**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** |  |
|  | | | | | | | | |
| *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 UE power savings enhancements in NR | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_UE\_pow\_sav\_enh-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 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Corrections on UE power savings enhancements in NR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Include DCI format 2\_7 for EPRE assumption of DMRS in PDCCHs that a UE monitors for detection of DCI formats when the UE is not provided dedicated higher layer parameters in clause 4.1 2. Include PEI-RNTI and *peiSearchSpace* in clause 10.1. 3. Clarify that a configuration of a PDCCH monitoring adaptation field is applicable to all scheduling DCI formats in clause 10.4. 4. Capture the determination of the first PDCCH MO for DCI format 2\_7 associated with a PO when a number of POs associated with PDCCH MOs for DCI format 2\_7 is smaller than *NS* in clause 10.4A. 5. Capture that a UE can receive a DCI format 2\_7 indicating presence of TRS resource sets prior to expiration of the validity time for the TRS resource in clause 10.4B. 6. Remove case “K=1 when ” for early indication of paging operation in clause 10.4. 7. Capture that a UE is not required to apply procedures related to early indication of paging on the SCG in clause 10. 8. Capture timelines for a UE to apply PDCCH skipping or SSSG switching based on DCI indication or timer expiration in clause 10.4. 9. Capture timelines for required separation of successive indications for PDCCH skipping or SSSG switching in clause 10.4. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Incomplete support for UE power savings enhancements in NR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.1, 10, 10.1, 10.4, 10.4A, 10.4B | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 38.211, TS 38.212, TS 38.214 | | |
| ***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 \*\*\*

## 4.1 Cell search

Cell search is the procedure for a UE to acquire time and frequency synchronization with a cell and to detect the physical layer Cell ID of the cell.

A UE receives the following synchronization signals (SS) in order to perform cell search: the primary synchronization signal (PSS) and secondary synchronization signal (SSS) as defined in [4, TS 38.211].

A UE assumes that reception occasions of a physical broadcast channel (PBCH), PSS, and SSS are in consecutive symbols, as defined in [4, TS 38.211], and form a SS/PBCH block. The UE assumes that SSS, PBCH DM-RS, and PBCH data have same EPRE. The UE may assume that the ratio of PSS EPRE to SSS EPRE in a SS/PBCH block is either 0 dB or 3 dB. If the UE has not been provided dedicated higher layer parameters, the UE may assume that the ratio of PDCCH DMRS EPRE to SSS EPRE is within -8 dB and 8 dB when the UE monitors PDCCHs for a DCI format 1\_0 with CRC scrambled by SI-RNTI, P-RNTI, or RA-RNTI, or for a DCI format 2\_7.

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

# 10 UE procedure for receiving control information

If the UE is configured with a SCG, the UE shall apply the procedures described in this clause for both MCG and SCG except for PDCCH monitoring in Type0/0A/2/2A-PDCCH CSS sets where the UE is not required to apply the procedures in this clause for the SCG

- When the procedures are applied for MCG, the terms 'secondary cell', 'secondary cells' , 'serving cell', 'serving cells' in this clause refer to secondary cell, secondary cells, serving cell, serving cells belonging to the MCG respectively.

- When the procedures are applied for SCG, the terms 'secondary cell', 'secondary cells', 'serving cell', 'serving cells' in this clause refer to secondary cell, secondary cells (not including PSCell), serving cell, serving cells belonging to the SCG respectively. The term 'primary cell' in this clause refers to the PSCell of the SCG.

\*\*\* 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 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 by *searchSpaceZero* in *PDCCH-ConfigCommon* when *pdcch-Config-MCCH* or *pdcch-Config-MCCH* is not provided, for a DCI format with CRC scrambled by a MCCH-RNTI or a G-RNTI, on the primary cell of the MCG

- 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 *searchSpaceBroadcast* in *pdcch-Config-MCCH* and *pdcch-Config-MTCH* for a DCI format with CRC scrambled by a MCCH-RNTI or a G-RNTI, on the primary cell of the MCG

- a Type1-PDCCH CSS set configured by *ra-SearchSpace* in *PDCCH-ConfigCommon* for a DCI format 1\_0 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 *peiSearchSpace* in *DownlinkConfigCommonSIB* 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, or CI-RNTI and, only for the primary cell, C-RNTI, MCS-C-RNTI, CS-RNTI(s), or PS-RNTI, or configured by *SearchSpace-Multicast* in *PDCCH-Config-Multicast* for DCI formats with CRC scrambled by G-RNTI, or G-CS-RNTI 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, or SL Semi-Persistent Scheduling V-RNTI, or configured by *sdt-CG-SearchSpace* for DCI formats with CRC scrambled by C-RNTI or CS-RNTI as described in clause 19.1.

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 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 MTCH scheduling PDSCH receptions are also referred to as broadcast DCI formats.

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 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 the UE has not been provided *sdt-SearchSpace* for Type1A-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 as described in clause 19.2.

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. If the UE is provided *peiSearchSpace* with zero value for the Type2A-PDCCH CSS set index, and for the SS/PBCH block and CORESET multiplexing patterns 2 and 3, the UE determines PDCCH monitoring occasions as described in clause 13.

If a UE is provided a zero value for *searchSpaceID* in *PDCCH-ConfigCommon* for a Type0/0A/2-PDCCH CSS set, or is not provided *searchSpaceBroadcast*, the UE determines monitoring occasions for PDCCH candidates of the Type0/0A/2-PDCCH CSS set as described in clause 13, and the UE is provided a C-RNTI, the UE monitors PDCCH candidates only at monitoring occasions associated with a SS/PBCH block, where the SS/PBCH block is determined by the most recent of

- a MAC CE activation command indicating a TCI state of the active BWP that includes a CORESET with index 0, as described in [6, TS 38.214], where the TCI-state includes a CSI-RS which is quasi-co-located with the SS/PBCH block, or

- a random access procedure that is not initiated by a PDCCH order that triggers a contention-free random access procedure

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/2-PDCCH CSS set, or monitors PDCCH candidates for DCI formats with CRC scrambled by a MCCH-RNTI or a G-RNTI and the UE is provided a non-zero value for *searchSpaceBroadcast* in *pdcch-Config-MCCH* and *pdcch-Config-MTCH* for a Type0/0B-PDCCH CSS set, the UE determines monitoring occasions for PDCCH candidates of the Type0/0A/2-PDCCH CSS set, or of the Type0/0B-PDCCH set, respectively, based on the search space set associated with the value of *searchSpaceID*.

The UE may assume that the DM-RS antenna port associated with PDCCH receptions in the CORESET configured by *pdcch-ConfigSIB1* in *MIB*, the DM-RS antenna port associated with corresponding PDSCH receptions, and the corresponding SS/PBCH block are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable [6, TS 38.214], if the UE is not provided a TCI state indicating quasi co-location information of the DM-RS antenna port for PDCCH reception in the CORESET. The value for the DM-RS scrambling sequence initialization is the cell ID. For operation without shared spectrum channel access in FR1 and FR2-1, a SCS is provided by *subCarrierSpacingCommon* in *MIB*. For operation with shared spectrum channel access in FR1 and for operation in FR2-2, a SCS is same as the SCS of a corresponding SS/PBCH block.

For single cell operation or for operation with carrier aggregation in a same frequency band, a UE does not expect to monitor a PDCCH in a Type0/0A/2/3-PDCCH CSS set or in a USS set if a DM-RS for monitoring a PDCCH in a Type1-PDCCH CSS set is not configured with same *qcl-Type* set to 'typeD' properties [6, TS 38.214] with a DM-RS for monitoring the PDCCH in the Type0/0A/2/3-PDCCH CSS set or in the USS set, and if the PDCCH or an associated PDSCH overlaps in at least one symbol with a PDCCH the UE monitors in a Type1-PDCCH CSS set or with an associated PDSCH.

If a UE is provided

- one or more search space sets by corresponding one or more of *searchSpaceZero, searchSpaceSIB1*, *searchSpaceOtherSystemInformation*, *pagingSearchSpace*, *ra-SearchSpace*, and

- a C-RNTI, an MCS-C-RNTI, or a CS-RNTI

the UE monitors PDCCH candidates for DCI format 0\_0 and DCI format 1\_0 with CRC scrambled by the C-RNTI, the MCS-C-RNTI, or the CS-RNTI in the one or more search space sets in a slot where the UE monitors PDCCH candidates for at least a DCI format 0\_0 or a DCI format 1\_0 with CRC scrambled by SI-RNTI, RA-RNTI, MsgB-RNTI, or P-RNTI.

If a UE is provided

- one or more search space sets by corresponding one or more of *searchSpaceZero, searchSpaceSIB1*, *searchSpaceOtherSystemInformation*, *pagingSearchSpace*, *peiSearchSpace, ra-SearchSpace*, or a CSS set by *PDCCH-Config*, and

- a SI-RNTI, a P-RNTI, a PEI-RNTI, a RA-RNTI, a MsgB-RNTI, a SFI-RNTI, an INT-RNTI, a TPC-PUSCH-RNTI, a TPC-PUCCH-RNTI, or a TPC-SRS-RNTI

then, for a RNTI from any of these RNTIs, the UE does not expect to process information from more than one DCI format with CRC scrambled with the RNTI per slot.

Table 10.1-1: CCE aggregation levels and maximum number of PDCCH candidates per CCE aggregation level for CSS sets configured by *searchSpaceSIB1*

|  |  |
| --- | --- |
| CCE Aggregation Level | Number of Candidates |
| 4 | 4 |
| 8 | 2 |
| 16 | 1 |

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

## 10.4 Search space set group switching and skipping of PDCCH monitoring

A UE can be provided a group index for a respective Type3-PDCCH CSS set or USS set by *searchSpaceGroupIdList* for PDCCH monitoring on a serving cell. If the UE is not provided *searchSpaceGroupIdList* for a search space set, the following procedures are not applicable for PDCCH monitoring according to the search space set.

If a UE is provided *cellGroupsForSwitchList*, indicating one or more groups of serving cells, the following procedures apply to all serving cells within each group; otherwise, the following procedures apply only to a serving cell for which the UE is provided *searchSpaceGroupIdList*.

When a UE is provided *searchSpaceGroupIdList*, the UE resets PDCCH monitoring according to search space sets with group index 0, if provided by *searchSpaceGroupIdList*.

A UE can be provided by *searchSpaceSwitchDelay* a number of symbols where a minimum value of is provided in Table 10.4-1 for UE processing capability 1 and UE processing capability 2 and SCS configuration . UE processing capability 1 for SCS configuration applies unless the UE indicates support for UE processing capability 2.

Table 10.4-1: Minimum value of [symbols]

|  |  |  |
| --- | --- | --- |
|  | Minimum value for  UE processing capability 1 [symbols] | Minimum value for  UE processing capability 2 [symbols] |
| 0 | 25 | 10 |
| 1 | 25 | 12 |
| 2 | 25 | 22 |
| 3 | 40 | - |
| 5 | 160 | - |
| 6 | 320 | - |

A UE can be provided, by *searchSpaceSwitchTimer*, a timer value for a serving cell that the UE is provided *searchSpaceGroupIdList* or, if provided, for a set of serving cells provided by *cellGroupsForSwitchList*. The UE decrements the timer value by one after each slot based on a reference SCS configuration that is the smallest SCS configuration among all configured DL BWPs in the serving cell, or in the set of serving cells. The UE maintains the reference SCS configuration during the timer decrement procedure.

If a UE is provided by *SearchSpaceSwitchTrigger* a location of a search space set group switching flag field for a serving cell in a DCI format 2\_0, as described in clause 11.1.1;

- if the UE detects a DCI format 2\_0 and a value of the search space set group switching flag field in the DCI format 2\_0 is 0, the UE starts monitoring PDCCH according to search space sets with group index 0, and stops monitoring PDCCH according to search space sets with group index 1, for the serving cell at a first slot that is at least symbols after the last symbol of the PDCCH with the DCI format 2\_0

- if the UE detects a DCI format 2\_0 and a value of the search space set group switching flag field in the DCI format 2\_0 is 1, the UE starts monitoring PDCCH according to search space sets with group index 1, and stops monitoring PDCCH according to search space sets with group index 0, for the serving cell at a first slot that is at least symbols after the last symbol of the PDCCH with the DCI format 2\_0, and the UE sets the timer value to the value provided by *searchSpaceSwitchTimer*

- if the UE monitors PDCCH for a serving cell according to search space sets with group index 1, the UE starts monitoring PDCCH for the serving cell according to search space sets with group index 0, and stops monitoring PDCCH according to search space sets with group index 1, for the serving cell at the beginning of the first slot that is at least symbols after a slot where the timer expires or after a last symbol of a remaining channel occupancy duration for the serving cell if indicated by DCI format 2\_0

If a UE is not provided *SearchSpaceSwitchTrigger* for a serving cell,

- if the UE detects a DCI format by monitoring PDCCH according to a search space set with group index 0, the UE starts monitoring PDCCH according to search space sets with group index 1, and stops monitoring PDCCH according to search space sets with group index 0, for the serving cell at a first slot that is at least symbols after the last symbol of the PDCCH with the DCI format, the UE sets the timer value to the value provided by *searchSpaceSwitchTimer* if the UE detects a DCI format by monitoring PDCCH in any search space set

- if the UE monitors PDCCH for a serving cell according to search space sets with group index 1, the UE starts monitoring PDCCH for the serving cell according to search space sets with group index 0, and stops monitoring PDCCH according to search space sets with group index 1, for the serving cell at the beginning of the first slot that is at least symbols after a slot where the timer expires or, if the UE is provided a search space set to monitor PDCCH for detecting a DCI format 2\_0, after a last symbol of a remaining channel occupancy duration for the serving cell if indicated by DCI format 2\_0

A UE determines a slot and a symbol in the slot to start or stop PDCCH monitoring according to search space sets for a serving cell that the UE is provided *searchSpaceGroupIdList* or, if *cellGroupsForSwitchList* is provided, for a set of serving cells, based on the smallest SCS configuration among all configured DL BWPs in the serving cell or in the set of serving cells and, if any, in the serving cell where the UE receives a PDCCH and detects a corresponding DCI format 2\_0 triggering the start or stop of PDCCH monitoring according to search space sets.

A UE can be provided a set of durations by *PDCCHSkippingDurationList* for PDCCH monitoring on a serving cell and, if the UE is not provided *searchSpaceGroupIdList-r17*, a DCI format 0\_1 and a DCI format 0\_2 that schedule PUSCH transmission, and a DCI format 1\_1 and a DCI format 1\_2 that schedule PDSCH receptions can include a PDCCH monitoring adaptation field of 1 bit or of 2 bits.

If the field has 1 bit and for PDCCH monitoring according to Type3-PDCCH CSS sets or USS sets on the serving cell

- a '0' value for the bit indicates no skipping in PDCCH monitoring

- a '1' value for the bit indicates skipping PDCCH monitoring for a duration provided by the first value in the set of durations

If the field has 2 bits and for PDCCH monitoring according to Type3-PDCCH CSS sets or USS sets on a serving cell

- a '00' value for the bits indicates no skipping in PDCCH monitoring

- a '01' value for the bits indicates skipping PDCCH monitoring for a duration provided by the first value in the set of durations and the UE sets the timer value to the one provided by *searchSpaceSwitchTimer-r17*

- a '10' value for the bits indicates skipping PDCCH monitoring for a duration provided by the second value in the set of durations and the UE sets the timer value to the one provided by *searchSpaceSwitchTimer-r17*

- a '11' value for the bits indicates skipping PDCCH monitoring for a duration provided by the third value in the set of durations, if any; otherwise, if the set of durations includes two values, a use of the '11' value is reserved

A UE can be provided group indexes for a Type3-PDCCH CSS set or USS set by *searchSpaceGroupIdList-r17* for PDCCH monitoring on a serving cell and, if the UE is not provided *PDCCHSkippingDurationList*, a DCI format 0\_1 and a DCI format 0\_2 that schedule PUSCH transmissions, and a DCI format 1\_1 and a DCI format 1\_2 that schedule PDSCH receptions can include a PDCCH monitoring adaptation field of 1 bit or of 2 bits for the serving cell.

If the field has 1 bit and for PDCCH monitoring by the UE according to Type3-PDCCH CSS sets or USS sets on the serving cell

- a '0' value for the bit indicates start of PDCCH monitoring according to search space sets with group index 0 and stop of PDCCH monitoring according to search space sets with other group indexes, if any

- a '1' value for the bit indicates start of PDCCH monitoring according to search space sets with group index 1 and stop of PDCCH monitoring according to search space sets with other group indexes, if any, and the UE sets the timer value to the one provided by *searchSpaceSwitchTimer-r17*

If the field has 2 bits and for PDCCH monitoring by the UE according to Type3-PDCCH CSS sets or USS sets on the serving cell

- a '00' value for the bit indicates start of PDCCH monitoring according to search space sets with group index 0 and stop of PDCCH monitoring according to search space sets with other group indexes, if any

- a '01' value for the bit indicates start of PDCCH monitoring according to search space sets with group index 1 and stop of PDCCH monitoring according to search space sets with other group indexes, if any, and the UE sets the timer value to the one provided by *searchSpaceSwitchTimer-r17*

- a '10' value for the bit indicates start of PDCCH monitoring according to search space sets with group index 2 and stop of PDCCH monitoring according to search space sets with other group indexes, if any, and the UE sets the timer value to the one provided by *searchSpaceSwitchTimer-r17*

- a '11' value is reserved

A UE can be provided a set of durations by *PDCCHSkippingDurationList* and group indexes for a Type3-PDCCH CSS set or USS set by *searchSpaceGroupIdList-r17* for PDCCH monitoring on a serving cell and, a DCI format 0\_1 and a DCI format 0\_2 that schedule PUSCH transmissions, and a DCI format 1\_1 and a DCI format 1\_2 that schedule PDSCH receptions can include a PDCCH monitoring adaptation field of 2 bits.

If the set of durations includes one value and for PDCCH monitoring by the UE according to Type3-PDCCH CSS sets or USS sets on the serving cell

- a '00' value for the bits indicates start of PDCCH monitoring according to search space sets with group index 0 and stop of PDCCH monitoring according to search space sets with group index 1, if any

- a '01' value for the bits indicates start of PDCCH monitoring according to search space sets with group index 1 and stop of PDCCH monitoring according to search space sets with group index 0, if any, and the UE sets the timer value to the one provided by *searchSpaceSwitchTimer-r17*

- a '10' value for the bits indicates skipping PDCCH monitoring for a duration provided by the value in the set of durations

- a '11' value is reserved

If the set of durations includes two values and for PDCCH monitoring by the UE according to Type3-PDCCH CSS sets or USS sets on the serving cell

- a '00' value for the bits indicates start of PDCCH monitoring according to search space sets with group index 0 and stop of PDCCH monitoring according to search space sets with group index 1, if any

- a '01' value for the bits indicates start of PDCCH monitoring according to search space sets with group index 1 and stop of PDCCH monitoring according to search space sets with group index 0, if any, and the UE sets the timer value to the one provided by *searchSpaceSwitchTimer-r17*

- a '10' value for the bits indicates skipping PDCCH monitoring for a duration provided by the first value in the set of durations

- a '11' value for the bits indicates skipping PDCCH monitoring for a duration provided by the second value in the set of durations

When the PDCCH monitoring adaptation field indicates to a UE to start PDCCH monitoring according to search space sets with a first group index and stop PDCCH monitoring according to search space sets with a second group index, the UE applies the indication

- at the beginning of a first slot that is at least symbols after the last symbol of the PDCCH reception providing the DCI format with the PDCCH monitoring adaptation field when ,

- at the beginning of a first slot, of a slot group of slots, that is at least symbols after the last symbol of the PDCCH reception providing the DCI format with the PDCCH monitoring adaptation field when

When the PDCCH monitoring adaptation field indicates to a UE to skip PDCCH monitoring for a duration, the UE starts skipping of PDCCH monitoring

- at the beginning of a first slot that is after the last symbol of the PDCCH reception providing the DCI format with the PDCCH monitoring adaptation field when ,

- at the beginning of a first slot, of a slot group of slots, that is after the last symbol of the PDCCH reception providing the DCI format with the PDCCH monitoring adaptation field when

If a UE is provided group indexes for a Type3-PDCCH CSS set or a USS set by *searchSpaceGroupIdList-r17* and a timer value by *searchSpaceSwitchTimer-r17* for PDCCH monitoring on an active DL BWP of a serving cell and the timer is running, the UE

- decrements the timer after a slot of the active DL BWP of the serving cell when the UE does not detect a DCI format in a PDCCH reception in the slot

- resets the timer after a slot of the active DL BWP of the serving cell when the UE detects a DCI format in a PDCCH reception in the slot with CRC scrambled by C-RNTI/CS-RNTI/MCS-C-RNTI

When the timer expires in a first slot, the UE monitors PDCCH on the serving cell according to search space sets with group index 0 starting in a second slot that

- is not earlier than symbols after the first slot

- is a first slot in a slot group of slots that is not earlier than symbols after the first slot

- is not earlier than a slot where a PDCCH skipping duration expires, if applicable

When a UE receives

- a first PDCCH in a first slot that provides a first DCI format with a PDCCH monitoring adaptation field having a first value and indicating skipping PDCCH monitoring, or indicating start of PDCCH monitoring according to a search space sets with a first group index and stop of PDCCH monitoring according to search space sets with a second group index, for an active DL BWP and

- a second PDCCH that provides a second DCI format with a PDCCH monitoring adaptation field having a second value and indicating skipping PDCCH monitoring, or indicating start of PDCCH monitoring according to search space sets with a first group index and stop of PDCCH monitoring according to search space sets with a second group index different than the first group index, for the active DL BWP where the second PDCCH is received

- in the first slot if the indication is for skipping PDCCH monitoring

- before a slot that is at least symbols after the first slot if the indication is for start of PDCCH monitoring according to search space sets with a first group index

the UE does not expect the second value to be different than the first value.

## A UE does not expect to receive in a second slot a PDCCH on an active DL BWP that provides a DCI format indicating skipping PDCCH monitoring, or start of PDCCH monitoring according to search space sets with group index 1 or 2 for the active DL BWP, if the second slot is not at least symbols after a first slot where the timer expires.10.4A PDCCH monitoring for early indication of paging

A UE can be provided the following for detection of a DCI format 2\_7 in RRC\_IDLE state or in RRC\_INACTIVE state [12, TS 38.331]

- a search space set, by *peiSearchSpace*, to monitor PDCCH for detection of DCI format 2\_7 according to a Type2A-PDCCH CSS set as described in clause 10.1

- a number of frames, by *PEI-F\_offset*, from the start of a first paging frame of paging frames associated with a number of PDCCH monitoring occasions for DCI format 2\_7 [17, TS 38.304] to the start of a frame

- a number of symbols, by *firstPDCCH-MonitoringOccasionOfPEI-O*, from the start of the frame to the start of the first PDCCH monitoring occasion for DCI format 2\_7

- a size, by *payloadSizeDCI\_format2\_7*

- a number of subgroups per paging occasion, , by *subgroupsNumPerPO*

- a number of paging occasions associated with the number of PDCCH monitoring occasions for DCI format 2\_7, , by *PONumPerPEI*

A paging indication field of DCI format 2\_7 includes segments of bits, where if and if is not provided. For a subgroup index , , a UE determines a value for the bit in the paging indication field, where is a paging occasion index, and , , , , and are defined in [17, TS 38.304]. When the value is '1', the UE monitors a paging occasion determined according to [17, TS 38.304]; otherwise, the UE is not required to monitor the paging occasion.

If , the number of symbols from the start of the frame to the start of the first PDCCH monitoring occasion for DCI format 2\_7 that is associated with paging occasion index is the -th value from the values provided by *firstPDCCH-MonitoringOccasionOfPEI-O*.

## 10.4B Indication of TRS resources

A UE in RRC\_IDLE state or RRC\_INACTIVE state can be provided by *TRS-ResourceSetConfig* a set of TRS occasions [6, TS 38.214]. If *TRS-ResourceSetConfig* is provided, a DCI format 2\_7, if *peiSearchSpace* is provided, and a DCI format 1\_0 with CRC scrambled by P-RNTI includes a TRS availability indication field [4, TS 38.212] that provides a bitmap to groups of TRS resource sets where the configuration of each TRS resource set includes an association to a bit of the bitmap. The UE can be additionally provided a multiple, by *validityDuration*, for a number of frames provided by *defaultPagingCycle* for TRS resource sets with indicated presence; if *validityDuration* is not provided, the multiple is equal to 2.

A value of '1' for a bit of the bitmap indicates presence of associated TRS resource sets for the multiple of the number of frames, starting from a SFN determined from [17, TS 38.304] that corresponds to the frame that includes a PDCCH providing the DCI format 2\_7, or the DCI format 1\_0 with CRC scrambled by P-RNTI, with the TRS availability indication field indicating the TRS resource sets, where is provided by *defaultPagingCycle*. A value of '0' for a bit of the bitmap indicates no change to a current assumption for the availability or unavailability of associated TRS resource sets. A UE can receive first and second PDCCHs that provide DCI format 2\_7 or DCI format 1\_0 with CRC scrambled by P-RNTI that indicate presence of TRS resource sets for the multiple of the number of frames, where the second PDCCH reception after the first PDCCH reception by a time that is smaller than the multiple of the number of frames.

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