**3GPP TSG RAN WG1 #118** **R1-240XXXX**

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

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| *CR-Form-v12.2* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **18.3.0** |  |
|  | | | | | | | | |
| *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:*** | Correction on HARQ-ACK skipping for Rel-18 multi-cell scheduling | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Moderator (Lenovo), Samsung, Ericsson, | | | | | | | | | |
| ***Source to TSG:*** | R1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_MC\_Enh-Core | | | | |  | ***Date:*** | | | 2024-08-22 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | According to below agreements in RAN1#116, HARQ-ACK skipping due to active UL BWP change on the PUCCH cell has not been fully captured in current specifications due to missing the condition of “and the PUCCH indicated by the DCI format 1\_3 is to be transmitted after the active UL BWP change on the PUCCH cell,”.  **Agreement**   * When a PDCCH MO that provides a DCI format 1\_3 is before active UL BWP change on the PUCCH cell, and the PUCCH indicated by the DCI format 1\_3 is to be transmitted after the active UL BWP change on the PUCCH cell, the corresponding HARQ-ACK information for the DCI format 1\_3 is skipped.   Furthermore, HARQ-ACK skipping due to active DL BWP change for a cell scheduled by DCI format 1\_3 for Type-2 HARQ-ACK codebook has not been captured in current specifications. How to generate the second Type-2 HARQ-ACK codebook is unclear based on current specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Capture the condition of “the PUCCH transmission with the HARQ-ACK information starts at or after a slot for the active UL BWP change,” in the description of HARQ-ACK skipping due to active UL BWP change on the PUCCH cell.  Capture the HARQ-ACK skipping due to active DL BWP change for a cell scheduled by DCI format 1\_3 when generating the second sub-codebook of Type-2 HARQ-ACK codebook, i.e., the corresponding HARQ-ACK information for the cell with active DL BWP change is generated with NACK bit, and the generated HARQ-ACK information bits for scheduled cells are ordered in ascending order of associated serving cell indices as current specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Ambiguous specifications for generating the second sub-codebook of Type-2 HARQ-ACK codebook when active DL BWP change happens on a cell scheduled by DCI format 1\_3 or active UL BWP change happens on the PUCCH cell. | | | | | | | | |
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| ***Clauses affected:*** | | 9.1.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

9.1.3.1 Type-2 HARQ-ACK codebook in physical uplink control channel

\*\*\* Unchanged parts are omitted \*\*\*

If a UE is provided by *MC-DCI-SetofCellsToAddModList* a number of sets of serving cells and is provided USS sets to monitor PDCCH for detection of DCI format 1\_3, the UE separately applies the following procedures for determining a corresponding second Type-2 HARQ-ACK sub-codebook for scheduling cells associated with DCI format 1\_3 that

- schedules PDSCH receptions on more than one serving cells from a set of serving cells, and/or

- does not include a SCell dormancy indication field or the SCell dormancy indication field is reserved, indicates SCell dormancy, and schedules PDSCH reception on one or more serving cells from the set of serving cells

- in the following, and for the purpose of providing HARQ-ACK information corresponding to SCell dormancy indication, the UE assumes that the UE receives a PDSCH on the serving cell associated with fields in DCI format 1\_3 used for SCell dormancy indication, as described in Clause 10.3, and that the PDSCH provides one transport block that the UE correctly decodes

from the procedures for determining a first Type-2 HARQ-ACK sub-codebook that is associated with unicast SPS PDSCH receptions or with any unicast DCI format scheduling a PDSCH reception on a single serving cell, or has associated HARQ-ACK information without scheduling a PDSCH reception as described in this clause. The UE appends the second Type-2 HARQ-ACK sub-codebook to the first Type-2 HARQ-ACK sub-codebook.

Denote by the number of bits for the counter DAI field in DCI format 1\_3 and set . Denote by the value of the counter DAI in a DCI format 1\_3 scheduling PDSCH receptions on more than one serving cells among the more than one serving cells, in PDCCH monitoring occasion according to Table 9.1.3-1. Denote by the value of the total DAI in DCI format 1\_3 scheduling PDSCH receptions on more than one cells in PDCCH monitoring occasion according to Table 9.1.3-1. The UE assumes a same value of total DAI in all DCI formats 1\_3 in PDCCH monitoring occasion that schedule more than one PDSCH receptions on respective more than one serving cells from a set of serving cells.

The UE determines the , for a total number of HARQ-ACK information bits in the second Type-2 HARQ-ACK sub-codebook according to the following pseudo-code.

Set to the maximum number of serving cells in *ScheduledCell-ListDCI-1-3* of a set of serving cells provided by *MC-DCI-SetofCells*, across the number of sets of serving cells, that can be scheduled PDSCH receptions by DCI format 1\_3

Set to the maximum total number of TBs in PDSCH receptions that can be scheduled by a DCI format 1\_3 over more than one serving cells in a set of serving cells across the number of sets of serving cells

Set to the number of sets of serving cells *MC-DCI-SetofCells* in a PUCCH group

Set to the number of serving cells, across sets of serving cells in the PUCCH group

Set to the index of serving cells, , a lower index corresponds to a lower RRC index of a corresponding serving cell

- if the UE indicates *type2-HARQ-ACK-Codebook* and receives PDSCHs on a serving cell that are scheduled by DCI formats 1\_3 in PDCCH receptions at a same PDCCH monitoring occasion , where

- each of the DCI formats 1\_3 schedules more than one PDSCH receptions on respective more than one serving cells,

- is the smallest cell index among the respective more than one serving cells, and

- is same across the DCI formats 1\_3

the serving cell is counted times for PDCCH monitoring occasion in increasing order of the PDSCH reception starting time among the PDSCH receptions

Set to the index of a serving cell, in a set of indexes of serving cells arranged in ascending order, from the set of serving cells,

Set – PDCCH monitoring occasion index for detection of a DCI format 1\_3 scheduling PDSCH receptions on more than one serving cells from a set of serving cells: lower index corresponds to earlier PDCCH monitoring occasion

Set

Set

Set

Set

Set to the number of PDCCH monitoring occasions

while

if *harq-ACK-SpatialBundlingPUCCH* is not provided,

while

if PDCCH monitoring occasion is before an active UL BWP change on the serving cell of PUCCH transmission if the UE is provided *pucch-sSCellDyn*, or an active UL BWP change on the PCell if the UE is not provided *pucch-sSCellDyn*, and the PUCCH transmission with the HARQ-ACK information starts at or after a slot for the active UL BWP change

;

else

if there is a PDSCH reception on serving cell that is scheduled by a DCI format scheduling more than one PDSCHs that provide respective more than one transport blocks with enabled HARQ-ACK information on respective more than one serving cells, where the DCI format is associated with a PDCCH reception in PDCCH monitoring occasion and *c* is the smallest serving cell index among the more than one serving cells

if

;

end if

;

if

;

else

;

end if

;

;

while

if the UE is scheduled PDSCH reception on serving cell, if any, from the more than one serving cells

if PDCCH monitoring occasion is before an active DL BWP change on serving cell , and the active DL BWP change is not triggered in PDCCH monitoring occasion , and the PUCCH with the HARQ-ACK information starts at or after a slot for the active DL BWP change,

if *maxNrofCodeWordsScheduledByDCI* is 2 for serving cell,

= NACK;

= NACK;

;

else

= NACK;

;

end if

elseif *maxNrofCodeWordsScheduledByDCI* is 2 for serving cell, if any, from the more than one serving cells

= HARQ-ACK information bit corresponding to the first transport block of this cell

= HARQ-ACK information bit corresponding to the second transport block of this cell

;

else

= HARQ-ACK information bit corresponding to the transport block of this cell

;

end if

end ifend if

;

end while

while

= NACK;

;

end while

;

end if

;

end if

end while

else

while

if PDCCH monitoring occasion is before an active UL BWP change on the serving cell of PUCCH transmission if the UE is provided *pucch-sSCellDyn*, or an active UL BWP change on the PCell if the UE is not provided *pucch-sSCellDyn*, and the PUCCH transmission with the HARQ-ACK information starts at or after a slot for the active UL BWP change

;

else

if there is a PDSCH reception on serving cell that is scheduled by a DCI format scheduling more than one PDSCHs that provide respective more than one transport blocks with enabled HARQ-ACK information on respective more than one serving cells, where the DCI format is associated with a PDCCH reception in PDCCH monitoring occasion and *c* is the smallest serving cell index among the more than one serving cells

if

;

end if

;

if

;

else

;

end if

;

;

while

if the UE is scheduled PDSCH reception for transport blocks with enabled HARQ-ACK information on serving cell , if any, from the more than one serving cells

if PDCCH monitoring occasion is before an active DL BWP change on serving cell , and the active DL BWP change is not triggered in PDCCH monitoring occasion , and the PUCCH with the HARQ-ACK information starts at or after a slot for the active DL BWP change,

= NACK;

else

if *maxNrofCodeWordsScheduledByDCI* is 2 for serving cell

if the PDSCH reception provides two transport blocks

= binary AND operation of the HARQ-ACK information bits corresponding to the first and second transport blocks of this cell

else

= HARQ-ACK information bit corresponding to the first transport block of this cell

end if

else

= HARQ-ACK information bit of this cell

end if

;

end if

end if

;

end while

while

= NACK;

;

end while

;

end if

;

end if

end while

end if

;

end while

;

if UE does not set and

;

end if

;

if

;

end if

if *harq-ACK-SpatialBundlingPUCCH* is not provided,

else

end if

for any .

\*\*\* Unchanged parts are omitted \*\*\*