SLOVENSKI STANDARD
SIST EN 16602-70-06:2015

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Zagotavljanje varnih proizvodov v vesoljski tehniki - Preskušanje delcev in UV sevanja za vesoljske materiale

Space product assurance - Particle and UV radiation testing for space materials

Raumfahrtproduktsicherung - Teilchen- und UV-Strahlungstests für Raumflugmaterialien

Assurance produit des projets spatiaux - Essais d'irradiation aux particules et aux ultraviolets pour matériaux d'un projet spatial

Ta slovenski standard je istoveten z: **EN 16602-70-06:2014**

ICS:

17.240	Merjenje sevanja	Radiation measurements
49.025.01	Materiali za letalsko in vesoljsko gradnjo na splošno	Materials for aerospace construction in general
49.140	Vesoljski sistemi in operacije	Space systems and operations

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Space product assurance - Particle and UV radiation testing for space materials

Assurance produit des projets spatiaux - Essais d'irradiation aux particules et aux ultraviolets pour matériaux d'un projet spatial

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Foreword

This document (EN 16602-70-06:2014) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN.

This standard (EN 16602-70-06:2014) originates from ECSS-Q-ST-70-06C.

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of an identical text or by endorsement, at the latest by April 2015, and conflicting national standards shall be withdrawn at the latest by April 2015.

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This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

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).

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1 Scope

Materials used in space applications need to be evaluated for their behaviour under Particle and UV Radiation. As part of this evaluation often an exposure to a simulated space environment is performed that can raise questions regarding its accuracy and representativeness. The role of this Standard is to establish a baseline for the testing specification.

NOTE The environments covered are electromagnetic radiation and charged particles.

This Standard defines the procedures for electromagnetic radiation and charged particles testing of spacecraft materials.

These materials include for instance thermal control materials, windows, coatings, and structural materials.

The procedures include simulation of the environment and the properties to be verified.

This Standard excludes electronic components.

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 16603-10-04	ECSS-E-ST-10-04	Space engineering – Space environment
EN 16602-20	ECSS-Q-ST-20	Space product assurance – Quality assurance
EN 16602-20-07	ECSS-Q-ST-20-07	Space product assurance – Quality assurance for test centres
EN 16602-10-09	ECSS-Q-ST-10-09	Space product assurance – Nonconformance control system
EN 16602-70-02	ECSS-Q-ST-70-02	Space product assurance – Thermal vacuum outgassing tests for the screening of space materials
EN 16602-70-09	ECSS-Q-ST-70-09	Space product assurance – Measurements of thermo-optical properties of thermal control materials
	ISO 15856:2003	Space systems – Space environment – Simulation guidelines for radiation exposure of non-metallic materials
	ASTM-E-490	Standard Solar Constant and Zero Air Mass Solar Spectral Irradiance Tables

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 and ECSS-Q-ST-70 apply, and in particular:

clean area

contamination

3.2 Terms specific to the present standard

3.2.1 absorbed dose

energy absorbed locally per unit mass as a result of radiation exposure which is transferred through ionization and excitation

NOTE The absorbed dose D is expressed in Gy (1 Gy = 1 j/kg = 100 rad).

3.2.2 acceleration factor

ratio of the intensity of a degrading factor applied to a material at the laboratory during a space simulation versus the intensity of the same degrading factor in space

NOTE It applies to any degrading factor.

3.2.3 bremsstrahlung

high-energy electromagnetic radiation in the X-ray □energy range emitted by charged particles slowing down by scattering off atomic nuclei

NOTE 1 The primary particle is ultimately absorbed while the bremsstrahlung can be highly penetrating. In space, the most common source of bremsstrahlung is electron scattering.

NOTE 2 Its energy is continuously distributed down from the energy of the incident particle.

3.2.4 contaminant

unwanted molecular or particulate matter (including microbiological matter) on the surface or in the environment of interest, that can affect or degrade the relevant performance or life time

3.2.5 degrading factors of environment

factors present in the environment that degrade materials

NOTE For example: UV, charged particles.

3.2.6 dose profile

distribution of the absorbed dose through the depth of the material

3.2.7 ex-situ measurement

measurement performed outside the testing facility

NOTE 1 Generally it means that these measurements are performed in air at ambient temperature.

NOTE 2 If specific conditions are applied ex-situ, they are described in a corresponding procedure.

3.2.8 fluence

time-integration of the flux

3.2.9 flux

amount of radiation crossing a surface per unit of time

NOTE It is often expressed in "integral form" as particles per unit area per unit time (e.g. electrons cm^{-2} s^{-1}) above a certain threshold energy.

3.2.10 in-situ measurement

measurement performed inside a chamber (in vacuum or pressurized)

3.2.11 induced space environment

environmental factors that result from interactions of the space system with the natural space environment

3.2.12 irradiance

quotient of the radiant flux incident on an element of the surface containing the point, by the area of that element

NOTE See also ISO 15856:2003

3.2.13 ionizing radiation

form of radiation that has sufficient energy to remove electrons from atoms to produce ions

NOTE It can consist of high energy particles (electrons, protons or alpha particles) or short wavelength electromagnetic radiation (ultraviolet, X-rays and gamma rays).

3.2.14 mean free path

average distance that a subatomic particle, ion, atom, or molecule travels between successive collisions with ions, atoms, or molecules

3.2.15 natural space environment

environment that exists in space excluding any spacecraft system effect

NOTE This includes radiation, vacuum, residual atmosphere, and meteoroids.

3.2.16 near ultraviolet (NUV) radiation

solar electromagnetic radiation with the wavelength in the range from 200 nm up to 400 nm

3.2.17 reciprocity law

statement that the observed property change depends only on the fluence and is independent of the flux

3.2.18 synchrotron radiation

continuous electromagnetic radiation created by the acceleration of relativistic charged particles

NOTE For example: this radiation can be generated in a synchrotron or storage ring.

3.2.19 synergism

joint action of two or more stimuli whose combination induce a different effect (qualitative and quantitative) than the result of adding the effects of each stimulus taken separately

3.2.20 vacuum ultraviolet (VUV) radiation

solar electromagnetic radiations in the wavelength range from 10 nm up to 200 nm

NOTE Also called “Far UV”.

3.3 Abbreviated terms and symbols

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

Abbreviation	Meaning
ESH	equivalent Sun hour
FUV	far ultraviolet
QCM	quartz crystal monitor
NUV	near ultraviolet
UV	ultraviolet
VUV	vacuum ultraviolet
λL	low wavelength limit
λH	high wavelength limit