

SINGLE-FREQUENCY LASER *for research*

Key benefits

- ▶ High-output power
- ▶ Broad-wavelength coverage
- ▶ Narrow-linewidth single frequency
- ▶ Excellent beam quality

Proven applications

- ▶ Laser cooling
- ▶ Rydberg transitions
- ▶ Optical traps
- ▶ Qubit addressing
- ▶ Optical clock transition addressing



*Vertical-external-cavity surface-emitting laser (VECSEL)
a.k.a. Optically pumped semiconductor laser (OPSL)*

VALO SF

VALO SHG

	Direct emitting VECSEL	Intracavity doubled VECSEL
Architecture	Direct emitting VECSEL	Intracavity doubled VECSEL
Gain	Optically-pumped semiconductor	
Wavelength ¹	700 – 2150 nm	350 – 750 nm
Power ²	0.5 – 12 W	0.1 – 5 W
Additional output	-	Secondary fundamental output for frequency-/phase locking
Beam quality	$M^2 < 1.1 \text{ TEM}_{00}$	$M^2 < 1.2 \text{ TEM}_{00}$
Free-running linewidth	< 10 kHz (100 μ s)	
Mode-hop free tuning range ³	> 1 GHz	
Coarse tuning ⁴	Minimum +/- 1 THz, up to +/- 5 THz	
Frequency locking	Piezo actuator, 10 kHz bandwidth	
Phase locking	Intra-cavity electro-optical modulator, 1 MHz bandwidth	
Laser size	320 mm x 190 mm x 101 mm (6.1 L)	
Control electronics ⁵	Control Unit (VCU) for CW operation, height 4U	
Cooling ⁵	Water-to-air chiller, height 4U	

¹ Center wavelength can be selected within the provided wavelength range.

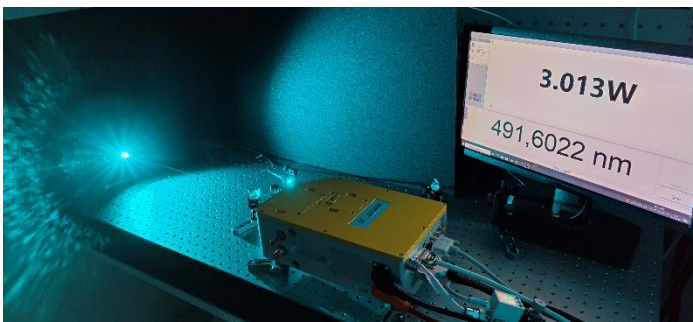
² Output power is wavelength dependent. See next page for example power levels. >35 dB single-stage isolator is recommended.

³ Mode-hop free tuning range corresponds to the laser cavity free-spectral range.

⁴ Coarse tuning range is wavelength dependent. Maximum 10 THz tuning range corresponds to the typical gain bandwidth.

⁵ The control unit and chiller are 19" rack installable.

Turnkey single-frequency laser system for AMO research



Versatile VECSEL platform

- ▶ Designed to meet the diverse needs of the atomic, molecular and optical (AMO) physics research community
- ▶ High output power with excellent beam quality, with small SWaP-C, thanks to simple disk laser geometry
- ▶ Efficient ("3-in-1") intracavity second harmonic generation (SHG) for unparalleled visible power and simplicity
- ▶ Proven sub-Hz linewidth using intracavity EOM
- ▶ Tunable for spectroscopy

Selected output powers

