LIGHT CONVERSION

Product Catalog

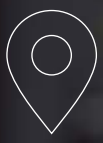
Wavelenght-Tunable Sources

LIGHT CONVERSION is a global leader in ultrafast technology, designing and manufacturing femtosecond lasers, wavelength-tunable sources, optical parametric chirped-pulse amplifiers, spectroscopy systems, and microscopy sources.

The comprehensive portfolio represents the best-in-class lasers tailored for industry, science, and medicine.

10 000

Femtosecond laser systems installed worldwide



17 500

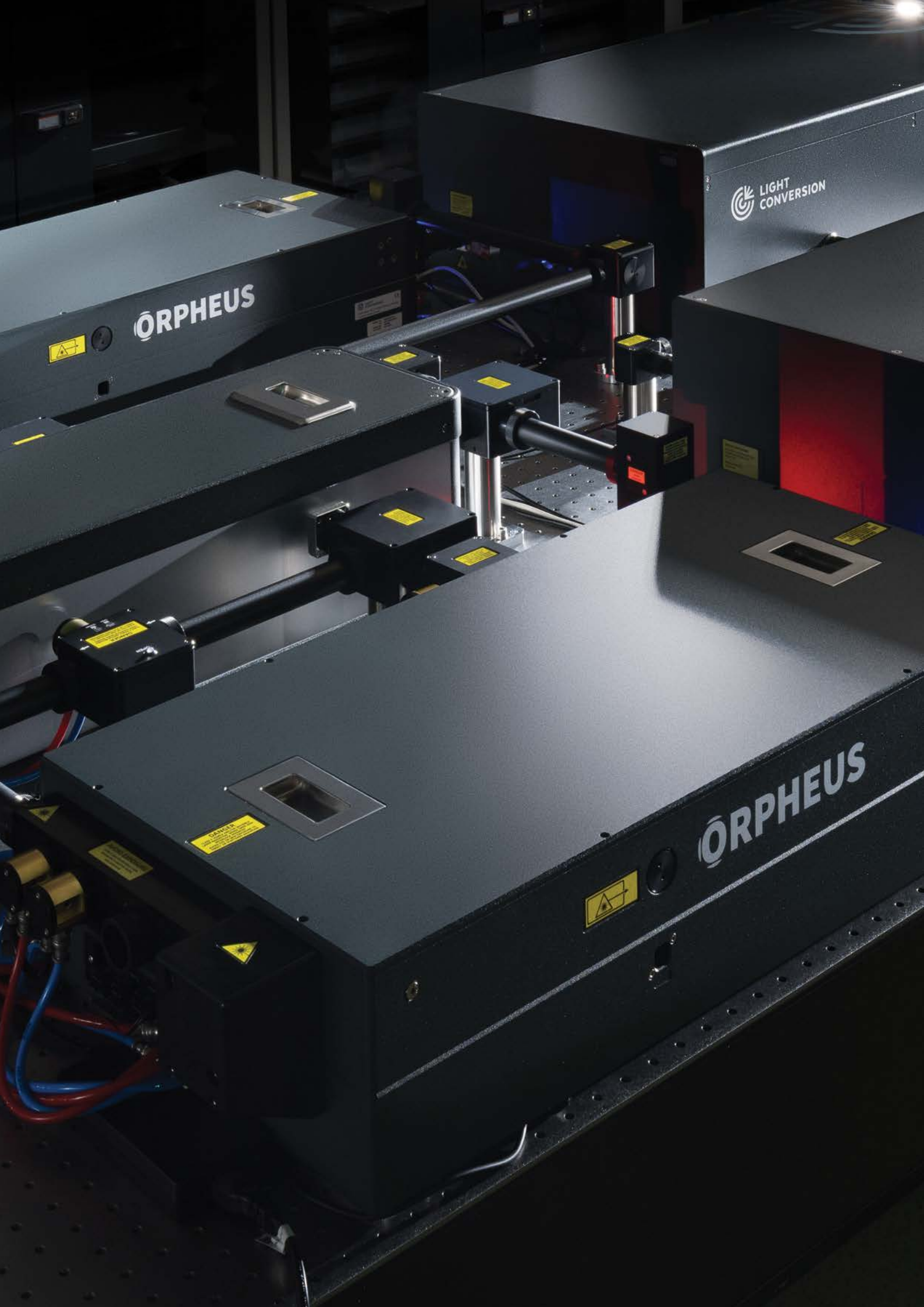
Square meters designated for manufacture and R&D

750

Employees, of whom 15% focus on R&D

About Us

Founded in 1994, LIGHT CONVERSION has evolved into a leading company in ultrafast laser technology with over 10 000 systems installed worldwide and 750 employees, 15% of whom focus on R&D. The company's lasers are used by all of the world's top 50 universities, highlighting its commitment to state-of-the-art research, while also ensuring the reliability and performance in 24/7 industrial applications. With international offices in the US, China, and Korea, along with a global representative network, the company ensures worldwide sales and service.


ORPHEUS
LIGHT
CONVERSION
ORPHEUS

Wavelength-Tunable Sources

Coupled with femtosecond lasers, these OPAs provide an invaluable source for ultrafast spectroscopy, nonlinear microscopy, and a variety of other scientific applications.

Continuous wavelength tunability from UV to MIR

Pulse durations from tens of femtoseconds to a few picoseconds

Leading OPA manufacturer for more than 30 years

I-OPA

The only industrial-grade commercial OPA, combining wavelength tunability with compact and robust design.

ORPHEUS

A classic OPA platform that many are familiar with – simple to use yet offers an extensive range of parameters.

ORPHEUS | NEO

Next-generation OPA featuring exceptional stability and multiple detectors for continuous power monitoring and diagnostics.

TOPAS

Classic OPAs for Ti:Sapphire lasers.

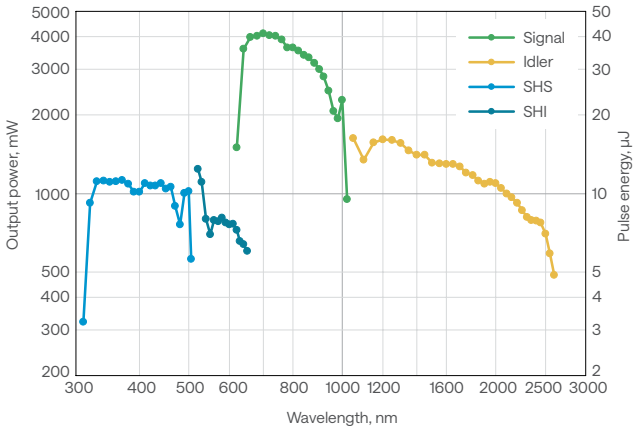
I-OPA

Industrial-Grade Optical Parametric Amplifier

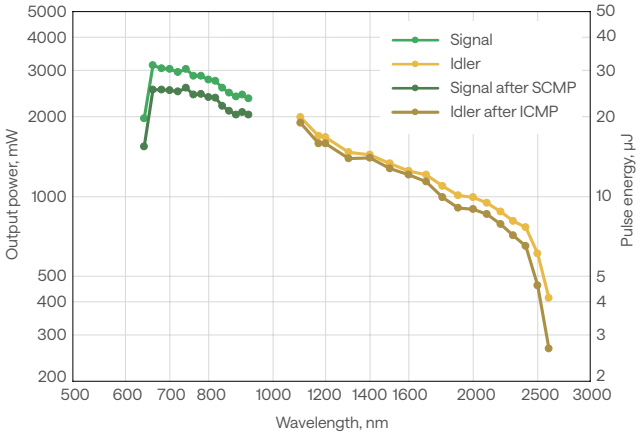
- Wavelength tunability in an industrial design
- Single-box solution
- Tunable or fixed-wavelength models
- Plug-and-play installation and robust performance
- The most compact OPA in the market

CARBIDE-CB3 with I-OPA-HP

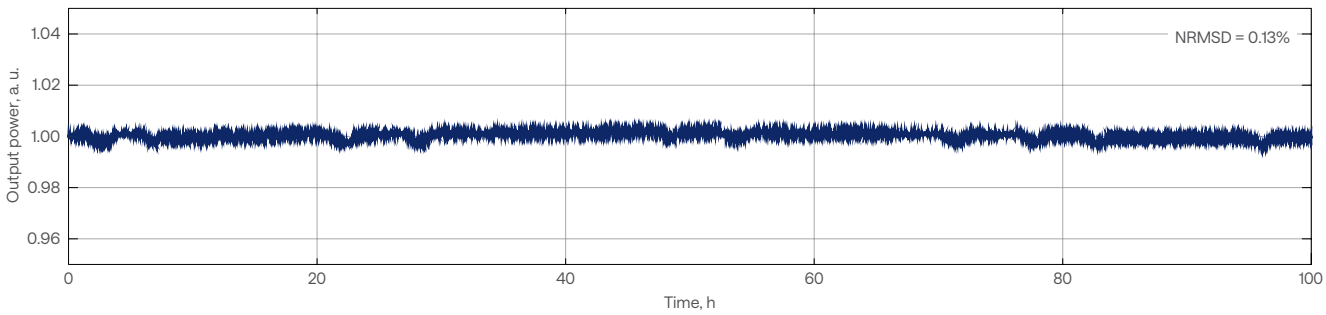
I-OPA-HP typical tuning curves
Pump: 40 W, 400 µJ, 100 kHz



I-OPA-F typical tuning curves
Pump: 40 W, 400 µJ, 100 kHz



I-OPA-HP
Typical power stability at 1300 nm



Specifications

Model	I-OPA-HP	I-OPA-F	I-OPA-ONE
Configuration	ORPHEUS	ORPHEUS-F	ORPHEUS-ONE
Pump power	Up to 40 W		
Pump pulse energy	20 – 400 µJ		
Repetition rate	Up to 2 MHz		
Tuning range [1]	640 – 1010 nm (signal) 1050 – 2600 nm (idler)	650 – 920 nm (signal) 1200 – 2500 nm (idler)	1350 – 2000 nm (signal) 2100 – 4500 nm (idler)
Conversion efficiency	> 7% @ 700 nm (40 – 400 µJ pump; up to 1 MHz)		> 9% @ 1550 nm (40 – 400 µJ pump; up to 1 MHz)
	> 3.5% @ 700 nm (20 – 40 µJ pump; up to 2 MHz)		> 6% @ 1550 nm (20 – 40 µJ pump; up to 2 MHz)
Spectral bandwidth [2]	80 – 220 cm^{-1} @ 700 – 960 nm	200 – 1000 cm^{-1} @ 650 – 920 nm 150 – 1000 cm^{-1} @ 1200 – 2000 nm	60 – 150 cm^{-1} @ 1450 – 2000 nm
Pulse duration [2] [3]	120 – 250 fs	< 55 fs @ 800 – 920 nm < 70 fs @ 650 – 800 nm < 100 fs @ 1200 – 2000 nm	100 – 300 fs
Long-term power stability, 8 h [4]	< 1% @ 800 nm		< 1% @ 1550 nm
Pulse-to-pulse energy stability, 1 min [4]	< 1% @ 800 nm		< 1% @ 1550 nm
Wavelength extension options	320 – 505 nm (SHS) [5] 525 – 640 nm (SHI) [5]	Contact sales@lightcon.com	4500 – 10 000 nm (DFG)
Pulse compression options [2]	n/a	SCMP (signal pulse compressor) ICMP (idler pulse compressor)	n/a

PUMP LASER REQUIREMENTS

Pump laser	CARBIDE or PHAROS
Center wavelength	1030 ± 10 nm
Maximum pump power	40 W
Maximum repetition rate	Up to 2 MHz
Pump pulse energy	20 – 400 µJ
Pulse duration	180 – 300 fs

ENVIRONMENTAL & UTILITY REQUIREMENTS

Refer to lightcon.com

[1] *In the case of a fixed wavelength (FW), a single wavelength can be selected from the signal or idler range. The signal may have an accessible idler pair, and vice versa.*

[2] *I-OPA-F broad-bandwidth pulses are compressed externally. Typical pulse duration before compression: 120 – 250 fs, after compression: 25 – 70 fs @ 650 – 920 nm, 40 – 100 fs @ 1200 – 2000 nm.*

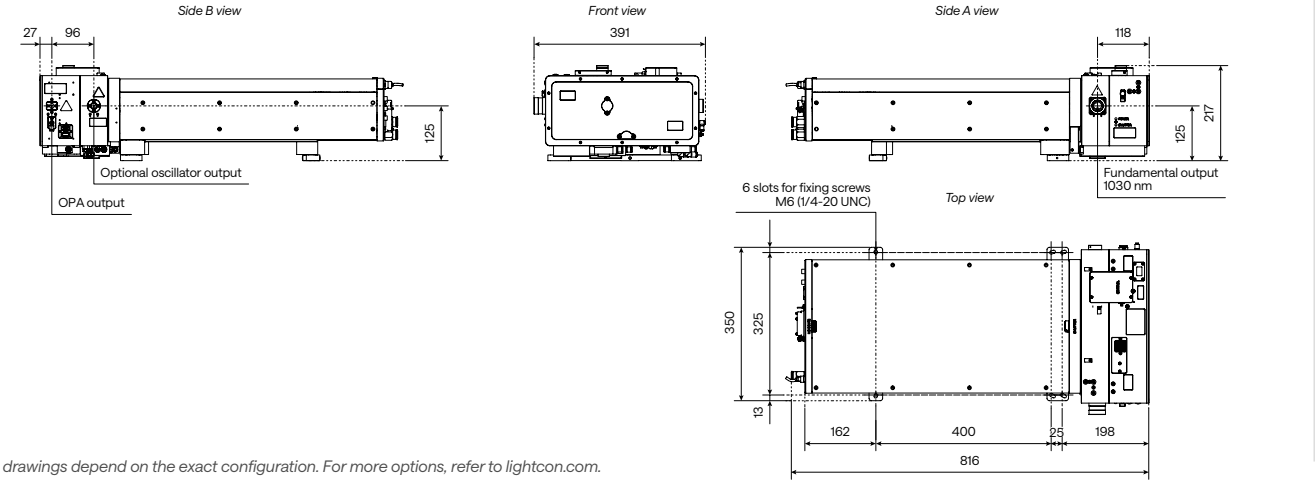
[3] *Output pulse duration depends on the selected wavelength and the pump laser pulse duration.*

[4] *Expressed as normalized root mean squared deviation (NRMSD).*

[5] *Conversion efficiency is 1.2% at peak; specified as a percentage of pump power.*

Drawings

CARBIDE-CB3 with I-OPA-HP



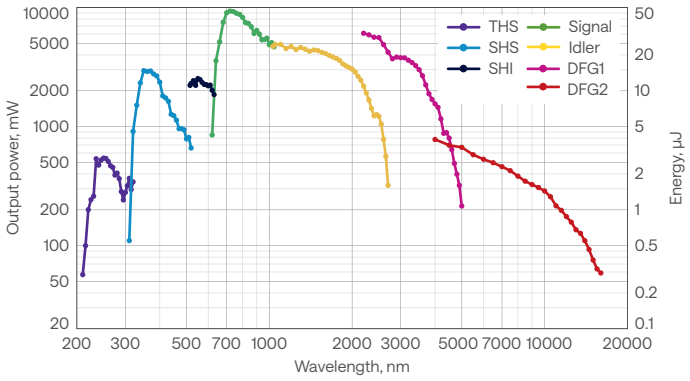
The drawings depend on the exact configuration. For more options, refer to lightcon.com.

ORPHEUS

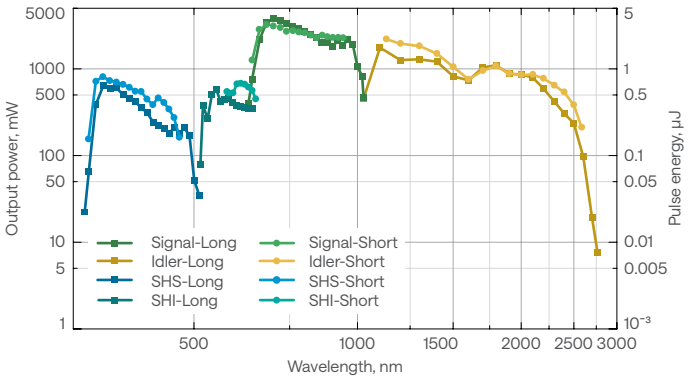
Optical Parametric Amplifier

- Continuous tunability from UV to MIR, 190 – 16 000 nm
- Single-shot – 2 MHz repetition rate
- Up to 80 W pump power
- Up to 0.4 mJ pump pulse energy

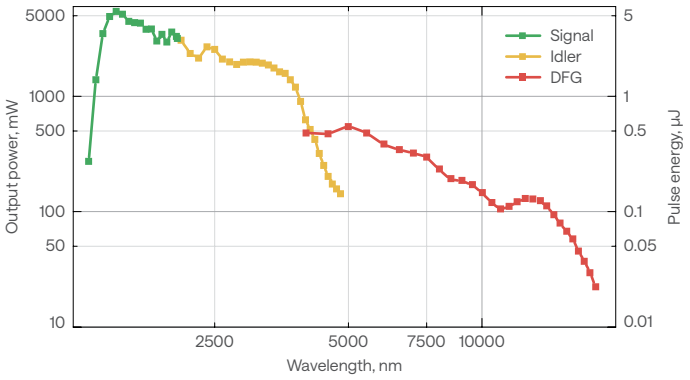
ORPHEUS typical tuning curves
Pump: 80 W, 400 µJ, 200 kHz



ORPHEUS-F typical tuning curves
Pump: 40 W, 40 µJ, 1000 kHz



ORPHEUS-ONE typical tuning curves
Pump: 40 W, 40 µJ, 1000 kHz



Optics Toolbox

Specifications

Model	ORPHEUS		ORPHEUS-F	ORPHEUS-ONE
Tuning range [1]	630 – 1030 nm (signal) 1030 – 2600 nm (idler)		650 – 900 nm (signal) 1200 – 2500 nm (idler) [2]	1400 – 2000 nm (signal) 2100 – 4200 nm (idler)
Pump power	Up to 80 W			
Repetition rate	Up to 2 MHz			
Pump pulse energy [3]	8 – 20 µJ	20 – 400 µJ	10 – 400 µJ	12 – 400 µJ
Conversion efficiency	> 4.5% @ peak (signal) > 2% @ peak (idler)	> 9% @ peak (signal) > 4% @ peak (idler)	> 7% @ 700 nm [4]	> 9%, 30 – 40 µJ pump @ 1550 nm > 6%, 12 – 30 µJ pump @ 1550 nm
Pulse duration	120 – 400 fs		< 55 fs @ 800 – 900 nm [5] < 70 fs @ 650 – 800 nm [5] < 100 fs @ 1200 – 2000 nm [5]	100 – 300 fs
Spectral bandwidth	60 – 220 cm^{-1}		200 – 750 cm^{-1} @ 650 – 900 nm	50 – 150 cm^{-1} @ 1450 – 2000 nm
Long-term power stability, 8 h [6]	< 2% @ 800 nm			< 2% @ 1550 nm
Pulse-to-pulse energy stability, 1 min [6]	< 2% @ 800 nm			< 2% @ 1550 nm
Compressor transmission	n/a		65% @ 650 – 900 nm 80% @ 1200 – 2000 nm	n/a

WAVELENGTH EXTENSIONS

DUV	n/a	190 – 215 nm: > 0.3% @ 200 nm [7]	n/a	n/a
THS	210 – 315 nm: > 0.4% @ 250 nm [8]	210 – 315 nm: > 0.8% @ 250 nm [8]	n/a	n/a
SHS, SHI	315 – 630 nm: > 1.2% @ 350 nm	315 – 630 nm: > 2.4% @ 350 nm	325 – 450 nm: > 1% @ peak 600 – 650 nm: 0.5% @ peak	n/a
DFG	2200 – 4200 nm: > 1.5% @ 3000 nm	2200 – 4200 nm: > 3% @ 3000 nm	n/a	4000 – 16 000 nm: > 0.3% @ 10 000 nm, 30 – 2000 µJ pump > 0.2% @ 10 000 nm, 12 – 30 µJ pump
	4000 – 16 000 nm: > 0.1% @ 10 000 nm	4000 – 16 000 nm: > 0.2% @ 10 000 nm		

PUPM LASER, ENVIRONMENTAL & UTILITY REQUIREMENTS

Refer to lightcon.com

[1] *Dual output model (-TWINS) available, providing two optically synchronized and simultaneous outputs.*

[2] *Long pulse mode is optional, providing 650 – 1010 nm (signal) and 1050 – 2500 nm (idler) range at < 290 fs.*

[3] *Pump pulse energy up to 5 mJ applicable, refer to ORPHEUS-HE.*

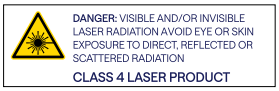
[4] *Specified before pulse compressor. Conversion efficiency at peak is 10% for signal and idler combined.*

[5] *After pulse compression. Typical pulse duration before compression: 120 – 250 fs, after compression: 25 – 70 fs @ 650 – 920 nm, 40 – 100 fs @ 1200 – 2000 nm.*

[6] *Expressed as normalized root mean squared deviation (NRMSD).*

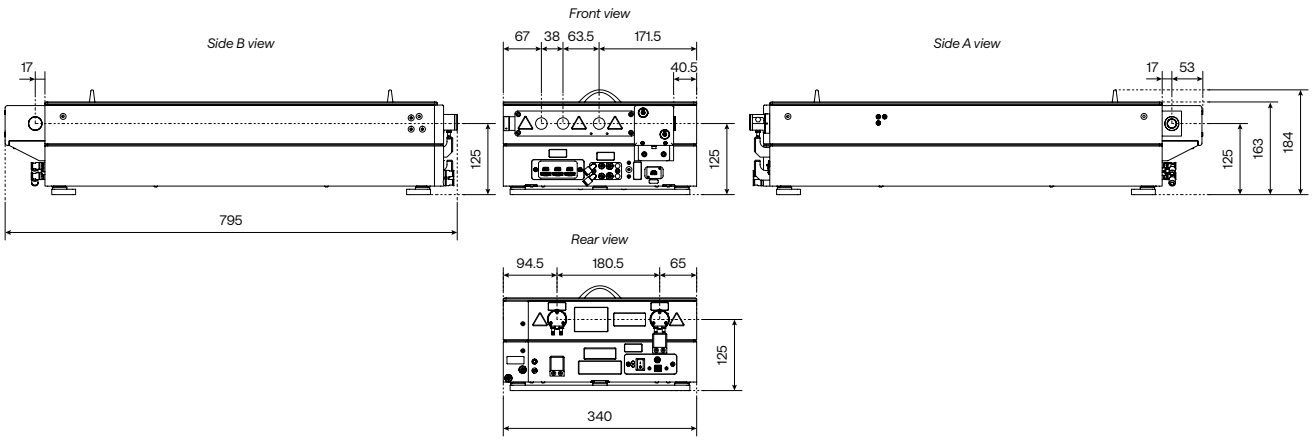
[7] *DUV conversion efficiency is specified for pump power up to 10 W and frequencies up to 200 kHz. In the case of higher pump power, conversion efficiency decreases. The maximum output power is 40 mW at 200 nm.*

[8] *For > 15 µJ pump pulse energy.*



Drawings

ORPHEUS



ORPHEUS | HE

NEW

High-Energy Optical Parametric Amplifier

NEW Up to 5 mJ pump pulse energy

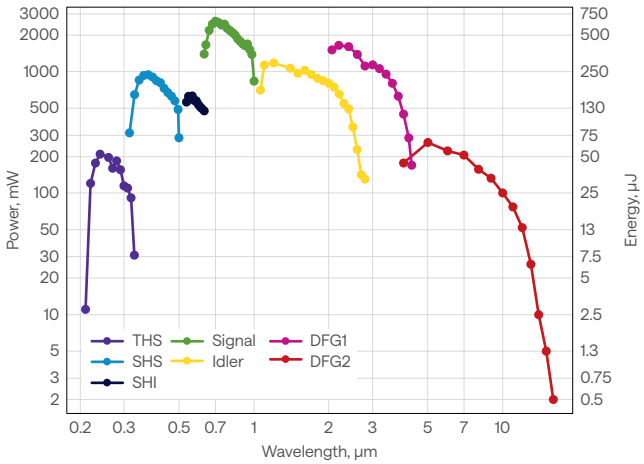
Continuous tunability from UV to MIR, 210 – 16 000 nm

Up to 80 W pump power

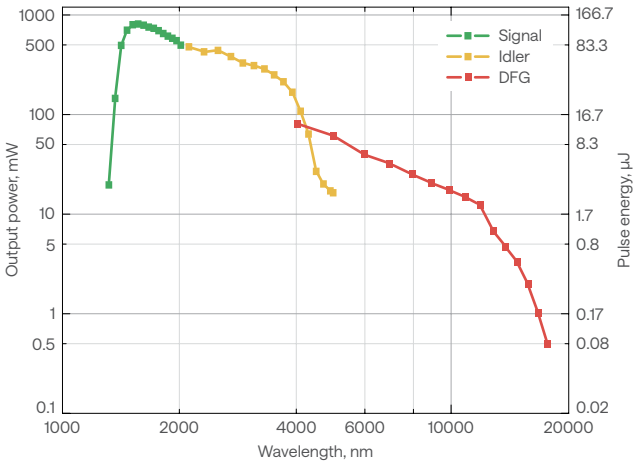
Single-shot – 200 kHz repetition rate

ORPHEUS-HE-5mJ

ORPHEUS-HE-5mJ typical tuning curves
Pump: 20 W, 5 mJ, 4 kHz



ORPHEUS-ONE-HE typical tuning curves
Pump: 6 W, 1 mJ, 6 kHz



Optics Toolbox

Specifications

Model	ORPHEUS-HE	ORPHEUS-HE-5mJ [1]	ORPHEUS-ONE-HE	ORPHEUS-ONE-HE-5mJ [1]
Pump pulse energy [2]	0.4 – 2 mJ	2 – 5 mJ	0.4 – 2 mJ	2 – 5 mJ
Pump power	Up to 80 W	Up to 20 W	Up to 80 W	Up to 20 W
Tuning range	630 –1030 nm (signal) 1030 – 2600 nm (idler)	630 – 1000 nm (signal) 1050 – 2600 nm (idler)	1400 – 2000 nm (signal) 2100 – 4200 nm (idler)	1400 – 2000 nm (signal) 2100 – 4500 nm (idler)
Conversion efficiency	> 8% @ 700 nm		> 9% @ 1550 nm	
Spectral bandwidth	60 – 220 cm^{-1} @ 700 – 960 nm		50 – 150 cm^{-1} @ 1450 – 2000 nm	
Pulse duration	120 – 400 fs		100 – 400 fs	
Long-term power stability, 8 h [3]	< 2% @ 800 nm	< 1% @ 800 nm	< 2% @ 1550 nm	< 1% @ 1550 nm
Pulse-to-pulse energy stability, 1 min [3]	< 2% @ 800 nm	< 1% @ 800 nm	< 2% @ 1550 nm	< 1% @ 1550 nm

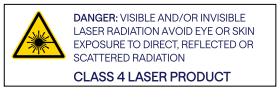
WAVELENGTH EXTENSIONS

THS	210 – 315 nm: > 0.8% @ 250 nm [4]	210 – 320 nm: > 0.4% @ 250 nm [4]	n/a
SHS, SHI	315 – 630 nm: > 2.4% @ 350 nm	320 – 500 nm, 525 – 640 nm: > 2.4% @ 350 nm	n/a
DFG	2200 – 4200 nm: > 3% @ 3000 nm	2500 – 4200 nm: > 3% @ 3000 nm	4000 – 16 000 nm: > 0.3% @ 10 000 nm
	4000 – 16 000 nm: > 0.2% @ 10 000 nm	4000 – 16 000 nm: > 0.2% @ 10 000 nm	

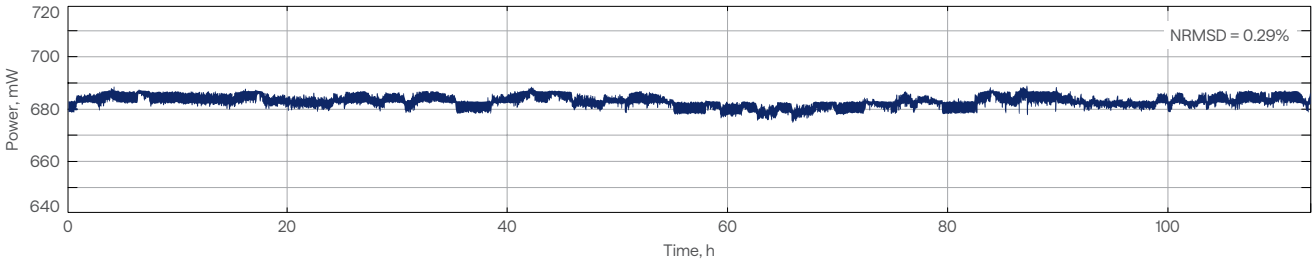
PUMP LASER, ENVIRONMENTAL & UTILITY REQUIREMENTS

Refer to lightcon.com

[1] *Applicable only for PHAROS-5mJ.*
[2] *For lower pump pulse energy, refer to I-OPA, ORPHEUS, or ORPHEUS-NEO platforms.*
[3] *Expressed as normalized root mean squared deviation (NRMSD).*
[4] *Maximum output power of 400 mW.*

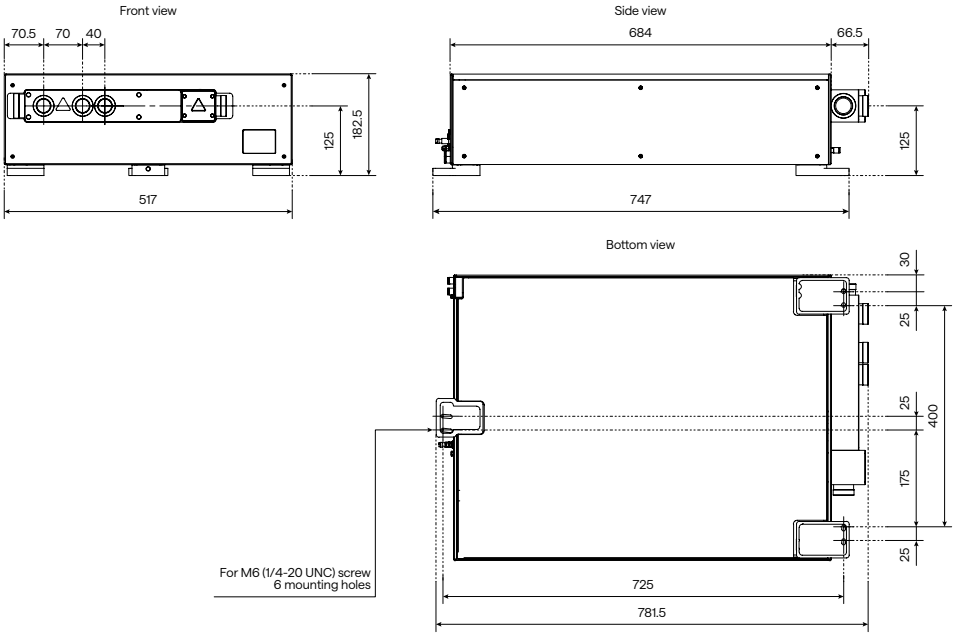


ORPHEUS-HE-5mJ
Long-term power stability at 400 nm



Drawings

ORPHEUS-HE-5mJ / -ONE-HE-5mJ

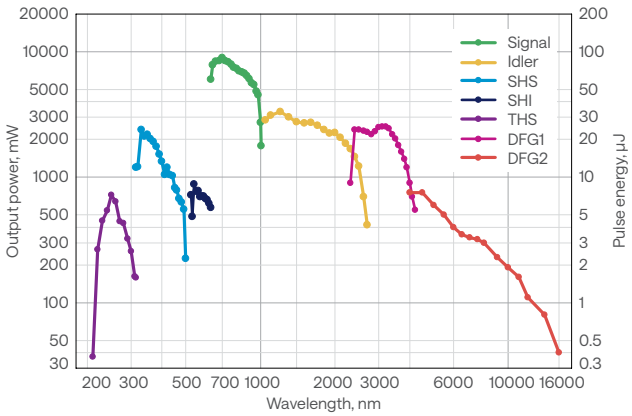


ORPHEUS | NEO

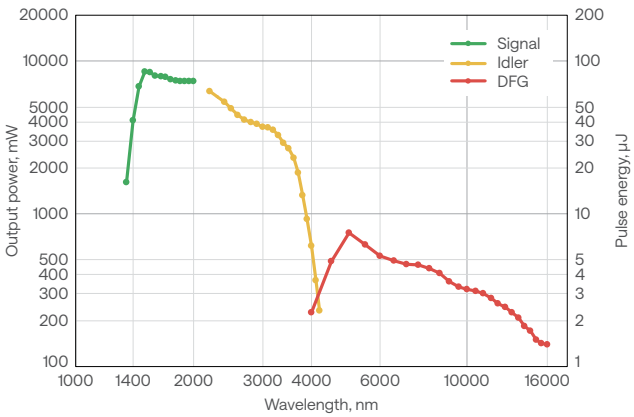
Next-Generation Optical Parametric Amplifier

- Wavelength range from UV to MIR, 210 – 16 000 nm
- Continuous power monitoring and diagnostics
- Pumped by PHAROS-UP for 100 fs pulses
- Supports up to 80 W, 800 µJ pump at 2 MHz
- Fully integrated wavelength extensions

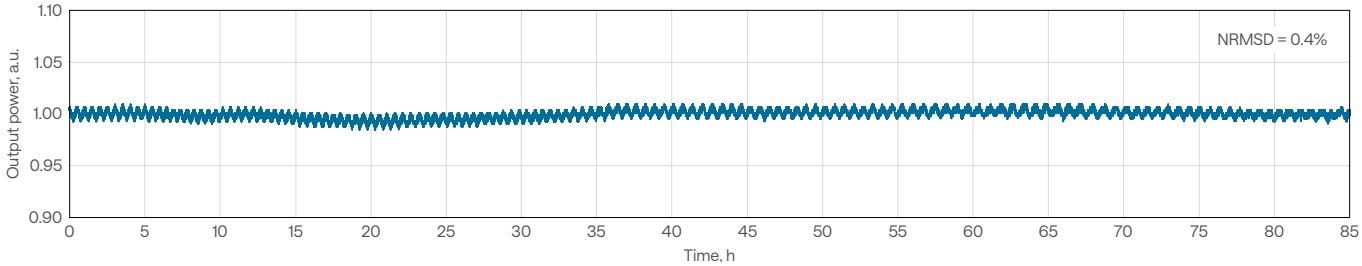
ORPHEUS-NEO typical tuning curves
Pump: 80 W, 800 µJ, 100 kHz



ORPHEUS-NEO-ONE typical tuning curves
Pump: 80 W, 800 µJ, 100 kHz



ORPHEUS-NEO typical long-term power stability at 800 nm



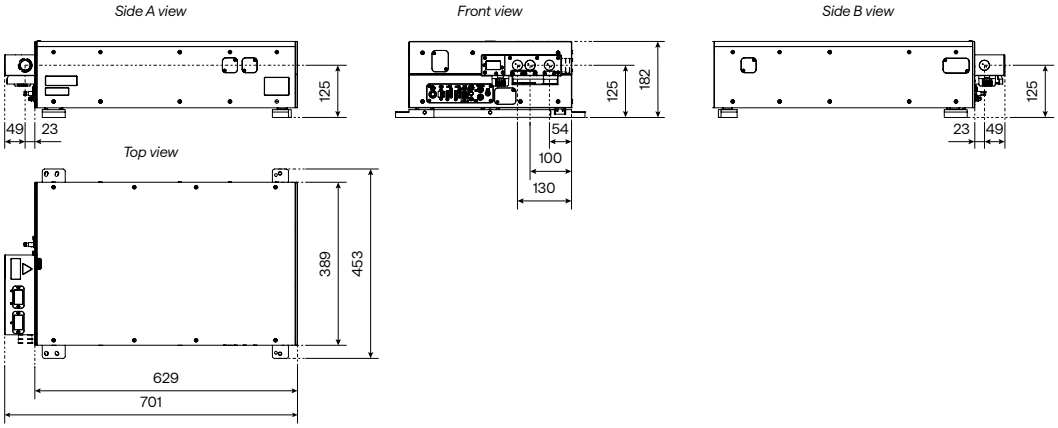
ORPHEUS-NEO specifications

Model	ORPHEUS-NEO	ORPHEUS-NEO-ONE	ORPHEUS-NEO-UP	ORPHEUS-NEO-ONE-UP
Configuration	ORPHEUS	ORPHEUS-ONE	ORPHEUS	ORPHEUS-ONE
Pump laser	CARBIDE or PHAROS		PHAROS-UP	
Pump power	Up to 80 W		Up to 20 W	
Pump pulse energy	20 – 800 µJ		20 – 400 µJ	
Repetition rate	Up to 2 MHz		Up to 1 MHz	
Tuning range	640 – 1000 nm (signal) 1050 – 2600 nm (idler)	1400 – 2000 nm (signal) 2100 – 4200 nm (idler)	640 – 1000 nm (signal) 1050 – 2600 nm (idler)	1450 – 2000 nm (signal) 2100 – 4500 nm (idler)
Conversion efficiency	> 7% @ 700 nm (40 – 800 µJ pump; up to 1 MHz)	> 9% @ 1550 nm (40 – 800 µJ pump; up to 1 MHz)	> 7% @ 700 nm	> 9% @ 1550 nm
	> 3.5% @ 700 nm (20 – 40 µJ pump; up to 2 MHz)	> 6% @ 1550 nm (20 – 40 µJ pump; up to 2 MHz)		
Spectral bandwidth	60 – 220 cm^{-1} @ 700 – 960 nm	50 – 150 cm^{-1} @ 1450 – 2000 nm	120 – 300 cm^{-1} @ 700 – 2600 nm	150 – 300 cm^{-1} @ 1500 – 1900 nm; 2200 – 3500 nm [1]
Pulse duration [2]	120 – 400 fs	100 – 400 fs	< 110 fs @ 700 – 1000 nm < 120 fs @ 1060 – 2000 nm	< 120 fs @ 1500 – 1900 nm
Beam quality, M^2	< 1.3 @ 800 nm	< 1.3 @ 1550 nm	< 1.3 @ 800 nm	< 1.3 @ 1550 nm
Beam diameter [3]	2.1 ± 0.9 mm @ 800 nm	2.1 ± 0.9 mm @ 1550 nm	2.1 ± 0.9 mm @ 800 nm	2.1 ± 0.9 mm @ 1550 nm
Beam divergence (full-angle)	< 2 mrad @ 800 nm	< 4 mrad @ 1550 nm	< 2 mrad @ 800 nm	< 4 mrad @ 1550 nm
Long-term power stability, 8 h [4]	< 1% @ 800 nm	< 1% @ 1550 nm	< 1% @ 800 nm	< 1% @ 1550 nm
Pulse-to-pulse energy stability, 1 min [4]	< 1% @ 800 nm	< 1% @ 1550 nm	< 1% @ 800 nm	< 1% @ 1550 nm
WAVELENGTH EXTENSIONS				
THS	210 – 320 nm; > 0.4% @ 250 nm	n/a	210 – 320 nm; > 0.2% @ 250 nm	n/a
SHS, SHI	320 – 500 nm; 525 – 640 nm; > 1.2% @ 350 nm		320 – 500 nm; 525 – 640 nm; > 1.2% @ 350 nm	
DFG	2500 – 4200 nm; > 3% @ 3000 nm	4000 – 16 000 nm [5]; > 0.3% @ 10 000 nm (for > 40 µJ pump)	2500 – 4500 nm; > 3% @ 3000 nm	4500 – 14 000 nm [5]; 0.2% @ 10 000 nm
	4000 – 16 000 nm [5]; > 0.2% @ 10 000 nm		4500 – 14 000 nm [5]; > 0.1% @ 10 000 nm	
PUMP LASER, ENVIRONMENTAL & UTILITY REQUIREMENTS				
	Refer to lightcon.com			

[1] *Spectral bandwidth is equal to 150 – 250 cm^{-1} @ 5000 – 12 000 nm.*
[2] *Output pulse duration depends on the selected wavelength and the pump laser pulse duration.*
[3] *FW 1/e^2, measured at laser output, using maximum pulse energy.*
[4] *Expressed as normalized root mean squared deviation (NRMSD).*
[5] *Pre-installed output window limits the tuning range to 12 µm. The window is used for dust protection and output power diagnostics, but it can be removed to access the full wavelength range.*

Drawings

ORPHEUS-NEO / ORPHEUS-NEO-UP

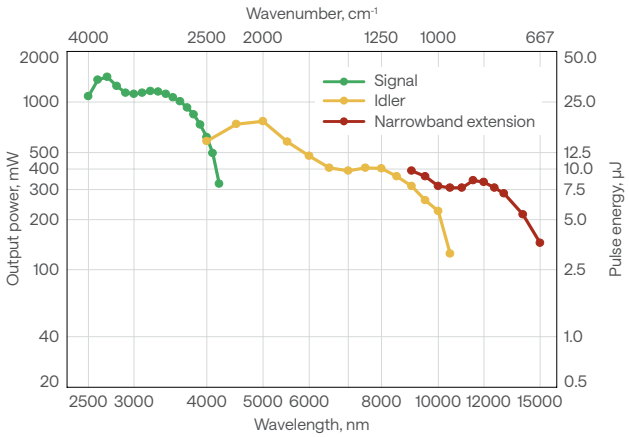


ORPHEUS | MIR

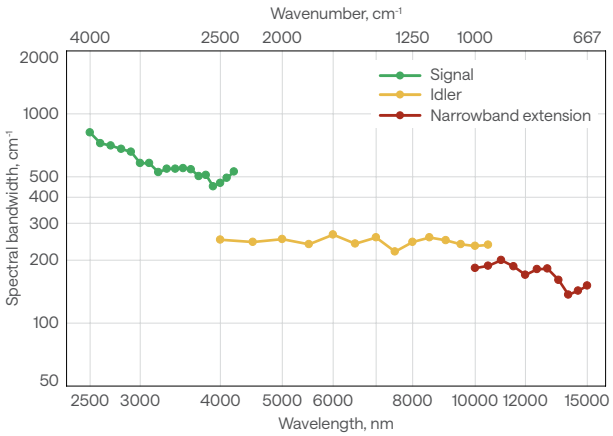
Broad-Bandwidth MIR Optical Parametric Amplifier

- Broad-bandwidth MIR pulses at high repetition rates
- Continuously tunable from 2500 to 15 000 nm
- Pumped by industrial-grade lasers for high stability
- CEP-stable option
- NEW New housing for high output stability

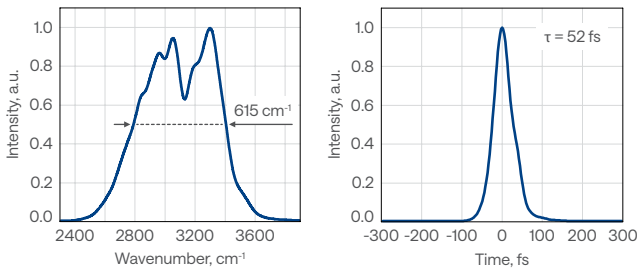
ORPHEUS-MIR typical tuning curves
Pump: 80 W, 2 mJ, 40 kHz



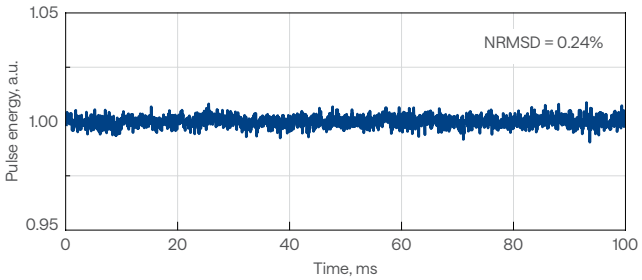
ORPHEUS-MIR typical spectral bandwidth



ORPHEUS-MIR typical output spectrum (left) and pulse duration (right) measured at ≈ 3000 nm



ORPHEUS-MIR pulse-to-pulse energy stability measured at ≈ 3000 nm



Specifications

MAIN OUTPUT (2500 – 10 000 nm)

Mode of operation	Non-collinear	Collinear [1]
Tuning range	2500 – 4000 nm (signal) 4000 – 10 000 nm (idler)	2500 – 4500 nm (signal) [2] 4500 – 10 000 nm (idler)
Maximum pump power	80 W	
Pump pulse energy	200 µJ – 3 mJ	
Maximum repetition rate	100 kHz	
Pulse duration	< 100 fs	< 400 fs (< 100 fs with dispersion compensation) [1]
Conversion efficiency [3]	> 1.2% @ 3000 nm > 1.0% @ 3500 nm > 0.6% @ 5000 nm > 0.3% @ 9000 nm	
Spectral bandwidth [4]	> 300 cm^{-1} @ 3000 – 4000 nm > 200 cm^{-1} @ 4000 – 10 000 nm	
Long-term power stability, 8 h [5]	< 2% @ 5000 nm	
Pulse-to-pulse energy stability, 1 min [5]	< 2% @ 5000 nm	

AUXILIARY OUTPUT (2000 nm)

Output wavelength [6]	2000 ± 100 nm
Pulse duration	< 50 fs
Conversion efficiency [3]	> 8%
Spectral bandwidth	> 350 cm^{-1}

WAVELENGTH EXTENSION (10 000 – 15 000 nm)

Tuning range	10 000 – 15 000 nm	n/a
Conversion efficiency [3]	> 0.2% @ 12 000 nm	
Spectral bandwidth	> 100 cm^{-1}	

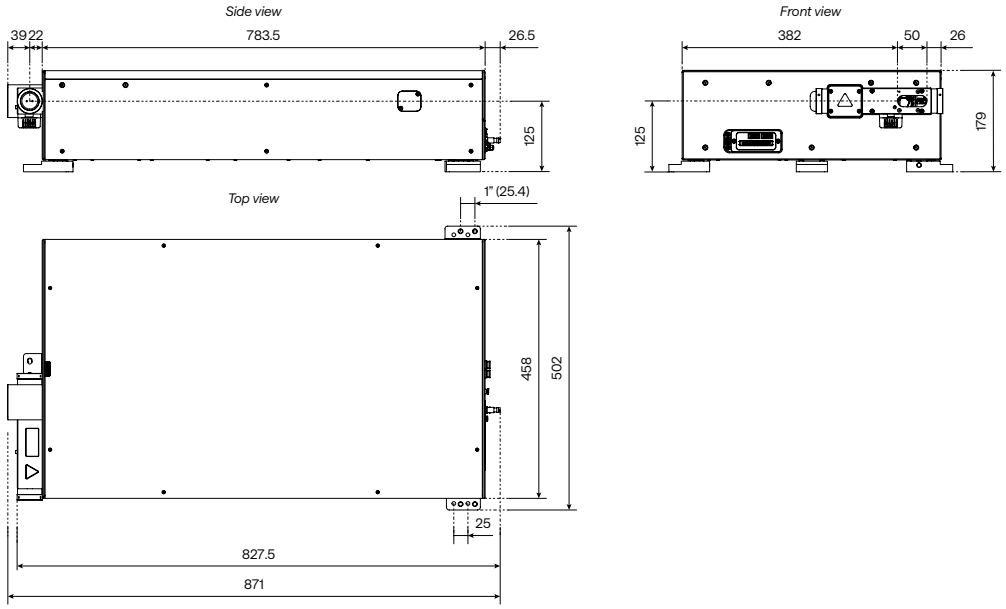
PUMP LASER, ENVIRONMENTAL & UTILITY REQUIREMENTS

Refer to lightcon.com

[1] *Collinear mode is achieved with an additional external separator box. Dispersion compensation is optional.*
[2] *Signal output is realized in non-collinear configuration.*
[3] *Specified as a percentage of pump power.*
[4] *Full width at half maximum (FWHM).*
[5] *Expressed as normalized root mean squared deviation (NRMSD)*
[6] *Not tunable, optimized for best overall performance. Not simultaneous to OPA output.*

Drawings

ORPHEUS-MIR

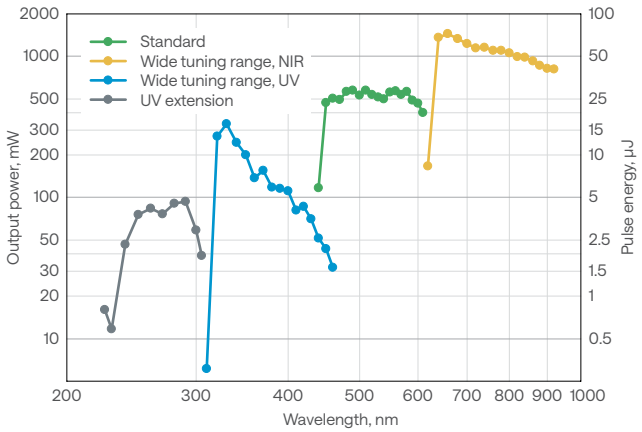


ORPHEUS | VIS

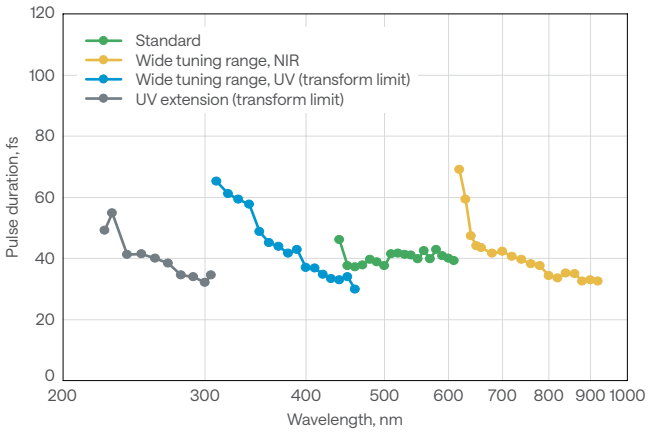
Broad-Bandwidth VIS Optical Parametric Amplifier

- Ultrashort UV – VIS – NIR pulses
- < 50 fs pulse duration at 500 nm
- Up to 100 kHz repetition rate
- Up to 20 W, 1 mJ pump
- Optional UV extension down to 250 nm

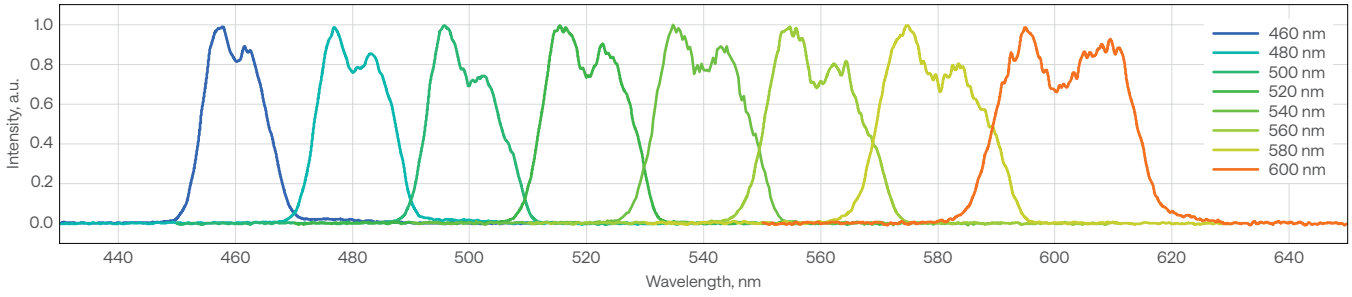
ORPHEUS-VIS tuning curves
Pump: 20 W, 1 mJ



ORPHEUS-VIS typical pulse duration



ORPHEUS-VIS standard configuration's typical spectra set



Specifications

MAIN OUTPUT

Configuration	Standard	Wide tuning range
Tuning range	450 – 600 nm	320 – 900 nm
Maximum pump power	20 W	
Pump pulse energy	200 – 1000 µJ	
Conversion efficiency [1]	> 1.5% @ 500 nm	> 1.5% @ 500 nm > 5.0% @ 660 nm > 0.5% @ 350 nm
Pulse duration	< 50 fs @ 500 – 600 nm	< 50 fs @ 500 – 600 nm < 55 fs @ 800 – 900 nm < 70 fs @ 650 – 800 nm
Spectral bandwidth [2]	200 – 700 cm^{-1}	
Long-term power stability, 8 h [3]	< 2% @ 500 nm	

OPTIONAL EXTENSION (UV)

Tuning range	250 – 300 nm
Conversion efficiency [1]	> 0.15% @ 280 nm
Spectral bandwidth [2]	200 – 600 cm^{-1}

PUMP LASER REQUIREMENTS

Pump laser	CARBIDE or PHAROS
Center wavelength	1030 ± 10 nm
Maximum pump power	20 W
Maximum repetition rate	100 kHz
Pump pulse energy	200 – 1000 µJ
Pump pulse duration [4]	200 – 350 fs

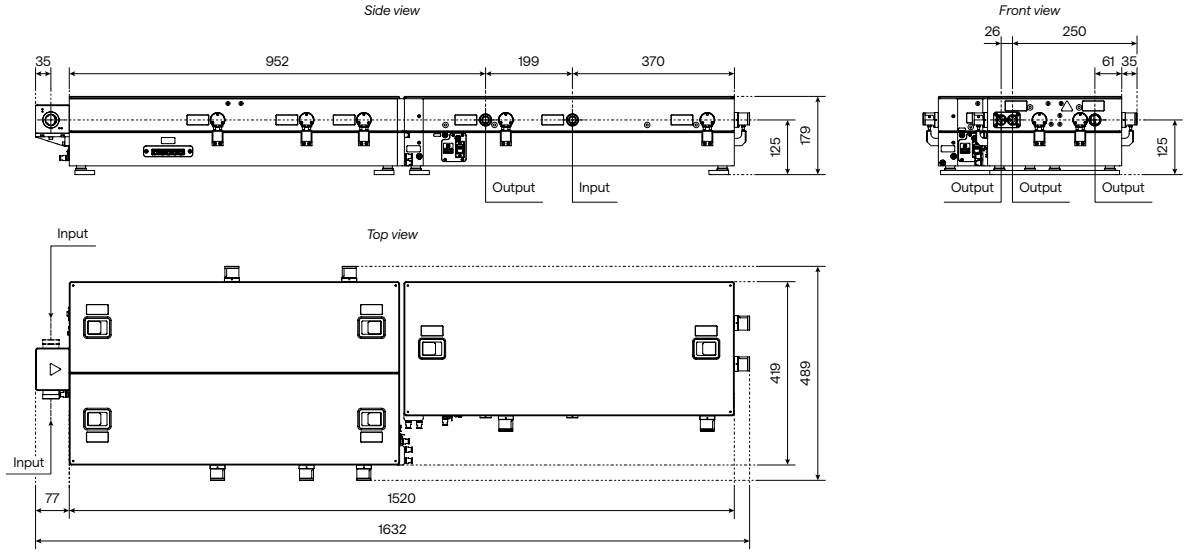
ENVIRONMENTAL & UTILITY REQUIREMENTS

Operating temperature [5]	19 – 25 °C (air conditioning recommended)
Relative humidity [5]	20 – 70% (non-condensing)
Electrical requirements	100 – 240 V AC, 1.4 A; 50 – 60 Hz
Rated power	120 W
Power consumption	Standby: 10 W Max during wavelength tuning: 100 W

[1] *Specified as a percentage of pump power.*
[2] *Full width at half maximum (FWHM).*
[3] *Expressed as normalized root mean squared deviation (NRMSD).*
[4] *Full width at half maximum (FWHM), assuming a Gaussian pulse shape.*
[5] *Specifications are guaranteed for a maximum temperature variation of ± 1 °C and humidity variation of ± 10%.*

Drawings

ORPHEUS-VIS

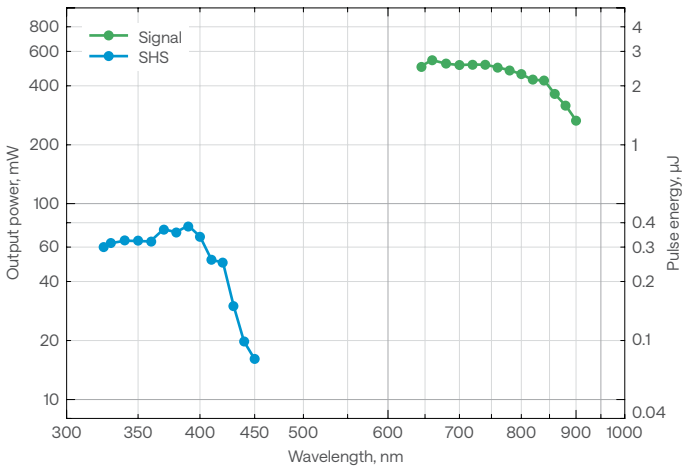


ORPHEUS | N

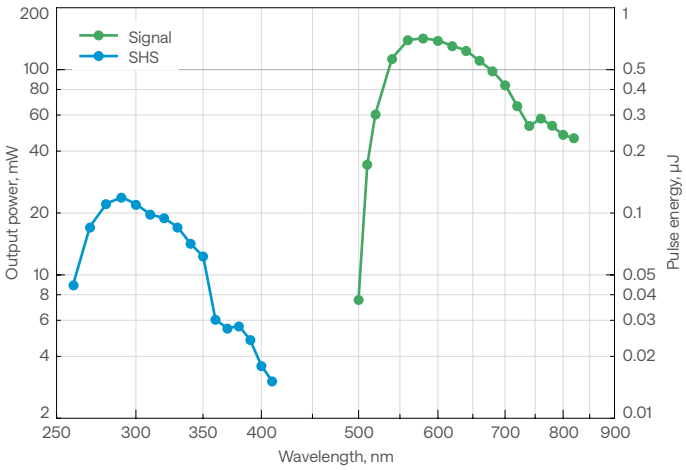
Non-Collinear Optical Parametric Amplifier

- Pulse duration down to < 30 fs
- Integrated prism compressor
- Adjustable spectral bandwidth and pulse duration
- Wavelength feedback with an internal spectrometer

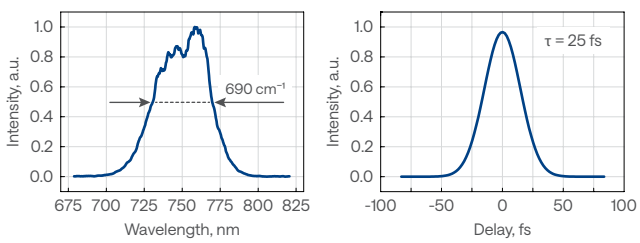
ORPHEUS-N-2H typical tuning curves
Pump: 6 W, 30 µJ, 200 kHz



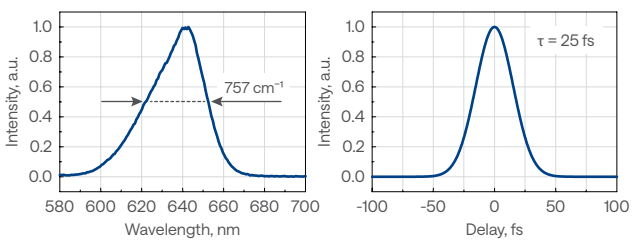
ORPHEUS-N-3H typical tuning curves
Pump: 6 W, 30 µJ, 200 kHz



ORPHEUS-N-2H typical output



ORPHEUS-N-3H typical output



Specifications

Model	ORPHEUS-N-2H	ORPHEUS-N-3H
MAIN OUTPUT		
Tuning range	650 – 900 nm (signal)	520 – 900 nm (signal)
Maximum pump power	8 W	
Pump pulse energy	10 – 200 µJ	12 – 200 µJ
Conversion efficiency	> 7% @ 700 nm > 5% @ 800 nm	> 1.3% @ 580 nm > 0.7% @ 700 nm > 0.3% @ 800 nm
Integrated 2H / 3H generation efficiency [1]	> 35% (515 nm)	> 25% (343 nm)
Pulse duration after compressor	< 30 fs @ 700 – 850 nm	< 30 fs @ 540 – 660 nm < 70 fs @ 660 – 800 nm
Long-term power stability, 8 h [2]	< 2% @ 800 nm	< 2% @ 580 nm
Pulse-to-pulse energy stability, 1 min [2]	< 2% @ 800 nm	< 2% @ 580 nm
WAVELENGTH EXTENSIONS		
Tuning range (SHS)	325 – 450 nm	260 – 450 nm
Conversion efficiency	> 0.7% @ 350 nm	> 0.15% @ 290 nm
PUMP LASER REQUIREMENTS		
Pump laser	CARBIDE or PHAROS	
Center wavelength	1030 ± 10 nm	
Maximum pump power	8 W	
Repetition rate	Single-shot – 800 kHz	Single-shot – 600 kHz
Pump pulse energy	10 – 200 µJ	12 – 200 µJ
Pump pulse duration [3]	180 – 500 fs	
ENVIRONMENTAL & UTILITY REQUIREMENTS		
Operating temperature [4]	19 – 25 °C (air conditioning recommended)	
Relative humidity [4]	20 – 70% (non-condensing)	
Electrical requirements	100 – 240 V AC, 1.4 A; 50 – 60 Hz	
Rated power	120 W	
Power consumption	Standby: 10 W Max during wavelength tuning: 100 W	
Purging requirements	Nitrogen purge – optional	Nitrogen purge – required, 1 – 3 liters per minute

[1] Not simultaneous to NOPA output.

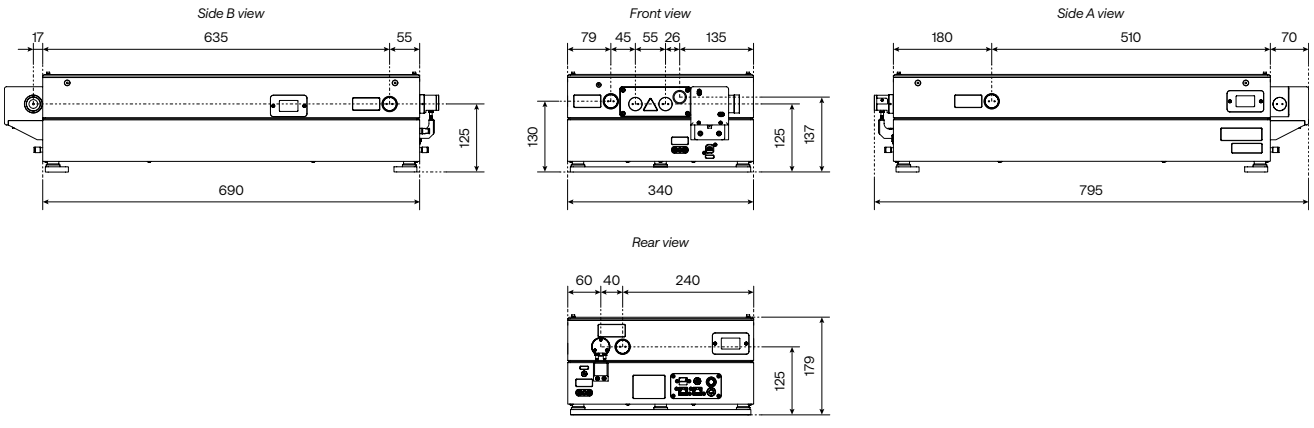
[2] Expressed as normalized root mean squared deviation (NRMSD).

[3] Full width at half maximum (FWHM), assuming a Gaussian pulse shape.

[4] Specifications are guaranteed for a maximum temperature variation of ± 1 °C and humidity variation of ± 10%.

Drawings

ORPHEUS-N

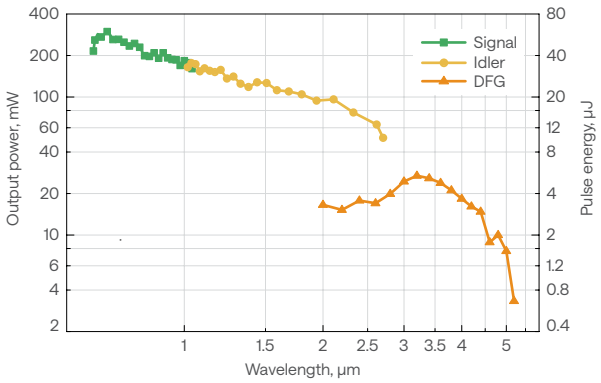


ORPHEUS | PS

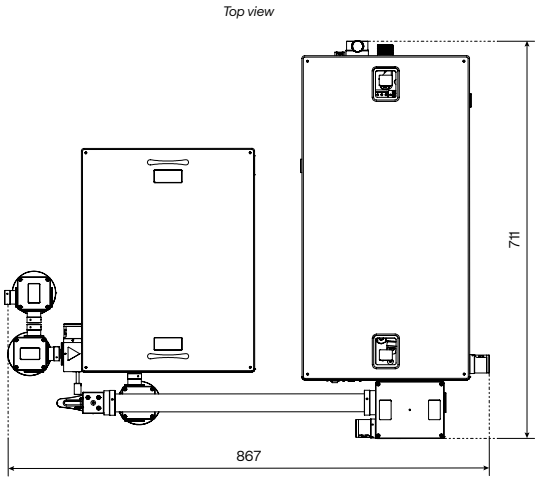
Narrow-Bandwidth Optical Parametric Amplifier

- Picosecond pulses from a femtosecond pump
- 210 – 4800 nm tuning range
- 800 fs – 3 ps pulse duration
- < 20 cm^{-1} spectral bandwidth
- Up to 100 kHz repetition rate

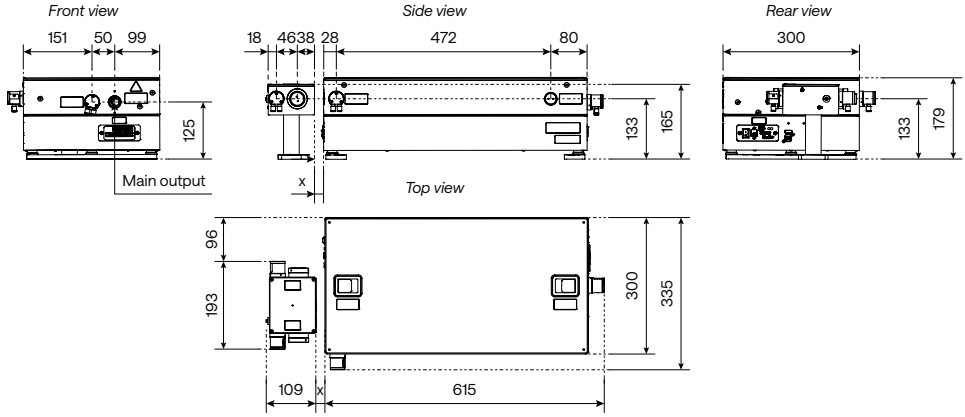
ORPHEUS-PS tuning curves
Pump: 5 W, 1000 µJ, 5 kHz from **PHAROS-20W-SP**



ORPHEUS-PS with **SHBC** drawing



ORPHEUS-PS drawing



Specifications

MAIN OUTPUT

Tuning range [1]	640 – 1000 nm (signal) 1060 – 2600 nm (idler)
Conversion efficiency	> 6% @ 700 nm
Pulse duration	800 fs – 3 ps
Spectral bandwidth	< 20 cm^{-1} @ 800 nm
Pulse-to-pulse energy stability [2]	< 2% @ 800 nm

AUXILIARY OUTPUT 1 (515 nm)

Center wavelength [3]	515 nm ± 5 nm
Generation efficiency [4]	> 15%

AUXILIARY OUTPUT 2 (1030 nm)

Center wavelength [5]	1030 ± 10 nm
Pulse duration	< 300 fs
Pulse energy	> 5 µJ

WAVELENGTH EXTENSION

SHS, SHI	320 – 500 nm, 530 – 640 nm: > 3% @ 350 nm
FHS, FHI	210 – 250 nm, 265 – 320 nm: > 0.3% @ 230 nm
DFG	2400 – 4800 nm: contact sales@lightcon.com

PUMP LASER REQUIREMENTS

Pump laser [6]	CARBIDE or PHAROS with uncompressed output option [7]
Center wavelength	1030 ± 10 nm
Repetition rate	Single-shot – 100 kHz
Maximum pump power	20 W
Pump pulse energy	100 µJ – 3.2 mJ

ENVIRONMENTAL & UTILITY REQUIREMENTS

Operating temperature [8]	19 – 25 °C (air conditioning recommended)
Relative humidity [8]	20 – 70% (non-condensing)
Electrical requirements	100 – 240 V AC, 1.4 A; 50 – 60 Hz
Rated power	120 W
Power consumption	Standby: 10 W Max during wavelength tuning: 100 W

[1] *For a single wavelength (515 nm) picosecond output, refer to SHBC.*

[2] *Expressed as normalized root mean squared deviation (NRMSD)*

[3] *Direct SHBC output, not simultaneous to OPA; see more details in SHBC specifications.*

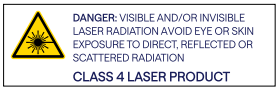
[4] *Specified as a percentage of pump pulse energy.*

[5] *Compressed pump output.*

[6] *The pump laser is first paired with the SHBC module, then the SHBC output is used to pump the OPA. The parameter requirements are for the pump laser.*

[7] *Not compatible with PHAROS-UP.*

[8] *Specifications are guaranteed for a maximum temperature variation of ± 1 °C and humidity variation of ± 10%.*



TOPAS

Optical Parametric Amplifiers for Ti:Sapphire Lasers

- Tuning range 1160 – 2600 nm, extendable to 189 nm – 20 µm
- Conversion efficiency of > 25%
- Wavelength extensions and high-energy upgrades
- Nearly bandwidth- and diffraction-limited output
- CEP stabilization of idler, 1600 – 2600 nm

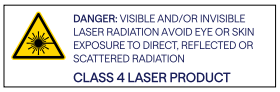
Comparison table

Product [1]	Pump pulse energy [2]	Tuning range	Extended tuning range	Output pulse duration	Upgrades	Features
TOPAS-PRIME	0.15 – 6 mJ	1160 – 2600 nm	189 nm – 20 µm	30 – 150 fs	HE-STAGE	Motorized wavelength control, hands-free operation
TOPAS-PRIME-HE	2 – 60 mJ				n/a	High energy, high conversion efficiency
TOPAS-TWINS [3]	0.3 – 6 mJ				HE-STAGE	Two independently tunable CEP-stable outputs

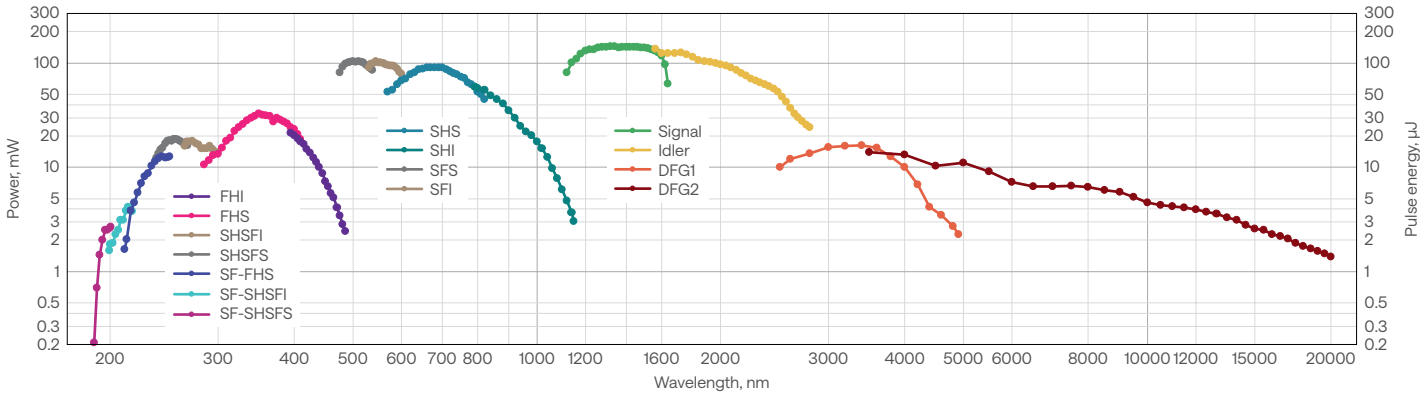
[1] *Custom solutions are available, contact sales@lightcon.com for more details.*

[2] *Maximum pump pulse energy depends on pump pulse duration.*

[3] *TWINS consists of two OPAs, seeded by the same white light source. Specifications and upgrades are applicable for each output.*



TOPAS-PRIME tuning curves. Pump: 1 mJ, 100 fs, 800 nm



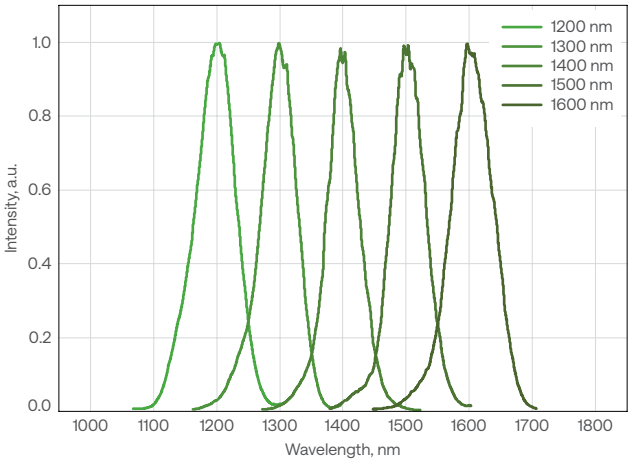
Wavelength extensions and upgrades

Product	Tuning range	Features
HE-STAGE	1160 – 2600 nm	High-energy upgrade for TOPAS-PRIME or TOPAS-TWINS
NIRUVIS	240 – 2600 nm	Motorized wavelength tuning, single housing
NIRUVIS-DUV-HE	189 – 2600 nm	High-energy version, broadest tuning range, motorized wavelength tuning, single housing
NIRUVIS-DUV	189 – 2600 nm	Broadest tuning range, motorized wavelength tuning, single housing
NIRUVIS-MW	240 – 2600 nm	Fully automated version, the same output port for the entire wavelength range, motorized wavelength tuning, single housing
NDFG	2600 nm – 20 µm	Noncolinear generator for background-free mid-IR pulses
SIG-SIG NDFG	4500 nm – 16 µm	Noncolinear generator for CEP-stable mid-IR pulses used with TOPAS-TWINS, CEP slow drift compensation-ready [1]

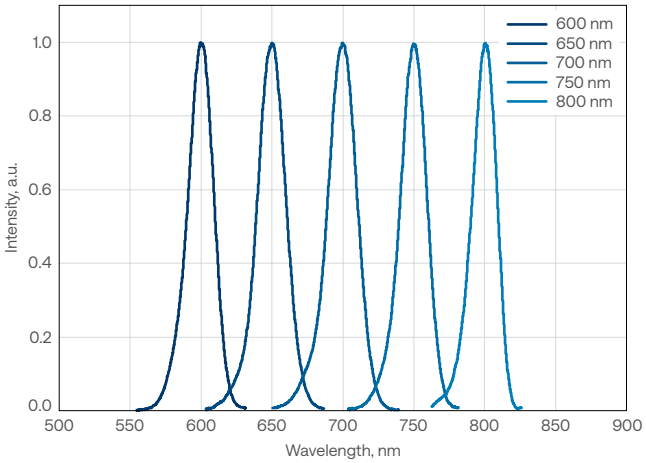
[1] *CEP slow drift is available upon request.*

Performance

TOPAS-PRIME typical signal spectra set



TOPAS-PRIME SHS typical signal spectra set

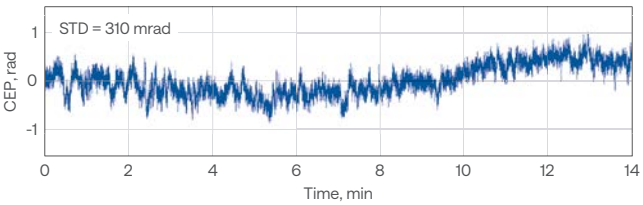


CEP stabilization of idler

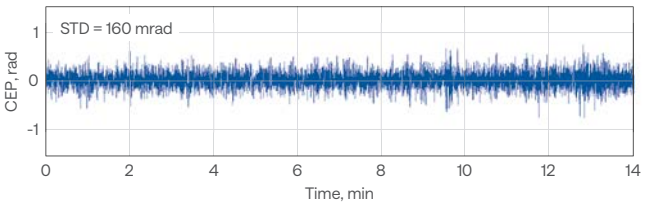
TOPAS idler (1600 – 2600 nm) is passively CEP locked due to a three-wave interaction. However, a slow CEP drift may persist because of changes in pump beam pointing or environmental conditions.

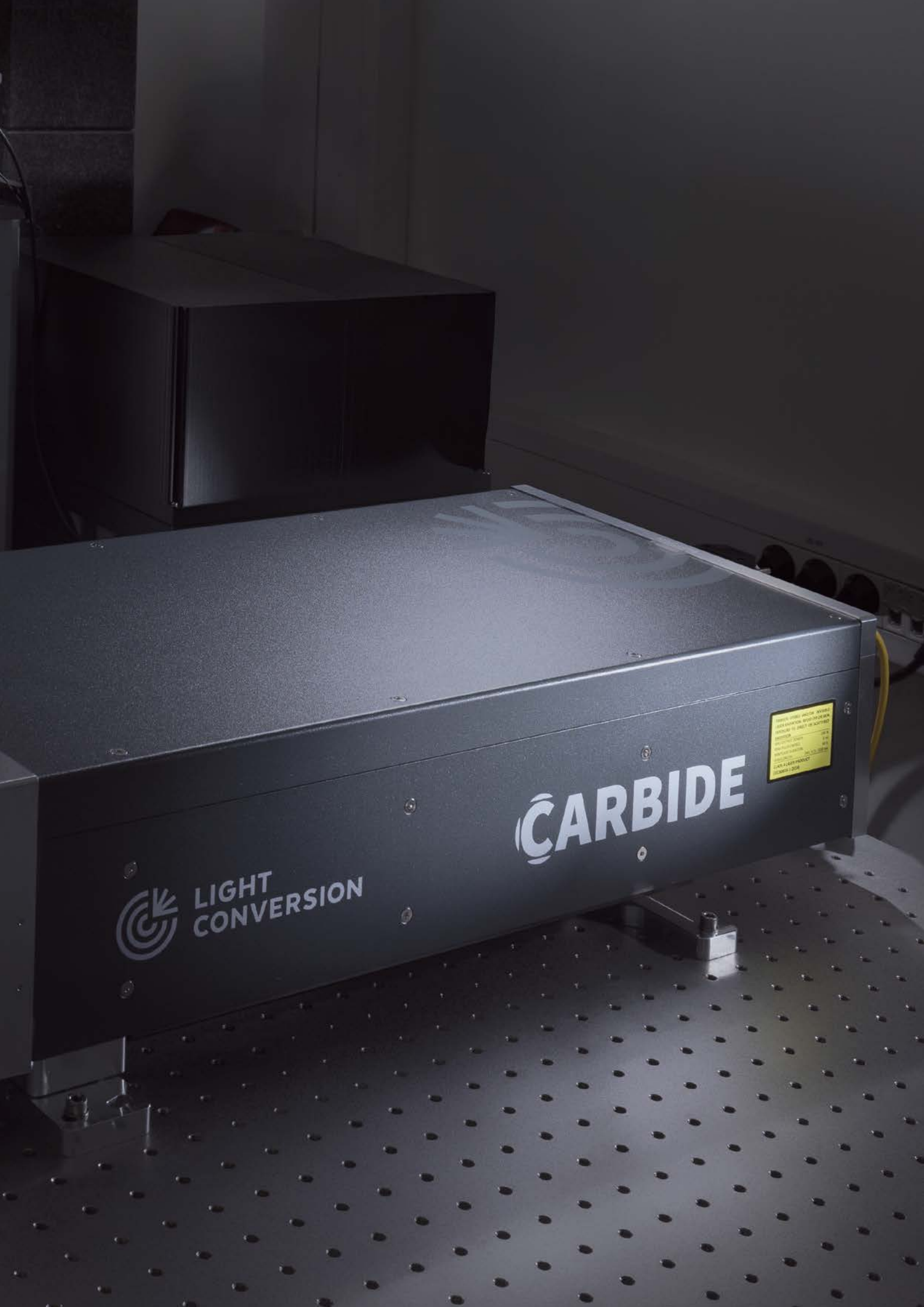
Such a drift can be compensated by employing an f-2f interferometer and a feedback loop controlling the temporal delay between the seed and pump in the power amplification stage of **TOPAS-PRIME** and **TOPAS-PRIME-HE.**

CEP stability of idler over 14 min
(a) without drift compensation



(b) with drift compensation with a slow loop




CARBIDE
LIGHT
CONVERSION

Femtosecond Lasers

LIGHT CONVERSION is world-renowned for its industrial-grade Yb-based femtosecond lasers, covering a wide range of industrial, scientific, and medical applications.

High average power and pulse energy at high repetition rates

Market-proven industrial-grade stability and reliability

Automated harmonics and wavelength-tunable extensions

CARBIDE

Compact industrial design in air- or water-cooled models, providing up to 120 W, 1 mJ or 80 W, 2 mJ with excellent output stability.

PHAROS

Scientific flexibility with process-tailored output parameters, offering up to 1 mJ pulse energy at < 100 fs or up to 5 mJ at < 250 fs.

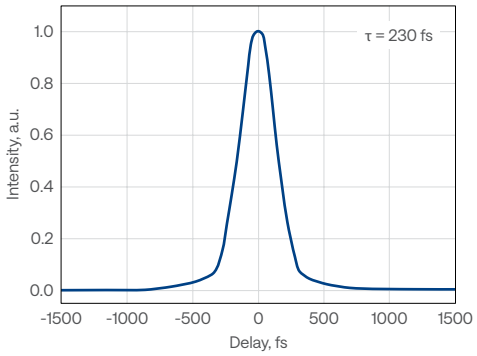
CARBIDE

Industrial Femtosecond Lasers

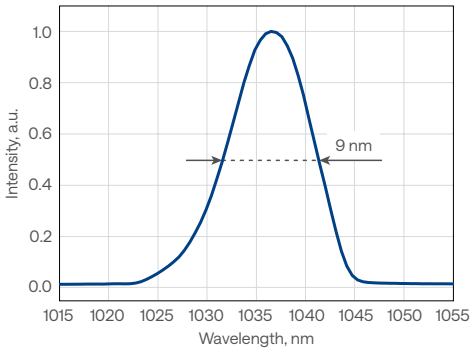
- Maximum output of 120 W (IR) or 50 W (UV)
- NEW — Single-shot – 10 MHz repetition rate
- Pulse-on-demand and BiBurst for pulse control
- Automated harmonics up to the 5th and wavelength-tunable extensions
- Air-cooled or water-cooled models

CARBIDE-CB3

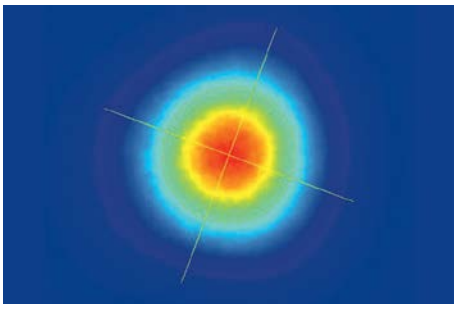
CARBIDE-CB3
Typical pulse duration



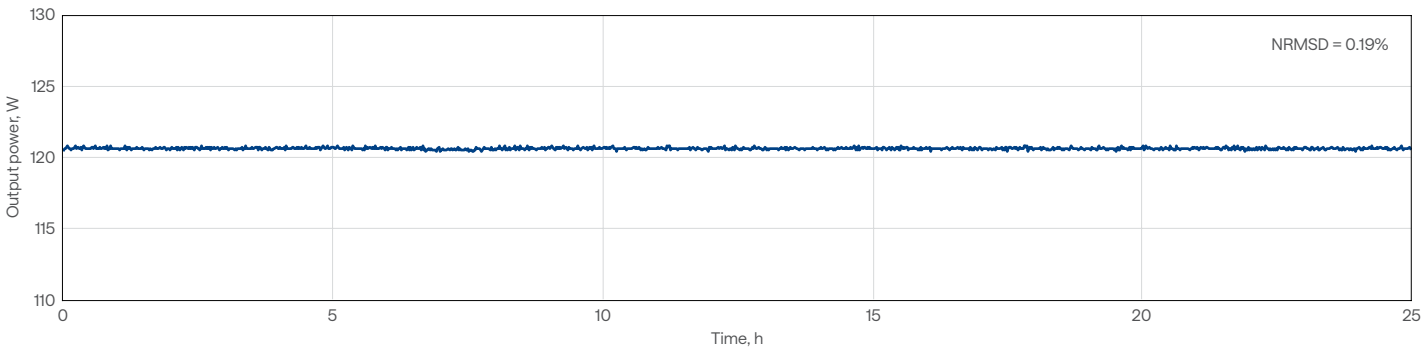
CARBIDE-CB3
Typical spectrum



CARBIDE-CB3
Typical beam profile



CARBIDE-CB3-120W
Long-term power stability



CARBIDE-CB3 specifications

NEW

Model	CB3-20W	CB3-40W	CB3-40W-10MHz	CB3-80W	CB3-120W
OUTPUT CHARACTERISTICS					
Cooling method	Water-cooled				
Center wavelength	1030 ± 10 nm				
Maximum output power	20 W	40 W		80 W	120 W
Pulse duration [1]	< 250 fs			< 350 fs [2]	< 250 fs
Pulse duration tuning range	250 fs – 10 ps			350 fs – 10 ps	250 fs – 10 ps
Maximum pulse energy	0.4 mJ		0.2 mJ	0.8 mJ	2 mJ / 1 mJ
Repetition rate	Single-shot – 1 MHz	Single-shot – 1 MHz (2 MHz on request)	Single-shot – 10 MHz	Single-shot – 2 MHz	
Pulse selection	Single-shot, pulse-on-demand, any fundamental repetition rate division				
Polarization	Linear, vertical; 1 : 1000				
Beam quality, M^2	< 1.2				
Beam diameter [3]	3.9 ± 0.4 mm			4.2 ± 0.4 mm	5.1 ± 0.7 mm / 5 ± 0.5 mm
Beam pointing stability	< 20 µrad/°C				
Pulse energy control	FEC [4]		Attenuator [5]	FEC [4]	
Pulse picker leakage	< 0.25%		< 0.5%	< 0.25%	
Pulse-to-pulse energy stability, 12 h [6]	< 0.5%				
Long-term power stability, 100 h [6]	< 0.5%				
MAIN OPTIONS					
Oscillator output [7]	< 0.5 W, 120 – 250 fs, 1030 ± 10 nm, ≈ 65 MHz				
Harmonic generator [8]	515 nm, 343 nm, 257 nm, or 206 nm; refer to CARBIDE HG				
Optical parametric amplifier [9]	UV – MIR; refer to I-OPA or ORPHEUS				
BiBurst option	Tunable GHz and MHz burst with burst-in-burst capability; refer to BiBurst				
PHYSICAL DIMENSIONS					
Laser head (L × W × H)	633 × 350 × 174 mm				
Chiller (L × W × H)	585 × 484 × 221 mm		680 × 484 × 307 mm		
24 V DC power supply (L × W × H)	352 × 195 × 75 mm				376 x 449 x 88 mm
ENVIRONMENTAL & UTILITY REQUIREMENTS					
Operating temperature	15 – 30 °C				
Relative humidity	< 80% (non-condensing)				
Electrical requirements	Laser	100 V AC, 7 A – 240 V AC, 3 A; 50 – 60 Hz		100 V AC, 12 A – 240 V AC, 5 A; 50 – 60 Hz	100 V AC, 15 A – 240 V AC, 7 A; 50 – 60 Hz
	Chiller	100 – 230 V AC; 50 – 60 Hz		200 – 230 V AC; 50 – 60 Hz	
Rated power	Laser	1000 W		1000 W	2000 W
	Chiller	1400 W		2000 W	
Power consumption	Laser	500 W		900 W	1500 W
	Chiller	1000 W		1300 W	1800 W

[1] *Assuming a Gaussian pulse shape.*

[2] *Pulse duration can be reduced to < 250 fs if a pulse peak intensity of > 50 GW/cm² is tolerated by the customer setup.*

[3] *FW 1/e², using maximum pulse energy.*

[4] *Fast energy control (FEC) provides fast, full-scale individual pulse energy control; an external analog control input is available. An optional integrated waveplate-based variable optical attenuator is available.*

[5] *Waveplate-based variable optical attenuator (VOA); an external analog control input is available. FEC is available for repetition rates up to 2 MHz.*

[6] *Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).*

[7] *Available simultaneously, requires a scientific interface. Contact sales@lightcon.com for more details or customized solutions.*

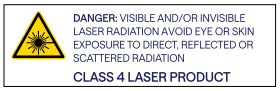
[8] *Integrated. For an external harmonic generator, refer to HIRO.*

[9] *Integrated. For more details and stand-alone OPAs, refer to wavelength-tunable sources.*

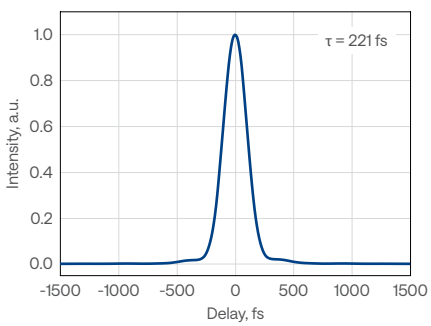
CARBIDE-CB5 specifications

Model	CB5-6W	CB5-5W	CB5-SP
OUTPUT CHARACTERISTICS			
Cooling method	Air-cooled [1]		
Center wavelength	1030 ± 10 nm		
Maximum output power	6 W	5 W	
Pulse duration [2]	< 290 fs		< 190 fs
Pulse duration tuning range	290 fs – 20 ps		190 fs – 20 ps
Maximum pulse energy	100 µJ	83 µJ	100 µJ
Repetition rate	Single-shot – 1 MHz		
Pulse selection	Single-shot, pulse-on-demand, any fundamental repetition rate division		
Polarization	Linear, vertical; 1 : 1000		
Beam quality, M^2	< 1.2		
Beam diameter [3]	2.1 ± 0.4 mm		
Beam pointing stability	< 20 µrad/°C		
Pulse energy control	Attenuator [4]	AOM [5]	Attenuator [4]
Pulse picker leakage	< 2%	< 0.1%	< 2%
Pulse-to-pulse energy stability, 12 h [6]	< 0.5%		
Long-term power stability, 100 h [6]	< 0.5%		
MAIN OPTIONS			
Oscillator output	n/a		
Harmonic generator [7]	515 nm, 343 nm, 257 nm, or 206 nm; refer to CARBIDE HG		
Optical parametric amplifier [8]	UV – MIR; refer to I-OPA or ORPHEUS		
BiBurst option	n/a		
PHYSICAL DIMENSIONS			
Laser head (L × W × H)	633 × 324 × 162 mm		
Chiller	Not required		
24 V DC power supply (L × W × H)	220 × 95 × 46 mm		
ENVIRONMENTAL & UTILITY REQUIREMENTS			
Operating temperature	17 – 27 °C		
Relative humidity	< 80% (non-condensing)		
Electrical requirements	100 V AC, 3 A – 240 V AC, 1.3 A; 50 – 60 Hz		
Rated power	280 W		
Power consumption	250 W		

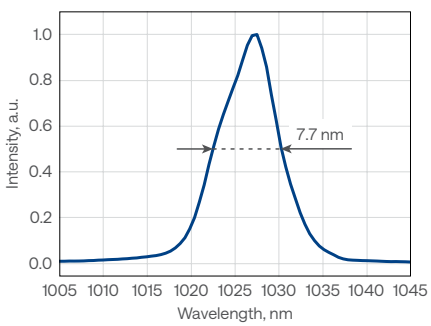
[1] *Water-cooled version available on request.*
[2] *Assuming a Gaussian pulse shape.*
[3] *FW 1/e², using maximum pulse energy.*
[4] *Waveplate-based variable optical attenuator (VOA); an external analog control input is available.*
[5] *Enhanced contrast AOM. Provides fast, full-scale individual pulse energy control; an external analog control input is available.*
[6] *Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).*
[7] *Integrated. For an external harmonic generator, refer to HIRO.*
[8] *Integrated. For more details and stand-alone OPAs, refer to wavelength-tunable sources.*



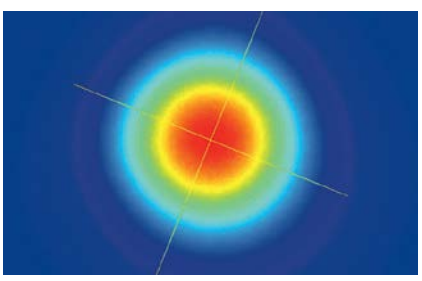
CARBIDE-CB5
Typical pulse duration



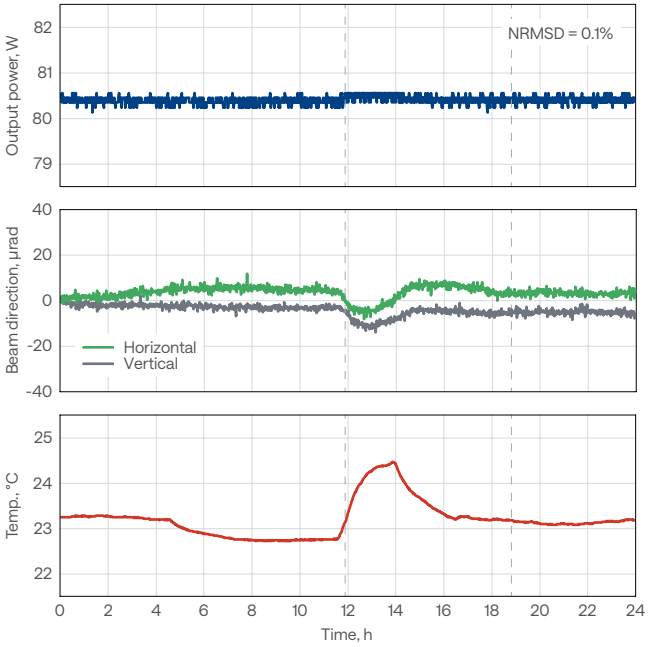
CARBIDE-CB5
Typical spectrum



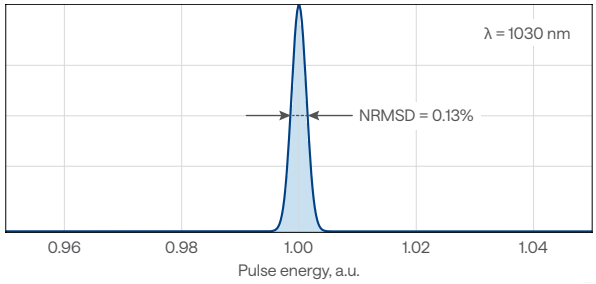
CARBIDE-CB5
Typical beam profile



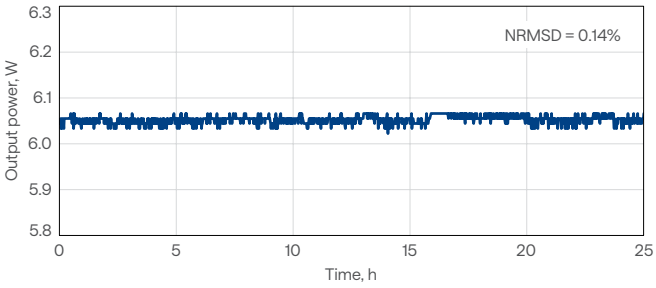
CARBIDE-CB3 output power and beam direction stability with power lock enabled, across varying environmental conditions



CARBIDE-CB3
Typical pulse-to-pulse energy stability

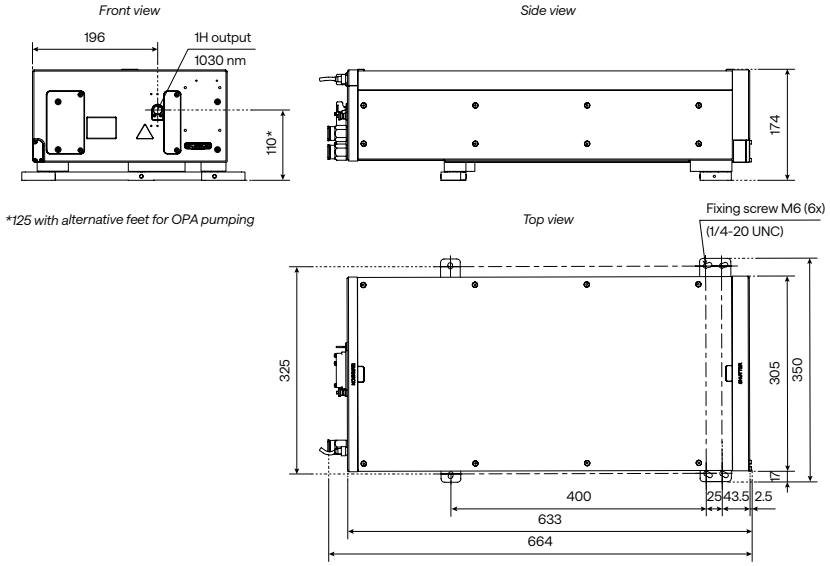


CARBIDE-CB5-6W
Long-term power stability

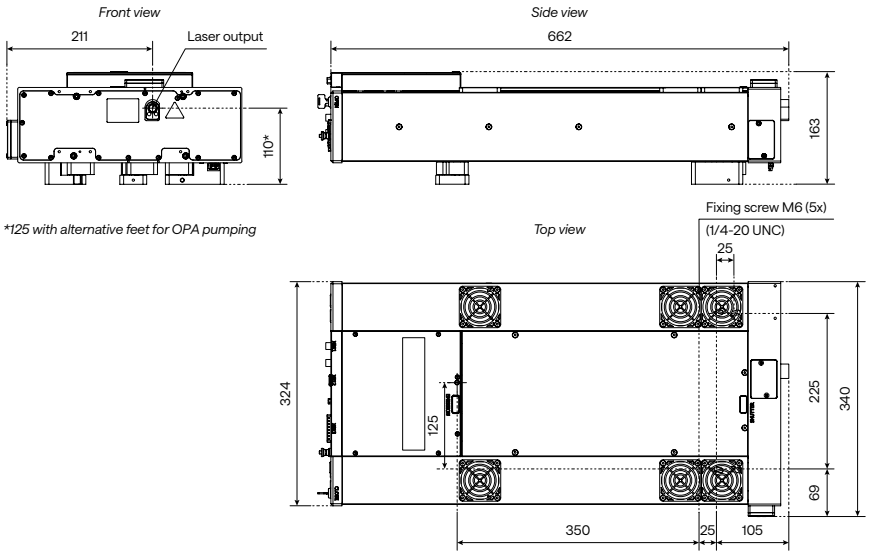


Drawings

CARBIDE-CB3



Air-cooled **CARBIDE-CB5** with an attenuator



The drawings depend on the exact configuration. If crucial for integration, please contact sales@lightcon.com.

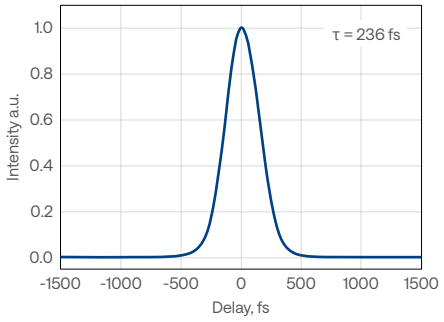
PHAROS

High-Energy Femtosecond Lasers

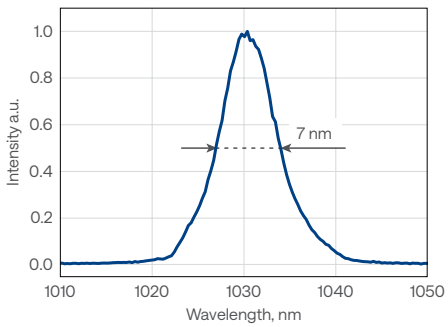
NEW

- Maximum pulse energy of up to 5 mJ
- Down to < 100 fs right at the output
- Tunable pulse duration, 100 fs – 20 ps
- Pulse-on-demand and BiBurst for pulse control
- Automated harmonics up to the 5th and wavelength-tunable extensions

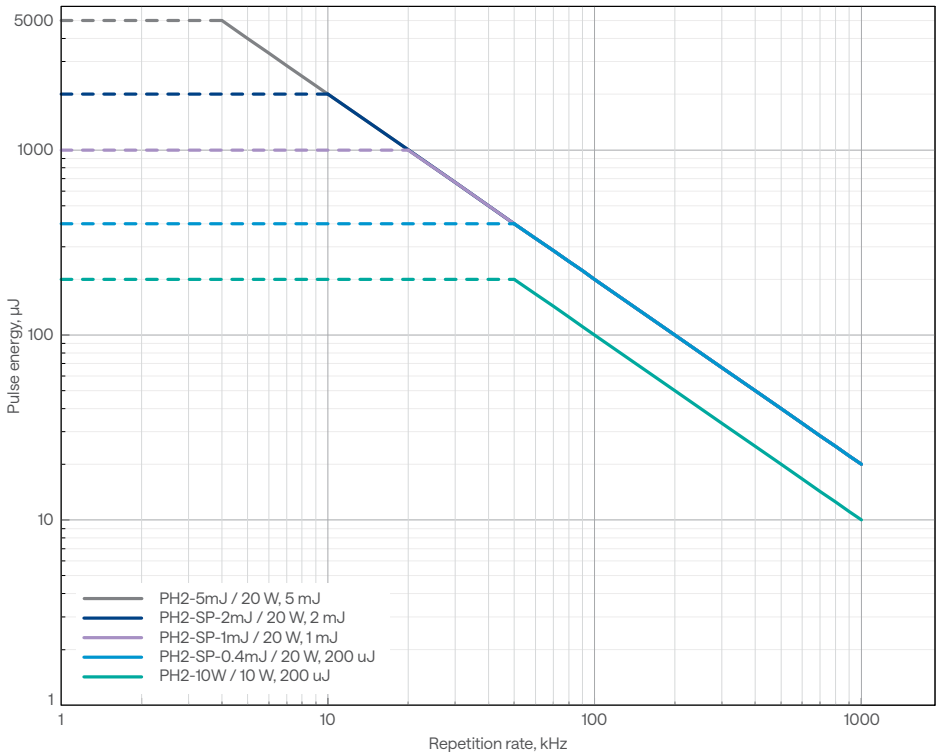
PHAROS-PH2-5mJ
Typical pulse duration



PHAROS-PH2-5mJ
Typical spectrum



PHAROS
Pulse energy vs fundamental repetition rate



Specifications

NEW

Model	PH2-10W	PH2-SP			PH2-5mJ	PH2-UP	
OUTPUT CHARACTERISTICS							
Center wavelength [1]	1030 ± 10 nm						
Maximum output power	10 W	20 W					
Pulse duration [2]	< 290 fs	< 190 fs			< 250 fs	< 100 fs	
Pulse duration tuning range	290 fs – 10 ps (20 ps on request)	190 fs – 10 ps (20 ps on request)			n/a	100 fs – 10 ps	
Maximum pulse energy	0.2 mJ	0.4 mJ	1 mJ	2 mJ	5 mJ	0.4 mJ	1 mJ
Repetition rate	Single-shot – 1 MHz						
Pulse selection	Single-shot, pulse-on-demand, any fundamental repetition rate division						
Polarization	Linear, horizontal						
Beam quality, M^2	< 1.2		< 1.3			< 1.2	
Beam diameter [3]	3.3 ± 0.5 mm	4.0 ± 0.5 mm	4.5 ± 0.5 mm	6.8 ± 0.7 mm	11 ± 0.5 mm	4.5 ± 0.5 mm	6 ± 0.5 mm
Beam pointing stability	< 20 µrad/°C						
Pre-pulse contrast	< 1 : 1000						
Post-pulse contrast	< 1 : 200						
Pulse-to-pulse energy stability, 12 h [4]	< 0.5%						
Long-term power stability, 100 h [4]	< 0.5%						
MAIN OPTIONS							
Oscillator output [5]	1 – 7 W, 50 – 250 fs, ≈ 1035 nm, ≈ 76 MHz						
Harmonic generator [6]	515 nm, 343 nm, 257 nm, or 206 nm; refer to PHAROS HG or HIRO						
Optical parametric amplifier [7]	UV – MIR; refer to I-OPA or ORPHEUS						
BiBurst option	Tunable GHz and MHz burst with burst-in-burst capability; refer to BiBurst						
CEP stabilization	Refer to CEP & RRL Option						
Repetition rate locking							
PHYSICAL DIMENSIONS							
Laser head (L × W × H) [8]	730 × 419 × 230 mm				827 × 492 × 250 mm	770 × 419 × 230 mm	
Chiller (L × W × H)	590 × 484 × 267 mm						
24 V DC power supply (L × W × H) [8]	280 × 144 × 49 mm						
ENVIRONMENTAL & UTILITY REQUIREMENTS							
Operating temperature	15 – 30 °C (air conditioning recommended)						
Relative humidity	< 80% (non-condensing)						
Electrical requirements – Laser	100 V AC, 12 A – 240 V AC; 5 A, 50 – 60 Hz						
Electrical requirements – Chiller	100 – 230 V AC; 50 – 60 Hz						
Rated power – Laser	1000 W						
Rated power – Chiller	1400 W						
Power consumption – Laser	600 W						
Power consumption – Chiller	1000 W						

[1] *Precise wavelengths for specific models are available upon request.*

[2] *Assuming a Gaussian pulse shape.*

[3] *FW 1/e², measured at laser output, using maximum pulse energy.*

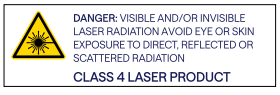
[4] *Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).*

[5] *Available simultaneously. Contact sales@lightcon.com for more details or customized solutions.*

[6] *Integrated except for PH2-5mJ. For an external harmonic generator, refer to HIRO.*

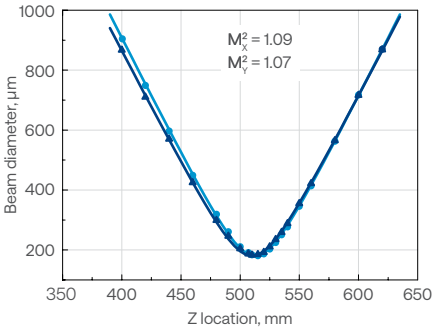
[7] *Integrated except for PH2-5mJ. For more options and OPAs for -5mJ and -UP models, refer to the ORPHEUS series of OPAs.*

[8] *Dimensions depend on the laser configuration and integrated options.*

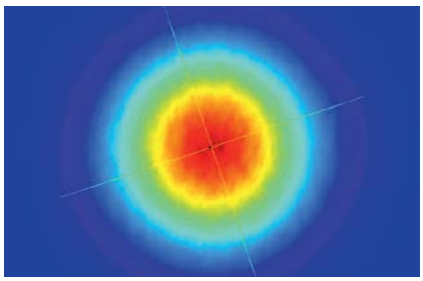


Beam properties

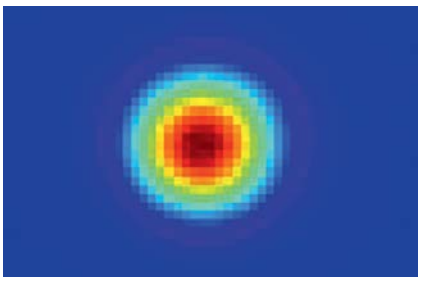
PHAROS
Typical M^2 measurement data



PHAROS
Typical near-field beam profile

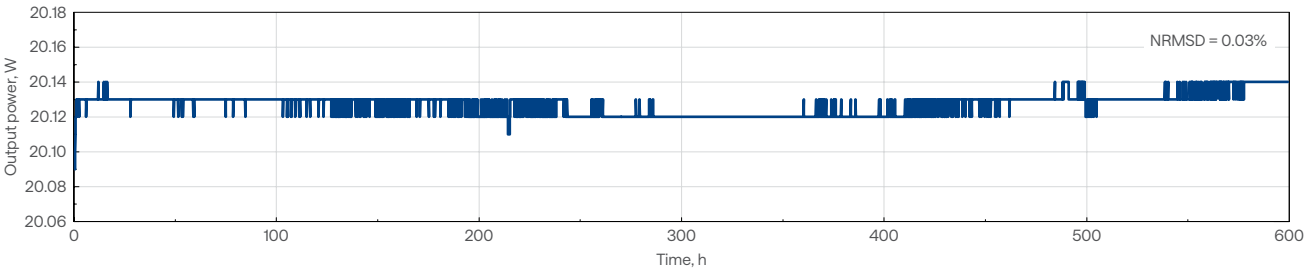


PHAROS
Typical far-field beam profile

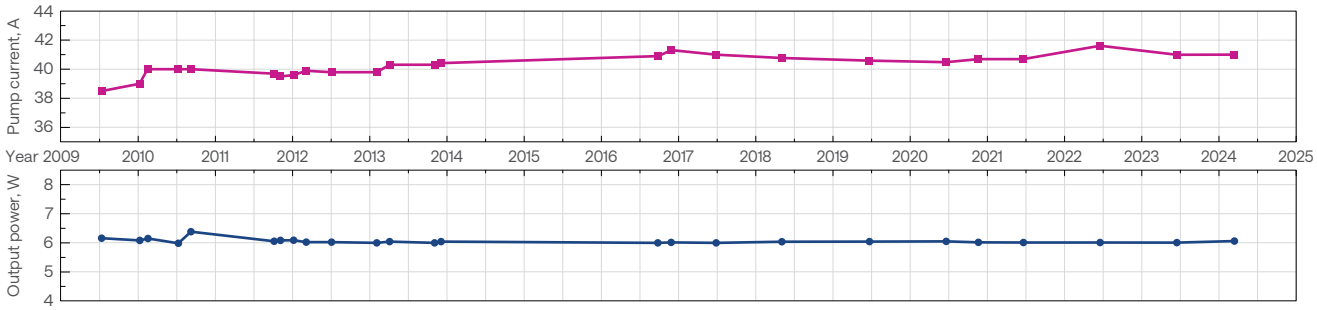


Stability measurements

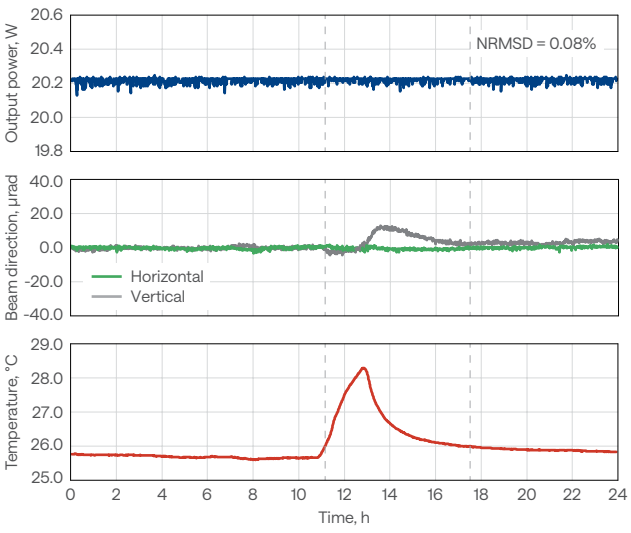
PHAROS
Long-term power stability



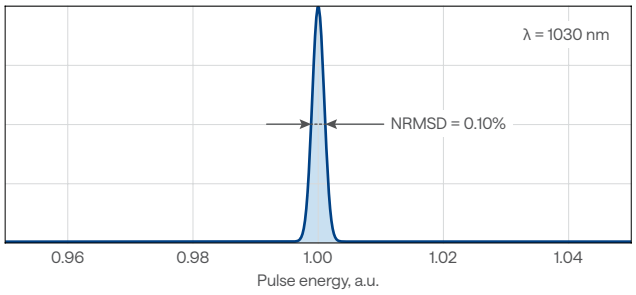
Output power of industrial-grade **PHAROS** lasers operating 24/7 and the current of the pump diodes over the years



PHAROS output power and beam pointing stability with power lock enabled, across varying environmental conditions



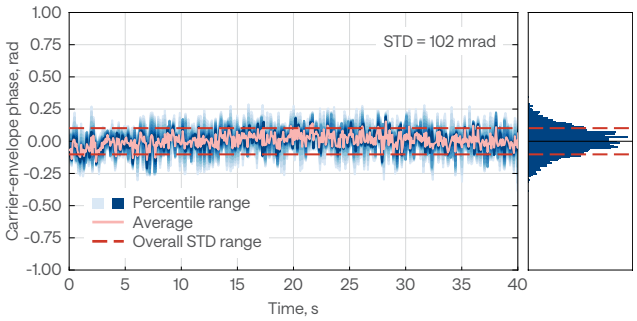
PHAROS
Typical pulse-to-pulse energy stability



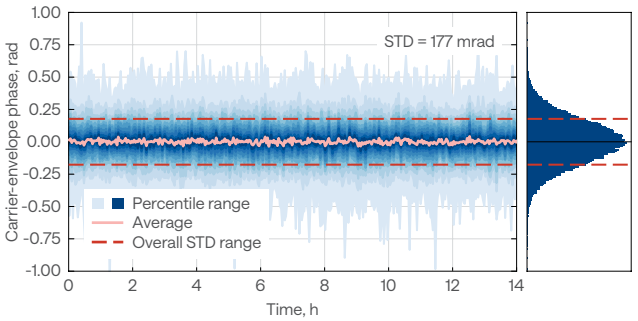
CEP stabilization

PHAROS lasers can be equipped with feedback electronics for carrier-envelope phase (CEP) stabilization of the output pulses. The carrier-envelope offset (CEO) of the **PHAROS** oscillator is actively locked to 1/4th of the repetition rate with a < 100 mrad standard deviation. The CEP stable pulses from the synchronized amplifier have a < 350 mrad standard deviation. The CEP drift occurring inside the amplifier and the user's setup can be compensated with an out of loop f-2f interferometer, which is a part of the complete **PHAROS** active CEP stabilization package.

PHAROS
Short-term CEP stability operating at 200 kHz repetition rate



PHAROS
Long-term CEP stability operating at 200 kHz repetition rate

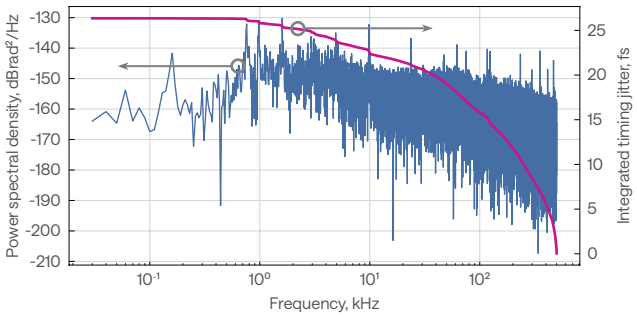


Repetition rate locking

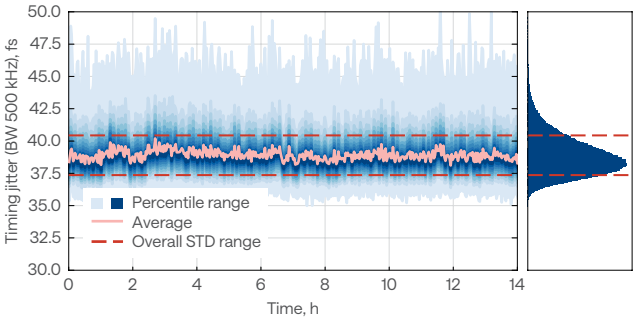
The oscillators in **PHAROS** lasers can be customized for repetition rate locking applications. Coupled with the necessary feedback electronics, the oscillator's repetition rate can be synchronized to an external RF source using the two piezo stages installed within the cavity.

The repetition rate locking system ensures an integrated timing jitter of less than 200 fs for RF reference frequencies above 500 MHz. Additionally, continuous phase shifting is available upon request.

Phase noise data of **PHAROS** oscillator
locked to a 2.8 GHz RF source

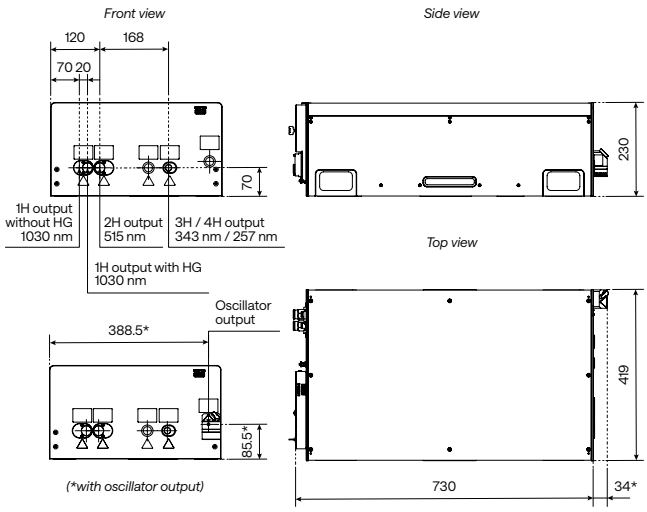


Timing jitter stability over 14 h
PHAROS oscillator locked to a 2.8 GHz RF source

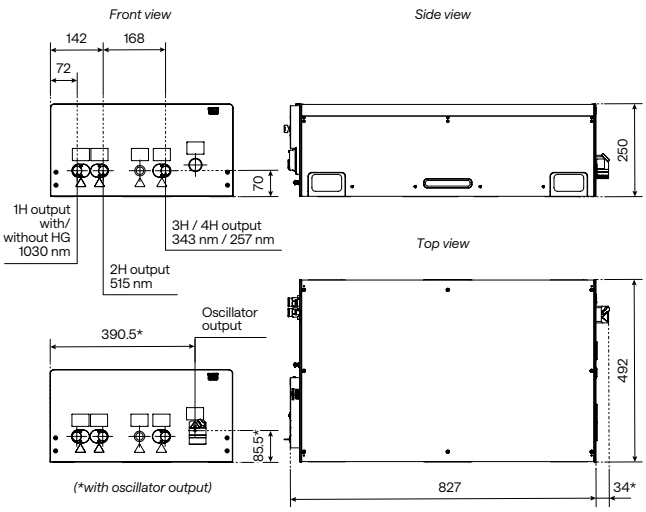


Drawings

PHAROS-PH2-730
-10W or -20W-SP with a FEC or BiBurst option, or a harmonic generator



PHAROS-PH2-827
-10W with an -HE harmonic generator option, or -5mJ



The drawings depend on the exact configuration. If crucial for integration, please contact sales@lightcon.com.

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