**3GPP TSG-RAN WG3 Meeting#108-e R3-204299**

**1 – 12 June 2020**

**Agenda item:** 19.2.1.3

**Source:** Qualcomm Incorporated

**Title:** (TP to BL CR#0008 / 38.455 on NR Positioning) Addition of UL SRS Activation and Deactivation Procedures

**Document for:** Discussion and Agreement

1. Introduction

This TP provides new NRPPa procedures to support this request from RAN2.

**Proposal 1:** **A new Class 1 NRPPa procedure to support UL-SRS Activation and a new Class 2 NRPPa procedure to support UL-SRS Deactivation should be added to NRPPa to extend the Positioning Information Transfer function.**

2. Appendix / Text Proposal

**START OF CHANGES**

# 7 Functions of NRPPa

The NRPPa protocol provides the following functions:

- E-CID Location Information Transfer. This function allows the NG-RAN node to exchange location information with LMF for the purpose of E-CID positioning.

- OTDOA Information Transfer. This function allows the NG-RAN node to exchange information with the LMF for the purpose of OTDOA positioning.

- Reporting of General Error Situations. This function allows reporting of general error situations, for which function specific error messages have not been defined.

- Positioning Information Transfer. This function allows the NG-RAN node to exchange positioning information with the LMF for the purpose of positioning.

- Measurement Information Transfer. This function allows the LMF to exchange measurement information with the NG-RAN node for the purpose of positioning.

- TRP Information Transfer. This function allows an LMF to obtain TRP related information from an NG-RAN node.

The mapping between the above functions and NRPPa EPs is shown in the table below.

Table 7-1: Mapping between NRPPa functions and NRPPa EPs

| Function | Elementary Procedure(s) |
| --- | --- |
| E-CID Location Information Transfer | a) E-CID Measurement Initiation  b) E-CID Measurement Failure Indication  c) E-CID Measurement Report  d) E-CID Measurement Termination |
| OTDOA Information Transfer | OTDOA Information Exchange |
| Assistance Information Transfer | a) Assistance Information Control  b) Assistance Information Feedback |
| Reporting of General Error Situations | Error Indication |
| Positioning Information Transfer | a) Positioning Information Exchange  b) Positioning Information Update  c) Positioning Activation  d) Positioning Deactivation |
| TRP Information Transfer | TRP Information Exchange |
| Measurement Information Transfer | a) Measurement  b) Measurement Update  c) Measurement Report  d) Measurement Abort  e) Measurement Failure Indication |

**NEXT CHANGE**

## 8.1 Elementary procedures

In the following tables, all EPs are divided into Class 1 and Class 2 EPs.

[Editor’s Notes: procedures and associated functions require further checking

It is also FFS if all the measurements should be aimed at specific TRPs or not]

Table 8.1-1: Class 1 Elementary Procedures

| Elementary Procedure | Initiating Message | Successful Outcome | Unsuccessful Outcome | |
| --- | --- | --- | --- | --- |
| Response message | Response message | |
| E-CID Measurement Initiation | E-CID MEASUREMENT INITIATION REQUEST | E-CID MEASUREMENT INITIATION RESPONSE | E-CID MEASUREMENT INITIATION FAILURE |
| OTDOA Information Exchange | OTDOA INFORMATION REQUEST | OTDOA INFORMATION RESPONSE | OTDOA INFORMATION FAILURE |
| Positioning Information Exchange | POSITIONING INFORMATION REQUEST | POSITIONING INFORMATION RESPONSE | POSITIONING INFORMATION FAILURE |
| TRP Information Exchange | TRP INFORMATION REQUEST | TRP INFORMATION RESPONSE | TRP INFORMATION FAILURE |
| Measurement | MEASUREMENT REQUEST | MEASUREMENT RESPONSE | MEASUREMENT FAILURE |
| Positioning Activation | POSITIONING ACTIVATION REQUEST | POSITIONING ACTIVATION RESPONSE | POSITIONING ACTIVATION  FAILURE |

Table 8.1-2: Class 2 Elementary Procedures

| Elementary Procedure | Initiating Message |
| --- | --- |
| E-CID Measurement Failure Indication | E-CID MEASUREMENT FAILURE INDICATION |
| E-CID Measurement Report | E-CID MEASUREMENT REPORT |
| E-CID Measurement Termination | E-CID MEASUREMENT TERMINATION COMMAND |
| Error Indication | ERROR INDICATION |
| Assistance Information Control | ASSISTANCE INFORMATION CONTROL |
| Assistance Information Feedback | ASSISTANCE INFORMATION FEEDBACK |
| Positioning Information Update | POSITIONING INFORMATION UPDATE |
| Measurement Report | MEASUREMENT REPORT |
| Measurement Update | MEASUREMENT UPDATE |
| Measurement Abort | MEASUREMENT ABORT |
| Measurement Failure Indication | MEASUREMENT FAILURE INDICATION |
| Positioning Deactivation | POSITIONING DEACTIVATION |

[Editor’s Note: further procedural details are FFS]

**NEXT CHANGE**

### 8.2.q Positioning Activation

#### 8.2.q.1 General

The Positioning Activation procedure is initiated by the LMF to request the NG-RAN NODE to activate semi-persistent or trigger aperiodic UL SRS transmission by the UE.

#### 8.2.q.2 Successful Operation



Figure 8.2.q.2-1: Positioning Activation procedure, successful operation

The LMF initiates the procedure by sending a POSITIONING ACTIVATION REQUEST message to the NG-RAN node.

The message includes an indication of the UL SRS resource set to be activated. For semi-persistent UL SRS, the message also indicates the spatial relation for the semi-persistent UL SRS resource to be activated.

Following successful activation of UL SRS transmission in the UE, the NG-RAN node shall respond with a POSITIONING ACTIVATION RESPONSE message.

#### 8.2.q.3 Unsuccessful Operation



Figure 8.2.q.3-1: Positioning Activation procedure, unsuccessful operation

If the NG-RAN node is unable to activate UL SRS transmission in the UE, it shall respond with a POSITIONING ACTIVATION FAILURE message.

#### 8.2.q.4 Abnormal Conditions

Void.

### 8.2.r Positioning Deactivation

#### 8.2.r.1 General

The Positioning Deactivation procedure is initiated by the LMF to indicate to the NG-RAN node that UL SRS transmission should be deactivated in the UE.

#### 8.2.r.2 Successful Operation



Figure 8.2.y.2-1: Positioning Deactivation procedure, successful operation

The LMF initiates the procedure by sending a POSITIONING DEACTIVATION message to the NG-RAN node. This message shall include an indication of the UL SRS resource set to be deactivated.

#### 8.2.y.3 Unsuccessful Operation

Not Applicable.

#### 8.2.y.4 Abnormal Conditions

Void.

**NEXT CHANGE**

#### 9.1.1.d1 POSITIONING ACTIVATION REQUEST

This message is sent by the LMF to cause the NG RAN node to activate/trigger UL SRS transmission by the UE.

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 |  | - |  |
| **Semi-persistent** |  | *0..1* |  |  | YES | ignore |
| >SRS Resource Set ID | M |  | 9.2.y1 |  | YES | reject |
| >SRS Spatial Relation | O |  | 9.2.y2 |  | YES | ignore |
| **Aperiodic** |  | *0..1* |  |  | YES | ignore |
| >SRS Resource Trigger | M |  | 9.2.y3 |  | YES | reject |
| Activation Time | O |  | 9.2.y4 |  | YES | ignore |

[Editor’s Note: further details on the IEs are FFS / pending RAN2]

#### 9.1.1.d2 POSITIONING ACTIVATION RESPONSE

This message is sent by NG-RAN node to confirm successful UL SRS activation in the UE.

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 |  | - |  |
| Criticality Diagnostics | O |  | 9.2.2 |  | YES | ignore |

[Editor’s Note: further details on the IEs are FFS / pending RAN2]

#### 9.1.1.d3 POSITIONING ACTIVATION FAILURE

This message is sent by NG-RAN node to indicate that activation of UL SRS transmission in the UE was unsuccessful.

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 |

[Editor’s Note: further details on the IEs are FFS / pending RAN2]

#### 9.1.1.d4 POSITIONING DEACTIVATION

This message is sent by the LMF to cause the NG RAN node to deactivate UL SRS transmission by the UE.

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 |  | - |  |
| SRS Resource Set ID | M |  | 9.2.y1 |  | YES | Ignore |

[Editor’s Note: further details on the IEs are FFS / pending RAN2]

**NEXT CHANGE**

### 9.2.y1 SRS Resource Set ID

This information element indicates a resource set in the UE for UL SRS transmission.

[Editor’s Note: further details on the IEs are FFS / pending RAN2]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| Positioning SRS Resource Set ID | M |  | INTEGER (0..15) | According to TS 38.331 [x] |

### 9.2.y2 SRS Spatial Relation

This information element indicates a spatial relation for transmission if UL SRS by a UE.

[Editor’s Note: further details on the IEs are FFS / pending RAN2]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| **Spatial Relation for Resource IDi** |  | *1..<maxnoSpatialRelations>* |  | According to TS 38.321 [y] |
| CHOICE *Reference Signal* | M |  |  |  |
| >*NZP CSI-RS* |  |  |  |  |
| >>NZP CSI-RS Resource ID | M |  | INTEGER (0..191) |  |
| >*SSB* |  |  |  |  |
| >>PCI | M |  | INTEGER (0..1007) |  |
| >>SSB Index | M |  | INTEGER (0..63) |  |
| >*SRS* |  |  |  |  |
| >>SRS Resource ID | M |  | INTEGER (0..63) |  |
| >*Positioning SRS* |  |  |  |  |
| >>SRS Pos Resource ID | M |  | INTEGER (0..63) |  |
| >*DL-PRS* |  |  |  |  |
| >>DL-PRS ID | M |  | INTEGER (0..255) |  |
| >>DL-PRS Resource Set ID | M |  | INTEGER (0..7) |  |
| >>DL PRS Resource ID | M |  | INTEGER (0..63) |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoSpatialRelations | Maximum no. of Spatial Relations that can be configured. Value is 64. |

### 9.2.y3 SRS Resource Trigger

This information element indicates a DCI code point according to a SRS resource set configuration.

[Editor’s Note: further details on the IEs are FFS / pending RAN2]

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| **Aperiodic SRS Resource Trigger List** |  | *1..<maxnoSRS-TriggerStates>* |  | According to TS 38.331 [x] |
| >Aperiodic SRS Resource Trigger |  |  | INTEGER (1..3) |  |

|  |  |
| --- | --- |
| Range bound | Explanation |
| maxnoSRS-TriggerStates | Maximum no. of SRS trigger states. Value is 3. |

### 9.2.y4 Activation Time

This information element indicates the start time when the SRS activation is requested.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE Type and Reference | Semantics Description |
| SFN initialization time | M |  | BIT STRING (64) |  |

**END OF CHANGES**