**3GPP TSG- Meeting #**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *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 |  | Core Network |  |

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| ***Source to WG:*** |  | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | |  | | | | | | | | |
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| ***Summary of change:*** | |  | | | | | | | | |
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| ***Consequences if not approved:*** | |  | | | | | | | | |
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| ***Clauses affected:*** | |  | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

8.2.1.4.2 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 channel bandwidth, defined in table 8.2.1.4.2-1.

**Table 8.2.1.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
|  | 5 | -86.5 dBm / 4.5MHz |
| 15 kHz | 10 | -83.3 dBm / 9.36MHz |
|  | 20 | -80.2 dBm / 19.08MHz |
|  | 10 | -83.6 dBm / 8.64MHz |
| 30 kHz | 20 | -80.4 dBm / 18.36MHz |
|  | 40 | -77.2 dBm / 38.16MHz |
|  | 100 | -73.1 dBm / 98.28MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.2.1.4.2-2.

**Table 8.2.1.4.2-2: Test parameters for testing PUSCH**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Disabled |
| Default TDD UL-DL pattern (Note 1) | | 15 kHz SCS:  3D1S1U, S=10D:2G: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 |
|  | 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}, {0, 1} |
|  | DM-RS sequence generation | NID0=0, nSCID =0 |
| Time domain resource assignment | PUSCH mapping type | A, B |
|  | Start symbol | 0 |
|  | Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | Full applicable test bandwidth |
|  | Frequency hopping | Disabled |
| TPMI index for 2Tx two layer spatial multiplexing transmission | | 0 |
| 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.

8.2.2.4.2 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 SCS and channel bandwidth, defined in table 8.2.2.4.2-1.

**Table 8.2.2.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 5 | -86.5 dBm / 4.5MHz |
| 30 | 10 | -83.6 dBm / 8.64MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.2.2.4.2-2.

**Table 8.2.2.4.2-2: Test parameters for testing PUSCH**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Enabled |
| Default TDD UL-DL pattern (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 |
|  | 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, group hopping and sequence hopping are disabled |
| Time domain resource assignment | PUSCH mapping type | A, B |
|  | Start symbol | 0 |
|  | Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | 15 kHz SCS: 25 PRBs in the middle of the test bandwidth  30 kHz SCS: 24 PRBs in the middle of the 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. | | |

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 8.2.2.5-1 to 8.2.2.5-4 is achieved at the BS input.

6) For each of the reference channels in table 8.2.2.5-1 to 8.2.2.5-4 applicable for the base station, measure the throughput.

8.2.3.4.2 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 combination of SCS and channel bandwidth defined in table 8.2.3.4.2-1.

**Table 8.2.3.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 30 | 10 | -80.6 dBm / 8.64 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

3) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A and the specific test parameters are configured as below. The UCI information bit payload per slot is equal to 7 bits with CSI part 1 5bits, CSI part 2 2bit; and the UCI information bit payload per slot is equal to 40 bits with CSI part 1 20bits, CSI part 2 20bits.

**Table: 8.2.3.4.2-2: Test parameters for testing UCI multiplexed on PUSCH**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Disabled |
| Default TDD UL-DL pattern (Note 1) | | 30 kHz SCS:  7D1S2U, S=6D:4G:4U |
| HARQ | Maximum number of HARQ transmissions | 1 |
|  | RV sequence | 0 |
| 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 resource assignment | PUSCH mapping type | A, B |
|  | 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 |
|  | Number of CSI part 1 and CSI part 2 information bit payload | {5,2}, {20, 20} |
|  | *scaling* | 1 |
|  | *betaOffsetACK-Index1* | 11 |
| UC | *betaOffsetCSI-Part1-Index1 and betaOffsetCSI-Part1-Index2* | 13 |
|  | *betaOffsetCSI-Part2-Index1 and betaOffsetCSI-Part2-Index2* | 13 |
|  | UCI partition for frequency hopping | 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 8.2.3.5-1 to 8.2.3.5-4 is achieved at the BS input during the UCI multiplexed on PUSCH transmissions.

6) The signal generators sends a test pattern where UCI with CSI part 1 and CSI part 2 information can be multiplexed on PUSCH. The following statistics are kept: the number of incorrectly decoded CSI part 1 information transmission, the number of incorrectly decoded CSI part 2 information transmission during UCI multiplexed on PUSCH transmission.

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 |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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.

8.2.5.4.2 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 combination of SCS and channel bandwidth defined in table 8.2.5.4.2-1.

**Table 8.2.5.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 5 | -86.5 dBm / 4.5MHz |
|  | 10 | -83.3 dBm / 9.36MHz |
| 30 | 10 | -86.3 dBm / 8.64MHz |
|  | 40 | -77.2 dBm / 38.16MHz |

|  |
| --- |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. |

3) The characteristics of the wanted signals (transmitted by moving UE) shall be configured according to the corresponding UL reference measurement channel defined in annex A and the test parameters in Table 8.2.5.4.2-2.

**Table 8.2.5.4.2-2 Test parameters for testing UL timing adjustment**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Disabled |
| Uplink-downlink allocation for TDD (Note1) | | 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 |
|  | 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(s) | {0} |
|  | DM-RS sequence generation | NID0=0, nSCID =0 for moving UE  NID0=1, nSCID =1 for stationary UE |
| Time domain resource assignment | PUSCH mapping type | A, B |
|  | Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | 5 MHz CBW/15kHz SCS: 12 RB for each UE  10MHz CBW/15kHz SCS: 25 RB for each UE  10MHz CBW/30kHz SCS: 12 RB for each UE  40MHz CBW/30kHz SCS: 50 RB for each UE |
|  | Starting PRB index | Moving UE: 0  Stationary UE: 12 for 5MHz CBW/15kHz SCS,  25 for 10 MHz CBW/15kHz SCS, 12 for 10MHz CBW/30kHz SCS and 50 for 40 MHz CBW/30kHz SCS |
|  | Frequency hopping | Disabled |
| SRS resource allocation | Slots in which sounding RS is transmitted (Note2) | For FDD: slot #1 in radio frames  For TDD:  last symbol in slot #3 in radio frames for 15kHz  last symbol in slot #7 in radio frames for 30kHz |
|  | SRS resource allocation | 15 kHz SCS:  CSRS =5, BSRS =0, for 20 RB  CSRS = 11, BSRS =0, for 40 RB  30 kHz SCS:  CSRS =5, BSRS =0, for 20 RB  CSRS = 21, BSRS =0, for 80 RB |
| NOTE 1: The same requirements are applicable to FDD and TDD with different UL-DL patterns.  NOTE 2: The transmission of SRS is optional. And the transmission comb and SRS periodic are configured as KTC = 2, and TSRS = 10 respectively. | | |

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

5) Adjust the equipment so that required SNR specified in Table 8.2.5.5-1 to Table 8.2.5.5-2 is achieved at the BS input for high speed train.

Adjust the equipment so that required SNR specified in Table 8.2.5.6-1 to Table 8.2.5.6-2 is achieved at the BS input for normal mode.

6) For each of the reference channels in Table 8.2.5.5-1 to Table 8.2.5.5-2 applicable for the base station, measure the throughput for high speed train.

For each of the reference channels in Table 8.2.5.6-1 to Table 8.2.5.6-2 applicable for the base station, measure the throughput for normal mode.

8.2.6.4.2 Procedure

1) Connect the BS tester generating the wanted signal 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 8.2.6.4.2-1.

**Table 8.2.6.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 kHz | 5 | -86.5 dBm / 4.5MHz |
| 10 | -83.3 dBm / 9.36MHz |
| 30 kHz | 10 | -83.6 dBm / 8.64MHz |
| 40 | -77.2 dBm / 38.16MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.2.6.4.2-2.

**Table 8.2.6.4.2-2: Test parameters for testing PUSCH with 0.001% BLER**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Disabled |
| Default TDD UL-DL pattern (Note 1) | | 15 kHz SCS:  3D1S1U, S=10D:2G:2U  30 kHz SCS:  7D1S2U, S=6D:4G:4U |
| HARQ | Maximum number of HARQ transmissions | 1 |
| RV sequence | 0 |
| 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 | 1 |
| 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 resource assignment | PUSCH mapping type | A, B |
| 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. | | |

4) No multipath fading channel is included in the test.

5) Adjust the equipment so that required SNR specified in table 8.2.6.5-1 to 8.2.6.5-8 is achieved at the BS input.

6) For each of the reference channels in table 8.2.6.5-1 to 8.2.6.5-8 applicable for the base station, measure the BLER. BLER is evaluated based on the test methodology described in Annex I.

8.2.7.4.2 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, defined in table 8.2.7.4.2-1.

**Table 8.2.7.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 kHz | 5 | -86.5 dBm / 4.5MHz |
| 10 | -83.3 dBm / 9.36MHz |
| 30 kHz | 10 | -83.6 dBm / 8.64MHz |
| 40 | -77.2 dBm / 38.16MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.2.7.4.2-2.

**Table 8.2.7.4.2-2: Test parameters for testing PUSCH repetition Type A**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Disabled |
| Default TDD UL-DL pattern (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, 3, 0, 3 [Note 2] |
| 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 | 0 |
| DM-RS sequence generation | NID0=0, nSCID =0 |
| Time domain resource assignment | PUSCH mapping type | A, B |
| Start symbol | 0 |
| Allocation length | 14 |
| PUSCH aggregation factor | 30 kHz SCS: n2  15 kHz SCS: n2 for FDD and n8 for TDD [Note 3] |
| 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 pattern.  Note 2: The effective RV sequence is {0, 2, 3, 1} with slot aggregation.  Note 3: The intention of this configuration is to have two effective transmissions of the transport block. To achieve this for the standard TDD pattern captured in this table, a value of n8 is necessary, while for FDD a value of n2 is necessary. | | |

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 8.2.7.5-1 to 8.2.7.5-8 is achieved at the BS input.

6) For each of the reference channels in table 8.2.7.5-1 to 8.2.7.5-8 applicable for the base station, measure the BLER.

8.2.8.4.2 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 8.2.8.4.2-1.

**Table 8.2.8.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 kHz | 5 | -86.5 dBm / 4.5MHz |
| 10 | -83.3 dBm / 9.36MHz |
| 30 kHz | 10 | -83.6 dBm / 8.64MHz |
| 40 | -77.2 dBm / 38.16MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.2.8.4.2-2.

**Table 8.2.8.4.2-2: Test parameters for testing PUSCH Mapping Type B with non-slot transmission**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Disabled |
| Default TDD UL-DL pattern (Note 1) | | 15 kHz SCS:  3D1S1U, S=10D:2G:2U  30 kHz SCS:  7D1S2U, S=6D:4G:4U |
| HARQ | Maximum number of HARQ transmissions | 1 |
| RV sequence | 0 |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| Number of additional DM-RS | 0 |
| 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 | B |
| Start symbol | 0 |
| Allocation length | 2 |
| PUSCH aggregation factor | 1 |
| 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 pattern. | | |

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 8.2.8.5-1 to 8.2.8.5-4 is achieved at the BS input.

6) For each of the reference channels in table 8.2.8.5-1 to 8.2.8.5-8 applicable for the base station, measure the throughput.

8.2.9.4.2 Procedure

1) Connect the BS tester generating the wanted signal, channel 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 8.2.9.4.2-1.

**Table 8.2.9.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 kHz | 10 | -83.3 dBm / 9.36MHz |
| 30 kHz | 40 | -77.2 dBm / 38.16MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.2.9.4.2-2.

**Table 8.2.9.4.2-2: Test parameters for testing msgA PUSCH for 2-step RA type**

|  |  |  |
| --- | --- | --- |
| **Parameter** | | **Value** |
| Transform precoding | | Disabled |
| Channel bandwidth | | 15 kHz SCS: 10 MHz |
|  | | 30 kHz SCS: 40 MHz |
| MCS | | 1 |
| DM-RS | DM-RS configuration type | 1 |
|  | DM-RS duration | single-symbol DM-RS |
|  | DM-RS position (*l0*) | 2 |
|  | Additional DM-RS position | pos2 or pos1 (Note 2) |
|  | 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 | Both A and B |
| Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | 2 PRBs |
| Starting PRB index | 0 |
| Frequency hopping | Disabled |
| Time offset (TO) Cycling (µs) | start:step:end | 15k SCS: 0:0.2:3.8 |
|
|  |  | 30k SCS: 0:0.1:2 |
|
| Test Metric | BLER | 0.01 |
| Note 1: The same requirements are applicable to FDD and TDD with different UL-DL patterns.  Note 2: For FR1, either pos 1 or pos 2 may be used for the test FRC. A pass with either of these possibilities is sufficient to demonstrate compliance to the core requirement.  Note 3: The power ratio between preamble and msgA (msgA-DeltaPreamble) is set to be sufficient to achieve 100% preamble detection. The SNR for the requirement is defined on the msgA PUSCH. | | |

4) The channel simulators shall be configured according to the corresponding channel model defined in annex G.3.

5) Adjust the equipment so that required SNR specified in table 8.2.9.5-1 to 8.2.9.5-4 is achieved at the BS input.

6) The test signal genentor send a MsgA including a preamble and PUSCH signal and the receiver tries to detect the MsgA signal. The MsgA signal is sent with a timing offset as described below.

The timing offset base value for MsgA signal is set to 0. For each newly transmitted MsgA, this offset is increased within the loop, by adding in each step a value of 0.2 us, until the end of the tested range, which is 3.8 us for 15kHz SCS or 2 us for 30kHz SCS. At the end of the testing range, the offset is reset to zero. The timing offset scheme for MsgA transmission is presented in Figure 8.2.9.4.2-1 for 30 kHz SCS and in Figure 8.2.9.4.2-2 for 15 kHz SCS.

****

**Figure 8.2.9.4.2-1: Timing offset scheme for MsgA transmission for BS type 1-C and type 1-H with 30 kHz SCS**

****

**Figure 8.2.9.4.2-2: Timing offset scheme for MsgA transmission for BS type 1-C and type 1-H with 15 kHz SCS**

7) For each of the reference channels in table 8.2.9.5-1 to 8.2.9.5-4 applicable for the base station, measure the BLER.

8.3.1.4.2 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 channel bandwidth and sub-carrier spacing defined in table 8.3.1.4.2-1.

**Table 8.3.1.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Subcarrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 5 | -83.5 dBm / 4.5 MHz |
|  | 10 | -80.3 dBm / 9.36 MHz |
|  | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 10 | -80.6 dBm / 8.64 MHz |
|  | 20 | -77.4 dBm / 18.36 MHz |
|  | 40 | -74.2 dBm / 38.16 MHz |
|  | 100 | -70.1 dBm / 98.28 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.3.1.4.2-2:

**Table 8.3.1.4.2-2: Test Parameters**

|  |  |
| --- | --- |
| **Parameter** | **Test** |
| number of UCI information bits | 1 |
| Number of PRBs | 1 |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | N/A for 1 symbol  Enabled for 2 symbols |
| First PRB after frequency hopping | The largest PRB index – (Number of PRBs – 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 13 for 1 symbol  12 for 2 symbols |

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 8.3.1.5-1 or table 8.3.1.5-2 is achieved at the BS input during the ACK transmissions.

6) The signal generator sends a test pattern with the pattern outlined in figure 8.3.1.4.2-1. The following statistics are kept: the number of ACKs detected in the idle periods and the number of missed ACKs.

****

**Figure 8.3.1.4.2-1: Test signal pattern for single user PUCCH format 0 demodulation tests**

8.3.2.1.4.2 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 8.3.2.1.4.2-1.

**Table 8.3.2.1.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 kHz | 5 | -83.5 dBm / 4.5 MHz |
|  | 10 | -80.3 dBm / 9.36 MHz |
|  | 20 | -77.2 dBm / 19.08 MHz |
| 30 kHz | 10 | -80.6 dBm / 8.64 MHz |
|  | 20 | -77.4 dBm / 18.36 MHz |
|  | 40 | -74.2 dBm / 38.16 MHz |
|  | 100 | -70.1 dBm / 98.28 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.3.2.1.4.2-2: Test parameters**

|  |  |
| --- | --- |
| **Parameter** | **Values** |
| Number of information bits | 2 |
| Number of PRBs | 1 |
| Number of symbols | 14 |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (nrofPRBs -1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |

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 8.3.2.1.5-1 and table 8.3.2.1.5-2 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.

8.3.2.2.4.2 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 8.3.2.2.4.2-1.

**Table 8.3.2.2.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 kHz | 5 | -83.5 dBm / 4.5 MHz |
|  | 10 | -80.3 dBm / 9.36 MHz |
|  | 20 | -77.2 dBm / 19.08 MHz |
| 30 kHz | 10 | -80.6 dBm / 8.64 MHz |
|  | 20 | -77.4 dBm / 18.36 MHz |
|  | 40 | -74.2 dBm / 38.16 MHz |
|  | 100 | -70.1 dBm / 98.28 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.3.2.2.4.2-2: Test parameters**

|  |  |
| --- | --- |
| **Parameter** | **Values** |
| Number of information bits | 2 |
| Number of PRBs | 1 |
| Number of symbols | 14 |
| First PRB prior to frequency hopping | 0 |
| Intra-frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (nrofPRBs – 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |

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 8.3.2.2.5-1 and table 8.3.2.2.5-2 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 8.3.2.1.4.2 for NACK to ACK detection. Both statistics are measured in the same testing.

**Figure 8.3.2.2.4.2-1: Void**

8.3.3.1.4.2 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 channel bandwidth defined in table 8.3.3.1.4.2-1.

**Table 8.3.3.1.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 5 | -83.5 dBm / 4.5 MHz |
|  | 10 | -80.3 dBm / 9.36 MHz |
|  | 20 | -77.2 dBm / 19.08MHz |
| 30 | 10 | -80.6 dBm / 8.64 MHz |
|  | 20 | -77.4 dBm / 18.36 MHz |
|  | 40 | -74.2 dBm / 38.16 MHz |
|  | 100 | -70.1 dBm / 98.28 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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

**Table 8.3.3.1.4.2-2: Test parameters**

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

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 8.3.3.1.5-1 and table 8.3.3.1.5-2 is achieved at the BS input during the UCI transmissions.

6) The signal generator sends a test pattern with the pattern outlined in figure 8.3.3.1.4.2-1. The following statistics are kept: the number of ACKs detected in the idle periods and the number of missed ACKs.

****

**Figure 8.3.3.1.4.2-1: Test signal pattern for PUCCH format 2 demodulation tests**

8.3.3.2.4.2 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 BS type 1-H respectively.

2) Adjust the AWGN generator, according to the channel bandwidth defined in table 8.3.3.2.4.2-1.

**Table 8.3.3.2.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 5 | -83.5 dBm / 4.5 MHz |
|  | 10 | -80.3 dBm / 9.36 MHz |
|  | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 10 | -80.6 dBm / 8.64 MHz |
|  | 20 | -77.4 dBm / 18.36 MHz |
|  | 40 | -74.2 dBm / 38.16 MHz |
|  | 100 | -70.1 dBm / 98.28 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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

**Table 8.3.3.2.4.2-2: Test parameters**

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

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 8.3.3.2.5-1 or table 8.3.3.2.5-2 is achieved at the BS input during the UCI transmissions.

6) The signal generator sends a test pattern with the pattern outlined in figure 8.3.3.2.4.2-1. The following statistics are kept: the number of incorrectly decoded UCI.

****

**Figure 8.3.3.2.4.2-1: Test signal pattern for PUCCH format 2 demodulation tests**

8.3.4.4.2 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 8.3.4.4.2-1.

**Table 8.3.4.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 5 | -83.5 dBm / 4.5 MHz |
|  | 10 | -80.3 dBm / 9.36 MHz |
|  | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 10 | -80.6 dBm / 8.64 MHz |
|  | 20 | -77.4 dBm / 18.36 MHz |
|  | 40 | -74.2 dBm / 38.16 MHz |
|  | 100 | 70.1 dBm / 98.28 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.3.4.4.2-2: Test parameters**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Test 1** | **Test 2** |
| Modulation order | QPSK | |
| First PRB prior to frequency hopping | 0 | |
| Intra-slot frequency hopping | enabled | |
| First PRB after frequency hopping | The largest PRB index - (Number of PRBs - 1) | |
| Group and sequence hopping | neither | |
| Hopping ID | 0 | |
| Number of PRBs | 1 | 3 |
| Number of symbols | 14 | 4 |
| The number of UCI information bits | 16 | 16 |
| First symbol | 0 | 0 |

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 8.3.4.5-1 or table 8.3.4.5-2 is achieved at the BS input during the UCI transmissions.

6) The signal generator sends a test pattern with the pattern outlined in figure 8.3.4.4.2-1. The following statistics are kept: the number of incorrectly decoded UCI.

****

**Figure 8.3.4.4.2-1: Test signal pattern for PUCCH format 3 demodulation tests**

8.3.5.4.2 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 8.3.5.4.2-1.

**Table 8.3.5.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 5 | -83.5 dBm / 4.5 MHz |
|  | 10 | -80.3 dBm / 9.36 MHz |
|  | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 10 | -80.6 dBm / 8.64 MHz |
|  | 20 | -77.4 dBm / 18.36 MHz |
|  | 40 | -74.2 dBm / 38.16 MHz |
|  | 100 | -70.1 dBm / 98.28 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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

**Table 8.3.5.4.2-2: Test parameters**

|  |  |
| --- | --- |
| **Parameter** | **Values** |
| Modulation order | QPSK |
| First PRB prior to frequency hopping | 0 |
| Number of PRBs | 1 |
| Intra-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (Number of PRBs - 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Number of symbols | 14 |
| The number of UCI information bits | 22 |
| First symbol | 0 |
| Length of the orthogonal cover code | n2 |
| Index of the orthogonal cover code | n0 |

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 8.3.5.5-1 or table 8.3.5.5-2 is achieved at the BS input during the UCI transmissions.

6) The signal generator sends a test pattern with the pattern outlined in figure 8.3.5.4.2-1. The following statistics are kept: the number of incorrectly decoded UCI.

****

**Figure 8.3.5.4.2-1: Test signal pattern for PUCCH format 4 demodulation tests**

8.3.6.1.1.4.2 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 combinations of SCS and channel bandwidth defined in Table 8.3.6.1.1.4.2-1.

**Table 8.3.6.1.1.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 5 | -83.5 dBm / 4.5 MHz |
|  | 10 | -80.3 dBm / 9.36 MHz |
|  | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 10 | -80.6 dBm / 8.64 MHz |
|  | 20 | -77.4 dBm / 18.36 MHz |
|  | 40 | -74.2 dBm / 38.16 MHz |
|  | 100 | -70.1 dBm / 98.28 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.3.6.1.1.4.2-2: Test parameters for multi-slot PUCCH format 1**

|  |  |
| --- | --- |
| **Parameter** | **Test** |
| Number of information bits | 2 |
| Number of PRBs | 1 |
| Number of symbols | 14 |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | disabled |
| Inter-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (nrofPRBs – 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |
| Number of slots for PUCCH repetition | 2 |

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 8.3.6.1.1.5-1 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.

8.3.6.1.2.4.2 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 *BS type 1-H* respectively.

2) Adjust the AWGN generator, according to the combinations of SCS and channel bandwidth defined in table 8.3.6.1.2.4.2-1.

**Table 8.3.6.1.2.4.2-1: AWGN power level at the BS input**

|  |  |  |
| --- | --- | --- |
| **Sub-carrier spacing (kHz)** | **Channel bandwidth (MHz)** | **AWGN power level** |
| 15 | 5 | -83.5 dBm / 4.5 MHz |
|  | 10 | -80.3 dBm / 9.36 MHz |
|  | 20 | -77.2 dBm / 19.08 MHz |
| 30 | 10 | -80.6 dBm / 8.64 MHz |
|  | 20 | -77.4 dBm / 18.36 MHz |
|  | 40 | -74.2 dBm / 38.16 MHz |
|  | 100 | -70.1 dBm / 98.28 MHz |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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 8.3.6.1.2.4.2-2: Test parameters for multi-slot PUCCH format 1**

|  |  |
| --- | --- |
| **Parameter** | **Test** |
| Number of information bits | 2 |
| Number of PRBs | 1 |
| Number of symbols | 14 |
| First PRB prior to frequency hopping | 0 |
| Intra-slot frequency hopping | disabled |
| Inter-slot frequency hopping | enabled |
| First PRB after frequency hopping | The largest PRB index - (nrofPRBs – 1) |
| Group and sequence hopping | neither |
| Hopping ID | 0 |
| Initial cyclic shift | 0 |
| First symbol | 0 |
| Index of orthogonal cover code (*timeDomainOCC*) | 0 |
| Number of slots for PUCCH repetition | 2 |

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 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 8.3.6.1.1.4.2 for NACK to ACK detection. Both statistics are measured in the same testing.

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 |
| NOTE: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | |

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.

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 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**