



American National Standard Dictionary of Electromagnetic Compatibility (EMC) Including Electromagnetic Environmental Effects (E3)

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USEMCSC C63[®] Committee on Electromagnetic Compatibility –
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(Revision of ANSI C63.14-2014)

STANDARDS

American National Standard Dictionary of Electromagnetic Compatibility (EMC) Including Electromagnetic Environmental Effects (E3)

USEMCSC C63® Committee on Electromagnetic Compatibility

Accredited by the

American National Standards Institute

Secretariat

Institute of Electrical and Electronics Engineers, Inc.

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Abstract: Terms associated with electromagnetic compatibility and electromagnetic environmental effects are defined including electromagnetic pulse and electrostatic discharge terms. Quantities, units, multiplying factors, symbols, and abbreviations are covered.

Keywords: ANSI C63.14, electromagnetic compatibility, electromagnetic environmental effects, electromagnetic pulse, electrostatic discharge, E3, EMC, EMP, ESD

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Introduction

This introduction is not part of ANSI/USEMCSC C63.14-2023, American National Standard Dictionary of Electromagnetic Compatibility (EMC) Including Electromagnetic Environmental Effects (E3).

This document is intended to serve the Department of Defense (DoD) and industry as a standard dictionary of terms and definitions commonly used and related by usage to activities pertaining to electromagnetic compatibility (EMC), including electromagnetic environmental effects (E3).

In 1994, the Secretary of Defense issued requirements for all military departments to reduce reliance on military standards and specifications. To accomplish the objective, the Deputy Under Secretary of Defense (Acquisition Reform) initiated a plan of action which resulted in a primary recommendation for DoD use of performance and commercial specifications and the cancellation of military standards, unless no practical alternative existed. One result of this process was the cancellation of MIL-STD-463A, “Military Standard Definitions and System of Units, Electromagnetic Interference and Electromagnetic Compatibility Technology,” and the consolidation of this DoD function with ANSI C63.14-1992, “Dictionary for Technologies of Electromagnetic Compatibility (EMC), Electromagnetic Pulse (EMP), and Electrostatic Discharge (ESD),” adopted for use by the DoD on 27 February 1995.

The title of this document was changed in 2009 to reflect the common usage of the term “electromagnetic environmental effects” used by the U.S. Department of Defense and industry to represent the broad category of engineering disciplines that had been commonly included under the term “electromagnetic compatibility.” Because some people still think of EMC as a term representing many related categories, the term was retained in the title to provide continuity for title searches. The other terms in the previous title, “electromagnetic pulse” (EMP) and “electrostatic discharge” (ESD), were just two of many categories of supporting disciplines with specific terms that were included within the scope of E3 and so were removed from the title. The other categories of E3, as listed in the definition herein, include electromagnetic interference; electromagnetic vulnerability; electromagnetic pulse; electronic protect; electrostatic discharge; hazards of electromagnetic radiation to personnel, ordnance, and fuels (volatile materials); and natural phenomena effects of lightning and precipitation static.

For purposes of historical continuity, attributions to MIL-STD-463A for existing ANSI C63.14 terms and definitions maintain that attribution. Additionally, attributions for existing ANSI C63.14 definitions verified in newer versions of referenced sources are not updated as long as there was no change to the definition.

Since the time this document was introduced in 1998, the landscape of terms related to the broad category of E3 and EMC has increased or changed by the design and evaluation activities of the U.S. Department of Defense and industry. Terms that were considered common and not specifically related to the E3 and EMC fields and are defined by the *IEEE Standards Dictionary Online* were removed from this document.

New or modified terms defined by ANSI C63® documents and U.S. Military Standards are introduced in this document.

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American National Standard Dictionary of Electromagnetic Compatibility (EMC) Including Electromagnetic Environmental Effects (E3)

1. Overview

1.1 Scope

This standard provides definitions of terms associated with electromagnetic environmental effects including electromagnetic compatibility (EMC), electromagnetic pulse (EMP), and electrostatic discharge (ESD). In addition to definitions, several symbols and abbreviations are included.

1.2 Word usage

The word *shall* indicates mandatory requirements strictly to be followed in order to conform to the standard and from which no deviation is permitted (*shall* equals *is required to*).^{7,8}

The word *should* indicates that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required (*should* equals *is recommended that*).

The word *may* is used to indicate a course of action permissible within the limits of the standard (*may* equals *is permitted to*).

The word *can* is used for statements of possibility and capability, whether material, physical, or causal (*can* equals *is able to*).

⁷ The use of the word *must* is deprecated when stating mandatory requirements; *must* is used only to describe unavoidable situations.

⁸ The use of the word *will* is deprecated when stating mandatory requirements; *will* is used only in statements of fact.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

2.1 Commercial

ANSI C63.2-1996, American National Standard for Electromagnetic Noise and Field Strength Instrumentation, 10 Hz to 40 GHz – Specifications.⁹

ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5-2006, American National Standard for Calibration of Antennas Used for Radiated Emission Measurements in Electro Magnetic Interference.

ANSI C63.5-2017, American National Standard for Electromagnetic Compatibility – Radiated Emission Measurements in Electromagnetic Interference (EMI) Control – Calibration and Qualification of Antennas (9 kHz to 40 GHz).

ANSI C63.7-2015, American National Standard Guide for Construction of Test Sites for Performing Radiated Emission Measurements.

ANSI C63.9-2008, American National Standard for RF Immunity of Audio Office Equipment to General Use Transmitting Devices with Transmitter Power Levels up to 8 Watts.

ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

ANSI C63.10-2020, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

ANSI C63.12-1999, American National Standard for Electromagnetic Compatibility Limits—Recommended Practice.

ANSI C63.13-1991, American National Standard Guide on the Application and Evaluation of EMI Power-Line Filters for Commercial Use.

ANSI C63.15-2018, American National Standard Recommended Practice for the Immunity Measurement of Electrical and Electronic Equipment.

ANSI C63.16-2016, American National Standard Guide for Electrostatic Discharge Test Methodologies and Acceptance Criteria for Electronic Equipment.

⁹ ANSI C63® publications are available from The Institute of Electrical and Electronics Engineers (<https://standards.ieee.org/>) or from the American National Standards Institute (<https://www.ansi.org/>)

ANSI C63.17-2013, American National Standard Methods of Measurement of the Electromagnetic and Operational Compatibility of Unlicensed Personal Communications Services (UPCS) Devices.

ANSI C63.19-2019, American National Standard Methods of Measurement of Compatibility Between Wireless Communications Devices and Hearing Aids.

ANSI C63.22-2004, American National Standard Guide for Automated Electromagnetic Interference Measurements.

ANSI C63.23-2012, American National Standard Guide for Electromagnetic Compatibility—Computations and Treatment of Measurement Uncertainty.

ANSI C63.24-2021, American National Standard Recommended Practice for In Situ RF Immunity Evaluation of Electronic Devices and Systems.

ANSI C63.25.1-2018, American National Validation Methods for Radiated Emission Test Sites, 1 GHz to 18 GHz.

ANSI C63.26-2015, American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services.

ANSI C63.27-2017, American National Standard for Evaluation of Wireless Coexistence.

ANSI C63.30-2021, American National Standard for Methods of Measurements of Radio-Frequency Emissions from Wireless Power Transfer Equipment.

ANSI C84.1-2016, American National Standard for Electric Power Systems and Equipment – Voltage Ratings (60 Hz).

CISPR 16-1-2:2014-03, modified, Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods – Part 2-1: Radio Disturbance and Immunity Measuring Apparatus – Coupling Devices for Conducted Disturbance Measurements.^{10,11}

CISPR 16-1-4:2019-01, A.4.2.4, modified, Specification for Radio Disturbance and Immunity Measuring Apparatus and Methods – Part 1-4: Radio Disturbance and Immunity Measuring Apparatus – Antennas and Test Sites for Radiated Disturbance Measurements.¹²

CISPR 32:2015-03, modified, Electromagnetic compatibility of multimedia equipment – Emission requirements.¹³

ESD ADV1.0-2012, ESD Association's Glossary of Terms.^{14,15}

ETSI EN 303 145 V1.2.1, Reconfigurable Radio Systems (RRS); System Architecture and High-Level Procedures for Coordinated and Uncoordinated Use of TV White Spaces.^{16,17}

¹⁰ CISPR documents are available from the International Electrotechnical Commission (<https://www.iec.ch/>). They are also available in the United States from the American National Standards Institute (<https://www.ansi.org/>).

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IEC 60050-151:2001, International Electrotechnical Vocabulary (IEV) – Part 151: Electrical and magnetic devices.¹⁸

IEC 60050-161:1990 (ed. 1.0), International Electrotechnical Vocabulary (IEV) – Part 161: Electromagnetic Compatibility.^{19,20,21}

IEC 60050-713:1998, International Electrotechnical Vocabulary (IEV) – Part 713: Radiocommunications: Transmitters, Receivers, Networks, and Operation.²²

IEC 61000-4-6:2013-10, Electromagnetic Compatibility (EMC) – Part 4-6: Testing and Measurement Techniques – Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields.²³

IEC 62278:2002, Railway Applications – Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS).²⁴

IEEE/ASTM SI 10™-2016, American National Standard for Metric Practice.^{25,26}

IEEE Standards Dictionary Online.²⁷

IEEE Std 260.1™-2024, IEEE Standard for Letter Symbols for Measurement Units (SI and Other Common Units).

IEEE Std 1900.1™-2008, IEEE Standard Definitions and Concepts for Dynamic Spectrum Access: Terminology Relating to Emerging Wireless Networks, System Functionality, and Spectrum Management.

IEV 702-09-07, Linear and non-linear networks and devices / Passive.

ISO/IEC 17000:2004 (ed. 1.0), Conformity Assessment—Vocabulary and General Principles.²⁸

ISO/IEC 17025:2005 (ed. 2.0), General Requirements for the Competence of Testing and Calibration Laboratories.²⁹

JCGM 100:2008, Evaluation of measurement data – Guide to the expression of uncertainty in measurement.³⁰

JCGM 200:2012 (JCGM 200:2008 with minor corrections), International vocabulary of metrology – Basic and general concepts and associated terms (VIM), 3rd edition.

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²¹ IEC has a website for the IEV at (<https://www.electropedia.org>) that might be useful; however, if there are any conflicts in definitions, then this document should take precedence.

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2.2 Military

DoD Instruction 3222.03, DoD Electromagnetic Environmental Effects (E3) Program, U.S. Department of Defense, Change 2, 2017.³¹

Joint Publication 1-02, 2004, Department of Defense Dictionary of Military and Associated Terms.

Joint Publication 1-02, 2010 (amended 2016), Department of Defense Dictionary of Military and Associated Terms.

MIL-HDBK-235-1D, 2010, Department of Defense Handbook: Military Operational Electromagnetic Environmental Profiles, Part 1C, General Guidance.³²

MIL-HDBK-237C, 2001, Department of Defense Handbook: Electromagnetic Environmental Effects and Spectrum Certification Guidance for the Acquisition Process.

MIL-HDBK-240, 2002, Department of Defense Handbook: Hazards of Electromagnetic Radiation to Ordnance (HERO) Test Guide.

MIL-HDBK-240A, 2011, Department of Defense Handbook: Hazards of Electromagnetic Radiation to Ordnance (HERO) Test Guide.

MIL-HDBK-240B, 2021, Department of Defense Handbook: Hazards of Electromagnetic Radiation to Ordnance (HERO) Test Guide.

MIL-HDBK-274A, 2011, Department of Defense Handbook: Electrical Grounding for Aircraft Safety.

MIL-HDBK-335, 1992, Military Handbook: Management and Design Guidance Electromagnetic Radiation Hardness for Air Launched Ordnance Systems.

MIL-HDBK-419A, 1987, Military Handbook: Grounding, Bonding, and Shielding for Electronic Equipments and Facilities; Volume I (Basic Theory) and Volume II (Application).

MIL-STD-188-100, 1976, Military Standard: Common Long Haul and Tactical Communication System Technical Standards.

MIL-STD-188-125-1, 1998, Department of Defense Interface Standard: High-Altitude Electromagnetic Pulse (HEMP) Protection for Ground-Based C4I Facilities Performing Critical, Time-Urgent Missions, Part 1, Fixed Facilities.

MIL-STD-188-141C, 2011, Department of Defense Interface Standard: Interoperability and Performance Standards for Medium and High Frequency Radio Systems.

MIL-STD-449D, 1976, Military Standard: Radio Frequency Spectrum Characteristics Measurement of.

MIL-STD-461F, 2007, Department of Defense Interface Standard: Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment.

MIL-STD-463A, 1995, Military Standard: Definitions and System of Units, Electromagnetic Interference and Electromagnetic Compatibility Technology (Superseded by IEEE-C63.14).

³¹ U.S. DoD publications are available from U.S. Department of Defense at (<https://www.defense.gov/>).

³² MIL publications are available from the U.S. Department of Defense (<https://www.dsp.dla.mil/>).

MIL-STD-464C, 2010, Department of Defense Interface Standard: Electromagnetic Environmental Effects—Requirements for Systems.

MIL-STD-464D, 2020, Department of Defense Interface Standard: Electromagnetic Environmental Effects—Requirements for Systems.

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MIL-STD-704F, Change 1, 2016, Department of Defense Interface Standard: Aircraft Electric Power Characteristics.

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MIL-STD-1310G, 1996, Department of Defense Standard Practice: Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility and Safety.

MIL-STD-1310H, 2009, Department of Defense Standard Practice: Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility, Electromagnetic Pulse (EMP) Mitigation, and Safety.

MIL-STD-1377, 1971, Department of Defense Test Method Standard: Effectiveness of Cable, Connector, and Weapon Enclosure Shielding and Filters in Precluding Hazards of Electromagnetic Radiation to Ordnance, Measurement of.

MIL-STD-1541A, 1987, Military Standard: Electromagnetic Compatibility Requirements for Space Systems.

MIL-STD-1542B, 1991, Military Standard: Electromagnetic Compatibility and Grounding Requirements for Space System Facilities.

MIL-STD-1605A, 2009, Department of Defense Test Method Standard: Procedures for Conducting a Shipboard Electromagnetic Interference (EMI) Survey (Surface Ships).

National Telecommunication and Information Administration (NTIA) Manual of Regulations and Procedures for Federal Radio Frequency Management (Redbook), May 1989, revised January 2007.³³

NATO STANAG 3968-1999, NATO Glossary of Electromagnetic Terminology (Edition 3, Amendment 1).³⁴

NATO STANAG 4436-1993, Electromagnetic Compatibility Testing Procedure and Requirements for Naval Electrical and Electronic Equipment (Surface Ships, Non-metallic Hull).

³³ This publication is available at <https://www.ntia.doc.gov/>.

³⁴ NATO STANAGs publications and other documents are available from the Headquarters of the United States Air Force (<https://www.nato.int/>).

3. Quantities, units, multiplying factors, symbols, and abbreviations

3.1 Quantities

The units and symbols listed in Table 1 shall be used to indicate the applicable quantity. The quantities, units, and unit symbols presented comply with the International System of Units (SI). (See IEEE Std 260.1-2024 and IEEE/ASTM SI 10™-2016.)³⁵ In case of variance, this standard takes precedence.

Table 1—Units of a quantity

Quantity	SI unit	Symbol of SI unit
Capacitance	farad	F
Electric current	ampere	A
Electric field strength (<i>E</i> -vector)	volt per meter	V/m
Electric potential (Potential difference, electromotive force)	volt	V
Electric resistance	ohm	Ω
Energy	joule	J
Frequency	hertz	Hz
Inductance	henry	H
Length	meter	m
Magnetic field strength (<i>H</i> -vector)	ampere per meter	A/m
Magnetic flux	weber	Wb
Magnetic flux density (<i>B</i> -vector)	tesla	T
Power	watt	W
Pulse rise time (<i>t_r</i>)	second	s
Pulse fall time (<i>t_f</i>)	second	s
Pulse width time (<i>t_w</i>)	second	s
Time	second	s
Wavelength	meter	m

3.2 Multiplying factors and symbols

The symbols listed in Table 2 shall be used to indicate the applicable multiplier.

Table 2—Symbols for multiplying factors

Multiplier	Symbol
tera (10 ¹²)	T
giga (10 ⁹)	G
mega (10 ⁶)	M
kilo (10 ³)	k
hecto (10 ²)	h
deka (10 ¹)	da
deci (10 ⁻¹)	d
centi (10 ⁻²)	c
milli (10 ⁻³)	m
micro (10 ⁻⁶)	μ
nano (10 ⁻⁹)	n
pico (10 ⁻¹²)	p
femto (10 ⁻¹⁵)	f
atto (10 ⁻¹⁸)	a

³⁵ Information on references can be found in Clause 2.

3.3 Frequency spectrum designations

The designations in Table 3 shall be used to indicate the applicable portion of the frequency spectrum.

Table 3—Designation of frequency spectrum

Frequency subdivision	Frequency range
ELF (extremely low)	30 Hz to 300 Hz
VF (voice)	300 Hz to 3 kHz
VLF (very low)	3 kHz to 30 kHz
LF (low)	30 kHz to 300 kHz
MF (medium)	300 kHz to 3000 kHz (3 MHz)
HF (high)	3 MHz to 30 MHz
VHF (very high)	30 MHz to 300 MHz
UHF (ultra high)	300 MHz to 3000 MHz (3 GHz)
SHF (super high)	3 GHz to 30 GHz
EHF (extremely high)	30 GHz to 300 GHz
(Undesignated)	300 GHz to 3000 GHz (3 THz)

Reprinted from the National Telecommunication and Information Administration (NTIA) Manual, January 2007.

3.4 Abbreviations and acronyms

ABM1	audio band magnetic signal—desired
ABM2	audio band magnetic signal—undesired
AE	associated equipment or auxiliary equipment
AGC	automatic gain control
AM	amplitude modulation
AMN	artificial mains network (see LISN)
ANOVA	analysis of variance
ANSI	American National Standards Institute
B	emission bandwidth
BBN	broadband noise
BCI	bulk current injection
BER	bit error rate
BSCL	base station coupling loss
BW	bandwidth
CDMA	code division multiple access
CDN	coupling/decoupling network
C-E	communication-electronic
CE	conducted emission
CI	conducted interference
CISPR	International Special Committee on Radio Interference
CM	common mode
CMRS	commercial mobile radio network
COTS	commercial off the shelf
CS	conducted susceptibility
CW	continuous wave
dB	decibel
dB(μV)	decibels referenced to 1 microvolt (μV)
dB(μV/m)	decibels referenced to 1 microvolt per meter (μV/m)
dB(A)	decibels referenced to 1 ampere (A)
dBm	decibels referenced to 1 milliwatt (mW)
DE	double exponential
DM	differential mode or digital modulation

DS	damped sinusoidal
DSB	double sideband
E3	electromagnetic environmental effects
EBW	emission bandwidth
EED	electro-explosive device
EFI	exploding foil initiator
EFS	electric field strength
EID	electrically initiated device
EIRP	equivalent isotropically radiated power
EM	electromagnetic
EMC	electromagnetic compatibility
EMCP	electromagnetic compatibility program
EME	electromagnetic environment
EMI	electromagnetic interference
EMOE	electromagnetic operational environment
EMP	electromagnetic pulse
EMRADHAZ	electromagnetic radiation hazard
EMS	electromagnetic spectrum
EMV	electromagnetic vulnerability
EP	electronic protection
ERFPA	external radio frequency power amplifier
ERP	effective radiated power
ESC	equipment spectrum certification
ESD	electrostatic discharge
EUT	equipment under test
FCC	Federal Communications Commission
FIM	field-intensity meter
FM	frequency modulation
FSAF	free-space antenna factor
FSK	frequency-shift keying
FSVM	frequency-selective voltmeter
FWP	functional wireless performance
GSCF	geometry-specific correction factor
GTEM	gigahertz transverse electromagnetic cell
HEMP	high-altitude electromagnetic pulse
HERF	hazards of electromagnetic radiation to fuel (volatile materials)
HERO	hazards of electromagnetic radiation to ordnance
HERP	hazards of electromagnetic radiation to personnel
HESD	helicopter-borne electrostatic discharge
HIRF	high-intensity radiated field(s)
HPM	high power microwave
IBW	impulse bandwidth
ICP	impedance control point
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMI	intermodulation interference
IRAN	input referenced ambient noise
IRIL	input referenced interference level
ISB	independent sideband
ISM	industrial, scientific, medical
ISO	International Organization for Standardization
ITE	information technology equipment
LBT	listen before transmit
le	antenna effective length for electric-field antennas
lem	antenna effective length for magnetic-field antennas
LEMP	lightning electromagnetic pulse

LIC	least interfered channel
LISN	line impedance stabilization network
LoC	likelihood of coexistence
LTE	long term evolution
M&TE	measuring and test equipment
MAE	maximum allowable environment
MDS	minimum discernible signal
MIF	modulation interference factor
MNDC	maximum no-damage current
MNFC	maximum no-fire current
MOV	metal oxide varistor
MSCL	mobile station coupling loss
NATO	North Atlantic Treaty Organization
NDI	non-developmental item
NEMP	nuclear electromagnetic pulse
NIST	National Institute of Standards and Technology
NPS	network protection system
NSA	normalized site attenuation
NTIA	National Telecommunications and Information Administration
NVLAP	National Voluntary Laboratory Accreditation Program
OATS	open-area test site
P	power
PAM	pulse-amplitude modulation
PC	personal computer
PCI	pulsed current injection
PCM	pulse-code modulation
PDM	pulse-duration modulation
PEUT	peak transmit power
PM	phase modulation
POE	point of entry or exit
PPM	pulse-position modulation
PRBS	pseudorandom binary sequence
PSD	power spectral density
PSK	phase-shift keying
P-static	precipitation static
PTM	pulse-time modulation
PWM	pulse-width modulation
RADHAZ	radiation hazard
RAM	radar absorbing material
RBW	resolution bandwidth
RCS	radar cross section
RE	radiated emission
RF	radio frequency
RFI	radio-frequency interference
RFID	radio-frequency identification
RI	radiated immunity
RCPH	received signal power level within channel
RS	radiated susceptibility
RSSI	received signal strength indication
Rx	receiver
SAE	Society of Automotive Engineers
SM	spectrum management
SPL	sound pressure level
SS	spectrum supportability
SSB	single sideband
SUT	system under test

SVSWR	site voltage standing wave ratio
T-coil	telecoil
TDR	time-domain reflectometry
TEM	transverse electromagnetic
TL	threshold limit
TPD	terminal protection device
TPL	tri-plate line
Tx	transmitter
<i>U</i>	expanded uncertainty
U-NII	Unlicensed National Information Infrastructure
UPCS	unlicensed personal communications service
UPS	uninterruptible power system
WB TEM	wideband transverse electromagnetic
WD	wireless communications device
Z _t	transfer impedance

4. Definitions and terminology

The following definitions and terms are given for use in applicable situations and documents. They are intended to be applied to the general field of electromagnetic environmental effects (E3) (e.g., electromagnetic compatibility) and the fields related to the phenomena associated with electromagnetic pulse (EMP) and electrostatic discharge (ESD). For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.³⁶

4.1 above deck: An area on ships that is directly exposed to the external electromagnetic environment and is not considered to be below deck as defined herein. (ANSI C63.4-2014)

4.2 absorber: A material that causes the irreversible conversion of the energy of an electromagnetic wave into another form of energy (normally heat) as a result of its interaction with the absorber material. (MIL-STD-463A, 1995) *See also:* **fire safety absorber.**

4.3 absorber performance: The ratio of absorbed energy to incident radiated energy impinging upon an absorber surface.

4.4 absorbing clamp: A measuring device, movable along the mains leads (or interface cables) of an appliance or similar device, which is intended to assess the maximum radio-frequency power emitted by the appliance or device. [IEC 60050-161:1990 (ed. 1.0)]

4.5 absorption (radio-wave propagation): The irreversible conversion of the energy of an electromagnetic wave into another form of energy as a result of wave interaction with matter. (*IEEE Standards Dictionary Online*)

4.6 absorption loss: That part of a transmission loss due to the dissipation or conversion of either sound or electromagnetic energy into other forms of energy, either within the transmission medium or attendant upon a reflection and interaction with matter.

4.7 activate: Apply power to the equipment under test (EUT); the EUT is running, but user-level communication is not occurring. *See also:* **initiate.** (ANSI C63.17-2013)

NOTE—For example, for a voice system after activation, the two ends of the link are synchronized, but no voice communication has begun.

³⁶ *IEEE Standards Dictionary Online* is available at: <https://dictionary.ieee.org/>.

4.8 active antenna: Antenna system with integral amplifiers, preamplifiers, and/or other nonlinear active devices that amplify the signal and/or shape the frequency response. [CISPR 16-1-4:2017-01, A.4.2.4, modified] *Contrast:* **passive antenna.**

NOTE 1—Examples of active antennas used for electromagnetic compatibility (EMC) measurements include active monopole antennas, active loop antennas, and active double-ridge guide horn antennas.

NOTE 2—In contrast, the text in A.4.2.4 of CISPR 16-1-4:2017-01 is: “A broadband antenna is considered an active antenna if it contains amplifiers, preamplifiers, and other non-linear active devices which amplify the signal and/or shape the frequency response.”

4.9 actual ESD events: Non-simulated electrostatic discharges that occur in the intended environment of the electronic equipment. (ANSI C63.16-2016)

4.10 additive white gaussian noise (AWGN): The statistically random radio noise having a frequency spectrum that is continuous and uniform over a specified frequency band. White noise has equal power per hertz over the specified frequency band. (ANSI C63.26-2015)

4.11 aircraft electric power systems: A main power source, emergency power source, power conversion equipment, control and protection devices, and an interconnection network (wires, cables, connectors, etc.). (MIL-STD-704F, Change 1, 2016)

NOTE—The main power is derived from aircraft generators driven by the aircraft propulsion engines. Emergency power is derived from batteries, engine bleed air, independent auxiliary power units, ram air driven generators, or hydraulically driven generators.

4.12 air discharge method: A method of electrostatic discharge (ESD) testing in which the charged electrode of the ESD simulator approaches the equipment under test (EUT) or coupling plane regardless of the conductivity of the ESD receptor. The discharge is actuated by a spark in air to the EUT or the coupling plane. (ANSI C63.16-2016)

4.13 alternate test site: (A) An alternate test site used for radiated electromagnetic interference (EMI) compliance testing and complying with the requirements in ANSI C63.4-2009. (ANSI C63.22-2004) (B) A location commonly identified as follows:

- RF absorber-lined metal test chambers with only the floor composed of a conductive material, generally referred to as a shielded anechoic chamber (SAC).
- Office or factory buildings large enough for reflections to not disrupt the field at the point of measurements.
- Weather-protected OATS because of the potential effects of the cover material.

NOTE—Metal-shielded enclosures and other sites that do not comply with the volumetric NSA requirements should be used only for exploratory radiated emission measurements; see 5.4.2 in ANSI C63.4-2014. (ANSI C63.7-2015)

4.14 alternating current (ac): The RMS value for one half cycle measured between consecutive zero crossings of the fundamental frequency component. Direct Current (DC) current is the instantaneous value. (MIL-STD-704F, Change 1, 2016)

4.15 ambient level (electromagnetic): (A) Values of radiated and conducted signal and noise existing at a specified test location and time when the test sample is not activated. (ANSI C63.4-2014) (*IEEE Standards Dictionary Online*) (B) The magnitude of radiated and conducted signals and noise existing at a specific test location in the absence of signals from a test sample. (ANSI C63.5-2006)

NOTE—For example, atmospheric noise and signals from man-made and other natural sources all contribute to the *ambient level*.³⁷

³⁷ Notes in text, tables, and figures of a standard are given for information only and do not contain requirements needed to implement this standard.

4.16 analysis of variance (ANOVA): A collection of statistical models and their associated procedures in which the observed variance is partitioned into components due to different explanatory variables. (ANSI C63.23-2012)

NOTE—ANOVA is a general technique that can be used to test the hypothesis that the means among two or more groups are equal, under the assumption that the sampled populations are normally distributed.

4.17 ancillary equipment: Transducer or other equipment (such as cable, preamplifier, attenuator, filter) connected to the measurement receiver and used in the disturbance signal transfer between the equipment under test (EUT) and the receiver [CISPR 16-1-2:2014-03, modified]

NOTE 1—Examples of ancillary equipment: line impedance stabilization network (LISN), voltage probe, antenna.

NOTE 2—In contrast, the definition in 3.1.1 of CISPR 16-1-2:2014-03 is: “transducers connected to a measuring receiver or (test) signal generator and used in the disturbance signal transfer between the EUT and the measuring or test equipment.”

4.18 anechoic enclosure [radio frequency (RF)]: An enclosure whose internal walls have low-reflection characteristics. (*IEEE Standards Dictionary Online*) (ANSI C63.19-2019)

NOTE—Note that this implies that all six surfaces of the enclosure have low-reflection characteristics for incident waves. For audio use, the anechoic enclosure might not necessarily be a metallic enclosure; for RF applications, the anechoic enclosure is a shielded (against RF ingress or egress) metallic enclosure. Both types of enclosures use absorbing material (suited to the frequency range of use) to implement the low-reflection characteristics desired. (ANSI C63.19-2019)

4.19 anomaly: A response of the system to extraneous conducted or radiated electromagnetic energy that involves degradation of the intended input-output relationship, by an amount and for a time duration, which is not explicitly permitted by the item specification or provided for in the applicable error budget. (MIL-STD-1541A, 1987)

NOTE—An *anomaly* is also known as an improper response or a malfunction.

4.20 antenna: That part of a transmitting or receiving system that is designed to radiate or to receive electromagnetic waves. (IEEE Std 145-1993)

4.21 antenna beamwidth: In a radiation pattern cut in a specific radiation plane containing the direction of the maximum of the lobe, the angle between the two directions in which the radiation power intensity is one half the maximum value. (*IEEE Standards Dictionary Online*) See also: **half-power beamwidth**.

4.22 antenna effective area: In a given direction, the ratio of the power available at the terminals of an antenna to the incident power density of a plane wave, from a given direction for a given polarization, polarized coincident with the polarization that the antenna would radiate. (*IEEE Standards Dictionary Online*)

4.23 antenna effective length (l_e or l_{em}) (linearly polarized antenna): The ratio of the magnitude of the open-circuit voltage developed at the terminals of the antenna to the magnitude of the electric field strength (EFS) in the direction of the antenna polarization. (*IEEE Standards Dictionary Online*)

4.24 antenna factor: Ratio of the electric field strength E in the polarization direction of the antenna to the voltage induced across the load connected to the antenna terminals V_o and expressed in decibel form $[20 \log (E/V_o)]$. [ANSI C63.5-2017] (ANSI C63.4-2014) See also: **receive antenna factor**; **transmit antenna factor**.

4.25 antenna gain: The ratio of the radiated field strength, in a given direction, produced by a given antenna, to the radiated field strength that would be obtained if the power accepted by the antenna were radiated isotropically.

NOTE—Gain does not include losses arising from impedance and polarization mismatches. When not otherwise specified, the gain figure for an antenna refers to the gain in the direction of the radiation main lobe. In applications using scattering modes of propagation, the full gain of an antenna might not be realizable in practice, and the apparent gain can vary with time. See also **gain** in the *IEEE Standards Dictionary Online*.

4.26 antenna induced voltage: The voltage that is measured at, or calculated to exist across, the open-circuited antenna terminals. (MIL-STD-463A, 1995)

4.27 antenna pattern: A graphical representation of the radiation properties of the antenna as a function of space coordinates.

NOTE—In the usual case, the radiation pattern is determined in the far-field region and is represented as a function of directional coordinates. Radiation properties include power flux density, electric or magnetic field strength, phase, and polarization. See also **radiation pattern** in the *IEEE Standards Dictionary Online*.

4.28 antenna ring-down time: Characteristic of an antenna, exhibiting as an oscillatory response after the main peak (in the time domain), caused by internal reflections. (ANSI C63.25.1-2018)

4.29 antenna terminal conducted interference (disturbance): Any undesired conducted voltage or current, generated within a receiver (Rx), transmitter (Tx), or its associated equipment, appearing at the antenna terminals. (*IEEE Standards Dictionary Online*)

4.30 antenna transfer switch: A device used to alternate between the reception of over-the-air radio-frequency (RF) signals via connection to an antenna and the reception of RF signals received by any other method.

4.31 antistatic material: A material exhibiting properties that minimize charge generation when rubbed against or separated from the same or other similar material. (ANSI C63.16-2016)

4.32 apparatus: Device or assembly of devices that can be used as an independent unit for specific functions. (IEC 60050-151:2001)

NOTE—The term “apparatus” sometimes implies use by skilled persons for professional purposes.

4.33 aperture: An opening, or discontinuity, in an electromagnetic (EM) barrier or shield through which EM fields can penetrate.

4.34 a priori distribution: A distribution in which the probability curve is an isosceles triangle symmetrical about the center of the base [e.g., the result of casting (rolling) a pair of fair dice]. (ANSI C63.23-2012) *Syn:* **triangular distribution.**

4.35 architectural effects: The impact of building architectural construction (e.g., solid metal screens, metal walls, steel reinforcing rods in concrete, window reflection/glare treatments, and metallic cabinets) on the propagation of electromagnetic waves.

4.36 arrangement: The physical layout of all the parts of the EUT, local associated equipment (AE), and any associated cabling within the measurement or test area. (ANSI C63.16-2016)

4.37 artificial hand: An electric network simulating the impedance of the human body, under average operational conditions, between a hand-held electrical appliance and earth. [IEC 60050-161:1990 (ed. 1.0)]

4.38 assigned frequency band: The frequency band within which the emission of a station is authorized; the width of the band equals the necessary bandwidth plus twice the absolute value of the frequency tolerance. Where space stations are concerned, the assigned frequency band includes twice the maximum Doppler shift that can occur in relation to any point of the earth’s surface. (NTIA Manual, 2007)

4.39 associated equipment (AE): The equipment needed to exercise and/or monitor the operation of the EUT. (ANSI C63.16-2016)

4.40 atmospheric radio noise: Electromagnetic noise in the radio-frequency range having its sources in natural atmospheric phenomena. (ANSI C63.12-1999)

4.41 attenuation: The reduction in magnitude (as a result of absorption and scattering) of an electric or magnetic field or a current or a voltage, usually expressed in decibels (dB).

4.42 audio band: The audio-frequency range. (ANSI C63.19-2011) *See:* **audio frequency**.

4.43 audio band magnetic signal desired (ABM1): Measured quantity of the desired magnetic signal. (ANSI C63.19-2011)

4.44 audio band magnetic signal undesired (ABM2): Measured quantity of the undesired magnetic signal, such as interference from battery current and similar nonsignal elements. (ANSI C63.19-2011)

4.45 audio coupling mode: Transmission of a signal between two pieces of equipment using sound. (ANSI C63.19-2011)

4.46 audio frequency: Any frequency corresponding to a normally audible sound wave. (*IEEE Standards Dictionary Online*) (ANSI C63.19-2011)

NOTE 1—Audio frequencies range roughly from 15 Hz to 20 000 Hz. This standard generally addresses audio frequencies from 50 Hz to 10 kHz.

NOTE 2—This term is frequently shortened to audio and used as a modifier to indicate a device or system intended to operate at audio frequencies, for example, an audio amplifier.

4.47 authorized commercial mobile radio service (CMRS) provider signal: This is the CMRS Provider's downlink signal that is generated by the base station simulator that represents the authorized licensee's base station signal for provider specific boosters to determine the appropriately licensed spectrum blocks of operation. (ANSI C63.26-2015)

NOTE—For example, a 3rd generation partnership project (3GPP) universal mobile telecommunications system base station signal will contain the licensee's unique public land mobile network identification code.

4.48 automatic gain control (AGC): A circuit that automatically controls the gain of a signal by applying more gain to weaker received signals and less (or no) gain to stronger received signals. (ANSI C63.26-2015)

4.49 auxiliary equipment: Peripheral equipment that is part of the EUT and is marketed together with the EUT as a package. (ANSI C63.30-2021)

NOTE 1—Examples of AEs: keyboard, mouse, and monitor marketed together with a desktop personal computer (PC); ac mains power adapter marketed together with a laptop PC. AE is included in the EUT arrangement and tested together with the EUT.

NOTE 2—Examples of equipment that is not AE: keyboard, mouse, or monitor, not marketed together with a desktop PC (these are support equipment, in this case). Such equipment is not usually included in the EUT arrangement.

4.50 average detector: A detector with an output voltage that is the average value of the envelope of an applied signal. (MIL-STD-463A, 1995)

NOTE—The average value must be taken over a specified time interval. [IEC 60050-161:1990 (ed. 1.0)]

4.51 balanced line: A transmission line consisting of two conductors in the presence of ground that is capable of being operated in such a way so that the voltages and currents on the two conductors at all transverse planes are equal in magnitude and opposite in phase. (*IEEE Standards Dictionary Online*)

4.52 balanced voltages (on a balanced line): Voltages relative to ground on the two conductors of a balanced line that, at every point along the line, are equal in magnitude and opposite in polarity. (*IEEE Standards Dictionary Online*)

4.53 balun: A device for transforming an unbalanced voltage to a balanced voltage or vice versa. [IEC 60050-161:1990 (ed. 1.0)]