**3GPP T****SG-RAN WG1 Meeting #106-e R1-2108667**

**e-Meeting, August 16th – 27th, 2021**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.213** | **CR** | **0259** | **rev** | **-** | **Current version:** | **16.6.0** |  |
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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 on HARQ-ACK timing | | | | | | | | | |
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| ***Source to WG:*** | Moderator (Apple Inc.), Ericsson | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** | [NR\_L1enh\_URLLC-Core](http://portal.3gpp.org/desktopmodules/WorkItem/WorkItemDetails.aspx?workitemId=830174) | | | | |  | ***Date:*** | | | 2021-08-30 |
|  |  | | | |  | |  | | |  |
| ***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 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | The following agreements on slot-based and sub-slot-based HARQ-ACK timing from RAN1#105-e and RAN1#106-e need to be captured in TS 38.213.  **Working Assumption** (RAN1#105-e)  For HARQ-ACK timing in Rel-16 with slot-based HARQ-ACK feedback, in case UL SCS is larger than DL SCS, k = 0 corresponds to the last UL slot that overlaps with the DL slot for the PDSCH.   * Further discuss the HARQ-ACK timing for sub-slot-based HARQ-ACK feedback * FFS specification impact   Agreement (RAN1#106-e)  For HARQ ACK timing in Rel-16 with sub-slot-based HARQ-ACK feedback, irrespective of UL SCS and DL SCS, k = 0 corresponds to the last UL sub-slot that overlaps with the PDSCH.  Agreement (RAN1#106-e)  Confirm the RAN1#105-e working assumption with the following modification:  For HARQ-ACK timing in Rel-16 with slot-based HARQ-ACK feedback, in case UL SCS is larger than DL SCS, k = 0 corresponds to the last UL slot that overlaps with the DL slot for the PDSCH.   * ~~Further discuss the HARQ-ACK timing for sub-slot-based HARQ-ACK feedback~~ * FFS specification impact | | | | | | | | |
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| ***Summary of change:*** | | Clarify the HARQ-ACK timing for slot-based and sub-slot-based HARQ-ACK feedback. | | | | | | | | |
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| ***Consequences if not approved:*** | | The gNB and the UE may have different understanding on the HARQ-ACK timing indicated or configured by the gNB. | | | | | | | | |
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| ***Clauses affected:*** | | 9.1.2, 9.2.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | **Isolated impact analysis:**  If either the gNB or the UE does not implement the CR, the gNB and the UE may have different understanding on the HARQ-ACK timing indicated or configured by the gNB. | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

9.1.2 Type-1 HARQ-ACK codebook determination

This clause applies if the UE is configured with *pdsch-HARQ-ACK-Codebook = semi-static*.

A UE does not expect to be configured with *pdsch-HARQ-ACK-Codebook = semi-static* for a codebook if a UE is provided *subslotLength-ForPUCCH* for the codebook.

A UE reports HARQ-ACK information for a corresponding PDSCH reception or SPS PDSCH release only in a HARQ-ACK codebook that the UE transmits in a slot indicated by a value of a PDSCH-to-HARQ\_feedback timing indicator field in a corresponding DCI format. The UE reports NACK value(s) for HARQ-ACK information bit(s) in a HARQ-ACK codebook that the UE transmits in a slot not indicated by a value of a PDSCH-to-HARQ\_feedback timing indicator field in a corresponding DCI format.

If a UE is not provided *pdsch-HARQ-ACK-OneShotFeedback*, the UE does not expect to receive a PDSCH scheduled by a DCI format that the UE detects in any PDCCH monitoring occasion and includes a PDSCH-to-HARQ\_feedback timing indicator field providing an inapplicable value from *dl-DataToUL-ACK-r16*.

If the UE is provided *pdsch-AggregationFactor-r16* in *SPS-Config* or *pdsch-AggregationFactor* in *PDSCH-Config* and no entry in *pdsch-TimeDomainAllocationList* and *pdsch-TimeDomainAllocationListDCI-1-2* includes *repetitionNumber* in *PDSCH-TimeDomainResourceAllocation-r16*, is a maximum value of *pdsch-AggregationFactor-r16* in *SPS-Config* or *pdsch-AggregationFactor* in *PDSCH-Config*; otherwise . The UE reports HARQ-ACK information for a PDSCH reception

- from DL slot to DL slot , if is provided by *pdsch-AggregationFactor* or *pdsch-AggregationFactor-r16* [6, TS 38.214], or

- from DL slot to DL slot , if the time domain resource assignment field in the DCI format scheduling the PDSCH reception indicates an entry containing *repetitionNumber,* or

- in DL slot , otherwise

only in a HARQ-ACK codebook that the UE includes in a PUCCH or PUSCH transmission in slot , where is the last UL slot overlapping with DL slot and is a number of slots indicated by the PDSCH-to-HARQ\_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ\_feedback timing indicator field is not present in the DCI format. If the UE reports HARQ-ACK information for the PDSCH reception in a slot other than slot , the UE sets a value for each corresponding HARQ-ACK information bit to NACK.

< Unchanged parts are omitted >

9.2.3 UE procedure for reporting HARQ-ACK

A UE does not expect to transmit more than one PUCCH with HARQ-ACK information in a slot per priority index, if the UE is not provided *ackNackFeedbackMode = separate*.

For DCI format 1\_0, the PDSCH-to-HARQ\_feedback timing indicator field values map to {1, 2, 3, 4, 5, 6, 7, 8}. For a DCI format, other than DCI format 1\_0, scheduling a PDSCH reception or a SPS PDSCH release, the PDSCH-to-HARQ\_feedback timing indicator field values, if present, map to values for a set of number of slots provided by *dl-DataToUL-ACK*, *dl-DataToUL-ACK-r16*, or *dl-DataToUL-ACKForDCIFormat1\_2*, as defined in Table 9.2.3-1.

If the UE is provided *subslotLengthForPUCCH*, is the last UL slot that overlaps with the PDSCH reception or with the PDCCH reception in case of SPS PDSCH release or in case of SCell dormancy indication or in case of the DCI format that requests Type-3 HARQ-ACK codebook report and does not schedule a PDSCH reception; otherwise, is the last UL slot that overlaps with the DL slot for the PDSCH reception or with the DL slot for the PDCCH reception in case of SPS PDSCH release or in case of SCell dormancy indication or in case of the DCI format that requests Type-3 HARQ-ACK codebook report and does not schedule a PDSCH reception.

For a SPS PDSCH reception ending in DL slot , the UE transmits the PUCCH in UL slot where is provided by the PDSCH-to-HARQ\_feedback timing indicator field, if present, in a DCI format activating the SPS PDSCH reception.

If the UE detects a DCI format that does not include a PDSCH-to-HARQ\_feedback timing indicator field and schedules a PDSCH reception or activates a SPS PDSCH reception ending in DL slot , the UE provides corresponding HARQ-ACK information in a PUCCH transmission within UL slot where is provided by *dl-DataToUL-ACK*, or *dl-DataToUL-ACK-r16*, or *dl-DataToUL-ACKForDCIFormat1\_2*.

If the UE detects a DCI format scheduling a PDSCH reception ending in DL slot or if the UE detects a DCI format indicating a SPS PDSCH release or indicating SCell dormancy through a PDCCH reception ending in DL slot , or if the UE detects a DCI format that requests Type-3 HARQ-ACK codebook report and does not schedule a PDSCH reception through a PDCCH reception ending in DL slot , as described in clause 9.1.4, the UE provides corresponding HARQ-ACK information in a PUCCH transmission within UL slot , where is a number of slots and is indicated by the PDSCH-to-HARQ\_feedback timing indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, *dl-DataToUL-ACK-r16*, or *dl-DataToUL-ACKForDCIFormat1\_2*.

< Unchanged parts are omitted >