Sintec Optronics

STGS series PM Pico-second Pulsed Fiber Lasers

STGS series PM Pico-second pulsed fiber laser is a new product recently launched by Sintec Optronics. This ultrafast fiber laser uses self-developed gain-switching technology which results higher long term reliability than the traditional passively mode-locked technique. Combined with all-fiber PM amplifier structure, the system becomes more compact and more reliable. High performance makes this laser suitable for LED wafer scribing and ultrafast material processing.

Features:

- Gain-switching seed laesr
- All-fiber system
- 5W @ 1064nm and 500kHz
- Repetition rate: 50-500kHz
- Single pulse energy up to 10uJ
- Beam quality M2<1.3
- Cost effective

Technical specifications:

Model	STGS01
Power	Up to 5W (500kHz)
Spatial mode	TEM00(M2<1.3)
Central wavelength	1060nm
Power stability	<± 1 % over 8 hrs
Repetition rate	50-500kHz (optional)
Fundamental pulse width	150-200ps
Beam ellipticity	<10%
Computer interface	RS232
Sync (trigger) output	SMA
Cooling	Integrated air cooling
Power requirements	100-240V, 50/60Hz
Dimensions(L*W*H)	413mm*269mm*142mm & 366mm*132mm*104mm
Weight	<20kg
Output	Free space

Sintec Optronics

STOF-PL Series Laser Diode System

STOF-PL series Picosecond gain switched laser diode module for OEM and R&D applications.

Features:

- High pulse quality – no satellite pulse and minimized pulse tail
- Variable pulse repetition rate – single shot to 100 MHz
- Pulse on demand
- Wavelengths from 375 – 2000 nm
- High repeatability and 24/7 operation
- Compact, dust-sealed OEM package
- External and internal trigger
- Simple user interface
- Plug & play
- Air cooled
- Remote control
- Maintenance free – no user-serviceable parts inside or outside laser

Specifications:

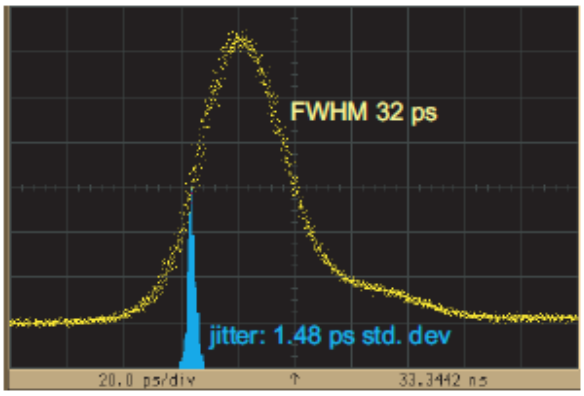
Model	**STOF-PL-xxx**
Center wavelength[1]	375nm-2um
Pulse duration[2]	20ps-1ns variable
Pulse peak power[2]	25-1000mW
Pulse repetition rate	Single shot – 120MHz
Output	Free space or fiber output
PER	>23dB
Timing jitter	<3ps rms
Warm-up time	<5 minutes
Size laser head	95 x 31 x 147 mm^3
Size controller	235 x 88 x 326 mm^3
Power consumption	< 15 W
Weight laser head	0.45 kg
Weight controller	2.5 kg

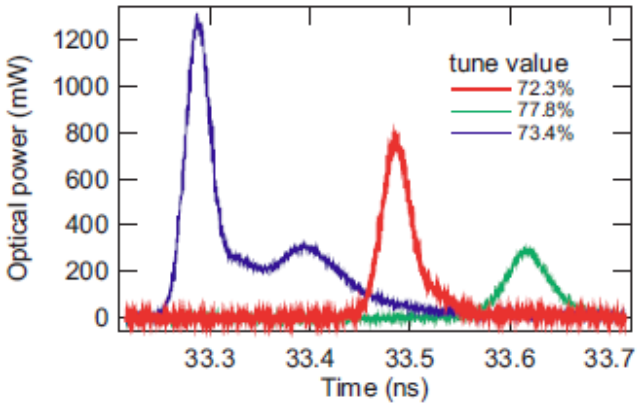
[1] all commercially available laser diode wavelengths in this range
[2] depending on center wavelength regime

Options

- Single mode or multi mode fiber output, fiber collimator with or w/o microfocus
- Thermal wavelength tuning
- Converter TTL to NIM level for trigger-out
- Narrow spectral line-width DFB-laser
- Single box OEM package

Data of STOF-PL-xx with center wavelength of 405nm





Sintec Optronics

STOF-GK series Pico-second Lasers

STOF-GK series low-noise picosecond laser module designed for OEM and R&D applications.

Features:

- Pedestal-free high quality pulses
- Clean and narrow optical spectrum – no ripple
- Very low amplitude and phase noise
- No amplifier built in – no ASE noise
- Diffraction limited beam
- High repeatability and 24/7 operation
- Compact, dust-sealed OEM package
- Plug & play
- Passively air cooled – no water cooling
- Low power consumption
- Remote control
- One-button operation – no adjustment knobs or screws
- Maintenance free – no user-serviceable parts inside or outside laser

Specifications:

Model	**STOF-GK-10**	**STOF-GK-15**
Center wavelength	1030-1064nm	1530-1575nm
Pulse duration	1-15ps	<5ps
Average power (up to)	15mW	150mW
Pulse repetition rate	40MHz-10GHz	40MHz-10GHz
Spectral bandwidth	<2nm	<5nm
Output[1]	Collimated free space, M^2<1.1	Collimated free space, M^2<1.1
PER	>20dB	>20dB
Amplitude noise	<0.2% rms, <0.5% pk-pk (24h)	<0.2% rms, <0.5% pk-pk (24h)
Center wavelength drift	<0.1nm pk-pk (24h)	<0.1nm pk-pk (24h)
Warm-up time	<10 minutes	<10 minutes
Specs guaranteed	10°C -40°C	10°C -40°C
Storage temperature	-20°C -65°C	-20°C -65°C
On/Off cycles	>10 000	>10 000
Size laser head[2]	296 x 112 x 54 mm^3	296 x 112 x 54 mm^3
Size std. controller	165 x 104 x 40 mm^3	165 x 104 x 40 mm^3
Power consumption	< 15 W	< 15 W
Power supply	90-264VAC, 47-63Hz	90-264VAC, 47-63Hz
Weight laser head	2.5 kg	2.5 kg
Weight controller	0.65 kg	0.65 kg

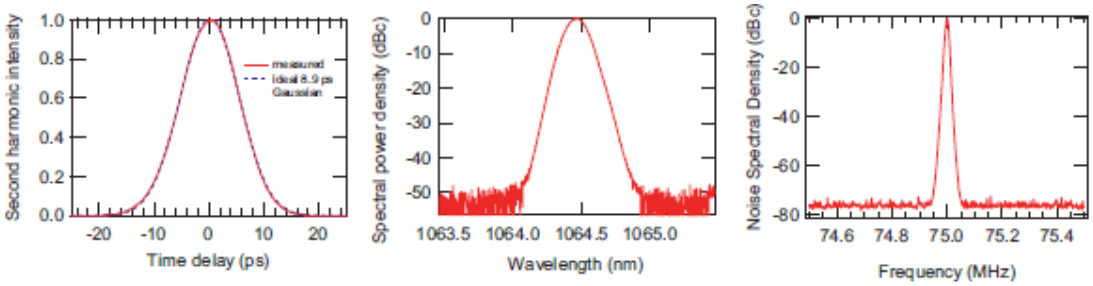
[1] fiber output is available as an option

[2] exact size and weight depend on the pulse repetition rate, data for 80MHz version

Options:

- Synchronization to external clock for ultralow timing jitter
- Electrical interface for pump power control
- Piezo controlled cavity length
- Repetition rate tunability
- Wavelength tunability
- Internal monitor PD
- Optical isolator
- On request: Integration of user-defined opto-electronic devices (e.g. THz emitter or speciality fibers)

Technical data:



Sintec Optronics

STOF-GK series High Power Pico-second Lasers

STOF-GK series high power 1-um picosecond laser module designed for OEM and R&D applications.

Features:

- Pedestal-free high quality pulses
- Clean optical spectrum – no spectral ripple
- Low amplitude and phase noise
- No amplifier built in – no ASE noise
- High repeatability and 24/7 operation
- Compact, dust-sealed OEM package
- Plug & play
- Lightweight – mountable in any orientation
- Low power consumption
- Remote control
- One-button operation – no adjustment knobs or screws
- Maintenance free – no user-serviceable parts inside or outside laser

Specifications:

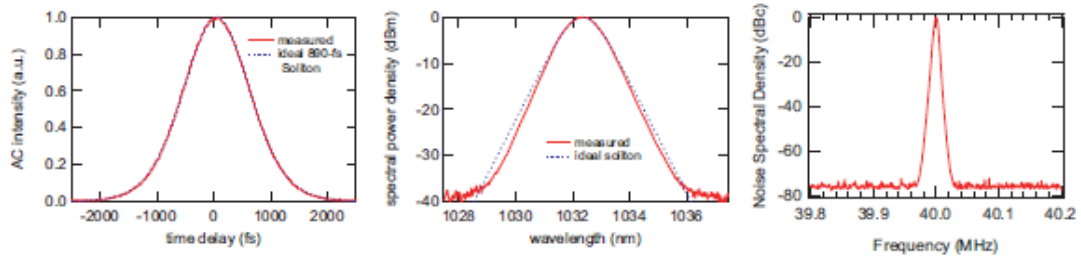
Model	STOF-GK-10 HPND	STOF-GK-10 HPYB
Center wavelength	1064nm	1030nm
Pulse duration	<15ps	1-7ps
Average power (up to)	>3W	>3W
Pulse repetition rate	40-250MHz	40-250MHz
Pulse energy (up to)	80nJ	80nJ
Spectral bandwidth	<0.6nm	<1.3nm
Output	Collimated free space, M^2<1.2	Collimated free space, M^2<1.2
PER	>23dB	>23dB
Amplitude noise	<0.5% rms, <1% pk-pk (1h)	<0.5% rms, <1% pk-pk (1h)
Center wavelength drift	<0.1nm (1h)	<0.1nm (1h)
Pointing stability	<50 urad rms (12h)	<50 urad rms (12h)
Warm-up time	<15 minutes	<15 minutes
Specs guaranteed	-18°C -32°C	-18°C -32°C
Storage temperature	-20°C -65°C	-20°C -65°C
On/Off cycles	>10 000	>10 000
Size laser head[1]	240 x 330 x 125 mm^3	240 x 330 x 125 mm^3
Power consumption	< 300 W	< 300 W
Power supply	24VDC or 90-264VAC, 47-63Hz	24VDC or 90-264VAC, 47-63Hz
System weight[1]	12 kg	12 kg

[1] Exact size and weight depend on the pulse repetition rate

Options:

- Synchronization to external clock for ultralow timing jitter
- Electrical interface for pump power control
- Piezo controlled cavity length
- Repetition rate tunability
- Internal monitor PD
- Optical isolator
- SHG, THG, FHG
- Other pulse repetition rates are available on request

Technical data:



Sintec Optronics

STOF-KT Series Pico-second Lasers

STOF-KT series versatile picosecond laser module designed for OEM and R&D applications.

Features:

- Variable pulse repetition rate
- Pulse on demand – trigger input
- High pulse quality
- Narrow optical spectrum
- High repeatability and 24/7 operation
- Compact, dust-sealed OEM package
- Lightweight – mountable in any direction
- Air cooled – no water cooling
- Low power consumption
- Remote control
- Plug & play – one-button operation – no adjustment knobs or screws
- Maintenance free – no user-serviceable parts inside or outside laser

Specifications:

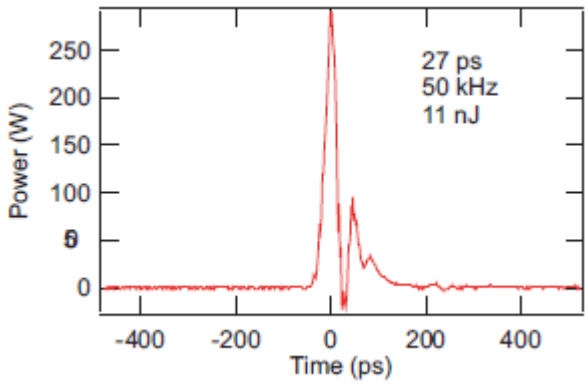
Model	STOF-KT-05	STOF-KT-08	STOF-KT-10	STOF-KT-15
Center wavelength	515/532nm	775nm	1030/1064nm	1550nm
Average power (up to)[1]	50mW	50mW	500mW	500mW
Pulse repetition rate[1]	25kHz-100MHz	25kHz-100MHz	25kHz-100MHz	25kHz-100MHz
Pulse energy (up to)[1]	20nJ	20nJ	100nJ	100nJ
Peak power (up to)	0.8kW	0.8kW	4kW	4kW
Pulse duration	Sub20ps-1ns	Sub20ps-1ns	Sub20ps-1ns	Sub20ps-1ns
Spectral bandwidth (down to)	0.1nm	0.1nm	0.1nm	0.1nm
Output	PM fiber or collimated free space, M^2<1.1			
PER	>17dB	>17dB	>17dB	>17dB
Timing jitter	<3ps	<3ps	<3ps	<3ps
Amplitude noise (10h)	<4% rms	<4% rms	<4% rms	<4% rms
Warm-up time	<15 minutes	<15 minutes	<15 minutes	<15 minutes
Specs guaranteed	15°C -35°C	15°C -35°C	15°C -35°C	15°C -35°C
Storage temperature	-20°C -65°C	-20°C -65°C	-20°C -65°C	-20°C -65°C
Power consumption	< 40 W	< 40 W	< 40 W	< 40 W
Power supply[2]	24VDC	24VDC	24VDC	24VDC
Typical size[3]	374 x 184 x 32 mm^3			
Typical weight[3]	2 kg	2 kg	2 kg	2 kg

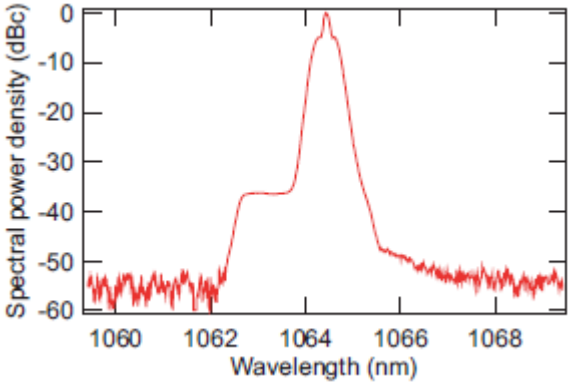
[1] Please inquire for possible combinations of average power and pulse repetition rate and pulse energy

[2] optional 90 - 264 VAC, 47 - 63 Hz

[3] exact size and weight depend on model

Technical data:





Sintec Optronics

STOF-KT Series High Power Pico-second Lasers

STOF-KT versatile high power picosecond laser module designed for OEM and R&D applications.

Features:

- Variable pulse repetition rate
- Pulse on demand / burst mode
- High pulse quality
- Narrow optical spectrum
- High repeatability and 24/7 operation
- Compact, dust-sealed OEM package
- Air cooled
- Remote control
- Plug & play – one-button operation no adjustment knobs or screws
- Maintenance free – no user-serviceable parts inside or outside laser

Specifications:

Model	STOF-KT-05 HP	STOF-KT-08 HP	STOF-KT-10 HP	STOF-KT-15 HP
Center wavelength	532nm	775nm	1064nm	1550nm
Average power (up to)[1]	5W	3W	20W	7W
Pulse repetition rate[1]	25kHz-100MHz Variable			
Pulse energy (up to)[1]	10uJ	1uJ	20uJ	3uJ
Peak power (up to)	500kW	40kW	1MW	100kW
Pulse duration	Sub20ps-1ns	Sub20ps-1ns	Sub20ps-1ns	Sub20ps-1ns
Spectral bandwidth (down to)	0.1nm	0.1nm	0.1nm	0.1nm
Output	Collimated free space, M^2<1.6			
PER	>23dB	>23dB	>23dB	>23dB
Amplitude noise (10h)	<4% rms	<4% rms	<4% rms	<4% rms
Timing jitter	<3ps	<3ps	<3ps	<3ps
Warm-up time	<15 minutes	<15 minutes	<15 minutes	<15 minutes
Operation temperature	18°C -32°C	18°C -32°C	18°C -32°C	18°C -32°C
Storage temperature	-20°C -65°C	-20°C -65°C	-20°C -65°C	-20°C -65°C
Power consumption	< 300 W	< 300 W	< 300 W	< 300 W
Power supply	90-264VAC, 47-63Hz			
Size laser head[2]	300 x 330 x 71 mm^3			
Size controller[2]	447 x 281 x 134 mm^3 (19"/4U rack mount)			
Weight laser head[2]	7kg			
Weight controller[2]	14 kg			

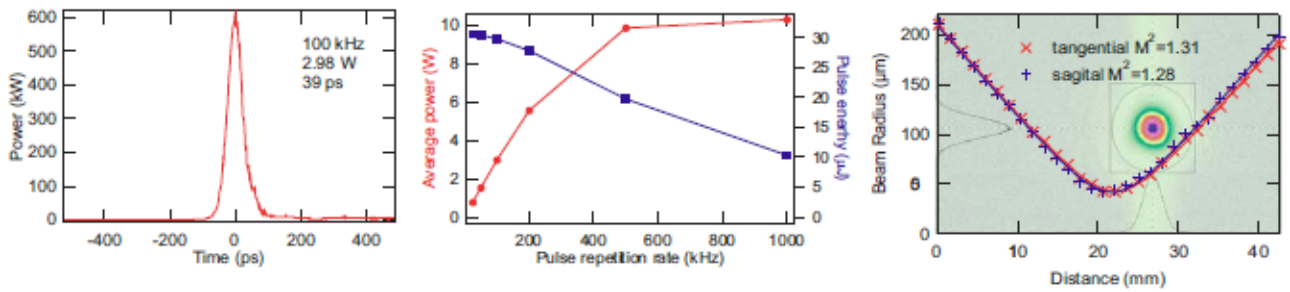
[1] please inquire for possible combinations of average power, pulse energy and repetition rate

[2] exact size and weight depend on model

UV Options:

Model	STOF-KT-02 HP	STOF-KT-03 HP
Center wavelength	266nm	355nm
Average power (up to)[1]	0.5W	2W
Pulse energy (up to)[1]	0.5uJ	2uJ

Technical data:



Sintec Optronics

STOF-KT Series High Energy Pico-second Lasers

STOF-KT versatile high energy picosecond laser system designed for OEM and R&D applications.

Features:

- Variable pulse repetition rate
- Trigger input
- Diffraction limited beam
- Narrow optical spectrum
- No ASE background
- High repeatability and 24/7 operation
- Lightweight – mountable in any direction
- Compact, dust-sealed OEM package
- Complete remote control
- Plug & play – one-button operation no adjustment knobs or screws
- Maintenance free – no user-serviceable parts inside or outside laser

Specifications:

Model	STOF-KT-02 XP	STOF-KT-03 XP	STOF-KT-05 XP	STOF-KT-10 XP
Center wavelength	266nm	355nm	532nm	1064nm
Average power (up to)[1]	0.5W	1.8W	3.3W	6W
Pulse repetition rate[1]	Single shot-1MHz Variable			
Pulse energy (up to) [1]	20uJ	75uJ	140uJ	250uJ
Pulse duration	<50ps	<50ps	<50ps	<50ps
Spectral bandwidth (down to)	1nm	1nm	1nm	1nm
Output	Collimated free space, M^2<1.2			
PER	>23dB	>23dB	>23dB	>23dB
Amplitude noise (10h)	<4% rms	<4% rms	<4% rms	<4% rms
Timing jitter	<3ps	<3ps	<3ps	<3ps
Warm-up time	<15 minutes	<15 minutes	<15 minutes	<15 minutes
Operation temperature	18°C -32°C	18°C -32°C	18°C -32°C	18°C -32°C
Storage temperature	-15°C -65°C	-20°C -65°C	-20°C -65°C	-20°C -65°C
Power consumption	< 600 W	< 600 W	< 600 W	< 600 W
Power supply	24VDC, 25A			
Size laser head[2]	420 x 260 x 125 mm^3			
Size controller[2]	No external controller			
System weight[2]	14kg			
Interfaces	RS232, Ethernet			

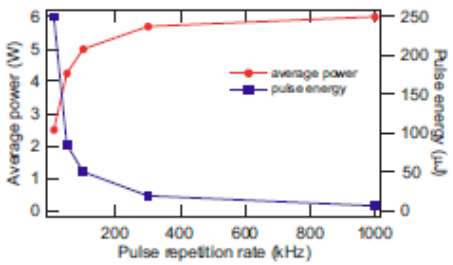
[1] please inquire for possible combinations of average power, pulse energy and repetition rate

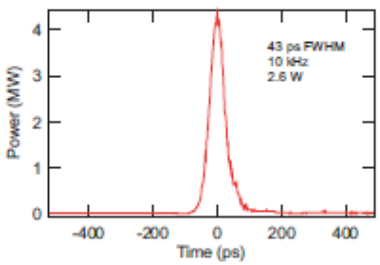
[2] exact size and weight depend on model

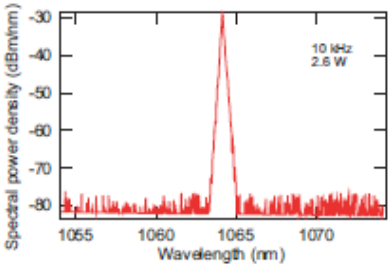
Options:

- Short pulses < 20 ps
- Long pulses up to 1 ns
- Burst mode - programmable pulse sequence with arbitrary amplitude
- Pulse on demand

Technical data (STOF-KT-10 XP):







Sintec Optronics

STOF-OG Series Femto-second Lasers

STOF-OG ultra-low-noise solution femtosecond laser module designed for OEM and R&D applications.

Features:

- Excellent pulse quality – pedestal-free transform-limited soliton pulses
- Clean sech2-shaped optical spectrum
- No Kelly-sidebands – no spectral ripple
- Diffraction-limited beam quality
- Lowest phase noise and timing jitter available on market
- Shot noise limited relative intensity noise
- No amplifier built in – no ASE noise
- High repeatability and 24/7 operation
- Compact, dust-sealed OEM package
- Plug & play
- Passively air cooled – no water cooling
- Low power consumption
- Remote control
- One-button operation – no adjustment knobs or screws
- Maintenance free – no user-serviceable parts inside or outside laser

Specifications:

Model	STOF-OG-05	STOF-OG-08	STOF-OG-10	STOF-OG-15	STOF-OG-17
Center wavelength	513-535nm	765-785nm	1025-1070nm	1530-1586nm	1580-1700nm
Pulse duration [1,2]	<100-230fs	<130-200fs	<90-400fs	<100-500fs	<200-300fs
Average power (up to)[2]	100mW	30mW	250mW	120mW	50mW
Pulse repetition rate[2]	20MHz-1.3GHz				
Pulse energy (up to) [2]	1.2nJ	0.7nJ	5nJ	2nJ	1nJ
Peak power (up to)	10kW	4.5kW	30kW	15kW	3kW
Spectral bandwidth[3]	transform-limited ($\tau_p \cdot \Delta \nu$ ~ 0.32) > 18 nm				
Output	Collimated free space, M^2<1.1(fiber output optional)				
PER	>23dB	>23dB	>23dB	>23dB	>23dB
Amplitude noise (10h)	<0.2% rms, <0.5% pk-pk (24h)				
Center wavelength drift	<0.1nm pk-pk (24h)				
Warm-up time	<10 minutes	<10 minutes	<10 minutes	<10 minutes	<10 minutes
Operation temperature	10°C -40°C	10°C -40°C	10°C -40°C	10°C -40°C	10°C -40°C
Storage temperature	-20°C -65°C	-20°C -65°C	-20°C -65°C	-20°C -65°C	-20°C -65°C
On/Off cycles	>10 000	>10 000	>10 000	>10 000	>10 000
Power consumption	< 15 W (steady state)				
Power supply	90-264VAC, 47-63Hz				
Size laser head[4]	296 x 112 x 54 mm^3				
Size std. controller	165 x 104 x 44 mm^3				
Weight laser head[4]	2.5kg				
Weight controller	0.65kg				

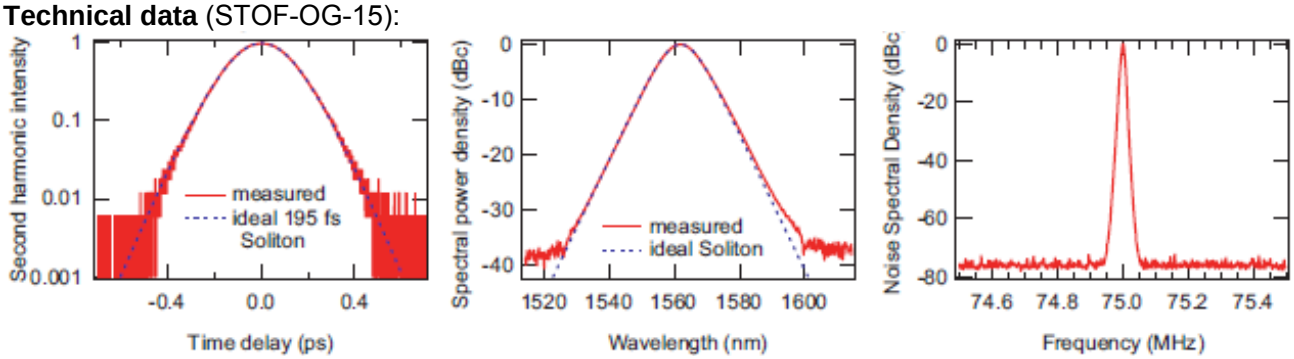
1 tunable (requires external adjustable power supply)

[2] please inquire for possible combinations of pulse duration, average power, and repetition rate

[3] bandwidth to support sub 60 fs available with close to linear chirp

[4] exact size and weight depend on pulse repetition rate

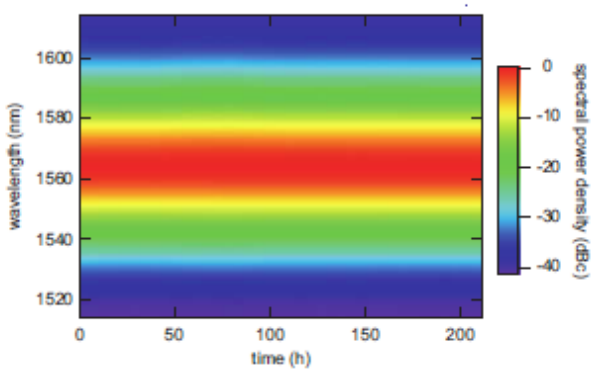
Technical data (STOF-OG-15):



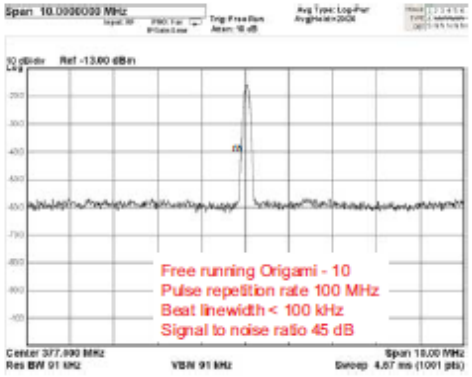
Options:

- Linear controller for ultra low noise & timing jitter
  < 5 fs rms with low noise controller (1 kHz - 10 MHz)
  < 30 fs rms with standard controller (1 kHz - 10 MHz)
- Synchronization to external clock • Wavelength tunability
- Electrical interface for pump power control
- Piezo controlled cavity length
- Carrier Envelope Phase (CEP) stabilization ready
- Fiber output (PM or SMF)
- UV generation
- Repetition rate tunability
- Internal monitor PD
- Optical isolator

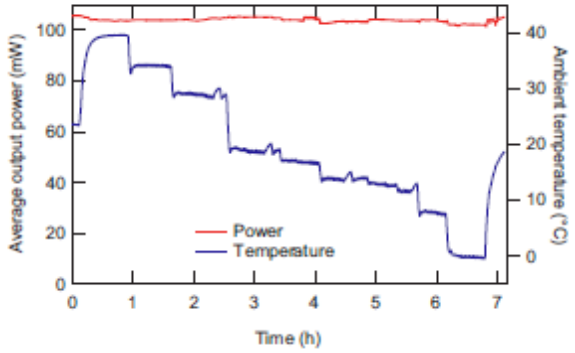
Optical spectrum as a function of time



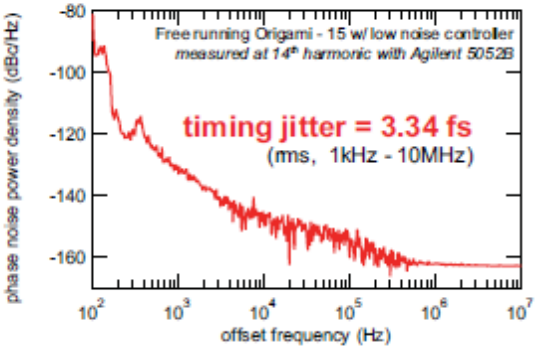
Carrier envelope phase beat note



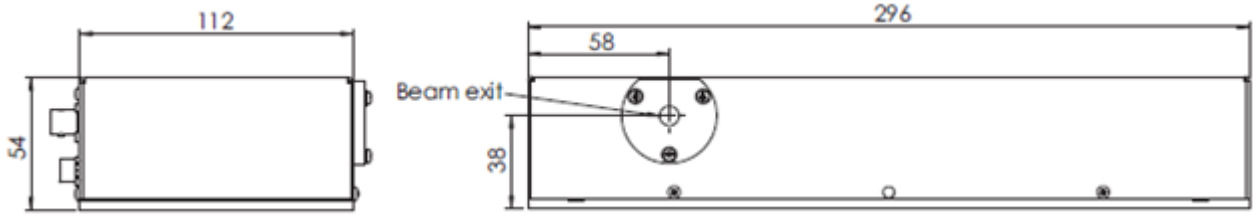
Temperature cycling



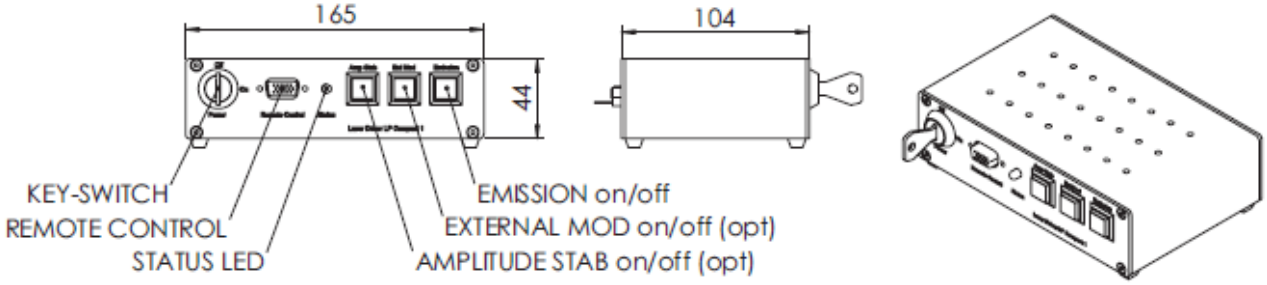
Phase noise / timing jitter



Technical drawing of laser head (mm, 80MHz version)



Technical drawing of standard laser controller (mm)



Sintec Optronics

STOF-OG Series High Power Femto-second Lasers

STOF-OG series high power air cooled femtosecond laser module for OEM and R&D applications.

Features:

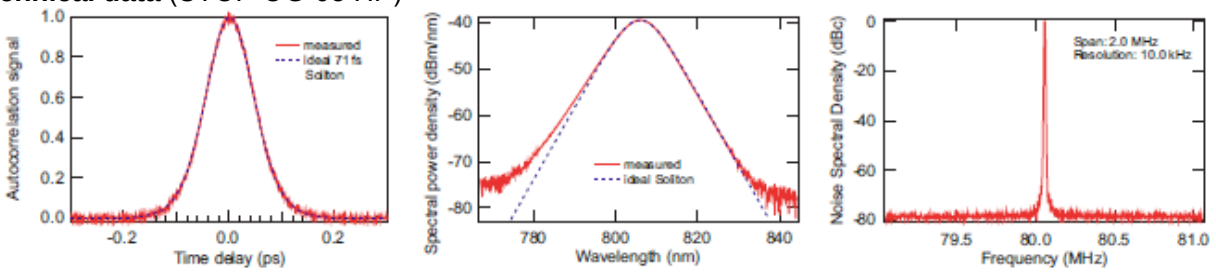
- Excellent pulse quality – pedestal-free transform-limited soliton pulses
- Clean sech2-shaped optical spectrum
- No Kelly-sidebands – no spectral ripple
- Diffraction-limited beam quality
- Low amplitude and phase noise
- No amplifier built in – no ASE noise
- High repeatability and 24/7 operation
- Compact, dust-sealed OEM package
- Plug & play
- Air cooled – no water cooling
- Low power consumption
- Remote control
- One-button operation – no adjustment knobs or screws
- Maintenance free – no user-serviceable parts inside or outside laser

Specifications:

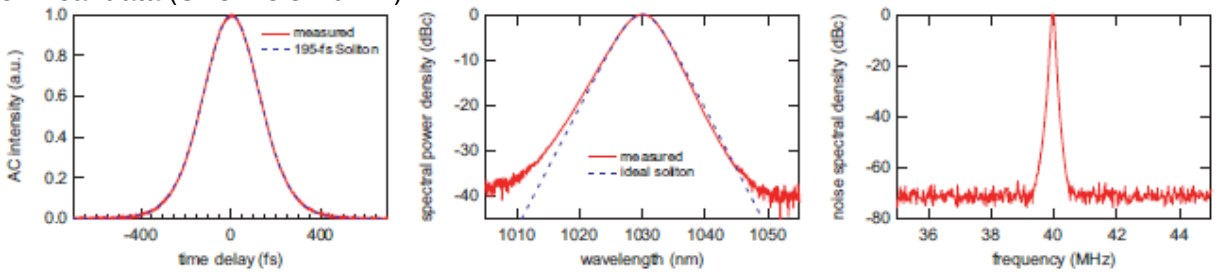
Model	STOF-OG-05 HP	STOF-OG-10 HP	STOF-OG-08 HP
Center wavelength	514-520nm	1028-1040nm	780-820nm
Pulse duration	<200fs	<200fs	<100fs
Average power (up to)	>1.5W	>3W	>300mW
Pulse repetition rate	40-200MHz		40-200MHz
Pulse energy (up to)	40nJ	80nJ	8nJ
Peak power (up to)	>160kW	>320kW	>60kW
Spectral bandwidth	Transform limited (τ_p . Δv ~ 0.32)		Transform limited (τ_p . Δv ~ 0.32)
Output	collimated free space, M^2 < 1.2		collimated free space, M^2 < 1.2
PER	>23dB	>23dB	>20dB
Amplitude noise	< 0.5% rms, < 1% pk-pk (1h)		< 0.5% rms, < 1% pk-pk (1h)
Center wavelength drift	< 0.1 nm pk-pk (1h)		< 0.3 nm pk-pk (1h)
Pointing stability	<50urad rms (12h)		<50mrad rms (12h)
Warm-up time	<15 minutes	<15 minutes	<15 minutes
Operation temperature	18°C -32°C	18°C -32°C	18°C -32°C
Storage temperature	-20°C -65°C	-20°C -65°C	-20°C -65°C
On/Off cycles	>10 000	>10 000	>10 000
Power consumption	< 300W		< 300W
Power supply	24VDC or 90-264VAC, 47-63Hz		24VDC or 90-264VAC, 47-63Hz
Size laser head[1]	240 x 330 x 125 mm^3		260 x 420 x 125 mm^3
System weight[1]	12kg		16kg

1 exact size and weight depend on pulse repetition rate

Technical data (STOF-OG-08 HP)



Technical data (STOF-OG-10 HP)



Sintec Optronics

STOF-OG Series High Energy Femto-second Lasers

STOF-OG high energy compact 1-um amplified femtosecond laser for OEM and R&D applications.

Features:

- Excellent pulse quality
- Close to diffraction-limited beam quality
- Low ASE background
- Burst mode
- Variable repetition rate
- Variable pulse energy
- High repeatability and 24/7 operation
- Complete remote control / user interface
- One-button operation
- Plug & play – no installation required
- Compact, dust-sealed OEM package
- Lightweight – mountable in any direction
- Low power consumption
- Closed-loop chiller included
- Maintenance free – no user-serviceable parts inside or outside laser

Specifications:

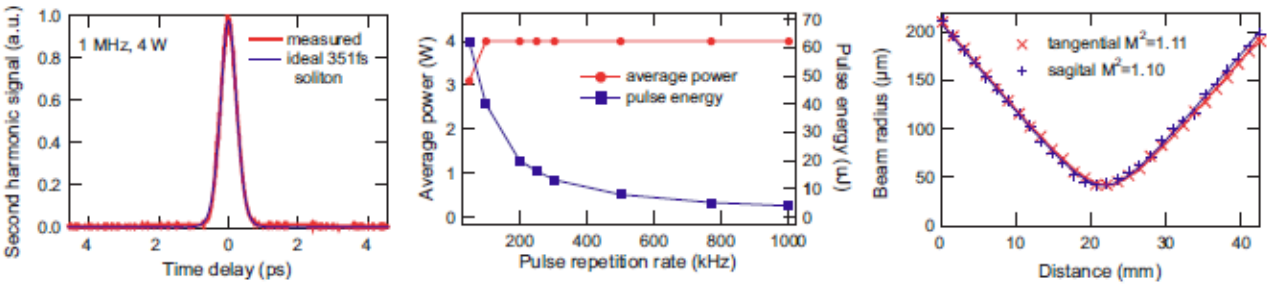
Model	STOF-OG-10 XP
Center wavelength	1030nm
Pulse duration	<400fs
Average power (up to)	4W
Pulse repetition rate	Single shot-1MHz
Pulse energy (up to)	>40uJ up to 100kHz, >20uJ up to 200kHz
Peak power (up to)	80MW
Spectral bandwidth	<6nm
Output	collimated free space, M_2 < 1.2
Ellipticity	<1.1
PER	>20dB, horizontal
Amplitude noise	< 1% rms, (12h)
Energy contrast	23dB
Pointing stability	<50urad rms (12h)
Beam height	44.5mm
Warm-up time	<10 minutes
Specs guarranteed	18°C -32°C
Storage temperature	-20°C -65°C
Size laser	260 x 420 x 125 mm
Size controller	447 x 281 x 134 mm (19”/4U rack mount)
Weight laser	16kg
Power supply	90-264VAC, 47-63Hz
Power consumption	< 500W
Interfaces	RS232, Ethernet

Options

- Synchronization to
- external clock
- Circular polarization
- Picosecond operation
- Second harmonic
- Third harmonic
- Forth harmonic
- Different form factor is available on request

1 exact size and weight depend on pulse repetition rate

Technical data (STOF-OG-10 XP):



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/ iPod[2] 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 ≥2MHz repetition rate
- Repetition rate: User adjustable via computer from 200kHz to 25MHz (in increments of oscillator repetition rate divided by a whole number[1])
- Pulse energy: User adjustable via computer from 100nJ to 10μJ (eg., >0.8μJ at 25MHz, >10μJ at <2MHz)
- Pulse width: User adjustable via computer between < 250fs and >8ps
- 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 cm^3
- Control cabinet 123Hx53.5W x81D cm^3

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

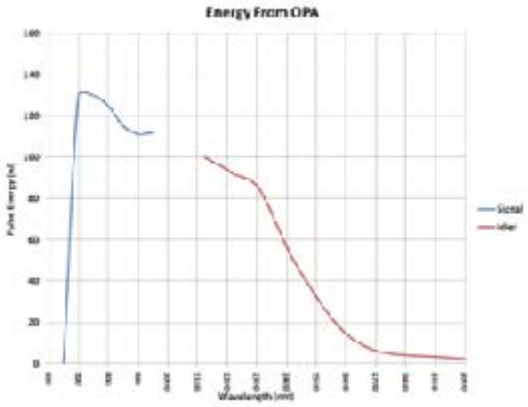
- All diode and direct diode-pumped
- No intermediate laser-pumped laser needed to pump either oscillator or amplifier stage, thereby improving reliability and performance, reducing cost-of-ownership
- All solid-state construction
- Entire optical system occupies one enclosure to minimize drift
- Computer-control of all major functions via controller touch screen
- Remote control and monitoring via Apple iPhone/iPod App[1]
- 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.

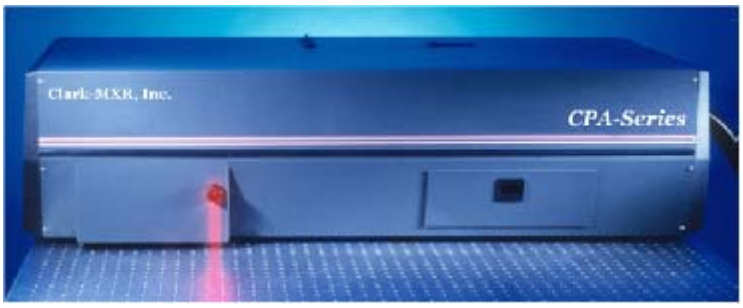
The Model cOPA™ consists of two synchronized optical parametric amplifiers (OPAs) in one enclosure pumped by our Model IMPULSE™ MHz repetition rate, fiber laser oscillator/amplifier system[2]. Each OPA is independently tunable from 700 to 950nm in the signal range and from 1130 to 1300nm in the idler 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 ($sech^2$)
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 ≤1kHz Linewidth: <8cm^{-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:

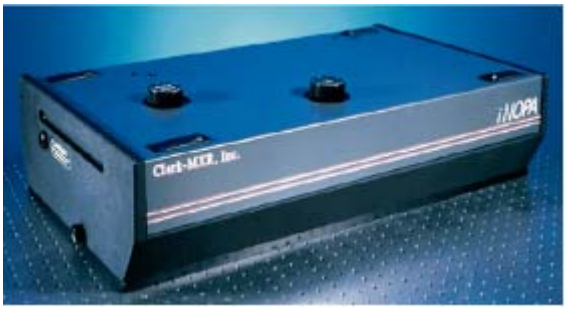
Electric: 110 VAC, 60 or 50 Hz, 10 A and 208 VAC, 60 or 50 Hz, 40 A
Water: Tap water, 4 gpm, 15-20°C, 30-50 psi

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 IMPULSETM Yb-doped Fiber
- Oscillator/Amplifier
- Pulses as short as 14 fs[1]
- 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 the 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 >2Hz
Polarization: Linear, horizontal

General
Size: 15"W x 32.5”L x 9”H
Electrical/Water: None

Please contact us for more information.

1Christian Schriever, 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 rate[1])
- 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 System[2]:

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
Resolution[3]: 1µm
Field of View[3]: 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 options[1] that include pulsewidth as short as 15fs[2], 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 amplifier[3]. 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