**3GPP TSG-RAN4 Meeting #104-e *R4-2214657***

**Electronic meeting, 15th Aug-26th Aug, 2022**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.104** | **CR** | 4960 | **rev** | **-** | **Current version:** | **17.6.0** |  |
|  | | | | | | | | |
| *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 |  | Radio Access Network | **x** | Core Network |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Big CR for 36.104 for Rel-17 NB-IoT BS performance requirements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei,HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NB\_IOTenh4\_LTE\_eMTC6-Perf | | | | |  | ***Date:*** | | | 2022-8-30 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | As indicated by chairman, Huawei should submit the big CR for 36.104 for Rel-17 NB-IOT. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Merge the following draft CR into this big CR:  R4-2213663 Draft CR on NPUSCH format1 demodulation requirements for TS 36.104 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The requirements will be missing | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.5.1.1.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS 36.141 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of R4-2213663>

##### 8.5.1.1.1 Minimum requirements

The throughput shall be equal to or larger than the fraction of maximum throughput stated in table 8.5.1.1.1-1 for the single-subcarrier of 3.75KHz subcarrier spacing, in table 8.5.1.1.1-2 for 15KHz subcarrier spacing at the given SNR for 1Tx, and in table 8.5.1.1.1-3 for multi-subcarrier of 15KHz subcarrier spacing at the given SNR for 1Tx.

Table 8.5.1.1.1-1: Minimum requirements for NPUSCH format 1, 200KHz Channel Bandwidth, 3.75KHz subcarrier spacing, 1Tx

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Subcarrier spacing | Number of allocated subcarriers | Propagation conditions and correlation matrix (Annex B) | FRC (Annex A) | Repetition number | Fraction of maximum throughput | SNR  [dB] |
| 1 | 2 | 3.75KHz | 1 | ETU 1Hz Low | A16-1 | 1 | 70% | -1.9 |
| 16 | 70% | -9.2 |
| 64 | 70% | -12.2 |

Table 8.5.1.1.1-2: Minimum requirements for NPUSCH format 1, 200KHz Channel Bandwidth, 15KHz subcarrier spacing, single subcarrier, 1Tx

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Subcarrier spacing | Number of allocated subcarriers | Propagation conditions and correlation matrix (Annex B) | FRC (Annex A) | Repetition number | Fraction of maximum throughput | SNR  [dB] |
| 1 | 2 | 15KHz | 1 | ETU 1Hz Low | A16-2 | 1 | 70% | -2.1 |
| 16 | 70% | -8.8 |
| 64 | 70% | -12.6 |

Table 8.5.1.1.1-3: Minimum requirements for NPUSCH format 1, 200KHz Channel Bandwidth, 15KHz subcarrier spacing, multiple subcarriers, 1Tx

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Subcarrier spacing | Number of allocated subcarriers | Propagation conditions and correlation matrix (Annex B) | FRC (Annex A) | Repetition number | Fraction of maximum throughput | SNR  [dB] |
| 1 | 2 | 15KHz | 3 | ETU 1Hz Low | A16-3 | 2 | 70% | -3.0 |
| 16 | 70% | -8.1 |
| 64 | 70% | -11.4 |
| 6 | ETU 1Hz Low | A16-4 | 2 | 70% | -0.6 |
| 16 | 70% | -6.8 |
| 64 | 70% | -10.5 |
| 12 | ETU 1Hz Low | A16-5 | 2 | 70% | -0.7 |
| 16 | 70% | -6.4 |
| 64 | 70% | -10.1 |

Table 8.5.1.1.1-4: Minimum requirements for NPUSCH format 1 with two HARQ processes and multiple TBs with interleaved transmission

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Subcarrier spacing | Number of allocated subcarriers | Propagation conditions and correlation matrix (Annex B) | FRC (Annex A) | Repetition number | Fraction of maximum throughput | SNR  [dB] |
| 1 | 2 | 15KHz | 12 | ETU 1Hz Low | A16-6 | 64 | 70% | -13.9 |

Table 8.5.1.1.1-5: Minimum requirements for NPUSCH format 1 with 16QAM, single TB scheduling

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Subcarrier spacing | Number of allocated subcarriers | Propagation conditions and correlation matrix (Annex B) | FRC (Annex A) | Repetition number | Fraction of maximum throughput | SNR  [dB] |
| 1 | 2 | 15KHz | 12 | ETU 1Hz Low | A16-7 | 64 | 70% | [9.1] |

# A.16 Fixed Reference Channels for NB-IoT NPUSCH format 1

## A.16.1 One PRB

Table A.16.1-1: FRC parameters for NB-IoT NPUSCH format 1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Reference channel | A16-1 | A16-2 | A16-3 | A16-4 | A16-5 | A16-6 |
| Subcarrier spacing (kHz) | 3.75 | 15 | 15 | 15 | 15 | 15 |
| Number of allocated subcarriers | 1 | 1 | 3 | 6 | 12 | 12 |
| Diversity | No | No | No | No | No | No |
| Modulation | BPSK | BPSK | QPSK | QPSK | QPSK | QPSK |
| ITBS / IRU | 0 / 1 | 0 / 1 | 3 / 0 | 7 / 0 | 9 / 0 | 5/4 |
| Payload size (bits) | 32 | 32 | 40 | 104 | 136 | 424 |
| Allocated resource unit | 2 | 2 | 1 | 1 | 1 | 5 |
| Code rate (target) | 1/3 | 1/3 | 1/3 | 1/3 | 2/3 | 1/3 |
| Code rate (effective) | 0.29 | 0.29 | 0.22 | 0.44 | 0.56 | 0.34 |
| Transport block CRC (bits) | 24 | 24 | 24 | 24 | 24 | 24 |
| Code block CRC size (bits) | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of code blocks - C | 1 | 1 | 1 | 1 | 1 | 1 |
| Total number of bits per resource unit | 96 | 96 | 288 | 288 | 288 | 1440 |
| Total symbols per resource unit | 96 | 96 | 144 | 144 | 144 | 720 |
| Channel estimation length (ms) Note 1 | 16 | 4 | 4 | 4 | 2 (when repetition = 2)  4 (when repetition > 2) | 4 |
| Note 1: Channel estimation lengths are included in the table for information only. | | | | | | |

Table A.16.1-2: FRC parameters for NB-IoT NPUSCH format 1 with 16QAM

|  |  |
| --- | --- |
| Reference channel | A16-7 |
| Subcarrier spacing (kHz) | 15 |
| Number of allocated subcarriers | 12 |
| Diversity | No |
| Modulation | 16QAM |
| ITBS / IRU | 15 / 0 |
| Payload size (bits) | 280 |
| Allocated resource unit | 1 |
| Code rate (target) | 1/2 |
| Code rate (effective) | 0.528 |
| Transport block CRC (bits) | 24 |
| Code block CRC size (bits) | 0 |
| Number of code blocks - C | 1 |
| Total number of bits per resource unit | 576 |
| Total symbols per resource unit | 144 |
| Channel estimation length (ms) Note 1 | 1 |
| Note 1: Channel estimation lengths are included in the table for information only | |

<End of R4-2213663>