Leibniz Ferdinand Braun Institut

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High-power diode lasers for advanced applications, from bars to custom-made modules

High-performance broad area diode lasers are available with a wide range of wavelengths, leveraging optimized device design and technology. These diode lasers are required for direct use or as pump sources for advanced solid-state and fiber laser systems. They are delivered as single emitters or diode laser bars for assembly at the customer. Alternatively, they are integrated into novel stacks or high-power modules ready for use.

Device technology options

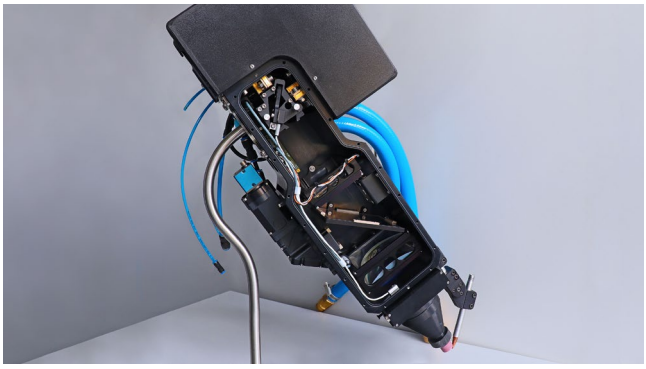
- wavelengths from λ = 630 to 1200 nm
- single bars with high efficiency (> 60%) to kW-class-powers from λ = 900...1000 nm
- bars with extremely low vertical divergence for low-loss external optical stabilization
- devices with monolithically integrated gratings for pumping of narrow absorption lines
- brillant, wide-aperture single emitters with 191 W for QCW and 71 W for CW from a 1.0 mm aperture

Packaging options for bars and single emitters

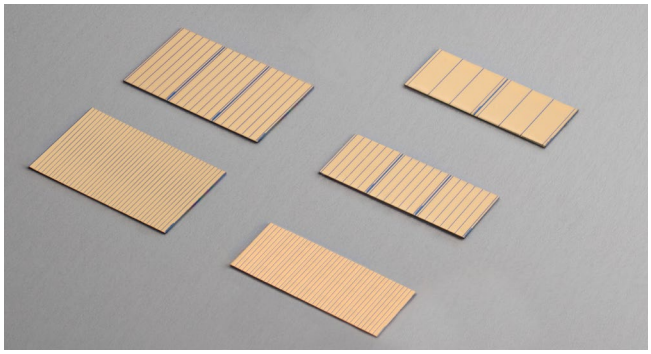
- on submount
- in low-resistance “sandwich” carriers
- assembled into passively-side-cooled stacks
- integrated into free space or fiber-coupled modules

Applications

- direct use
- increased performance in pumping of established laser media (e.g. Nd:YAG, Yb:YAG, Tm:YAG, YLF)
- pumping of novel laser media (e.g. alkali gas lasers, Yb:CaF2, Cr:LiSAF and alexandrite lasers)



Compact 780 nm direct diode laser module for additive manufacturing of aluminum.



Kilowatt-class diode laser bars, customized for the respective application.

Example performance

- CW 1-kW-class 9xx nm bars: 15°C, actively cooled
- QCW 2-kW-class 9xx nm bars: peak power at -70°C, passively cooled
- CW 500 W 970 nm grating stabilized stack: > 50% efficiency, Δ λ < 0.7 nm at FWHM
- QCW 6-kW-class 9xx nm fiber-coupled module: 1.9 mm core NA 0.22, 20% duty cycle
- QCW 1.5-kW-class 780 nm stack: 10-50% duty cycle
- CW 1-kW-class 780 nm module: 0.5 mm^2, NA 0.2

Profile

The Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (FBH) researches electronic and optical components, modules and systems based on compound semiconductors. In the field of III-V electronics, it manufactures high-frequency devices and circuits for communications, power electronics, and sensor technology. Moreover, FBH develops light sources from the visible to the UV spectral range: high-power diode lasers, UV light sources, and hybrid laser systems. Applications range from medical technology, materials processing and sensors to optical communications in space and integrated quantum technology. In close cooperation with industry, its research results lead to cutting-edge products.

The institute is a member of the Leibniz Association and part of Research Fab Microelectronics Germany (FMD)..