**3GPP TSG-RAN WG1 Meeting #112bis-e *R1-2304088***

 **E-meeting, 17 – 26 April, 2023**

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| *CR-Form-v12.2* |
| **[DRAFT]CHANGE REQUEST** |
|  |
|  | **38.213** | **CR** | **xxx** | **rev** | **-** | **Current version:** | **17.5.0** |  |
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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:***  | Draft CR on referred PUCCH resources for multiplexing HARQ-ACK |
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| ***Source to WG:*** | Moderator (Huawei), HiSilicon, CBN, [ZTE], [MediaTek] |
| ***Source to TSG:*** | R1 |
|  |  |
| ***Work item code:*** | NR\_MBS-Core |  | ***Date:*** | 2023-04-23 |
|  |  |  |  |  |
| ***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 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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | When UE is not provided *pucch-ConfigurationListMulticast1* or *pucch-ConfigurationListMulticast2* for PUCCH transmissions, what resources will be used for PUCCH transmission is unclear.  |
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| ***Summary of change:*** | For the second HARQ-ACK reporting mode, when a number of HARQ-ACK information bits is one, a UE transmits a PUCCH only when the HARQ-ACK information bit has NACK value. The UE determines a PUCCH **from *pucch-ConfigMulticast1/ pucch-ConfigurationListMulticast1*, if provided, otherwise, from *pucch-Config/pucch-ConfigurationList*** to provide the HARQ-ACK information as described in clause 9.2.1 **or 9.2.3** when UE is not provided *moreThanOneNackOnlyMode*,or as the first PUCCH in Table 18-1 when UE is provided *moreThanOneNackOnlyMode.* For a PUCCH resource associated with PUCCH format 0, the UE transmits the PUCCH as described in [4, TS 38.211] by obtaining $m\_{0}$ as described for HARQ-ACK information in clause 9.2.3 and by setting $m\_{cs}=0$. For a PUCCH resource associated with PUCCH format 1, the UE transmits the PUCCH as described in [4, TS 38.211] by setting $b\left(0\right)=0$.If a UE is provided *pucch-ConfigurationListMulticast1* or *pucch-ConfigurationListMulticast2* for PUCCH transmissions with a priority value, the UE transmits a PUCCH with the priority value according to *pucch-ConfigurationListMulticast1* or *pucch-ConfigurationListMulticast2* for each G-RNTI for multicast or G-CS-RNTI that the UE provides associated HARQ-ACK information according to the first HARQ-ACK reporting mode or the second HARQ-ACK reporting mode, respectively; **otherwise, the UE determines a PUCCH resource from *pucch-ConfigurationList* as described in clause 9.2.3**. For HARQ-ACK information associated only with the second HARQ-ACK reporting mode, when the UE is not provided *moreThanOneNackOnlyMode* and the UE provides the HARQ-ACK information according to the first HARQ-ACK reporting mode, the UE determines a PUCCH resource from *pucch-ConfigMulticast1/pucch-ConfigurationListMulticast1*, if provided; otherwise, the UE determines a PUCCH resource from *pucch-Config/pucch-ConfigurationList* **as described in clause 9.2.3**.If a UE multiplexes in a PUCCH HARQ-ACK information of same priority associated with unicast DCI formats and with multicast DCI formats in a same PUCCH, the last DCI format that the UE uses to determine the PUCCH resource **from *pucch-Config/pucch-ConfigurationList***, as described in clause 9.2.3, is a last unicast DCI format.If the UE multiplexes in a PUCCH only multicast HARQ-ACK information of same priority that is according to both the first and second HARQ-ACK reporting modes, the last DCI format that the UE uses to determine the PUCCH resource **from *pucch-ConfigMulticast1/pucch-ConfigurationListMulticast1*, if provided, otherwise, from *pucch-Config/pucch-ConfigurationList***, as described in clause 9.2.3, is a last DCI format associated with multicast HARQ-ACK information that is according to the first HARQ-ACK reporting mode. |
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| ***Consequences if not approved:*** | UE behavior is unclear in terms of which PUCCH resources to be used for PUCCH transmission when UE is not provided *pucch-ConfigurationListMulticast1* or *pucch-ConfigurationListMulticast2* for multicast.  |
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| ***Clauses affected:*** | 18 |
|  |  |
|  | **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:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

# 18 Multicast Broadcast Services

< Unchanged parts are omitted >

For the first HARQ-ACK reporting mode, the UE generates HARQ-ACK information with ACK value when a UE correctly decodes a transport block or detects a DCI format indicating an SPS PDSCH release; otherwise, the UE generates HARQ-ACK information with NACK value, as described in clauses 9 and 9.1 through 9.3. The UE determines a PUCCH or a PUSCH to provide the HARQ-ACK information as described in clause 9.2.

For the second HARQ-ACK reporting mode, the UE does not transmit a PUCCH that would include only HARQ-ACK information with ACK values. The second HARQ-ACK reporting mode is not applicable for the first SPS PDSCH reception after activation of SPS PDSCH receptions for a SPS configuration, or for DCI formats having associated HARQ-ACK information without scheduling a PDSCH reception.

For the second HARQ-ACK reporting mode, when a number of HARQ-ACK information bits is one, a UE transmits a PUCCH only when the HARQ-ACK information bit has NACK value. The UE determines a PUCCH from *pucch-ConfigMulticast1/ pucch-ConfigurationListMulticast1*, if provided, otherwise, from *pucch-Config/pucch-ConfigurationList* to provide the HARQ-ACK information as described in clause 9.2.1 or 9.2.3 when UE is not provided *moreThanOneNackOnlyMode*,or as the first PUCCH in Table 18-1 when UE is provided *moreThanOneNackOnlyMode.* For a PUCCH resource associated with PUCCH format 0, the UE transmits the PUCCH as described in [4, TS 38.211] by obtaining $m\_{0}$ as described for HARQ-ACK information in clause 9.2.3 and by setting $m\_{cs}=0$. For a PUCCH resource associated with PUCCH format 1, the UE transmits the PUCCH as described in [4, TS 38.211] by setting $b\left(0\right)=0$.

A UE that is indicated the second HARQ-ACK reporting mode, and for the case when the UE reports more than one HARQ-ACK information bits, the UE can be indicated to provide the HARQ-ACK information bits in a PUCCH either according to the first HARQ-ACK reporting mode when the UE is not provided *moreThanOneNackOnlyMode* or, for only one G-RNTI or only one G-CS-RNTI, according to the second HARQ-ACK reporting mode by selecting a PUCCH resource from a set of PUCCH resources for the PUCCH transmission based on the values of the HARQ-ACK information bits as described in Table 18-1 when the UE is provided *moreThanOneNackOnlyMode*. The UE generates HARQ-ACK information bits for the second HARQ-ACK reporting mode according to a Type-2 HARQ-ACK codebook as described in clause 9.1.3.1. For a PUCCH resource associated with PUCCH format 0, the UE transmits the PUCCH as described in [4, TS 38.211] by obtaining $m\_{0}$ as described for HARQ-ACK information in clause 9.2.3 and by setting $m\_{cs}=0$. For a PUCCH resource associated with PUCCH format 1, the UE transmits the PUCCH as described in [4, TS 38.211] by setting $b\left(0\right)=0$.

< Unchanged parts are omitted >

If a UE is provided *pucch-ConfigurationListMulticast1* or *pucch-ConfigurationListMulticast2* for PUCCH transmissions with a priority value, the UE transmits a PUCCH with the priority value according to *pucch-ConfigurationListMulticast1* or *pucch-ConfigurationListMulticast2* for each G-RNTI for multicast or G-CS-RNTI that the UE provides associated HARQ-ACK information according to the first HARQ-ACK reporting mode or the second HARQ-ACK reporting mode, respectively; otherwise, the UE determines a PUCCH resource from *pucch-ConfigurationList* as described in clause 9.2.3. For HARQ-ACK information associated only with the second HARQ-ACK reporting mode, when the UE is not provided *moreThanOneNackOnlyMode* and the UE provides the HARQ-ACK information according to the first HARQ-ACK reporting mode, the UE determines a PUCCH resource from *pucch-ConfigMulticast1/pucch-ConfigurationListMulticast1*, if provided; otherwise, the UE determines a PUCCH resource from *pucch-Config/pucch-ConfigurationList* as described in clause 9.2.3.

< Unchanged parts are omitted >

If a UE multiplexes in a PUCCH HARQ-ACK information of same priority associated with unicast DCI formats and with multicast DCI formats in a same PUCCH, the last DCI format that the UE uses to determine the PUCCH resource from *pucch-Config/pucch-ConfigurationList*, as described in clause 9.2.3, is a last unicast DCI format.

If the UE multiplexes in a PUCCH only multicast HARQ-ACK information of same priority that is according to both the first and second HARQ-ACK reporting modes, the last DCI format that the UE uses to determine the PUCCH resource from *pucch-ConfigMulticast1/pucch-ConfigurationListMulticast1*, if provided, otherwise, from *pucch-Config/pucch-ConfigurationList*, as described in clause 9.2.3, is a last DCI format associated with multicast HARQ-ACK information that is according to the first HARQ-ACK reporting mode.

If a UE multiplexes in a PUCCH only first HARQ-ACK information associated with multicast SPS PDSCH receptions and second HARQ-ACK information associated with multicast DCI formats and having same priority value as the first HARQ-ACK information, and both the first and second HARQ-ACK information are according to the first HARQ-ACK reporting mode, the UE determines the PUCCH resource based on the last multicast DCI format, as described in clause 9.2.3.

< Unchanged parts are omitted >