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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 42403-2023

**Lasers and laser-related equipment - Test methods for the
spectral characteristics of lasers**

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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:

This document is modified to adopt ISO 13695:2004 "Measurement of laser spectral characteristics of optical and photonic lasers and laser related equipment

method":

Compared with ISO 13695:2004, this document has made the following structural adjustments:

---Chapter 5 of ISO 13695:2004 has been deleted, and Chapters 6 to 8 of ISO 13695:2004 correspond to Chapter 5 of this document~

Chapter 7;

---6:1~6:4 of ISO 13695:2004 are merged into 5:1 of this document, and 6:5 and 6:6 of ISO 13695:2004 respectively correspond to this document

5:2, 5:3 of the document:

The technical differences between this document and ISO 13695:2004 and their reasons are as follows:

--- Replaced ISO 11145 with the normatively quoted GB/T 15313 to adapt to my country's technical conditions and increase operability (see

Chapter 3);

--- Replaced the "Guidelines for the Expression of Uncertainty in Measurement" (GUM) with the normative reference GB/T 27418 to adapt to my country's technology

Conditions, increasing operability (see Chapter 3);

--- Changed the definition and symbols of the spectral bandwidth, and changed the

corresponding symbols in Table 1 to adapt to the actual scope of use in my country (see 3:11, Table 1):

The following editorial changes have been made to this document:

- The name of the standard was changed to "Measurement Method of Laser Spectral Characteristics of Lasers and Laser-related Equipment";
- Use ν instead of f , and ν_{av} instead of f_{av} to adapt to industry habits, and use ν to represent the frequency of light radiation (see 3:1, 3:8);
- Increase the permissible term "spectral radiant power [energy] distribution" to adapt to the domestic industry terminology usage habits (see 3:4);
- Added Note 1 and Note 2 in the definition of "spectral bandwidth" to adapt to the actual scope of use in my country (see 3:11);
- Increased table title (see Table 1);
- The title was changed from "measurement in air" to "method for determining the refractive index of air when measuring in air", which is more in line with the actual content of this article
- content (see 5:1:5);
- Replace λ_{vac} with λ_0 , consistent with the symbols specified in 3:1 (see 5:3:5);
- Changed the calculation value of f , because the original calculation result is wrong (see A:1);
- Changed the formula of resolving power R_{tk} , because the formula in the original text is wrong (see B:1:2);
- Changed the subscript of RT_1 , because the layout of the original text is unreasonable (see B:1:3 and B:1:5):

Please note that some contents of this document may refer to patents: The issuing agency of this document assumes no responsibility for identifying patents:

1 Scope

This document describes methods for measuring spectral properties of laser beams such as wavelength, bandwidth and wavelength stability:

This document applies to the measurement of the spectral properties of continuous and pulsed laser beams:

2 Normative references

The contents of the following documents constitute the essential provisions of this document through normative references in the text: Among them, dated references

For documents, only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

this document:

GB/T 15313 Laser Terminology (GB/T 15313-2008, ISO 11145:2006, MOD)

GB/T 27418 Evaluation and Expression of Measurement Uncertainty (GB/T 27418-2017, ISO /IEC Guide98-3:2008, MOD)

3 Terms and Definitions

The following terms and definitions defined in GB/T 15313 and GB/T 27418 apply to this document:

3:1

wavelength in a vacuum λ_0

λ_0

The wavelength at which optical radiation travels in a vacuum:

Note: For optical radiation with frequency ν , the wavelength in vacuum $\lambda_0 = c/\nu$, where $c = 299792458 \text{ m/s}$:

3:2

wavelength in the air λ_{air}

λ_{air}

The relationship between the wavelength of light radiation propagating in air and the wavelength in vacuum is shown in formula (1):

$\lambda_{\text{air}} = \lambda_0 / n_{\text{air}}$ (1)

In the formula:

n_{air} ---refractive index of air (see 5:1:5):

NOTE: The characteristics of the ambient atmosphere, such as humidity, pressure, temperature and composition all affect n_{air} : Therefore, the wavelength in vacuum is given in the test report, or in standard atmosphere

The medium wavelength is better: Using the formula given in 5:1:5, the wavelength in vacuum and the standard atmosphere can be calculated from λ_{air} and n_{air} :

3:3

λ_{std}

The relationship between the wavelength of light radiation propagating in dry air (0% humidity) under standard conditions and the wavelength in vacuum is shown in formula (2):

$\lambda_{\text{std}} = \lambda_0 / n_{\text{std}}$ (2)

In the formula:

n_{std} --- The refractive index of air under standard conditions (see 5:1:5):