**3GPP TSG-RAN WG1 Meeting #101-eR1-20wxyz**

**e-Meeting, May 25 – June 5, 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **36.212** | **CR** | **0337** | **rev** | **1** | **Current version:** | **16.1.0** |  |
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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:***  | Miscellaneous corrections for Rel-16 NB-IoT features in 36.212 |
|  |  |
| ***Source to WG:*** | FUTUREWEI |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NB\_IOTenh3-Core |  | ***Date:*** | 2020-6-11 |
|  |  |  |  |  |
| ***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-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:*** | Corrections are needed for the multi-TB scheduling and resource reservation features of Rel-16 NB-IoT in 36.212 |
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| ***Summary of change:*** | 1. [100e-LTE-NB\_IOTenh3-Multi-TB-02] / endorsed TP in R1-2002975

A missing agreement is captured in the specification.**Agreement**A UE is not expected to receive a DCI scheduling more than one TB with CRC scrambled by SPS-C-RNTI1. [100e-LTE-NB\_IOTenh3-Multi-TB-03] / endorsed TP in R1-2002976

The DCI format N0 scheduling TBs for unicast field (STUF) text is updated to align with the other NB-IoT and eMTC formats.1. [101-e-LTE-NB\_IoTenh3-Coex-NR-01] / endorsed TP in R1-2004843

Since N1 can now be bigger than N0, in order to keep the sizes matched and avoid increased blind decoding the DCI format N0 will be padded by zeros to align the size of DCI formats N0 and N1.1. [101-e-LTE-NB\_IoTenh3-Multi-TB-02] / endorsed TP in R1-2004956

DCI format N1 only schedules one codeword in non-multi-TB, so “per-TTI” is added to the DCI preamble.1. Update of a few RRC parameter names to align with 36.331.
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| ***Consequences if not approved:*** | Rel-16 NB-IoT feature is incomplete |
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| ***Clauses affected:*** | 6.4.3.1, 6.4.3.2 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 36.211, TS 36.213 |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

### 6.4.3 Downlink control information

A DCI transports downlink or uplink scheduling information for one cell and one RNTI. The RNTI is implicitly encoded in the CRC. The processing structure for one DCI is according to Clause 5.3.3.

#### 6.4.3.1 DCI Format N0

DCI format N0 is used for the scheduling of NPUSCH and operation on preconfigured UL resources in one UL cell.

The following information is transmitted by means of the DCI format N0:

- Flag for format N0/format N1 differentiation – 1 bit, where value 0 indicates format N0 and value 1 indicates format N1

- Modulation and coding scheme – 4 bits as defined in clause 16.5.1.2 of [3]. This field is only present if format N0 CRC is scrambled by PUR C-RNTI.

If format N0 CRC is scrambled by PUR C-RNTI and Modulation and coding scheme is set to '1110', the remaining fields are set as follows:

- ACK or Fallback indicator – 1 bit, where value 0 indicates ACK and value 1 indicates fallback as defined in clause 16.6.4 of [3]

- NPUSCH repetition adjustment – 3 bits as defined in clause 16.5.1.1 of [3]

- Timing advance adjustment – 6 bits as defined in clause 16.1.2 of [3]. The field is only present if ACK or Fallback indicator is set to 0.

- All the remaining bits in format N0 are set to one

Otherwise

- Subcarrier indication – 6 bits as defined in clause 16.5.1.1 of [3]

- Resource assignment – 3 bits as defined in clause 16.5.1.1 of [3]

- Scheduling delay – 2 bits as defined in clause 16.5.1 of [3]

- Modulation and coding scheme – 4 bits as defined in clause 16.5.1.2 of [3]. This field is not present if format N0 CRC is scrambled by PUR C-RNTI.

- Redundancy version – 1 bit as defined in clause 16.5.1.2 of [3]

- Repetition number – 3 bits as defined in clause 16.5.1.1 of [3]

- New data indicator – 1 bit

- DCI subframe repetition number – 2 bits as defined in clause 16.6 in [3]

- Number of scheduled TB for Unicast – 1 bit, where value 0 indicates a single TB is scheduled and value 1 indicates multiple TB are scheduled. This field is only present if higher layer parameter *npusch-MultiTB-Config* is enabled and the corresponding DCI is mapped onto the UE specific search space given by the C-RNTI as defined in [3]. The field is set to 0 if the CRC of the DCI is scrambled by SPS C-RNTI.

- HARQ process number – 1 bit. This field is only present if 2 HARQ processes are configured and the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI as defined in [3], or if Number of scheduled TB for Unicast is present. If multiple TB are scheduled, it functions as New data indicator for the second TB.

- Resource reservation – 1 bit as defined in clause 16.5 of [3]. This field is only present if higher layer parameter *valid-subframe-config-UL* or *slot-reserved-resource-config-UL* is configured and the DCI is mapped onto the UE-specific search space given by C-RNTI as defined in [3].

If the number of information bits in format N0 mapped onto the UE specific search space given by the C-RNTI as defined in [3] is less than that of format N1 in the same search space, zeros shall be appended to format N0 until the payload size equals that of format N1.

#### 6.4.3.2 DCI Format N1

DCI format N1 is used for the scheduling of one NPDSCH codeword per TTI in one cell, random access procedure initiated by a NPDCCH order, notifying SC-MCCH change, and operation on preconfigured UL resources. The DCI corresponding to a NPDCCH order is carried by NPDCCH.

The following information is transmitted by means of the DCI format N1:

- If the format N1 CRC is scrambled by C-RNTI or RA-RNTI or PUR C-RNTI:

- Flag for format N0/format N1 differentiation – 1 bit, where value 0 indicates format N0 and value 1 indicates format N1

- NPDCCH order indicator – 1 bit

- Else if the format N1 CRC is scrambled by a G-RNTI:

- Information for SC-MCCH change notification – 2 bits as defined in clause 5.8a of [6]

Format N1 is used for random access procedure initiated by a NPDCCH order only if NPDCCH order indicator is set to '1', format N1 CRC is scrambled with C-RNTI, and all the remaining fields are set as follows:

- Preamble format indicator – 1 bit, where value 0 indicates preamble format 0/1 and value 1 indicates preamble format 2. This field is only present if *SystemInformationBlockType2-NB* or *SystemInformationBlockType23-NB* is configured and the UE indicates the *nprach-Format2* capability.

- Starting number of NPRACH repetitions – 2 bits as defined in clause 16.3.2 of [3]

- Subcarrier indication of NPRACH – 6 or 8 bits, this field is 8 bits only if Preamble format indicator is present and set to 1, as defined in clause 16.3.2 of [3]

- Carrier indication of NPRACH – 4 bits as defined in clause 16.3.2 of [3]. This field is only present if *ul-ConfigList* is configured and the UE indicates the *multiCarrier-NPRACH* capability.

- All the remaining bits in format N1 are set to one

Otherwise,

- Scheduling delay – 3 bits as defined in clause 16.4.1 of [3]

- Resource assignment – 3 bits as defined in clause 16.4.1.3 of [3]

- Modulation and coding scheme – 4 bits as defined in clause 16.4.1.5 of [3]

- Repetition number – 4 bits as defined in clause 16.4.1.3 of [3]

- New data indicator – 1 bit

- HARQ-ACK resource – 4 bits as defined in clause 16.4.2 of [3].

- DCI subframe repetition number – 2 bits as defined in clause 16.6 in [3]

- Number of scheduled TB for SC-MTCH – 3 bits, indicating from 1 to 8 TBs. This field is only present if higher layer parameter *sc-mtch-InfoListMultiTB-r16* is enabled and the CRC of the DCI is scrambled by G-RNTI.

- Number of scheduled TB for Unicast – 1 bit, where value 0 indicates a single TB is scheduled and value 1 indicates multiple TB are scheduled. This field is only present if higher layer parameter *npdsch-MultiTB-Config* is enabled and the corresponding DCI is mapped onto the UE specific search space given by the C-RNTI as defined in [3]

- HARQ process number – 1 bit. This field is only present if 2 HARQ processes are configured and the corresponding DCI format is mapped onto the UE specific search space given by the C-RNTI as defined in [3], or if Number of scheduled TB for Unicast is present. If multiple TB are scheduled, it functions as New data indicator for the second TB.

- Resource reservation – 1 bit as defined in clause 16.4 of [3]. This field is only present if higher layer parameter *valid-subframe-config-DL* or *slot-reserved-resource-config-DL* is configured and the DCI is mapped onto the UE-specific search space given by C-RNTI as defined in [3].

When the format N1 CRC is scrambled with a RA-RNTI or a G-RNTI, then the following fields among the fields above are reserved for RA-RNTI and not present for G-RNTI:

- New data indicator

- HARQ-ACK resource

If the number of information bits in format N1 is less than that of format N0 and the format N1 CRC is not scrambled by G-RNTI, zeros shall be appended to format N1 until the payload size equals that of format N0.

#### 6.4.3.3 DCI Format N2

DCI format N2 is used for paging, direct indication, scheduling of one NPDSCH codeword carrying SC-MCCH in one cell, and notifying SC-MCCH change.

The following information is transmitted by means of the DCI format N2:

- If the format N2 CRC is scrambled by P-RNTI:

- Flag for paging/direct indication differentiation – 1 bit, with value 0 for direct indication and value 1 for paging

- Else if the format N2 CRC is scrambled by a SC-RNTI:

- Information for SC-MCCH change notification – 1 bit as defined in clause 5.8a of [6]

- If the format N2 CRC is scrambled by P-RNTI and Flag=0:

- Direct Indication information – 8 bits provide direct indication of system information update and other fields, as defined in [6]

- Reserved information bits are added until the size is equal to that of format N2 with Flag=1

- If the format N2 CRC is scrambled by P-RNTI and Flag=1, or if the format N2 CRC is scrambled by SC-RNTI:

- Resource assignment – 3 bits as defined in clause 16.4.1.3 of [3]

- Modulation and coding scheme – 4 bits as defined in clause 16.4.1.5 of [3]

- Repetition number – 4 bits as defined in clause 16.4.1.3 of [3]

- DCI subframe repetition number – 3 bits as defined in clause 16.6 of [3]