**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *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:*** | Corrrections to higher-layers parameters for IoT (Internet of Things) NTN (non-terrestrial network) enhancements | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | Align higher-layer parameter names to match the ASN.1 according to RAN2 LS R1-2407592(R2-2407827) | | | | | | | | |
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| ***Summary of change:*** | | Corrected the following higher-layer parameter names:   1. *downlinkHARQ-FeedbackDisabled-Bitmap* to *downlinkHARQ-FeedbackDisabledBitmap* 2. *downlinkHARQ-FeedbackDisabled-DCI* to*downlinkHARQ-FeedbackDisabledDCI* 3. *downlinkHARQ-FeedbackDisabled-Bitmap-NB* to *downlinkHARQ-FeedbackDisabledBitmap-NB* 4. *downlinkHARQ-FeedbackDisabled-DCI-NB* to *downlinkHARQ-FeedbackDisabledDCI-NB* | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Inconsitency on higher-layer parameter names between RAN1 TS 36.213 and RAN2 specifcations | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.1, 7.3, 10.2, 16.4.2, 16.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

7.1 UE procedure for receiving the physical downlink shared channel

<Unchanged parts are omitted>

A BL/CE UE shall upon detection of a MPDCCH with DCI format 6-1A, 6-1B, 6-2 intended for the UE, decode the corresponding PDSCH in one more BL/CE DL subframes as described in Clause 7.1.11, with the restriction of the number of transport blocks defined in the higher layers.

For a BL/CE UE in a NTN FDD serving cell with a PDSCH ending in subframe *n*, and the UE configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap* or higher layer parameter *downlinkHARQ-FeedbackDisabledDCI*, if the UE shall not provide HARQ-ACK for a HARQ process associated with a transport block in the PDSCH, the UE is not expected to receive a MPDCCH or a PDSCH without a corresponding MPDCCH for the same HARQ process as the PDSCH ending in subframe *n* in any BL/CE DL subframe starting from subframe *n*+1 to subframe *n*+3.

For the purpose of decoding PDSCH containing *SystemInformationBlockType2,* a BL/CE UE shall assume that subframes in which *SystemInformationBlockType2* is scheduled are non-MBSFN subframes.

<Unchanged parts are omitted>

## 7.3 UE procedure for reporting HARQ-ACK

If the UE is not configured with *shortTTI*, the term 'subframe/slot' refers to a subframe in this clause.

<Unchanged parts are omitted>

For a BL/CE UE in a NTN FDD serving cell, and the UE not configured with higher layer parameter *downlinkHARQ-FeedbackDisabledDCI* and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap* indicating enabled HARQ-ACK information for a HARQ process associated with a transport block in the PDSCH, the UE shall provide HARQ-ACK for the HARQ process associated with the transport block.

For a BL/CE UE in a NTN FDD serving cell, and the UE configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap* indicating disabled HARQ-ACK information for a HARQ process associated with a transport block in the PDSCH, the UE shall provide HARQ-ACK for a HARQ process associated with a transport block in a detected PDSCH

- if the UE is configured with CEModeA, and configured with higher layer parameter *harq-FeedbackEnablingforSPSactive* = *'enabled'*, and the detected PDSCH is the first SPS PDSCH after SPS activation.

For a BL/CE UE in a NTN FDD serving cell, and the UE configured with CEModeB and higher layer parameter *downlinkHARQ-FeedbackDisabledDCI*, the UE shall provide HARQ-ACK for a HARQ process associated with a transport block in a detected PDSCH

- if the HARQ-ACK Resource offset field does not function as HARQ feedback disabled indicator as specified in [4] in DCI format 6-1B in the MPDCCH corresponding to the PDSCH.

For a BL/CE UE in half-duplex FDD operation in a NTN serving cell, if the UE is configured with CEModeA, and configured with higher layer parameter *ce-HARQ-AckBundling*, and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap* indicating disabled HARQ-ACK information for a HARQ process associated with a transport block in the PDSCH, the UE is not expected to receive the corresponding DCI with HARQ-ACK bundling flag set to 1.

For a BL/CE UE, if the UE is configured with CEModeA, and if the UE is configured with higher layer parameter *harq-AckBundling* in *ce-PDSCH-MultiTB-Config* and multiple TB are scheduled in the corresponding DCI format 6-1A with CRC scrambled by C-RNTI,

- for the UE in a NTN FDD serving cell, if the UE is configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap* indicating disabled HARQ-ACK information for a HARQ process associated with a transport block of the multiple TB, and if the UE shall provide HARQ-ACK for at least one TB of the multiple TB, the UE shall generate an ACK for HARQ-ACK corresponding to the transport block associated with the HARQ process with disabled HARQ-ACK information;

- for HARQ-ACK transmission associated with the corresponding DCI, the UE shall generate *M* HARQ-ACK bits by performing a logical AND operation of HARQ-ACKs across all TBs in each TB bundle where *b* = 1, …, *M*;

- the set of TBs that belong to TB bundle and the number of TB bundles *M* are given by Table 7.3-1;

- the value of is the number of scheduled TB determined in the corresponding DCI.

<Unchanged parts are omitted>

## 10.2 Uplink HARQ-ACK timing

For TDD or for FDD-TDD and primary cell frame structure type 2 or for FDD-TDD and primary cell frame structure type 1, if a UE configured with *EIMTA-MainConfigServCell-r12* for a serving cell, "UL/DL configuration" of the serving cell in Clause 10.2 refers to the UL/DL configuration given by the parameter *eimta-HARQ-ReferenceConfig-r12* for the serving cell unless specified otherwise.

<Unchanged parts are omitted>

For FDD, if a BL/CE UE is not configured with higher layer parameter *harq-AckBundling* in *ce-PDSCH-MultiTB-Config* and multiple TB are scheduled in the corresponding DCI, the BL/CE UE shall upon detection of a PDSCH intended for the UE and for which an HARQ-ACK shall be provided, transmit the HARQ-ACK response using the same  derived according to Clause 10.1.2.1 in subframe(s) with , *i =0,1, …, N-1*, where

- if the UE is in a NTN serving cell and the UE is configured with CEModeA and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap* indicating disabled HARQ-ACK information for a HARQ process associated with a transport block in the PDSCH, or

- if the UE is in a NTN serving cell and the UE is configured with CEModeB and not configured with higher layer parameter *downlinkHARQ-FeedbackDisabled-DCI* and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap* indicating disabled HARQ-ACK information for a HARQ process associated with a transport block in the PDSCH,

-  is the number of scheduled TB associated with HARQ processes with enabled HARQ-ACK information and with TB indices in increasing order denoted by ;

- otherwise

- is the number of scheduled TB determined in the corresponding DCI, and ;

- if the UE is not configured with higher layer parameter *interleaving* in *ce-PDSCH-MultiTB-Config* and the UE is not in half-duplex FDD operation

- ,

- otherwise

- **,**

- is the last subframe in which the PDSCH containing TB is transmitted;

- subframe is the last subframe in which the PDSCH is transmitted;

- denotes the number of consecutive subframes including non-BL/CE subframes where the PUCCH with HARQ ACK for TB with repetition number of *N* is transmitted;

and

*- 0≤k0<k1<…,kN-1* and the value of and  is provided by higher layer parameter *pucch-NumRepetitionCE-format1,* if configured, otherwise it is provided by higher layer parameter *pucch-NumRepetitionCE*-*Msg4-Level0-r13, pucch-NumRepetitionCE-Msg4-Level1-r13, pucch-NumRepetitionCE-Msg4-Level2-r13* or *pucch-NumRepetitionCE-Msg4-Level3-r13* depending on whether the most recent PRACH coverage enhancement level for the UE is 0, 1, 2 or 3, respectively; and

if *N>1*

- subframe(s) with *i=0,1,…,N-1* for TB are *N* consecutive BL/CE UL subframe(s) immediately after subframe , and the set of BL/CE UL subframes are configured by higher layers;

otherwise

- k0 =0

<Unchanged parts are omitted>

### 16.4.2 UE procedure for reporting ACK/NACK

The UE shall upon detection of a NPDSCH transmission ending in NB-IoT subframe *n* intended for the UE and for which an ACK/NACK shall be provided, start, after the end of

-  DL subframe for FDD,

-  NB-IoT UL subframes following the end of n+12 subframe for TDD,

transmission of the NPUSCH carrying ACK/NACK response, and SR (if any) if the serving cell is FDD and the UE is configured with higher layer parameter *sr-with-HARQ-ACK-Config*, using NPUSCH format 2 in *N* consecutive NB-IoT UL slots, where

- , where

- the value of is given by the higher layer parameter *ack-NACK-NumRepetitions-Msg4* configured for the associated NPRACH resourcefor Msg4 NPDSCH transmission, and higher layer parameter *ack-NACK-NumRepetitions* otherwise,

- the value of  is the number of slots of the resource unit (defined in clause 10.1.2.3 of [3]), and

- if the UE is configured with higher layer parameter *harq-ACK-Bundling* in *npdsch-MultiTB-Config*, or if the UE is in a NTN serving cell and multiple TB are scheduled in the NPDCCH corresponding to the NPDSCH and the UE is not configured with higher layer parameter *downlinkHARQ-FeedbackDisabledDCI-NB -* and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap-NB* indicating disabled HARQ-ACK information for a HARQ process associated with a transport block in the NPDSCH, then , otherwise , where the value of is determined by the Number of scheduled TB for Unicast field if present in the NPDCCH corresponding to the NPDSCH, otherwise ,

- allocated subcarrier for ACK/NACK and value of *k0* is determined by the ACK/NACK resource field in the DCI format of the corresponding NPDCCH according to Table 16.4.2-1, and Table 16.4.2-2,

- for FDD, .

- for TDD, .

- For 

- if the UE is configured with higher layer parameter *harq-AckBundling* in *npdsch-MultiTB-Config*, and the NPDSCH corresponding to a NPDCCH with DCI CRC scrambled by C-RNTI,

- if the UE is in a NTN serving cell and if the UE is not configured with higher layer parameter *downlinkHARQ-FeedbackDisabledDCI-NB* and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap-NB* indicating disabled HARQ-ACK information for a HARQ process associated with a transport block in the NPDSCH, the UE shall generate an ACK for HARQ-ACK corresponding to the transport block

- the ACK/NACK response is generated by performing a logical AND operation of HARQ-ACKs corresponding to the TB*r+*1 ,

- otherwise,

- if 

- the ACK/NACK response is the HARQ-ACK corresponding to the transport block associated with the HARQ process with enabled HARQ-ACK information

- otherwise

- NB-IoT UL slots  with  of the NPUSCH carry ACK/NACK response for TB*r+*1 ,

except if the UE is in a NTN serving cell, and the UE is not configured with higher layer parameter *downlinkHARQ-FeedbackDisabledDCI-NB* and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap-NB* indicating disabled HARQ-ACK information for all HARQ process(es) associated with transport block(s) in the NPDSCH, or the HARQ-ACK Resource field functions as HARQ feedback disabled indicator in DCI format N1 as specified in [4] in the NPDCCH corresponding to the NPDSCH.

<Unchanged parts are omitted>

## 16.6 Narrowband physical downlink control channel related procedures

Throughout this clause, if a NB-IoT UE is configured with higher layer parameter *k-Mac*, *K*mac = *k-Mac* otherwise, *K*mac = 0.

<Unchanged parts are omitted>

If a NB-IoT UE is configured with higher layer parameter *twoHARQ-ProcessesConfig*

- and if the UE has a NPUSCH transmission ending in subframe *n*,

- the UE is not required to receive transmissions in the Type B half-duplex guard periods as specified in [3]for FDD ; and

- the UE is not expected to receive an NPDCCH with DCI format N0/N1 for the same HARQ process ID as the NPUSCH transmission in any subframe starting from subframe n+1 to subframe n+3, or in a NTN serving cell, in any downlink subframe that overlaps with uplink subframe *n*+1 to subframe *n*+*K*mac+3 except if the UE is configured with higher layer parameter *uplinkHARQ-mode* set to ‘*HARQModeB*’ for the same HARQ process ID, or if the NPUSCH transmission carries ACK/NACK response, as determined in clause 16.4.2, for the same HARQ process ID associated with a transport block scheduled in a NPDCCH scheduling a single transport block, and the UE is configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap-NB* indicating disabled HARQ-ACK information for the same HARQ process ID and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledDCI-NB;*

else if the UE is not using higher layer parameter *edt-Parameters* or if the UE is using higher layer parameter *edt-Parameters* and 

- if the NB-IoT UE has a NPUSCH transmission ending in subframe *n*,

- the UE is not required to receive transmissions in the Type B half-duplex guard periods as specified in [3] for FDD; and

- the UE is not required to monitor NPDCCH in any subframe starting from subframe *n+1* to subframe *n+3* or in a NTN serving cell, in any downlink subframe that overlaps with uplink subframe *n*+*1* to subframe *n*+*K*mac+3 except if the UE is configured with higher layer parameter *uplinkHARQ-mode* set to ‘*HARQModeB*’, or if the NPUSCH transmission carries ACK/NACK response as determined in clause 16.4.2 and the UE is configured with higher layer parameter *downlinkHARQ-FeedbackDisabledBitmap-NB* indicating disabled HARQ-ACK information and configured with higher layer parameter *downlinkHARQ-FeedbackDisabledDCI-NB*.

otherwise,

- If the NB-IoT UE has a NPUSCH transmission for Msg3 ending in subframe with transport block size , whereas if would have been selected the NPUSCH transmission would have ended in subframe *n*, the UE is not required to monitor NPDCCH in any subframe starting from subframe *n'+1* to subframe *n+3* or in a NTN serving cell, in any downlink subframe that overlaps with uplink subframe *n'*+*1* to subframe *n*+*K*mac+*3*.

<Unchanged parts are omitted>