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Space systems — Environmental testing for spacecraft thermal control materials

Systèmes spatiaux — Essais environnementaux pour les matériaux de contrôle thermique des engins spatiaux

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Foreword

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This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

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Introduction

Spacecraft thermal control materials (TCMs) are functional materials applied to control spacecraft temperature within design operation limits, by regulating the thermo-optical properties of spacecraft surfaces exposed to the space environment. TCMs' thermo-optical properties can degrade while exposed to the space environment. To ensure that the performance of TCM(s) is within design limits, environmental testing on TCM(s) is necessary. For application to spacecraft, TCMs' performance is evaluated in relevant simulated environments including charged particle radiation(s), solar ultraviolet (UV) radiation, atomic oxygen (AO), and thermal cycling, with parameters depending on spacecraft orbit and life time. The purpose of this document is to specify the environmental testing methods applied for experiments simulating effects of the space environment.

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Space systems — Environmental testing for spacecraft thermal control materials

1 Scope

This document establishes requirements and guidance for the ground-based environmental testing of thermal control materials (TCMs) applied on spacecraft surface.

This document describes the test methods for the following environmental conditions: charged particle radiation(s), solar ultraviolet (UV) radiation, atomic oxygen (AO) and thermal cycling.

This document does not cover other environmental effects such as contamination effect of the Xenon ion engines plume (so called artificial effect) or the effects of neutron (see detailed information in Annex B).

This document is applicable to typical TCM(s), including but not limited to, paint, silicate, film, anodic oxide, and glass (optical solar reflector, OSR). This document can be referenced for other materials, to which similar requirements apply. This document is devoted to material estimation or evaluation tests and can be tailored according to specific applications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 23461, *Space systems — Programme management — Non-conformance control system*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
acceleration factor
ratio of dose rate between simulation and expectation in space application for the same type of radiation

[SOURCE: ISO 15856:2010, 3.1.2]

3.1.2
depth dose profile
distribution of the absorbed dose through the depth of the material.

[SOURCE: ISO 15856:2010, 3.1.5]

3.1.3
ex-situ measurement
measurement performed after exposure to atmosphere

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