**3GPP TSG-RAN WG1 Meeting #104-e *R1-210xxxx***

**E-meeting, January 25 – February 5, 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.213** | **CR** | **<CR#>** | **rev** | **-**  | **Current version:** | **16.4.0** |  |
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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:***  | Correction of Type-3 HARQ-ACK codebook generation for a PDSCH with one transport block for a configuration with a maximum number of two TBs |
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| ***Source to WG:*** | Moderator (Huawei), CATT |
| ***Source to TSG:*** | R1 |
|  |  |
| ***Work item code:*** | NR\_unlic-Core |  | ***Date:*** | 2021-01-27 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | In Clause 9.1.4 for a Type-3 HARQ-ACK codebook, the HARQ-ACK feedback generation for a PDSCH with one transport block is missing if $N\_{TB,c}^{DL}>1$. |
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| ***Summary of change:*** | Specify NACK as the default value for any instance of “= HARQ-ACK information bit for CBG $g$ of TB $t$ for HARQ process number $h$ of serving cell $c$” if a value is not available because the UE didn’t receive a scheduling DCI for the corresponding TB or CBG on serving cell *c* |
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| ***Consequences ifnot approved:*** | The Type-3 HARQ-ACK codebook construction is ambiguous if the UE receives a PDSCH with one transport block if $N\_{TB,c}^{DL}>1$. |
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| ***Clauses affected:*** | 9.1.4 |
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|  | **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 ...  |
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| ***Other comments:*** | **Impact Analysis:** |
|  |  |
| ***This CR's revision history:*** |  |

<Unchanged parts are omitted>

**9.1.4 Type-3 HARQ-ACK codebook determination**

If a UE is provided *pdsch-HARQ-ACK-OneShotFeedback*, the UE determines a Type-3 HARQ-ACK codebook according to the following procedure.

Set $N\_{cells}^{DL}$ to the number of configured serving cells

Set $N\_{HARQ,c}^{DL}$ to the value of *nrofHARQ-ProcessesForPDSCH* for serving cell $c$, if provided; else, set $N\_{HARQ,c}^{DL}=8$

Set $N\_{TB,c}^{DL}$ to the value of *maxNrofCodeWordsScheduledByDCI* for serving cell $c$ if *harq-ACK-SpatialBundlingPUCCH* is provided and $NDI\_{HARQ}=0$, or if *harq-ACK-SpatialBundlingPUCCH* is not provided, or if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$; else, set $N\_{TB,c}^{DL}=1$

Set $N\_{HARQ-ACK,c}^{CBG/TB,max}$ to the number of HARQ-ACK information bits per TB for PDSCH receptions on serving cell $c$ as described in Clause 9.1.1 if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$ and *pdsch-HARQ-ACK-OneShotFeedbackCBG* is provided; else, set $N\_{HARQ-ACK,c}^{CBG/TB,max}=0$

Set $NDI\_{HARQ}=0$ if *pdsch-HARQ-ACK-OneShotFeedbackNDI* is provided; else set $NDI\_{HARQ}=1$

Set $c=0$ – serving cell index

Set $h=0$ – HARQ process number

Set $t=0$ – TB index

Set $g=0$ – CBG index

Set $j=0$

while $c<N\_{cells}^{DL}$

while $h<N\_{HARQ,c}^{DL}$

if $NDI\_{HARQ}=0$

if $N\_{HARQ-ACK,c}^{CBG/TB,max}>0$

while $t<N\_{TB,c}^{DL}$

while $g<N\_{HARQ-ACK,c}^{CBG/TB,max}$

= HARQ-ACK information bit for CBG $g$ of TB $t$ for HARQ process number $h$ of serving cell $c$, if any; else, 

$j=j+1$

$g=g+1$

end while

= NDI value indicated in the DCI format corresponding to the HARQ-ACK information bit(s) for TB $t$ for HARQ process number $h$ on serving cell $c$, if any; else, 

$g=0$

$j=j+1$

$t=t+1$

end while

else

while $t<N\_{TB,c}^{DL}$

= HARQ-ACK information bit for TB $t$ for HARQ process $h$ of serving cell $c$, if any; else, 

$j=j+1$

= NDI value indicated in the DCI format corresponding to the HARQ-ACK information bit(s) for TB $t$ for HARQ process number $h$ on serving cell $c$, if any; else, 

$j=j+1$

$t=t+1$

end while

end if

$t=0$

else

if $N\_{HARQ-ACK,c}^{CBG/TB,max}>0$

while $t<N\_{TB,c}^{DL}$

if UE has reported HARQ-ACK information for TB $t$ for HARQ process number $h$ on serving cell $c$, and has not subsequently detected a DCI format scheduling a PDSCH reception, or received a SPS PDSCH, with TB $t$ for HARQ process number $h$ on serving cell $c$

while $g<N\_{HARQ-ACK,c}^{CBG/TB,max}$



$j=j+1$

$g=g+1$

end while

end if

if UE has obtained HARQ-ACK information for TB $t$ for HARQ process number $h$ on serving cell $c$ corresponding to a PDSCH reception and has not reported the HARQ-ACK information corresponding to the PDSCH reception

while $g<N\_{HARQ-ACK,c}^{CBG/TB,max}$

= HARQ-ACK information bit for CBG $g$ of TB $t$ for HARQ process number $h$ of serving cell $c$

$j=j+1$

$g=g+1$

end while

end if

$g=0$

$t=t+1$

end while

else

while $t<N\_{TB,c}^{DL}$

if UE has reported HARQ-ACK information for TB $t$ for HARQ process number $h$ on serving cell $c$ and has not subsequently detected a DCI format scheduling a PDSCH reception, or received a SPS PDSCH, with TB $t$ for HARQ process number $h$ on serving cell $c$

= NACK

$j=j+1$

$t=t+1$

end if

if UE has obtained HARQ-ACK information for TB $t$ for HARQ process number $h$ on serving cell $c$ corresponding to a PDSCH reception and has not reported the HARQ-ACK information corresponding to the PDSCH reception

if *harq-ACK-SpatialBundlingPUCCH* is not provided

= HARQ-ACK information bit for TB $t$ for HARQ process $h$ of serving cell $c$

else

= binary AND operation of the HARQ-ACK information bits corresponding to first and second transport blocks for HARQ process $h$ of serving cell $c$. If the UE receives one transport block, the UE assumes ACK for the second transport block

end if

$j=j+1$

$t=t+1$

end if

end while

end if

$t=0$

end if

$h=h+1$

end while

$h=0$

$c=c+1$

end while

If $N\_{TB,c}^{DL}>1$, when a UE receives a PDSCH with one transport block, the HARQ-ACK information is associated with the first transport block

If a UE receives a SPS PDSCH, or a PDSCH that is scheduled by a DCI format 1\_0 for a serving cell $c$ and if *maxCodeBlockGroupsPerTransportBlock* is provided for serving cell $c$, and *pdsch-HARQ-ACK-OneShotFeedbackCBG* is provided, the UE repeats $N\_{HARQ-ACK,c}^{CBG/TB,max}$ times the HARQ-ACK information for the transport block in the PDSCH.

If a UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, the UE determines a PUCCH or a PUSCH to multiplex a Type-3 HARQ-ACK codebook for transmission in a slot as described in Clauses 9.2.3 and 9.2.5. The UE multiplexes only the Type-3 HARQ-ACK codebook in the PUCCH or the PUSCH for transmission in the slot.

If

- a UE detects a DCI format that includes a One-shot HARQ-ACK request field with value 1, and

- the CRC of the DCI is scrambled by a C-RNTI or an MCS-C-RNTI, and

- *resourceAllocation* = *resourceAllocationType0* and all bits of the frequency domain resource assignment field in the DCI format are equal to 0, or

- *resourceAllocation* = *resourceAllocationType1* and all bits of the frequency domain resource assignment field in the DCI format are equal to 1, or

- *resourceAllocation = dynamicSwitch* and all bits of the frequency domain resource assignment field in the DCI format are equal to 0 or 1

the DCI format provides a request for a Type-3 HARQ-ACK codebook report and does not schedule a PDSCH reception. The UE is expected to provide HARQ-ACK information in response to the request for the Type-3 HARQ-ACK codebook after $N$ symbols from the last symbol of a PDCCH providing the DCI format, where the value of $N$ for $μ=0,1,2$ is provided in Clause 10.2 by replacing "SPS PDSCH release" with "DCI format".

If a UE multiplexes HARQ-ACK information in a PUSCH transmission, the UE generates the HARQ-ACK codebook as described in this Clause except that *harq-ACK-SpatialBundlingPUCCH* is replaced by *harq-ACK-SpatialBundlingPUSCH*.

<Unchanged parts are omitted>