

10 fs Laser for 2P-Microscopy

In two-photon microscopy, the fluorescence signal intensity depends quadratically on both the excitation laser intensity and average power divided by repetition rate and laser pulse width:

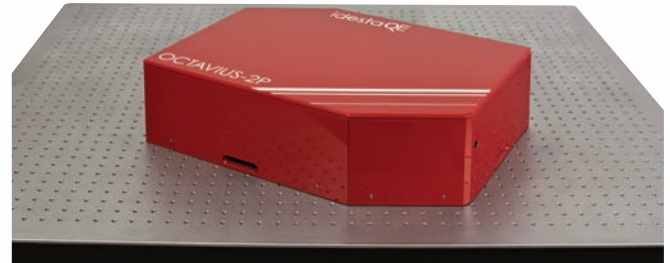
$$I_{2p\text{-signal}} \propto I_{\text{Laser}}^2 = \left(\frac{P_{\text{ave}}}{f_{\text{rep}}\tau} \right)^2$$

Here, P_{ave} is the average power of the femtosecond laser, f_{rep} is the repetition rate, and τ is the pulse width.

The two-photon signal can be increased either by increasing the average power of the femtosecond laser or by reducing the pulse width. Increasing the average power requires a high-power pump laser, which is expensive to buy and exhibits a high cost of ownership.

IdestaQE, a strategic partner of Thorlabs, designed the Octavius-2P, which offers a cost-effective alternative. Rather than incorporating a multi-watt average output power system, IdestaQE reduced the pulse width to 10 fs. The reduced pulse width increases the intensity tenfold compared to a 100 fs system with the same average power. The result is better signal intensity with reduced average laser power, which decreases the probability of photodamage.

The Octavius-2P is pumped using newly developed Optically Pumped Semiconductor Laser (OPSL) technology. These next-generation pump sources allow for high compactness and low cost of ownership. The ultra-high peak power of over 500 kW, compared to other commercially available 300 kW lasers, provides the ability to probe deeper into biological tissue. Additionally, the extended spectral bandwidth of the 10 fs laser pulse stretches over 100 nm, allowing the Octavius-2P laser to efficiently excite multiple fluorophores simultaneously.



OCTAVIUS-2P

Features

- Ultra-High Peak Power (>500 kW) for Deep Imaging
- >100 nm Wide Spectral Bandwidth Allows Multiple Fluorophores to be Excited Simultaneously
- 10 Femtosecond Pulse Provides More Signal and Less Photodamage
- Small Footprint Conserves Lab Bench Space

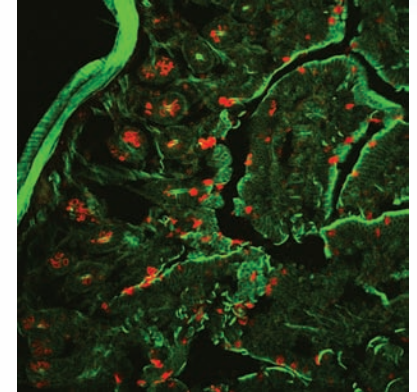
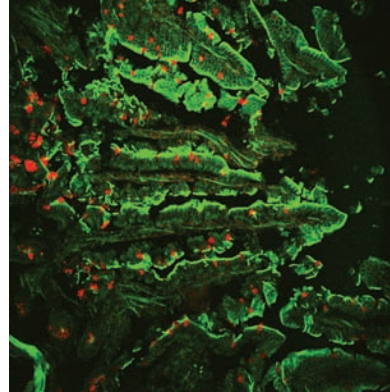
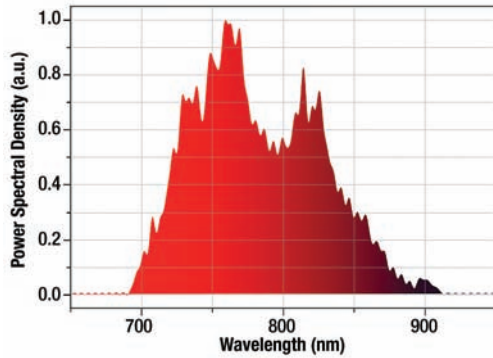
Specifications

PARAMETER	VALUE
Peak Power	>500 kW
Average Power	500 mW
Pulse Width	10 fs
Repetition Rate	85 MHz
Power Stability (over 2 hours)	±0.5%
Beam Height	3.0"
Laser Head Dimensions	533 mm x 394 mm x 132 mm (21.0" x 15.5" x 5.2")
Power Supply Dimensions	432 mm x 279 mm x 381 mm (17.0" x 11.0" x 15.0")
Chiller Supply Dimensions	267 mm x 203 mm x 406 mm (10.5" x 8.0" x 16.0")

Common Fluorophores that can be Excited by the Octavius-2P:

- Fura-2
- CFP
- Oregon Green
- Fluo-3 and Fluo-5F
- Alexa Dyes
- Cy2 and Cy3
- e and w Type GFP
- DAPI
- NADH

Laser Pulse Spectrum



Mouse Intestine

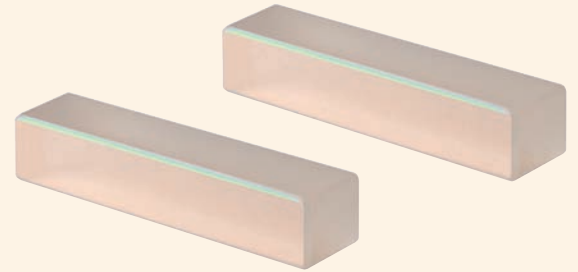
Photos are taken with a two-photon microscope using the Octavius-2P as the laser source. The sample was labeled with Alexa 350 and Alexa 568 dyes, which have fairly well separated excitation bands. Simultaneous excitation of these two dyes with a traditional 100 fs laser source is difficult, since the bandwidth of the source is too narrow. In contrast, the 10 fs Octavius-2P is able to excite both fluorophores due to its large spectral bandwidth of over 100 nm.

Price

ITEM #	DESCRIPTION	PRICE
OCTAVIUS-2P	10 Femtosecond Mode-Locked Laser, 85 MHz Repetition Rate, >500 kW Peak Power	Call

Dispersion-Compensating Mirrors

The Dispersion-Compensating Mirrors correct for phase distortions that occur when ultrafast pulses travel through an optical system. The highly reflective coating for the 700-1000 nm range is deposited on the surface using ion-beam sputtering (IBS) technology.



Specs^a

PARAMETER	VALUE
Operating Wavelength Range	700 - 1000 nm
Reflectivity (Over Operating Wavelength Range)	>99.5%
Dispersion per Reflection (@ 800 nm)	-175 fs ²
Surface Flatness (@ 633 nm) ^b	$\lambda/10$
Substrate Dimensions (L x W x D) ^c	2.10" x 0.47" x 0.47" (53.0 mm x 12.0 mm x 12.0 mm)

^aAOI=8°, P-Polarized Light

^bOver any Ø10 mm Clear Aperture

^cCoated Surface Dimensions: 53.0 mm x 12.0 mm with 50 mm x 10 mm Usable Area

Pricing

ITEM #	DESCRIPTION	PRICE
DCMP175	Dispersion-Compensating Mirror Set, 2 Pieces	\$5,000.00

For custom bandwidth configurations, please contact Thorlabs.

Optical Accessory

For more information or to place an order, contact one of our Customer Support Specialists at 973-300-3000 or visit www.thorlabs.com.