

# Mai Tai® DeepSee™

Ultrafast Ti:Sapphire Laser with  
Automated Dispersion Compensation

mks | Spectra-Physics

The Mai Tai DeepSee Ti:Sapphire oscillator with our patented automated dispersion compensation<sup>1</sup> has been specifically optimized for use in multiphoton microscopy. The Mai Tai DeepSee laser delivers the industry's highest peak power to the sample thus maximizing the fluorescence signal.

In addition, the Mai Tai DeepSee laser offers over 2.4 W of average power and 350 nm (690-1040 nm) in useable tuning range. For access to longer wavelengths beyond 1040 nm, Spectra-Physics offers InSight® X3™ with the widest tuning range (680-1300 nm) for deepest in vivo imaging.

The Mai Tai DeepSee oscillator's reliability is maintained through the ultra-stable regenerative mode locking technique developed by Spectra-Physics. With hands free, drop-out free wavelength tuning, excitation profiles can be quickly collected with just the click of a mouse. StabiLok® real-time monitoring technology also enhances system reliability by providing excellent beam pointing stability and minimal average power fluctuations, as well as eliminating wavelength drift. These two features make the Mai Tai DeepSee oscillator the most reliable and most versatile hands-free laser currently on the market.

## The MaiTai DeepSee Advantage

- Delivers the highest peak power to the sample
- Wide tuning range for efficient excitation of commonly used fluorophores
- Fully automated
- Excellent beam pointing stability to preserve the critical microscope alignment

## Applications

- Multiphoton microscopy
- Time-resolved photoluminescence
- Nonlinear spectroscopy
- Surface second harmonic generation
- Terahertz imaging
- Semiconductor metrology
- Materials processing
- Amplifier seeding

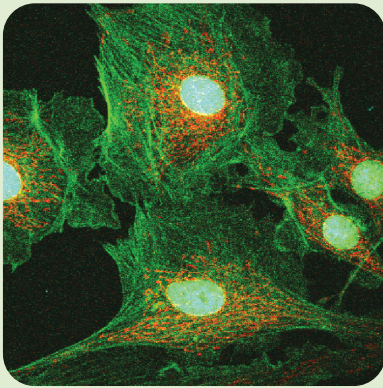


## Mai Tai DeepSee Technical Advantage

With the Mai Tai DeepSee oscillator, deeper penetration depths can be achieved without the risk of sample damage from increased average powers. When ultrafast laser pulses are transmitted through optical materials (i.e. windows, lenses, and nonlinear crystals), the added dispersion broadens the pulse. This pulse broadening has a negative affect on the fluorescence signal obtained.

The Mai Tai DeepSee option corrects in advance for the optical setup dispersion through pre-compensation, which maximizes the observed fluorescence signals. Sample damage could prevent the average power from being increased. For these cases, high peak power is the most effective way to increase the fluorescence.

With DeepSee



Two multiphoton microscope images of bovine endothelial cells; both were taken at 800 nm with 1.5 mW average power at the sample and the same PMT settings. The image with dispersion compensation on the left has a higher resolution than the image on the right without compensation.

Images courtesy of Holly Aaron at the Molecular Imaging Center at UC Berkeley

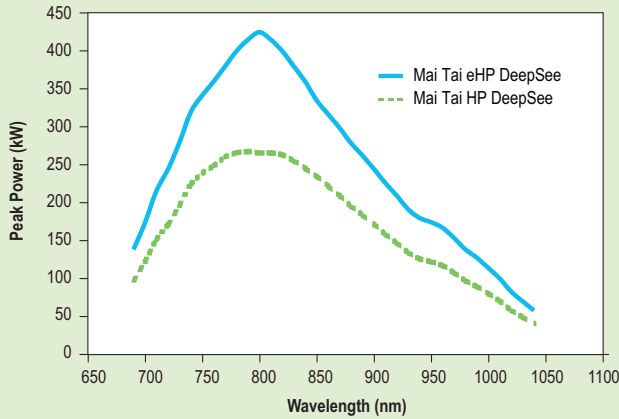
## MaiTai DeepSee Specifications<sup>1, 12</sup>

	Mai Tai eHP DS	Mai Tai HP DS
<b>Output Characteristics</b>		
Peak Power <sup>2</sup>	>425 kW	>266 kW
Pulse Width <sup>2, 3, 9</sup>	<70 fs	<100 fs
Tuning Range <sup>4</sup>	690–1040 nm	690–1040 nm
Average Power <sup>2</sup>	>2.4 W	>2.1 W
Peak Power, Alternative Wavelengths <sup>5</sup>	>56 kW at 690 nm >217 kW at 710 nm >217 kW at 920 nm >34 kW at 1040 nm	>56 kW at 690 nm >150 kW at 710 nm >150 kW at 920 nm >34 kW at 1040 nm
Beam Roundness <sup>2</sup>	0.9–1.1	
Astigmatism <sup>2</sup>	<25%	
Repetition Rate <sup>2, 6</sup>	80 MHz ±1 MHz	
Beam Pointing Stability	<50 μrad/100 nm	
Noise <sup>2, 7</sup>	<0.15%	
Stability <sup>8</sup>	<±1%	
Spatial Mode <sup>2</sup>	TEM <sub>00</sub> , M <sup>2</sup> <1.1	
Polarization <sup>2</sup>	>500:1 horizontal	
Beam Divergence <sup>2</sup>	< 1.2 mrad	
Beam Diameter (1/e <sup>2</sup> ) <sup>2</sup>	<1.2 mm	
Standard Dispersion Compensation Range <sup>10</sup>	690 nm: -22,500 fs <sup>2</sup> to -41,700 fs <sup>2</sup> 800 nm: -8,900 fs <sup>2</sup> to -24,500 fs <sup>2</sup> 1040 nm: 0 fs <sup>2</sup> to -9,600 fs <sup>2</sup>	
<b>Physical Characteristics</b>		
Size (L x W x H)	35.89 x 13.79 x 5.95 in (911.67 x 350.27 x 151.13 mm)	
Weight – Laser Head	106 lbs (48 kg)	
Umbilical Length	10 ft (3 m)	
<b>Utility Requirements</b>		
Voltage	110 VAC ±10% / 220 VAC ±10%	
Current	Power Supply and Closed-loop Chiller: <10 A/<6 A	
Frequency	60 Hz/50 Hz	
<b>Environmental Requirements<sup>11</sup></b>		
Altitude	Up to 2000 m	
Temperature, Operating	20–25°C	
Relative Humidity, Operating	Maximum 75% non-condensing up to 25°C	
Temperature, Storage	15–35°C	
Relative Humidity, Storage	<65% for 15–35°C	
Cooled Water Temperature in Closed-loop Chiller	21°C typical	

1. Due to our continuous product improvement program, specifications may change without notice.
2. Specification applies to 800 nm only.
3. A sech<sup>2</sup> pulse shape is used to determine the pulse width as measured with a Newport PulseScout<sup>®</sup> autocorrelator.
4. Mai Tai is also available with a fixed, factory preset wavelength within the wavelength range noted.
5. Specifications apply to operation at the wavelength noted.
6. Laser operation is specified at a nominal repetition rate of 80 MHz.
7. Specification represents rms noise measured in a 10 Hz to 10 MHz bandwidth.
8. Percent power drift in any 2-hour period with <±1°C temperature change after a 1-hour warm up.

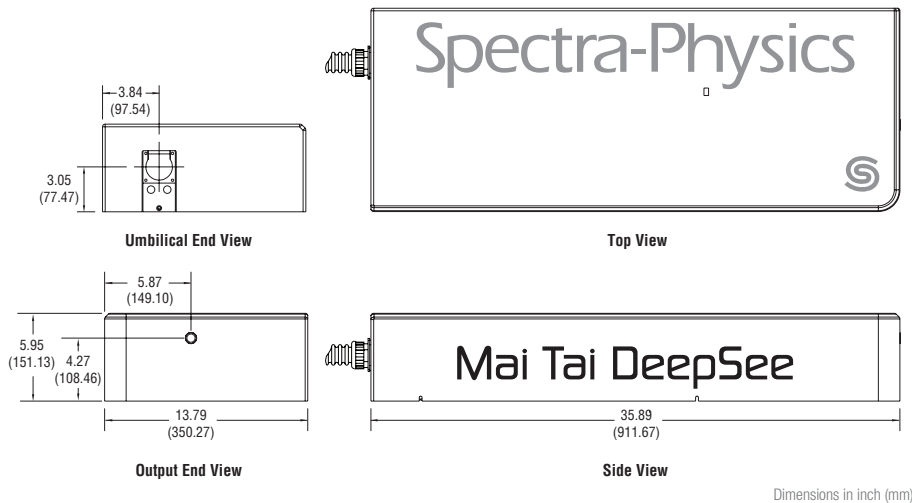
9. Measured after external pulse compression, or measured at the sample on a system configured with the DeepSee.
10. For optional range down to 0 fs<sup>2</sup>, contact Spectra-Physics.
11. Avoid obstructing the air exhaust grills which will result in the recirculation of hot exhaust air. Cooling air enters through the front panel and exits through the rear fan apertures.
12. The Mai Tai DeepSee 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.

**Mai Tai DeepSee Delivers the Industry's Highest Peak Power\***



\*Calculated using specified values for average power and pulse width for each laser with dispersion compensation

**MaiTai DeepSee Dimensional Drawing**



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