

Our fiber-based femtosecond Ytterbia lasers feature high output powers and pulse energies that are ideal for ultrafast applications such as photostimulation and multiphoton imaging. We offer a fiber laser with 1035 nm output and an optical parametric amplifier with output between 1600 nm and 1700 nm.

Ytterbia fs Fiber Laser



FSL1030X1
Ytterbium Femtosecond
Fiber Laser

Features

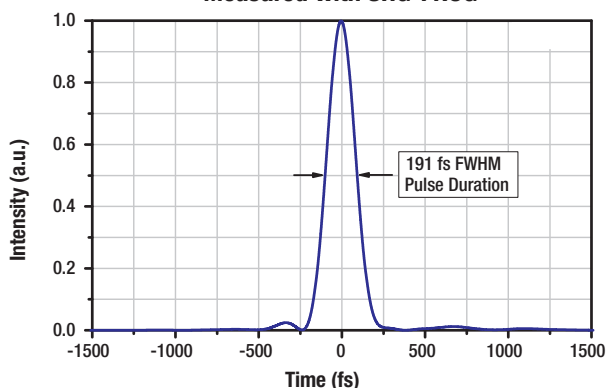
- ◆ >20 W High Output Power and >3 μ J Pulse Energies
- ◆ User-Tunable Repetition Rate from 1 to 11 MHz
- ◆ Clean, Ultrafast <220 fs Pulses
- ◆ Integrated Pre-Compensation
- ◆ Pump Laser for the Ytterbia Femtosecond Optical Parametric Amplifier

Applications

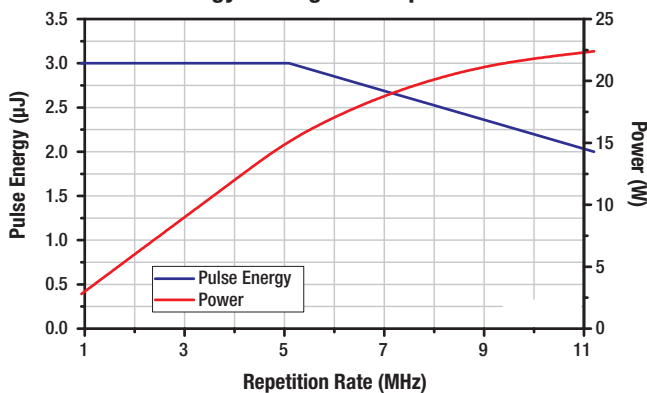
- ◆ Photostimulation
- ◆ Multiphoton Imaging
- ◆ OPA and NOPA Pumping
- ◆ Micromachining
- ◆ Terahertz Generation

Thorlabs' Ytterbium Femtosecond Fiber Laser emits clean, ultrafast NIR pulses centered at 1035 nm. With >20 W average output power, and a tunable repetition rate from 1 to 11 MHz, this fiber laser enables a wide range of applications, including photostimulation, multiphoton imaging, and terahertz generation. It also serves as the integrated pump laser for Thorlabs' optical parametric amplifier.

**Typical FSL1030X1 Laser Pulse Intensity
Measured with SHG-FROG**



**Typical FSL1030X1 Laser Power and
Pulse Energy Scaling with Repetition Rate**



Specifications

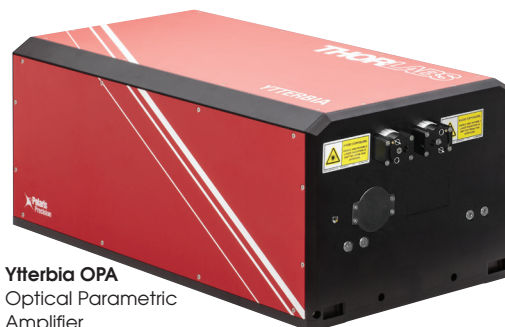
Item #	FSL1030X1	FSL1030X2 ^a
Center Wavelength	1035 nm \pm 5 nm	
Pulse Duration (FWHM)	<220 fs (Typical)	<130 fs (Typical)
Temporal Strehl Ratio	0.90 (Typical)	
Pulse Energy	3 μ J (1 - 5 MHz)	2 μ J (1 - 11 MHz)
Repetition Rate	1 - 11 MHz (User Tunable)	
Average Power	20 W at 11 MHz	
Beam Quality	<1.15 (Typical)	
Mode Field Diameter	2.0 mm - 2.5 mm (Typical)	
Pointing Stability	<10 μ Rad/ $^{\circ}$ C (Typical)	
Polarization	Linear, Vertical	

a. This item will be available in late Fall 2022.

Ytterbia fs Optical Parametric Amplifier

Features

- ◆ Center Wavelength of $1650 \text{ nm} \pm 5 \text{ nm}$, Customizable Between 1600 - 1700 nm
- ◆ Pulse Duration Down to 50 fs (<90 fs Standard)
- ◆ User-Tunable Repetition Rate from 1 to 4 MHz
- ◆ Average Power: >1.6 W at 4 MHz
- ◆ Constant >400 nJ Pulse Energy from 1 to 4 MHz
- ◆ Single Optical Head with Integrated Ytterbia Pump Laser



Available in 2023, Thorlabs' Ytterbia Optical Parametric Amplifier (OPA) converts 1035 nm light from the integrated FSL1030X1 pump laser into ultrafast NIR pulses using optical parametric amplification. With >400 nJ pulse energies at a center wavelength of 1650 nm and a user-tunable repetition rate from 1 to 4 MHz, the Ytterbia OPA facilitates life science applications that require three-photon microscopy to reach deep imaging depths while providing high signal-to-noise ratios and minimal phototoxicity. The signal output has typical pulse durations of <90 fs that can be configured down to 50 fs, while the center wavelength can be configured at the time of order for values between 1600 nm to 1700 nm within the three-photon transmission window.

The Ytterbia OPA is designed to be a robust and compact single-unit solution. The optical head features two output ports: one port for the signal and one port for the pump beam. The second port provides full access to the 1035 nm pump beam in an either/or bypass configuration. In addition, the vertical stacking of the FSL1030X1 pump laser and the OPA within a single housing eliminates the need for beam routing on the table and creates an optical system less sensitive to environmental changes.

With a high peak power and tunable repetition rate, the Ytterbia OPA is optimized for deep-tissue imaging via three-photon excitation. By including a tunable repetition rate, the user has the flexibility to adjust the imaging frame rate to accommodate the time scales of various processes or events, and control the average power incident on a sample to reduce heat-induced degradation. At the same time, the pulse energy maintains a constant >400 nJ over the entire tunable range of the repetition rate.

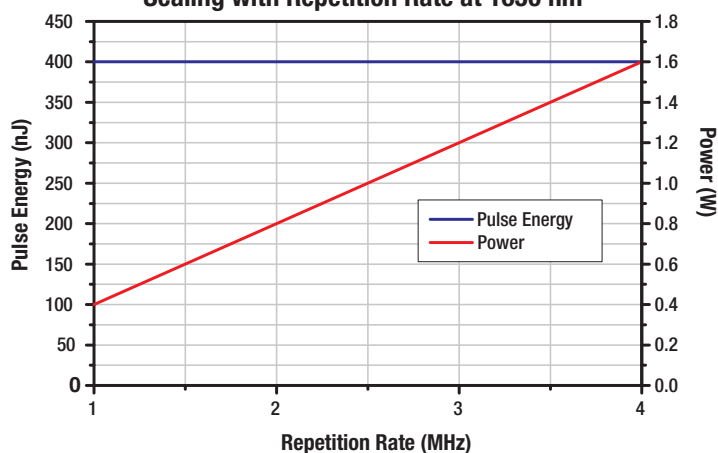
Applications

- ◆ Three-Photon Microscopy
- ◆ Supercontinuum Generation (NIR & MIR)
- ◆ Tip-Enhanced MIR Nanospectroscopy
- ◆ Pump-Probe Spectroscopy

Specifications

Center Wavelength	$1650 \text{ nm} \pm 5 \text{ nm}$
Pulse Duration (FWHM)	<90 fs
Temporal Strehl Ratio	>0.80
Pulse Energy	>400 nJ
Repetition Rate (Tunable)	1 - 4 MHz
Average Power	>0.4 W at 1 MHz >0.8 W at 2 MHz >1.2 W at 3 MHz >1.6 W at 4 MHz
Beam Quality (M^2)	<1.3
Mode Field Diameter ($1/e^2$)	$2.0 \text{ mm} \pm 0.5 \text{ mm}$
Pointing Stability	<10 $\mu\text{Rad}/^\circ\text{C}$ (Typical)
Polarization	Linear, Vertical

Ytterbia OPA Power and Pulse Energy Scaling with Repetition Rate at 1650 nm



The energy per pulse maintains a constant value over the user-tunable range of the repetition rate.