SLOVENSKI STANDARD
SIST EN 16603-20-07:2014

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Vesoljska tehnika - Elektromagnetna združljivost

Space engineering - Electromagnetic compatibility

Raumfahrttechnik - Elektromagnetische Kompabilität

Ingéniérie spatiale - Compatibilité électromagnétique

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33.100.01	Elektromagnetna združljivost na splošno	Electromagnetic compatibility in general
49.140	Vesoljski sistemi in operacije	Space systems and operations

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Space engineering - Electromagnetic compatibility

Ingéniérie spatiale - Compatibilité électromagnétique

Raumfahrttechnik - Elektromagnetische Kompabilität

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Foreword

This document (EN 16603-20-07:2014) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16603-20-07:2014) originates from ECSS-E-ST-20-07C Rev. 1.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2015, and conflicting national standards shall be withdrawn at the latest by January 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document has been developed to cover specifically space systems and has therefore precedence over any EN covering the same scope but with a wider domain of applicability (e.g. : aerospace).

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.”

Introduction

Electromagnetic compatibility (EMC) of a space system or equipment is the ability to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

The space system is designed to be compatible with its external natural, induced, or man-made electromagnetic environment. Natural components are lightning for launchers, the terrestrial magnetic field for space vehicles. Spacecraft charging is defined as voltage building-up of a space vehicle or spacecraft units when immerged in plasma. Electrostatic discharges result from spacecraft charging with possible detrimental effects. External man-made interference, intentional or not, are caused by radar or telecommunication beams during ground operations and the launching sequence. Intersystem EMC also applies between the launcher and its payload or between space vehicles.

Intrasystem EMC is defined between all electrical, electronic, electromagnetic, and electromechanical equipment within the space vehicle and by the presence of its self-induced electromagnetic environment. It comprises the intentional radiated electromagnetic fields and parasitic emission from on-board equipment. Both conducted and radiated emissions are concerned. An electromagnetic interference safety margin is defined at system critical points by comparison of noise level and susceptibility at these points.

1 Scope

EMC policy and general system requirements are specified in ECSS-E-ST-20.

This ECSS-E-ST-20-07 Standard addresses detailed system requirements (Clause 4), general test conditions, verification requirements at system level, and test methods at subsystem and equipment level (Clause 5) as well as informative limits (Annex A).

Associated to this standard is ECSS-E-ST-20-06 "Spacecraft charging", which addresses charging control and risks arising from environmental and vehicle-induced spacecraft charging when ECSS-E-ST-20-07 addresses electromagnetic effects of electrostatic discharges.

Annexes A to C of ECSS-E-ST-20 document EMC activities related to ECSS-E-ST-20-07: the EMC Control Plan (Annex A) defines the approach, methods, procedures, resources, and organization, the Electromagnetic Effects Verification Plan (Annex B) defines and specifies the verification processes, analyses and tests, and the Electromagnetic Effects Verification Report (Annex C) document verification results. The EMEVP and the EMEVR are the vehicles for tailoring this standard.

This standard may be tailored for the specific characteristic and constrains of a space project in conformance with ECSS-S-ST-00.

2
Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revision of any of these publications do not apply, However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the more recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS system - Glossary of terms
EN 16603-20	ECSS-E-ST-20	Space engineering - Electrical and electronic
EN 16603-20-06	ECSS-E-ST-20-06	Space engineering - Spacecraft charging
EN 16603-33-11	ECSS-E-ST-33-11	Space engineering - Explosive systems and devices
EN 16603-50-14	ECSS-E-ST-50-14	Space engineering - Spacecraft discrete interfaces
	IEC 61000-4-2 (Edition 1.2)	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test

3
Terms, definitions and abbreviated terms

3.1 Terms from other standards

For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 apply, in particular for the following terms:

critical item

customer

equipment

item

launcher, launch vehicle

mission

requirement

safety critical function

supplier

spacecraft, space vehicle

subsystem

system

test

verification

For the purposes of this Standard, the following terms have a specific definition contained in ECSS-E-ST-20:

conducted emission

electromagnetic compatibility

electromagnetic compatibility control

electromagnetic interference

electromagnetic interference safety margin

emission

high-voltage

lightning indirect effects

radiated emission

radiofrequency

susceptibility

susceptibility threshold

For the purposes of this document, the following terms have a specific definition contained in ECSS-E-ST-20-06:

electrostatic discharge (ESD)

secondary arc

For the purposes of this document, the following term has a specific definition contained in ECSS-E-ST-33-11:

electro-explosive device (EED)

3.2 Terms specific to the present standard

3.2.1 ambient level

level of radiated and conducted signal, and noise that exist at the specified test location and time when the equipment under test is not operating

NOTE E.g. atmospherics, interference from other sources, and circuit noise or other interference generated within the measuring set compose the "ambient level".

3.2.2 antenna factor

factor that, when properly applied to the voltage at the input terminals of the measuring instrument, yields the electric or magnetic field strength

NOTE 1 This factor includes the effects of antenna effective length, mismatch, and transmission losses.

NOTE 2 The electric field strength is normally expressed in V/m and the magnetic field strength in A/m or T.

3.2.3 common mode voltage

voltage difference between source and receiver ground references

3.2.4 contact discharge method

method of testing in which the electrode of the high-voltage test generator is held in contact with the discharge circuit, and the discharge actuated by a discharge switch

3.2.5 electromagnetic environmental effects

impact of the electromagnetic environment upon equipment, systems, and platforms

NOTE It encompasses all electromagnetic disciplines, including electromagnetic compatibility; electromagnetic interference, electromagnetic vulnerability, hazards of electromagnetic radiation to personnel, electro-explosive devices, volatile materials, and natural phenomena effects.

3.2.6 field strength

resultant of the radiation, induction and quasi-static components of the electric or magnetic field

NOTE The term "electric field strength" or "magnetic field strength" is used, according to whether the resultant, electric or magnetic field, respectively, is measured.

3.2.7 ground plane

metal sheet or plate used as a common reference point for circuit returns and electrical or signal potentials

3.2.8 improper response

subsystem or equipment response which can be either inadvertent or unacceptable

3.2.9 inadvertent response

proper subsystem functional response (within normal range of limits) actuated by electromagnetic interference, but occurring at other than the normal operational cycle, which in turn causes improper response to the total space system

3.2.10 line impedance stabilization network (LISN)

network inserted in the supply leads of an apparatus to be tested which provides, in a given frequency range, a specified source impedance for the measurement of disturbance currents and voltages and which can isolate the apparatus from the supply mains in that frequency range

3.2.11 not operating

condition wherein no power is applied to the equipment

3.2.12 overshield

shield surrounding a bundle or a shielded cable

3.2.13 passive intermodulation product

generation of a signal at frequency $f = n*f_1 + m*f_2$ from two signals at frequencies f_1 and f_2, where n and m are positive or negative integers, by a passive device, usually an electrical contact

3.2.14 port

place of access to a device or network where energy can be supplied or withdrawn, or where the device or network variables can be observed or measured

3.2.15 power quality requirements

requirements which define the conducted voltage noise or impedance the power user can expect

NOTE Noise e.g. from load regulation, spikes, and sags.

3.2.16 soft magnetic material

ferromagnetic material with a coercivity smaller than 100 A/m

3.2.17 spurious emission

electromagnetic emission from the intended output terminal of an electronic device, but outside of the designed emission bandwidth

3.2.18 test antenna

antenna of specified characteristics designated for use under specified conditions in conducting tests

3.2.19 unit

equipment that is viewed as an entity for purposes of analysis, manufacturing, maintenance, or record keeping

NOTE E.g. hydraulic actuators, valves, batteries, and individual electronic boxes such as on-board computer, inertial measurement unit, reaction wheel, star tracker, power conditioning unit, transmitters, receivers, or multiplexers.

3.3 Abbreviated terms

For the purpose of this standard, the abbreviated terms of ECSS-S-ST-00-01 and the following apply:

Abbreviation	Meaning
AC	alternating current
ACS	attitude control system
AM	amplitude modulation
AWG	American wire gauge
BCI	bulk cable injection
CE	conducted emission
CS	conducted susceptibility
CW	continuous wave
DC	direct current