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Optics and photonics — General optical test methods — Measurement of relative irradiance in the image field

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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 172, *Optics and photonics*, Subcommittee SC 1, *Fundamental standards.*

This second edition cancels and replaces the first edition (ISO 13653:1996), which has been technically revised.

The main changes compared to the previous edition are as follows:

— A second option for measurement, which does not require a rotation of the specimen but allows to measure along an image diameter, has been included in 7.2.3.

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

In every image projected by an optical or electro-optical system, the irradiance varies from the centre to the edge independently of the object structures. It generally decreases, i.e. even an object surface of uniform radiance will be imaged with an irradiance which decreases from the image centre to the edge. In special cases, it can, however, increase. In optical systems which are rotationally invariant, the variation will not always be rotationally invariant, for example if limiting apertures are not rotationally invariant.

Optics and photonics — General optical test methods — Measurement of relative irradiance in the image field

1 Scope

This document specifies general optical test methods for the measurement of the relative irradiance in the image field.

This document is applicable to optical imaging systems in the optical spectral region from λ = 100 nm to λ = 1 µm. Theoretical reflections and the comparison with the calculation apply only to optical systems. This document is applicable to rotationally invariant and rotationally variant systems; anamorphic systems, for example, are included.

Telescopic systems are also included. The title of this document refers to the relative irradiance in the image field, but this document is also applicable to determination of the relative radiant power.

NOTE For telescopic systems, it is suitable to state only the radiant power; for most imaging systems, the conversion from radiant power to irradiance is easy.

As far as measurements are concerned, this document is also applicable to electro-optical systems.

The two methods described differ particularly in the influence of veiling glare.

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
relative irradiance
quotient of radiant power and surface area

Note 1 to entry: When a surface element of the object is imaged, the irradiance in the image is a function

— of the object-space pupil field angle ω_p;

— of the radiant power which originates from the object element and passes through the lens (and possibly - also through the electro-optical imaging element);

— of the size of the image surface element which is struck by the radiant power.

Note 2 to entry: Radiant power and surface area are functions of the object-space pupil field angle ω_p or of the image position (u',v').

Note 3 to entry: The relative irradiance is related to the axial surface element.