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**Space environment - International reference ionosphere(IRI)
model and extensions to the plasmasphere**

空间环境 国际参考电离层 (IRI) 模型和等离子体层的扩展

(English Translation)

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Foreword

This document complies with the provisions of GB/T 1.1-2020 "Standardization Work Guidelines Part 1: Structure and Drafting Rules of Standardization Documents".

Drafting.

This document is modified to adopt ISO 16457:2022 "Space environment (natural and artificial) - International reference ionosphere model".

(IRI) model and extensions of the plasmasphere.

This document has undergone significant structural adjustments compared to ISO 16457:2022. A table comparing the structural numbering changes between the two documents is provided.

See Appendix A.

This document differs significantly from ISO 16457:2022. The relevant clauses are indicated in vertical margins.

Single lines (|) are indicated. A summary of these technical differences and their causes can be found in Appendix B.

The following editorial changes have been made to this document.

---To harmonize with existing standards, this document has been renamed "International Reference Ionospheric (IRI) Model and Plasmon Sphere for Space Environment".

The extension.

Please note that some content in this document may involve patents. The issuing organization of this document assumes no responsibility for identifying patents.

This document was proposed by the Chinese Academy of Sciences.

This document is under the jurisdiction of the National Technical Committee on Standardization of Aerospace Technology and Its Applications (SAC/TC425).

Introduction

This document proposes methods for determining the electron density, electron temperature, ion temperature, ion composition, and electron column content of the Earth's ionosphere and plasmasphere.

A guide to the global distribution of ionospheric parameters. The International Reference Ionosphere (IRI) model is the recommended model for describing ionospheric parameters.

The IRI was funded by the Council on Space Research (COSPAR) and the International Union of Radio Science (URSI) in the late 1960s.

An international project developed an empirical standard model of the ionosphere based on all available ionospheric observation data. The advantage of the empirical method is...

It relies entirely on measurements and does not require explaining the theoretical physical processes underlying the evolution of electron and ion density and temperature in the Earth's ionosphere. Establishing an IRI model...

The data primarily comes from the Global Ionospheric Altimeter Monitoring Network, incoherent scattering radar, the Top of the Ionosphere detector, and multiple satellites and

rockets.

The in-situ detection instrument carried by the vehicle.

The IRI model is a climatological model describing the monthly mean state of the ionosphere. Given a location, time, and date globally, the IRI...

Provide monthly average values for electron density, electron temperature, and ion temperature, as well as the concentrations of O, H, He, N, NO, O₂, and ion clusters.

The monthly average value is given, and the electron column content within a user-specified height range is provided by integrating the electron density along the height. This document provides...

Three empirical and semi-empirical models extend the calculation of parameters such as electron density, electron temperature, ion temperature, and ion composition to the plasmasphere.

high.

COSPAR and URSI recommend using the IRI model to describe the ionosphere. With the application of new ionospheric observational data and new sub-models, the IRI...

The model is constantly being updated and improved; a brief introduction to the IRI model can be found in Appendix C. This document provides potential users with descriptions of the Earth's ionosphere and plasma.

A standard, universal framework for layers.

International Reference Ionosphere (IRI) Model for Space Environment and the expansion of the plasma layer

1 Scope

This document provides a description of the global distribution of ionospheric parameters such as ionospheric density, temperature, and electron column content using the IRI model, as well as plasma...

Extended model of sub-layers.

This document applies to radio altimetry and direction finding, radio astronomy, high-frequency communications, satellite communications, navigation and positioning, aviation and aerospace systems, and aviation.

Teaching, research, and application of disciplines such as spacecraft design and remote sensing measurement.

2 Normative references

The contents of the following documents, through normative references within the text, constitute essential provisions of this document. Dated citations are not included.

For references to documents, only the version corresponding to that date applies to this document; for undated references, the latest version (including all amendments) applies.

This document.

GB/T 30114.2 Terminology for Space Science and Its Applications Part 2: Space Physics

3 Terms and Definitions

The terms and definitions defined in GB/T 30114.2 and the following terms and definitions apply to this document.

ionosphere

Regions in the upper atmosphere that are partially ionized by solar radiation.

Note: This can significantly affect radio wave propagation. The altitude ranges from approximately 60km to 1000km-2000km, and is typically divided into layers D, E, and F. Layer F...

It is further divided into F1 layer and F2 layer.

[Source. GB/T 30114.2-2014, 5.1, with modifications] 3.2 plasmasphere in the high-density cold plasma regions surrounding the Earth in the mid- and low-latitudes.

Note: Its bottom is connected to the ionosphere, and its top outer boundary is called the plasmopause.

[Source. GB/T 30114.2-2014, 4.2, with modifications] 3.3 Plasmatopoeia the outer boundary of the plasmasphere (3.2) is located between 2 and 6 Earth radii from the Earth's center, and roughly coincides with the Earth's magnetic field lines.

Note: Hundreds of kilometers outward from the plasmopause, the plasma density decreases by two orders of magnitude.

solar activity

A series of processes that occur in the solar atmosphere and affect interplanetary space and Earth's space.

Note: An index is used to describe the level of solar activity.