

PHAROS

High-power Femtosecond Laser System

GENERAL DESCRIPTION

PHAROS is a single-unit integrated femtosecond laser system combining millijoule pulse energies and high average power. It features market leading compact size for

Tunability of laser output parameters allows PHAROS system to cover applications normally requiring different class of lasers. Tunable parameters include: pulse duration (200 fs – 10 ps), repetition rate (1 kHz to 1 MHz), pulse energy (up to 1 mJ) and average power (up to 10 W). Its deliverable power is abundant for a number of material processing applications, while achievable pulse durations and energies make it an attractive research tool.

PHAROS compact and robust optomechanical design includes easy to replace modules (oscillator, amplifier and stretcher/compressor) with temperature stabilized and sealed housings ensuring stable laser operation within varying environments. Those features being of critical importance for OEM and industrial users.

PHAROS is equipped with an extensive software package, which ensures its smooth hands-free operation as well as allows fast and easy integration into various processing devices.



FEATURES

- <200 fs Pulse duration
- Up to 1 mJ Pulse energy
- Up to 10 W Average power (Extendable to 15 W)
- 1kHz–1 MHz Flexible repetition rate
- Includes pulse picker for pulse-on-demand operation
- Rugged, industrial grade mechanical design
- Harmonic generators (SH, TH, FH)
- Tunable OPA, NOPA, continuum generator

APPLICATIONS

- Micromachining
- Micro- and nano-structuring
- Writing of Bragg gratings and waveguides
- Multi-photon polymerization
- Nonlinear optics
- Time-resolved spectroscopy
- Biomedical applications
- Microscopy

easy OEM integration and laboratory space saving. Most of PHAROS output parameters can be easily set via control pad or PC tuning the laser for your particular application in seconds.

OPERATION

PHAROS is built upon conventional chirped pulse amplification technique, employing the seed oscillator, regenerative amplifier and pulse stretcher/compressor modules. Kerr lens mode-locked oscillator delivers >700 mW output with sub-80 fs pulse duration. Regenerative amplifier is based on Yb:KGW lasing medium. Amplifier is non-collinearly pumped by one or two (respectively 4 W or 6-10 W PHAROS) Light Conversion proprietary design high brightness pump modules delivering up to 60 W of power. Low loss BBO Pockels cells support the operation of amplifier and optional pulse picker at repetition rates up to 200 kHz (extendable to 1 MHz). The stretcher/compressor module is based on single transmission grating exhibiting high efficiency and excellent power handling capability.

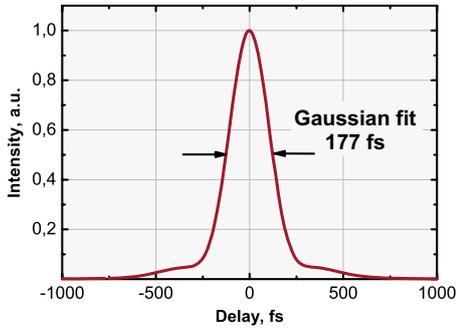
Operating parameters are adjustable from the remote control module or external PC connected via USB interface.



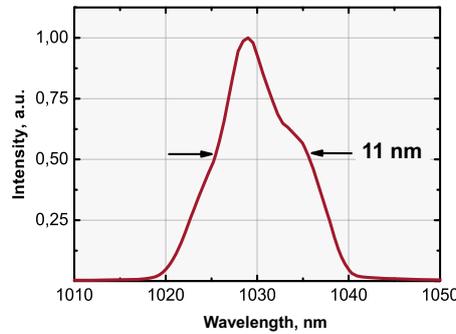
Micro image of "birefringent rose" printed with PHAROS laser in 1 × 1 mm fused silica square. Courtesy of Prof. P. Kazansky, Optoelectronics Research Centre, University of Southampton

SPECIFICATIONS

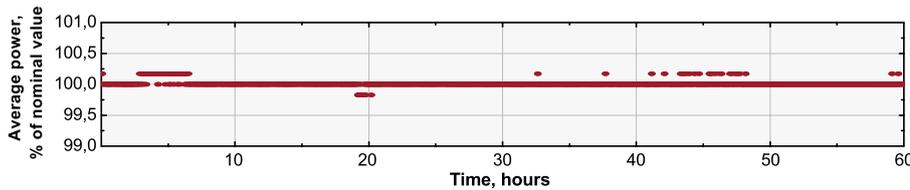
PHAROS model	PHAROS-4W	PHAROS-6W	PHAROS-8W	PHAROS-10W	PHAROS SP
Max. average power	4 W	6 W	8 W	10 W	5 W
Pulse duration (assuming Gaussian pulse shape)	290 fs	290 fs	290 fs	290 fs	200 fs
Max. pulse energy	> 0.2 mJ	> 0.2 mJ	> 0.3 mJ	> 0.3 mJ	> 1.0 mJ
Repetition rate	Single pulse – 200 kHz (extendable to 1 MHz)				
Centre Wavelength	1028 nm ± 5 nm				
Output pulse stability	< 1.0 % rms				
Beam quality	TEM ₀₀ ; M ² < 1.2				



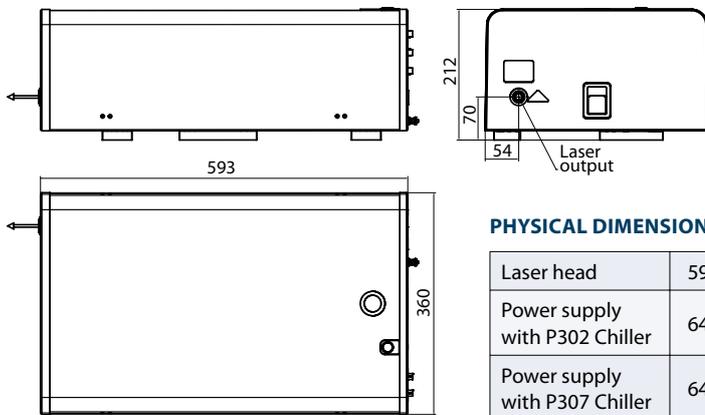
Pulse duration of PHAROS SP



Spectrum of PHAROS SP



PHAROS long term stability graph



Typical laser head drawing

PHYSICAL DIMENSIONS (mm)

Laser head	593 L x 360 W x 212 H
Power supply with P302 Chiller	640 L x 520 W x 420 H
Power supply with P307 Chiller	640 L x 520 W x 553 H

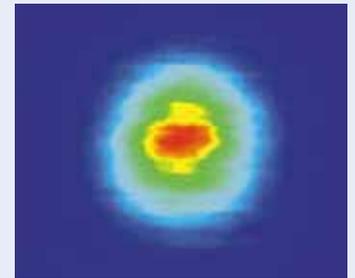
UTILITY REQUIREMENTS

Electric	110 VAC, 50-60 Hz, 20 A or 220 VAC, 50-60 Hz, 10 A
Room temperature	15-30 °C (air conditioning recommended)
Relative humidity	20-80 % (non condensing)

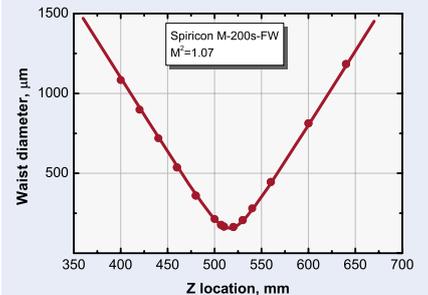
OPTIONAL ACCESSORIES

- Computer controllable pulse duration
- OPA (pumped by 2nd harmonics) and/or NOPA (pumped by 2nd and 3rd harmonics)
- Harmonics generators (2nd, 3rd and 4th)
- Continuum generator

Local distributor list available at www.lightcon.com



Typical PHAROS near field beam profile at 200 kHz



Typical PHAROS M² measurement data



Specifications are subject to change without notice.



UAB MGF "Sviesos konversija"
(Light Conversion Ltd)
Sauletekio av. 10
LT-10223 Vilnius, Lithuania
Phone: +370 5 2491830
Fax: +370 5 2698723
e-mail: company@lightcon.com
<http://www.lightcon.com>



FEATURES

- High conversion rate to the second/third/fourth harmonic
- Easy switching between active harmonic
- Small footprint
- Integrated separation of the harmonics
- Flexible in fixing and easily customized to include additional options (continuum generators, beam expanders down-collimators)

General description

"HIRO" is a valuable option for "PHAROS" laser that provides high power harmonics radiation at 515 nm, 343 nm and 258 nm wavelengths. With its small foot print – 155x325 mm – and a wide variety of fixing methods "HIRO" fulfills the needs of OEM, industrial and scientific users. We offer several standard "HIRO" models (with open prospect of future upgrades) which meet most of the user needs. The active harmonic is selected by manual rotation of the knob – changing the harmonics will never take longer than few seconds. Due to its unique layout and housing construction

Operation

The principal of "HIRO" operation is based on collinear generation of higher laser radiation harmonics in angle-phase-matched nonlinear crystals. The optical layout of "HIRO" also includes beam reduction and collimation optics that ensures highest harmonics conversion efficiencies. Usually one active harmonic can be selected from the "HIRO", however the residual lower harmonics can be also accessed through the output ports. All the accessible harmonics exiting "HIRO" are already separated from the lower ones by dichroic mirrors.

"HIRO" is the most customizable and upgradable harmonics generator available on the market. It can be easily modified to provide white light continuum, beam splitting/expanding/down-collimating options integrated in the same housing as well as harmonics splitting that makes all three harmonics available at a time. While pumped with 6W of fundamental "PHAROS" radiation "HIRO" can generate >3W of the second, >2W of the third and >0.6W of the fourth harmonic. Do not hesitate to contact Light Conversion for customized version of "HIRO".

HIRO models

Model	Generated harmonics	Output wavelengths
PH1F1	SH	1030nm*, 515nm
PH1F2	SH, FH	1030nm*, 515nm, 258nm
PH1F3	SH, TH	1030nm*, 515nm, 343nm
PH1F4	SH, TH, FH	1030nm*, 515nm, 343nm, 258nm

* residual fundamental radiation

Performance specifications

Harmonic conversion efficiencies are given as percentage of the input pump power/energy when the repetition rate is up to 200kHz

Harmonic	Conversion efficiencies for different HIRO models		Output polarizations
	PH1F1, PH1F2	PH1F3, PH1F4	
SH	>50%	>30% (>50%*)	V (H**)
TH	-	>30%	H (V**)
FH	>10%	>8% (>10%*)	H (V**)

* when the third harmonic is not in use

** optional, depending on request

Fixing

The housing of "HIRO" can be fixed at different beam heights from 45 mm up to 200 mm depending on request.

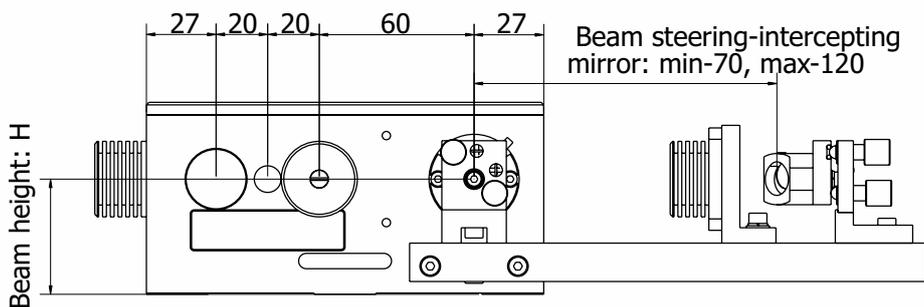
Dimensions

For all models

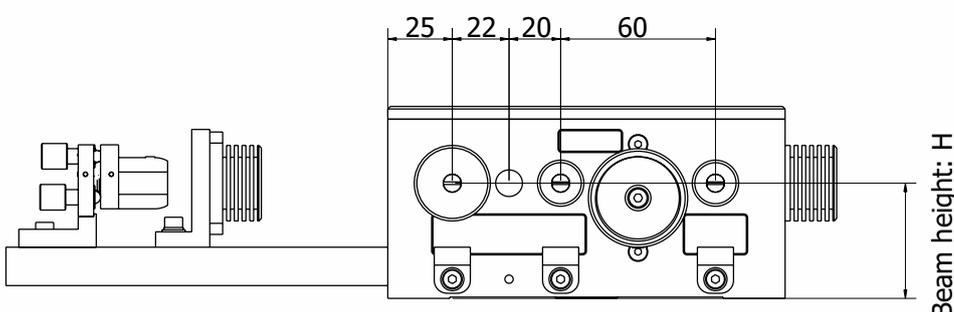
	W x L x H (mm)
General dimension of the housing	155 x 355 x 75
Recommended area for fixing	255 x 425
Beam steering/intercepting	55 x 150 x 75

Dimensions

Location of front output and input ports



Location of back output ports



Sauletekio av. 10
 LT-10223 Vilnius, Lithuania
 Phone: +370 5 2491830
 e-mail: lc@lightcon.com
<http://www.lightcon.com>

