3GPP TSG-RAN WG4 Meeting # 94-e-Bis DRAFT R4-2005473

Electronic Meeting, 20 – 30 Apr., 2020

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.124** | **CR** |  | **rev** | **1** | **Current version:** | **15.2.0** |  |
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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:*** | DraftCR to TS 38.113: DraftCR to TS 38.124: specification corrections and removal of [], Rel-15 | | | | | | | | | |
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| ***Source to WG:*** | Huawei | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Perf | | | | |  | ***Date:*** | | | 2020-04-08 |
|  |  | | | |  | |  | | |  |
| ***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-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:*** | | Referring to the RAN4#94-e-bis meeting arrangements and guidelines shared by RAN4 chairman, the following was provided:  *• ITU submission requires no TBD or [] in core specification in the June version*  Based on this, the NR UE EMC specification was reviewed and it was found that it still requires corrections before the IMT submission. | | | | | | | | |
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| ***Summary of change:*** | | * CISPR 22 updated with CISPR 32 * OOB emission clarification note removed (not seen as applicable to the NR UE specification) * The “call setup” text removed as seen as copy-paste from legacy specifications, * Removal of [] and other editorial corrections * Missing symbols, abbreviations added | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Specification would still contain many [] brackets. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.1, 3.2, 3.3, 4.1, 4.2, 4.3, 7.1, 7.2, 9.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 section ------------------------------*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.113: "NR; Base Station (BS) ElectroMagnetic Compatibility (EMC)".

[3] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[4] 3GPP TS 38.101-2: " NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[5] ITU-R Recommendation SM.329: "Unwanted emissions in the spurious domain".

[6] Void

[7] IEC CISPR publication 16-1: "Specification for radio disturbance and immunity measuring apparatus and methods".

[8] IEC 61000-3-2; (2000): "Electromagnetic compatibility; Part 3 - Limits; section 2 - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)"; Am.1 (1997-09)".

[9] IEC 61000-3-3; (19952): "Electromagnetic compatibility; Part 3 - Limits; section 2 - Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤ 16 A"

[10] IEC 61000-4-3: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - section 3: Radiated, radio-frequency electromagnetic field immunity test".

[11] IEC 61000-4-2: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - section 2: Electrostatic discharge immunity test - Basic EMC publication".

[12] IEC 61000-4-4: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - section 4: Electrical fast transient/burst immunity test - Basic EMC publication".

[13] IEC 61000-4-6: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - section 6: immunity to conducted disturbances induced by radio frequency fields".

[14] ISO 7637‑1 (1990): "Road vehicles - Electrical disturbance by conduction and coupling - Part 1: Passenger cars and light commercial vehicles with nominal 12 V supply voltage - Electrical transient conduction along supply lines only".

[15] ISO 7637‑2 (1990): "Road vehicles - Electrical disturbance by conduction and coupling - Part 2: Commercial vehicles with nominal 24 V supply voltage - Electrical transient conduction along supply lines only".

[16] IEC 61000-4-11: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - section 11: Voltage dips, short interruptions, and voltage variations immunity test".

[17] IEC 61000-4-5: "Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - section 5: Surge immunity test".

[18] ITU-R Recommendation SM.1539 (2001): "Variation of the boundary between the out-of-band and spurious domains required for the application of Recommendations ITU-R SM.1541 and ITU-R SM.329".

[19] IEC 60050(161): "International Electrotechnical Vocabulary - Chapter 161: Electromagnetic compatibility".

[20] IEC CISPR 32: "Electromagnetic compatibility of multimedia equipment - Emission requirements".

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

## 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:** Idle mode is the 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.

NOTE: Any unwanted emission which falls at frequencies separated from the centre frequency of the emission by less than 250% of the necessary bandwidth of the emission will generally be considered out-of-band emission. **Spurious emission from ITU-R SM 329:** 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.

**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.

## 3.2 Symbols

For the purposes of the present document, the following symbols apply:

BWChannel Channel bandwidth

FOOB The boundary between the NR out of band emission and spurious emission domains

NRB Transmission bandwidth configuration, expressed in units of resource blocks

## 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].

EUT Equipment Under Test

FAC Fully Anechoic Chamber

FR Frequency Range

NR New Radio

RF Radio Frequency

RMS Root Mean Square (value)

UE User Equipement

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## 4.1 General

The equipment shall be tested under normal test conditions according to the relevant product and basic standards. If these conditions are not specified then the manufacturers declared range of humidity, temperature and supply voltage shall be used. The test conditions shall be recorded in the test report.

Whenever the Equipment under test (EUT) is provided with a detachable antenna, the EUT shall be tested with the antenna fitted in a manner typical of normal intended use, unless specified otherwise.

Where the equipment incorporates an external 50 Ω RF antenna connector that is normally connected via a coaxial cable, then the wanted signal to establish a communication link also uses a coaxial cable.

Where the equipment has an external 50 Ω RF antenna connector that is not normally connected via a coaxial cable or where the equipment has no external 50 Ω RF connector (i.e., integral antenna equipment), then the wanted signal, to establish a communication link, shall be delivered from the equipment to an antenna located within the test environment.

Requirements throughout the RF specifications are in many cases defined separately for different frequency ranges (FR). The frequency ranges in which a UE equipment (NR) can operate according to this version of the specification are identified as described in table 4.1-1. The test conditions may be different for operations in FR1 and FR2.

Table 4.1-1: Definition of frequency ranges

|  |  |
| --- | --- |
| Frequency range designation | Corresponding frequency range |
| FR1 | 410 MHz – 7125 MHz |
| FR2 | 24250 MHz – 52600 MHz |

## 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:

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

- 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 [x] with parameters specified in table 7.3.2-1 and table 7.3.2-2 in TS 38.101-1 [x];

- 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 [x];

- 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.

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.

## 4.3 Narrow band responses on receivers

Responses on receivers or duplex transceivers occurring during the test at discrete frequencies, which are narrow band responses (spurious responses), are identified by the following method:

- If during an immunity test the quantity being monitored goes outside the specified tolerances, it is necessary to establish whether the deviation is due to an unwanted effect on the receiver of the UE or on the test system (narrow band response) or to a wide band (EMC) phenomenon. Therefore, the test shall be repeated with the unwanted signal frequency increased or decreased by BWChannel MHz, where BWChannel is the channel bandwidth as defined in TS 38.101-1 [3];

- if the deviation does not disappear, the procedure is repeated the unwanted signal frequency increased or decreased by 2 x BWChannel MHz, where BWChannel is the channel bandwidth as defined in TS 38.101-1 [3];

- if the deviation does not disappear with the increased and/or decreased frequency, the phenomenon is considered wide band and therefore an EMC problem and the equipment fails the test.

Narrow band responses are disregarded.

The procedure above does not apply to conducted immunity tests in the frequency range 150 kHz to 80 MHz.

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

## 7.1 EMC emissions

Table 7.1-1: Emission applicability

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Equipment test requirement** | | |  |  |
| **Phenomenon** | **Application** | **Equipment connected to fixed AC or DC power installations** | **Equipment connected to vehicular DC supplies** | **Equipment powered by integral battery** | **Reference clause in the present document** | **Reference standard** |
| **Radiated emission** | Enclosure | applicable | applicable | applicable | 8.2 | ITU-R SM.329 [5]  TS 38.101-1 [3] |
| **Conducted emission** | DC power input/output port | applicable | applicable | not applicable | 8.3 | CISPR 32 [20],  CISPR 16‑1 [7] |
| **Conducted emission** | AC mains input/output port | applicable | not applicable | not applicable | 8.4 | CISPR 32 [20] |
| **Harmonic current emissions** | AC mains input port | applicable | not applicable | not applicable | 8.5 | IEC 61000-3-2 [8] |
| **Voltage fluctuations and flicker** | AC mains input port | applicable | not applicable | not applicable | 8.6 | IEC 61000-3-3 [9] |

For UE equipment operating in FR1 (table 4.1-1), the radiated emission applies to the enclosure port antenna ports available.

For UE equipment supporting operations in FR2 (table 4.1-1) the enclosure port is inseparable from the antenna port.

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## 7.2 Immunity

Table 7.2-1: Immunity applicability

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | **Equipment test requirement** | | |  |  |
| **Phenomenon** | **Application** | **Equipment connected to fixed AC or DC power installations** | **Equipment connected to vehicular DC supplies** | **Equipment powered by integral battery** | **Reference clause in the present document** | **Reference standard** |
| **RF electro­magnetic field (80 MHz to 2700 MHz)** | Enclosure | applicable | applicable | applicable | 9.2 | IEC 61000‑4‑3 [10] |
| **Electrostatic discharge** | Enclosure | applicable | applicable | applicable | 9.3 | IEC 61000‑4‑2 [11] |
| **Fast transients common mode** | Signal and control ports, DC and AC power input ports | applicable | not applicable | not applicable | 9.4 | IEC 61000‑4‑4 [12] |
| **RF common mode**  **0.15 MHz to 80 MHz** | Signal and control ports, DC and AC power input ports | applicable | applicable | applicable | 9.5 | IEC 61000‑4‑6 [13] |
| **Transients and surges, vehicular environment** | DC power input ports | not applicable | applicable | not applicable | 9.6 | ISO 7637 Part 1 [14]  and  ISO 7637 Part 2 [15] |
| **Voltage dips and interruptions** | AC mains power input ports | applicable | not applicable | not applicable | 9.7 | IEC 61000‑4‑11 [16] |
| **Surges, common and differential mode** | DC and AC power input ports | applicable | not applicable | not applicable | 9.8 | IEC 61000‑4‑5 [17] |

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## 9.2 RF electromagnetic field (80 MHz – 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;

- when using the max hold detector method (see annex A) at each test frequency step initially an unmodulated test signal shall be applied. Then the test modulation shall be applied;

- the test shall be performed over the frequency range 80 MHz to 1000 MHz and 1400 MHz to 2700 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.

### 9.2.3 Performance criteria

The performance criteria of clause 6.1 shall apply.

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