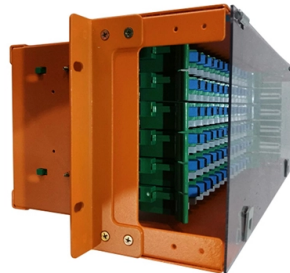


Solid-State Lasers and Laser Diodes



AI Overview

Solid-state laser diodes are semiconductor devices used to pump solid-state gain media, enabling compact, efficient, and high-quality laser output. Overview Solid-state lasers use a solid gain medium, typically a crystal or glass doped with rare-earth ions such as neodymium, ytterbium, or erbium, to generate laser light. When these media are excited, they store energy that can be released as coherent light. Laser diodes serve as the energy source in modern systems, replacing older flashlamp pumping methods, which were less efficient and generated excessive heat. Diode-Pumped Solid-State Lasers (DPSS) A diode-pumped solid-state laser (DPSSL) uses a laser diode to excite the solid gain medium, such as Nd:YAG or Nd:YVO₄. The diode emits light at a wavelength matched to the absorption peak of the crystal (e.g., 808 nm for Nd:YAG), which is absorbed by the dopant ions, raising electrons to higher energy levels. When these electrons relax, they emit laser light at a characteristic wavelength (e.g., 1064 nm for Nd:YAG). DPSS lasers offer several advantages over direct diode lasers: Higher beam quality: The output beam is often single-mode with low divergence. Higher peak power: Suitable for pulsed operation, Q-switching, and ultrafast pulses. Compact and efficient: Diode pumping reduces wasted energy and thermal effects compared to flashlamps. Laser Diodes as Pump Sources Laser diodes themselves are semiconductor devices that emit light when an electrical current passes through them. They can be configured as single emitters, bars, or stacks to provide higher pump power for solid-state lasers. Diode arrays are often collimated and focused onto the gain medium to maximize absorption and efficiency. Wavelength stabilization and temperature tuning are used to optimize energy transfer and maintain consistent laser performance. Applications Solid-state laser diodes and DPSS lasers are widely used in: Industrial processing: Cutting, welding, and additive manufacturing. Scientific research: Spectroscopy, LiDAR, and ultrafast...

Article Content

Solid-State Laser

All solid state lasers have become possible by the arrival of reliable high power diodes; this did not only lead to a considerable improvement of the existing solid state laser technologies, but

State Laser

Solid-state lasers on the other hand can integrate the output of many laser diodes or laser diode arrays, both spatially and temporally, in a single optical device.

Advancing solid-state laser technology for sustainable

The IFuEL project is developing efficient solid-state laser technology for sustainable fusion energy and provides a test facility for plasma-facing

Laser Source Types: Fiber, Diode, And Solid-State Tradeoffs

Explore the evolution of laser technology from ruby lasers to modern fiber, diode, and solid-state systems with insights on efficiency and future development trajectories.

Diode-pumped solid-state laser

A diode-pumped solid-state laser (DPSSL) is a solid-state laser made by pumping a solid gain medium, for example, a ruby or a neodymium-doped YAG crystal, with a laser diode.

How do lasers work? | Who invented the laser?

Photo: A classic solid-state ruby laser: Photo courtesy of US Department of Energy. Solid-state lasers produce high-powered beams, typically in very brief pulses.

Sales Projections and Analysis in the Laser Diodes and Direct Diode ...

The Laser Diodes and Direct Diode Lasers market is experiencing robust growth across North America, driven by advancements in telecommunications, medical devices, and industrial

Laser Diode Drivers

We offer pulsed diode drivers for pumping different types of diode-pumped solid-state lasers based on crystal (Nd:YAG and similar lasers), microchip, fiber, or

Quantel/Lumibird Centurion + Diode Pumped Solid State Laser (50mJ)

The Centurion + is an air cooled, diode pumped laser, delivering 50 mJ energy in nanosecond pulses at repetition rates up to 100 Hz. Diode pumping eliminates the need of water, reduces size, improves

Laser diode vs solid-state laser: Which is better for precision cutting?

In this article, we will explore the key differences between laser diode and solid-state laser technologies, and determine which might be better suited for precision cutting applications.

Understanding the Structure of Solid-State Lasers and the Role of

Explore the structure of solid-state lasers, the role of diode pump sources, and how pump specifications like wavelength and power affect laser performance and stability.

CrystaLaser GCL532 Series 532 nm Diode-Pumped Solid-State

Overview The CrystaLaser GCL532 Series is a family of compact, air-cooled, diode-pumped solid-state (DPSS) continuous-wave (CW) lasers emitting at the fundamental wavelength of 532 nm.

Global Leader in Materials, Networking, and Lasers

KINTEX Exhibition Center 1, Goyang, South Korea Discover Coherent at LASER KOREA 2026, Asia's leading exhibition for laser and photonics technologies.

Laser Diodes | IR & High Power Laser Diode | RS AU

High-power laser diodes deliver output from 100mW through to multiple watts for industrial material processing, laser cutting, engraving, solid-state laser pumping, and medical systems including

Laser Technology Market Size, Outlook & Share Analysis | 2026

Laser Technology Market Size & Share Analysis - Growth Trends and Forecast (2026 - 2031) The Laser Technology Market Report is Segmented by Technology (CO2 Laser, Fiber Laser,

Diode Laser—Pumped Solid-State Lasers | Science

Potential applications of diode laser—pumped solid-state lasers include coherent radar, global sensing from satellites, medical uses, micromachining, and miniature visible sources for digital optical storage.

High-power, high-efficiency semiconductor laser diodes: advances and ...

These advancements highlight the essential role of high-power semiconductor lasers in applications such as materials processing, high peak-power systems, additive manufacturing, inertial

All-solid-state Lasers – diode-pumped lasers, laser diodes

All-solid-state lasers are lasers which rely on solid-state components not only concerning the gain medium, but also the pump source. Such lasers are solid-state lasers (bulk or fiber lasers) pumped

Coherent AVIA NX Diode Pumped Solid State Q-switched Lasers

AVIA NX is a diode-pumped, solid-state, Q-switched laser offered at 532 nm and 355 nm. The AVIA NX family delivers the highest power on the market, in a small lightweight package.

Solid-state Lasers – diode-pumped, lamp-pumped, DPSS laser, doped ...

Solid-state lasers are lasers based on solid-state gain media (usually ion-doped crystals or glasses). They constitute the most important type of lasers.

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