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Narrow-linewidth semiconductor disk lasers

Optically pumped SDL for the 2–3 μm wavelength range

Narrow-linewidth 2.X μm semiconductor disk lasers
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Fraunhofer IAF develops Semiconductor Disk Lasers (SDLs) for the 1.9–2.8 μm wavelength range. These SDLs exhibit excellent beam quality, high output powers and stable, low-noise laser output. High power laser modules with multimode emission spectra are available as well as single-frequency broadly tunable lasers and high-power single-frequency lasers with very narrow emission linewidth (100 kHz range) and stable, mode-hop free long-term operation. These class A lasers are relaxation-oscillation-free and can be precisely wavelength-tuned. Therefore, they are ideally suited for extra-cavity or intra-cavity pumping of solid-state lasers or non-linear optical crystals as well as for metrology or quantum optics.

Features

- Central emission wavelength in the 1.9–2.8 μm range
- Very good beam quality ($M^2 < 2$ typical, < 1.05 possible)
- High Power Laser (multimode spectra) with multiple Watt output power, depending on the emission wavelength
- Single-frequency laser with extremely small linewidth (100 kHz at 100 μs integration time) and 0.5–1 W output power
- Broadly tunable, narrow linewidth laser with up to 30 nm tuning range

Applications

- Pumping of nonlinear crystals
 - quantum frequency converter
 - optical parametric oscillators
- Pumping of solid state materials
 - Ho-, Cr-doped
- Precision metrology
- Medical technology

1.9–2.8
 μm central
emission
wavelength

More information:



Optically pumped SDL for the 2–3 μm wavelength range

Our semiconductor disk lasers are customized depending on the application. Below we present some general specs as well as the different options for SDL modules.

Wavelength coverage

- Central emission wavelength: 1.9–2.8 μm

High power SDL

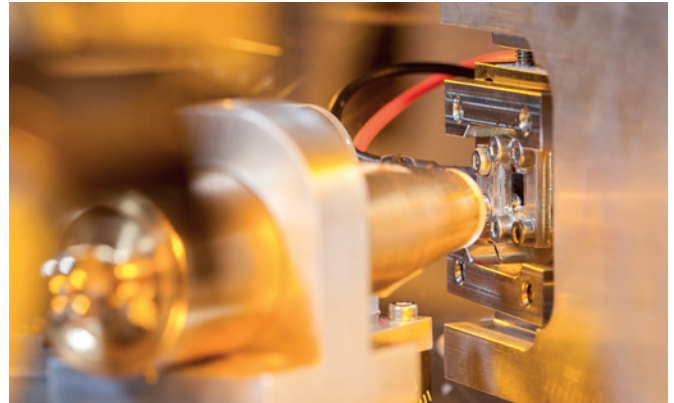
- Emission spectra: Multimode (15–25 nm width)
- Optical power: 1–4 W (depending on emission wavelength)
- Beam quality: $M^2 < 3$, $M^2 < 1.5$ possible

Single frequency SDL

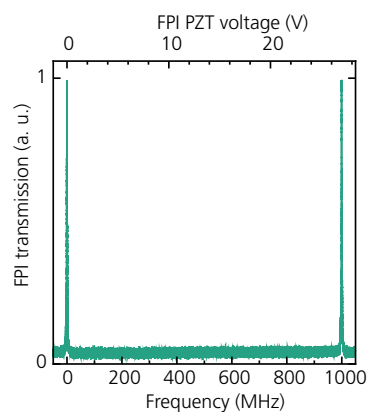
- Emission spectra: single-frequency, narrow linewidth (100 kHz range). Stable mode-hop free long-term operation
- Optical power: 0.1–1 W (depending on emission wavelength)
- Beam quality: $M^2 < 1.05$
- Fine tuning: few GHz mode-hop free fine tuning
- Coarse tuning: Wavelength fixed at assembly

Broadly tunable single-frequency SDL

- Emission spectra: single-frequency, narrow linewidth (100 kHz range). Stable mode-hop free long-term operation
- Optical power: 0.1 – 0.4 W (depending on emission wavelength)
- Beam quality: $M^2 < 1.05$
- Fine Tuning: few GHz mode-hop free fine tuning
- Coarse-tuning: 20–30 nm



Laboratory setup of a GaS based semiconductor disk laser
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Spectrum of a scanning Fabry-Perrot interferometer (FPI) confirming single-frequency operation
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