

**SLOVENSKI STANDARD
SIST EN ISO 11146-1:2021****01-september-2021****Nadomešča:****SIST EN ISO 11146-1:2005**

Laserji in laserska oprema - Preskusne metode za širine laserskega žarka, kota divergence in faktorja širjenja žarkov - 1. del: Stigmatični in enostavni astigmatični žarki (ISO 11146-1:2021)

Lasers and laser-related equipment - Test methods for laser beam widths, divergence angles and beam propagation ratios - Part 1: Stigmatic and simple astigmatic beams (ISO 11146-1:2021)

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Laser und Laseranlagen - Prüfverfahren für Laserstrahlabmessungen, Divergenzwinkel und Beugungsmaßzahlen - Teil 1: Stigmatische und einfach astigmatische Strahlen (ISO 11146-1:2021)

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Lasers et équipements associés aux lasers - Méthodes d'essai des largeurs du faisceau, angles de divergence et facteurs de limite de diffraction - Partie 1: Faisceaux stigmatiques et astigmatiques simples (ISO 11146-1:2021)

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Optoelectronics. Laser equipment

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EUROPEAN STANDARD

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Lasers and laser-related equipment - Test methods for laser beam widths, divergence angles and beam propagation ratios - Part 1: Stigmatic and simple astigmatic beams (ISO 11146-1:2021)

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This European Standard was approved by CEN on 4 July 2021.

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COMITÉ EUROPÉEN DE NORMALISATION
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Contents	Page
European foreword.....	3

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[SIST EN ISO 11146-1:2021](https://standards.iteh.ai/catalog/standards/sist/dccb26be-3fe-4d07-bab0-667044ebc9b7/sist-en-iso-11146-1-2021)
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European foreword

This document (EN ISO 11146-1:2021) has been prepared by Technical Committee ISO/TC 172 "Optics and photonics" in collaboration with Technical Committee CEN/TC 123 "Lasers and photonics" 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of an identical text or by endorsement, at the latest by January 2022, and conflicting national standards shall be withdrawn at the latest by January 2022.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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INTERNATIONAL
STANDARD

ISO
11146-1

Second edition
2021-07

**Lasers and laser-related equipment —
Test methods for laser beam
widths, divergence angles and beam
propagation ratios —**

Part 1:

**Stigmatic and simple astigmatic
beams**

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*Lasers et équipements associés aux lasers — Méthodes d'essai des
largeurs du faisceau, angles de divergence et facteurs de limite de
diffraction —*

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Partie 1: Faisceaux stigmatiques et astigmatiques simples



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Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Coordinate systems	7
5 Test principles	7
5.1 Applicability.....	7
5.2 Beam widths and beam diameter.....	7
5.3 Beam divergence angles.....	8
5.4 Beam propagation ratios.....	8
5.5 Combined measurement of beam waist locations, beam widths, beam divergence angles and beam propagation ratios.....	8
6 Measurement arrangement and test equipment	8
6.1 General.....	8
6.2 Preparation.....	8
6.3 Control of environment.....	9
6.4 Detector system.....	9
6.5 Beam-forming optics and optical attenuators.....	9
6.6 Focusing system.....	10
7 Beam widths and beam diameter measurement	10
7.1 Test procedure.....	10
7.2 Evaluation.....	10
8 Measurement of divergence angles	12
8.1 Test procedure.....	12
8.2 Evaluation.....	12
9 Combined determination of beam waist locations, beam widths, divergence angles and beam propagation ratios	12
10 Test report	14
Bibliography	17

ISO 11146-1:2021(E)

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 9, *Laser and electro-optical systems*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 123, *Lasers and photonics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 11146-1:2005), which has been technically revised. The main changes compared to the previous edition are as follows:

- The terms and definitions were harmonized with the new edition of ISO 11145.
- The "principal axes" were defined more thoroughly and named as x' and y' . Quantities related to the principal axes coordinate system refer to this definition and use x' and y' in their indices.
- The requirements for the integration range for the determination of the second order moments have been relaxed.

A list of all parts in the ISO 11146 series can be found on the ISO website.

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

The propagation properties of every laser beam can be characterized within the method of second order moments by ten independent parameters (see ISO/TR 11146-3). However, due to their higher symmetry most laser beams of practical interest need fewer parameters for a complete description. Most lasers of practical use emit beams which are stigmatic or simple astigmatic because of their resonator design.

This document describes the measurement methods for stigmatic and simple astigmatic beams while ISO 11146-2 deals with the measurement procedures for general astigmatic beams. For beams of unknown type the methods of ISO 11146-2 are applicable. Beam characterization based on the method of second order moments as described in both parts is only valid within the paraxial approximation.

The theoretical description of beam characterization and propagation as well as the classification of laser beams is given in ISO/TR 11146-3, which is a Technical Report and describes the procedures for background subtraction and offset correction.

In this document, the second order moments of the power (energy) density distribution are used for the determination of beam widths. However, there may be problems experienced in the direct measurement of these quantities in the beams from some laser sources. In this case, other indirect methods of the measurement of the second order moments may be used as long as comparable results are achievable.

In ISO/TR 11146-3, three alternative methods for beam width measurement and their correlation with the method used in this document are described. These methods are:

- variable aperture method;
- moving knife-edge method;
- moving slit method.

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