**3GPP TSG RAN WG1 #117** **R1-240xxxx**

Fukuoka, Japan, May 20th – 24th, 2024

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| *CR-Form-v12.2* |
| **DRAFT CHANGE REQUEST** |
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|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **18.2.0** |  |
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| *For* [***HELP***](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:***  | Rel-18 editorial corrections for TS 38.213 |
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| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** | R1 |
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| ***Work item code:*** | NR\_cov\_enh2-Core, NR\_SL\_enh2-Core, NR\_mob\_enh2-Core, NR\_NTN\_enh-Core, NR\_Mob\_enh2, NR\_MBS\_enh-Core |  | ***Date:*** | 2024-05-27 |
|  |  |  |  |  |
| ***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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | RAN1#116bis1. Clarify total power ramp-up for PRACH preamble by referring to TS 38.321 in Clause 7.1.1.
2. Missing reference to Clause 22.1 for DM-RS antenna port quasi co-location with SS-PPCH block for PDCCH receptions in CORESET 0. In Clause 10.1.
3. Editorial correction in Clause 16.1.
4. Misaligned parameter names with TS 38.331 v18.1.0 in Clauses 8.1, 21, and 22.2.
5. Introduce NTN operation for frequency bands defined by FR2-NTN.

RAN1#1171. Misaligned parameter names with TS 38.331 v18.1.0 in Clause 7.7.1.
2. Missing RRC parameters for power control procedure of first Type 1 CG-PUSCH transmission after RACH-less HO in NTN in Clause 7.1.1.
3. Incorrect statement that the LTM Cell Switch Command includes a *CandidateTCI-State* and/or *CandidateTCI-UL-State* in Clause 21*.*
4. Misaligned parameter name with TS 38.331 v18.1.0 for multicast reception in RRC\_INACTIVE state in Clauses 9, 10.1, and 18.
5. Misaligned parameter names with TS 38.331 v18.1.0 in Clause 22.1.
6. Misaligned description with TS 38.214 v18.2.0. for pathloss measurement in Clause 7.3.1.
7. Misaligned parameter names with TS 38.331 v18.1.0 in Clause 16.1.
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| ***Summary of change:*** | RAN1#116bis1. Remove “from the first to the last random access preamble” and add reference to TS 38.321 in Clause 7.1.1.
2. Add reference to Clause 22.1 for DM-RS antenna port quasi co-location with SS-PPCH block for PDCCH receptions in CORESET 0 in Clause 10.1.
3. Editorial correction in Clause 16.1.
4. Align parameter names with TS 38.331 v18.1.0 in Clauses 8.1, 21, and 22.2.
5. Update references, abbreviations, and UE procedures for cell search and for reporting control information to include definition of FR2-NTN.

RAN1#1171. Align parameter names with TS 38.331 v18.1.0 in Clause 7.7.1.
2. Add RRC parameters for power control procedure of first Type 1 CG-PUSCH transmission after RACH-less HO in NTN in Clause 7.1.1.
3. Align with TS 38.321 v18.1.0 and clarify that the LTM Cell Switch Command provides a TCI state ID or an UL TCI state ID in Clause 21.
4. Align parameter name with TS 38.331 v18.1.0 for multicast reception in RRC\_INACTIVE state in Clauses 9, 10.1, and 18.
5. Change ntn-SSB-Subset to rrc-SSB-Subset, and change ntn-SSB-PerCG-PUSCH to rrc-SSB-PerCG-PUSCH in Clause 22.1
6. Align description with TS 38.214 v18.2.0. for pathloss measurement in Clause 7.3.1.
7. Align parameter names with TS 38.331 v18.1.0 in Clause 16.1.
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| ***Consequences if not approved:*** | Ambiguous/incorrect/incomplete specifications. |
|  |  |
| ***Clauses affected:*** | 2, 3.3, 4.1, 7.1.1, 7.3.1, 7.7.1, 8.1, 9, 10.1, 16.1, 21, 22.1, 22.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ... |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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

# 2 References

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

 [8-3] 3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios"

[8-4] 3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements"

[8-5] 3GPP TS 38.101-5: " User Equipment (UE) radio transmission and reception; Part 5: Satellite access Radio Frequency (RF) and performance requirements NR"

[9] 3GPP TS 38.104: "NR; Base Station (BS) radio transmission and reception"

[10] 3GPP TS 38.133: "NR; Requirements for support of radio resource management"

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

## 3.3 Abbreviations

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

FR1 Frequency Range 1

FR2 Frequency Range 2

FR2-NTN Frequency Range 2 for non-terrestrial networks [8-5]

G-CS-RNTI Group Configured Scheduling RNTI

G-RNTI Group RNTI

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

## 4.1 Cell search

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

- Case D - 120 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes $\left\{4,8,16,20\right\}+28⋅n$. For carrier frequencies within FR2 and FR2-NTN, $n=0, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16, 17, 18$.

- Case E - 240 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes $\left\{8,12,16,20,32,36,40,44\right\}+56⋅n$. For carrier frequencies within FR2-1 and FR2-NTN, $n=0, 1, 2, 3, 5, 6, 7, 8$.

- Case F – 480 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes $\left\{2, 9\right\}+14⋅n$. For carrier frequencies within FR2-2, $n=0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31.$

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

### 7.1.1 UE behaviour

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

- For a PUSCH (re)transmission configured by *ConfiguredGrantConfig*, $j=1$, $P\_{O\\_NOMINAL,PUSCH,f,c}\left(1\right)$ is provided by *p0-NominalWithoutGrant*, or $P\_{O\\_NOMINAL,PUSCH,f,c}\left(1\right)=P\_{O\\_NOMINAL,PUSCH,f,c}\left(0\right)$ if *p0-NominalWithoutGrant* is not provided.

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

- else, $P\_{O\\_UE\\_PUSCH,b,f,c}\left(1\right)$ is provided by *p0* obtained from *p0-PUSCH-Alpha* in *ConfiguredGrantConfig* that provides an index *P0-PUSCH-AlphaSetId* to a set of *P0-PUSCH-AlphaSet*, or by *sdt*-*P0-PUSCH* for a PUSCH (re)transmission as described in clause 19.1, or by *rrc-P0-PUSCH* for a PUSCH (re)transmission as described in clause 22.1, for active UL BWP $b$ of carrier $f$ of serving cell $c$

- For $j\in \left\{2,…,J-1\right\}=S\_{J}$, a $P\_{O\\_NOMINAL,PUSCH,f,c}\left(j\right)$ value, applicable for all $j\in S\_{J}$, is provided by *p0-NominalWithGrant,* or $P\_{O\\_NOMINAL,PUSCH,f,c}\left(j\right)=P\_{O\\_NOMINAL,PUSCH,f,c}\left(0\right)$ if *p0-NominalWithGrant* is not provided, for each carrier $f$ of serving cell $c$ and a set of $P\_{O\\_UE\\_PUSCH,b,f,c}\left(j\right) $values are provided by a set of *p0* in *P0-PUSCH-AlphaSet* indicated by a respective set of *p0-PUSCH-AlphaSetId* for active UL BWP $b$ of carrier $f$ of serving cell $c$

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

- For $α\_{b,f,c}\left(j\right)$

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

- else $α\_{b,f,c}(1)$ is provided by *alpha* obtained from *p0-PUSCH-Alpha* in *ConfiguredGrantConfig* providing an index *P0-PUSCH-AlphaSetId* to a set of *P0-PUSCH-AlphaSet*, or by *sdt*-*Alpha* for a PUSCH (re)transmission as described in clause 19.1, or by *rrc-Alpha* for a PUSCH (re)transmission as described in clause 22.1, for active UL BWP $b$ of carrier $f$ of serving cell $c$

- For $j\in S\_{J}$, a set of $α\_{b,f,c}\left(j\right)$ values are provided by a set of *alpha* in *P0-PUSCH-AlphaSet* indicated by a respective set of *p0-PUSCH-AlphaSetId* for active UL BWP $b$ of carrier $f$ of serving cell $c$

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

If the UE transmits a PUSCH associated with the first RS resource index $q\_{d}$, the UE applies the first $P\_{O\\_UE\\_PUSCH,b,f,c}\left(j\right)$ value, the first $α\_{b,f,c}\left(j\right)$ value, and $f\_{b,f,c}\left(i,l\right)$ for determining $P\_{PUSCH,b,f,c}(i,j,q\_{d},l)$. If the UE transmits a PUSCH associated with the second RS resource index $q\_{d}$, the UE applies the second $P\_{O\\_UE\\_PUSCH,b,f,c}\left(j\right)$ value, the second $α\_{b,f,c}\left(j\right)$ value, and $f\_{b,f,c}\left(i,l\right)$ or $f\_{b,f,c}\left(i,0\right)$ if *twoPUSCH-PC-AdjustmentStates* is provided or not provided, respectively, for determining $P\_{PUSCH,b,f,c}(i,j,q\_{d},l)$.

- If the UE receives a random access response message in response to a PRACH transmission or a MsgA transmission on active UL BWP $b$ of carrier $f$ of serving cell $c$ as described in clause 8

- $f\_{b,f,c}\left(0,l\right)=∆P\_{rampup,b,f,c}+δ\_{msg2,b,f,c}$, where $l=0$ and

- $δ\_{msg2,b,f,c}$ is a TPC command value indicated in a random access response grant of the random access response message corresponding to a PRACH transmission according to Type-1 random access procedure, or in a random access response grant of the random access response message corresponding to a MsgA transmission according to Type-2 random access procedure with RAR message(s) for fallbackRAR, on active UL BWP $b$ of carrier $f$ of serving cell $c$, and

-  and $∆P\_{rampup\\_requested,b,f,c}$ is provided by higher layers and corresponds to the total power ramp-up requested by higher layers [11, TS 38.321] for carrier $f$ in the serving cell $c$, $M\_{RB,b,f,c}^{PUSCH}(0)$ is the bandwidth of the PUSCH resource assignment expressed in number of resource blocks for the first PUSCH transmission on active UL BWP$ b$ of carrier $f$ of serving cell $c$, and $∆\_{TF,b,f,c}\left(0\right)$ is the power adjustment of first PUSCH transmission on active UL BWP $b$ of carrier $f$ of serving cell $c$.

- If the UE transmits the PUSCH in PUSCH transmission occasion $i$ on active UL BWP $b$ of carrier $f$ of serving cell $c$ as described in clause 8.1A, $f\_{b,f,c}(0,l)=ΔP\_{rampup,b,f,c}$, where

- $l=0$, and

-  and $ΔP\_{rampup\\_requested,b,f,c}$ is provided by higher layers and corresponds to the total power ramp-up requested by higher layers, $M\_{RB,b,f,c}^{PUSCH}(i)$ is the bandwidth of the PUSCH resource assignment expressed in number of resource blocks, and $Δ\_{TF,b,f,c}(i)$ is the power adjustment of the PUSCH transmission in PUSCH transmission occasion $i$.

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

#### 7.3.1 UE behavior

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

If a UE transmits SRS on multiple SRS resources for positioning bandwidth aggregation according to *linkage* [6, TS 38.214], the UE calculates $P\_{SRS,b,f,c}\left(i,q\_{s}\right)$ using the same values of $P\_{O\\_SRS,b,f,c}\left(q\_{s}\right)$, $α\_{SRS,b,f,c}\left(q\_{s}\right)$, and $PL\_{b,f,c}\left(q\_{d}\right)$ for each of the multiple SRS resources.

If a UE transmits SRS based on a configuration by *SRS-PosResourceSet* in *SRS-PosRRC-InactiveValidityAreaConfig* in RRC\_INACTIVE state [12, TS 38.331], the active UL BWP *b* refers to the BWP provided by *bwp* in *SRS-PosRRC-InactiveValidityAreaConfig*. If the UE is not provided *pathlossReferenceRS-Pos* in *SRS-PosResourceSet*, or if the UE is provided *pathlossReferenceRS-Pos* in *SRS-PosResourceSet* and the UE cannot accurately measure the pathloss RS provided in *pathlossReferenceRS-Pos*, the UE calculates $PL\_{b,f,c}(q\_{d})$ using an RS resource from an SS/PBCH block with same index as the one the UE used to obtain *MIB*; otherwise, the UE uses the RS indicated by *pathlossReferenceRS-Pos* to calculate $PL\_{b,f,c}(q\_{d})$.

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

### 7.7.1 Type 1 PH report

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

If a UE provides a Type 1 power headroom report for an activated serving cell based on an actual PUSCH transmission, is provided *phr-AssumedPUSCH-Reporting*, and *dynamicTransformPrecoderFieldPresenceDCI-0-1* or *dynamicTransformPrecoderFieldPresenceDCI-0-2* is set to enabled for the active UL BWP of the serving cell, the UE provides

- $P\_{CMAX,f,c}(i)$ based on any applicable maximum output power reduction for an assumed PUSCH transmission with transform precoder enabled, if supported, if transform precoder is disabled for the actual PUSCH transmission, or

- $P\_{CMAX,f,c}(i)$ based on any applicable maximum output power reduction for an assumed PUSCH transmission with transform precoder disabled, if supported, if the transform precoder is enabled for the actual PUSCH transmission,

where all other parameters used for the calculation of $P\_{CMAX,f,c}(i)$ of the assumed PUSCH transmission are same as for the actual PUSCH transmission.

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

## 8.1 Random access preamble

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

For single cell operation or for operation with contiguous carrier aggregation in a same frequency band or for operation with non-contiguous carrier aggregation in a same frequency band if the UE is not provided with *intraBandNC-PRACH-simulTx-r17*, a UE

- does not transmit PRACH and PUSCH/PUCCH/SRS in a same slot with respect to the smallest SCS configuration between the SCS configuration for the UL BWP with the PRACH and the SCS configuration for the UL BWP with the PUSCH/PUCCH/SRS transmissions

- does not transmit PRACH and PUSCH/PUCCH/SRS when a first or last symbol of a PRACH transmission in a first slot is separated by less than $N$ symbols from the last or first symbol, respectively, of a PUSCH/PUCCH/SRS transmission in a second slot; for a PRACH transmission with $N\_{preamble}^{rep}>1$ preamble repetitions, this applies to each preamble repetition

- for a PRACH transmission with $N\_{preamble}^{rep}>1$ preamble repetitions, if the UE does not indicate *prach-Repetition*, the UE does not transmit a first repetition of the PRACH and a second repetition of the PRACH when a first or last symbol of the first repetition of the PRACH in a first slot is separated by less than $N$ symbols from the last or first symbol, respectively, of the second repetition of the PRACH in a second slot; otherwise, the UE transmits the first repetition of the PRACH and the second repetition of the PRACH

where $N=2$ for $μ=0$ or $μ=$1, $N=4$ for $μ=2$ or $μ=3$, $N=16$ for $μ=5$, $N=32$ for $μ=6$, and $μ$ is the smallest SCS configuration between the SCS configuration for the UL BWP with the PRACH and the SCS configuration for the UL BWP with the PUSCH/PUCCH/SRS transmissions. For a PUSCH transmission with repetition Type B, this applies to each actual repetition for PUSCH transmission [6, TS 38.214].

\*\*\* 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 Multicast MCCH-RNTI, G-RNTI for multicast or G-CS-RNTI are also referred to as multicast DCI formats. Corresponding unicast DCI formats are DCI formats 0\_0/0\_1/0\_2/0\_3/1\_0/1\_1/1\_2/1\_3 and multicast DCI formats are DCI formats 4\_0/4\_1/4\_2 [4, TS 38.212]. PDSCH receptions scheduled by unicast or multicast DCI formats are referred as unicast or multicast PDSCH receptions. HARQ-ACK information associated with unicast or multicast DCI formats for PDCCH receptions in RRC\_CONNECTED state are also respectively referred as unicast or multicast HARQ-ACK information.

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

For the remaining of this clause, if a UE is provided $K\_{cell,offset}$ by *cellSpecificKoffset* or $K\_{UE,offset}$ by a MAC CE command, reference to a slot $n+k$ for a PUCCH transmission or PUSCH transmission corresponds to a slot $n+k+2^{μ-μ\_{K\_{offset}}}∙K\_{offset}$ for the PUSCH or the PUCCH transmission, and reference to a slot $n\_{U}-K\_{1,k}$ corresponds to slot $n\_{U}-K\_{1,k}-2^{μ-μ\_{K\_{offset}}}∙K\_{offset}$, where $μ$ is the SCS configuration for the PUCCH transmission or PUSCH transmission, $K\_{offset}$ is defined in clause 4.2, and $μ\_{K\_{offset}}=0$ in FR1 and in FR2-NTN. If *cellSpecificKoffset* or if the MAC CE command is not provided, $K\_{cell,offset}=0$ or $K\_{UE,offset}=0$, respectively. If the PUCCH or PUSCH transmission is scheduled by a DCI format, or if SRS transmission is triggered by a DCI format, the value of $K\_{UE,offset}$ is the one that is applicable at the slot overlapping with the last symbol of the PDCCH reception providing the DCI format. If the PUCCH transmission or the PUSCH transmission is scheduled by a DCI format with CRC scrambled by TC-RNTI, $K\_{UE,offset}=0$. If the UE is provided a $K\_{UE,offset}$ value by a MAC CE command, the UE applies the MAC CE command in the first slot that is after slot $k+3N\_{slot}^{subframe,μ}$ where $k$ is the slot where the UE would transmit a PUCCH with HARQ-ACK information for the PDSCH providing the MAC CE command, $μ$ 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 \*\*\*

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

A set of PDCCH candidates for a UE to monitor is defined in terms of PDCCH search space sets. A search space set can be a CSS set or a USS set. A UE monitors PDCCH candidates in one or more of the following search spaces sets

- a Type0-PDCCH CSS set on the primary cell of the MCG configured by

- *pdcch-ConfigSIB1* in MIB or by *searchSpaceSIB1* in *PDCCH-ConfigCommon* or by *searchSpaceZero* in *PDCCH-ConfigCommon* for a DCI format 1\_0 with CRC scrambled by a SI-RNTI, or

- *searchSpaceZero* by providing *searchSpaceID*=0 for *searchSpaceMCCH* or *searchSpaceMTCH* for a DCI format 4\_0 with CRC scrambled by a MCCH-RNTI or a G-RNTI for broadcast, or

- *searchSpaceZero* by providing *searchSpaceID*=0 for *searchspaceMulticastMCCH* for a DCI format 4\_0 with CRC scrambled by a Multicast MCCH-RNTI, or by *searchSpaceMulticastMTCH* for a DCI format 4\_1 with CRC scrambled by a G-RNTI for multicast in RRC\_INACTIVE state

- a Type0A-PDCCH CSS set configured by *searchSpaceOtherSystemInformation* in *PDCCH-ConfigCommon* for a DCI format 1\_0 with CRC scrambled by a SI-RNTI on the primary cell of the MCG

- a Type0B-PDCCH CSS set configured by

- *searchSpaceMCCH* and *searchSpaceMTCH* for a DCI format 4\_0 with CRC scrambled by a MCCH-RNTI or a G-RNTI for broadcast, on the primary cell of the MCG

- *searchspaceMulticastMCC*H for a DCI format 4\_0 with CRC scrambled by a Multicast MCCH-RNTI, or by *searchSpaceMulticastMTCH* for a DCI format 4\_1 with CRC scrambled by a G-RNTI for PDCCH receptions in RRC\_INACTIVE state

- a Type1-PDCCH CSS set configured by *ra-SearchSpace* in *PDCCH-ConfigCommon* for a DCI format with CRC scrambled by a RA-RNTI, a MsgB-RNTI, or a TC-RNTI on the primary cell

- a Type1A-PDCCH CSS set configured by *sdt-SearchSpace* in *PDCCH-ConfigCommon* for a DCI format with CRC scrambled by a C-RNTI or a CS-RNTI on the primary cell as described in clause 19.1

- a Type2-PDCCH CSS set configured by *pagingSearchSpace* in *PDCCH-ConfigCommon* for a DCI format 1\_0 with CRC scrambled by a P-RNTI on the primary cell of the MCG

- a Type2A-PDCCH CSS set configured by *pei-SearchSpace* in *pei-ConfigBWP* for a DCI format 2\_7 with CRC scrambled by a PEI-RNTI on the primary cell of the MCG

- a Type3-PDCCH CSS set configured by

- *SearchSpace* in *PDCCH-Config* with *searchSpaceType* = *common* for DCI formats with CRC scrambled by INT-RNTI, SFI-RNTI, TPC-PUSCH-RNTI, TPC-PUCCH-RNTI, TPC-SRS-RNTI, CI-RNTI, or cellDTRX-RNTI and, only for the primary cell, C-RNTI, MCS-C-RNTI, CS-RNTI(s), or PS-RNTI, or

- *SearchSpace* in *pdcch-ConfigMulticast* for DCI formats with CRC scrambled by G-RNTI, or G-CS-RNTI, or

- *searchSpaceMCCH* and *searchSpaceMTCH* on a secondary cell for a DCI format 4\_0 with CRC scrambled by a MCCH-RNTI or a G-RNTI for broadcast, and

- a USS set configured by

- *SearchSpace* in *PDCCH-Config* with *searchSpaceType* = *ue-Specific* for DCI formats with CRC scrambled by C-RNTI, MCS-C-RNTI, SP-CSI-RNTI, CS-RNTI(s), SL-RNTI, SL-CS-RNTI, SL Semi-Persistent Scheduling V-RNTI, or NCR-RNTI

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, DCI formats with CRC scrambled by G-RNTI for multicast or G-CS-RNTI are also referred to as multicast DCI formats, and DCI formats with CRC scrambled by MCCH-RNTI or G-RNTI for broadcast scheduling PDSCH receptions are also referred to as broadcast DCI formats, and DCI formats with CRC scrambled by Multicast MCCH-RNTI or G-RNTI for multicast scheduling PDSCH receptions in RRC\_INACTIVE state are also referred as multicast DCI formats for RRC\_INACTIVE state.

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

If a UE monitors PDCCH candidates for DCI formats with CRC scrambled by a C-RNTI and the UE is provided a non-zero value for *searchSpaceID* in *PDCCH-ConfigCommon* for a Type0/0A/1A/2-PDCCH CSS set, or monitors PDCCH candidates for DCI formats with CRC scrambled by a MCCH-RNTI or a G-RNTI for broadcast and the UE is provided a non-zero value for *searchSpaceMCCH* and *searchSpaceMTCH* in *PDCCH-ConfigCommon* for a Type0B-PDCCH CSS set, or monitors PDCCH candidates for DCI formats with CRC scrambled by a Multicast MCCH-RNTI or a G-RNTI for multicast in RRC\_INACTIVE state and the UE is provided a non-zero value for *searchSpaceMulticastMCCH* and *searchSpaceMulticastMTCH* in *PDCCH-ConfigCommon* for a Type0B-PDCCH CSS set, the UE determines monitoring occasions for PDCCH candidates of the Type0/0A/1A/2-PDCCH CSS set, or of the Type0B-PDCCH CSS set, respectively, based on the search space set associated with the value of *searchSpaceID*.

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

For a CORESET with index 0,

- if the UE is provided *TCI-State* and *followUnifiedTCI-State* for the CORESET, the UE assumes that a DM-RS antenna port for PDCCH receptions in the CORESET and a DM-RS antenna port for PDSCH receptions scheduled by DCI formats provided by PDCCH receptions in the CORESET are quasi co-located with the reference signals provided by the indicated *TCI-State* [6, TS 38.214]

- else if the UE is provided *dl-OrJointTCI-StateList* and is indicated a first *TCI-State* and a second *TCI-State*, and *apply-IndicatedTCIState* for the CORESET

- if the CORESET is associated with a Type 0/0A/2-PDCCH CSS set that has search space set index 0

- if *apply-IndicatedTCIState* = 'first', the UE assumes that a DM-RS antenna port for PDCCH receptions in the CORESET is quasi co-located with the reference signals provided by the first *TCI-State*,

- if *apply-IndicatedTCIState* = 'second', the UE assumes that a DM-RS antenna port for PDCCH receptions in the CORESET is quasi co-located with the reference signals provided by the second *TCI-State*,

- if *apply-IndicatedTCIState* = 'none', the UE assumes that a DM-RS antenna port for PDCCH receptions in the CORESET is quasi co-located with the one or more DL RS configured by a TCI state, where the TCI state is indicated by a MAC CE activation command for the CORESET, if any

- else

- if *apply-IndicatedTCIState* = 'first', the UE assumes that a DM-RS antenna port for PDCCH receptions in the CORESET is quasi co-located with the reference signals provided by the first *TCI-State*,

- if *apply-IndicatedTCIState* = 'second', the UE assumes that a DM-RS antenna port for PDCCH receptions in the CORESET is quasi co-located with the reference signals provided by the second *TCI-State*,

- if *apply-IndicatedTCIState* = 'both', the UE assumes that a DM-RS antenna port for PDCCH receptions in the CORESET is quasi co-located with the reference signals provided by the first and the second *TCI-State,*

- if *apply-IndicatedTCIState* = 'none', the UE assumes that a DM-RS antenna port for PDCCH receptions in the CORESET is quasi co-located with the one or more DL RS configured by a TCI state, where the TCI state is indicated by a MAC CE activation command for the CORESET.

- else, the UE assumes that a DM-RS antenna port for PDCCH receptions in the CORESET is quasi co-located with

- the one or more DL RS configured by a TCI state, where the TCI state is indicated by a MAC CE activation command for the CORESET, if any, or

- a SS/PBCH block the UE identified during a most recent random access procedure not initiated by a PDCCH order that triggers a contention-free random access procedure, if no MAC CE activation command indicating a TCI state for the CORESET is received after the most recent random access procedure, or a SS/PBCH block the UE identified during a most recent configured grant PUSCH transmission as described in clauses 19 or 22.1.

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

A UE does not expect to detect, in a same PDCCH monitoring occasion, a DCI format with CRC scrambled by a SI-RNTI, RA-RNTI, MsgB-RNTI, TC-RNTI, P-RNTI, C-RNTI, CS-RNTI, MCS-RNTI, MCCH-RNTI, G-RNTI, G-CS-RNTI, or Multicast MCCH-RNTI and a DCI format with CRC scrambled by a SL-RNTI or a SL-CS-RNTI for scheduling respective PDSCH reception and PSSCH transmission on a same serving cell.

A PDCCH candidate with index $m\_{s\_{j},n\_{CI}}^{(L)}$ for a search space set $s\_{j}$ using a set of $L$ CCEs in a CORESET $p$ on the active DL BWP for serving cell $n\_{CI}$, or for set of serving cells associated with *nCI-Value* having value $n\_{CI}$, is not counted for monitoring if there is a PDCCH candidate with index $m\_{s\_{i},n\_{CI}}^{(L)}$ for a search space set $s\_{i}<s\_{j}$, or if there is a PDCCH candidate with index $n\_{s\_{j},n\_{CI}}^{(L)}$ and $n\_{s\_{j},n\_{CI}}^{(L)}<m\_{s\_{j},n\_{CI}}^{(L)}$, in the CORESET $p$ on the active DL BWP for serving cell $n\_{CI}$, or for set of serving cells $n\_{CI}$, respectively, using a same set of $L$ CCEs, the PDCCH candidates have identical scrambling, and the corresponding DCI formats for the PDCCH candidates have a same size; otherwise, the PDCCH candidate with index $m\_{s\_{j},n\_{CI}}^{(L)}$ is counted for monitoring.

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

16.1 Synchronization procedures

A UE receives the following SL synchronization signals in order to perform synchronization procedures based on S-SS/PSBCH blocks: SL primary synchronization signals (S-PSS) and SL secondary synchronization signals (S-SSS) [4, TS 38.211].

A UE assumes that reception occasions of a physical sidelink broadcast channel (PSBCH), S-PSS, and S-SSS are in consecutive symbols [4, TS 38.211] and form a S-SS/PSBCH block.

For reception of a S-SS/PSBCH block,

- for operation without shared spectrum channel access, or for operation with shared spectrum channel access and when *sl-NumOfSSSBRepetition* is not provided and for RB-set $j$, a UE assumes a frequency location corresponding to the subcarrier with index 66 in the S-SS/PSBCH block [4, TS 38.211], is provided by

- *sl-AbsoluteFrequencySSB*, for operation without shared spectrum channel access or when RB-set $j$ is the anchor RB-set that is the RB set that includes the S-SS/PSBCH block

- a corresponding value in *sl-AbsoluteFrequencySSB-NonAnchorList* when RB-set$j$ is a non-anchor RB-set

- for operation with shared spectrum channel access when *sl-NumOfSSSBRepetition* is provided and in RB-set $j$, a UE assumes a frequency location corresponding to the subcarrier with index 66 in the S-SS/PSBCH block [4, TS 38.211] is provided by $f\_{start,j}^{S-SSB}$+$ k\_{S-SSB,j}⋅\left(N\_{gap,j}^{S-SSB}+M\_{RB}^{S-SSB}\right)⋅12⋅2^{μ}∙15 kHz$, where

- $f\_{start, j}^{S-SSB}$ is a frequency location of a lowest S-SS/PSBCH block in RB-set $j$, where $f\_{start, j}^{S-SSB}$ is provided by

- *sl-AbsoluteFrequencySSB* when RB-set *j* is the anchor RB-set,

- a corresponding value in *sl-AbsoluteFrequencySSB-NonAnchorList* when RB-set$j$ is a non-anchor RB-set

- $k\_{S-SSB,j}$ is an index of an S-SS/PSBCH block from repeated S-SS/PSBCH blocks in the frequency domain and within the RB-set $j$, where $0\leq k\_{S-SSB,j}\leq N\_{repetition,j}^{S-SSB}-1$, and $N\_{repetition,j}^{S-SSB}$ is provided by a value in *sl-NumOfSSSBRepetition* corresponding to RB-set $j$;

- $N\_{gap,j}^{S-SSB}$ is a number of resource blocks, provided by *sl-GapBetweenSSSBRepetition*, for a gap between two adjacent repeated S-SS/PSBCH blocks;

- $M\_{RB}^{S-SSB}=11$ is a number of resource blocks for a S-SS/PSBCH block transmission with SCS configuration $μ$.

For operation with shared spectrum channel access, a UE attempts to transmit at least S-SS/PSBCH blocks in the slots including S-SS/PSBCH blocks in the anchor RB set. The UE applies CP extension to the first symbol of an S-SS/PSBCH block and within the first one or two symbols before the first symbol of the S-SS/PSBCH block according to an index [4, TS 38.211] provided by *sl-CPE-StartingPositionS-SSB*. The UE assumes PRB(s) in an intra-cell guard band [6, TS 38.214] are not used for transmission of S-SS/PSBCH blocks.

The UE assumes that a S-PSS symbol, a S-SSS symbol, and a PSBCH symbol have a same transmission power. The UE assumes a same numerology of the S-SS/PSBCH block as for a SL BWP of the S-SS/PSBCH block reception, and that a bandwidth of the S-SS/PSBCH block is within a bandwidth of the SL BWP. The UE assumes the subcarrier with index 0 in the S-SS/PSBCH block is aligned with a subcarrier with index 0 in an RB of the SL BWP.

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

# 18 Multicast Broadcast Services

This clause is applicable only for PDCCH receptions, PDSCH receptions, and PUCCH transmissions for MBS on a serving cell. DCI formats with CRC scrambled by Multicast MCCH-RNTI for multicast PDSCH receptions in RRC\_INACTIVE state, G-RNTI for multicast, or G-CS-RNTI scheduling PDSCH receptions are referred to as multicast DCI formats and the PDSCH receptions are referred to as multicast PDSCH receptions. DCI formats with CRC scrambled by MCCH-RNTI or G-RNTI for broadcast scheduling PDSCH receptions are referred to as broadcast DCI formats and the PDSCH receptions are referred to as broadcast PDSCH receptions. HARQ-ACK information associated with multicast DCI formats or multicast PDSCH receptions in RRC\_CONNECTED state is referred to as multicast HARQ-ACK information.

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

# 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]. 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.

If *ltm-UE-MeasuredTA-ID* of a candidate cell and *ltm-ServingCellUE-MeasuredTA-ID* of the serving cell are provided to a UE and have same value, the UE estimates based on the UE implementation a timing advance to apply from a first transmission on the candidate cell that is after the reception of a cell switch command for the candidate cell when the condition defined in clause 5.18.35 of [11, TS 38.321] is satisfied.

A UE can be provided configurations, by *EarlyUL-SyncConfig*, for PRACH transmission parameters for each of the candidate cells. The UE can be triggered a PRACH transmission on a candidate cell by a PDCCH order that the UE receives on a serving cell and includes an indication of the candidate cell for the PRACH transmission [4, TS 38.212]. If the serving cell and the candidate cell operate in a same frequency range and the UE would have transmissions that overlap in time, or when a gap between a first or last symbol of a PRACH transmission to the candidate cell is less than 𝑁 symbols from a last or first symbol, respectively, of an UL transmission to the serving cell, where $N$ is defined in Clause 8.1, the UE

- drops the transmissions on the serving cell when the UE does not support transmissions that overlap in time or are separated by less than the gap on the serving cell and the candidate cell

- prioritizes power allocation to the PRACH transmission on the candidate cell in clause 7.5 when the UE supports transmissions that overlap in time or are separated by less than the gap, and a total UE transmit power in the frequency range would exceed $\hat{P}\_{CMAX}$

The UE transmits the PRACH on the candidate cell as described in Clause 8.1 with a power determined as described in Clause 7.4.

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 TCI state ID and/or an UL TCI state ID indicating a *CandidateTCI-State* and/or *CandidateTCI-UL-State* from *ltm-DL-OrJointTCI-StateToAddModList* and/or *ltm-UL-TCI-StateToAddModList* [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 $T\_{LTM-RRC-processing}+T\_{LTM-processing}+T\_{first-RS}+T\_{RS-proc}+3 msec$ after the last symbol of a PUCCH or PUSCH with HARQ-ACK information for the PDSCH providing the MAC CE, where $T\_{LTM-RRC-processing}$, $T\_{LTM-processing}$, $T\_{first-RS}$and $T\_{RS-proc}$ 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.

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

# 22 PUSCH transmission in NTN RACH-less handover

## 22.1 Configured-grant PUSCH transmission

A UE indicated to perform PUSCH transmission in RACH-less handover 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 *rrc-SSB-Subset* a number of SS/PBCH block indexes $N\_{PUSCH}^{SS/PBCH}$ 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*, the UE determines $N\_{PUSCH}^{SS/PBCH}$ 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) and 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 $N\_{PUSCH}^{SS/PBCH}$ 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 $N\_{PUSCH}^{SS/PBCH}$ 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*. 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 $N\_{PUSCH}^{SS/PBCH}$ 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.

$N\_{PUSCH}^{SS/PBCH}$ 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 $DMRS\_{id}$ 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.

A UE determines a power of a PUSCH transmission as described in clause 7.1.1, where the UE obtains $PL\_{b,f,c}(q\_{d})$ using a RS resource from an SS/PBCH block with index associated with the PUSCH transmission.

## 22.2 Dynamic-grant PUSCH transmission

If *ssb-Index* is provided in *RACH-LessHO,* the UE may assume that the DM-RS antenna port associated with the PDCCH receptions for scheduling initial PUSCH transmission and the SS/PBCH block indicated by *ssb-Index* are quasi co-located with respect to average gain and quasi co-location 'typeA' or 'typeD' properties.