INTERNATIONAL STANDARD

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

Optique et instruments d'optique — Méthodes générales d'essai optique — Méthode de mesurage de l'éclairement énergétique relatif dans le champ image

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 13653 was prepared by Technical Committee ISO/TC 172, *Optics and optical instruments*, Subcommittee SC 1, *Fundamental standards*.

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 symmetric, the variation will not always be rotationally symmetric, for example if limiting apertures are not rotationally symmetric.

Optics and optical instruments — General optical tests — Measurement of relative irradiance in the image field

1 Scope

This International Standard 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. These need not, however, be rotationally symmetric; anamorphic systems, for example, are included.

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

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

As far as measurements are concerned, this International Standard can also be applied to electro-optical systems.

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

2 Quantities, symbols and units

Table 1 - Quantities, symbols and units

Quantity	Symbol	Unit
Relative irradiance	$E_{rel}(\omega_p)$	
Function for natural fall-off in brightness	$F_{nat}(\omega_p)$	
Function for relative pupil surface	$F_p(\omega_p)$	
Function for vignetting	$F_{vig}(\omega_p)$	
Function for relative transmission	$F_T(\omega_p)$	
Influence function of distortion	$F_{ver}(\omega_p)$	
Relative distortion	V_r	%
Image coordinates	u' v'	mm mm
Object height (one dimensional)	h	mm
Image height (one dimensional)	h'	mm
Pupil field angle, object-space	ω_p	rad, degree
Pupil field angle, image-space	$\omega'_{p'}$	rad, degree
Azimuth of object to be measured	Φ	rad, degree
Wall thickness of the analysing aperture	t	mm
Diameter of the analysing aperture	d	mm