**3GPP TSG-RAN WG4 Meeting #** **95-e R4-200**

**Electronic Meeting, 25 May – 5 June, 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **38.124** | **CR** | **0005** | **rev** | **<1>** | **Current version:** | **15.2.0** |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | CR to 38.124 adding Methods of measurement and limits for EMC emissions |
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| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core |  | ***Date:*** | 2020-05-25 |
|  |  |  |  |  |
| ***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-12 (Release 12)Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | Missing methods of measurement and limits for EMC emissions. |
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| ***Summary of change:*** | Addition of methods of measurement and limits for EMC emissions. |
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| ***Consequences if not approved:*** | Lack of methods and limits for testing UE EMC. |
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| ***Clauses affected:*** | 8 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ... |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

------------------------------ Start of new section ------------------------------

8 Methods of measurement and limits for EMC emissions

8.1 Test configurations

This sub-clause defines the configurations for emission tests as follows:

- the equipment shall be tested under normal test conditions;

- the test configuration shall be as close to normal intended use as possible;

- if the equipment is part of a system, or can be connected to ancillary equipment, then it shall be acceptable to test the equipment while connected to the minimum configuration of ancillary equipment necessary to exercise the ports;

- if the equipment has a large number of ports, then a sufficient number shall be selected to simulate actual operation conditions and to ensure that all the different types of termination are tested;

- the test conditions, test configuration and mode of operation shall be recorded in the test report;

- ports which in normal operation are connected shall be connected to an ancillary equipment or to a representative piece of cable correctly terminated to simulate the input/output characteristics of the ancillary equipment, Radio Frequency (RF) input/output ports shall be correctly terminated;

- ports that are not connected to cables during normal operation, e.g. service connectors, programming connectors; temporary connectors etc. shall not be connected to any cables for the purpose of EMC testing. Where cables have to be connected to these ports, or interconnecting cables have to be extended in length in order to exercise the EUT, precautions shall be taken to ensure that the evaluation of the EUT is not affected by the addition or extension of these cables;

- emission tests shall be performed in two modes of operation:

- with a communication link established (traffic mode); and

- in the idle mode.

8.2 Radiated Emission

8.2.1 General

This test is applicable to radio communications equipment and ancillary equipment.

This test shall be performed on the radio equipment and/or a representative configuration of the ancillary equipment.

8.2.2 Definition

This test assesses the ability of radio equipment and ancillary equipment to limit unwanted emissions from the enclosure port.

[For UE equipment supporting operations in FR2 (Table 4.1-1) with integral antennas only (no antenna connectors available), the EMC radiated emissions cannot be distinguished between the intended emissions nor to any spurious emissions related to these intentional transmissions.]

8.2.3 Test method

Whenever possible the site shall be a fully anechoic chamber (FAC) simulating the free-space conditions. EUT shall be placed on a non-conducting support. Mean power of any spurious components shall be detected by the test antenna and measuring receiver (e.g. a spectrum analyser).

At each frequency at which a component is detected, the EUT shall be rotated to obtain maximum response, and the effective radiated power (e.r.p.) of that component determined by a substitution measurement, which shall be the reference method. The measurement shall be repeated with the test antenna in the orthogonal polarization plane.

NOTE: Effective radiated power e.r.p. refers to the radiation of a half wave tuned dipole instead of an isotropic antenna. There is a constant difference of 2.15 dB between e.i.r.p. and e.r.p.

 e.r.p. (dBm)  e.i.r.p. (dBm)  2.15 Ref. ITU-R SM. 329 ANNEX 1 [5]

Measurements are made with a tuned dipole antenna or a reference antenna with a known gain referenced to an isotropic antenna. Unless otherwise stated, all measurements are done as mean power (RMS).

8.2.4 Limits

The references for these requirements are ITU-R SM 329 [5], SM.1539 [18] and TS 38.101-1 [3] for FR1 [and TS 38.101-2] for FR2.

The frequency boundary and reference bandwidths for the detailed transitions of the limits between the requirements for out of band emissions and spurious emissions are based on ITU-R SM 329 [5].

These requirements are only applicable for frequencies in the spurious domain. The limits are specified in Table 8.2.3-1 for UE equipment supporting operations in FR1 only.

**Table 8.2.4-1: Radiated spurious emissions requirements for UE equipment supporting operations in FR1 only**

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| **Frequency** | **Minimum requirement (e.r.p.)/ Reference Bandwidth****Idle mode** | **Minimum requirement (e.r.p.) / Reference Bandwidth****Traffic mode** |
| 30 MHz ≤ f < 1000 MHz | -57dBm / 100 kHz | -36 dBm / 100 kHz |
| 1 GHz ≤ f < [12.75] GHz | -47dBm / 1MHz  | -30 dBm / 1 MHz |
| fc - 2.5 x BWChannel MHz < f < fc + 2.5 x BWChannel MHz | Not defined | Not defined |

NOTE: fc is the centre frequency of the TCH. The frequency range fc ± 2.5 x BWChannel MHz are covered by the "Out of Band" emission requirements of TS 36.101-1 [].

BWChannel: Channel bandwidth as defined in TS 36.101-1 [].

### 8.2.5 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the radiated emission measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;

- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;

- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figure in table 8.2.5-1.

Table 8.2.5-1 specifies the Maximum measurement uncertainty of the Test System. The Test System shall enable the equipment under test to be measured with an uncertainty not exceeding the specified values. All tolerances and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95% is the measurement uncertainty tolerance interval for a specific measurement that contains 95% of the performance of a population of test equipment.

Table 8.2.5-1: Maximum measurement uncertainty

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| **Parameter** | **Uncertainty** |
| Effective radiated RF power between 30 MHz and 180 MHz | ±6 dB |
| Effective radiated RF power between 180 MHz and 12,75 GHz | ±3 dB |

NOTE: If the Test System for a test is known to have a measurement uncertainty greater than that specified in table 4, this equipment can still be used, provided that an adjustment is made follows:

 Any additional uncertainty in the Test System over and above that specified in table 8.2.5-1 is used to tighten the Test Requirements - making the test harder to pass. This procedure will ensure that a Test System not compliant with table 8.2.5-1 does not increase the probability of passing an EUT that would otherwise have failed a test if a Test System compliant with table 4 had been used.

## 8.3 Conducted emission DC power input/output port

This test is applicable to all equipment, which may have DC cables longer than 3 m.

If the DC power cable of the UE and/or the ancillary equipment is intended to be less than 3 m in length, and intended only for direct connection to a dedicated AC to DC power supply, then the measurement shall be performed only on the AC power input of that power supply as specified in subclause 8.4.

This test shall be performed on a representative configuration of the radio equipment or a representative configuration of the combination of radio and ancillary equipment.

### 8.3.1 Definition

This test assesses the ability of radio equipment and ancillary equipment to limit internal noise from the DC power input/output ports.

### 8.3.2 Test method

The test method shall be in accordance with CISPR 32 [20], and the Line Impedance Stabilising Networks (LISN) shall be connected to a DC power source.

In the case of DC output ports, the ports shall be connected via a LISN to a load drawing the rated current of the source.

A measuring receiver shall be connected to each LISN measurement port in turn and the conducted emission recorded. The LISN measurement ports not being used for measurement shall be terminated with a 50 W load.

The equipment shall be installed with a ground plane as defined in CISPR 32 [20], The reference earth point of the LISNs shall be connected to the reference ground plane with a conductor as short as possible.

### 8.3.3 Limits

The equipment shall meet the limits according to CISPR 32 [20] table A.9 which are defined for average detector receiver and for quasi peak detector receiver. If the average limit is met when using a quasi‑peak detector, the equipment shall be deemed to meet both limits and measurement with the average detector receiver is not necessary.

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## 8.4 Conducted emissions, AC mains power input/output port

This test is applicable to equipment powered by the AC mains.

This test is not applicable to AC output ports, which are connected directly (or via a switch or circuit breaker) to the AC input port.

This test shall be performed on a representative configuration of the radio equipment or a representative configuration of the combination of radio and ancillary equipment.

### 8.4.1 Definition

This test assesses the ability of radio equipment and ancillary equipment to limit internal noise from the AC mains power input/output ports.

### 8.4.2 Test method

The test method shall be in accordance with CISPR 32 [20].

### 8.4.3 Limits

The equipment shall meet the limits according to CISPR 32 [20] table A.10, which are defined for the average detector receiver and for quasi-peak detector receiver. If the average limit is met when using a quasi‑peak detector, the equipment shall be deemed to meet both limits and measurement with the average detector receiver is not necessary.

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## 8.5 Harmonic current emissions (AC mains input port)

The requirements of IEC 61000-3-2 [8] for harmonic current emission apply for equipment covered by the scope of the present document.

## 8.6 Voltage fluctuations and flicker (AC mains input port)

The requirements of IEC 61000-3-3 [9] for voltage fluctuations and flicker apply for equipment covered by the scope of the present document.

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