

Tsunami[®] Series

Ti:Sapphire Ultrafast Oscillators



The Tsunami ultrafast Ti:Sapphire oscillator series provides unmatched flexibility and capability. The Tsunami series' regenerative mode-locking mechanism sustains transform limited pulses, even during perturbation of the cavity, and enables coverage of a broad range of wavelengths with short femtosecond pulses out to very long picosecond pulses.

Flexibility

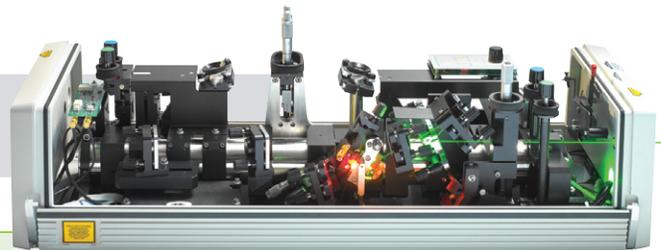
The Tsunami series contains the flexibility to have both femtosecond and picosecond pulses on the same platform with the 3960 series, a femtosecond only version with the 3941, and picosecond only with the 3950 series. The Tsunami series can be pumped with a Millennia eV in powers of 5, 10 or 15 watts so that the laser output can match the required amount of energy for each experiment.

Design

The superior design of the Tsunami prism dispersion compensation enables short, transform-limited pulses. The unique l-track prism movement enables excellent beam pointing as the laser is tuned. The use of slits for wavelength selection in femtosecond operation, combined with advanced dispersion compensation allows wide pulse duration adjustment over the femtosecond range from <60 femtoseconds to >900 femtoseconds. The Tsunami laser can then be easily converted to picosecond mode to cover from less than 2 picoseconds to greater than 100 picoseconds with use of the appropriate GTI.

Tsunami Advantage

- High-performance optics (HP models) offer the broadest tuning range of 700 nm – >1080 nm
- High peak power of >337 kW efficiently drives non-linear optical processes
- Regenerative mode locking for long-term stability
- Stable mode locking at the edges of tuning range
- Capable of long pulses >100 ps
- Invar tube-based construction for temperature stability and rigidity



Applications

- Time-resolved spectroscopy
- Seed source for high-energy amplifiers
- High harmonic generation
- Deep-penetration multiphoton imaging
- Ultrafast tissue ablation
- Micromachining

Tsunami Series

Lock-to-Clock

The Tsunami laser pulses can be synchronized to other lasers or laboratory equipment with the optional Lok-to-Clock® accessory that actively stabilizes cavity length. Lok-to-Clock electronics also provide high-speed input that can be used to slave the laser to a reference pulse train from another laser.

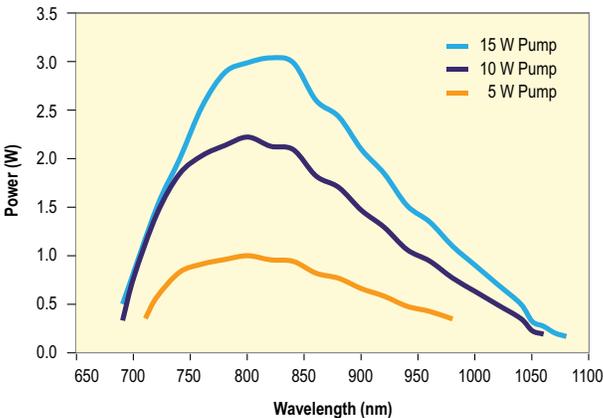
Short Pulse Width

The short pulse Tsunami systems use the latest generation of high-performance optics to allow >65 nm of bandwidth for <30 fs in pulse width. When pumped by the Millennia eV 10, the Tsunami 3941-30-X1S typically achieves >800 mW of average power with >350 kW of peak power.

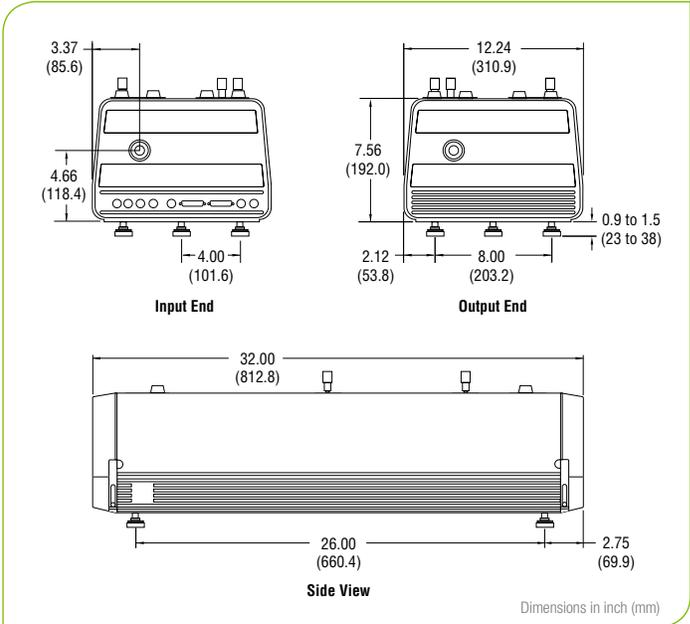
Expansion

When the Tsunami oscillator is combined with the broad range of Spectra-Physics harmonic generators and optical parametric oscillators, such as the Inspire™ OPO, wavelength coverage spans from 210 nm – 5 μm. Pulse picking can offer repetition rate flexibility from single shot to 8 MHz, while still providing enough pulse energy for demanding fluorescence lifetime applications.

Tsunami Typical Performance¹



1. Typically measured performance; not a guaranteed or warranted specification.



Tsunami Dimensions

Tsunami HP and BB Specifications¹

	Tsunami HP fs 15 W Pump	Tsunami HP ps 15 W Pump	Tsunami HP fs 10 W Pump	Tsunami BB fs 10 W Pump	Tsunami BB ps 10 W Pump
Output Characteristics					
Tuning Range	700–1080 nm ²	700–1000 nm	700–1050 nm	700–1000 nm	700–1000 nm
Average Power ³	>2.7 W at 800 nm	>2.9 W at 800 nm	>1.4 W at 800 nm	>1.4 W at 800 nm	>1.5 W at 800 nm
Pulse Width ^{3,4}	<100 fs	<2–100 ps	<100 fs	<100 fs	<2–100 ps
Peak Power ²	>337 kW at 800 nm	–	>170 kW at 800 nm	>170 kW at 800 nm	–
Pulse Energy	~34 nJ	~36 nJ	~15 nJ	~14 nJ	~19 nJ
Tsunami HP Models	3960C-15HP ⁵ 3941C-15HP	3950C-15HP 3960C-15HP ⁵	3960-10HP ⁵ 3941-10HP	3960-X1BB 3941-X1BB	3950C-X1BB 3950-X1BB

Tsunami BB and Short Pulse Specifications¹

	Tsunami BB fs 5 W Pump	Tsunami BB ps 5 W Pump	Sub 30 fs Tsunami 5 W Pump	Ultra Short Pulse Tsunami 10 W Pump	Ultra Short Pulse Tsunami 5 W Pump
Output Characteristics					
Tuning Range	700–980 nm	700–980 nm	780–820 nm	780–850 nm	780–850 nm
Average Power ³	>0.7 W at 800 nm	>0.7 W at 800 nm	400 mW at 800 nm	900 mW at 800 nm	500 mW at 800 nm
Pulse Width ^{3,4}	<100 fs	<2–100 ps	<30 fs	<50 fs	<50 fs
Peak Power ²	>85 kW at 800 nm	–	>160 kW at 800 nm	>225 kW at 800 nm	>125 kW at 800 nm
Pulse Energy	~8 nJ	~8 nJ	~5 nJ	~11 nJ	~6 nJ
Tsunami Broadband Models	3960-M1BB ⁵ 3941-M1BB 3960C-M1BB ⁵ 3941C-M1BB	3950-M1BB 3960-M1BB ⁵ 3960C-M1BB ⁵ 3950C-M1BB	3941-30-M1S	3941-X1S-USP	3941-M1S-USP

1. Due to our continuous product improvement program, specifications may change without notice. Specifications only apply when the specific Tsunami model is pumped by a Spectra-Physics Millennia eV 15 W, 10 W or 5 W solid state laser and the entire Tsunami Environmental Package is installed.
2. Requires Lok-to-Clock.
3. Specification applies to 800 nm only.
4. A sech² pulse shape (0.65 deconvolution factor) is used to determine the pulse width as measured with a Newport PulseScout®.
5. The Tsunami model 3960 requires additional components to run in picosecond mode (sold separately).

General Tsunami Specifications⁴

General Characteristics	
Repetition Rate (nominal) ¹	80 MHz
Noise ²	<0.2
Stability ³	<5%
Spatial Mode	TEM ₀₀
Beam Diameter (1/e ²)	<2 mm
Beam Divergence, full angle	<1 mrad
Polarization	>500:1 vertical

1. Laser operation is specified at a nominal repetition rate of 80 MHz.
2. Specification represents rma noise measured in a 10 Hz to 2 MHz bandwidth.
3. Percent power drift in any two-hour period with $\pm 1^\circ\text{C}$ temperature change after a one-hour warm up.
4. Tsunami is a Class IV – High-Power Laser, whose beam is, by definition, a safety and fire hazard. Take precautions to prevent exposure to direct and reflected beams. Diffuse as well as specular reflections can cause severe skin or eye damage.



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