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STANDARD DOCUMENT OF TEC

TEC 11016:2026

दूरसंचार उपकरण के लिए विद्युतचुम्बकीय संगतता मानदण्ड

Electromagnetic Compatibility Standard for
Telecommunication Equipment



ISO 9001:2015

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इस सर्वाधिकार सुरक्षित प्रकाशन का कोई भी हिस्सा, दूरसंचार अभियांत्रिकी केंद्र, नई दिल्ली की लिखित स्वीकृति के बिना, किसी भी रूप में या किसी भी प्रकार से जैसे - इलेक्ट्रॉनिक, मैकेनिकल, फोटोकॉपी, रिकॉर्डिंग, स्कैनिंग आदि रूप में प्रेषित, संग्रहीत या पुनरुत्पादित न किया जाए।।

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Release 6: 2026

FOREWORD

Telecommunication Engineering Centre (TEC) functions under Department of Telecommunications (DOT), Government of India.

Its activities include:

- Issue of Generic Requirements (GR), Interface Requirements (IR), Service Requirements (SR) and Standards for Telecom Products and Services
- Field evaluation of products and Systems
- National Fundamental Plans
- Support to DOT on technology issues
- Testing & Certification of Telecom products

For the purpose of testing, four Regional Telecom Engineering Centres (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This Standard pertains to the assessment of telecom systems and ancillary equipment in general, and radio systems in particular, in respect of electromagnetic compatibility (EMC).

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HISTORY SHEET

<i>S. No.</i>	<i>Standard / Document No.</i>	<i>Title</i>	<i>Remarks</i>
1.	SD /EMI-02/01.DEC 97	Electromagnetic Compatibility Standard for Telecommunication Equipment	First Issue
2.	SD /EMI-02/02.SEP 01 TBRR/F/GQR- AMD/18.TEC/2001, dated 01/01/2008		Second issue Amendment 1
3.	SD /EMI-02/03. MAY 2006 TBRR/F/EMS-STD/01 TEC 2006, dated 01/01/2008 TBRR/F/EMS-STD/01 TEC 2008, dated 03/11/2008		Third issue Amendment 1 Amendment 2
4.	No. TEC/EMI/TEL- 001/01/FEB-09		Fourth edition (Consolidated version consists of third issue with its amendment No. 1 dated 1/1/2008 & amendment No. 2 dated 3/11/2008)
5.	No. TEC/SD/DD/EMC- 221/05/OCT-16		Fifth edition
6.	TEC 11016:2026		Sixth edition (Requirements in

			<u>respect of certain EMC parameters have been modified in the relevant clauses to align with the latest standard revisions, technological advancements and for better clarity)</u>
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REFERENCES

<i>S. No.</i>	<i>Document No</i>	<i>Title/Document Name</i>
1.	IEC 61000-4-2(2025) <u>Or</u> IS 14700 : Part 4 : Sec 2 : 2018 (IEC 61000- 4-2 : 2008) (Reaffirmed Year : 2024)	Electrostatic discharge immunity test
2.	IEC 61000-4-3(2020) <u>Or</u> IS 14700 : Part 4 : Sec 3 : 2023 (IEC 61000- 4-3 : 2020)	Radiated, radio-frequency, electromagnetic field immunity test
3.	IEC 61000-4-4(2012) <u>Or</u> IS 14700 : Part 4 : Sec 4 : 2018 (IEC 61000- 4-4 : 2012) (Reaffirmed Year : 2021)	Electrical fast transient / burst immunity test
4.	IEC 61000-4-5 (2014) + A1: 2017 <u>Or</u> IS 14700 : Part 4 : Sec 5 : 2019 (IEC 61000- 4-5 : 2017) (Reaffirmed Year : 2022)	Surge immunity test

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5.	IEC 61000-4-6 (2023) <u>Or</u> IS 14700 : Part 4 : Sec 6 : 2026 (IEC 61000- 4-6 : 2023)	Immunity to conducted disturbances, induced by radio-frequency fields
6.	IEC 61000-4-11(2020) <u>Or</u> IS 14700 : Part 4 : Sec 11 : 2021 (IEC 61000-4-11: 2020)	Voltage dips, shot interruptions and voltage variations immunity tests
7.	CISPR 16-1-1 (2019**)	Specification for radio disturbance and immunity measuring apparatus and methods - part1-1: Radio disturbance and immunity measuring apparatus- Measuring apparatus
8.	CISPR 16-1-2 (2017**)	Specification for radio disturbance and immunity measuring apparatus and met hods - part1-2: Radio disturbance and immunity measuring apparatus- Coupling devices for conducted disturbance measurement Ancillary equipment Conducted disturbances
9.	CISPR 11 (2024)	Industrial, scientific and medical (ISM) radio-frequency equipment- Electromagnetic disturbance characteristic-Limits and methods of Measurement
10.	CISPR 32 (2015) + A1:2019 <u>Or</u> IS/CISPR 32 : 2015 (CISPR 32 : 2015)	Limits and methods of measurement of radio disturbance characteristics of information technology equipment

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	(Reaffirmed Year : 2022)	
11.	ITU-T Rec. G.821	Error performance of an international digital connection forming part of an integrated services digital network
12.	ITU-T Rec. G.826	Error performance parameters and objectives for international constant bit-rate digital paths at/or above the primary rate
13.	IEC 61000-4-29 (2000)	Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests.
14.	IEC 61000-4-34 (2005) + AMD1:2009 +AMD2+:2025	Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase
15.	ISO 7637-2 (2004)	Road vehicles - Electrical disturbances from conduction and coupling - Part 2: Electrical transient conduction along supply lines only
<u>16.</u>	<u>ETSI EN 301 489-1:2019</u>	<u>ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard for ElectroMagnetic Compatibility</u>
<u>17.</u>	<u>ETSI EN 301 489-17:2024</u>	<u>ElectroMagnetic Compatibility (EMC) standard for radio equipment and</u>

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		services; Part 17: Specific conditions for Broadband and Wideband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility
<u>18</u>	ITU-T K.136 (11/2022)	Electromagnetic compatibility requirements for radio telecommunication equipment

Note:

- i. *At the time of publication of this document, the editions indicated above were valid. All the standards are subject to revision. Thus editions of the standards indicated in this clause or their subsequent versions shall be applicable unless otherwise stated.*

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ELECTROMAGNETIC COMPATIBILITY STANDARD FOR TELECOMMUNICATION

EQUIPMENT No: [11016](#)

CHAPTER 1

1.0 Scope

This standard covers the assessment of telecom systems and ancillary equipment in general, and radio systems, in respect of electromagnetic compatibility (EMC). This standard specifies the following: -

- applicable EMC test
- test methods/ procedures
- minimum performance criteria

For RF systems, the processing and protection switch, (de) modulator, transmitter, receiver, RF filters, branching networks, feeders are covered by this standard. The multiplexing and /or de- multiplexing elements are covered, if they form part of the transmitter, receiver and/ or transceiver.

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

This standard may not cover those cases where a potential source of interference which is producing individually repeated transient phenomena or a continuous phenomenon is permanently present, e.g. a radar or broadcast site in the vicinity. In such a case, it may be necessary to use special protection, applied to either the source of interference or the interfered part or both.

Compliance of a telecom equipment with the requirements of this standard does not signify compliance with any requirement related to the use of the equipment (i.e. licensing requirements etc.)

Compliance with this standard does not signify compliance with any safety requirement. However, it is the responsibility of the assessor of the equipment that any observation regarding apparatus becoming dangerous or unsafe as a result of the application of the tests of this standard should be recorded in the test report.

This standard has been prepared taking into consideration the guidance provided in ITU-T Recommendation K.136 on "Electromagnetic Compatibility Requirements for Radio

Telecommunication Equipment”, particularly with respect to general EMC principles, operational conditions, performance assessment and performance criteria, wherever applicable and other IEC and CISPR standards as referred in this document. The applicable emission and immunity test methods, test levels and limits shall be as specified in the respective CISPR, IEC 61000 series and other normative references cited in this standard.

Note : EMC requirements are not applicable to passive devices/components.

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1.1 Definitions

- i) **Ancillary equipment:** Equipment (apparatus), used in connection with main equipment.(e.g. for performing the intended function as a receiver, transmitter or transceiver) is considered as an ancillary equipment (apparatus) if:
- the equipment is intended for use in conjunction with the main eqpt. (e.g. a receiver, transmitter or transceiver) to provide additional operational and /or control features to the telecom 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 the main equipment. (e.g. a receiver, transmitter or transceiver) and
 - the main equipment (e.g. receiver, transmitter or transceiver) 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).

Definition of Ancillary equipment as described in ITU-T K.136 (11/2022) Recommendation is also applicable.

- ii) a) **Anechoic chamber:** A shielded enclosure which is lined with radio-frequency absorbers to reduce reflections from the internal surfaces
- b) **Fully anechoic chamber:** A shielded enclosure whose internal surfaces are totally lined with anechoic material
- c) **Semi-anechoic chamber:** A shielded enclosure where all internal surfaces are covered with anechoic material with the exception of the floor, which shall be

reflective (ground plane)

- iii) a) **Common- mode impedance:** The ratio of the common- mode voltage and the common-mode current at a certain port.
- b) **Total common mode impedance:** The impedance between the cables attached to the EUT port under test and the reference ground plane.
- iv) **Continuous phenomena (continuous disturbance):** Electromagnetic disturbance, the effects of which on a particular device or equipment cannot be resolved into a succession of distinct effects.
- v) **Enclosure port:** The physical boundary of the apparatus through which an electromagnetic fields may radiate or impinge.
- vi) a) **Port:** a particular interface, of the specified equipment (apparatus), with the external electromagnetic environment.

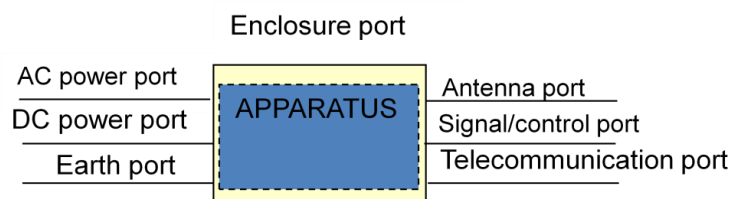


Figure 1: Example of Ports

Source: ITU-T K.136 (11/2022) Recommendation.

Note 1: For example, any connection point on an equipment intended for connection of cables to or from that equipment is consider as a port (see figure 1).

Note 2: An interface, which uses optical fiber, is not a port for the purposes of testing because it does not interface with the electromagnetic environment within the frequency range, which is applicable for the present document. An optical fiber interface may be used in the assessment of performance.

~~b) **Telecommunication port:** The ports which are intended to be connected to~~

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~~telecommunication networks (e.g. public switched telecommunication networks, integrated services digital networks), local area networks (e.g. Ethernet, Token Ring) and similar networks. This may include wired network port.~~

POE port : i) PoE In and ii) PoE Out

~~<Inputs are invited from the stakeholder>~~

b) **AC mains power port:** Port used to connect to the mains supply network.

Note 1 to entry: Equipment with a DC power port which is powered by a dedicated AC/DC power converter is defined as AC mains powered equipment.

c) **DC network power port:** Port, not powered by a dedicated AC/DC power converter and not supporting communication, that connects to a DC supply network.

Note 1 to entry: Equipment with a DC power port which is powered by a dedicated AC/DC power converter is considered to be AC mains powered equipment.

Note 2 to entry: DC power ports supporting communications are considered to be wired networks ports, for example Ethernet ports which include Power Over Ethernet (POE).

d) **Signal port/Control port:** port intended for the interconnection of components of an EUT, or between an EUT and local AE and used in accordance with relevant functional specifications (for example for the maximum length of cable connected to it)

Note 1 to entry: Examples include RS-232, Universal Serial Bus (USB), High-Definition Multimedia Interface (HDMI), IEEE Standard 1394 ("Fire Wire"), and waveguide ports used for interconnecting MME.

e) **Wired network port:** Port for the connection of voice, data and signalling transfers intended to interconnect widely-dispersed systems by direct connection to a single-user or multi-user communication network.

Note 1 to entry: Examples of these include CATV, PSTN, ISDN, xDSL, LAN and similar networks.

Note 2 to entry: These ports may support screened or unscreened cables and

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may also carry AC or DC power where this is an integral part of the telecommunication specification.

~~Note 3: Wired network port definition include/covers Telecom /Telecommunication port also. Wired network port definition/covers also~~ The definition of "Wired Network Port" includes and covers Telecommunication Ports/Telecom Ports. A Telecommunication Port refers to the ports 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 4: For Standalone LAN cable No EMC tests are applicable.~~

e)f) **Optical fibre port:** port at which an optical fibre is connected to an equipment.

~~enclosure port: physical boundary of the EUT through which electromagnetic fields may radiate:~~

vii) **Radio communications equipment:** An apparatus that includes one or more transmitters and/or receivers and/or parts there-of. This type of equipment (apparatus) is used in a fixed, mobile or portable application. Also, as defined in ITU-T K.136 (11/2022) recommendation, Radio equipment is defined as an electrical or electronic product, which primary function is to intentionally transmits and/or receives radio waves for the purpose of radio communication.

viii) a) **Symmetric voltage:** In a two wire circuit, such as a single- phase main supply, the symmetric voltage is the radio-frequency disturbance voltage appearing between the two wires. This is sometime called the differential mode voltage. If V_a is the vector voltage between one of the mains terminals and earth and V_b is the vector voltage between the other mains terminal and earth, the symmetric voltage difference is $(V_a - V_b)$

b) **Asymmetric voltage:** The asymmetric voltage is the radio- frequency disturbance voltage appearing between the electrical mid – point of the mains terminals and earth. It is sometimes called the common mode voltage. If V_a is the vector voltage between one of the mains terminals and earth and V_b is the vector voltage between the other mains terminal and earth, the asymmetric voltage is half

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the vector sum of V_a and V_b , i.e., $(V_a + V_b)/2$

c) **Unsymmetric voltage:** If V_a is the vector voltage between one of the mains terminals and earth and V_b is the vector voltage between the other mains terminal and earth, unsymmetric voltage is the amplitude of the vector voltage, V_a or V_b . This is the voltage measured by the use of an artificial mains V-network.

ix) **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.

x) **Equipment classification:** For the purpose of testing of telecom equipment for immunity against electromagnetic disturbance, the equipment are classified into the following two grades:

a) **Grade A** of telecom / radio link equipment for which no harmonized grade of service is specified;

b) **Grade B** of telecom / radio link equipment for which a harmonized grade of service is specified as in ITU-T Recommendations G .821 and / or G.826.

xi) **The telecom equipment:** For the purpose of their radio disturbance emission characteristics, are subdivided into categories, denoted class A & class B.

a) **“Class B” equipment**

“Class B” Telecom equipment is intended primarily for use in the domestic environment and may include:

- equipment with no fixed place of use; for example, portable equipment powered by built- in batteries;
- telecommunication terminal equipment powered by a telecommunication network;
- personal computers and auxiliary connected equipment.

Note: The domestic environment is an environment where the use of broadcast radio and television receivers may be expected within a distance of 10 m of the apparatus concerned.

b) **“Class A” equipment**

Class A Telecom equipment is a category of all other Telecom Equipments which satisfies class A Telecom Equipment limits but not the class B limits. Such equipment may cause Radio Interference in the domestic environment.

xii) Emission Tests

a) Radiated Emission Test: This test is applicable to telecom / radio equipment and ancillary equipment.

This test assesses the ability of telecom / RF equipments (such as transmitters, receivers, transceivers and ancillary equipment etc.) to limit **unintentional** emission from the enclosure.

b) Conducted Emission Test : This test assesses the ability of EUT (such as telecom equipment, transmitter, receiver, transceiver and ancillary equipment etc.) to limit its internal noise from being present on the D.C. power input/output ports, the a. c. mains power input/output ports, Wired network port etc.

xiii) Immunity Tests

a) Immunity To Electrostatic Discharge: This test assesses the ability of equipment under test (EUT) to operate as intended in the event of an electrostatic discharge.

b) Immunity To Radiation: This test assesses the ability of EUT (such as transmitters, receivers, transceivers and ancillary equipment) to operate as intended in the presence of a radio frequency electromagnetic field disturbance.

c) Immunity To Fast Transient/Burst: This test assesses the ability of the EUT (such as transmitter, receiver, transceiver and ancillary equipment) to operate as intended in the event of fast transients / burst on one of the input/output / signal/ control/**Wired network port**. Burst is a sequence of a limited number of distinct pulses or an oscillation of limited duration, whereas a transient varies between two consecutive steady states during a time interval which is short compared with the time-scale of interest.

d) Surge Immunity Tests: These tests assess the ability of the EUT (such as transmitters, receivers and ancillary equipment) to operate as intended in the

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event of surges on the, a.c. / d.c. power input ports , **Wired network port** etc. A surge is defined as a transient wave of electrical current, voltage, or power propagating along a line or a circuit and characterized by a rapid increase followed by a slower decrease.

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e) Immunity To Conducted Disturbances In RF Common Mode: This test assesses the ability of EUT (such as transmitter, receiver, transceiver and ancillary equipments) to operate as intended in the presence of conducted disturbances induced by radio frequency electromagnetic disturbance on the input / output ports / **signal / control / telecom ports**.

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f) Immunity To Voltage Dips, Short Interruptions (AC mains): These tests assess the ability of the EUT to operate as intended in the event of voltage dips and interruptions on the a .c. mains power input ports. Voltage dips and short interruptions are caused by faults in the network, primarily short circuits, in installations or by sudden large changes of load. In certain cases, two or more consecutive dips or interruptions may occur.

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Dip is defined as a sudden reduction of the voltage at a particular point of an electricity supply below a specified dip threshold followed by its recovery after a brief interval.

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Short interruption is defined as a sudden reduction of the voltage on all phases at a particular point of an electric supply system below a specified interruption threshold followed by its restoration after a brief interval.

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g) Immunity To Voltage Dips, Short Interruptions (DC Power Port): These tests assess the ability of the EUT or system to perform without degradation in the presence of electromagnetic disturbances occurring at the d.c. power input ports. Voltage dips and short interruptions on d.c. power ports may occur due to disturbances in the d.c. distribution system.

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Voltage dip is defined as a sudden reduction of the voltage at a point in the low-voltage d.c. distribution system, followed by recovery of the voltage after a short period of time, ranging from a few milliseconds up to a few seconds.

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Short interruption is defined as the disappearance of the supply voltage at a point of the low-voltage d.c. distribution system for a period of time typically not exceeding 1 minute. In practice, a dip with an amplitude of at least 80 % of the

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rated voltage may be considered as an interruption.

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Note: The definitions provided herein are based latest applicable standards and they are subjected to revisions from time to time in accordance with the latest editions of the relevant applicable standards.

1.2 General Conditions:

1.2.1 Laboratory Conditions

1.2.1.1 General

For the purposes of the present document, the test conditions of ETSI EN 301 489-1 [1], clause 4, shall apply. ~~except where modified in clauses 4.2 to 4.5 of this document.~~

The radio equipment may take forms which may require special software and/or test fixtures. Equipment which requires connection to a host equipment to function shall use a test configuration representative of the EUT's intended use and shall be recorded in the test report.

1.2.2 Test Conditions / Equipments

1.2.2.1 General

The manufacture shall, at the time of submission of the equipment for test, furnish the following information to be recorded in the test report:

- *1. The primary functions of the equipment to be tested during and after the EMC testing;
- *2. The intended functions of the equipment which shall be in accordance with the documentation accompanying the equipment;
- *3. the ancillary equipment to be combined with the telecom ~~radio~~ equipment for testing (where applicable) for

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4. the user control functions and stored data that are required for normal operation and the method to be used to assess whether these have been lost after EMC stress;

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An Ancillary equipment may be:

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-3. tested with it connected to a telecom/ equipment under test(e.g. a receiver, transmitter or transceiver) in which case compliance shall be demonstrated to the appropriate clauses of this standard;

-5. for the immunity tests of ancillary equipment without a separate pass/fail criteria, the receiver, transmitter or

transceiver coupled to the ancillary equipment, shall be used to judge whether the ancillary equipment passes or fails.

1.3 Requirements:

1.3.1 Emission Requirements

1.3.1.1 General

The following emission requirements set out in table 1 shall apply to all ports and in all configurations of the EUT.

Table 1: Emission Requirements

Phenomenon	Port	Applicability			Test Method/Setup
		Fixed Clause equipment	Vehicular equipment	Portable equipment	
radiated emission	Enclosure port of ancillary equipment and EUT	applicable	applicable	applicable	The test method for unintentional emission from the enclosure shall be in accordance with CISPR 32 (Latest Issue).
conducted emission	DC power input/output port	applicable	applicable	not applicable	The test method will be governed by CISPR 32 (Latest Issue) [Ⓢ] .
conducted emission	AC mains input/output	applicable	not applicable	not applicable	The test method shall be in accordance with CISPR 32.

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conducted emission	wired network port/ Telecom municatio n-port	applicable	not applicable	not applicable	Test method shall be on the accordance with CISPR 32. The measurement frequency range extends from 150 KHz to 30 MHz

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Note - Radiated emission requirements apply to the enclosure ports of both EUT and ancillary equipment.

1.3.2 Limits

1.3.2.1 Limits for Radiated Emission

The value of the limits from “Annex A of CISPR 32 (Latest Issue)-2015+AMD1:2019” at clause 6 Annex A” [and reproduced below in tables 2(a), 2(b) & 3(a), 3(b)] shall be used for class B and class A equipment respectively.

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Alternatively the Limits as per Table 2 (a1) & 3(a1) for measuring distance of 3m are also acceptable, as applicable, in place of Table 2 (a) & 3 (a) respectively.

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a) Limits below 1 GHz

Table 2(a): Limits for unwanted radiated emission of “Class B” equipment at a measuring distance of 10m.

Frequency range	Limits (quasi-peak)
30-230 MHz	30 dB (μV/m)
230- 1000 MHz	37dB (μV/m)

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Note: 1) The lower limit shall apply at the transition Frequency.

Note: 2) Additional provisions may be required for cases where interference occurs.

Note: 3) Table 2(a) has been referenced from Table A.4 of CISPR 32.

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Table 3(a): Limits for unwanted radiated emission of "Class A" equipment ~~(for Telecommunication Centres)~~ at a measuring distance of 10m.

Frequency range	Limits (quasi-peak)
30-230 MHz	40 dB (µV/m)
230- 1000 MHz	47 dB (µV/m)
<i>Note: 1) The lower limit shall apply at the transition Frequency.</i>	
<i>Note: 2) Additional provisions may be required for cases where interference occurs.</i>	
<i>Note: 3) <u>Table 3(a) has been referenced from Table A.2 of CISPR 32.</u></i>	

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Note: Limits are shown here for a measurement distance of 10m. However, measurements made using alternative test sites are also acceptable in accordance with CISPR 32 including clause No. 10.4.5.

Table 2(a1): Limits for unwanted radiated emission of class B Equipment. at a measuring distance of 3 m

Frequency range	limits (quasi – peak)
30 – 230 MHz	40dB (µV/m)
230 – 1000 MHz	47dB (µV/m)

Notes: 1) The lower limits shall apply at transition frequency

Notes: 2) Additional provisions may be required for cases where interference occurs.

Note: 3) Table 2(a1) has been referenced from Table A.4 of CISPR 32.

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Table 3 (a1): Limits for unwanted radiated emission of class A Equipment at a measuring distance of 3 m

Frequency range	limits (quasi – peak)
30 – 230 MHz	50dB (μV/m)
230 – 1000 MHz	57dB (μV/m)
1- <u>Note: 1)</u> The lower limits shall apply at transition frequency	
2- <u>Note: 2)</u> Additional provisions may be required for cases where interference occurs.	
3- <u>Note: 3)</u> Table 3(a1) has been referenced from Table A.2 of CISPR 32.	

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b) Limits above 1 GHz

The EUT shall meet the following limits when measured in accordance with the prescribed method and the conditional testing procedure as described.

Table 2(b): Limits for radiated disturbance of class B ~~Equipment~~Eqpt. for 1-6 GHz frequency range at a measurement distance of 3 m.

Frequency range GHz	Average limit dB (μV/m)	Peak limit dB (μV/m)
1 to 6	54	74

Note: Table 2(b) has been referenced from Table A.5 of CISPR 32.

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Table 2(c): Limits for radiated disturbance of class B Equipment for 6-40 GHz frequency range at a measurement distance of 3 m.

Frequency range GHz	Average limit dB ($\mu\text{V/m}$)
6 to 40	54
<u>Note: Table 2(c) has been aligned with the ITU-T K.136 Recommendation. All other requirements for this parameter shall be as per ITU-T Recommendation K.136.</u>	

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Table 3(b): Limits for radiated disturbance of class A Equipment ~~pt. for~~ 1-6 GHz frequency range at a measurement distance of 3 m.

Frequency range GHz	Average limit dB ($\mu\text{V/m}$)	Peak limit dB ($\mu\text{V/m}$)
1 to 6	60	80
<u>Note: Table 3(b) has been referenced from Table A.3 of CISPR 32.</u>		

Table 3(c): Limits for radiated disturbance of class A Equipment for 6-40 GHz frequency range at a measurement distance of 3 m.

Frequency range GHz	Average limit dB ($\mu\text{V/m}$)
6 to 40	60

Note: Table 2(c) has been aligned with the ITU-T K.136 Recommendation. All other requirements for this parameter shall be as per ITU-T Recommendation K.136.

Conditional testing procedure for 1-~~406~~ GHz testing:

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes.

If the highest frequency of the internal sources of the EUT is less than 108 MHz, the measurement shall only be made up to 1 GHz.

If the highest frequency of the internal sources of the EUT is between 108 MHz and 500 MHz, the measurement shall only be made up to 2 GHz. If the highest frequency of the internal sources of the EUT is between 500 MHz, and 1 GHz, the measurement shall only be made up to 5 GHz.

If the highest frequency of the internal sources of the EUT is above 1 GHz, the measurement shall be made up to 5 times the highest frequency or ~~406~~ GHz, whichever is less.

1.3.2.2 Limits for Conducted Emission (~~disturbance~~)

The equipment shall meet the limits below (including the average limit and the quasi-peak limit) when using respectively an average detector receiver and a quasi-peak detector receiver and measured in accordance with the method described in 1.5.2.2 below. 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 unnecessary.

The following limits as given in Table 4 shall apply to Class B Telecom Equipment.

Table 4: Limits of conducted emission (disturbance) at the AC mains power ports of Class B Telecom Equipment

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Frequency range	Limit (Quasi -Peak)	Limit (Average)
0.15 -0.5 MHz	66-56 dB (μV)	56-46 dB (μV)
0.5-5 MHz	56 dB (μV)	46 dB (μV)
5-30 MHz	60 dB (μV)	50 dB (μV)
<i>Note: 1) The lower limit shall apply at the transition Frequencies.</i> <i>Note: 2) The limits decreases linearly with logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.</i> <i>Note: 3) Table 4 has been referenced from Table A.10 of CISPR 32.</i>		

Additionally the limits in table 5 shall apply to Class A equipment including equipment in Telecommunication Centres.

Table 5: Limit of conducted emission (disturbance) at the AC mains power ports of Class A Telecom Equipment

Frequency range	Limit (Quasi -Peak)	Limit (Average)
0.15 –0.5 MHz	79 dB (μV)	66 dB (μV)
0.5-30 MHz	73 dB (μV)	60 dB (μV)
<i>Note 1): The lower limit shall apply at the transition Frequencies.</i> <i>Note: 2) Table 5 has been referenced from Table A.9 of CISPR 32.</i>		

Table 6(A): Limits for conducted common mode (asymmetric mode) emission from ~~telecommunication ports~~ **wired network port for class B equipment**

Frequency range	Voltage limits dB (μV)	Current limits dB (μA)

MHz	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.5	84 to 74	74 to 64	40 to 30	30 to 20
0.5 to 30	74	64	30	20
<i>Note 1): The limits decrease linearly with the logarithm of the frequency in the 0.15 MHz to 0.5 MHz.</i> <i>Note 2): The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 ohm to the telecommunication port wired network port under test (conversion factor is 20 log₁₀ 150/1=44 dB).</i> <i>Note: 3) Table 6(A) has been referenced from Table A.12 of CISPR 32.</i> <i>Note: 4) These limits are not applicable for DC power port.</i>				

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Table 6(B): Limits for conducted common mode (asymmetric mode) emissions from ~~telecommunication ports~~ **wired network port** of Class A equipment. ~~(intended for use in telecommunication centers only).~~

Frequency range MHz	Voltage limits dB (μV)		Current limits dB (μA)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 to 0.5	97 to 87	84 to 74	53 to 43	40 to 30
0.5 to 30	87	74	43	30

Note: 1) The limits decrease linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

*Note: 2) The current and voltage disturbance limits are derived for use with an impedance stabilization network (ISN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the ~~telecommunication port~~ **wired network port** under test (conversion factor is 20 log10 150/1= 44 dB).*

Note: 3) Table 6(B) has been referenced from Table A.11 of CISPR 32.

Note: 4) These limits are not applicable for DC power port.

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1.3.3 Immunity Requirements

1.3.3.1 General

The following immunity requirements set out in table 7 shall apply to all ports and in all configurations of the EUT.

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Table 7: Immunity Test Requirements

Phenomenon	Port	Applicability			<u>Test Method/Setup</u>
		Clause Fixed equipment	Vehicular equipment	Portable equipment	
RF electromagnetic field (80 MHz to 6 000 MHz)	Enclosure	Applicable	Applicable	Applicable	<u>The test method shall be in accordance with IEC 61000-4-3 (Latest Issue) (2020) IS 14700-part</u>

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					4,section 3 Note:- <i>for equipment operating up to 6425 MHz, the immunity testing requirements specified in the existing international standard (up to 6 GHz) shall continue to be applicable until an appropriate international standard covering the higher frequency range is published.</i> [India specific for IEC 61000-4-3 frequency part] The test method shall be in accordance with IEC 61000-4-3(2020).The following requirements and evaluation of test
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					results shall apply: i) The applied electromagnetic field shall be amplitude modulated to a depth of 80% by a sinusoidal audio signal of 1KHz. For Telecom Equipment and Telecom Terminal Equipment with Voice interface (s), the effective amplitude shall be 3V/m (measured unmodulated) in frequency range 80-1000 MHz and 10 V/m (measured unmodulated) in frequency ranges 800 MHz-960 MHz, 1.4 GHz-2.0 GHz and 2 GHz-6 GHz. Voice Terminal Equipment (as per ITU-T K.49) covers the normal analogue telephone used in a PSTN network, the digital telephones used in
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					<u>an ISDN network</u> <u>and all type of</u> <u>terminal equipment</u> <u>attached to a wired</u> <u>telecom network</u> <u>having a voice</u> <u>interface:</u> <u>However, for</u> <u>Telecom Terminal</u> <u>Equipment without</u> <u>voice interface (s);</u> <u>the effective</u> <u>amplitude shall be</u> <u>3V/m (measured</u> <u>unmodulated) in</u> <u>frequency range 80-</u> <u>1000 MHz, 1.4</u> <u>GHz-6 GHz:</u> <u>Over 2GHz to 6</u> <u>GHz, the test shall</u> <u>be performed over</u> <u>the following</u> <u>frequency bands:</u> <u>i) 2.110 GHz.</u> <u>to 2.170 GHz. (IMT-</u> <u>2000 FDD)</u> <u>ii) 2.446 GHz.</u> <u>to 2.454 GHz.</u> <u>(RFID)</u> <u>iii) 2.400 GHz.</u> <u>to 2.4835 GHz.</u> <u>(Unlicensed band)</u> <u>iv) 5.150-5.350-</u>
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					GHz. (Wireless access system) v) 5.470-5.725 GHz. (Wireless LANs) vi) 5.725-5.875 GHz. (Wireless access system) vii) 5.795-5.815 GHz. (RTTT / ITS) ii) The dwell time of the amplitude-modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5s. The sensitive frequencies (e.g. the clock frequency (ies)) shall be analyzed separately. iii) The Frequency selected including additional sensitive
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					frequencies selected during the test, shall be recorded in the test report.The test shall normally be performed with the generating antenna facing each of the four sides of the EUT.When equipment can be used in different orientation (i.e. vertical or horizontal), the test shall be performed on all sides. The polarization of the field, generated by the each antenna necessitates testing each side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. <Note IF any, India specific clause
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					Modification/addition required in terms of test method values, then may please be specified. Inputs are requested on the same>
electrostatic discharge	Enclosure	Applicable	Applicable	Applicable	The test method shall be in accordance with IEC 61000-4-2 (Latest Issue). <Note – IF any, India-specific clause Modification/addition required in terms of test method values, then may please be specified. Inputs are requested on the same>
Fast transients common mode	Signal, wired network and control	Applicable	Not applicable	Not applicable	The test method shall be in accordance with IEC 61000-4-4 (Latest Issue).
	DC power	Applicable	Not applicable (see note)	Not applicable	Note: This test

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			1)		shall be performed on d.c. power ports and signal / control/ telecom ports if the cables are of higher length than 3m.
	AC mains power	Applicable	Not applicable	Not applicable	
					<Note – IF any, India-specific clause Modification/addition required in terms of test method values, then may please be specified. Inputs are requested on the same>
RF common mode 0.15 MHz to 80 MHz	Signal, wired network and control	Applicable	Applicable	Not applicable	The test method shall be the Current clamp injection or EM clamp injection Method in accordance with IEC 61000-4-6 (Latest Issue).
	DC power	Applicable	Applicable	Not applicable	
	AC mains power	Applicable	Applicable	Not applicable	Note: This test shall be performed on signal / control / telecom ports (with more than 3m cable length), dc power and ac mains power input ports of the

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					equipment and ancillary equipment. <Note — IF any, India-specific clause Modification/addition required in terms of test method values, then may please be specified. Inputs are requested on the same>
Transients and surges in the vehicular environment	DC power input	Not applicable	Applicable	Not applicable	<<Inputs are invited from the stakeholders>><Not e — IF any, India specific clause Modification/addition required in terms of test method values, then may please be specified. Inputs are requested on the same> The test method shall be in accordance with ISO 7637-2 [8], clause 4 for 12 V DC and 24 V DC powered equipment. The

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					test method shall be in accordance with ISO 7637-2 [8], clause 4, applying pulses 1, 2a, 2b, 3a, 3b, and 4, using immunity test level III. For the purpose of EMC testing it is sufficient to apply pulses 1, 2a, 2b and 4, 10 times each, and apply the test pulses 3a and 3b for 20 minutes each.
Voltage dips and interruptions	AC mains power input	Applicable	Not applicable	Not applicable	The test method shall be in accordance with IEC 61000-4-11 (Latest Issue). <Note — IF any, India specific clause Modification/addition required in terms of test method values, then may please be specified. Inputs are requested on the same>
Surges, line	AC mains	Applicable	Not	Not	The test method

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	to line and line to ground	power input		applicable	applicable	shall be in accordance with IEC 61000-4-5 (Latest Issue). <Note — IF any, India specific clause Modification/additio n required in terms of test method values, then may please be specified. Inputs are requested on the same><Inputs are invited from the stakeholders>
		Wired network	Applicable	Not applicable (see note 1)	Not applicable	The test method shall be in accordance with IEC 61000-4-5 (Latest Issue). <Note — IF any, India specific clause Modification/additio n required in terms of test method values, then may please be specified. Inputs are requested on the

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					same><Inputs are invited from the stakeholders>
Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests	DC power Port	Applicable	Not applicable	Not applicable	The test method shall be in accordance with IEC 61000-4-29 (Latest Issue). <Note IF any, India-specific clause Modification/addition required in terms of test method values, then may please be specified. Inputs are requested on the same><Inputs are invited from the stakeholders>

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1.3.4 Limits For Immunity Tests

1.3.4.1 Immunity to radiated RF

Table 8: Test Levels for Immunity to Radiated Radio Frequency (RF) Electromagnetic Fields.

Frequency range	Limits/ Test Levels
80 MHz to 6.0 GHz	Test level 2: Test field strength of 3 V/m Performance Criteria A

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80 MHz to 1 GHz	Test level 2: Test field strength of 3 V/m
800 MHz to 960 MHz & 1.4 to 6.0 GHz	Test level 3: Test field strength of 10 V/m
	Performance Criteria A

1.3.4.2 Immunity to Electrostatic Discharge

Table 9: Test Levels for Immunity to Electrostatic Discharge.

Test Levels	Limits
Test Level 2	± 4kV, or higher voltage;
Contact discharge	Performance Criteria B
Test Level 3	± 8kV or higher voltage;
Air discharge	Performance Criteria B

1.3.4.3 Immunity to fast transients (burst)

Table 10: Test Levels for Immunity to fast transients (burst).

Test Levels	Limits
Test Level 2	1.0 kV: Performance Criteria B
AC/DC Power Lines	
Test level 2	0.5kV: Performance Criteria B
Signal/Control/Data/Telecom Lines	

1.3.4.4 Immunity to conducted disturbance induced by Radio frequency fields

Table 11: Test Levels for Immunity to conducted disturbance induced by Radio frequency fields.

Frequency range	Limits/ Test Levels
150 kHz to 80 MHz	Test level 2: 3 V r.m.s.
(AC/DC lines & signal control /telecom lines)	Performance Criteria A

1.3.4.5 Transients and surges in the vehicular environment

Table 12: Test Levels for Immunity to Transient and surges in

the vehicular environment.

System	Limits/Test levels
12V System	Test Level III: As per the applicable version of ETSI EN 301-489-1. Performance Criteria A and B, as applicable.
24V System	Test Level III: As per the applicable version of ETSI EN 301-489-1. Performance Criteria A and B, as applicable.

1.3.4.6 Immunity to surges

Table 13: Test Levels for Immunity to surges.

Line to Ground/ Line to Line Power/Common mode	Limits/ Test Levels
line to ground – power port	2kV: Performance Criteria B
line to line – power port	1kV: Performance Criteria B
line to ground - telecom ports	1 KV: Performance Criteria C
line to line – telecom ports	0.5kV: Performance Criteria C

1.3.4.7 Immunity to Voltage Dips and Short Interruptions (AC power ports)

Table 14: Test Levels for Immunity to Voltage Dips and Short Interruptions (AC Mains).

Voltage Reduction Values	Limits/Test Levels
30% for 500ms	Voltage dip corresponding to a reduction of supply voltage of 30% for 500ms (i.e. 70 % supply voltage for 500ms) Performance criteria B
60% for 200ms	Voltage dip corresponding to a reduction of supply voltage of 60% for 200ms; (i.e. 40% supply voltage for 200ms). Performance criteria C
> 95% for 5s	Voltage interruption corresponding to a

	reduction of supply voltage of > 95% for 5s. Performance criteria C
>95% for 10ms	Voltage interruption corresponding to a reduction of supply voltage of >95% for 10ms. Performance criteria B

1.3.4.8 Immunity to Voltage Dips and Short Interruptions (DC power ports)

Table 15: Test Levels for Immunity to Voltage Dips and Short Interruptions (DC power ports).

Voltage Reduction Values	Limits/ Test Levels
0% for 10ms	Voltage Interruption with 0% of supply for 10ms. Performance criteria B
0% for 30ms, 100ms, 300ms and 1000ms	Voltage Interruption with 0% of supply for 30ms, 100ms, 300ms and 1000ms. Performance criteria C
40% & 70% for 10ms, 30ms	Voltage dip corresponding to 40% & 70% of supply for 10ms, 30 ms. Performance criteria B
40% & 70% for 100ms, 300ms and 1000 ms	Voltage dip corresponding to 40% & 70% of supply for 100ms, 300ms and 1000 ms. Performance criteria C
80% and 120% for 100 ms to 10s	Voltage variations corresponding to 80% and 120% of supply for 100 ms to 10s. Performance criteria B

1.4 Performance Criteria

1.4.1 General performance criteria

The applicable performance criteria are:

- performance criteria A for immunity tests with phenomena of a continuous nature;
- performance criteria B for immunity tests with phenomena of a transient nature;

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- c) performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

1.4.2 Performance table

An overview of the different performance criteria applicable to the EUT is given in table 816.

Table 168: Performance criteria

Criteria	During test	After test
A	Shall operate as intended. (See note). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data.
B	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after

		recovering. Shall be no loss of critical stored data.
NOTE: Operate as intended during the test shall be considered as: - For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %. - For equipment that does not support a PER or a FER, (e.g. audio equipment and equipment transmitting sporadic messages) the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment. <i>Note: Table 8 has been referenced from Table 2 of ETSI EN 301 489-17 V3.3.1.</i> <i>Note : If the device has non-redundant power supply the compliance criteria as per IEC 61000-4-29 the performance criteria C is applicable.</i>		

1.4.3 Performance criteria for Continuous phenomena

The performance criteria A shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test.

1.4.4 Performance criteria for Transient phenomena

The performance criteria B shall apply for transient phenomena, except for voltage dips greater than or equal to 100 ms, voltage interruptions of 5 000 ms duration, and surges of 10/700 µs for which performance criteria C shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur as result of the application of the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur as result of the application of the test.

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1.5—Test Method/Test Setup for Emission Tests

This clause defines the requirements for test configuration. This test shall be performed on a representative configuration of the equipment under test (EUT).

The measurements shall be made in the operational mode producing the largest emission in the frequency band being investigated consistent with normal applications.

1.5.1—Radiated emission

1.5.1.1—Definition

This test is applicable to telecom / radio equipment and ancillary equipment.

This test assesses the ability of telecom / RF equipments (such as transmitters, receivers, transceivers and ancillary equipment etc.) to limit spurious emission from the enclosure.

1.5.1.2—Test method for radiation emission (disturbance)

The test method for spurious emission from the enclosure shall be in accordance with CISPR 32 (-).

1.5.2—Conducted emission: DC power input / output port

This test is applicable to equipment which may have

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d.c. cables longer than 3 metres. If the DC power cable of the telecom / radio and / or the ancillary equipment is less than or equal to 3m in length, and intended for direct connection to a dedicated AC/DC power supply, then the measurement shall be performed on the AC power input ports of that power supply as specified in clause 1.5.3. If the DC power cable is longer than 3m, then the measurement shall additionally be performed on the DC power port of the telecom / radio and / or ancillary equipment as specified in clause 1.5.2.

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

1.5.2.1—Definition

This test assesses the ability of EUT (such as telecom equipment, transmitter, receiver, transceiver and ancillary equipment etc.) to limit its internal noise from being present on the d.c. power input/ output ports.

1.5.2.2—Test method

The test method shall be in accordance with CISPR 32 (-). The Line Impedance Stabilization Network (LISN) / Artificial Mains Network (AMN) shall be connected to a d.c. power source. For emission measurements on DC output ports, the relevant port shall be connected via an AMN to a load drawing the current of the source. For mains network ac/dc, AMN (for defined impedance at high frequency) will be normally 50 ohm / 50 μ H or 50 ohm / 50 μ H +5 ohm, as applicable. For telecom port, common mode impedance will be normally 150 $\pm$ 20 ohm. However the exact details for ac / dc / telecom ports etc. shall be as per CISPR 16-1-2 (2014).

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

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

~~The measurement receiver shall be in accordance with the requirements of CISPR 16-1-1 (2015).~~

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

~~The equipment shall be installed with a ground plane as defined in CISPR 32 (2015). The reference earth point of the LISNs shall be connected to the reference ground plane with a conductor as short as possible.~~

~~The measurement receiver shall be in accordance with the requirements of CISPR 16-1-1 (2015).~~

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~~1.5.3 Conducted Emission: AC mains power input/output port~~

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~~This test is applicable to equipment powered by the a.c. mains. This test shall be performed on a representative configuration of the equipment, the associated ancillary equipment or a representative configuration of the combination of telecom / radio and ancillary equipment.~~

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~~1.5.3.1 Definition~~

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~~This test assesses the ability of EUT (such as telecom~~

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equipment, transmitter, receiver, transceiver and ancillary equipment) to limit its internal noise from being present on the a. c. mains power input/output ports.

1.5.3.2 — Test method for conducted emission (disturbance)

The test method shall be in accordance with CISPR32 (2015). For emission measurements on AC output ports of the EUT, the relevant port shall be connected via an AMN as given in para 2 of clause 1.5.2.2 to a load drawing the rated current of the source. In case where the AC output port is directly connected (or via a circuit breaker) to the AC power input port of the EUT, the AC power output port need not to be tested.

1.5.4 — Conducted emission: Telecommunication ports

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

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

1.5.4.1 — Definition

This test assesses the ability of EUT (such as telecom equipment, transmitter, receiver, transceiver and ancillary equipment) to limit its internal noise from being present on the telecommunication ports.

1.5.4.2 — Test method

Test method shall be on the accordance with CISPR 32.

The measurement frequency range extends from 150 KHz to 30 MHz.

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1.6 Test Method/Test Setup For Immunity Tests

1.6.1 Immunity To Electrostatic Discharge

< TBD > This test is applicable to telecommunications / RF equipment and associated ancillary equipment.

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

Definition

This test assesses the ability of equipment under test (EUT) to operate as intended in the event of an electrostatic discharge.

Test method and level

The test method shall be in accordance with IEC 61000-4-2(2025).

For telecom / RF equipment (such as transmitters, receivers, transceivers) and ancillary equipment, the following requirements and evaluation of test results shall apply:

The test set-up consists of the test generator, EUT and auxiliary instrumentation necessary to perform direct and indirect application of discharges to the EUT in the following manner:

contact discharge to the conductive surfaces and to coupling planes;

air discharge at insulating surfaces;

For contact discharge, the equipment shall be tested at ± 2 kV and ± 4 kV or higher voltage; and for air discharge, the equipment shall be tested at ± 2 kV and ± 4 kV and ± 8 kV or higher voltage. For all other

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details pl. see IEC 61000-4-2(2025).

— Electrostatic discharge shall be applied to all exposed surfaces of the EUT except where the user documentation specifically indicates a requirement for appropriate protective measures. ((See IEC 61000-4-2 (2025)).

— For direct application of discharge to EUT, the test shall be performed with single discharges. On pre-selected points, at least ten single discharges (in the most sensitive polarity) shall be applied. For the time interval between successive single discharges, an initial value of 1 s is recommended. Longer intervals may be necessary to determine whether a system failure has occurred.

— For indirect application of discharge to EUT, in addition to the requirements for direct discharge above, the following shall be met also:

— Discharge to the Horizontal coupling plane (HCP) shall be made horizontally to the edge of the HCP. At least 10 single discharges (in the most sensitive polarity) shall be applied at the front edge of each HCP opposite the center point of each unit (if applicable) of the EUT and 0,1 m from the front of the EUT. Consideration should be given to exposing all sides of the EUT to this test.

— As regards discharge to the Vertical coupling plane (VCP), at least 10 single discharges (in the most sensitive polarity) shall be applied to the center of one vertical edge of the coupling plane. Further discharge shall be applied to the coupling plane, with sufficient different positions such that the four faces of the EUT are completely illuminated.

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1.6.2 Radiated Radio Frequency, Electromagnetic Field (80MHz-6.0 GHz)

~~<TBD> This test is applicable to telecom /radio equipment and associated ancillary equipment. The test shall be performed on representative configurations of the equipment, the associated ancillary equipment or a representative configuration of the combination of telecom / radio and ancillary equipment.~~

~~— Definition: Immunity to radiation~~

~~This test assesses the ability of EUT (such as transmitters, receivers, transceivers and ancillary equipment) to operate as intended in the presence of a radio frequency electromagnetic field disturbance.~~

~~— Test method and level~~

~~The test method shall be in accordance with IEC 61000-4-3(2020). The following requirements and evaluation of test results shall apply:~~

~~— The applied electromagnetic field shall be amplitude modulated to a depth of 80% by a sinusoidal audio signal of 1KHz. For Telecom Equipment and Telecom Terminal Equipment with Voice interface (s), the effective amplitude shall be 3V/m (measured unmodulated) in frequency range 80-1000 MHz and 10 V/m (measured unmodulated) in frequency ranges 800 MHz-960 MHz, 1.4 GHz-2.0 GHz and 2 GHz-6 GHz. Voice Terminal Equipment (as per ITU-T K.49) covers the normal analogue telephone used in a PSTN network, the digital telephones used in an ISDN network and all type of terminal equipment attached to a wired telecom network having a voice~~

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interface:

However, for Telecom Terminal Equipment without voice interface (s), the effective amplitude shall be 3V/m (measured unmodulated) in frequency range 80-1000 MHz, 1.4 GHz-6 GHz.

Over 2GHz to 6 GHz, the test shall be performed over the following frequency bands:

— 2.110 GHz. to 2.170 GHz. (IMT-2000 FDD)

— 2.446 GHz. to 2.454 GHz. (RFID)

— 2.400 GHz. to 2.4835 GHz. (Unlicensed band)

— 5.150-5.350 GHz. (Wireless access system)

— 5.470-5.725 GHz. (Wireless LANs)

— 5.725-5.875 GHz. (Wireless access system)

— 5.795-5.815 GHz. (RTTT / ITS)

— The dwell time of the amplitude modulated carrier at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0.5s. The sensitive frequencies (e.g. the clock frequency (ies)) shall be analyzed separately.

— The Frequency selected including additional sensitive frequencies selected during the test, shall be recorded in the test report.

— The test shall normally be performed with the generating antenna facing each of the four sides of the EUT. When equipment can be used in different orientation (i.e. vertical or horizontal), the test shall be performed on all sides.

i) The polarization of the field, generated by the each antenna necessitates testing each side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally.

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1.6.3 Immunity To Fast Transient/Burst

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<TBD>This test is applicable for telecom / radio

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communications equipment and ancillary equipment.

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This test shall be performed on a.c power ports if any.

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Additionally, the test shall be performed on d. c. power

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ports and signal / control/ telecom ports if the cables

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are of higher length than 3m.

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This test shall be performed on a representative

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configuration of the equipment or a representative

configuration of combination of telecom / radio and

ancillary equipment.

—Definition

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This test assesses the ability of the EUT (such as

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transmitter, receiver, transceiver and ancillary

equipment) to operate as intended in the event of fast

transients / burst on one of the input/output / signal/

control/telecom ports. Burst is a sequence of a limited

number of distinct pulses or an oscillation of limited

duration, whereas a transient varies between two

consecutive steady states during a time interval which

is short compared with the time-scale of interest.

1.6.3.2 Test method and level

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The test method shall be in accordance with IEC

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61000-4-4 (2012). The following requirements and

evaluation of test results shall apply:

—The test level for signal port, control ports, data

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ports and telecom port shall be 0.5KV, peak open

circuit output voltage with repetition rate of impulses 5

kHz as given in clause 5 of IEC 61000-4-4(2012);

—The test level for d.c. power ports shall be 1KV

peak open circuit output voltage with repetition rate of impulses 5 kHz as given in clause 5 of IEC 61000-4-4(2012);

—The test level for a.c. mains power ports shall be 1 KV peak open circuit output voltage with repetition rate of impulses 5kHz as given in the clause 5 of IEC 61000-4-4(2012);

—Either a direct coupling network or a capacitive clamp, as appropriate & applicable, shall be used for the application of the test voltages;

—The coupling / decoupling network is required for acceptance tests of a.c / d.c power supply ports;

—The coupling method, using the capacitive coupling clamp, is required for acceptance tests on lines connected to I/O and communication ports. It may also be used on ac/dc power supply ports only if the coupling / decoupling network as per IEC 61000-4-4 cannot be used;

For ac/dc power supply ports & earth ports, the test voltage shall be applied simultaneously between a ground reference plane and all of the power supply terminals, a.c. or d.c., and the protective or functional earth port on the EUT cabinet;

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1.6.4 — Surge Immunity Tests

<TBD>These tests, Line to Earth coupling (Common mode) and Line to Line coupling (Differential mode) are applicable to telecom / radio communications equipment and ancillary equipment;

These tests shall be performed on a.c. mains / d.c. power input ports (only those DC ports intended to be directly connected to outdoor lines), telecom ports etc. These tests shall be performed on a representative

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configuration of the equipment, the associated ancillary equipment or a representative configuration of the combination of telecom / radio and ancillary equipment.

— Definition

These tests assess the ability of the EUT (such as transmitters, receivers and ancillary equipment) to operate as intended in the event of surges on the, a.c. / d.c. power input ports , telecom ports etc. A surge is defined as a transient wave of electrical current, voltage, or power propagating along a line or a circuit and characterized by a rapid increase followed by a slower decrease.

— Test method and level

The test method shall be in accordance with IEC 61000-4-5 (2014). The following requirement and evaluation of test results shall apply:

— The test level for telecommunication ports (circuit / lines, intended to be connected to a telecommunication network), shall be 2-KV peak open circuit voltage for line to ground coupling and line to line coupling as given in IEC 61000-4-5 (2014). In this case the total output impedance of the surge generator shall be in accordance with the basic standard IEC 61000-4-5(2014).

— The test level for mains power input ports shall be 2-KV peak open circuit voltage for line to ground coupling and 1-KV peak open circuit voltage for line to line coupling with the output impedance of the surge generator as given in IEC 61000-4-5(2014). Regarding DC ports, only those DC ports shall be tested that are intended to be directly connected to outdoor lines.

— The surges have to be applied line to line and

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lines(s) to earth. When testing line to earth the test voltage has to be applied successively between each of the lines and earth, if there is no other specification.

—Coupling / decoupling networks are used for applying surges. To simulate the representative coupling impedances, additional specified resistors (as per IEC 61000-4-5) have to be used for the tests.

—A capacitive coupling is normally used for a.c / d.c power supply circuits for line to line, and line to earth testing, while power supply decoupling network is also connected. For interconnection lines (i.e. input / out lines, telecommunication lines etc.), the capacitive coupling is the preferred method for unshielded unsymmetrical I/O circuits when there is no influence to the functional communication on that line. However, where capacitive coupling is not possible clamping device, avalanche devices are adopted.

—Coupling via arrestors is the preferred coupling method for unshielded symmetrical circuits (telecommunication). In case of Coupling / Decoupling networks for high-speed communication lines, because of physical constraints, most coupling/decoupling networks are limited to handling frequencies of up to about 100 kHz. In cases where no adequate coupling/decoupling network is commercially available, surges shall be applied to the high-speed communication data port directly.

In the case of shielded lines a coupling / decoupling network may not be applicable. Shielded lines may be earthed at one end or both ends and accordingly surges are applied to the shields (metallic enclosures) of the EUT and connected shields of the lines.

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1.6.5 Immunity To Conducted Disturbances In Rf Common Mode, Range 0.15 MHz-80 MHz (Current Clamp Injection Or EmM Clamp Injection)

<TBD> This test is applicable to telecom / radio communication equipment and ancillary equipment.

This test shall be performed on signal / control / telecom ports (with more than 3m cable length), de-power and ac mains power input ports of the equipment and ancillary equipment. This test shall be performed on a representative configuration of the equipment, the associated ancillary equipment or a representative configuration of the combination, of telecom / radio and ancillary equipment.

— Definition

This test assesses the ability of EUT (such as transmitter, receiver, transceiver and ancillary equipments) to operate as intended in the presence of conducted disturbances induced by radio frequency electromagnetic disturbance on the input / output ports.

— Test method and level

The test method shall be the Current clamp injection or EM clamp injection method in accordance with IEC 61000-4-6 (2023). The following requirements and evaluation of test results shall apply:

— The test level shall be of severity level 2 as given in IEC 61000-4-6 corresponding to 3 V_{rms} (unmodulated).

— The frequency range is swept from 150 KHz to 80 MHz, using the signal levels established during the

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setting process, and with the disturbance signal 80% amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or switch coupling devices as necessary. The rate of sweep shall not exceed $1,5 \times 10^{-3}$ decades/s. Where the frequency is swept incrementally, the step size shall not exceed 1% of the start and thereafter 1% of the preceding frequency value.

—The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequency e.g. clock frequency (ies) and harmonics or frequencies of dominant interest shall be analyzed separately.

—Coupling and decoupling devices shall be used for appropriate coupling of the disturbing signal (over the entire frequency range, with a defined commonmode impedance at the EUT Port) to the various cables connected to the EUT. A Coupling network is an electrical circuit for transferring energy from one circuit to another with a defined impedance. A decoupling network is an electrical circuit for preventing test signals applied to the EUT from affecting other devices / equipment or systems that are under test.

—The test signal is injected on to the screened and coaxial cable via direct injection (through 100 ohm resistor normally). Coupling and decoupling network (CDNs) are recommended for power supply lines, unscreened balanced / non — balanced lines.

—For the balanced & non-balanced unscreened multiwire cables, clamp injection is more appropriate.

—Clamp injection is obtained by :

—current clamp: A transformer, the secondary winding of which consists of the cable into which the

injection is made:

—Electromagnetic clamp (EM-clamp): Injection device with combined capacitive and inductive coupling:

—With clamp injection devices, the coupling and decoupling functions are separated. Coupling is provided by the clamp on device while the common mode impedance and decoupling function are established at the auxiliary equipment. ix) The frequency selected, and used during the test as well as additional sensitive frequencies, if any, shall be recorded in the test report.

—The frequency selected, and used during the test as well as additional sensitive frequencies, if any, shall be recorded in the test report.

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1.6.6 Immunity To Voltage Dips, Short Interruptions (AC mains)

<TBD>These tests are applicable to telecom / radio communications equipment and ancillary equipment. These tests shall be performed on ac mains power input ports (if any) of telecom /radio equipment and associated ancillary equipment. These tests are applicable to electrical and electronic equipment having a rated input current not exceeding 16A per phase, for connection to 50 Hz or 60Hz a.c. networks. These tests shall be performed on a representative configuration of the equipment, the associated ancillary equipment or a representative configuration of the combination of telecom / radio equipment and ancillary equipment.

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—Definition

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These tests assess the ability of the EUT to operate as intended in the event of voltage dips and interruptions on the a.c. mains power input ports. Voltage dips and short interruptions are caused by faults in the network, primarily short circuits, in installations or by sudden large changes of load. In certain cases, two or more consecutive dips or interruptions may occur.

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Dip is defined as a sudden reduction of the voltage at a particular point of an electricity supply below a specified dip threshold followed by its recovery after a brief interval.

Short interruption is defined as a sudden reduction of the voltage on all phases at a particular point of an electric supply system below a specified interruption threshold followed by its restoration after a brief interval.

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—Test method and level

The test method shall be in accordance with IEC 61000-4-11 (2020). The following requirements and evaluation of test results shall apply:

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The test levels shall be:

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—a voltage dip corresponding to a reduction of the supply voltage of 30% for 500ms (i.e. 70 % supply voltage for 500 ms)

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—a voltage dip corresponding to a reduction of the supply voltage of 60% for 200ms; (i.e. 40% supply voltage for 200ms) and

—a voltage interruption corresponding to a reduction of supply voltage of > 95% for 5 s.

—a voltage interruption corresponding to a reduction of supply voltage of > 95% for 10ms.

—The EUT shall be tested for each selected

~~combination of test level and duration with a sequence of three dips / interruptions with intervals of 10s minimum (between each test event). Each representative mode of operation shall be tested.~~
~~For EUTs with more than one power cord, each power cord should be tested individually.~~
~~<Inputs are invited from the stakeholder>~~

1.6.7 Immunity To Voltage Dips, Short Interruptions (DG Power Port)

~~<Inputs are invited from~~ CHAPTER 2

Indicative Test Setup Guidelines for Test Setup/Setup Diagram

Following figures are the indicative test setups being used in Emission and Immunity tests.

2.0 A transmitter shall, as a minimum, comprise the element between E' and A' of figure 2. Additionally the transmitter may comprise any of the other elements from the transmitter chain shown in figure 2.

2.1 A receiver shall, as a minimum, comprise the elements between A and E of Figure 3. Additionally the receiver may comprise any of the other elements from the receiver chain shown in figure 3.

2.2 A transceiver shall comprise as a minimum the elements E' to A' and A to E, shown the figures 2 and 3, and additionally it may comprise any combinations of other elements.

Under the Immunity tests For RF equipments following shall be applicable –

2.3 For transmitter, the test configuration shall be in accordance with the principle of the figures 4,6 or 7 and

2.4 For receivers, it shall be in accordance with the principle of one of the figure 5, 6, or

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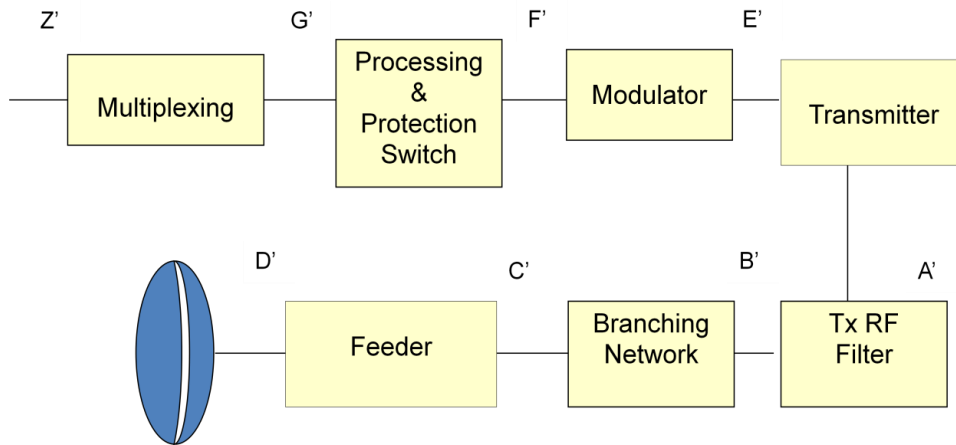
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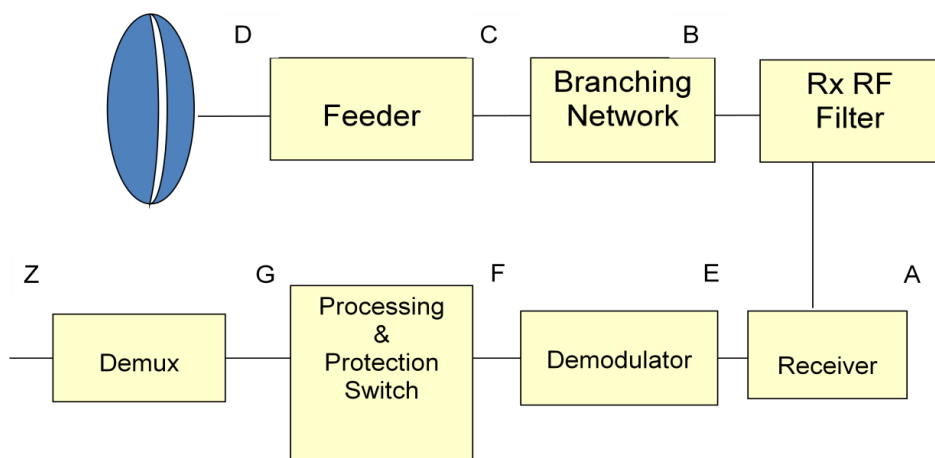
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NOTE 1: For the purpose of defining the measurements points, the branching network (B' to C') does not include a hybrid.

NOTE 2: Points B' and C' may coincide, dependent on the equipment configuration.

Figure 2: Elements of transmitter



NOTE 3: For the purpose of defining the measurement points, the branching network (B to C) does not include a hybrid.

NOTE 4: Points B and C may coincide, dependent on the equipment configuration.

Figure 3: Elements of a receiver

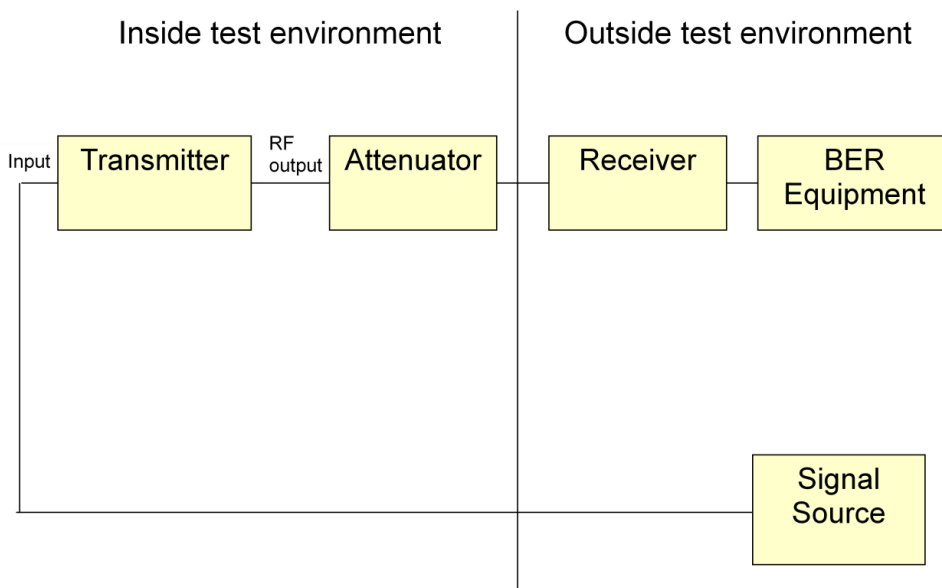


Figure 4: Test Configuration for transmitters

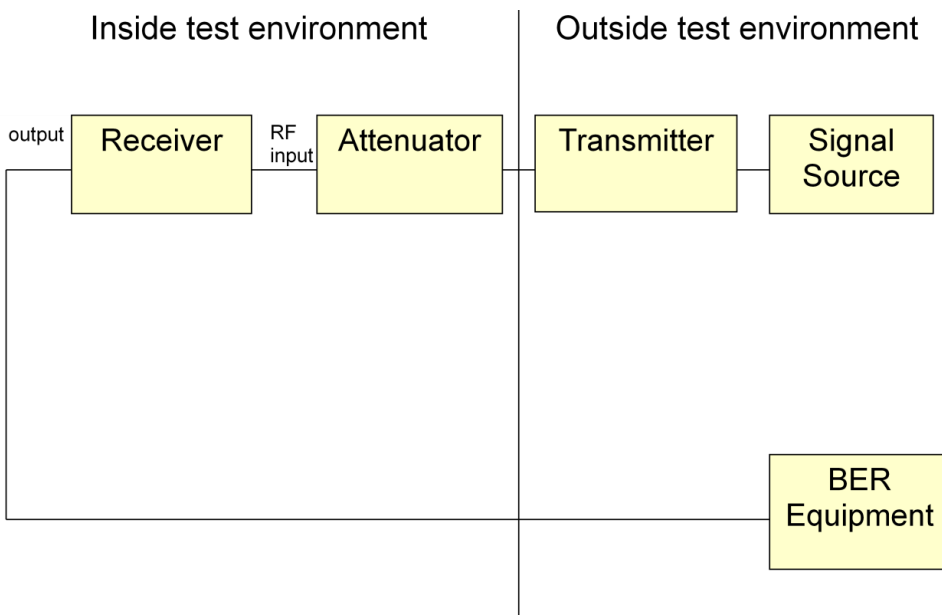


Figure 5: Test Configuration for receivers

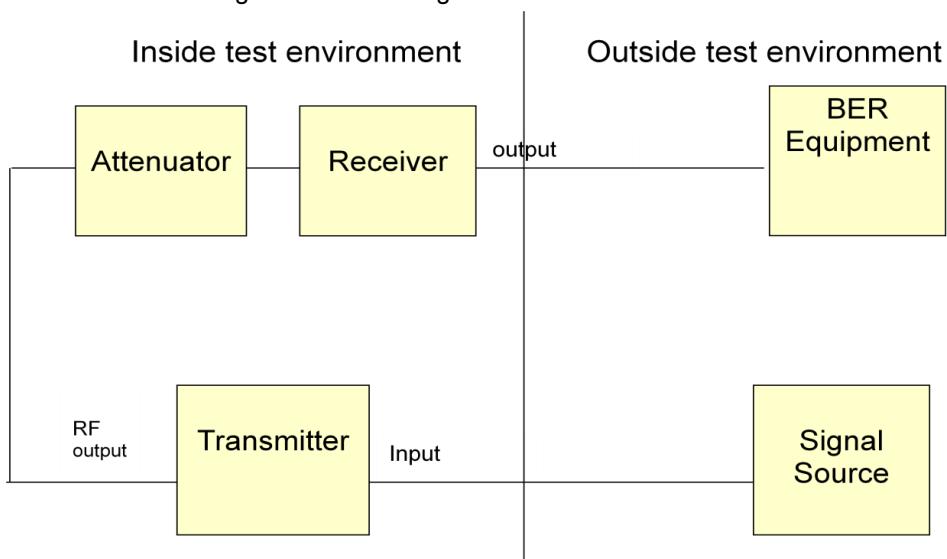


Figure 6: Test Configuration of transceiver, operating on the same receiver and transmitter frequency

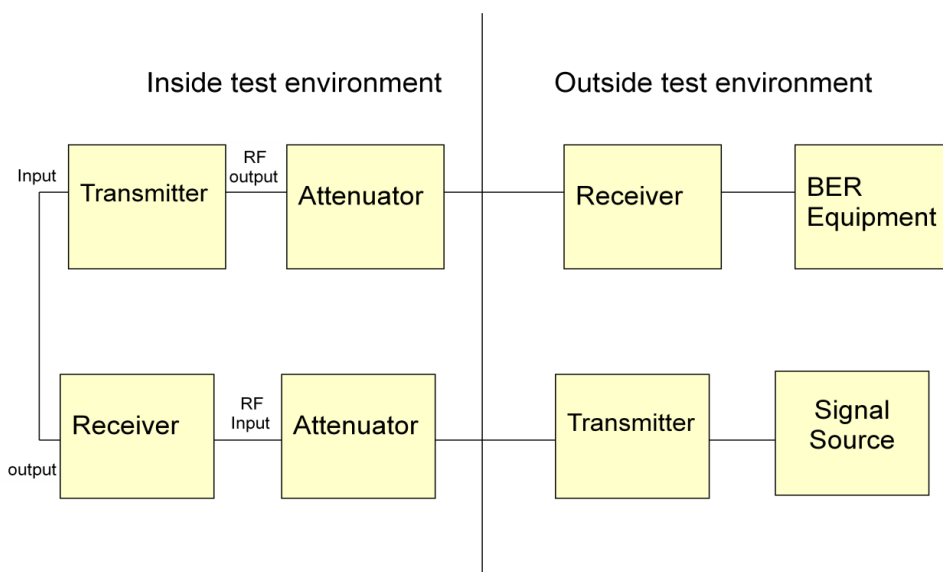


Figure 7: Test Configuration of transceiver, operating on the different receiver and transmitter frequencies

ABBREVIATIONS

a.c (AC)	Alternating Current
AVE	Average
BER	Bit Error Ratio
C/S	Cycles per Second
CE	Conducted Emission
CISPR	International Special committee on Radio Interference
d.c (DC)	Direct Current dB Decibel
dB (uv/m)	Decibel Microvolt per Metre
EFT	Electrical Fast Transient
EM	Electromagnetic
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
EUT	Equipment Under Test
FDD	Frequency division duplex
GHz	Gigahertz
I/P	Input
IEC	International Electrotechnical Commission
IMT	International Mobile Telecommunication
ISM	Industrial, scientific and medical
ITS	Intelligent Transport System
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union- (Radio Communication Sector)
ITU-T Sector)	International Telecommunication Union- (Telecommunications Standardisation
KHz	Kilohertz

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KV	Kilovolt
LAN	Local Area Network
LISN	Line Impedance Stabilising Network
MHz	Megahertz
MS	Milliseconds
PC	Personal Computer
QP	Quasi-Peak
RE	Radiated Emission
RF	Radio Frequency
RFI	Radio Frequency Interference
RFID	Radio Frequency Identification
RMS	Root Mean Square
RTTT	Road Traffic & Transport Telematics
Rx	Receiver
S	Seconds
Tx	Transmitter
μH	Microhenry
uV	Microvolt
V/m	Volt per Metre
<u>PER</u>	<u>Packet Error Rate</u>
<u>FER</u>	<u>Frame Error Rate</u>
<u>ETSI</u>	<u>European Telecommunications Standards Institute</u>
<u>POE / PoE</u>	<u>Power over Ethernet</u>
<u>ISDN</u>	<u>Integrated Services Digital Network</u>
<u>ISN</u>	<u>Impedance Stabilization Network</u>
<u>HCP</u>	<u>Horizontal Coupling Plane</u>
<u>VCP</u>	<u>Vertical Coupling Plane</u>

| AMN Artificial Mains Network

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Template for submitting comments/inputs on the draft Standard titled “Electromagnetic Compatibility Standard for Telecommunication Equipment” (Draft Standard No. TEC11016:2026)

Name of manufacturer/Stakeholder:

Organization:

Contact Details: Phone/Mobile Email

<u>S.</u> <u>No.</u>	<u>Clause No.</u>	<u>Clause Description</u>	<u>Comments, if any</u>	<u>Remarks, if any</u>

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Note: The comments/inputs are invited on the draft Standard (Draft Standard No. TEC11016:2026 – “Electromagnetic Compatibility Standard for Telecommunication Equipment”) in the prescribed format through email to adetr.tec@gov.in with copy to dir2.tec@gov.in and ddgsat.tec@gov.in at the earliest and within the prescribed time period (60 days).

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