3GPP TSG-RAN WG3 Meeting #109-e***R3-205633***

Electronic, August 17 – 28, 2020

**Agenda item:**

**Source:** Qualcomm Incorporated

**Title:** TP to BL CR TS 38.455: Addition of missing parameters

**Document for:**  Discussion and Decision

# 1. Discussion

## 1.1 NR UL Measurement Report Configuration

At RAN1#101-e, the following agreement was made [1]:

Agreement:

Introduce the following new parameters to the higher layer parameter list:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NR\_pos-Core | NR UL Measurement Report Configuration | FFS in RAN3 WG | Expected Propagation Delay | Expected Propagation Delay | New | For providing an indication of when the SRS is expected to arrive in time at the gNB relative to the UL-RTOA reference time. | +/- 500us  Granularity 4 Ts | NRPPa 38.455 | Similar to expected propagation delay in SLmAP. |
| NR\_pos-Core | NR UL Measurement Report Configuration | FFS in RAN3 WG | Delay Uncertainty | Delay Uncertainty | New | For providing an indication of when the SRS is expected to arrive in time at the gNB with uncertainty (search window). | Maximum 32us  Granularity 4 Ts | NRPPa 38.455 | Similar to delay uncertainty in SLmAP. |

In addition, TS 38.305 [2] specifies the following for the TRP measurement request information that may be signalled from the LMF to the gNBs (Tables 8.10.2.4-2 (Multi-RTT), 8.13.2.3-2 (UL-TDOA), and 8.14.2.3-2 (UL-AoA) in [2]):

|  |
| --- |
| Information |
| PCI, GCI, and TRP ID of the TRP to receive UL-SRS |
| UE-SRS configuration |
| UL timing information together with timing uncertainty of candidate TRPs (search window), for reception of SRS by candidate TRPs |
| Start time, duration and report characteristics for the measurements |

Currently, the (UL-RTOA) reference time relative to which the search window parameter above are defined is supposed to be present in IE *SRS Configuration* (9.2.y). Adding the Expected Propagation Delay and Delay Uncertainty to the IE *SRS Configuration* (9.2.y) seems not appropriate since the SRS Configuration can also be included in the POSITIONING INFORMATION RESPONSE/UPDATE messages as well (i.e., gNB🡪LMF direction).

Therefore, a new IE *Measurement Time Information* is proposed for the MEASUREMENT REQUEST message which contains the Reference Time together with the Expected Propagation Delay and Delay Uncertainty summarized above. With these parameters, a TRP should be able to know when the UE UL-SRS is expected to arrive in time at the TRP. Note, this is equivalent to SLmAP [3], but generally applicable to all UL measurements.

The SFN Initialization Time in IE *SRS Configuration* (9.2.y) is then proposed to be moved one level higher to the POSITIONING INFORMATION RESPONSE/UPDATE messages.

**Proposal 1:** Agree to the TP in Annex A for the NRPPa BL CR.

## 1.2 Requested SRS Transmission Characteristics

The "Requested SRS Transmission Characteristics" may be provided in a POSITIONING INFORMATION REQUEST message sent from the LMF to the serving gNB to request a UE SRS configuration. The gNB may then configure a SRS in the UE (via IE *SRS-Config* in TS 38.331 [4]). The LMF may recommend certain SRS parameter which are desired in order to fullfill the service request from the LCS client, which can include number of periodic transmissions, desired bandwidth and other assistance data (e.g., spatial relation, pathloss reference, SSB info).

In order to fulfill a particular response time requirement for the location estimate, the LMF should be able to request not only a number of periodic transmissions but also a desired periodicity. E.g., if a high number of periodic transmissions is deemed necessary to fulfill the service request, it would also affect the positioning response time. Therefore, it is proposed to add the desired SRS periodicity to the IE Requested SRS Transmission Characteristics.

The SRS periodicity in TS 38.331 [4] can range from 1 – 81920 slots, where the slot length depends on the numerology. Therefore, the desired periodicity should be expressed in milli-seconds, including the values:

ENUMERATED (0.125, 0.25, 0.5, 0.625, 1, 1.25, 2, 2.5, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120, 10240, …).

Since the SRS periodicity is a property of the SRS Resource, the requested SRS periodicity should be per number of requested resources.

**Proposal 2:** Agree to the TP in Annex B for the NRPPa BL CR.

# References

[1] RAN1 Chairman’s Notes, RAN1 Meeting #101-e, May 25th – June 5th, 2020.

[2] 3GPP TS 38.305, "Stage 2 functional specification of User Equipment (UE) positioning in NG-RAN".

[3] 3GPP TS 36.459, "SLm interface Application Protocol (SLmAP)".

[4] 3GPP TS 38.331, "NR; Radio Resource Control (RRC) protocol specification".

# Annex A: Text Proposal

9.1.1.a POSITIONING INFORMATION REQUEST

This message is sent by LMF to request positioning information.

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 |  | - |  |
| Requested SRS Transmission Characteristics | O |  | 9.2.x |  | YES | ignore |

9.1.1.b POSITIONING INFORMATION RESPONSE

This message is sent by NG-RAN node to provide positioning information.

Direction: NG-RAN node → LMF.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **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 |  | - |  |
| SRS Configuration | O |  | 9.2.y |  | YES | ignore |
| SFN Initialization Time | O |  | 9.2.y5 |  | YES | ignore |
| Criticality Diagnostics | O |  | 9.2.2 |  | YES | ignore |

9.1.1.c POSITIONING INFORMATION FAILURE

This message is sent by NG-RAN node to indicate that the positioning information cannot be provided.

Direction: NG-RAN node → LMF.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **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 |  | - |  |
| Cause | M |  | 9.2.1 |  | YES | ignore |
| Criticality Diagnostics | O |  | 9.2.2 |  | YES | ignore |

9.1.1.d POSITIONING INFORMATION UPDATE

This message is sent by NG-RAN node to indicate that a change in the SRS configuration has occurred.

Direction: NG-RAN node → LMF.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **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 |  | - |  |
| SRS Configuration | O |  | 9.2.y |  | YES | ignore |
| SFN Initialization Time | O |  | 9.2.y5 |  | YES | ignore |

9.1.x Messages for Measurement Information Transfer Procedures

9.1.x.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>* |  |  |  |  |
| >>TRP ID | M |  | 9.2.aa |  |  |  |
| >>Search Window Information | O |  | 9.2.a |  |  |  |
| 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,…) |  | YES | reject |
| **Measurement Quantities** |  | *1 .. <maxnoMeas>* |  |  | EACH | reject |
| >Measurement Quantities Item | M |  | ENUMERATED (gNB-RxTxTimeDiff, UL-SRS-RSRP, UL-AoA, UL-RTOA,…) |  | - |  |
| Reference Time | O |  | SFN Initialization Time  9.2.y5 |  |  |  |
| SRS Configuration | O |  | 9.2.y |  | YES | ignore |
| Measurement Beam Information Request | O |  | ENUMERATED (true,...) |  | YES | ignore |

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

|  |  |
| --- | --- |
| **Range bound** | **Explanation** |
| maxnoMeas | Maximum no. of measured quantities that can be configured and reported with one message. Value is 63. |
| maxnoofMeasTRPs | Maxmum no. of TRPs that can be included within one message. Value is 16 |

### 9.2.a Search Window Information

This information element contains search window information for the TRP.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| Expected Propagation Delay | M |  | INTEGER  (-3841..3841,…) | Indicates when the SRS is expected to arrive in time at the TRP relative to the Reference Time.  Granularity 4Ts, where Ts=1/(15⋅103 ⋅2048) seconds.  Centre of the search window. |
| Delay Uncertainty | M |  | INTEGER  (1..246,…) | Indicates the uncertainty of the expected SRS arrival time at the TRP  Granularity 4Ts, where Ts=1/(15⋅103⋅2048) seconds.  Single-sided search window. |

### 9.2.y SRS Configuration

This information element contains the SRS configuration configured by the NG-RAN node for the UE.

[Editor’s Note: further details on the IEs are FFS : IEs following the “SRS Resource Set List” FFS 🡺]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| **SRS Resource Set List** |  | 1 |  | [FFS 🡺… |
| >SRS Resource set item |  | 1..<maxnoSRS-ResourceSets> |  |  |
| >>Point A | M |  | INTEGER (0..3279165)  NR ARFCN |  |
| >>Subcarrier Spacing | M |  | ENUMERATED(15kHz, 30kHz, 60kHz, 120kHz) |  |
| >>CP Type | M |  | ENUMERATED(Normal, Extended) |  |
| >>Offset To Carrier | M |  | INTEGER(0..2199) | First usable RB to Point A in the number of PRBs |
| >>BWP Start | M |  | INTEGER(0..274) | Start PRB of the UL BWP to the first usable RB |
| >>SRS Resource Set ID | M |  | INTEGER(0.. 63) |  |
| **>>SRS Resource** | M | 1..<maxnoSRS-ResourcePerSet> |  |  |
| >>>CHOICE *SRS Resource type* |  |  |  |  |
| >>>> SRS Resource | M |  | 9.2.ya |  |
| >>>> Positioning SRS Resource | M |  | 9.2.yb |  |
| >>CHOICE *Resource Type* | M |  |  |  |
| >>>aperiodic |  |  |  |  |
| >>>> SRS Resource Trigger | M |  | 9.2.y3 |  |
| >>>semipersistent |  |  |  |  |
| >>>periodic |  |  |  |  |
| >>Pathloss Reference | O |  | 9.2.y6 | …🡸FFS] |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoSRS-ResourceSets | Maximum no of SRS resource sets. Value is 16. |
| maxnoSRS-ResourcesPerSet | Maximum no of SRS resource per set. Value is 64. |

### 9.2.x Requested SRS Transmission Characteristics

This IE contains the requested SRS configuration for the UE.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| Number Of Periodic Transmissions | O |  | INTEGER (0..500,…) | The number of periodic SRS transmissions requested. The value of ‘0’ represents an infinite number of periodic SRS transmissions. |
| Resource Type | O |  | ENUMERATED (semi-persistent, aperiodic, …) |  |
| CHOICE *Bandwidth* | M |  |  |  |
| >FR1 |  |  | ENUMERATED (5, 10, 20, 40, 50, 80, 100, ...) |  |
| >FR2 |  |  | ENUMERATED (50, 100, 200, 400,…) |  |
| **SRS Resource Set List** |  | *0..<maxNoSets>* |  |  |
| >Number of SRS Resources Per Set | O |  | INTEGER (1..64,...) | The number of SRS Resources per resource set for SRS transmission. |
| >**Periodicity List** |  | 0..<maxNoResources> |  |  |
| >>Periodicity |  |  | ENUMERATED (0.125, 0.25, 0.5, 0.625, 1, 1.25, 2, 2.5, 4, 5, 8, 10, 16, 20, 32, 40, 64, 80, 160, 320, 640, 1280, 2560, 5120, 10240, …) | Milli-seconds |
| >Spatial Relation Information | O |  | 9.2.y2 |  |
| >Pathloss Reference Information | O |  | 9.2.y6 |  |
| SSB Information | O |  | 9.2.z7 |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxNoResources | Maximum no of SRS Resources per set. Value is 64. |