3GPP TSG-RAN WG4 Meeting # 103-e *R4-22xxxxx*

Electronic Meeting, May 09 – May 20, 2022

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.124** | **CR** |  | **rev** |  | **Current version:** | **17.0.0** |  |
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| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm%22%20%5Cl%20%22_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm%22%20%5Cl%20%22_blank)*** *on using this form: comprehensive instructions can be found at <http://www.3gpp.org/Change-Requests>.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  | Big CR for TS 38.124 Maintenance, Rel-17 |
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| ***Source to WG:*** | MCC, ZTE  |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | TEI15, NR\_newRAT-Core |  | ***Date:*** | 2022-05-23 |
|  |  |  |  |  |
| ***Category:*** | **A** |  | ***Release:*** | Rel-17 |
|  | *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 multiple endorsed draft CRs. The reason for change in each endorsed draft CR is copied below.**R4-2209656 Draft CR to TS 38.124: addition of the missing Rx spurious emissions limits for idle mode testing, Rel-17**Referring to the TS 38.124 v 15.2.0, the following was captured for the radiated Rx spurious emissions limits:Despite the above highlighted unresolved [], there were also inconsistencies with the limits defined in the NR UE RF specification TS 38.101-1. Therefore, CR in R4-2008717 was agreed and implemented.Afterwards it was observed, that the radiated Rx spurious emissions limits (for idle mode testing) were unintentionally removed from the specification. In this CR we are fixing this by bringing the Rx spurious emissions limits back, further aligning them with the TS 38.101-1 specification to better reflect SM.329 guidelines (missing consideration of the 5th harmonic, missing 12.75-26 GHz range). |
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| ***Summary of change:*** | The summary of change in each endorsed draft CR is copied below.**R4-2209656 Draft CR to TS 38.124: addition of the missing Rx spurious emissions limits for idle mode testing, Rel-17*** 3.1: Traffic mode definition introduced, aligned with the definition in 34.124 and 36.124.
* 3.3: missing abbreviations added
* 4.2: text consistency correction
* 8.1, 9.1: clarification on the idle mode definition
* 8.2.4: addition of the missing Rx spur limits, aligned with the TS 38.101-1, clause 7.9
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| ***Consequences if not approved:*** | The consequences if not approved for each endorsed draft CR is copied below.**R4-2209656 Draft CR to TS 38.124: addition of the missing Rx spurious emissions limits for idle mode testing, Rel-17**Idle mode testing would be incomplete in the specification. |
|  |  |
| ***Clauses affected:*** | Clauses affected for each endorsed draft CR is copied below.**R4-2209656 Draft CR to TS 38.124: addition of the missing Rx spurious emissions limits for idle mode testing, Rel-17**3.1, 3.3, 4.2, 8.1, 9.1, 8.2.4, 9.2.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  |  |
| ***affected:*** |  | **x** |  Test specifications |  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

**Ancillary equipment:** Equipment (apparatus), used in connection with a user equipment (UE) is considered as an ancillary equipment (apparatus) if:

- the equipment is intended for use in conjunction with a UE to provide additional operational and/or control features to the UE, (e.g. to extend control to another position or location); and

- the equipment cannot be used on a stand-alone basis to provide user functions independently of a UE; and

- the UE to which it is connected, is capable of providing some intended operation such as transmitting and/or receiving without the ancillary equipment (i.e. it is not a sub‑unit of the main equipment essential to the main equipment basic functions).

**Channel bandwidth:** The RF bandwidth supporting a single NR RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell. The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

**Enclosure port:** Physical boundary of the apparatus through which electromagnetic fields may radiate or impinge. In the case of integral antenna equipment, this port is inseparable from the antenna port.

**Idle mode:** state of User Equipment (UE) when switched ON but with no Radio Resource Control (RRC) connection.

**Integral antenna:** Antenna designed to be connected directly to the equipment with or without the use of an external connector and considered to be part of the equipment. An integral antenna may be fitted internally or externally to the equipment.

**Necessary bandwidth:** For a given class of emission, the width of the frequency band which is just sufficient to ensure the transmission of information at the rate and with the quality required under specified conditions.

**Out of band emissions:** Emission on a frequency or frequencies immediately outside the necessary bandwidth, which results from, the modulation process, but excluding spurious emissions.

**Spurious emission:** Emission on a frequency, or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out‑of‑band emissions.

**Traffic mode:** state of User Equipment (UE) when switched ON and with Radio Resource Control (RRC) connection established.

**Transient phenomena:** Pertaining to or designating a phenomenon or a quantity which varies between two consecutive steady states during a time interval short compared with the time-scale of interest (IEC 60050-161 [19])

**User equipment:** is a "Mobile Station" (MS) which is an entity capable of accessing a set of NR services via one or more radio interfaces. This entity may be stationary or in motion within the NR service area while accessing the NR services, and may simultaneously serve one or more users.

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## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

AC Alternating Current

CA Carrier Aggregation

DC Direct Current

DRX Discontinuous Reception

DTX Discontinuous Transmission

ESD Electrostatic Discharge

EUT Equipment Under Test

FAC Fully Anechoic Chamber

FR Frequency Range

HCP Horizontal Coupling Plane

LISN Line Impedance Stabilising Networks

LR Location Registration

NR New Radio

RF Radio Frequency

RMS Root Mean Square (value)

RRC Radio Resource Control

UE User Equipment

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

## 4.2 Arrangements for establishing a communication link

For transmitters with an integral antenna, the wanted RF output signal to establish a communication link shall be delivered from the EUT to an antenna located within the test environment. This antenna shall be connected to the external measuring equipment by a coaxial cable.

For transmitters with an antenna connector, the wanted RF output signal to establish a communication link shall be delivered from the antenna connector to the external measuring equipment by a shielded transmission line, such as a coaxial cable. Adequate measures shall be taken to minimize the effect of unwanted common mode currents on the external conductor of the transmission line at the point of entry to the transmitter.

The wanted RF input signal nominal frequency shall be selected by setting the NR Absolute Radio Frequency Channel Number to an appropriate number.

For UE equipment only support operations in FR1 a communication link shall be set up with a suitable base station simulator (hereafter called "the test system"). The test system shall be located outside of the test environment.

When the EUT is required to be in the traffic mode, a call is set up according to the generic call set-up procedure and the following conditions shall be met:

- Set and send continuously positive TPC commands to the UE;

- The DTX shall be disabled;

- Uplink power control shall be enabled;

- transmitting and/or receiving (UL/DL) bit rate for reference test channel shall be the reference measurement channel as specified in annex A in TS 38.101-1 [3] with parameters specified in table 7.3.2-1 and table 7.3.2-2 in TS 38.101-1 [3];

- Adequate measures shall be taken to avoid the effect of the unwanted signal on the measuring equipment;

- For immunity testing, the wanted input signal level shall be set to 40 dB above the reference sensitivity level to provide a stable communication link. The reference sensitivity level is defined in TS 38.101-1 [3];

- For emission testing, the wanted input signal level shall be no more than 15 dB above the reference sensitivity level, such that the performance of the measuring receiver is not limited by strong signal effects.

See TS 38.508-1 [21] and TS 38.509 [22] for details regarding generic call set-up procedure and throughput test loop scenarios.

When the EUT is required to be in the idle mode the following conditions shall be met:

- UE shall be camped on a cell;

- UE shall perform Location Registration (LR) before the test, but not during the test;

- UE´s neighbour cell list shall be empty;

- Paging repetition period and DRX cycle shall be set to minimum (shortest possible time interval).

For immunity tests, clause 4.3 applies.

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# 8 Methods of measurement and limits for EMC emissions

## 8.1 Test configurations

This 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

- without a communication link established (idle mode).

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### 8.2.4 Limits

Unless otherwise stated, the radiated spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in table 8.2.4-0 from the edge of the channel bandwidth. The radiated spurious emission limits in table 8.2.4-1 for traffic mode and in table 8.2.4.-2 for idle mode, apply for all transmitter band configurations (NRB) and channel bandwidths.

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

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 8.2.4-1 for traffic mode and in table 8.2.4.-2 for idle mode for UE equipment supporting operations in FR1 only.

Table 8.2.4-0: Boundary between NR out of band and general spurious emission domain

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| --- | --- |
| Channel bandwidth | OOB boundary FOOB (MHz) |
| BWChannel  | BWChannel + 5 |

Table 8.2.4-1: Radiated spurious emissions requirements for UE equipment supporting operations in FR1, traffic mode

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Maximum level (dBm) | Measurement bandwidth | Notes |
| 30 MHz ≤ f < 1000 MHz | -36 | 100 kHz |  |
| 1 GHz ≤ f < 12.75 GHz | -30 | 1 MHz | 4 |
|  | -25 | 1 MHz | 3 |
| 12.75 GHz ≤ f < 5th harmonic of the upper frequency edge of the UL operating band in GHz | -30 | 1 MHz | 1 |
| 12.75 GHz < f < 26 GHz | -30 | 1 MHz | 2 |
| NOTE 1: Applies for Band that the upper frequency edge of the UL Band more than 2.69 GHz.NOTE 2: Applies for Band that the upper frequency edge of the UL Band more than 5.2 GHz.NOTE 3: As specified in TS 38.101-1 [3]: Applies for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in clause 5.2B of TS 38.101-3 [3] when NS\_04 is signalled.NOTE 4: As specified in TS 38.101-1 [3]: Does not apply for Band n41, CA configurations including Band n41, and EN-DC configurations that include n41 specified in clause 5.2B of TS 38.101-3 [3] when NS\_04 is signalled. |

NOTE: Void.

Table 8.2.4-2: Radiated spurious emissions requirements for UE equipment supporting operations in FR1, idle mode

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Maximum level (dBm) | Measurementbandwidth | NOTE |
| 30 MHz ≤ f < 1 GHz | -57  | 100 kHz |  |
| 1 GHz ≤ f ≤ 12.75 GHz | -47  | 1 MHz |  |
| 12.75 GHz ≤ f ≤ 5th harmonic of the upper frequency edge of the DL operating band in GHz | -47  | 1 MHz | 2 |
| 12.75 GHz – 26 GHz | -47  | 1 MHz | 3 |
| NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH as defined in TS 38.101-1 [3], annex C.3.1.NOTE 2: Applies for Band that the upper frequency edge of the DL Band more than 2.69 GHz.NOTE 3: Applies for Band that the upper frequency edge of the DL Band more than 5.2 GHz. |

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# 9 Test methods and levels for immunity tests

## 9.1 Test configurations

This clause defines the configurations for immunity tests as follows:

- the equipment shall be tested under normal test conditions as specified in the core specification;

- 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, which 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;

- the test arrangements for transmitter and receiver clauses of the transceiver are described separately for the sake of clarity. However, where possible the test of the transmitter clause and receiver clause of the EUT may be carried out simultaneously to reduce test time;

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

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

- without a communication link established (idle mode).

## 9.2 RF electromagnetic field (80 MHz to 6000 MHz)

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

### 9.2.1 Definition

This test assesses the ability of UE and ancillary equipment to operate as intended in the presence of a radio frequency electromagnetic field disturbance at the enclosure.

### 9.2.2 Test method and level

The test method shall be in accordance with IEC 61000-4-3 [10]:

- For UE and ancillary equipment, the following requirements shall apply;

- The test level shall be 3 V/m amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1 kHz;

- The stepped frequency increments shall be 1 % of the momentary frequency;

- The test shall be performed over the frequency range 80 MHz to 6000 MHz;

- Responses in stand-alone receivers or receivers which are part of transceivers occurring at discrete frequencies which are narrow band responses, shall be disregarded, see clause 4.3;

- The frequencies selected during the test shall be recorded in the test report.

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