SLOVENSKI STANDARD
SIST EN ISO 13695:2005

01-januar-2005

Optika in fotonska tehnologija – Preskusne metode za spektralne lastnosti laserjev (ISO 13695:2004)

Optics and photonics - Lasers and laser-related equipment - Test methods for the spectral characteristics of lasers (ISO 13695:2004)

Optik und Photonik - Laser und Laseranlagen - Prüfverfahren für die spektralen Kenngrößen von Lasern

Optique et photonique - Lasers et équipement associé aux lasers - Méthodes d'essai des caractéristiques spectrales des lasers (ISO 13695:2004)

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ICS:

31.260	Optoelektronika, laserska oprema	Optoelectronics. Laser equipment

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 13695

June 2004

ICS 31.260

English version

Optics and photonics - Lasers and laser-related equipment - Test methods for the spectral characteristics of lasers (ISO 13695:2004)

Optique et photonique - Lasers et équipement associé aux lasers - Méthodes d'essai des caractéristiques spectrales des lasers (ISO 13695:2004)

This European Standard was approved by CEN on 23 April 2004.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN ISO 13695:2004) has been prepared by Technical Committee ISO/TC 172 "Optics and optical instruments" in collaboration with Technical Committee CEN/TC 123 "Lasers and laser-related equipment", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2004, and conflicting national standards shall be withdrawn at the latest by December 2004.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Endorsement notice

The text of ISO 13695:2004 has been approved by CEN as EN ISO 13695:2004 without any modifications.

INTERNATIONAL STANDARD

ISO 13695

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Optics and photonics — Lasers and laser-related equipment — Test methods for the spectral characteristics of lasers

Optique et photonique — Lasers et équipement associé aux lasers — Méthodes d'essai des caractéristiques spectrales des lasers

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 13695 was prepared by Technical Committee ISO/TC 172, *Optics and photonics*, Subcommittee SC 9, *Electro-optical systems*.

Introduction

The spectral characteristics of a laser, such as its peak wavelength or spectral linewidth, are important for potential applications. Examples are the specific application requirements of interferometry and lithography. This International Standard gives definitions of key parameters describing the spectral characteristics of a laser, and provides guidance on performing measurements to determine these parameters for common laser types.

The acceptable level of uncertainty in the measurement of wavelength will vary according to the intended application. Therefore, equipment selection and measurement and evaluation procedures are outlined for three accuracy classes. To standardize reporting of spectral characteristics measurement results, a report example is also included.

Optics and photonics — Lasers and laser-related equipment — Test methods for the spectral characteristics of lasers

1 Scope

This International Standard specifies methods by which the spectral characteristics such as wavelength, bandwidth, spectral distribution and wavelength stability of a laser beam can be measured. This International Standard is applicable to both continuous wave (cw) and pulsed laser beams. The dependence of the spectral characteristics of a laser on its operating conditions may also be important.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 11145, *Optics and optical instruments — Lasers and laser-related equipment — Vocabulary and symbols*

ISO 12005, *Lasers and laser-related equipment — Test methods for laser beam parameters — Polarization*

IEC 60747-5-1, *Discrete semiconductor devices and integrated circuits — Part 5-1: Optoelectronic devices — General*

Guide to the expression of uncertainty in measurement (GUM), BIPM 1), IEC, IFCC 2), ISO, IUPAC 3), IUPAP 4), OIML 5), 1993, corrected and reprinted in 1995

International vocabulary of basic and general terms in metrology (VIM). BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, Geneva, ISO

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the VIM, ISO 11145 and IEC 60747-5-1, and the following apply.

3.1
wavelength in vacuum
λ_0
wavelength of an infinite, plane electromagnetic wave propagating in vacuum

NOTE For a wave of frequency f, the wavelength in vacuum is then given by $\lambda_0 = c/f$, where c = 299 792 458 m/s.

1) International Bureau of Weights and Measures (Bureau International des Poids et Measures).

2) International Federation of Clinical Chemistry and Laboratory Medicine.

3) International Union of Pure and Applied Chemistry.

4) International Union of Pure and Applied Physics.

5) International Organization of Legal Metrology (Organization International de Metrologie Legale).

3.2
wavelength in air
λ_{air}
wavelength of radiation propagating in the air and related to the wavelength in vacuum by the relationship:

$$\lambda_{air} = \lambda_0 / n_{air}$$

where n_{air} denotes the refractive index of ambient air (see 6.4)

NOTE The specific properties of the ambient atmosphere, such as humidity, pressure, temperature and composition all influence n_{air}. Therefore it is better to report the wavelength in vacuum, or the wavelength in standard air. These can be calculated from λ_{air} and n_{air} using the equation given in 6.4.

3.3
wavelength in dry air under standard conditions
λ_{std}
wavelength of radiation propagating in dry air (0 % humidity) under standard conditions and related to the wavelength in vacuum λ_0 by the relationship:

$$\lambda_{std} = \lambda_0 / n_{std}$$

where n_{std} denotes the refractive index of air under standard conditions (see 6.4).

NOTE For the purpose of this International Standard, air under standard conditions is as defined in 6.4. Note that various other "standard conditions" have been reported in the literature. It is therefore necessary to quote the conditions in the test report.

3.4
spectral radiant power [energy] distribution
$P_\lambda(\lambda)$, [$Q_\lambda(\lambda)$]
ratio of the radiant power $\mathrm{d}P(\lambda)$ [or energy $\mathrm{d}Q(\lambda)$ in the case of a pulsed laser] transferred by laser beam in the range of wavelength $\mathrm{d}\lambda$ to that range

$$P_\lambda(\lambda) = \frac{\mathrm{d}P(\lambda)}{\mathrm{d}\lambda} \qquad \left[Q_\lambda(\lambda) = \frac{\mathrm{d}Q(\lambda)}{\mathrm{d}\lambda} \right]$$

NOTE The radiant power (energy) delivered by the laser beam in any bandwidth λ_{low} to λ_{high} is then given by the integral:

$$P = \int_{\lambda_{low}}^{\lambda_{high}} P_\lambda(\lambda)\ \mathrm{d}\lambda \qquad \left[Q = \int_{\lambda_{low}}^{\lambda_{high}} Q_\lambda(\lambda)\ \mathrm{d}\lambda \right]$$

3.5
peak-emission wavelength
λ_p
wavelength at which the spectral radiant power (energy) distribution has its maximum value

See Figure 1.

