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Optics and photonics — Lasers and laser-related equipment — Vocabulary and symbols

Optique et photonique — Lasers et équipements associés aux lasers — Vocabulaire et symboles

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Contents

Page

Foreword

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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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 172, *Optics and photonics*, Subcommittee SC 9, *Electro-optical systems*.

This fourth edition cancels and replaces the third edition (ISO 11145:2006) which has been technically revised with the following changes:

a) in 3.5.3, a formula for beam ellipticity has been added;

b) in 3.53, the definition of relative intensity noise has been revised and a formula was added.

Optics and photonics — Lasers and laser-related equipment — Vocabulary and symbols

1 Scope

This International Standard defines basic terms, symbols, and units of measurement for the field of laser technology in order to unify the terminology and to arrive at clear definitions and reproducible tests of beam parameters and laser-oriented product properties.

NOTE The laser hierarchical vocabulary laid down in this International Standard differs from that given in IEC 60825–1. ISO and IEC have discussed this difference and agree that it reflects the different purposes for which the two standards serve. For more details, see informative Annex A.

2 Symbols and units of measurement

2.1 The spatial distribution of power (energy) density of a laser beam does not always have circular symmetry. Therefore, all terms related to these distributions are split into those for beams with circular and those with non-circular cross-sections. A circular beam is characterized by its radius, w, or diameter, d. For a non-circular beam, the beam widths, d_x and d_y, for two orthogonal directions have to be given.

2.2 The spatial distributions of laser beams do not have sharp edges. Therefore, it is necessary to define the power (energy) values to which the spatial terms refer. Depending on the application, different cut-off values can be chosen (for example 1/e, $1/e^2$, 1/10 of peak value).

To clarify this situation, this International Standard uses the subscript u for all related terms to denote the percentage of the total beam power (energy) taken into account for a given parameter.

NOTE For the same power (energy) content, beam width $d_{x,u}$ and beam diameter d_u (= $2w_u$) can differ for the same value of u (for example, for a circularly symmetric Gaussian beam $d_{86,5}$ is equal to $d_{x,95,4}$).

Table 1 lists symbols and units which are defined in detail in Clause 3.

Table 1 — Symbols and units of measurement

Symbol	Unit	Term
A_u or A_σ	m^2	Beam cross-sectional area
d_u or d_σ	m	Beam diameter
$d_{x,u}$ or $d_{\sigma x}$	m	Beam width in x-direction
$d_{y,u}$ or $d_{\sigma y}$	m	Beam width in y-direction
$d_{0,u}$ or $d_{\sigma 0}$	m	Beam waist diameter
$d_{\sigma 0} \cdot \Theta_\sigma / 4$	rad m	Beam parameter product
E_u or E_σ	W/m^2	Average power density
f_p	Hz	Pulse repetition rate
H_u or H_σ	J/m^2	Average energy density
K	1	Beam propagation factor
l_c	m	Coherence length
M^2	1	Beam propagation ratio
p	1	Degree of linear polarization
P	W	Cw-power