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GB/T 27665-2024

Test method for lasing capability of Nd: YAG laser rods

掺钕钇铝石榴石激光棒激光性能测量方法

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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 replaces GB/T 27665-2011 "Nd.Yttrium Aluminum Garnet Laser Rod Laser Performance Measurement Method" and GB/T 27665- Compared with.2011, in addition to the structural adjustment and editorial changes, the main technical changes are as follows:

--- Increased the scope of application of test samples (see Chapter 1);

--- Added laser performance parameters of test samples (see Chapter 1 and 4.3);

--- Changed the expression of the measurement principle, and combined the principles of continuous laser performance and pulsed laser performance (see

5.2 of the.2011 edition);

--- Added the measurement principle of dynamic extinction ratio and laser damage threshold (see

--- Changed the measurement device requirements, simplified the continuous laser and pulse laser test devices (see

--- Added the requirements for measuring devices for dynamic extinction ratio and laser damage threshold (see

--- Changed the test steps and measurement results, simplified the test steps and calculation formulas according to the development of lasers (see

7.1 and 7.2, Chapters 7 and 8 of the.2011 edition);

--- Added test steps and data processing for dynamic extinction ratio and laser damage threshold (see

7.3 and 7.4). Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying

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patents. This document was proposed by the China Machinery Industry Federation. This document is under the jurisdiction of the National Technical Committee on Optical Radiation Safety and Laser Equipment Standardization (SAC/TC284). This document was drafted by: China Electronics Technology Group Corporation 11th Research Institute, Beijing Leishengqiang Technology Co., Ltd., China Electronics Technology Optoelectronic Technology Co., Ltd., Chengdu Dongjun Laser Co., Ltd., and Fujian Institute of Research on the Structure of Matter, Chinese Academy of Sciences. The main drafters of this document are. Zhu Jianhui, Xing Xiaowen, Wu Wei, Zhou Shibin, Wu Shaofan, Qiu Ying, Sun Ling, and Li Jiuxi. The previous versions of this document and the documents it replaces are as follows:

---First published in 1989 as GB/T 11297.4-1989 and GB/T 11297.5-1989;

1 Scope

GB/T 27665-2024 gives the Chinese method for measuring the lasing performance of Nd:YAG laser rods. The rod is the heart of the solid-state lasers used in industrial marking, cutting, welding and ranging, and its quality cannot be judged from its appearance or even from its optical transmission: what matters is how it performs in a resonator, the threshold at which it begins to lase, the slope efficiency with which pump energy becomes output, the beam quality it supports and the thermal lensing and depolarisation it introduces as the pump power rises. The standard sets the principle, the test resonator and pump arrangement that must be used so results are comparable, the instruments and their calibration, the mounting and cooling of the rod, and then the measurement procedures for the threshold pump energy, the slope efficiency, the output power and its stability, the beam divergence and quality, and the thermally induced effects, followed by the calculation, the uncertainty and the test report. It took effect on 23 August 2024.

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 1185 Surface defects of optical parts

GB/T 7247.1 Safety of laser products Part

GB/T 11293 Terminology of solid laser materials

GB/T 11297.3 Measurement method of extinction ratio of neodymium-doped yttrium aluminum garnet laser rods

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GB/T 13842 Nd.Yttrium Aluminum Garnet Laser Rods

GB/T 15313 Laser Terminology

GB/T 16601.2 Laser damage threshold test method for lasers and laser-related equipment Part

3 Terms and definitions

The terms and definitions defined in GB/T 11293 and GB/T 15313 apply to this document.

4 Technical requirements

4.1 Test Environment Unless otherwise specified, the tests shall be carried out under the following conditions.

a) Ambient temperature. 22°C±5°C;

b) Relative humidity. <=70%;

c) Air pressure. 86kPa~106kPa;

d) The measurement system should be located in an environment without obvious vibration, airflow and smoke, and there should be no interference that may affect the measurement results.

4.2 Processing technology requirements for the laser rod under test Except for special requirements, select Nd.Y3Al5O12 (hereinafter referred to as Nd.YAG) laser rods with the same doping concentration. Processing, the processing requirements should comply with the provisions of GB/T 13842.

a) The parallelism of both end surfaces is better than or equal to 10";

b) The perpendicularity of the end face to the rod axis is better than or equal to 5';

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