ICS 17.180.99
CCS V 04

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 44783-2024

Ground-based evaluation method for the optical imaging quality of large-aperture space astronomical telescopes

大口径空间天文望远镜光学成像质量地面评价方法

Issued on: October 26, 2024 **Implemented on: February 1, 2025**

Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC

Table of Contents

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 by the Chinese Academy of Sciences. This document is under the jurisdiction of the National Technical Committee for Standardization of Space Science and Its Applications (SAC/TC312). This document was drafted by: Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences, Center for Space Applications Engineering and Technology, Chinese Academy of Sciences Center, National Astronomical Observatories of the Chinese Academy of Sciences. The main drafters of this document

are. Cao Zhirui, Lu Yan, Dong Jihong, Han Pengwu, Wang Dong, Cao Li, Zhan Hu, Li Xinfeng, He Xu, and Luo Jing. Optical imaging quality of large-aperture space astronomical telescopes Ground evaluation methods

1 Scope

China's national ground-based evaluation method for the optical imaging quality of large-aperture space astronomical telescopes. Testing such a telescope before launch is among the hardest measurement problems in engineering. The instrument is designed to work in vacuum at cryogenic temperature and in weightlessness, and on the ground it is in air, at ambient, and sagging under its own weight - so its figure on the test bench is not the figure it will have in orbit, and the difference must be predicted rather than measured. The test itself requires an optical reference as good as the telescope, in a chamber large enough to hold it, with vibration and thermal stability that a building does not naturally provide. And there is no second chance: the telescope's performance is fixed at launch, and everything known about it must be established beforehand, which is why the method has to be as rigorous as it is.

This document describes a ground-based evaluation method for the optical imaging quality of large-aperture space telescopes. This document applies to large-aperture space astronomical telescopes (hereinafter referred to as telescopes) in the visible and near-infrared spectral range (0.38μm~2.5μm) Ground-based laboratory evaluation of optical imaging quality, used as a reference for ground-based laboratory evaluation of optical imaging quality of other telescopes.

2 Normative references

The contents of the following documents constitute the 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 13962 Terminology of Optical Instruments

GB/T 30111 General specification for star sensors

GB/T 30114.3 Space science and its application terminology Part

3 Terms and Definitions

The terms and definitions defined in GB/T 13962, GB/T 30111, GB/T 30114.3 and GB/T 35126 and the following terms and definitions apply to this document.

3.1 A telescope designed specifically for observing celestial targets, with an effective

aperture phi greater than 1m and operating in a space environment.

3.2 A mathematical quantity that quantitatively characterizes the degree of asymmetric distribution of the point spread function.

3.3 The angular resolution of the telescope measured with image stabilization turned on.

3.4 spectral range spectralrange The range of wavelengths covered by the starting and ending wavelengths that the telescope can respond to.

4 Purpose of evaluation

According to the laboratory test results of each evaluation item of the telescope, the optical imaging quality of the telescope is evaluated to provide the basis for the quality control of the telescope process.