

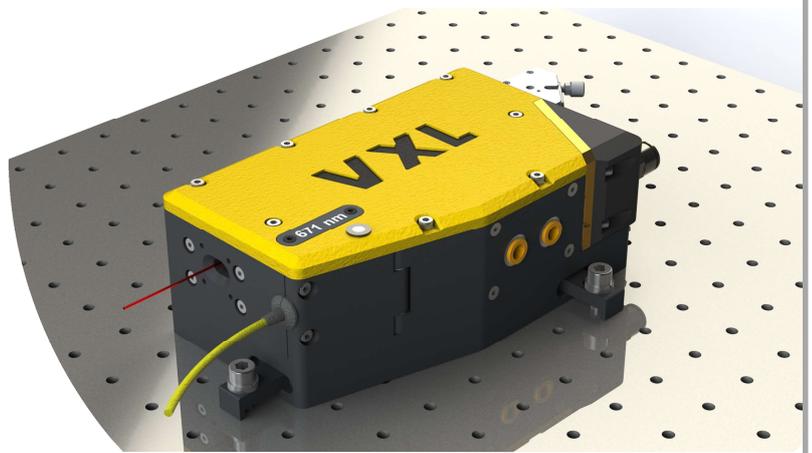
SINGLE-FREQUENCY LASER *for enterprise*

Features

- ▶ High-power output
- ▶ Broad-wavelength selection
- ▶ Narrow-linewidth single-frequency spectrum
- ▶ Excellent spatial quality

Integration features

- ▶ Compact modular design
- ▶ Rugged sealed laser cavity
- ▶ Unparalleled SWaP-C for watt-level output
- ▶ Improved system performance
- ▶ High fiber coupling efficiency



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

Specification	VXL® SF	VXL® SHG
Architecture	Direct emitting VECSEL	Intracavity doubled VECSEL
Gain	Optically-pumped semiconductor gain mirror	
Target wavelength	700 – 2150 nm	350 – 800 nm
Free-space output power ¹	0.5 – 10 W with external pump laser	0.01 – 3 W with external pump laser
Coarse tuning ²	+/- 0.5 nm	+/- 0.25 nm
Mode-hop free tuning range ³	1 GHz	2 GHz
Free-running linewidth (typical)	< 100 Hz (instantaneous), < 10 kHz (RMS, 10 µs), < 100 kHz (RMS, 100 µs)	
Slow modulation (typical)	Piezoelectric element on cavity mirror, 10 kHz bandwidth, 50 MHz/V modulation depth	
Fast modulation (typical, optional)	Intra-cavity electro-optical modulator (EOM), 1 MHz bandwidth, 50 kHz/V modulation depth	
RMS RIN (typical, unlocked)	< 0.05 % (10 Hz – 3 MHz)	
Power stability (typical, unlocked)	< 0.1 % (1.5 h)	
Optical signal-to-noise ratio (typical)	> 70 dB	
Beam quality ⁴	M ² < 1.1 TEM ₀₀	
Beam diameter and divergence ⁴	< 1.5 mm, < 5 mrad	< 1.5 mm, < 8 mrad
Polarization, linear	Horizontal, p-polarized	Vertical, s-polarized
Secondary output beam	Not applicable	Fundamental λ (horizontal, p-pol.)
Polarization extinction ratio (PER)	> 20 dB, linear polarization	
Laser head dimensions	179 mm x 104 mm x 66 mm (1.2 L. Rack mountable, 2U height requirement)	
Control electronics ^{5,6}	Control unit (rack mount 3U unit, additional 1U required for ventilation)	
Cooling ⁶	Air-cooling or water-cooling (rack mount 4U unit)	

¹ Output power is wavelength dependent. See the next page for typical power levels. Single-stage isolator is recommended for applications with back reflections.

² Coarse tuning range is wavelength dependent.

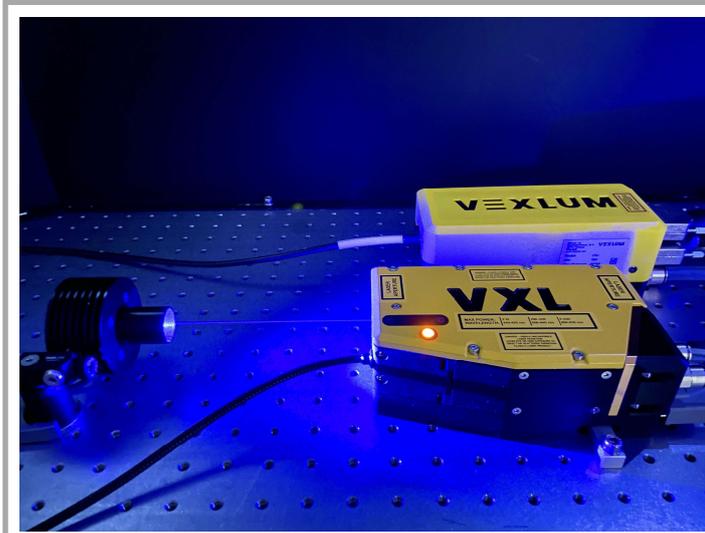
³ Mode-hop free tuning range corresponds to the laser cavity free-spectral range scanned with piezo voltage control. Larger tuning range can be reached by adjusting other tuning elements simultaneously.

⁴ Typical values at the laser exit aperture. Beam diameter = full width at 1/e² level of the beam. Divergence = full mean divergence angle. Values depend on the laser cavity configuration, i.e. the wavelength.

⁵ The control unit includes a low noise laser diode driver for the pump laser, and up to 5 cavity element temperature controllers, which can be used for wavelength tuning and power optimization.

⁶ The control unit and the standard water-cooling unit are 19" rack mountable. VXL® can support air-cooling in low output power operation

Compact single-frequency laser for system integration



Next generation VECSEL platform

- ▶ Designed for system integration and 24/7 operation
- ▶ Reduced system Size, Weight, Power consumption and cost (SWaP-C)
- ▶ Modular design for easy and fast servicing with spares
- ▶ Fiber-in & fiber-out interface for fieldable applications

