UltraFlux 1k

High Repetition Rate Tunable Wavelength Femtosecond OPCPA Systems

UltraFlux 1k series is a compact high repetition rate tunable wavelength femtosecond laser system which incorporates the advantages of ultrafast fiber laser, solid-state and parametric chirped pulse 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 enhanced.

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 chirped pulse 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*
- *Patented front-end design (patents no. EP2827461 and EP2924500)*
- *750 – 960 nm, 375 – 480 nm, 250 – 320 nm and 210 – 230 nm tuning ranges*
- *Up to 14 mJ pulse energy at 1 kHz repetition rate*
  – Excellent pulse energy stability: ≤ 1 % RMS
  – Excellent long-term average power stability: ≤ 1.5 % RMS over > 12-hour period
- *Perfectly synchronized fs and ps output option*
- *Hands free wavelength tuning*
- *High contrast pulses without any additional improvement equipment*

APPLICATIONS

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

Ask for separate brochure

SPECIFICATIONS

Model	UltraFlux FT031k	UltraFlux FT31k	UltraFlux FT61k	UltraFlux FT141k
MAIN SPECIFICATIONS [1]				
Output energy [2]				
Signal	300 µJ	3 mJ	6 mJ	14 mJ
SH output [3]	60 µJ	0.6 mJ	1.5 mJ	3.5 mJ [4]
TH output [3]	15 µJ	150 µJ	0.4 mJ	1.2 mJ [4]
FH output [3]	3 µJ	30 µJ	100 µJ	300 µJ [4]
Pulse repetition rate	1 kHz			
Wavelength tuning range				
Signal [5]	750 – 960 nm			
SH output [3]	375 – 480 nm			
TH output [3]	250 – 320 nm			
FH output [3]	210 – 230 nm			
Scanning steps				
Signal	5 nm			
SH output [3]	5 nm			
TH output [3]	3 nm			
FH output [3]	2 nm			
Pulse duration [5] [7]	40 ± 20 fs			
Pulse energy stability [8]	≤ 1.5 %	≤ 1 %		
Long-term power drift [9]	± 1.5 %			
Beam spatial profile	Gaussian	Super-Gaussian [10]		
Beam diameter [11]	~ 2 mm	~ 5 mm	~ 7 mm	~ 15 mm
Beam pointing stability [12]	≤ 30 µrad			
Temporal contrast [13]				
APFC (within ± 50 ps)	10^7 : 1			
Pre-pulse (≤ 50 ps)	10^9 : 1			
Post-Pulse (>50 ps)	10^8 : 1			
Optical pulse jitter [14]				
Trig out	≤ 50 ps			
Pre-Trig out	≤ 10 ps			
With –PLL option	≤ 3 ps			
Polarization	Linear, Horizontal			
PHYSICAL CHARACTERISTICS [15]				
Laser head size (W×L×H mm)	750 × 1200 × 300	900 × 1500 × 300	900 × 1800 × 300	1200 × 2000 × 300
Power supply size (W×L×H mm)	553 × 600 × 850			553 × 600 × 1250
Umbilical length [16]	2.5 m			
OPERATING REQUIREMENTS [17]				
Electrical power	200 – 240 V AC, single-phase, 47 – 63 Hz		208, 380 or 400 V AC, three-phase, 50/60 Hz [18]	
Power consumption [19]	≤ 1 kVA	≤ 2 kVA	≤ 5 kVA	≤ 8 kVA
Water supply	not required			≤ 5 l/min, 2 Bar, max 20 °C
Operating ambient temperature	22 ± 2 °C			
Storage ambient temperature	15 – 35 °C			
Relative humidity (non-condensing)	≤ 80 %			
Cleanness of the room	ISO Class 7			

1) Due to continuous improvement, all specifications are subject to change without notice. The parameters marked 'typical' are indications of typical performance and will vary with each unit we manufacture. Presented parameters can be customized to meet customer's requirements.

2) Maximum pulse energy specified at 840 nm, SH output at 420 nm, TH output at 280 nm and FH output at 210 nm.

3) Harmonic outputs are optional. Specifications valid with respective harmonic module purchased. Outputs are not simultaneous. Maximum harmonic energy depends on OPCPA signal beam profile and pulse duration.

4) Maximum pump energy for harmonics limited to 10 mJ @ 840 nm.

5) Optional extended tuning range of 700 – 1010 nm available upon request.

6) Standard pulse duration changes though the wavelength range – shortest pulse duration is achieved ~840 nm spectral range.

7) Separate 'F10' option can be ordered to reduce pulse duration to ≤ 10 fs. Wavelength tunability not available with 'F10' option.

8) Under stable environmental conditions, normalized to average pulse energy (RMS, averaged from 60 s).

9) Measured over 8 hours period after 30 min warm-up when ambient temperature variation is less than ±2 °C.

10) Super-Gaussian spatial mode of 6-11th order in near field.

11) Beam diameter is measured at signal output at $1/e^2$ level for Gaussian beams and FWHM level for Super-Gaussian beams.

12) Beam pointing stability is evaluated as movement of the beam centroid in the focal plane of a focusing element (RMS, averaged from 30 s).

13) Pulse contrast is only limited by amplified parametric fluorescence (APFC) in the temporal range of ~90 ps which covers OPCPA pump pulse duration and is better than 106:1. APFC contrast depends on OPCPA saturation level. Our OPCPA systems are ASE-free and pulse contrast value in nanosecond range is limited only by measurement device capabilities (third-order autocorrelator). There are no pre-pulses generated in the system and post-pulses are eliminated by using wedged transmission optics.

14) Optical pulse jitter in respect to electrical outputs:
– Trig out > 3.5 V @ 50 Ω
– Pre-Trig out > 1 V @ 50 Ω
– PLL option > 1 V @ 50 Ω

15) System sizes are preliminary and depend on customer lab layout and additional options purchased.

16) Longer umbilical with up to 10 m for flash lamp pumped and up to 5 m for diode pumped systems available upon request.

17) The laser and auxiliary units must be settled in such a place void of dust and aerosols. It is advisable to operate the laser in air conditioned room, provided that the laser is placed at a distance from air conditioning outlets. The laser should be positioned on a solid worktable. Access from one side should be ensured.

18) Voltage fluctuations allowed are +10 % / -15 % from nominal value.

19) Required current rating can be calculated by dividing power rating by mains voltage. Power rating is given in apparent power (kVA) for systems with flash lamp power supplies and in real power (kW) for systems without flash lamp power supplies where reactive power is neglectable.

OPTIONS

Option	Description	Comment
-F10	Short Pulse option reduces output pulse duration to ≤ 10 fs	Wavelength tunability not available with 'F10' option
-CEP	CEP stabilization to ≤ 400 mrad	Passive and active CEP stabilization
-DM	'Deformable Mirror' option for Strehl ration improvement to > 0.9	
-SH/TH/FH	Second, third and fourth harmonic outputs	Conversion efficiency from signal respectively ~20 %, ~5 % and ~1 %. Harmonic outputs not simultaneous with signal output
-ps out	Additional ps output that is optically synchronized to main system output	Can be simultaneous and non-simultaneous to the main system output
-AW	Air-Water cooling	No external water required. Heat dissipation equals total power consumption

PEFORMANCE

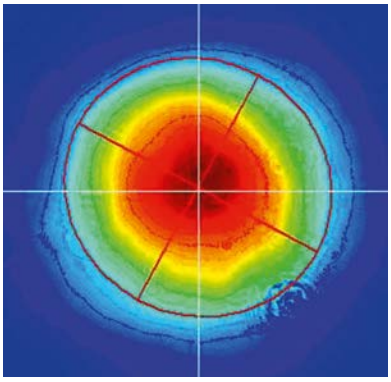

Fig 1. Typical UltraFlux FT031k near field beam profile

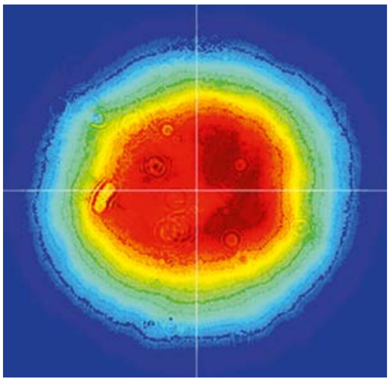

Fig 2. Typical UltraFlux FT31k near field beam profile

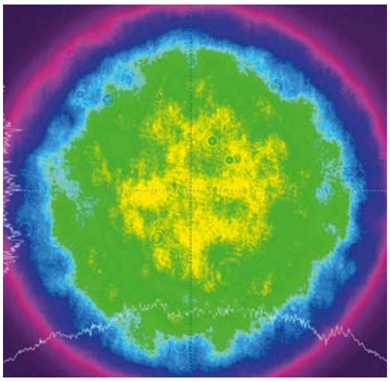

Fig 3. Typical UltraFlux FT61k and FT141k near field beam profile

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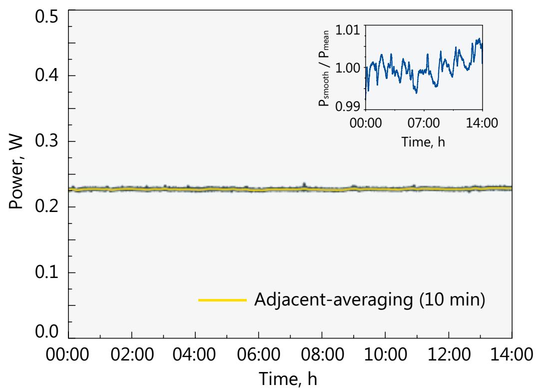

Fig 4. Long-term power stability measurement at 800 nm wavelength

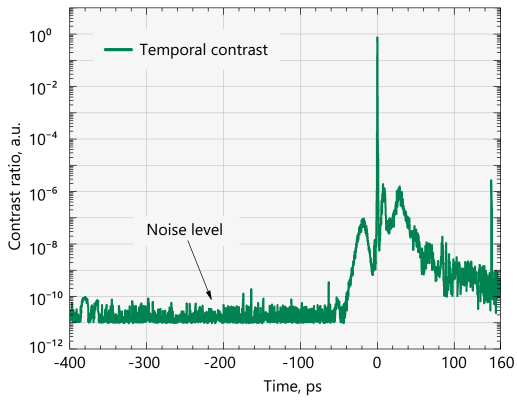

Fig 5. Typical temporal contrast of UltraFlux systems

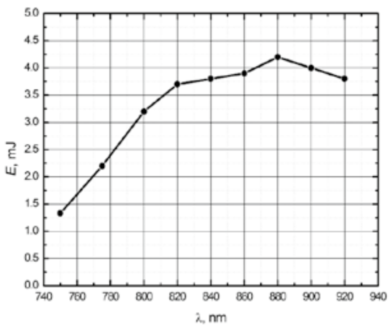

Fig 6. Typical tuning curve of UltraFlux FT31k laser system

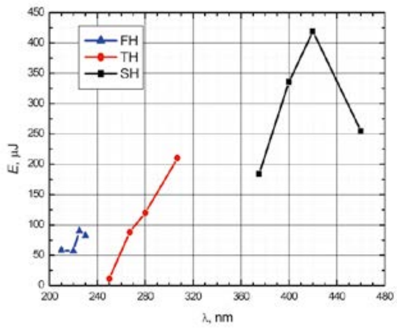

Fig 7. Typical energies of UltraFlux FT31k second, third and fourth harmonic outputs

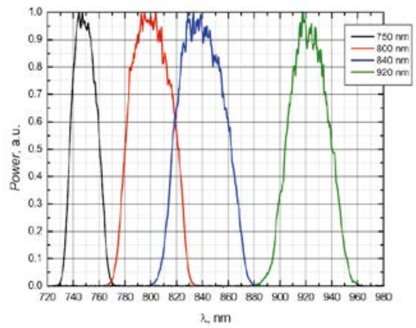

Fig 8. Typical output spectra of UltraFlux FT031k system at multiple wavelengths

Fig 9. Typical external view of UltraFlux FT031k system (actual design might vary)

UltraFlux 1k

OUTLINE DRAWINGS

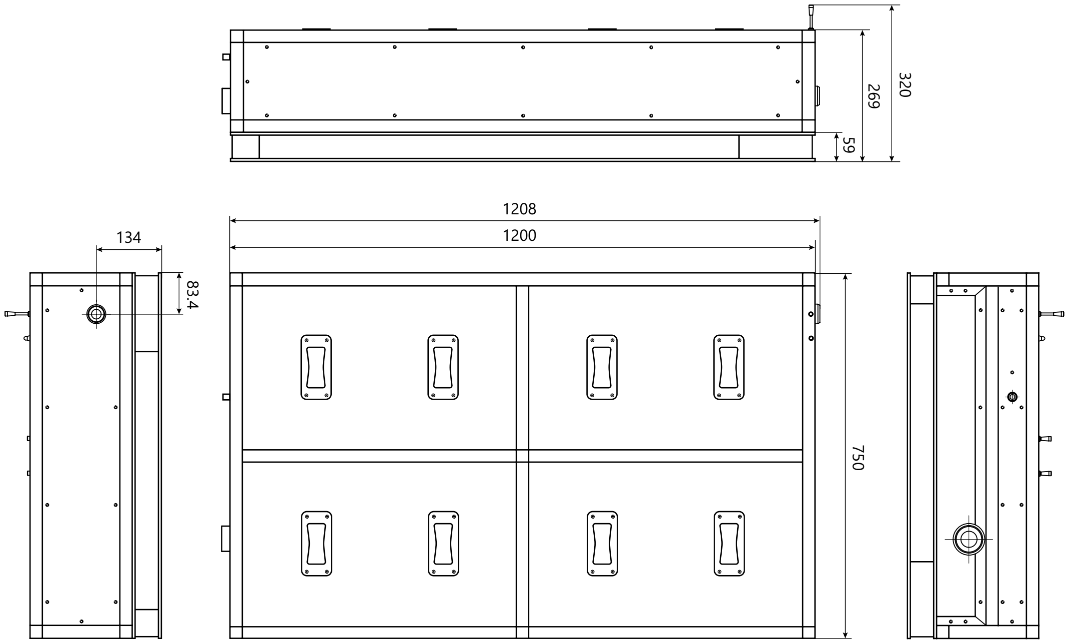

Fig 10. Typical UltraFlux FT031k laser system external dimensions

POWER SUPPLY

Cabinet	Usable height	Height H, mm	Width W, mm	Depth D, mm
MR-9	9 U	455.5 (519 [1])	553	600
MR-12	12 U	589 (653 [1])	553	600
MR-16	16 U	768 (832 [1])	553	600
MR-20	20 U	889 (952 [1])	553	600
MR-25	25 U	1167 (1231 [1])	553	600

[1] Full height with wheels.

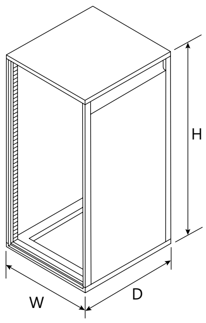

Fig 11. Typical UltraFlux laser system power supply dimensions (MR rack used depends on the laser model)

ORDERING INFORMATION

Note: Laser must be connected to the mains electricity all the time. If there will be no mains electricity for longer that 1 hour then laser (system) needs warm up for a few hours before switching on.

UltraFlux FT (2)(3)-(4)

Model

Any additional options:
See 'Options' table

Wavelength:
FT → tunable wavelength

Pulse repetition rate:
1k → 1 kHz

Energy level:
03 → 300 μJ
3 → 3 mJ
6 → 6 mJ
14 → 14 mJ