**3GPP TSG RAN WG1 #109-e** **R1-22xxxxx**

**e-Meeting, May 9th – 20th, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **17.1.0** |  |
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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:*** | Corrections on UE power savings enhancements in NR | | | | | | | | | |
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| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** | R1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_UE\_pow\_sav\_enh-Core | | | | |  | ***Date:*** | | | 2022-05-24 |
|  |  | | | |  | |  | | |  |
| ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | 1. Clarify the number of PDCCH candidates per CCE aggregation level and the CCE aggregation levels for Type2A-PDCCH CSS set when *searchSpaceZero* is used in clause 10.1. 2. New agreement for a UE to stop skipping PDCCH monitoring after a PUCCH transmission with positive SR in clause 10.4. 3. Clarify the number of frames for detection of DCI format 2\_7 in clause 10.4A. 4. Number of bits in each segment corresponding to a paging occasion depends on whether or not number of subgroups per paging occasion is provided in clause 10.4A which is not according to RAN2#117-e and RAN2#118-e agreements. 5. Clarify reference point of TRS availability indication in clause 10.4B. | | | | | | | | |
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| ***Summary of change:*** | | 1. Update the number of PDCCH candidates per CCE aggregation level and the CCE aggregation levels for Type2A-PDCCH CSS set when *searchSpaceZero* is used in clause 10.1. 2. Capture that a UE stops skipping PDCCH monitoring after a PUCCH transmission with positive SR in clause 10.4. 3. Adjustment of the text in clause 10.4A. 4. Remove dependence of number of bits in each segment corresponding to a paging occasion on whether or not number of subgroups per paging occasion is provided in clause 10.4A. 5. Update text in clause 10.4B to capture that the frame providing the DCI format with the TRS availability indication is within the DRX cycle. | | | | | | | | |
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| ***Consequences if not approved:*** | | Incomplete support for for UE power savings enhancements in NR. | | | | | | | | |
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| ***Clauses affected:*** | | 10.1, 10.4, 10.4A, 10.4B | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS 38.212 | | |
| ***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 \*\*\*

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

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 *pei-SearchSpace* 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 *pei-SearchSpace* 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 and the CCE aggregation levels and the number of PDCCH candidates per CCE aggregation level for Type2A-PDCCH CSS set are given in Table 10.1-1.

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

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

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

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 on the active DL BWP of a serving cell, 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. If the UE transmits a PUCCH providing a positive SR after the UE detects a DCI format providing the PDCCH monitoring adaptation field indicating to the UE to skip PDCCH monitoring for the duration on the active DL BWP of the serving cell, the UE resumes PDCCH monitoring starting at the beginning of a first slot that is after a last symbol of the PUCCH transmission.

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 an active DL BWP of on a serving cell and the timer is running, the UE

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

- otherwise, decrements the timer value by one after a slot of the active DL BWP of the serving cell

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

## 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 *pei-SearchSpace*, 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-FrameOffset*, from the start of a frame to 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]

- 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-2-7*

- 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 *po-NumPerPEI*

A paging indication field of DCI format 2\_7 includes segments of bits, where . 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*.

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

## 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 *pei-SearchSpace* 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 within the DRX cycle that includes the 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 \*\*\*