**3GPP TSG RAN WG1 #107-e** **R1-2112449**

**e-Meeting, November 11th – 19th, 2021**

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| *CR-Form-v12.0* |
| **DRAFT CHANGE REQUEST** |
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|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **16.7.0** |  |
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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:***  | Introduction of UE power savings enhancements in NR |
|  |  |
| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_UE\_pow\_sav\_enh-Core |  | ***Date:*** | 2021-11-29 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***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)* |
|  |  |
| ***Reason for change:*** | Introduction of UE power savings enhancements in NR. |
|  |  |
| ***Summary of change:*** | Add description for enhanced PDCCH monitoring, TRS presence indication in IDLE/INCATIVE, and for enhanced paging procedure. |
|  |  |
| ***Consequences if not approved:*** | Incomplete support for UE power savings enhancements in NR. |
|  |  |
| ***Clauses affected:*** | 2, 3.3, 10.1, 10.4, 10.4A (new), 10.4B (new) |
|  |  |
|  | **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 \*\*\*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications"

[2] 3GPP TS 38.201: "NR; Physical Layer – General Description"

[3] 3GPP TS 38.202: "NR; Services provided by the physical layer"

[4] 3GPP TS 38.211: "NR; Physical channels and modulation"

[5] 3GPP TS 38.212: "NR; Multiplexing and channel coding"

[6] 3GPP TS 38.214: "NR; Physical layer procedures for data"

[7] 3GPP TS 38.215: "NR; Physical layer measurements"

[8-1] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone"

[8-2] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone"

[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"

[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"

[11] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification"

[12] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification"

[13] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures"

[14] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification"

[15] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access"

[16] 3GPP TS 38.473: "F1 application protocol (F1AP)"

[17] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in Idle mode and RRC Inactive state"

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

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in [1, TR 21.905].

BPRE Bits per resource element

BWP Bandwidth part

CB Code block

CBG Code block group

CBR Channel busy ratio

CCE Control channel element

CORESET Control resource set

CP Cyclic prefix

CRC Cyclic redundancy check

CSI Channel state information

CSS Common search space

DAI Downlink assignment index

DAPS Dual active protocol stack

DC Dual connectivity

DCI Downlink control information

DL Downlink

DL-SCH Downlink shared channel

EPRE Energy per resource element

EN-DC E-UTRA NR dual connectivity with MCG using E-UTRA and SCG using NR

FR1 Frequency range 1

FR2 Frequency range 2

GSCN Global synchronization channel number

HARQ-ACK Hybrid automatic repeat request acknowledgement

MCG Master cell group

MCS Modulation and coding scheme

NDI New Data Indicator

NE-DC E-UTRA NR dual connectivity with MCG using NR and SCG using E-UTRA

NR-DC NR NR dual connectivity

PBCH Physical broadcast channel

PCell Primary cell

PDCCH Physical downlink control channel

PDSCH Physical downlink shared channel

PRACH Physical random access channel

PRB Physical resource block

PRG Physical resource block group

PSCell Primary secondary cell

PSBCH Physical sidelink broadcast channel

PSCCH Physical sidelink control channel

PSFCH Physical sidelink feedback channel

PSS Primary synchronization signal

PSSCH Physical sidelink shared channel

PUCCH Physical uplink control channel

PUCCH-SCell PUCCH SCell

PUSCH Physical uplink shared channel

QCL Quasi co-location

PO Paging occasion

RB Resource block

RE Resource element

RLM Radio link monitoring

RRM Radio resource management

RS Reference signal

RSRP Reference signal received power

SCG Secondary cell group

SCI Sidelink control information

SCS Subcarrier spacing

SFCI Sidelink feedback control information

SFN System frame number

SL Sidelink

SLIV Start and length indicator value

SPS Semi-persistent scheduling

SR Scheduling request

SRI SRS resource indicator

SRS Sounding reference signal

SSS Secondary synchronization signal

SSSG Search space set group

TA Timing advance

TAG Timing advance group

TCI Transmission Configuration Indicator

UCI Uplink control information

UE User equipment

UL Uplink

UL-SCH Uplink shared channel

USS UE-specific search space

\*\*\* 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 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 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 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 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 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.

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 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 a UE is provided a zero value for *searchSpaceID* in *PDCCH-ConfigCommon* for a Type0/0A/2-PDCCH CSS set, 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, the UE determines monitoring occasions for PDCCH candidates of the Type0/0A/2-PDCCH CSS set 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. A SCS is provided by *subCarrierSpacingCommon* in *MIB*.

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*, *ra-SearchSpace*, or a CSS set by *PDCCH-Config*, and

- a SI-RNTI, a P-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 |

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/or DCI format 1\_1, and/or DCI format 0\_2, and/or DCI format 1\_2 that schedules a PUSCH transmission or a PDSCH reception 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

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

- 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*, DCI format 0\_1, or DCI format 1\_1, or DCI format 0\_2, or DCI format 1\_2 that schedules a PUSCH transmission or a PDSCH reception 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 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

If the field has 2 bits and for PDCCH monitoring 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

- 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

- 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/or DCI format 1\_1, and/or DCI format 0\_2, and/or DCI format 1\_2 that schedules a PUSCH transmission or a PDSCH reception can include a PDCCH monitoring adaptation field of 2 bits.

If the set of durations includes one value and for PDCCH monitoring 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 group index 1, 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 group index 0, if any

- 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 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 group index 1, 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 group index 0, if any

- 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

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 a serving cell and the timer is running, the UE

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

- 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 for TBD

## When the timer expires, the UE monitors PDCCH on the serving cell according to search space sets with group index 0.10. 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 or . 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.

## 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]. A DCI format 2\_7 with CRC scrambled by RNTI or 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 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], where is provided by *defaultPagingCycle*.