

SMR Series Femtosecond Pulse Fiber Lasers

1. 1560nm Femtosecond Pulse Fiber Laser

E-fiber series ultrafast lasers integrate the latest femtosecond laser technology. The stable output of 1560 nm femtosecond pulse laser is realized by using high-performance erbium-doped fiber as working medium and high-precision dispersion compensation technology. The output laser pulse has the characteristics of extremely narrow duration and high pulse peak power. The laser is a turnkey product with long-term stable operation and maintenance free. It can be widely used in the research fields of optical frequency comb, supercontinuum, terahertz and so on. Specific combination of pulse duration, repetition rate and average power is customizable.

Features

- Pulse duration < 50fs
- 1560 nm wavelength
- Turn-Key Product
- ALL PM fiber Laser cavity

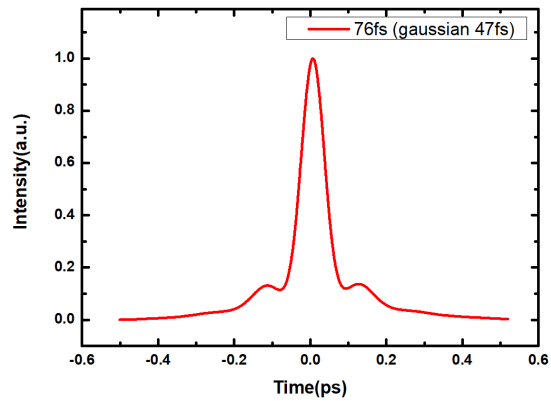
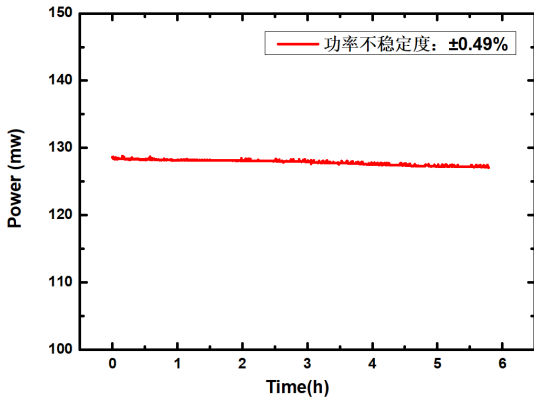
Applications

- Optical Frequency Comb
- Supercontinuum
- THz
- Ultra Fast Laser Research

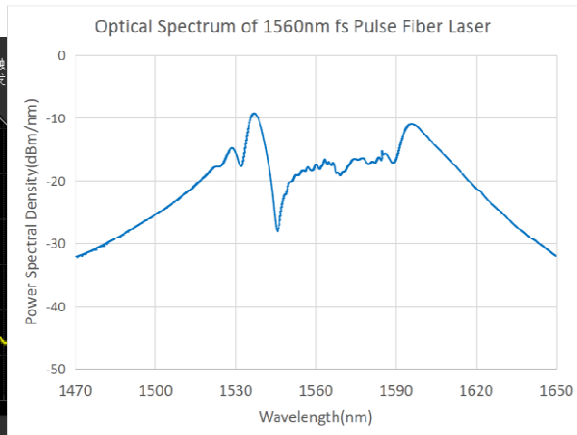
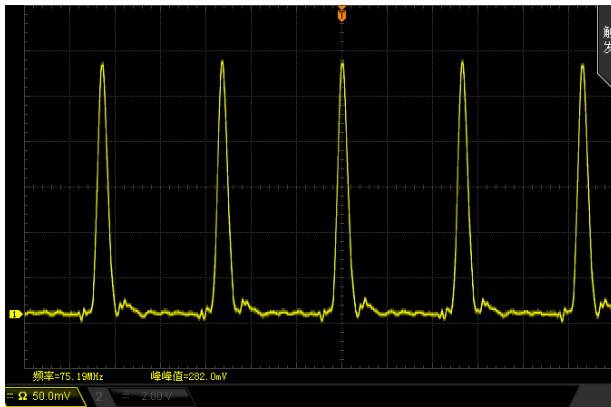


Parameters	Unit	Typical Value		Remarks
Center Wavelength	nm	1560±10		
Spectrum Width	nm	20	60	
Pulse Duration	fs	50/100/200/500		Customizable
Average Power	mW	1~120		Customizable
Power Instability	-	< ±1%		
Repetition Rate	MHz	80		
Repetition Rate Instability	Hz	< 100		
Pulse Energy	nJ	>1		
Polarization	-	Linear		Aligned to Slow Axis
Fiber Type	-	PM Fiber 0.5m	PM Fiber 2m	
Fiber connector	-	FC/APC		
Warm Up time	min	< 1		

General Parameters	Benchtop	Module
Control function	Push Button in Front Panel	RS232 Serial Port
Synchronous electrical signal port	SMA	SMA
Power Supply	AC100~240V, <30W	DC5V, <20W
Dimensions(mm)	260(W)×280(D)×120(H)	200(W)×121(D)×65(H)
Operation Temperature	5 ~ 35°C	
Operation Humidity	0~70%	



Autocorrelation pulse duration < 50fs Power Instability



Pulse Train Typical Optical Spectrum

Ordering Information/Product Code						
SMR-FSPL	WL (nm)	Pulse Duration(fs)	Power(mW)	Freq (MHz)	Fiber	Packaging
	1560	50/100/200/500	10/50/100	80/100	SM PM	B=Benchtop M=Module

2. 1560nm High-Power Femtosecond Pulse Fiber Laser

E-fiber series ultrafast lasers integrate the latest femtosecond laser technology. The stable output of 1560 nm femtosecond pulse laser is realized by using high-performance erbium-doped fiber as working medium and high-precision dispersion compensation technology. The average power can be 1 Watt. The laser is a turnkey product with long-term stable operation and maintenance free. It can be widely used in the research fields of optical frequency comb, supercontinuum, terahertz and so on. Specific combination of pulse duration, repetition rate and average power is customizable.

Features

- Pulse duration < 120fs
- Average Power 1W
- Turn-Key Product
- ALL PM fiber Laser cavity

Applications

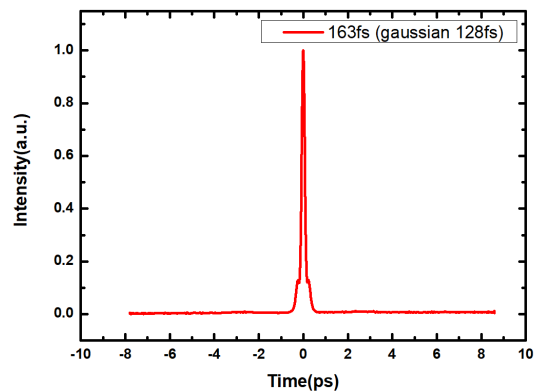
- Optical Frequency Comb
- Supercontinuum Light
- THz Generation
- Ultra Fast Laser Research



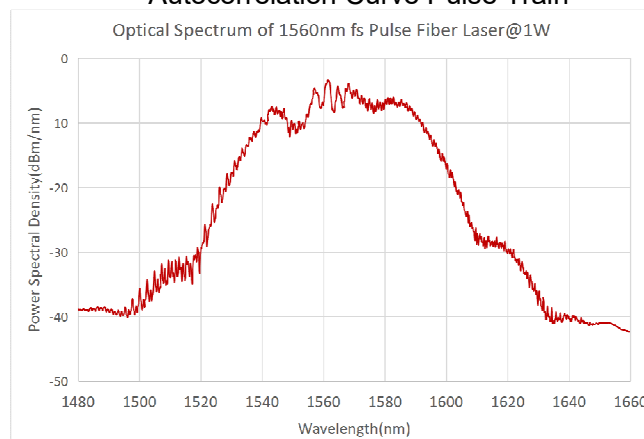
Parameters	Unit	Typical Value	Remarks
Center Wavelength	nm	1560±10	

Pulse Duration	fs	≤120	Customizable
Average Power	W	1	Customizable
Power Instability	-	< ±1%	24h@25°C
Repetition Rate	MHz	80~100	Customizable
Pulse Energy	nJ	>10	
Polarization	-	Line	Vertical
DOP	dB	>20dB	
Output	-	Free Space	
M ²	-	<1.2	TEM00
Beam Diameter	mm	≤1.6	* 1/e ² Waist Diameter
Divergence Angle	mrad	<1.5	
Warm Up time	min	< 1	

General Parameters	Unit	Value	Remarks
Synchronous signal Port	-	SMA	
Operation temperature	°C	5 ~ 45	
Power Supply	-	AC 110~240VAC	Power <40W
Dimension	mm	330(W)×398(D)×112(H)	Benchtop
Weight	kg	≤5	



Autocorrelation Curve Pulse Train



Optical Spectrum

Ordering Information/Product Code						
SMR-FSPL	WL(nm)	Pulse Duration(fs)	Power(mW)	Freq (MHz)	Fiber	Packaging
	1560	120	1000	80/100	FS=Free Space	B=Benchtop

3. 1560nm High Frequency Femtosecond Pulse Fiber Laser

E-fiber series ultrafast lasers integrate the latest femtosecond laser technology. The stable output of 1560 nm femtosecond pulse laser is realized by using high-performance erbium-doped fiber as working medium and high-precision dispersion compensation technology. The laser has high repetition rate. The laser is a turnkey product with long-term stable operation and maintenance free. It can be widely used in the research fields of optical frequency comb, supercontinuum, terahertz and so on. Specific combination of pulse duration, repetition rate and average power is customizable.

Features

- Pulse duration 50~500 fs
- Repetition Rate 200MHz~1GHz Customizable
- Turn-Key Product
- ALL PM fiber Laser cavity

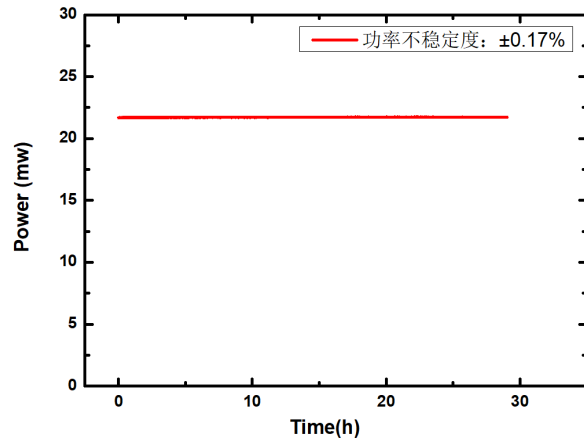
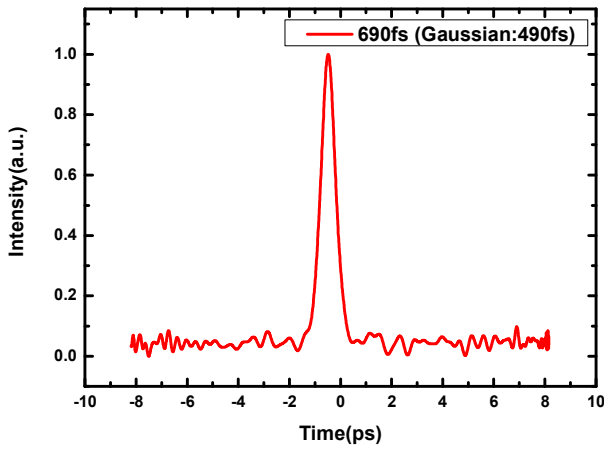
Applications

- Optical Frequency Comb
- Supercontinuum Light
- THz Generation
- Ultra fast Laser Research

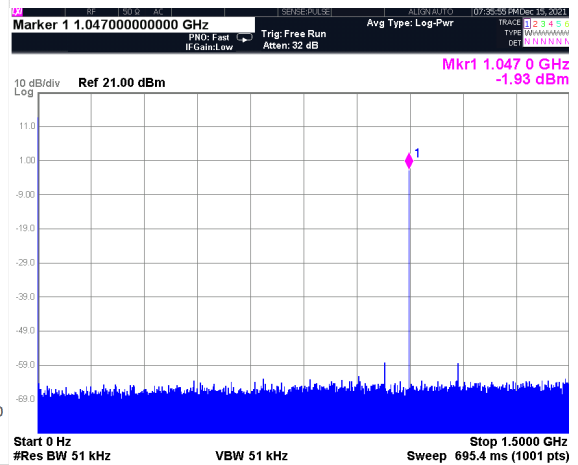
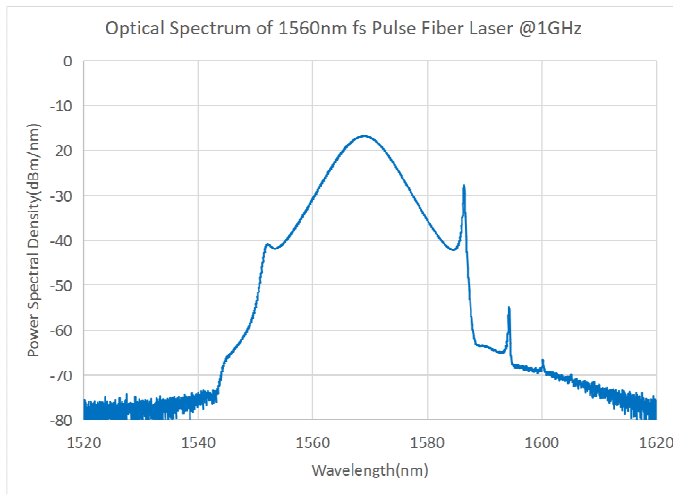


Parameters	Unit	Typical Value	Remarks
Center Wavelength	nm	1560±10	
Spectrum Width	nm	20	
Pulse Duration	fs	50 ~ 500	Customizable
Average Power	mW	1 ~ 200	Customizable
Power Instability	-	< ±1%	
Repetition Rate	MHz	≥ 200	200MHz~1GHz
Repetition Rate Instability	Hz	< 200	
Pulse Energy	nJ	> 1	
Polarization	-	Linear	Aligned to Slow Axis
Fiber Type	-	PM fiber, 1m	
Fiber connector	-	FC/APC	
Warm Up time	min	< 1	

General Parameters	Benchtop	Module
Control function	Push Button in Front Panel	RS232 Serial Port
Synchronous electrical signal port	SMA	SMA
Power Supply	AC100~240V, <30W	DC5V, <20W
Dimensions(mm)	260(W)×280(D)×120(H)	200(W)×121(D)×65(H)
Operation Temperature	5 ~ 35°C	
Operation Humidity	0~70%	



Autocorrelation Curve Power Stability



Frequency Optical Spectrum

Ordering Information/Product Code						
SMR-FSPL	WL(nm)	Pulse Duration(fs)	Power(mW)	Freq (MHz)	Fiber	Packaging
	1560	50/100/200/500	10/50/100	200/600/1000	SM PM	B=Benchtop M=Module

4. 1560nm Picosecond Pulse Fiber Laser

Specific combination of pulse duration, repetition rate and average power is customizable.

Features

- Pulse Duration 1~100ps
- Center Wavelength 1530~1560 nm
- Turn-Key Product
- ALL PM fiber Laser cavity

Applications

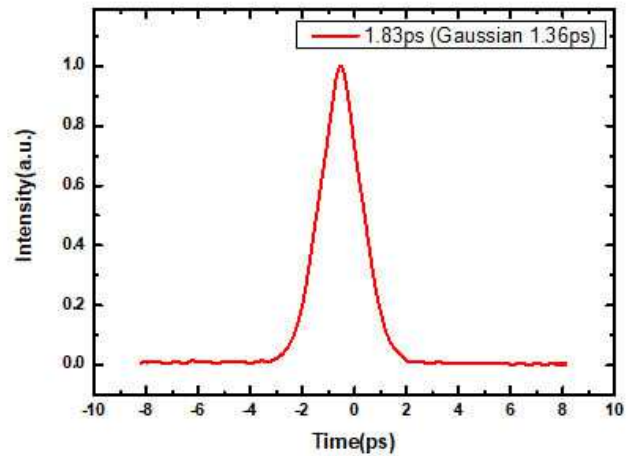
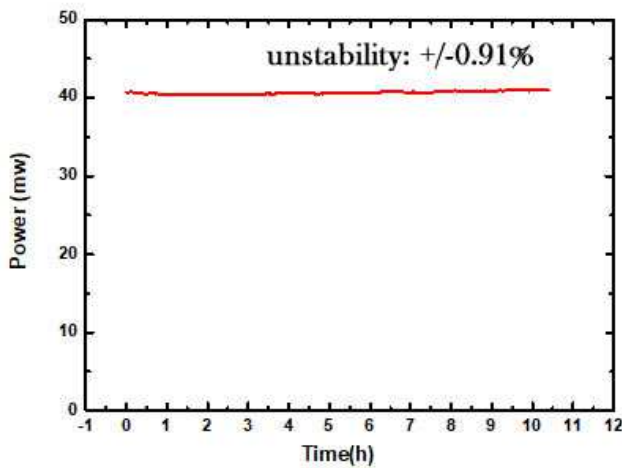
- Optical Frequency Comb
- Supercontinuum Light
- THz Generation
- Ultra fast Laser Research



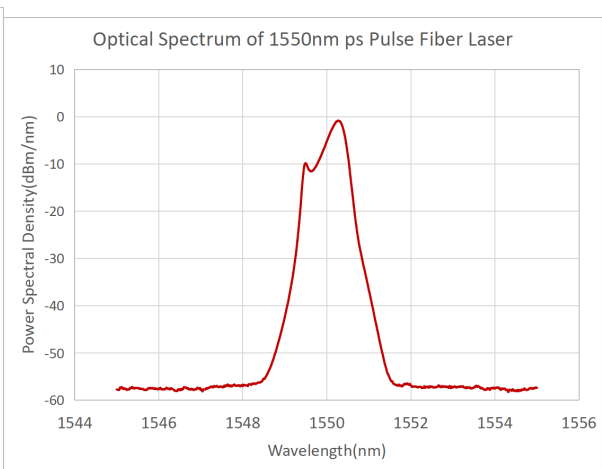
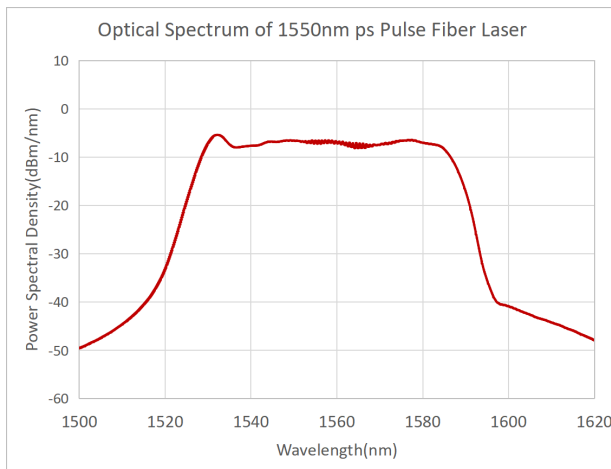
Parameters	Unit	Typical Value	Remarks
Center Wavelength	nm	1530~1560	Customizable
Spectrum Width	nm	0.5~50	
Pulse Duration	ps	1/10/50/100	Customizable

Average Power	mW	1~120	Customizable
Power Instability	-	< ±1%	
Repetition Rate	MHz	80	Customizable
Repetition Rate Instability	Hz	< 100	
Pulse Energy	nJ	>1	
Polarization	-	Linear	Aligned to Slow Axis
Fiber Type	-	PM Fiber	
Fiber connector	-	FC/APC	
Warm Up time	min	< 1	

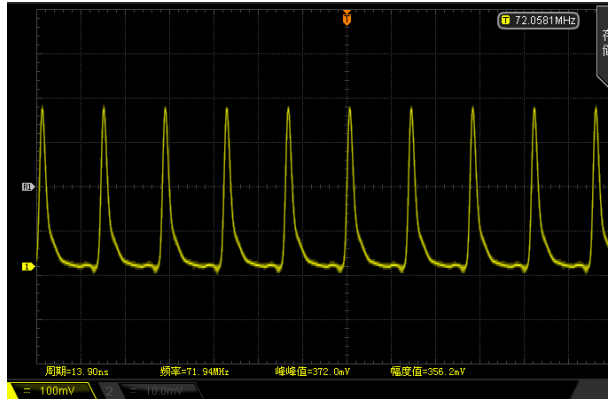
General Parameters	Benchtop	Module
Control function	Push Button in Front Panel	Push Button in Front Panel
Synchronous electrical signal port	SMA	SMA
Power Supply	AC100~240V, <30W	DC5V, <20W
Dimensions(mm)	260(W)×280(D)×120(H)	200(W)×121(D)×65(H)mm
Operation Temperature	5 ~ 35°C	
Operation Humidity	0~70%	



Autocorrelation Curve Power Stability



Optical Spectrum (narrow linewidth) Optical Spectrum (broadband)

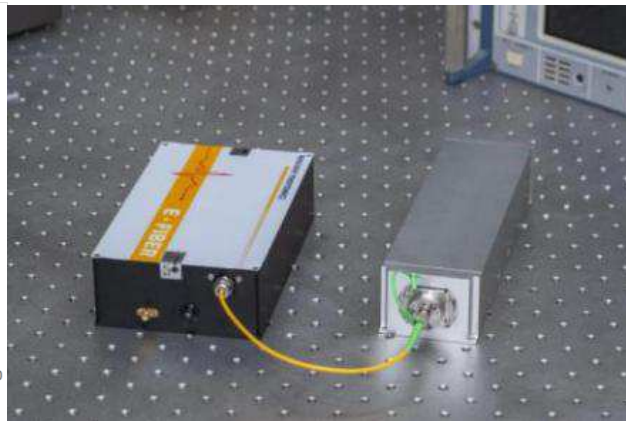
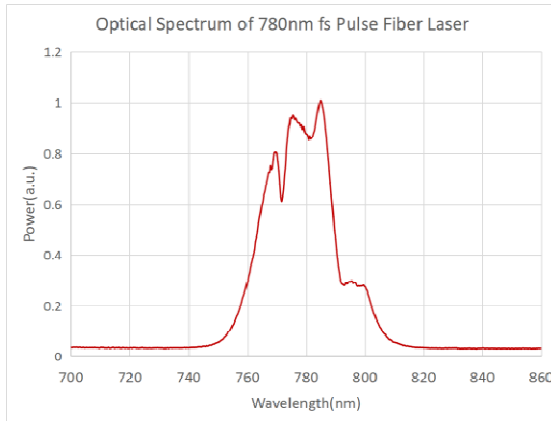


Pulse Train

Ordering Information/Product Code						
SMR-PSPL	WL(nm)	Pulse Duration(fs)	Power(mW)	Freq (MHz)	Fiber	Packaging
	1560	50/100/200/ 500	10/50/100	80/100	SM PM	B= benchtop M=Module

5. 780nm Femtosecond Pulse Fiber Laser

The 780nm is generated by second-harmonic of 1560nm. The laser is a turnkey product with long-term stable operation and maintenance free. It can be widely used in the research fields of optical frequency comb, supercontinuum, terahertz and so on. Specific combination of pulse duration, repetition rate and average power is customizable.



Features

- 100fs
- Turn-Key Product
- All PM fiber Laser cavity

Applications

- multiphoton
- two-photon absorption
- Ultrafast Optics

Parameters	Unit	Typical Value	Remarks
Center Wavelength	nm	780±10	
Spectrum Width	nm	20	
Pulse Duration	fs	<100	Customizable
Average Power	mW	>30	Customizable
Power Instability	-	< ±1%	
Repetition Rate	MHz	80	Customizable

Repetition Rate	Hz	< 100	
Instability			
Pulse Energy	nJ	> 0.4	
Polarization	-	Linear	
Fiber Type	-	Free Space	
Fiber connector	min	< 1	

General Parameters	Benchtop	Module
Control function	Push Button in Front Panel	Push Button in Front Panel
Synchronous electrical signal port	SMA	SMA
Power Supply	AC100~240V, <30W	DC5V, <20W
Dimensions(mm)	260(W)×280(D)×120(H)mm	200(W)×121(D)×65(H)mm
Operation Temperature	5 ~ 35°C	
Operation Humidity	0~70%	

Ordering Information/Product Code						
SMR-FSPL	WL (nm)	Pulse Duration(fs)	Power (mW)	Freq (MHz)	Fiber	Packaging
	780	50/100/200/500	1/10/50/100	80/100	FS=Free Space	B= benchtop M=Module

FSM Series Femtosecond Mode-Locked Fiber Lasers

1. Femtosecond Mode Locked Seeder

The Femtosecond Mode Lock Fiber Laser is a compact, high-reliability laser featuring an all-fiber design (no bulk optics) with a center wavelength of 1030 nm at an average output power of 10mW, repetition rate of 25 MHz with pulse duration of 600 fs.



Applications

- Mode-locked Seeder for High-Power, High Reliability Systems
- Biomedical and Biological Imaging
- Multiphoton Microscopy
- Ultrafast Spectroscopy
- Terahertz Imaging
- Optical Metrology
- Microfabrication and micromachining
- Material Characterization

Features

- All-Fiber Design for Greatly Improved Laser Lifetime
- Femtosecond Pulsed Output on PM Fiber
- Superior Beam Quality
- Compact Size
- Optical Tap Output and GUI Control Included

Specifications

- Central Wavelength: 1030nm
- Repetition Rate: 25MHz
- Pulse Duration: 600 to 800fs
- Output Power: 3 to 10mW

2. High Power Femtosecond Mode Locked Fiber Lasers

The 920nm and 1190nm are made up of two modules: 2RU pump module 440 x 343 x 92 (mm), and the Femtosecond Fiber Laser - 284 x 324 x 116 (mm).

The high-power Mode Locked Femtosecond Fiber Lasers operate at the 920nm and 1190 nm spectral range - which is traditionally covered by ultrafast Ti:Sapphire lasers and optical parametric oscillators. They generate linearly polarized nearly transformed-limited pulses with a pulse duration of 200 fs, at a repetition rate of 80 MHz, and an average power of 1 W.

Compact and maintenance-free, the lasers are fiber-based, have a very good beam profile, and do not require optical alignment.

The Femtosecond Fiber Laser is a natural product extension with its extensive suite of our visible fiber lasers developed for the microscopy industry, and its existing line of Picosecond Pulsed Mode Locked Fiber Lasers.



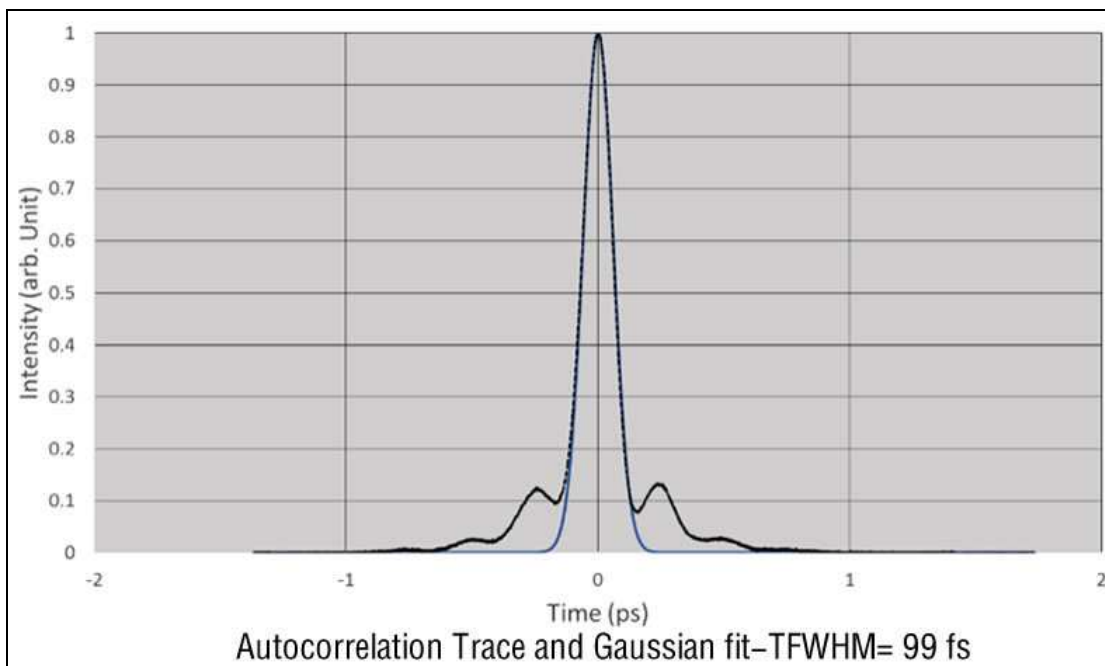
Features

- 920 nm and 1190 nm MLFL
- Emits sub 200-femtosecond optical pulses
- Repetition rate of 80 MHz or custom
- Average output power of 1 W at the central wavelengths of 920 nm and 1190 nm

Applications

- Multi-photon Microscopy
- Ultra-fast Spectroscopy
- Terahertz Imaging
- Can be used as a seed source for Titanium–Sapphire systems

Part number	FSM-MLFL-920-femto	FSM-MLFL-1190-femto	
Central Wavelength	920	1190	nm
Repetition Rate	80	90	MHz
Pulse Duration	100	200	fs
Average Output Power	≥ 1	≥ 1	W
Spec. Width	10	10	nm
Beam Diameter	1	1	mm
Polarization	Linear, 99	Linear, 99	%



PSM Series Picosecond Mode-Locked Fiber Lasers

Our picosecond passively Mode-Locked Fiber Lasers (MLFL) are designed to address a range of market applications including semi-conductor inspection, micro-machining, metrology, multi-photon spectroscopy, and can be used as a seed source for optical amplifiers, and second harmonic generation.

Based on an all-fiber design, our laser is highly reliable (10,000 hrs) and maintenance-free.



Features

- Self-starting
- Low amplitude noise
- Spectrally transform-limited pulse widths without CW light content
- Linearly-polarized, environmentally-stable output
- Compact
- Low power consumption

Applications

- Biomedical and Chemistry (multi-photon microscopy, ultra-fast spectroscopy)
- Micro-Machining (semiconductor wafer and transparent materials processing)
- Tera-Hertz Generation (material defect imaging, security)
- Time Response Characterization
- High-Speed Optical Sampling
- Metrology

Specification Overview

Our picosecond Mode-Locked Fiber Lasers are available with customized specifications within the following range:

- Emission Wavelength: 1020 to 1100nm
- Pulse Duration: 2 to 50 ps
- Average Output Power
 - Seed Only: 2 - 20mW
 - with Preamplifier: 150mW
 - with Booster: 3000mW
- Repetition Rate: 30 to 100MHz
- Polarization: Linear

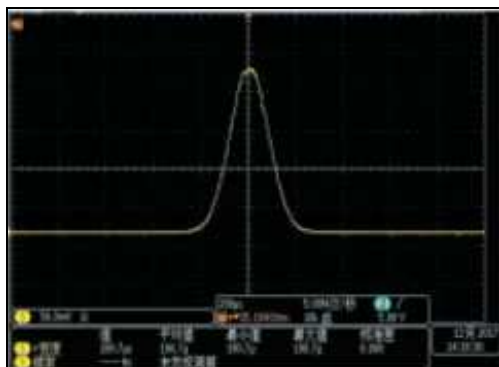
PSZ Series Diode-pumped High-frequency Pico-second Lasers

The diode pumped pico-second lasers is a laser with pulse width <math><5\text{ps}</math>, pulse repetition rate 10-100kHz, beam quality factor $M^2 < 1.2$. The laser is the first choice for sapphire cutting , LED etching, remote rangefinding, physics & chemistry, material science, photonics.

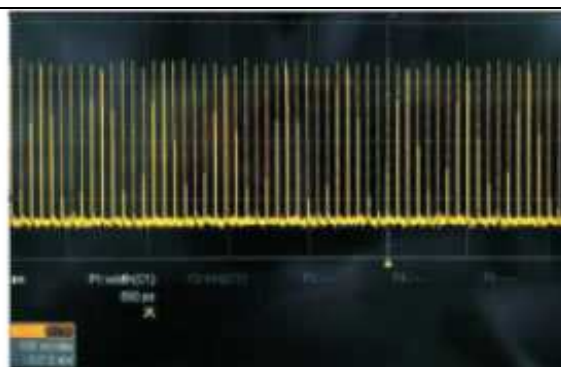


Features

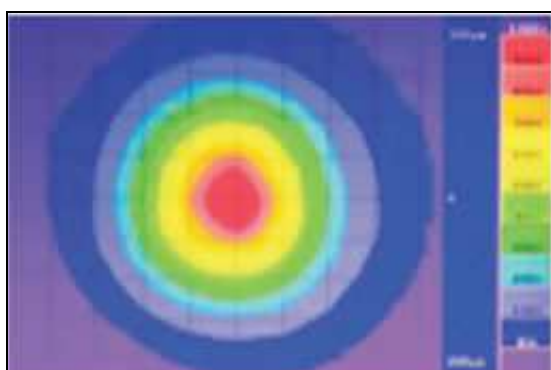
- Electrically-controlled laser wavelength conversion
- Adjustable high-frequency
- Multi-stage amplifiers



pulse shape (4.18ps)



mode locked waveform



beam energy distribution



$M^2 < 1.2$

Specifications:

Model	PSZ-1064-10, PSZ-532-6	PSZ-1064-30, PSZ-532-18
Wavelength	1064nm/532nm	1064nm/532nm
Average power	10W@1064nm; 6W@532nm	30W@1064nm; 18W@532nm
Pulse repetition rate	10-100kHz	10-100kHz
Power stability	≤0.5%	≤0.5%
Pulse width	≤5ps	≤5ps
Polarization	Horizontal	Horizontal
Beam quality M2	≤1.2	≤1.2
Beam mode	TEM00	TEM00
Cooling	Water	Water
Pumping	Diode pumping	Diode pumping
Dimension (laser head)	1158x352x212mm	1358x452x212mm

Model	PSZ-1064-2, PSZ-532-1
Wavelength	1064nm/532nm (2 exits, electrically switching)
Pulse energy	≥2mJ@1064nm; ≥1mJ@532nm
Power stability	≤3%
Pulse repetition rate	2kHz
Pulse width	≤15ps
Polarization	Horizontal
Beam divergence	≤0.5mrad
Beam diameter	≤2mm
Beam mode	TEM00
Cooling	Water
Pumping	Diode pumping
Power input	220VAC/25A/50Hz
Dimension (laser head)	481x314x125mm
Weight (laser head)	<15kg

The above lasers are typical lasers and please contact us to discuss your requirements if you have any specific demands. We can customize the lasers according to your needs.

FSF Series High Power Femtosecond Fiber Laser

1. FSF Series High-power Femtosecond Fiber Lasers

FSF series high-power fs fiber laser is a 1030 nm high-power femtosecond fiber laser delivering up to 160µJ at 20W. With truly monolithic all-fiber front-end this laser provides fast warm-up time, unprecedented long-term stability and hands-free operation. Contrary to free space laser amplifiers, fiber amplifiers ensure unbeatable beam pointing stability even in harsh environment.

The laser is the right choice whenever there is a need for the high power and high pulse energy while maintaining a very short pulse duration. Some applications include:

- Micromachining
- Glass cutting
- Surface structuring
- Ophthalmology
- Non-linear optics
- Pumping of Optical Parametric Amplifiers

Options:

- Automated pulse duration tuning
- Second Harmonic Generation output
- Third Harmonic Generation output
- Fourth Harmonic Generation output

If you require continues wavelength tuning, please contact us for more information.



	FSF-1030-10	FSF-1030-20	FSF-1030-30
Maximum average power	> 10 W	> 20 W	> 30 W
Maximum pulse energy	> 50 µJ	> 50 µJ	> 100 µJ
System base repetition rate	100 kHz – 25 MHz, selectable with control software		
Pulse duration	< 250 fs (FWHM)		
Pulse duration tuning	Option: Ask for details		
Central wavelength	1030 ± 5 nm		
Optional wavelength outputs	515 nm, 343 nm, 258 nm		
Built-in pulse picker	Pulse on demand, any division of the base repetition rate		
Beam quality M2	< 1.3		
Polarization	Linear, vertical		
External gating trigger	Included		
Laser control software	Included		
Laser head size	1096x446x97mm (LxWxD)		
Power supply size	3U 19" rack unit: 485x376x132mm (LxWxD)		
Electrical	100-240VAC, 50/60Hz, <250W		
Operating temperature	15-35°C		
Operating humidity	Non-condensing		
Chiller size	3U 19" rack unit: 485x381x132mm (LxWxD)		
Electrical	100-240VAC, 50/60Hz, <10A		

We also have the laser with power up 100W. Please contact us for more information.



2. FSF Series Low-power Femto-second Fiber Lasers

FSF series fiber laser is a compact, single-box, all-fiber femtosecond laser, specifically designed to meet the most demanding applications in the field of neuroscience, bio-photonics, microscopy and engineering. With pulses as short as $< 180\text{fs}$, average power up to 2W at 1030nm and option of second harmonic at 515nm, it is an irreplaceable tool in every lab that needs a reliable, turn-key, ultrafast light source. Thanks to its unique construction and SESAM-free technology it is a cost-effective solution that provides high pulse energy (up to 100nJ) with an excellent beam quality. Our industrial design facilitates easy integration with both experimental and commercial systems.

The laser can be used in applications that need pure and stable laser pulses. This includes:

- Multi-photon imaging & excitation
- Neuroscience
- Optogenetics

Features:

- Truly all-fiber, SESAM-free construction
- Pulse energy up to 100 nJ
- Power up to 2 W
- Pulse duration $< 190\text{ fs}$
- One-box, compact, turn-key solution



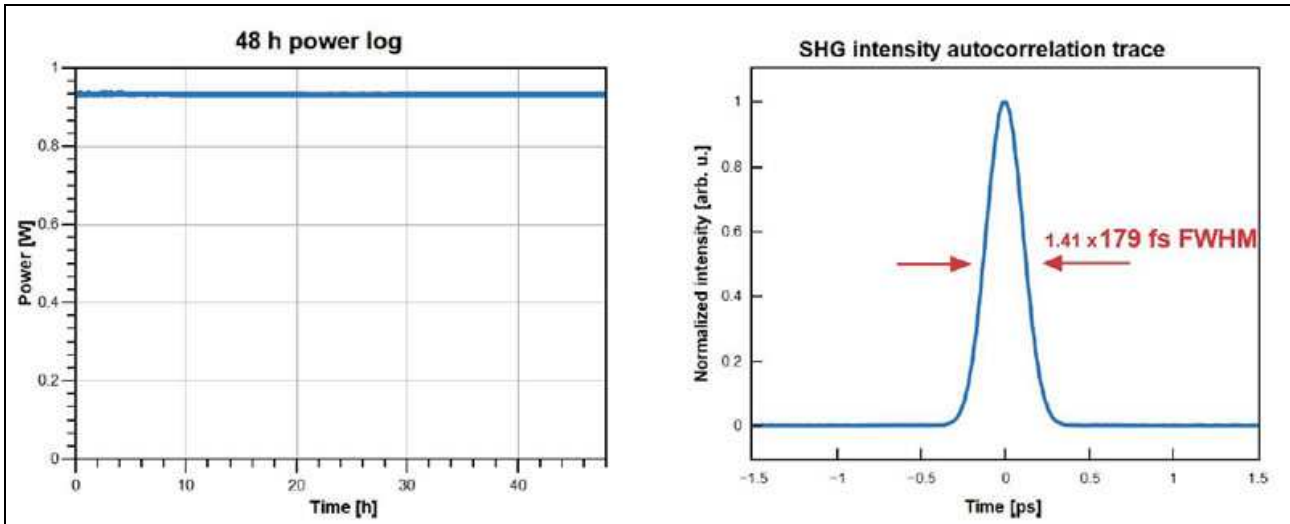
Part number	FSF-1030-0.7	FSF-1030-2
Maximum average power	$> 700\text{mW}$	$> 2\text{W}$
Maximum pulse energy	$> 35\text{nJ}$	$> 100\text{nJ}$
Pulse duration	$< 200\text{fs}$ ($< 170\text{fs}$ option)	$< 250\text{fs FWHM}$
System base repetition rate	$20 \pm 2\text{ MHz}$	
Central wavelength	$1030 \pm 5\text{ nm}$	
Optional wavelength outputs	515 nm, 343 nm, 258 nm	
Beam quality M2	< 1.2	
Polarization	Linear, vertical	
Power supply	Standard 24VDC	
Weight	3kg	
Size	350x230x60mm (LxWxD)	
Electrical	100-240VAC, 50/60Hz, $< 50\text{W}$	
Operating temperature	$15\text{-}35^\circ\text{C}$	
Operating humidity	Non-condensing	

Laser control software included

Options:

- Shorter pulse option $< 170\text{ fs}$
- Higher-harmonic generation option
- module converting the 1030 nm output wavelength into 515 nm, 343 nm or 258 nm. Changes the scope of the output power.
- Automated GDD pre-compensation option

- Computer controlled GDD pre-compensation tuning 10.000 to -50.000 fs²



3. FSF Series 1030 nm Industry Grade Femtosecond Oscillators

This is not a usual laser. This is the superhero of laser oscillators. It has special superpowers that make it stand out from the crowd. Super-short yet ultra-fast. Small in size but very stable and robust. The earth may tremble but the laser will operate as usual. Same power, same pulse and no degradation over many years. Meet our Oscillator – the first SESAM-free and truly-all-fiber 1030 nm ultrafast laser.

This oscillator was specifically developed to be the rock-solid heart of the SFS series amplified system. It is built upon our truly-all-fiber technology, with no degradable components inside and no SESAM. The oscillator is equipped with a special self-starting solution ensuring the laser mode-locks every time. This feature together with the low size and power consumption makes the Oscillator perfect for OEM applications.

The Oscillator can be used in applications that need pure and stable laser pulses. Applications include:

- Seeding amplifiers
- Neuroscience
- Two photon imaging
- Ultrafast science



Features:

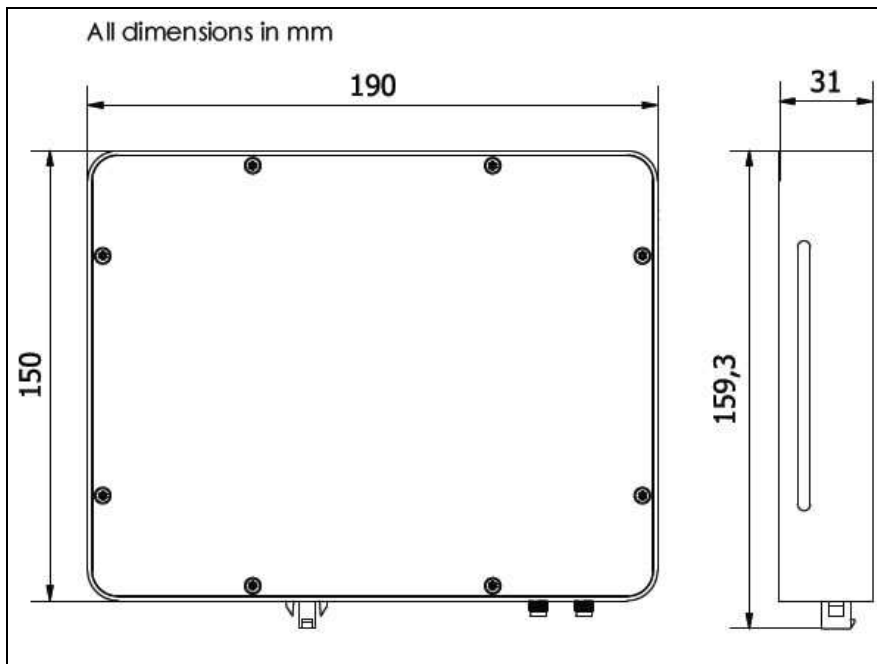
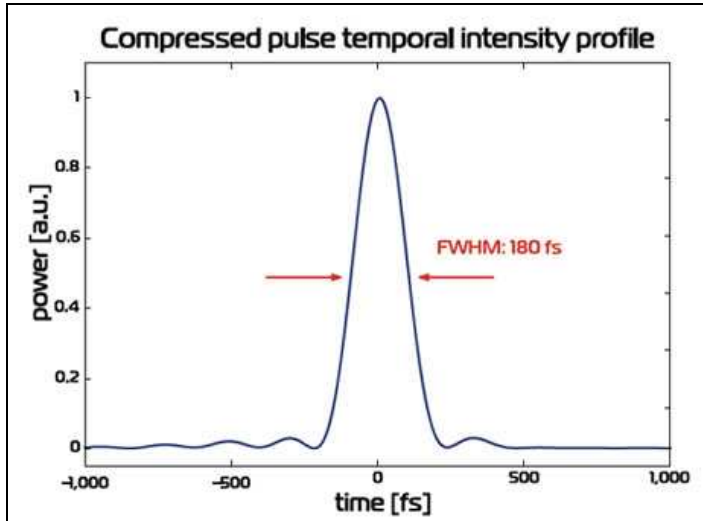
- Truly all-fiber construction
- Extreme endurance to shock and vibration
- Long lifetime with no degradable components
- High temperature stability
- Small footprint
- Self-starting, OEM-ready product
- Every laser we produce is subject to rigorous tests.

Options:

- Ultra-short pulse option <190fs: output compressor module allowing the compression of output chirped pulses. Changes the scope of the fiber output into the free-space output.
- Higher-harmonic generation option: module converting the 1030 nm output wavelength into 515 nm, 343 nm or 258 nm. Changes the scope of the output power.
- Pulse duration adjustment option: allows to adjust the pulse duration. Only available with the "ultra-short pulse option".
- Remote control console: key-switch, warning light, interlock equipped console for the non-OEM use.

Specifications:

- Type of output: fiber connector
- Pulse duration: chirped pulse (compression option available <190fs)
- Maximum average power: >25mW
- Pulse energy: >2.5nJ
- Polarization: linear, vertical
- Central wavelength: $1030 \pm 5\text{nm}$
- Optional wavelength outputs: 515nm, 343nm, 258nm
- Repetition rate: 20 MHz (other on request)



4. FSF Series Optical Parametric Amplifiers

Our optical parameter amplifier is a device that precisely converts ultrafast pulses of one band (e.g. 1030 nm pulses coming from FSF series femto-second lasers) into a set of pulsed laser beams tunable in an extremely broad spectrum of wavelengths, ranging from 210nm up to 2600nm. All automated, all software-controlled.

Growing number of ultrafast spectroscopy techniques has prompted the need for a robust and reliable, self-diagnostic device. The Optical Parametric Amplifier can be fully compatible with most femtosecond lasers and provides automated tuning across the basic tuning range.

Features:

- Quick and precise, all-automated tuning
- Passive and stable
- User-friendly software
- Perfect extension for the SFS series femto-second lasers



The OPA is a versatile piece of equipment, due to its broad range of tuning and high conversion efficiency. When seeded with a reliable ultrafast laser such as our femto-second lasers, it may find use in many applications like pump probe spectroscopy, non-linear optics & neuroscience.

Specifications

	Harmony Basic
Number of outputs	Four, as per table below
Pulse duration of Signal	< 200 fs
Signal bandwidth	< 250 cm^{-1}
Polarization	Linear, horizontal
Beam quality M^2	<1.5*

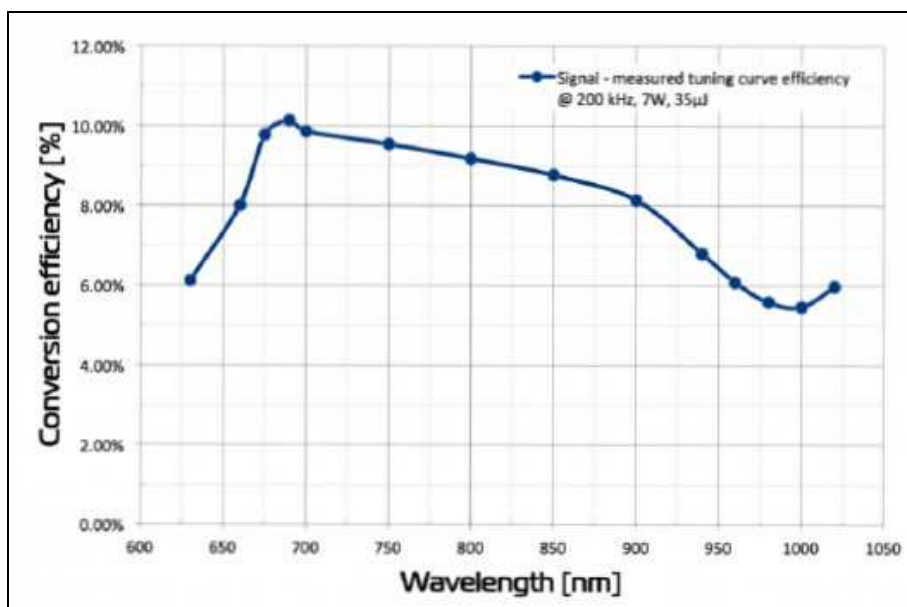
Performance and tuning

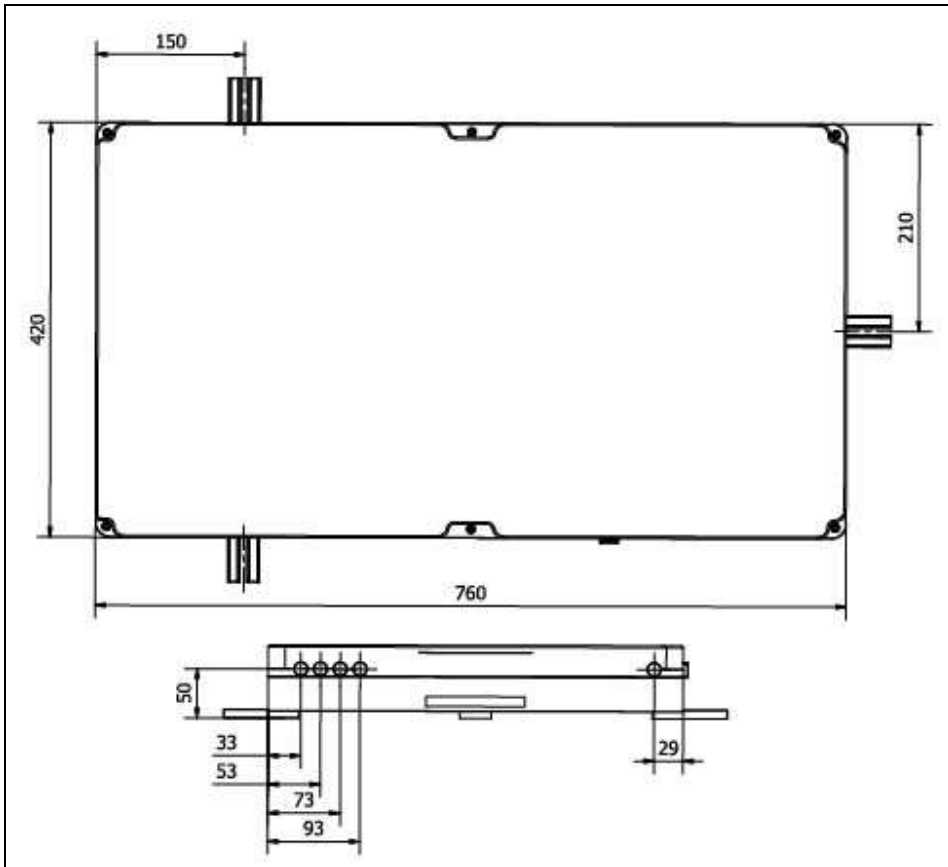
Output	Tuning range	Conversion efficiency**
Signal and idler	630–1020nm and 1040–2600nm	> 5% across tuning range, 12% at peak of tuning range
SH of signal and idler	315 – 510 nm and 520 – 630 nm	> 2% at peak of tuning range
FH of signal and idler	210 – 250 nm and 260 – 310 nm	> 0.5% at peak of tuning range
FH of pump beam	fixed 257 \pm 2 nm	> 5%***

* – for signal and idler

** – combined signal and idler with respect to input pump laser average power at 200 kHz. SH – second harmonic, TH – third harmonic, FH – fourth harmonic

*** – BOL – beginning of lifetime





PSH Picosecond Ultra-fast Lasers

- <10 picosecond pulses
- Long term power stability <3%rms
- High beam quality with $M^2 \leq 1.3$
- Serial Interface

Our PSH series picosecond ultra-fast lasers are robust and affordable. They produce high energy pulses with durations below 10ps. The laser is based on a hybrid optical amplifier architecture that combines the advantages of fiber laser technology with solid state diode pumped multi-pass amplifiers. Compact and water-cooled, this laser is low maintenance and never needs realignment. Special specification can be customized, Our laser is ideal for fast, high precision material processing at an affordable price.



These lasers are widely used in micro-machining, ceramic processing, glass cutting, medical plastic processing, sapphire processing, steel processing, laser deposition, thin film patterning, hard materials machining and so on.

Part Number	PSH-1064-20	PSH-1064-30A	PSH-1064-30B	PSH-1064-50
Wavelength	1064nm	1064nm	1064nm	1064nm
Output Power	>20W@500kHz	>30W@500kHz	>17.5W@50kHz (3 pulses)	>50W@500kHz
Max. Pulse Energy	>100uJ	>100uJ@200kHz	>350uJ@50kHz (3 pulses)	>300uJ@100kHz
Repetition Rates	100kHz-1MHz	200kHz-1MHz	50kHz-100kHz	100kHz-1MHz
Pulse Width	<10ps	<10ps	<10ps	<10ps
Power Stability	$\leq 1\%$ rms	$\leq 1\%$ rms	$\leq 1\%$ rms	$\leq 3\%$ rms
Peak-to-peak Stability	$\leq 2\%$ rms	$\leq 2\%$ rms	$\leq 2\%$ rms	$\leq 2\%$ rms
Spatial Mode	TEM ₀₀ ($M^2 \leq 1.3$)	TEM ₀₀ ($M^2 \leq 1.3$)	TEM ₀₀ ($M^2 \leq 1.3$)	TEM ₀₀ ($M^2 \leq 1.3$)
Beam Diameter	$\leq 2.4\text{mm} \pm 0.2\text{mm}$	$\leq 2.4\text{mm} \pm 0.2\text{mm}$	$\leq 2.4\text{mm} \pm 0.2\text{mm}$	$\leq 3\text{mm} \pm 0.5\text{mm}$
Beam Divergence	$\leq 1.5\text{mrad}$	$\leq 1.5\text{mrad}$	$\leq 1.5\text{mrad}$	$\leq 3\text{mrad}$
Beam Roundness	$\geq 90\%$	$\geq 90\%$	$\geq 90\%$	$\geq 90\%$
Polarization Ratio	Horizontal, >100:1	Vertical, >100:1	Vertical >100:1	Horizontal, >100:1
Warm-up Time	<30min	<30min	<30min	<30min
Ambient Temperature	150-35°C	150-35°C	15-35°C	10-35°C
Humidity	<65%	<65%	<65%	<65%
Cooling	Water	Water	Water	Water
Voltage	100-240VAC, 50/60Hz	100-240VAC, 50/60Hz	100-240VAC, 50/60Hz	100-240VAC, 50/60Hz
Power Consumption	1200W	1200W	1200W	1200W
Classification	Class 4	Class 4	Class 4	Class 4
Laser Head Size	745x306x186 mm ³	856x466x186mm ³	856x466x186mm ³	840x466x186mm ³
Power Supply Model	P-1200B0	P-1200B0	P-1200B0	P-1200B0
Power Supply Size	484x412x88mm ³	484x412x88mm ³	484x412x88mm ³	484x412x88 mm ³

Part Number	PSH-355-10	PSH-532-15	PSH-532-30
Wavelength	355nm	532nm	532nm
Output Power	>10W@1MHz	>15W@500kHz	>30W@1MHz
Max. Pulse Energy	>10uJ@1MHz	>30uJ@500kHz	>30uJ@1MHz
Repetition Rates	400kHz-1MHz	400kHz-1MHz	1MHz-2MHz
Pulse Width	<10ps	<10ps	<10ps
Power Stability	≤1% rms	≤1% rms	≤3% rms
Peak-to-peak Stability	≤2% rms	≤2%rms	≤2%rms
Spatial Mode	TEM ₀₀ (M ² ≤1.3)	TEM ₀₀ (M ² ≤1.3)	TEM ₀₀ (M ² ≤1.3)
Beam Diameter	≤1.5mm±0.2mm	≤1.5mm±0.2mm	≤1.5mm±0.5mm
Beam Divergence	≤2mrad	≤2mrad	≤3mrad
Beam Roundness	≥85%	≥85%	≥85%
Polarization Ratio	Horizontal >100:1	Horizontal, >100:1	Horizontal, >100:1
Warm-up Time	<30min	<30min	<30min
Ambient Temperature	15-35°C	150-35°C	10-35°C
Humidity	<65%	<65%	<65%
Cooling	Water	Water	Water
Voltage	100-240VAC,50/60Hz	100-240VAC,50/60Hz	100-240VAC,50/60Hz
Power Consumption	1200W	1200W	1200W
Classification	Class 4	Class 4	Class 4
Laser Head Size	1016×466×195 mm ³	1016×466×186 mm ³	1000×466×186 mm ³
Power Supply Model	P-1200B0	P-1200B0	P-1200B0
Power Supply Size	484×412×88mm ³	484×412×88mm ³	484×412×88 mm ³

FSH Series Femtosecond Fiber Lasers

The FSH series fiber lasers are stable and reliable femtosecond pulsed fiber lasers. This series of products adopts integrated optical and electrical design, pulse width less than 350fs, single pulse energy up to 200μJ, and supports Burst Mode, which can be widely used in semiconductor wafer processing, glass and other hard and brittle materials processing or Welding, processing and processing of polymer materials, medical device manufacturing, ceramics and polymer processing.

Feature:

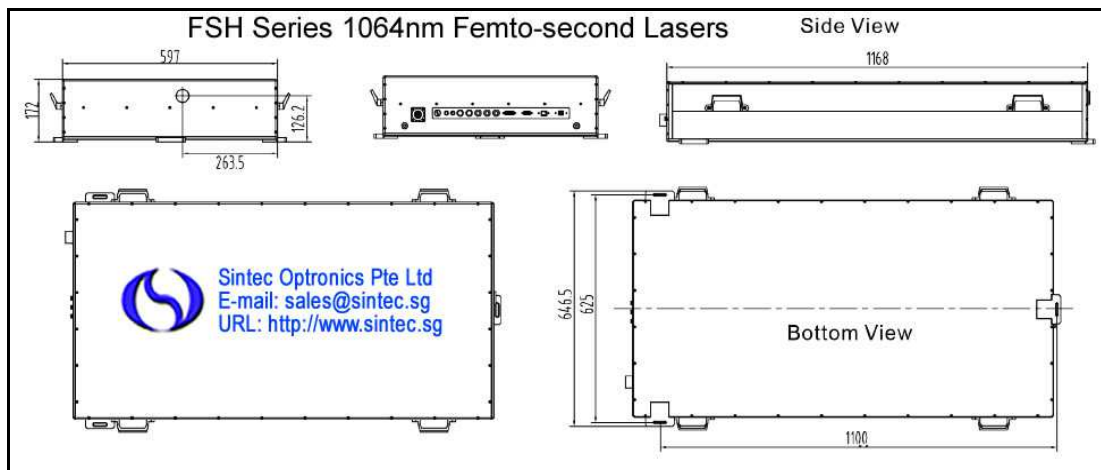
- Single pulse energy up to 200 microjoules
- Support Burst Mode
- Pulse width less than 350fs
- Optical and electrical integrated design
- One-button operation without any adjustment knob
- Built-in optical isolation device
- Built-in pulse selector
- Remote control, maintenance free



Applications:

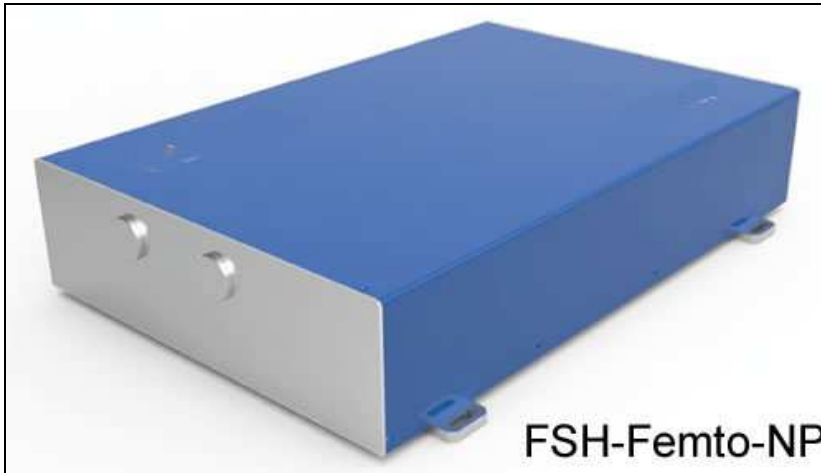
- Semiconductor wafer processing
- Ceramic and polymer processing
- Diamond processing
- New energy material processing
- Hard and brittle material processing and welding
- Polymer material processing

Part Number	FSH-1064-35
Wavelength	1035nm
Average Power	35W
Pulse Energy	200μJ @ 175 kHz
Pulse Duration	<350fs
Peak Power	>500MW
Repetition Rate	Single shot to 2MHz
Beam Quality	M2≤1.3
Beam Divergence	<1mrad, 2θ
Beam Circularity	85%
Beam Diameter	4 ±2 mm, 1/e2
Polarization Ratio	>100:1
Polarization Direction	Vertical
Pulse Energy Stability	<2% RMS
Power Stability	<2% RMS
External Control	RS-232, Ethernet, USB
Dimension	1168x647x172mm



2. FSH Series Narrow Pulse Width Femto-second Fiber Lasers

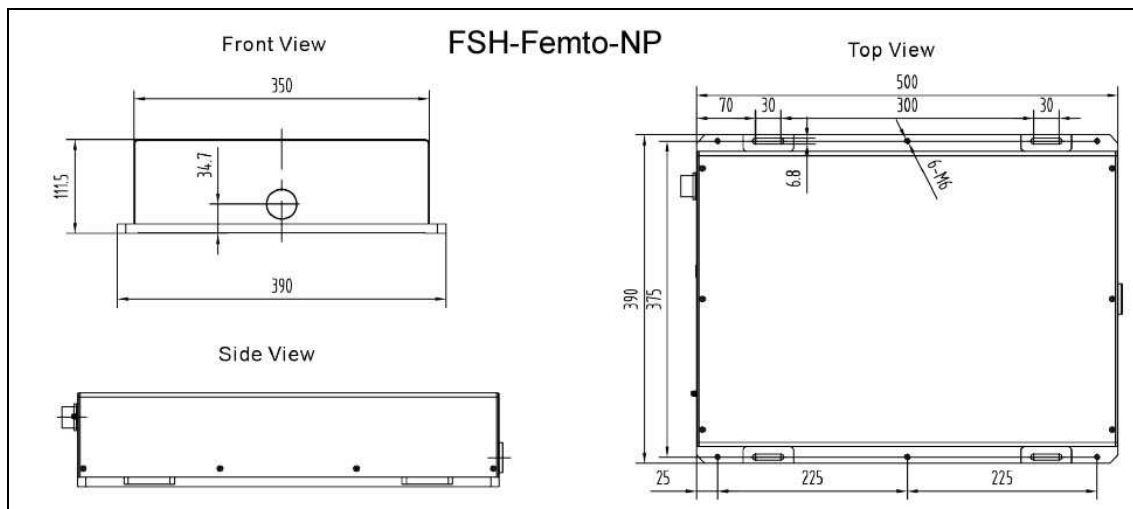
FSH-Femto-NP (Narrow Pulse Width) series femtosecond fiber lasers can support the pulse width sub 150fs and average output power up to 5 W. Internal second harmonic generation module is also optional. The applications include micromachining, photo polymerization, Multiple photon excitation, Biological Imaging, ultrafast spectroscopy etc.



Feature:

- Pulse width <150fs
- Average power 1-5W
- Support 1035/517nm output
- Internal optical isolator
- Internal power monitor

	FSH-Femto-NP-1	FSH-Femto-NP-1-SHG	FSH-Femto-NP-5
Central wavelength	1035±4nm	517±2nm	1035±4nm
Average power	>1W	>400mW	>5W
Pulse duration	<150fs	<150fs	<150fs
Pulse repetition rate	90-100MHz	90-100MHz	45±5MHz
Beam quality	M ² <1.2	M ² <1.2	M ² <1.2
Beam divergence (full)	<3mrad	<3mrad	<3mrad
Beam circularity	≥90%	≥90%	≥90%
Beam diameter	3±1mm	3±1mm	3±1mm
Polarization ratio	>100:1	>100:1	>100:1
Pulse stability	<2% RMS	<2% RMS	<2% RMS
Power stability	<1% RMS	<1% RMS	<1% RMS
Operation temp.	10 – 30 °C	10 – 30 °C	10 – 30 °C
Dimension	500x390x111.5mm	500x390x111.5mm	500x390x111.5mm



PSY Series Picosecond 1064nm Fiber Lasers

Our PSY-1064-15 has a continuously tunable pulse duration from 100 ps to 4ns and repetition rates from 100 kHz up to 5MHz. The short pulse duration, high repetition rates combined with over 50kW peak power give high speed, permanent black/color marking on a variety of metals, thin film coating and thermal sensitive materials. The single mode beam quality picosecond pulses with over 50kW peak power open up a variety of micromachining applications such as Li-Ion battery foil cutting, resistor trimming and marking of transparent material. The laser is completely controlled via an industry standard digital interface with optional DB25 or RS-232.

Features:

- Average Power >15W
- Pulse Duration 100ps-4ns
- Peak Power 50kW
- Repetition Rate 100kHz-5MHz
- Pulse Energy >150μJ@4ns or >30μJ@600ps
- M2<1.3
- Burst Mode Function

Applications:

- Black Marking
- Lion Ion Battery Foil Cutting
- Thin Film Solar Cell Scribing
- Silicon or SiC Dicing
- Resister Trimming
- Chrome Vanadium Texturing
- Micromaching of Transparent materials



Specifications:

Part Number	PSY-1064-15
Wavelength	1064nm
Average Power	>15W
Repetition Rate	100kHz-5MHz
Power Stability	<2%
Pulse Energy	>30μJ@600ps or >150μJ@4ns
Peak Power	50kW
Pulse Duration	600ps-4ns
Switch On/Off Time	<5μs
Beam Quality	M2<1.3
Beam Diameter	7mm
Beam Divergence	<1mrad
Output Polarization	Random
Trigger	SMA
Supply Power/Current	AC 100V-240V 50/60Hz Rated output > 960W
Dimensions	300mm*270mm*70mm
Control	RS232 or DB25

PSY Series Picosecond 1030nm Fiber Lasers

Our PSY series pico-second 1030nm fiber lasers have a tunable pulse duration from 50 ps to 800ps, repetition rates from 25 kHz up to 5 MHz and over 100W average power. The short pulse duration, high repetition rates combined with over 1MW peak power open up a variety of micromachining applications such as PERC solar cell dicing, glass drilling, sapphire drilling, Li-Ion battery foil cutting, resistor trimming and marking of transparent material. The laser is completely controlled via an industry standard digital interface with optional DB25 or RS-232.

Features

- Average Power 100W
- Pulse Duration 50-800ps
- Peak Power 1MW
- Repetition Rate 25kHz-5MHz
- Pulse Energy 300uJ@800ps
- $M^2 < 1.3$
- Burst Mode Function

Applications

- PERC Solar Cell Dicing
- Lion Ion Battery Foil Cutting
- Glass Drilling
- Silicon or SiC Dicing
- Metal Marking
- Chrome Vanadium Texturing
- Micromaching of Transparent materials



Model	PSY-1030-20	PSY-1030-50	PSY-1030-70
Center Wavelength	1030±5nm	1030±5nm	1030±5nm
Total power	20W	50W	75W
Repetition rate	30 - 1000kHz	25kHz -5MHz	25kHz - 5MHz
Power stability	<2%	<2%	<2%
Pulse energy	100μJ@2ns, 30μJ@200ps	25μJ@50ps, 180μJ@800ps	>50μJ@50ps, 350μJ@800ps
Peak power	150kW	>500kW	>1MW
Pulse width	200ps - 2ns	50, 300, 800ps	50, 300, 800ps
Beam quality	$M^2 < 1.3$	$M^2 < 1.3$	$M^2 < 1.3$
Beam diameter	5mm	2mm	5mm
Beam divergence	<2mrad	<2mrad	<2mrad
Polarization	Linear	Linear	Linear
Sync (trigger) output	SMA	SMA	SMA
Power supply	AC 100V - 240V, 50/60Hz, >960W	DC24V/8A	AC 100V - 240V, 50/60Hz, >960W
Dimensions (L*W*H)	400*336*138mm	767*560*230mm	1200*410*141mm
Control	RS232 or DB25	RS232 or DB25	RS232 or DB25

PSY Series Pico-second 515nm & 343nm Fiber Lasers



The PSY series green and UV lasers have the features of short pulse duration, high repetition rates and high peak power, which results in a variety of micromachining applications such as PERC solar cell dicing & stripping, FPC/PCB cutting, glass drilling, sapphire drilling, silicone ablating, Li-Ion battery foil cutting, resistor trimming and marking of transparent material. The laser is completely controlled via an industry standard digital interface with optional DB25 or RS-232.

Part Number	PSY-343-15 PSY-343-10	PSY-515-50 PSY-515-40 PSY-515-30
Wavelength	343nm	515nm
Average Power	15W/10W	50W/40W/30W
Repetition Rate	300kHz-1.2MHz	300kHz-2.5MHz
Power Stability	<2%	<2%
Pulse Energy	30μJ/20μJ	40μJ/32μJ/24μJ
Peak Power	40kW/25kW	50kW/40kW/30kW
Pulse Duration	800ps	800ps
Beam Quality	M ₂ <1.3	M ₂ <1.3
Beam Diameter	~2mm	~2mm
Beam Divergence	<2mrad	<2mrad
Output Polarization	Linear Polarized(S)	Linear Polarized(S)
Sync Output	SMA TTL pulse	SMA TTL pulse
Control	RS232 or DB25	RS232 or DB25
Power Requirements	AC 100V-240V 50/60Hz > 960W	AC 100V-240V 50/60Hz 960W
Dimensions (L*W*H)	540mm*320mm*127mm	540mm*320mm*127mm

FSY Series Femtosecond Fiber Lasers

FSY series femtosecond fiber lasers have been widely used in the material micro-processing field. Our femtosecond fiber lasers offer >80W average power, >5MHz repetition rate with the pulse energy upto 100 μ J.



Technical Specifications:

Model	FSY-Femto-6	FSY-Femto-10	FSY-Femto-20	FSY-Femto-50	FSY-Femto-100
Center Wavelength	1035nm	1035nm	1035nm	1035nm	1035nm
Total power	>6W	>10W	>20W	>50W	>100W
Repetition rate	80MHz	1Hz - 5MHz	1Hz - 5MHz	1Hz - 5MHz	1Hz - 5MHz
Power stability	<1%	<1%	<1%	<1%	<1%
Pulse energy		>10 μ J	>40 μ J	>100 μ J	>200 μ J
Number of burst pulse		1 ~10	1 ~10	1 ~10	1 ~10
Burst pulse combinatintion energy		>100 μ J	>120 μ J	>300 μ J	>400 μ J
Pulse width	150fs	400fs - 6ps	400fs - 8ps	400fs - 8ps	400fs - 8ps
Beam diameter	3mm	3mm	3mm	3mm	3mm
Beam divergence	<1mrad	<2mrad	<2mrad	<2mrad	<2mrad
Polarization	Linear	Linear	Linear	Linear	Linear
Sync (trigger) output	SMA TTL pulse	SMA TTL pulse	SMA TTL pulse	SMA TTL pulse	SMA TTL pulse
Power supply	AC 100V - 240V, 50/60Hz, >960W	AC 100V - 240V, 50/60Hz, >960W	AC 100V - 240V, 50/60Hz, >960W	AC 100V - 240V, 50/60Hz, >960W	AC 100V - 240V, 50/60Hz, >960W
Dimensions (L*W*H)	680mm*480mm*212mm	680mm*480mm*212mm	680mm*480mm*212mm	1200mm*410mm*141mm	1200mm*410mm*141mm
Control	RS232 or DB25	RS232 or DB25	RS232 or DB25	RS232 or DB25	RS232 or DB25

PSK Series Picosecond IR Lasers



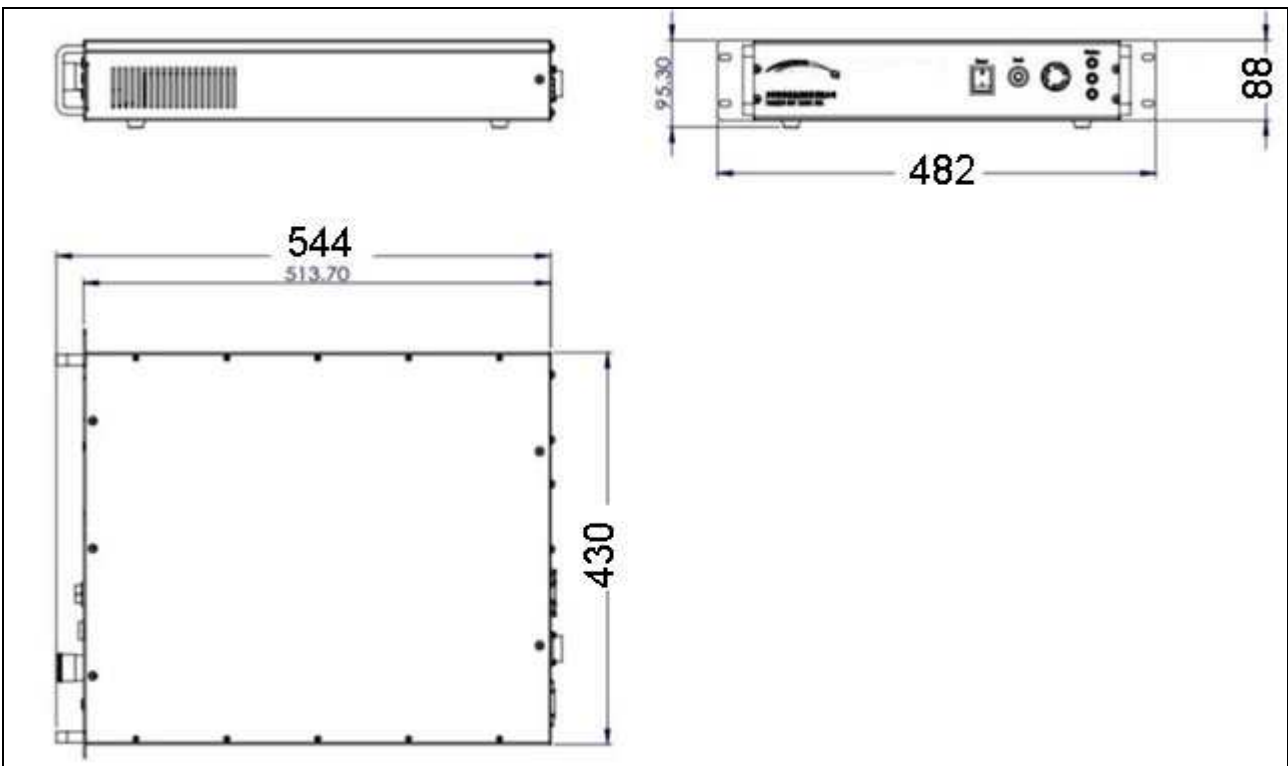
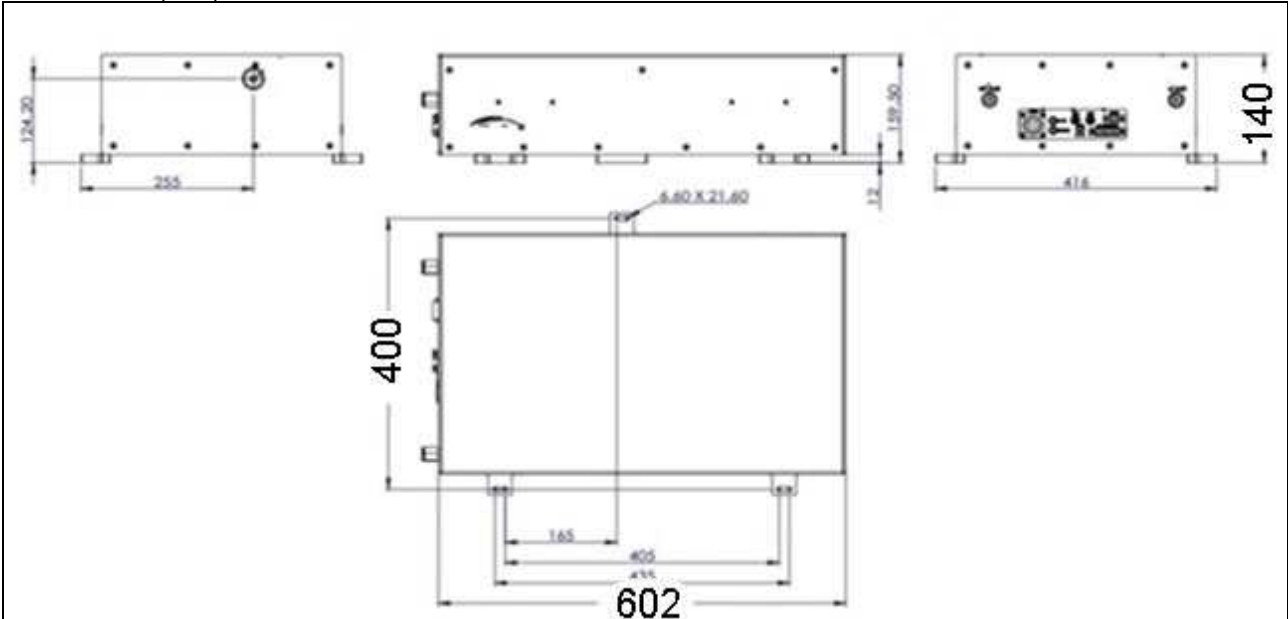
The PSK Series picosecond IR lasers are based on fiber seed and multiple-pass solid state amplifiers configuration, which keeps the stability benefits of fiber laser and at the same time enables the extraction of high pulse energy from the laser system. The entire laser is built inside a sealed cavity which effectively prevent micro-dust from getting inside the laser cavity. There are multiple photo-detectors built inside the laser to monitor the system performance and to fine-adjust parameters to ensure the optimum performance. All lasers are built inside class-10k cleanroom environment and we strictly follow advanced production process protocols. This Picosecond laser is suitable for glass and ceramic cutting and drilling, metal parts precision machining, etc.

Technical Specifications:

Power	10W	20W	30W	50W	75W
Model number	PSK-1064-10B	PSK-1064-20B	PSK-1064-30B	PSK-1064-50B	PSK-1064-75B
Central Wavelength	1064nm				
Rep Rate	Single pulse – 1MHz				
Pulse Width	< 15 ps				
Output Power	10W@100kHz	20W@200kHz 2 pulses	30W@150kHz	50W@200kHz	75W@200kHz
Max Pulse Energy	100μJ	100μJ	200μJ	250μJ	350μJ
Power Stability	<2% rms over 8 hours				
Pulse Energy stability	< 3% rms				
Beam Quality	TEM00 ($M^2 < 1.4$)				
Beam Dia.	2±0.2mm@500mm away from exit				
Beam Circularity($1/e^2$)	>90%				
Polarization	Vertical	Vertical	Horizontal	Horizontal	Horizontal
PER	>100: 1				
External Control	RS232, GATE, TRIG				
Cooling	Water Cooling				
Storage Temperature	10 ~ 50 °C				

Ambient Temperature	15 ~ 30 °C
Ambient Humidity	10% ~ 80% (non-condensing)
Warm-up Time	<20min
Voltage	AC 90 ~ 260 V

Dimensions (mm):



Femtosecond/Picosecond Fiber Oscillator

Magellan II™ delivers on the promise of fiber laser technology with performance comparable to diode-bar-pumped Vanadate laser-pumped Ti:Sapphire oscillators – and does so at a fraction of the cost, with much longer lifetime, and substantially lower cost-of-ownership.

Magellan II™ is a fiber-pigtailed, telecom-qualified, direct-diode-pumped oscillator (no intermediate Vanadate pump laser) in a compact “all-in-one-box” enclosure. It can be configured to produce low noise picosecond or femtosecond pulses and has the ease-of-operation, and reliability you expect from a plug-and-play device. Free-space propagating output coupling is standard. Fiber output coupling and/or harmonic generator are optional.

Features

- Yb-doped fiber gain medium ⇒ high stability
- Single-emitter diode pump ⇒ long life
- Compact, all-in-one-box design ⇒ easy to use
- Operates from 1.025-1.035 μm ⇒ ideal for bio applications
- 25 MHz repetition rate ⇒ longer sample relaxation time
- nJ level pulse energies ⇒ access to nonlinear effects
- Extremely low noise ⇒ high signal-to-noise ratio
- Free-space or fiber output ⇒ flexible delivery
- Optional SHG ⇒ access to visible wavelength

Ideal for

- TPEF
- OCT
- THz generation
- Microscopy
- Photopolymerization
- Amplifier seed oscillator

Performance Parameters

Femtosecond Version

Pulse energy: >1 nJ/pulse

Pulse width: < 200 fs

Average power: 20 mW

Picosecond (Option)

Pulse energy: >2 nJ/pulse

Pulse width: ~ 3 ps

Average power: 60 mW

Amplified (Option)

Pulse energy: ~10 nJ/pulse

Pulse width: < 200 fs

Average power: ~ 200 mW

General

Center wavelength: fixed between 1.025 and 1.035 microns

Transverse mode: TEM₀₀

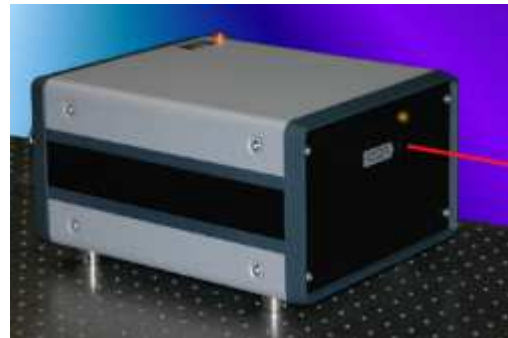
Repetition rate: nominal 25 MHz

Beam diameter: 1.8 mm +/- 0.2 mm

Beam divergence: < 2 mrad

Dimensions: 13 x 10 x 6.2 in³

Electrical: 100 - 240 volts, 2 amps



STFC-Femto series



STFC-Femto series is a powerful industrial femtosecond lasers offering output powers up to 30W and pulse energies in excess of 160 μJ , with pulses shorter than 800 fs.

This series is the only ultrafast laser available integrating the Taranis Single Crystal Fiber (SCF) technology which enables high pulse energy and flexible repetition rate to meet requirements for both high throughput applications and high energy demanding applications.

This unique architecture provides excellent reliability and beam quality, all in a compact packaging.

Features

- Pulse width less than 800 fs
- Tunable repetition rate from 100 kHz to 1 MHz
- Excellent beam quality $M^2 < 1.3$
- Peak power up to 200 MW
- Fast warm up
- Frequency change on the fly

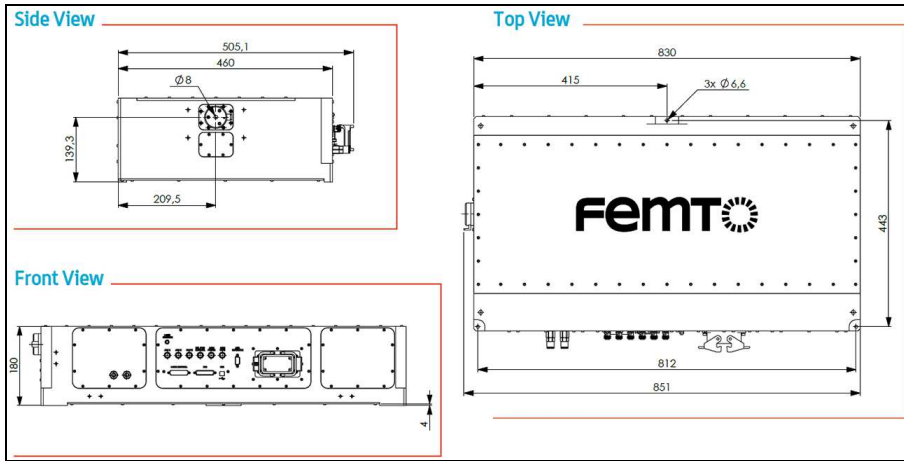
Applications

- Cutting and drilling of hard material, glass, sapphire, ceramics...
- Cold machining of polymers and composites
- Micromachining and surface structuring

Specifications

Wavelength	1030nm	
Average Power	30W	
Pulse Repetition Rate	100kHz to 1MHz	
Spatial Mode TE00	$M^2 < 1.3$	
Pulse Duration	<800s	
Polarization Ratio	>100:1	
Electric Supply	115 to 230VAC/ 50 to 60Hz	
Beam Diameter	2mm	
Warm-Up Time	95% of power in <10mm	
Max Out Dimensions	830x443x180mm ³	
Laser specifications at Min/Max repetition rate		
Repetition rate	100kHz	1000kHz
Average Power	16W	30W
Pulse Energy	160uJ	30uJ
Peak Power	220MW	42MW

Dimensions



IMPULSE™ High-Average-Power Femtosecond Laser

Features:

- Direct diode-pumped Yb-fiber oscillator/amplifier design
- All-diode-pumped, all-solid-state construction
- Robust, one-box design
- >20 watts average power
- Repetition rate user-selectable from 200kHz to 25MHz
- High beam quality
- Low noise, cw-pumped
- High stability and longevity
- Complete computer control including iPhone/iPod App
- Ideal for: Micromachining, Photo polymerization, Direct-write waveguides, High S/N pump/probe, OPA/NOPA pumping



IMPULSE™ is an all-diode-pumped, direct-diode-pumped, Yb-doped fiber oscillator/amplifier system capable of producing variable pulse energies up to 10μJ with user-selectable repetition rate between 200 kHz and 25 MHz. With 20 watts average power output at 2MHz, IMPULSE™ offers more than an order-of-magnitude higher power than has traditionally been available in a one-box ultrashort pulse laser design.

IMPULSE™ is based on a revolutionary new concept in mode-locked oscillator/amplifier technology. The Yb-doped fiber oscillator/fiber-amplifier design combines the low noise performance of solid-state operation with high spatial mode quality of fiber lasers.

IMPULSE™ is a compact, robust, one-box source of femtosecond to picosecond pulses with the ease-of-operation, stability and reliability you expect from a fiber source. All major parameters are computer controlled, enabling easy interface to workstation or experiment. IMPULSE™ is even iPhone/ iPod² App enabled.

Optional accessories include multi-photon photo-polymerization, waveguide writing, micromachining, harmonic generation, and OPA/NOPA wavelength conversion for high S/N and rapid data acquisition in pump/probe experiments.

Performance Parameters:

- Average power output: User adjustable via embedded computer up to 20watts at ≥ 2 MHz repetition rate
- Repetition rate: User adjustable via computer from 200kHz to 25MHz (in increments of oscillator repetition rate divided by a whole number¹)
- Pulse energy: User adjustable via computer from 100nJ to 10μJ (eg., $>0.8\mu\text{J}$ at 25MHz, $>10\mu\text{J}$ at <2 MHz)
- Pulse width: User adjustable via computer between < 250 fs and >8 ps
- Transverse mode: TEM₀₀
- M₂ <1.2 - 1.5 depending on pulse energy
- Noise: $<1\%$ rms
- Center Wavelength: 1.03microns
- Electrical: 220VAC (110VAC Optional), 20 Amps
- Head dimensions 103Lx62.5Wx26H cm³
- Control cabinet 123Hx53.5W x81D cm³

Remark:

- 1 Optional pulse picker available to additionally adjust repetition rate in the range of 200kHz to single shot.
- 2 iPhone and iPod are Trademarks of Apple Inc.

Model cOPA™ Fully-Integrated Tunable Ultrafast Source for Microscopy Applications

- All diode and direct diode-pumped
- No intermediate laser-pumped laser needed to pump either oscillator or amplifier stage, thereby improving reliability and performance, reducing cost-of-ownership
- All solid-state construction
- Entire optical system occupies one enclosure to minimize drift
- Computer-control of all major functions via controller touch screen
- Remote control and monitoring via Apple iPhone/iPod App¹
- One year warranty on entire system including nonlinear crystals

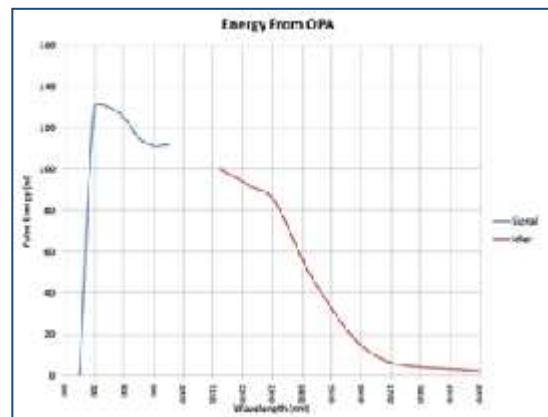


The Model cOPA™ is a unique, three-beam source of ultrashort pulses at MHz repetition rate that operates in the 1-micron wavelength range. It is an ideal source for high repetition rate, 4-wave mixing experiments such as 3D multimodal imaging microscopy in cells and tissue. All three beams are synchronized to less than 10 femtoseconds. Two beams are independently tunable. At more than 100nJ/pulse, the Model cOPA™ provides enough energy to perform multi-modal microspectroscopy followed by ablative sectioning of tissue samples.

The Model cOPA™ consists of two synchronized optical parametric amplifiers (OPAs) in one enclosure pumped by our Model IMPULSE™ MHz repetition rate, fiber laser oscillator/amplifier system². Each OPA is independently tunable from 700 to 950nm in the signal range and from 1130 to 1300nm in the idler range. Residual 1030nm pump light of >1μJ is available from a separate output port. Motorized drives for electronic tuning are included. An optional wavelength extension is available providing tunability from 1125nm to 1950nm.

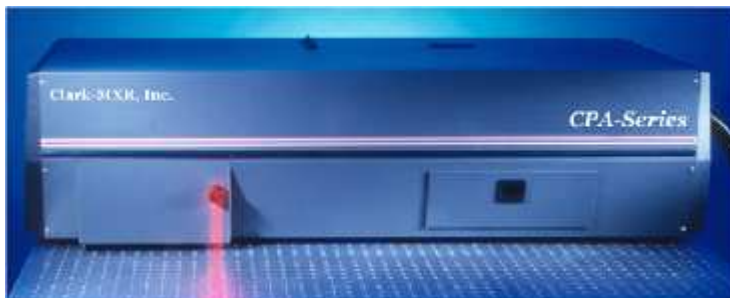
Specifications

- Tuning Range: 700-950nm (Signal) 1130-1300nm (Idler) (>100nJ/pulse throughout signal range)
- Pulse Energy: >100nJ (Signal) >80nJ at peak (Idler) (Over entire signal tuning range)
- Bandwidth: <150cm⁻¹ (200cm⁻¹ to 250cm⁻¹ available at higher power output)
- Repetition rate: 1MHz
- Compressibility: <1.5 x transform limit
- Pulse Energy Noise: <1%rms for f>2Hz



CPA-Series Ti:Sapphire Ultrashort Pulse Laser

- Drift-free, NO TWEAK™ performance
- Smallest footprint in the industry
- Transportable
- Fully-integrated plug-and-play design
- Built-in computer control with embedded .Net DLL files accessible from LabView, MatLab (R2009a & later), C#, VisualBasic
- Apple iPod Touch with iLase CPA client app for remote operation and monitoring
- Built-in electronic shutter for “pulse-on-demand” delivery of single or multiple pulses up to 64,000
- Over 10,000 hours of proven utility in micromachining applications
- Ideal for
 - Pumping OPA (NOPA, TOPAS)
 - Nonlinear spectroscopy
 - Micromachining



Our field-proven CPA-Series Ti:Sapphire lasers redefine user-friendliness in a low cost-of-ownership source of ultrashort pulses of light. It is a complete, fully-integrated, ultrashort pulse oscillator/amplifier system controlled by an embedded touch-screen computer or from any Windows-based computer with a network connection. The included software provides control of laser performance parameters such as power output, pulsewidth, pump power, timing, and selection of single pulse or groups of multiple pulses. A suite of diagnostics is also included to monitor laser performance. The simple, intuitive, user-friendly interface provides both status information and control from external devices such as the included Apple iPod Touch preloaded with our iLase CPA software app. Resident .Net DLL files allow interfacing with your existing application-specific, custom software (LabView, MatLab, VisualBasic, etc.)

The Model CPA-Series provides the best of both worlds by combining the long life of telecom-qualified single-emitter pump diode with the low cost of operation of a single cw lamp. The result is a laser with the lowest cost of ownership on the market today. It is fully compatible with our NOPA series of optical parametric amplifiers providing tunable sub-50 fs pulses, TOPAS series of OPAs, STORC Harmonic Generators, and ShapeShifter™ ultrashort pulse nonlinear spectrometers (transient absorption, pump/probe, CARS, surface-specific SFG, SHG, THG, etc.)

Performance Parameters:

Model	Pulse energy	M ²	Repetition Rate
CPA-2101	>0.8 mJ at ≤1kHz	<1.5	Up to 1 kHz
CPA-2110	>1mJ at 1kHz >0.6 mJ at 1-2kHz	1.2 +/- 0.1	Up to 2 kHz
CPA-2161	Constant average power of 2.5 W from 3kHz to 6kHz (Customer-chosen factory setting)	1.2 +/- 0.1	3 to 6 kHz fixed
CPA-2210	>2mJ at 1kHz >1.5mJ at 1-2kHz	1.2 +/- 0.1	Up to 2 kHz

Pulsewidth: <150fs
 Wavelength: 775nm
 TBWP: <1.4 x transform limit (sech²)
 Polarization: Linear, horizontal
 Aspect Ratio: 100:1
 Transverse mode: TEM₀₀
 Energy stability: <1%rms
 Beam diameter (FWHM): 4 – 6mm
 Beam divergence: <100 microradians

Additional Output Options:

Amplifier pump laser: Up to 10mJ/pulse at circa 200ns pulsewidth at 532nm

Oscillator wavelength: Average power output >10 mW at 1550nm
or >3mW at 775nm at nominal repetition rate of 30MHz

Picosecond Option for CPA-2101:

Pulse energy:>0.6mJ at rep. rates \leq 1kHz Linewidth: $<8\text{cm}^{-1}$
TBWP: <1.2 x transform limit (Gaussian)

Physical Dimensions:

Laser head: 48" L x 20" W x 12" H
Power supply: 28" H x 23" W x 38" D

Utility Requirements:

Electric: 110 VAC, 60 or 50 Hz, 10 A and 208 VAC, 60 or 50 Hz, 40 A
Water: Tap water, 4 gpm, 15-20°C, 30-50 psi

Warranty:

Oscillator parts, including the diode laser, are warranted for 40,000 hours or five (5) years, whichever comes first. Please contact us for further details.

These products protected under US patent numbers:
5,530,582; 5,572,358; 5,592,327; 5,594,256

iNOPA™ Non-Collinear Optical Parametric Amplifier

- Optimized to be pumped by the Clark-MXR Model IMPULSE™ Yb-doped Fiber Oscillator/Amplifier
- Oscillator/Amplifier
- Pulses as short as 14 fs¹
- Near TEM₀₀ output mode
- Compact, user-friendly design
- White light continuum-seeded for high stability



iNOPA™ is a white light continuum-seeded, non-collinear, optical parametric amplifier capable of generating extremely short pulses when pumped by the Model IMPULSE™ Yb-doped Fiber Oscillator/Amplifier. To generate short pulses the output beam of the Model IMPULSE laser is split into two beams inside the Model iNOPA enclosure. One beam is used to generate an extremely broad continuum seed beam which is then amplified by the second, higher intensity beam from IMPULSE™ in a BBO crystal operated in a non-collinear arrangement. Non-collinear amplification preserves the very broad linewidth of the seed beam, which can then be compressed to a pulsewidth as short as 15 fs in a prism compressor. Non-collinear amplification is preferred since the resulting pulsewidth is dependent only on the bandwidth of the seed and not on the pulsewidth of the pump laser. In fact, conversion efficiency is improved by having a longer, rather than shorter, pump pulse because there is more overlap in time between the two beams.

Specifications when pumped with 10uJ/pulse from a Model IMPULSE™

Pulsewidth: <40fs (deconvolved)

Repetition Rate: 1MHz (other repetition rates available as options)

Tuning range: 650nm to 950nm and 1100nm to >1300nm (other tuning ranges available options)

Pulse energy: >250nJ/pulse at peak of tuning range

Noise: <1%rms for $f > 2\text{Hz}$

Polarization: Linear, horizontal

General

Size: 15"W x 32.5"L x 9"H

Electrical/Water: None

Please contact us for more information.

¹Christian Schrieber, Stefan Lochbrunner, Patrizia Krok, and Eberhard Riedle; *Tunable pulses from below 300 to 970 nm with durations down to 14 fs based on a 2 MHz ytterbiumdoped fiber system*, OPTICS LETTERS / Vol. 33, No. 2 / January 15, 2008

Model UMW-Series Ultrafast Micromachining Workstation

- Fully-integrated system including
 - Field-proven laser source technology (Model CPA-Series)
 - Multi-axis positioning system
 - Beam delivery system
 - Selection of processing parameters
 - Class I enclosure
 - Integrated, intelligent, on-axis machine vision and inspection system
 - Motion control
- Pulses “on-demand” (1, 2, ... 64,000 at user-selectable repetition rate¹)
- Optional digital and/or analog IO
- Complete computer control
- Granite base mounted on pneumatic vibration isolators
- Small footprint



Over twenty years experience with ultrashort pulse lasers combined with hundreds of real world projects and years of processing knowhow have led to our latest generation of femtosecond micromachining workstations. The Model UMW-Series encompasses everything you need to micromachine with ultrashort pulse lasers. This design benefits from our years of experience learning the optimum combination of components, performance parameters, and software required to micromachine materials with ultrashort pulses of light. The Model UMW Series provides ample space for custom beam delivery and manipulation, and includes a sophisticated machine vision and inspection system, and complete computer control. The software interface provides powerful and intuitive access to all system functionality including the laser, motion, and machine vision systems, and provides advanced intercommunication between them.

Performance Parameters:

Positioning System²:

X, Y Axis		Z Axis	
Max. Travel:	300mm	Max Travel:	100mm
Repeatability:	0.5µm	Repeatability:	1.0µm
Accuracy:	1.0µm	Accuracy:	+/-1µm
Orthogonality:	5arc sec	Max. Velocity:	5cm/sec
Max. Velocity	5cm/sec		

Vision System:

Zoom Lens: 12x

Resolution³: 1µm

Field of View³: 4mm

Lighting: LED Ring and Coaxial Light

Inspection System: Pattern recognition, edge location, part rotation, part measurement

Laser:

See Model CPA-2101 & CPA-2110 brochures for performance parameters & features.

Enclosure:

Class I Laser Enclosure

Warranty

Please contact us for details.

This product protected under US patent numbers: 5,530,582; 5,572,358; 5,592,327; 5,594,256.

1. TTL-0,+1 ΔT = 1/repetition rate

2. Values are for the base system. Other configurations are available upon request.

3. Resolution is for maximum magnification and depends on focusing objective; FOV is for minimum magnification.

ShapeShifter™ Ultrashort Pulse Nonlinear Spectrometer

- Transient Absorption Spectroscopy (TA)
- Pump-Dump-Probe Spectroscopy
- Coherent Anti-Stokes Raman Spectroscopy (CARS)
- Femtosecond Stimulated Raman Spectroscopy (fsSRS)
- 4-Wave Mixing Spectroscopy
- Surface-Specific Vibrational Sum Frequency Generation Spectroscopy (Vib-SFG)
- Two Photon Fluorescence Spectroscopy (TPF/TPEF)
- Fluorescence Lifetime Imaging Microscopy (FLIM)
- Photoluminescence Spectroscopy
- Second Harmonic Generation Spectroscopy (SHG)
- Third Harmonic Generation Spectroscopy (THG)
- Laser Induced Breakdown Spectroscopy (LIBS)
- Heat-Affected-Zone-Free, Embrittlement-Free Ablation (Micromachining)



ShapeShifter™ is a state-of-the-art research tool that can be configured to perform experiments using many different types of nonlinear processes. It is designed, fabricated and tested using field-proven components from a single manufacturer, thereby minimizing your technology adoption risk.

ShapeShifter™ is capable of meeting your current needs while retaining the flexibility to add options¹ that include pulsewidth as short as 15fs², a large range of pump and probe wavelengths (e.g. sub-200 nm to beyond 10 microns) with decay times ranging from sub-30 femtoseconds to nanoseconds, and at user-selectable repetition rates that are variable from single-shot to multiple kHz. It can be used to explore heat-affected-zone and embrittlement-free structuring in a wide variety of materials using pulse widths that are variable from 30fs to 10ps.

ShapeShifter™ begins with the field proven Model CPA-series patented, fiber-oscillator- seeded, Ti:Sapphire amplifier³. The output beam of the Model CPA can be split into as many as seven beams to pump as many as seven tunable, non-collinear OPAs (NOPAs). Or you can use one beam to generate multiple continua and/or you can microstructure materials to create features smaller than 1 micron. Clearly, ShapeShifter™ is the ideal tool for a user facility.

Why limit your future options when ShapeShifter™ offers you unmatched flexibility to go where your research takes you?

Only an introduction to ShapeShifter™ can be provided here due to space limitations. Please contact us to find out how ShapeShifter™ can be configured to meet your specific needs.

¹ May require some additional components. Please contact us for more information.

² Riedle, M. E. Beutter, S. Lochbrunner, J. Piel, S. Schenkl, S. Spörlein, W. Zinth Appl. Phys. B 71, 457 - 465 (2000) *Generation of 10 to 50 fs pulsestunable through all of the visible and the NIR.*

³ Patent #5,530,582

FSC Series Femto-second Lasers



1. FSC1040 Series Ultrashort Pulse Lasers at 1040nm

The FSC1040 is an air-cooled, compact ultrafast laser.

Applications

- SHG and multi-photon microscopy
- Light sheet microscopy
- Optogenetics imaging experiments
- Pump source for non-linear optics (OPOs, SHG)
- THz generation
- Supercontinuum generation
- Time resolved experiments (e.g. TCSPC/FLIM)

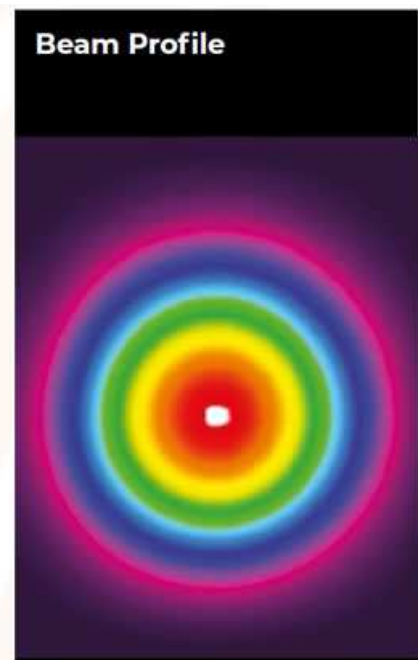
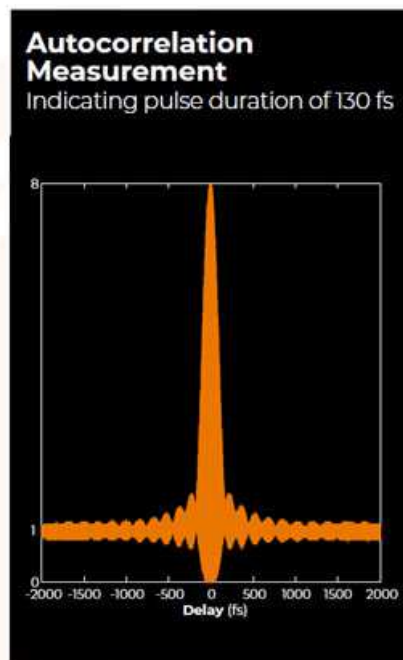
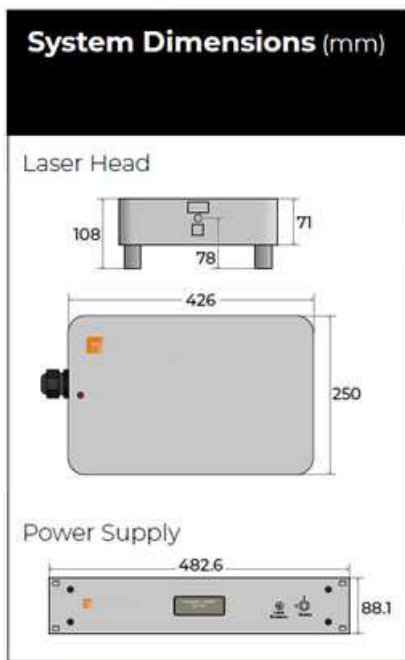
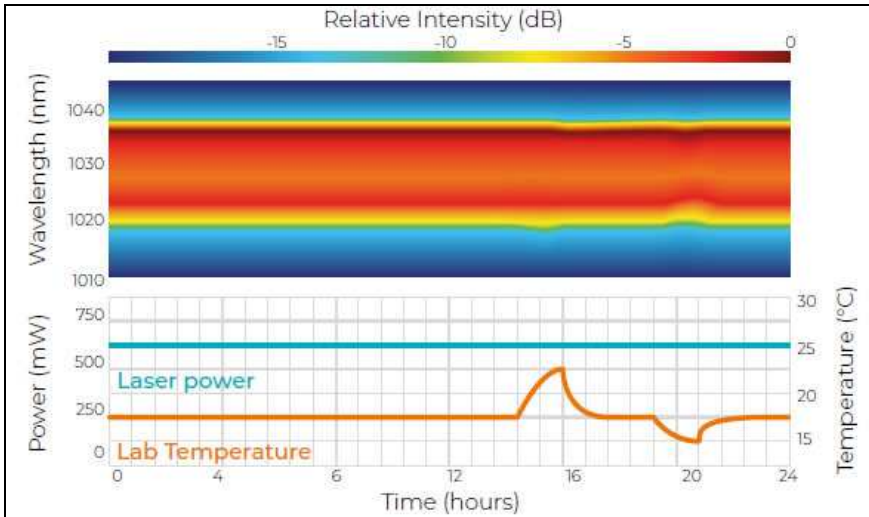
Technical Overview

- Up to 4W average power is available (500kW peak power)
- Pulse duration: < 150fs (Chirped output pulse option also available)
- 100 MHz repetition frequency (80 MHz also available)

Features & Benefits

- Compact laser housing (air-cooled operation)
- Intuitive web browser interface
- Power efficient laser cavity (low power consumption)

Part number	FSC-1030-750	FSC-1040-2500	FSC-1040-3500
Output power	Up to 750 mW	>2.5W	>3.5
Wavelength	1030nm	1040nm	1040nm
Pulse energy	7.5nJ	25nJ	> 35nJ
Pulse duration	< 150fs		
Repetition frequency	100MHz		
Beam parameters	Free space, M2 < 1.3, Linearly polarized Divergence < 2mrad		
Beam diameter	0.5 - 1.2 mm		
Control Interface	Web browser interface. Ethernet & serial port (RS232) also available.		
Electrical	Voltage 110 – 240V AC, Frequency 50 – 60Hz, Power 80W		
Dimensions	426x250x108mm (laser head) 483x285x88mm (control unit – 19" 2U rack mount)		



2. FSC520 Series 520nm Ultrafast Lasers

Applications

- Pump source for OPO
- Non-linear optics
- Telecoms / quantum imaging
- Raman spectroscopy
- Photo-dynamic therapy
- Nanophotonics

Technical Overview

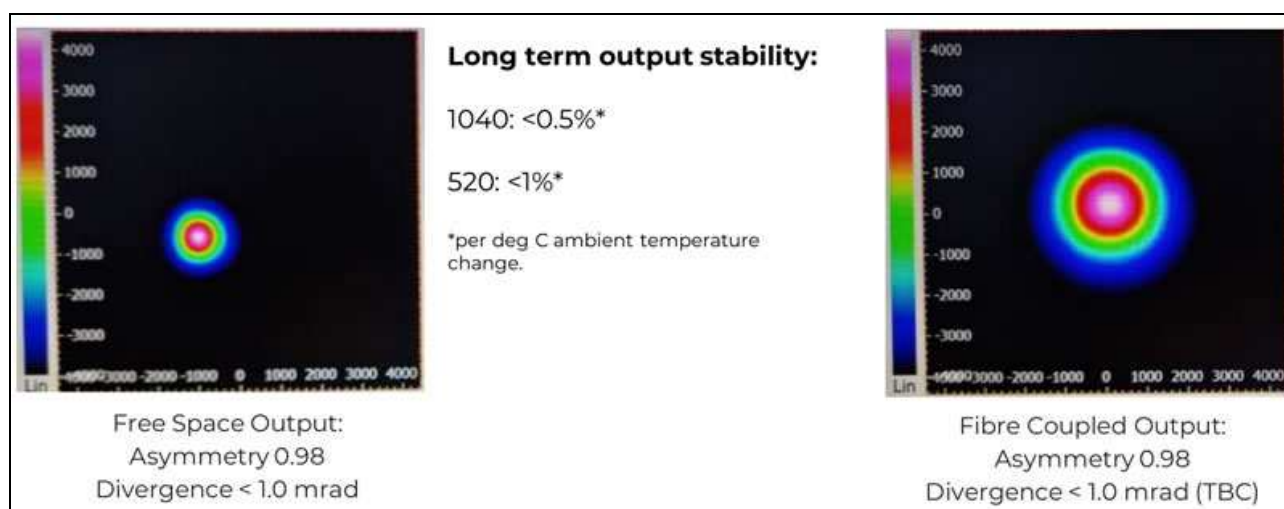
- Pulse duration <100fs
- 2.5W average power available
- Access to 1040nm pulses

Features & Benefits

- Compact laser housing
- Intuitive web browser interface
- Power efficient laser cavity (low power consumption)

Pumped by a PSC1040 ensures delivery of high quality ultrashort pulses in the green.

Part number	FSC-520-2500-FS	FSC-520-1800-FC
Specifications	Free space	Fibre-coupled
Output power	Up to 2.5W	Up to 1.8W
Wavelength	~520nm	
Pulse duration	<100fs	
Pulse energy	> 25nJ	> 18nJ
Repetition frequency	100MHz	
Beam parameters	Free space & FC: $M^2 < 1.3$, Linearly polarized; 100:1 Divergence < 1.0 mrad	
Beam diameter	~1.5 mm	
Control interface	Ethernet and web page, Serial port	
Electrical	Voltage 110 – 240V AC, Frequency 50 – 60Hz, Power 80W	
Dimensions	426 x 250 x 108 mm (pump source laser head) 240 x 114 x 90 mm (520 laser head) 483 x 285 x 88 mm (control unit – 19" 2U rack mount)	



3. FSC Series OPOs

delivers high power, broadband coherent light.

Our OPO is our flagship product. We are the first company to offer tunable optical parametric oscillator products that cover both the near-IR and mid-IR wavelength regions.

Our near-IR OPO generates light across the 1.4 μm – 4 μm region (7100 cm^{-1} – 2500 cm^{-1}). Wavelength selection is achieved by translation of a PPLN crystal with varying grating periodicity.

Our mid-IR OPO makes use of a new generation of non-linear crystals which allows the generation of light across the 5 μm – 12 μm region (2000 cm^{-1} – 1000 cm^{-1}).

Both systems are optically pumped by the FSC series 1040 HP, which is fully integrated into the optical head to maximize stability and reduce the overall footprint.

The near-IR OPO generates few-picoseconds pulse durations which doesn't require long hours in set up time. Our laser source does not require water cooling and comes with a simple user interface, making it one of the easiest laser sources to operate.



For spectroscopy applications and CARS microscopy, there is often a need to tune to several specific wavelengths. The ability to generate light at these longer infrared wavelengths is key to detecting a wide range of solids, liquids, gases. Being able to generate instantaneous broadband light across the 3

– 4 μm wavelength region lends itself to being able to identify and quantify a large number of hydrocarbons using techniques such as FTIR spectroscopy. The same is also true across the 5 – 12 μm fingerprint region where more complex chemical signatures can be readily identified.

Applications

- Vibrational spectroscopy
- FTIR / stand-off techniques
- Multi-species gas analysis
- Telecoms / Quantum research
- Materials characteristics
- Explosive detection
- Raman spectroscopy

Features & Benefits

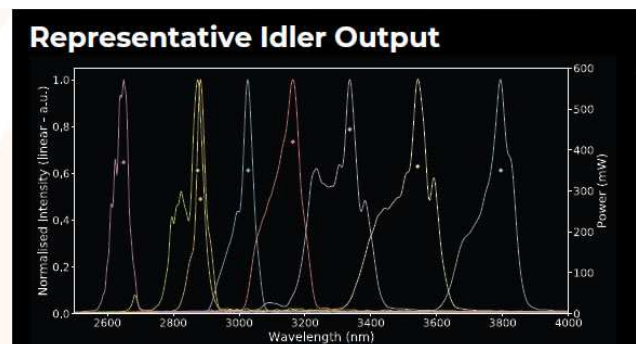
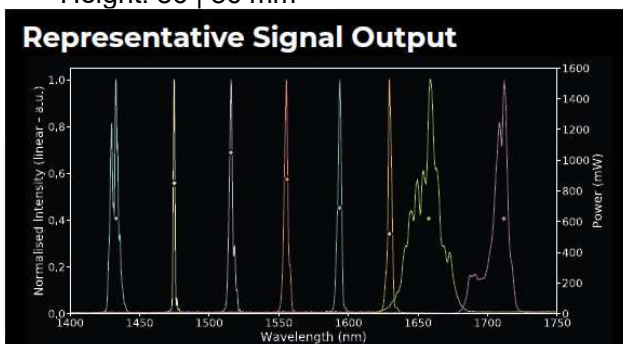
- Compact laser housing with an integrated pump source
- Broadband, coherent beam
- An intuitive web browser interface

Tunability and high average power enables a broad range of spectroscopic and sensing applications.

Specifications:

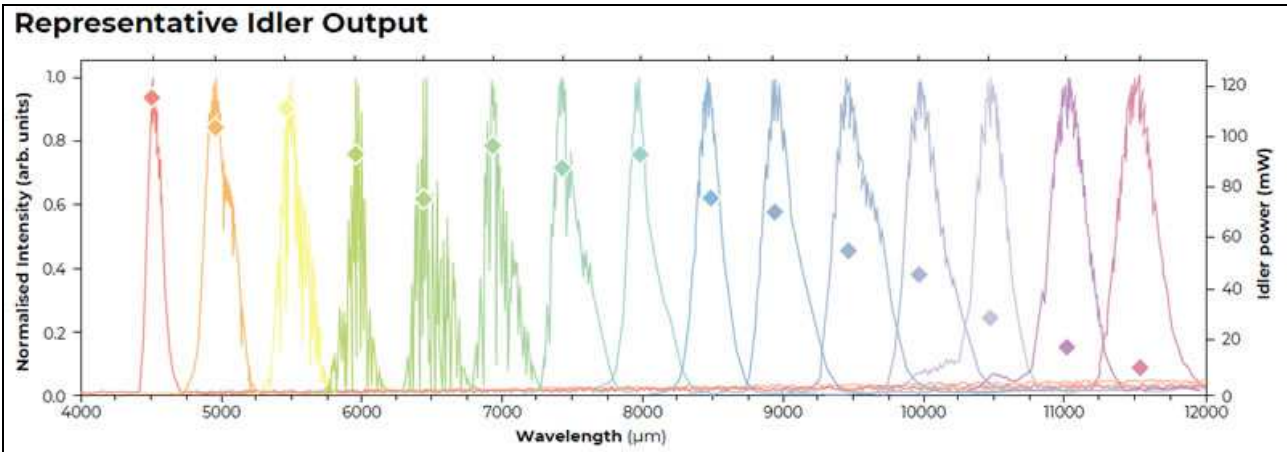
(1) Near-IR OPO

- Signal Wavelength: 1.4 μm – 1.8 μm
- Signal Power: Up to 850 mW (@ 1.5 μm) and > 350 mW across the range
- Idler Wavelength: 2.4 μm – 4 μm
- Pump Source: Fully integrated FSC-1040 pump laser
- Repetition Frequency: 100 MHz
- Control interface: Web browser interface. Ethernet & serial port (RS232) also available.
- Cooling: Air cooled
- Dimensions (Near IR Laser Head | Control Unit): Length: 814 | 483 mm; Width: 255 | 285 mm; Height: 86 | 86 mm



(2) Mid-IR OPO

- Output Wavelength: Output within 5-12 μm available (2000 cm^{-1} – 833 cm^{-1})
- Output Power: Up to 80 mW at 5-7 μm and up to 10 mW at 12 μm
- Crystal Specifications: Crystals with different central wavelengths available.
- Pump Source: Fully integrated FSC-1040 pump laser
- Repetition Frequency: 100 MHz
- Control interface: Web browser interface. Ethernet & serial port (RS232) also available.
- Cooling: Air cooled
- Dimensions (Near IR Laser Head | Control Unit): Length: 970 | 485 mm; Width: 245 | 285 mm; Height: 86 | 86 mm



Representative instantaneous bandwidth as the OPO is tuned across its full range. Water absorption lines can be observed across the 5.5 – 7.5 µm range.

Application Notes:

Product / Application Matrix		FSC 520	FSC 1040	Near IR OPO	Mid IR OPO
		●	●	●	●
Microscopy	Life Science Imaging – Two Photons + SHG	●	●	●	●
	Life Science Imaging – Lightsheet / SPIM	●	●	●	●
Spectroscopy	FTIR (Stand-off Detection / Process Control)	●	●	●	●
	Time-resolved Fluorescence Life Time Spectroscopy	●	●	●	●
	Vibrational Spectroscopy	●	●	●	●
	Fundamental Research – Spectroscopy	●	●	●	●
Test and Measurement	Novel Semi Conductor Material	●	●	●	●
	LIDAR	●	●	●	●
Material Characterisation	Material Deformation – Sintering	●	●	●	●
	Material Deformation – Nano Particles	●	●	●	●
	Photopolymerisation	●	●	●	●
Agritech	SHG Imaging (Collagen and Starch)	●	●	●	●
Fundamental Research – Photonics	Nonlinear Optics	●	●	●	●
	Quantum Optics – Communications	●	●	●	●
	Quantum Optics – Entanglement	●	●	●	●

- Measuring Picosecond Fluorescence Lifetimes using a FSC 520
- Deep tissue cardiac imaging using the FSC 1040
- SHG imaging in starch and collagen fibres using the FSC 1040
- Two-photon fluorescence microscopy using the FSC 1040
- Two-Photon Lightsheet Microscopy using the FSC 1040
- Heating of Hybrid Gold-Iron Oxide Nanoparticles in Biological Media using the FSC 1040
- Supercontinuum using FSC 1040
- Two-Photon quantum interference and entanglement at 2.1µm using the FSC 1040 and Near-IR OPO
- Active FTIR-based stand-off spectroscopy using a femtosecond optical parametric oscillator
- White powder identification using broadband coherent light in the molecular fingerprint region
- Stand-off identification of aerosols using mid-infrared backscattering Fourier-transform spectroscopy (Near-IR OPO)
- Photon counting LIDAR at 2.3µm wavelength with superconducting nanowaves
- Open-path multi-species remote sensing with a broadband optical parametric oscillator
- Experimental observation of gain in a resonantly pumped Pr³⁺-doped chalcogenide glass mid-infrared fibre amplifier
- Dual-comb spectroscopy in the spectral fingerprint region using OPGaP optical parametric oscillators
- Infrared fingerprint-region aerosol spectroscopy
- Molecular fingerprint-region spectroscopy from 5 to 12µm using an orientation-patterned gallium phosphide optical parametric oscillator

STKM Series Ultrafast Lasers

1. STKM-YFi High Power and Repetition Rate Near-IR Ultrafast Fiber Lasers



The STKM-YFi laser series is a family of high average power, high repetition rate near-IR ultrafast fiber lasers. STKM-YFi products are based on a single rugged opto-mechanical platform and are engineered for hands-free operation.

STKM-YFi Outstanding Characteristics

The STKM-YFi system employs a patented all normal dispersion (ANDi) mode-locked fiber laser coupled with a fiber amplifier. This configuration offers numerous unique advantages, including:

- Bandwidth supporting sub-100 fs pulses
- High output energy from oscillator requires less amplification for shorter, low temporal pedestal pulses
- Robust long-term operation

The short, clean pulses of the STKM-YFi laser series deliver more peak intensity per mJ than competing products. We guarantee both pulse duration and pedestal energy content, verified with a FROG pulse measurement, to ensure each laser pulse is free of picosecond background that robs energy from the main short pulse. Thus, more of the laser output is truly usable, requiring less energy/average power and decreasing the probability of seeing collateral damage and other detrimental interactions.

Features:

- Average power: 5W / 20 W / 50 W (STKM-YFi / STKM-YFi HP / STKM-YFi Ultra)
- < 150/170/190 fs pulse length with low pulse pedestal gives improved performance for driving nonlinear optical interaction: optimum efficiency at lower pulse energy / average power
- Tuneable repetition rate (0.5-15, 60MHz)
- Fully integrated, ruggedized, hands-free laser source
- Stable over large temperature range (16-26° C)
- Graphical, intuitive software control with integrated diagnostics
- Computer controlled pulse width pre-compensation: optimize your experiment with no external prisms or gratings
- No manual adjustments on head
- Small optical head footprint (~ 30 x 45 cm) for STKM-YFi and STKM-YFi HP

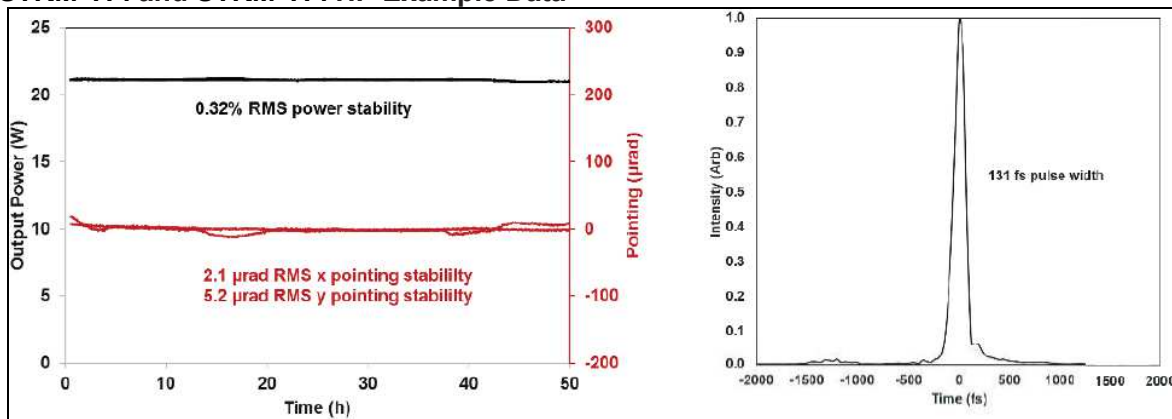
Key Specification

Parameter	STKM-YFi	STKM-YFi HP	STKM-YFi Ultra
Pulse Width	<150 fs (<120 fs typical)	<170 fs	<190 fs
Compressor Dispersion Pre-compensation	±20,000 fs ²	±10,000 fs ²	Inquire
Centre Wavelength	1035 ± 5 nm	1035 ± 5 nm	1035 ± 5 nm
Pulse Energy	> 0.45 μJ @ 10 MHz	> 3 μJ @ 1 MHz	> 40 μJ @ 1 MHz
Beam Quality	M ₂ < 1.2	M ₂ < 1.2	M ₂ < 1.2
Average Power	> 4.5 W @ 10 MHz	> 20 W @ 10 MHz	> 50 W @ 10 MHz
Repetition Rate	0.5 - 15, 60 MHz	0.5 - 15, 60 MHz	0.5 - 15, 60 MHz
Auto-Correlation Pedestal	< 12%	< 15%	< 20%

Content			
Background content	< 1.0%	< 1.0%	< 2.0%
Pre-Pulse Contrast	< 0.5%	< 0.5%	< 1%
Post-Pulse Contrast	< 0.5%	< 0.5%	< 1%
Power Stability*	<1% RMS over 12 hours after 30 min warm-up	<1% RMS over 12 hours after 30 min warm-up	<1% RMS over 12 hours after 30 min warm-up
Pointing Stability*	< 10 μ Rad RMS after 30 min warm-up	< 10 μ Rad RMS after 30 min warm-up	Inquire
Operational Temp. Range	16 - 26 $^{\circ}$ C	16 - 26 $^{\circ}$ C	16 - 26 $^{\circ}$ C
Physical Configuration	12"x16"x2.4" (optical head)	12"x16"x2.4" (optical head)	24"x48"x8" (optical head)
Computer Interface	Laptop provided, w/GUI	Laptop provided, w/GUI	Laptop provided, w/GUI
SHG Power	Inquire	> 8 W @ 10 MHz	Inquire
SHG Pulse Duration	Inquire	< 150 fs	Inquire

*Ambient \pm 0.5 $^{\circ}$ C

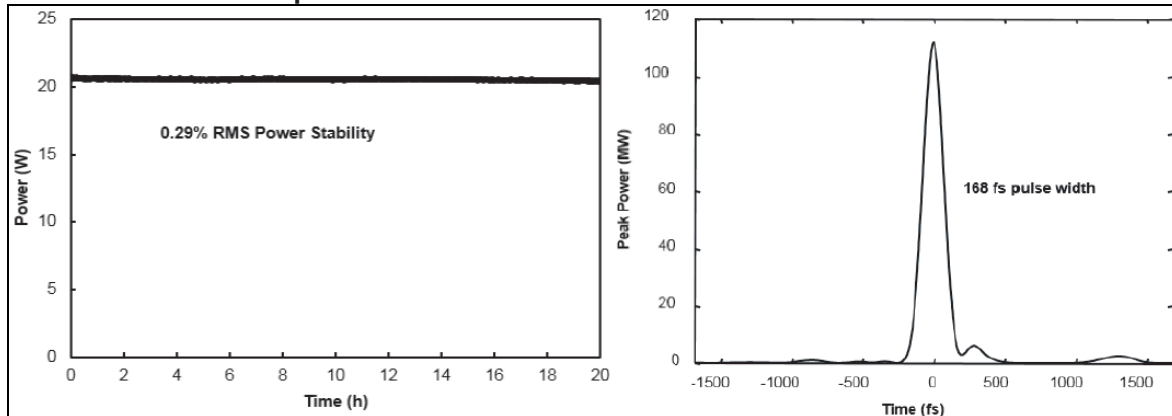
STKM-YFi and STKM-YFi HP Example Data



STKM-YFi HP power and pointing stability over 50 hours, in typical lab conditions

M-YFi HP clean 131 fs pulses at 20W output (2 mJ, 10 MHz), measured with frequency resolved optical grating (FROG).

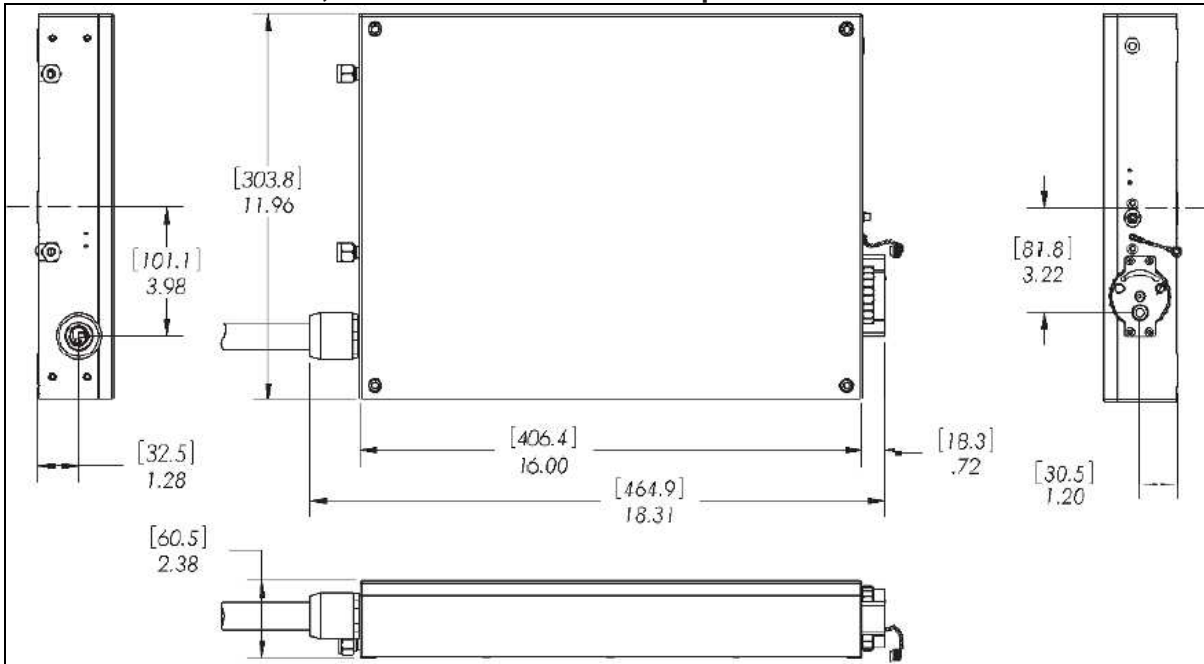
STKM-YFi Ultra Example Data:



Average power measured over 20h showing fluctuations < 0.3% RMS

Measured temporal pulse with a duration of 168 fs FWHM operating at 22 μ J at 1 MHz

Mechanical Dimensions, STKM-YFi / STKM-YFi HP Optical Head:



Application:

- OPCPA seeding
- OPA pumping
- Multiphoton microscopy
- Chemical spectroscopy
- Precision micromachining of tissues, glass, and plastics

2. STKM-YFi OPA Robust, Briefcase-sized Tuneable Ultrafast SWIR/MWIR Source



The STKM-YFi OPA is our vertically integrated optical parametric amplifier pumped by a STKM-YFi HP. The class-leading pulse duration of the 1035 nm centred STKM-YFi HP results in both a stable, coherent white light seed source and exceptionally high conversion efficiency into the short-wave and mid-wave infrared.

Y-FiTM OPA Unique Features:

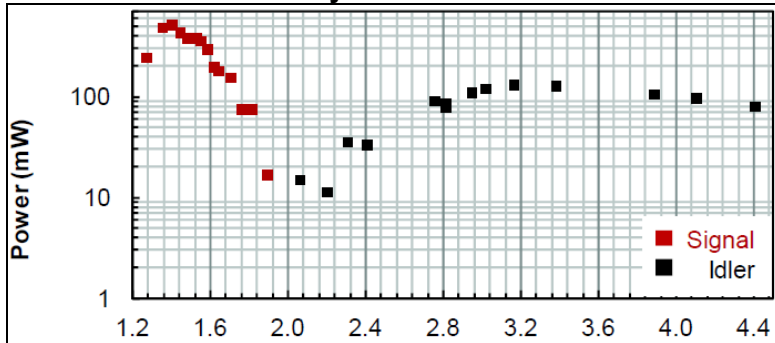
- Tuneable repetition rate range of 1-2 MHz
- > 15% conversion efficiency into Signal and Idler
- Supports < 50 fs pulses
- STKM-YFi HP output (1035nm, 3μJ) also available, direct or residual after OPA
- Compact form factor: 12"x16"x5.5" optical head

Features:

- Coherent white light seeded OPA
- Average power up to 400mW in the Signal and 100mW in the Idler
- <1.5% shot-to-shot pulse energy deviation in Signal
- Excellent beam quality: M2 typically <1.4

- Residual 1 mm output available at separate port
- Intuitive control GUI including wavelength and pulse optimization
- Combination of clean (low pedestal) short pulses and high energy gives higher peak intensities to drive nonlinear optical processes
- Custom configurations available

STKM-YFi OPA Tenability



Specification

Parameter	STKM-YFi OPA Signal	STKM-YFi OPA Idler
Central wavelength	1250 – 1800nm	2.4 – 4.4μm
Pulse Width	< 50fs bandwidth*	< 100fs bandwidth*
Beam Quality	$M^2 < 1.4^{**}$	Not specified
Average Power	>0.4W @ 1MHz***	>0.1W @ 1MHz***
Pulse Energy	>0.4μJ @ 1MHz***	>0.1μJ @ 1MHz***
Peak Power	>3MW supported	Not specified
Repetition Rate	1 -2MHz	1 -2MHz
Power Stability	<3% RMS over 12 hours after 30min of warm-up	<3% RMS over 12 hours after 30min of warm-up****
Pointing Stability	<20μrad RMS over 12 hours after 30min of warm-up**	Not specified

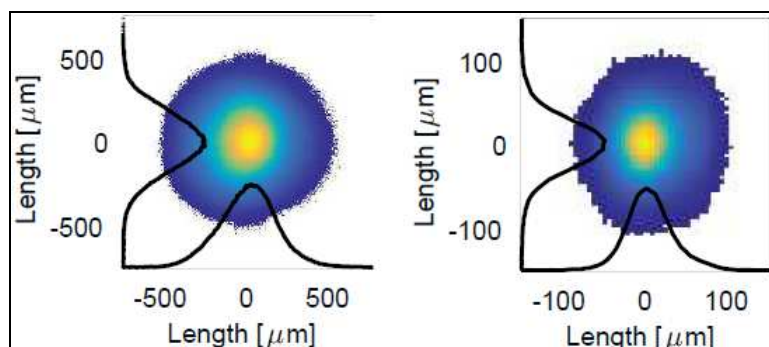
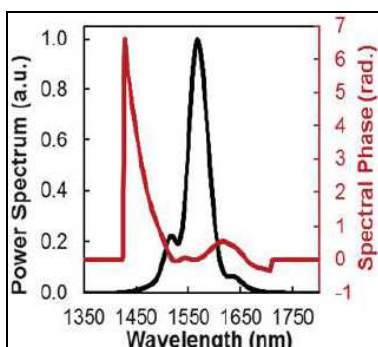
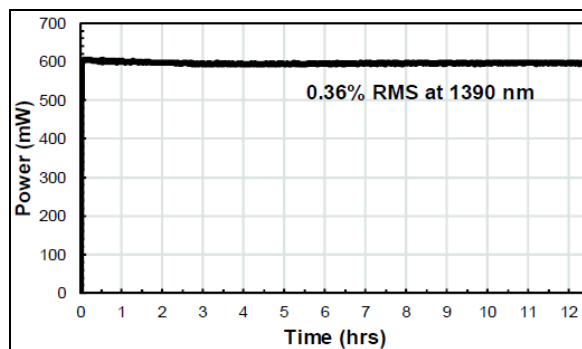
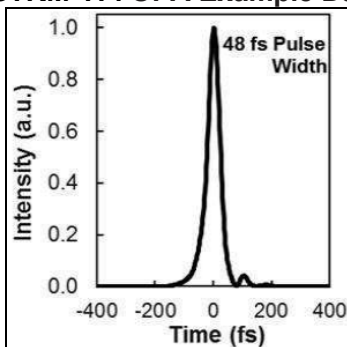
* At the tuning range minimum

** Measurement performed on SHG of signal at tuning range maximum

*** At the tuning range peak

**** Typical performance

STKM-YFi OPA Example Data:



2-photon image of signal mode $\lambda = 1350 \text{ nm}$

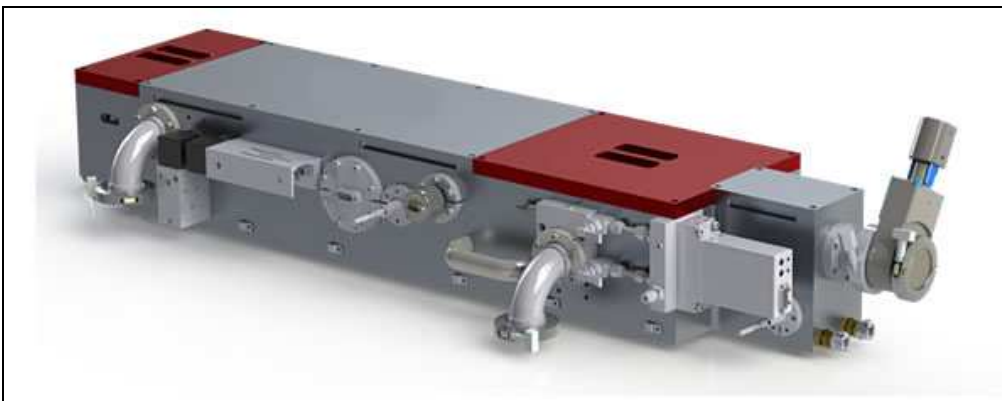
4-photon image of idler mode $\lambda = 4000 \text{ nm}$

Application:

- Short-wave infrared (SWIR) supercontinuum generation
- Mid-wave infrared (MWIR) supercontinuum generation
- Three and Four photon excitation fluorescence microscopy
- Pump probe spectroscopy
- Tip-enhanced mid-wave infrared nanoscopy and nanospectroscopy
- Retina-safe coherent Raman scattering (simulated Raman scattering, coherent anti-stokes Raman scattering, impulsive stimulated Raman scattering, etc.)

3. STKM-XUUS-5 High Harmonic Generation Source for EUV and Soft X-ray (10nm to 50nm)

Coherent, EUV-wavelength light, made through high harmonic generation (HHG), has finally come of age. STKM-XUUS-5 is our fifth generation of EUV conversion platform designed to offer “black-box” conversion of ultra-short, infrared laser pulses into short wavelength, laser-like radiation. Our patented use of fiber-based HHG architecture ensures repeatable, highly-stable, bright and low gas-usage generation of EUV light.



STKM-XUUS-5 upconverts ultrafast laser pulses into the Extreme UV (EUV or XUV) or soft X-ray regions of the spectrum. Employing HHG processes, the output beam inherits the coherent properties of a driving laser such as the amplifier with wavelengths that can be tuned from ~10 to 50 nm. Moreover, customized systems can generate coherent beams with wavelengths as short as 6 nm. The STKM-XUUS-5 employs our patented hollow waveguide for the high harmonic up-conversion process.

The STKM-XUUS hollow-core fiber, or waveguide, architecture enables harmonics generated by the system to be distinguished from other HHG methods, guaranteeing your harmonics originate from the same point in space every time, minimizing any pointing drift. This architecture optimizes repeatability for your experiments. Additionally, the use of a fiber--rather than typical gas jet or semi-infinite gas cell target geometries--provides superior pressure tunability for phase-matched HHG. Now you can choose robustness without sacrificing flexibility.

Features

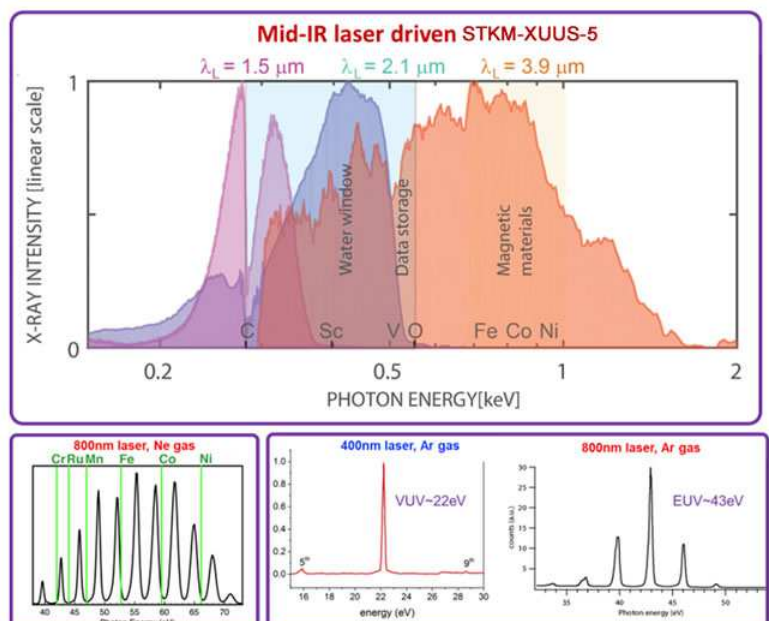
- High Brightness EUV conversion
- High Efficiency EUV conversion, when paired with our amplifier
- Low Gas Usage
- Active Stabilization of Input Beam

Applications

- Photo Electron Spectroscopy
- Coherent Diffractive Imaging
- Time Resolved EUV Spectroscopy
- Attoscience
- Advanced Tomography

Specifications

- Wavelength Range (for ~800nm pump): ~10-50nm
- Flux: Up to 1012ph/s/harmonic
- Flux Fluctuations (>8 hours): <5% RMS
- Pointing Fluctuations (> 8 hours): <5μrad RMS



- Dimensions (mm): 1200 L x 330 W x 176 H
- Beam Height: 4.5" (114.3mm)

Wavelength	Flux*	Repetition Rate	Pointing Stability	Power Stability
30 nm	>5x10 ¹² ph/sec per harmonic	1 - 20	<5 μrad RMS	<5% RMS
13 nm	>10 ¹⁰ ph/sec per harmonic	1 - 10	<5 μrad RMS	<5% RMS
6 nm	>10 ⁶ ph/sec per 10% BW	1	<10 μrad RMS	<10% RMS

*Achievable when optimally coupled to our Ti:sapphire amplifier. Performance will vary with other driving lasers.

4. STKM-Hyperion-VUV – Vacuum Ultraviolet Source (115nm to 205nm)



We provide bright femtosecond pulses at numerous wavelengths across the vacuum ultraviolet (VUV) region, from 6.0 eV (205 nm) to 10.8 eV (115 nm). The discrete tunability of our STKM-Hyperion-VUV vacuum ultraviolet source enables researchers to study a wide range of materials and materials properties. A simple computer-selected change of photon energy provides a powerful capability, previously only available at a synchrotron; this ability to easily change the laser wavelength can enhance many experiments. For example, in angle-resolved photoemission (ARPES) experiments, this tunability allows researchers to distinguish surface effects from bulk effects. For time-of-flight (ToF) studies of molecules, the tunability can distinguish otherwise identical isomers.

STKM-Hyperion-VUV is also highly focusable, and the appropriate optics can be used to reach spot sizes below 10 microns. This ability will allow researchers to examine new types of samples, including materials that are polycrystalline, spatially inhomogeneous, faceted, or simply very small.

STKM-Hyperion-VUV produces pulses with durations below 250 femtoseconds, enabling scientists to probe ultrafast dynamics of molecules and materials. The 1 MHz repetition rate enables rapid data collection and avoids space-charge effects.

Additionally, STKM-Hyperion-VUV is “application ready,” including the appropriate focusing and beam-steering elements to enable fast integration with experimental apparatus. Importantly, STKM-Hyperion-VUV can be used with a window between the source and the experimental chamber, guaranteeing that applications demanding ultrahigh vacuum (such as ARPES) will remain contamination-free.

In addition to ARPES, STKM-Hyperion-VUV will enable breakthrough research in photoemission electron microscopy (PEEM), photoionization mass spectroscopy (PIMS) for combustion research, and other studies of next-generation materials and molecular systems.

STKM-Hyperion-VUV:

- Is discretely tunable
- Provides high energy resolution
- Enables femtosecond time-resolved experiments
- Allows high spatial resolution
- Provides synchrotron-quality VUV in your lab

Applications:

- Angle-resolved photoemission spectroscopy (ARPES)
- Time-resolved ARPES
- Photoemission electron microscopy (PEEM)
- Photo-ionization mass spectroscopy (PIMS)
- Molecular time-of-flight (ToF) studies

- Applications that require tunable VUV light
- Applications that require femtosecond pulses of VUV light

Features that lead to significant benefits:

Tunable (computer-selected) photon energy between 6–10.8 eV enhances capabilities for laser ARPES experiments:

- Achieve high momentum resolution using low energy photons (< 7 eV) and still cover higher momentum range using higher energy photons (> 10 eV)
- Obtain surface vs. bulk information
- Reveal "hidden bands" by changing wavelength
- Bandwidth is adjustable to optimize data collection

Tight focal spot provides greater sample flexibility, allowing the study of

- Extremely small samples
- Spatially heterogeneous samples
- Polycrystalline materials

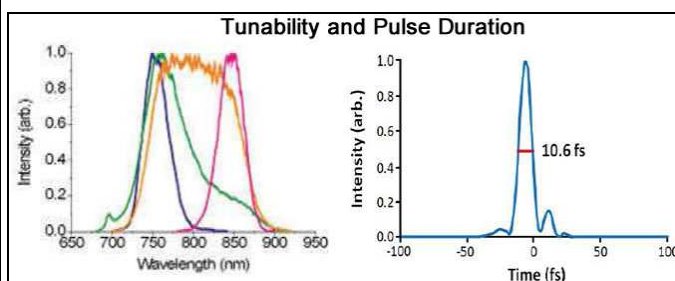
A window provides complete isolation between Hyperion VUV and the experimental chamber, maintaining high vacuum

Femtosecond pulses enable time-resolved experiments

Hyperion VUV measures only 2.5 feet x 5 feet, bringing the power of the synchrotron to your lab

Photon energy (eV)	User selectable: 6, 7.2, 8.4, 9.6, 10.8	
Repetition rate	1MHz	
Power stability	<5% (RMS)	
Photon flux	Full bandwidth (~40meV)	Moderate bandwidth (<5meV)
7.2eV	1012 ph/s delivered	5x10 ¹⁰ ph/s delivered
10.8eV	1010 ph/s delivered	5x10 ⁸ ph/s delivered
Laser head size	750x1500mm	
Electrical power	110/230V 20A (x2)	

6. STKM-Halcyon – Ti:Sapphire Oscillator



The STKM-Halcyon repetition-rate stabilized oscillator is popular with customers who need to synchronize oscillator laser pulses with pulses from another laser or with a synchrotron. Electronics included with the STKM-Halcyon lock its output to the customers reference signal and can provide timing jitter of less than 150 fs. Stabilization of the repetition rate is achieved through multiple features including a temperature-stabilized breadboard, a motorized stage for coarse feedback, and a small piezo-mounted mirror for fast feedback. Our team works closely with each customer to ensure that the system meets their specific needs. Due to the flexible design of STKM-Halcyon it can lock to reference signals over a very wide range: 75 MHz to 4 GHz.

Applications:

- Synchrotron locking
- Pumping OPOs
- Materials Research
- Femtochemistry
- Spectroscopy
- THx Generation
- Ultrafast Imaging
- 2-photon polymerization
- Pump-probe experiments

Unique Features:

- Low jitter, <150 fs, locking to your RF reference signal

- Customer-specified reference frequency: 75 MHz – 4 GHz
- Ultrashort sub-12 fs pulses, up to 1.4 W average power
- Easy-to-use, computer-controlled interface

Product Configurations:

- STKM-Halcyon-5: <12 fs, 750-840 nm, >550 mW, 75-102 MHz, Integrated 5 W pump
- STKM-Halcyon-10: <25 fs, 750-850 nm, >1.4 W, 75-102 MHz, Integrated 10 W pump

Custom configurations available

7. STKM-Griffin – Ti:sapphire Oscillator Family

Our SYKM-Griffin series of Ti:sapphire oscillators gives customers ultimate control over their system, are simple to maintain, and offer a wide range of performance specifications enabling many different applications. These prism-based oscillators use Kerr lens modelocking to generate ultrashort < 12 fs pulses. All STKM-Griffin lasers include computerized control of the spectral bandwidth and center wavelength and water-cooled breadboards for maximum long term stability. There are options within STKM-Griffin series that include integrated pump lasers and diagnostics. STKM-Griffin lasers are very simple to maintain, since components are easily accessible.

Applications:

- Frequency conversion into the UV and mid-IR
- Pumping OPO
- Materials Research
- Femtochemistry
- Spectroscopy
- THz Generation
- Ultrafast Imaging
- 2-photon polymerization
- Pump-probe experiments

Our STKM-Griffin oscillator was used as the front end seed of a 0.85PW laser amplifier system operating at 3.3Hz.


Product Configurations:

- STKM-Griffin-5: <12 fs, >550 mW, 750-840 nm tuning range, 80-95 MHz
- STKM-Griffin-10: <15 fs, >1.4 W, 750-840 nm tuning range, 80-95 MHz
- STKM-Griffin-10-WT: <25 fs, >0.8 W, 700-920 nm tuning range, 80-95 MHz

Custom configurations available

8. STKM-RAEA Series Ultrafast Ti:sapphire Amplifier

20W average power over a wide range of repetition rates



STKM-RAEA sub-25 fs, single-box amplifier is a fully engineered and integrated commercial source based on a single rugged optomechanical platform. It employs our patented cryogenically-cooled amplifier technology, allowing for a continuous trade-off between pulse energy and repetition rate flexibility, optimizing the laser to utilize its full output power while also optimizing pulse energy for the experiment. It offers often more than an order of magnitude increase in experimental throughput.

STKM-RAEA Unique Features:

Optimized for pumping HHG using STKM-XUUS extreme UV ultrafast source.

Systems Built to Perform

Sealed modular components for plug and play upgradeability

- Hands-free, software-based operation including repetition rate adjustments, and real-time power and spectrum monitoring and tuning
- Next-generation oscillator
- Unprecedented output power for a single-stage Ti:sapphire system
- 2nd-generation cryocell technology for improved performance and temperature-cycling capabilities, and ultra-low maintenance

The Cryo-cooling Advantage:

Cooling a Ti:sapphire crystal to 50-80K results in greater than a 200x decrease in thermally-induced distortions in the beam being amplified. At 90W pump power, the thermal lens of several meters is easily managed, while a room temperature crystal would exhibit a catastrophic < 1 cm thermal lens effect. This capability underpins our unique ability to offer versatile repetition rate and power-scalable systems.

Applications:

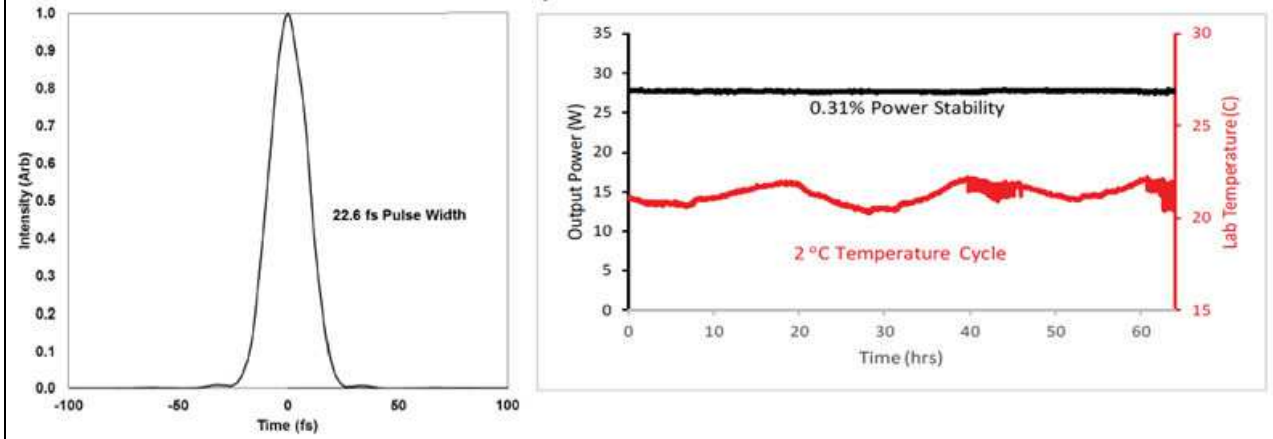
- High harmonic generation (HHG)
- Frequency conversion, OPA pumping
- Materials research
- Femtochemistry
- Laser particle acceleration
- Spectroscopy
- THz generation
- Ultrafast Imaging
- Pump probe experiments

Features:

- Cryogenic cooling enables highest average powers on the market
- Average power 20W from a single box configuration
- Pulse energies up to 20 mJ
- Software based tuning of repetition rate
- Pulse duration of < 35 or < 25 fs
- Excellent beam quality: M2 typically 1.1-1.2
- Intuitive control GUI including wavelength, bandwidth, power, and repetition rate control with integrated diagnostics
- One-box configuration with integrated pump lasers and oscillator
- Combination of clean (low pedestal), short pulses and high energies gives higher peak intensities to drive nonlinear processes

	STKM-RAEA	STKM-RAEA Short Pulse Option
Software Tunable PRF Range	5-30 kHz	5-15 kHz
Average Power	Up to 20 W standard	Up to 13 W standard
Pulse Energy	3 mJ @ 5 kHz 2 mJ @ 10 kHz 0.6 mJ @ 20 kHz	2 mJ @ 5 kHz 1.3 mJ @ 10 kHz
Pulse Width	35 fs	25 fs
Spatial Mode	Near TEM ₀₀ , M ² < 1.25	Near TEM ₀₀ , M ² < 1.3

STKM-RAEA Example Performance Data at 10 kHz



STFT Series 2.8-3.5 μ m Mid-IR Ultrafast Fiber Lasers

We are pleased to offer the first ultrafast fiber lasers in the mid-IR. Various advantages include:



- Built to last
- Fiber laser technology inside
- Efficient, all-fiber diode pumping
- Fiber tip protections
- Passive cooling



- Improve your optical performance
- High average power (Watt level)
- Diffraction-limited laser beam (TEM00)
- Ultrashort pulses down to 100 fs
- Can cover the 2.8 to 4 μ m range



- Plug and play setup
- Start your experiment within seconds
- Turn-key lasers
- Simple software
- Tablet controlled



- Benefit from mid-IR absorption bands
- 100 times more absorbing
- Resonant laser-matter interaction
- Covers the fundamental O-H and C-H bands
- Higher absorption = higher precision + speed

The simplest way to do nonlinear optics in the mid-infrared. Avoid 2-photon absorption, benefit from the lower dispersion of mid-infrared materials and avoid useless light generation in the near-infrared

Applications:



Supercontinuum generation



Pump-probe experiments



Femtochemistry



Frequency Combs



Ultrafast vibrational dynamics



Seed source for OPCPA and DFG systems



Quantum Optics



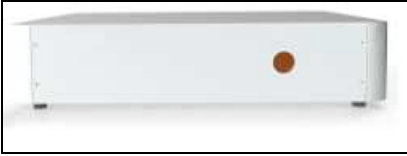
THz wave generation



Silicon Photonics

1. STFT-UL-2800 Ultrafast Fiber Laser

We offer a cutting-edge 3- μ m class ultrafast fiber oscillator. This reliable, compact and maintenance-free laser is designed to enable novel applications in the mid-infrared.



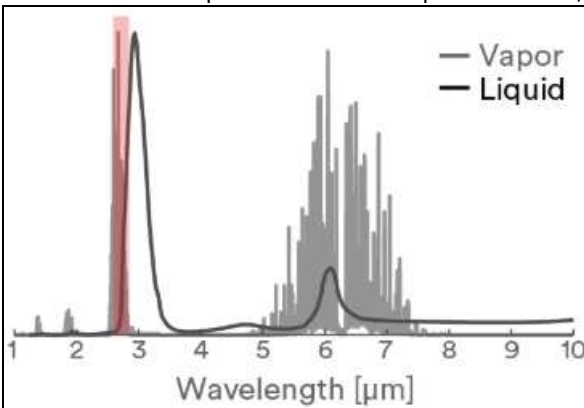
Challenging mid-IR applications require unique Optical Features such as:

1. Perfect beam for waveguide and fiber injection
2. High peak power and femtosecond duration
3. High average power for high SNR
4. Low amplitude and frequency noise

We offer a compact, robust and reliable design:

- Fiber laser cavity
- Unique fiber pump-combiner inside
- Optimize end-caps for high-power operation
- Passively cooled
- Plug and play setup
- Self-starting mode-locked laser
- Tablet controlled
- Integrated ultrafast detector for monitoring

Centered near the peak of water absorption of water, STF-UL-2800 lets you interact with H₂O like never before

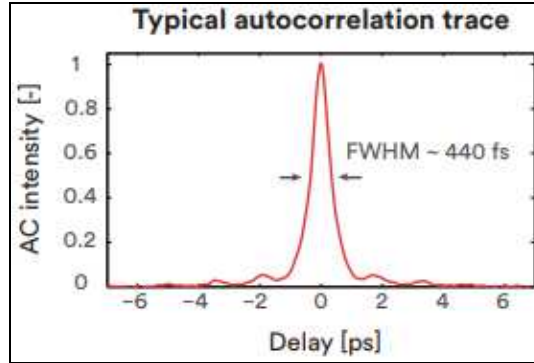
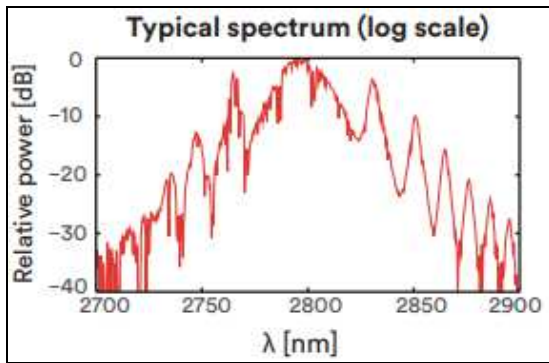


Unique optical features for unique, high-impact applications

Peak Wavelength: 2.8μm	Pulse Duration: < 500 fs
Average Power: 10 – 100 mW	Repetition Rate: 25- 70 MHz

Specifications:

Optical	Standard	Custom
Central Wavelength	2800 (+-5) nm	
Bandwidth (FWHM)	10-30nm	
Average Power	35 mW	> 300 mW
Pulse Energy	1 mJ	> 5 nJ
Repetition rate	~ 35 MHz	40 – 100 MHz
Peak Power	> 1 kW	> 10 kW
Pulse Duration	~ 500 fs	250 - 500 fs
Beam Diameter	< 3 mm	
M ² (average of X and Y)	< 1.3	
Output Polarisation	Linear	
Systems specifications		
Dimensions	16 x 14 x 3.5 in.	
Cooling	Passive Cooling	
Voltage	100 to 240 V	
Beam Delivery	Free space	Fiber output
Controller	Computer controlled or integrated touch screen	



Features

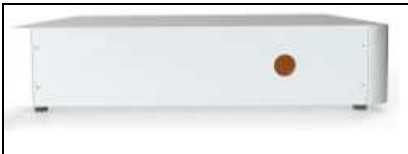
- Compact and turn-key laser system
- Self-starting mode locking
- Integrated fast detector for monitoring
- Efficient all-ber diode pumping at 980 nm
- Pulse duration < 600 fs
- Average power up to 300 mW
- Single-mode output

Applications

- Mid-infrared frequency combs
- Material processing
- Mid-infrared spectroscopy and imaging
- Nonlinear frequency conversion
- High-field physics
- Supercontinuum generation

2. STFT-ULT-3400 tunable wavelength ultrafast fiber laser

We are proud to introduce the first commercial ultrafast fiber laser emitting above 3 μm . This compact, maintenance-free and electronically tunable laser system offers unique optical performances for scientific applications.



We are proud to introduce the first commercial ultrafast fiber laser in the mid-infrared. This compact and electronically tunable laser system is ideal for scientific and industrial uses.

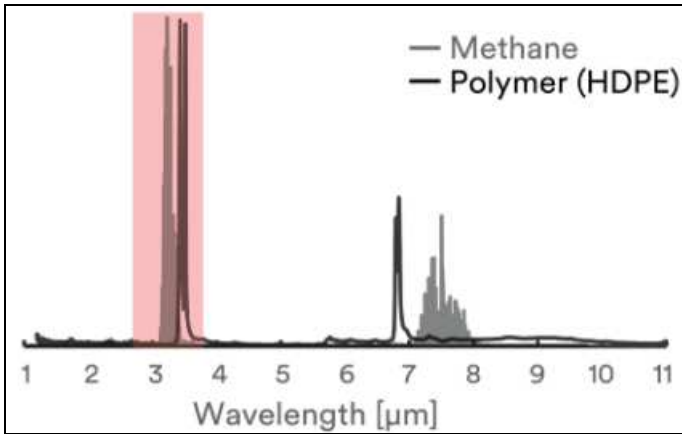
Benefit from a resonant laser interaction

The STFT-ULT-3400 can be tuned precisely for optimal interaction with organic materials

Hydrocarbons absorption spectrum

Depending on the material, the C-H fundamental absorption band is located in the 3.3-3.4 μm window. At these wavelengths, laser-matter interaction can be > 100 times more efficient than CO₂ lasers

For industrial applications, the STFT-ULT-3400 combines the strong laser absorption of a UV laser (without denaturing the polymer) and the reliability and beam quality of a fiber laser.



Applications:



- Non-metal laser processing
- Thin-film ablation and marking
 - Polymer ablation and marking
 - Precise tissue ablation
 - Adhesive removal
 - Solar panel scribing



- Microscopy and Sensing
- Hyperspectral imaging
 - Water and Methane remote sensing
 - Mid-IR Spectral-domain OCT
 - CARS enhancement
 - Frequency comb

Challenging mid-IR applications require Unique Optical Features such as:

- Fast and wide tunability from 2.8 to 3.6 μm
- Single-mode fiber output = Perfect beam pointing and quality (TEM00)
- High spectral brightness
- Low frequency and amplitude noise
- High wall-plug efficiency

Compact, robust and reliable design:

- Fiber laser cavity
- Fiber pump combiner inside
- Optimized endcaps for high-power operation
- Passive or fan cooling
- Plug and play setup
- Turn-key laser system
- Simple software
- Tablet controlled

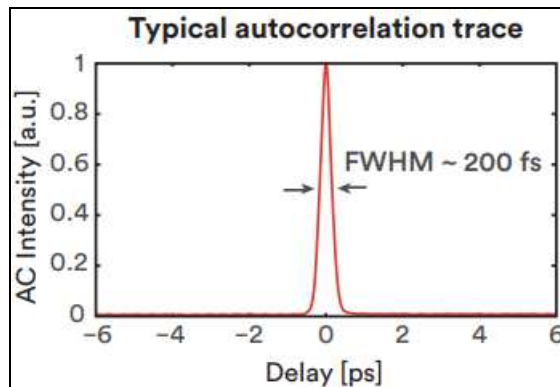
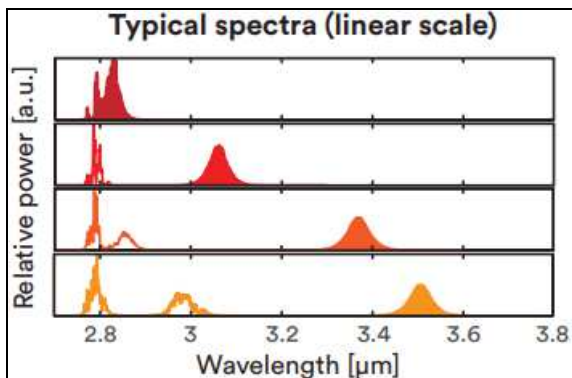
With advanced laser technology, improve your business competitiveness with a faster, more precise laser processing. Our products reduce maintenance needs and reliance on mechanical consumables.

Peak Wavelength	2.8-3.5μm	Pulse Duration	<200fs
Average Power	30-1000mW	Repetition Rate	M² < 1.1

Specifications:

Optical	Standard
Central Wavelength	2.8 – 3.5 μm tunable
Bandwidth (FWHM)	10-75nm
Average Power	30-1000mW
Pulse Energy	1-30nJ
Repetition rate	~35MHz
Peak Power	~1-100kW
Pulse Duration	<500fs
Beam Diameter	<3mm
M ² (average of X and Y)	<1.3
Output Polarisation	Elliptical
Systems specifications	
Dimensions	16x30x3.5 in.

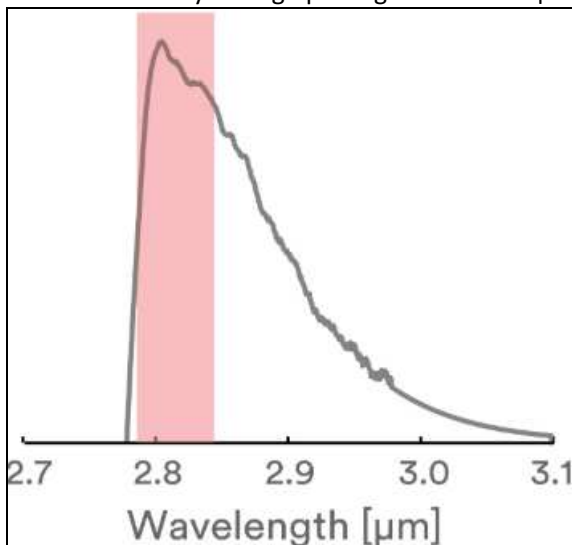
Cooling	Passive cooling
Voltage	100 to 240V
Beam Delivery	Freespace
Controller	Computer Controlled or integrated touch screen



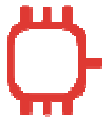
3. STFT-AMP-2800 fiber amplifier

We introduce the first commercial erbium-doped fluoride fiber amplifier in the mid-infrared. This compact fiber system can efficiently amplify light at wavelengths around 2800 nm. The most efficient mid-IR amplifier on the market.

Benefit from very strong optical gain around 3 μm



Amplify low-power seed lasers to the watt-level, From CW to fs pulses, STFT-AMP-2800 is an efficient all-fiber amplifier for various applications:



Semiconductor lasers (ICL, LED, DFB, Quantum well)



Solid-state lasers (OPO, OPA, OPG, OPCPA, DFG and Er:YSGG)



Supercontinuum generation



Tunable, spectrally isolated ultrafast pulses

Increase both the average power and the beam quality of your laser

- Up to $>$ 20 dB amplification (2780 to 2830 nm)
- Single-mode fiber output = Beam quality (TEM 00) + stability
- High wall-plug efficiency

Compact, robust and reliable design

- All-fiber pump-combiner inside
- Optimize endcaps for protecting the fiber tip
- Passive cooling
- Plug and play setup
- Easily plug your low-power seed laser to our fiber amplifier
- Tablet controlled

Powerful, reliable and user friendly

Signal Wavelength: 2.8μm	Signal gain: 10 to > 20 dB
Output Power: 10 mW - > 1 W	M ² : < 1.1

Specifications:

Optical	Standard
Signal Wavelength	2800 (+-20) nm
Output Power	10 mW to > 1 W
Signal Gain	10 to > 20 dB
Output beam diameter	< 3 mm
M ² (average of X and Y)	< 1.3
Systems specifications	
Dimensions	16x30x3.5 in.
Cooling	Passive cooling
Voltage	100 to 240V
Beam Delivery	Freespace
Controller	Computer Controlled or integrated touch screen

KEY FEATURES

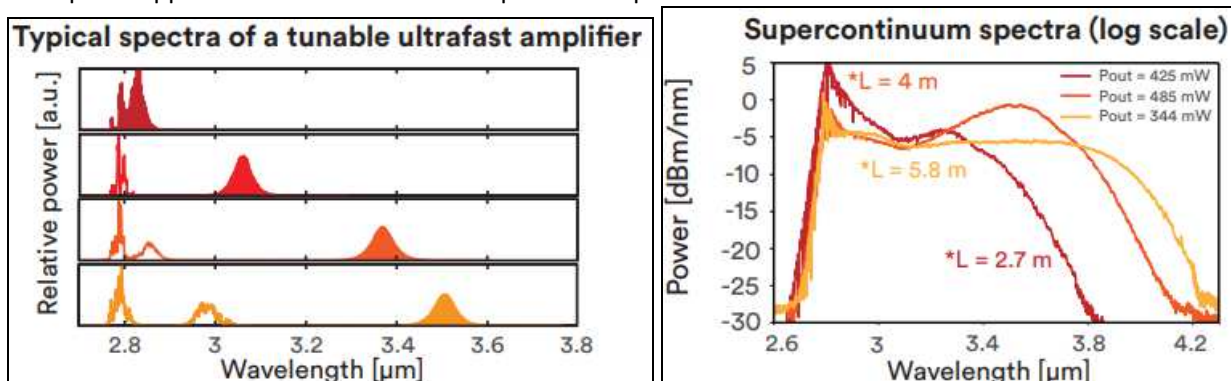
- Compact and turn-key system
- Efficient all-fiber diode pumping at 980 nm
- Signal gain > 10 dB
- Single-mode output

APPLICATIONS

- Amplifier for ICL, OPO, DFG sources
- Material processing
- Mid-infrared spectroscopy and imaging
- Nonlinear frequency conversion
- High-field physics
- Supercontinuum generation

When seeded with an ultrafast laser, this amplifier can generate a watt-level tunable ultrafast output or a high energy supercontinuum spanning from 2.6 to 4.2 μ m.

Example of application: Mid-IR ultrafast amplifier and spectral converter:



STLM Series Femtosecond Fiber Lasers



Femtosecond lasers enable high precision processing without any heat effect on the material. Despite the pristine quality they deliver, ultrashort pulsed micromachining often have the reputation of being “too slow” and therefore are not cost effective for industrial-grade applications.

We proudly announce that our game changer GHz femtosecond fiber lasers have up to 1000X higher processing speed ability while maintaining high precision.

Technical specifications:

Part number	STLM-DURO-GHz
Wavelength	1030 nm
Pulse Duration	<300 fs
Burst Energy	200 μ J
Intra-Burst Repetition Rate	4 GHz
Burst Repetition Rate	100 kHz
Pulse Energy	200 ~ 500 nJ
Number of Pulse Inside Burst	400 ~ 1000 Pulses
Average Power	20 W
Burst Envelope Shaping	available via analog modulation or laser user interface
Power Stability	<1%
M2	<1.2
Polarization, PER	Linear, 200:1
Power Consumption	<300 W
Electrical Requirements	100 ~ 240 VAC, 50/60 Hz
Cooling System	Air Cooling
External Interfaces	USB 2.0, RS232
Software Interfaces	User-friendly and Customizable GUI
Pulse Repetition Control	Amplifier Diode Modulation or Ext/Int AOM Both Available
Pulse Duration Control	Adjustable Between 300 fs to 10 ps