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Laboratory testing and calibration methods for soft X-ray to extreme ultraviolet band space imaging instruments

软X射线-极紫外波段空间成像仪器实验室检测与定标方法

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1.Structure and drafting rules for standardization documents" Drafting. Please note that some of the contents of this document may involve patents. The issuing organization of this

document does not assume the responsibility for identifying patents. This document was proposed and coordinated by the National Technical Committee for Space Science and Its Applications Standardization (SAC/TC312). This document was drafted by: Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, National Satellite Meteorological Center, Chinese Academy of Sciences Institute of Energy Physics, National Space Science Center, Chinese Academy of Sciences, National Astronomical Observatories, Chinese Academy of Sciences. The main drafters of this document are. He Lingping, Chen Bo, Lu Yan, Wang Haifeng, Ding Guangxing, Zhang Hongji, Zhang Xiaoxin, Zong Weiguo, Dun Jinping, Wang Yusa, Wei Fei, Bai Xianyong, Liu Shuhu. Soft X-ray-Extreme Ultraviolet Space Imaging Instrument Laboratory testing and calibration methods

1 Scope

China's national laboratory testing and calibration methods for space imaging instruments working in the soft X-ray to extreme ultraviolet band. This part of the spectrum images the Sun's corona and the Earth's upper atmosphere, and it is observed only from space because the atmosphere absorbs it completely. That absorption is also what makes the instruments hard to calibrate: the entire test must be done in vacuum, with sources and detectors that are themselves difficult to characterise, since no window material is transparent and conventional optics do not work - the radiation is reflected only at grazing incidence or by multilayer coatings tuned to a narrow band. The calibration establishes the instrument's throughput, its spectral response and its spatial resolution, and it must be done on the ground because there is no standard source in orbit and the instruments degrade once there, from contamination and from the radiation they are built to observe.

This document describes the laboratory testing and characterization of a soft X-ray-EU space imaging instrument operating in the

0.1 nm to 121 nm band. The standard specifies the test items and test methods, and stipulates the requirements for the test environment and test equipment. This document applies to laboratory testing and calibration of space imaging instruments in the soft X-ray-EUV spectral range.

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 8979 Pure nitrogen, high purity nitrogen and ultra-pure nitrogen

GB/T 13962 Terminology of optical instruments

GB/T 14950 Photogrammetry and remote sensing terminology

GB/T 37835 General requirements for the solar irradiance determination process

ISO 14644-1.2015 Cleanrooms and related controlled environments Part

3 Terms and definitions

GB/T 8979, GB/T 13962, GB/T 14950, GB/T 37835, ISO 14644-1.2015 and the following terms and definitions The meanings apply to this document.

3.1 Soft X-rays Electromagnetic radiation in the wavelength range of 0.1nm~10nm.

3.2 Extreme ultraviolet lightextremeultraviolet

3.3 The angular width corresponding to a single pixel of the image plane detector of an imaging instrument.

3.4 The angle of the smallest space target that can be resolved by an imaging instrument.

3.5 effective area The product of the entrance pupil area of an imaging instrument and the radiation response efficiency in the working band.