**3GPP TSG-RAN2 Meeting #117-e *R2-2202608***

**Online, 21st Feb – 3rd Mar, 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **38.300** | **CR** | **0407** | **rev** | **1** | **Current version:** | **16.8.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Introduction of RACH triggers for T\_ADV in NR E-CID [NRTADV] |
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| ***Source to WG:*** | Huawei, CATT, Ericsson, HiSilicon, NTT DOCOMO, Deutsche Telekom, Polaris Wireless, ZTE Corporation |
| ***Source to TSG:*** | RAN2 |
|  |  |
| ***Work item code:*** | TEI17 |  | ***Date:*** | 2022-01-17 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…**Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | In R1-106bise, during the discussion of NR UL E-CID, the following agreement has been reached

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| AgreementDefine a new timing advance measurement for NR as below* + Timing advance (TADV) is defined as the time difference TADV = TgNB-RX –TgNB-TX, where
		- TgNB-RX is the Transmission and Reception Point (TRP) [18] received timing of uplink subframe #*i* containing PRACH transmitted from UE, defined by the first detected path in time
		- TgNB-TX is the TRP transmit timing of downlink subframe #*j* that is closest in time to the subframe #*i* received from the UE
		- The detected PRACH is used to determine the start of one subframe containing that PRACH

Send a LS to RAN2 and RAN3 with the agreement to add TADV reporting for NR UL E-CID so that their corresponding specification changes can be updated. LS is endorsed in R1-2110601. |

Furthermore, in R2, the following CR has been agreed in principle in R2#116e:[R2-2110711](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_116-e%5CDocs%5CR2-2110711.zip) Addition of Timing Advance measurement reporting in NR E-CID Ericsson, NTT Docomo, Polaris Wireless, Verizon, China Telecom, FirstNet, Deutsche Telekom, Intel Corporation, CATT, Nokia, Nokia Shanghai Bell, Huawei CR Rel-17 38.305 16.6.0 0082 - B TEI17 * Agreed in principle (with coversheet update, see comments, updates can be included in final version)

The gNB measurement of Rx-Tx is done by the gNB first sending a PDCCH order to the UE for random access. Then, the UE transmits a PRACH to the network and the gNB Rx-TX is measured as the time difference between the gNB’s downlink transmission and uplink reception of PRACH. However, in the current stage2 spec 38.300, in the description for RACH triggers, there is still no description for PRACH for the purpose of positioning. While, in the LTE spec, such description is given, that Random Access Procedure can be triggered when it is needed for positioning in RRC\_CONNECTED |
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| ***Summary of change:*** | 1) Add to the list of triggers for RACH procedure in the stage2 spec TS 38.300 that random access procedure can be triggered when it is needed for the purpose of positioning in RRC\_CONNECTED |
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| ***Consequences if not approved:*** | There is no propre description of trigger for RACH when it is triggered for UL NR E-CID in the stage2 spec |
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| ***Clauses affected:*** | 9.2.6 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.305 CR 0082 |
| ***affected:*** |  | **X** |  Test specifications | TS 38.455 CR 0042 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS 38.473 CR 0817TS 38.215 CR 0038 |
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| ***Other comments:*** |  |
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| ***This CR's revision history:*** | Ver0 R2-2200434 submitted to R2#116bisCatB CR submitted to R2#117e as R2-2202608 |

=====================================START OF CHANGES===============================

### 9.2.6 Random Access Procedure

The random access procedure is triggered by a number of events:

- Initial access from RRC\_IDLE;

- RRC Connection Re-establishment procedure;

- DL or UL data arrival during RRC\_CONNECTED when UL synchronisation status is "non-synchronised";

- UL data arrival during RRC\_CONNECTED when there are no PUCCH resources for SR available;

- SR failure;

- Request by RRC upon synchronous reconfiguration (e.g. handover);

- RRC Connection Resume procedure from RRC\_INACTIVE;

- To establish time alignment for a secondary TAG;

- Request for Other SI (see clause 7.3);

- Beam failure recovery;

- Consistent UL LBT failure on SpCell;

- Positioning purpose during RRC\_CONNECTED requiring random access procedure, e.g., when timing advance is needed for UE positioning

Two types of random access procedure are supported: 4-step RA type with MSG1 and 2-step RA type with MSGA. Both types of RA procedure support contention-based random access (CBRA) and contention-free random access (CFRA) as shown on Figure 9.2.6-1 below.

The UE selects the type of random access at initiation of the random access procedure based on network configuration:

- when CFRA resources are not configured, an RSRP threshold is used by the UE to select between 2-step RA type and 4-step RA type;

- when CFRA resources for 4-step RA type are configured, UE performs random access with 4-step RA type;

- when CFRA resources for 2-step RA type are configured, UE performs random access with 2-step RA type.

The network does not configure CFRA resources for 4-step and 2-step RA types at the same time for a Bandwidth Part (BWP). CFRA with 2-step RA type is only supported for handover.

The MSG1 of the 4-step RA type consists of a preamble on PRACH. After MSG1 transmission, the UE monitors for a response from the network within a configured window. For CFRA, dedicated preamble for MSG1 transmission is assigned by the network and upon receiving random access response from the network, the UE ends the random access procedure as shown in Figure 9.2.6-1(c). For CBRA, upon reception of the random access response, the UE sends MSG3 using the UL grant scheduled in the response and monitors contention resolution as shown in Figure 9.2.6-1(a). If contention resolution is not successful after MSG3 (re)transmission(s), the UE goes back to MSG1 transmission.

The MSGA of the 2-step RA type includes a preamble on PRACH and a payload on PUSCH. After MSGA transmission, the UE monitors for a response from the network within a configured window. For CFRA, dedicated preamble and PUSCH resource are configured for MSGA transmission and upon receiving the network response, the UE ends the random access procedure as shown in Figure 9.2.6-1(d). For CBRA, if contention resolution is successful upon receiving the network response, the UE ends the random access procedure as shown in Figure 9.2.6-1(b); while if fallback indication is received in MSGB, the UE performs MSG3 transmission using the UL grant scheduled in the fallback indication and monitors contention resolution as shown in Figure 9.2.6-2. If contention resolution is not successful after MSG3 (re)transmission(s), the UE goes back to MSGA transmission.

If the random access procedure with 2-step RA type is not completed after a number of MSGA transmissions, the UE can be configured to switch to CBRA with 4-step RA type.

 

(a) CBRA with 4-step RA type (b) CBRA with 2-step RA type

 

(c) CFRA with 4-step RA type (d) CFRA with 2-step RA type

Figure 9.2.6-1: Random Access Procedures



Figure 9.2.6-2: Fallback for CBRA with 2-step RA type

For random access in a cell configured with SUL, the network can explicitly signal which carrier to use (UL or SUL). Otherwise, the UE selects the SUL carrier if and only if the measured quality of the DL is lower than a broadcast threshold. UE performs carrier selection before selecting between 2-step and 4-step RA type. The RSRP threshold for selecting between 2-step and 4-step RA type can be configured separately for UL and SUL. Once started, all uplink transmissions of the random access procedure remain on the selected carrier.

When CA is configured, random access procedure with 2-step RA type is only performed on PCell while contention resolution can be cross-scheduled by the PCell.

When CA is configured, for random access procedure with 4-step RA type, the first three steps of CBRA always occur on the PCell while contention resolution (step 4) can be cross-scheduled by the PCell. The three steps of a CFRA started on the PCell remain on the PCell. CFRA on SCell can only be initiated by the gNB to establish timing advance for a secondary TAG: the procedure is initiated by the gNB with a PDCCH order (step 0) that is sent on a scheduling cell of an activated SCell of the secondary TAG, preamble transmission (step 1) takes place on the indicated SCell, and Random Access Response (step 2) takes place on PCell.

==================================END OF CHANGES====================================