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

**e-Meeting, February 21st – March 3rd, 2021**

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| *CR-Form-v12.0* |
| **DRAFT CHANGE REQUEST** |
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|  | **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 small data transmission in RRC\_INACTIVE state for NR |
|  |  |
| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** | R1 |
|  |  |
| ***Work item code:*** | NR\_SmallData\_INACTIVE-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 small data transmission in RRC\_INACTIVE state. |
|  |  |
| ***Summary of change:*** | 1. Capture that a UE can monitor PDCCH candidates for DCI format 0\_0/1\_0 with CRC scrambled by the C-RNTI in a Type1-PDCCH CSS set if the UE is not provided *sdt-CG-SearchSpace* in clause 10.1.
2. Include the mapping between PUSCH configuration period and SS/PBCH block to configured PUSCH resource association period in clause 19.1.
3. Capture that an association period for mapping SS/PBCH block indexes to valid PUSCH occasions and associated DM-RS resources starts from frame with SFN 0 in clause 19.1.
4. Capture that a PUCCH with HARQ-ACK associated with PDSCHs scheduled by PDCCHs received according to *sdt-CG-SearchSpace* or *sdt-SearchSpace* is transmitted with same spatial filter as the last PUSCH transmission in clause 19.1.
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| ***Consequences if not approved:*** | Incomplete support for small data transmissions in NR. |
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| ***Clauses affected:*** | 10.1, 19.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.211, TS 38.214, 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 \*\*\*

## 10.1 UE procedure for determining physical downlink control channel assignment

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

For a DL BWP, if a UE is not provided *searchSpaceSIB1* for Type0-PDCCH CSS set by *PDCCH-ConfigCommon*, the UE does not monitor PDCCH candidates for a Type0-PDCCH CSS set on the DL BWP. The Type0-PDCCH CSS set is defined by the CCE aggregation levels and the number of PDCCH candidates per CCE aggregation level given in Table 10.1-1. If the active DL BWP and the initial DL BWP have same SCS and same CP length and the active DL BWP includes all RBs of the CORESET with index 0, or the active DL BWP is the initial DL BWP, the CORESET configured for Type0-PDCCH CSS set has CORESET index 0 and the Type0-PDCCH CSS set has search space set index 0.

For a DL BWP, if a UE is not provided *searchSpaceOtherSystemInformation* for Type0A-PDCCH CSS set, the UE does not monitor PDCCH for Type0A-PDCCH CSS set on the DL BWP. The CCE aggregation levels and the number of PDCCH candidates per CCE aggregation level for Type0A-PDCCH CSS set are given in Table 10.1-1.

For a DL BWP, if a UE is not provided *ra-SearchSpace* for Type1-PDCCH CSS set, the UE does not monitor PDCCH for Type1-PDCCH CSS set on the DL BWP. If the UE has not been provided a Type3-PDCCH CSS set, or a Type1A-PDCCH CSS set, or a USS set and the UE has received a C-RNTI and has been provided a Type1-PDCCH CSS set, the UE monitors PDCCH candidates for DCI format 0\_0 and DCI format 1\_0 with CRC scrambled by the C-RNTI in the Type1-PDCCH CSS set.

If a UE is not provided *pagingSearchSpace* for Type2-PDCCH CSS set, the UE does not monitor PDCCH for Type2-PDCCH CSS set on the DL BWP. The CCE aggregation levels and the number of PDCCH candidates per CCE aggregation level for Type2-PDCCH CSS set are given in Table 10.1-1.

If a UE is not provided *peiSearchSpace* for Type2A-PDCCH CSS set, the UE does not monitor PDCCH for Type2A-PDCCH CSS set on the DL BWP. The CCE aggregation levels and the maximum number of PDCCH candidates per CCE aggregation level for Type2A-PDCCH CSS set are given in Table 10.1-1.

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

# 19 PUSCH transmission in RRC\_INACTIVE state

## 19.1 Configured-grant based PUSCH transmission

A UE indicated to release a dedicated RRC connection can be provided one or more configurations by respective one or more *ConfiguredGrantConfig*, for configured grant Type 1 PUSCH transmissions on the initial UL BWP [12, TS 38.331]. For the remaining of this clause, PUSCH transmissions refer to configured grant Type-1 PUSCH transmissions for a configuration provided by *ConfiguredGrantConfig*.

A UE can be provided by *sdt-SSB-Subset* a number of SS/PBCH block indexes to map to a number of valid PUSCH occasions for PUSCH transmissions over an association period. If the UE is not provided *sdt-SSB-Subset*, the UE determines from the value of *ssb-PositionsInBurst* in *SIB1* or by *ServingCellConfigCommon*. A PUSCH occasion for a PUSCH transmission is defined by a time resource and a frequency resource and is associated with a DM-RS provided by *cg-DMRS-Configuration* for the configuration of PUSCH transmissions.

An association period, starting from frame with SFN 0, for mapping SS/PBCH block indexes, from the number of SS/PBCH block indexes, to valid PUSCH occasions and associated DM-RS resources is the smallest value in the set determined by the PUSCH configuration period provided by *periodicity* in *ConfiguredGrantConfig* according to Table 19.1-1 such that SS/PBCH block indexes are mapped at least once to valid PUSCH occasions and associated DM-RS resources within the association period. A UE is provided a number of SS/PBCH block indexes associated with a PUSCH occasion and a DM-RS resource by *sdt-SSB-perCG-PUSCH*. If after an integer number of SS/PBCH block indexes to PUSCH occasions and associated DMRS resources mapping cycles within the association period there is a set of PUSCH occasions and associated DMRS resources that are not mapped to SS/PBCH block indexes, no SS/PBCH block indexes are mapped to the set of PUSCH occasions and associated DMRS resources. An association pattern period includes one or more association periods and is determined so that a pattern between PUSCH occasions with associated DMRS resources and SS/PBCH block indexes repeats at most every 640 msec. PUSCH occasions and associated DMRS resources not associated with SS/PBCH block indexes after an integer number of association periods, if any, are not used for PUSCH transmissions.

Table 19.1-1: Mapping between PUSCH configuration period and SS/PBCH block to configured PUSCH resource association period

|  |  |
| --- | --- |
| PUSCH configuration period (msec) | Association period (number of PUSCH configuration periods except when PUSCH configuration period is less than 5 msec) |
| 5 | {1, 2, 4, 8,16, 32, 64, 128} |
| 8 | {1, 2, 4, 5, 8, 10, 16, 20, 40, 80} |
| 10 | {1, 2, 4, 8,16, 32, 64} |
| 16 | {1, 2, 4, 5, 8,10,20,40} |
| 20 | {1, 2, 4, 8,16, 32} |
| 32 | {1, 2, 4, 5, 10, 20} |
| 40 | {1, 2, 4, 8, 16} |
| 64 | {1, 2, 5, 10} |
| 80 | {1, 2, 4, 8} |
| 128 | {1, 5} |
| 160 | {1, 2, 4} |
| 320 | {1, 2} |
| 640 | {1 } |

 SS/PBCH block indexes are mapped to valid PUSCH occasions and associated DMRS resources in the following order

- first, in increasing order of DMRS resource indexes within a PUSCH occasion, where a DMRS resource index is determined first in an ascending order of a DMRS port index and second in an ascending order of a DMRS sequence index [4, TS 38.211]

- second, in increasing order of PUSCH configuration period indexes

A PUSCH occasion is valid if it does not overlap with a valid PRACH occasion as described in clause 8.1.

For unpaired spectrum and for SS/PBCH blocks with indexes provided by *ssb-PositionsInBurst* in *SIB1* or by *ServingCellConfigCommon*

- if a UE is not provided *tdd-UL-DL-ConfigurationCommon*, a PUSCH occasion is valid if the PUSCH occasion

- does not precede a SS/PBCH block in the PUSCH slot, and

- starts at least symbols after a last SS/PBCH block symbol, where is provided in Table 8.1-2

- if a UE is provided *tdd-UL-DL-ConfigurationCommon*, a PUSCH occasion is valid if the PUSCH occasion

- is within UL symbols

- starts at least symbols after a last downlink symbol, and at least symbols after a last SS/PBCH block symbol, where is provided in Table 8.1-2

A UE determines a power of a PUSCH transmission as described in clause 7.1.1, where the UE obtains using a RS resource from an SS/PBCH block with index associated with the PUSCH transmission.

A UE can be provided a USS set by *sdt-CG-SearchSpace*, or a CSS set by *sdt-SearchSpace*, to monitor PDCCH for detection of DCI format 0\_0 with CRC scrambled by C-RNTI or CS-RNTI for scheduling PUSCH transmission or of DCI format 1\_0 with CRC scrambled by C-RNTI for scheduling PDSCH receptions [12, TS 38.331]. The UE may assume that the DM-RS antenna port associated with the PDCCH receptions, the DM-RS antenna port associated with the PDSCH receptions, and the SS/PBCH block associated with the PUSCH transmission are quasi co-located with respect to average gain and quasi co-location 'typeA' or 'typeD' properties. The UE transmits a PUCCH with HARQ-ACK information associated with the PDSCH receptions as described in clause 9.2.1 using a same spatial domain transmission filter as for the last PUSCH transmission.