**3GPP TSG-RAN WG2 Meeting # 130 R2-250xxxx**

**St Julian’s, Malta, May. 19th – 23rd, 2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | **38.321** | **CR** |  **2076** | **rev** | **r1** | **Current version:** | **16.19.0** |  |
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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 | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:***  | Clarification on power ramping |
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| ***Source to WG:*** | OPPO |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_2step\_RACH-Core |  | ***Date:*** | 2025-05-20 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-16 |
|  | *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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | According to section 7.1.1 of TS 38.213 as quote below, the transmission power of Msg3 PUSCH is based on the “total power ramp-up”.According the MAC specification as quoted below, the UE can switch from 2-step RACH to 4-step RACH, and “*POWER\_OFFSET\_2STEP\_RA*” added in section 5.1.1a and 5.1.3 is used to compensate the power ramping difference between 2-step RACH and 4-step RACH, as the value of “*PREAMBLE\_POWER\_RAMPING\_STEP*” (i.e. *powerRampingStep*) for 4-step RACH can be different from “*MSGA\_PREAMBLE\_POWER\_RAMPING\_STEP*” (i.e. *msgA-PreamblePowerRampingStep*) for 2-step RACH. The total power ramping amount for the 4-step RACH is calculated in 5.1.3 as follows:(*PREAMBLE\_POWER\_RAMPING\_COUNTER* – 1) × *PREAMBLE\_POWER\_RAMPING\_STEP* *+* *POWER\_OFFSET\_2STEP\_RA*However, in section 5.1.4 of TS 38.321, the example formula used for indicating the power ramping value to PHY was not changed since Rel-15, which does not include *POWER\_OFFSET\_2STEP\_RA*. This causes the misalignment between TS 38.213 and TS 38.321.TS 38.213:7.1 Physical uplink shared channel…7.1.1 UE behaviour…- If the UE receives a random access response message in response to a PRACH transmission or a MsgA transmission on active UL BWP $b$ of carrier $f$ of serving cell $c$ as described in clause 8- $f\_{b,f,c}\left(0,l\right)=∆P\_{rampup,b,f,c}+δ\_{msg2,b,f,c}$, where $l=0$ and- $δ\_{msg2,b,f,c}$ is a TPC command value indicated in a random access response grant of the random access response message corresponding to a PRACH transmission according to Type-1 random access procedure, or in a random access response grant of the random access response message corresponding to a MsgA transmission according to Type-2 random access procedure with RAR message(s) for fallbackRAR, on active UL BWP $b$ of carrier $f$ of serving cell $c$, and -  and $∆P\_{rampup\\_requested,b,f,c}$ is provided by higher layers and corresponds to the total power ramp-up requested by higher layers [11, TS 38.321] for carrier $f$ in the serving cell $c$, $M\_{RB,b,f,c}^{PUSCH}(0)$ is the bandwidth of the PUSCH resource assignment expressed in number of resource blocks for the first PUSCH transmission on active UL BWP$ b$ of carrier $f$ of serving cell $c$, and $∆\_{TF,b,f,c}\left(0\right)$ is the power adjustment of first PUSCH transmission on active UL BWP $b$ of carrier $f$ of serving cell $c$. TS 38.321:5.1.1a    Initialization of variables specific to Random Access type…2> if *RA\_TYPE* is switched from *2-stepRA* to *4-stepRA* during this Random Access procedure:3> set *POWER\_OFFSET\_2STEP\_RA* to (*PREAMBLE\_POWER\_RAMPING\_COUNTER* – 1) × (*MSGA\_PREAMBLE\_POWER\_RAMPING\_STEP* – *PREAMBLE\_POWER\_RAMPING\_STEP*).5.1.3       Random Access Preamble transmission…1> set *PREAMBLE\_RECEIVED\_TARGET\_POWER* to *preambleReceivedTargetPower* + *DELTA\_PREAMBLE* + (*PREAMBLE\_POWER\_RAMPING\_COUNTER* – 1) × *PREAMBLE\_POWER\_RAMPING\_STEP* *+* *POWER\_OFFSET\_2STEP\_RA*; |
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| ***Summary of change:*** | In section 5.1.4, it is clarified that the amount of power ramping applied to the latest Random Access Preamble transmission includes *POWER\_OFFSET\_2STEP\_RA.***Impact analysis**Impacted 5G architecture options: Standalone Impacted functionality: 2-step RACH Inter-operability: If the network implements the CR and the UE does not, there is no interoperability issue. If the UE implements the CR and the network does not, there is no inter-operability issue. |
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| ***Consequences if not approved:*** | There could be some misunderstanding that when the UE switches from 2-step RACH to 4-step RACH, the power ramping of 4-step RACH does not include *POWER\_OFFSET\_2STEP\_RA*. |
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| ***Clauses affected:*** | 5.1.4 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
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| ***This CR's revision history:*** |  |

START OF CHANGE

5.1.4 Random Access Response reception

Once the Random Access Preamble is transmitted and regardless of the possible occurrence of a measurement gap, the MAC entity shall:

1> if the contention-free Random Access Preamble for beam failure recovery request was transmitted by the MAC entity:

2> start the *ra-ResponseWindow* configured in *BeamFailureRecoveryConfig* at the first PDCCH occasion as specified in TS 38.213 [6] from the end of the Random Access Preamble transmission;

2> monitor for a PDCCH transmission on the search space indicated by *recoverySearchSpaceId* of the SpCell identified by the C-RNTI while *ra-ResponseWindow* is running.

1> else:

2> start the *ra-ResponseWindow* configured in *RACH-ConfigCommon* at the first PDCCH occasion as specified in TS 38.213 [6] from the end of the Random Access Preamble transmission;

2> monitor the PDCCH of the SpCell for Random Access Response(s) identified by the RA-RNTI while the *ra-ResponseWindow* is running.

1> if notification of a reception of a PDCCH transmission on the search space indicated by *recoverySearchSpaceId* is received from lower layers on the Serving Cell where the preamble was transmitted; and

1> if PDCCH transmission is addressed to the C-RNTI; and

1> if the contention-free Random Access Preamble for beam failure recovery request was transmitted by the MAC entity:

2> consider the Random Access procedure successfully completed.

1> else if a valid (as specified in TS 38.213 [6]) downlink assignment has been received on the PDCCH for the RA-RNTI and the received TB is successfully decoded:

2> if the Random Access Response contains a MAC subPDU with Backoff Indicator:

3> set the *PREAMBLE\_BACKOFF* to value of the BI field of the MAC subPDU using Table 7.2-1, multiplied with *SCALING\_FACTOR\_BI*.

2> else:

3> set the *PREAMBLE\_BACKOFF* to 0 ms.

2> if the Random Access Response contains a MAC subPDU with Random Access Preamble identifier corresponding to the transmitted *PREAMBLE\_INDEX* (see clause 5.1.3):

3> consider this Random Access Response reception successful.

2> if the Random Access Response reception is considered successful:

3> if the Random Access Response includes a MAC subPDU with RAPID only:

4> consider this Random Access procedure successfully completed;

4> indicate the reception of an acknowledgement for SI request to upper layers.

3> else:

4> apply the following actions for the Serving Cell where the Random Access Preamble was transmitted:

5> process the received Timing Advance Command (see clause 5.2);

5> indicate the *preambleReceivedTargetPower* and the amount of power ramping applied to the latest Random Access Preamble transmission to lower layers (i.e. (*PREAMBLE\_POWER\_RAMPING\_COUNTER* – 1) × *PREAMBLE\_POWER\_RAMPING\_STEP +* *POWER\_OFFSET\_2STEP\_RA*);

5> if the Random Access procedure for an SCell is performed on uplink carrier where *pusch-Config* is not configured:

6> ignore the received UL grant.

5> else:

6> process the received UL grant value and indicate it to the lower layers.

4> if the Random Access Preamble was not selected by the MAC entity among the contention-based Random Access Preamble(s):

5> consider the Random Access procedure successfully completed.

4> else:

5> set the *TEMPORARY\_C-RNTI* to the value received in the Random Access Response;

5> if this is the first successfully received Random Access Response within this Random Access procedure:

6> if the transmission is not being made for the CCCH logical channel:

7> indicate to the Multiplexing and assembly entity to include a C-RNTI MAC CE in the subsequent uplink transmission.

6> if the Random Access procedure was initiated for SpCell beam failure recovery and *spCell-BFR-CBRA* with value *true* is configured:

7> indicate to the Multiplexing and assembly entity to include a BFR MAC CE or a Truncated BFR MAC CE in the subsequent uplink transmission.

6> obtain the MAC PDU to transmit from the Multiplexing and assembly entity and store it in the Msg3 buffer.

NOTE: If within a Random Access procedure, an uplink grant provided in the Random Access Response for the same group of contention-based Random Access Preambles has a different size than the first uplink grant allocated during that Random Access procedure, the UE behavior is not defined.

1> if *ra-ResponseWindow* configured in *BeamFailureRecoveryConfig* expires and if a PDCCH transmission on the search space indicated by *recoverySearchSpaceId* addressed to the C-RNTI has not been received on the Serving Cell where the preamble was transmitted; or

1> if *ra-ResponseWindow* configured in *RACH-ConfigCommon* expires, and if the Random Access Response containing Random Access Preamble identifiers that matches the transmitted *PREAMBLE\_INDEX* has not been received:

2> consider the Random Access Response reception not successful;

2> increment *PREAMBLE\_TRANSMISSION\_COUNTER* by 1;

2> if *PREAMBLE\_TRANSMISSION\_COUNTER* = *preambleTransMax* + 1:

3> if the Random Access Preamble is transmitted on the SpCell:

4> indicate a Random Access problem to upper layers;

4> if this Random Access procedure was triggered for SI request:

5> consider the Random Access procedure unsuccessfully completed.

3> else if the Random Access Preamble is transmitted on an SCell:

4> consider the Random Access procedure unsuccessfully completed.

2> if the Random Access procedure is not completed:

3> select a random backoff time according to a uniform distribution between 0 and the *PREAMBLE\_BACKOFF*;

3> if the criteria (as defined in clause 5.1.2) to select contention-free Random Access Resources is met during the backoff time:

4> perform the Random Access Resource selection procedure (see clause 5.1.2);

3> else if the Random Access procedure for an SCell is performed on uplink carrier where *pusch-Config* is not configured:

4> delay the subsequent Random Access transmission until the Random Access Procedure is triggered by a PDCCH order with the same *ra-PreambleIndex*, *ra-ssb-OccasionMaskIndex*, and UL/SUL indicator TS 38.212 [9].

3> else:

4> perform the Random Access Resource selection procedure (see clause 5.1.2) after the backoff time.

The MAC entity may stop *ra-ResponseWindow* (and hence monitoring for Random Access Response(s)) after successful reception of a Random Access Response containing Random Access Preamble identifiers that matches the transmitted *PREAMBLE\_INDEX*.

HARQ operation is not applicable to the Random Access Response reception.

END OF CHANGE