**3GPP TSG-RAN4 Meeting #98-bis-e *R4-2104554***

**Electronic Meeting, 12th – 20th April 2021**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.104** | **CR** | **-** | **rev** | **1** | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *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:*** | Draft CR for TS38.104 Introduction of interlaced PUCCH format 0 and format 1 demodulation requirements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_unlic-Perf | | | | |  | ***Date:*** | | | 2021-03-26 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The requirement discussion of NR-U PUCCH with interlacing structure is completed and corresponding specification should be added. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Requirement introduction of interlaced PUCCH format 0 and 1.   * Adding chapter 8.3.8 for interlaced PUCCH format 0 conducted requirement * Adding chapter 8.3.9 for interlaced PUCCH format 1 conducted requirement * Adding chapter 11.3.1.8 for interlaced PUCCH format 0 radiated requirement * Adding chapter 11.3.1.9 for interlaced PUCCH format 1 radiated requirement | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | There will be no requirement for interlaced PUCCH format 0 and 1 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.3, 11.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR … CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS/TR 38.141-1, 38.141-2 CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

######################### Start of change#1 ############################

### 8.3.8 Performance requirements for interlaced PUCCH format 0

#### 8.3.8.1 General

The ACK missed detection probability is the probability of not detecting an ACK when an ACK was sent.

Table 8.3.8.1-1: Test Parameters

|  |  |
| --- | --- |
| Parameter | Test |
| Number of UCI information bitsNote 1 | 1 |
| Number of symbols | 1 |
| Intra-slot frequency hopping | N/A |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 13 |
| Number of interlaces | 1 |
| Interlace index | 0Note2 |
| Note 1: The UCI information only contain HARQ-ACK and the bit pattern is [0].  Note 2: RBs 0, 10, 20, …, 100 are allocated for 15kHz SCS and RBs 0, 5, 10, …, 50 are allocated for 30kHz SCS. | |

#### 8.3.8.2 Minimum requirements

The ACK missed detection probability shall not exceed 1% at the SNR given in table 8.3.8.2-1

Table 8.3.8.2-1: Minimum requirements for interlaced PUCCH format 0

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number of Tx antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Channel bandwidth (MHz) | SCS (kHz) | SNR (dB) |
| 1 | 2 | TDLA30-10 Low | 20 | 15 | [TBD] |
| 30 | [TBD] |

### 8.3.9 Performance requirements for interlaced PUCCH format 1

#### 8.3.9.1 NACK to ACK requirements

##### 8.3.9.1.1 General

The NACK to ACK detection probability is the probability that an ACK bit is falsely detected when an NACK bit was sent on the particular bit position, where the NACK to ACK detection probability is defined as follows:

**,

where:

- denotes the total number of NACK bits transmitted

- denotes the number of NACK bits decoded as ACK bits at the receiver, i.e. the number of received ACK bits

- NACK bits in the definition do not contain the NACK bits which are mapped from DTX, i.e. NACK bits received when DTX is sent should not be considered.

~~Random codeword selection is assumed~~.

Table 8.3.9.1.1-1: Test Parameters

|  |  |
| --- | --- |
| Parameter | Test |
| Number of information bitsNote1 | 2 |
| Number of symbols | 14 |
| Intra-slot frequency hopping | N/A |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |
| Number of interlace | 1 |
| Interlace index | 0Note2 |
| Note 1: The UCI information only contain HARQ-ACK and the bit pattern is [0 1].  Note 2: RBs 0, 10, 20, …, 100 are allocated for 15kHz SCS and RBs 0, 5, 10, …, 50 are allocated for 30kHz SCS. | |

##### 8.3.9.1.2 Minimum requirements

The NACK to ACK probability shall not exceed 0.1% at the SNR given in table 8.3.9.1.2-1.

Table 8.3.9.1.2-1: Minimum requirements for interlaced PUCCH format 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number of Tx antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Channel bandwidth (MHz) | SCS (kHz) | SNR (dB) |
| 1 | 2 | TDLA30-10 Low | 20 | 15 | [TBD] |
| 30 | [TBD] |

#### 8.3.9.2 ACK missed detection requirements

##### 8.3.9.2.1 General

The ACK missed detection probability is the probability of not detecting an ACK when an ACK was sent. The test parameters in table 8.3.9.1.1-1 are configured.

##### 8.3.9.2.2 Minimum requirements

The ACK missed detection probability shall not exceed 1% at the SNR given in table 8.3.9.2.2-1.

Table 8.3.9.2.2-1: Minimum requirements for interlaced PUCCH format 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Number of Tx antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Channel bandwidth (MHz) | SCS (kHz) | SNR (dB) |
| 1 | 2 | TDLA30-10 Low | 20 | 15 | [TBD] |
| 30 | [TBD] |

######################### End of change#1 ############################

######################### Start of change#2 ############################

#### 11.3.1.8 Performance requirements for interlaced PUCCH format 0

Apply the requirements defined in clause 8.3.8.

#### 11.3.1.9 Performance requirements for interlaced PUCCH format 1

Apply the requirements defined in sub-clause 8.3.9.

######################### End of change#2 ############################