# Introduction

This is the report of offline discussion [Pre117-e][612][POS] Open issues on positioning UE capabilities (Intel).

Feb 9th Start of Pre-discussions that collects structured company Input.

Feb 14th, 2359 UTC. **General Tdoc Submission Deadline**. Tdoc number allocation deadline. Kick off, summaries. Stop of Pre-discussions that collects structured company Input (rapporteurs to provide report at earliest convenient time, within 24h if possible).

Feb 17th 1800 UTC Tdocs submission deadline for Summaries

Companies please provide your comments by Feb 14th, 2359 UTC.

# Annex: companies’ point of contact

|  |  |  |
| --- | --- | --- |
| **Company** | **Point of contact** | **Email address** |
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| Swift Navigation | Grant Hausler | grant@swiftnav.com |
| Qualcomm | Sven Fischer | sfischer@qti.qualcomm.com |
| CATT | Jianxiang Li | lijianxiang@catt.cn |
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| Xiaomi | Xiaolong Li | lixiaolong1@xiaomi.com |
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# Discussion

Based on R2-2202005 and R2-2201722, positioning UE capabilities related open issues list for are captured in section 5 and 6. Only the issues not covered by other pre-meeting discussions will be discussed in Pre-117-e612.

## 3.2 RAN2 led items

### 3.2.1 Finer granularity of response time

LPP running CR rapporteur captured it as

|  |
| --- |
| ResponseTime --> unit-r15 --> ten-milli-seconds-r17  OTDOA-ProvideCapabilities --> ten-ms-unit-ResponseTime-r17  A-GNSS-ProvideCapabilities --> ten-ms-unit-ResponseTime-r17  ECID-ProvideCapabilities --> ten-ms-unit-ResponseTime-r17  TBS-ProvideCapabilities-r13 --> ten-ms-unit-ResponseTime-r17  Sensor-ProvideCapabilities-r13 --> ten-ms-unit-ResponseTime-r17  WLAN-ProvideCapabilities-r13 --> ten-ms-unit-ResponseTime-r17  BT-ProvideCapabilities-r13 --> ten-ms-unit-ResponseTime-r17  NR-ECID-ProvideCapabilities-r16 --> ten-ms-unit-ResponseTime-r17  NR-DL-TDOA-ProvideCapabilities-r16 --> ten-ms-unit-ResponseTime-r17  NR-DL-AoD-ProvideCapabilities-r16 --> ten-ms-unit-ResponseTime-r17  NR-Multi-RTT-ProvideCapabilities-r16 --> ten-ms-unit-ResponseTime-r17 |

The discussion was:

|  |
| --- |
| Huawei:  Not clear why the capability is affecting OTDOA/E-CID and RAT-independent response time capability.  We assume that 10-ms granularity only applies for NR positioning methods (DL and DL+UL as in the WID).  Nokia:  1. Whether the LTE positioning shall be enhanced to support finer granularity?  2. Although we support to introduce ten-milli-seconds, we would like to know if this has been concluded?  QC:  Issue #R1-7  Because it is in CommonIEsRequestLocationInformation. However, if we don't want this potentially being applicable to all methods, it can also be solved via field description. |

**Discussion point** **3.2.1-1: For the finer granularity, which option do you prefer?**

**Option 1** Finer granularity is only applied for NR RAT dependent positioning methods;

**Option 2** Finer granularity is only applied for NR RAT dependent positioning methods and RAT independent positioning methods;

**Option 3** Finer granularity is applied for LTE and NR RAT dependent positioning methods and RAT independent positioning methods;

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Option 1 or**  **Option 2 or Option 3** | **Comments, if any** |
| Huawei,HiSilicon | Option1 | No strong view on the supporting for the others though |
| Qualcomm | Option 1 | I think it is O.K. to support this for DL-TDOA, DL-AoD, and Multi-RTT only. Not sure if NR-ECID is needed as well. Corresponding field description can be added. |
| CATT | Option 3 |  |
| OPPO | Option 1 |  |
| Xiaomi | Option 1 |  |

**Summary:**

### 3.2.2 GNSS integrity

The capability on GNSS integrity was discussion in RAN2#116bis. Companies have different view on how to handle it. LPP running CR rapporteur captured it as

|  |
| --- |
| GNSS-SSR-CodeBiasSupport-r15🡪ssr-IntegrityCodeBiasBoundsSup-r17  GNSS-SSR-PhaseBiasSupport-r16🡪ssr-IntegrityPhaseBiasBoundsSup-r17  GNSS-SSR-STEC-CorrectionSupport-r16🡪stec-IntegritySup-r17  GNSS-SSR-GriddedCorrectionSupport-r16 🡪griddedCorrectionIntegritySup-r17  GNSS-CommonAssistanceDataSupport🡪GNSS-Integrity-ServiceAlertSupport-r17  GNSS-CommonAssistanceDataSupport🡪GNSS-Integrity-ServiceParametersSupport-r17 |

**Discussion point 3.2.2-1: For GNSS integrity capability, do you agree capabilities captured in the running LPP CR R2-2201723?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | Yes |  |
| Swift Navigation | Yes, with comments | Subject to the outcomes of Questions 1 & 5 in [Pre117-e][610][POS], if the Constellation Alert IE and Orbit/Clock Error Bound IE are added, then additional ‘Support’ messages for each IE are also needed under *GNSS-GenericAssistanceDataSupport.* |
| Qualcomm | Yes |  |
| CATT | Yes, with comments | Not sure why GNSS-Integrity-ServiceParametersSupport-r17 belongs to GNSS-CommonAssistanceDataSupport. Should the GNSS-Integrity-ServiceParameters be in the service parameter in Provide Location Information message? |
| OPPO | Yes |  |
| Xiaomi | Yes | We also would like to understand the issue indicated by CATT, |

**Summary: .**

## 3.3 RAN1 feature lists

Note: For RAN1 feature lists, Rapporteur will only provide TP to show how to capture RAN1 features. FFS should be resolved by RAN1.

### 3.3.1 27-1 TEG

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-1-1 | UE-RxTEGs for UE-assisted DL TDOA and/or Multi-RTT positioning | 1. Support of UE-RxTEGs for UE-assisted DL TDOA and/or Multi-RTT positioning  2. The maximum number of UE-RxTEG, which is supported and reported by UE for UE assisted DL TDOA and/or Multi-RTT positioning | 13-1, one or more of {13-3, 13-4} | No |  | UE-RxTEG reporting is not supported and no assumption can be made on the UE Rx timing errors for the measurements | per band | n/a | n/a | n/a | Component 1 candidate values: [One or more of] {UE-assisted DL TDOA, Multi-RTT positioning, UE-assisted DL TDOA and Multi-RTT positioning}  Component 2 candidate values: {1, 2, 3, 4, 6, 8}  Note: a single value is reported when both multi-RTT and DL-TDOA are supported  Need for location server to know if the feature is supported  If the UE does not include RxTEG-ID associated with a measurement, no assumption can be made on the UE Rx timing errors for this measurement  Note: The “per band” reporting on this capability does not imply, that the RxTEG IDs in the measurement report are grouped per band; In the measurement report, the RxTEG ID can span from 0, up to 31 | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-1-2 | Support of UE-TxTEGs for UL TDOA | The maximum number of UE-TxTEG for SRS resource for positioning, which is supported and reported by UE for UL TDOA | 13-8 | Yes |  | UE-TxTEGs for UL TDOA is not supported and no assumption can be made on the [mitigation of] UE Tx timing error for the SRS resource for positioning | per band | n/a | n/a | n/a | The candidate values are {1,2,3,4,6,8}  Need for location server to know if the feature is supported  Note: It should support the serving gNB to request the UE to provide the association information of UL SRS resources for positioning with Tx TEGs to the serving gNB for UL TDOA  Note: If the UE does not include TxTEG-ID associated with a SRS resource for positioning, no assumption can be made on the UE Tx timing error for this SRS resource for positioning. | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-1-2a | Support of UE-TxTEGs for Multi-RTT positioning | The maximum number of UE-TxTEG, which is supported and reported by UE for Multi-RTT positioning | 13-4, 13-8 | No |  | UE-TxTEGs for Multi-RTT positioning is not supported and no assumption can be made on the [mitigation of] UE Tx timing error for the SRS resource for positioning | per band | n/a | n/a | n/a | The candidate values are {1,2,3,4,6,8}  Need for location server to know if the feature is supported  If the UE does not include TxTEG-ID associated with a measurement, no assumption can be made on the [mitigation of] UE Tx timing errors for this SRS resource for positioning  Note: It should support the LMF to request the UE to provide the association information of UL SRS resources for positioning with Tx TEGs directly to the LMF for Multi-RTT if Multi-RTT is supported by UE | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-1-3 | Support of UE-RxTxTEGs for Multi-RTT | The maximum number of UE-RxTxTEG, which is supported and reported by UE for Multi-RTT positioning | 13-4 and 13-8 | No |  | UE RxTx for Multi-RTT is not supported and no assumption can be made on the UE RxTx timing [error/delays] for the measurement | per band | n/a | n/a | n/a | The candidate values are {1, 2, 4, 6, 8, 12, 16, 24, 32, 36, 48, 64}  Need for location server to know if the feature is supported  If the UE does not include RxTxTEG-ID associated with a measurement, no assumption can be made on the UE RxTx timing [errors/delays] for this measurement  Note: The “per band” reporting on this capability does not imply, that the RxTxTEG IDs in the measurement report are grouped per band; In the measurement report, the RxTxTEG ID can span from 0, up to 255 | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-1-4 | Support of UE Rx TEGs for measuring the same DL PRS resource | The maximum number of different UE-RxTEGs that a UE can support to measure the same DL PRS of a TRP | 27-1-1 | No |  | Up to 1 RxTEG is used to measure the same DL PRS resource of a TRP | per band | n/a | n/a | n/a | The candidate values are {2, 3, 4, 6, 8}  Need for location server to know if the feature is supported | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-1-4a | Support of UE Rx TEGs for measuring the same DL PRS resource simultaneously | The maximum number of UE Rx TEGs for measuring the same DL PRS resource simultaneously | 27-1-4 | No |  |  | Per band | n/a | n/a | n/a | The candidate values are {1,2,34,6,8}  Need for location server to know if the feature is supported. | Optional with capability signaling |

In LPP running CR R2-2201723, 27-1 was captured as per UE capability

DL TDOA

nr-UE-Rx-TEG-ID-Support-r17 INTEGER (1..maxNumOfRxTEGs-r17) OPTIONAL,

measureSameDL-PRS-ResourceWithDifferentRxTEGsFR1-r17 INTEGER (1..maxNumOfRxTEGs-r17) OPTIONAL,

measureSameDL-PRS-ResourceWithDifferentRxTEGsFR2-r17 INTEGER (1..maxNumOfRxTEGs-r17) OPTIONAL,

Multi-RTT

nr-UE-RxTx-TEG-ID-Support-r17 NR-UE-RxTx-TEG-ID-Support-r17 OPTIONAL,

NR-UE-RxTx-TEG-ID-Support-r17 ::= SEQUENCE {

case1-Sup-r17 SEQUENCE {

nr-UE-RxTx-TEG-Sup-r17 INTEGER (1..maxNumOfRxTxTEGs-r17)

} OPTIONAL,

case2-Sup-r17 SEQUENCE {

nr-UE-RxTx-TEG-Sup-r17 INTEGER (1..maxNumOfRxTxTEGs-r17),

nr-UE-Tx-TEG-Sup-r17 INTEGER (1..maxNumOfTxTEGs-r17)

} OPTIONAL,

case3-Sup-r17 SEQUENCE {

nr-UE-Rx-TEG-Sup-r17 INTEGER (1..maxNumOfRxTEGs-r17),

nr-UE-Tx-TEG-Sup-r17 INTEGER (1..maxNumOfTxTEGs-r17)

} OPTIONAL,

case4-Sup-r17 SEQUENCE {

nr-UE-RxTx-TEG-Sup-r17 INTEGER (1..maxNumOfRxTxTEGs-r17),

nr-UE-Tx-TEG-Sup-r17 INTEGER (1..maxNumOfTxTEGs-r17),

nr-UE-Rx-TEG-Sup-r17 INTEGER (1..maxNumOfRxTEGs-r17)

} OPTIONAL,

...

}

measureSameDL-PRS-ResourceWithDifferentRxTxTEGsFR1-r17 INTEGER (1..maxNumOfRxTxTEGs-r17)

OPTIONAL,

measureSameDL-PRS-ResourceWithDifferentRxTxTEGsFR2-r17 INTEGER (1..maxNumOfRxTxTEGs-r17)

OPTIONAL,

measureSameDL-PRS-ResourceWithDifferentRxTEGsFR1-r17 INTEGER (1..maxNumOfRxTEGs-r17)

OPTIONAL,

measureSameDL-PRS-ResourceWithDifferentRxTEGsFR2-r17 INTEGER (1..maxNumOfRxTEGs-r17)

OPTIONAL,

However it should be per band capability, and some of features are not captured. Therefore it should be captured as

**Suggested LPP TP:**

DL TDOA/Multi-RTT, we may introduce common IE, and clarify 27-1-2a, 27-1-3 are only for multi-RTT;

nr-UE-TEG-ID-CapabilityBandList-r17 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

NR-UE-TEG-ID-CapabilityPerBand-r17,

NR-UE-TEG-ID-CapabilityPerBand-r17 ::= SEQUENCE {

freqBandIndicatorNR-r17 FreqBandIndicatorNR-r16,

nr-UE-RxTEG-ID-Support-r17 INTEGER (1..maxNumOfRxTEGs-r17) OPTIONAL, -- 27-1-1 for both DL TDOA and multi-RTT

nr-UE-RxTEG-ID-MaxSupport-r17 ENUMERATED {n1, n2, n3, n4, n6, n8} OPTIONAL, -- 27-1-1 for both DL TDOA and multi-RTT

nr-UE-TxTEG-ID-MaxSupport-r17 ENUMERATED {n1, n2, n3, n4, n6, n8} OPTIONAL, -- 27-1-2a for multi-RTT

nr-UE-RxTxTEG-ID-MaxSupport-r17 ENUMERATED {n1, n2, n3, n4, n6, n8, n12, n16,

n24, n32, n36, n48, n64} OPTIONAL, -- 27-1-3 for multi-RTT

measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17 ENUMERATED {n2, n3, n4, n6, n8} OPTIONAL, -- 27-1-4 for both DL TDOA and multi-RTT

measureSameDL-PRS-ResourceWithDifferentRxTEGsSimul-r17 ENUMERATED {n1, n2, n3, n4, n6, n8} OPTIONAL, -- 27-1-4a for both DL TDOA and multi-RTT

}

UL TDOA

-- ASN1START

NR-UL-ProvideCapabilities-r16 ::= SEQUENCE {

nr-UL-SRS-Capability-r16 NR-UL-SRS-Capability-r16,

...

[[

nr-UE-TEG-ID-CapabilityBandList-r17 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

NR-UE-TEG-ID-CapabilityPerBand-r17

]]

}

NR-UE-TEG-ID-CapabilityPerBand-r17 ::= SEQUENCE {

freqBandIndicatorNR-r17 FreqBandIndicatorNR-r16,

nr-UE-TxTEG-ID-MaxSupport-r17 ENUMERATED {n1, n2, n3, n4, n6, n8} OPTIONAL -- 27-1-2 for UL TDOA

}

**Suggested TS38.331 TP (27-1-2):**

BandNR ::= SEQUENCE {

--Skip unrelated parts;--

[[

enhancedSkipUplinkTxConfigured-v1660 ENUMERATED {supported} OPTIONAL,

enhancedSkipUplinkTxDynamic-v1660 ENUMERATED {supported} OPTIONAL

]],

[[

maxUplinkDutyCycle-PC1dot5-MPE-FR1-r16 ENUMERATED {n10, n15, n20, n25, n30, n40, n50, n60, n70, n80, n90, n100} OPTIONAL,

txDiversity-r16 ENUMERATED {supported} OPTIONAL

]],

[[

nr-UE-TxTEG-ID-MaxSupport-r17 ENUMERATED {n1, n2, n3, n4, n6, n8} OPTIONAL -- 27-1-2 for UL TDOA

]]

}

-- TAG-RF-PARAMETERS-STOP

-- ASN1STOP

**Suggested TS38.306 TP (27-1-2):**

| ***nonGroupSINR-reporting-r16***  Indicates N\_max L1-SINR values reported when UE supports non-group based L1-SINR reporting. UE indicates support of this feature shall indicate support of *ssb-csirs-SINR-measurement-r16.* | Band | No | N/A | N/A |
| --- | --- | --- | --- | --- |
| ***nr-UE-TxTEG-ID-MaxSupport-r17***  Indicates the maximum number of UE-TxTEG for SRS resource for positioning, which is supported and reported by UE for UL TDOA. | Band | No | N/A | N/A |

**Discussion point 3.3.1-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | Yes in general, but | We suggest to remove the following field from *NR-UE-TEG-ID-CapabilityPerBand-r17* for DL-TDOA and Multi-RTT. This field seems duplicated with *nr-UE-RxTEG-ID-MaxSupport-r17*  nr-UE-RxTEG-ID-Support-r17 INTEGER (1..maxNumOfRxTEGs-r17) OPTIONAL, -- 27-1-1 for both DL TDOA and multi-RTT |
| Qualcomm | Yes | Agree with Huawei above that the *nr-UE-RxTEG-ID-Support* can be combined with *nr-UE-RxTEG-ID-MaxSupport*.  Suggest defining a new common IE for this: IE *NR-UE-TEG-Capability.* |
| CATT | Yes | Agree with Qualcomm and Huawei. |
| OPPO | Yes | Agree with Huawei |
| Xiaomi | Yes | We also would like to understand the difference between nr-UE-RxTEG-ID-Support-r17 and nr-UE-RxTEG-ID-MaxSupport-r17. |

### 3.3.2 27-2, 27-13, 27-13a, 27-14, 27-14a

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-2-1 | DL PRS RSRP measurement report of the first path for UE-assisted DL-AoD | 1.) Support of measuring and reporting the PRS RSRPP of the first path for DL-AoD positioning method  2.) The maximum number of first path PRS RSRPP per TRP | 13-5 or 27-2-2 | No |  |  | FFS: Per UE or per band | n/a | n/a | n/a | Component 2 candidate values: 2,4,8,16,24  Need for location server to know if the feature is supported  The maximum number of first path PRS RSRP per TRP should be less than or equal to the maximum number of PRS RSRP (27-2-2)  [Note: Having FG 13-5 as the prerequisite FG does not imply that in a measurement report, reporting PRS-RSRP of a PRS resource should be the prerequisite of reporting PRS-RSRPP for the first path of the PRS resource] | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-2-2 | DL PRS RSRP reporting for more than 8 measurements for UE-assisted DL-AoD positioning | Support reporting K> 8 DL PRS RSRP measurements per TRP.  Note: Multiple RSRPs corresponding to same or different Rx Beam index should be able to be reported for a given PRS resource for different timestamps. | 13-5 | No |  | UE report of more than 8 DL PRS-RSRP is not supported. | Per UE | n/a | Yes | n/a | The candidate values are {16, 24}  Need for location server to know if the feature is supported  The maximum number of reported DL PRS RSRP in the capability signaling should be no less than the maximum number of reported DL PRS RSRPP of the first path in the capability signaling | Optional with capability signaling |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-13 | Additional path reporting for UE-assisted DL-TDOA | 1. Support of additional detected path timing reporting for K>2 additional paths for UE-assisted DL-TDOA  2. Support of RSRPP reporting for additional paths | 13-13a | No |  |  | Per UE | No | No | No | Component 1 candidate values: [{4, 6, 8}]  Need for location server to know if the feature is supported. | Optional with capability signaling. |
| 27. NR\_pos\_enh | 27-13a | First path reporting for UE-assisted DL-TDOA | 1. Support of RSRPP reporting for first path | 13-1 | No |  |  | FFS: Per UE or per band | No | No | No | Need for location server to know if the feature is supported. | Optional with capability signaling. |
| 27. NR\_pos\_enh | 27-14 | Additional path reporting for Multi-RTT | 1. Support of additional detected path timing reporting for K>2 additional paths for Multi-RTT  2. Support of RSRPP reporting for additional paths | 13-14a | No |  |  | Per UE | No | No | No | Component 1 candidate values: [{4, 6, 8}]  Need for location server to know if the feature is supported. | Optional with capability signaling. |
| 27. NR\_pos\_enh | 27-14a | First path reporting for Multi-RTT | 1. Support of RSRPP reporting for first path | 13-1 | No |  |  | FFS: Per UE or per band | No | No | No | Need for location server to know if the feature is supported. | Optional with capability signaling. |

In LPP running CR R2-2201723, it was captured as per UE capability

DL AoD, DL-TDOA, Multi-RTT

...,

[[

maxDL-PRS-RSRP-MeasurementFR1-r17 INTEGER (9..24) OPTIONAL,

maxDL-PRS-RSRP-MeasurementFR2-r17 INTEGER (9..24) OPTIONAL,

supportOfDL-PRS-FirstPathRSRP-MeasFR1-r17 ENUMERATED { supported } OPTIONAL,

supportOfDL-PRS-FirstPathRSRP-MeasFR2-r17 ENUMERATED { supported } OPTIONAL,

supportedDL-PRS-ProcessingSamplesFR1-r17 BIT STRING {

m1 (0)

} (SIZE(1..8)) OPTIONAL,

supportedDL-PRS-ProcessingSamplesFR2-r17 BIT STRING {

m1 (0)

} (SIZE(1..8)) OPTIONAL

]]

}

However it cannot match RAN1 feature list very well.

**Suggested LPP TP:**

**DL-AoD**

...,

[[

maxDL-PRS-FirstPathRSRP-MeasPerTRP-r17 ENUMERATED { n2, n4, n8, n16, n24 } OPTIONAL, --27-2-1, FFS per UE or Per band

supportOfDL-PRS-FirstPathRSRP-Meas-r17 ENUMERATED { supported } OPTIONAL,--27-2-1, FFS per UE or Per band

dl-PRS-FirstPathRSRP-MeasAboveEightPerTRP-r17 ENUMERATED { n16, n24 } OPTIONAL, --27-2-1, per UE

]]

DL-TDOA

...,

[[

supportOfDL-PRS-AdditionalPathRSRP-MeasAbove2-r17 ENUMERATED { n4, n6, n8 } OPTIONAL,--27-13

supportOfDL-PRS-AdditionalPathRSRP-Meas-r17 ENUMERATED { supported } OPTIONAL,--27-13

supportOfDL-PRS-FirstPathRSRP-Meas-r17 ENUMERATED { supported } OPTIONAL --27-13a, FFS per UE or Per band

]]

Multi-RTT

...,

[[

supportOfDL-PRS-AdditionalPathRSRP-MeasAbove2-r17 ENUMERATED { n4, n6, n8 } OPTIONAL,--27-14

supportOfDL-PRS-AdditionalPathRSRP-Meas-r17 ENUMERATED { supported } OPTIONAL,--27-14

supportOfDL-PRS-FirstPathRSRP-Meas-r17 ENUMERATED { supported } OPTIONAL--27-14a, FFS per UE or Per band

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**Discussion point 3.3.2-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | See the comments | For DL-AoD:  1. we do not need to have two fields, with one describing support or not while the other describing the number. Keeping only the first field seems sufficient.  maxDL-PRS-FirstPathRSRP-MeasPerTRP-r17  supportOfDL-PRS-FirstPathRSRP-Meas-r17  2. dl-PRS-FirstPathRSRP-MeasAboveEightPerTRP-r17 should be dl-PRS-RSRPMeasAboveeightPerTRP-r16, i.e. no “first path” for this field  For DL-TDOA and Multi-RTT  1. We only need two field corresponding to two rows  supportOfDL-PRS-FirstPathRSRP-Meas-r17 ENUMERATED { supported }  supportOfDL-PRS-AdditionalPathMeasAbove2-r17 ENUMERATED { n4, n6, n8 }  We do not need a separate capability entry denoting support of additional path RSRPP because it is just a component within a FG. |
| Qualcomm | See comment: | DL-AoD:  Agree with Huawei above that the two items 27-2-1 can be combined.  27-2-2 needs FR1/FR2 differentiation. However, the proposed name dl-PRS-FirstPathRSRP-MeasAboveEightPerTRP is confusing. Propose to use the same name as for Rel-16 but with Rel-17 suffix (as in draft LPP):  maxDL-PRS-RSRP-MeasurementFR1-r16 INTEGER (1..8),  maxDL-PRS-RSRP-MeasurementFR2-r16 INTEGER (1..8),  dl-AoD-MeasCapabilityBandList-r16 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF  DL-AoD-MeasCapabilityPerBand-r16,  ...,  [[  maxDL-PRS-RSRP-MeasurementFR1-r17 ENUMERATED { n16, n24 } OPTIONAL,  maxDL-PRS-RSRP-MeasurementFR2-r17 ENUMERATED { n16, n24 } OPTIONAL,  (strange that only 2 values are supported instead of simply INTEGER (9..24)…even more strange for the firstPath RSRP: ENUMERATED { n2, n4, n8, n16, n24 } …)  DL-TDOA & Multi-RTT:  On Huawei's comment: 27-13 are separate capabilities; one for the extended additional paths ("additional detected path timing"), and one for path power ("RSRPP reporting for additional paths"). This is also the case in the draft LPP:  additionalPathsExtSupport-r17 INTEGER (3..8) OPTIONAL,  additionalPathsPowerSupport-r17 ENUMERATED { supported } OPTIONAL,  I suggest to simply change the INTEGER (3..8) to ENUMERATED {n4, n6, n8}…quite strange why not all integer values are supported...  I think 27-13a/14a should be checked with RAN1. I think this should be FR1/FR2 as the Rel-16 RSRP. I.e., why has existing RSRP FR1/FR2 differentiation but RSRPP not?  Draft LPP has it as follows:  supportOfDL-PRS-RSRP-MeasFR1-r16 ENUMERATED { supported} OPTIONAL,  supportOfDL-PRS-RSRP-MeasFR2-r16 ENUMERATED { supported} OPTIONAL,  ...,  [[  supportOfDL-PRS-FirstPathRSRP-MeasFR1-r17 ENUMERATED { supported} OPTIONAL,  supportOfDL-PRS-FirstPathRSRP-MeasFR2-r17 ENUMERATED { supported} OPTIONAL,  This should also be checked for DL-AoD with RAN1, since for Rel-16 there is no separate RSRP capability (i.e., mandatory for DL-AoD) and the FR1/FR2 differentiation is implicit in other capabilities (but not for the first path RSRP). |
| OPPO |  | Agree with Huawei that only the first filed is needed: maxDL-PRS-FirstPathRSRP-MeasPerTRP-r17，supportOfDL-PRS-AdditionalPathMeasAbove2-r17，supportOfDL-PRS-AdditionalPathRSRP-MeasAbove2-r17 |

### 3.3.3 27-3/27-6 PPW

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-3-1 | M-sample measurements | The capability to support reporting a measurement based on measuring M=1 samples (instances) of a DL PRS resource set | 13-1 | No |  |  | per band | n/a | n/a | n/a | The candidate values are {1 [FFS others]}  If the UE does not provide the capability, the UE is assumed to support M=4 only.  Need for location server to know if the feature is supported  Note: The sample number M=1 does not account for the potential AGC sample  Note: this feature is supported for both UE-assisted and UE based positioning | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-3-2 | DL PRS measurement outside MG and in a PRS processing window - processing types | 1. Supported PRS processing types subject to the UE determining that DL PRS to be higher priority for PRS measurement outside MG and in a PRS processing window  Note:   * Type 1A refers to the determination of prioritization between DL PRS and other DL signals/channels in all OFDM symbols within the PRS processing window. The DL signals/channels from all DL CCs (per UE) are affected across LTE and NR * Type 1B refers to the determination of prioritization between DL PRS and other DL signals/channels in all OFDM symbols within the PRS processing window. The DL signals/channels from a certain band are affected (FFS FR2) * Type 2 refers to the determination of prioritization between DL PRS and other DL signals/channels only in DL PRS symbols within the PRS processing window [The DL signals/channels from all DL CCs (per UE) are affected (FFS FR2)]   Note: When the UE determines higher priority for other DL signals/channels over the PRS measurement/processing, the UE is not expected to measure/process DL PRS which is applicable to all of the above capability options  Note: Within a PRS processing window, UE measurement is inside the active DL BWP with PRS having the same numerology as the active DL BWP | 13-1 | Yes |  |  | per band | n/a | n/a | n/a | Component 1 candidate values: [One or more of] {Type 1A, Type 1B, Type 2}  Need for location server to know if the feature is supported  Note: A UE that supports FG 27-3-2 also needs to support FG 27-3-2a | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-3-2a | Support of priority handing of PRS when PRS measurement is outside MG | Support of priority handing options of PRS: Option1, Option2 or Option3   * 1. Option 1: UE may indicates support of two priority states.      1. State 1: PRS is higher priority than all PDCCH/PDSCH/CSI-RS      2. State 2: PRS is lower priority than all PDCCH/PDSCH/CSI-RS   2. Option 2: UE may indicate support of three priority states      1. State 1: PRS is higher priority than all PDCCH/PDSCH/CSI-RS      2. State 2: PRS is lower priority than PDCCH and URLLC PDSCH and higher priority than other PDSCH/CSI-RS         1. Note: The URLLC channel corresponds a dynamically scheduled PDSCH whose PUCCH resource for carrying ACK/NAK is marked as high-priority.      3. State 3: PRS is lower priority than all PDCCH/PDSCH/CSI-RS   3. Option 3: UE may indicate support of single priority state      1. State 1: PRS is higher priority than all PDCCH/PDSCH/CSI-RS | [27-3-3] | Yes |  |  | Per band | No | No | No | Candidate values: {option1, option2, option3}  Note: A UE that supports FG 27-3-2a also needs to support FG 27-3-2  Note: if the FFS in FG 27-2a gets resolved as “per band’, FG 27-2a will be deleted and becomes a component of FG 27-3-2 | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-3-3 | DL PRS Processing Capability outside MG - buffering capability | 1. DL PRS buffering capability  a) Type 1 – sub-slot/symbol level buffering  b) Type 2 – slot level buffering  [2. Maximum duration of DL PRS symbols N in units of ms a UE can process in the first part of a PRS processing window assuming maximum DL PRS bandwidth in MHz, such that the UE is capable of reporting the measurements T-N ms after the last PRS symbol]  3. Max number of DL PRS resources that UE can process in a slot under it | 27-3-2 | No |  |  | Per band | n/a | n/a | n/a | Component 1 candidate values: {Type 1, Type 2}  [Candidate 2 component values:  a) N: {0.125, 0.25, 0.5, 1, 2, 3, 4, 5, 6, 8, 12} ms  b) T: {N+4, N+5, N+6, N+8} ms]  Component 3 candidate values:  FR1 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 15kHz, 30kHz, 60kHz  FR2 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 60kHz, 120kHz  Need for location server to know if the feature is supported  Note: A UE may declare PRS processing capabilities of each of the supported Type-1A, Type-1B, Type-2” capabilities in case it supports multiple types in a band | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-6 | DL PRS processing capabilities in RRC inactive state | 1. DL PRS buffering capability  a) Type 1 – sub-slot/symbol level buffering  b) Type 2 – slot level buffering  2. Duration of DL PRS symbols N in units of ms a UE can process every T ms assuming maximum DL PRS bandwidth in MHz, which is supported and reported by UE  3. Max number of DL PRS resources that UE can process in a slot under it |  |  |  |  |  |  |  |  | Component 1 candidate values: {Type 1, Type 2}  Component 2 candidate values:  T: {8, 16, 20, 30, 40, 80, 160, 320, 640, 1280} ms  N: {0.125, 0.25, 0.5, 1, 2, 4, 6, 8, 12, 16, 20, 25, 30, 32, 35, 40, 45, 50} ms  Component 3 candidate values:  FR1 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 15kHz, 30kHz, 60kHz  FR2 bands: {1, 2, 4, 6, 8, 12, 16, 24, 32, 48, 64} for each SCS: 60kHz, 120kHz  Note: Having the PRS processing capabilities in RRC\_INACTIVE state does not imply that LMF is aware of or controlling UE RRC state [, but instead LMF may set the response time assuming a specific RRC state during the PRS measurement and inform the gNB on the assumed RRC state, while the actual RRC state is still determined by UE/gNB that take the response time requirement and assumed RRC state into account.] | Optional with capability signaling |

In LPP running CR R2-2201723, it was captured for DL AoD, DL TDOA and Multiple RTT separately and as per UE capability

supportedDL-PRS-ProcessingSamplesFR1-r17 BIT STRING {

m1 (0)

} (SIZE(1..8)) OPTIONAL,

supportedDL-PRS-ProcessingSamplesFR2-r17 BIT STRING {

m1 (0)

However it should be per band capability, and some of features are not captured. Therefore it should be captured as

**Suggested LPP TP:**

DL AoD, DL TDOA/Multi-RTT, we may introduce common IE, and then add the common IE per positioning method.

nr-DL-PRS-ProcessingCapabilityBandList-r17 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

NR-DL-PRS-ProcessingCapabilityPerBand-r17,

NR-DL-PRS-ProcessingCapabilityPerBand-r17 ::= SEQUENCE {

freqBandIndicatorNR-r17 FreqBandIndicatorNR-r16,

supportedDL-PRS-ProcessingSamples-r17 BIT STRING {

m1 (0)

} (SIZE(1..8)) OPTIONAL, --27-3-1

prs-ProcessingWindowType1A-r17 ENUMERATED { supported } OPTIONAL, -- 27-3-2

prs-ProcessingWindowType1B-r17 ENUMERATED { supported } OPTIONAL, -- 27-3-2

prs-ProcessingWindowType2-r17 ENUMERATED { supported } OPTIONAL, -- 27-3-2

supportedPrioHandlingOutOfPPW-r17 ENUMERATED { option1, option2, option3 } OPTIONAL, -- 27-3-2a

prs-BufferingCapability-r17 ENUMERATED { type1, type2 } OPTIONAL, -- 27-3-3 FFS on component 2

maxDL-PRS-ResourcesProcessInSlot-r17 ENUMERATED { n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 } OPTIONAL -- 27-3-3 Do not see why FR1/FR2 is needed for per band capability

prs-ProcessingWindowTypeRRC-Inactive-r17 ENUMERATED { type1, type2 } OPTIONAL, -- 27-6 FFS on component 2

maxDL-PRS-ResourcesProcessInSlotRRC-Inactive-r17 ENUMERATED { n1, n2, n4, n6, n8, n12,

n16, n24, n32, n48, n64 } OPTIONAL -- 27-6 Do not see why FR1/FR2 is needed for per band capability

}

**Suggested TS38.331 TP:**

BandNR ::= SEQUENCE {

--Skip unrelated parts;--

[[

enhancedSkipUplinkTxConfigured-v1660 ENUMERATED {supported} OPTIONAL,

enhancedSkipUplinkTxDynamic-v1660 ENUMERATED {supported} OPTIONAL

]],

[[

maxUplinkDutyCycle-PC1dot5-MPE-FR1-r16 ENUMERATED {n10, n15, n20, n25, n30, n40, n50, n60, n70, n80, n90, n100} OPTIONAL,

txDiversity-r16 ENUMERATED {supported} OPTIONAL

]],

[[

prs-ProcessingWindowType1A-r17 ENUMERATED { supported } OPTIONAL, -- 27-3-2

prs-ProcessingWindowType1B-r17 ENUMERATED { supported } OPTIONAL, -- 27-3-2

prs-ProcessingWindowType2-r17 ENUMERATED { supported } OPTIONAL, -- 27-3-2

supportedPrioHandlingOutOfPPW-r17 ENUMERATED { option1, option2, option3 } OPTIONAL, -- 27-3-2a

]]

}

-- TAG-RF-PARAMETERS-STOP

-- ASN1STOP

**Suggested TS38.306 TP :**

| ***powerBoosting-pi2BPSK***  Indicates whether UE supports power boosting for pi/2 BPSK, when applicable as defined in 6.2 of TS 38.101-1 [2]. This capability is not applicable to IAB-MT. | Band | No | TDD only | FR1 only |
| --- | --- | --- | --- | --- |
| ***prs-ProcessingWindowType1A-r17***  Indicates the UE supports the determination of prioritization between DL PRS and other DL signals/channels in all OFDM symbols within the PRS processing window. The DL signals/channels from all DL CCs (per UE) are affected across LTE and NR. | Band | No | N/A | N/A |
| ***prs-ProcessingWindowType1B-r17***  Indicates the UE supports the determination of prioritization between DL PRS and other DL signals/channels in all OFDM symbols within the PRS processing window. The DL signals/channels from a certain band are affected (FFS FR2). | Band | No | N/A | N/A |
| ***prs-ProcessingWindowType2-r17***  Indicates the UE supports the determination of prioritization between DL PRS and other DL signals/channels only in DL PRS symbols within the PRS processing window [The DL signals/channels from all DL CCs (per UE) are affected (FFS FR2)]. | Band | No | N/A | N/A |

| ***supportCodeWordSoftCombining-r16***  Indicates whether UE supports codeword soft combining for FDMSchemeB. UE indicates support of this feature depends on whether the *supportFDM-SchemeB-r16* is also supported. | Band | No | N/A | N/A |
| --- | --- | --- | --- | --- |
| ***supportedPrioHandlingOutOfPPW-r17***  Indicates the support of priority handing options of PRS when PRS measurement is outside MG. | Band | No | N/A | N/A |

**Discussion point 3.3.3-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | See comments | According to the Note 27-3-2a  Note: if the FFS in FG 27-2a gets resolved as “per band’, FG 27-2a will be deleted and becomes a component of FG 27-3-2  27-3-2 and 27-3-2a should be combined into a single FG.  Then we should have a single field added to BandNR with its subfields being mandatory.  In addition, we do not need separate fields for the support of different processing window types.  The suggested change is  BandNR ::= SEQUENCE {  --Skip unrelated parts;--  [[  enhancedSkipUplinkTxConfigured-v1660 ENUMERATED {supported} OPTIONAL,  enhancedSkipUplinkTxDynamic-v1660 ENUMERATED {supported} OPTIONAL  ]],  [[  maxUplinkDutyCycle-PC1dot5-MPE-FR1-r16 ENUMERATED {n10, n15, n20, n25, n30, n40, n50, n60, n70, n80, n90, n100} OPTIONAL,  txDiversity-r16 ENUMERATED {supported} OPTIONAL  ]],  [[  supportOfPPW-r17 PRS-ProcessingWindow OPTIONAL, -- 27-3-2/2a  ]]  }  PRS-ProcessingWindow ::= SEQUENCE {  supportedProcessingType ENUMERATED {Type1A, Type1B, Type2,..},  supportedPrioHandlingOutOfPPW-r17 ENUMERATED { option1, option2, option3,.. }  } |
| Qualcomm | See comments | 27-3-3 and 27-6, component 2 seems missing.  I think we can replace the bit string now with ENUMERATED { m1 }. |
| CATT | See comments | Only the TP of LPP is agreed.  In legacy, the PRS related capability are specified in LPP specification, thus we prefer to introduce the PRS processing window related capability to LPP specification only.  As for the issues that some capability should be obtained by NG-RAN, RAN3 already agreed to introduce a new NRPPa message to support the LMF to provide per-UE assistance information to NG-RAN, thus if needed, LMF can indicate the required capability to NG-RAN as assistance data. |
| Xiaomi | See comments | We prefer only introduce PPW capability in LPP specification. As CATT indicated, the LMF can provide the related capabilities to gNB. |

### 3.3.4 27-4, 27-12

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-4-1 | LOS/NLOS Indicator for UE-assisted positioning | 1. Support reporting LoS/NLoS indicator type to LMF  2. LOS/NLOS indicator granularity | one of 13-5,13-6, or 13-11 | No |  |  | Per UE | n/a | n/a | n/a | [Component 1 candidate values: {hard value, soft value[, both]}]  Component 2 candidate values: {trpSpecific, resourceSpecific[, both]}  [Note: a single value is reported when both multi-RTT and DL-TDOA are supported]  FFS: signalling per method  Need for location server to know if the feature is supported | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-12 | LOS/NLOS indicator for UE-based positioning assistance data | Support reception of the assistance data containing the LOS/NLOS indicator.  1. LOS/NLOS indicator type  2. LOS/NLOS indicator granularity |  | No |  |  | Per UE | No | No | No | [Component 1 candidate values: {softValue, hardValue, both}]  Component 2 candidate values: {resourceSpecific, trpSpecific[, both]}  Need for location server to know if the feature is supported. | Optional with capability signaling. |

In LPP running CR R2-2201723, it was captured for DL AoD, DL TDOA and Multiple RTT separately and as per UE capability

nr-los-nlos-IndicatorSupport-r17 BIT STRING { case1 (0),

case2 (1)

} (SIZE(1..8)) OPTIONAL,

However some of features are not captured. Therefore it should be captured as

**Suggested LPP TP:**

DL AoD, DL TDOA/Multi-RTT.

nr-LOS-NLOS-IndicatorUE-Based-r17 ENUMERATED { hardvalue, softvalue, both } OPTIONAL, -- 27-4-1

nr-LOS-NLOS-IndicatorGranularityUE-Based-r17 ENUMERATED { trpspecific, resourcespecific, both} OPTIONAL, -- 27-4-1

nr-LOS-NLOS-IndicatorUE-Assisted-r17 ENUMERATED { hardvalue, softvalue, both } OPTIONAL, -- 27-4-1

nr-LOS-NLOS-IndicatorGranularityUE-Assisted-r17 ENUMERATED { trpspecific, resourcespecific, both} OPTIONAL -- 27-4-1

**Discussion point 3.3.4-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | Yes | We understand that RAN1 is still discussing whether “both” should be supported. |
| Qualcomm | See comment | (1) For the measurement, suggest combining the two elements, since they look confusing if defined separately. I.e., both must be either present or absent.  nr-los-nlos-IndicatorSupport-r17 SEQUENCE {  type-r17 ENUMERATED { hardvalue, softvalue, both },  granularity-r17 ENUMERATED { trpspecific, resourcespecific, both},  ...  } OPTIONAL,  (2) There is no LOS/NLOS indicator for UE-based. There is support indicator for the LOS/NLOS assistance data (IE *NR-DL-PRS-Expected-LOS-NLOS-Assistance* in draft LPP). Suggest to comine the two as well:  nr-los-nlos-AssistanceDataSupport-r17 SEQUENCE {  type-r17 ENUMERATED { hardvalue, softvalue, both },  granularity-r17 ENUMERATED { trpspecific, resourcespecific, both},  ...  } OPTIONAL, |
| CATT | See comments | Prefer to define a new common IE carrying all of capabilities within the suggested LPP TP, and include the newly introduced IE for NR-DL-TDOA-ProvideCapabilities/*NR-DL-AoD-ProvideCapabilities*/*NR-Multi-RTT-ProvideCapabilities*. |
| OPPO | Yes | The suggested TP is fine for us, and it can be further updated once RAN1 reaches consensus on whether support “both”. |
| Xiaomi | Yes |  |

### 3.3.5 27-7

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-7 | Multiple measurement instances which can be included in a single measurement report | Support of mutiple measurement instances which can be included in a single measurement report  FFS: 2. Maximum number of measurement instances which can be included in a single measurement report |  |  |  |  |  |  |  |  | FFS: Component 2 candidate values | Optional with capability signaling |

**Suggested LPP TP:**

DL AoD, DL TDOA/Multi-RTT.

multiMeasInSameMeasReport-r17 ENUMERATED { supported } OPTIONAL, -- 27-7, FFS on component 2

**Discussion point 3.3.5-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSIlicon | Yes | OK to keep it as it is for now. but when the maximum number is determined, same issues as above that we don’t need two fields, one indicating the support another indicating the maximum number |
| Qualcomm | Yes | O.K. for now |
| CATT | Yes |  |
| OPPO | Yes | And it can be further updated once the maximum number of measurement instances that can be included in a single measurement report is defined. |
| Xiaomi | Yes |  |

### 3.3.6 27-8

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-8 | Support of PRS TEG association information for UE-based DL-TDOA | Support of reception of association between PRS and TRP Tx TEG for UE-based positioning | 13-1 | No |  | Positioning calculation assistance data containing association between PRS and TRP Tx TEG is not supported by UE | Per UE | n/a | n/a | n/a | Need for location server to know if the feature is supported. | Optional with capability signaling |

**Suggested LPP TP:**

DL TDOA

prs-TEG-AssociationUE-BasedSupport-r17 ENUMERATED { supported } OPTIONAL, -- 27-8

**Discussion point 3.3.6-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSIlicon | Yes |  |
| Qualcomm | No | This should be one bit in *nr-PosCalcAssistanceSupport*:  nr-PosCalcAssistanceSupport-r17 BIT STRING { trpLocSup (0),  beamInfoSup (1),  rtdInfoSup (2),  beamAntInfoSup (3),  losNlosInfoSup (4),  trpTEG-InfoSup (5)  } (SIZE (1..8)) OPTIONAL, |
| CATT | No | Agree with Qualcomm. |
| Xiaomi | No | Agree with Qualcomm. |

### 3.3.7 27-9

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-9 | Support of lower Rx beam sweeping factor | 1. Support of the lower Rx beam sweeping factor than 8 for FR2  2. Number of Rx beam sweeping factors |  | No |  | UE only supports 8 as the Rx beam sweeping factor defined by RAN4. | Per band | n/a | n/a  FR2 only | n/a | Component 2 candidate values: FFS  Need for location server to know if the feature is supported | Optional with capability signaling |

**Suggested LPP TP:**

nr-DL-PRS-ProcessingCapabilityBandList-r17 SEQUENCE (SIZE (1..nrMaxBands-r16)) OF

NR-DL-PRS-ProcessingCapabilityPerBand-r17,

NR-DL-PRS-ProcessingCapabilityPerBand-r17 ::= SEQUENCE {

freqBandIndicatorNR-r17 FreqBandIndicatorNR-r16,

lowerRxBeamSweepingThan8-FR2-r17 ENUMERATED { supported } OPTIONAL, -- 27-9

numberOfRxBeamSweepingFactor-r17 ENUMERATED { ffs } OPTIONAL -- 27-9, FFS on value

}

**Discussion point 3.3.7-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | No | Single field is sufficient. We do not need separate fields each for a component, which is against the common understanding on the relationship between FG and component. |
| Qualcomm | Yes | O.K. for now. We can check later if the two can be combined. There is still an FFS. |
| Xiaomi | Yes |  |

### 3.3.8 27-10, 27-10a, 27-11

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-10 | Support of UL MAC CE based MG activation request for PRS measurements | 1. Support of using UL MAC CE to request measurement gap for PRS measurements: The information in the UL MAC CE for MG activation request by the UE can be one ID associated with the preconfiguration of the MG  2. Support of preconfiguration of MGs in RRC signaling for PRS measurements: Each MG in the preconfiguration is associated with an ID | 27-11 | Yes |  | Using UL MAC CE to indicate measurement gap for PRS measurements to the gNB is not supported. | Per UE | No | No | No |  | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-10a | Low latency MG activation request for PRS measurements | support of low latency MG activation request for PRS measurements | [27-10] | No |  | Low latency MG activation request for PRS measurements is not supported | Per UE | No | No | No | Need for location server to know if the feature is supported | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-11 | Support of DL MAC CE based MG activation request for PRS measurements | 1. Support of preconfiguration of MGs in RRC signaling for PRS measurements: Each MG in the preconfiguration is associated with an ID  2. Support of using DL MAC CE to activate the MG for PRS measurements: The DL MAC CE for MG activation indicates the ID associated with the preconfigured MG |  | Yes |  | Using DL MAC CE to activate the preconfigured MG for PRS measurements is not supported | Per UE | No | No | No |  | Optional with capability signaling. |

**Suggested LPP TP:**

DL AOD, DL TDOA/Multi-RTT

mg-ActivationRequest-r17 ENUMERATED { supported } OPTIONAL -- 27-10a

**Suggested TS38.331 TP :**

MAC-ParametersCommon ::= SEQUENCE {

lcp-Restriction ENUMERATED {supported} OPTIONAL,

dummy ENUMERATED {supported} OPTIONAL,

lch-ToSCellRestriction ENUMERATED {supported} OPTIONAL,

...,

[[

recommendedBitRate ENUMERATED {supported} OPTIONAL,

recommendedBitRateQuery ENUMERATED {supported} OPTIONAL

]],

[[

recommendedBitRateMultiplier-r16 ENUMERATED {supported} OPTIONAL,

preEmptiveBSR-r16 ENUMERATED {supported} OPTIONAL,

autonomousTransmission-r16 ENUMERATED {supported} OPTIONAL,

lch-PriorityBasedPrioritization-r16 ENUMERATED {supported} OPTIONAL,

lch-ToConfiguredGrantMapping-r16 ENUMERATED {supported} OPTIONAL,

lch-ToGrantPriorityRestriction-r16 ENUMERATED {supported} OPTIONAL,

singlePHR-P-r16 ENUMERATED {supported} OPTIONAL,

ul-LBT-FailureDetectionRecovery-r16 ENUMERATED {supported} OPTIONAL,

-- R4 8-1: MPE

tdd-MPE-P-MPR-Reporting-r16 ENUMERATED {supported} OPTIONAL,

lcid-ExtensionIAB-r16 ENUMERATED {supported} OPTIONAL

]],

[[

spCell-BFR-CBRA-r16 ENUMERATED {supported} OPTIONAL

]],

[[

srs-ResourceId-Ext-r16 ENUMERATED {supported} OPTIONAL

]],

[[

mg-ActivationRequest-r17 ENUMERATED {supported} OPTIONAL, --27-10

mg-Activation-r17 ENUMERATED {supported} OPTIONAL, --27-11

]]

}

**Suggested TS38.306 TP**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***longDRX-Cycle***  Indicates whether UE supports long DRX cycle as specified in TS 38.321 [8]. | UE | Yes | Yes | No |
| ***mg-Activation-r17***  Indicates the support of using DL MAC CE to activate the preconfigured MG for PRS measurements: . | UE | No | Yes | No |
| ***mg-ActivationRequest-r17***  Indicates the support of using UL MAC CE to request the activation of the preconfigured MG for PRS measurements: . | UE | No | Yes | No |

**Discussion point 3.3.8-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | Yes in general, but | We suggest the rename the field to highlight the MG activation request and command corresponds to PRS measurement. |
| Qualcomm | See comment | Looks O.K. and is according to the spread sheet. However, for LPP, what does the "Low latency MG activation request for PRS measurements" comprise? Is it all of UL/DL MAC-CE and RRC pre-configuration? From the description, it's not clear to me how a UE should set this bit. |
| CATT | See comments | In legacy, the PRS related capability are specified in LPP specification, thus we prefer to introduce the positioning MG related capability to LPP specification only.  As for the issues that some capability should be obtained by NG-RAN, RAN3 already agreed to introduce a new NRPPa message to support the LMF to provide per-UE assistance information to NG-RAN, thus if needed, LMF can indicate the required capability to NG-RAN as assistance data. |
| OPPO | See comments | In last meeting, we agreed to support of MAC CE based MG activation and deactivation request/command. We wonder whether we need to add the capability of deactivation. |
| Xiaomi | See comments | We prefer only introduce PRS related capability in LPP specification. |

### 3.3.9 27-20, 27-21, 27-22

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-20 | PRS subset association for UE assisted DL-AoD | 1. Support of assistance data enhancement to indicate a subset of PRS resources for each PRS resource for the purpose of prioritization of DL-AoD reporting.  [2. Supported resource set relationship for the target PRS resource and the associated subset  [3. Support associated subset measurement reporting] |  | No |  | PRS subset association for DL-AoD is not supported by the UE. | Per UE | n/a | n/a | n/a | [Component 2 candidate values: {sameSet, DifferentSet, sameOrDifferentSet}]  [Component 3 candidate values: {associated subset only, the target PRS resource and the associated subset}]  Need for location server to know | Optional with capability signaling. |
| 27. NR\_pos\_enh | 27-21 | PRS boresight direction for UE-assisted DL-AoD | Support of assistance data enhancement to indicate the boresight direction of a PRS resource for UE-assisted DL-AoD. |  | No |  | UE-assisted DL-AoD with boresight direction of each DL-PRS is not supported. | Per UE | n/a | n/a | n/a | Need for location server to know | Optional with capability signaling. |
| 27. NR\_pos\_enh | 27-22 | PRS beam pattern for UE-based DL-AoD | Support of PRS beam pattern for DL-AoD |  | No |  | UE-based DL-AoD with PRS beam pattern is not supported. | Per UE | n/a | n/a | n/a | Need for location server to know | Optional with capability signaling. |

In LPP running CR R2-2201723, it was captured as

nr-DL-PRS-BeamInfoSup-r17 ENUMERATED { supported } OPTIONAL, -- 27-22

nr-DL-PRS-ResourcePriorityListSup-r17 ENUMERATED { supported } OPTIONAL, --27-20 FFS on component 2 and 3

**Seems 27-21 is missing.**

**Suggested LPP TP:**

DL AOD

nr-DL-PRS-BoresightInfoSup-r17 ENUMERATED { supported } OPTIONAL, -- 27-21

nr-DL-PRS-BeamInfoSup-r17 ENUMERATED { supported } OPTIONAL, -- 27-22

nr-DL-PRS-ResourcePriorityListSup-r17 ENUMERATED { supported } OPTIONAL, --27-20 FFS on component 2 and 3

**Discussion point 3.3.9-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | Yes |  |
| Qualcomm | Partly | Note, that the *nr-DL-PRS-BeamInfoSup* referes to the IE *NR-DL-PRS-BeamInfo,* which provides the boresight direction of a PRS resource:  ***dl-PRS-Azimuth***  This field specifies the azimuth angle of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.  ***dl-PRS-Elevation***  This field specifies the elevation angle of the boresight direction in which the DL-PRS Resources associated with this DL-PRS Resource ID in the DL-PRS Resource Set are transmitted.  Therefore, the nr-DL-PRS-BoresightInfoSup-r17 is not needed. |
| CATT | Yes |  |
| OPPO |  | Agree with QC. |
| Xiaomi | Yes |  |

### 3.3.10 27-15---27-19

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 27. NR\_pos\_enh | 27-15 | Support of positioning SRS transmission in RRC\_INACTIVE state for initial BWP | 1. Max number of SRS Resource Sets for positioning supported by UE  2. Max number of [P/SP]SRS Resources for positioning  3. Max number of [P/SP]SRS Resources for positioning per slot  4. Max number of periodic SRS Resources for positioning  5. Max number of periodic SRS Resources for positioning per slot  Note: OLPC for SRS for positioning based on SSB from the last serving cell (the cell that releases UE from connection) is part of this FG. No dedicated capability signaling is intended for this component |  | Yes |  |  | Per band | n/a | n/a | n/a | Component 1 candidate values: {1, 2, 4, 8, 12, 16}  Component 2 candidate values: {1,2,4,8,16,32,64}  Component 3 candidate values: {1, 2, 3, 4, 5, 6, 8, 10, 12, 14}  Component 4 candidate values: {1,2,4,8,16,32,64}  Component 5 candidate values: {1, 2, 3, 4, 5, 6, 8, 10, 12, 14}  [Need for location server to know if the feature is supported]  FFS: outside initial BWP | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-15a | Support of positioning SRS transmission in RRC\_INACTIVE state for initial BWP with semi-persistent SRS | 1. Max number of semi-persistent SRS Resources for positioning  2. Max number of semi-persistent SRS Resources for positioning per slot | 27-15 | Yes |  |  | Per band | n/a | n/a | n/a | Component 1 candidate values: {1,2,4,8,16,32,64}  Component 2 candidate values: {1, 2, 3, 4, 5, 6, 8, 10, 12, 14}  [Need for location server to know if the feature is supported]  FFS: outside initial BWP | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-16 | OLPC for positioning SRS in RRC\_INACTIVE state | Same as  LPP  OLPC-SRS-Pos-r16  RRC  OLPC-SRS-Pos-r16 |  | Yes |  |  | Per band | n/a | n/a | n/a | Need for location server to know if the feature is supported. | Optional with capability signaling |
| 27. NR\_pos\_enh | 27-17 | Support of positioning in RRC\_INACTIVE state | Support of PRS processing in RRC\_INACTIVE | [13-1, 13-2, 13-3, 13-4] | FFS |  |  | FFS | FFS | FFS | FFS | [Need for location server to know if the feature is supported.]  FFS: separate UE capability for location information reporting in RRC\_INACTIVE state using SDT  Note: UE supporting this feature may support at least one from DL RSTD, DL PRS-RSRP, or UE Rx – Tx time difference measurement | Optional with capability signaling. |
| 27. NR\_pos\_enh | 27-18a | Support of PRS measurement in RRC\_INACTIVE state for DL-TDOA | Support of PRS measurement in RRC\_INACTIVE state for DL-TDOA |  | FFS |  |  | FFS | FFS | FFS | FFS | [Need for location server to know if the feature is supported.]  Note: Applicable for both UE-assisted and UE-based DL-TDOA  Note: PRS capabilities for DL-TDOA measurement and reporting described in FGs in 13-3, 13-3a, 13-3b, 13-6, 13-13 are the same for RRC Inactive. | Optional with capability signaling. |
| 27. NR\_pos\_enh | 27-18b | Support of PRS measurement in RRC\_INACTIVE state for DL-AoD | Support of PRS measurement in RRC\_INACTIVE state for DL-AoD |  | FFS |  |  | FFS | FFS | FFS | FFS | [Need for location server to know if the feature is supported.]  Note: Applicable for both UE-assisted and UE-based DL-AoD  Note: PRS capabilities for DL-AOD measurement and reporting described in FGs 13-2, 13-2a, 13-2b, 13-5, 13-13 are the same for RRC Inactive. | Optional with capability signaling. |
| 27. NR\_pos\_enh | 27-18c | Support of PRS measurement in RRC\_INACTIVE state for Multi-RTT | 1. Support of PRS measurement in RRC\_INACTIVE state for Multi-RTT  [2. Support of positioning SRS transmission in RRC\_INACTIVE state] |  | FFS |  |  | FFS | FFS | FFS | FFS | [Need for location server to know if the feature is supported.]  Note: PRS capabilities for Multi-RTT measurement and reporting described in FGs in 13-4, 13-4a, 13-4b, 13-11, 13-11a, 13-14 are the same for RRC Inactive | Optional with capability signaling. |
| 27. NR\_pos\_enh | 27-19 | Spatial relation for positioning SRS in RRC\_INACTIVE state | Same as  *LPP*  *SpatialRelationsSRS-Pos-r16*  *RRC*  *SpatialRelationsSRS-Pos-r16* |  | Yes |  |  | Per band | n/a | n/a | n/a | Need for location server to know if the feature is supported. | Optional with capability signalling |

The content of 27-15, 27-15a, 27-16, 27-19 is same as Rel-16 RRC capability. But in Rel-16, 27-15, 27-15a was per FSPC instead of per band.

**Suggested LPP TP:**

SRS-CapabilityPerBand-r16 ::= SEQUENCE {

freqBandIndicatorNR-r16 FreqBandIndicatorNR-r16,

olpc-SRS-Pos-r16 OLPC-SRS-Pos-r16 OPTIONAL,

spatialRelationsSRS-Pos-r16 SpatialRelationsSRS-Pos-r16 OPTIONAL,

...,

[[

olpc-SRS-PosRRC-Inactive-r17 OLPC-SRS-Pos-r16 OPTIONAL, --27-16

spatialRelationsSRS-Pos-r16 SpatialRelationsSRS-Pos-r16 OPTIONAL --27-19

]]

}

DL AOD, DL TDOA, Multi-RTT

nr-DL-PRS-MeasRRC-Inactive-r17 ENUMERATED { supported } OPTIONAL, -- 27-18a, 27-18b, 27-18c,

nr-DL-PRS-ProcessingRRC-Inactive-r17 ENUMERATED { supported } OPTIONAL, -- 27-17

**Suggested TS38.331 TP:**

BandNR ::= SEQUENCE {

--Skip unrelated parts;--

[[

enhancedSkipUplinkTxConfigured-v1660 ENUMERATED {supported} OPTIONAL,

enhancedSkipUplinkTxDynamic-v1660 ENUMERATED {supported} OPTIONAL

]],

[[

maxUplinkDutyCycle-PC1dot5-MPE-FR1-r16 ENUMERATED {n10, n15, n20, n25, n30, n40, n50, n60, n70, n80, n90, n100} OPTIONAL,

txDiversity-r16 ENUMERATED {supported} OPTIONAL

]],

[[

srs-AllPosResourcesRRC-Inactive-r17 SRS-AllPosResources-r16 OPTIONAL, -- 27-15, 27-15a, FFS on LPP capability

olpc-SRS-PosRRC-Inactive-r16 OLPC-SRS-Pos-r16 OPTIONAL, -- 27-16

spatialRelationsSRS-PosRRC-Inactive-r177 SpatialRelationsSRS-Pos-r16 OPTIONAL --27-19

]]

}

-- TAG-RF-PARAMETERS-STOP

-- ASN1STOP

**Suggested TS38.306 TP :**

| ***spatialRelationsSRS-Pos-r16***  Indicates whether the UE supports spatial relations for SRS for positioning. The capability signalling comprises the following parameters.  - *spatialRelation-SRS-PosBasedOnSSB-Serving-r16* indicates whether the UE supports spatial relation for SRS for positioning based on SSB from the serving cell in the same band. The UE can include this field only if the UE supports *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnCSI-RS-Serving-r16* indicates whether the UE supports spatial relation for SRS for positioning based on CSI-RS from the serving cell in the same band. The UE can include this field only if the UE supports *spatialRelation-SRS-PosBasedOnSSB-Serving-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnPRS-Serving-r16* indicates whether the UE supports spatial relation for SRS for positioning based on PRS from the serving cell in the same band. The UE can include this field only if the UE supports any of DL PRS Resources for DL AoD, DL PRS Resources for DL-TDOA or DL PRS Resources for Multi-RTT defined in TS37.355 [22], or *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnSRS-r16* indicates whether the UE supports spatial relation for SRS for positioning based on SRS in the same band. The UE can include this field only if the UE supports *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnSSB-Neigh-r16* indicates whether the UE supports spatial relation for SRS for positioning based on SSB from the neighbouring cell in the same band. The UE can include this field only if the UE supports *spatialRelation-SRS-PosBasedOnSSB-Serving-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16* indicates whether the UE supports spatial relation for SRS for positioning based on PRS from the neighbouring cell in the same band. The UE can include this field only if the UE supports *spatialRelation-SRS-PosBasedOnPRS-Serving-r16*. Otherwise, the UE does not include this field;  NOTE: A PRS from a PRS-only TP is treated as PRS from a non-serving cell. | Band | No | N/A | FR2 only |
| --- | --- | --- | --- | --- |
| ***spatialRelationsSRS-PosRRC-Inactive-r17***  Indicates whether the UE supports spatial relations for SRS for positioning in RRC\_INACTIVE. The capability signalling comprises the following parameters.  - *spatialRelation-SRS-PosBasedOnSSB-Serving-r16* indicates whether the UE supports spatial relation for SRS for positioning based on SSB from the serving cell in the same band. The UE can include this field only if the UE supports *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnCSI-RS-Serving-r16* indicates whether the UE supports spatial relation for SRS for positioning based on CSI-RS from the serving cell in the same band. The UE can include this field only if the UE supports *spatialRelation-SRS-PosBasedOnSSB-Serving-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnPRS-Serving-r16* indicates whether the UE supports spatial relation for SRS for positioning based on PRS from the serving cell in the same band. The UE can include this field only if the UE supports any of DL PRS Resources for DL AoD, DL PRS Resources for DL-TDOA or DL PRS Resources for Multi-RTT defined in TS37.355 [22], or *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnSRS-r16* indicates whether the UE supports spatial relation for SRS for positioning based on SRS in the same band. The UE can include this field only if the UE supports *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnSSB-Neigh-r16* indicates whether the UE supports spatial relation for SRS for positioning based on SSB from the neighbouring cell in the same band. The UE can include this field only if the UE supports *spatialRelation-SRS-PosBasedOnSSB-Serving-r16*. Otherwise, the UE does not include this field;  - *spatialRelation-SRS-PosBasedOnPRS-Neigh-r16* indicates whether the UE supports spatial relation for SRS for positioning based on PRS from the neighbouring cell in the same band. The UE can include this field only if the UE supports *spatialRelation-SRS-PosBasedOnPRS-Serving-r16*. Otherwise, the UE does not include this field;  NOTE: A PRS from a PRS-only TP is treated as PRS from a non-serving cell. | Band | No | N/A | FR2 only |

| ***srs-AssocCSI-RS***  Parameters for the calculation of the precoder for SRS transmission based on channel measurements using associated NZP CSI-RS resource (srs-AssocCSI-RS) as described in clause 6.1.1.2 of TS 38.214 [12]. UE supporting this feature shall also indicate support of non-codebook based PUSCH transmission.  This capability signalling includes list of the following parameters:  - *maxNumberTxPortsPerResource* indicates the maximum number of Tx ports in a resource;  - *maxNumberResourcesPerBand* indicates the maximum number of resources across all CCs within a band simultaneously;  *-* *totalNumberTxPortsPerBand* indicates the total number of Tx ports across all CCs within a band simultaneously. | Band | No | N/A | N/A |
| --- | --- | --- | --- | --- |
| ***srs-PosResources-r16***  Indicates support of SRS for positioning in RRC\_INACTIVE. UE supporting this feature should also support open loop power control for positioning SRS based on SSB from the serving cell. The capability signalling comprises the following parameters:  - *maxNumberSRS-PosResourceSetPerBWP-r16* Indicates the max number of SRS Resource Sets for positioning supported by UE per BWP*;*  - *maxNumberSRS-PosResourcesPerBWP-r16* indicates the max number of SRS resources for positioning supported by UE per BWP, including periodic, semi-persistent, and aperiodic SRS;  - *maxNumberSRS-ResourcesPerBWP-PerSlot-r16* indicates the max number of SRS resources configured by *SRS-Resource* and *SRS-PosResource-r16* supported by UE per BWP, including periodic, semi-persistent, and aperiodic SRS;  - *maxNumberPeriodicSRS-PosResourcesPerBWP-r16* indicates the max number of periodic SRS resources for positioning supported by UE per BWP;  - *maxNumberPeriodicSRS-PosResourcesPerBWP-PerSlot-r16* indicates the max number of periodic SRS resources for positioning supported by UE per BWP per slot. | Band | No | N/A | N/A |
| ***srs-PosResourceAP-r16***  Indicates support of aperiodic SRS for positioning in RRC\_INACTIVE. The UE can include this field only if the UE supports *srs-PosResources-r16*. Otherwise, the UE does not include this field. The capability signalling comprises the following parameters:  - *maxNumberAP-SRS-PosResourcesPerBWP-r16* indicates the max number of aperiodic SRS resources for positioning supported by UE per BWP;  - *maxNumberAP-SRS-PosResourcesPerBWP-PerSlot-r16* indicates the max number of aperiodic SRS resources for positioning supported by UE per BWP per slot. | Band | No | N/A | N/A |
| ***srs-PosResourceSP-r16***  Indicates support of semi-persistent SRS for positioning in RRC\_INACTIVE. The UE can include this field only if the UE supports *srs-PosResources-r16*. Otherwise, the UE does not include this field. The capability signalling comprises the following parameters:  - *maxNumberSP-SRS-PosResourcesPerBWP-r16* indicates the max number of semi-persistent SRS resources for positioning supported by UE per BWP;  - *maxNumberSP-SRS-PosResourcesPerBWP-PerSlot-r16* indicates the max number of semi-persistent SRS resources for positioning supported by UE per BWP per slot | Band | No | N/A | N/A |

| ***olpc-SRS-Pos-r16***  Indicates whether the UE supports OLPC for SRS for positioning. The capability signalling comprises the following parameters.  - *olpc-SRS-PosBasedOnPRS-Serving-r16* indicates whether the UE supports OLPC for SRS for positioning based on PRS from the serving cell in the same band. The UE can include this field only if the UE supports *NR-DL-PRS-ProcessingCapability-r16* defined in TS 37.355 [22], and *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *olpc-SRS-PosBasedOnSSB-Neigh-r16* indicates whether the UE supports OLPC for SRS for positioning based on SSB from the neighbouring cell in the same band. The UE can include this field only if the UE supports *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *olpc-SRS-PosBasedOnPRS-Neigh-r16* indicates whether the UE supports OLPC for SRS for positioning based on PRS from the neighbouring cell in the same band. The UE can include this field only if the UE supports *olpc-SRS-PosBasedOnPRS-Serving-r16*. Otherwise, the UE does not include this field;  NOTE: A PRS from a PRS-only TP is treated as PRS from a non-serving cell.  - *maxNumberPathLossEstimatePerServing-r16* indicates the maximum number of pathloss estimates that the UE can simultaneously maintain for all the SRS resource sets for positioning per serving cell in addition to the up to four pathloss estimates that the UE maintains per serving cell for the PUSCH/PUCCH/SRS transmissios. The UE shall include this field if the UE supports any of *olpc-SRS-PosBasedOnPRS-Serving-r16, olpc-SRS-PosBasedOnSSB-Neigh-r16* and *olpc-SRS-PosBasedOnPRS-Neigh-r16.* Otherwise, the UE does not include this field. | Band | No | N/A | N/A |
| --- | --- | --- | --- | --- |
| ***olpc-SRS-PosRRC-Inactive-r17***  Indicates whether the UE supports OLPC for SRS for positioning in RRC\_INACTIVE. The capability signalling comprises the following parameters.  - *olpc-SRS-PosBasedOnPRS-Serving-r16* indicates whether the UE supports OLPC for SRS for positioning based on PRS from the serving cell in the same band. The UE can include this field only if the UE supports *NR-DL-PRS-ProcessingCapability-r16* defined in TS 37.355 [22], and *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *olpc-SRS-PosBasedOnSSB-Neigh-r16* indicates whether the UE supports OLPC for SRS for positioning based on SSB from the neighbouring cell in the same band. The UE can include this field only if the UE supports *srs-PosResources-r16*. Otherwise, the UE does not include this field;  - *olpc-SRS-PosBasedOnPRS-Neigh-r16* indicates whether the UE supports OLPC for SRS for positioning based on PRS from the neighbouring cell in the same band. The UE can include this field only if the UE supports *olpc-SRS-PosBasedOnPRS-Serving-r16*. Otherwise, the UE does not include this field;  NOTE: A PRS from a PRS-only TP is treated as PRS from a non-serving cell.  - *maxNumberPathLossEstimatePerServing-r16* indicates the maximum number of pathloss estimates that the UE can simultaneously maintain for all the SRS resource sets for positioning per serving cell in addition to the up to four pathloss estimates that the UE maintains per serving cell for the PUSCH/PUCCH/SRS transmissios. The UE shall include this field if the UE supports any of *olpc-SRS-PosBasedOnPRS-Serving-r16, olpc-SRS-PosBasedOnSSB-Neigh-r16* and *olpc-SRS-PosBasedOnPRS-Neigh-r16.* Otherwise, the UE does not include this field. | Band | No | N/A | N/A |

**Discussion point 3.3.10-1: do companies agree the Suggested TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | Yes in general, but | We do not think there should be the capability signaling to indicate support of AP-SRS in RRC\_INACTIVE state.  Also no need to capture 27-17 in LPP. |
| Qualcomm | Yes | O.K. for now. |
| CATT | Yes |  |
| OPPO | Yes |  |
| Xiaomi | Yes |  |

## 3.4 RAN4 feature lists

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 14. NR\_pos\_enh | 14-1 | per-FR MG for PRS measurement | Capability of supporting per-FR MG for PRS measurement | Rel-15 per-FR gap (independentGapConfig) | yes | no |  | Per UE | No | No | N/A |  | Optional with capability signalling |

**TS38.331 TP:**

MeasAndMobParametersCommon ::= SEQUENCE {

supportedGapPattern BIT STRING (SIZE (22)) OPTIONAL,

ssb-RLM ENUMERATED {supported} OPTIONAL,

ssb-AndCSI-RS-RLM ENUMERATED {supported} OPTIONAL,

...,

[[

eventB-MeasAndReport ENUMERATED {supported} OPTIONAL,

handoverFDD-TDD ENUMERATED {supported} OPTIONAL,

eutra-CGI-Reporting ENUMERATED {supported} OPTIONAL,

nr-CGI-Reporting ENUMERATED {supported} OPTIONAL

]],

[[

independentGapConfig ENUMERATED {supported} OPTIONAL,

periodicEUTRA-MeasAndReport ENUMERATED {supported} OPTIONAL,

handoverFR1-FR2 ENUMERATED {supported} OPTIONAL,

maxNumberCSI-RS-RRM-RS-SINR ENUMERATED {n4, n8, n16, n32, n64, n96} OPTIONAL

]],

[[

nr-CGI-Reporting-ENDC ENUMERATED {supported} OPTIONAL

]],

[[

eutra-CGI-Reporting-NEDC ENUMERATED {supported} OPTIONAL,

eutra-CGI-Reporting-NRDC ENUMERATED {supported} OPTIONAL,

nr-CGI-Reporting-NEDC ENUMERATED {supported} OPTIONAL,

nr-CGI-Reporting-NRDC ENUMERATED {supported} OPTIONAL

]],

[[

reportAddNeighMeasForPeriodic-r16 ENUMERATED {supported} OPTIONAL,

condHandoverParametersCommon-r16 SEQUENCE {

condHandoverFDD-TDD-r16 ENUMERATED {supported} OPTIONAL,

condHandoverFR1-FR2-r16 ENUMERATED {supported} OPTIONAL

} OPTIONAL,

nr-NeedForGap-Reporting-r16 ENUMERATED {supported} OPTIONAL,

supportedGapPattern-NRonly-r16 BIT STRING (SIZE (10)) OPTIONAL,

supportedGapPattern-NRonly-NEDC-r16 ENUMERATED {supported} OPTIONAL,

maxNumberCLI-RSSI-r16 ENUMERATED {n8, n16, n32, n64} OPTIONAL,

maxNumberCLI-SRS-RSRP-r16 ENUMERATED {n4, n8, n16, n32} OPTIONAL,

maxNumberPerSlotCLI-SRS-RSRP-r16 ENUMERATED {n2, n4, n8} OPTIONAL,

mfbi-IAB-r16 ENUMERATED {supported} OPTIONAL,

dummy ENUMERATED {supported} OPTIONAL,

nr-CGI-Reporting-NPN-r16 ENUMERATED {supported} OPTIONAL,

idleInactiveEUTRA-MeasReport-r16 ENUMERATED {supported} OPTIONAL,

idleInactive-ValidityArea-r16 ENUMERATED {supported} OPTIONAL,

eutra-AutonomousGaps-r16 ENUMERATED {supported} OPTIONAL,

eutra-AutonomousGaps-NEDC-r16 ENUMERATED {supported} OPTIONAL,

eutra-AutonomousGaps-NRDC-r16 ENUMERATED {supported} OPTIONAL,

pcellT312-r16 ENUMERATED {supported} OPTIONAL,

supportedGapPattern-r16 BIT STRING (SIZE (2)) OPTIONAL

]],

[[

independentGapConfigPRS-r17 ENUMERATED {supported} OPTIONAL ]]

}

**TS38**.306 TP:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***independentGapConfig***  This field indicates whether the UE supports two independent measurement gap configurations for FR1 and FR2 specified in clause 9.1.2 of TS 38.133 [5]. The field also indicates whether the UE supports the FR2 inter-RAT measurement without gaps when (NG)EN-DC is not configured. | UE | No | No | No |
| ***independentGapConfigPRS-r17***  This field indicates for PRS measurement whether the UE supports two independent measurement gap configurations for FR1 and FR2 specified in clause 9.1.2 of TS 38.133 [5]. | UE | No | No | No |

**Discussion point 3.4-1: For 14-1, do companies agree the TPs shown as above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Huawei, HiSilicon | Yes |  |
| Qualcomm | Yes |  |
| OPPO | Yes |  |
| Xiaomi | Yes |  |

**Summary:**

# Summary report and proposals

**Easy agreements:**

**Online discussion:**

**Postpone:**

# Open issues list for Positioning UE capabilities (R2-2202005)

**Table 3.7: open issue lists for UE positioning capability**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Topic** | **Open issues**  **Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Related to the completion of WI?**  **The topic has to be removed from Rel-17 scope if the corresponding open issues cannot be resolved.** | **Remark**  RAN1 provided updated UE feature list in R1-2200767; some are still open. | **Status** |
| **Latency reduction** | Scheduled location time UE capability |  | **Status**: draft in LPP running CR, check the status of LPP email discussion 116bis-628  RAN2#116bis: Include the capability to support scheduled location in each method-ProvideCapabilities message, where 'method' can be any of the LPP positioning methods. The capability should indicate the time base(s) supported for scheduling location measurements.Pre117-e607Question2: Do comapies agree that it is necessary for the UE capability reporting for positioning methods that support multiple positioning modes to differentiate its UE capability of time based for different positioning modes? |  |
| Preconfigured AD  UE capability/configuration limitation  FFS the maximum number of preconfigured assistance data instances; | Yes | **Status**: check the status of LPP email discussion 116bis-628  RAN2#116bis:  Proposal 3.2.1.3-1 (modified): [Easy agreements] [10/10] Include the capability to support validity area in each method ProvideCapabilities message, where “method” can be any of the LPP positioning methods that rely on DL-PRS. FFS on other validity criteria.  **Pre117-e607**  Question6: Do companies agree that multiple AD instances can already be supported by the current LPP spec? |  |
| UE capabilities for MG enhancements | Yes | **Status**: check the status of RAN1 feature list  RAN2 also needs to discuss how to capture UE capability based on RAN1 feature list ~~R1-2111810~~R1-2200767  RRC:27-10, 27-11  LPP:27-10a, | Pre117-e612 based on RAN1 feature list |
| UE capabilities for PPW enhancements | Yes | **Status**: check the status of RAN1 feature list  RAN2 also needs to discuss how to capture UE capability based on RAN1 feature list ~~R1-2111810~~R1-2200767  RRC: 27-3-2,  LPP: 27-3-3 | Pre117-e612 based on RAN1 feature list |
| On-Demand PRS | UE capability on On-Demand PRS  FFS on per positioning method | Yes | **Pre117-e608**  **Q16 Do companies agree that the LMF may request UE-initiated on-demand PRS capability per positioning method, while the UE may similarly respond on its UE-initiated on-demand PRS capability per positioning method?**  **Q17 Companies are invited to provide their views on the following UE behaviour related to the reception of the on-demand PRS configuration index and whether it has an impact on the UE-initiated on-demand PRS capability:**   1. **The UE may store a number of pre-defined on-demand PRS configurations until it is overridden by a new index of on-demand PRS configurations.** 2. **The number of pre-defined on-demand PRS configurations that a UE may store has an impact on the UE’s capability.** |  |
| RRC\_INACTIVE | UE capabilities on positioning in RRC\_INACTIVE in RAN1 feature lists  27-6 DL PRS processing capabilities in RRC inactive state  27-15 Support of positioning SRS transmission in RRC\_INACTIVE state [for initial BWP]  27-16 OLPC for positioning SRS in RRC\_INACTIVE state  27-17 Support of [PRS measurement in RRC\_INACTIVE]  27-18a Support of PRS measurement in RRC\_INACTIVE state for DL-TDOA  27-18b Support of PRS measurement in RRC\_INACTIVE state for DL-AoD  27-18c Support of PRS measurement in RRC\_INACTIVE state for Multi-RTT  27-19 Spatial relation for positioning SRS in RRC\_INACTIVE state | Yes | **Status:** check the status of RAN1 feature list and the discussion in R2-2201767;  Follow RAN2 agreements “RRC state is transparent to LMF and no different handling on PRS for different RRC state”, RAN2 should avoid to optimize these aspects even if RAN1 agrees to introduce RRC\_INACTIVE specific LPP capabilities (27-6, 27-16, 27-17, 27-18a, 27-18b, 27-18c, 27-19).  **RAN1 feature lists in** R1-2200767;  FFS on LPP: 27-17, 27-18a, 27-18b, 27-18c  FFS on RRC: 27-17, 27-18a, 27-18b, 27-18c  LPP: 27-6  Note from RAN1 on 27-6: Having the PRS processing capabilities in RRC\_INACTIVE state does not imply that LMF is aware of or controlling UE RRC state [, but instead LMF may set the response time assuming a specific RRC state during the PRS measurement and inform the gNB on the assumed RRC state, while the actual RRC state is still determined by UE/gNB that take the response time requirement and assumed RRC state into account.] | Pre117-e612 based on RAN1 feature list |
| UL capability  Wait for RAN1 decision on whether UL related RRC\_INACTIVE specific capabilities (27-15, 27-16, 27-19) should be captured in RRC or LPP. | Yes | **Status:** check the status of RAN1 feature list and the discussion in R2-2201767;  **RAN1 feature lists in** R1-2200767;  RAN1 has agreed:  RRC: 27-15, 27-15a,  FFS on LPP: 27-15, 27-15a, | Pre117-e612 based on RAN1 feature list |
| GNSS Integrity | GNSS Integrity capability | Yes | **Status**: see the discussion in R2-2201767  **Companies would like to wait for the outcome from GNSS integrity discussion.** | Pre117-e612  **Discussion point 3.2.2-1: For GNSS integrity capability, do you agree capabilities captured in the running LPP CR R2-2201723?** |
| RAN1 Led Item-Accuracy | Accuracy improvements-PRU | Yes | **Status**  RAN2#116bis  RAN2 will not discuss PRUs further without further guidance from RAN1 (LS or feature list).  RAN1 did not provide capability on this in RAN1 feature list R1-2200767 |  |
|  | UE capability for Enhancements of information reporting from UE and gNB for multipath/NLOS mitigation | Yes | **Status**: check the status of LPP email discussion 116bis-628, check the status of RAN1 feature list.  Check RAN1 feature list R1-2200767; | Pre117-e612 based on RAN1 feature list |
|  | UE capability for Accuracy improvements by mitigating UE Rx/Tx and/or gNB Rx/Tx timing delays | Yes | **Status**: Discussion see R2-2201768. check the status of LPP email discussion 116bis-628, check the status of RRC email discussion 116bis-631  Check RAN1 feature list R1-2200767;  RRC: 27-1-2 | Pre117-e612 based on RAN1 feature list |
|  | UE capability for Accuracy improvements for DL-AoD positioning solutions | Yes | **Status**: Discussion see R2-2201768. check the status of LPP email discussion 116bis-628;  Check RAN1 feature list R1-2200767; | Pre117-e612 based on RAN1 feature list |
| RAN4 feature list (Not listed in R2-2202005) | 14-1 per-FR MG for PRS measurement Capability of supporting per-FR MG for PRS measurement |  | **Need to be captured;** | Pre117-e612 based on RAN4 feature list |

# Open issues list for Positioning UE capabilities (R2-2201722)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| R2-A1 | UE capabilities | Capabilities may need corrections based on RAN1/RAN4 input. | ProvideCapabilities | Rapporteur |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| R2-B4 | Capability for scheduled location request | Differentiation between UE-based and UE-assisted support and indication of time bases supported. | OTDOA-ProvideCapabilities-->scheduledLocationRequest-r17  A-GNSS-ProvideCapabilities-->scheduledLocationRequest-r17  ECID-ProvideCapabilities-->scheduledLocationRequest-r17  TBS-ProvideCapabilities-r13-->scheduledLocationRequest-r17  Sensor-ProvideCapabilities-r13-->scheduledLocationRequest-r17  WLAN-ProvideCapabilities-r13-->scheduledLocationRequest-r17  BT-ProvideCapabilities-r13-->scheduledLocationRequest-r17  NR-ECID-ProvideCapabilities-r16-->scheduledLocationRequest-r17  NR-DL-TDOA-ProvideCapabilities-r16-->scheduledLocationRequest-r17  NR-DL-AoD-ProvideCapabilities-r16-->scheduledLocationRequest-r17  NR-Multi-RTT-ProvideCapabilities-r16-->scheduledLocationRequest-r17 | Huawei, vivo, Nokia  **Pre117-e607** Question2: Do comapies agree that it is necessary for the UE capability reporting for positioning methods that support multiple positioning modes to differentiate its UE capability of time based for different positioning modes? |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| R1-7 | Capability for 10ms Response Time | Do we need a capability for all methods? | ResponseTime --> unit-r15 --> ten-milli-seconds-r17 | Huawei(110)  vivo(110) | Pre117-e612  **Discussion point 3.2.1-1: For the finer granularity, which option do you prefer?**  **Option 1** Finer granularity is only applied for NR RAT dependent positioning methods;  **Option 2** Finer granularity is only applied for NR RAT dependent positioning methods and RAT independent positioning methods;  **Option 3** Finer granularity is applied for LTE and NR RAT dependent positioning methods and RAT independent positioning methods; |

# Reference

1. R1-2200780 Rel17 RAN1 UE feature List
2. R4-2202400 (R4 feature list)
3. R2-2202005 Summary of postmeeting 634
4. R2-2201722\_([Post116bis-e][628][POS]37.355)\_summary
5. R2-2201723 LPP running CR