

Octavius-85M: The 85 MHz, 6 fs Ti:Sapphire Oscillator



The Octavius-85M Ti:Sa laser is capable of producing a sub 6 fs pulse. This laser system is well-suited for amplifier seeding, particularly in optical parametric chirped pulse amplifiers (OPCPA), as well as for attosecond pulse generation or use in pump/probe experiments. CE-phase stabilization is available. In addition the Octavius can also be used in linear and nonlinear biological probing and imaging applications like single molecule detection or 2-photon microscopy.

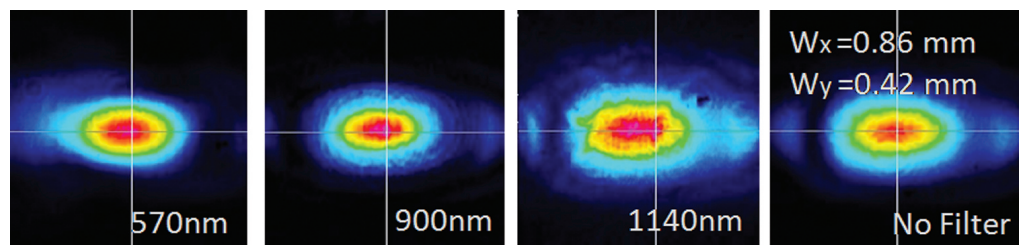
Technology

The Octavius-85M is a soft aperture Kerr-lens mode locked (KLM) Ti:Sa. The laser cavities incorporate Dispersion Compensation Mirror (DCM) pairs, which are required for smooth, high-precision group delay control over an octave-wide bandwidth. The design of these unique mirror pairs requires more than 200 coating layers.

The high intensity of the intra-cavity circulating laser pulses and a carefully set temporal focus are used to create additional bandwidth outside of the Ti:Sa gain bandwidth through Self-Phase Modulation (SPM) in the Ti:Sa crystal. These uniquely-engineered cavities exploit the interplay between strong KLM in the crystal and the dispersion generated by the DCM pairs to provide stable ultra-short pulses that are not possible with standard cavity designs.

Applications

- Amplifier Seeding, Particularly OPCPA
- Pump-Probe Experiments
- Biological Probing and Imaging





Mechanical Design

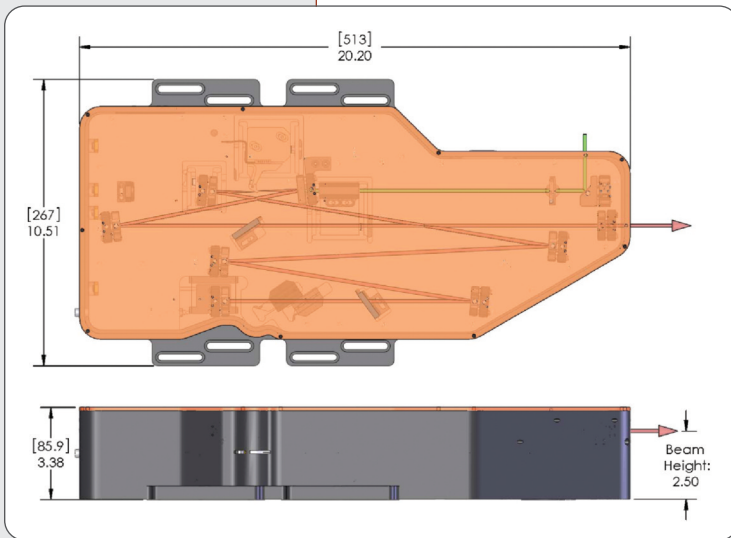
Ease of use and mechanical robustness were at the forefront of the design for the Octavius lasers. Unlike typical laser designs, which use traditional translation stages for tuning and alignment, the alignment of the Octavius-85M is controlled using a unique flexure stage design that eliminates the various materials typically used for springs, bearings, and frames while still maintaining unprecedented

accuracy and repeatability. Custom tooling and fixtures guarantee a stress free machining during production and minimize therefore drifts and misalignment of the laser cavity caused by stress relaxation. Two independent all solid state temperature controllers for the laser cavity and the crystal, respectively, further increase the long term stability of the cavity alignment. The oscillator requires no cooling water which reduces short term noise due to vibration caused by turbulent water flow.

The crystal and pump lens positions as well as the curved mirror separation are all tracked using optical linear position encoders that offer ~1 μm resolution. Therefore, it is easy to reestablish modelocked operation, and switching between multiple working configurations becomes seamless.

Pump Laser

The Octavius-85M can be purchased separately or with a single-mode, CW, diode-pumped solidstate (DPSS) pump laser that outputs 6 W of power at 532 nm. In the latter case, both the DPSS laser and the Ti:Sa oscillator are integrated on a rigid, water-cooled platform.



Specifications	Octavius-85M-UB	Octavius-85M-HP
Pulse Width	6 fs	10 fs
Bandwidth @-10 dB	300 nm	200 nm
Average Out Power	200 mW	400 mW
Repetition Rate	85 MHz	
Divergence	<2 mrad	
Polarization	>90:1	
Power Stability Over 8 h	± 1%	
Dimensions	20.2" x 10.5" (513 mm x 267 mm)	

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