**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* | | | | | | | | |
| **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 |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** |  | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** | NR\_NTN\_enh-Perf | | | | |  | ***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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduce NTN radiated performance requirements for PUSCH. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | For introducing NTN radiated performance requirements for PUSCH, update clause 11. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | There will be inconsist between specification and RAN4 agreements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 11 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.181 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Change the original clause 11.2.1 to clause 11.2.1.1.  Change the original clause 11.2.2 to clause 11.2.1.2.  Change the original clause 11.2.3 to clause 11.2.1.3.  Change the original clause 11.2.4 to clause 11.2.1.4.  New clause: 11.2.1, 11.2.2 | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*<START OF THE CHANGE 1>*

11 Radiated performance requirements

11.1 General

11.1.1 Scope and definitions

Radiated performance requirements specify the ability of the *SAN type 1-O* or *SAN type 2-O* to correctly transmit and receive radiated signals in various conditions and configurations. Radiated performance requirements are specified at the RIB.

Radiated performance requirements for the SAN are specified for the fixed reference channels defined inannex A and for the propagation conditions defined in Recommendation ITU-R P.618 (*Propagation data and prediction methods required for the design of Earth-space telecommunication systems*). The requirements only apply to those FRCs that are supported by the SAN.

The radiated performance requirements for *SAN type 1-O* and for *SAN type 2-O* are limited to two OTA *demodulation branches* as described in clause 11.1.2. Conformance requirements can only be tested for 1 or 2 *demodulation branches* depending on the number of polarizations supported by the SAN, with the required SNR applied separately per polarization.

Unless stated otherwise, radiated performance requirements apply for a single carrier only. Radiated performance requirements for a SAN supporting carrier aggregation are defined in terms of single carrier requirements.

For *SAN type 1-O* in FDD operation the requirements in clause 8 shall be met with the transmitter units associated with the RIB in the *operating* *band* turned ON.

NOTE 1: *SAN type 1-O* in normal operating conditions in FDD operation is configured to transmit and receive at the same time. The transmitter unit(s) associated with the RIB may be OFF for some of the tests as specified in TS 38.181[3].

In tests performed with signal generators a synchronization signal may be provided from the SAN to the signal generator, to enable correct timing of the wanted signal.

Whenever the "RX antennas" term is used for the radiated performance requirements description, it shall refer to the *demodulation branches* (i.e. not physical antennas of the antenna array).

The SNR used in this clause is specified based on a single carrier and defined as:

SNR = S / N

Where:

*S* is the total signal power in a slot on a RIB.

*N* is the noise density integrated in a bandwidth corresponding to the *transmission bandwidth* over the duration where signal energy exists on a RIB.

11.1.2 OTA demodulation branches

Radiated performance requirements are only specified for up to 2 *demodulation branches*.

If the *SAN type 1-O* or the *SAN type 2-O* uses polarization diversity and has the ability to maintain isolation between the signals for each of the *demodulation branches*, then radiated performance requirements can be tested for up to two *demodulation branches* (i.e. 1RX or 2RX test setups). When tested for two *demodulation branches*, each demodulation branch maps to one polarization.

If the *SAN type 1-O* or the *SAN type 2-O* does not use polarization diversity then radiated performance requirements can only be tested for a single *demodulation branch* (i.e. 1RX test setup).

11.2 Performance requirements for PUSCH

### 11.2.1 Requirements for *SAN type 1-O*

#### 11.2.1.1 Requirements for PUSCH with transform precoding disabled

Apply the requirements defined in clause 8.2.1.

#### 11.2.1.2 Requirements for PUSCH with transform precoding enabled

Apply the requirements defined in clause 8.2.2.

#### 11.2.1.3 Requirements for UL timing adjustment

Apply the requirements defined in clause 8.2.3.

#### 11.2.1.4 Requirements for PUSCH repetition Type A

Apply the requirements defined in clause 8.2.4.

### 11.2.2 Requirements for *SAN type 2-O*

11.2.2.1 Requirements for PUSCH with transform precoding disabled

11.2.2.1.1 General

The performance requirement of PUSCH is determined by a minimum required throughput for a given SNR. The required throughput is expressed as a fraction of maximum throughput for the FRCs listed in annex A. The performance requirements assume HARQ retransmissions.

**Table 11.2.2.1.1-1: Test parameters for testing PUSCH**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Disabled |
| HARQ | Maximum number of HARQ transmissions | 4 |
| RV sequence | 0, 2, 3, 1 |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| Additional DM-RS symbols | Pos1 |
| Number of DM-RS CDM group(s) without data | 2 |
| Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB |
| DM-RS port(s) | {0} |
| DM-RS sequence generation | NID=0, nSCID =0 |
| Time domain  resource | PUSCH mapping type | B |
| Start symbol index | 0 |
| Allocation length | 10 |
| Frequency domain  resource | RB assignment | Full applicable test bandwidth |
| Frequency hopping | Disabled |
| Code block group based PUSCH transmission | | Disabled |
| PT-RS  configuration | Frequency density (*KPT-RS*) | Disabled |
| Time density (*LPT-RS*) | Disabled |

11.2.2.1.2 Minimum requirements

The throughput shall be equal to or larger than the fraction of maximum throughput stated in the tables 11.2.2.1.2-1 at the given SNR for 1Tx.

**Table 11.2.2.1.2-1: Minimum requirements for PUSCH with 70% of maximum throughput, Type B, 50 MHz channel bandwidth, 120 kHz SCS in FR2-NTN**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Cyclic prefix** | **Propagation conditions and correlation matrix (Annex D)** | **Fraction of maximum throughput** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 1 | Normal | NTN-TDLC5-1200 Low | 70 % | G-FR2-NTN-A5-1 | pos1 | [0.0] |
| Normal | NTN-TDLC5-1200 Low | 70 % | G-FR2-NTN-A6-1 | pos1 | [8.9] |
| 2 | Normal | NTN-TDLC5-1200 Low | 70 % | G-FR2-NTN-A5-1 | pos1 | [-3.4] |
| Normal | NTN-TDLC5-1200 Low | 70% | G-FR2-NTN-A6-1 | pos1 | [5.5] |

11.2.2.2 Requirements for PUSCH with transform precoding enabled

11.2.2.2.1 General

The performance requirement of PUSCH is determined by a minimum required throughput for a given SNR. The required throughput is expressed as a fraction of maximum throughput for the FRCs listed in Annex A. The performance requirements assume HARQ retransmissions.

**Table 11.2.2.2.1-1: Test parameters for testing PUSCH**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Enabled |
| HARQ | Maximum number of HARQ transmissions | 4 |
| RV sequence | 0, 2, 3, 1 |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| Additional DM-RS symbols | Pos1 |
| Number of DM-RS CDM group(s) without data | 2 |
| Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB |
| DM-RS port(s) | {0} |
| DM-RS sequence generation | NID=0, nSCID =0 |
| Time domain resource | PUSCH mapping type | B |
| Start symbol index | 0 |
| Allocation length | 10 |
| Frequency domain resource | RB assignment | 30 PRBs in the middle of the test bandwidth |
| Frequency hopping | Disabled |
| Code block group based PUSCH transmission | | Disabled |
| PT-RS configuration | Frequency density (*KPT-RS*) | Disabled |
| Time density (*LPT-RS*) | Disabled |

11.2.2.2.2 Minimum requirements

The throughput shall be equal to or larger than the fraction of maximum throughput stated in the tables 11.2.2.2.2-1 at the given SNR for 1Tx.

**Table 11.2.2.2.2-1: Minimum requirements for PUSCH with 70% of maximum throughput, Type B, 50 MHz Channel Bandwidth, 120 kHz SCS in FR2-NTN**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Cyclic prefix** | **Propagation conditions and correlation matrix (Annex D)** | **Fraction of maximum throughput** | **FRC (annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 1 | Normal | NTN-TDLC5-1200 Low | 70 % | G-FR2-NTN-A5-2 | pos1 | [0.1] |
| 2 | Normal | NTN-TDLC5-1200 Low | 70 % | G-FR2-NTN-A5-2 | pos1 | [-3.2] |

11.2.2.3 Requirements for PUSCH repetition Type A

11.2.2.3.1 General

The performance requirement of PUSCH is determined by a maximum block error rate (BLER) for a given SNR. The BLER is defined as the probability of incorrectly decoding the PUSCH information when the PUSCH information is sent. The performance requirements assume HARQ retransmissions.

**Table 11.2.2.3.1-1: Test parameters for testing PUSCH repetition Type A**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Disabled |
| HARQ | Maximum number of HARQ transmissions | 4 |
| RV sequence | 0, 3, 0, 3 [Note 1] |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| Additional DM-RS symbols | Pos1 |
| Number of DM-RS CDM group(s) without data | 2 |
| Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB |
| DM-RS port(s) | 0 |
| DM-RS sequence generation | NID=0, nSCID =0 |
| Time domain resource | PUSCH mapping type | B |
| Start symbol index | 0 |
| Allocation length | 10 |
| PUSCH aggregation factor | n2 |
| Frequency domain resource | RB assignment | Full applicable test bandwidth |
| Frequency hopping | Disabled |
| Code block group based PUSCH transmission | | Disabled |
| PT-RS configuration | Frequency density (*KPT-RS*) | Disabled |
| Time density (*LPT-RS*) | Disabled |
| NOTE 1: The effective RV sequence is {0,2,3,1} with slot aggregation | | |

11.2.2.3.2 Minimum requirements

The BLER shall be equal to or smaller than the required target BLER for the FRCs stated in tables 11.2.2.3.2-1 at the given SNR for 1Tx.

**Table 11.2.2.3.2-1: Minimum requirements for PUSCH, TypeB, 50 MHz channel bandwidth, 120 kHz SCS in FR2-NTN**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of demodulation branches** | **Cyclic prefix** | **Propagation conditions and correlation matrix (Annex D)** | **Target BLER** | **FRC**  **(Annex A)** | **Additional**  **DM-RS position** | **SNR**  **(dB)** |
| 1 | 1 | Normal | NTN-TDLC5-1200 Low | 1% (Note1) | G-FR2-NTN-A3A-3 | Pos1 | TBD |
| 2 | Normal | NTN-TDLC5-1200 Low | 1% (Note1) | G-FR2-NTN-A3A-3 | Pos1 | TBD |
| NOTE 1: BLER is defined as residual BLER, i.e. ratio of incorrectly received transport blocks/sent transport blocks, independently of the number of HARQ transmission(s) for each transport block | | | | | | | |

*<END OF THE CHANGE 1>*