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Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

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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.

1 Scope

The present document covers the assessment for NR Integrated access and backhaul (IAB) node and associated ancillary equipment in respect of Electromagnetic Compatibility (EMC).

The present document specifies the applicable test conditions, performance assessment and performance criteria for NR Integrated access and backhaul (IAB) node and associated ancillary equipment.

The environment classification used in the present document refers to the residential, commercial and light industrial environment classification used in IEC 61000-6-1 [4] and IEC 61000-6-3 [5].

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.

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 38.174: "NR; Integrated access and backhaul radio transmission and reception".
- [3] 3GPP TR 38.809: "NR; Background for Integrated access and backhaul radio transmission and reception".
- [4] IEC 61000-6-1: "Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments".
- [5] IEC 61000-6-3: "Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments".
- [6] CISPR 32: "Electromagnetic compatibility of multimedia equipment - Emission requirements".
- [7] IEC 60050-161: "International Electrotechnical Vocabulary (IEV) - Part 161: Electromagnetic compatibility".
- [8] IEC 61000-3-2: "Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)".
- [9] 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 ≤ 75 A per phase".
- [10] 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 ≤ 16 A per phase and not subject to conditional connection".
- [11] 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 ≤ 75 A and subject to conditional connections".

- [12] IEC 61000-4-2: "Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test".
- [13] IEC 61000-4-3: "Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test".
- [14] IEC 61000-4-4: "Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test".
- [15] IEC 61000-4-5: "Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test".
- [16] IEC 61000-4-6: "Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio frequency fields".
- [17] IEC 61000-4-11: "Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests".
- [18] IEC 61000-4-21: "Electromagnetic compatibility (EMC) - Part 4-21: Testing and measurement techniques - Reverberation chamber test methods".
- [19] 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".
- [20] Recommendation ITU-R SM.329: "Unwanted emissions in the spurious domain".
- [21] Recommendation ITU-R SM.1539: "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".

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].

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 [7]).

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.

IAB-node: RAN node that supports wireless access to UEs and wirelessly backhauls the access traffic.

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.

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 *IAB type 1-H* are as presented in figure 3.1-1:

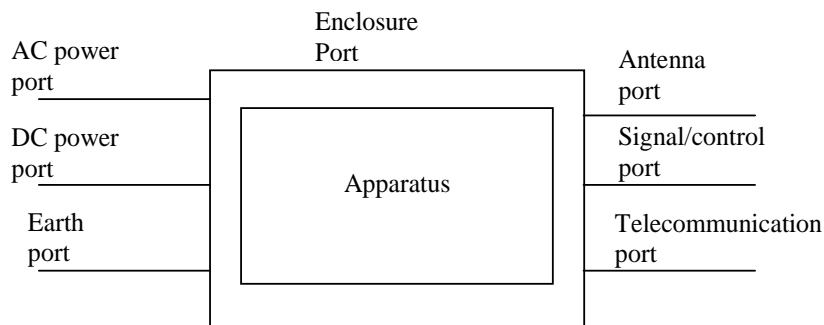


Figure 3.1-1: Examples of ports for *IAB type 1-H*

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

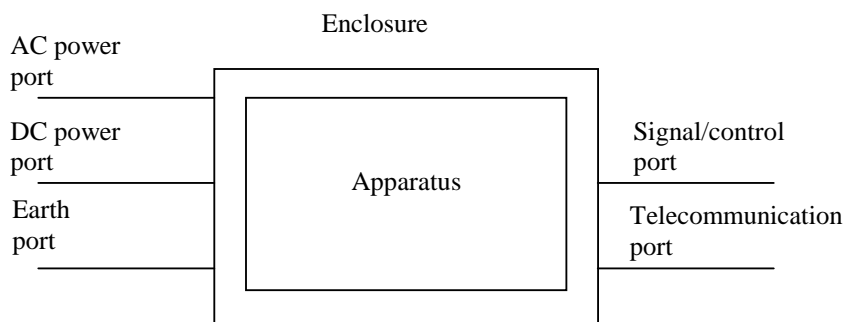


Figure 3.1-2: Examples of ports for *IAB type 1-O* and *IAB type 2-O*

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

signal port: port intended for the interconnection of components of an EUT, or between an EUT and associated equipment and used in accordance with relevant functional specifications (for example for the maximum length of cable connected to it).

Throughput: number of payload bits successfully received per second for a reference measurement channel in a specified reference condition.

telecommunication port: ports which are intended to be connected to telecommunication networks (e.g. public switched telecommunication networks, integrated services digital networks), local area networks (e.g. Ethernet, Token Ring) and similar networks.

NOTE: *Telecommunication port* is called "wired network port" in CISPR 32 [6] and ETSI EN 301 489-1 [19].

transient phenomena: pertaining to or designating a phenomena 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 [7]).

3.2 Symbols

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

BW_{Channel} Channel bandwidth

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

AC	Alternating Current
AMN	Artificial Mains Network
BC	Band Category
BH	Backhaul
CA	Carrier Aggregation
CDN	Coupling/Decoupling Network
CS	Capability Set
DC	Direct Current
EIRP	Equivalent Isotropic Radiated Power
EMC	Electromagnetic Compatibility
e.r.p.	Effective Radiated Power
ESD	Electrostatic Discharge
EUT	Equipment Under Test
FR	Frequency Range
FRC	Fixed Reference Channel
IAB	Integrated Access and Backhaul
NC	Non Contiguous
NG	Next Generation
NGC	Next Generation Core
NR	New Radio
NR-ARFCN	NR Absolute Radio Frequency Channel Number
NRTC	NR Test Configuration
NTC	Test Configuration for Non-contiguous operation
RAT	Radio Access Technology
RF	Radio Frequency
RIB	Radiated Interface Boundary
rms	root mean square
SC	Single Carrier
TC	Test Configuration

4 Test conditions

4.1 General

Texts will be added.

4.2 Arrangements for establishing a communication link

Texts will be added.

4.3 Narrow band responses on receivers

Texts will be added.

4.4 Exclusion bands

4.4.1 Transmitter exclusion band

The *transmitter exclusion band* for IAB is the frequency range over which no tests of radiated immunity of a transmitter are made. As the IAB node may operate its access and backhaul link in different NR IAB *operating band*, the *transmitter exclusion band* for IAB applies separately for the access and backhaul link. The *transmitter exclusion band* applies to *IAB type 1-O*.

The *transmitter exclusion band* is defined as:

$$F_{DL,low} - \Delta f_{OBUE} < f < F_{DL,high} + \Delta f_{OBUE}$$

Where:

- Values of $F_{DL,low}$ and $F_{DL,high}$ are defined for each NR IAB *operating band* in TS 38.174 [2], clause 5.2.
- The value of Δf_{OBUE} is derived considering the width of the NR IAB *operating band*, and is defined as in table 4.4.1-1.

Table 4.4.1-1: Δf_{OBUE} offset values for NR IAB

IAB type	NR IAB <i>operating band</i> characteristics	Δf_{OBUE} (MHz)
IAB type 1-O	$F_{DL,high} - F_{DL,low} < 100$ MHz	[10]
	$100 \text{ MHz} \leq F_{DL,high} - F_{DL,low} \leq 900$ MHz	[40]

NOTE: As the radiated immunity testing is defined in the frequency range 80 MHz to 6 GHz, there is no *transmitter exclusion band* defined for *IAB type 2-O*.

4.4.2 Receiver exclusion band

The *receiver exclusion band* for IAB is the frequency range over which no tests of radiated immunity of a receiver are made. As the IAB node may operate its access and backhaul link in different NR IAB *operating band*, the *receiver exclusion band* for IAB applies separately for the access and backhaul link. The *receiver exclusion band* applies to *IAB type 1-O*.

The *receiver exclusion band* is defined as:

$$F_{UL,low} - \Delta f_{RX} < f < F_{UL,high} + \Delta f_{RX}$$

Where:

- Values of $F_{UL,low}$ and $F_{UL,high}$ are defined for each NR IAB *operating band* in in TS 38.174 [2], clause 5.2.
- The value of Δf_{RX} is derived considering the width of the NR IAB *operating band*, and is defined as in table 4.4.2-1. [Value of the Δf_{RX} also depends on the RI test setup, i.e. whether or not the *spatial exclusion zone* (as depicted in figure x) is considered during the RI test].

Table 4.4.1-1: Δf_{RX} offset values for IAB

IAB type	IAB <i>operating band</i> characteristics	RI test setup	Δf_{RX} (MHz)
IAB type 1-O	$F_{UL,high} - F_{UL,low} < 100$ MHz	With exclusion zone	[20]
		Without exclusion zone	[60]
	$100 \text{ MHz} \leq F_{UL,high} - F_{UL,low} \leq 900$ MHz	With exclusion zone	[60]
		Without exclusion zone	[200]

NOTE: As the radiated immunity testing is defined in the frequency range 80 MHz to 6 GHz, there is no *receiver exclusion band* defined for *IAB type 2-O*.

4.5 IAB test configurations

Texts will be added.

5 Performance assessment

5.1 General

Texts will be added.

5.2 Assessment of throughput of IAB-DU

Texts will be added.

5.3 Assessment of throughput of IAB-MT

Texts will be added.

5.4 Ancillary equipment

Texts will be added.

6 Performance criteria

6.1 Performance criteria for continuous phenomena for IAB

Texts will be added.

6.2 Performance criteria for transient phenomena for IAB

Texts will be added.

6.3 Performance criteria for continuous phenomena for Ancillary equipment

Texts will be added.

6.4 Performance criteria for transient phenomena for Ancillary equipment

Texts will be added.

7 Applicability overview

7.1 Emission

Throughout this specification, whenever the IAB requirement is referred, its applicability shall be considered as applicable to the IAB node as a whole (MT and DU), irrespective of its implementation. Performance assessment of an IAB node with multiple enclosures may be done separately for each of them, according to the manufacturer's choice.

Table 7.1-1: Emission requirements applicability

Phenomenon	Application	Equipment test requirement		Reference clause in the present document	Reference standard
		IAB equipment	Ancillary equipment		
Radiated emission	IAB enclosure (Note 1)	applicable for IAB type 1-H (Note 2)	not applicable	8.2.1	ITU-R SM.329 [20]
Radiated emission	Enclosure of ancillary equipment	not applicable	applicable	8.2.2	CISPR 32 [6]
Conducted emission	DC power input/output port	applicable	applicable	8.3	CISPR 32 [6]
Conducted emission	AC mains input/output port	applicable	applicable	8.4	CISPR 32 [6]
Conducted emission	Telecommunication port	applicable	applicable	8.5	CISPR 32 [6]
Harmonic current emissions	AC mains input port	applicable	applicable	8.6	IEC 61000-3-2 [8] or IEC 61000-3-12 [9]
Voltage fluctuations and flicker	AC mains input port	applicable	applicable	8.7	IEC 61000-3-3 [10] or IEC 61000-3-11 [11]

NOTE 1: Radiated emission measurement of an IAB node with multiple enclosures may be done separately for each of them, according to the manufacturer's choice.

NOTE 2: Radiated emission requirements for IAB type 1-O and IAB type 2-O are described in clause 8.2.1.

7.2 Immunity

Table 7.2-1: Immunity requirements applicability

Phenomenon	Application	Equipment test requirement		Reference clause in the present document	Reference standard
		IAB equipment	Ancillary equipment		
RF electromagnetic field (80 – 6000 MHz)	Enclosure	applicable	applicable	9.2	IEC 61000-4-3 [13]
Electrostatic discharge	Enclosure	applicable	applicable	9.3	IEC 61000-4-2 [12]
Fast transients common mode	Signal, telecommunications and control ports, DC and AC power input ports	applicable	applicable	9.4	IEC 61000-4-4 [14]
RF common mode 0.15 - 80 MHz	Signal, telecommunications and control ports, DC and AC power input ports	applicable	applicable	9.5	IEC 61000-4-6 [16]
Voltage dips and interruptions	AC mains power input ports	applicable	applicable	9.6	IEC 61000-4-11 [17]
Surges, common and differential mode	AC power input ports and telecommunications port	applicable	applicable	9.7	IEC 61000-4-5 [15]

8 Emission

8.1 Test configurations

Texts will be added.

8.2 Radiated emission

8.2.1 Radiated emission, IAB

Texts will be added.

8.2.2 Radiated emission, ancillary equipment

This test is only applicable to *ancillary equipment* not incorporated in the radio equipment and intended to be measured on a stand-alone basis, as declared by the manufacturer. This test shall be performed on a representative configuration of the *ancillary equipment*.

This test is not applicable for *ancillary equipment* incorporated in the radio equipment, or for *ancillary equipment* intended to be measured in combination with the radio equipment. In these cases, the requirements of the relevant product standard for the effective use of the radio spectrum shall apply.

8.2.2.1 Definition

This test assesses the ability of *ancillary equipment* to limit unwanted emission from the *enclosure port*.

8.2.2.2 Test method

The test method shall be in accordance with CISPR 32[6].

8.2.2.3 Limits

The *ancillary equipment* shall meet the limits according to CISPR 32[6] table A.4 and table A.5.

For the referred limit values, the following shall apply:

Where the limits value varies over a given frequency range, it changes linearly with respect to the logarithm of the frequency.

Where there is a step in the relevant limit, the lower value shall be applied at the transition frequency.

8.3 Conducted emission DC power input/output port

If the DC power cable of the radio 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 clause 8.4.

This test shall be performed on a representative configuration of the radio equipment, the associated *ancillary equipment*, or 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 [6] and the Artificial Mains Network (AMN) shall be connected to a DC power source.

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

A measuring receiver shall be connected to each AMN measurement port in turn and the conducted emission recorded.

The equipment shall be installed with a ground plane as defined in CISPR 32 [6]. The reference earth point of the AMN 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 [6] 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.

Where there is a step in the referred limit values, the lower value shall be applied at the transition frequency.

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 circuit breaker) to the AC power port of the EUT.

This test shall be performed on a representative configuration of the radio equipment, the associated *ancillary equipment*, or 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 [6].

8.4.3 Limits

The equipment shall meet the limits according to CISPR 32 [6] 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.

For the referred limit values following shall apply:

Where the limits value varies over a given frequency range, it changes linearly with respect to the logarithm of the frequency.

Where there is a step in the relevant limit, the lower value shall be applied at the transition frequency.

Alternatively, for equipment intended to be used in telecommunication centres the limits given in CISPR 32 [6] table A.9 shall be used.

8.5 Conducted emissions, telecommunication port

This test is applicable for radio equipment and/or *ancillary equipment* for fixed use which have *telecommunication ports*.

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

8.5.1 Definition

This test assesses the EUT unwanted emission present at the *telecommunication ports*.

8.5.2 Test method

The test method shall be in accordance with CISPR 32 [6].

8.5.3 Limits

The *telecommunication ports* shall meet the limits according to CISPR 32 [6] table A.12.

For the referred limit values, following shall apply:

Where the limits value varies over a given frequency range, it changes linearly with respect to the logarithm of the frequency.

Where there is a step in the relevant limit, the lower value shall be applied at the transition frequency.

Alternatively, for equipment intended to be used in telecommunication centres only, the limits given in CISPR 32 [6] table A.11 may be used.

8.6 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. For equipment with an input current of greater than 16A per phase, IEC 61000-3-12 [9] applies.

8.7 Voltage fluctuations and flicker (AC mains input port)

The requirements of IEC 61000-3-3 [10] for voltage fluctuations and flicker apply for equipment covered by the scope of the present document. For equipment with an input current of greater than 16 A per phase, IEC 61000-3-11 [11] applies.

9 Immunity

9.1 Test configurations

Texts will be added.

9.2 RF electromagnetic field (80 MHz - 6000 MHz)

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

9.2.1 Definition

This test assesses the ability of radio equipment 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 [13]. The use of reverberation chamber test method according to IEC 61000-4-21 [18], clause 6.1 and Annex D as alternative method is allowed.

- For transmitters, receivers and transceivers 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 - 6000 MHz; with the exception of the exclusion band for receivers (see clause X);
- 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 X;
- The frequencies selected during the test shall be recorded in the test report.
- [For the test method in accordance with IEC 61000-4-3[13], the following *spatial exclusion zone* can be chosen to protect the IAB node receiver].

9.2.3 Performance criteria

IAB node:

The performance criteria of clause X shall apply.

Ancillary equipment:

The performance criteria of clause X shall apply.

9.3 Electrostatic discharge

The test shall be performed on a representative configuration of the radio equipment, the associated *ancillary equipment*, or representative configuration of the combination of radio and *ancillary equipment*.

9.3.1 Definition

This test assesses the ability of radio equipment and *ancillary equipment* to operate as intended in the event of an electrostatic discharge.

9.3.2 Test method and level

The test method shall be in accordance with IEC 61000-4-2 [12]:

- for contact discharge, the equipment shall pass at ± 4 kV;
- for air discharge shall pass at ± 8 kV;
- electrostatic discharge shall be applied to all exposed surfaces of the EUT except where the user documentation specially indicates a requirement for appropriate protective measures.

NOTE: Ensure that the EUT is fully discharged between each ESD exposure.

9.3.3 Performance criteria

IAB node:

The performance criteria of clause X shall apply.

Ancillary equipment:

The performance criteria of clause X shall apply.

9.4 Fast transients common mode

The test shall be performed on AC mains power input ports.

This test shall be performed on *signal ports*, *telecommunication ports*, *control ports* and DC power input/output ports if the cables may be longer than 3 m.

Where this test is not carried out on a port or any other ports because the manufacturer declares that it is not intended to be used with cables longer than 3 m, a list of ports which were not tested for this reason shall be included in the test report.

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

9.4.1 Definition

This test assesses the ability of radio equipment and *ancillary equipment* to operate as intended in the event of fast transients present on one of the input/output ports.

9.4.2 Test method and level

The test method shall be in accordance with IEC 61000-4-4 [14]:

- The test level for *signal ports*, *telecommunication ports* and *control ports* shall be 0.5 kV open circuit voltage as given in IEC 61000-4-4 [14];
- The test level for DC power input/output ports shall be 0.5 kV open circuit voltage as given in IEC 61000-4-4 [14];
- The test level for AC mains power input ports shall be 1 kV open circuit voltage as given in IEC 61000-4-4 [14].

For AC and DC power input ports the transients shall be applied (in parallel) to all the conductors in the cable with reference to the cabinet reference earth (true common mode) and the source impedance shall be 50 Ω .

9.4.3 Performance criteria

IAB node:

The performance criteria of clause X shall apply.

Ancillary equipment:

The performance criteria of clause X shall apply.

9.5 RF common mode (0.15 MHz - 80 MHz)

The test shall be performed on AC mains power input/output ports.

This test shall be performed on *signal ports*, *telecommunication ports*, *control* and DC power input/output ports, which may have cables longer than 3 m.

Where this test is not carried out on a port or any other ports because the manufacturer declares that it is not intended to be used with cables longer than stated above, a list of ports which were not tested shall be included in the test report.

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

NOTE: This test can also be performed using the intrusive method, where appropriate, see IEC 61000-4-6 [16].

9.5.1 Definition

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

9.5.2 Test method and level

The test method shall be in accordance with IEC 61000-4-6 [16]:

- The test signal shall be amplitude modulated to a depth of 80 % by a sinusoidal audio signal of 1 kHz;
- The stepped frequency increments shall be 50 kHz in the frequency range 150 kHz to 5 MHz and 1% frequency increment of the momentary frequency in the frequency range 5 MHz to 80 MHz;
- The test level shall be severity level 2 as given in IEC 61000-4-6 [16] corresponding to 3 V rms, at a transfer impedance of 150 Ω ;
- The test shall be performed over the frequency range 150 kHz - 80 MHz;
- The injection method to be used shall be selected according to the basic standard IEC 61000-4-6 [16];
- Responses of stand-alone receivers or receivers which are part of transceivers occurring at discrete frequencies which are narrow band responses, shall be disregarded, see clause X;
- The frequencies of the immunity test signal selected and used during the test shall be recorded in the test report.

9.5.3 Performance criteria

IAB node:

The performance criteria of clause X shall apply.

Ancillary equipment:

The performance criteria of clause X shall apply.

9.6 Voltage dips and interruptions

The tests shall be performed on AC mains power input ports.

These tests shall be performed on a representative configuration of the equipment, the associated *ancillary equipment*, or representative configuration of the combination of radio and *ancillary equipment*.

9.6.1 Definition

These tests assess the ability of radio equipment and *ancillary equipment* to operate as intended in the event of voltage dips and interruptions present on the AC mains power input ports.

9.6.2 Test method and level

The following requirements shall apply.

The test method shall be in accordance with IEC 61000-4-11 [17].

The test levels shall be:

- Voltage dip: 0 % residual voltage for 0.5 cycle;
- Voltage dip: 0 % residual voltage for 1 cycle;

- Voltage dip: 70 % residual voltage for 25/30 cycles (at 50/60 Hz);
- Voltage interruption: 0 % residual voltage for 250/300 cycles (at 50/60 Hz).

9.6.3 Performance criteria

For a voltage dip the performance criteria for transient phenomena shall be applied:

- Criteria X for IAB node
- Criteria X for *ancillary equipment*

For a voltage interruption, the following applies:

1. In the case where the equipment is fitted with or connected to a battery back-up, the following performance criteria shall be applied:
 - Criteria X for IAB node
 - Criteria X for *ancillary equipment*
2. In the case where the equipment is powered solely from the AC mains supply (without the use of a parallel battery back-up) volatile user data may have been lost and if applicable the communication link need not to be maintained and lost functions should be recoverable by user or operator:
 - No unintentional responses shall occur at the end of the test
 - In the event of loss of communications link or in the event of loss of user data, this fact shall be recorded in the test report.

9.7 Surges, common and differential mode

The tests shall be performed on AC mains power input ports.

This test shall be additionally performed on *telecommunication ports*.

These tests shall be performed on a representative configuration of the equipment, the associated *ancillary equipment*, or representative configuration of the combination of radio and *ancillary equipment*.

9.7.1 Definition

These tests assess the ability of radio equipment and *ancillary equipment* to operate as intended in the event of surges being present at the AC mains power input ports and *telecommunication ports*.

9.7.2 Test method and level

The test method shall be in accordance with IEC 61000-4-5 [15].

The requirements and evaluation of test results given in clause 9.7.2.1 (*telecommunication ports*, outdoor cables), clause 9.7.2.2 (*telecommunication ports*, indoor cables) and clause 9.7.2.3 (AC power ports) shall apply, but no test shall be required where normal functioning cannot be achieved, because of the impact of the CDN on the EUT.

9.7.2.1 Test method for telecommunication ports directly connected to outdoor cables

The test level for *telecommunications ports*, intended to be directly connected to the telecommunications network via outdoor cables, shall be 1 kV line to ground as given in IEC 61000-4-5 [15]. In this case the total output impedance of the surge generator shall be in accordance with the basic standard IEC 61000-4-5 [15].

The test generator shall provide the 1.2/50 μ s pulse as defined in IEC 61000-4-5 [15].

9.7.2.2 Test method for telecommunication ports connected to indoor cables

The test level for telecommunication *ports*, intended to be connected to indoor cables (longer than 10 m) shall be 0.5 kV line to ground. In this case the total output impedance of the surge generator shall be in accordance with the basic standard IEC 61000-4-5 [15].

The test generator shall provide the 1.2/50 μ s pulse as defined in IEC 61000-4-5 [15].

9.7.2.3 Test method for AC power ports

The test level for AC power input *ports* shall be 2 kV line to ground, and 1 kV line to line, with the output impedance of the surge generator as given in IEC 61000-4-5 [15].

In telecommunication centres 1 kV line to ground and 0.5 kV line to line shall be used.

The test generator shall provide the 1.2/50 μ s pulse as defined in IEC 61000-4-5 [15].

9.7.3 Performance criteria

IAB node:

The performance criteria of clause X shall apply.

Ancillary equipment:

The performance criteria of clause X shall apply.

Annex A (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2020-09	RAN#89-e	RP-201714				Capture contributions approved in RAN4#96-e: R4-2012636 TPs to TS on IAB EMC section 1 (Scope) R4-2012639 , Definitions and immunity of IAB EMC R4-2012640, IAB EMC specification: Exclusion bands (4.4) R4-2012641, IAB EMC specification: Emission (7.1) R4-2012642, Emission for IAB EMC R4-2012643, References for IAB EMC R4-2012638, TPs to TS on IAB EMC section 9 (Immunity)	1.0.0
2020-09	RAN#89	RP-202108				Approved by plenary – Rel-16 spec under change control	16.0.0

History

Document history		
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