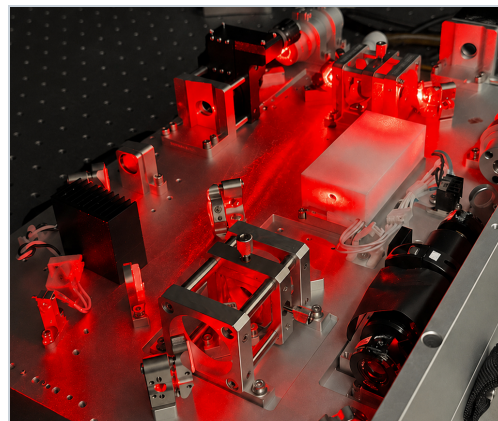


QTekLaser™ 649 nm Fiber Laser

Product Description

The QTekLaser™ 649 nm Fiber Laser is a state-of-the-art system using robust sum-frequency generation (SFG) to deliver stable, narrow-linewidth (<10 kHz), polarization-maintaining light with output power up to 6 W. It offers excellent power stability (<1%) and incorporates a user-friendly, IoT-enabled interface in an industrial-grade 19" rack-mount chassis, setting a new standard for reliability in demanding environments.



Features

- Wavelength: 649 nm
- High output power: up to 6 W
- High reliability with all-fiber design
- Narrow linewidth: <10 kHz
- Power stability: <1%
- IoT-enabled interface for intuitive control
- 19" rack-mount chassis
- Certified to IEC 60825-1:2014 safety standards

Applications

- Quantum computing
- Single-qubit gate operations
- Signal readout
- Repumping
- Mid-circuit measurement
- Research

Sum-Frequency Generation (SFG) Technology

The wavelength range of QTekLaser™ products can be further extended using the nonlinear process of sum-frequency generation (SFG). In this architecture the two fundamental lasers are usually built from different gain-fiber amplifiers, and their frequencies are summed in a nonlinear crystal. The extended wavelength values are summarized in the blue-shaded cells of table 1; 649 nm lies in the Tm×Yb SFG range (645–706 nm). This method achieves high power at wavelengths otherwise difficult to reach directly with fiber gain media.

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Wavelength Extension

	SF-AMP-Yb (1012 – 1080 nm)	SF-AMP-Er (1530 – 1610 nm)	SF-AMP-Tm (1776 – 2040 nm)
SF-AMP-Yb (1012 – 1080 nm)	506 – 540 nm		
SF-AMP-Er (1530 – 1610 nm)	609 – 646 nm	765 – 805 nm	
SF-AMP-Tm (1776 – 2040 nm)	645 – 706 nm	822 – 900 nm	888 – 1020 nm

Table 1 – Wavelength extension of QTekLaser™ products using nonlinear frequency conversion (649 nm: Tm×Yb SFG, 645–706 nm cell).

Specifications

Category	Parameter	Value	Unit
Laser	Wavelength	649	nm
	Operation mode	CW	/
	Max output power	6	W
	Linewidth	<10	kHz
	Output 1/e ² beam diameter	1–2	mm
	Beam quality (M ²)	1.01	/
	Relative intensity noise (RIN) for freq. >10 kHz	<-130	dBc/Hz
	Fiber length to chassis	2	m
	Polarization direction	Vertical	/
	Polarization extinction ratio (PER)	>20	dB
	Optical signal-to-noise ratio (OSNR)	60	dB
Electrical / Cooling	Warm-up time	30	min
	Max power consumption	350	W
	AC power supply voltage	110	V
	Fuse	6.3A, 250VAC, 5×20mm	/
	Remote interlock voltage	3.3	V
	Cooling	Chilled water	/
Environmental	Room humidity	30–60	%

Category	Parameter	Value	Unit
	Room temperature	17–25	°C
	Weight	~54 (120)	Kg (lbs)

Safety & Retro-Reflection Advisory

The 649 nm laser system complies with 21 CFR Subchapter J, Part 1040 (as enforced by FDA) and IEC 60825-1:2014 safety standards. Users must ensure that significant light is not retroreflected into the system—doing so may harm performance or damage the laser. Use of an external optical isolator is strongly recommended. Damage from retroreflected light is not covered under warranty.

Ordering Information

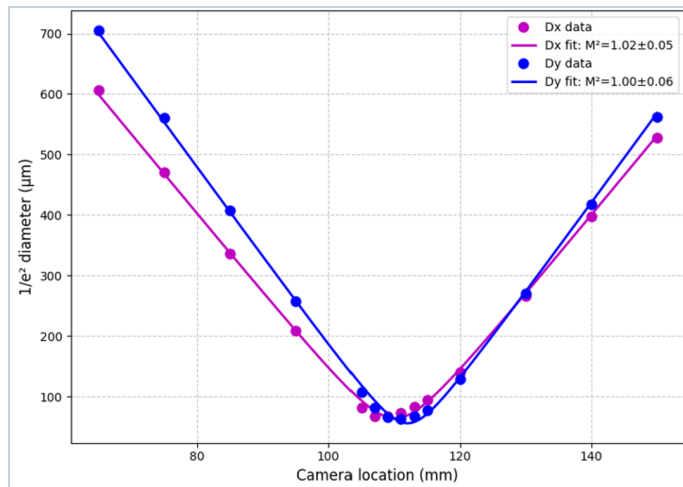
Part Number: QT-LASR-BSFG-649-6-W-2

Configuration: Two seed lasers + Tm- and Yb-doped fiber amplifiers + SFG stage

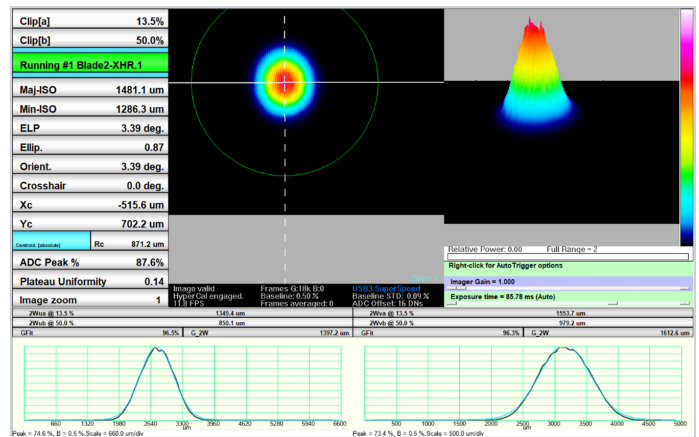
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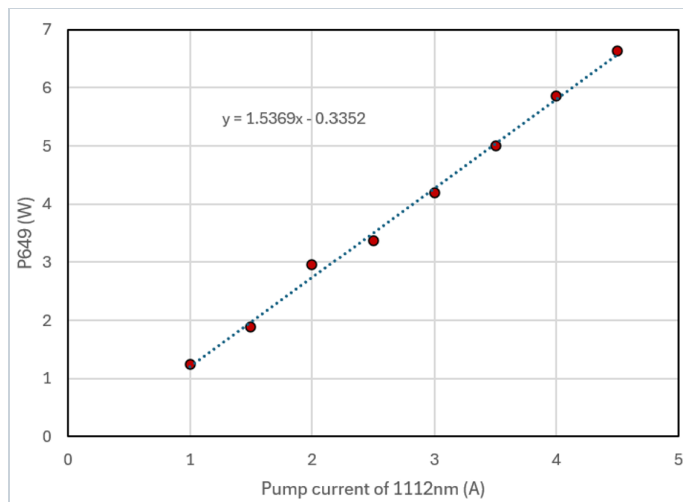
Performance Figures



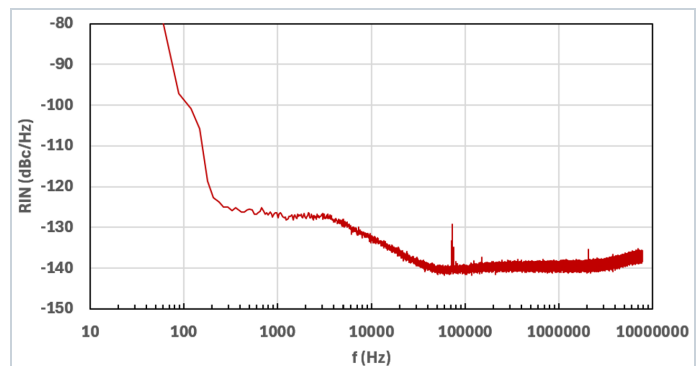
Beam Quality: $M^2 = 1.01$.



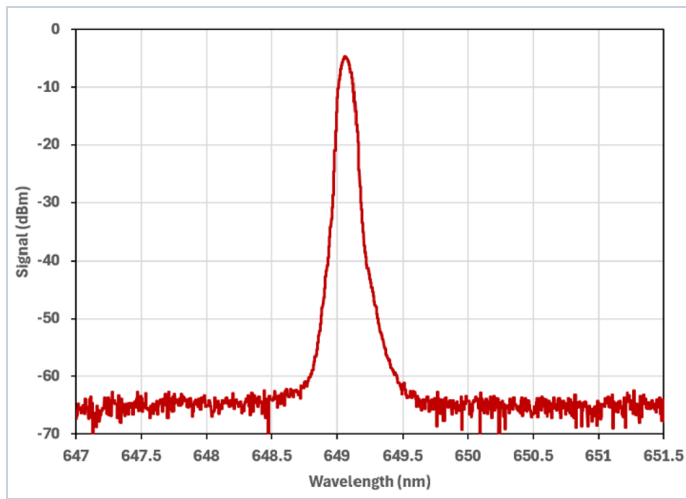
Beam Profile.



Laser Power vs. Current.



Relative Intensity Noise (RIN): < -130 dBc/Hz @ >10 kHz.

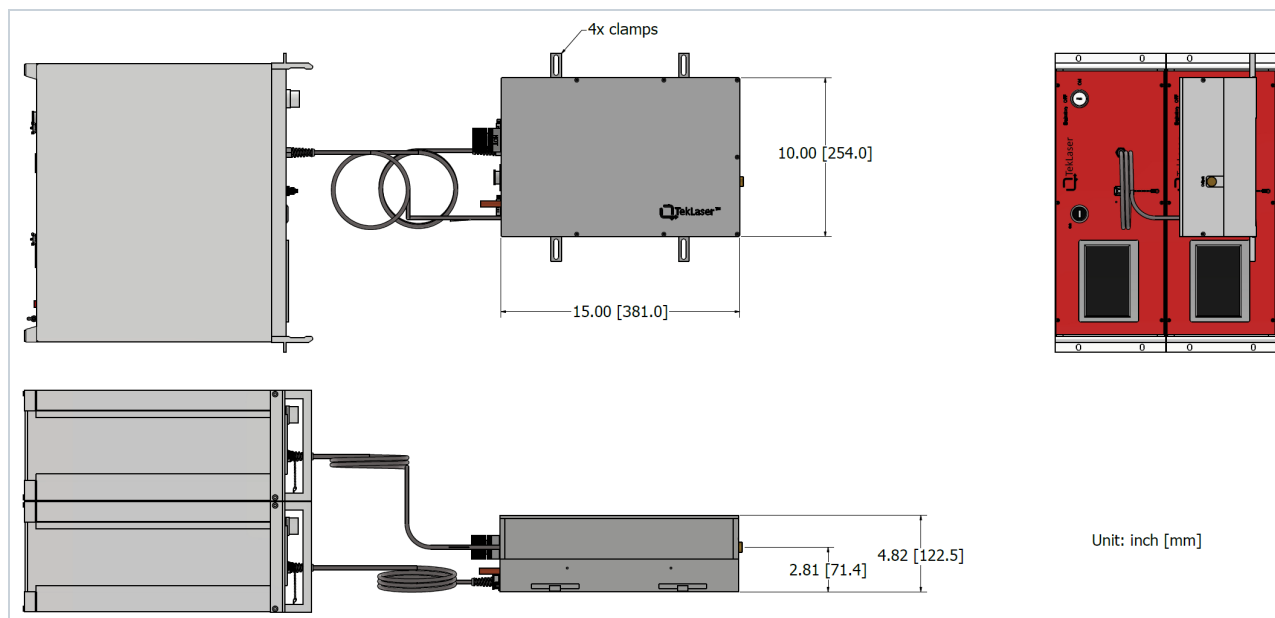


Optical Spectrum: OSNR ~60 dB.

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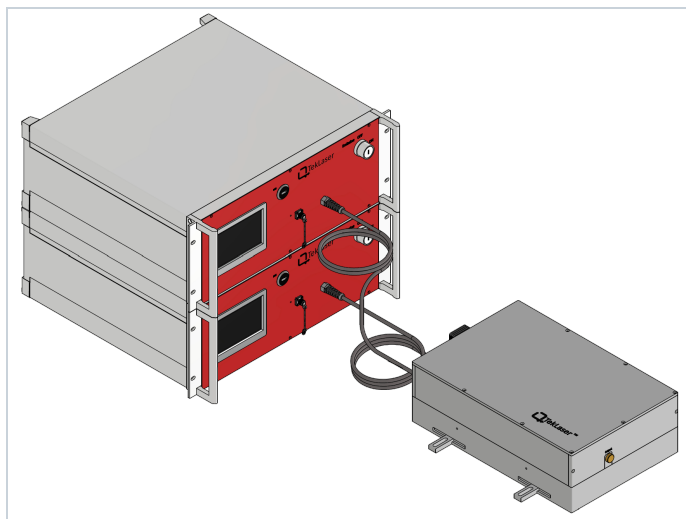
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Mechanical Details



Mechanical dimensions of the 649 nm fiber-laser system.

Product Photographs



649 nm fiber laser – water-cooled rack-mount chassis.



Rear panel – water-cooled chassis.