**3GPP TSG RAN WG1 #108-e** **R1-22xxxxx**

**e-Meeting, February 21st – March 3rd, 2022**

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| *CR-Form-v12.0* |
| **DRAFT CHANGE REQUEST** |
|  |
|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **17.0.0** |  |
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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:***  | Corrections on non-terrestrial network operation in NR |
|  |  |
| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** | R1 |
|  |  |
| ***Work item code:*** | NR\_NTN\_Solutions-Core |  | ***Date:*** | 2022-03-07 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | Corrections on NTN operation in NR. |
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| ***Summary of change:*** | 1. Clarify conditions for applicability of in clauses 8.2 and 8.2A.
2. Correct application time for MAC CE commands providing - use of is removed.
3. Other miscellaneous corrections/alignments.
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| ***Consequences if not approved:*** | Incomplete support for NTN operation in NR. |
|  |  |
| ***Clauses affected:*** | 4.2, 8.1, 8.2, 8.2A, 8.3, 9 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.211, TS 38.321, TS 38.331 |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

\*\*\* Unchanged text is omitted \*\*\*

## 4.2 Transmission timing adjustments

\*\*\* Unchanged text is omitted \*\*\*

Adjustment of an value by a positive or a negative amount indicates advancing or delaying the uplink transmission timing for the TAG by a corresponding amount, respectively.

For a timing advance command received on uplink slot and for a transmission other than a PUSCH scheduled by a RAR UL grant or a fallbackRAR UL grant as described in clause 8.2A or 8.3, or a PUCCH with HARQ-ACK information in response to a successRAR as described in clause 8.2A, the corresponding adjustment of the uplink transmission timing applies from the beginning of uplink slot where , is a time duration in msec of symbols corresponding to a PDSCH processing time for UE processing capability 1 when additional PDSCH DM-RS is configured, is a time duration in msec of symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214], is the maximum timing advance value in msec that can be provided by a TA command field of 12 bits, is the number of slots per subframe, is the subframe duration of 1 msec, and , where is provided by *CellSpecific\_Koffset* and is provided by a MAC CE command; otherwise, if not respectively provided,  or . and are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG and of all configured DL BWPs for the corresponding downlink carriers. For , the UE assumes [6, TS 38.214]. Slot and are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG. is determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG and for all configured initial UL BWPs provided by *initialUplinkBWP*. The uplink slot is the last slot among uplink slot(s) overlapping with the slot(s) of PDSCH reception assuming , where the PDSCH provides the timing advance command and is defined in [4, TS 38.211].

\*\*\* Unchanged text is omitted \*\*\*

## 8.1 Random access preamble

\*\*\* Unchanged text is omitted \*\*\*

An association period, starting from frame 0, for mapping SS/PBCH block indexes to PRACH occasions is the smallest value in the set determined by the PRACH configuration period according Table 8.1-1 such that SS/PBCH block indexes are mapped at least once to the PRACH occasions within the association period, where a UE obtains from the value of *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon*. If after an integer number of SS/PBCH block indexes to PRACH occasions mapping cycles within the association period there is a set of PRACH occasions or PRACH preambles that are not mapped to SS/PBCH block indexes, no SS/PBCH block indexes are mapped to the set of PRACH occasions or PRACH preambles. An association pattern period includes one or more association periods and is determined so that a pattern between PRACH occasions and SS/PBCH block indexes repeats at most every 160 msec. PRACH occasions not associated with SS/PBCH block indexes after an integer number of association periods, if any, are not used for PRACH transmissions.

For a PRACH transmission by a UE triggered by a PDCCH order, the PRACH mask index field [5, TS 38.212], if the value of the random access preamble index field is not zero, indicates the PRACH occasion for the PRACH transmission where the PRACH occasions are associated with the SS/PBCH block index indicated by the SS/PBCH block index field of the PDCCH order. If the UE is provided by *CellSpecific\_Koffset*, the PRACH occasion is after slot where is the slot of the UL BWP for the PRACH transmission that overlaps with the end of the PDCCH order reception assuming , and is the SCS configuration for the PRACH transmission. If the PDCCH reception for the PDCCH order includes two PDCCH candidates from two linked search space sets based on *searchSpaceLinking*, as described in clause 10.1, the last symbol of the PDCCH reception is the last symbol of the PDCCH candidate that ends later. The PDCCH reception includes the two PDCCH candidates also when the UE is not required to monitor one of the two PDCCH candidates as described in clauses 10, 11.1, and 11.1.1.

For a PRACH transmission triggered by higher layers, if *ssb-ResourceList* is provided, the PRACH mask index is indicated by *ra-ssb-OccasionMaskIndex* which indicates the PRACH occasions for the PRACH transmission where the PRACH occasions are associated with the selected SS/PBCH block index.

The PRACH occasions are mapped consecutively per corresponding SS/PBCH block index. The indexing of the PRACH occasion indicated by the mask index value is reset per mapping cycle of consecutive PRACH occasions per SS/PBCH block index. The UE selects for a PRACH transmission the PRACH occasion indicated by PRACH mask index value for the indicated SS/PBCH block index in the first available mapping cycle.

\*\*\* Unchanged text is omitted \*\*\*

## 8.2 Random access response - Type-1 random access procedure

In response to a PRACH transmission, a UE attempts to detect a DCI format 1\_0 with CRC scrambled by a corresponding RA-RNTI during a window controlled by higher layers [11, TS 38.321]. The window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for Type1-PDCCH CSS set, as defined in clause 10.1, that is at least one symbol, after the last symbol of the PRACH occasion corresponding to the PRACH transmission, where the symbol duration corresponds to the SCS for Type1-PDCCH CSS set as defined in clause 10.1. Ifor, as defined in [4, TS 38.211], is not zero, the window starts after an additional msec where is defined in [4, TS 38.211] and is provided by *K-Mac* or if *K-Mac* is not provided. The length of the window in number of slots, based on the SCS for Type1-PDCCH CSS set, is provided by *ra-ResponseWindow*.

If the UE detects the DCI format 1\_0 with CRC scrambled by the corresponding RA-RNTI and LSBs of a SFN field in the DCI format 1\_0, if included and applicable, are same as corresponding LSBs of the SFN where the UE transmitted PRACH, and the UE receives a transport block in a corresponding PDSCH within the window, the UE passes the transport block to higher layers. The higher layers parse the transport block for a random access preamble identity (RAPID) associated with the PRACH transmission. If the higher layers identify the RAPID in RAR message(s) of the transport block, the higher layers indicate an uplink grant to the physical layer. This is referred to as random access response (RAR) UL grant in the physical layer.

\*\*\* Unchanged text is omitted \*\*\*

## 8.2A Random access response - Type-2 random access procedure

In response to a transmission of a PRACH and a PUSCH, or to a transmission of only a PRACH if the PRACH preamble is mapped to a valid PUSCH occasion, a UE attempts to detect a DCI format 1\_0 with CRC scrambled by a corresponding MsgB-RNTI during a window controlled by higher layers [11, TS 38.321]. The window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for Type1-PDCCH CSS set, as defined in clause 10.1, that is at least one symbol, after the last symbol of the PUSCH occasion corresponding to the PRACH transmission, where the symbol duration corresponds to the SCS for Type1-PDCCH CSS set. Ifor, as defined in [4, TS 38.211], is not zero, the window starts after an additional msec where is defined in [4, TS 38.211] and is provided by *K-Mac* or if *K-Mac* is not provided. The length of the window in number of slots, based on the SCS for Type1-PDCCH CSS set, is provided by *msgB-ResponseWindow*.

In response to a transmission of a PRACH, if the PRACH preamble is not mapped to a valid PUSCH occasion, a UE attempts to detect a DCI format 1\_0 with CRC scrambled by a corresponding MsgB-RNTI during a window controlled by higher layers [11, TS 38.321]. The window starts at the first symbol of the earliest CORESET the UE is configured to receive PDCCH for Type1-PDCCH CSS set, as defined in clause 10.1, that is at least one symbol, after the last symbol of the PRACH occasion corresponding to the PRACH transmission, where the symbol duration corresponds to the SCS for Type1-PDCCH CSS set. The length of the window in number of slots, based on the SCS for Type1-PDCCH CSS set, is provided by *msgB-ResponseWindow*.

If the UE detects the DCI format 1\_0, with CRC scrambled by the corresponding MsgB-RNTI and LSBs of a SFN field in the DCI format 1\_0, if applicable, are same as corresponding LSBs of the SFN where the UE transmitted PRACH, and the UE receives a transport block in a corresponding PDSCH within the window, the UE passes the transport block to higher layers. The higher layers indicate to the physical layer

- an uplink grant if the RAR message(s) is for fallbackRAR and a random access preamble identity (RAPID) associated with the PRACH transmission is identified, and the UE procedure continues as described in clauses 8.2, 8.3, and 8.4 when the UE detects a RAR UL grant, or

- transmission of a PUCCH with HARQ-ACK information having ACK value if the RAR message(s) is for successRAR, where

- a PUCCH resource for the transmission of the PUCCH is indicated by PUCCH resource indicator field of 4 bits in the successRAR from a PUCCH resource set that is provided by *pucch-ResourceCommon*

- a slot for the PUCCH transmission is indicated by a HARQ Feedback Timing Indicator field of 3 bits in the successRAR having a value from {1, 2, 3, 4, 5, 6, 7, 8} and, with reference to slots for PUCCH transmission having duration , the slot is determined as , where is a slot of the PDSCH reception, is as defined for PUSCH transmission in Table 6.1.2.1.1-5 of [6, TS 38.214], is the SCS configuration of the active UL BWP, and is provided by *CellSpecific\_Koffset*; otherwise, if not provided,

- the UE does not expect the first symbol of the PUCCH transmission to be after the last symbol of the PDSCH reception by a time smaller than msec where is the PDSCH processing time for UE processing capability 1 [6, TS 38.214]

- for operation with shared spectrum channel access, a channel access type and CP extension [15, TS 37.213] for a PUCCH transmission is indicated by a ChannelAccess-CPext field in the successRAR as defined in Table 7.3.1.1.1-4 in TS 38.212 or Table 7.3.1.1.1-4A in TS 38.212 if *ChannelAccessMode-r16* = "*semistatic*" is provided

- the PUCCH transmission is with a same spatial domain transmission filter and in a same active UL BWP as a last PUSCH transmission

\*\*\* Unchanged text is omitted \*\*\*

## 8.3 PUSCH scheduled by RAR UL grant

\*\*\* Unchanged text is omitted \*\*\*

Msg3 PUSCH retransmissions, if any, of the transport block, are scheduled by a DCI format 0\_0 with CRC scrambled by a TC-RNTI provided in the corresponding RAR message [11, TS 38.321].

With reference to slots for a PUSCH transmission scheduled by a RAR UL grant, if a UE receives a PDSCH with a RAR message ending in slot for a corresponding PRACH transmission from the UE, the UE transmits the PUSCH in slot , where and are provided in [6, TS 38.214] and is provided by *CellSpecific\_Koffset*; otherwise, if not provided, .

A UE can be provided in *RACH-ConfigCommon* a set of numbers of repetitions for a PUSCH transmission with PUSCH repetition Type A that is scheduled by a RAR UL grant or by a DCI format 0\_0 with CRC scrambled by a TC-RNTI. The UE repeats the PUSCH transmission over slots, where is indicated by the 2 MSBs of the MCS field in the RAR UL grant or in the DCI format 0\_0 with CRC scrambled by the TC-RNTI, and determines a redundancy version and RBs for each repetition as described in [6, TS 38.214]. For unpaired spectrum operation, the UE determines the slots as the first slots starting from slot where a repetition of the PUSCH transmission does not include a symbol indicated as downlink by *tdd-UL-DL-ConfigurationCommon* or indicated as a symbol of an SS/PBCH block with index provided by *ssb-PositionsInBurst*.

\*\*\* Unchanged text is omitted \*\*\*

# 9 UE procedure for reporting control information

\*\*\* Unchanged text is omitted \*\*\*

In the following, DCI formats with CRC scrambled by C-RNTI or CS-RNTI or MCS-C-RNTI are also referred to as unicast DCI formats and DCI formats with CRC scrambled by G-RNTI or G-CS-RNTI are also referred to as multicast DCI formats. Corresponding unicast DCI formats are DCI formats 0\_0/0\_1/0\_2/1\_0/1\_1/1\_2 and multicast DCI formats are DCI formats 4\_1/4\_2 [4, TS 38.212]. PDSCH receptions scheduled by unicast or multicast DCI formats or HARQ-ACK information associated with unicast or multicast DCI formats are also respectively referred as unicast or multicast PDSCH receptions or unicast or multicast HARQ-ACK information.

For the remaining of this clause, if a UE is provided by *CellSpecific\_Koffset* or by a MAC CE command, reference to a slot for a PUCCH transmission or PUSCH transmission corresponds to a slot for the PUSCH or the PUCCH transmission, where is the SCS configuration for the PUCCH transmission or PUSCH transmission, is defined in clause 4.2, and in FR1. If *Koffset* or if the MAC CE command is not provided, or , respectively. If the PUCCH transmission or the PUSCH transmission is scheduled by a DCI format with CRC scrambled by TC-RNTI, . If the UE is provided a value by a MAC CE command, the UE applies the MAC command in the first slot that is after slot where is the slot where the UE would transmit a PUCCH with HARQ-ACK information for the PDSCH providing the MAC CE command, is the SCS configuration for the PUCCH transmission that is determined in the slot when the MAC CE command is applied.

\*\*\* Unchanged text is omitted \*\*\*