**3GPP TSG-RAN WG4 Meeting #97-e *R4-2017551***

**Electronic Meeting, 2 November – 13 November 2020**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.141-1** | **CR** | **0153** | **rev** | **1** | **Current version:** | **16.5.0** |  |
|  | | | | | | | | |
| *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:*** | CR for TS 38.141-1: Updates of NR PUSCH performance requirements for Multi-path fading channel models under high Doppler values and applicability rules. | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | NTT DOCOMO, INC | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_HST-Perf | | | | |  | ***Date:*** | | | 2020-10-23 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | This CR updates performance requirements of PUSCH for Multi-path fading channel models under high Doppler values and applicability rules for PUSCH for HST. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Add new section 8.1.2.4 for applicability rules for PUSCH for HST. * The texts of clause 8.2.4.1/8.2.4.3/8.2.4.4 have been revised. * Add new tables 8.2.4.5-9 and 8.2.4.5-10 for PUSCH performance requirements under high Doppler values (5MHz CBW for 15kHz SCS and 10 MHz CBW for 30kHz SCS) respectively. * Add TDLC300-600 and TDLC300-1200 to the table G 2.2-1. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Performances of PUSCH for multi-path fading channel models under high Doppler values and applicability rule for PUSCH for HST are not ensured. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.1.2.4, 8.2.4.1, 8.2.4.3, 8.2.4.4, 8.2.4.5, G 2.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS 38.104 | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.141-2 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revised from R4-2014822 | | | | | | | | |

**--------------Start of text proposal-------------**

### 8.1.2 Applicability rule

#### 8.1.2.0 General

Unless otherwise stated, for a BS supporting more than 8 antenna connectors (for *BS type 1-C*) or *TAB connectors* (for *BS type 1-H*) (see D.37 in table 4.6-1), the performance requirement tests for 8 RX antennas shall apply, and the specific connectors used for testing are based on manufacturer declaration.

Unless otherwise stated, for a BS supporting different numbers of antenna connectors (for *BS type 1-C*) or *TAB connectors* (for *BS type 1-H*) (see D.37 in table 4.6-1), the tests with low MIMO correlation level shall apply only for the lowest and highest numbers of supported connectors, and the specific connectors used for testing are based on manufacturer declaration.

#### 8.1.2.1 Applicability of PUSCH performance requirements

##### 8.1.2.1.1 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, PUSCH requirement tests shall apply only for each subcarrier spacing declared to be supported (see D.14 in table 4.6-1).

Unless otherwise stated, PUSCH requirement tests with 30% of maximum throughput shall apply only for the lowest subcarrier spacing declared to be supported (see D.14 in table 4.6-1) for each frequency range.

##### 8.1.2.1.2 Applicability of requirements for different channel bandwidths

For each subcarrier spacing declared to be supported, the tests for a specific channel bandwidth shall apply only if the BS supports it (see D.14 in table 4.6-1).

Unless otherwise stated, for each subcarrier spacing declared to be supported, the tests shall be done only for the widest supported channel bandwidth. If performance requirement is not specified for this widest supported channel bandwidth, the tests shall be done by using performance requirement for the closest channel bandwidth lower than this widest supported bandwidth; the tested PRBs shall then be centered in this widest supported channel bandwidth.

##### 8.1.2.1.3 Applicability of requirements for different configurations

Unless otherwise stated, PUSCH requirement tests shall apply only for the mapping type declared to be supported (see D.100 in table 4.6-1). If both mapping type A and type B are declared to be supported, the tests shall be done for either type A or type B; the same chosen mapping type shall then be used for all tests.

8.1.2.1.4 Applicability of requirements for uplink carrier aggregation

The tests for uplink carrier aggregation shall be carried out according to the declaration (see D.107 in table 4.6-1).

Unless otherwise stated, the tests for uplink carrier aggregation shall apply only for PUSCH with transform precoding disabled, and shall be conducted on per component carrier basis.

8.1.2.1.5 Applicability of requirements for TDD with different UL-DL patterns

Unless otherwise stated, for each subcarrier spacing declared to be supported, if BS supports multiple TDD UL-DL patterns, only one of the supported TDD UL-DL patterns shall be used for all tests.

#### 8.1.2.2 Applicability of PUCCH performance requirements

##### 8.1.2.2.1 Applicability of requirements for different formats

Unless otherwise stated, PUCCH requirement tests shall apply only for each PUCCH format declared to be supported (see D.102 in table 4.6-1).

##### 8.1.2.2.2 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, PUCCH requirement tests shall apply only for each subcarrier spacing declared to be supported (see D.14 in table 4.6-1).

##### 8.1.2.2.3 Applicability of requirements for different channel bandwidths

For each subcarrier spacing declared to be supported by the BS, the tests for a specific channel bandwidth shall apply only if the BS supports it (see D.14 in table 4.6-1).

Unless otherwise stated, for each subcarrier spacing declared to be supported, the tests shall be done only for the widest supported channel bandwidth. If performance requirement is not specified for this widest supported channel bandwidth, the tests shall be done by using performance requirement for the closest channel bandwidth lower than this widest supported bandwidth; the tested PRBs shall then be centered in this widest supported channel bandwidth.

##### 8.1.2.2.4 Applicability of requirements for different configurations

Unless otherwise stated, PUCCH format 3 requirement tests shall apply only for the additional DM-RS configuration declared to be supported (see D.104 in table 4.6-1). If both options (without and with additional DM-RS) are declared to be supported, the tests shall be done for either without or with additional DM-RS; the same chosen option shall then be used for all tests.

Unless otherwise stated, PUCCH format 4 requirement tests shall apply only for the additional DM-RS configuration declared to be supported (see D.105 in table 4.6-1). If both options (without and with additional DM-RS) are declared to be supported, the tests shall be done for either without or with additional DM-RS; the same chosen option shall then be used for all tests.

##### 8.1.2.2.5 Applicability of requirements for multi-slot PUCCH

Unless otherwise stated, multi-slot PUCCH requirement tests shall apply only if the BS supports it (see D.106 in table 4.6-1).

#### 8.1.2.3 Applicability of PRACH performance requirements

##### 8.1.2.3.1 Applicability of requirements for different formats

Unless otherwise stated, PRACH requirement tests shall apply only for each PRACH format declared to be supported (see D.103 in table 4.6-1).

##### 8.1.2.3.2 Applicability of requirements for different subcarrier spacings

Unless otherwise stated, for each PRACH format with short sequence declared to be supported, for each FR, the tests shall apply only for the smallest supported subcarrier spacing in the FR (see D.103 in table 4.6-1).

##### 8.1.2.3.3 Applicability of requirements for different channel bandwidths

Unless otherwise stated, for the subcarrier spacing to be tested, the tests shall apply only for anyone channel bandwidth declared to be supported (see D.14 in table 4.6-1).

##### 8.1.2.3.4 Applicability of requirements for different restricted set types of long PRACH format 0

Unless otherwise stated, PRACH requirement tests for long PRACH preamble format 0 with restricted set Type A and B shall apply only for the restricted set type declared to be supported (see D.110 in table 4.6-1). If both restricted set type A and type B are declared to be supported, the tests shall be done for type B; the same chosen mapping type shall then be used for all tests.

#### 8.1.2.4 Applicability of PUSCH for high speed train performance requirements

##### 8.1.2.4.1 Applicability of requirements for different speeds

Unless otherwise stated, a BS that declares to support 500km/h (see D.109 in table 4.6-1) and passes the tests for 500km/h, can also consider the tests for 350km/h as passed.

##### 8.1.2.4.2 Applicability of requirements for 1T1R

In high speed train requirements, unless otherwise stated, for a BS supporting different numbers of antenna connectors (for BS type 1-C) or TAB connectors (for BS type 1-H) (see D.37 in table 4.6-1), if the BS supports 1RX, the tests with low MIMO correlation level shall apply only for either one connector or the second lowest number of supported connectors, in addition to the highest numbers of supported connectors, and the specific connectors used for testing are based on manufacturer declaration.

If the BS doesn’t support 1RX, the tests with low MIMO correlation level shall apply only for the lowest and highest numbers of supported connectors, and the specific connectors used for testing are based on manufacturer declaration.

Note: The highest number of connectors can simultaneously be second lowest number.

**--------------Omitted unchanged sections-------------**

### 8.2.4 Performance requirements for PUSCH for high speed train

#### 8.2.4.1 Definition and applicability

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 re-transmissions. The performance requirements for high speed train conditions are optional.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2.1 and clause 8.1.2.4.

The performance requirements for PUSCH for high speed train only apply to Wide Area Base Stations and Medium Range Base Stations (Subject to declaration).

#### 8.2.4.2 Minimum Requirement

The minimum requirement is in TS 38.104 [2] clause 8.2.4.

#### 8.2.4.3 Test Purpose

The test shall verify the receiver's ability to achieve throughput under high speed train conditions for a given SNR.

#### 8.2.4.4 Method of test

##### 8.2.4.4.1 Initial Conditions

Test environment: Normal, see annex B.2.

RF channels to be tested: M; see clause 4.9.1.

RF channels to be tested for carrier aggregation: MBW Channel CA; see clause 4.9.1.

##### 8.2.4.4.2 Procedure

1) Connect the BS tester generating the wanted signal, channel simulators and AWGN generators to all BS antenna connectors (depending on HST scenario) for diversity reception via a combining network as shown in annex D.5 and D.6 for *BS type 1-C* and *type 1-H* respectively.

2) Adjust the AWGN generator, according to the channel bandwidth, defined in table 8.2.4.4.2-1.

Table 8.2.4.4.2-1: AWGN power level at the BS input

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 15 kHz | 5 | -86.5dBm / 4.5MHz |
|  | 10 | -83.3 dBm / 9.36MHz |
| 30 kHz | 10 | -83.6dBm / 8.64MHz |
|  | 40 | -77.2 dBm / 38.16MHz |

3) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A and the test parameters in table 8.2.4.4.2-2.

Table 8.2.4.4.2-2: Test parameters for testing high speed train PUSCH

|  |  |  |
| --- | --- | --- |
| Parameter | | Value |
| Transform precoding | | Disabled |
| Uplink-downlink allocation for TDD (Note 1) | | 15 kHz SCS:  3D1S1U, S=10D:2G:2U  30 kHz SCS:  7D1S2U, S=6D:4G:4U |
| 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 |
|  | First DM-RS position | pos2 or pos3 (NOTE2) |
|  | Additional DM-RS position | pos2 |
|  | Number of DM-RS CDM group(s) without data | 2 |
|  | Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB |
|  | DM-RS port | {0} |
|  | DM-RS sequence generation | NID0=0, nSCID =0 |
| Time domain resource assignment | PUSCH mapping type | A |
|  | Start symbol | 0 |
|  | Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | Full applicable test bandwidth |
|  | Frequency hopping | Disabled |
| Code block group based PUSCH transmission | | Disabled |
| NOTE 1: The same requirements are applicable to FDD and TDD with different UL-DL patterns.  NOTE 2: Either pos2 or pos3 may be selected for conformance testing. | | |

4) The channel simulators shall be configured according to the corresponding channel model defined in annex G.

5) Adjust the equipment so that required SNR specified in table 8.2.4.5-1 to 8.2.4.5-10 is achieved at the BS input.

6) For each of the reference channels in table 8.2.4.5-1 to 8.2.4.5-10 applicable for the base station, measure the throughput.

#### 8.2.4.5 Test Requirement

The throughput measured according to clause 8.2.4.4.2 shall not be below the limits for the SNR levels specified in table 8.2.4.5-1 to 8.2.4.5-10. Unless stated otherwise, the MIMO correlation matrices for the gNB are defined in annex G for low correlation.

Table 8.2.4.5-1: Test requirements for PUSCH, Type A, 10 MHz channel bandwidth, 15 kHz SCS, 350km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
|  | 1 | Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A3-33 | pos2 | [-0.5] |
|  |  | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-33 | pos2 | -3.4 |
|  | 2 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-29 | pos2 | 8.7 |
| 1 |  | Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A3-33 | pos2 | -3.3 |
|  |  | Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A4-29 | pos2 | 9.0 |
|  | 8 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-33 | pos2 | -8.9 |
|  |  | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-29 | pos2 | 2.9 |

Table 8.2.4.5-2: Test requirements for PUSCH, Type A, 40 MHz channel bandwidth, 30 kHz SCS, 350km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
|  | 1 | Normal | HST Scenario 3-NR350 | 70% | G-FR1-A3-34 | pos2 | [-0.5] |
|  |  | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-34 | pos2 | -3.4 |
|  | 2 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-30 | pos2 | 8.8 |
| 1 |  | Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A3-34 | pos2 | -3.3 |
|  |  | Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A4-30 | pos2 | 9.0 |
|  | 8 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-34 | pos2 | -8.8 |
|  |  | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-30 | pos2 | 3.0 |

Table 8.2.4.5-3: Test requirements for PUSCH, Type A, 10 MHz channel bandwidth, 15 kHz SCS, 500km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
|  | 1 | Normal | HST Scenario 3-NR500 | 70% | G-FR1-A3-33 | pos2 | [-0.4] |
|  |  | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-33 | pos2 | -3.6 |
|  | 2 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-29 | pos2 | 8.8 |
| 1 |  | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A3-33 | pos2 | -3.3 |
|  |  | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A4-29 | pos2 | 9.5 |
|  | 8 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-33 | pos2 | -9.1 |
|  |  | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-29 | pos2 | 3.0 |

Table 8.2.4.5-4: Test requirements for PUSCH, Type A, 40 MHz channel bandwidth, 30 kHz SCS, 500km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
|  | 1 | Normal | HST Scenario 3-NR500 | 70% | G-FR1-A3-34 | pos2 | [-0.4] |
|  |  | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-34 | pos2 | -3.6 |
|  | 2 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-30 | pos2 | 9.0 |
| 1 |  | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A3-34 | pos2 | -3.3 |
|  |  | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A4-30 | pos2 | 8.3 |
|  | 8 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-34 | pos2 | -8.9 |
|  |  | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-30 | pos2 | 3.1 |

Table 8.2.4.5-5: Test requirements for PUSCH, Type A, 5 MHz channel bandwidth, 15 kHz SCS, 350km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
|  | 1 | Normal | HST Scenario 3-NR350 | 70% | G-FR1-A3-33A | pos2 | [-0.4] |
|  |  | Normal | HST Scenario 1-NR350 | 70% | G-FR1-A3-33A | pos2 | [-3.4] |
|  | 2 | Normal | HST Scenario 1-NR350 | 70% | G-FR1-A4-29A | pos2 | [8.8] |
| 1 |  | Normal | HST Scenario 3-NR350 | 70% | G-FR1-A3-33A | pos2 | [-3.3] |
|  |  | Normal | HST Scenario 3-NR350 | 70% | G-FR1-A4-29A | pos2 | [8.8] |
|  | 8 | Normal | HST Scenario 1-NR350 | 70% | G-FR1-A3-33A | pos2 | [-8.8] |
|  |  | Normal | HST Scenario 1-NR350 | 70% | G-FR1-A4-29A | pos2 | [3.1] |

Table 8.2.4.5-6: Test requirements for PUSCH, Type A, 10 MHz channel bandwidth, 30 kHz SCS, 350km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
|  | 1 | Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A3-34A | pos2 | [-0.5] |
|  |  | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-34A | pos2 | [-3.4] |
|  | 2 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-30A | pos2 | [8.6] |
| 1 |  | Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A3-34A | pos2 | [-3.4] |
|  |  | Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A4-30A | pos2 | [8.7] |
|  | 8 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-34A | pos2 | [-8.9] |
|  |  | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-30A | pos2 | [2.8] |

Table 8.2.4.5-7: Test requirements for PUSCH, Type A, 5 MHz channel bandwidth, 15 kHz SCS, 500km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
|  | 1 | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A3-33A | pos2 | [-0.3] |
|  |  | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-33A | pos2 | [-3.3] |
|  | 2 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-29A | pos2 | [9.0] |
| 1 |  | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A3-33A | pos2 | [-3.2] |
|  |  | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A4-29A | pos2 | [9.1] |
|  | 8 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-33A | pos2 | [-8.8] |
|  |  | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-29A | pos2 | [3.3] |

Table 8.2.4.5-8: Test requirements for PUSCH, Type A, 10 MHz channel bandwidth, 30 kHz SCS, 500km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
|  | 1 | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A3-34A | pos2 | [-0.4] |
|  |  | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-34A | pos2 | [-3.4] |
|  | 2 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-30A | pos2 | [8.8] |
| 1 |  | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A3-34A | pos2 | [-3.3] |
|  |  | Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A4-30A | pos2 | [8.7] |
|  | 8 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-34A | pos2 | [-8.9] |
|  |  | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-30A | pos2 | [3.0] |

Table 8.2.4.5-9: Test requirements for PUSCH, Type A, 5 MHz channel bandwidth, 15 kHz SCS, multi-path fading channel under high Doppler value

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | Normal | TDLC300-600 | 70 % | G-FR1-A3-33A | pos2 | [-1.3] |

Table 8.2.4.5-10: Test requirements for PUSCH, Type A, 10 MHz channel bandwidth, 30 kHz SCS, multi-path fading channel under high Doppler value

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Cyclic prefix** | **Propagation conditions**  **(Annex G)** | **Fraction of maximum throughput** | **FRC**  **(Annex A)** | **Additional DM-RS position** | **SNR**  **(dB)** |
| 1 | 2 | Normal | TDLC300-1200 | 70 % | G-FR1-A3-34A | pos2 | [-1.4] |

**--------------Omitted unchanged sections-------------**

## G.2.2 Combinations of channel model parameters

The propagation conditions used for the performance measurements in multi-path fading environment are indicated as a combination of a channel model name and a maximum Doppler frequency, i.e., TDLA<DS>-<Doppler>, TDLB<DS>-<Doppler> or TDLC<DS>-<Doppler> where '<DS>' indicates the desired delay spread and '<Doppler>' indicates the maximum Doppler frequency (Hz).

Table G.2.2-1 show the propagation conditions that are used for the performance measurements in multi-path fading environment for low, medium and high Doppler frequencies for FR1.

Table G.2.2-1: Channel model parameters for FR1

|  |  |  |
| --- | --- | --- |
| Combination name | Model | Maximum Doppler frequency |
| TDLA30-5 | TDLA30 | 5 Hz |
| TDLA30-10 | TDLA30 | 10 Hz |
| TDLB100-400 | TDLB100 | 400 Hz |
| TDLC300-100 | TDLC300 | 100 Hz |
| TDLC300-600 | TDLC300 | 600 Hz |
| TDLC300-1200 | TDLC300 | 1200 Hz |

**--------------End of text proposal-------------**