**3GPP TSG-RAN WG3 #109-e *R3-205640***

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Agenda Item: 19.4

Source: Intel Corporation, Huawei

**Title: (TP to BL CR for TS 38.305): stage-2 corrections for positioning**

Document for: Other

# 1. Introduction

In this TP we propose a few stage-2 corrections for TS 38.305 to fix:

1. NR E-CID description
2. NRPPa message names, i.e. Positioning Activation/Deactivation

# 2 Annex – TP to BL CR for TS 38.305

*Start of text for TS 38.305*

### 4.3.10 NR Enhanced Cell ID methods

NR Enhanced Cell ID (NR E‑CID) positioning refers to techniques which use additional UE measurements and/or NG-RAN radio resource and other measurements to improve the UE location estimate.

Although NR E-CID positioning may utilise some of the same measurements as the measurement control system in the RRC protocol, the UE generally is not expected to make additional measurements for the sole purpose of positioning; i.e., the positioning procedures do not supply a measurement configuration or measurement control message, and the UE reports the measurements that it has available rather than being required to take additional measurement actions.

The operation of the NR Enhanced Cell ID method is described in clause 8.9.

*Next Change*

8.10.2.4 Information that may be transferred from the LMF to gNBs

The requested UL-SRS transmission characteristics information that may be signalled from the LMF to the gNB is listed in Table 8.10.2.4-1.

**Table 8.10.2.4-1: Requested UL-SRS transmission characteristics information that may be transferred from LMF to gNB.**

|  |
| --- |
| **Information**  |
| Number Of Transmissions/duration for which the UL-SRS is requested |
| Bandwidth |
| Resource type (periodic, semi-persistent) |
| Pathloss reference: - PCI, SSB Index - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |
| Spatial relation info - PCI, SSB Index - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |

The TRP measurement request information that may be signalled from the LMF to the gNBs is listed in Table 8.10.2.4-2.

**Table 8.10.2.4-2: TRP Measurement request information that may be transferred from LMF to gNBs.**

|  |
| --- |
| **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 |

The Positioning Activation/Deactivation request information that may be signalled from the LMF to the gNB is listed in Table 8.10.2.4-3.

**Table 8.10.2.4-3: Requested positioning activation/deactivation information that may be transferred from LMF to gNB.**

|  |
| --- |
| **Information**  |
| SP UL-SRS: - Activation or Deactivation request - Positioning SRS Resource Set ID which is to be activated/deactivated - Spatial relation for Resource IDi |

*Next Change*

8.10.3.2.3 Positioning Activation/Deactivation Procedure

The purpose of this procedure is to enable the LMF to request activation and deactivation of UL-SRS transmission of the target UE.

Figure 8.10.3.2.3-1 shows the messaging between the LMF and the gNB to perform this procedure.

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**Figure 8.10.3.2.3-1: Positioning Activation/Deactivation Procedure.**

(1) The LMF sends NRPPa the Positioning Activation Request message to the serving gNB of the target UE to request UL-SRS activation for the target UE. For a semi-persistent UL-SRS, the message includes an indication of an UL-SRS resource set to be activated and may include information that indicates the spatial relation for the semi-persistent UL-SRS resource to be activated, as listed in Table 8.10.2.4-3.

(2) For semi-persistent UL-SRS, the serving gNB may then activate the configured semi-persistent UL-SRS resource sets by sending the SP Positioning SRS Activation/Deactivation MAC CE command as specified in TS 38.211 [39].
If the UL-SRS has been successfully activated as requested in step 1, the gNB sends the NRPPa Positioning Activation Response message to the LMF. If the serving gNB is not able to fulfil the request from step 1, it returns the NRPPa Positioning Activation Failure message indicating the cause of the failure.

(3) If a previously activated UL-SRS should be deactivated, the LMF sends the NRPPa Positioning Deactivation message to the serving gNB of the target device to request deactivation. This message includes an indication of the UL-SRS resource set to be deactivated.

*Next Change*

### 8.10.4 Sequence of Procedure for Multi-RTT positioning

Figure 8.10.4-1 shows the messaging between the LMF, the gNBs and the UE to perform LMF-initiated Location Information Transfer Procedure for Multi-RTT.

Figure 8.10.4-1: Multi-RTT positioning procedure

0. The LMF may use the procedure in Figure 8.10.3.2.1-1 to obtain the TRP information required for Multi-RTT positioning.

1. The LMF may request the positioning capabilities of the target device using the LPP Capability Transfer procedure described in clause 8.10.3.1.1.

2. The LMF sends a NRPPa POSITIONING INFORMATION REQUEST message to the serving gNB to request UL information for the target device as described in Figure 8.10.3.2.1-2.

3. The serving gNB determines the resources available for UL-SRS and configures the target device with the UL-SRS resource sets at step 3a.

4. The serving gNB provides the UL-SRS configuration information to the LMF in a NRPPa POSITIONING INFORMATION RESPONSE message.

NOTE: It is up to implementation on whether SRS configuration is provided earlier than DL-PRS configuration.

5. The LMF may request activation of UE SRS transmission by sending a NRPPa Positioning Activation Request message to the serving gNB of the target device as described in subclause 8.10.3.2.3. The gNB then activates the UE SRS transmission and sends a NRPPa Positioning Activation Response message. The target device begins the UL-SRS transmission according to the time domain behavior of UL-SRS resource configuration.

6. The LMF provides the UL information to the selected gNBs in a NRPPa MEASUREMENT REQUEST message as described in clause 8.10.3.2.2. The message includes all information required to enable the gNBs/TRPs to perform the UL measurements.

7. The LMF sends a LPP Provide Assistance Data message to the target device as described in subclause 8.10.3.1.2.1. The message includes any required assistance data for the target device to perform the necessary DL-PRS measurements.

8. The LMF sends a LPP Request Location Information message to request Multi-RTT measurements.

9a: The target device performs the DL-PRS measurements from all gNBs provided in the assistance data at step 7.

9b: Each gNB configured at step 6 measures the UE SRS transmissions from the target device.

10. The target device reports the DL-PRS measurements for Multi-RTT to the LMF in a LPP Provide Location Information message.

11. Each gNB reports the UE SRS measurements to the LMF in a NRPPa Measurement Response message as described in clause 8.10.3.2.2.

12. The LMF determines the RTTs from the UE and gNB Rx-Tx time difference measurements for each gNB for which corresponding UL and DL measurements were provided at steps 10 and 11 and calculates the position of the target device.

*Next Change*

8.13.2.3 Information that may be transferred from the LMF to gNBs

The requested UL-SRS transmission characteristics information that may be signalled from the LMF to the gNB is listed in Table 8.13.2.3-1.

**Table 8.13.2.3-1: Requested UL-SRS transmission characteristics information that may be transferred from LMF to gNB.**

|  |
| --- |
| **Information**  |
| Number Of Transmissions/duration for which the UL-SRS is requested |
| Bandwidth |
| Resource type (periodic, semi-persistent) |
| Pathloss reference: - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs) - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |
| Spatial relation info - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs) - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |

The TRP measurement request information that may be signalled from the LMF to the gNB is listed in table 8.13.2.3-2.

**Table 8.13.2.3-2: TRP Measurement request information that may be transferred from LMF to gNB.**

|  |
| --- |
| **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 |

The Positioning Activation/Deactivation request information that may be signalled from the LMF to the gNB is listed in Table 8.13.2.3-3.

**Table 8.13.2.3-3: Requested Positioning activation/deactivation information that may be transferred from LMF to gNB.**

|  |
| --- |
| **Information**  |
| SP UL-SRS: - Activation or Deactivation request - Positioning SRS Resource Set ID which is to be activated/deactivated - Spatial relation for Resource IDi |

*Next Change*

8.13.3.3a Positioning Activation/Deactivation Procedure

The purpose of this procedure is to enable the LMF to request activation and deactivation of UL-SRS transmission of the target UE.

Figure 8.13.3.3a-1 shows the messaging between the LMF and the gNB to perform this procedure.

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**Figure 8.13.3.3a-1: Positioning Activation/Deactivation Procedure.**

(1) The LMF sends the NRPPa Positioning Activation Request message to the serving gNB of the target UE to request UL-SRS activation for the target UE. For a semi-persistent UL-SRS, the message includes an indication of an UL-SRS resource set to be activated and may include information that indicates the spatial relation for the semi-persistent UL-SRS resource to be activated, as listed in Table 8.13.2.3-3.

(2) For semi-persistent UL-SRS, the serving gNB may then activate the configured semi-persistent UL-SRS resource sets by sending the SP Positioning SRS Activation/Deactivation MAC CE command as specified in TS 38.211 [39].
If the UL-SRS has been successfully activated as requested in step 1, the gNB sends the NRPPa Positioning Activation Response message to the LMF. If the serving gNB is not able to fulfil the request from step 1, it returns the NRPPa Positioning Activation Failure message indicating the cause of the failure.

(3) If a previously activated UL-SRS should be deactivated, the LMF sends the NRPPa Positioning Deactivation message to the serving gNB of the target device to request deactivation. This message includes an indication of the UL-SRS resource set to be deactivated.

*Next Change*

8.13.3.4 Sequence of Procedure for UL-TDOA positioning

Figure 8.13.3.4-1 shows the messaging between the LMF, the gNBs and the UE to perform UL-TDOA procedure.

**Figure 8.13.3.4-1: UL-TDOA positioning procedure**

0. The LMF may use the procedure in Figure 8.13.3.2.1-2 to obtain the TRP information required for UL-TDOA positioning.

1. The LMF may request the positioning capabilities of the target device using the LPP Capability Transfer procedure as described in clause 8.13.3.1.

2. The LMF sends a NRPPa POSITIONING INFORMATION REQUEST message to the serving gNB to request UL-SRS configuration information for the target device as described in Figure 8.13.3.2.1-1.

3. The serving gNB determines the resources available for UL-SRS and configures the target device with the UL-SRS resource sets at step 3a.

4. The serving gNB provides the UL information to the LMF in a NRPPa POSITIONING INFORMATION RESPONSE message.

5. The LMF may request activation of UE SRS transmission by sending the NRPPa Positioning Activation Request message to the serving gNB of the target device as described in subclause 8.13.3.3a. The gNB then activates the UL-SRS transmission and sends a NRPPa Positioning Activation Response message. The target device begins the UL-SRS transmission according to the time domain behavior of UL-SRS resource configuration.

6. The LMF provides the UL-SRS configuration to the selected gNBs in a NRPPa MEASUREMENT REQUEST message as described in clause 8.13.3.3. The message includes all information required to enable the gNBs/TRPs to perform the UL measurements.

7. Each gNB configured at step 6 measures the UL-SRS transmissions from the target device.

8. Each gNB reports the UL-SRS measurements to the LMF in a NRPPa Measurement Response message as described in clause 8.13.3.3.

*Next Change*

8.14.2.3 Information that may be transferred from the LMF to gNB

The requested UL-SRS transmission characteristics information that may be signalled from the LMF to the gNB is listed in Table 8.14.2.3-1.

**Table 8.14.2.3-1: Requested UL-SRS transmission characteristics information that may be transferred from LMF to gNB.**

|  |
| --- |
| **Information**  |
| Number Of Transmissions/duration for which the UL-SRS is requested |
| Bandwidth |
| Resource type (periodic, semi-persistent) |
| Pathloss reference:  - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs) - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |
| Spatial relation info - PCI, SSB Index, SSB configuration (time/frequency occupancy of SSBs) - DL-PRS ID, DL-PRS Resource Set ID, DL-PRS Resource ID |

The TRP measurement request information that may be signalled from the LMF to the gNB is listed in table 8.14.2.3-2.

**Table 8.14.2.3-2: TRP Measurement request information that may be transferred from LMF to gNB.**

|  |
| --- |
| **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 |

The Positioning Activation/Deactivation request information that may be signalled from the LMF to the gNB is listed in Table 8.14.2.3-3.

**Table 8.14.2.3-3: Requested Positioning activation/deactivation information that may be transferred from LMF to gNB.**

|  |
| --- |
| **Information** |
| SP UL-SRS: - Activation or Deactivation request - Positioning SRS Resource Set ID which is to be activated/deactivated - Spatial relation for Resource IDi |

*Next Change*

8.14.3.3a Positioning Activation/Deactivation Procedure

The purpose of this procedure is to enable the LMF to request activation and deactivation of UL-SRS transmission of the target UE.

Figure 8.14.3.3a-1 shows the messaging between the LMF and the gNB to perform this procedure.

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**Figure 8.14.3.3a-1: Positioning Activation/Deactivation Procedure.**

(1) The LMF sends the NRPPa Positioning Activation Request message to the serving gNB of the target UE to request UL-SRS activation for the target UE. For a semi-persistent UL-SRS, the message includes an indication of an UL-SRS resource set to be activated and may include information that indicates the spatial relation for the semi-persistent UL-SRS resource to be activated, as listed in Table 8.14.2.3-3.

(2) For semi-persistent UL-SRS, the serving gNB may then activate the configured semi-persistent UL-SRS resource sets by sending the SP Positioning SRS Activation/Deactivation MAC CE command as specified in TS 38.211 [39].
If the UL-SRS has been successfully activated as requested in step 1, the gNB sends the NRPPa Positioning Activation Response message to the LMF. If the serving gNB is not able to fulfil the request from step 1, it returns the NRPPa Positioning Activation Failure message indicating the cause of the failure.

(3) If a previously activated UL-SRS should be deactivated, the LMF sends the NRPPa Positioning Deactivation message to the serving gNB of the target device to request deactivation. This message includes an indication of the UL-SRS resource set to be deactivated.

*Next Change*

8.14.3.4 Sequence of Procedure for UL-AoA positioning

Figure 8.14.3.4-1 shows the messaging between the LMF, the gNBs and the UE to perform UL-AoA procedure.

**Figure 8.14.3.4-1: UL-AoA positioning procedure**

0. The LMF may use the procedure in Figure 8.14.3.2.1-2 to obtain the TRP information required for UL-AoA positioning.

1. The LMF may request the positioning capabilities of the target device using the LPP Capability Transfer procedure as described in clause 8.14.3.1.

2. The LMF sends a NRPPa POSITIONING INFORMATION REQUEST message to the serving gNB to request UL-SRS configuration information for the target device as described in Figure 8.14.3.2.1-1.

3. The serving gNB determines the resources available for UL-SRS and configures the target device with the UL-SRS resource sets at step 3a.

4. The serving gNB provides the UL-SRS configuration information to the LMF in a NRPPa POSITIONING INFORMATION RESPONSE message.

5. The LMF may request activation of UE SRS transmission by sending the NRPPa Positioning Activation Request message to the serving gNB of the target device as described in subclause 8.14.3.3a. The gNB then activates the UL-SRS transmission and sends a NRPPa Positioning Activation Response message. The target device begins the UL-SRS transmission according to the time domain behavior of UL-SRS resource configuration.

6. The LMF provides the UL-SRS configuration to the selected gNBs in a NRPPa MEASUREMENT REQUEST message as described in clause 8.14.3.3. The message includes all information required to enable the gNBs/TRPs to perform the UL measurements.

7. Each gNB configured at step 6 measures the UL-SRS transmissions from the target device.

8. Each gNB reports the UL-SRS measurements to the LMF in a NRPPa Measurement Response message as described in clause 8.14.3.3.

*End of Changes*