**3GPP TSG-RAN4 Meeting #98-bis-e *R4-2106167***

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

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.141-1** | **CR** | **-** | **rev** | **-** | **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 big CR for TS38.141-1 Introduction of NR-U BS demodulation requirements |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_unlic-Perf |  | ***Date:*** | 2021-04-20 |
|  |  |  |  |  |
| ***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 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | The requirement discussion on NR-U BS demodulation have been completed and corresponding draft CRs are endorsed. The NR-U demodulation requirements should be included in specification. |
|  |  |
| ***Summary of change:*** | Based on following draft CRs.R4-2106011 Applicability rulesR4-2106015 introducation of conducted comformance performance testing for interlaced PUSCHR4-2106016 introduction of FRC tables R4-2106020 introduction of conducted comformance performance testing for interlaced PUCCH format 0/1R4-2106023 introduction of conducted comformance performance testing for interlaced PUCCH format 2/3R4-2106026 introduction of conducted comformance performance testing for PRACH format with with LRA=1151 and LRA=571 |
|  |  |
| ***Consequences if not approved:*** | There will be no test requirements for NR-U BS demodulation.  |
|  |  |
| ***Clauses affected:*** | 4.68.1.2, new clauses: 8.1.2.5, 8.1.2.6, 8.1.2.78.2, new clauses: 8.2.10.1; 8.2.10.2; 8.2.10.3; 8.2.10.4.1; 8.2.10.4.2; 8.2.10.58.3, new clauses: 8.3.7, 8.3.8, 8.3.9, 8.3.108.4.1, new clauses: 8.4.1.7 A.5, A.6 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR … CR ...  |
| ***affected:*** | **x** |  |  Test specifications | TS/TR 38.141-2 ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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

## 4.6 Manufacturer declarations

The following BS declarations listed in table 4.6-1, when applicable to the BS under test, are required to be provided by the manufacturer for the conducted requirements testing of the *BS type 1-C* and *BS type 1-H*.

For the *BS type 1-H* declarations required for the radiated requirements testing, refer to TS 38.141-2 [3].

Table 4.6-1 Manufacturer declarations for *BS type 1-C* and *BS type 1-H* conducted test requirements

|  |  |  |  |
| --- | --- | --- | --- |
| Declaration identifier | Declaration | Description | Applicability |
|  |  |  | *BS type 1-C* | *BS type 1-H* |
| D.1 | BS requirements set | Declaration of one of the NR base station *requirement's set* as defined for *BS type 1-C*, or *BS type 1-H*. | x | x |
| D.2 | BS class | BS class of the BS, declared as Wide Area BS, Medium Range BS, or Local Area BS. | x | x |
| D.3 | *Operating bands* and frequency ranges | List of NR *operating band(s)* supported by *single-band connector(s)* and/or *multi-band connector(s)* of the BS and if applicable, frequency range(s) within the *operating band(s)* that the BS can operate in. Declarations shall be made per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H*. | x | x |
| D.4 | Spurious emission category | Declare the BS spurious emission category as either category A or B with respect to the limits for spurious emissions, as defined in Recommendation ITU-R SM.329 [5].  | x | x |
| D.5 | Additional operating band unwanted emissions | The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where the additional operating band unwanted emission limits defined in clause 6.6.4.5.6 apply. (Note 3). | x | x |
| D.6 | Co-existence with other systems | The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA, PHS and/or NR operating in another band are deployed.  | x | x |
| D.7 | Co-location with other base stations | The manufacturer shall declare whether the BS under test is intended to operate co-located with Base Stations of one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA and/or NR operating in another band.  | x | x |
| D.8 | *Single band connector* or *multi-band connector* | Declaration of the single band or multi-band capability of *single band connector(s)* or *multi-band connector(s),* declared for every connector. | x | x |
| D.9 | Contiguous or non-contiguous spectrum operation support | Ability to support contiguous or non-contiguous (or both) frequency distribution of carriers when operating multi-carrier. Declared per *single band connector* or *multi-band connector*, per *operating band*. | x | x |
| D.10 | void | void | x | x |
| D.11 | Maximum *Base Station RF Bandwidth* | Maximum *Base Station RF Bandwidth* in the *operating band* for single-band operation. Declared per supported *operating band,* per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* (Note 2) | x | x |
| D.12 | Maximum *Base Station RF Bandwidth* for multi-band operation | Maximum *Base Station RF Bandwidth* for multi-band operation. Declared per supported *operating band,* per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D.13 | Total RF bandwidth (BWtot) | Total RF bandwidth BWtot of transmitter and receiver, declared per the band combinations (D.27).  | x | x |
| D.14 | NR supported channel bandwidths and SCS | NR supported SCS and channel bandwidths per supported SCS. Declared per supported *operating band,* per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D.15 | CA only operation | Declaration of CA-only operation (with equal power spectral density among carriers) but not multiple carriers, declared per *operating band* per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H*. | x | x |
| D.16 | Single or multiple carrier | Capable of operating with a single carrier (only) or multiple carriers. Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D.17 | Maximum number of supported carriers per operating band in single band operation | Maximum number of supported carriers per supported *operation band* in single band operation*.* Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* (Note 2) | x | x |
| D.18 | Maximum number of supported carriers per operating band in multi-band operation | Maximum number of supported carriers per supported *operation band* in multi-band operation. (Note 2) | x | x |
| D.19 | Total maximum number of supported carriers in multi-band operation | Maximum number of supported carriers for all supported *operating bands* in multi-band operation*.* Declared for all connectors (D.18)*.* | x | x |
| D.20 | Other band combination multi-band restrictions | Declare any other limitations under simultaneous operation in the declared band combinations (D.35) for each *multi-band connector* which have any impact on the test configuration generation.Declared for every *multi-band connector*. | x | x |
| D.21 | Rated carrier output power(Prated,c,AC, or Prated,c,TABC) | Conducted rated carrier output power, per *single band connector* or *multi-band connector.*Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H*. (Note 1, 2) | x | x |
| D.22 | R*ated total output power* (Prated,t,AC, or Prated,t,TABC) | Conducted total rated output power*.*Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.*For *multi-band connectors* declared for each supported *operating band* in each supported band combination. (Note 1, 2) | x | x |
| D.23 | Rated multi-band total output power, Prated,MB,TABC | Conducted multi-band rated total output power*.*Declared per supported operating band combinations, per *multi-band connector*. (Note 1) | x | x |
| D.24 | Ncells | Number corresponding to the minimum number of cells that can be transmitted by a BS in a particular *operating band* with transmission on all *TAB connectors* supporting the *operating band*.  |  | x |
| D.25 | Maximum supported power difference between carriers | Maximum supported power difference between carriers. Declared per supported *operating band*, per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D.26 | Maximum supported power difference between carriers is different *operating bands* | Supported power difference between any two carriers in any two different supported *operating bands.* Declared per supported operating band combination, per *multi-band connector.* | x | x |
| D.27 | Operating band combination support | List of operating bands combinations supported by *single-band connector(s)* and/or *multi-band connector(s)* of the BS. Declared per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H.* | x | x |
| D.28 | void  | void | x | x |
| D.29 | Intra-system interfering signal declaration list | List of *single band connector(s)* or *multi-band connector(s)* for which an intra-system interfering signal level is required to be declared. Declaration is required if the intra-system interfering signal level is larger than the co-location interfering signal level. |  | x |
| D.30 | Intra-system interfering signal level | The interfering signal level in dBm. Declared per supported *operating band*, per *TAB connector* for *BS type 1-H* covered by D.29. |  | x |
| D.31 | TAE groups | Set of declared *TAB connector beam forming groups* on which the TAE requirements apply.*All TAB connectors* belong to at least one *TAB connector beam forming group* (even if it's a *TAB connector beam forming group* consisting of one connector).The smallest possible number of *TAB connector beam forming groups* need to be declared such that there is no *TAB connector* not contained in at least one of the declared *TAB connector beam forming groups*.Declared per supported *operating band*. |  | x |
| D.32 | Equivalent connectors | List of *antenna connectors* of *BS type 1-C*, or *TAB connector* of *BS type 1-H*, which have been declared equivalent.Equivalent connectors imply that the *antenna connector* of *BS type 1-C*, or *TAB connector* of *BS type 1-H*, are expected to behave in the same way when presented with identical signals under the same operating conditions. All declarations made for the *antenna connector* of *BS type 1-C*, or *TAB connector* of *BS type 1-H* are identical and the transmitter unit and/or receiver unit driving the *antenna connector* of *BS type 1-C* or *TAB connector* of *BS type 1-H* are of identical design. | x | x |
| D.33 | *TAB connector RX min cell group* | Declared as a group of *TAB connectors* to which RX requirements are applied. This declaration corresponds to group of *TAB connectors* which are responsible for receiving a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells (Ncells) with transmission on all *TAB connectors* supporting an *operating band*. |  | x |
| D.34 | *TAB connector TX min cell group* | Declared group of *TAB connectors* to which TX requirements are applied. This declaration corresponds to group of *TAB connectors* which are responsible for transmitting a cell when the *BS type 1-H* setting corresponding to the declared minimum number of cells (Ncells) with transmission on all *TAB connectors* supporting an *operating band*. |  | x |
| D.35 | Connecting network loss range for BS testing with ancillary RF amplifiers | Declaration of the range of connecting network losses (in dB) for *BS type 1-C* testing with ancillary Tx RF amplifier only, or with Rx RF amplifier only, or with combined Tx/Rx RF amplifiers. (Note 4) | x |  |
| D.36 | Relation between supported maximum RF bandwidth, number of carriers and Rated total output power | If the rated total output power and total number of supported carriers are not simultaneously supported, the manufacturer shall declare the following additional parameters:- The reduced number of supported carriers at the rated total output power;- The reduced total output power at the maximum number of supported carriers. | x | x |
| D.37 | *TAB connectors* used for performance requirement testing | To reduce test complexity, declaration of a representative (sub)set of *TAB connectors* to be used for performance requirement test purposes. At least one *TAB connector* mapped to each *demodulation branch* is declared. |  | x |
| D.38 | Inter-band CA  | Band combinations declared to support inter-band CA (per CA capable *multi-band connector(s)*, as in D.15).Declared for every *multi-band connector* which support CA. | x | x |
| D.39 | Intra-band contiguous CA  | Bands declared to support intra-band contiguous CA (per CA capable *single band connector(s)* or *multi-band connector(s)*, as in D.15).Declared per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H*. | x | x |
| D.40 | Intra-band non-contiguous CA | Bands declared to support intra-band non-contiguous CA (per CA capable *single band connector(s)* or *multi-band connector(s)*, as in D.15).Declared per *antenna connector* for *BS type 1-C*, or *TAB connector* for *BS type 1-H*. | x | x |
| D.41 | NB-IoT operation | Manufacturer shall declare the support of NB-IoT operation in NR in-band and the number of supported NB-IoT carriers in total and for each supported band, frequency range and channel bandwidth. | x |  |
| D.42 | NB-IoT sub-carrier spacing | If the BS supports NB-IoT operation in NR in-band, manufacturer shall declare if it supports 15 kHz sub-carrier spacing, 3.75 kHz sub-carrier spacing, or both for NPUSCH. | x |  |
| D.43 | NB-IoT power dynamic range | If the BS supports NB-IoT operation in NR in-band, manufacturer shall declare the maximum power dynamic range it could support with a minimum of +6dB or +3dB as specified in clause 6.3.4 of TS 38.104 [2] (Note 5). | x |  |
| D.100 | PUSCH mapping type | Declaration of the supported PUSCH mapping type as specified in TS 38.211 [17], i.e., type A, type B or both. | x | x |
| D.101 | PUSCH additional DM-RS positions  | Declaration of the supported additional DM-RS position(s), i.e., pos0, pos1 or both. |  |  |
| D.102 | PUCCH format | Declaration of the supported PUCCH format(s) as specified in TS 38.211 [17], i.e., format 0, format 1, format 2, format 3, format 4. | x | x |
| D.103 | PRACH format and SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: 0, A1, A2, A3, B4, C0, C2.Declaration of the supported SCS(s) per supported PRACH format with short sequence, as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. | x | x |
| D.104 | Additional DM-RS for PUCCH format 3 | Declaration of the supported additional DM-RS for PUCCH format 3: without additional DM-RS, with additional DM-RS or both. | x | x |
| D.105 | Additional DM-RS for PUCCH format 4 | Declaration of the supported additional DM-RS for PUCCH format 4: without additional DM-RS, with additional DM-RS or both. | x | x |
| D.106 | PUCCH multi-slot  | Declaration of multi-slot PUCCH support. | x | x |
| D.107 | UL CA | For the highest supported SCS, declaration of the carrier combination with the largest aggregated bandwidth. If there is more than one combination, the carrier combination with the largest number of carriers shall be declared. | x | x |
| D.108 | High speed train | Declaration of high speed train scenario support, i.e. HST support or no HST support | x | x |
| D.109 | Maximum speed of high speed train for PUSCH | Declaration of supported maximum speed for high speed train scenario, i.e. 350 km/h or 500 km/h. This declaration is applicable to PUSCH for high speed train and UL timing adjustment only if BS declares to support high speed train in D.108. | x | X |
| D.110 | PRACH format for high speed train | Declaration of supported PRACH format(s) for high speed train scenario, i.e. format 0 restricted set type A, format 0 restricted set type B, format A2, format B4, format C2.This declaration is applicable to PRACH for high speed train only if BS declares to support high speed train in D.108. | x | x |
| [D.111] | Interlaced formats | Declaration of support of interlaced PUSCH and PUCCH formats. | x | x |
| [D.112] | PRACH format with LRA = 1151 for 15 kHz SCS and LRA = 571 for 30 kHz SCS | Declaration of the supported PRACH format(s) as specified in TS 38.211 [17], i.e., format: A2, B4, C2. Declaration of the supported SCS(s) per supported PRACH format as specified in TS 38.211 [17], i.e., 15 kHz, 30 kHz or both. | x | x |
| [D.113] | CG-UCI | Declaration of support of GC-UCI multiplexed on PUSCH as specified in TS 38.211 [17].  | x | x |
| NOTE 1: If a BS is capable of 256QAM DL operation then two rated output power declarations may be made. One declaration is applicable when configured for 256QAM transmissions and the other declaration is applicable when not configured for 256QAM transmissions.NOTE 2: Parameters for contiguous or non-contiguous spectrum operation in the operating band are assumed to be the same unless they are separately declared. When separately declared, they shall still use the same declaration identifier.NOTE 3: If BS is declared to support Band n20 (D.3), the manufacturer shall declare if the BS may operate in geographical areas allocated to broadcasting (DTT). Additionally, related declarations of the emission levels and maximum output power shall be declared.NOTE 4: This manufacturer declaration is optional. NOTE 5: This manufacturer may declare two values, one with a minimum of +6dB and the other with a minimum of +3dB. |

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

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

### 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 test requirements 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 except the requirement for PUSCH mapping Type B with 2 symbol length allocated.

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.

8.1.2.1.6 Applicability of UL timing adjustment requirements for different scenarios

Unless otherwise stated, the tests for UL timing adjustment for scenario Y and scenario Z shall apply only if high speed train is declared to be supported (see D.109 in table 4.6-1). A BS that passes the tests for scenario Y or scenario Z, can also consider the tests for scenario X passed.

##### 8.1.2.1.7 Applicability of 2-step RA type requirements for different subcarrier spacings

In 2-step RA type requirements, unless otherwise stated, MsgA PUSCH tests shall be done only for one (freely selected) subcarrier spacing declared to be supported (see D.14 in table 4.6-1).

#### 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 test requirements 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 test requirements 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.

#### 8.1.2.5 Applicability of interlaced PUSCH performance requirements

##### 8.1.2.5.1 General applicability of interlaced PUSCH performance requirements

Interlaced PUSCH requirement tests shall apply only for a BS declaring support of interlaced formats (see D.111 in table 4.6-1).

##### 8.1.2.5.2 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, for each subcarrier-spacing declared to be supported for interlaced PUSCH, the tests shall apply only for the supported subcarrier spacing. If both 15kHz and 30kHz SCS are declared to be supported, the tests shall be done for 30kHz SCS (see D.14 in table 4.6-1).

##### 8.1.2.5.3 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 defined for 20 MHz channel bandwidth. For 15kHz subcarrier spacing, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {110, 120, …,210}. For 30kHz subcarrier spacing, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {55, 60,…,105}.

##### 8.1.2.5.4 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.

##### 8.1.2.5.5 Applicability of CG-UCI multiplexed on PUSCH requirements

Unless otherwise stated, interlaced CG-UCI multiplexed on interlaced PUSCH requirements shall apply only for a BS declaring support of CG-UCI (see [D.113] in table 4.6-1).

#### 8.1.2.6 Applicability of interlaced PUCCH performance requirements

##### 8.1.2.6.1 General applicability of interlaced PUCCH performance requirements

Interlaced PUCCH requirement tests shall apply only for a BS declaring support of interlaced formats (see D.111 in table 4.6-1).

##### 8.1.2.6.2 Applicability of requirements for different formats

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

##### 8.1.2.6.3 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).

##### 8.1.2.6.4 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 defined for 20 MHz channel bandwidth. For 15kHz subcarrier spacing, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {110, 120, …,210} for PUCCH formats 0, 1, and 2, and {110, 120, …,200} for PUCCH format 3. For 30kHz subcarrier spacing, the tested RB’s are uniformly spaced over the channel bandwidth at RB index {55, 60, …,105} for PUCCH formats 0, 1, and 2, and {55, 60, …,100} for PUCCH format 3.

#### 8.1.2.7 Applicability of performance requirements for PRACH with LRA =1151 and LRA =571

##### 8.1.2.7.1 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.112] in table 4.6-1).

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

Unless otherwise stated, for each PRACH format with LRA =1151 and LRA =571 declared to be supported, the tests shall apply only for the supported subcarrier spacing. If both 15kHz and 30kHz SCS are declared to be supported, the tests shall be done for 30kHz SCS (see [D.112] in table 4.6-1).

##### 8.1.2.7.3 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).

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

######################### Start of change#3 ############################

### 8.2.10 Requirements for interlaced PUSCH

#### 8.2.10.1 Definition and applicability

The performance requirement of PUSCH with interlace allocation 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.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2.5.

#### 8.2.10.2 Minimum Requirement

The minimum requirement is in TS 38.104 [2] clause 8.2.10.

#### 8.2.10.3 Test Purpose

The test shall verify the receiver's ability to achieve throughput under multipath fading propagation conditions for a given SNR

#### 8.2.10.4 Method of test

##### 8.2.10.4.1 Initial Conditions

Test environment: Normal, see annex B.2.

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

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

##### 8.2.10.4.2 Procedure

1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to all BS antenna connectors 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 8.2.10.4.2-1.

Table 8.2.10.4.2-1: AWGN power level at the BS input

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15  | 20 | -80.2 dBm / 19.08MHz |
| 30  | 20 | -80.4 dBm / 18.36MHz |

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 8.2.10.4-2-2

Table 8.2.10.4.2-2: Test parameters for testing PUSCH

|  |  |
| --- | --- |
| Parameter | Value |
| Transform precoding | Disabled |
| Default TDD UL-DL pattern (Note 1) | 15 kHz SCS:3D1S1U, S=10D:2G:2U30 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 |
|  | Additional DM-RS position | 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 | NID0=0, nSCID =0 |
| Time domain  | PUSCH mapping type | A, B |
| resource | Start symbol | 0 |
| assignment | Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | Full applicable test bandwidth.Frist interlace with RBs 0,10,20,…,100 are allocated for tests with 15kHz and first interlace with RBs 0,5,10,…50 are allocated for tests with 30kHz. |
|  | 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. |

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

5) Adjust the equipment so that required SNR specified in table 8.2.1.5-1 to 8.2.1.5-18 is achieved at the BS input.

6) For each of the reference channels in table 8.2.1.5-1 to 8.2.1.5-18 applicable for the base station, measure the throughput.

#### 8.2.10.5 Test Requirement

The throughput measured according to clause 8.2.10.4.2 shall not be below the limits for the SNR levels specified in tables 8.2.10.5-1 to 8.2.10.5-4.

Table 8.2.10.5-1: Minimum requirements for PUSCH with 70% of maximum throughput, Type A, 20 MHz channel bandwidth, 15 kHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Fraction of maximum throughput | FRC(Annex A) | Additional DM-RS position | SNR(dB) |
| 1 | 2 | Normal | TDLA30-10 Low | 70% | G-FR1-A5-15 | pos1 | TBD |

Table 8.2.10.5-2: Minimum requirements for PUSCH with 70% of maximum throughput, Type A, 20 MHz channel bandwidth, 30 kHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Fraction of maximum throughput | FRC(Annex A) | Additional DM-RS position | SNR(dB) |
| 1 | 2 | Normal | TDLA30-10 Low | 70% | G-FR1-A5-16 | pos1 | TBD |

Table 8.2.10.2-3: Minimum requirements for PUSCH with 70% of maximum throughput, Type B, 20 MHz channel bandwidth, 15 kHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Fraction of maximum throughput | FRC(Annex A) | Additional DM-RS position | SNR(dB) |
| 1 | 2 | Normal | TDLA30-10 Low | 70% | G-FR1-A5-15 | pos1 | TBD |

Table 8.2.10.2-4: Minimum requirements for PUSCH with 70% of maximum throughput, Type B, 20 MHz channel bandwidth, 30 kHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Fraction of maximum throughput | FRC(Annex A) | Additional DM-RS position | SNR(dB) |
| 1 | 2 | Normal | TDLA30-10 Low | 70% | G-FR1-A5-16 | pos1 | TBD |

######################### End of change#3 ############################

######################### Start of change#4 ############################

### 8.3.7 Performance requirements for interlaced PUCCH format 0

#### 8.3.7.1 Definition and applicability

The performance requirement of single user interlaced PUCCH format 0 for ACK missed detection is determined by the two parameters: probability of false detection of the ACK and the probability of detection of ACK. The performance is measured by the required SNR at probability of detection equal to 0.99. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a conditional probability of erroneous detection of the ACK when input is only noise.

The probability of detection of ACK is defined as conditional probability of detection of the ACK when the signal is present.

The ACK missed deection requirement only applies to the PUCCH format 0 with 1 UCI bits. The UCI information only contrains ACK/NACK information

The 1bit UCI information is further defined with bitmap as [0].

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2.6.

#### 8.3.7.2 Minimum Requirement

The minimum requirements are in TS 38.104 [2] clause 8.3.8.

#### 8.3.7.3 Test purpose

The test shall verify the receiver's ability to detect ACK under multipath fading propagation conditions for a given SNR.

#### 8.3.7.4 Method of test

##### 8.3.7.4.1 Initial conditions

Test environment: Normal, see annex B.2.

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

##### 8.3.7.4.2 Procedure

1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to all BS antenna connectors 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 and sub-carrier spacing defined in table 8.3.7.4.2-1.

Table 8.3.7.4.2-1: AWGN power level at the BS input

|  |  |  |
| --- | --- | --- |
| Subcarrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 15 | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 20 | -77.4 dBm / 18.36 MHz |

3) The characteristics of the wanted signal shall be configured according to TS 38.211 [17] and the specific test parameters are configured as mentioned in table 8.3.7.4.2-2:

Table 8.3.7.4.2-2: Test Parameters

|  |  |
| --- | --- |
| Parameter | Test |
| Number of UCI information bits | 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 | 0Note1 |
| Note 1: RBs 0, 10, 20, …, 100 are allocated for 15kHz SCS and RBs 0, 5, 10, …, 50 are allocated for 30kHz SCS. |

4) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex B.

5) Adjust the equipment so that the SNR specified in table 8.3.7.5-1 or table 8.3.7.5-2 is achieved at the BS input during the ACK transmissions.

6) The signal generator sends a test pattern with the pattern outlined in figure 8.3.7.4.2-1. The following statistics are kept: the number of ACKs detected in the idle periods and the number of missed ACKs.



Figure 8.3.7.4.2-1: Test signal pattern for single user interlaced PUCCH format 0 demodulation tests

#### 8.3.7.5 Test Requirement

The fraction of falsely detected ACKs shall be less than 1% and the fraction of correctly detected ACKs shall be larger than 99% for the SNR listed in table 8.3.7.5-1.

Table 8.3.7.5-1: Test requirements for interlaced PUCCH format 0 with 15 kHz SCS, 20MHz channel bandwidth

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Tx antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Number ofOFDM symbols | SNR (dB) |
| 1 | 2 | TDLA30-10 Low | 1 | [TBD] |

Table 8.3.7.5-2: Test requirements for interlaced PUCCH format 0 with 30 kHz SCS, 20MHz channel bandwidth

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Tx antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Number ofOFDM symbols | SNR (dB) |
| 1 | 2 | TDLA30-10 Low | 1 | [TBD] |

### 8.3.8 Performance requirements for interlaced PUCCH format 1

#### 8.3.8.1 NACK to ACK detection

##### 8.3.8.1.1 Definition and applicability

The performance requirement of interlaced PUCCH format 1 for NACK to ACK detection is determined by the two parameters: probability of false detection of the ACK and the NACK to ACK detection probability. The performance is measured by the required SNR at probability of the NACK to ACK detection equal to 0.1% or less. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a conditional probability of erroneous detection of the ACK at particular bit position when input is only noise. Each false bit detection is counted as one error.

The NACK to ACK detection probability is the probability of detecting an ACK bit when a NACK bit was sent on particular bit position. Each NACK bit erroneously detected as ACK bit is counted as one error. Erroneously detected 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.

The NACK to ACK deection requirement only applies to the PUCCH format 1 with 2 UCI bits. The UCI information only contrains ACK/NACK information

The 2bits UCI information is further defined with bitmap as [0 1].

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2.6.

##### 8.3.8.1.2 Minimum Requirement

The minimum requirement is in TS 38.104 [2] clause 8.3.9.

##### 8.3.8.1.3 Test purpose

The test shall verify the receiver's ability not to falsely detect NACK bits as ACK bits under multipath fading propagation conditions for a given SNR.

##### 8.3.8.1.4 Method of test

###### 8.3.8.1.4.1 Initial Conditions

Test environment: Normal; see annex B.2.

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

###### 8.3.8.1.4.2 Procedure

1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to all BS antenna connectors 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 combinations of SCS and channel bandwidth defined in table 8.3.8.1.4.2-1.

Table 8.3.8.1.4.2-1: AWGN power level at the BS input

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 15 | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 20 | -77.4 dBm / 18.36 MHz |

3) The characteristics of the wanted signal shall be configured according to TS 38.211 [17], and the specific test parameters are configured as below:

Table 8.3.8.1.4.2-2: Test parameters

|  |  |
| --- | --- |
| Parameter | Test |
| Number of information bits | 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 | 0Note1 |
| Note 1: RBs 0, 10, 20, …, 100 are allocated for 15kHz SCS and RBs 0, 5, 10, …, 50 are allocated for 30kHz SCS. |

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

5) Adjusting the equipment so that the SNR specified in table 8.3.8.1.5-1 and table 8.3.8.1.5-2 is achieved at the BS input during the transmissions.

6) The signal generator sends random codeword from applicable codebook, in regular time periods. The following statistics are kept: the number of ACK bits detected in the idle periods and the number of NACK bits detected as ACK.

##### 8.3.8.1.5 Test Requirement

The fraction of falsely detected ACK bits shall be less than 1% and the fraction of NACK bits falsely detected as ACK shall be less than 0.1% for the SNR listed in tables 8.3.8.1.5-1.

Table 8.3.8.1.5-1: Required SNR for interlaced PUCCH format 1 with 15 kHz SCS, 20MHz channel bandwidth

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Tx antennas | Number of RX antennas | Cyclic-Prefix | Propagation conditions and correlation matrix (Annex G) | SNR (dB) |
| 1 | 2 | Normal | TDLA30-10 Low | [TBD] |

Table 8.3.8.1.5-2: Required SNR for interlaced PUCCH format 1 with 30 kHz SCS, 20MHz channel bandwidth

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Tx antennas | Number of RX antennas | Cyclic-Prefix | Propagation conditions and correlation matrix (Annex G) | SNR (dB) |
| 1 | 2 | Normal | TDLA30-10 Low | [TBD] |

#### 8.3.8.2 ACK missed detection

##### 8.3.8.2.1 Definition and applicability

The performance requirement of interlaced PUCCH format 1 for ACK missed detection is determined by the two parameters: probability of false detection of the ACK and the probability of detection of ACK. The performance is measured by the required SNR at probability of detection equal to 0.99. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a conditional probability of erroneous detection of the ACK when input is only noise.

The probability of detection of ACK is defined as conditional probability of detection of the ACK when the signal is present.

The ACK missed deection requirement only applies to the PUCCH format 1 with 2 UCI bits. The UCI information only contrains ACK/NACK information.

The 2bits UCI information is further defined with bitmap as [0 1].

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2.6.

##### 8.3.8.2.2 Minimum Requirement

The minimum requirement is in TS 38.104 [2] clause 8.3.9.

##### 8.3.8.2.3 Test purpose

The test shall verify the receiver's ability to detect ACK bits under multipath fading propagation conditions for a given SNR.

##### 8.3.8.2.4 Method of test

###### 8.3.8.2.4.1 Initial Conditions

Test environment: Normal; see annex B.2.

RF channels to be tested: for single carrier (SC): M; see clause 4.9.1.

###### 8.3.8.2.4.2 Procedure

1) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to all BS antenna connectors 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 combinations of SCS and channel bandwidth defined in table 8.3.8.2.4.2-1.

Table 8.3.8.2.4.2-1: AWGN power level at the BS input

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 15 | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 20 | -77.4 dBm / 18.36 MHz |

3) The characteristics of the wanted signal shall be configured according to TS 38.211 [17], and the specific test parameters are configured as below:

Table 8.3.8.2.4.2-2: Test parameters

|  |  |
| --- | --- |
| Parameter | Test |
| Number of information bits | 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 | 0Note1 |
| Note 1: RBs 0, 10, 20, …, 100 are allocated for 15kHz SCS and RBs 0, 5, 10, …, 50 are allocated for 30kHz SCS. |

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

5) Adjusting the equipment so that the SNR specified in table 8.3.8.2.5-1 and table 8.3.8.2.5-2 is achieved at the BS input during the transmissions.

6) The signal generator sends random codewords from applicable codebook, in regular time periods. The following statistics are kept: the number of ACK bits falsely detected in the idle periods and the number of missed ACK bits. Each falsely detected ACK bit in the idle periods is accounted as one error for the statistics of false ACK detection, and each missed ACK bit is accounted as one error for the statistics of missed ACK detection.

Note that the procedure described in this clause for ACK missed detection has the same condition as that described in clause 8.3.8.1.4.2 for NACK to ACK detection. Both statistics are measured in the same testing.

##### 8.3.8.2.5 Test Requirement

The fraction of falsely detected ACK bits shall be less than 1% and the fraction of correctly detected ACK bits shall be larger than 99% for the SNR listed in tables 8.3.8.2.5-1.

Table 8.3.8.2.5-1 Required SNR for interlaced PUCCH format 1 with 15 kHz SCS, 20MHz channel bandwidth

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Tx antennas | Number of RX antennas | Cyclic-Prefix | Propagation conditions and correlation matrix (Annex G) | SNR (dB) |
| 1 | 2 | Normal | TDLA30-10 Low | [TBD] |

Table 8.3.8.2.5-2 Required SNR for interlaced PUCCH format 1 with 30 kHz SCS, 20MHz channel bandwidth

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Tx antennas | Number of RX antennas | Cyclic-Prefix | Propagation conditions and correlation matrix (Annex G) | SNR (dB) |
| 1 | 2 | Normal | TDLA30-10 Low | [TBD] |

### 8.3.9 Performance requirements for interlaced PUCCH format 2

#### 8.3.9.1 Definition and applicabilty

The performance is measured by the required SNR at UCI block error probability not exceeding 1%.

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 UCI block error probability performance requirement only applies to the PUCCH format 2 with 22 UCI bits.

The 22bits UCI information case is assumed random information bit selection.

Which specific test(s) are applicable to BS is based on the test applicabity rules defines in clause 8.1.2.6

#### 8.3.9.2 Minimum requirement

The minimum requirement is in TS 38.104 [2] clause 8.3.10.

#### 8.3.9.3 Test purpose

The test shall verify the receiver's ability to detect UCI under multipath fading propagation conditions for a given SNR.

#### 8.3.9.4 Method of test

##### 8.3.9.4.1 Initial conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1

##### 8.3.9.4.2 Procedure

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

2) Adjust the AWGN generator, according to the subcarrier spacing and channel bandwidth defined in table 8.3.9.4.2-1.

**Table 8.3.9.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 20 | -77.4 dBm / 18.36 MHz |

3) The characteristics of the wanted signal shall be configured according to TS 38.211 [17]. The specific test parameters are configured as below:

**Table 8.3.9.4.2-2: Test parameters**

|  |  |
| --- | --- |
| **Parameter** | **Value**  |
| Modulation order | QSPK |
| Intra-slot frequency hopping | N/A |
| Number of symbols | 1 |
| The number of UCI information bits | 22 |
| First symbol | 13 |
| DM-RS sequence generation | *NID*0=0 |
| Number of interlaces | 1 |
| Interlace index | 0(note 1) |
| OCC-length-r16 | Not configured |
| NOTE 1: RBs 0,10,20,…,100 are allocated for 15kHz SCS and RBs 0, 5, 10,…,50 are allocated for 30kHz SCS |

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

5) Adjust the equipment so that the SNR specified in table 8.3.9.5-1 or table 8.3.9.5-2 is achieved at the BS input during the UCI transmissions.

6) The signal generator sends a test pattern with the pattern outlined in figure 8.3.9.4.2-1. The following statistics are kept: the number of incorrectly decoded UCI.



**Figure 8.3.9.4.2-1: Test signal pattern for interlaced PUCCH format 2 demodulation tests**

#### 8.3.9.5 Test requirement

The fraction of incorrectly decoded UCI is shall be less than 1% for the SNR listed in table 8.3.9.5-1 and table 8.3.9.5-2.

**Table 8.3.9.5-1: Required SNR for interlaced PUCCH format 2 with 15 kHz SCS, 20 MHz channel bandwidth**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of Tx antennas** | **Number of RX antennas** | **Cyclic Prefix** | **Propagation conditions and correlation matrix****(Annex G)** | **SNR(dB)** |
| 1 | 2 | Normal | TDLA30-10 Low | TBD |

**Table 8.3.9.5-2: Required SNR for interlaced PUCCH format 2 with 30 kHz SCS, 20 MHz channel bandwidth**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of Tx antennas** | **Number of RX antennas** | **Cyclic Prefix** | **Propagation conditions and correlation matrix****(Annex G)** | **SNR(dB)** |
| 1 | 2 | Normal | TDLA30-10 Low | TBD |

### 8.3.10 Performance requirements for interlaced PUCCH format 3

#### 8.3.10.1 Definition and applicabilty

The performance requirement of interlaced PUCCH format 3 for ACK missed detection is determined by the two parameters: probability of false detection of the ACK and the probability of detection of ACK. The performance is measured by the required SNR at probability of detection equal to 0.99. The probability of false detection of the ACK shall be 0.01 or less.

The probability of false detection of the ACK is defined as a probability of erroneous detection of the ACK when input is only noise.

The probability of detection of ACK is defined as probability of detection of the ACK when the signal is present.

The ACK missed deection requirement only applies to the PUCCH format 3 with 4 UCI bits. The UCI information only contrains ACK/NACK information.

The 4bits UCI information case is further defined with the bitmap as [0 0 0 0].

Which specific test(s) are applicable to BS is based on the test applicabity rules defines in clause 8.1.2.6

#### 8.3.10.2 Minimum requirement

The minimum requirement is in TS 38.104 [2] clause 8.3.11.

#### 8.3.10.3 Test purpose

The test shall verify the receiver's ability to detect ACK bits under multipath fading propagation conditions for a given SNR.

#### 8.3.10.4 Method of test

##### 8.3.10.4.1 Initial conditions

Test environment: Normal; see annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1

##### 8.3.10.4.2 Procedure

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

2) Adjust the AWGN generator, according to the subcarrier spacing and channel bandwidth defined in table 8.3.10.4.2-1.

**Table 8.3.10.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 20 | -77.4 dBm / 18.36 MHz |

3) The characteristics of the wanted signal shall be configured according to TS 38.211 [17]. The specific test parameters are configured as below:

**Table 8.3.10.4.2-2: Test parameters**

|  |  |
| --- | --- |
| **Parameter** | **Value** |
| Modulation order | QPSK |
| Intra-slot frequency hopping | N/A |
| Group and sequence hopping | Neither |
| Hopping ID | 0 |
| Number of symbols | 4 |
| The number of UCI information bits | 4 |
| Index of OCC | Not configured |
| Length of OCC | Not configured |
| Cyclic shift index for DMRS | 0 |
| Number of Interlace | 1 |
| Interlace index | 0(note 1) |
| NOTE 1: RBs 0,10,20,…,90 are allocated for 15kHz SCS and RBs 0,5,10,…,45 are allocated for 30kHz SCS |

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

5) Adjust the equipment so that the SNR specified in table 8.3.10.5-1 or table 8.3.10.5-2 is achieved at the BS input during the UCI transmissions.

6) The signal generator sends a test pattern with the pattern outlined in figure 8.3.10.4.2-1. The following statistics are kept: the number of ACKs detected in the idle periods and the number of missed ACKs.



**Figure 8.3.10.4.2-1: Test signal pattern for interlaced PUCCH format 3 demodulation tests**

#### 8.3.10.5 Test requirement

The fraction of falsely detected ACKs shall be less than 1% and the fraction of correctly detected ACKs shall be larger than 99% for the SNR listed in table 8.3.10.5-1 and table 8.3.10.5-2.

**Table 8.3.10.5-1: Required SNR for interaced PUCCH format 3 with 15 kHz SCS, 20 MHz channel bandwidth**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of Tx antennas** | **Number of RX antennas** | **Cyclic Prefix** | **Propagation conditions and correlation matrix****(Annex G)** | **Additional DM-RS configuration** | **SNR(dB)** |
| 1 | 2 | Normal | TDLA30-10 Low | No additional DM-RS | TBD |

**Table 8.3.10.5-2: Required SNR for interlaced PUCCH format 3 with 30 kHz SCS, 20 MHz channel bandwidth**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Number of Tx antennas** | **Number of RX antennas** | **Cyclic Prefix** | **Propagation conditions and correlation matrix****(Annex G)** | **Additional DM-RS configuration** | **SNR(dB)** |
| 1 | 2 | Normal | TDLA30-10 Low | No additional DM-RS | TBD |

######################### End of change#4 ############################

######################### Start of change#5 ############################

## 8.4 Performance requirements for PRACH

### 8.4.1 PRACH false alarm probability and missed detection

#### 8.4.1.1 Definition and applicability

The performance requirement of PRACH for preamble detection is determined by the two parameters: total probability of false detection of the preamble (Pfa) and the probability of detection of preamble (Pd). The performance is measured by the required SNR at probability of detection, Pd of 99%. Pfa shall be 0.1% or less.

Pfa is defined as a conditional total probability of erroneous detection of the preamble (i.e. erroneous detection from any detector) when input is only noise.

Pd is defined as conditional probability of detection of the preamble when the signal is present. The erroneous detection consists of several error cases – detecting only different preamble(s) than the one that was sent, not detecting any preamble at all, or detecting the correct preamble but with the out-of-bounds timing estimation value.

For AWGN and TDLC300-100, and TDLA30-10, a timing estimation error occurs if the estimation error of the timing of the strongest path is larger than the time error tolerance values given in table 8.4.1.1-1.

Table 8.4.1.1-1: Time error tolerance for AWGN and TDLC300-100

|  |  |  |
| --- | --- | --- |
| PRACH  | PRACH SCS  | Time error tolerance |
| preamble | (kHz) | AWGN | TDLC300-100 | TDLA30-10 |
| 0 | 1.25 | 1.04 us | 2.55 us | N/A |
| A1, A2, A3, B4, | 15 | 0.52 us | 2.03 us | 0.67 us |
| C0, C2 | 30 | 0.26 us | 1.77 us | 0.41 us |

The test preambles for normal mode are listed in table A.6-1. The test preambles for high speed train restricted set type A are listed in table A.6-3 and the test preambles for high speed train restricted set type B are listed in table A.6-4. The test preambles for high speed train short formats are listed in table A.6-5. The test preambles for PRACH with LRA=1151 and LRA=571 are listed in table A.6-6.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2. The performance requirements for high speed train (table 8.4.1. 6-1 to 8.4.1.6-4) are optional.

#### 8.4.1.2 Minimum requirement

The minimum requirement is in TS 38.104 [2] clause 8.4.1.2 and 8.4.2.2, 8.4.2.3, and 8.4.2.4.

#### 8.4.1.3 Test purpose

The test shall verify the receiver's ability to detect PRACH preamble under static conditions and multipath fading propagation conditions for a given SNR.

#### 8.4.1.4 Method of test

##### 8.4.1.4.1 Initial conditions

Test environment: Normal; see annex B.2.

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

##### 8.4.1.4.2 Procedure

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

2) Adjust the AWGN generator, according to the SCS and channel bandwidth.

Table 8.4.1.4.2-1: AWGN power level at the BS input

|  |  |  |
| --- | --- | --- |
| Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 15  | 5 | -83.5 dBm / 4.5MHz |
|  | 10 | -80.3 dBm / 9.36MHz |
|  | 20 | -77.2 dBm / 19.08MHz |
| 30  | 10 | -80.6 dBm / 8.64MHz |
|  | 20 | -77.4 dBm / 18.36MHz |
|  | 40 | -74.2 dBm / 38.16MHz |
|  | 100 | -70.1 dBm / 98.28MHz |

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 parameter *msg1-FrequencyStart* is set to 0.

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

5) Adjust the frequency offset of the test signal according to table 8.4.1.5-1 or 8.4.1.5-2 or 8.4.1.5-3 or 8.4.1.6-1 or 8.4.1.6-2 or 8.4.1.6-3 or 8.4.1.6-4 or 8.4.1.7-1 or 8.4.1.7-2.

6) Adjust the equipment so that the SNR specified in table 8.4.1.5-1 or 8.4.1.5-2 or 8.4.1.5-3 or 8.4.1.6-1 or 8.4.1.6-2 or 8.4.1.6-3 or 8.4.1.6-4 or 8.4.1.7-1 or 8.4.1.7-2 is achieved at the BS input during the PRACH preambles.

7) The test signal generator sends a preamble and the receiver tries to detect the preamble. This pattern is repeated as illustrated in figure 8.4.1.4.2-1. The preambles are sent with certain timing offsets as described below. The following statistics are kept: the number of preambles detected in the idle period and the number of missed preambles.



Figure 8.4.1.4.2-1: PRACH preamble test pattern

The timing offset base value for PRACH preamble format 0 is set to 50% of Ncs. This offset is increased within the loop, by adding in each step a value of 0.1us, until the end of the tested range, which is 0.9us. Then the loop is being reset and the timing offset is set again to 50% of Ncs. The timing offset scheme for PRACH preamble format 0 is presented in figure 8.4.1.4.2-2.



Figure 8.4.1.4.2-2: Timing offset scheme for PRACH preamble format 0

The timing offset base value for PRACH preamble format A1, A2, A3, B4, C0 and C2 is set to 0. This offset is increased within the loop, by adding in each step a value of 0.1us, until the end of the tested range, which is 0.8 us. Then the loop is being reset and the timing offset is set again to 0. The timing offset scheme for PRACH preamble format A1, A2, A3, B4, C0 and C2 is presented in figure 8.4.1.4.2-3.



Figure 8.4.1.4.2-3: Timing offset scheme for PRACH preamble format A1 A2, A3, B4, C0 and C2

#### 8.4.1.5 Test requirement for Normal Mode

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in tables 8.4.1.5-1 to 8.4.1.5-3.

Table 8.4.1.5-1: PRACH missed detection test requirements for Normal Mode, 1.25 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX  | Number of RX  | Propagation conditions  | Frequency offset | SNR (dB) |
| antennas | antennas | and correlation matrix (annex G) |  | Burst format 0 |
| 1 | 2 | AWGN | 0 |  -14.2 |
|  |  | TDLC300-100 Low | 400 Hz  | -6.0 |
|  | 4 | AWGN | 0 |  -16.4 |
|  |  | TDLC300-100 Low | 400 Hz  |  -11.3 |
|  | 8 | AWGN | 0 |  -18.6 |
|  |  | TDLC300-100 Low | 400 Hz  |  -15.2 |

Table 8.4.1.5-2: PRACH missed detection test requirements for Normal Mode, 15 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number | Number | Propagation | Frequency  | SNR (dB) |
| of TX antennas | of RX antennas | conditions and correlation matrix (annex G) | offset | Burst format A1 | Burst format A2 | Burst format A3 | Burst format B4 | Burst format C0 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -9.0 | -12.3 | -13.9 | -16.5 | -6.0 | -12.2 |
|  |  | TDLC300-100 Low | 400 Hz | -1.5 | -4.2 | -6.0 | -8.2 | 1.4 | -4.3 |
|  | 4 | AWGN | 0 | -11.3 | -14.0 | -15.7 | -18.7 | -8.4 | -13.8 |
|  |  | TDLC300-100 Low | 400 Hz | -6.7 | -9.7 | -11.1 | -13.2 | -3.7 | -9.6 |
|  | 8 | AWGN | 0 | -13.5 | -16.4 | -17.9 | -20.9 | -10.8 | -16.3 |
|  |  | TDLC300-100 Low | 400 Hz | -10.4 | -13.3 | -14.6 | -16.7 | -7.5 | -13.3 |

Table 8.4.1.5-3: PRACH missed detection test requirements for Normal Mode, 30 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number | Number | Propagation | Frequency  | SNR (dB) |
| of TX antennas | of RX antennas | conditions and correlation matrix (annex G) | offset | Burst format A1 | Burst format A2 | Burst format A3 | Burst format B4 | Burst format C0 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -8.8 | -11.7 | -13.5 | -16.2 | -5.8 | -11.6 |
|  |  | TDLC300-100 Low | 400 Hz | -2.2 | -5.1 | -6.8 | -9.3 | 0.7 | -5.0 |
|  | 4 | AWGN | 0 | -11.1 | -13.9 | -15.6 | -18.7 | -8.3 | -13.8 |
|  |  | TDLC300-100 Low | 400 Hz | -6.6 | -9.8 | -11.4 | -13.9 | -3.9 | -9.8 |
|  | 8 | AWGN | 0 | -13.4 | -16.3 | -17.8 | -20.8 | -10.7 | -16.2 |
|  |  | TDLC300-100 Low | 400 Hz | -10.1 | -13.1 | -14.5 | -17.0 | -7.2 | -13.1 |

Table 8.4.1.5-4: Void

Table 8.4.1.5-5: Void

#### 8.4.1.6 Test requirement for high speed train

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in tables 8.4.1.6-1 to 8.4.1.6-4.

Table 8.4.1.6-1: PRACH missed detection requirements for high speed train, burst format 0, restricted set type A, 1.25 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX  | Number of RX  | Propagation conditions  | Frequency offset | SNR (dB) |
| antennas | antennas | and correlation matrix (annex G) |  | Burst format 0 |
| 1 | 2 | AWGN | 625 Hz | -11.7 |
|  |  | AWGN | 1340 Hz | -13.5 |
|  |  | TDLC300-100 Low | 0 Hz | [-5.7] |
|  | 4 | AWGN | 625 Hz | -14.2 |
|  |  | AWGN | 1340 Hz | -15.9 |
|  |  | TDLC300-100 Low | 0 Hz | [-11.2] |
|  | 8 | AWGN | 625 Hz | -16.2 |
|  |  | AWGN | 1340 Hz | -18.1 |
|  |  | TDLC300-100 Low | 0 Hz | [-15.6] |

Table 8.4.1.6-2: PRACH missed detection requirements for high speed train, burst format 0, restricted set type B, 1.25 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX  | Number of RX  | Propagation conditions  | Frequency offset | SNR (dB) |
| antennas | antennas | and correlation matrix (annex G) |  | Burst format 0 |
| 1 | 2 | AWGN | 625 Hz | -11.3 |
|  |  | AWGN | 2334 Hz | -12.8 |
|  |  | TDLC300-100 Low | 0 Hz | [-5.4] |
|  | 4 | AWGN | 625 Hz | -13.7 |
|  |  | AWGN | 2334 Hz | -15.1 |
|  |  | TDLC300-100 Low | 0 Hz | [-11.1] |
|  | 8 | AWGN | 625 Hz | -16.0 |
|  |  | AWGN | 2334 Hz | -17.1 |
|  |  | TDLC300-100 Low  | 0 Hz | [-15.4] |

Table 8.4.1.6-3: PRACH missed detection requirements for high speed train, 15 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of  | Number of  | Propagation  | Frequency  | SNR (dB) |
| TX antennas | RX antennas | conditions and correlation matrix (Annex G) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 1740 Hz | -11.0 | -14.0 | -10.8 |
|  | 4 | AWGN | 1740 Hz | -13.2 | -16.4 | -13.1 |
|  | 8 | AWGN | 1740 Hz | -15.3 | -17.9 | -15.2 |

Table 8.4.1.6-4: PRACH missed detection requirements for high speed train, 30 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of  | Number of  | Propagation  | Frequency  | SNR (dB) |
| TX antennas | RX antennas | conditions and correlation matrix (Annex G) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 3334 Hz | -10.9 | -14.3 | -10.7 |
|  | 4 | AWGN | 3334 Hz | -13.1 | -16.4 | -13.1 |
|  | 8 | AWGN | 3334 Hz | -15.1 | -18.1 | -15.1 |

#### 8.4.1.7 Test requirement for PRACH with LRA=1151 and LRA=571

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in tables 8.4.1.7-1 and 8.4.1.7-2.

Table 8.4.1.7-1: Missed detection requirements for PRACH with LRA=1151, 15 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of  | Number of | Propagation | Frequency | SNR (dB) |
| TX antennas | RX antennas | conditions and correlation matrix (Annex G) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | [TBD] | [TBD] | [TBD] |
|  |  | TDLA30-10 Low | 400 Hz | [TBD] | [TBD] | [TBD] |

Table 8.4.1.7-2: Missed detection requirements for PRACH with LRA=571, 30 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of  | Number of | Propagation | Frequency | SNR (dB) |
| TX antennas | RX antennas | conditions and correlation matrix (Annex G) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | [TBD] | [TBD] | [TBD] |
|  |  | TDLA30-10 Low | 400 Hz | [TBD] | [TBD] | [TBD] |

######################### End of change#5 ############################

######################### Start of change#6 ############################

Table A.5-3: FRC parameters for FR1 interlaced PUSCH performance requirements, transform precoding disabled, *additional DM-RS position = pos1* and 1 transmission layer (64QAM, R=567/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR1-A5-15 | G-FR1-A5-16 |
| Subcarrier spacing [kHz] | 15 | 30 |
| Allocated resource blocks | 11 | 11 |
| CP-OFDM Symbols per slot (Note 1) | 12 | 12 |
| Modulation | 64QAM | 64QAM |
| Code rate  | 567/1024 | 567/1024 |
| Payload size (bits) | 5248 | 5248 |
| Transport block CRC (bits) | 24 | 24 |
| Code block CRC size (bits) | 24 | 24 |
| Number of code blocks - C | 1 | 1 |
| Code block size including CRC (bits) (Note 2) | 5272 | 5272 |
| Total number of bits per slot | 9504 | 9504 |
| Total symbols per slot | 1584 | 1584 |
| NOTE 1: *DM-RS configuration type* = 1 with *DM-RS duration = single-symbol DM-RS* and the number of DM-RS CDM groups without data is 2, *Additional DM-RS position = pos1*, *l0*= 2 and *l* =11 for PUSCH mapping type A, *l0*= 0 and *l* =10 for PUSCH mapping type B as per table 6.4.1.1.3-3 of TS 38.211 [5].NOTE 2: Code block size including CRC (bits) equals to *K'* in clause 5.2.2 of TS 38.212 [15]. |

######################### End of change#6 ############################

######################### Start of change#7 ############################

# A.6 PRACH test preambles

Table A.6-1 Test preambles for Normal Mode in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| 0 | 1.25 | 13 | 22 | 32 |
| A1, A2, A3,  | 15 | 23 | 0 | 0 |
| B4, C0, C2 | 30 | 46 | 0 | 0 |

Table A.6-2: Void

Table A.6-3: Test preambles for high speed train restricted set type A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| 0 | 1.25 | 15 | 384 | 0 |

Table A.6-4: Test preambles for high speed train restricted set type B

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| 0 | 1.25 | 15 | 30 | 30 |

Table A.6-5: Test preambles for high speed train short formats

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A2, B4, C2 | 15 | 23 | 0 | 0 |
|  | 30 | 46 | 0 | 0 |

Table A.6-6: Test preambles for PRACH with LRA=1151 and LRA=571

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A2, B4, C2 | 15 | 164 | 0 | 0 |
|  | 30 | 190 | 0 | 0 |

######################### End of change#7 ############################