**3GPP TSG-RAN WG2 Meeting #117-e R2-220xxxx**

**Electronic meeting, 21 February – 3 March, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.321** | **CR** | **TBD** | **rev** | **-** | **Current version:** | **16.7.0** |  |
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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:*** | Introduction of Extending NR operation to 71GHz | | | | | | | | | |
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| ***Source to WG:*** | LG Electronics | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_ext\_to\_71GHz-Core | | | | |  | ***Date:*** | | | 2022-02-23 |
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| ***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 can be 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | MAC specification should be updated to implement RAN2 agreements for extending NR operation to 71Ghz.  RAN2#116bis-e agreements   * The interpretation of t\_id in the formula for RA-RNTI/MsgB-RNTI calculation is to be updated as shown in Table 1 and Table 2 of R2-2201682. | | | | | | | | |
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| ***Summary of change:*** | | The agreements are captured:   * Update interpretation of t\_id in the formula for RA-RNTI calculation in Section 5.1.3 * Update interpretation of t\_id in the formula for MsgB-RNTI calculation in Section 5.1.3a | | | | | | | | |
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| ***Consequences if not approved:*** | | FR2-2 operation is not supported in Rel-17. | | | | | | | | |
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| ***Clauses affected:*** | | 5.1.3, 5.1.3a | | | | | | | | |
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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:*** | |  | | | | | | | | |

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| *Start of Changes* |

5.1.3 Random Access Preamble transmission

The MAC entity shall, for each Random Access Preamble:

1> if *PREAMBLE\_TRANSMISSION\_COUNTER* is greater than one; and

1> if the notification of suspending power ramping counter has not been received from lower layers; and

1> if LBT failure indication was not received from lower layers for the last Random Access Preamble transmission; and

1> if SSB or CSI-RS selected is not changed from the selection in the last Random Access Preamble transmission:

2> increment *PREAMBLE\_POWER\_RAMPING\_COUNTER* by 1.

1> select the value of *DELTA\_PREAMBLE* according to clause 7.3;

1> set *PREAMBLE\_RECEIVED\_TARGET\_POWER* to *preambleReceivedTargetPower* + *DELTA\_PREAMBLE* + (*PREAMBLE\_POWER\_RAMPING\_COUNTER* – 1) × *PREAMBLE\_POWER\_RAMPING\_STEP* *+* *POWER\_OFFSET\_2STEP\_RA*;

1> except for contention-free Random Access Preamble for beam failure recovery request, compute the RA-RNTI associated with the PRACH occasion in which the Random Access Preamble is transmitted;

1> instruct the physical layer to transmit the Random Access Preamble using the selected PRACH occasion, corresponding RA-RNTI (if available), *PREAMBLE\_INDEX*, and *PREAMBLE\_RECEIVED\_TARGET\_POWER*.

1> if LBT failure indication is received from lower layers for this Random Access Preamble transmission:

2> if *lbt-FailureRecoveryConfig* is configured:

3> perform the Random Access Resource selection procedure (see clause 5.1.2).

2> else:

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

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

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

5> indicate a Random Access problem to upper layers;

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

6> consider the Random Access procedure unsuccessfully completed.

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

5> consider the Random Access procedure unsuccessfully completed.

3> if the Random Access procedure is not completed:

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

The RA-RNTI associated with the PRACH occasion in which the Random Access Preamble is transmitted, is computed as:

RA-RNTI = 1 + s\_id + 14 × t\_id + 14 × 80 × f\_id + 14 × 80 × 8 × ul\_carrier\_id

where s\_id is the index of the first OFDM symbol of the PRACH occasion (0 ≤ s\_id < 14), t\_id is the index of the first slot of the PRACH occasion in a system frame (0 ≤ t\_id < 80), where the subcarrier spacing to determine t\_id is based on the value of μ specified in clause 5.3.2 in TS 38.211 [8] for μ = {0, 1, 2, 3}, and for μ = {5, 6}, t\_id is the index of the 120 kHz slot in a system frame that contains the PRACH occasion (0 ≤ t\_id < 80), f\_id is the index of the PRACH occasion in the frequency domain (0 ≤ f\_id < 8), and ul\_carrier\_id is the UL carrier used for Random Access Preamble transmission (0 for NUL carrier, and 1 for SUL carrier).

5.1.3a MSGA transmission

The MAC entity shall, for each MSGA:

1> if *PREAMBLE\_TRANSMISSION\_COUNTER* is greater than one; and

1> if the notification of suspending power ramping counter has not been received from lower layers; and

1> if LBT failure indication was not received from lower layers for the last MSGA Random Access Preamble transmission; and

1> if SSB selected is not changed from the selection in the last Random Access Preamble transmission:

2> increment *PREAMBLE\_POWER\_RAMPING\_COUNTER* by 1.

1> select the value of *DELTA\_PREAMBLE* according to clause 7.3;

1> set *PREAMBLE\_RECEIVED\_TARGET\_POWER* to *msgA-PreambleReceivedTargetPower* + *DELTA\_PREAMBLE* + (*PREAMBLE\_POWER\_RAMPING\_COUNTER* – 1) × *PREAMBLE\_POWER\_RAMPING\_STEP*;

1> if this is the first MSGA transmission within this Random Access procedure:

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

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

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

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

2> obtain the MAC PDU to transmit from the Multiplexing and assembly entity according to the HARQ information determined for the MSGA payload (see clause 5.1.2a) and store it in the MSGA buffer.

1> compute the MSGB-RNTI associated with the PRACH occasion in which the Random Access Preamble is transmitted;

1> instruct the physical layer to transmit the MSGA using the selected PRACH occasion and the associated PUSCH resource of MSGA (if the selected preamble and PRACH occasion is mapped to a valid PUSCH occasion), using the corresponding RA-RNTI, MSGB-RNTI, *PREAMBLE\_INDEX*, *PREAMBLE\_RECEIVED\_TARGET\_POWER*, *msgA-PreambleReceivedTargetPower*, and the amount of power ramping applied to the latest MSGA preamble transmission (i.e. (*PREAMBLE\_POWER\_RAMPING\_COUNTER* – 1) × *PREAMBLE\_POWER\_RAMPING\_STEP*);

1> if LBT failure indication is received from lower layers for the transmission of this MSGA Random Access Preamble:

2> instruct the physical layer to cancel the transmission of the MSGA payload on the associated PUSCH resource;

2> if *lbt-FailureRecoveryConfig* is configured:

3> perform the Random Access Resource selection procedure for 2-step RA type (see clause 5.1.2a).

2> else:

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

3> if *PREAMBLE\_TRANSMISSION\_COUNTE*R = *preambleTransMax* + 1:

4> indicate a Random Access problem to upper layers;

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

5> consider this Random Access procedure unsuccessfully completed.

3> if the Random Access procedure is not completed:

4> if *msgA-TransMax* is applied (see clause 5.1.1a) and *PREAMBLE\_TRANSMISSION\_COUNTER* = *msgA-TransMax* + 1:

5> set the *RA\_TYPE* to *4-stepRA*;

5> perform initialization of variables specific to Random Access type as specified in clause 5.1.1a;

5> if the Msg3 buffer is empty:

6> obtain the MAC PDU to transmit from the MSGA buffer and store it in the Msg3 buffer;

5> flush HARQ buffer used for the transmission of MAC PDU in the MSGA buffer;

5> discard explicitly signalled contention-free 2-step RA type Random Access Resources, if any;

5> perform the Random Access Resource selection procedure as specified in clause 5.1.2.

4> else:

5> perform the Random Access Resource selection procedure for 2-step RA type (see clause 5.1.2a).

NOTE: The MSGA transmission includes the transmission of the PRACH Preamble as well as the contents of the MSGA buffer in the PUSCH resource corresponding to the selected PRACH occasion and *PREAMBLE\_INDEX* (see TS 38.213 [6])

The MSGB-RNTI associated with the PRACH occasion in which the Random Access Preamble is transmitted, is computed as:

MSGB-RNTI = 1 + s\_id + 14 × t\_id + 14 × 80 × f\_id + 14 × 80 × 8 × ul\_carrier\_id + 14 × 80 × 8 × 2

where s\_id is the index of the first OFDM symbol of the PRACH occasion (0 ≤ s\_id < 14), t\_id is the index of the first slot of the PRACH occasion in a system frame (0 ≤ t\_id < 80), where the subcarrier spacing to determine t\_id is based on the value of μ specified in clause 5.3.2 in TS 38.211 [8] for μ = {0, 1, 2, 3}, and for μ = {5, 6}, t\_id is the index of the 120 kHz slot in a system frame that contains the PRACH occasion (0 ≤ t\_id < 80), f\_id is the index of the PRACH occasion in the frequency domain (0 ≤ f\_id < 8), and ul\_carrier\_id is the UL carrier used for Random Access Preamble transmission (0 for NUL carrier, and 1 for SUL carrier). The RA-RNTI is calculated as specified in clause 5.1.3.

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| *The end of change* |