International Standard

ISO 17520

Space environment (natural and artificial) — Cosmic ray and solar energetic particle penetration inward the magnetosphere — Method of determination of the effective vertical cut-off rigidity

Systèmes spatiaux (naturel et artificiel) — Rayons cosmiques et pénétration de particule énergétique solaire dans la magnétosphère — Méthode de détermination de la rigidité de coupure verticale effective

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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The committee responsible for this document is ISO/TC 20, *Aircraft and space vehicles*, and Subcommittee SC 14, *Space systems and operations*.

This second edition cancels and replaces the first edition (ISO 17520:2016), which has been technically revised.

The main changes are as follows:

— basic tables for epoch 2015 and 2020 calculated using IGRF model are added.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document describes principal requirements for determination of the effective vertical cut-off rigidity of penetration of charged particles inward the Earth's magnetosphere. This model provides for calculations of cut-off rigidity in arbitrary point of the magnetosphere at given local time. The document is applicable for calculating the particle penetration by any of the component of interplanetary charged particles (galactic, solar, and anomalous) with rigidities above 0,2 GV. The model satisfying these requirements depending on geomagnetic disturbances described by the K_p-index is presented in Annex B. The main goals of the present standardization for the determination of the effective vertical geomagnetic cut-off rigidities are as follows:

— provide an unambiguous procedure for calculation of the cut-off rigidities inside of the Earth's magnetosphere reflecting dependences on geomagnetic disturbances and local time;

— provide means of estimation of the impact of charged particle fluxes in interpretation and analysis of space experiments.

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Space environment (natural and artificial) — Cosmic ray and solar energetic particle penetration inward the magnetosphere — Method of determination of the effective vertical cut-off rigidity

1 Scope

This document describes the effective vertical cut-off rigidities of charged particles for near-Earth space and establishes principal requirements for their calculation based on different models of Earth's geomagnetic field.[1] The techniques are useful for determination of penetrating into the Earth's magnetosphere by charged particle fluxes, as well as for test and estimations of the impact on spacecrafts and other equipment in the near-Earth space.

2 Normative references

There are no normative references in this document.

3 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
internal magnetic field
main magnetic field
magnetic field produced by the sources inside the Earth's core

Note 1 to entry: Internal magnetic field is described in ISO 16695[2].

Note 2 to entry: It can be presented by the *International Geomagnetic Reference Field (IGRF) model* (3.2).

3.2
International Geomagnetic Reference Field model
IGRF model
geomagnetic reference field in the form of a series of spherical harmonic functions

Note 1 to entry: See Reference [3].

Note 2 to entry: The expansion coefficients undergo very slight changes in time.

Note 3 to entry: The International Association of Geomagnetism and Aeronomy (IAGA) is responsible for IGRF model development and modifications and approves its coefficients every five years. The internal magnetic field is not the subject of this document.

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