**3GPP TSG-RAN2 Meeting # 127 R2-240**

**Masstricht, Netherlands, 19 – 23 Aug., 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | 38.321 | **CR** | 1881 | **rev** | - | **Current version:** | 18.2.0 |  |
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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:***  | Rapporteur MAC CR for generalized RACH-less HO/LTM [RACH-lessHO] |
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| ***Source to WG:*** | Huawei, HiSIlicon |
| ***Source to TSG:*** | R2 |
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| ***Work item code:*** | TEI18, NR\_Mob\_enh2-Core, NR\_NTN\_enh-Core, NR\_mobile\_IAB-Core |  | ***Date:*** | 19-08-2024 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-18 |
|  | *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:*** | Chagne#1: When describing about the timer cg-RRC-RetransmissionTimer, the current spec uses the wording "initial transmission for RACH-less HO or RACH-less LTM". However, the wording of "initial transmission" was misused. The original woridng of "initial tranmission" was used in CG-SDT, because the CG-SDT comprise of two phase: initial CG-SDT tranmission and subsequent CG-SDT transmission.While the above is not the case for RACH-less HO and LTM, the correct wording to use should be "first PUSCH transmission", to align the wording with the other parts of the spec.Change#2: FROM R2-2406492In 5.8.2, the condition "PDCCH addressed to the MAC entity's C-RNTI has not been received" is still used to describe the case that RACH-less handover is not successfully completed.

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| For the uplink grant configured for configured grant Type 1 for RACH-less handover, if the configured uplink grant is valid according to TS 38.214 [7] for which the above formula is satisfied, the MAC entity shall:1> if, after the initial transmission of RACH-less handover has been performed according to clause 5.4.1 and 5.33, PDCCH addressed to the MAC entity's C-RNTI has not been received: |

This does not follow the below agreement from last meeting (which has already been captured in other places in the Spec for the same case), and thus needs to be revised for consistency throughout the Spec:

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| 3 Agree to the intention to: Replace the condition "PDCCH addressed to the MAC entity's C-RNTI has not been received for configured grant retransmission for RACH-less handover" with "the RACH-less handover procedure has not been completed successfully" in section 5.4.1. |

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| ***Summary of change:*** | 1/ Change "initial transmisison of RACH-less HO/LTM" to "first PUSCH transmission"2/ Change the condition “PDCCH addressed to the MAC entity's C-RNTI has not been received” to “RACH-less handover is not successfully completed”. |
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| ***Consequences if not approved:*** | Change#1: Misuse of wording, which makes the spec confusing and in-consistent.**Inter-Operability analysis:**Impacted functionality:RACH-less HO/LTMInter-operability: There is no inter-operability issue for the CR. Editorial change. The other part of MAC spec captures the correct UE behavior.Change#2: **Impact analysis**Impacted functionality: RACH-less HO**Inter-operability** 1. If the UE is implemented according to this CR but the network is not, the UE and the network has different understanding on whether RACH-less HO has been successfully completed when the UL grant on different HARQ processes used for the first PUSCH transmission is sent to the UE, and wrong scheduling may happen.
2. If the network is implemented according to this CR but the UE is not, the UE and the network has different understanding on whether RACH-less HO has been successfully completed when the UL grant on different HARQ processes used for the first PUSCH transmission is sent to the UE, and wrong scheduling may happen.
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| ***Clauses affected:*** | 5.8.2 |
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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:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

===================================CHANGE BEGINS====================================

### 5.8.2 Uplink

There are two types of transmission without dynamic grant:

- configured grant Type 1 where an uplink grant is provided by RRC, and stored as configured uplink grant;

- configured grant Type 2 where an uplink grant is provided by PDCCH, and stored or cleared as configured uplink grant based on L1 signalling indicating configured uplink grant activation or deactivation.

Type 1 and Type 2 are configured by RRC for a Serving Cell per BWP. Multiple configurations can be active simultaneously in the same BWP. For Type 2, activation and deactivation are independent among the Serving Cells. For the same BWP, the MAC entity can be configured with both Type 1 and Type 2.

A multi-PUSCH configured grant has multiple consecutive configured uplink grants within a *periodicity*. Both Type 1 and Type 2 can be configured for a multi-PUSCH configured grant by RRC.

Only configured grant Type 1 can be configured for CG-SDT or for RACH-less LTM cell switch or for RACH-less handover. CG-SDT can only be configured on initial BWP.

RRC configures the following parameters when the configured grant Type 1 is configured:

- *cs-RNTI*: CS-RNTI for retransmission;

- *cg-SDT-CS-RNTI*: CS-RNTI for CG-SDT retransmission;

- *cg-SDT-RSRP-ThresholdSSB*: an RSRP threshold configured for SSB selection for CG-SDT;

- *cg-RRC-RSRP-ThresholdSSB*: an RSRP threshold configured for SSB selection for RACH-less handover;

- *periodicity*: periodicity of the configured grant Type 1;

- *timeDomainOffset*: Offset of a resource with respect to SFN = *timeReferenceSFN* in time domain;

- *timeDomainAllocation*: Allocation of configured uplink grant in time domain which contains *startSymbolAndLength* (i.e. *SLIV* in TS 38.214 [7]) or *startSymbol* (i.e. *S* in TS 38.214 [7]);

- *nrofHARQ-Processes*: the number of HARQ processes for configured grant;

- *harq-ProcID-Offset*: offset of HARQ process for configured grant configured with *cg-RetransmissionTimer* for operation with shared spectrum channel access;

- *harq-ProcID-Offset2*: offset of HARQ process for configured grant not configured with *cg-RetransmissionTimer*;

- *timeReferenceSFN*: SFN used for determination of the offset of a resource in time domain. The UE uses the closest SFN with the indicated number preceding the reception of the configured grant configuration;

- *timeReferenceH-SFN*: H-SFN used for determination of the offset of a resource in time domain. The UE uses the closest H-SFN with the indicated number preceding the reception of the configured grant configuration.

RRC configures the following parameters when the configured grant Type 2 is configured:

- *cs-RNTI*: CS-RNTI for activation, deactivation, and retransmission;

- *periodicity*: periodicity of the configured grant Type 2;

- *nrofHARQ-Processes*: the number of HARQ processes for configured grant;

- *harq-ProcID-Offset*: offset of HARQ process for configured grant configured with *cg-RetransmissionTimer* for operation with shared spectrum channel access;

- *harq-ProcID-Offset2*: offset of HARQ process for configured grant not configured with *cg-RetransmissionTimer*.

RRC configures the following parameter when retransmissions on configured uplink grant is configured:

- *cg-RetransmissionTimer*: the duration after a configured grant (re)transmission of a HARQ process when the UE shall not autonomously retransmit that HARQ process;

- *cg-SDT-RetransmissionTimer*: the duration after a configured grant (re)transmission of a HARQ process of the initial CG-SDT transmission with CCCH message when the UE shall not autonomously retransmit the HARQ process;

- *cg-RRC-RetransmissionTimer*: the duration after a configured grant (re)transmission of a HARQ process of the first PUSCH transmission of RACH-less handover and RACH-less LTM cell switch when the UE shall not autonomously retransmit the HARQ process.

RRC configures the following parameter when a multi-PUSCH configured grant is configured:

*- nrofSlotsInCG-Period*: the number of configured uplink grants in a *periodicity* of a multi-PUSCH configured grant.

RRC configures the following parameter when UTO-UCI (as specified in clause 9.3 in TS 38.213 [6]) is configured for a configured grant:

*- nrofBitsInUTO-UCI*: number of bits in a UTO-UCI bitmap.

For a configured uplink grant, the MAC entity shall:

1> if its associated configured grant is configured with UTO-UCI and it has not been indicated to the lower layers as unused for PUSCH transmission; or

1> if its associated configured grant is not configured with UTO-UCI:

2> if it is associated with a multi-PUSCH configured grant and meets the validity conditions specified in the clause 6.1 in TS 38.214 [7]; or

2> if it is not associated with a multi-PUSCH configured grant:

3> consider it available for use.

The MAC entity shall not include the UL-SCH resource of a configured uplink grant not available for use in its procedures (e.g. in clause 5.4.4).

For a configured grant configured with UTO-UCI, the MAC entity determines if a configured uplink grant which is within the subsequent *nrofBitsInUTO-UCI* valid occasions of its associated configured grant configuration is going to be used for PUSCH transmission by considering at least the amount of buffered data that can be transmitted on the available occasions of the associated configured grant and other available UL-SCH resources. Upon this determination, the MAC entity sends an indication to lower layers, for use in the procedure for reporting UTO-UCI.

Upon configuration of a configured grant Type 1 for a BWP of a Serving Cell by upper layers, the MAC entity shall:

1> store the uplink grant provided by upper layers as a configured uplink grant for the indicated BWP of the Serving Cell;

1> initialise or re-initialise the configured uplink grant to start in the symbol according to *timeDomainOffset*, *timeReferenceSFN*, and *S* (derived from *SLIV* or provided by *startSymbol* as specified in TS 38.214 [7]), and to reoccur with *periodicity*.

If *cg-SDT-PeriodicityExt* (as defined in TS 38.331 [5]) is not configured, after an uplink grant is configured for a configured grant Type 1, the MAC entity shall consider sequentially that the configured uplink grant, or the first configured uplink grant in a multi-PUSCH configured grant, in the Nth (N ≥ 0) *periodicity* occurs in the symbol for which:

 [(SFN × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot*)
 + (slot number in the frame × *numberOfSymbolsPerSlot*) + symbol number in the slot] =
 (*timeReferenceSFN* × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot*
 + *timeDomainOffset* × *numberOfSymbolsPerSlot* + S + N × *periodicity*)
 modulo (1024 × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot*)

If *cg-SDT-PeriodicityExt* (as defined in TS 38.331 [5]) is configured, after an uplink grant is configured for a configured grant Type 1, the MAC entity shall consider sequentially that the configured uplink grant, or the first configured uplink grant in a multi-PUSCH configured grant, in the Nth (N ≥ 0) *periodicity* occurs in the symbol for which:

 [(H-SFN × *numberOfSFNperH-SFN* + SFN) × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot*
 + (slot number in the frame × *numberOfSymbolsPerSlot*) + symbol number in the slot] =
 ((*timeReferenceH-SFN* × *numberOfSFNperH-SFN + timeReferenceSFN*)
 × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot*
 + *timeDomainOffset* × *numberOfSymbolsPerSlot* + S + N × *periodicity*)
 modulo (1024 × 1024 × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot*)

For a multi-PUSCH configured grant Type 1, the Mth (1 < M ≤ *nrofSlotsInCG-Period*) configured uplink grant within a *periodicity* occurs (M-1) × *numberOfSymbolsPerSlot* symbols after the symbol in which the first configured uplink grant in that *periodicity* occurs.

For an uplink grant configured for configured grant Type 1 for CG-SDT on the selected uplink carrier as in clause 5.27, when CG-SDT is triggered and not terminated, for each configured uplink grant valid according to TS 38.214 [7] for which the above formula is satisfied, the MAC entity shall:

1> if, after initial transmission for CG-SDT with CCCH message has been performed according to clause 5.4.1, PDCCH addressed to the MAC entity's C-RNTI has not been received:

2> if the SSB corresponding to the configured UL grant has the same SSB index as the SSB selected for initial transmission for CG-SDT with CCCH message (i.e., retransmission of initial transmission of CG-SDT):

3> select this SSB;

3> indicate the SSB index corresponding to the configured uplink grant to the lower layer;

3> consider this configured uplink grant as valid.

1> else if at least one SSB configured for CG-SDT with SS-RSRP above *cg-SDT-RSRP-ThresholdSSB* is available:

2> if at least one SSB corresponding to the configured uplink grant with SS-RSRP above the *cg-SDT-RSRP-ThresholdSSB* is available:

3> if this is the initial transmission of CG-SDT with CCCH message after the CG-SDT procedure is initiated as in clause 5.27 (i.e., initial transmission for CG-SDT):

4> select an SSB with SS-RSRP above *cg-SDT-RSRP-ThresholdSSB* amongst the SSB(s) associated with the configured uplink grant.

3> else if PDCCH addressed to C-RNTI has been received after the initial transmission of CG-SDT with CCCH message (i.e., subsequent new transmission for CG-SDT):

4> if SS-RSRP of the SSB selected for the previous transmission for CG-SDT is above *cg-SDT-RSRP-ThresholdSSB* and this SSB is associated with this configured uplink grant:

5> select this SSB.

4> else if SS-RSRP of the SSB selected for the previous transmission for CG-SDT is not above *cg-SDT-RSRP-ThresholdSSB*:

5> select an SSB with SS-RSRP above *cg-SDT-RSRP-ThresholdSSB* amongst the SSB(s) associated with the configured uplink grant.

3> if SSB is selected above:

4> indicate the SSB index to the lower layer;

4> consider this configured uplink grant as valid.

1> else:

2> consider this configured uplink grant as not valid.

2> if PDCCH addressed to C-RNTI after the initial transmission of the CG-SDT with CCCH message has been received:

3> if there is data available for transmission for at least one RB configured for SDT:

4> initiate Random Access procedure in clause 5.1.

NOTE 1: Void.

For an uplink grant configured for configured grant Type 1 for RACH-less LTM cell switch, when there is an ongoing RACH-less LTM cell switch procedure, for each configured uplink grant valid according to TS 38.214 [7] for which the above formula is satisfied, the MAC entity shall:

1> if an SSB corresponding to the configured UL grant has the same SSB index as the SSB associated with the TCI state indicated by the TCI state ID field in LTM Cell Switch Command MAC CE, as specified in clause 5.18.35:

2> select the SSB associated with the TCI state indicated by LTM Cell Switch Command MAC CE.

2> indicate the SSB index to the lower layer;

2> consider this configured uplink grant as valid.

1> else:

2> consider this configured uplink grant as not valid.

NOTE 1a: When there is an ongoing RACH-less LTM cell switch, the configured grant Type 1 which is not specifically configured for LTM (see *cg-LTM-Configuration* in TS 38.331 [5]) is not used.

NOTE 1b: After completion of LTM cell switch, the UE stops using the grant configured for RACH-less LTM cell switch (see *cg-LTM-Configuration* in TS 38.331 [5]).

For the uplink grant configured for configured grant Type 1 for RACH-less handover, if the configured uplink grant is valid according to TS 38.214 [7] for which the above formula is satisfied, the MAC entity shall:

1> if, after the initial transmission of RACH-less handover has been performed according to clause 5.4.1 and 5.33, RACH-less handover is not successfully completed:

2> if the SSB corresponding to the configured UL grant has the same SSB index as the SSB selected for the initial transmission of RACH-less handover (i.e., retransmission of initial transmission of RACH-less handover):

3> select this SSB;

3> indicate the SSB index corresponding to the configured uplink grant to the lower layer;

3> consider this configured uplink grant as valid.

1> else if at least one SSB corresponding to the configured uplink grant with SS-RSRP above *cg-RRC-RSRP-ThresholdSSB* is available:

2> select an SSB with SS-RSRP above *cg-RRC-RSRP-ThresholdSSB* amongst the SSB(s) associated with the configured uplink grant;

2> indicate the selected SSB index to the lower layer;

2> consider this configured uplink grant as valid.

1> else:

2> consider this configured uplink grant as not valid;

2> initiate Random Access procedure in clause 5.1.

NOTE 1A: When the UE determines if there is an SSB with SS-RSRP above *cg-RRC-RSRP-ThresholdSSB* or *cg-SDT-RSRP-ThresholdSSB*, the UE uses the latest unfiltered L1-RSRP measurement.

After an uplink grant is configured for a configured grant Type 2, the MAC entity shall consider sequentially that the configured uplink grant, or the first configured uplink grant in a multi-PUSCH configured grant, in the Nth (N ≥ 0) *periodicity* occurs in the symbol for which:

 [(SFN × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot*)
 + (slot number in the frame × *numberOfSymbolsPerSlot*) + symbol number in the slot] =
 [(SFNstart time × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot*
 + slotstart time × *numberOfSymbolsPerSlot* + symbolstart time) + N × *periodicity*]
 modulo (1024 × *numberOfSlotsPerFrame* × *numberOfSymbolsPerSlot*)

where SFNstart time, slotstart time, and symbolstart time are the SFN, slot, and symbol, respectively, of the first transmission opportunity of PUSCH where the configured uplink grant was (re-)initialised.

For a multi-PUSCH configured grant Type 2, the Mth (1 < M ≤ *nrofSlotsInCG-Period*) configured uplink grant within the same *periodicity* occurs (M-1) × *numberOfSymbolsPerSlot* symbols after the symbol in which the first configured uplink grant in that *periodicity* occurs.

If *cg-nrofPUSCH-InSlot* or *cg-nrofSlots* is configured for a configured grant Type 1 or Type 2, the MAC entity shall consider the uplink grants occur in those additional PUSCH allocations as specified in clause 6.1.2.3 of TS 38.214 [7].

NOTE 2: In case of unaligned SFN across carriers in a cell group, the SFN of the concerned Serving Cell is used to calculate the occurrences of configured uplink grants.

When the configured uplink grant is released by upper layers, all the corresponding configurations shall be released and all corresponding uplink grants shall be cleared.

The MAC entity shall:

1> if at least one configured uplink grant confirmation has been triggered and not cancelled; and

1> if the MAC entity has UL resources allocated for new transmission:

2> if, in this MAC entity, at least one configured uplink grant is configured by *configuredGrantConfigToAddModList*:

3> instruct the Multiplexing and Assembly procedure to generate a Multiple Entry Configured Grant Confirmation MAC CE as defined in clause 6.1.3.31.

2> else:

3> instruct the Multiplexing and Assembly procedure to generate a Configured Grant Confirmation MAC CE as defined in clause 6.1.3.7.

2> cancel all triggered configured uplink grant confirmation(s).

For a configured grant Type 2, the MAC entity shall clear the configured uplink grant(s) immediately after first transmission of Configured Grant Confirmation MAC CE or Multiple Entry Configured Grant Confirmation MAC CE which confirms the configured uplink grant deactivation.

Retransmissions use:

- repetition of configured uplink grants; or

- received uplink grants addressed to CS-RNTI; or

- configured uplink grants with *cg-RetransmissionTimer*, *cg-RRC-RetransmissionTimer* or *cg-SDT-RetransmissionTimer* configured.

====================================CHANGE ENDS====================================