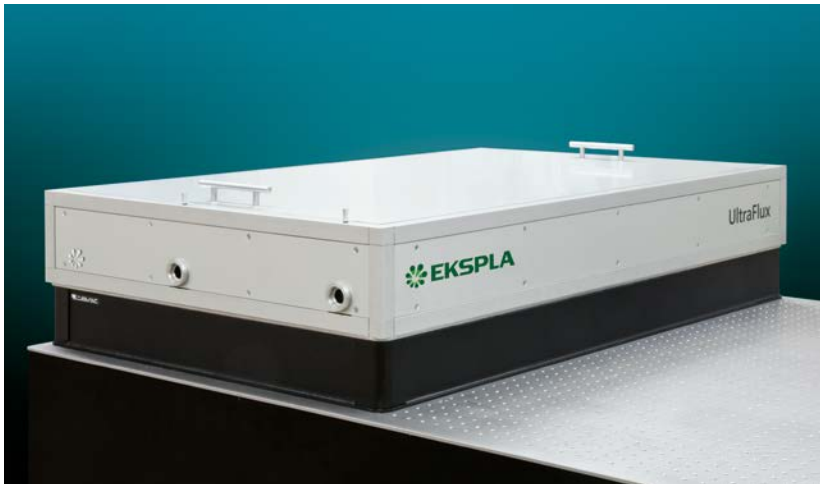
UltraFlux

Tunable Wavelength Femtosecond Laser Systems



UltraFlux is a compact high energy tunable wavelength femtosecond laser system which incorporates the advantages of ultrafast fiber laser, solid-state and parametric amplification technologies. Novel OPCPA front-end technology uses the same picosecond fiber laser for seeding both picosecond DPSS pump laser and femtosecond parametric amplifier by spectrally broadened output. This approach greatly simplifies the system – excludes femtosecond regenerative amplifier and eliminates the need of pump and seed pulse synchronization. In addition to that, contrast of the output pulses in picosecond to nanosecond time scale is potentially increased.

All UltraFlux series laser systems are assembled on a rigid breadboard to ensure excellent long-term stability. Modular internal design offers high level of customization and easy scalability. These systems can be customized according to customer requirements.

Incorporation of parametric amplification technology together with a novel ultrafast fiber laser helped to create and bring to the market a new tool for femtosecond pump-probe, nonlinear spectroscopy, emerging high harmonic generation experiments and other femtosecond and nonlinear spectroscopy applications. With this laser ultrafast science breakthrough is closer to any photonics lab than ever before.

FEATURES

- *Based on the novel **OPCPA** (Optical Parametric Chirped Pulse Amplification) technology – simple and cost-efficient operation*
- *Patented front-end design (patents no. EP2827461 and EP2924500)*
- *Hands free wavelength tuning*
- *Up to **1 kHz** repetition rate*
- *Up to **40 mJ** pulse energy*
  - *Excellent pulse energy stability: < 1.5 % rms*
  - *Excellent long-term average power stability: < 1.5 % rms over > 12 hour period*
- *High contrast pulses without any additional improvement equipment*

APPLICATIONS

- *Broadband CARS and SFG*
- *Femtosecond pump-probe spectroscopy*
- *Nonlinear spectroscopy*
- *High harmonic generation*

OPTIONS

- *Second harmonic: **350 – 480 nm***
- *Third harmonic: **245 – 320 nm***
- *Fourth harmonic: **210 – 250 nm***
- *Optically synchronized ps output*
- *PLL (Phase Locking Loop) for precise (<1 ps, RMS) locking with external synchronization pulse*

SPECIFICATIONS [1]

Model	UltraFlux FT2101	UltraFlux FT2105HE	UltraFlux FF4010
Max. pulse energy	0.3 mJ	2.5 mJ	40 mJ
Tunability	700 – 1010 nm	820 – 970 nm	840 nm fixed
Pulse duration	35 – 60 fs	20 – 35 fs	10 – 20 fs
Pulse repetition rate	1 kHz	5 Hz	10 Hz
Pulse energy stability	< 1.5 % rms		
Long-term power stability	< 1.5 % rms		
Footprint on optical table	1.2 × 0.75 m	1.2 × 0.9 m	1.2 × 4.80 m

[1] Presented parameters are from delivered systems and can be customized to meet customer's requirements.

PERFORMANCE

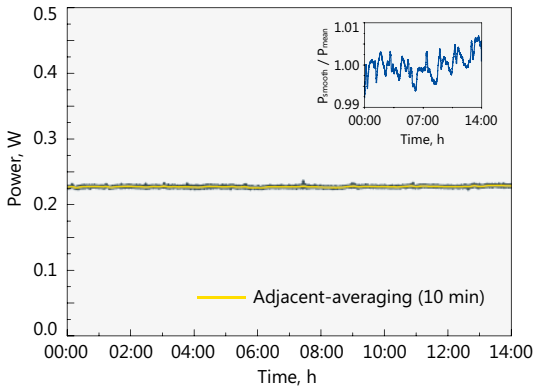


Fig 1. Long-term power stability measurement at 800 nm wavelength

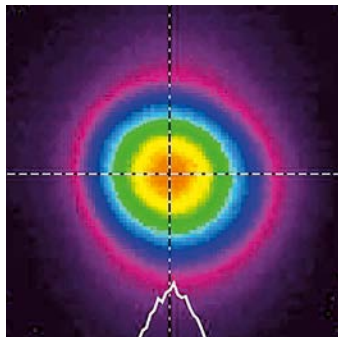


Fig 2. Typical beam profile. Output pulse energy 0.3 mJ at 890 nm

DELIVERED SYSTEMS

UltraFlux FT2105HE. Customised compact (1.2 × 0.9 m), fully diode pumped, tunable wavelength femtosecond laser system delivering up to 2.5 mJ pulse energy with pulse duration down to 20 fs. Optically synchronized (low jitter) fs and ps outputs available.

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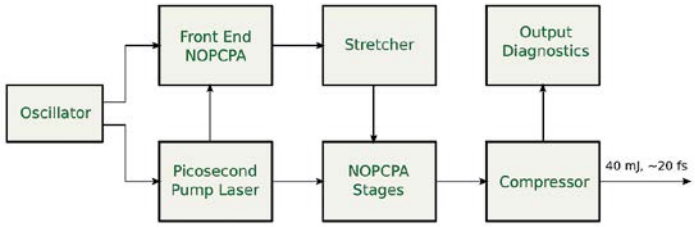
UltraFlux 4010

UltraFlux 4010. Custom high pulse energy femtosecond fixed wavelength laser system delivering up to 40 mJ pulse energy with pulse duration down to 11 fs.

The UltraFlux 4010 laser is a 2 TW tabletop femtosecond OPCPA (Optical Parametric Chirped Pulse Amplification) based system operating at 10 Hz. Originally built for ELI-ALPS (Extreme Light Infrastructure – Attosecond Light Pulse Source) in Hungary, this laser is now available for a wide variety of applications.

The master oscillator is a patent pending (EP2827461A2) all-in-fiber Yb fiber picosecond laser seed source with two fiber outputs. One seeds the OPCPA Front-End and another seeds the Picosecond Pump Laser (PPL). Both outputs originate from the same fiber so they are synchronized optically. This approach eliminates the need for a complex temporal synchronization system typically present in other OPCPA systems.

The Nd:YAG Picosecond Pump Laser (PPL) system is comprised of several sub-systems: diode pumped Regenerative Amplifier, diode pumped Preamplifier, two flash lamp pumped Amplifiers, and Second Harmonic Generators which convert fundamental 1064 nm wavelength to 532 nm. PPL outputs four beams at 532 nm and 10 Hz pulse repetition rate. One beam is directed to NOPCPA Front-End subsystem and others are directed to NOCPA stages.



UltraFlux 4010 laser block diagram

The Front-End NOPCPA (Non-collinear Optical Parametric Chirped Pulse Amplifier) consists of several sub-systems: Picosecond Optical Parametric Amplifier (ps-OPA) amplifying oscillator output pulses, Grating Compressor compressing Ps-OPA output pulses, White Light Generator (WLG) broadening the spectrum of Ps-OPA output pulses and Femtosecond Non-collinear Optical Parametric Amplifier (fs-NOPA) amplifying WLG output pulses.

The Stretcher sub-system is a Grism (diffraction gratings combined together with prisms) based pulse stretcher, which stretches output pulse from NOPCPA Front-End and Dazzler (Acousto-Optic Programmable Dispersive Filter) for high order phase compensation.

Three stages of NOPCPA (Non-collinear Optical Parametric Chirped Pulse Amplifiers) are used to amplify the stretched pulse from the Stretcher up to 50 mJ.

Finally, amplified pulses are compressed below 20 fs in the Pulse Compressor. Bulk glass compressors are combined together with chirped mirror compressors. Pulse energy after Compressor is >40 mJ.

The built-in Output Diagnostics stage ensures reliable, turn-key operation by monitoring critical parameters such as energy, duration, and beam profile.