**3GPP TSG-RAN WG4 Meeting #102-e draft R4-2207494**

**Electronic Meeting, 21st Feb – 3rd Mar, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.141-2** | **CR** | **xxxx** | **rev** | **-** | **Current version:** | **15.12.0** |  |
|  | | | | | | | | |
| *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:*** | Big CR for TS 38.141-2 Maintenance RF part (Rel-15, CAT F) | | | | | | | | | |
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| ***Source to WG:*** | MCC, Huawei | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Perf | | | | |  | ***Date:*** | | | 2022-03-07 |
|  |  | | | |  | |  | | |  |
| ***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 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This big CR merges the following endorsed draft CRs. The reason for change in each endorsed draft CR is copied below:   * R4-2207296 (On sweep time for unwanted emission testing (Rel-15)): Sweep time has critical impact for some emission test. However there is no definition on the sweep time for the concerning test in the current specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The summary of change in each each endorsed draft CR is copied below:   * R4-2207296 (On sweep time for unwanted emission testing (Rel-15)): Add the clarification on sweep time for true RMS detection mode. | | | | | | | | |
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| ***Consequences if not approved:*** | | The consequences if not approved for each endorsed draft CR are coppied below:   * R4-2207296 (On sweep time for unwanted emission testing (Rel-15)): Sweep time for true RMS detection mode is not clear, which will affect measurement accuracy of unwanted emission. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.7.3.4.2, 6.7.4.4.2, 6.7.5.2.4.2, 6.7.5.3.4.2, 6.7.5.4.4.2, 6.7.5.5.4.2, 6.8.4.2, 7.7.4.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS38.141-1 CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*------------------------------ Modified sections ------------------------------*

##### 6.7.3.4.2 Procedure

The following procedure for measuring TRP is based on the directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 6, 8, 9, 10, 11, 12 and 13.

1) Place the BS at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the BS with the test system.

3) The measurement devices characteristics shall be:

- measurement filter bandwidth: defined in clause 6.7.3.5.

- detection mode: true RMS voltage or true power averaging.

The emission power should be averaged over an appropriate time duration to ensure the measurement is within the measurement uncertainty in Table 4.1.2.2-1.

4) For single carrier operation, set the BS to transmit according to the applicable test configuration in clause 4.8 using the corresponding test model(s) in clause 4.9.2 at manufacturers declared *rated carrier output power* (Prated,c,TRP).

For a BS declared to be capable of multi-carrier and/or CA operation use the applicable test signal configuration and corresponding power setting specified in clauses 4.7.2 and 4.8 using the corresponding test model(s) in clause 4.9.2 on all carriers configured.

5) Orient the positioner (and BS) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

6) Measure the absolute power of the assigned channel frequency and the (adjacent channel frequency).

7) Repeat step 5-6 for all directions in the appropriated TRP measurement grid needed for TRPEstimate (see annex I).

8) Calculate TRPEstimate for the absolute total radiated power of the wanted channel and the adjacent channel using the measurements made in Step 7.

9) Calculate relative ACLR estimate.

NOTE 1: ACLR is calculated by the ratio of the absolute TRP of the assigned channel frequency and the absolute TRP of the adjacent frequency channel.

NOTE 2: For FR1 the measurement uncertainty of the reverberation chamber for the relative ACLR is higher than the measurement uncertainty in clause 4.1.2 the test requirements in table 6.7.3.5.1-1 shall be tightened following the procedure in clause 4.1.3.

10) Measure OTA ACLR for the frequency offsets both side of channel frequency as specified in table 6.7.3.5.1-1 for *BS type 1-O* or table 6.7.3.5.2-1for *BS type 2-O* respectively. In multiple carrier case only offset frequencies below the lowest and above the highest carrier frequency used shall be measured.

11) For the OTA ACLR requirement applied inside sub-block gap for non-contiguous spectrum operation or inside *Inter RF Bandwidth gap* for multi-band operation:

a) Measure OTA ACLR inside sub-block gap or *Inter RF Bandwidth gap*, if applicable.

b) Measure OTA CACLR inside sub-block gap or *Inter RF Bandwidth gap*, if applicable.

12) Repeat the test with the channel set-up using NR- FR1-TM1.2 defined in clause 4.9.2 in TS 38.141-1 [3] for *BS type 1-O*.

In addition, for *multi-band RIB*, the following steps shall apply:

13) For *BS type 1-O* and *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

*------------------------------ Next modified section ------------------------------*

##### 6.7.4.4.2 Procedure

The following procedure for measuring TRP is based on the directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 6 and 9.

1) Place the BS at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the BS with the test system.

3) The measurement devices characteristics shall be:

- measurement filter bandwidth: defined in clause 6.7.4.5.

- detection mode: true RMS voltage or true power averaging.

As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity, efficiency and avoiding e.g. carrier leakage, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The emission power should be averaged over an appropriate time duration to ensure the measurement is within the measurement uncertainty in Table 4.1.2.2-1.

4) For single carrier operation, set the BS to transmit according to the applicable test configuration in clause 4.8 using the corresponding test model(s) in clause 4.9.2 at manufacturers declared *rated carrier output power* (Prated,c,TRP).

For a BS declared to be capable of multi-carrier and/or CA operation, use the applicable test signal configuration and corresponding power setting specified in clause 4.7.2 and 4.8 using the corresponding test model(s) in clause 4.9.2 on all carriers configured.

5) Orient the positioner (and BS) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

6) Sweep the centre frequency of the measurement filter in contiguous steps and measure emission power within the specified frequency ranges with the specified measurement bandwidth.

7) Repeat step 5-6 for all directions in the appropriated TRP measurement grid needed for TRPEstimate (see annex I).

8) Calculate TRPEstimate using the measurements made in step 6.

9) For *BS type 1-O* and *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

*------------------------------ Next modified section ------------------------------*

6.7.5.2.4.2 Procedure

The following procedure for measuring TRP is based on directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 5, 7 and 10.

1) Place the BS at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the BS with the test system.

3) Measurements shall use a measurement bandwidth in accordance to the conditions in clause 6.7.5.2.5.

4) The measurement device characteristics shall be:

- Detection mode: True RMS.

The emission power should be averaged over an appropriate time duration to ensure the measurement is within the measurement uncertainty in Table 4.1.2.2-1.

5) Set the BS to transmit

- For RIBdeclared to be capable of single carrier operation only, set the RIB to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test model in clause 4.9.2 (i.e. NR-FR1-TM1.1 for *BS type 1-O* and NR-FR2-TM1.1 for *BS type 2-O*), at manufacturer's declared rated output power Prated,c,TRP.

- For a RIB declared to be capable of multi-carrier and/or CA operation, set the RIB to transmit according to the corresponding test model in clause 4.9.2 on all carriers configured using the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8.

6) Orient the positioner (and BS) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

7) Measure the emission at the specified frequencies with specified measurement bandwidth.

8) Repeat step 6-7 for all directions in the appropriated TRP measurement grid needed for full TRP estimation (see annex I).

NOTE 1: The TRP measurement grid may not be the same for all measurement frequencies.

NOTE 2: The frequency sweep or the TRP measurement grid sweep may be done in any order.

9) Calculate TRP at each specified frequency using the directional measurements.

In addition, for *multi-band RIB(s)*, the following steps shall apply:

10) For *BS type 1-O* and *multi-band RIBs* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

*------------------------------ Next modified section ------------------------------*

6.7.5.3.4.2 Procedure

1) Select and place the NR BS and CLTA as described in clause 4.12 with parameters as specified in table 4.12.2.2-1 and table 4.12.2.3-1.

2) Several CLTAs might be required to cover the whole co-location spurious emission frequency ranges.

3) Place test antenna in reference direction at far-field distance, aligned in all supported polarizations (single or dual) with the NR BS as depicted in annex E.1.3.

4) The test antenna shall be dual (or single) polarized with the same frequency range as the NR BS for co-location spurious emission test case.

5) Connect test antenna and CLTA to the measurement equipment as depicted in annex E.1.3.

6) OTA co-location spurious emission is measured as the power sum over all supported polarizations at the CLTA conducted output(s).

7) The measurement device (signal analyzer) characteristics shall be:

- Detection mode: True RMS.

The emission power should be averaged over an appropriate time duration to ensure the measurement is within the measurement uncertainty in Table 4.1.2.2-1.

8) Set the *BS type 1-O* to transmit:

- Set the NR BSto transmit maximum power according to the applicable test configuration in clause 4.8 using the corresponding test models or set of physical channels in clause 4.9.2.

- For the NR BS declared to be capable of multi-carrier and/or CA operation, set the BS to transmit according to NR-FR1-TM1.1 on all carriers configured using the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8.

9) Measure the emission at the specified frequencies with specified measurement bandwidth.

NOTE: An alternative measurement method to be used for measuring the OTA emission is described in annex K.

In addition, for *multi-band RIB*, the following steps shall apply:

10) For *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

*------------------------------ Next modified section ------------------------------*

6.7.5.4.4.2 Procedure

The following procedure for measuring TRP is based on the directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 5, 7 and 10.

1) Place the BS at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the BS with the test system.

3) Measurements shall use a measurement bandwidth in accordance to the conditions in clause 6.7.5.4.5.

4) The measurement device characteristics shall be:

- Detection mode: True RMS.

The emission power should be averaged over an appropriate time duration to ensure the measurement is within the measurement uncertainty in Table 4.1.2.2-1.

5) Set the BS to transmit:

- For RIBdeclared to be capable of single carrier operation only, set the RIB to transmit a signal according to the applicable test configuration in clause 4.8 using the corresponding test model in clause 4.9.2 (NR-FR1-TM1.1 for *BS type 1-O* and NR-FR2-TM1.1 for *BS type 2-O*), at manufacturer's declared rated output power Prated,c,TRP.

- For a RIB declared to be capable of multi-carrier and/or CA operation, set the RIB to transmit according to NR-FR1-TM1.1 in clause 4.9.2 on all carriers configured using the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8.

6) Orient the positioner (and BS) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

7) Measure the emission at the specified frequencies with specified measurement bandwidth.

8) Repeat step 6-7 for all directions in the appropriated TRP measurement grid needed for full TRP estimation (see annex I).

NOTE 1: The TRP measurement grid may not be the same for all measurement frequencies.

NOTE 2: The frequency sweep or the TRP measurement grid sweep may be done in any order.

9) Calculate TRP at each specified frequency using the directional measurements.

In addition, for *multi-band RIB(s)*, the following steps shall apply:

10) For *multi-band RIBs* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

*------------------------------ Next modified section ------------------------------*

6.7.5.5.4.2 Procedure

1) Select and place the NR BS and CLTA as described in clause 4.12, with parameters as specified in table 4.12.2.2-1 and table 4.12.2.3-1.

2) Several CLTAs might be required to cover the whole co-location spurious emission frequency ranges.

3) Place test antenna in reference direction at far-field distance, aligned in all supported polarizations (single or dual) with the NR BS as depicted in annex E.1.3.

4) The test antenna shall be dual (or single) polarized with the same frequency range as the NR BS for co-location spurious emission test case.

5) Connect test antenna and CLTA to the measurement equipment as depicted in annex E.1.3.

6) OTA co-location spurious emission is measured as the power sum over all supported polarizations at the CLTA conducted output(s).

7) The measurement device (signal analyzer) characteristics shall be:

- Detection mode: True RMS.

The emission power should be averaged over an appropriate time duration to ensure the measurement is within the measurement uncertainty in Table 4.1.2.2-1.

8) Set the *BS type 1-O* to transmit:

- Set the NR BSto transmit maximum power according to the applicable test configuration in clause 4.8 using the corresponding test models or set of physical channels in clause 4.9.2.

- For the NR BS declared to be capable of multi-carrier and/or CA operation, set the BS to transmit according to the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8 using the corresponding test models on all carriers configured.

9) Measure the emission at the specified frequencies with specified measurement bandwidth.

In addition, for *multi-band RIB*, the following steps shall apply:

10) For *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

*------------------------------ Next modified section ------------------------------*

#### 6.8.4.2 Procedure

1) Select a CLTA according to the description in clause 4.12 and parameters given in table 4.12.2.2-1.

2) Place the CLTA according to the description in clause 4.12 and parameters given in table 4.12.2.3-1.

3) The test antenna(s) shall be dual (or single) polarized covering the same frequency range as the NR BS and the emission frequencies.

4) Several test antennas are required to cover both the NRBSand the whole emission frequency range.

5) Connect test antenna and CLTA to the measurement equipment as shown in annex E.1.5.

6) During the OTA emission measurements at the test antenna conducted output(s), both NR BS and CLTA are rotated around same axis.

7) The OTA emission measurement method shall be TRP, according to the procedure described in annex I.

8) The measurement device (signal analyzer) characteristics shall be:

- Detection mode: True RMS.

The emission power should be averaged over an appropriate time duration to ensure the measurement is within the measurement uncertainty in Table 4.1.2.2-1.

9) Set the BS *type 1-O* to transmit:

- Set the NR BSto transmit maximum power according to the applicable test configuration in clause 4.8 using the corresponding test models or set of physical channels in clause 4.9.2.

- For the NR BS declared to be capable of multi-carrier and/or CA operation, set the BS to transmit according to the applicable test configuration and corresponding power setting specified in clause 4.7.2 and 4.8 using the corresponding test models on all carriers configured.

10) Generate the interfering signal via the CLTA. The CLTA is fed with a power level equal to declared Prated,t,TRP, divided over all the supported polarizations, from the same signal generator source:

- using test model as defined in clause 4.9.2, at a centre frequency offset according to the conditions in table 9.8.2-1 in TS 38.104 [2], but exclude interfering frequencies that are outside of the allocated downlink operating band or interfering frequencies that are not completely within the sub-block gap or within the *Inter RF Bandwidth gap*.

11) Adjust the interfering signal level at the CLTA conducted input(s) as defined in:

- transmitter intermodulation table 9.8.2-1 in TS 38.104 [2].

12) If the interferer signal is applicable according to clause 4.7, perform the unwanted emission tests specified in clauses 6.7.3 (OTA ACLR) and 6.7.4 (OTA OBUE) for all third and fifth order intermodulation products which appear in the frequency ranges defined in clauses 6.7.3 and 6.7.4 (Note 2). The width of the intermodulation products shall be taken into account.

13) If the interferer signal is applicable according to clause 4.7, perform the Transmitter spurious emissions test as specified in clause 6.7.5 (OTA spurious emission), except OTA co-location spurious emission, for all third and fifth order intermodulation products which appear in the frequency ranges defined in clause 6.7.5 (Note 2). The width of the intermodulation products shall be taken into account.

14) Verify that the emission level does not exceed the required level in clause 6.8.5 (Test requirements) with the exception of interfering signal frequencies.

15) Repeat the test for the remaining interfering signal centre frequency offsets according to the conditions of:

- transmitter intermodulation table 9.8.2-1 in TS 38.104 [2].

16) Repeat the test for the remaining interfering signals defined in clause 4.7 for requirements 6.7.3 (OTA ACLR), 6.7.4 (OTA OBUE) and 6.7.5 (OTA spurious emission), except OTA co-location spurious emission.

In addition, for *multi-band RIB,* the following steps shall apply:

17) For *multi-band RIB* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

NOTE 1: The third order intermodulation products are centred at 2F1±F2 and 2F2±F1. The fifth order intermodulation products are centred at 3F1±2F2, 3F2±2F1, 4F1±F2, and 4F2±F1 where F1 represents the test signal centre frequency or centre frequency of each sub-block and F2 represents the interfering signal centre frequency. The widths of intermodulation products are:

- (n\*BWF1 + m\* BWF2) for the nF1±mF2 products;

- (n\* BWF2 + m\* BWF1) for the nF2±mF1 products;

where BWF1 represents the test wanted signal RF bandwidth or channel bandwidth in case of single carrier, or sub-block bandwidth and BWF2 represents the interfering signal channel bandwidth.

NOTE 2: During the conformance test the interferer signal can be applied on one side of the wanted signal, while the transmitter intermodulation emission is measured only on the opposite side of the wanted signal. This applies for intermodulation products which are within the operating band or OBUE region.

*------------------------------ Next modified section ------------------------------*

#### 7.7.4.2 Procedure

The following procedure for measuring TRP is based on the directional power measurements as described in annex I. An alternative method to measure TRP is to use a characterized and calibrated reverberation chamber if so follow steps 1, 3, 4, 5, 7 and 10.

1) Place the BS at the positioner.

2) Align the manufacturer declared coordinate system orientation (D.2) of the BS with the test system.

3) Measurements shall use a measurement bandwidth in accordance to the conditions in clause 7.7.5.

4) The measurement device characteristics shall be:

- Detection mode: True RMS.

The emission power should be averaged over an appropriate time duration to ensure the measurement is within the measurement uncertainty in Table 4.1.2.2-1.

5) Set the TDD BS to receive only.

6) Orient the positioner (and BS) in order that the direction to be tested aligns with the test antenna such that measurements to determine TRP can be performed (see annex I).

7) Measure the emission at the specified frequencies with specified measurement bandwidth

8) Repeat step 6-9 for all directions in the appropriated TRP measurement grid needed for full TRP estimation (see annex I).

NOTE 1: The TRP measurement grid may not be the same for all measurement frequencies.

NOTE 2: The frequency sweep or the TRP measurement grid sweep may be done in any order

9) Calculate TRP at each specified frequency using the directional measurements.

In addition, for *multi-band RIB(s)*, the following steps shall apply:

10) For *BS type 1-O* and *multi-band RIB(s)* and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

*------------------------------ End of modified section ------------------------------*