56 Sparta Avenue • Newton, New Jersey 07860
(973) 300-3000 Sales • (973) 300-3600 Fax
www.thorlabs.com

THORLABS

OCTAVIUS-85M- March 5, 2019

Item # OCTAVIUS-85M was discontinued on March 5, 2019. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

OCTAVIUS® TI:SAPPHIRE LASERS, <8 FEMTOSECONDS

- **Ti:Sa Lasers with <8 Femtosecond Pulse Width**
- **Broadband Version: >300 nm Bandwidth**
- **High-Power Version: >600 mW Output**
- **Robust Design and Turnkey Operation**

Spectrum Emitted by the OCTAVIUS-85M

Versions Optimized for Broadband Output or High-Power Output Available

Hide Overview

OVERVIEW

Features

- Long Term Output Power Stability (±1% Over 900 Hours)
- Two Laser Options:
  - High-Power Version with >600 mW Output Power and <8 fs Pulse Width
  - Broadband Version with >300 nm Bandwidth and <6 fs Pulse Width
- Turnkey, Maintenance-Free Operation
- Low Cost of Ownership

Applications

- Attosecond Science and High Harmonic Generation (HHG)
  - Optional CE-Phase Stabilization for Ti:Sa Chirped Pulse Amplifier (CPA) Seeding
  - Optical Parametric Chirped Pulse Amplifier (OPCPA) Seeding
- Two-Photon Fluorescent Imaging
- Surface Plasmon Resonance
- THz Experiments
- Nonlinear Optics
- Ultrafast Spectroscopy

Thorlabs' Octavius® 85 MHz Titanium:Sapphire (Ti:Sa) lasers offer some of the broadest spectra commercially available. The spectra of these ultrafast laser systems are well suited for amplifier seeding, particularly for Optical Parametric Chirped Pulse Amplifiers (OPCPA), or use in pump/probe experiments. The OCTAVIUS-85M is optimized for broadband output and features a >300 nm bandwidth and a <6 fs transform-limited pulse width, while our OCTAVIUS-85M-HP is a high-power laser capable of >600 mW output while maintaining a <8 fs transform-limited pulse width. For more detailed specifications and a comparison of these models, please see the *Specs* tab.

The Octavius lasers are ideal for life science applications such as multiphoton or coherent anti-Stokes Raman scattering (CARS) imaging. With a pulse duration of less than 8 fs, the OCTAVIUS-85M-HP laser provides an exceptionally high peak power of more than 700 kW and a large spectral bandwidth spanning more than 200 nm (at -10 dB). This wide bandwidth, covering more than half the typical tuning range of most Ti:Sapphire lasers, allows for

the simultaneous excitation of several spectrally separated fluorophores at their optimal absorption wavelengths without tuning.

Technology

The Octavius-85M and Octavius-85M-HP are soft aperture Kerr-lens mode-locked (KLM) Ti:Sa lasers. The laser cavity incorporates Dispersion-Compensating Mirror (DCM) pairs, which are required for smooth, high-precision group delay control over an octave-wide bandwidth. The fabrication of these unique mirror pairs requires the optimization of a 150-coating-layer design.

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 is controlled via a unique flexure stage design that eliminates the various materials generally used for springs, bearings, and frames while still maintaining unprecedented accuracy and repeatability. Custom tooling and fixtures guarantee stress-free machining during production and therefore minimize drifts and misalignment of the laser cavity caused by stress relaxation.

Pump Laser

The Octavius 85 MHz Ti:Sa Oscillators come with an integrated pump laser. The pump laser is based on state-of-the-art Optically Pumped Semiconductor Laser (OPSL) technology, which allows for high compactness. As an option, the laser is available without a pump laser; in this case, an input port can be used to direct the external pump laser into the oscillator.

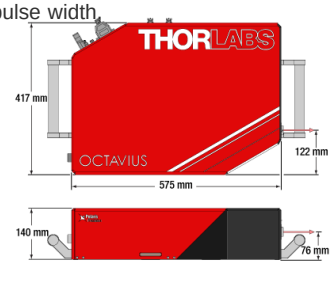
Please contact techsupport@thorlabs.com for more information about these systems, customization options, or to request a quote.

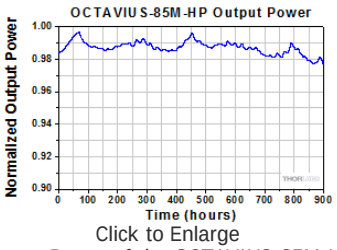
Hide Specs

SPECS

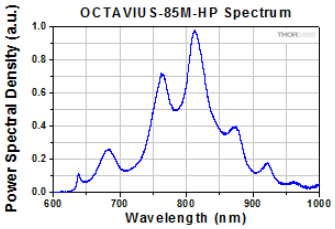
Item #	OCTAVIUS-85M (Optimized for Broadband Output)	OCTAVIUS-85M-HP (Optimized for Power Output)
Pulse Specifications		
Transform-Limited Pulse Width[a]	<6 fs	<8 fs
Bandwidth (at -10 dB)	>300 nm	>200 nm
Average Output Power	>150 mW	>600 mW
Repetition Rate	85 MHz	
M^2 (at 800 nm)	<1.5	<1.3
Beam Diameter	750 µm (Nominal)	
Beam Ellipticity	1.15 (Nominal)	
Divergence	<2 mrad	
Polarization Ratio	>90:1	
Power Stability Over 8 Hours	±0.3%	
RMS Noise (10 Hz to 625 kHz)	<0.2%	
Physical Specifications		
Laser Housing Dimensions	575 mm x 417 mm x 140 mm (22.6" x 16.4" x 5.5")	
Controller Dimensions	432 mm x 267 mm x 381 mm (17" x 10.5" x 15")	
Controller Power Consumption	750 W	
Chiller Dimensions	203 mm x 386 mm x 277 mm (8" x 15.2" x 10.9")	
Chiller Power Consumption	625 W (Max)	
Air Circulator Dimensions	483 mm x 178 mm x 330 mm (19" x 7" x 13")	
Air Circulator Power Consumption	25 W	

a. The output pulse is chirped to account for dispersive materials outside the laser. To obtain the transform-limited pulse width, dispersion compensation is needed to counter-chirp and compress the pulse.





Click to Enlarge
Output Power of the OCTAVIUS-85M-HP
Measured Over 900 Hours



Click to Enlarge
Measured Spectrum of the OCTAVIUS-85M-HP

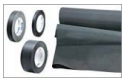
Hide Laser Safety

LASER SAFETY

Laser Safety and Classification

Safe practices and proper usage of safety equipment should be taken into consideration when operating lasers. The eye is susceptible to injury, even from very low levels of laser light. Thorlabs offers a range of laser safety accessories that can be used to reduce the risk of accidents or injuries. Laser emission in the visible and near infrared spectral ranges has the greatest potential for retinal injury, as the cornea and lens are transparent to those wavelengths, and the lens can focus the laser energy onto the retina.

Safe Practices and Light Safety Accessories



- Thorlabs recommends the use of safety eyewear whenever working with laser beams with non-negligible powers (i.e., > Class 1) since metallic tools such as screwdrivers can accidentally redirect a beam.
- Laser goggles designed for specific wavelengths should be clearly available near laser setups to protect the wearer from unintentional laser reflections.
- Goggles are marked with the wavelength range over which protection is afforded and the minimum optical density within that range.
- Blackout Materials can prevent direct or reflected light from leaving the experimental setup area.
- Thorlabs' Enclosure Systems can be used to contain optical setups to isolate or minimize laser hazards.
- A fiber-pigtailed laser should always be turned off before connecting it to or disconnecting it from another fiber, especially when the laser is at power levels above 10 mW.
- All beams should be terminated at the edge of the table, and laboratory doors should be closed whenever a laser is in use.
- Do not place laser beams at eye level.
- Carry out experiments on an optical table such that all laser beams travel horizontally.
- Remove unnecessary reflective items such as reflective jewelry (e.g., rings, watches, etc.) while working near the beam path.
- Be aware that lenses and other optical devices may reflect a portion of the incident beam from the front or rear surface.
- Operate a laser at the minimum power necessary for any operation.
- If possible, reduce the output power of a laser during alignment procedures.
- Use beam shutters and filters to reduce the beam power.
- Post appropriate warning signs or labels near laser setups or rooms.
- Use a laser sign with a lightbox if operating Class 3R or 4 lasers (i.e., lasers requiring the use of a safety interlock).
- Do not use Laser Viewing Cards in place of a proper Beam Trap.

Laser Classification

Lasers are categorized into different classes according to their ability to cause eye and other damage. The International Electrotechnical Commission (IEC) is a global organization that prepares and publishes international standards for all electrical, electronic, and related technologies. The IEC document 60825-1

outlines the safety of laser products. A description of each class of laser is given below:

Class	Description	Warning Label
1	This class of laser is safe under all conditions of normal use, including use with optical instruments for intrabeam viewing. Lasers in this class do not emit radiation at levels that may cause injury during normal operation, and therefore the maximum permissible exposure (MPE) cannot be exceeded. Class 1 lasers can also include enclosed, high-power lasers where exposure to the radiation is not possible without opening or shutting down the laser.	
1M	Class 1M lasers are safe except when used in conjunction with optical components such as telescopes and microscopes. Lasers belonging to this class emit large-diameter or divergent beams, and the MPE cannot normally be exceeded unless focusing or imaging optics are used to narrow the beam. However, if the beam is refocused, the hazard may be increased and the class may be changed accordingly.	
2	Class 2 lasers, which are limited to 1 mW of visible continuous-wave radiation, are safe because the blink reflex will limit the exposure in the eye to 0.25 seconds. This category only applies to visible radiation (400 - 700 nm).	
2M	Because of the blink reflex, this class of laser is classified as safe as long as the beam is not viewed through optical instruments. This laser class also applies to larger-diameter or diverging laser beams.	
3R	Lasers in this class are considered safe as long as they are handled with restricted beam viewing. The MPE can be exceeded with this class of laser, however, this presents a low risk level to injury. Visible, continuous-wave lasers are limited to 5 mW of output power in this class.	
3B	Class 3B lasers are hazardous to the eye if exposed directly. However, diffuse reflections are not harmful. Safe handling of devices in this class includes wearing protective eyewear where direct viewing of the laser beam may occur. In addition, laser safety signs lightboxes should be used with lasers that require a safety interlock so that the laser cannot be used without the safety light turning on. Class-3B lasers must be equipped with a key switch and a safety interlock.	
4	This class of laser may cause damage to the skin, and also to the eye, even from the viewing of diffuse reflections. These hazards may also apply to indirect or non-specular reflections of the beam, even from apparently matte surfaces. Great care must be taken when handling these lasers. They also represent a fire risk, because they may ignite combustible material. Class 4 lasers must be equipped with a key switch and a safety interlock.	
All class 2 lasers (and higher) must display, in addition to the corresponding sign above, this triangular warning sign		

Hide Part Numbers

Part Number	Description	Price	Availability
OCTAVIUS-85M	Ti:Sapphire Laser, <6 fs Pulses, Optimized for Broadband Output	$0.00	Lead Time
OCTAVIUS-85M-HP	Ti:Sapphire Laser, <8 fs Pulses, Optimized for High Power	$0.00	Lead Time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