3GPP TSG-RAN WG3 Meeting #123**R3-240908**

Athens, Greece, February 26 – March 1, 2024

**Agenda item:** 23.3

**Source:** Qualcomm Incorporated, CATT

**Title:** (TP to BL CR for TS 38.455) Support of CPP

**Document for:**  Discussion and Decision

# 1. Introduction

This contribution proposes corrections to NRPPa BL CR for CPP.

*Start of TP*

### 8.5.1 Measurement

#### 8.5.1.1 General

The Measurement procedure allows the LMF to request one or more TRPs in the NG-RAN node to perform and report positioning measurements. This procedure applies only if the NG-RAN node is a gNB.

#### 8.5.1.2 Successful Operation



Figure 8.5.1.2.1: Measurement procedure. Successful operation.

The LMF initiates the procedure by sending a MEASUREMENT REQUEST message to the NG-RAN node, indicating in the *TRP Measurement Request List* IE the TRP(s) from which measurements are requested. The NG-RAN node shall use the included information to configure positioning measurements by the indicated TRP(s). If at least one of the requested measurements has been successful for at least one of the TRPs, the NG-RAN node shall reply with a MEASUREMENT RESPONSE message including the *TRP Measurement Response List* IE.

If the *Report Characteristics* IE is set to "OnDemand", the NG-RAN node shall return the corresponding measurement results in the MEASUREMENT RESPONSE message, and the LMF shall consider that this reporting has been terminated by the NG-RAN node. If the *Report Characteristics* IE is set to "Periodic", the NG-RAN node shall initiate the corresponding measurements, and it shall reply with the MEASUREMENT RESPONSE message without including any measurement results in the message. The NG-RAN node shall then periodically initiate the Measurement Report procedure for the corresponding measurements, with the requested reporting periodicity.

If the *Measurement Beam Information Request* IE is included in the MEASUREMENT REQUEST message, the NG-RAN node shall include the *Measurement Beam Information* IE in the *TRP Measurement Result* IE of the MEASUREMENT RESPONSE message.

If the *Measurement Quality* IE is included in the *TRP Measurement Result* IE in the MEASUREMENT RESPONSE message, the LMF may take it into account as the TRP estimate of the measurement quality. If the *Measurement Quality* IE includes the *Zenith Quality* IE, the LMF may take it into account within the angle measurement quality.

If the *Timing Reporting Granularity Factor* IE is included in the *TRP Measurement Quantities* IE in the MEASUREMENT REQUEST message, the NG-RAN node may take it into account when configuring measurements including UL RTOA and gNB Rx-Tx Time Difference.

If the *System Frame Number* IE and/or the *Slot Number* IE are included in the MEASUREMENT REQUEST message, the NG-RAN node shall, if supported, consider that the respective information indicates the activation time of SRS transmission.

If the *Report Characteristics* IE is set to "OnDemand" and the *Response Time* IE is included in the MEASUREMENT REQUEST message, the NG-RAN node shall, if supported, return the corresponding measurement results in the MEASUREMENT RESPONSE message within the indicated time.

If the *Measurement Characteristics Request Indicator* IE is included in the MEASUREMENT REQUEST message, the NG-RAN node shall, if supported, take the requested measurement characteristics into account when configuring measurements, and include the requested information, if available, in the MEASUREMENT RESPONSE message.

If the *Number of TRP Rx TEGs* IE is included in the MEASUREMENT REQUEST message, the NG-RAN node shall, if supported, use it to measure the same SRS resource with different TRP Rx TEGs for the indicated TRP, and report the corresponding UL-RTOA and/or gNB Rx-Tx time difference measurements.

If the *Number of TRP RxTx TEGs* IE is included in the MEASUREMENT REQUEST message, the NG-RAN node shall, if supported, use it to measure the same SRS resource with different TRP RxTx TEGs with the same TRP Tx TEG for the indicated TRP, and report the corresponding gNB Rx-Tx time difference measurements.

If the *Measurement Time Occasion* IE is included in the MEASUREMENT REQUEST message, the NG-RAN node may take it into account as the number of SRS measurement time occasions for a measurement instance.

If the *Time Window Information Measurement List* IE is included in the MEASUREMENT REQUEST message, the NG-RAN node shall, if supported, measure the UL SRS resources from the UE within the indicated time window(s).

**Interaction with the** **Measurement Report procedure:**

If the *Report Characteristics* IE is set to "Periodic" and the *Measurement Amount* IE is included in the MEASUREMENT REQUEST message, the NG-RAN node shall, if supported, take it into account for sending the MEASUREMENT REPORT message.

*Next change*

#### 9.1.4.1 MEASUREMENT REQUEST

This message is sent by the LMF to request the NG-RAN node to configure a positioning measurement.

Direction: LMF → NG-RAN node.

| IE/Group Name | Presence | Range | IE type and reference | Semantics description | Criticality | Assigned Criticality |
| --- | --- | --- | --- | --- | --- | --- |
| Message Type | M |  | 9.2.3 |  | YES | reject |
| NRPPa Transaction ID | M |  | 9.2.4 |  | - |  |
| LMF Measurement ID | M |  | INTEGER (1..65536, …) |  | YES | reject |
| **TRP Measurement Request List** |  | *1* |  |  | YES | reject |
| **>TRP Measurement Request Item** |  | *1..<maxnoofMeasTRPs>* |  |  | EACH | reject |
| >>TRP ID | M |  | 9.2.24 |  | - |  |
| >>Search Window Information | O |  | 9.2.26 |  | - |  |
| >>Cell ID | O |  | NR CGI  9.2.9 | The Cell ID of the TRP identified by the *TRP ID* IE. | YES | ignore |
| >>AoA Search Window Information | O |  | UL-AoA Assistance Information 9.2.66 |  | YES | ignore |
| >>Number of TRP Rx TEGs | O |  | ENUMERATED (2, 3, 4, 6, 8, …) |  | YES | ignore |
| >>Number of TRP RxTx TEGs | O |  | ENUMERATED (2, 3, 4, 6, 8, …) |  | YES | ignore |
| Report Characteristics | M |  | ENUMERATED (OnDemand, Periodic, ...) |  | YES | reject |
| Measurement Periodicity | C-ifReportCharacteristicsPeriodic |  | ENUMERATED (120ms, 240ms, 480ms, 640ms, 1024ms, 2048ms, 5120ms, 10240ms, 1min, 6min, 12min, 30min, 60min,…, 20480ms, 40960ms, extended) | The codepoint 120ms, 240ms, 480ms, 1024ms, 2048ms, 1min, 6min, 12min, 30min, and 60min are not applicable | YES | reject |
| **TRP Measurement Quantities** |  | *1* |  |  | YES | reject |
| **>TRP Measurement Quantities Item** |  | *1 .. <maxnoPosMeas>* |  |  | EACH | reject |
| >>TRP Measurement Type | M |  | ENUMERATED (gNB-RxTxTimeDiff, UL-SRS-RSRP, UL-AoA, UL-RTOA,…, Multiple UL-AoA, UL SRS-RSRPP, UL-RSCP) |  | - |  |
| >>Timing Reporting Granularity Factor | O |  | INTEGER (0..5) | Value (0..5) corresponds to (k0..k5)  TS 38.133 [16].  This IE is ignored when the Timing Reporting Granularity Factor Extended IE is included. | - |  |
| >>Timing Reporting Granularity Factor Extended | O |  | INTEGER (-2..-1, …) | Value -1 corresponds to kminus1, value -2 corresponds to kminus2 and so on, see  TS 38.133 [16] |  |  |
| SFN initialisation Time | O |  | Relative Time 1900  9.2.36 | If this IE is not present, the TRP may assume that the value is same as its own SFN initialisation time. | YES | ignore |
| SRS Configuration | O |  | 9.2.28 |  | YES | ignore |
| Measurement Beam Information Request | O |  | ENUMERATED (true,...) | This IE is ignored when the *Measurement Characteristics Request Indicator* IE is included. | YES | ignore |
| System Frame Number | O |  | INTEGER(0..1023) |  | YES | ignore |
| Slot Number | O |  | INTEGER(0..79) |  | YES | ignore |
| Measurement Periodicity Extended | C-ifMeasPerExt |  | ENUMERATED (160ms, 320ms, 1280ms, 2560ms, 61440ms, 81920ms, 368640ms, 737280ms, 1843200ms, …) |  | YES | reject |
| Response Time | O |  | 9.2.68 | This IE is ignored when the *Report Characteristics* IE is set to “periodic”. | YES | ignore |
| Measurement Characteristics Request Indicator | O |  | 9.2.81 |  | YES | ignore |
| Measurement Time Occasion | O |  | ENUMERATED (o1, o4, …) |  | YES | ignore |
| Measurement Amount | O |  | ENUMERATED (0, 1, 2, 4, 8, 16, 32, 64) | This IE is ignored if the *Report Characteristics* IE is set to ‘OnDemand’.  Value 0 represents an infinite number of periodic reporting. | YES | ignore |
| Time Window Information Measurement List | O |  | 9.2.x2 |  | YES | ignore |

| Condition | Explanation |
| --- | --- |
| ifReportCharacteristicsPeriodic | This IE shall be present if the *Report Characteristics* IE is set to the value "Periodic". |
| ifMeasPerExt | This IE shall be present if the *Measurement Periodicity* IE is set to the value "extended". |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoPosMeas | Maximum no. of measured quantities that can be configured and reported with one positioning measurement message. Value is 16384. |
| maxnoofMeasTRPs | Maximum no. of TRPs that can be included within one message. Value is 64. |

*Next change*

### 9.2.37 TRP Measurement Result

This information element contains the measurement result.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description | Criticality | Assigned Criticality |
| **Measured Result Item** |  | *1 .. <maxnoPosMeas>* |  |  |  |  |
| >CHOICE *Measured Results Value* | M |  |  |  |  |  |
| >>UL Angle of Arrival | M |  | 9.2.38 |  | - |  |
| >>UL SRS-RSRP | M |  | INTEGER (0..126) |  | - |  |
| >>UL RTOA | M |  | 9.2.39 |  | - |  |
| >>gNB Rx-Tx Time Difference | M |  | 9.2.40 |  | - |  |
| >>Z-AoA | M |  | 9.2.67 |  | YES | reject |
| >>Multiple UL-AoA | M |  | 9.2.71 |  | YES | reject |
| >>UL SRS-RSRPP | M |  | 9.2.72 |  | YES | reject |
| >>UL RSCP | M |  | 9.2.x3 |  | YES | reject |
| >Time Stamp | M |  | 9.2.42 |  | - |  |
| >Measurement Quality | O |  | 9.2.43 |  | - |  |
| >Measurement Beam Information | O |  | 9.2.57 |  | - |  |
| >SRS Resource type | O |  | 9.2.73 |  | YES | ignore |
| >ARP ID | O |  | 9.2.75 |  | YES | ignore |
| >LoS/NLoS Information | O |  | 9.2.77 |  | YES | ignore |
| **>Aggregated Positioning SRS Resource ID List** |  | *0..1* |  | Indicates the used SRS for positioning resources across aggregated carriers. | YES | ignore |
| **>>Aggregated Positioning SRS Resource ID Item** |  | 1..< *maxnoaggregatedPosSRS-Resources* > |  |  | - |  |
| >>>Positioning SRS Resource ID | M |  | INTEGER (0..63) |  |  |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoPosMeas | Maximum no. of measured quantities that can be configured and reported with one positioning measurement message. Value is 16384. |
| maxnoaggregatedPosSRS-Resources | Maximum no of aggregated Positioning SRS resources per UL BWP. Value is 3. |

*Next change*

9.2.x2 Time Window Information Measurement List

This IE contains the time window(s) when UL SRS measurement is requested.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| Time Window Information Measurement List |  | 1 |  |  |
| **>Time Window Information Measurement Item** |  | *1..<maxnoofTimeWindowMeas>* |  |  |
| >>CHOICE *Time Window Duration* | M |  |  | Duration of time window with start time given by the *System Frame Number* IE and *Slot Number* IE. |
| *>>>Slots* |  |  |  |  |
| >>>>Duration in Slots | M |  | ENUMERATED (1, 2, 4, 6, 8, 12, 16, …) |  |
| >>Time Window Type | M |  | ENUMERATED (single, periodic, …) |  |
| >>Time Window Periodicity | C-ifTimeWindowTypePeriodic |  | ENUMERATED (160, 320, 640, 1280, 2560, 5120, 10240, 20480, 40960, 61440, 81920, 368640, 737280, 1843200, …) | Unit: Milli-seconds |

|  |  |
| --- | --- |
| Condition | Explanation |
| ifTimeWindowTypePeriodic | This IE shall be present if the *Time Window Type* IE is set to the value “periodic”. |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoofTimeWindowMeas | Maximum no of Time Window for measurement. Value is 16. |

9.3.5 Information Element definitions

TimeWindowDurationMeasurement ::= CHOICE {

durationSlots ENUMERATED {n1, n2, n4, n6, n8, n12, n16, ...},

choice-extension ProtocolIE-Single-Container { { TimeWindowDurationMeasurement-ExtIEs} }

}

TimeWindowDurationMeasurement-ExtIEs NRPPA-PROTOCOL-IES ::= {

...

}

TimeWindowPeriodicityMeasurement ::= ENUMERATED {ms160, ms320, ms640, ms1280, ms2560, ms5120, ms10240,

ms20480, ms40960, ms61440, ms81920, ms368640, ms737280, ms1843200, ...}

TimeWindowInformation-Measurement-List ::= SEQUENCE (SIZE (1.. maxnoofTimeWindowMea)) OF TimeWindowInformation-Measurement-Item

TimeWindowInformation-Measurement-Item ::= SEQUENCE {

timeWindowDurationMeasurement TimeWindowDurationMeasurement,

timeWindowType ENUMERATED {single, periodic, ...},

timeWindowPeriodicityMeasurement TimeWindowPeriodicityMeasurement OPTIONAL,

iE-Extension ProtocolExtensionContainer { { TimeWindowInformation-Measurement-Item-ExtIEs} } OPTIONAL,

...

}

TimeWindowInformation-Measurement-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {

...

}

TRPMeasurementQuantitiesList-Item-ExtIEs NRPPA-PROTOCOL-EXTENSION ::= {

{ID id-TimingReportingGranularityFactorExtended CRITICALITY ignore EXTENSION TimingReportingGranularityFactorExtended PRESENCE optional},

...

}

TRPMeasurementQuantities-Item ::= ENUMERATED {

gNB-RxTxTimeDiff,

uL-SRS-RSRP,

uL-AoA,

uL-RTOA,

...,

multiple-UL-AoA,

uL-SRS-RSRPP

UL-RSCP

}

*End of TP*