

# ETSI TS 138 113 V15.20.0 (2024-08)



**5G;  
NR;**  
**Base Station (BS) ElectroMagnetic Compatibility (EMC)**  
**(3GPP TS 38.113 version 15.20.0 Release 15)**

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**Reference**

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**Keywords**

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## Modal verbs terminology

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# Foreword

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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, modal verbs have the following meanings:

- shall** indicates a mandatory requirement to do something
- shall not** indicates an interdiction (prohibition) to do something

The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

- should** indicates a recommendation to do something
- should not** indicates a recommendation not to do something
- may** indicates permission to do something
- need not** indicates permission not to do something

The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

- can** indicates that something is possible
- cannot** indicates that something is impossible

The constructions "can" and "cannot" are not substitutes for "may" and "need not".

- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- will not** indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
- might** indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

**might not** indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

**is** (or any other verb in the indicative mood) indicates a statement of fact

**is not** (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

## iTeh Standards (<https://standards.iteh.ai>) Document Preview

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# 1 Scope

The present document covers the assessment of NR Base Station (BS) and ancillary equipment in respect of Electromagnetic Compatibility (EMC).

The present document specifies the applicable requirements, procedures, test conditions, performance assessment and performance criteria for NR base stations and associated ancillary equipment in the following categories:

- BS equipped with antenna connectors or *TAB connectors* which are possible to be terminated during EMC testing, meeting the *BS type 1-C* and *BS type 1-H* RF requirements of TS 38.104 [2], with conformance demonstrated by compliance to TS 38.141-1 [3].
- BS not equipped with antenna connectors nor *TAB connectors*, i.e. with antenna elements radiating during the EMC testing, meeting the *BS type 1-O* and *BS type 2-O* RF requirements of TS 38.104 [2], with conformance demonstrated by compliance to TS 38.141-2 [4].

Technical requirements related to the antenna and TAB connectors are not included in the present document. These are found in the relevant product standards [2-4].

The environment classification used in the present document refers to the residential, commercial and light industrial environment classification used in IEC 61000-6-1 [7], IEC 61000-6-3 [8] and IEC 61000-6-8 [33].

The EMC requirements have been selected to ensure an adequate level of compatibility for apparatus at residential, commercial and light industrial environments. The levels, however, do not cover extreme cases which may occur in any location but with low probability of occurrence.

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# 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 38.104: "NR; Base Station (BS) radio transmission and reception".
- [3] 3GPP TS 38.141-1: "NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing".
- [4] 3GPP TS 38.141-2: "NR; Base Station (BS) conformance testing Part 2: Radiated conformance testing".
- [5] 3GPP TS 37.113: "E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) Electromagnetic Compatibility (EMC)".
- [6] 3GPP TS 37.114: "Active Antenna System (AAS) Base Station (BS) Electromagnetic Compatibility (EMC)".
- [7] IEC 61000-6-1: "Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments".
- [8] IEC 61000-6-3: "Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for equipment in residential environments".

- [9] IEC 60050-161: "International Electrotechnical Vocabulary (IEV) - Part 161: Electromagnetic compatibility".
- [10] void
- [11] CISPR 32: "Electromagnetic compatibility of multimedia equipment - Emission requirements".
- [12] void
- [13] IEC 61000-3-2: "Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current  $\leq 16$  A per phase)".
- [14] IEC 61000-3-12: "Electromagnetic compatibility (EMC) - Part 3-12: Limits - Limits for harmonic currents produced by equipment connected to public low-voltage system with input current  $>16$  A and  $\leq 75$  A per phase".
- [15] IEC 61000-3-3: "Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in low-voltage supply systems, for equipment with rated current  $\leq 16$  A per phase and not subject to conditional connection".
- [16] IEC 61000-3-11: "Electromagnetic compatibility (EMC) - Part 3-11: Limits – Limitation of voltage changes, voltage fluctuations and flicker in low-voltage supply systems - Equipment with rated current  $\leq 75$  A and subject to conditional connections".
- [17] IEC 61000-4-2: "Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test".
- [18] IEC 61000-4-3: "Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test".
- [19] IEC 61000-4-4: "Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test".
- [20] IEC 61000-4-5: "Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test".
- [21] IEC 61000-4-6: "Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio frequency fields".
- [22] IEC 61000-4-11: "Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests".
- [23] ETSI EN 301 489-1: "ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU".
- [24] Recommendation ITU-R SM.329-12: "Unwanted emissions in the spurious domain".
- [25] 3GPP TS 37.105: "Active Antenna System (AAS) Base Station (BS) transmission and reception".
- [26] Recommendation ITU-R SM.1539-1: "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".
- [27] 3GPP TS 38.101-4: "NR; User Equipment (UE) radio transmission and reception; Part 4: Performance requirements".
- [28] ETSI EN 301 489-50: "Electromagnetic compatibility (EMC) standard for radio equipment and services; Part 50: Specific conditions for cellular communication base station (BS), repeater and ancillary equipment; Harmonised standard covering the essential requirements of article 3.1(b) of the Directive 2014/53/EU".
- [29] IEC 61000-4-21: "Electromagnetic compatibility (EMC) - Part 4-21: Testing and measurement techniques - Reverberation chamber test methods".

- [30] CISPR 16-1-4: 2019-01: "Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements"
- [31] CISPR 16-4-2: " Specification for radio disturbance and immunity measuring apparatus and methods - Part 4-2: Uncertainties, statistics and limit modelling - Measurement instrumentation uncertainty, Amendment 2"
- [32] ETSI TR 100 028-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics, part 1"
- [33] IEC 61000-6-8: "Electromagnetic compatibility (EMC) - Part 6-8: Generic standards - Emission standard for professional equipment in commercial and light-industrial locations".

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## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 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 TR 21.905 [1].

**ancillary equipment:** electrical or electronic equipment, that is intended to be used with a receiver or transmitter

NOTE: It is considered as an ancillary equipment if:

- the equipment is intended for use with a receiver or transmitter to provide additional operational and/or control features to the radio equipment, (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 receiver or transmitter; and
- the receiver or transmitter, 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).

**antenna port:** for EMC purposes, port for connection of an antenna used for intentional transmission and/or reception of radiated RF energy, equivalent to an RF antenna connector/*TAB connector* in TS 37.105 [25].

**BS type 1-C:** NR base station operating at FR1 with requirements set consisting only of conducted requirements defined at individual antenna connectors.

**BS type 1-H:** NR base station operating at FR1 with a requirement set consisting of conducted requirements defined at individual *TAB connectors* and OTA requirements defined at RIB.

**BS type 1-O:** NR base station operating at FR1 with a requirement set consisting only of OTA requirements defined at the RIB.

**BS type 2-O:** NR base station operating at FR2 with a requirement set consisting only of OTA requirements defined at the RIB.

**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.

**continuous phenomena:** electromagnetic disturbance, the effects of which on a particular device or equipment cannot be resolved into a succession of distinct effects (IEC 60050-161 [9]).

**enclosure port:** physical boundary of the equipment through which electromagnetic fields may radiate or impinge.

NOTE: In the case of *integral antenna* equipment, this port is inseparable from the antenna port.

**exclusion band:** frequency range(s) not subject to test or assessment.

**free-space open area test site:** reference test site with precautions to ensure that reflections do not influence the measurement.

NOTE: The free-space open area test site (FSOATS) is the concept of the test site. A practical approximation is a Fully-Anechoic Room (FAR).

**fully-anechoic room:** shielded enclosure, the internal surfaces of which are lined with radio-frequency-energy absorbing material (i.e. RF absorber) that absorbs electromagnetic energy in the frequency range of interest.

**integral antenna:** antenna designed for permanent connection to the equipment and considered part of the enclosure port.

NOTE: An *integral antenna* may be fitted internally or externally.

**lower RF bandwidth edge:** the frequency of the lower edge of the Base Station RF bandwidth, used as a frequency reference point for transmitter and receiver requirements.

**operating band:** frequency range in which NR operates (paired or unpaired), that is defined with a specific set of technical requirements.

**port:** particular interface of EUT used for EMC requirements testing purposes.

NOTE: Any connection point on EUT intended for connection of cables to or from EUT during the EMC testing is considered as a port.

EXAMPLE 1: Examples of ports for *BS type 1-C* and *BS type 1-H* are as presented in figure 3.1-1:

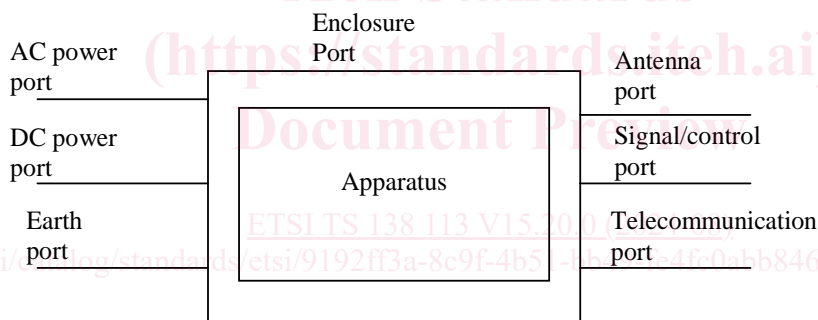


Figure 3.1-1: Examples of *ports* for *BS type 1-C* and *BS type 1-H*

EXAMPLE 2: Examples of ports for *BS type 1-O* and *BS type 2-O* (i.e. with no *antenna ports*) are as presented in figure 3.1-2:

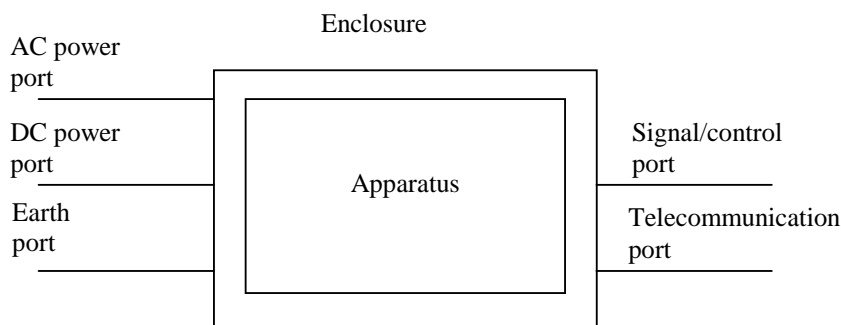


Figure 3.1-2: Examples of *ports* for *BS type 1-O* and *BS type 2-O*

**receiver exclusion band:** band of frequencies over which no tests of radiated immunity of a receiver are made, and expressed relative to the BS receive band.