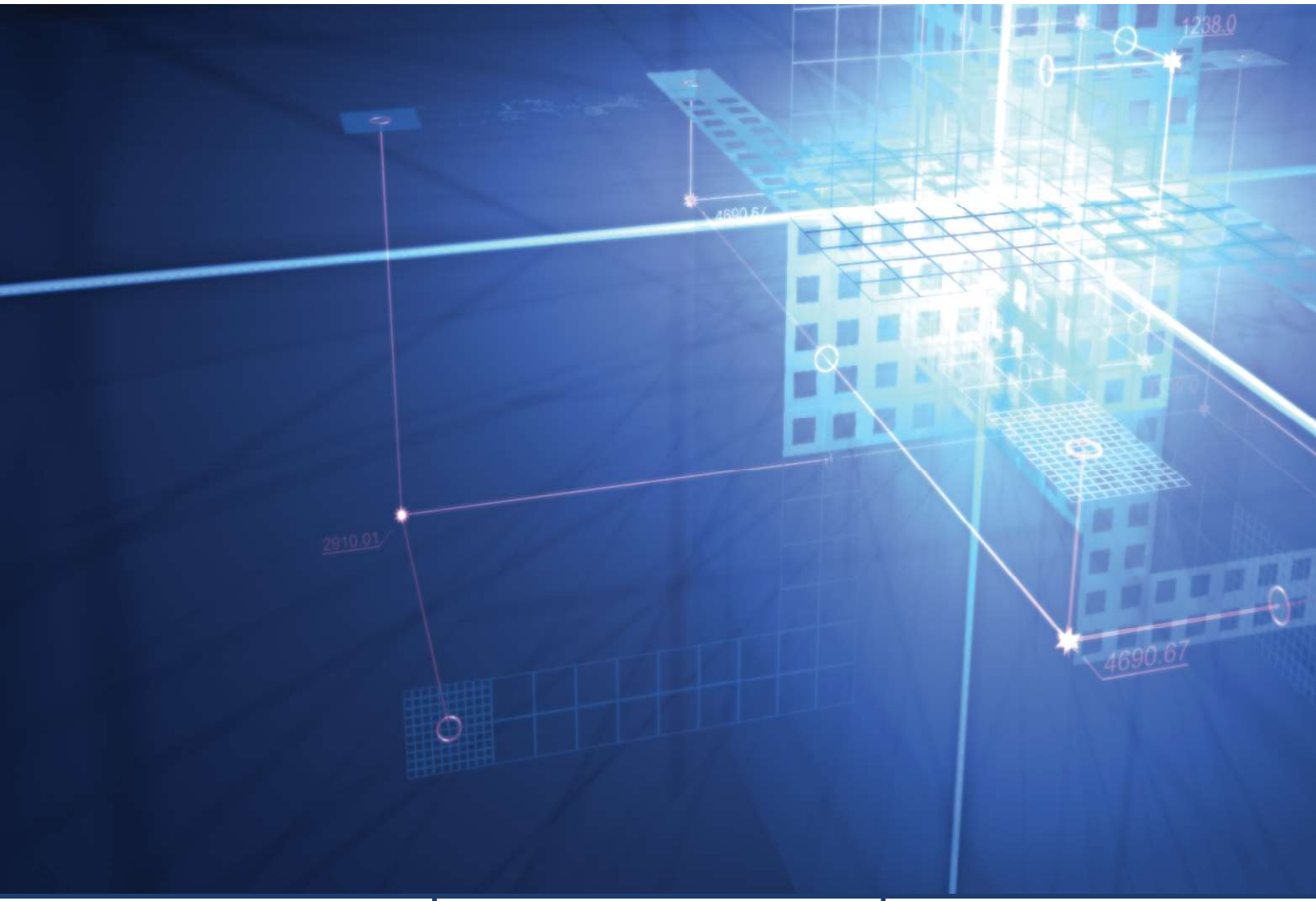
Enabling an Ultrafast World

ULTRAFAST FIBER LASER

Catalog 2023



CALMAR LASER

www.calmarlaser.com

Calmar Laser, Inc. *"Enabling an Ultrafast World"*

Calmar's vision is to become the world leader in supplying robust, compact, ultrafast fiber laser solutions for OEM, industrial, medical, and scientific applications by using its unique innovative laser technology and strong customer commitment.

Established in 1996, Calmar's first generation of ultrafast fiber laser products was targeted for test equipment in the demanding world of telecom. This provided an important foundation for today's organization, where establishing a culture with an intimate understanding of our customer needs is key, and delivering on a promise of product performance, quality, and reliability is the ultimate measure of our success. Currently, we are annually shipping hundreds of OEM femtosecond and picosecond fiber laser modules and systems to a global customer base. Our intrinsic designs ensure reproducibility and consistency in a volume-based manufacturing process to deliver unmatched product quality with stable, maintenance-free operation.

With their ease of use, superior performance, and compact reliable design, fiber lasers have enjoyed explosive growth over the past several years and gained significant market share in a wide array of industrial laser applications. Ultrafast fiber laser technology is now poised to be the catalyst that stimulates the next stage of growth. With over 12 years of extensive ultrafast fiber laser expertise, Calmar is perfectly positioned to be a leader in the field. Calmar intends to expand its business through serving OEM customers in the medical and industrial markets, while continuing to support the research community with leading edge products.

Located in the heart of Silicon Valley, Calmar has attracted and developed a distinguished team of professionals. Our people are the company's most valuable asset and provide us with a compelling competitive edge. Our world-class optical fiber laser engineers, prominent RF and electronics experts, and an insightful applications team work closely with our customers to provide creative optoelectronic solutions that set us part from our competitors. Calmar has more than ten US patents issued and several pending.

Ultrafast fiber laser is our key technology. Our existing products include:

- Optical fiber amplifier
- Actively mode-locked picosecond fiber laser system
- High pulse energy fiber laser based chirped pulse amplification system
- Passively mode-locked femtosecond fiber laser module and system
- Advanced Products including a bit rate multiplier, an electrical pulse generator, a pulse compressor and a second harmonic generator

Our products are widely used in a variety of markets and applications, such as:

- Security
- Defense
- Inspection
- Quality Control
- Optical sampling
- Medical diagnostics
- Medical therapeutics
- Multi-photon microscopy
- Precision materials processing
- Optical network characterization

TABLE OF CONTENTS

CARMEL

X-515

515 nm High Power Femtosecond Fiber Laser

Applications

- Multiphoton microscopy
- Optical metrology
- Materials characterization
- 3D-microprinting/photopolymerization
- Nonlinear spectroscopy
- Ophthalmology

Features

- High power stability (up to 400 mW)
- < 100 fs pulse widths
- Outstanding beam quality (M^2 < 1.2)
- Exceptional beam pointing stability
- All air-cooled, no chiller required
- Remote system diagnostics

The Carmel X-series is a range of high power, air-cooled, fiber-based femtosecond lasers with output powers from 0.25 to greater than 2.5 W and pulse widths of less than 90 fs in the industry's most compact, user-friendly package. The Carmel X-515 represents the latest member of the product family and provides the perfect 515 nm source for a wide range of ultrafast laser applications, including bio-imaging, multiphoton microscopy, optical metrology, 3D-microprinting, photopolymerization and ophthalmology. It is offered as both a scientific version with front panel controls and an OEM version controlled through an RS-232 interface. The Carmel X-515 can be configured for dual wavelength output to enable alternating access to 515 and 1030 nm outputs.

The system features a rack mountable controller with a robust armored cable interface to the compact laser head, which facilitates its incorporation into OEM designs. It is over 100 times smaller than many bulk crystal lasers with a similar output power level. A simple key switch interface provides for manual operation with full remote access through computer control. The X-series includes the capability of remote data logging, power monitoring, system diagnostics, and automated adjustments for prolonged lifetime and OEM preventative maintenance. The rugged design supports 24/7 operation in industrial environments.

The building block of the X-series is Calmar's renowned ultrafast fiber seed laser platform, which utilizes the proprietary Mendocino saturable absorber technology developed and perfected over a twenty-year period to deliver reproducible and reliable mode-locking at turn-on. The system provides an output pulse width of < 100 fs with minimal pulse pedestal and excellent long term pulse-to-pulse stability (< 1% rms) over a wide operating temperature range (17-38°C). An exceptional output beam quality (M^2 < 1.2) enables a near diffraction-limited spot size with suitable microscope objectives for demanding bio-imaging and 3D microprinting applications. Repetition rates can be specified from 27 to 100 MHz with an RF synchronization output provided as a trigger signal. The compact laser head and associated armored fiber cable make for straight forward integration into OEM microscope systems with minimal delivery optics.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

515 nm High Power Fiber Based Femtosecond Laser

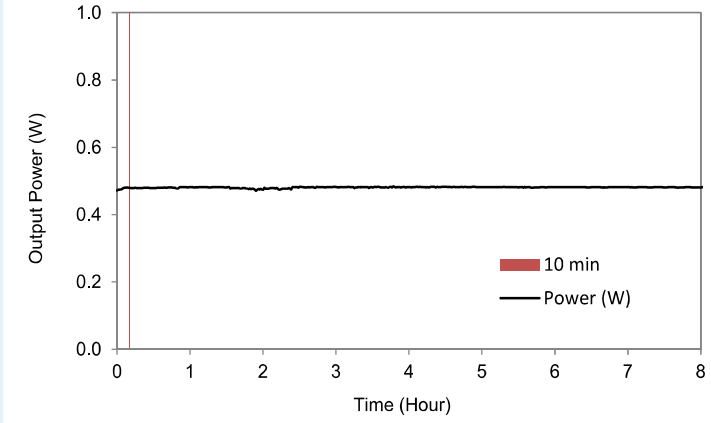
Technical Specifications[1]

Model Number	CFL-04VFF
OPTICAL	
Central Wavelength (nm)	515 ± 3
Pulse Width[2] (fs)	< 100
Average Power (W)	> 0.4
Repetition Rate[3] (MHz)	80
Pulse Energy (nJ)	> 5
Spectrum Width (FWHM, nm)	~ 5
Power Stability over 8 hours[4] (%, RMS)	< 1.0
Beam Quality (M^2)	< 1.2
Beam Diameter at Exit (typical, mm)	1.25
Beam Roundness (%)	> 90
Polarization Extinction Ratio (dB)	> 18
Output/Termination	Free space, collimated beam (UV filter)
ELECTRICAL	
Electrical Synchronization (V)	~ 0.5, SMA connector
Supply Voltage	85 - 264 VAC at 47 – 63 Hz, autoranging
Power Consumption (W)	200
MECHANICAL	
Operating Temperature (°C)	17 - 38
Storage Temperature (°C)	0 - 50
Connection between Controller and Head[5]	~ 1 m fixed armored cable
Laser Head Dimensions (cm)	9.0(W) x 18(D) x 3.5(H)
Laser Controller Dimensions (cm)	48.2(W) x 46.7(D) x 10(H); 19 inch 2U
Laser Head Weight (kg)	0.8
Laser Controller Weight (kg)	13.6
Cooling	Controller air-cooled by low noise fan
Warm-up Time (min)	~ 15
I/O CONTROL	
Communication Interface[6]	RS-232 Serial Port, Monitor Port
Front Panel Control Interface	Power Switch, Laser Key Switch, Emergency Stop Button

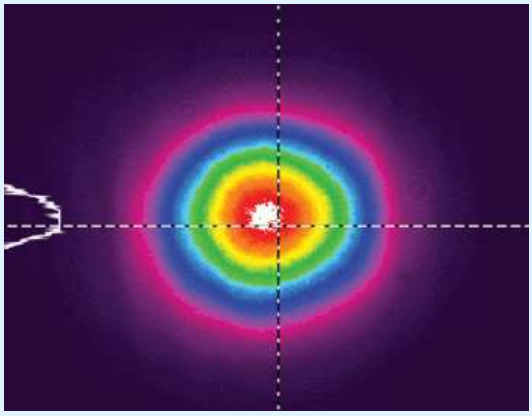
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting for the laser head.
5. For other cable length options, please contact sales@calmarlaser.com.
6. Standard on OEM version, for the scientific version please contact sales@calmarlaser.com.

CALMAR LASER

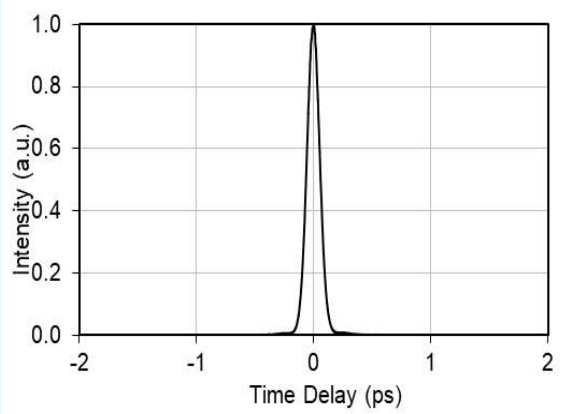
Optical Characterization



Typical Power Stability

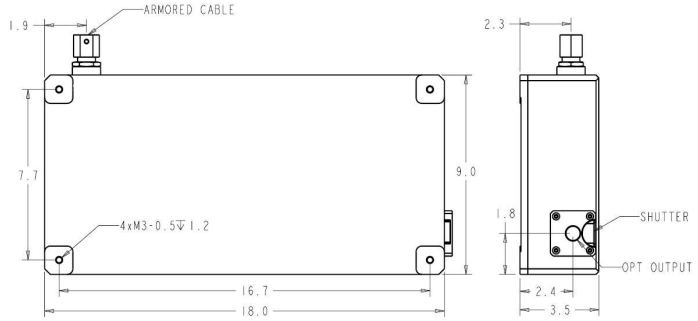


Typical Beam Profile

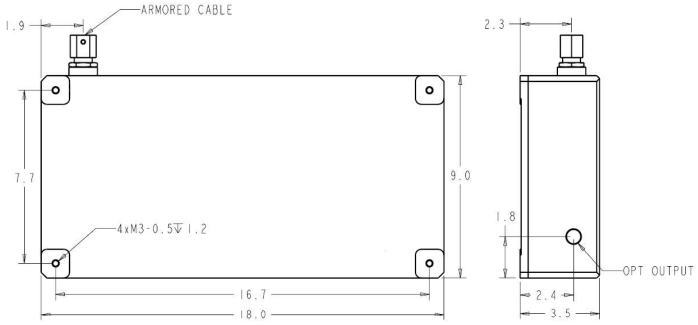


Typical Autocorrelation Trace

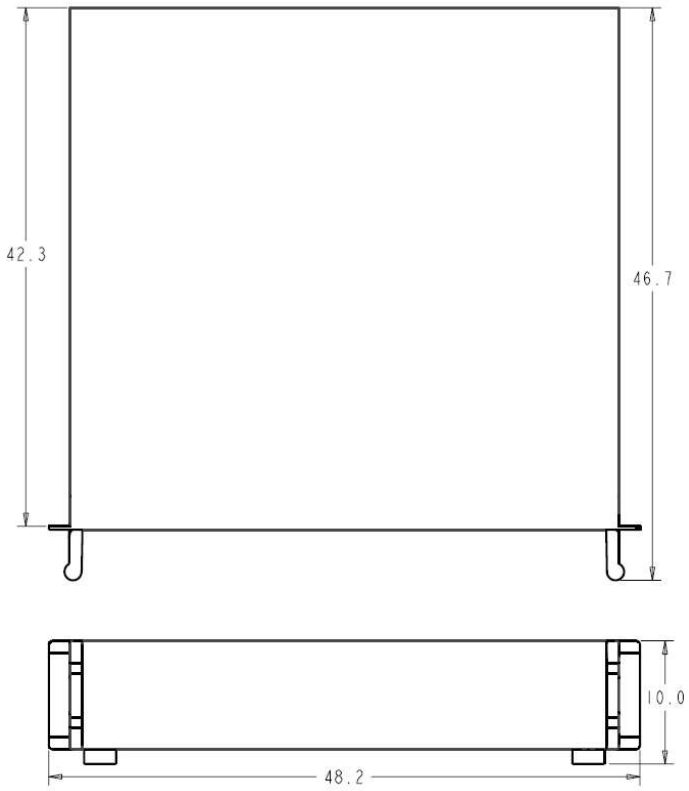
Mechanical Dimensions



Dimensions of Laser Head for Scientific Model (cm)



Dimensions of Laser Head for OEM Model (cm)



Dimensions of Laser Controller (cm)

CARMEL

X-780

780 nm High Power Femtosecond Fiber Laser

Applications

- Multiphoton microscopy
- Optical metrology
- Materials characterization
- Terahertz radiation
- 3D-microprinting
- Nonlinear spectroscopy
- Ophthalmology
- Replacement of a Ti:sapphire laser

Features

- High power stability (up to 1W)
- < 90 fs pulse widths
- Outstanding beam quality (M^2 < 1.1)
- Exceptional beam pointing stability
- Optional negative GVD pre-chirp up to -62,000 fs^2
- All air-cooled, no chiller required
- Remote system diagnostics
- Expected lifetime > 10,000 hours

The Carmel X-series is a range of high power, air-cooled, fiber-based femtosecond lasers with output powers from 0.25 to greater than 2.5 W and pulse widths of less than 90 fs in the industry's most compact, user-friendly package. The Carmel X-780 provides the perfect 780 nm source for a wide range of ultrafast laser applications, including bio-imaging, multiphoton microscopy, optical metrology, 3D-micro/nanoprinting, terahertz imaging and ophthalmology. It is offered as both a scientific version with front panel controls and an OEM version controlled through an RS-232 interface. The Carmel X-780 can be configured for dual wavelength output to enable alternating access to 780 and 1550 nm outputs (see the Carmel X-780/1550 data sheet for details).

The system features a rack mountable controller with a robust armored cable interface to the compact laser head, which facilitates its incorporation into OEM designs. It is over 100 times smaller than many Ti:sapphire lasers with a similar output power level. A simple key switch interface provides for manual operation with full remote access through computer control. The X-series includes the capability of remote data logging, power monitoring, system diagnostics, and automated adjustments for prolonged lifetime and OEM preventative maintenance. The rugged design supports 24/7 operation with an expected lifetime of > 10,000 hours.

The building block of the X-series is Calmar's renowned ultrafast fiber seed laser platform, which utilizes the proprietary Mendocino saturable absorber technology developed and perfected over a twenty year period to deliver reproducible and reliable mode-locking at turn-on. The system provides an output pulse width of < 90 fs with minimal pulse pedestal and excellent long term pulse-to-pulse stability (< 1% rms) over a wide operating temperature range (17-38°C). An exceptional output beam quality (M^2 < 1.1) enables a near diffraction-limited spot size with suitable microscope objectives for demanding multiphoton and 3D microprinting applications. Repetition rates can be specified from 10 to 80 MHz with an RF synchronization output provided as a trigger signal.

For multiphoton microscopy applications, the Carmel X-780 provides an ideal ultrafast laser solution for optimum two-photon fluorescence and second harmonic cellular tissue imaging with minimal scatter and reduced risk of photodamage. The compact laser head and associated armored fiber cable make for straight forward integration into existing microscopes with minimal delivery optics.

The X-780 now offers a new optional feature: the ability to incorporate a negative pre-chirp of up to -62,000 fs^2 in the output pulses. For many applications, femtosecond pulses can be significantly broadened by the optical beam delivery system. This is especially true for multiphoton bio-imaging applications, which use highly dispersive microscope objective lenses resulting in the use of higher average powers for optimum signal intensity with potential sample damage. The Carmel X-780 output pulses can now be tailored with up to -62,000 fs^2 of group velocity dispersion (GVD) to compensate for the positive GVD effects of downstream microscope components. This is accomplished in the same compact laser head and ensures the shortest optical pulses for optimal signal intensity are obtained at the sample region, resulting in the highest signal levels at the lowest average power.

If the performance parameters do not quite fit your application requirements or to learn more, please contact us at sales@calmarlaser.com.

780 nm High Power Fiber Based Femtosecond Laser

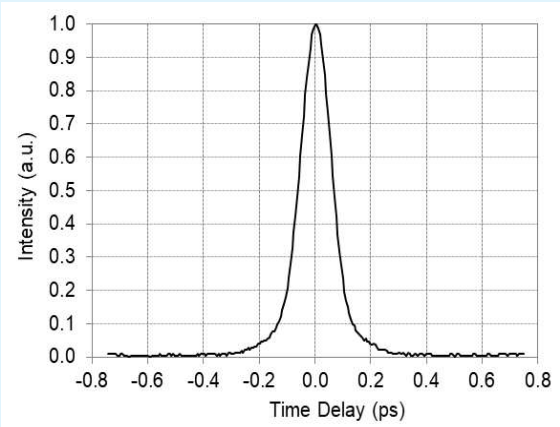
Technical Specifications[1]

Model Number	CFL-04RFF	CFL-05RFF	CFL-10RFF
OPTICAL			
Central Wavelength (nm)	780 ± 3		
Pulse Width[2] (fs)	< 90		
Optional Pre-chirp in Output Pulse[3] (fs^2)	~ -62,000		
Average Power (W)	0.25	0.50	1.0
Repetition Rate[4] (MHz)	50 or 80	50 or 80	80
Pulse Energy[5] (nJ)	> 5 or 3	> 10 or 6	> 12.5
Spectrum Width (FWHM, nm)	8 - 10		
Power Stability over 8 hours[6] (%, RMS)	< 1.0		
Beam Quality (M^2)	< 1.1		
Beam Diameter at Exit (typical, mm)	1.25		
Beam Roundness (%)	> 90		
Polarization Extinction Ratio (dB)	> 20		
Output/Termination	Free space, collimated beam		
ELECTRICAL			
Electrical Synchronization (V)	~ 0.5, SMA connector		
Supply Voltage	85 - 264 VAC at 47 – 63 Hz, autoranging		
Power Consumption (W)	200		
MECHANICAL			
Operating Temperature (°C)	17 - 38		
Storage Temperature (°C)	0 - 50		
Connection between Controller and Head[7]	1 m fixed armored cable		
Laser Head Dimensions (cm)	9.0(W) x 18(D) x 3.5(H)		
Laser Controller Dimensions (cm)	48.2(W) x 46.7(D) x 10(H); 19 inch 2U		
Laser Head Weight (kg)	0.8 (typical)		
Laser Controller Weight (kg)	13.6 (typical)		
Cooling	Controller air-cooled by low noise fan		
Warm-up Time (min)	~ 10		
I/O CONTROL			
Communication Interface[8]	RS-232 Serial Port, Monitor Port		
Front Panel Control Interface	Power Switch, Laser Key Switch, Emergency Stop Button		

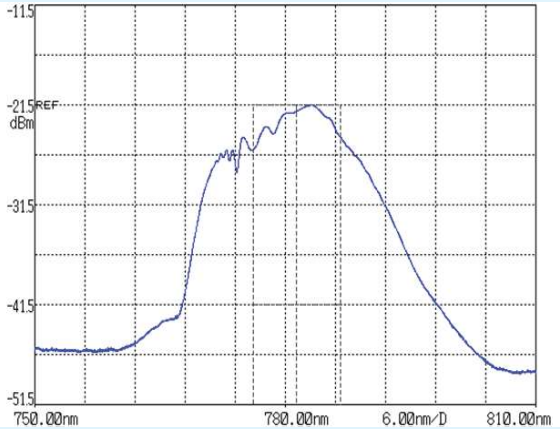
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. The output pulse can be prepared with an optional negative pre-chirp of up to -62,000 fs^2. This option must be specified at the time of purchase, please contact sales@calmarlaser.com.
4. For the -04 and -05 models, the repetition rate needs to be specified at the time of purchase. For other repetition rates, please contact sales@calmarlaser.com.
5. The absolute pulse energy will depend on the version and specified repetition rate.
6. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting for the laser head.
7. For other cable length options, please contact sales@calmarlaser.com.
8. Standard on the OEM version, for the scientific version please contact sales@calmarlaser.com.

CALMAR LASER

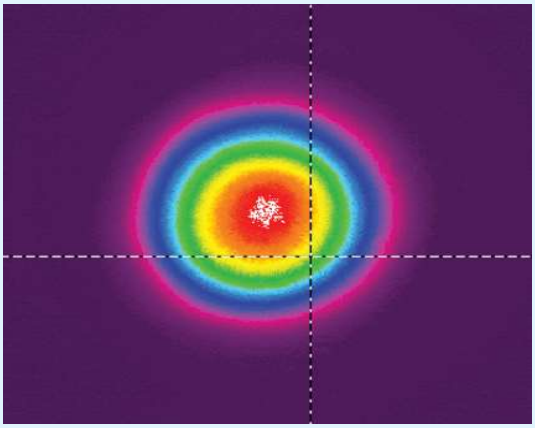
Optical Characterization



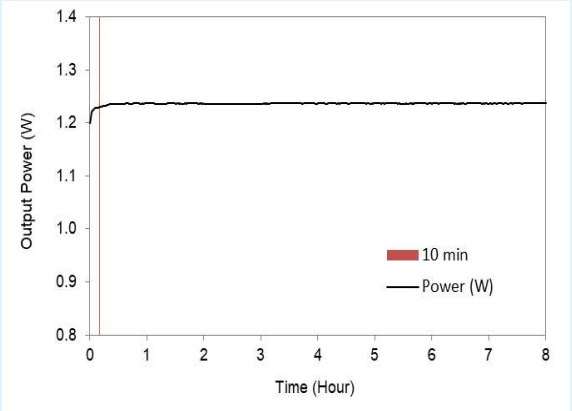
Typical Autocorrelation Trace



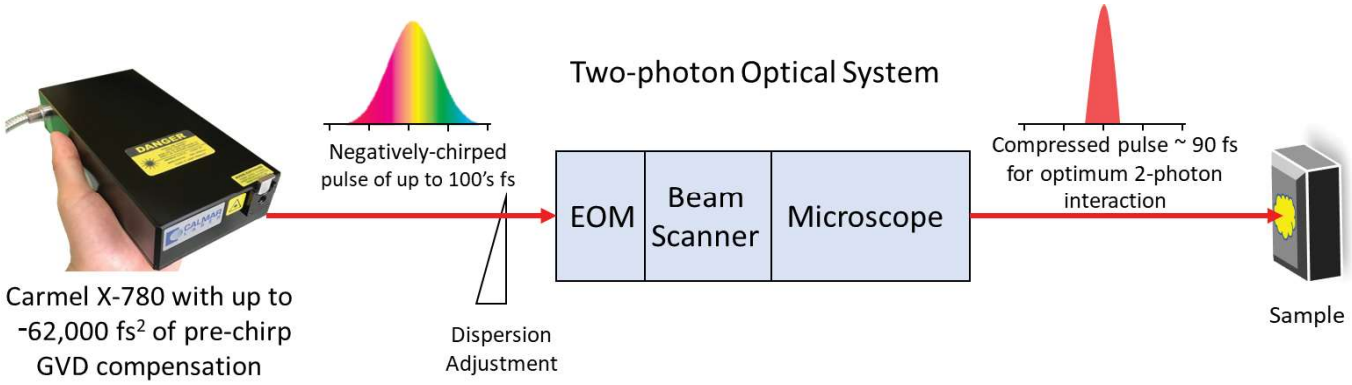
Typical Optical Spectrum



Typical Beam Profile



Typical Power Stability



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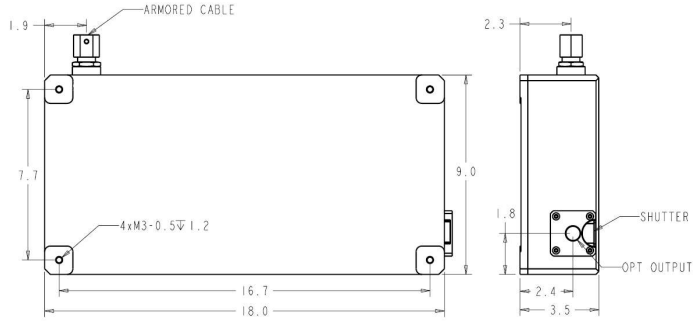
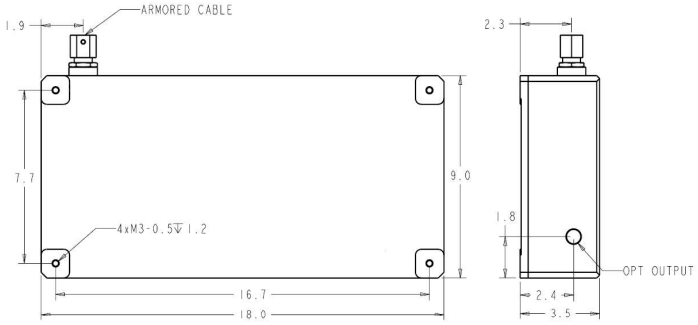
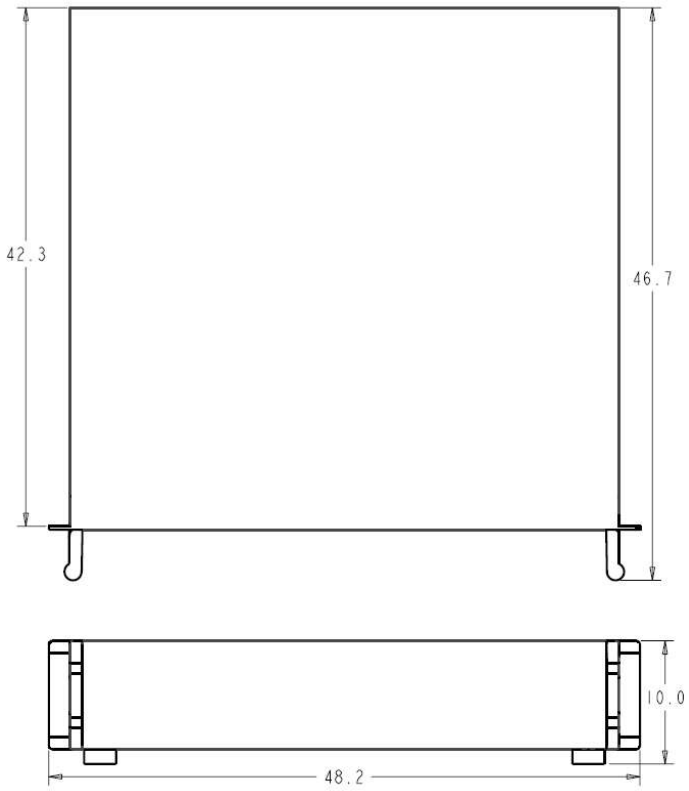
Mechanical Dimensions



Dimensions of Laser Head for Scientific Model (cm)



Dimensions of Laser Head for OEM Model (cm)



Dimensions of Laser Controller (cm)

CARMEL

X-780/1550

780/1550 nm High Power Femtosecond Fiber Laser

Applications

- Multiphoton microscopy
- Optical metrology
- Materials characterization
- Terahertz radiation
- 3D-microprinting
- Nonlinear spectroscopy
- Ophthalmology
- Replacement of a Ti:sapphire laser

Features

- High power (up to 2 W)
- < 90 fs pulse widths
- Outstanding beam quality (M^2 < 1.1)
- Exceptional beam pointing stability
- All air-cooled, no chiller required
- Turn-key operation and full computer control
- Remote system diagnostics
- Expected lifetime > 10,000 hours

The Carmel X-series is a range of high power, air-cooled, fiber-based femtosecond lasers with output powers from 0.2 to greater than 2.5 W and pulse widths of less than 90 fs in the industry's most compact, user-friendly package. The Carmel X-780/1550 provides switchable 780 nm and 1550 nm outputs for a wide range of ultrafast laser applications, including bio-imaging, multiphoton microscopy, optical metrology, 3D-microprinting, terahertz imaging and ophthalmology. It is offered as both a scientific version with front panel controls and an OEM version controlled through an RS-232 interface. A simple slide switch on the laser head enables the output to be toggled from between 780 and 1550 nm outputs.

The system features a rack mountable controller with a robust armored cable interface to the compact laser head, which facilitates its incorporation into OEM designs. It is over 100 times smaller than many Ti:sapphire lasers with a similar output power level. A simple key switch interface provides for manual operation with full remote access through computer control. The X-series includes the capability of remote data logging, power monitoring, system diagnostics, and automated adjustments for prolonged lifetime and OEM preventative maintenance. The rugged design supports 24/7 operation with an expected lifetime of > 10,000 hours.

The building block of the X-series is Calmar's renowned ultrafast fiber seed laser platform, which utilizes the proprietary Mendocino saturable absorber technology developed and perfected over a twenty year period to deliver reproducible and reliable mode-locking at turn-on. The system provides an output pulse width of < 90 fs with minimal pulse pedestal and excellent long term pulse-to-pulse stability (<1% rms) over a wide operating temperature range (17-30°C). An exceptional output beam quality (M^2 < 1.1) enables a near diffraction-limited spot size with suitable microscope objectives for demanding multiphoton, 3D microprinting and materials processing applications. Repetition rates can be specified from 10 to 80 MHz with an RF synchronization output provided as a trigger signal.

For multiphoton microscopy applications, the Carmel X-780/1550 provides an ideal ultrafast laser solution for optimum multiphoton fluorescence and second and third harmonic cellular tissue imaging with minimal scatter and reduced risk of photodamage. The compact laser head and associated armored fiber cable make for straight forward integration into existing microscopes with minimal delivery optics.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

780/1550 nm High Power Fiber Based Femtosecond Laser

Technical Specifications[1]

Model Number	CFL-04RCFF		CFL-05RCFF		CFL-10RCFF	
OPTICAL	Port 1	Port 2	Port 1	Port 2	Port 1	Port 2
Central Wavelength (nm)	780 ± 3	1550 ± 4	780 ± 3	1550 ± 4	780 ± 3	1550 ± 4
Pulse Width[2] (fs)	< 90					
Average Power (W)	0.25	0.5	0.5	1.0	1.0	2.0
Repitition Rate[3] (MHz)	50 or 80	50 or 80	50 or 80	50 or 80	80	80
Pulse Energy[4] (nJ)	5 or 3	10 or 6	10 or 6	20 or 12	12.5	25
Spectrum Width (FWHM, nm)	8 - 10	> 30	8 - 10	> 30	8 - 10	> 30
Power Stability over 8 hours[5] (%, RMS)	< 1.0					
Beam Quality (M^2)	< 1.1					
Beam Diameter at Exit (typical, mm)	1.3	1.6	1.3	1.6	1.3	1.6
	Beam roundness > 90%					
Polarization Extinction Ratio (dB)	> 20	> 18	> 20	> 18	> 20	> 18
Output/Termination	Free space, collimated beam					
ELECTRICAL						
Electrical Synchronization (V)	~ 0.5, SMA connector					
Supply Voltage	85 - 264 VAC at 47 – 63 Hz, autoranging					
Power consumption (W)	200					
MECHANICAL						
Operating Temperature (°C)	17 - 38					
Storage Temperature (°C)	0 - 50					
Connection between Controller and Head[6]	1 m fixed armored cable					
Laser Head Dimensions (cm)	9.0(W) x 18(D) x 3.5(H)					
Laser Controller Dimensions (cm)	48.2(W) x 46.7(D) x 10(H); 19 inch 2U					
Laser Head Weight (kg)	0.8 (typical)					
Laser Controller Weight (kg)	13.6 (typical)					
Cooling	Controller air cooled by low noise fan					
Warm-up Time (min)	< 10					
I/O CONTROL						
Communication Interface[7]	RS-232 Serial Port, Monitor Port					
Front Panel Control Interface	Power Switch, Laser Key Switch, Emergency Stop Button					

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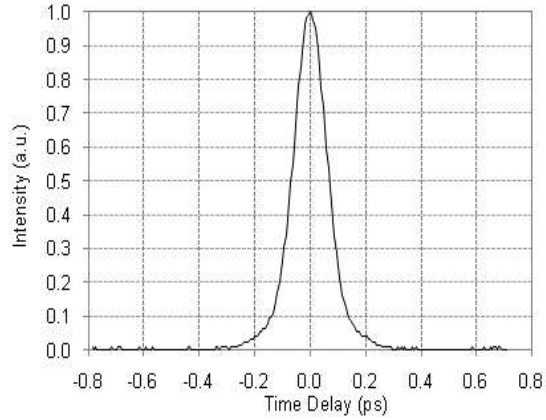
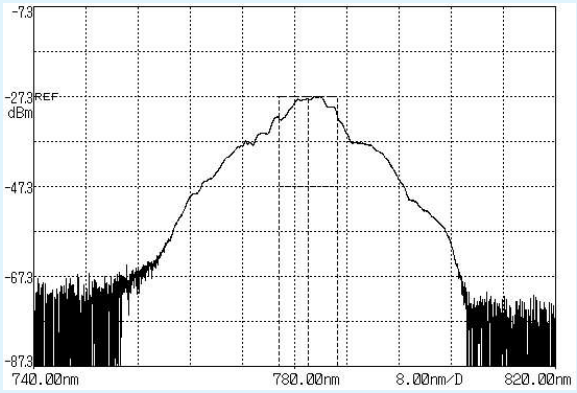
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For the -04 and -05 models, the repetition rate needs to be specified at the time of purchase. For other repetition rates, please contact sales@calmarlaser.com.
4. The absolute pulse energy will depend on the version and specified repetition rate.
5. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting for the laser head.
6. For other cable length options, please contact sales@calmarlaser.com.
7. Standard on the OEM version, for the scientific version please contact sales@calmarlaser.com.

CALMAR LASER

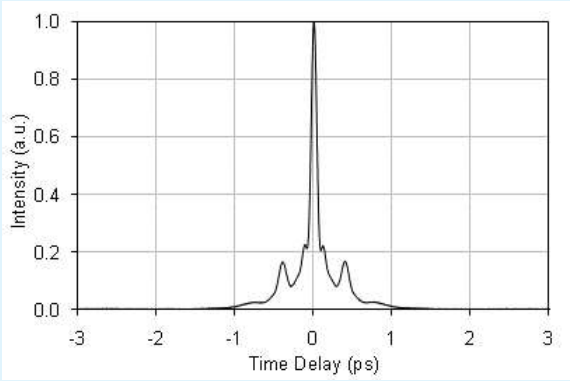
Optical Characterization



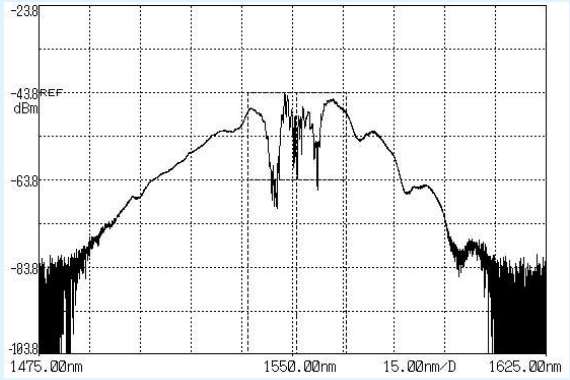
Typical Autocorrelation Trace for Port 1 (780 nm)



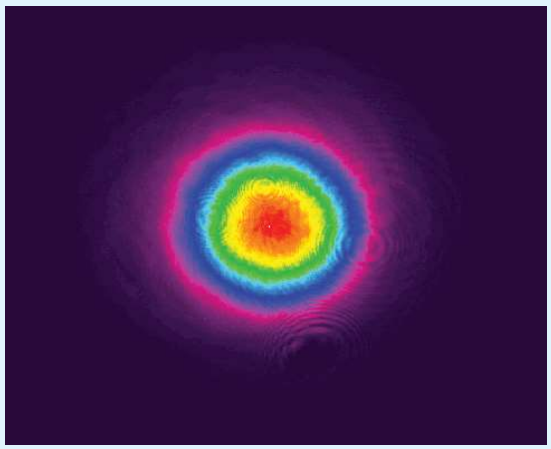
Typical Optical Spectrum for Port 1 (780 nm)



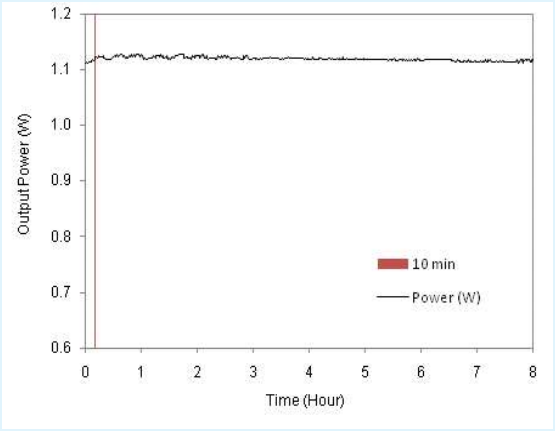
Typical Autocorrelation Trace for Port 2 (1550 nm)



Typical Optical Spectrum for Port 2 (1550 nm)



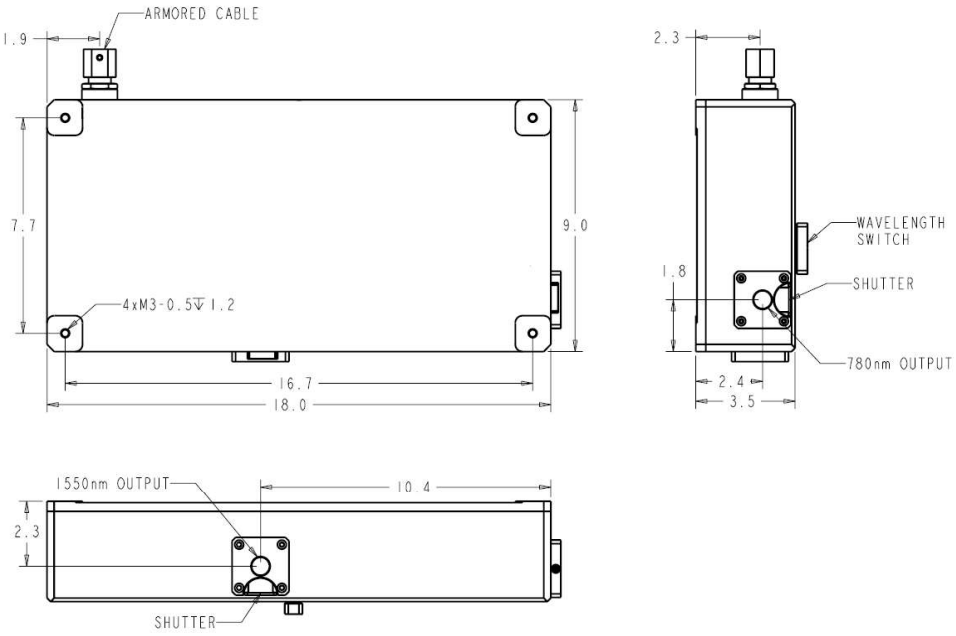
Typical Beam Profile for Port 1 (780 nm)



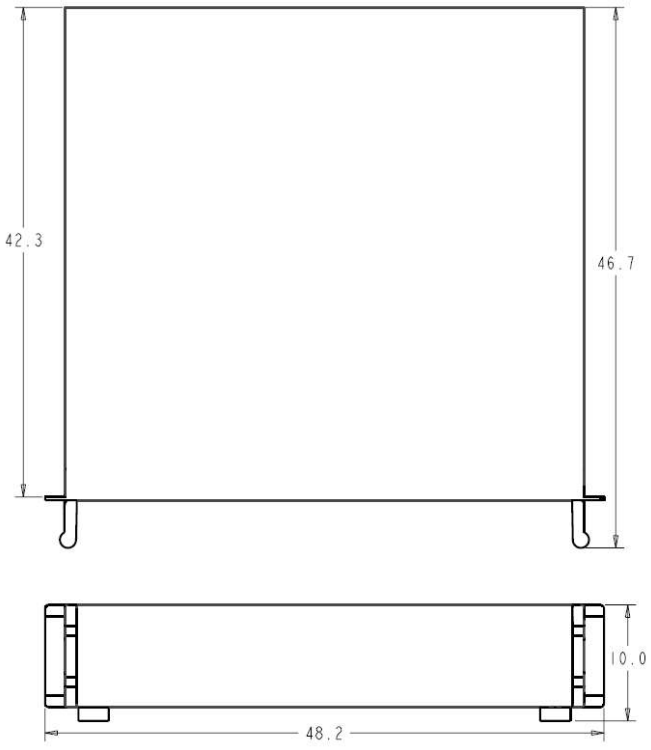
Typical Power Stability for Port 1 (780 nm)

CALMAR LASER

Mechanical Dimensions



Dimensions of Laser Head (cm)



Dimensions of Laser Controller (cm)

CARMEL

X-1550

1550 nm High Power Femtosecond Fiber Laser

Applications

- Multiphoton microscopy
- Optical metrology
- Two photon integrated circuit testing
- Materials characterization
- Terahertz radiation
- Nonlinear spectroscopy
- Micro-machining and materials processing
- Seeding high output lasers

Features

- High power stability (up to 2.5 W)
- < 90 fs pulse widths
- Outstanding beam quality (M^2 < 1.1)
- Exceptional beam pointing stability
- Optional 780 nm output
- All air-cooled, no chiller required
- Remote system diagnostics
- Expected lifetime > 10,000 hours

The Carmel X-series is a range of high power, air-cooled, fiber-based femtosecond lasers with output powers from 0.2 to greater than 2.5 W and pulse widths of less than 90 fs in the industry's most compact, user-friendly package. The Carmel X-1550 provides the perfect 1550 nm source for a wide range of ultrafast laser applications, including multiphoton microscopy, optical metrology, two photon integrated circuit testing and micro-machining. It is offered as both a scientific version with front panel controls and an OEM version controlled through an RS-232 interface. The Carmel X-1550 can be configured for dual wavelength output to enable alternating access to 1550 and 780 nm outputs (see the Carmel X-780/1550 data sheet for details).

The system features a rack mountable controller with a robust armored cable interface to the compact laser head, which facilitates its incorporation into OEM designs. A simple key switch interface provides for manual operation with full remote access through computer control. The X-series includes the capability of remote data logging, power monitoring, system diagnostics, and automated adjustments for prolonged lifetime and OEM preventative maintenance. The rugged design supports 24/7 operation with an expected lifetime of > 10,000 hours.

The building block of the X-series is Calmar's renowned ultrafast fiber seed laser platform, which utilizes the proprietary Mendocino saturable absorber technology developed and perfected over a twenty year period to deliver reproducible and reliable mode-locking at turn-on. The system provides an output pulse width of < 90 fs with minimal pulse pedestal and excellent long term pulse-to-pulse stability (<1% rms) over a wide operating temperature range (17-30°C). An exceptional output beam quality (M^2 < 1.1) enables a near diffraction-limited spot size with suitable microscope objectives for demanding multiphoton and materials processing applications. Repetition rates can be specified from 10 to 80 MHz with an RF synchronization output provided as a trigger signal.

For multiphoton microscopy applications, the Carmel X-1550 provides an ideal ultrafast laser solution for optimum multiphoton fluorescence and third harmonic cellular tissue imaging with minimal scatter and reduced risk of photodamage. The compact laser head and associated armored fiber cable make for straight forward integration into existing microscopes with minimal delivery optics.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution

1550 nm High Power Fiber Based Femtosecond Laser

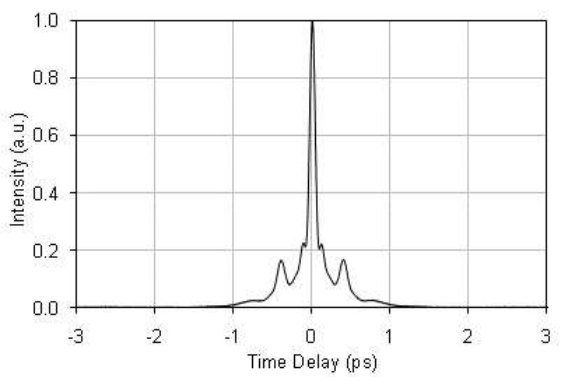
Technical Specifications[1]

Model Number[2]	CFL-ZCFF
OPTICAL	
Central Wavelength (nm)	1550 ± 4
Pulse Width[3] (fs)	< 90
Average Power (W)	Up to 2.5
Repitition Rate[4] (MHz)	10 - 80
Pulse Energy[5] (nJ)	Up to 50
Spectrum Width (FWHM, nm)	> 30
Power Stability over 8 hours[6] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Beam Diameter at Exit (typical, mm)	1.2 (beam roundness > 90%)
Polarization Extinction Ratio (dB)	> 18
Output/Termination	Free space, collimated beam
ELECTRICAL	
Electrical Synchronization (V)	~ 0.5, SMA connector
Supply Voltage	85 - 264 VAC at 47 – 63 Hz, autoranging
Power consumption (W)	200
MECHANICAL	
Operating Temperature (°C)	17 - 30
Storage Temperature (°C)	0 - 50
Connection between Controller and Head[7]	1 m fixed armored cable
Laser Head Dimensions (cm)	9.0(W) x 18(D) x 3.5(H)
Laser Controller Dimensions (cm)	48.2(W) x 46.7(D) x 10(H); 19 inch 2U
Laser Head Weight (kg)	0.8 (typical)
Laser Controller Weight (kg)	13.6 (typical)
Cooling	Controller air-cooled by low noise fan
Warm-up Time (min)	< 10
I/O CONTROL	
Communication Interface[8]	RS-232 Serial Port, Monitor Port
Front Panel Control Interface	Power Switch, Laser Key Switch, Emergency Stop Button

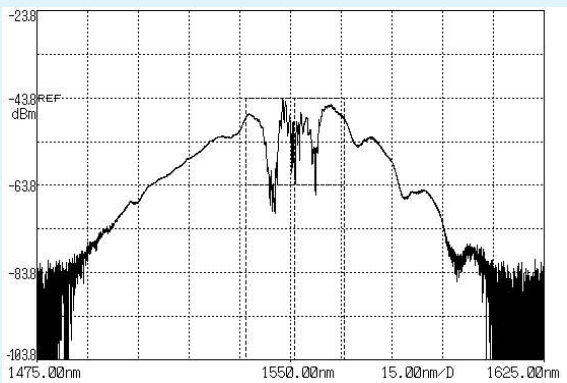
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. Z depends on the output power: Z = 04 (> 0.25W), 05 (> 0.5 W), 10 (> 1 W), 20 (> 2.0 W), or 25 (> 2.5W). Power needs to be specified at the time of purchase.
3. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
4. The repetition rate needs to be specified at the time of purchase. For other repetition rates, please contact sales@calmarlaser.com.
5. The absolute pulse energy will depend on the version and specified repetition rate.
6. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting for the laser head.
7. For other cable length options, please contact sales@calmarlaser.com.
8. Standard on the OEM version, for the scientific version please contact sales@calmarlaser.com.

CALMAR LASER

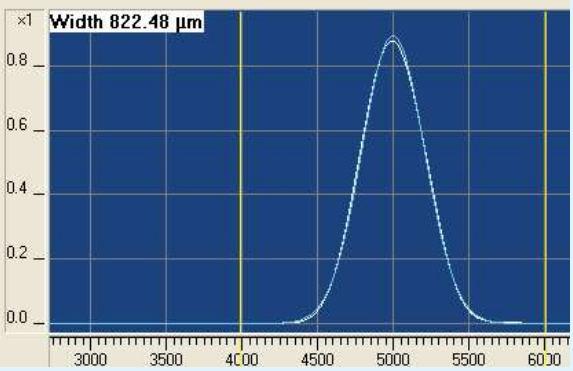
Optical Characterization



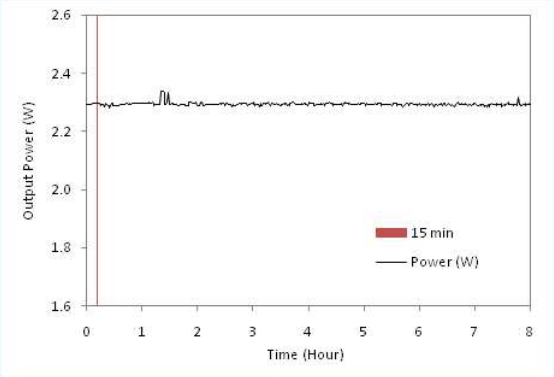
Typical Autocorrelation Trace



Typical Optical Spectrum

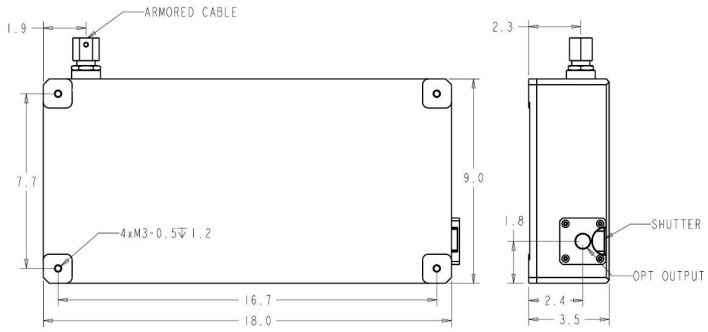


Typical Beam Profile

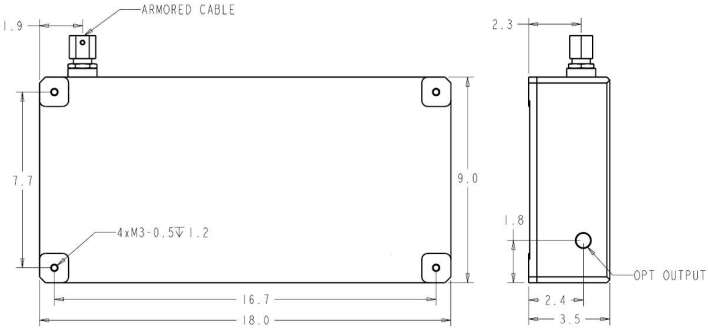


Typical Power Stability

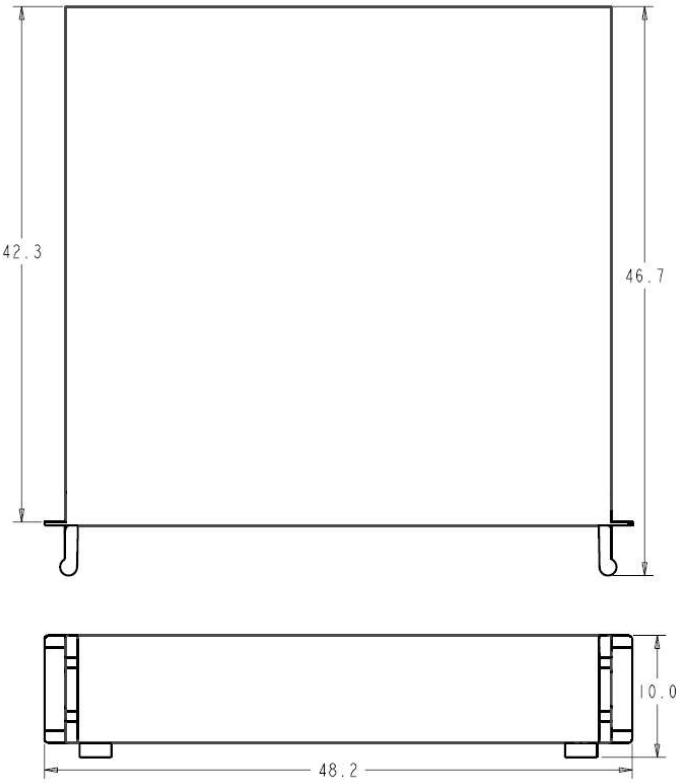
Mechanical Dimensions



Dimensions of Laser Head for Scientific Model (cm)



Dimensions of Laser Head for OEM Model (cm)



Dimensions of Laser Controller (cm)

CARMEL

X-1750

1750 nm High Power Femtosecond Fiber Laser

Applications

- Multiphoton microscopy
- Optical metrology
- Bioimaging
- Materials characterization
- Deep tissue interactions
- Nonlinear spectroscopy

Features

- High power stability (up to 1 W)
- < 80 fs pulse widths
- Outstanding beam quality (M^2 < 1.2)
- All air-cooled, no chiller required
- Optional 1550 nm output
- Remote system diagnostics

The Carmel X-series is a range of high power, air-cooled, fiber-based femtosecond lasers with output powers from 0.2 to greater than 2.5 W and pulse widths of less than 90 fs in the industry's most compact, user-friendly package. The Carmel X-1750 is the latest member of the X-series and is the first dedicated 1750 nm femtosecond source designed for deep tissue imaging. It can be configured for dual wavelength output to enable alternating access to 1750 and 1550 nm outputs.

The system features a rack mountable controller with front panel controls and a robust armored cable interface to the compact laser head. It is over 100 times smaller than competitive Ti:sapphire laser/optical parametric oscillator systems that can offer similar output power levels at 1750 nm. A simple key switch interface provides for manual operation with an RS-232 interface for remote data logging, power monitoring, system diagnostics and automated adjustments for prolonged lifetime.

The building block of the X-series is Calmar's renowned ultrafast fiber seed laser platform, which utilizes the proprietary Mendocino saturable absorber technology developed and perfected over a twenty year period to deliver reproducible and reliable mode-locking at turn-on. The system provides an output pulse width of < 80 fs and excellent long term pulse-to-pulse stability (< 1% rms) over a wide operating temperature range (20-30°C). An exceptional output beam quality (M^2 < 1.2) enables a near diffraction-limited spot size with suitable microscope objectives for demanding multiphoton fluorescence and harmonic imaging applications. The repetition rate is 80 MHz with an RF synchronization output provided as a trigger signal.

The wavelength region between 1600 and 1850 offers a unique high transmission window for brain tissue because of reduced scattering and absorption. The Carmel X-1750 is the first fixed wavelength femtosecond source designed for operation in this near infra-red region and enables mulitphoton imaging and tissue interactions at unprecedented penetration depths.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

1750 nm High Power Fiber Based Femtosecond Laser

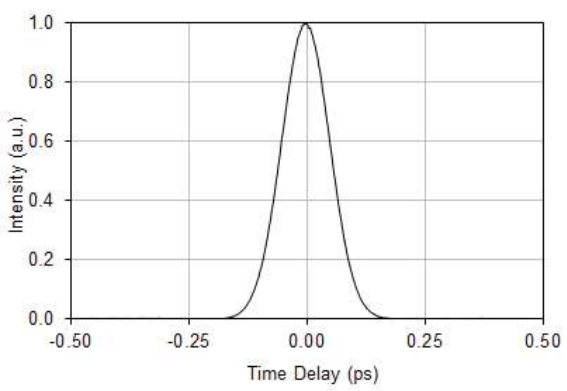
Technical Specifications[1]

Model Number	CFL-10WFF
OPTICAL	
Central Wavelength[2] (nm)	~ 1750
Pulse Width[3] (fs)	< 80
Average Power (W)	> 1.0
Repitition Rate (MHz)	80
Pulse Energy (nJ)	> 12.5
Spectrum Width (FWHM, nm)	~ 50
Power Stability over 8 hours[4] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.2
Beam Diameter at Exit (typical, mm)	~ 1.2 (beam roundness > 90%)
Polarization Extinction Ratio (dB)	> 20
Output/Termination	Free space, collimated beam
ELECTRICAL	
Electrical Synchronization (V)	~ 0.5, SMA connector
Supply Voltage	85 - 264 VAC at 47 – 63 Hz, autoranging
Power consumption (W)	200
MECHANICAL	
Operating Temperature (°C)	20 - 30
Storage Temperature (°C)	0 - 50
Connection between Controller and Head	~ 30 cm fixed armored cable
Laser Head Dimensions (cm)	9.0(W) x 18(D) x 3.5(H)
Laser Controller Dimensions (cm)	48.2(W) x 46.7(D) x 10(H); 19 inch 2U
Laser Head Weight (kg)	0.8 (typical)
Laser Controller Weight (kg)	13.6 (typical)
Cooling	Controller air-cooled by low noise fan
Warm-up Time (min)	15 (typical)
I/O CONTROL	
Communication Interface[8]	RS-232 Serial Port, Monitor Port
Front Panel Control Interface	Power Switch, Laser Key Switch, Emergency Stop Button

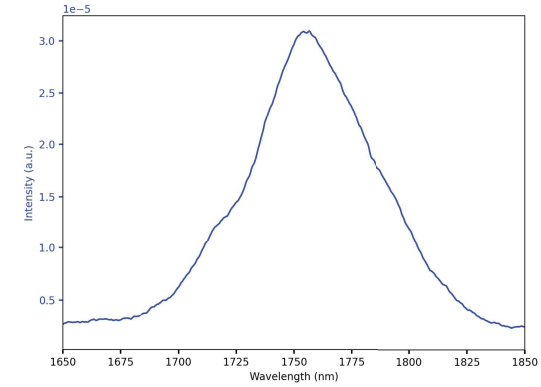
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. For optional second output at 1550 nm, please contact sales@calmarlaser.com.
3. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
4. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting for the laser head.

CALMAR LASER

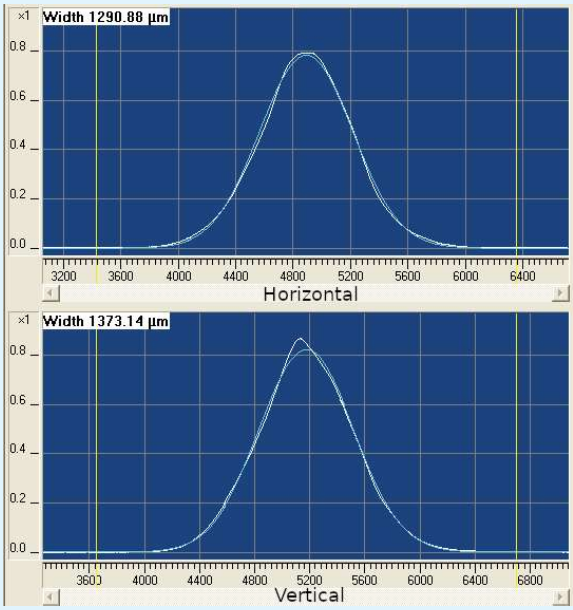
Optical Characterization



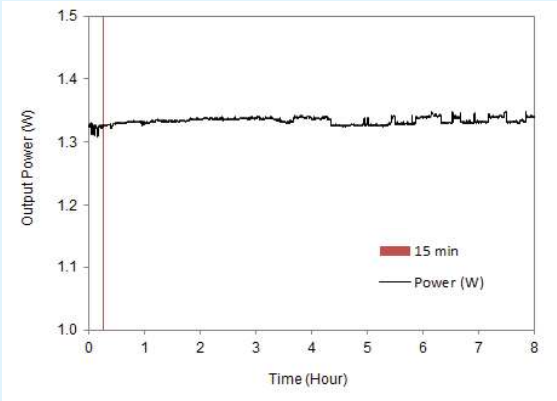
Typical Autocorrelation Trace



Typical Optical Spectrum

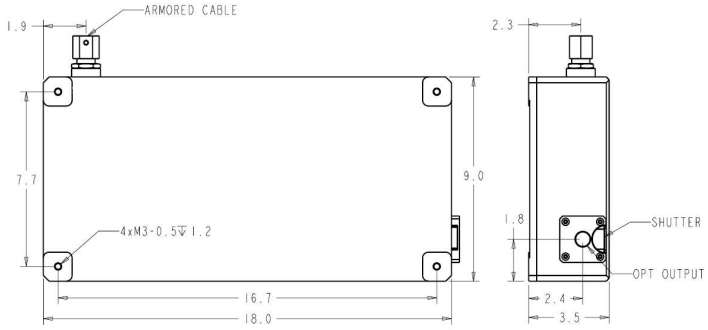


Typical Beam Profile

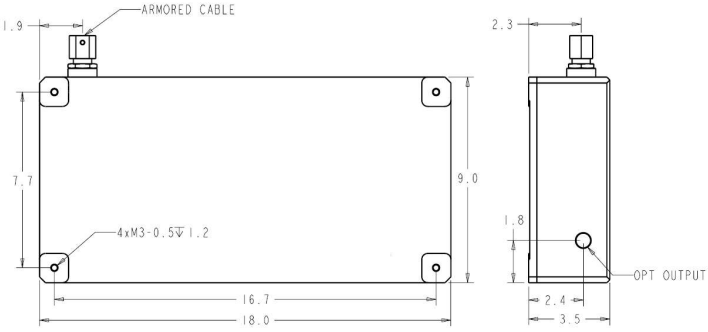


Typical Power Stability

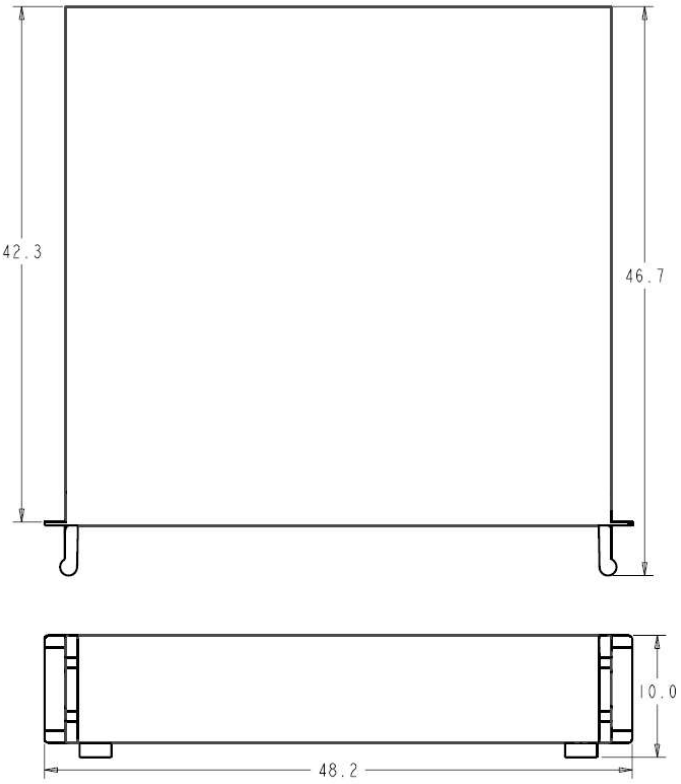
Mechanical Dimensions



Dimensions of Laser Head for Scientific Model (cm)



Dimensions of Laser Head for OEM Model (cm)



Dimensions of Laser Controller (cm)

CAZADERO

1550 nm High Pulse Energy Fiber Based Femtosecond Laser

Applications

- Two-photon integrated circuit testing
- Optical-beam-induced current microscopy
- Bioimaging
- Nonlinear optical studies
- Optical metrology
- Terahertz radiation
- Multiphoton microscopy
- Micro-machining and materials processing

Features

- Up to 3 µJ pulse energy at 1550 nm
- < 0.5 ps pulse widths
- Outstanding beam quality (M^2 < 1.2)
- Variable repetition rates down to single pulse
- All air-cooled, no chiller required
- Rack mountable controller module
- Turn-key operation and full computer control
- Remote system diagnostics

The Cazadero fiber laser chirped pulse amplification system (FLCPA) represents a unique product platform, offering pulse energies up to 3 µJ and pulse widths of less 500 fs at 1550 nm in a robust industrial package. It is the perfect source for two-photon integrated circuit testing, multiphoton microscopy studies, micro-machining and a host of other applications.

The system features a hands-off laser head and a rack mountable controller, which facilitate its incorporation into OEM designs and afford convenient access to high peak power optical pulses. A simple key switch interface provides for manual operation with full remote access through computer control. The system includes the capability of remote data logging, power monitoring and system diagnostics for OEM service support. The rugged, all fiber architecture is designed for 24/7 operation.

The building block of the Cazadero is Calmar's renowned ultrafast fiber seed laser platform, which utilizes the proprietary Mendocino saturable absorber technology developed and perfected over a twenty-year period to deliver reproducible and reliable mode-locking at turn-on. The short pulse is stretched in time to reduce the pulse intensity through the high power amplifier stage and then recompressed to yield low pedestal, high energy output pulses. The pulse repetition rate and pulse energy are user selectable to ensure excellent signal-to-noise for data averaging applications. In addition, the output pulse width can be varied and optimized for every repetition rate to fine tune signal intensities or accommodate a range of processing parameters. An RF synchronization output is also provided as a trigger signal.

The Cazadero is a compact, flexible, fiber based femtosecond laser offering a reliable, cost-effective alternative to solid state laser amplifiers for biomedical, scientific, industrial, and research applications. The system is offered in two versions, the -01C is optimized for higher average power while the -02C is optimized for higher pulse energy. However, if the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized option or design.

1550 nm High Pulse Energy Fiber Based Femtosecond Laser

Technical Specifications[1]

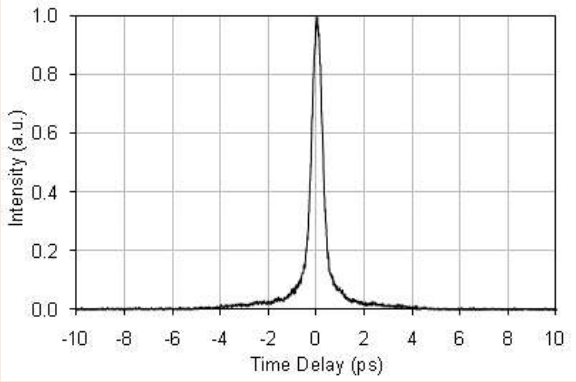
Model Number	FLCPA-01C	FLCPA-02C
OPTICAL		
Center Wavelength (nm)	1550 ± 4	
Pulse Width[2] (ps)	< 0.5	
Average Power (W)	up to 3	up to 2
Repetition Rate[3] (MHz)	Switchable between 0.67, 1, 2, 4, 6 and 12.5	
Maximum Pulse Energy[4] (µJ)	up to 1.5 µJ @ 2 MHz	up to 3 µJ @ 0.67 MHz
Spectrum Width (FWHM, nm)	10 (typical)	
Power Stability over 8 hours[5] (%, RMS)	< 1.0	
Beam Quality, M^2	< 1.2	
Beam Diameter at Exit (mm)	3.0 ± 0.3	
Polarization Extinction Ratio (dB)	> 20	
Output/Termination	Free space, collimated	
ELECTRICAL		
Electrical Synchronization (V)	LVCMOS format	
Supply Voltage	85 – 264 VAC at 47 – 63 Hz, autoranging	
Power Consumption (W)	< 300 (150 typical)	
MECHANICAL		
Operating Temperature (°C)	18 - 30	
Storage Temperature (°C)	0 - 50	
Connection between Controller and Head	~ 2 m electrical cables	
Laser Head Dimensions (cm)	47.8(W) x 76.2(D) x 14.4(H)	
Laser Controller Dimensions (cm)	48.2(W) x 54.2(D) x 18.7(H); 19 inch 4U rack mountable	
Laser Head Weight (kg)	27.3	
Laser Controller Weight (kg)	13.6	
Cooling	Air-cooled with low noise fan	
Warm-up time (min)	30 (typical)	
I/O CONTROL		
Communication Interface	RS-232 Serial Port	
Front Panel Control Interface	Power Switch, Laser Key Switch, Emergency Stop Button	

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. Programmable range 0.1 MHz to 12.5 MHz. For other repetition rates, please contact sales@calmarlaser.com.
4. The pulse energy will vary according to the repitition rate, up to the maximum average power.
5. Requires an ambient temperature control of ± 0.5ºC, after a 45 minute warm up.

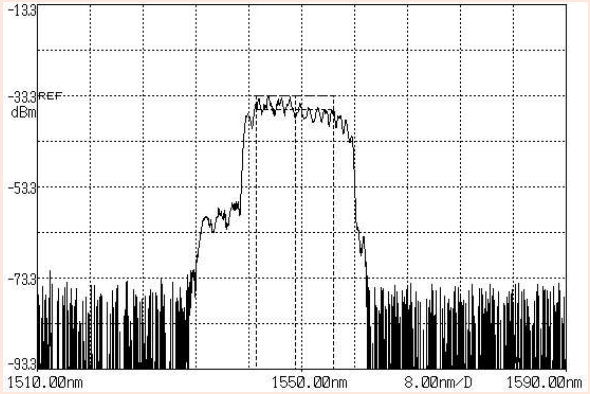
CALMAR LASER

1550 nm High Pulse Energy Fiber Based Femtosecond Laser

Optical Characterization



Typical Autocorrelation Trace



Typical Optical Spectrum

Mechanical Dimensions

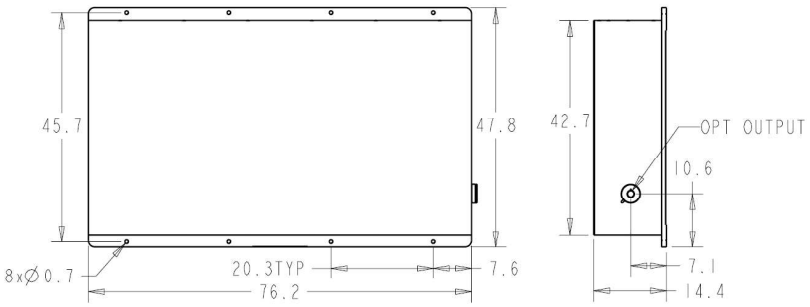


Figure 1 – Dimensions of Laser Head for FLCPA-02C (cm)

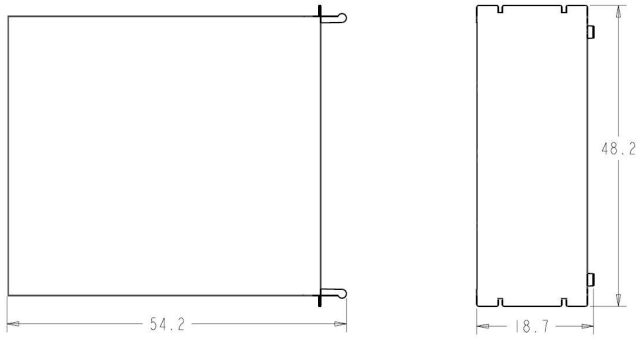


Figure 2 – Dimensions of Laser Controller (cm)

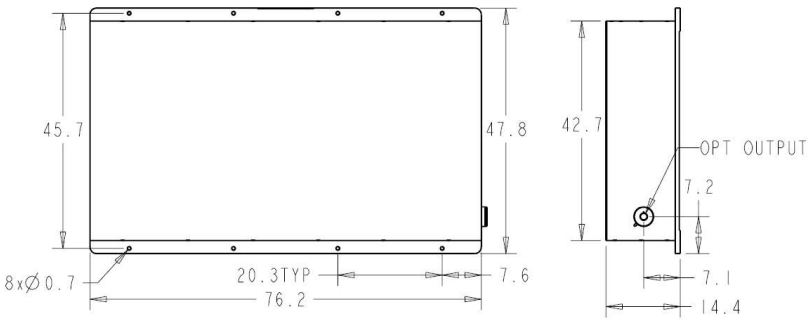
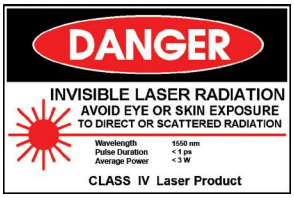


Figure 2 – Dimensions of Laser Head for FLCPA-01C (cm)



MENDOCINO

780 nm Low Power Femtosecond Fiber Laser Module

Applications

- Biophotonics
- Photodetector characterization
- Optical metrology
- Materials characterization
- Multiphoton imaging
- Seed source for Ti:sapphire Amplifiers

Features

- Average power > 10 mW
- Central Wavelength 780 nm
- Pulse width < 90 fs
- Near transform-limited output
- Robust all-fiber architecture
- Exceptional long term stability
- RF synchronization output

The 780 nm low power femtosecond fiber laser (FPL) is a passively mode-locked fiber laser that employs second harmonic generation to provide a stable short pulse output at 780 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It provides a free-space output with power levels of over 10 mW and a short optical pulse of less than 90 fs. The high quality spatial mode ensures excellent focusability for multiphoton microscopy applications or mode matching in Ti:sapphire amplifier systems. The laser also offers an RF 30 MHz synchronization output as a trigger signal..

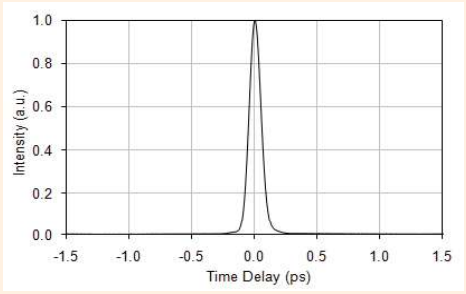
The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration. It can be used as a stand-alone laser system with a user-supplied 5 VDC power supply and is the perfect seed source for integration into demanding OEM amplifier applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

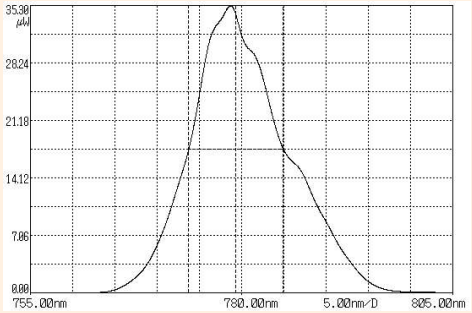
Technical Specifications[1]

Model Number	FPL-M3RFF
OPTICAL	
Central Wavelength (nm)	780 ± 3
Pulse Width[2] (fs)	< 90
Average Power (mW)	> 10
Repitition Rate[3] (MHz)	30
Spectral Width (FWHM, nm)	> 8
Power Stability over 8 hours[4] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 20
Output/Termination	Free space, collimated beam
ELECTRICAL	
Electrical Synchronization (V)	> 0.8, SMA connector
Operating Voltage (VDC)	~ 5
Power Consumption (W)	< 10 W
Electrical Interface	9 pin D-sub connector
Computer Control	N/A
MECHANICAL	
Operating Temperature (°C)	20 - 35
Dimensions (cm)	18.4(W) x 15.7(D) x 6.5(H)
Weight (kg)	1.5
Mounting	Heat sink for steady state heat load of up to 7 W (up to 10 W at turn-on)
Warm-up Time (min)	< 15

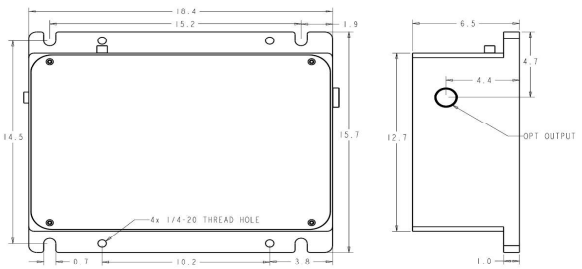
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink



Typical Autocorrelation Trace



Typical Optical Spectrum



CALMAR LASER

CE RoHS COMPLIANT LASER RADIATION

MENDOCINO

780 nm Medium Power Femtosecond Fiber Laser Module

Applications

- Biophotonics
- Terahertz generation
- Optical metrology
- Materials characterization
- Multiphoton imaging
- Seed source for Ti:sapphire Amplifiers

Features

- Average power > 60 mW
- Central Wavelength 780 nm
- Pulse width < 90 fs
- Near transform-limited output
- Robust all-fiber architecture
- Exceptional long term stability
- RF synchronization output

The 780 nm medium power femtosecond fiber laser (FPL) is a passively mode-locked fiber laser that employs second harmonic generation to provide a stable short pulse output at 780 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It provides a free-space output with power levels of over 60 mW and a short optical pulse of less than 90 fs. The high quality spatial mode ensures excellent focusability for tetrahertz generation and multiphoton microscopy applications. The laser also offers an RF 80 MHz synchronization output as a trigger signal.

The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration. It can be used as a stand-alone laser system with a user-supplied 5 VDC power supply and is the perfect seed source for integration into demanding OEM applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

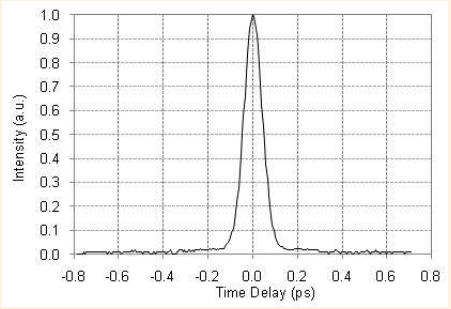
If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

780 nm Medium Power Femtosecond Fiber Laser

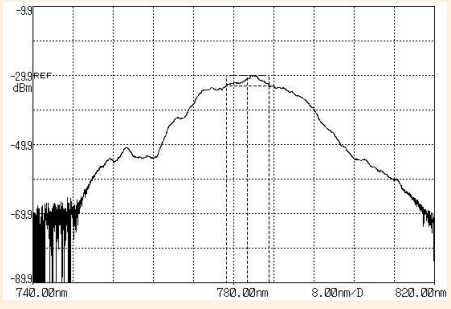
Technical Specifications[1]

Model Number	FPL-M3RFF
OPTICAL	
Central Wavelength (nm)	780 ± 3
Pulse Width[2] (fs)	< 90
Average Power (mW)	> 60
Repitition Rate[3] (MHz)	80
Spectral Width (FWHM, nm)	~ 7 - 9
Power Stability over 8 hours[4] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 20
Output/Termination	Free space, collimated beam
ELECTRICAL	
Electrical Synchronization (V)	> 0.5, SMA connector
Operating Voltage (VDC)	~ 5
Power Consumption (W)	< 20 W
Electrical Interface	USB Micro B
Computer Control	Yes
MECHANICAL	
Operating Temperature (°C)	20 - 35
Dimensions (cm)	18.4(W) x 15.7(D) x 6.5(H)
Weight (kg)	1.5
Mounting	Heat sink for steady state heat load of up to 15 W (up to 20 W at turn-on)
Warm-up Time (min)	< 5

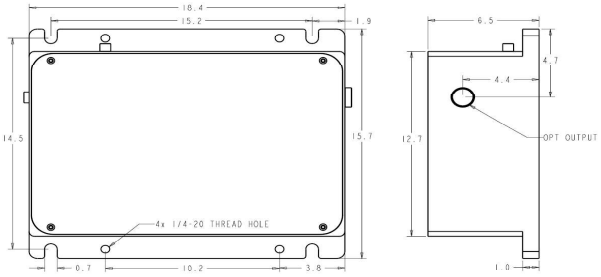
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink



Typical Autocorrelation Trace



Typical Optical Spectrum



MENDOCINO

780 nm High Power Femtosecond Fiber Laser Module

Applications

- Biophotonics
- Terahertz generation
- Optical metrology
- Materials characterization
- Multiphoton imaging
- Seed source for Ti:sapphire Amplifiers

Features

- Average power > 150 mW
- Central Wavelength 780 nm
- Pulse width < 110 fs
- Near transform-limited output
- Robust all-fiber architecture
- Exceptional long term stability
- RF synchronization output

The 780 nm high power femtosecond fiber laser (FPL) is a passively mode-locked fiber laser that employs second harmonic generation to provide a stable short pulse output at 780 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It provides a free-space output with power levels of over 150 mW and a short optical pulse of less than 110 fs. The high quality spatial mode ensures excellent focusability for tetrahertz generation and multiphoton microscopy applications. The laser also offers an RF 80 MHz synchronization output as a trigger signal.

The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration. It can be used as a stand-alone laser system with a user-supplied 5 VDC power supply and is the perfect seed source for integration into demanding OEM applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

780 nm High Power Femtosecond Fiber Laser

Technical Specifications[1]

Model Number	FPL-M4RFF
OPTICAL	
Central Wavelength (nm)	780 ± 3
Pulse Width[2] (fs)	< 110
Average Power (mW)	> 150
Repitition Rate[3] (MHz)	100
Spectral Width (FWHM, nm)	~ 5
Power Stability over 8 hours[4] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 20
Output/Termination	Free space, collimated beam
ELECTRICAL	
Electrical Synchronization (V)	> 0.5, SMA connector
Operating Voltage (VDC)	~ 5
Power Consumption (W)	< 20 W
Electrical Interface	USB Micro B
Computer Control	Yes
MECHANICAL	
Operating Temperature (°C)	20 - 35
Dimensions (cm)	18.4(W) x 15.7(D) x 6.5(H)
Weight (kg)	1.5
Mounting	Heat sink for steady state heat load of up to 20 W (up to 25 W at turn-on)
Warm-up Time (min)	< 5

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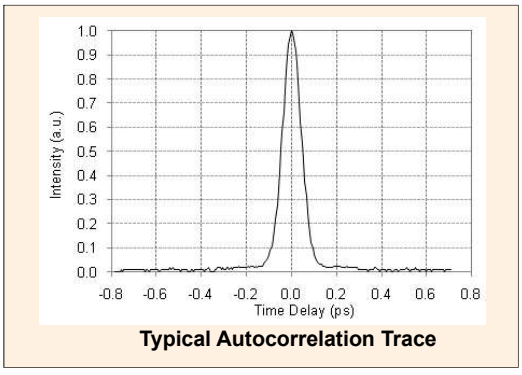
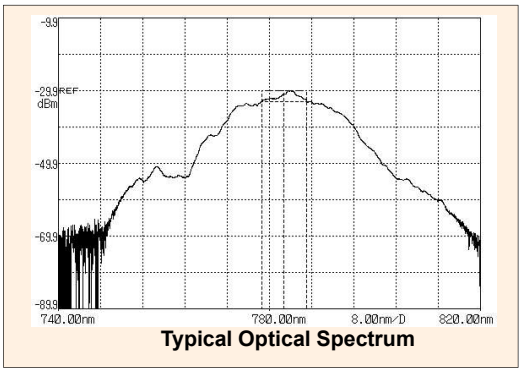
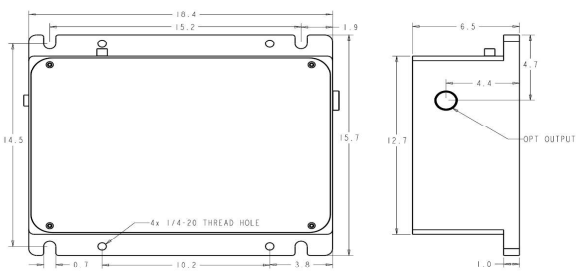
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink



Typical Autocorrelation Trace



Typical Optical Spectrum



CALMAR LASER

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MENDOCINO

925 nm Low Power Femtosecond Fiber Laser Module

Applications

- Biophotonics
- Photodetector characterization
- Optical metrology
- Materials characterization
- Multiphoton imaging
- Seed source for higher energy laser systems

Features

- Average power > 5 mW
- Central Wavelength 925 nm
- Pulse width compressible to < 100 fs
- Robust all-fiber architecture
- Fiber pigtail delivery
- Exceptional long term stability
- RF synchronization output

The 925 nm low power femtosecond fiber laser (FPL) is a passively mode-locked fiber laser that employs nonlinear wavelength conversion to provide a stable short pulse output at 925 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient polarization-maintaining (PM) fiber output with power levels up to 5 mW and an optical pulse that is compressible to less than 100 fs. The laser provides an RF 50 MHz synchronization output as a trigger signal.

The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration. It can be used as a stand-alone laser system with a user-supplied 5 VDC power supply and is the perfect source for integration into demanding OEM applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

925 nm Low Power Femtosecond Fiber Laser

Technical Specifications[1]

Model Number	FPL-M2TFF
OPTICAL	
Central Wavelength (nm)	925 ± 3
Pulse Width[2] (ps)	2 - 4 (compressible to < 0.1)
Average Power (mW)	> 5
Repitition Rate[3] (MHz)	50
Spectral Width (FWHM, nm)	~ 20
Power Stability over 8 hours[4] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 18
Output/Termination[5]	PM 980 fiber pigtail with FC/APC connector
ELECTRICAL	
Electrical Synchronization (V)	> 0.2, SMA connector
Operating Voltage (VDC)	~ 5
Power Consumption (W)	< 20 W
Electrical Interface	25 pin D-sub connector
Computer Control	Yes
MECHANICAL	
Operating Temperature (°C)	20 - 35
Dimensions (cm)	20.3(W) x 12.7(D) x 4.3(H)
Weight (kg)	1.5
Mounting	Heat sink for steady state heat load of up to 15 W (up to 20 W at turn-on)
Warm-up Time (min)	< 15

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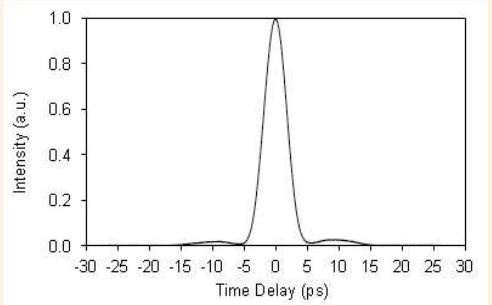
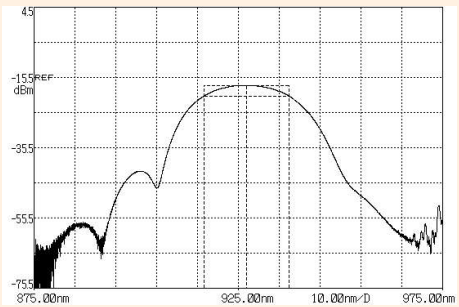
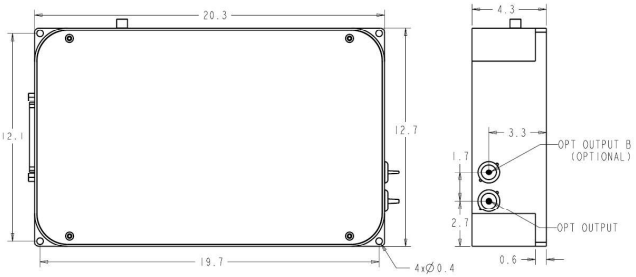
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink
5. For free space option, please contact sales@calmarlaser.com.



Typical Autocorrelation Trace



Typical Optical Spectrum



CALMAR LASER

LASER RADIATION

MENDOCINO

1030 nm Low Power Femtosecond Fiber Laser Module

Applications

- Biophotonics
- Photodetector characterization
- Optical metrology
- Materials characterization
- Multiphoton imaging
- Seed source for higher energy laser systems

Features

- Average power > 0.5 mW
- Central Wavelength 1030 nm
- Pulse width < 1 ps
- Robust all-fiber architecture
- Fiber pigtail delivery
- Exceptional long term stability
- RF synchronization output

The 1030 low power femtosecond fiber laser (FPL) is a passively mode-locked fiber laser that provides a stable short pulse output at 1030 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient polarization-maintaining (PM) fiber output with power levels greater than 0.5 mW and an optical pulse of less than 1 ps. The laser provides an RF 30 MHz synchronization output as a trigger signal.

The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration. It can be used as a stand-alone laser system with a user-supplied 5 VDC power supply and is the perfect source for integration into demanding OEM applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

1030 nm Low Power Femtosecond Fiber Laser

Technical Specifications[1]

Model Number	FPL-M1UFF
OPTICAL	
Central Wavelength (nm)	1030 ± 2
Pulse Width[2] (ps)	< 1
Average Power (mW)	> 0.5
Repitition Rate[3] (MHz)	30
Spectral Width (FWHM, nm)	~ 3 - 4
Power Stability over 8 hours[4] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 18
Output/Termination[5]	PM 980 fiber pigtail with FC/APC connector
ELECTRICAL	
Electrical Synchronization (V)	> 0.1, SMA connector
Operating Voltage (VDC)	~ 5
Power Consumption (W)	< 10 W
Electrical Interface	9 pin D-sub connector
Computer Control	No
MECHANICAL	
Operating Temperature (°C)	20 - 35
Dimensions (cm)	9.5(W) x 12.7(D) x 2.5(H)
Weight (kg)	0.3
Mounting	Heat sink for steady state heat load of up to 7 W (up to 10 W at turn-on)
Warm-up Time (min)	< 10

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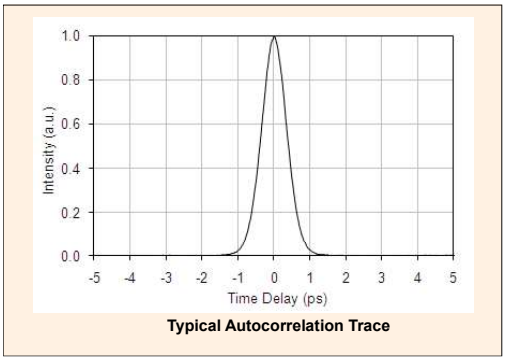
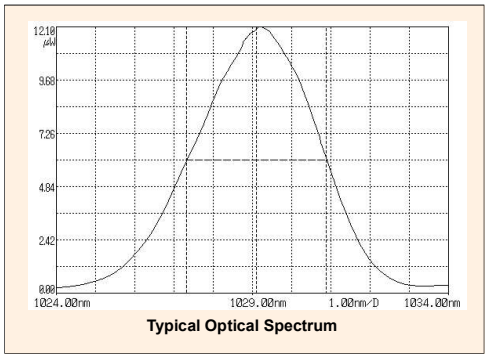
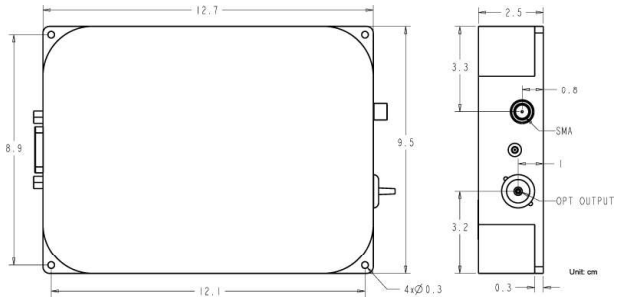
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink
5. For free space option, please contact sales@calmarlaser.com.



Typical Autocorrelation Trace



Typical Optical Spectrum



CALMAR LASER

RoHS COMPLIANT

LASER RADIATION

MENDOCINO

1030 nm High Power Femtosecond Fiber Laser Module

Applications

- Biophotonics
- Photodetector characterization
- Optical metrology
- Materials characterization
- Multiphoton imaging
- Seed source for higher energy laser systems

Features

- Average power > 100 mW
- Central Wavelength 1030 nm
- Pulse widths compressible to < 100 fs
- Robust all-fiber architecture
- Fiber pigtail delivery, customizable temporal chirp
- Exceptional long term stability
- RF synchronization output

The 1030 high power femtosecond fiber laser (FPL) is a passively mode-locked fiber laser that provides a stable short pulse output at 1030 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient polarization-maintaining (PM) fiber output with power levels greater than 100 mW and a chirped optical pulse that is compressible to sub 100 fs. The temporal chirp can be customized with precise group velocity and higher order dispersion values to accommodate the input requirements of specific amplifier platforms or optical systems. The laser provides an RF 50 MHz synchronization output as a trigger signal.

The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration. It can be used as a stand-alone laser system with a user-supplied 5 VDC power supply and is the perfect seed source for integration into demanding OEM amplifier applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

1030 nm High Power Femtosecond Fiber Laser

Technical Specifications[1]

Model Number	FPL-M4UFF
OPTICAL	
Central Wavelength (nm)	1030 ± 2
Pulse Width[2,3] (ps)	~ 1 - 3 (compressible to < 0.1)
Average Power (mW)	> 100
Repitition Rate[4] (MHz)	50
Spectral Width (FWHM, nm)	> 15
Power Stability over 8 hours[5] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 15
Output/Termination[6,7]	PM 980 fiber pigtail with FC/APC connector
ELECTRICAL	
Electrical Synchronization (V)	> 0.1, SMA connector
Operating Voltage (VDC)	~ 5
Power Consumption (W)	< 20 W
Electrical Interface	25 pin D-sub connector
Computer Control	Yes
MECHANICAL	
Operating Temperature (°C)	20 - 35
Dimensions (cm)	20.3(W) x 12.7(D) x 4.3(H)
Weight (kg)	1.5
Mounting	Heat sink for steady state heat load of up to 15 W (up to 20 W at turn-on)
Warm-up Time (min)	< 10

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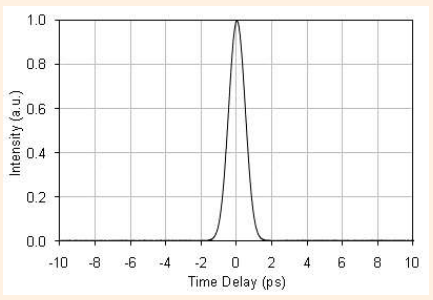
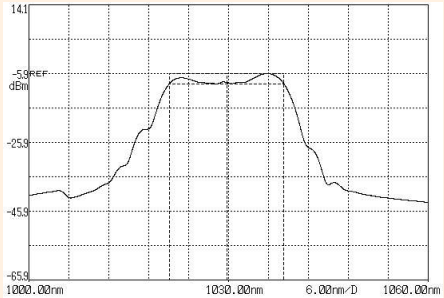
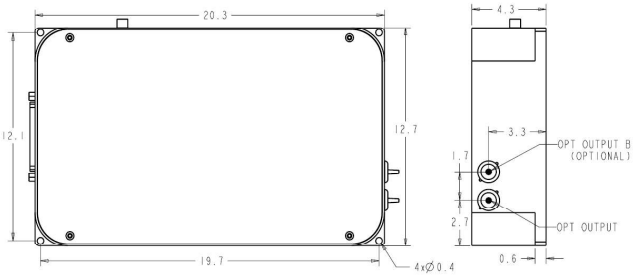
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For customizable temporal chirp, with specific GVD and higher order dispersion, please contact sales@calmarlaser.com.
4. For other repetition rates, please contact sales@calmarlaser.com.
5. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink
6. For free space option, please contact sales@calmarlaser.com
7. For optional second (monitor) output, please contact sales@calmarlaser.com



Typical Autocorrelation Trace



Typical Optical Spectrum



CALMAR LASER

RoHS COMPLIANT

LASER RADIATION

MENDOCINO

1064 nm High Power Femtosecond Fiber Laser Module

Applications

- Biophotonics
- Terahertz generation
- Optical metrology
- Materials characterization
- Multiphoton imaging
- Seed source for higher energy laser systems

Features

- Average power > 200 mW
- Central Wavelength 1064 nm
- Pulse widths compressible to < 100 fs
- Robust all-fiber architecture
- Fiber pigtail delivery, customizable temporal chirp
- Exceptional long term stability
- RF synchronization output

The 1064 high power femtosecond fiber laser (FPL) is a passively mode-locked fiber laser that provides a stable short pulse output at 1064 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient polarization-maintaining (PM) fiber output with power levels greater than 200 mW and a chirped optical pulse that is compressible to sub 100 fs. The temporal chirp can be customized with precise group velocity and higher order dispersion values to accommodate the input requirements of specific amplifier platforms or optical systems. The laser provides an RF 50 MHz synchronization output as a trigger signal.

The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration. It can be used as a stand-alone laser system with a user-supplied 5 VDC power supply and is the perfect seed source for integration into demanding OEM applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

1064 nm High Power Femtosecond Fiber Laser

Technical Specifications[1]

Model Number	FPL-M4UFF
OPTICAL	
Central Wavelength (nm)	1064 ± 4
Pulse Width[2,3] (ps)	~ 10 (compressible to < 0.1)
Average Power (mW)	> 200
Repitition Rate[4] (MHz)	50
Spectral Width (FWHM, nm)	> 30
Power Stability over 8 hours[5] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.2
Polarization Extinction Ratio (dB)	> 15
Output/Termination[6,7]	PM 980 fiber pigtail with FC/APC connector
ELECTRICAL	
Electrical Synchronization (V)	> 0.5, SMA connector
Operating Voltage (VDC)	~ 5
Power Consumption (W)	< 30 W
Electrical Interface	25 pin D-sub connector
Computer Control	Yes
MECHANICAL	
Operating Temperature (°C)	20 - 35
Dimensions (cm)	20.3(W) x 12.7(D) x 4.3(H)
Weight (kg)	1.5
Mounting	Heat sink for steady state heat load of up to 15 W (up to 20 W at turn-on)
Warm-up Time (min)	< 10

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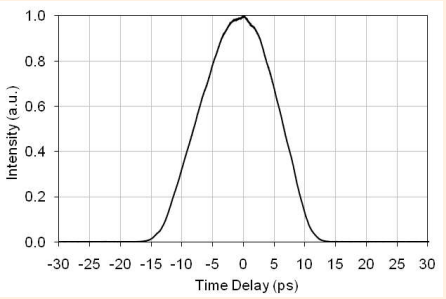
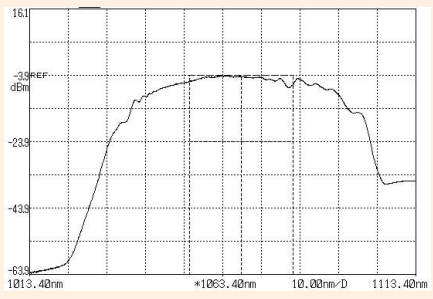
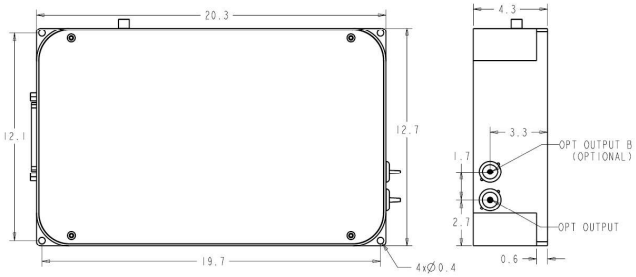
2. A sech2 pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For customizable temporal chirp, with specific GVD and higher order dispersion, please contact sales@calmarlaser.com.
4. For other repetition rates, please contact sales@calmarlaser.com.
5. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink
6. For free space option, please contact sales@calmarlaser.com
7. For optional second (monitor) output, please contact sales@calmarlaser.com



Typical Autocorrelation Trace



Typical Optical Spectrum



CALMAR LASER

RoHS COMPLIANT

LASER RADIATION

MENDOCINO

1550 nm Low Power Femtosecond Fiber Laser Module

Applications

- Telecommunications components testing
- Photodetector characterization
- Terahertz generation
- Optical metrology
- Materials characterization
- Biophotonics

Features

- Average power > 2 mW
- Central Wavelength 1550 nm
- Pulse width < 0.5 ps
- Robust all-fiber architecture
- Fiber pigtail delivery
- Exceptional long term stability
- RF synchronization output

The 1550 C-band low power femtosecond fiber laser (FPL) is a passively mode-locked fiber laser that provides a stable short pulse output at 1550 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient polarization-maintaining (PM) fiber output with power levels greater than 2 mW and an optical pulse of less than 0.5 ps. The laser provides an RF 50 MHz synchronization output as a trigger signal.

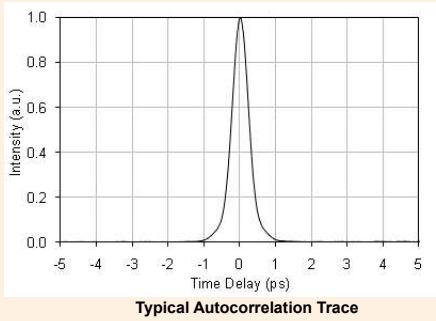
The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration. It can be used as a stand-alone laser system with a user-supplied 5 VDC power supply and is the perfect source for integration into demanding OEM applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

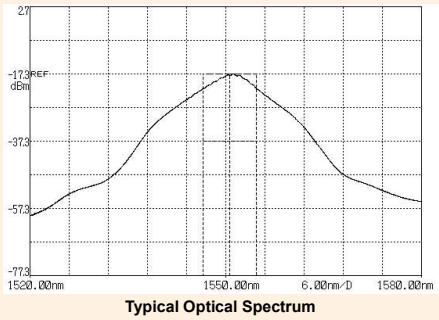
Technical Specifications[1]

Model Number	FPL-M2CFF
OPTICAL	
Central Wavelength (nm)	1550 ± 2
Pulse Width[2] (ps)	< 0.5
Average Power (mW)	> 2
Repitition Rate[3] (MHz)	50
Spectral Width (FWHM, nm)	> 6
Power Stability over 8 hours[4] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 18
Output/Termination[5,6]	PM 1550 fiber pigtail with FC/APC connector
ELECTRICAL	
Electrical Synchronization (V)	> 0.2, SMA connector
Operating Voltage (VDC)	~ 5
Power Consumption (W)	< 10 W
Electrical Interface	9 pin D-sub connector
Computer Control	No
MECHANICAL	
Operating Temperature (°C)	20 - 35
Dimensions (cm)	9.5(W) x 12.7(D) x 2.5(H)
Weight (kg)	0.3
Mounting	Heat sink for steady state heat load of up to 7 W (up to 10 W at turn-on)
Warm-up Time (min)	< 10

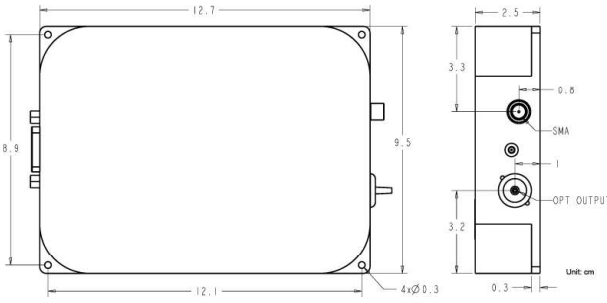
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A sech2 pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink
5. For free space option, please contact sales@calmarlaser.com.
6. For optional second (monitor) output, please contact sales@calmarlaser.com



Typical Autocorrelation Trace



Typical Optical Spectrum



MENDOCINO

1550 nm Medium Power Femtosecond Fiber Laser Module with Long Fiber Delivery

Applications

- Remote terahertz sensing/imaging
- Two-photon integrated circuit testing
- Telecom component testing
- Optical metrology
- Materials characterization
- Biophotonics

Features

- Average power > 100 mW
- Central Wavelength 1550 nm
- Pulse width < 110 fs
- Fiber delivery up to 50 m
- Robust all-fiber architecture
- Exceptional long term stability
- RF synchronization output

The 1550 medium power femtosecond fiber laser (FPL) is a passively mode-locked fiber laser that has been specifically optimized for industrial applications to deliver short pulse output (< 110 fs) at 1550 nm from up to 50 m of PM delivery fiber, which can be spilt into two branches for a pump-probe configuration. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to provide reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient polarization-maintaining (PM) fiber output with a total output power level of greater than 100 mW that can be configured to provide > 30 mW per limb in a dual branch fiber delivery system. The laser also provides an RF 100 MHz synchronization output as a trigger signal.

One specific application area for this laser is the generation of terahertz radiation (wavelengths in the range of 30 μm to 3 mm) to enable time-domain spectroscopy/imaging (THz-TDS) for thickness measurements in a wide range of materials, such as plastics, composites, textiles, etc. This non-destructive technique is increasingly used for process control in industrial environments, requiring dual fiber delivery of femtosecond laser pulses to a remote terahertz antenna source and receiver.

The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration. It can be used as a stand-alone laser system with a user-supplied 5 VDC power supply and is the perfect source for integration into demanding OEM applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

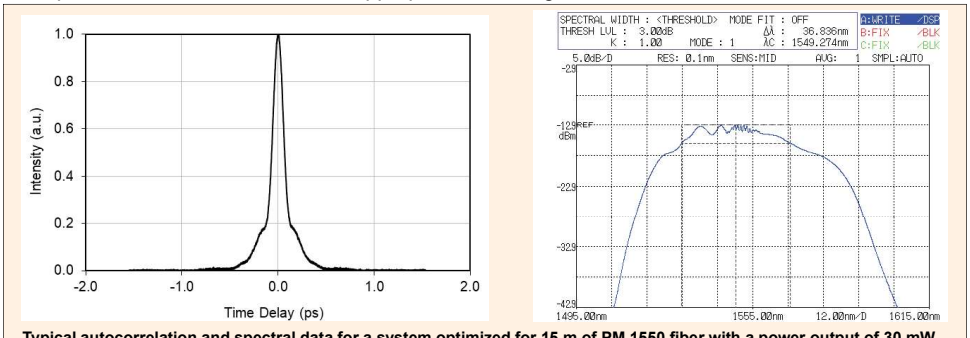
If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution

1550 nm Medium Power Femtosecond Fiber Laser

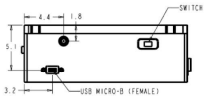
Technical Specifications[1]

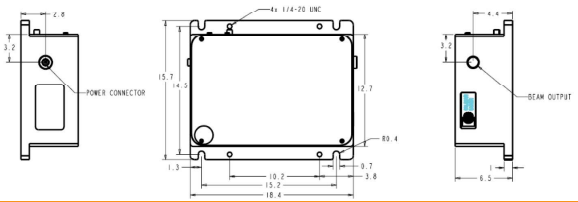
Model Number	FPL-M4CFF1
OPTICAL	
Central Wavelength (nm)	1550
Pulse Width[2] (fs)	Compressible to < 110 fs up to 30 mW with up to 50 m of PM 1550 delivery fiber[3]
Average Power (mW)	> 100
Repitition Rate[3] (MHz)	100
Spectral Width (FWHM, nm)	> 30
Power Stability over 8 hours[4] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 20
Output/Termination	~ 0.5 m PM 1550 fiber pigtail with FC/APC connector
ELECTRICAL	
Electrical Synchronization (V)	~ 0.5, SMA connector
Operating Voltage (VDC)	~ 5
Power Consumption (W)	< 20 W
Electrical Interface	USB Micro B
Computer Control	Yes
MECHANICAL	
Operating Temperature (°C)	20 - 35
Dimensions (cm)	18.5(W) x 15.7(D) x 6.5(H)
Weight (kg)	1.5
Mounting	Heat sink for steady state heat load of up to 20 W (up to 25 W at turn-on)
Warm-up Time (min)	< 10

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. The laser is configured to deliver > 30 mW per limb (up to 50 m) in a dual fiber delivery configuration.
4. For other repetition rates, please contact sales@calmarlaser.com.
5. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink



Typical autocorrelation and spectral data for a system optimized for 15 m of PM 1550 fiber with a power output of 30 mW





CALMAR LASER

RoHS COMPLIANT

LASER RADIATION

MENDOCINO

1550 nm Picosecond Fiber Laser for LIDAR and 3D Sensing

Portable.
Compact.
Battery-Powered.

Introducing the New, Portable,
Eye-safe, Picosecond Source.

- Eye-safe, 1550 nm output
- Average power up to 10 mW at 10 MHz
- Transform-limited pulse widths of 1 - 10 ps
- Robust all-fiber architecture
- Fiber pigtail delivery
- < 3 W power consumption
- Portable, battery-powered operation
- Passively air-cooled module

The Mendocino LDR is the first, battery-powered, ultrafast fiber laser specifically developed for optical communications and high resolution LIDAR (Light Detection and Ranging) and 3D sensing applications.

The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient polarization-maintaining (PM) fiber output with power levels up to 10 mW and optical pulses of 1 to 10 ps. The laser provides an RF 10 MHz synchronization output as a trigger signal.

The module (FPL-M) series features a robust architecture that is insensitive to shock and vibration and is the perfect source for integration into demanding OEM applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

1550 nm Picosecond Fiber Laser for LIDAR and 3D Sensing

Technical Specifications[1]

Model Number	FPL-M2CFF LDR I	FPL-M2CFF LDR II
OPTICAL		
Central Wavelength (nm)	1550 ± 2	
Pulse Width[2] (ps)	5 - 10	~ 1
Average Power (mW)	> 5	~ 10
Repitition Rate[3] (MHz)	10	
Spectral Width (FWHM, nm)	< 0.5	~ 10
Power Stability over 8 hours[4] (%, RMS)	< 1.0	
Beam Quality, M^2	< 1.1	
Polarization Extinction Ratio (dB)	> 20	
Output/Termination[5,6]	PM 1550 fiber pigtail with FC/APC connector	
ELECTRICAL		
Electrical Synchronization (V)	> 0.2, SMA connector	
Operating Voltage (VDC)	< 3.3, optional battery operation	
Power Consumption (W)	< 3 W	
Electrical Interface	9 pin D-sub connector	
Computer Control	No	
MECHANICAL		
Operating Temperature (°C)	15 - 35	
Dimensions (cm)	9.5(W) x 12.7(D) x 2.5(H)	
Weight (kg)	0.3	
Mounting	Heat sink to dissipate up to 3 W	
Warm-up Time (min)	< 10	

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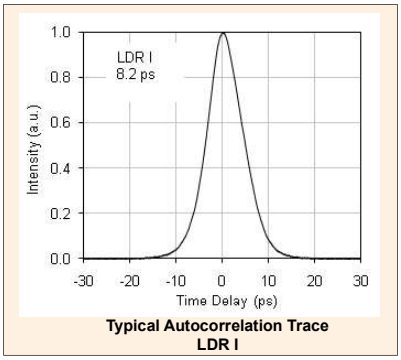
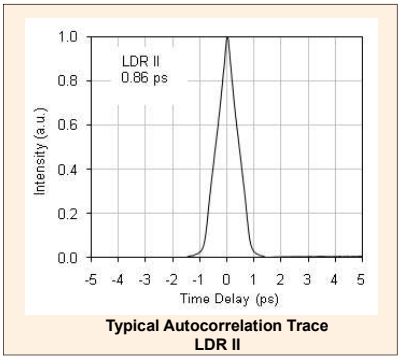
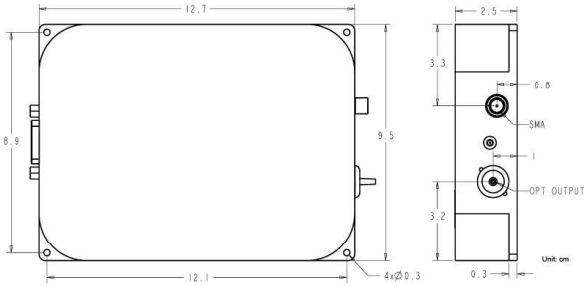
Please contact sales@calmarlaser.com for customized specifications.
2. A sech2 pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC and appropriate mounting with heat sink
5. For free space option, please contact sales@calmarlaser.com.
6. For optional second (monitor) output, please contact sales@calmarlaser.com



Typical Autocorrelation Trace
LDR I



Typical Autocorrelation Trace
LDR II



CALMAR LASER

LASER RADIATION

CORONADO

1550 nm Erbium-doped Fiber Amplifier Module

Applications

- Seed laser amplification
- C-band channel pre- or boost amplification
- Narrow band amplification in access or CATV networks
- DWDM metro network
- LIDAR/3D sensing amplifier
- Short pulse amplification

Features

- Saturated output power 15 to 23 dBm
- Input power range from -25 to 10 bBm
- Wavelength range 1530 to 1565 nm
- Low noise figure
- Robust all-fiber architecture
- Fiber pigtail connections
- Exceptional long term stability

The Coronado amplifier module (AMP-M) is a very compact optical fiber amplifier based upon erbium-doped fiber that provides broadband gain over the C-band (1530 to 1565 nm). The system has been optimized for amplification of short optical pulses (such as those provided from Calmar's Mendocino series) and offers high gain and low noise with long term dependable performance. It features convenient pigtail fiber connections with either polarization-maintaining (PM) or non-PM options. The former ensures the amplified output is linearly polarized and eliminates unwanted polarization effects. The compact design provides output power levels from 15 up to 23 dBm and a noise figure as low as 5 dB.

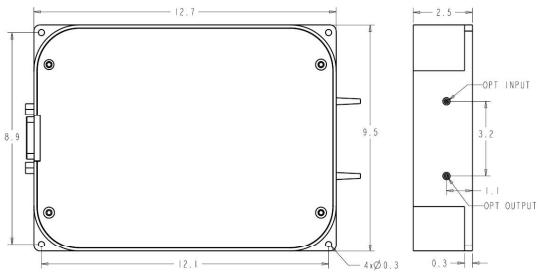
The module (AMP-M) series features a robust architecture that is insensitive to shock and vibration. It requires a user-supplied 5 VDC power supply and is the perfect amplifier module for either stand-alone use or for integration into demanding OEM applications. An advanced engineering design and consistent manufacturing process ensure the highest quality standards for volume production.

If the performance parameters do not quite fit your application requirements or you have interest in an L-band module, please contact us at sales@calmarlaser.com to discuss a customized solution.

Technical Specifications[1]

Model Number	AMP-PM15M	AMP-PM18M	AMP-PM20M	AMP-PM23M
OPTICAL (Polarization Maintaining EDFA Module)				
Center Wavelength[2] (nm)	1530 ~ 1565			
Output Power[3] (dBm)	15	18	20	23
Small Signal Gain	25	30	35	35
Input Power Range (dBm)	-25 ~ +10			
Noise Figure (dB)	< 5.0	< 5.5	< 6.5	< 6.5
Polarization Extinction Ratio (dB)	> 20			
Input/Output/Termination	Fiber pigtail with FC/APC connector			
Model Number	**AMP-ST15M**	**AMP-ST18M**	**AMP-ST20M**	**AMP-ST23M**
OPTICAL (Non-Polarization Maintaining EDFA Module)				
Center Wavelength[2] (nm)	1530 ~ 1565			
Output Power[3] (dBm)	15	18	20	23
Small Signal Gain	25	30	35	35
Input Power Range (dBm)	-25 ~ +10			
Noise Figure (dB)	< 4.5	< 5.0	< 6.0	< 6.0
Polarization State	Arbitrary			
Input/Output/Termination	Fiber pigtail with FC/APC connector			
ELECTRICAL				
Operating Voltage (VDC)	~ 5			
Electrical Interface	9-pin D-sub connector			
Computer Control	No			
MECHANICAL				
Operating Temperature (°C)	0 - 50			
Dimension (cm)	9.5(W) x 12.7(D) x 2.5(H)		20.3(W) x 12.7(D) x 4.3(H)	
Weight (kg)	0.3		1.5	
Mounting	Heat sink for steady state heat load of up to 7 W (up to 10 W at turn-on)		Heat sink for steady state heat load of up to 15 W (up to 20 W at turn-on)	
Warm-up Time (min)	< 10			

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. For other wavelengths, such as the L-band, please contact sales@calmarlaser.com
3. For other output powers, please contact sales@calmarlaser.com.



CALMAR LASER

CE RoHS COMPLIANT LASER RADIATION

MENDOCINO

780 and 1550 nm Femtosecond Fiber Laser

Applications

- High speed receiver conformance testing
- Photodetector characterization
- Optical metrology
- Materials characterization
- Silicon integrated circuit testing
- Seed source for higher energy laser systems

Features

- Average power > 0.5 mW
- Central wavelength 780, and 1550 nm
- Pulse width < 2 ps (780), < 0.5 ps (1550)
- GHz synchronization for low-jitter triggering
- Turnkey benchtop platform
- Convenient fiber pigtail output
- Exceptional long term stability

The benchtop (FPL-0) series is the perfect short pulse optical source for test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power and pulse width. Different synchronization outputs are available with GHz (high harmonic) options that can provide a time domain persistent timing jitter of less than 0.25 ps.

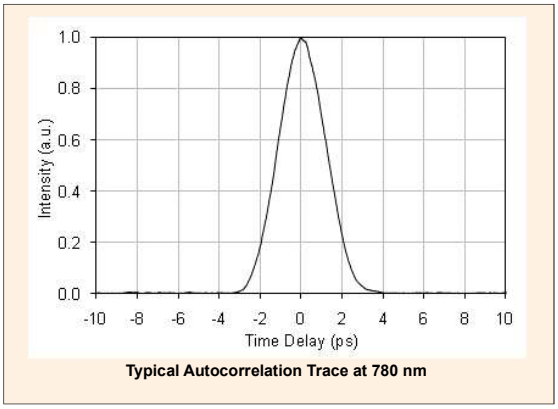
This dual output low power femtosecond fiber laser is a passively mode-locked fiber laser that employs nonlinear wavelength conversion to provide stable short pulse outputs at 780 and 1550 nm. The desired wavelengths need to be specified at the time of purchase. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features convenient fiber pigtail outputs for each wavelength with power levels greater than 0.5 mW and optical pulses of less than 2 ps at 780 nm and less than 0.5 ps at 1550 nm.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

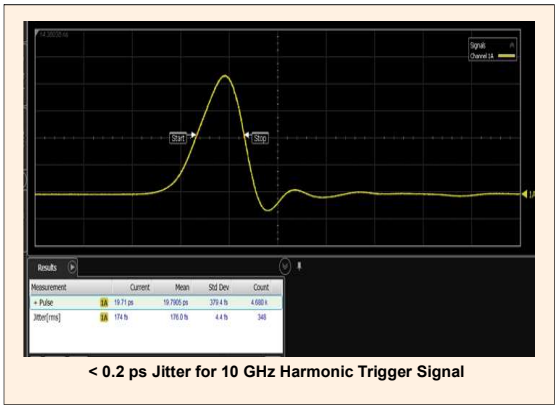
Technical Specifications[1]

Model Number	FPL-01RCFF		
Output	Port A	Port B	
OPTICAL			
Central Wavelength[2] (nm)	780 ± 3	1550 ± 2	
Pulse Width[3] (ps)	< 2	< 0.5	
Average Power (mW)	> 0.5		
Repitition Rate[4] (MHz)	20		
Power Stability over 8 hours[5] (%, RMS)	< 0.5		
Beam Quality, M^2	< 1.1		
Polarization Extinction Ratio (dB)	> 20		
Output	Single mode fiber (HI 780) pigtail	Single mode fiber (SMF-28) pigtail	
Termination	FC/APC connector		
ELECTRICAL			
Electrical Synchronization (V)	~ 0.5, SMA connector		
Electrical Synchronization Frequency[6]	Standard, 20 MHz	High Harmonic, 1 GHz	High Harmonic, 10 GHz
Persistent Timing Jitter[7] (RMS, ps)	< 2.0	< 0.5	< 0.25
Supply Voltage (VAC)	85 - 264 autoranging		
Supply Frequency (Hz)	47 - 63 autoranging		
MECHANICAL			
Operating Temperature (°C)	15 - 30		
Dimensions (cm)	34.9(W) x 43.7(D) x 10(H)		
Weight (kg)	~ 6		

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. The desired Port A output wavelength needs to be specified at the time of purchase. For more details, please contact sales@calmarlaser.com.
3. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
4. For other repetition rates, please contact sales@calmarlaser.com.
5. Requires an ambient temperature control of ± 1.0ºC.
6. The desired synchronization output needs to be specified at the time of purchase. For more details, please contact sales@calmarlaser.com.
7. Measured when used as a trigger signal with a high speed sampling oscilloscope.



Typical Autocorrelation Trace at 780 nm



< 0.2 ps Jitter for 10 GHz Harmonic Trigger Signal

MENDOCINO

1030 or 1064 nm Femtosecond Fiber Laser

Applications

- Biomedical instrumentation
- Seed source for high power lasers
- Optical high speed sampling
- Terahertz radiation
- Materials characterization
- Optical metrology

Features

- Average power up to 3 mW
- Central Wavelength of 1030 or 1064 nm
- Pulse width compressible to 200 - 400 fs
- Convenient fiber pigtail output
- Turnkey benchtop platform
- Integral optical monitor port

The benchtop (FPL-0) series is the perfect, economical, short pulse optical source for a variety of test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power. Different synchronization signals are available through a front panel RF output and an optical monitor port.

The 1 µm low power femtosecond fiber laser is a passively mode-locked fiber laser that provides a stable pulse output at either 1030 or 1064 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability.

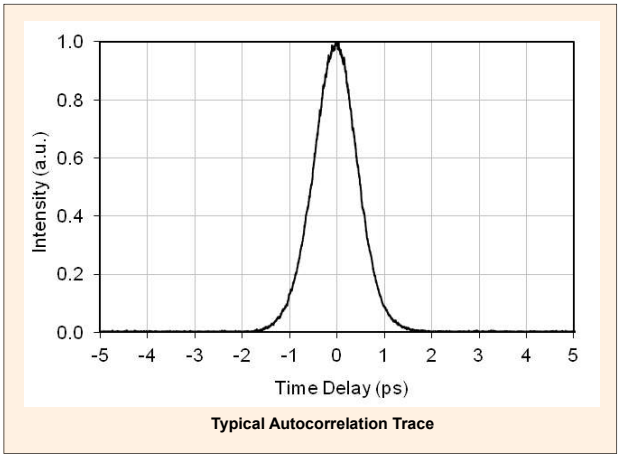
The laser features a convenient fiber pigtail output with power levels up to 3 mW and optical pulses that are compressible to 200 – 400 fs for the standard version, or in the range of 5 – 20 ps for the longer pulse width version. The repetition rate can be specified as 27, 55, or 100 MHz.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

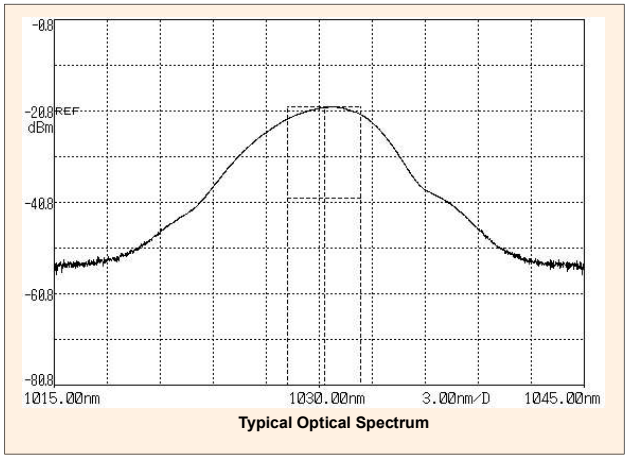
Technical Specifications[1]

Model Number	FPL-02UFF
OPTICAL	
Central Wavelength[2] (nm)	1030 or 1064
Pulse Width[3] (ps)	~ 1 - 2 (compressible to 0.2 - 0.4)
Average Power[4] (mW)	1 - 3
Spectral Width (FWHM, nm)	2 - 5
Repitition Rate[5] (MHz)	27, 55, 100
Power Stability over 8 hours[6] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 20
Output/Termination	PM-980 or HI-1060 fiber pigtail with FC/APC connector, key to slow axis
ELECTRICAL	
Electrical Synchronization (V)	~ 0.5, SMA connector
Supply Voltage (VAC)	85 - 264 autoranging
Supply Frequency (Hz)	47 - 63 autoranging
MECHANICAL	
Operating Temperature (°C)	15 - 30
Dimensions (cm)	34.9(W) x 43.7(D) x 10(H)
Weight (kg)	~ 6

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. Wavelength needs to be specified at the time of purchase.
3. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
4. From output port A, a monitor signal (~ 0.1 mW) is available from output port B.
5. Repetition rate needs to be specified at the time of purchase. For other repetition rates, please contact sales@calmarlaser.com.
6. Requires an ambient temperature control of ± 1.0ºC.



Typical Autocorrelation Trace



Typical Optical Spectrum

CALMAR LASER

CE

RoHS COMPLIANT

MENDOCINO

1030 or 1064 nm High Power Femtosecond Fiber Laser

Applications

- Biomedical instrumentation
- Seed source for high power lasers
- Optical high speed sampling
- Terahertz radiation
- Materials characterization
- Optical metrology

Features

- Average power > 100 mW
- Central Wavelength of 1030 or 1064 nm
- Pulse width compressible to < 100 - 300 fs
- Convenient fiber pigtail output
- Turnkey benchtop platform
- Integral optical monitor port

The benchtop (FPL-0) series is the perfect, economical, short pulse optical source for a variety of test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power. Different synchronization signals are available through a front panel RF output and an optical monitor port.

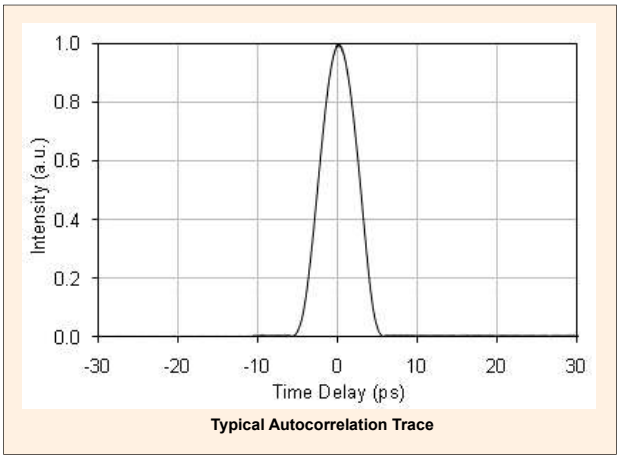
The 1 µm high power femtosecond fiber laser is a passively mode-locked fiber laser that provides a stable pulse output at either 1030 or 1064 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient fiber pigtail output with power levels up to greater than 100 mW and optical pulses that are compressible to less than 100 fs. The repetition rate can be specified as 27, 55, or 100 MHz..

If a free-space compressed short pulse output is required or the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

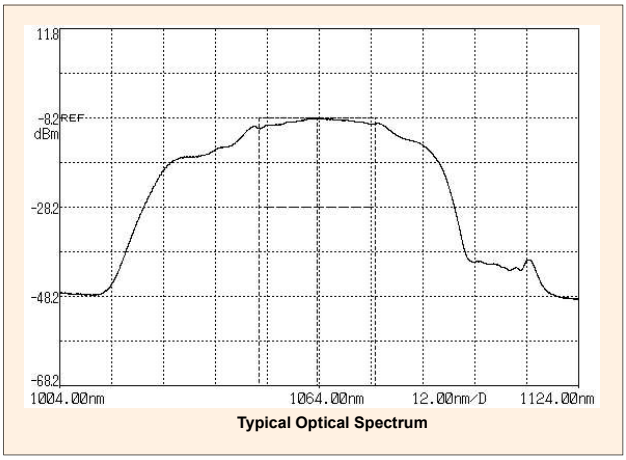
Technical Specifications[1]

Model Number	FPL-04UFF
OPTICAL	
Central Wavelength[2] (nm)	1030 or 1064
Pulse Width[3] (ps)	~ 3 - 6 (compressible to 0.1 - 0.3)
Average Power[4] (mW)	> 100
Spectral Width (FWHM, nm)	> 20
Repitition Rate[5] (MHz)	27, 55, 100
Power Stability over 8 hours[6] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 20
Output/Termination	PM-980 or HI-1060 fiber pigtail with FC/APC connector, key to slow axis
ELECTRICAL	
Electrical Synchronization (V)	~ 0.5, SMA connector
Supply Voltage (VAC)	85 - 264 autoranging
Supply Frequency (Hz)	47 - 63 autoranging
MECHANICAL	
Operating Temperature (°C)	15 - 30
Dimensions (cm)	34.9(W) x 43.7(D) x 10(H)
Weight (kg)	~ 6

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. Wavelength needs to be specified at the time of purchase.
3. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace. If a free-space compressed short pulse output is required, please contact sales@calmarlaser.com.
4. From output port A, a monitor signal (~ 0.1 mW) is available from output port B.
5. Repetition rate needs to be specified at the time of purchase. For other repetition rates, please contact sales@calmarlaser.com.
6. Requires an ambient temperature control of ± 1.0ºC.



Typical Autocorrelation Trace



Typical Optical Spectrum

CALMAR LASER

MENDOCINO

1030 or 1064 nm Picosecond Fiber Laser

Applications

- Biomedical instrumentation
- Seed source for high power lasers
- Optical high speed sampling
- Ultrafast spectroscopy
- Materials characterization
- Optical metrology

Features

- Average power > 5 mW
- Central Wavelength of 1030 or 1064 nm
- Pulse width of 5 - 20 ps
- Near transform-limited, spectral width 0.1 - 0.5 nm
- Convenient fiber pigtail output
- Turnkey benchtop platform
- Integral optical monitor port

The benchtop (FPL-0) series is the perfect, economical, picosecond pulse optical source for a variety of test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power and pulse width. Different synchronization signals are available through a front panel RF output and an optical monitor port.

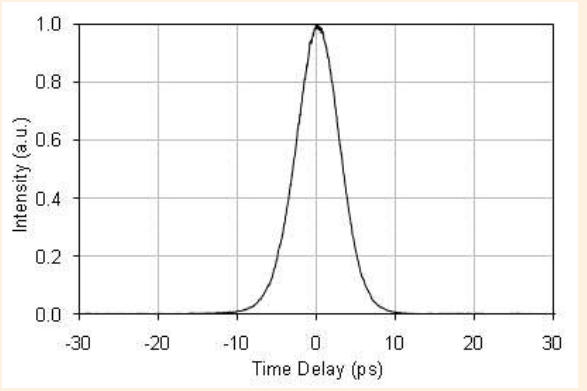
The 1 µm low power femtosecond fiber laser is a passively mode-locked fiber laser that provides a stable narrow band picosecond pulse output at either 1030 or 1064 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient fiber pigtail output with power levels up to 5 mW and optical pulses in the range of 5 – 20 ps, with near transformed-limited spectral width. The repetition rate can be specified as 20 ~ 100 MHz.

If higher output power is required or the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

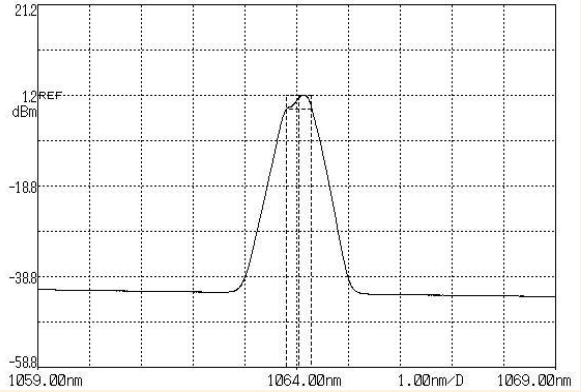
Technical Specifications[1]

Model Number	FPL-02UFFP
OPTICAL	
Central Wavelength[2] (nm)	1030 or 1064
Pulse Width[3] (ps)	5 - 20
Average Power[4] (mW)	> 5
Spectral Width (FWHM, nm)	~ 0.1 - 0.5
Repitition Rate[5] (MHz)	20 ~ 100
Power Stability over 8 hours[6] (%, RMS)	< 1.0
Beam Quality, M^2	< 1.1
Polarization Extinction Ratio (dB)	> 18
Output/Termination	PM-980 or HI-1060 fiber pigtail with FC/APC connector, key to slow axis
ELECTRICAL	
Electrical Synchronization (V)	~ 0.5, SMA connector
Supply Voltage (VAC)	85 - 264 autoranging
Supply Frequency (Hz)	47 - 63 autoranging
MECHANICAL	
Operating Temperature (°C)	15 - 30
Dimensions (cm)	34.9(W) x 43.7(D) x 10(H)
Weight (kg)	~ 6

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. Wavelength needs to be specified at the time of purchase.
3. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
4. From output port A, a monitor signal (~ 0.1 mW) is available from output port B. For higher output powers up to 200 mW, please contact sales@calmarlaser.com.
5. Repetition rate needs to be specified at the time of purchase. For other repetition rates, please contact sales@calmarlaser.com.
6. Requires an ambient temperature control of ± 1.0ºC.



Typical Autocorrelation Trace



Typical Optical Spectrum

CALMAR LASER

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
Wavelength 1um
Pulse Duration <5ps
Maximum Power <20mW
CLASS IIIb Laser Product

MENDOCINO

1310 nm Femtosecond Fiber Laser

Low Jitter GHz Trigger Option

Applications

- High speed receiver conformance testing
- Photodetector characterization
- Optical metrology
- Materials characterization
- Silicon integrated circuit testing
- Seed source for higher energy laser systems

Features

- Average power > 0.5 mW
- Central Wavelength 1310 nm
- Pulse width < 0.3 ps
- GHz synchronization for low-jitter triggering
- Turnkey benchtop platform
- Convenient fiber pigtail output
- Exceptional long term stability

The benchtop (FPL-0) series is the perfect short pulse optical source for test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power and pulse width. Different synchronization outputs are available with GHz (high harmonic) options that can provide a time domain persistent timing jitter of less than 0.25 ps.

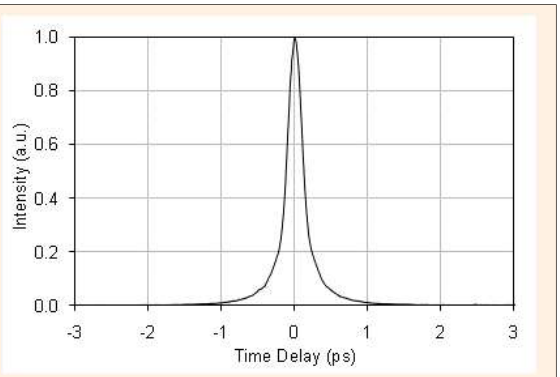
The 1310 nm low power femtosecond fiber laser is a passively mode-locked fiber laser that employs nonlinear wavelength conversion to provide a stable short pulse output at 1310 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient fiber pigtail output with power levels greater than 0.5 mW and an optical pulse of less than 0.3 ps.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

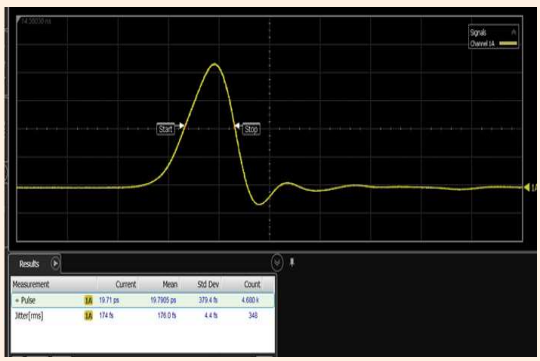
Technical Specifications[1]

Model Number	FPL-01OFF		
OPTICAL			
Central Wavelength (nm)	1310 ± 2		
Pulse Width[2] (ps)	< 0.3		
Average Power (mW)	> 0.5		
Repitition Rate[3] (MHz)	20		
Power Stability over 8 hours[4] (%, RMS)	< 0.5		
Beam Quality, M^2	< 1.1		
Polarization Extinction Ratio (dB)	> 20		
Output	Single mode fiber (SMF-28) pigtail		
Termination	FC/APC connector		
ELECTRICAL			
Electrical Synchronization (V)	~ 0.5, SMA connector		
Electrical Synchronization Frequency[5]	Standard, 20 MHz	High Harmonic, 1 GHz	High Harmonic, 10 GHz
Persistent Timing Jitter[6] (RMS, ps)	< 2.0	< 0.5	< 0.25
Supply Voltage (VAC)	85 - 264 autoranging		
Supply Frequency (Hz)	47 - 63 autoranging		
MECHANICAL			
Operating Temperature (°C)	15 - 30		
Dimensions (cm)	34.9(W) x 43.7(D) x 10(H)		
Weight (kg)	~ 6		

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC.
5. The desired synchronization output needs to be specified at the time of purchase. For more details, please contact sales@calmarlaser.com.
6. Measured when used as a trigger signal with a high speed sampling oscilloscope.



Typical Autocorrelation Trace



< 0.2 ps Jitter for 10 GHz Harmonic Trigger Signal

CALMAR LASER

DANGER
INVISIBLE LASER RADIATION
AVOID EYE OR SKIN EXPOSURE
TO DIRECT OR SCATTERED RADIATION
Wavelength 1310 nm
Pulse Duration < 0.3 ps
Maximum Power < 3 mW
CLASS IIIa Laser Product

MENDOCINO

1550 nm Femtosecond Fiber Laser

Low Jitter GHz Trigger Option

Applications

- High speed receiver conformance testing
- Photodetector characterization
- Optical metrology
- Materials characterization
- Silicon integrated circuit testing
- Seed source for higher energy laser systems

Features

- Average power > 0.5 mW
- Central Wavelength 1550 nm
- Pulse width < 0.5 ps
- GHz synchronization for low-jitter triggering
- Turnkey benchtop platform
- Convenient fiber pigtail output
- Exceptional long term stability

The benchtop (FPL-0) series is the perfect short pulse optical source for test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power and pulse width. Different synchronization outputs are available with GHz (high harmonic) options that can provide a time domain persistent timing jitter of less than 0.25 ps.

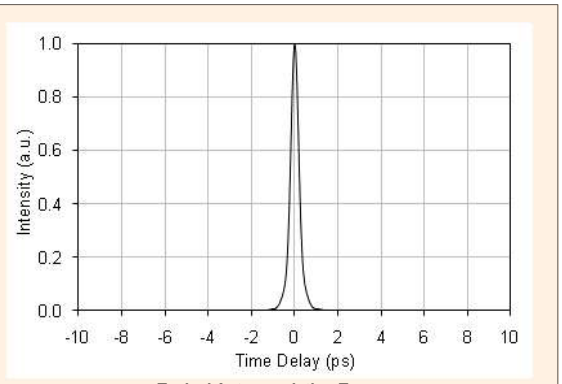
The 1550 C-band low power femtosecond fiber laser is a passively mode-locked fiber laser that provides a stable short pulse output at 1550 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient fiber pigtail output with power levels greater than 0.5 mW and an optical pulse of less than 0.5 ps.

If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

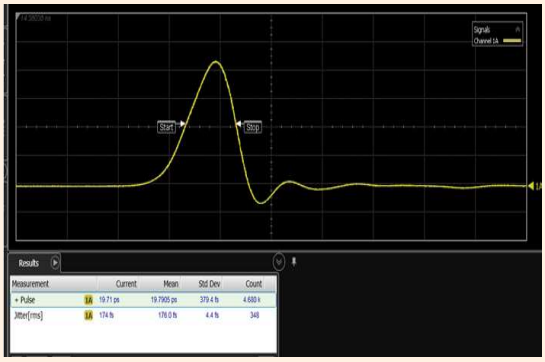
Technical Specifications[1]

Model Number	FPL-01CFF		
OPTICAL			
Central Wavelength (nm)	1550 ± 2		
Pulse Width[2] (ps)	< 0.5		
Average Power (mW)	> 0.5		
Repitition Rate[3] (MHz)	20		
Power Stability over 8 hours[4] (%, RMS)	< 0.5		
Output	Single mode fiber (SMF-28) pigtail		
Termination	FC/APC connector		
ELECTRICAL			
Electrical Synchronization (V)	~ 0.5, SMA connector		
Electrical Synchronization Frequency[5]	Standard, 20 MHz	High Harmonic, 1 GHz	High Harmonic, 10 GHz
Persistent Timing Jitter[6] (RMS, ps)	< 2.0	< 0.5	< 0.25
Supply Voltage (VAC)	85 - 264 autoranging		
Supply Frequency (Hz)	47 - 63 autoranging		
MECHANICAL			
Operating Temperature (°C)	15 - 30		
Dimensions (cm)	34.9(W) x 43.7(D) x 10(H)		
Weight (kg)	~ 6		

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A sech^2 pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC.
5. The desired synchronization output needs to be specified at the time of purchase. For more details, please contact sales@calmarlaser.com.
6. Measured when used as a trigger signal with a high speed sampling oscilloscope.



Typical Autocorrelation Trace



< 0.2 ps Jitter for 10 GHz Harmonic Trigger Signal

MENDOCINO

1550 nm High Power Femtosecond Fiber Laser

Applications

- Telecommunication components characterization
- Optical high speed sampling
- Terahertz radiation
- Optical switching
- Materials characterization
- Optical metrology

Features

- Average power up to 350 mW
- Central Wavelength 1550 nm
- Pulse width < 100 fs
- Near transform-limited output
- Convenient fiber pigtail output
- Turnkey benchtop platform

The benchtop (FPL-0) series is the perfect short pulse optical source for a variety of test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power and pulse width. Different synchronization signals are available through a front panel RF output and an optical monitor signal.

The 1550 C-band high power femtosecond fiber laser is a passively mode-locked fiber laser that provides a stable short pulse output at 1550 nm. The laser utilizes the proprietary Mendocino saturable absorber technology, which has been developed and perfected over a twenty-year period, to deliver reproducible mode-locking at turn-on with excellent stability and reliability. It features a convenient fiber pigtail output with power levels up to greater than 350 mW and an optical pulse of less than 100 fs.

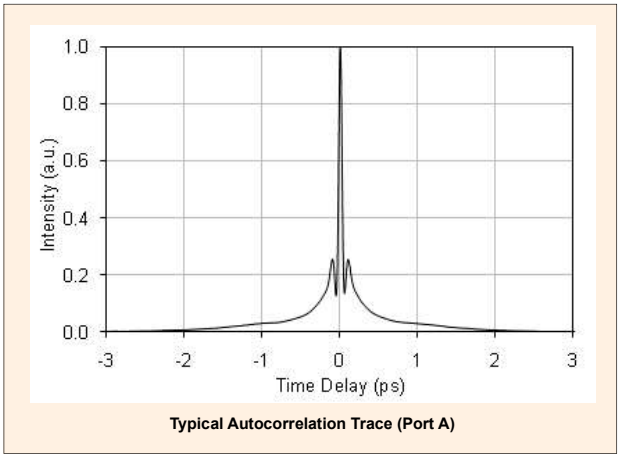
If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

1550 nm High Power Femtosecond Fiber Laser

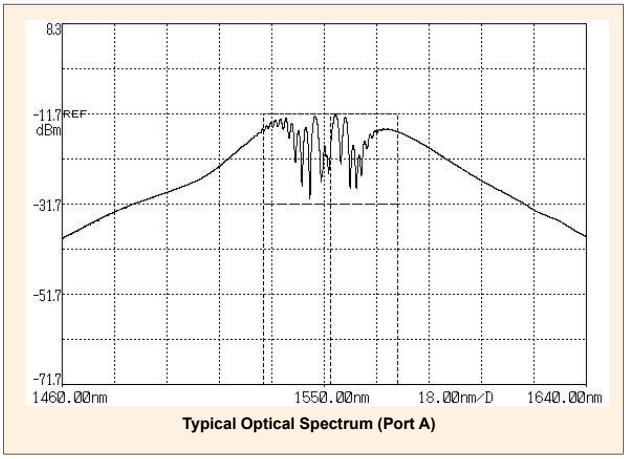
Technical Specifications[1]

Model Number	FPL-04CFF	
OPTICAL	**Port A (Main)**	**Port B (Monitor)**
Central Wavelength (nm)	1550	
Pulse Width[2] (ps)	< 0.1	< 0.5
Average Power (mW)	up to 350	~ 0.1
Repitition Rate[3] (MHz)	100	
Power Stability over 8 hours[4] (%, RMS)	< 1.0	
Beam Quality, M^2	< 1.1	
Polarization Extinction Ratio (dB)	> 20	N/A
Output	PM 1550	Single mode SMF-28
Termination	Fiber pigtail with FC/APC connector	N/A
ELECTRICAL		
Electrical Synchronization (V)	~ 0.5, SMA connector	
Supply Voltage (VAC)	85 - 264 autoranging	
Supply Frequency (Hz)	47 - 63 autoranging	
MECHANICAL		
Operating Temperature (°C)	15 - 30	
Dimensions (cm)	34.9(W) x 43.7(D) x 10(H)	
Weight (kg)	~ 6	

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A $sech^2$ pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. For other repetition rates, please contact sales@calmarlaser.com.
4. Requires an ambient temperature control of ± 1.0ºC.



Typical Autocorrelation Trace (Port A)



Typical Optical Spectrum (Port A)

CORONADO

1550 nm Benchtop Erbium-doped Fiber Amplifier

Applications

- Seed laser amplification
- C-band channel pre- or boost amplification
- Narrow band amplification in access or CATV networks
- DWDM metro network
- Core network
- Short pulse amplification

Features

- Saturated output power up to 37 dBm
- Input power range from -25 to 10 bBm
- Wavelength range 1530 to 1565 nm
- Low noise figure
- Convenient fiber pigtail connections
- Exceptional long term stability
- Turnkey benchtop platform with RS232 interface

The Coronado benchtop amplifier (AMP) is a compact optical amplifier based upon erbium-doped fiber that provides broadband gain over the C-band (1530 to 1565 nm). The system features a portable design and a user-friendly front panel control interface for adjustment of the amplifier gain. It has been optimized for amplification of short optical pulses (such as those provided from Calmar's Mendocino series) and offers high gain and low noise with long term dependable performance. Convenient pigtail fiber connections provide either polarization-maintaining (PM) or non-PM options. The former ensures the amplified output is linearly polarized and eliminates unwanted polarization effects. The system offers saturated output power levels up to 37 dBm and a noise figure as low as 6 dB.

If the performance parameters do not quite fit your application requirements or you have interest in an L-band module, please contact us at sales@calmarlaser.com to discuss a customized solution.

Technical Specifications[1]

Model Number	AMP-PM18	AMP-PM23	AMP-PM30	AMP-PM37
OPTICAL (Polarization Maintaining EDFA Module)				
Center Wavelength[2] (nm)	1530 ~ 1565			
Output Power[3] (dBm)	18	23	30	37
Small Signal Gain	30	35	35	35
Input Power Range (dBm)	-25 ~ +10		0 ~ 3	
Noise Figure (dB)	< 5.0	< 5.5	< 6.5	< 6.5
Polarization Extinction Ratio (dB)	> 20		> 17	
Input/Output/Termination	PM 1550 fiber pigtail with FC/APC connector			
Model Number	**AMP-ST18**	**AMP-ST23**	**AMP-ST30**	**AMP-ST37**
OPTICAL (Non-Polarization Maintaining EDFA Module)				
Center Wavelength[2] (nm)	1530 ~ 1565			
Output Power[3] (dBm)	18	23	30	37
Small Signal Gain	30	35	35	35
Input Power Range (dBm)	-25 ~ +10		0 ~ 3	
Noise Figure (dB)	< 5.5	< 6.0	< 6.5	< 6.5
Polarization State	Arbitrary			
Input/Output/Termination	Fiber pigtail with FC/APC connector			
ELECTRICAL				
Supply Voltage (VAC)	85 - 264 autoranging			
Supply Frequency (Hz)	47 - 63 autoranging			
Communication Interface	9 pin D-sub connector/RS232			
MECHANICAL				
Operating Temperature (°C)	0 - 50			
Dimension (cm)	34.9(W) x 43.7(D) x 10(H)		48.2(W) x 46.7(D) x 10(H)	
Weight (kg)	~ 6		~ 8	
Warm-up Time (min)	< 10			

1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. For other wavelengths, such as the L-band, please contact sales@calmarlaser.com
3. For other output powers, please contact sales@calmarlaser.com.

CALMAR LASER

EUREKA

1550 nm, 0.6 - 2.5 GHz, Picosecond Benchtop Fiber Laser

Applications

- Spectral comb
- Transmission network characterization
- High speed O/E conversion
- Optical metrology
- High speed analog to digital conversion
- Optical sampling

Features

- Repetition rate tunable from 0.6 to 2.5 GHz
- Wavelength tunable from 1530 to 1565 nm
- Pulse width tunable from 2 to 10 ps
- Average output power > 20 mW
- Transform-limited output with low timing jitter
- Convenient fiber pigtail output
- Integral optical monitor port

The benchtop Eureka (PSL-1) series is the perfect, picosecond pulse optical source for telecommunications test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power, wavelength, pulse width, and repetition rates. Different synchronization signals are available through a front panel RF output and an optical monitor port.

The C-band source is an actively mode-locked fiber laser with a tunable repetition rate from 0.6 to 2.5 GHz that provides a stable and reliable optical clock with turnkey operation. It features a convenient fiber pigtail output with wavelength tunability throughout the C-band and power levels up to 20 mW. The pulse width can be varied from 2 to 10 ps with a pedestal of less -30 dB and a near transform-limited spectral width.

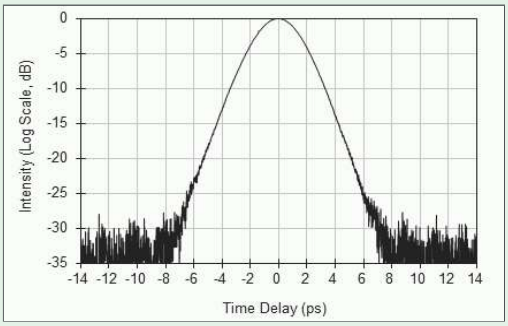
If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

1550 nm, 0.6 - 2.5 GHz, Picosecond Benchtop Fiber Laser

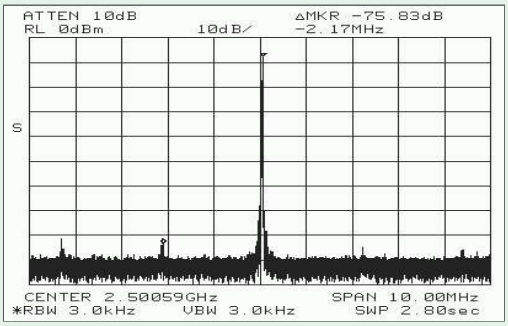
Technical Specifications[1]

Model Number	PSL-1-TT
OPTICAL	
Center Wavelength (nm)	1530 ~ 1565 (tunable)
Pulse Width[2] (ps)	2 ~ 10 (tunable)
Average Power[3] (mW)	> 20 at 2.5 GHz
Repitition Rate (GHz)	0.6 - 2.5 (discretely tunable with spacing ~ 2 MHz)
Pulse Amplitude Stability (%, RMS)	< 1.0
Polarization Extinction Ratio (dB)	> 18
Output/Termination	PM 1550 fiber pigtail with FC/APC connector, key to slow axis
ELECTRICAL	
RF Driver Source Input (V)	0.6 - 2.5 GHz, 0 - 5 dBm
Supply Voltage (VAC)	85 - 264 autoranging
Supply Frequency (Hz)	47 - 63 autoranging
MECHANICAL	
Operating Temperature (°C)	15 - 30
Dimensions (cm)	48.2(W) x 46.7(D) x 10(H)
Weight (kg)	~ 7

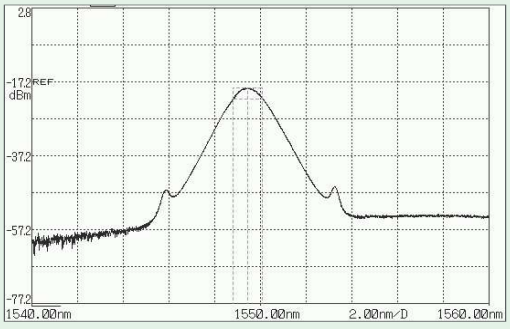
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A sech^2 pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. From output port A, a monitor signal (~ 0.1 mW) is available from output port B.



Typical Autocorrelation Trace



Typical Side Mode Supression



Typical Optical Spectrum

EUREKA

1550 nm, 5 - 20 GHz, Picosecond Benchtop Fiber Laser

Applications

- Optical clock for 10, 80, 160, 320 GHz OTDM
- Spectral comb
- Transmission network characterization
- High speed O/E conversion
- Quantum computing
- Optical metrology
- Optical sampling

Features

- Repetition rate tunable from 5 to 20 GHz
- Wavelength tunable from 1530 to 1565 nm
- Pulse width tunable from 1.5 to 10 ps
- Average output power > 20 mW
- Transform-limited output with low timing jitter
- Convenient fiber pigtail output
- Integral optical monitor port

The benchtop Eureka (PSL-10) series is the perfect, picosecond pulse optical source for telecommunications test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power, wavelength, pulse width, and repetition rates. Different synchronization signals are available through a front panel RF output and an optical monitor port.

The C-band source is an actively mode-locked fiber laser with a continuously tunable repetition rate from 5 to 20 GHz that provides a stable and reliable optical clock with turnkey operation. It features a convenient fiber pigtail output with wavelength tunability throughout the C-band and power levels up to 20 mW. The pulse width can be varied from 1.5 to 10 ps with a pedestal of less -25 dB and a near transform-limited spectral width. The timing jitter is as low as 50 fs and the side mode suppression is better than -75 dB.

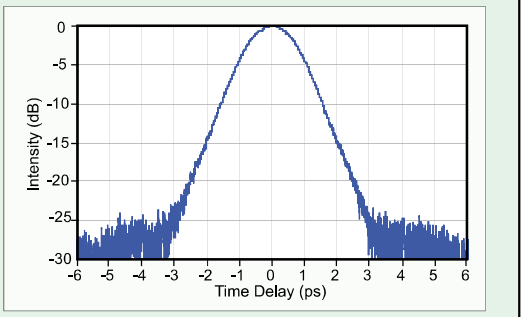
If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

1550 nm, 5 - 20 GHz, Picosecond Benchtop Fiber Laser

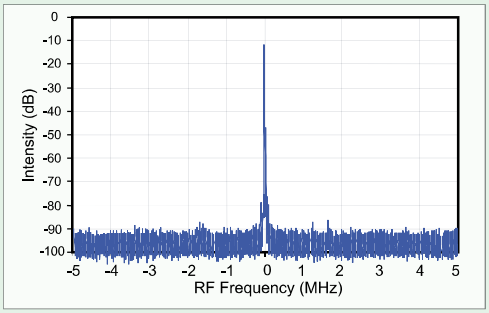
Technical Specifications[1]

Model Number	PSL-10-TT
OPTICAL	
Center Wavelength (nm)	1530 ~ 1565 (tunable)
Pulse Width[2] (ps)	1.5 ~ 10 (tunable)
Average Power[3] (mW)	> 20 at 10 GHz
Repitition Rate (GHz)	5 ~ 20 (tunable)
Pulse Amplitude Stability (%, RMS)	< 1.0
Polarization Extinction Ratio (dB)	> 18
Output/Termination	PM 1550 fiber pigtail with FC/APC connector, key to slow axis
ELECTRICAL	
RF Driver Source Input (V)	5 - 20 GHz, 0 - 5 dBm
Supply Voltage (VAC)	85 - 264 autoranging
Supply Frequency (Hz)	47 - 63 autoranging
MECHANICAL	
Operating Temperature (°C)	15 - 30
Dimensions (cm)	48.2(W) x 46.7(D) x 10(H)
Weight (kg)	~ 7

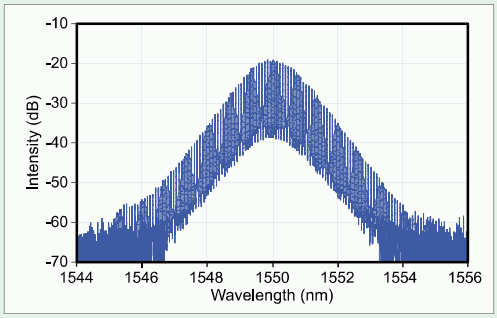
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A sech^2 pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. From output port A, a monitor signal (~ 0.1 mW) is available from output port B.



Autocorrelation Trace Corresponding to a Pulse Width of 1.2 ps



Typical Side Mode Supression of 82 dB



Optical Spectrum of 2.1 nm

CALMAR LASER

EUREKA

1550 nm, 20 - 40 GHz, Picosecond Benchtop Fiber Laser

Applications

- Optical clock for 20, 40, 80, 320 GHz OTDM
- Spectral comb
- Transmission network characterization
- High speed O/E conversion
- Optical metrology
- Optical sampling

Features

- Repetition rate tunable from 20 to 40 GHz
- Wavelength tunable from 1530 to 1565 nm
- Pulse width tunable from 0.8 to 5 ps
- Average output power > 20 mW
- Transform-limited output with low timing jitter
- Convenient fiber pigtail output
- Integral optical monitor port

The benchtop Eureka (PSL-40) series is the perfect, picosecond pulse optical source for telecommunications test and measurement applications. Along with a portable design, the series offers user-friendly front panel control knobs for adjustment of the output power, wavelength, pulse width, and repetition rates. Different synchronization signals are available through a front panel RF output and an optical monitor port.

The C-band source is an actively mode-locked fiber laser with a continuously tunable repetition rate from 20 to 40 GHz that provides a stable and reliable optical clock with turnkey operation. It features a convenient fiber pigtail output with wavelength tunability throughout the C-band and power levels up to 20 mW. The pulse width can be varied from 0.8 to 5 ps with a pedestal of less -25 dB and a near transform-limited spectral width. The timing jitter is as low as 50 fs and the side mode suppression is better than -70 dB.

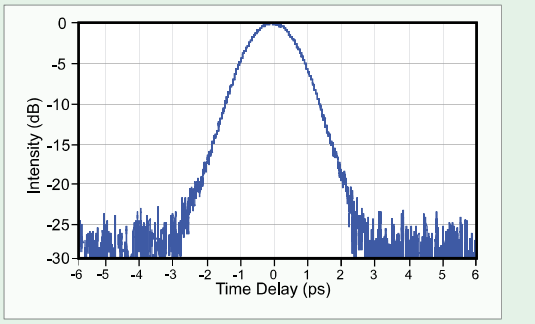
If the performance parameters do not quite fit your application requirements, please contact us at sales@calmarlaser.com to discuss a customized solution.

1550 nm, 20 - 40 GHz, Picosecond Benchtop Fiber Laser

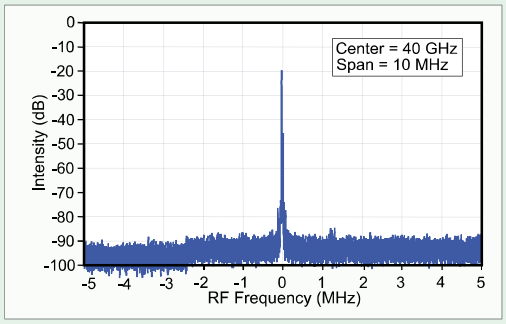
Technical Specifications[1]

Model Number	PSL-40-TT
OPTICAL	
Center Wavelength (nm)	1530 ~ 1565 (tunable)
Pulse Width[2] (ps)	0.8 ~ 5 (tunable)
Average Power[3] (mW)	> 20 at 40 GHz
Repitition Rate (GHz)	20 ~ 40 (tunable)
Pulse Amplitude Stability (%, RMS)	< 1.0
Polarization Extinction Ratio (dB)	> 18
Output/Termination	PM 1550 fiber pigtail with FC/APC connector, key to slow axis
ELECTRICAL	
RF Driver Source Input (V)	20 - 40 GHz, ~ 5 dBm
Supply Voltage (VAC)	85 - 264 autoranging
Supply Frequency (Hz)	47 - 63 autoranging
MECHANICAL	
Operating Temperature (°C)	15 - 30
Dimensions (cm)	48.2(W) x 46.7(D) x 10(H)
Weight (kg)	~ 7

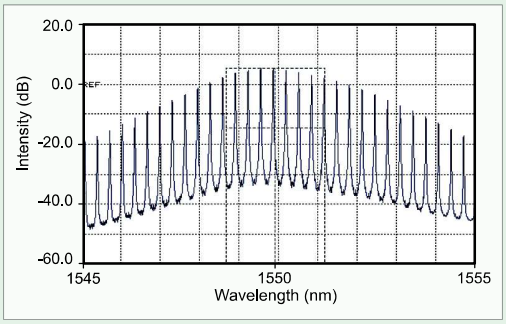
1. Due to our continuous improvement philosophy, all product specifications are subject to change without prior notice. Please contact sales@calmarlaser.com for customized specifications.
2. A sech^2 pulse shape (deconvolution factor of 0.65) is used to determine the pulse width from the second harmonic autocorrelation trace.
3. From output port A, a monitor signal (~ 0.1 mW) is available from output port B.



Autocorrelation Trace Corresponding to a Pulse Width of 0.8 ps



Typical Side Mode Supression of 72 dB



Optical Spectrum of 3.4 nm

CALMAR LASER

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