**3GPP TSG-RAN WG4 Meeting #104-e R4-2214xxx**

**Electronic Meeting, 15 – 26 August, 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.141-1** | **CR** | **XXX** | **rev** | **-** | **Current version:** | **15.12.0** |  |
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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 | **X** | Core Network |  |

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| ***Title:***  | Big CR for TS 38.141-1 Maintenance Demod part (Rel-15, CAT F) |
|  |  |
| ***Source to WG:*** | MCC, Huawei, HiSilicon |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Perf |  | ***Date:*** | 2022-08-30 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | This big CR merges the following endorsed draft CRs. The reason for change in each endorsed draft CR is copied below:* R4-2214862

SNR description in Clause 8 General section has mis-leading expression which could leads to higher SNR than defined requirement. For N (noise energy) to calculate SNR, it needs to take noise energy where wanted signal (S) exists. However, current text can be interpret as total noise energy of entire one slot which, in some cases, is longer period than where wanted signal exists especially cases like PRACH as example. This interpretation makes noise energy density lower than defined requirement.* R4-2214550

There is no intra slot frequency hopping configured in PF2 test with ACK miss detection requirements, but the test parameters of intra slot hopping are still existing. |
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| ***Summary of change:*** | The summary of change in each each endorsed draft CR is copied below:* R4-2214862: Description of N is updated to clarify noise energy to calculate SNR is where wanted signal energy exists in time domain as well as frequency domain.
* R4-2214550: Delate all the test parameters and description about intra slot frequency hopping for PF2 test with ACK miss detection requirements.
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| ***Consequences if not approved:*** | The consequences if not approved for each endorsed draft CR are coppied below:* R4-2214862: Without this clarification, it’s possible to misinterpret requirement then resulted noise density lower than requirement value (higher SNR)
* R4-2214550: The test parameters of PF2 are confusing.
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|  |  |
| ***Clauses affected:*** | 8.1.1, 8.3.3 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **x** |  |  Test specifications | TS 38.141-2 |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*<START OF THE CHANGE 1 from R4-2214862>*

### 8.1.1 Scope and definitions

Conducted performance requirements specify the ability of the *BS type 1-C* or *BS type 1-H* to correctly demodulate signals in various conditions and configurations. Conducted performance requirements are specified at the *antenna connector(s)* (for *BS type 1-C*) and at the *TAB connector(s)* (for *BS type 1-H*).

Conducted performance requirements for the BS are specified for the fixed reference channels and the propagation conditions defined in TS 38.104 [2] annex A and annex H, respectively. The requirements only apply to those FRCs that are supported by the BS.

Unless stated otherwise, performance requirements apply for a single carrier only. Performance requirements for a BS supporting CA are defined in terms of single carrier requirements.

For FDD operation the requirements in clause 8 shall be met with the transmitter units associated with *antenna connectors* (for *BS type 1-C*) or *TAB connectors* (for *BS type 1-H*) in the *operating* *band* turned ON.

NOTE: In normal operating conditions *antenna connectors* (for *BS type 1-C*) or *TAB connectors* (for *BS type 1-H*) in FDD operation are configured to transmit and receive at the same time. The associated transmitter unit(s) may be OFF for some of the tests.

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

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

 SNR = S / N

 Where:

S is the total signal energy in a slot on a single *antenna connector* (for *BS type 1-C*) or on a single *TAB connector* (for *BS type 1-H*).

N is the noise energy in a bandwidth corresponding to the transmission bandwidth over the same duration where signal energy exists.

*<END OF THE CHANGE 1>*

*<START OF THE CHANGE 2 from R4-2214550>*

### 8.3.3 Performance requirements for PUCCH format 2

#### 8.3.3.1 ACK missed detection

##### 8.3.3.1.1 Definition and applicability

The performance requirement of PUCCH format 2 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.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2.

##### 8.3.3.1.2 Minimum requirements

The minimum requirements are in TS 38.104 [2] clause 8.3.4.

##### 8.3.3.1.3 Test purpose

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

##### 8.3.3.1.4 Method of test

###### 8.3.3.1.4.1 Initial Condition

Test environment: Normal, see annex B.2.

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

###### 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 |
| Starting RB location  | 0 |
| Intra-slot frequency hopping | N/A |
|  |  |
| 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

##### 8.3.3.1.5 Test requirements

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 8.3.3.1.5-1 and table 8.3.3.1.5-2.

Table 8.3.3.1.5-1: Required SNR for PUCCH format 2 with 15 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX | Number of RX | Cyclic Prefix | Propagation | Channel bandwidth / SNR (dB) |
| antennas | antennas |  | conditions and correlation matrix (annex G) | 5 MHz | 10 MHz | 20 MHz |
|  | 2 | Normal | TDLC300-100 Low | 6.4 | 6.2 | 6.5 |
| 1 | 4 | Normal | TDLC300-100 Low | 1.0 | 1.1 | 0.9 |
|  | 8 | Normal | TDLC300-100 Low | -2.9 | -2.9 | -2.9 |

Table 8.3.3.1.5-2: Required SNR for PUCCH format 2 with 30 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX | Number of RX | Cyclic Prefix | Propagation | Channel bandwidth / SNR (dB) |
| antennas | antennas |  | conditions and correlation matrix (annex G) | 10MHz | 20MHz | 40MHz | 100MHz |
|  | 2 | Normal | TDLC300-100 Low | 6.1 | 6.2 | 6.1 | 6.3 |
| 1 | 4 | Normal | TDLC300-100 Low | 0.9 | 0.8 | 0.9 | 1.0 |
|  | 8 | Normal | TDLC300-100 Low | -3.0 | -3.0 | -2.9 | -2.7 |

*<END OF THE CHANGE 2>*