



QTekLaser™ 556 nm Fiber Laser

Product Description

The QTekLaser™ 556 nm Fiber Laser is a state-of-the-art green-wavelength system using robust second-harmonic generation (SHG) to deliver stable, narrow-linewidth (<10 kHz), polarization-maintaining light up to 2 W. With <1% power stability and an IoT-enabled interface in a compact 4U 19" rack-mount chassis, it sets a new standard for reliability in demanding environments.



2 W Max power | < 10 kHz Linewidth | < 1% Power stability

Features

- High output power (2 W)
- High reliability
- Narrow linewidth (<10 kHz)
- Excellent power stability (<1%)
- User-friendly interface via IoT technology
- 4U 19" rack mount
- Certified to IEC 60825-1:2014 safety standards

Applications

- Quantum Computing
- Cooling
- Loading atoms into tweezers and lattices
- In-trap cooling during imaging
- Low-loss, high-fidelity fluorescence readout of tweezer arrays
- Site-resolved single-atom detection
- Research

Second-Harmonic Generation (SHG)

QTekLaser™ offers laser systems with extended wavelength range by combining nonlinear frequency conversion technologies. Through second-harmonic generation (SHG) we achieve significant laser power at the visible and NIR regime (figure 2; red-shaded cells of table 1). With the development of periodic poled crystal technology and the associated waveguide technology, nonlinear frequency conversion has become a powerful tool to extend the application scope of fiber lasers.

For QTekLaser™ products, the max power of the converted laser light is constrained by the damage threshold of commercially available nonlinear crystals, which is typically several tens of watts.

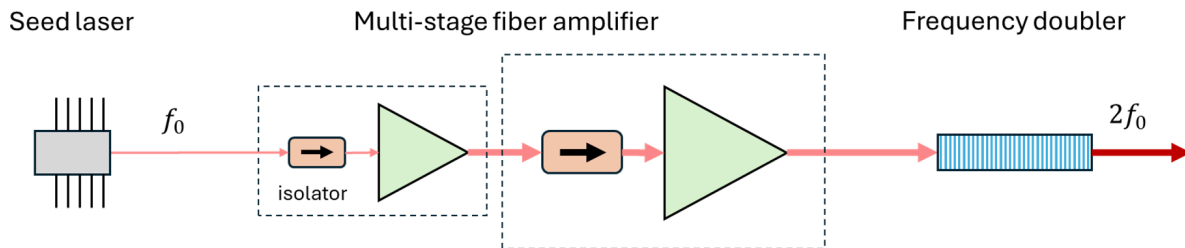


Figure 2. QTekLaser™ fiber laser system with an integrated frequency doubler.

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	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 via nonlinear frequency conversion. The red-shaded cells represent second-harmonic generation (SHG) and the blue-shaded cells sum-frequency generation (SFG).

Specifications

Category	Parameter	Value	Unit
Laser	Wavelength	555.8	nm
	Laser linewidth	<10	kHz
	Operation mode	CW	/
	Thermal tuning range of seed	0.7	nm
	Max output power	2	W
	Input seed power	5 - 20	mW
	Output 1/e ² beam diameter	1-2	mm
	Beam quality (M ²)	<1.1	/
	Relative intensity noise (RIN)	<-130 >10 kHz	dBc/Hz
	Fiber length to chassis	2	m
	Polarization direction	Vertical	/
	Polarization extinction ratio (PER)	>20	dB
	Optical signal-to-noise ratio (OSNR)	>45	dB
Electrical / Cooling	Warm-up time	20	min
	Max power consumption	200	W
	AC power supply voltage	110	V
	Fuse	6.3A, 250VAC, 5X20mm	/
	Remote interlock voltage	3.3	V
	Cooling	Chilled water	/
	Suggested chiller temperature	20	°C
Environmental	Chilled water flow rate	>=0.65	GPM
	Room humidity	30 - 60	%
	Room temperature	17 - 25	°C
	Weight	25 (55)	Kg (lbs)

Safety & Retro-Reflection Advisory

QTekLaser™ lasers comply with Federal Regulations (21 CFR Subchapter J, Part 1040) as administered by the Center for Devices and Radiological Health and are certified to IEC 60825-1:2014 standards.

It is the end user's responsibility to ensure that no significant light is retroreflected back into QTekLaser™ systems as this can degrade performance and potentially damage the lasers. To prevent this, the use of an external optical isolator is strongly recommended. Damage due to retroreflected light is not covered under warranty.

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Ordering Information

Part Number: QT-LASR-Yb-SHG-556-2-W-2.0-2
Laser Type: Seed laser + Yb-doped fiber amp + SHG

Performance Figures

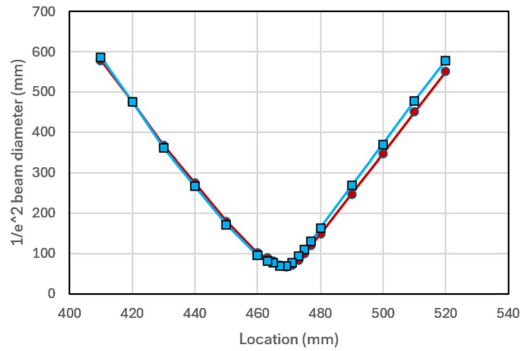


Figure 3. Beam Quality: 556 nm $M^2 < 1.1$.

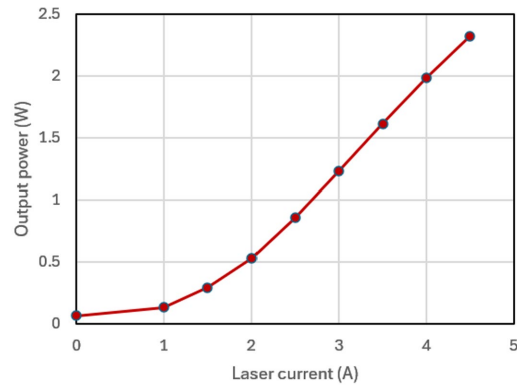


Figure 4. Laser Power vs. Current: 556 nm.

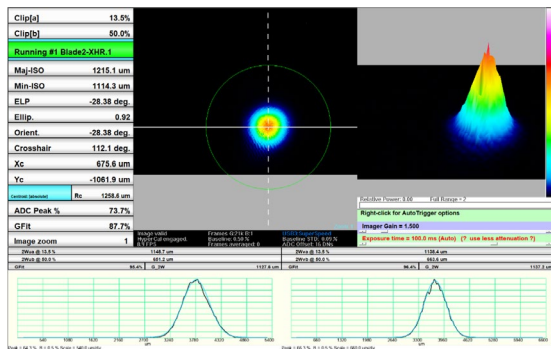


Figure 5. Beam Profile: 556 nm.

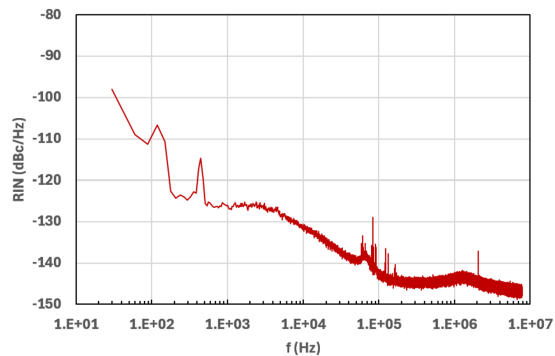


Figure 6. Relative Intensity Noise (RIN): 556 nm < -130 dBc/Hz @ >10 kHz.

Quantum Applications

At 556 nm, the QTekLaser™ system targets the $^1S_0 \rightarrow ^3P_1$ intercombination transition of neutral ytterbium, the narrow “green” line of second-stage laser cooling. Its kHz linewidth and excellent power stability make it ideal for narrow-line magneto-optical trapping (MOT), cooling ytterbium atoms to the low-microkelvin temperatures needed to load high-fidelity optical tweezer arrays and optical lattices.

These ultracold, tightly confined atoms are the foundation of neutral-atom quantum computing, quantum simulation, and state-of-the-art optical atomic clocks, where the 556 nm transition also supports precision spectroscopy and clock-state preparation. With its all-fiber architecture and IoT-enabled control, the 556 nm laser delivers the stability and reliability these demanding quantum experiments require.

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Mechanical Dimensions

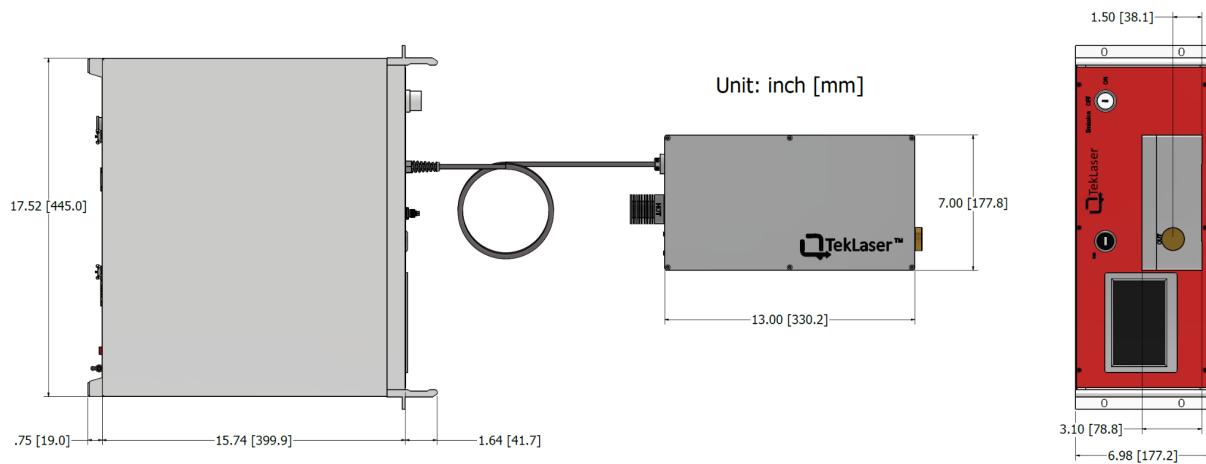


Figure 7. 556 nm fiber laser mechanical dimensions.

Product Photos



Figure 8. 556 nm fiber laser, 4U chassis water cooled.



Figure 9. 556 nm fiber laser, 4U chassis back panel water cooled

Web Page Reference

Product page: www.qteklaser.com/556-nm-fiber-laser

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