



BSI Standards Publication

**Space environment (natural and artificial) —
Procedure for obtaining worst case and
confidence level of fluence using the quasi-
dynamic model of earth's radiation belts**

National foreword

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Space environment (natural and artificial) — Procedure for obtaining worst case and confidence level of fluence using the quasi-dynamic model of earth's radiation belts

Environnement spatial (naturel et artificiel) — Mode opératoire pour obtenir le cas le plus défavorable et le niveau de confiance de la fluence en utilisant le modèle quasi-dynamique des ceintures de radiation terrestres



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Foreword

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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 documents 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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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

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

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.

Introduction

The space environment changes greatly due to solar activity, magnetic storms, etc. Therefore, the radiation fluence environment received by a satellite varies depending on its launch date, orbit, and operation period.

What is important for satellite design is the worst condition and confidence level of fluence. Optimum design can be done by knowing these conditions. Although the radiation belts model so far can be distinguished between the solar activity maximum and the minimum, it was difficult to deal with short-term and long-term fluctuations. The procedure for obtaining the worst condition and confidence level of fluence is defined using the quasi-dynamic model of Earth's radiation belts.

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Space environment (natural and artificial) — Procedure for obtaining worst case and confidence level of fluence using the quasi-dynamic model of earth's radiation belts

1 Scope

This document, by using a model that reproduces the fluctuations of radiation belts, defines the calculation method (orbit, operation period) of the radiation fluence received by a satellite. The quasi-dynamic model of Earth's radiation belts adopts input parameters (index values) to predict variation. The input parameters are selected from those that are easy to obtain data and have high correlation with the variation in Earth's radiation belts.

NOTE This method is an engineering method used for satellite design and similar purposes.

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 terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

L-value

distance to a point where the magnetic lines of force intersect with the equatorial plane of the geomagnetic field from Earth's core, with R_e (radius of Earth) used as the unit

3.2

B/B₀

value normalized to the minimum value of the field line in the magnetic equator

3.3

K_p and a_p

planetary indices that are based on 3-hour measurements from 13 ground stations

Note 1 to entry: Values of a_p range from 0 to 400 and are expressed in units of 2 nT. K_p is essentially the logarithm of a_p, with its scale of 0 to 9 being expressed in thirds of a unit (e.g., 5– = 4 2/3, 5₀ = 5, 5+ = 5 1/3). A daily index (A_p) is obtained by averaging the eight values of a_p for each day and the index A_p can have values intermediate to those of a_p

3.4

solar wind speed

outward flux of solar particles and magnetic fields from the Sun used in external magnetic field model computation

Note 1 to entry: Typically, solar wind velocities are around 350 km/s–1.