**3GPP TSG-RAN WG4 Meeting #95-e *R4-2009055***

**Electronic Meeting, 25 May – 5 June, 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** | **0206** | **rev** | **1** | **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 |  | Radio Access Network | **X** | Core Network |  |

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|  |
| ***Title:***  | Draft CR to 38.104 on Removal of brackets and TBD (Rel-15) |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core |  | ***Date:*** | 2020-06-03 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *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)* |
|  |  |
| ***Reason for change:*** | 3GPP specifications will be included as one part of the ITU-R submission of NR. For this reason, there can be no “ffs”, brackets or TBDs remaining in the specifications. |
|  |  |
| ***Summary of change:*** | Remaining “ffs”, brackets and TBDs are removed. |
|  |  |
| ***Consequences if not approved:*** | Brackets and TBDs would remain, making the specifications for ITU-R submission ambiguous. |
|  |  |
| ***Clauses affected:*** | 4.8, 6.7.2.2, 6.7.3.3, 8.2.3.2, 11.2.2.3.2, 11.3.2.4, G.2.3.1.2 |
|  |  |
|  | **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 ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

## 4.8 Requirements for BS capable of multi-band operation

For *multi-band connector* or *multi-band* *RIB*, the RF requirements in clause 6, 7, 9 and 10 apply separately to each supported *operating band* unless otherwise stated. For some requirements, it is explicitly stated that specific additions or exclusions to the requirement apply at *multi-band connector(s)*, and *multi-band RIB(s)* as detailed in the requirement clause. For *BS* capable of multi-band operation, various structures in terms of combinations of different transmitter and receiver implementations (multi-band or single band) with mapping of transceivers to one or more *antenna* *connectors* for *BS type 1-C* or *TAB connectors* for *BS type 1-H* in different ways are possible. For *multi-band connector(s)* the exclusions or provisions for multi-band apply. For *single-band connector(s)*, the following applies:

- Single-band transmitter spurious emissions, *operating band* unwanted emissions, ACLR, transmitter intermodulation and receiver spurious emissions requirements apply to this *connector* that is mapped to single-band.

- If the BS is configured for single-band operation, single-band requirements shall apply to this *connector* configured for single-band operation and no exclusions or provisions for multi-band capable BS are applicable. Single-band requirements are tested separately at the *connector* configured for single-band operation, with all other *antenna connectors* terminated.

A *BS type 1-H* may be capable of supporting operation in multiple *operating bands* with one of the following implementations of *TAB connectors* in the *transceiver array boundary*:

- All *TAB connectors* are *single-band connectors*.

- Different sets of *single-band connectors* support different *operating bands*, but each *TAB connector* supports only operation in one single *operating band*.

- Sets of *single-band connectors* support operation in multiple *operating bands* with some *single-band connectors* supporting more than one *operating band*.

- All *TAB connectors* are multi-band *connectors*.

- A combination of single-band sets and multi-band sets of *TAB connectors* provides support of the type *BS type 1-H* capability of operation in multiple *operating bands*.

Unless otherwise stated all requirements specified for an *operating band* apply only to the set of *TAB connectors* supporting that *operating band*.

In the case of an *operating band* being supported only by *single-band connectors* in a *TAB connector TX min cell group* or a *TAB connector RX min cell group*, *single-band requirements* apply to that set of *TAB connectors*.

In the case of an *operating band* being supported only by *multi-band connector*s supporting the same *operating band* combination in a *TAB connector TX min cell group* or a *TAB connector RX min cell group*, *multi-band requirements* apply to that set of *TAB connectors*.

The case of an *operating band* being supported by both *multi-band connectors* and *single-band connectors* in a *TAB connector TX min cell group* or a *TAB connector RX min cell group* is not covered by the present release of this specification.

The case of an *operating band* being supported by *multi-band connectors* which are not all supporting the same *operating band* combination in a *TAB connector TX min cell group* or a *TAB connector RX min cell group* is not covered by the present release of this specification.

*BS type 1-O* may be capable of supporting operation in multiple *operating bands* with one of the following implementations at the *radiated interface boundary*:

- All RIBsare *single-band RIBs*.

- All RIBsare *multi-band* *RIBs*.

- A combination of single-band *RIBs* and *multi-band RIBs* provides support of the *BS type 1-O* capability of operation in multiple *operating bands*.

For *multi-band connectors* and *multi-band RIBs* supporting the bands for TDD, the RF requirements in the present specification assume no simultaneous uplink and downlink occur between the bands.

The RF requirements for *multi-band connectors* and *multi-band RIBs* supporting bands for both FDD and TDD are not covered by the present release of this specification.

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*End of change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next changed section\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 6.7.2 Minimum requirements for *BS type 1-C*

#### 6.7.2.1 Co-location minimum requirements

For *BS type 1-C*, the wanted signal and interfering signal centre frequency is specified in table 6.7.2.1‑1, where interfering signal level is *Rated total output power* (Prated,t,AC) at *antenna connector* in the *operating band* – 30 dB.

The requirement is applicable outside the *Base Station RF Bandwidth* or *Radio Bandwidth*. The interfering signal offset is defined relative to the *Base Station RF Bandwidth* *edges* or *Radio Bandwidth* edges.

For a BS operating in *non-contiguous spectrum*, the requirement is also applicable inside a *sub-block gap* for interfering signal offsets where the interfering signal falls completely within the *sub-block gap*. The interfering signal offset is defined relative to the *sub-block* edges.

For a *multi-band connector*, the requirement shall apply relative to the *Base Station RF Bandwidth* edges of each supported *operating band*. In case the *Inter RF Bandwidth gap* is less than 3\*BWChannel (where BWChannel is the minimal *BS channel bandwidth* of the band), the requirement in the gap shall apply only for interfering signal offsets where the interfering signal falls completely within the *Inter RF Bandwidth gap*.

The transmitter intermodulation level shall not exceed the unwanted emission limits in clauses 6.6.3, 6.6.4 and 6.6.5 in the presence of an NR interfering signal according to table 6.7.2.1-1.

Table 6.7.2.1-1: Interfering and wanted signals for the co-location transmitter intermodulation requirement

| Parameter | Value |
| --- | --- |
| Wanted signal type | NR single carrier, or multi-carrier, or multiple intra-band contiguously or non-contiguously aggregated carriers |
| Interfering signal type | NR signal, the minimum *BS channel bandwidth* (BWChannel) with 15 kHz SCS of the band defined in clause 5.3.5.  |
| Interfering signal level | *Rated total output power* (Prated,t,AC) in the *operating band* – 30 dB |
| Interfering signal centre frequency offset from the lower/upper edge of the wanted signal or edge of *sub-block* inside a *sub-block gap* | , for n=1, 2 and 3  |
| NOTE 1: Interfering signal positions that are partially or completely outside of any downlink *operating band* of the base station are excluded from the requirement, unless the interfering signal positions fall within the frequency range of adjacent downlink *operating bands* in the same geographical area. In case that none of the interfering signal positions fall completely within the frequency range of the downlink *operating band*, TS 38.141-1 [5] provides further guidance regarding appropriate test requirements. NOTE 2: In Japan, NOTE 1 is not applied in Band n77, n78, n79. |

#### 6.7.2.2 Additional requirements

### No additional requirements.6.7.3 Minimum requirements for *BS type 1-H*

#### 6.7.3.1 Co-location minimum requirements

The transmitter intermodulation level shall not exceed the unwanted emission limits in clauses 6.6.3, 6.6.4 and 6.6.5 in the presence of an NR interfering signal according to table 6.7.3.1-1

The requirement is applicable outside the *Base Station RF Bandwidth edges*. The interfering signal offset is defined relative to the *Base Station RF Bandwidth* *edges* or *Radio Bandwidth* edges.

For *TAB connectors* supporting operation in *non-contiguous spectrum*, the requirement is also applicable inside a *sub-block gap* for interfering signal offsets where the interfering signal falls completely within the *sub-block gap*. The interfering signal offset is defined relative to the *sub-block* edges.

For *multi-band connector*, the requirement shall apply relative to the *Base Station RF Bandwidth* *edges* of each *operating band*. In case the *inter RF Bandwidth gap* is less than 3\*BWChannel (where BWChannel is the minimal *BS channel bandwidth* of the band), the requirement in the gap shall apply only for interfering signal offsets where the interfering signal falls completely within the *inter RF Bandwidth gap*.

Table 6.7.3.1-1: Interfering and wanted signals for the co-location transmitter intermodulation requirement

| Parameter | Value |
| --- | --- |
| Wanted signal type | NR single carrier, or multi-carrier, or multiple intra-band contiguously or non-contiguously aggregated carriers |
| Interfering signal type | NR signal, the minimum *BS channel bandwidth* (BWChannel) with 15 kHz SCS of the band defined in clause 5.3.5. |
| Interfering signal level | *Rated total output power* per *TAB connector* (Prated,t,TABC) in the *operating band* – 30 dB |
| Interfering signal centre frequency offset from the lower/upper edge of the wanted signal or edge of *sub-block* inside a gap | , for n=1, 2 and 3 |
| NOTE 1: Interfering signal positions that are partially or completely outside of any downlink *operating band* of the *TAB connector* are excluded from the requirement, unless the interfering signal positions fall within the frequency range of adjacent downlink *operating bands* in the same geographical area. In case that none of the interfering signal positions fall completely within the frequency range of the downlink *operating band*, TS 38.141-1 [5] provides further guidance regarding appropriate test requirements. NOTE 2: In Japan, NOTE 1 is not applied in Band n77, n78, n79. |

#### 6.7.3.2 Intra-system minimum requirements

The transmitter intermodulation level shall not exceed the unwanted emission limits in clauses 6.6.3 and 6.6.4 in the presence of an NR interfering signal according to table 6.7.3.2-1.

Table 6.7.3.2-1: Interfering and wanted signals for
intra-system transmitter intermodulation requirement

| Parameter | Value |
| --- | --- |
| Wanted signal type | NR signal |
| Interfering signal type | NR signal of the same *BS channel bandwidth* and SCS as the wanted signal (Note 1). |
| Interfering signal level | Power level declared by the base station manufacturer (Note 2). |
| Frequency offset between interfering signal and wanted signal | 0 MHz |
| NOTE 1: The interfering signal shall be incoherent with the wanted signal.NOTE 2: The declared interfering signal power level at each *TAB connector* is the sum of the co-channel leakage power coupled via the combined RDN and Antenna Array from all the other *TAB connectors*, but does not comprise power radiated from the Antenna Array and reflected back from the environment. The power at each of the interfering *TAB connectors* is Prated,c,TABC. |

#### 6.7.3.3 Additional requirements

No additional requirements.\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*End of change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next changed section\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#### 8.2.3.2 Minimum requirements

The CSI part 1 block error probability shall not exceed 0.1% at the SNR in table 8.2.3.2-1 and table 8.2.3.2-2.The CSI part 2 block error probability shall not exceed 1% at the SNR given in table 8.2.3.2-3 and table 8.2.3.2-4.

Table 8.2.3.2-1: Minimum requirements for UCI multiplexed on PUSCH, Type A, CSI part 1, 10 MHz Channel Bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | UCI bits(CSI part 1, CSI part 2) | Additional DM-RS position | FRC(Annex A) | SNR(dB) |
| 1 | 2 | Normal | TDLC300-100 Low | 7(5,2) | pos1 | G-FR1-A4-11 | 5.4 |
| 2 | Normal | TDLC300-100 Low | 40(20,20) | pos1 | G-FR1-A4-11 | 4.3 |

Table 8.2.3.2-2: Minimum requirements for UCI multiplexed on PUSCH, Type B, CSI part 1, 10 MHz Channel Bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | UCI bits(CSI part 1, CSI part2) | Additional DM-RS position | FRC(Annex A) | SNR(dB) |
| 1 | 2 | Normal | TDLC300-100 Low | 7(5,2) | pos1 | G-FR1-A4-11 | 5.8 |
| 2 | Normal | TDLC300-100 Low | 40(20,20) | pos1 | G-FR1-A4-11 | 4.1 |

Table 8.2.3.2-3: Minimum requirements for UCI multiplexed on PUSCH, Type A, CSI part 2, 10 MHz Channel Bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | UCI bits(CSI part 1, CSI part2) | Additional DM-RS position | FRC(Annex A) | SNR(dB) |
| 1 | 2 | Normal | TDLC300-100 Low | 7(5,2) | pos1 | G-FR1-A4-11 | -0.2 |
| 2 | Normal | TDLC300-100 Low | 40(20,20) | pos1 | G-FR1-A4-11 | 2.4 |

Table 8.2.3.2-4: Minimum requirements for UCI multiplexed on PUSCH, Type B, CSI part 2, 10 MHz Channel Bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | UCI bits(CSI part 1, CSI part2) | Additional DM-RS position | FRC(Annex A) | SNR(dB) |
| 1 | 2 | Normal | TDLC300-100 Low | 7(5,2) | pos1 | G-FR1-A4-11 | 0.3 |
| 2 | Normal | TDLC300-100 Low | 40(20,20) | pos1 | G-FR1-A4-11 | 2.6 |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*End of change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next changed section\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

##### 11.2.2.3.2 Minimum requirements

The CSI part 1 block error probability shall not exceed 0.1% at the SNR given in table 11.2.2.3.2-1 and table 11.2.2.3.2-2. The CSI part 2 block error probability shall not exceed 1% at the SNR given in table 11.2.2.3.2-3 and table 11.2.2.3.2-4.

Table 11.2.2.3.2-1: Minimum requirements for UCI multiplexed on PUSCH, Type B, With PT-RS, CSI part 1, 50 MHz Channel Bandwidth, 120 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | UCI bits(CSI part 1, CSI part 2) | Additional DM-RS position | FRC(Annex A) | SNR(dB) |
| 1 | 2 | Normal | TDLA30-300 Low | 7(5,2) | pos0 | G-FR2-A4-3 | 7.2 |
| 2 | Normal | TDLA30-300 Low | 40(20,20) | pos0 | G-FR2-A4-3 | 5.8 |
| 2 | Normal | TDLA30-300 Low | 7(5,2) | pos1 | G-FR2-A4-13 | 7.8 |
| 2 | Normal | TDLA30-300 Low | 40(20,20) | pos1 | G-FR2-A4-13 | 5.9 |

Table 11.2.2.3.2-2: Minimum requirements for UCI multiplexed on PUSCH, Type B, Without PTRS, CSI part 1, 50 MHz Channel Bandwidth, 120 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | UCI bits(CSI part 1, CSI part 2) | Additional DM-RS position | FRC(Annex A) | SNR(dB) |
| 1 | 2 | Normal | TDLA30-300 LOW | 7(5,2) | pos0 | G-FR2-A4-3 | 7.1 |
| 2 | Normal | TDLA30-300 LOW | 40(20,20) | pos0 | G-FR2-A4-3 | 5.8 |
| 2 | Normal | TDLA30-300 LOW | 7(5,2) | pos1 | G-FR2-A4-13 | 7.3 |
| 2 | Normal | TDLA30-300 LOW | 40(20,20) | pos1 | G-FR2-A4-13 | 5.5 |

Table 11.2.2.3.2-3: Minimum requirements for UCI multiplexed on PUSCH, Type B, With PTRS, CSI part 2, 50 MHz Channel Bandwidth, 120 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | UCI bits(CSI part 1, CSI part 2) | Additional DM-RS position | FRC(Annex A) | SNR(dB) |
| 1 | 2 | Normal | TDLA30-300 LOW | 7(5,2) | pos0 | G-FR2-A4-3 | 1.1 |
| 2 | Normal | TDLA30-300 LOW | 40(20,20) | pos0 | G-FR2-A4-3 | 4.0 |
| 2 | Normal | TDLA30-300 LOW | 7(5,2) | pos1 | G-FR2-A4-13 | 1.3 |
| 2 | Normal | TDLA30-300 LOW | 40(20,20) | pos1 | G-FR2-A4-13 | 4.0 |

Table 11.2.2.3.2-4: Minimum requirements for UCI multiplexed on PUSCH, Type B, Without PTRS, CSI part 2, 50 MHz Channel Bandwidth, 120 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | UCI bits(CSI part 1, CSI part 2) | Additional DM-RS position | FRC(Annex A) | SNR(dB) |
| 1 | 2 | Normal | TDLA30-300 LOW | 7(5,2) | pos0 | G-FR2-A4-3 | 1.1 |
| 2 | Normal | TDLA30-300 LOW | 40(20,20) | pos0 | G-FR2-A4-3 | 3.9 |
| 2 | Normal | TDLA30-300 LOW | 7(5,2) | pos1 | G-FR2-A4-13 | 1.2 |
| 2 | Normal | TDLA30-300 LOW | 40(20,20) | pos1 | G-FR2-A4-13 | 3.7 |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*End of change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next changed section\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#### 11.3.2.4 Performance requirements for PUCCH format 2

##### 11.3.2.4.1 ACK missed detection requirements

###### 11.3.2.4.1.1 General

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

The ACK missed detection requirement only applies to the PUCCH format 2 with 4 UCI bits.

Table 11.3.2.4.1.1-1: Test Parameters

|  |  |
| --- | --- |
| Parameter | Value  |
| Modulation order | QSPK |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | N/A |
| First PRB after frequency hopping | The largest PRB index – (Number of PRBs – 1) |
| Number of PRBs | 4 |
| Number of symbols | 1 |
| The number of UCI information bits | 4 |
| First symbol | 13 |
| DM-RS sequence generation | *NID*0=0 |

The transient period as specified in TS 38.101-1 [17] and TS 38.101-2 [18] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC center, i.e. intra-slot frequency hopping is enabled.

###### 11.3.2.4.1.2 Minimum requirements

The ACK missed detection probability shall not exceed 1% at the SNR given in table 11.3.2.4.1.2-1 and table 11.3.2.4.1.2-2 for 4UCI bits.

Table 11.3.2.4.1.2-1: Minimum requirements for PUCCH format 2 with 60 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches  | Cyclic Prefix | Propagation conditions and correlation matrix (Annex G) | Channel bandwidth / SNR (dB) |
| 50 MHz | 100 MHz |
| 1 | 2 | Normal | TDLA30-300 Low | 6.7 | 7.2 |

Table 11.3.2.4.1.2-2: Minimum requirements for PUCCH format 2 with 120 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic Prefix | Propagation conditions and correlation matrix (Annex G) | Channel bandwidth / SNR (dB) |
| 50 MHz | 100 MHz | 200 MHz |
| 1 | 2 | Normal | TDLA30-300 Low | 6.6 | 6.3 | 6.6 |

##### 11.3.2.4.2 UCI BLER performance requirements

###### 11.3.2.4.2.1 General

The UCI block error probability (BLER) is defined as the probability of incorrectly decoding the UCI information when the UCI information is sent. The UCI information does not contain CSI part 2.

The transient period as specified in TS 38.101-1 [17] and TS 38.101-2 [18] clause 6.3.3.1 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC centre, i.e. intra-slot frequency hopping is enabled.

The UCI performance only applies to the PUCCH format 2 with 22 UCI bits.

Table 11.3.2.4.2.1-1: Test Parameters

|  |  |
| --- | --- |
| Parameter | Value |
| Modulation order | QSPK |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (Number of PRBs-1) |
| Number of PRBs | 9 |
| Number of symbols | 2 |
| The number of UCI information bits | 22 |
| First symbol | 12 |
| DM-RS sequence generation | *NID*0=0 |

###### 11.3.2.4.2.2 Minimum requirements

The UCI block error probability shall not exceed 1% at the SNR given in table 11.3.2.4.2.2-1 and table 11.3.2.4.2.2-2 for 22 UCI bits.

Table 11.3.2.4.2.2-1: Minimum requirements for PUCCH format 2 with 60 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic Prefix | Propagation conditions and correlation matrix (Annex G) | Channel bandwidth / SNR (dB) |
| 50 MHz | 100 MHz |
| 1 | 2 | Normal | TDLA30-300 Low | 2.6 | 1.1 |

Table 11.3.2.4.2.2-2: Minimum requirements for PUCCH format 2 with 120 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches  | Cyclic Prefix | Propagation conditions and correlation matrix (Annex G) | Channel bandwidth / SNR (dB) |
| 50 MHz | 100 MHz | 200 MHz |
| 1 | 2 | Normal | TDLA30-300 Low | 1.2 | 1.2 | 1.1 |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*End of change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next changed section\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

#### G.2.3.1.2 MIMO Correlation Matrices at High, Medium and Low Level

The  and  for different correlation types are given in Table G.2.3.1.2-1.

Table G.2.3.1.2-1: Correlation for High Medium and Low Level

|  |  |  |
| --- | --- | --- |
| Low correlation | Medium Correlation | High Correlation |
| α | β | α | β | α | β |
| 0 | 0 | 0.9  | 0.3  | 0.9  | 0.9  |

The correlation matrices for high, medium and low correlation are defined in Table G.2.3.1.2-2, G.2.3.1.2-3 and G.2.3.1.2-4 as below.

The values in Table G.2.3.1.2-2 have been adjusted for the 2x4 and 4x4 high correlation cases to insure the correlation matrix is positive semi-definite after round-off to 4-digit precision. This is done using the equation:

 

Where the value “a” is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 2x4 high correlation case, a=0.00010. For the 4x4 high correlation case, a=0.00012.

The same method is used to adjust the 4x4 medium correlation matrix in Table G.2.3.1.2-3 to insure the correlation matrix is positive semi-definite after round-off to 4-digit precision with a =0.00012.

Table G.2.3.1.2-2: MIMO correlation matrices for high correlation

|  |  |
| --- | --- |
| 1x2 case |  |
| 2x2 case |  |
| 2x4 case |  |
| 4x4 case |  |

Table G.2.3.1.2-3: MIMO correlation matrices for medium correlation

|  |  |
| --- | --- |
| 1x2 case | [N/A] |
| 2x2 case |  |
| 2x4 case |  |
| 4x4 case |  |