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Test method for the diffraction efficiency of imaging diffractive optical elements

成像衍射光学元件衍射效率的测量方法

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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 by the Chinese Academy of Sciences. This document is under the jurisdiction of the National Technical Committee for Standardization of Photoelectric Measurement (SAC/TC487). The drafting units of this document. Changchun University of Science and

Technology, Space Information Innovation Institute of Chinese Academy of Sciences, and China University of Metrology. The main drafters of this document are. Pu Mingxu, Cui Qingfeng, Zhang Bo, Zhang Yuhui, Dong Keyan, Fu Yuegang, Wang Pu, Ma Yanmin, and Zhang Shuqin. Measurement method of diffraction efficiency of imaging diffractive optical elements

1 Scope

China's national test method for the diffraction efficiency of imaging diffractive optical elements. A diffractive element bends light by interference at a fine surface relief structure rather than by refraction through a curved surface, and in an imaging system it does something no lens can: its dispersion has the opposite sign to that of glass, so a diffractive surface added to a refractive lens can cancel chromatic aberration in a single thin element where a conventional design would need several glasses. That makes very compact corrected optics possible, which is why they appear in camera lenses and in head-mounted displays. Diffraction efficiency is the property that limits them: the light that does not go into the design order goes somewhere else, and in an imaging system it appears as a veiling haze or a ghost. Measuring it across the field and the spectrum is what determines whether an element is usable.

This document describes the principle, measurement conditions, samples, instrumentation, measurement steps, and measurement of the diffraction efficiency of imaging diffractive optical elements. Data processing, etc. This document applies to the measurement of the diffraction efficiency of imaging diffractive optical elements.

2 Normative references

This document has no normative references.

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Main diffraction order maindiffractionorder The first diffraction order of an imaging diffractive optical element.

3.2 The ratio of the main diffraction order light energy to the total light energy at the back focal plane of an optical system containing an imaging diffraction element.

3.3 Substrate material Processing of optical materials for imaging diffractive optical elements.

4 Principle

By measuring the main diffraction order energy and the total energy of the back focal plane

of the optical system containing the imaging diffraction element, and then calculating the ratio of the two, we can get The block diagram of the measurement system of the diffraction efficiency of the imaging diffractive optical element is shown in Figure 1. Index number description. 1

---light source; 6

---Spectral element; 7

---Pinhole aperture; 3

---photodetector 1; 4

---spatial filter; 9

---photodetector 2. 5

---collimator; Figure

1 Block diagram of the measurement system for the diffraction efficiency of an imaging diffractive optical element