**3GPP TSG RAN WG1 #118 R1-2407449**

**Maastricht, Netherlands, August 19th– 23rd, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.213** | **CR** | **0663** | **rev** | **-** | **Current version:** | **18.3.0** |  |
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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:*** | Correction on the first UL transmission after LTM cell switch | | | | | | | | | |
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| ***Source to WG:*** | Moderator (Fujitsu), Huawei, Ericsson, Nokia, ZTE Corporation, Sanechips, HiSilicon, Lenovo, Apple | | | | | | | | | |
| ***Source to TSG:*** | R1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Mob\_enh2-Core | | | | |  | ***Date:*** | | | 2024-08-20 |
|  |  | | | |  | |  | | |  |
| ***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 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)  Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | In RACH-less LTM, UE can transmit first UL after cell switch with configured grant Type 1 PUSCH. RAN2 agreed to use higher layer parameter of *cg-LTM-Configuration-r18* to configure the CG-PUSCH resource for LTM. However, the physical layer procedure corresponding to the configuration of *cg-LTM-Configuration-r18* for first UL transmission with configured grant Type 1 PUSCH is not defined. | | | | | | | | |
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| ***Summary of change:*** | | Add the physical layer procedure on the first UL transmission with configured grant Type 1 PUSCH corresponding to the configuration of *cg-LTM-Configuration-r18.* | | | | | | | | |
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| ***Consequences if not approved:*** | | UE cannot transmit the first UL after LTM cell switch with configured grant Type 1 PUSCH for RACH-less LTM. | | | | | | | | |
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| ***Clauses affected:*** | | 21 | | | | | | | | |
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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 ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | **Isolated Impact Analysis:**  This CR has no isolated impact on network and UE behavior. | | | | | | | | |
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| ***This CR's revision history:*** | | This is the first version of this CR | | | | | | | | |

# 21 L1/L2-triggered mobility procedures

A UE can be indicated, by *LTM-Config*, candidate cells and SS/PBCH blocks per candidate cell for the UE to obtain synchronization and measure corresponding L1-RSRPs [10, TS 38.133]. A Candidate Cell TCI States Activation/Deactivation MAC CE can activate TCI states, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*, associated with SS/PBCH blocks or TRS of corresponding candidate cells [11, TS 38.321]. The RS index for obtaining the candidate cell downlink pathloss estimate is provided by pathlossReferenceRS-Id in the *CandidateTCI-State* or *CandidateTCI-UL-State.* If the Candidate Cell TCI States Activation/Deactivation MAC CE activates TCI states, an LTM Cell Switch Command MAC CE can indicate a TCI state from the activated TCI states; otherwise, the LTM Cell Switch Command MAC CE can activate and indicate a TCI state, provided by *CandidateTCI-State* or/and *CandidateTCI-UL-State*. After reception of the LTM Cell Switch Command MAC CE, activated TCI states that are not indicated by the MAC CE are deactivated. The UE is provided configurations by *ltm-CSI-ReportConfigToAddModList* for reporting L1-RSRP measurements [6, TS 38.214] that include a number of candidate cells and a number of SS/PBCH blocks per candidate cell from the number of candidate cells.

< Unchanged parts are omitted >

A UE can be provided by a LTM Cell Switch Command MAC CE in a PDSCH reception on the serving cell [11, TS 38.321] a *CandidateTCI-State* and/or *CandidateTCI-UL-State* in *ltm-DL-OrJointTCI-StateToAddModList* and/or *ltm-UL-TCI-ToAddModList* indicating a unified TCI state [6, TS 38.214] for applicable receptions or transmissions on a candidate cell from the number of candidate cells. The UE may assume that DM-RS antenna ports for PDCCH receptions and for PDSCH receptions are quasi co-located with the SS/PBCH block or the TRS in the TCI state with respect to quasi co-location 'typeA' and 'typeD' properties, when applicable. The UE does not expect to be indicated quasi co-location 'typeA' properties when a SS/PBCH block is configured as a source RS of the TCI state. The UE applies the *CandidateTCI-State* and/or *CandidateTCI-UL-State,* if indicated by the MAC CE, no later than after the last symbol of a PUCCH or PUSCH with HARQ-ACK information for the PDSCH providing the MAC CE, where , , and are defined in [10, TS 38.133]*.* For RACH-based LTM cell switch [19, TS 38.300], the UE applies the *CandidateTCI-State* for receptions on the candidate cell, and applies a spatial domain filter corresponding to the *CandidateTCI-State* or the *CandidateTCI-UL-State* for transmissions on the candidate cell, that are after the completion of the random access procedure associated with the PRACH transmission on the candidate cell and before a new TCI state is indicated for the candidate cell. For RACH-less LTM cell switch [19, TS 38.300], the UE applies the *CandidateTCI-State* for receptions on the candidate cell and applies a spatial domain filter corresponding to the *CandidateTCI-State* or the *CandidateTCI-UL-State* for transmissions on the candidate cell before a new TCI state is indicated for the candidate cell.

## 21.1 Configured-grant PUSCH transmission in RACH-less LTM cell switch

A UE configured to perform PUSCH transmission in RACH-less LTM cell switch can be provided one or more configurations by respective one or more *ConfiguredGrantConfig*, for configured grant Type 1 PUSCH transmissions on the active 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 *rrc-SSB-Subset* in *cg-LTM-Configuration* 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 *rrc-SSB-Subset* in *cg-LTM-Configuration*, the UE determines from the value of *ssb-PositionsInBurst* in *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. A UE can be provided a number of repetitions for a PUSCH transmission by *repK* or *numberOfRepetitions*. If the number of repetitions is provided and larger than 1, all the PUSCH occasions of the repetitions for the PUSCH transmission are mapped to the same SS/PBCH block index(es). For the initial transmission or autonomous retransmission of an initial transport block provided for PUSCH transmission, the UE encodes the transport block using redundancy version number 0 if the UE is not provided *repK-RV*.

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 *rrc-SSB-PerCG-PUSCH* in *cg-LTM-Configuration*. 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.

Each *N* of SS/PBCH block indexes in increasing order 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

where N is provided by rrc-SSB-PerCG-PUSCH in cg-LTM-Configuration.

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*

- 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

If the UE is provided *cg-LTM-Configuration,* the UE performs configured grant Type 1 PUSCH transmission on the valid PUSCH occasions associated with the SS/PBCH block indexes same as the SS/PBCH block indexes provided by or associated with QCL RS of the *CandidateTCI-State* and/or *CandidateTCI-UL-State* indicated by the LTM Cell Switch Command MAC CE.

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 *pathlossReferenceRS-Id* included in the *CandidateTCI-State* and/or *CandidateTCI-UL-State* indicated by the LTM Cell Switch Command MAC CE.

< Unchanged parts are omitted >