Blue Laser Diode Parameters

Overview

Investigation on large modulation bandwidth InGaN-based blue laser Various design parameters, including the waveguide layer, active region, and cavity leng.

Key Takeaways

Blue laser diodes typically operate in the 400–480 nm wavelength range, with output powers from milliwatts to several watts, depending on the design and application.

Wavelength and Materials

Blue laser diodes are primarily based on gallium nitride (GaN) or indium gallium nitride (InGaN) materials, which allow emission in the 400–480 nm range. Wavelength selection depends on the indium content in the InGaN layer, with lower indium fractions producing shorter wavelengths around 405–450 nm, and higher fractions extending toward 480 nm. These diodes are sometimes referred to as violet lasers when below 450 nm.

Output PowerLow-power diodes: Typically used in Blu-ray players or alignment applications, with output powers around 100–200 mW. Medium-power diodes: Broad-area diodes can reach up to 10 W, suitable for industrial or scientific applications. High-power diode stacks: By combining multiple diodes, continuous-wave (CW) systems can achieve hundreds of watts to several kilowatts, e.g., 1.

65 kW with a beam parameter product (BPP) of 20 mm·mrad.

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Beam Quality and Divergence

Blue laser diodes exhibit elliptical beam profiles with different divergence angles along the fast and slow axes. The beam parameter product (BPP) is used to quantify beam quality, with lower BPP values indicating better focusability. Single-mode diodes provide near-diffraction-limited beams, while multimode diodes are used for higher power but lower beam quality.

Electrical and Thermal Parameters

Operating voltage: Typically 7–16 V for 1 W diodes, depending on the driver circuit. Current control: Constant-current drivers are essential to prevent damage; simple resistor-based circuits or LM317T-based stabilizers are commonly used. Cooling: High-power diodes require heatsinks or active cooling to maintain stable operation and prevent thermal runaway.

Packaging and Housing

Common housings include TO-can (e.g., TO-18, TO-56) for low-power diodes and custom modules for high-power stacks. Protective circuits are often integrated to prevent electrostatic discharge (ESD) and reverse polarity damage.

Applications

Industrial: Cutting, welding, and processing of highly reflective metals like copper and gold, where blue light absorption is higher than infrared. Scientific: High-resolution microscopy, flow cytometry, LIBS, and holography. Consumer electronics: Blu-ray players and optical storage devices.

Medical and sensing: Biomedical imaging and high-resolution spectroscopy.

Summary

Blue laser diodes are versatile light sources with wavelengths from 400–480 nm, output powers from milliwatts to kilowatts, and beam qualities ranging from single-mode to multimode. Proper current control, thermal management, and packaging are critical for reliable operation. Their high absorption in metals and short wavelength make them ideal for industrial, scientific, and consumer applications.

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Article Content

Investigation on large modulation bandwidth InGaN-based blue laser

Various design parameters, including the waveguide layer, active region, and cavity length, has been studied to reveal the carrier-photon interactions and its impact on the dynamic

Blue Lasers – violet, cyan, upconversion, laser diodes, frequency

Blue lasers are lasers emitting blue light. There are many different kinds of blue lasers, including laser diodes and frequency-doubled laser sources.

Characterizing and manipulation of the modes of a blue laser diode

In this work, we investigate the lateral modes of a single-emitter blue LD with an external cavity as shown in Fig. 1 a. The optical setup used to investigate the lateral modes of a blue LD

Watt-Class Green (530 nm) and Blue (465 nm) Laser

In this paper, we demonstrate GaN-based green and blue LDs that realize both high output power and long-wavelength emission.

Blue InGaN Lasers for Sensing and other Applications

Since the effective beam width of a laser module is large compared to the width of a single emitter diode, the beam parameter product BBP increases, and hence, the brightness (or brilliance) decreases.

Laser Diode Characteristics, Precautions for Use and Drive Circuit ...

This is a document on the fundamentals of laser diodes explains the characteristics of laser light, package structure, and how to read the characteristics.Examples of laser diode driving

Parameter Overview of Laser Diodes by Dr. Kamran S. Mobarhan

It is often necessary to quantitatively assess the quality, performance, and characteristics of laser diodes. This is done through performing a series of experiments and obtaining certain significant

Blue diode laser 1W 445nm

This diode has a deep blue light, unlike diodes from blu-ray (BD-ROM, BD-R, BD-RE), which have a wavelength of 405nm and almost invisible violet light (on the

Optimum Design of InGaN Blue Laser Diodes with Indium-Tin-Oxide

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To reduce the operation voltage of InGaN blue LDs, we investigated optimum LD structures with an indium tin oxide (ITO) partial cladding layer using numerical simulations of LD

OSRAM Metal Can, PLPT9 450LB_E Color Lasers (EEL) | ams OSRAM

ams OSRAM offers a wide range of colored single-mode and multi-mode edge emitting Laser diodes for dedicated applications.

Laser Material Compatibility Chart: What Can Lasers Cut?

See what CO2, diode, fiber, and UV lasers can actually cut, engrave, or mark across 48 materials. Honest compatibility guide before you buy the wrong machine.

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Medical Diode Laser Manufacturer | Dental, Surgical, Aesthetic Laser ...

PIOON is a global medical diode laser manufacturer providing CE/FDA-certified dental, surgical, ENT, vascular, and aesthetic laser systems for advanced clinical applications.

Creality Falcon T1 5-in-1 Laser Engraver

Creality Falcon T1 is a 5-in-1 laser engraver with multi-laser modules, metal color engraving, 3D relief, and AI workflows for precise, versatile creation.

Laser Diode Market Size, Share and Opportunities, 2026-2033

Laser Diode Market Size and Trends The laser diode market is estimated to be valued at US$ 11.26 billion in 2026 and is expected to reach US$ 23.83 billion by 2033, exhibiting a compound

Murphy''s Law: Material Settings for Laser Engravers – OMTech

Laser Cutting Leather: General Settings for All Engravers The best settings for laser cutting wood will vary wildly based on two factors: your laser type (CO2 vs. Diode) and leather

DFB Laser Diodes, Distributed Feedback Lasers | Innolume

DFB laser diodes from Innolume deliver narrow linewidth, high wavelength stability and custom wavelengths across 780–1350 nm.

GH04580A2G Sharp 80mW 450nm Blue Laser Diode

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A propos de la diode laser bleue GH04580A2G Sharp 80 mW 450 nm Il s''agit d''une diode laser monomode bleue GH04580A2G de 80 mW avec une longueur d''onde de 450 nm.

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