

Pulsed Infrared Laser Diode



Overview

NIR Lasers | 750-1400nm pulsed, CW & diode lasers RPMC's extensive selection of NIR lasers offers unparalleled versatility, covering everything from compact.

Key Takeaways

Pulsed infrared diode lasers emit short, high-intensity light pulses in the near-infrared spectrum, offering precise control for industrial, scientific, and biomedical applications. Overview

Pulsed infrared (IR) diode lasers are semiconductor lasers designed to emit light in the near-infrared range ($\approx 750\text{--}1400\text{ nm}$) in short bursts rather than continuously. Unlike continuous-wave (CW) lasers, pulsed diodes can achieve high peak powers for brief durations, making them ideal for applications requiring precision and minimal thermal load on materials. Pulse durations typically range from nanoseconds to hundreds of nanoseconds, with repetition rates from single-shot to several megahertz.

Technical Characteristics

- **Pulse Width and Repetition Rate:** Pulsed diodes can generate pulses as short as 100 ns, with low duty cycles ($\approx 0.1\%$) to prevent overheating. Repetition rates can reach MHz frequencies, depending on the system design.
- **Peak Power:** Pulsed diodes can produce hundreds of watts of peak power, significantly higher than their CW counterparts, while maintaining low average power.

- **Wavelength Flexibility:** Many pulsed IR diodes allow custom wavelength selection, often in the eye-safe 1.5 μm region for applications where human exposure is a concern .

- **Beam Quality:** These lasers can be delivered in free-space or fiber-coupled configurations, with options for beam shaping and collimation to suit specific tasks .

Applications

Pulsed IR diode lasers are widely used across multiple fields:

- **Industrial Processing:** High-power pulsed diodes are used for welding, cladding, and materials processing, where short, intense pulses minimize heat-affected zones .

- **Scientific Research:** They are employed in spectroscopy, LIDAR, and metrology, benefiting from narrow linewidths and precise pulse timing .

- **Biomedical Imaging:** Pulsed IR lasers enable non-invasive imaging and diagnostics, where controlled pulse energy reduces tissue damage .

- **Defense and Ranging:** Short, high-intensity pulses are ideal for distance measurement and target detection .

Safety Considerations

Near-infrared wavelengths can penetrate the eye and focus on the retina, posing a serious eye hazard. Pulsed IR lasers require strict safety protocols, including protective eyewear and controlled exposure, except for wavelengths around 1.5 μm , which are considered relatively eye-safe .

Summary

Pulsed infrared diode lasers combine high peak power, precise pulse control, and wavelength flexibility, making them versatile tools for industrial, scientific, and medical applications. Their ability to deliver intense, short pulses allows for precision work with minimal thermal impact, while safety measures are critical due to the potential hazards of near-infrared radiation .

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