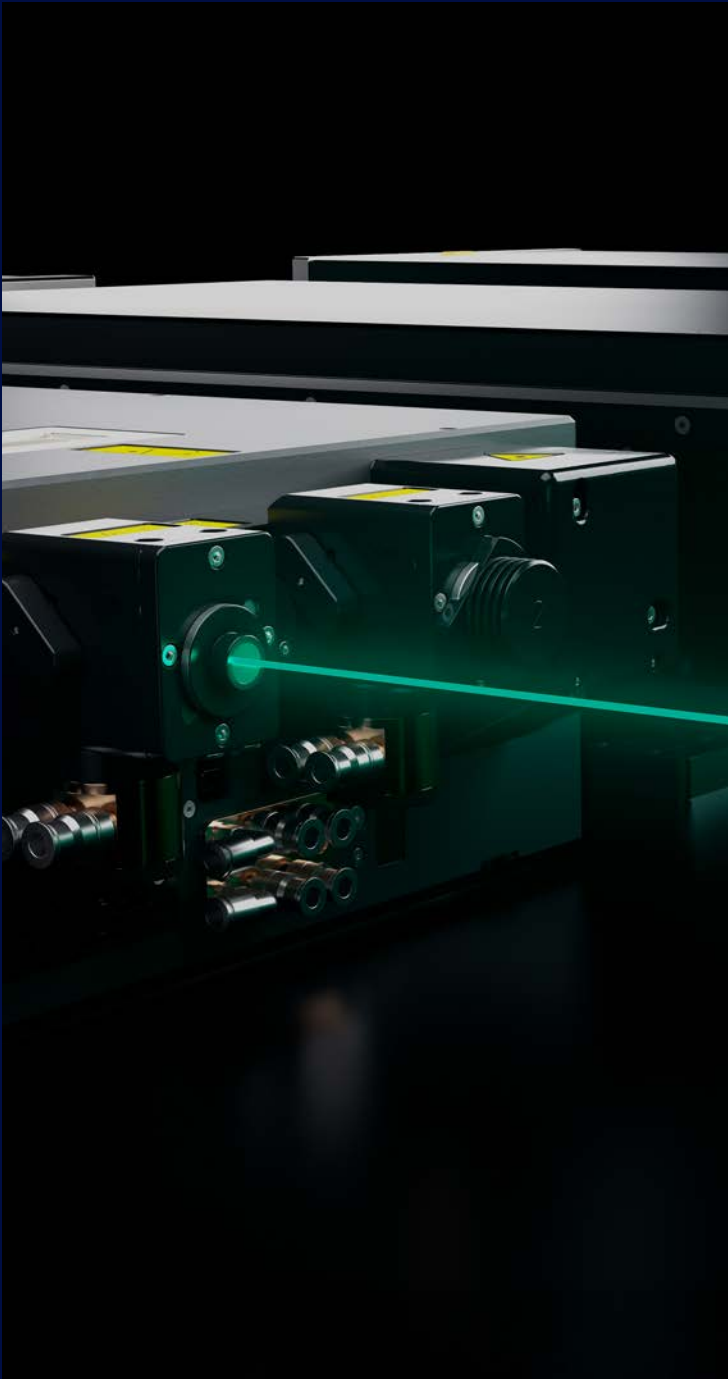


Wavelength-Tunable Sources

Product Catalog



LIGHT CONVERSION is a global leader in ultrafast technology, designing and manufacturing:

- > Femtosecond Lasers,
- > Wavelength-Tunable Sources,
- > OPCPA Systems,
- > Microscopy Sources,
- > Spectroscopy Systems.

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

About Us

Founded in 1994, LIGHT CONVERSION has evolved into a leading company in ultrafast laser technology with over 9000 systems installed worldwide and 600 employees, 15% of whom focus on R&D. The company's lasers are used in all of the top 50 universities worldwide, 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.

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Wavelength-Tunable Sources

LIGHT CONVERSION's OPAs offer a broad tuning range from deep-UV to mid-IR. Coupled with our femtosecond lasers, these OPAs provide an invaluable source for ultrafast spectroscopy, nonlinear microscopy, and a variety of other scientific applications.

I-OPA

The only commercial industrial-grade OPA combines wavelength tunability with robust industrial design.

ORPHEUS | NEO

The next-generation of OPAs with exceptional stability and multiple detectors for continuous power monitoring and diagnostics.

ORPHEUS

Classic OPAs that many are used to. Just like TOPAS, they are quite simple yet offer an extensive range of parameters.

Continuous wavelength tunability from UV to MIR

Pulse duration from tens of femtoseconds to a few picoseconds

Leading OPA manufacturer for more than 30 years

I-OPA

Industrial-Grade Optical Parametric Amplifier



I-OPA-TW on air-cooled CARBIDE-CB5

Wavelength tunability
in an industrial design

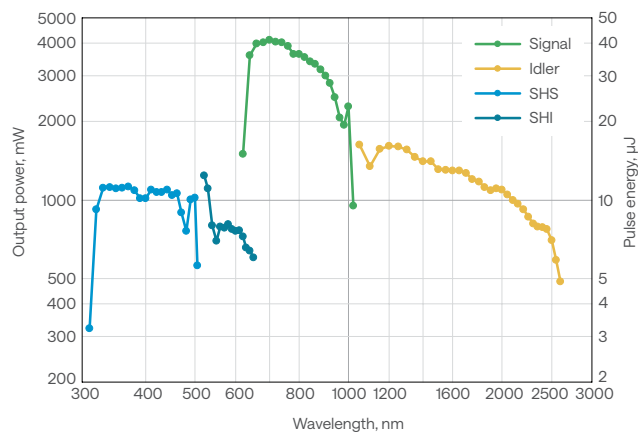
Single-box solution

Tunable or fixed-wavelength
models

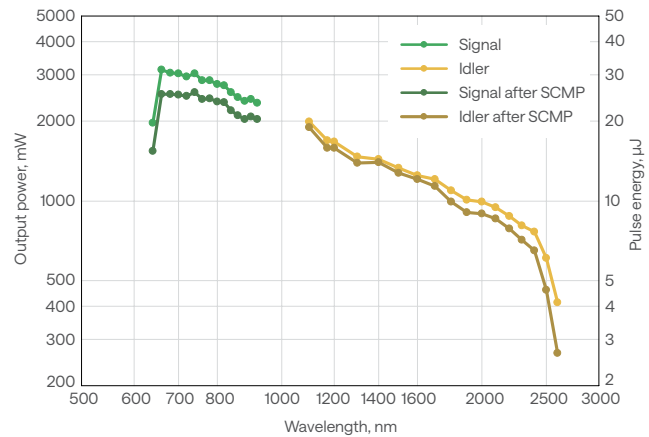
Plug-and-play installation and
robust performance

The most compact OPA
in the market

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



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



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 μ J		
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 μ J pump; up to 1 MHz)		> 9% @ 1550 nm (40 – 400 μ J pump; up to 1 MHz)
	> 3.5% @ 700 nm (20 – 40 μ J pump; up to 2 MHz)		> 6% @ 1550 nm (20 – 40 μ J 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 – 10000 nm (DFG)
Pulse compression options ²⁾	n/a	SCMP (signal pulse compressor) ICMP (idler pulse compressor) GDD-CMP (compressor with GDD control)	n/a

PUMP LASER REQUIREMENTS

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

ENVIRONMENTAL & UTILITY REQUIREMENTS

Operating temperature ⁶⁾	19 – 25 $^{\circ}$ C (air conditioning recommended)
Relative humidity ⁶⁾	20 – 70% (non-condensing)
Electrical requirements	n/a ⁷⁾

¹⁾ In case of 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 – 900 nm, 40 – 100 fs @ 1200 – 2000 nm.

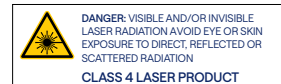
³⁾ Output pulse duration depends on selected wavelength and pump laser pulse duration.

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

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

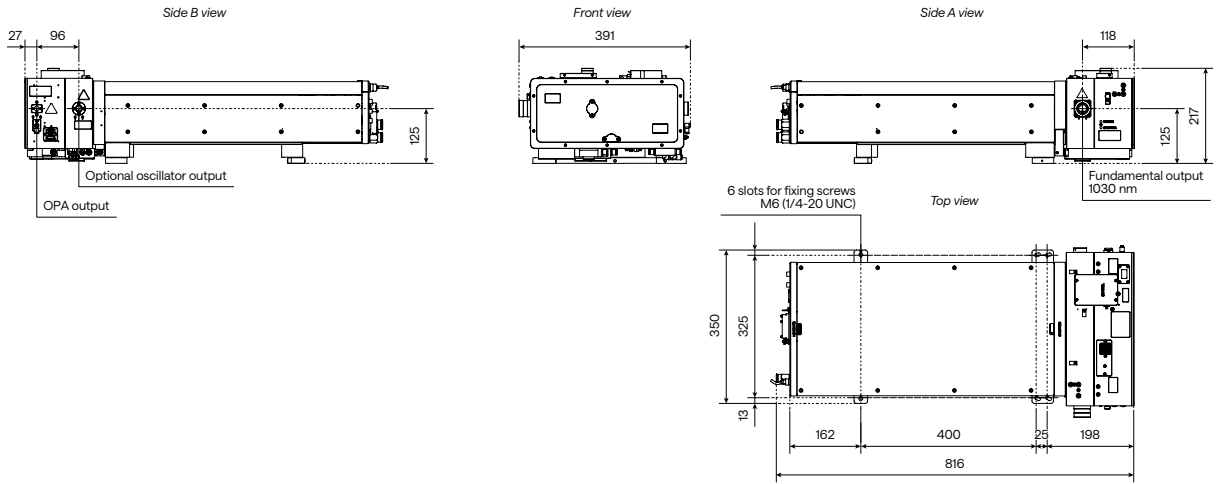
⁶⁾ Specifications are guaranteed for a maximum temperature variation of \pm 1 $^{\circ}$ C and humidity variation of \pm 10%.

⁷⁾ I-OPA is powered by the same electrical source as the pump laser. Thus, refer to the pump laser electrical requirements.

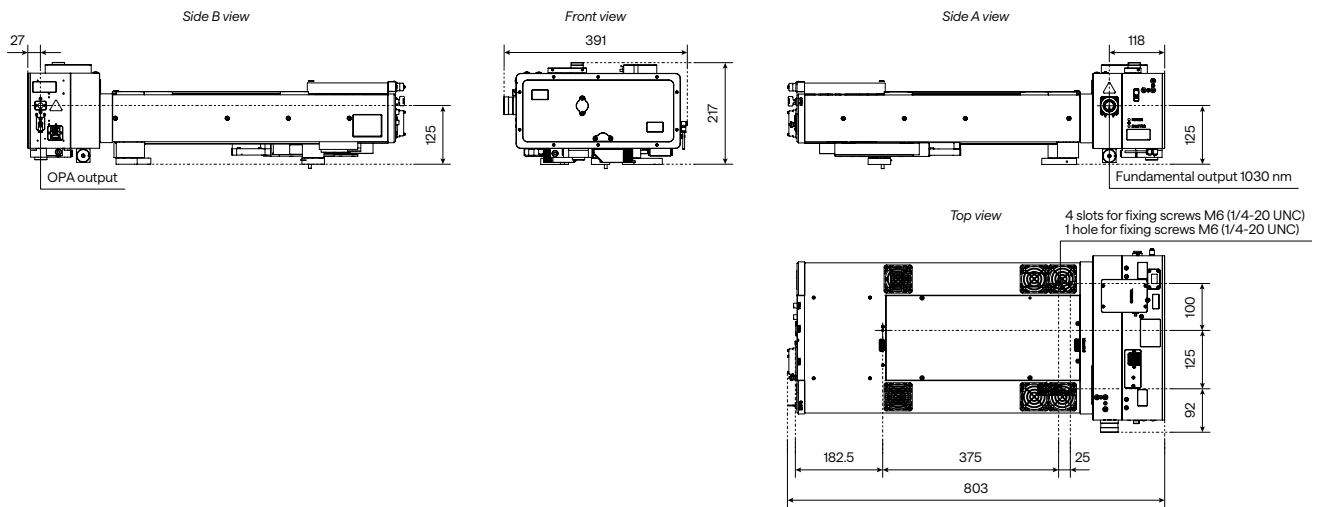


Drawings

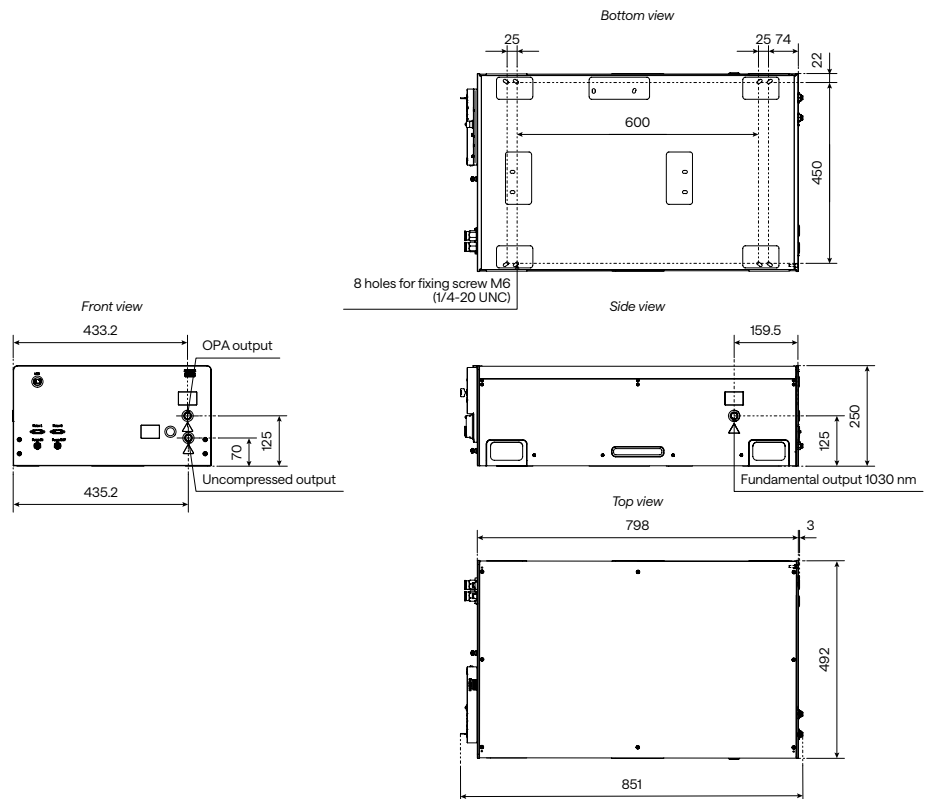
CARBIDE-CB3 with I-OPA-HP drawing and output ports



CARBIDE-CB5 with I-OPA-HP drawing and output ports



PHAROS-PH2 with I-OPA-HP drawing and output ports



Next-Generation Optical Parametric Amplifier



From UV to MIR

Continuous power monitoring and diagnostics

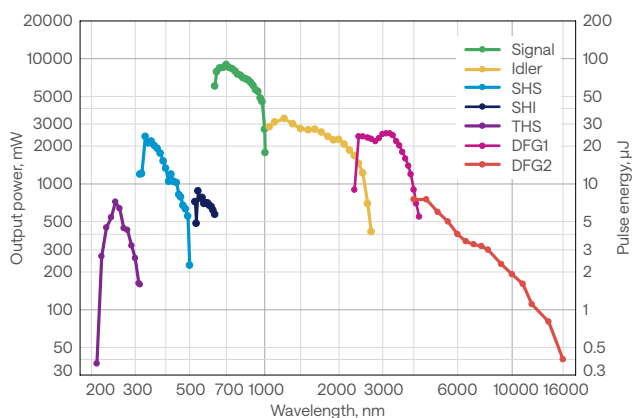
Pumped by PHAROS-UP for ultrashort pulses

Up to 80 W, 800 μ J pump at up to 2 MHz

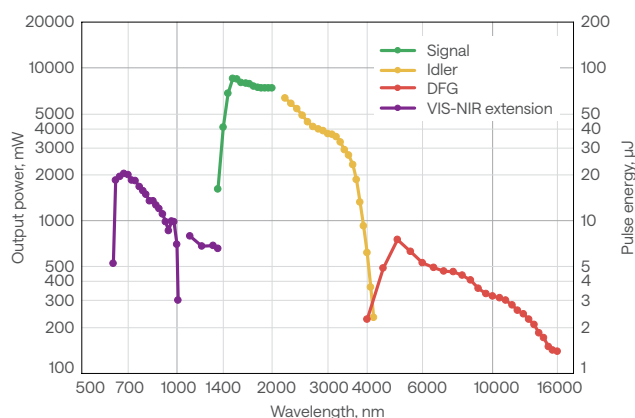
Fully integrated wavelength extensions

Exceptional output stability

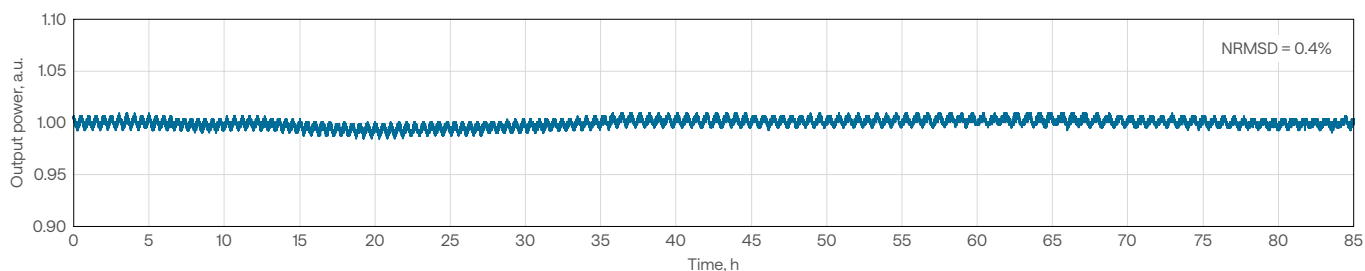
ORPHEUS-NEO typical tuning curves in HP configuration.
Pump: 80 W, 800 μ J, 100 kHz



ORPHEUS-NEO-ONE typical tuning curves in ONE configuration.
Pump: 80 W, 800 μ J, 100 kHz



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



ORPHEUS-NEO specifications

Model	ORPHEUS-NEO	ORPHEUS-NEO-ONE
Configuration	ORPHEUS	ORPHEUS-ONE
Pump power	Up to 80 W	
Pump pulse energy	20 – 800 μ J	
Repetition rate	Up to 2 MHz	
Tuning range	640 – 1000 nm (signal) 1050 – 2600 nm (idler)	1400 – 2000 nm (signal) 2100 – 4200 nm (idler)
Conversion efficiency	> 7% @ 700 nm (40 – 800 μ J pump; up to 1 MHz)	> 9% @ 1550 nm (40 – 800 μ J pump; up to 1 MHz)
	> 3.5% @ 700 nm (20 – 40 μ J pump; up to 2 MHz)	> 6% @ 1550 nm (20 – 40 μ J pump; up to 2 MHz)
Spectral bandwidth	60 – 220 cm^{-1} @ 700 – 960 nm	50 – 150 cm^{-1} @ 1450 – 2000 nm
Pulse duration ¹⁾	120 – 400 fs	100 – 400 fs
Beam quality, M^2	< 1.3 @ 800 nm	< 1.3 @ 1550 nm
Beam diameter ²⁾	2.1 \pm 0.6 mm @ 800 nm	2.1 \pm 0.6 mm @ 1550 nm
Beam divergence (full-angle)	< 2 mrad @ 800 nm	< 4 mrad @ 1550 nm
Long-term power stability, 8 h ³⁾	< 1% @ 800 nm	< 1% @ 1550 nm
Pulse-to-pulse energy stability, 1 min ³⁾	< 1% @ 800 nm	< 1% @ 1550 nm
Wavelength extension options; conversion efficiency	210 – 320 nm (THS); > 0.4% @ 250 nm	640 – 1000 nm and 1050 – 1350 nm (VIS-NIR); > 1% @ 700 nm
	320 – 500 nm (SHS) and 525 – 640 nm (SHI); > 1.2% @ 350 nm	
	2500 – 4200 nm (DFG1); > 3% @ 3000 nm	4000 – 16000 nm (DFG); > 0.3% @ 10000 nm (for > 40 μ J pump)
	4000 – 16000 nm (DFG2); > 0.2% @ 10000 nm	

PUMP LASER REQUIREMENTS

Configuration	PHAROS or CARBIDE
Center wavelength	1030 \pm 10 nm
Maximum pump power	80 W
Maximum repetition rate	2 MHz
Pump pulse energy	20 – 800 μ J
Pump pulse duration	180 – 500 fs

ENVIRONMENTAL & UTILITY REQUIREMENTS

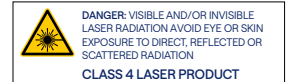
Operating temperature ⁴⁾	19 – 25 °C (air conditioning recommended)
Relative humidity ⁴⁾	20 – 70% (non-condensing)
Electrical requirements	100 – 240 V AC, 4.5 A; 50 – 60 Hz
Rated power	280 W
Power consumption	Standby: 20 W Max during wavelength tuning: 200 W

¹⁾ Output pulse duration depends on selected wavelength and pump laser pulse duration.

²⁾ $FW\ 1/e^2$, measured at laser output, using maximum pulse energy.

³⁾ Expressed as normalized root mean squared deviation (NRMSD).

⁴⁾ Specifications are guaranteed for a maximum temperature variation of ± 1 °C and humidity variation of $\pm 10\%$.



ORPHEUS-NEO-UP specifications

Model	ORPHEUS-NEO-UP	ORPHEUS-NEO-ONE-UP
Configuration	ORPHEUS	ORPHEUS-ONE
Pump power	Up to 20 W	
Pump pulse energy	20 – 400 μ J	
Repetition rate	Up to 1 MHz	
Tuning range	640 – 1000 nm (signal) 1050 – 2600 nm (idler)	1450 – 2000 nm (signal) 2100 – 4500 nm (idler)
Conversion efficiency	> 7% @ 700 nm	> 9% @ 1550 nm
Spectral bandwidth	120 – 300 cm^{-1} @ 700 – 2600 nm	150 – 300 cm^{-1} @ 1500 – 1900 nm & 2200 – 3500 nm ¹⁾
Pulse duration ²⁾	< 100 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
Beam diameter ³⁾	2.1 \pm 0.6 mm @ 800 nm	2.1 \pm 0.6 mm @ 1550 nm
Beam divergence (full-angle)	< 2 mrad @ 800 nm	< 4 mrad @ 1550 nm
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; conversion efficiency	210 – 320 nm (THS); > 0.2% @ 250 nm	640 – 1000 nm and 1050 – 1450 nm (VIS-NIR); > 1% @ 700 nm
	320 – 500 nm (SHS) and 525 – 640 nm (SHI); > 1.2% @ 350 nm	
	2500 – 4500 nm (DFG1); > 3% @ 3000 nm	
	4500 – 14000 nm (DFG2); > 0.1% @ 10000 nm	

PUMP LASER REQUIREMENTS

Configuration	PHAROS-UP
Center wavelength	1030 \pm 10 nm
Maximum pump power	20 W
Maximum repetition rate	1 MHz
Pump pulse energy	20 – 400 μ J
Pump pulse duration	80 – 100 fs

ENVIRONMENTAL & UTILITY REQUIREMENTS

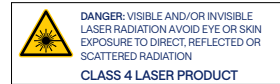
	Refer to www.lightcon.com
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¹⁾ Spectral bandwidth is equal to 150 – 250 cm^{-1} @ 5000 – 12000 nm.

²⁾ Output pulse duration depends on selected wavelength and pump laser pulse duration.

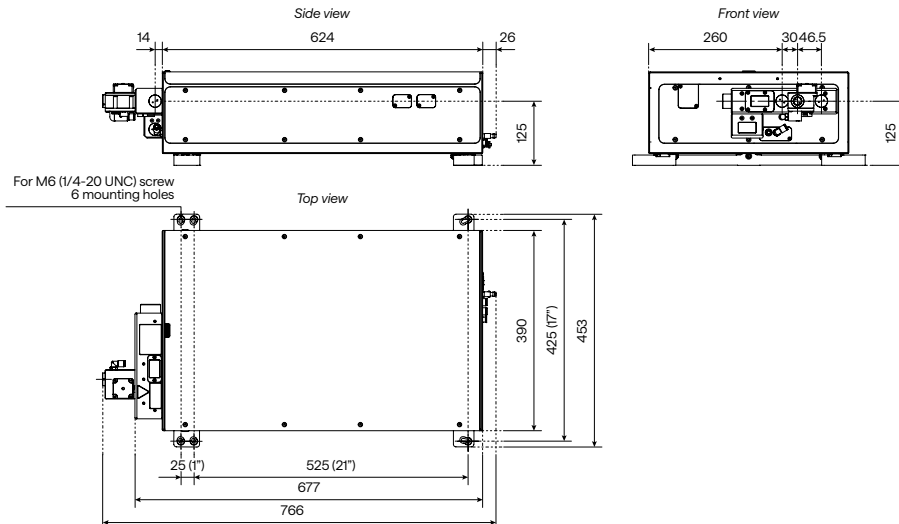
³⁾ $FW 1/e^2$, measured at laser output, using maximum pulse energy.

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



Drawings

ORPHEUS-NEO / ORPHEUS-NEO-UP drawings



Collinear Optical Parametric Amplifier



Continuous tunability
from UV to MIR, 190 – 16000 nm

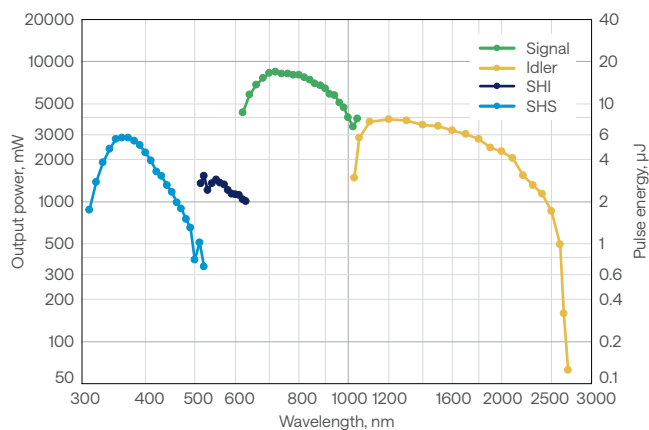
High energy and high power
models for all needs

Single-shot – 2 MHz
repetition rate

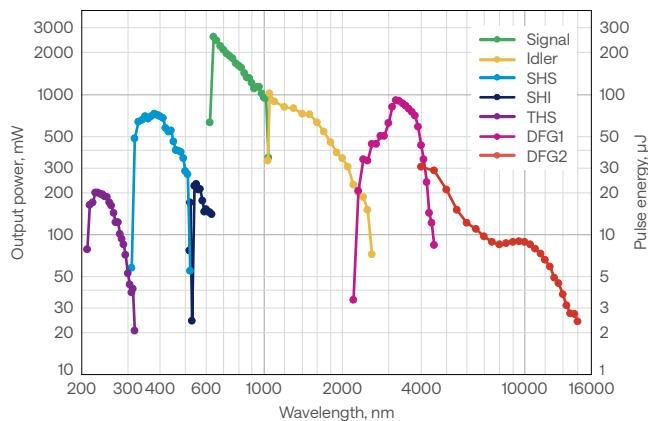
Up to 80 W pump power

Up to 2 mJ pump pulse energy

ORPHEUS-HP typical tuning curves.
Pump: 80 W, 160 μ J, 500 kHz



ORPHEUS-HE typical tuning curves.
Pump: 20 W, 2 mJ, 10 kHz



For custom tuning curves visit
<http://toolbox.lightcon.com/tools/tuningcurves>

Specifications

Model	ORPHEUS-HP		ORPHEUS-HE
MAIN OUTPUT (630 – 2600 nm)			
Tuning range	630 – 1030 nm (signal) 1030 – 2600 nm (idler)		
Maximum pump power	80 W		
Pump pulse energy	8 – 20 μ J	20 – 400 μ J	400 – 2000 μ J
Conversion efficiency at peak	> 4.5% (signal) > 2% (idler)	> 9% (signal) > 4% (idler)	
Pulse duration	120 – 400 fs		
Spectral bandwidth @ 700 – 960 nm	60 – 220 cm^{-1}		
Long-term power stability, 8 h ¹⁾	< 2% @ 800 nm		
Pulse-to-pulse energy stability, 1 min ¹⁾	< 2% @ 800 nm		

WAVELENGTH EXTENSIONS (190 – 16000 nm)

Pump pulse energy	8 – 20 μ J	20 – 400 μ J	400 – 2000 μ J
315 – 630 nm (SHS/SHI)	> 1.2% @ 350 nm	> 2.4% @ 350 nm	
210 – 315 nm (THS)	> 0.4% @ 250 nm ²⁾	> 0.8% @ 250 nm ²⁾	
190 – 215 nm (DUV)	n/a	> 0.3% @ 200 nm ³⁾	Contact sales@lightcon.com
2200 – 4200 nm (DFG1)	> 1.5% @ 3000 nm	> 3% @ 3000 nm	
4000 – 16 000 nm (DFG2)	> 0.1% @ 10000 nm	> 0.2% @ 10000 nm	

PUPM LASER REQUIREMENTS

Pump laser	PHAROS or CARBIDE		
Center wavelength	1030 \pm 10 nm		
Maximum pump power	80 W		
Maximum repetition rate	2 MHz	200 kHz	
Pump pulse energy	8 – 400 μ J	400 – 2000 μ J	
Pulse duration ⁴⁾	180 – 500 fs		

ENVIRONMENTAL & UTILITY REQUIREMENTS

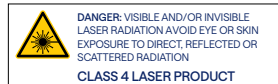
Refer to www.lightcon.com

¹⁾ Expressed as normalized root mean squared deviation (NRMSD).

²⁾ Maximum output power of 400 mW.

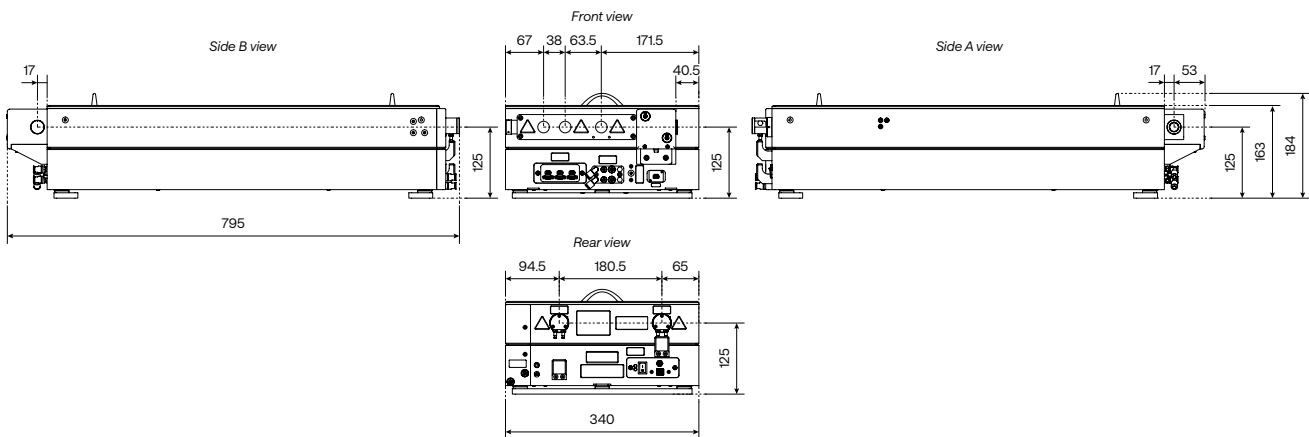
³⁾ DUV conversion efficiency is specified for pump power up to 10 W and up to 200 kHz. In case of higher pump power, conversion efficiency decreases. Maximum output power of 40 mW @ 200 nm.

⁴⁾ FWHM, assuming Gaussian pulse shape.



Drawings

ORPHEUS-HP/HE drawings



Broad-Bandwidth Hybrid Optical Parametric Amplifier



Combination of best collinear and non-collinear OPA features

Ultrashort pulses in NIR (650 – 900 nm and 1200 – 2500 nm)

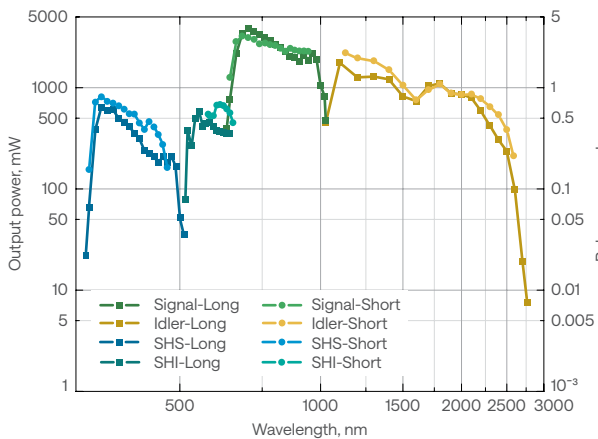
Single-shot – 2 MHz repetition rate

< 100 fs pulse duration

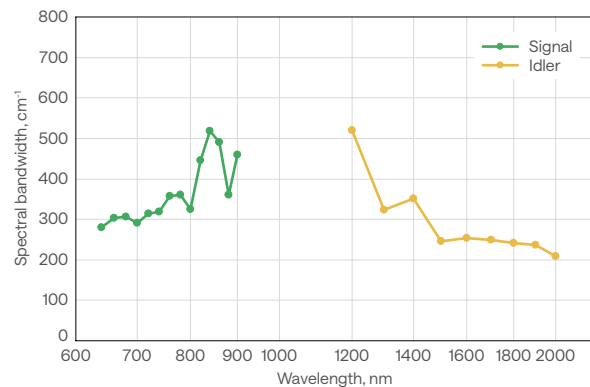
Adjustable spectral bandwidth

Optional long pulse mode for gap-free tunability

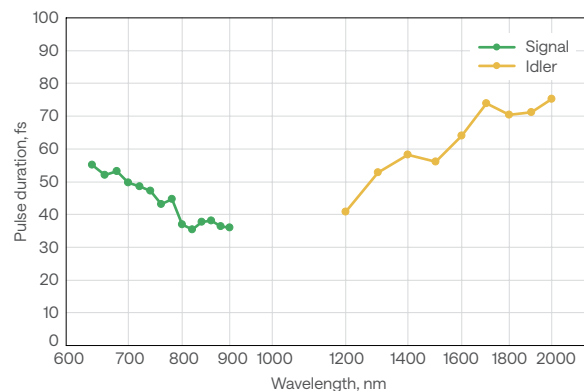
ORPHEUS-F typical tuning curves.
Pump: 40 W, 40 μ J, 1000 kHz



ORPHEUS-F typical spectral bandwidth



ORPHEUS-F pulse duration after compression



For custom tuning curves visit
<http://toolbox.lightcon.com/tools/tuningcurves>

Specifications

MAIN OUTPUT (650 – 900 nm and 1200 – 2500 nm)

Mode of operation	Short pulse mode ¹⁾	Long pulse mode
Tuning range	650 – 900 nm (signal) 1200 – 2500 nm (idler)	650 – 1010 nm (signal) 1050 – 2500 nm (idler)
Maximum pump power	80 W	
Pump pulse energy	10 – 500 μ J	
Conversion efficiency ²⁾	> 7% @ 700 nm	
Integrated 2H (515 nm) generation efficiency ³⁾	> 35%	
Pulse duration before compression ¹⁾	< 290 fs	
Spectral bandwidth	200 – 750 cm^{-1} @ 650 – 900 nm	60 – 220 cm^{-1} @ 650 – 900 nm
Pulse duration after compressor ¹⁾	< 55 fs @ 800 – 900 nm < 70 fs @ 650 – 800 nm < 100 fs @ 1200 – 2000 nm	n/a
Compressor transmission	> 65% @ 650 – 900 nm > 80% @ 1200 – 2000 nm	
Long-term power stability, 8 h ⁴⁾	< 2% @ 800 nm	
Pulse-to-pulse energy stability, 1 min ⁴⁾	< 2% @ 800 nm	

WAVELENGTH EXTENSION OPTIONS (325 – 15000 nm) ⁵⁾

325 – 450 nm (SHS)	> 1%	n/a
325 – 505 nm (SHS)	n/a	> 1%
525 – 650 nm (SHI)		> 0.5%
600 – 650 nm (SHI)	> 0.5%	n/a
210 – 252 nm (FHS)		> 0.1%
263 – 325 nm (FHI)	n/a	
2500 – 15000 nm	See ORPHEUS-MIR; page 18	

PUMP LASER REQUIREMENTS

Pump laser	PHAROS or CARBIDE
Center wavelength	1030 \pm 10 nm
Maximum pump power	80 W
Repetition rate	Single-shot – 2 MHz
Pump pulse energy	10 – 500 μ J
Pulse duration ⁶⁾	180 – 500 fs

ENVIRONMENTAL & UTILITY REQUIREMENTS

Refer to www.lightcon.com

¹⁾ In short pulse mode, broadband pulses are compressed externally. Typical pulse duration before compression:

120 – 250 fs, after compression: 25 – 70 fs @ 650 – 900 nm, 40 – 100 fs @ 1200 – 2000 nm.

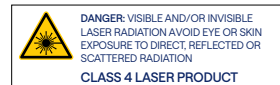
²⁾ Specified as a percentage of pump power, before compressor. Conversion efficiency at peak is equal to 10% for signal and idler combined.

³⁾ At designated output port; not simultaneous to OPA output.

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

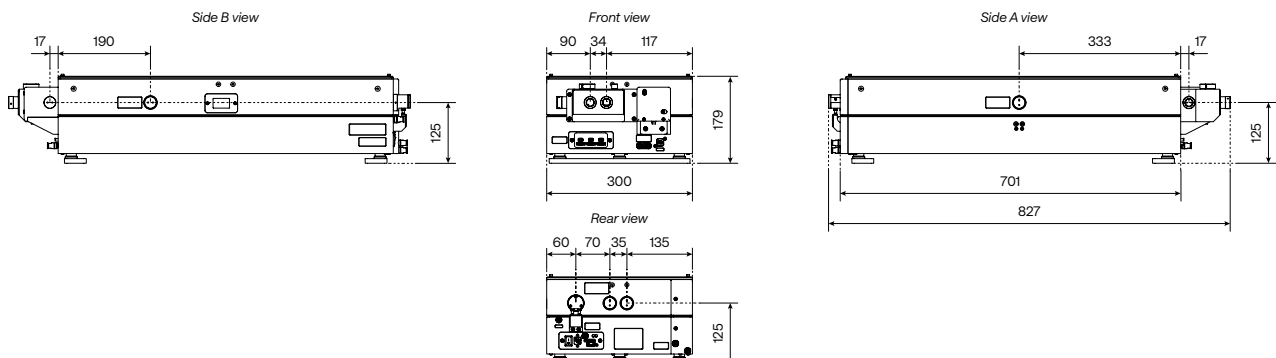
⁵⁾ For > 15 μ J pump pulse energy.

⁶⁾ FWHM, assuming Gaussian pulse shape.



Drawings

ORPHEUS-F drawings



Mid-Infrared Collinear Optical Parametric Amplifier



High conversion efficiency in MIR, 1400 – 16000 nm

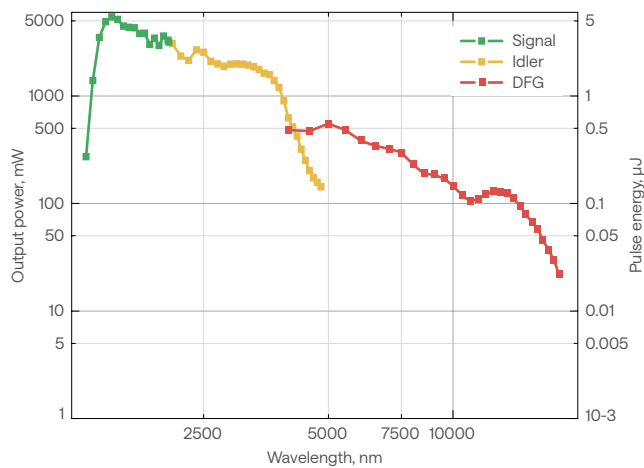
High energy and high power models for all needs

Single-shot – 2 MHz repetition rate

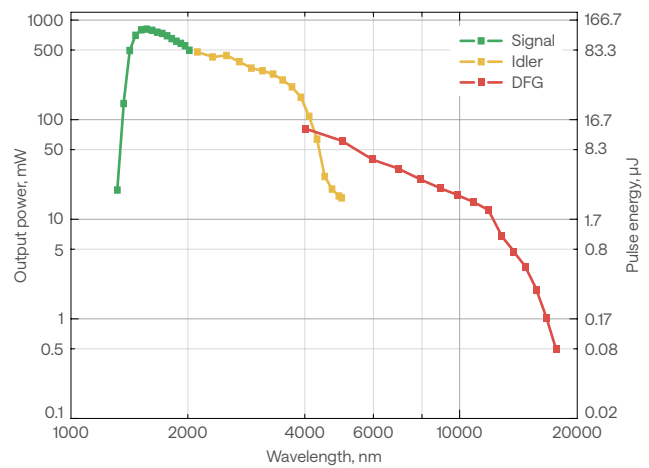
Up to 80 W pump power

Up to 2 mJ pump pulse energy

ORPHEUS-ONE-HP typical tuning curves.
Pump: 40 W, 40 μ J, 1000 kHz



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



For custom tuning curves visit
<http://toolbox.lightcon.com/tools/tuningcurves>

Specifications

Model	ORPHEUS-ONE-HP	ORPHEUS-ONE-HE
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MAIN OUTPUT

Tuning range	1400 – 2000 nm (signal) 2100 – 4200 nm (idler)	
Maximum pump power	80 W	
Pump pulse energy	12 – 400 μ J	400 – 2000 μ J
Conversion efficiency ¹⁾ @ 1550 nm	> 9%, 30 – 2000 μ J pump > 6%, 12 – 30 μ J pump	
Spectral bandwidth	50 – 150 cm^{-1} @ 1450 – 2000 nm	
Long-term power stability, 8 h ²⁾	< 2% @ 1550 nm	
Pulse-to-pulse energy stability, 1 min ²⁾	< 2% @ 1550 nm	

WAVELENGTH EXTENSION (MIR)

Tuning range	4000 – 16000 nm (DFG)	
Conversion efficiency ¹⁾	> 0.3% @ 10000 nm, 30 – 2000 μ J pump > 0.2% @ 10000 nm, 12 – 30 μ J pump	
Spectral bandwidth	50 – 120 cm^{-1} @ 5000 – 8000 nm	

PUMP LASER REQUIREMENTS

Pump laser	PHAROS or CARBIDE	
Center wavelength	1030 \pm 10 nm	
Maximum pump power	80 W	
Maximum repetition rate	2 MHz	200 kHz
Pump pulse energy	12 – 400 μ J	400 – 2000 μ J
Pulse duration ³⁾	180 – 500 fs	

ENVIRONMENTAL & UTILITY REQUIREMENTS

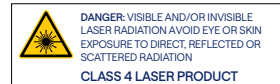
Operating temperature ⁴⁾	19 – 25 $^{\circ}$ C (air conditioning recommended)	
Relative humidity ⁴⁾	20 – 70% (non-condensing)	
Electrical requirements	100 – 240 V AC, 1.4 A; 50 – 60 Hz	
Rated power	120 W	
Power consumption	Standby: 10 W Max during wavelength tuning: 100 W	

¹⁾ Specified as a percentage of pump power.

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

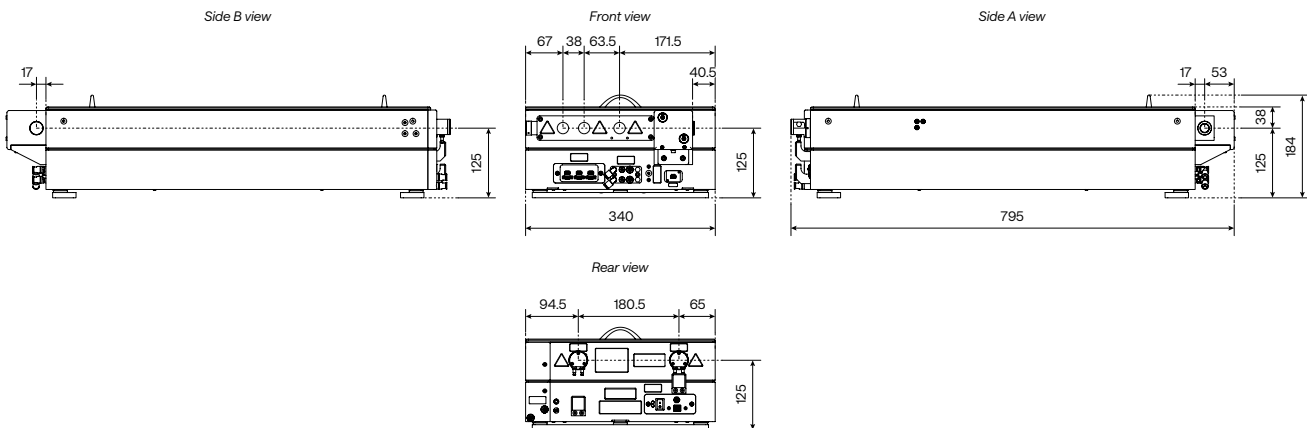
³⁾ FWHM, assuming Gaussian pulse shape.

⁴⁾ Specifications are guaranteed for a maximum temperature variation of ± 1 $^{\circ}$ C and humidity variation of ± 10 %.



Drawings

ORPHEUS-ONE-HP / HE drawings



Broad-Bandwidth Mid-Infrared Optical Parametric Amplifier



Broad-bandwidth MIR pulses at high repetition rate

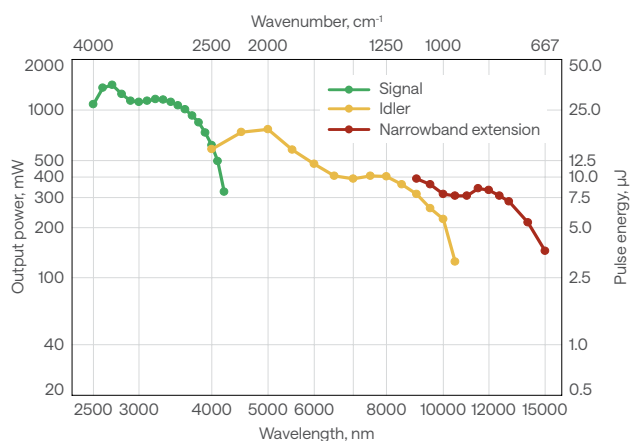
Continuously tunable in 2500 – 15000 nm range

Short-pulse high-energy auxiliary output at 2000 nm

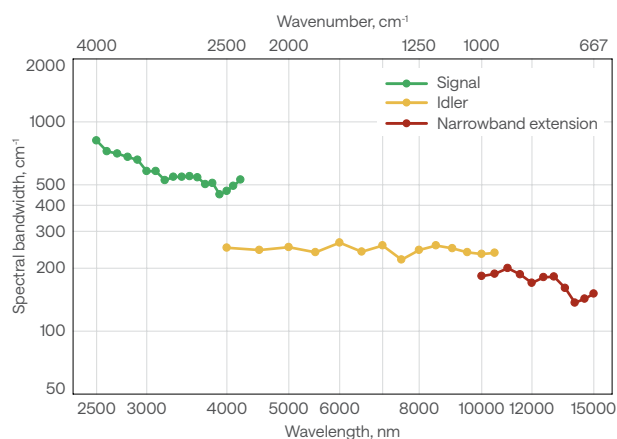
Pumped by industrial-grade lasers for high stability

CEP-stable option

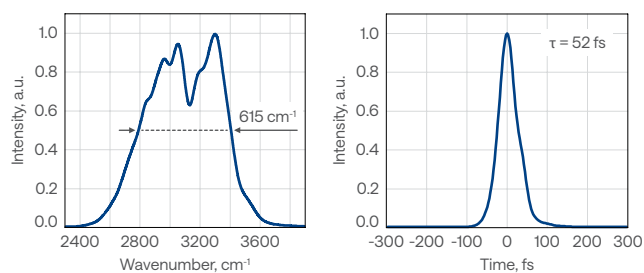
ORPHEUS-MIR typical tuning curves
Pump: 80 W, 2 mJ, 40 kHz



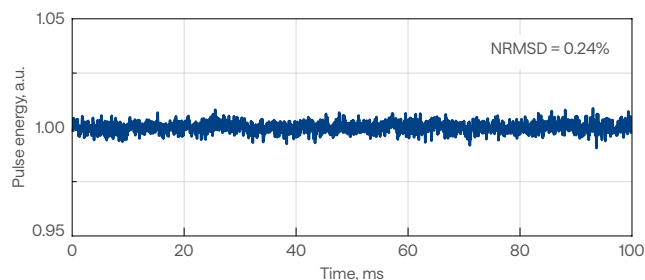
ORPHEUS-MIR typical spectral bandwidth



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	2 500 – 4 000 nm (signal) 4 000 – 10 000 nm (idler)	2 500 – 4 500 nm (signal) 4 500 – 10 000 nm (idler)
Maximum pump power	80 W	
Pump pulse energy	200 μ J – 3 mJ	
Pulse duration	< 100 fs	< 400 fs (< 100 fs with dispersion compensation) ¹⁾
Conversion efficiency ²⁾	> 1.2% @ 3 000 nm > 1.0% @ 3 500 nm > 0.6% @ 5 000 nm > 0.3% @ 9 000 nm	
Spectral bandwidth ³⁾	> 300 cm^{-1} @ 2 500 – 4 000 nm > 200 cm^{-1} @ 4 000 – 10 000 nm	
Long-term power stability, 8 h ⁴⁾	< 2% @ 5 000 nm	
Pulse-to-pulse energy stability, 1 min ⁴⁾	< 2% @ 5 000 nm	

AUXILIARY OUTPUT (2 000 nm)

Output wavelength ⁵⁾	2000 \pm 100 nm
Pulse duration	< 50 fs
Conversion efficiency ²⁾	> 8%
Spectral bandwidth	> 350 cm^{-1}

WAVELENGTH EXTENSION (10 000 – 15 000 nm)

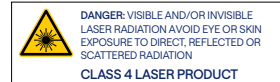
Tuning range ⁶⁾	10 000 – 15 000 nm	n/a
Pulse duration	< 350 fs	
Conversion efficiency ²⁾	> 0.2% @ 12 000 nm	
Spectral bandwidth	100 – 275 cm^{-1}	

PUMP LASER, ENVIRONMENTAL & UTILITY REQUIREMENTS

Refer to www.lightcon.com

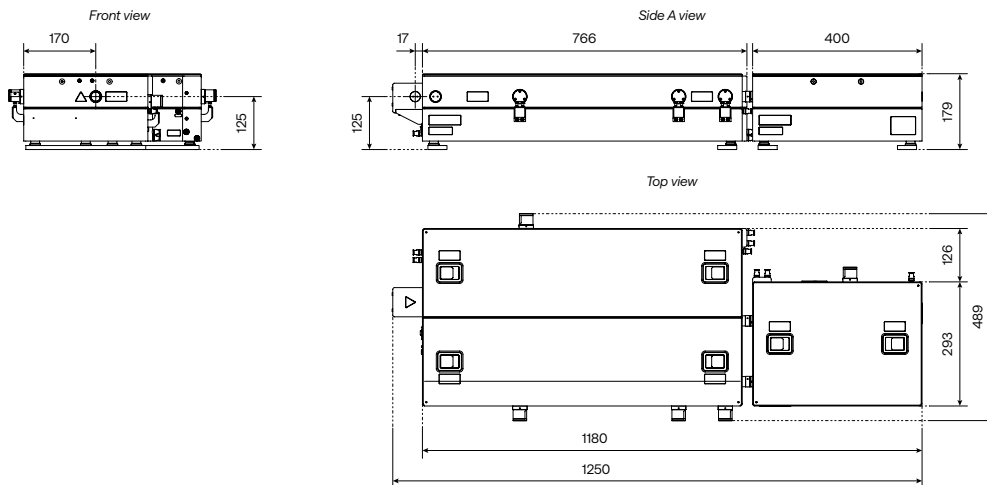
¹⁾ Collinear mode is achieved with additional external separator box. Dispersion compensation is optional.
²⁾ Specified as a percentage of pump power.
³⁾ Full width at half maximum (FWHM).

⁴⁾ Expressed as normalized root mean squared deviation (NRMSD).
⁵⁾ Not tunable, optimized for best overall performance. Not simultaneous to OPA output.
⁶⁾ Not available in collinear-output configuration.



Drawings

ORPHEUS-MIR drawings



Ultrashort-Pulse VIS Optical Parametric Amplifier



Ultrashort UV – VIS – NIR output

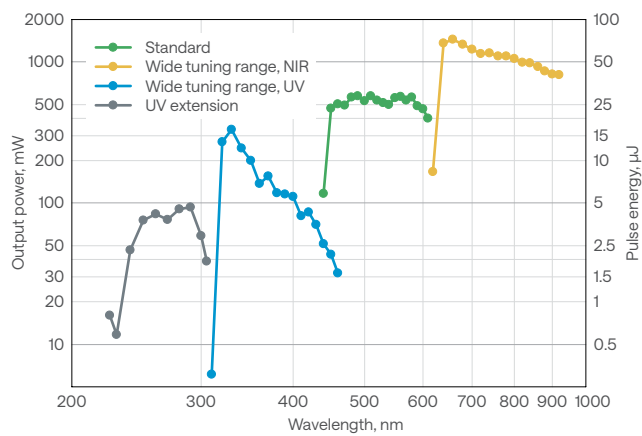
< 50 fs pulse duration at 500 nm

Up to 100 kHz repetition rate

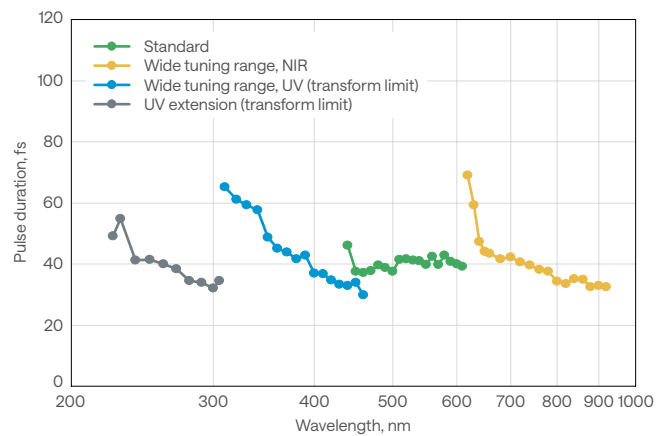
Up to 20 W, 1 mJ pump

Optional UV extension down to 250 nm

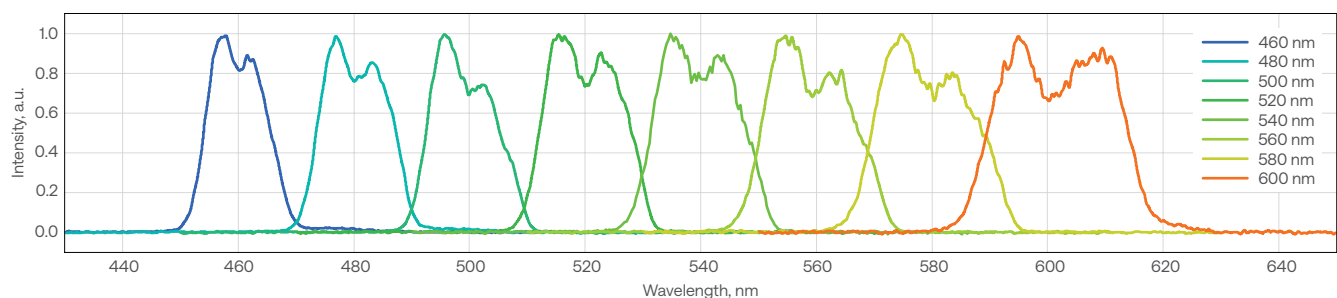
ORPHEUS-VIS tuning curves
Pump: 20 W, 1 mJ



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 μ J	
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	PHAROS or CARBIDE
Center wavelength	1030 \pm 10 nm
Maximum pump power	20 W
Maximum repetition rate	100 kHz
Pump pulse energy	200 – 1000 μ J
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

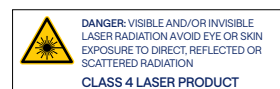
¹⁾ Specified as a percentage of pump power.

²⁾ Full width at half maximum (FWHM)

³⁾ Expressed as normalized root mean squared deviation (NRMSD).

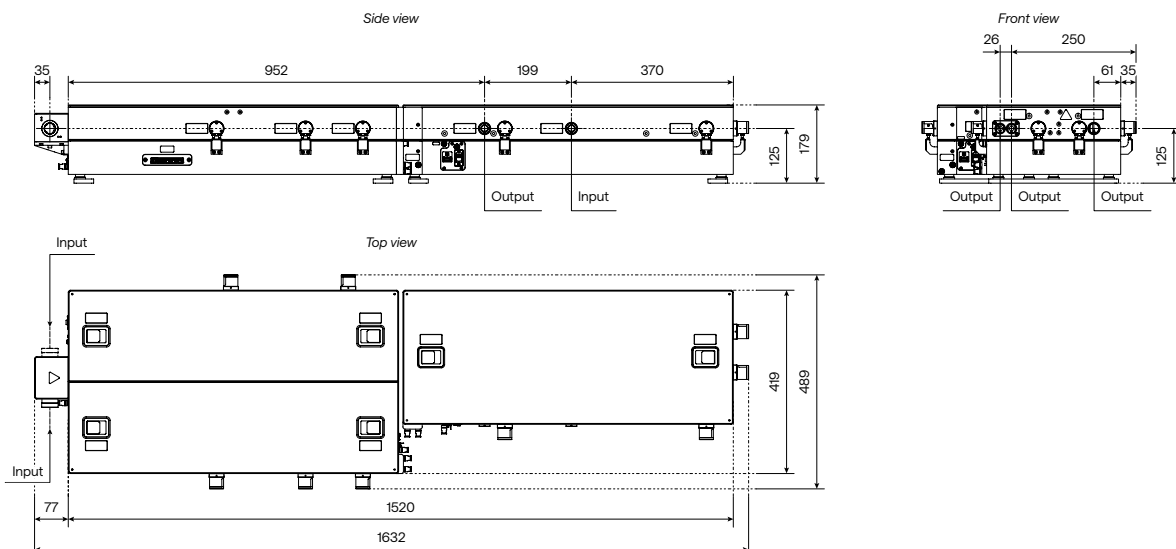
⁴⁾ FWHM, assuming Gaussian pulse shape.

⁵⁾ Specifications are guaranteed for a maximum temperature variation of ± 1 °C and humidity variation of $\pm 10\%$.



Drawings

ORPHEUS-VIS drawings



Non-Collinear Optical Parametric Amplifier



NOPA for the shortest tunable pulses

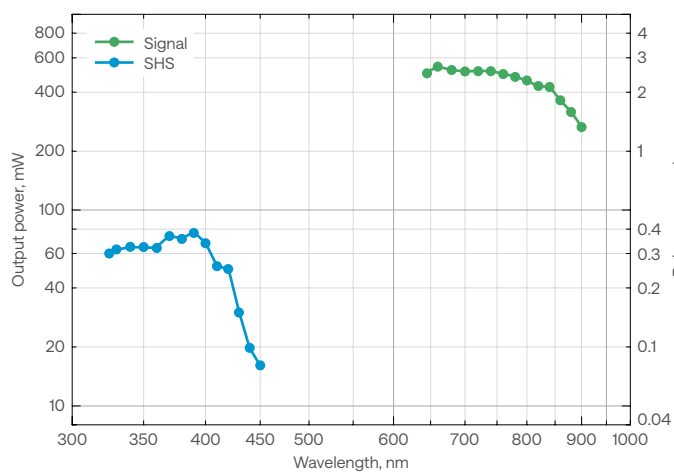
Pulse duration down to < 30 fs

Integrated prism compressor

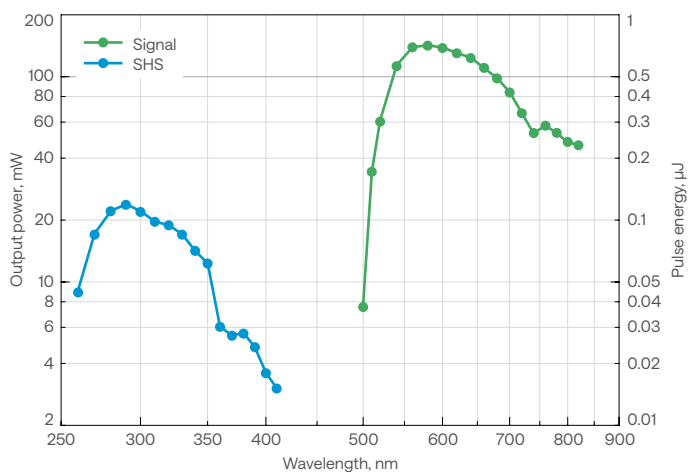
Adjustable spectral bandwidth and pulse duration

Wavelength feedback with internal spectrometer

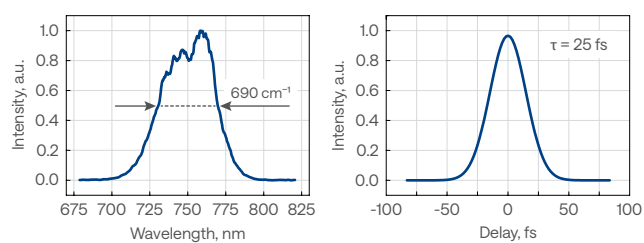
ORPHEUS-N-2H typical tuning curves
Pump: 6 W, 30 μ J, 200 kHz



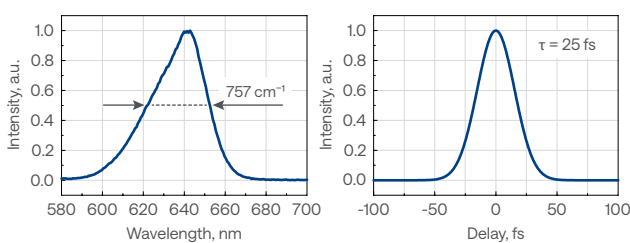
ORPHEUS-N-3H typical tuning curves
Pump: 6 W, 30 μ J, 200 kHz



ORPHEUS-N-2H typical output



ORPHEUS-N-3H typical output



For custom tuning curves visit
<http://toolbox.lightcon.com/tools/tuningcurves>

Specifications

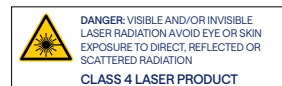
Model	ORPHEUS-N-2H	ORPHEUS-N-3H
MAIN OUTPUT		
Tuning range	650 – 900 nm (signal)	520 – 900 nm (signal)
Maximum pump power	8 W	
Pump pulse energy	10 – 200 μ J	12 – 200 μ J
Conversion efficiency	> 7% @ 700 nm > 5% @ 800 nm	> 1.3% @ 580 nm > 0.7% @ 700 nm > 0.3% @ 800 nm
Integrated 2H / 3H generation efficiency 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	PHAROS or CARBIDE	
Center wavelength	1030 \pm 10 nm	
Maximum pump power	8 W	
Repetition rate	Single-shot – 800 kHz	Single-shot – 600 kHz
Pump pulse energy	10 – 200 μ J	12 – 200 μ J
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).

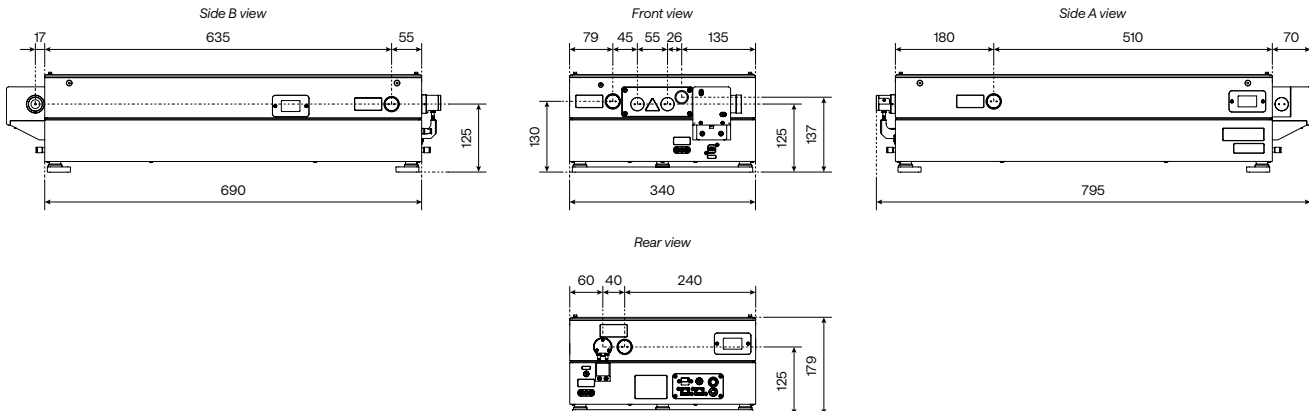
³⁾ FWHM, assuming Gaussian pulse shape.

⁴⁾ Specifications are guaranteed for a maximum temperature variation of \pm 1 °C and humidity variation of \pm 10%.



Drawings

ORPHEUS-N drawings



Dual Optical Parametric Amplifier



Two simultaneous independently tunable outputs

210 – 16000 nm tuning range

Single-shot – 2 MHz repetition rate

Up to 60 W, 0.5 mJ pump

Compact and cost-effective

CEP-stable option

Specifications

MAIN OUTPUT

Tuning range	Choice between ORPHEUS, ORPHEUS-F, and ORPHEUS-ONE configurations
Output pulse energy	Depends on the configuration, see the specifications of the chosen models
Spectral bandwidth	Depends on configuration, 100 – 750 cm^{-1}
Pulse duration	Depends on configuration, down to < 50 fs
Repetition rate	Single-shot – 2 MHz

PUMP LASER REQUIREMENTS

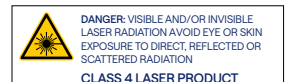
Pump laser	PHAROS or CARBIDE
Center wavelength	1030 \pm 10 nm
Maximum pump power	60 W
Repetition rate	Single-shot – 2 MHz
Pump pulse energy	16 – 500 μJ
Pulse duration ¹⁾	180-300 fs

ENVIRONMENTAL & UTILITY REQUIREMENTS

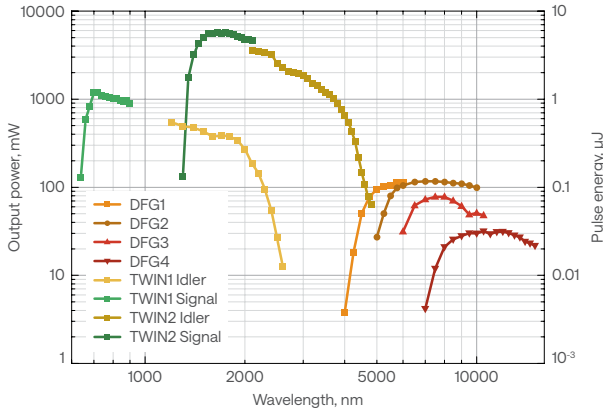
Operating temperature ²⁾	19 – 25 °C (air conditioning recommended)
Relative humidity ²⁾	20 – 70% (non-condensing)
Electrical requirements	100 – 240 V AC, 4.5 A; 50 – 60 Hz
Rated power	280 W
Power consumption	Standby: 20 W Max during wavelength tuning: 200 W

¹⁾ FWHM, assuming Gaussian pulse shape.

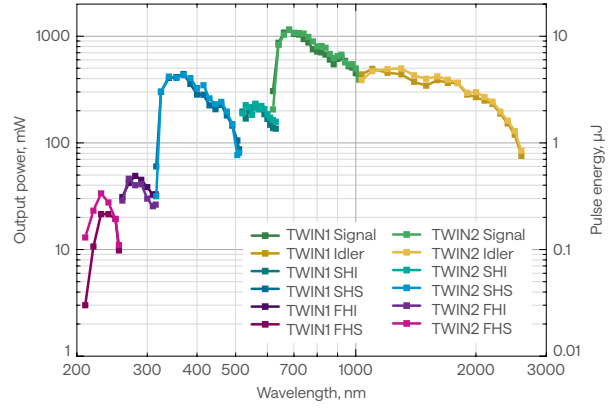
²⁾ Specifications are guaranteed for a maximum temperature variation of $\pm 1^\circ\text{C}$ and humidity variation of $\pm 10\%$.



ORPHEUS-TWINS (-ONE/-F configuration)
tuning curves.
Pump: 40 W, 40 μ J, 1000 kHz



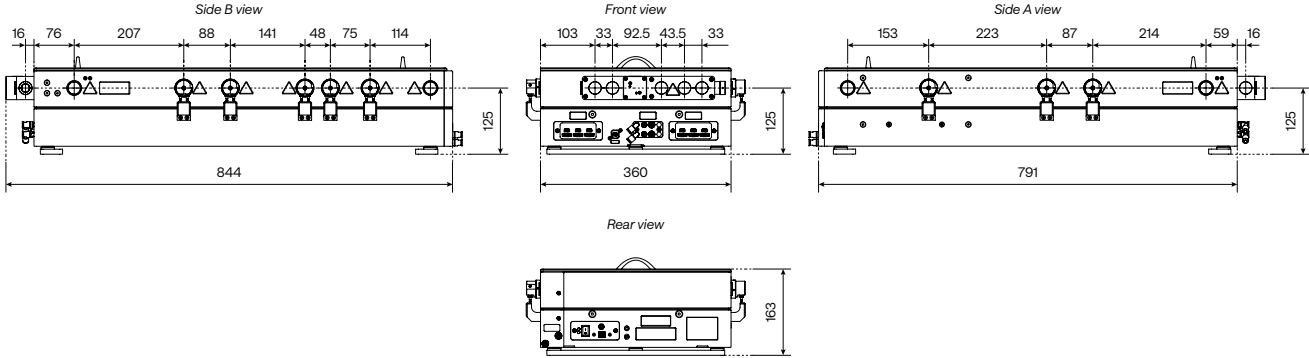
ORPHEUS-TWINS (ORPHEUS / ORPHEUS configuration)
tuning curves.
Pump: 20 W, 20 μ J, 100 kHz



For custom tuning curves visit
<http://toolbox.lightcon.com/tools/tuningcurves>

Drawings

ORPHEUS-TWINS drawings



Narrow-Bandwidth Optical Parametric Amplifier



Picosecond pulses from a femtosecond pump

210 – 4800 nm tuning range

800 fs – 3 ps pulse duration

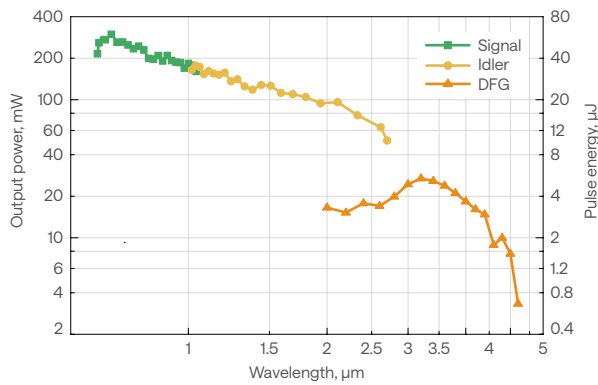
< 20 cm⁻¹ spectral bandwidth

Up to 100 kHz repetition rate

High output stability

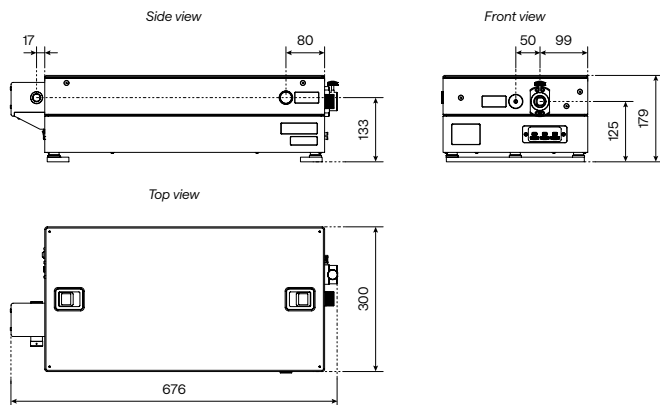
ORPHEUS-PS tuning curves

Pump: 5 W, 1000 μJ, 5 kHz from PHAROS-20W-SP

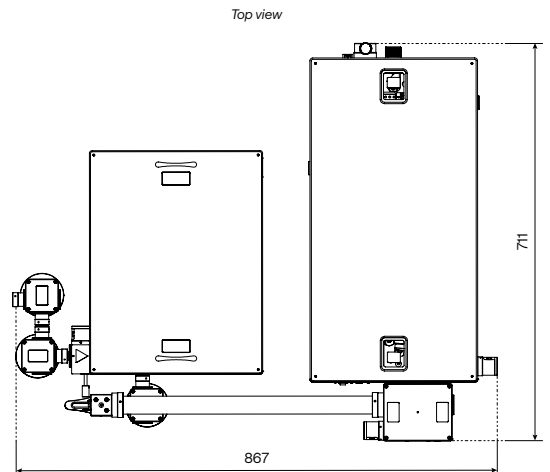


Drawings

ORPHEUS-PS drawings



ORPHEUS-PS with SHBC 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

SH package 320 – 500 nm (SHS), 530 – 640 nm (SHI)	> 3% @ 350 nm
FH package 210 – 250 nm (FHS), 265 – 320 nm (FHI)	> 0.3% @ 230 nm
2400 – 4800 nm (DFG)	> 0.25% @ 3200 nm ⁶⁾
4500-1600 nm (DFG3)	Available, contact sales@lightcon.com

PUMP LASER REQUIREMENTS

Pump laser ⁷⁾	PHAROS or CARBIDE with uncompressed output option ⁸⁾
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 ⁹⁾	19 – 25 °C (air conditioning recommended)
Relative humidity ⁹⁾	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.

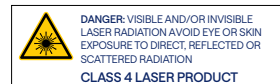
⁵⁾ Compressed pump output.

⁶⁾ For > 200 μJ pump pulse energy.

⁷⁾ 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.

⁸⁾ Not compatible with PHAROS-PH2-UP.

⁹⁾ Specifications are guaranteed for a maximum temperature variation of ± 1 °C and humidity variation of ± 10%.





Femtosecond Lasers

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

CARBIDE

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

PHAROS

Scientific flexibility and process-tailored output parameters, providing pulse duration down to 100 fs and pulse energy of up to 4 mJ.

High average power and high pulse energy at a high repetition rate

Market-proven industrial-grade stability and reliability

Tailored to the needs of industry and science

Unibody-Design Femtosecond Lasers for Industry and Science



CARBIDE-CB3

Tunable pulse duration,
190 fs – 20 ps

Maximum output of
120 W, 1 mJ or 80 W, 2 mJ

Single-shot – 10 MHz
repetition rate

NEW

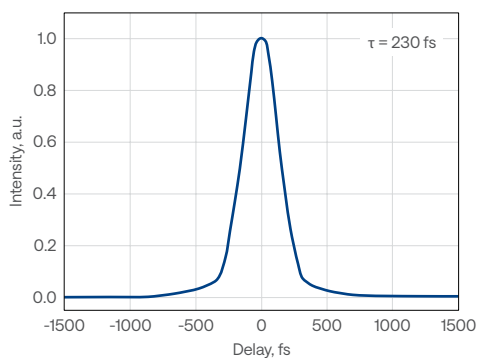
Pulse-on-demand and
BiBurst for pulse control

Up to 5th harmonic or
tunable extensions

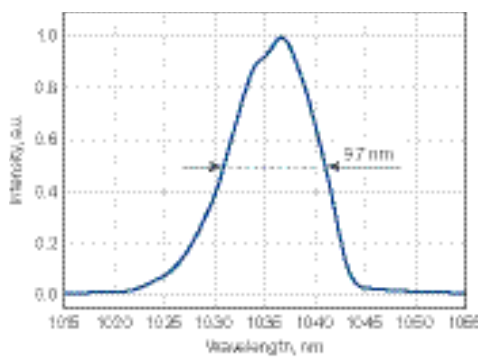
Air-cooled and
water-cooled models

Compact industrial-grade design

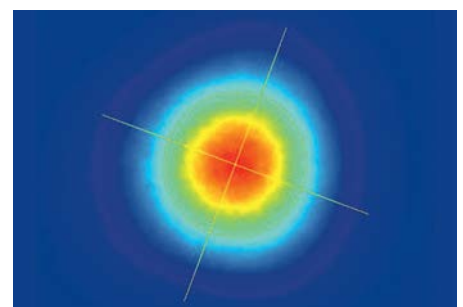
CARBIDE-CB3
Typical pulse duration



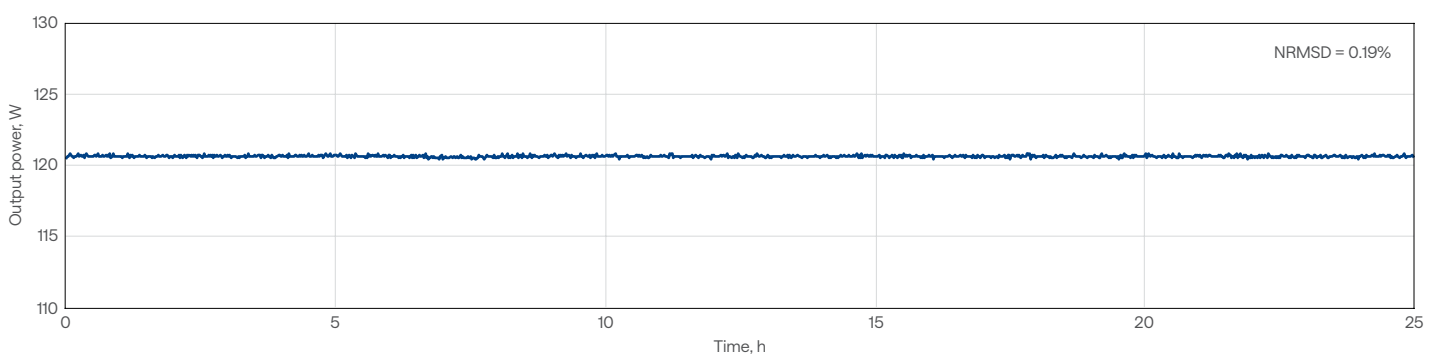
CARBIDE-CB3
Typical spectrum



CARBIDE-CB3
Typical beam profile



CARBIDE-CB3-120W
Long-term power stability



CARBIDE-CB3 specifications

NEW

Model	CB3-20W	CB3-40W	CB3-80W	CB3-120W
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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
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
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, 24 h ⁶⁾	< 0.5%			
Long-term power stability, 100 h ⁶⁾	< 0.5%			

MAIN OPTIONS

Oscillator output	< 0.5 W, 120 – 250 fs, 1030 ± 10 nm, ≈ 65 MHz ⁷⁾			
Harmonic generator ⁸⁾	515 nm, 343 nm, 257 nm, or 206 nm			
Optical parametric amplifier ⁹⁾	320 – 10000 nm; see page 6			n/a
BiBurst option	Tunable GHz and MHz burst with burst-in-burst capability			

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)	280 × 144 × 49 mm ¹⁰⁾	320 × 200 × 75 mm	376 × 449 × 88 mm

ENVIRONMENTAL AND UTILITY REQUIREMENTS

Operating temperature	15 – 30 °C		
Relative humidity	< 80% (non-condensing)		
Electrical requirements	Laser	100 V AC, 7 A – 240 V AC, 3A; 50 – 60 Hz	100 V AC, 12 A – 240 V AC, 5 A 50 – 60 Hz
	Chiller	100 – 230 V AC; 50 – 60 Hz	200 – 230 V AC; 50 – 60 Hz
Rated power	Laser	600 W	1000 W
	Chiller	1400 W	2000 W
Power consumption	Laser	500 W	900 W
	Chiller	1000 W	1300 W

¹⁾ Assuming Gaussian pulse shape.

²⁾ Pulse duration can be reduced to < 250 fs if 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.

⁵⁾ Waveplate-based variable optical attenuator (VOA); an external analog control input is available.

⁶⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSSD)

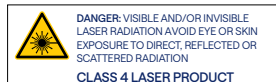
⁷⁾ Available simultaneously, requires a scientific interface.

Contact sales@lightcon.com for more details or customized solutions.

⁸⁾ Integrated. For external harmonic generator, refer to HIRO.

⁹⁾ Integrated. For more options and OPAs, refer to www.lightcon.com.

¹⁰⁾ Power supply can be different if optional 2 MHz version is selected.



CARBIDE-CB5 (air-cooled) specifications

Model	CB5	CB5-SP
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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, 24 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		
Optical parametric amplifier ⁸⁾	320 – 10000 nm; see page 6		
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 AND 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	300 W		
Power consumption	150 W		

¹⁾ Water-cooled version available on request.

²⁾ Assuming Gaussian pulse shape.

³⁾ $FW\ 1/e^2$, using maximum pulse energy.

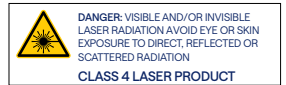
⁴⁾ Waveplate-based variable optical attenuator (VOA); an external analog control input is available.

⁵⁾ Enhanced contrast AOM. Provides fast amplitude control of output pulse train.

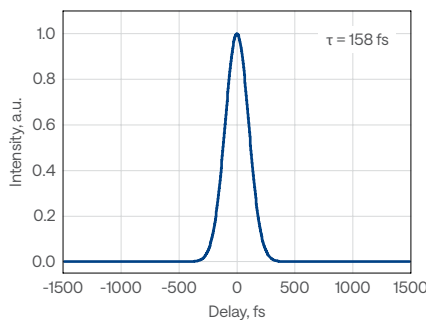
⁶⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMSD).

⁷⁾ Integrated. For external harmonic generator, refer to HIRO.

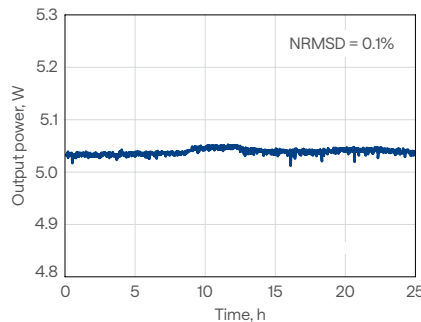
⁸⁾ Integrated. For stand-alone OPAs, refer to www.lightcon.com.



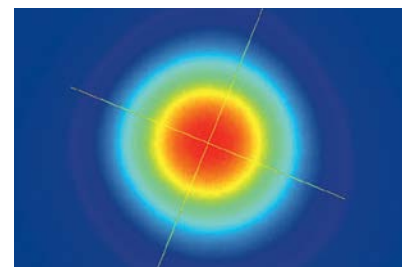
CARBIDE-CB5-SP
Typical pulse duration



CARBIDE-CB5
Long-term power stability

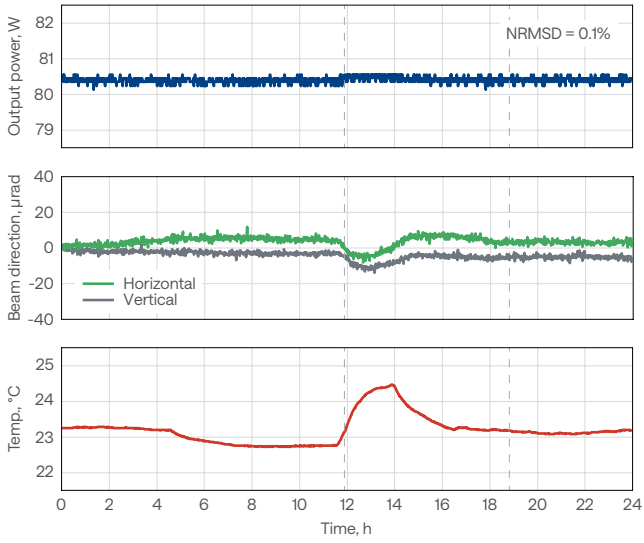


CARBIDE-CB5
Typical beam profile

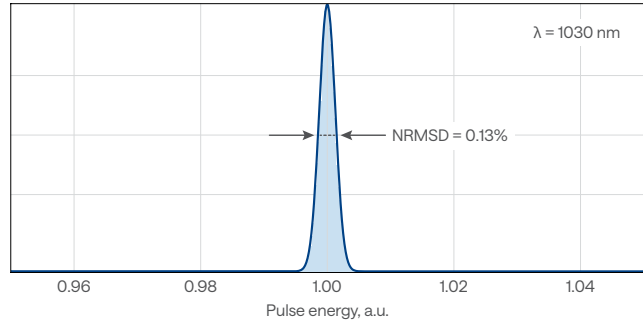


Stability measurements

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

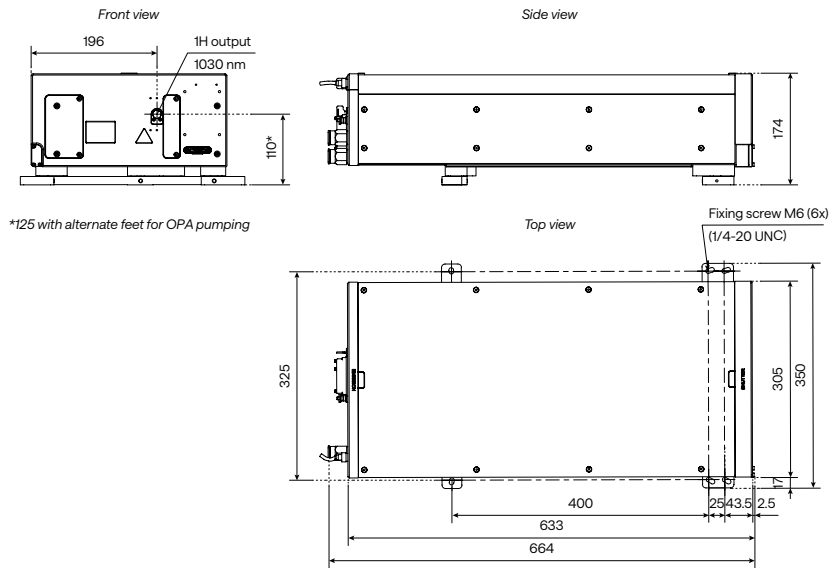


CARBIDE-CB3
Typical pulse-to-pulse energy stability

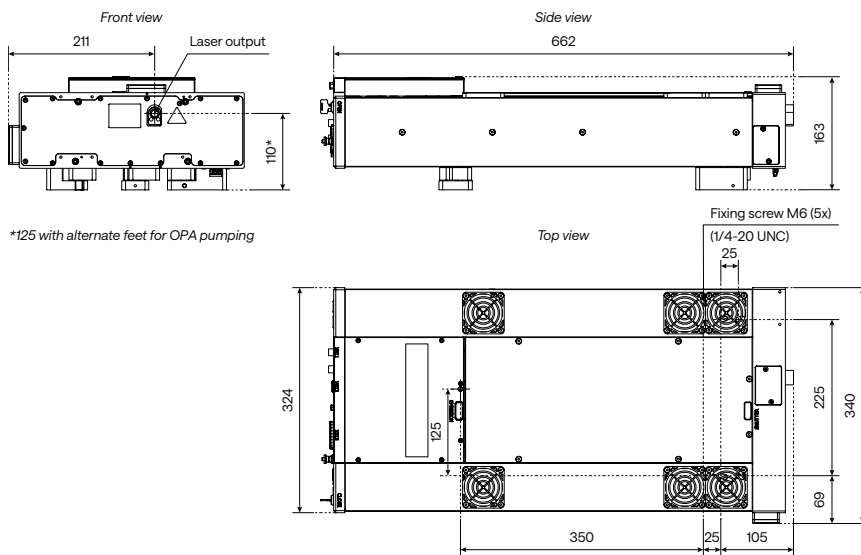


Drawings

CARBIDE-CB3 drawing



Air-cooled CARBIDE-CB5 with attenuator drawing



PHAROS

Modular-Design Femtosecond Lasers for Industry and Science



Tunable pulse duration, 100 fs – 20 ps

Maximum pulse energy of up to 4 mJ

Down to < 100 fs right at the output

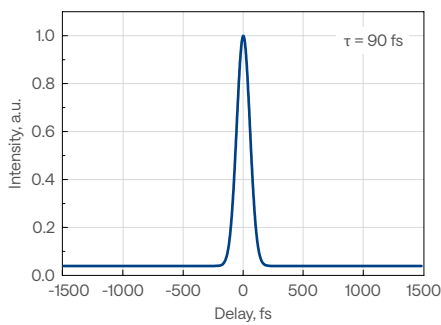
Pulse-on-demand and BiBurst for pulse control

Up to 5th harmonic or tunable extensions

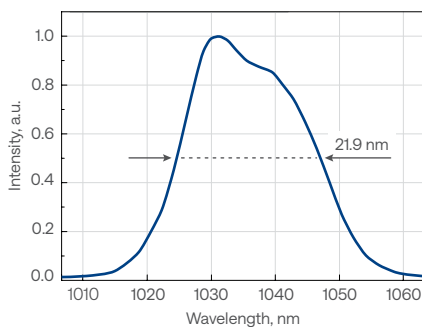
CEP stabilization or repetition rate locking

Thermally-stabilized and sealed design

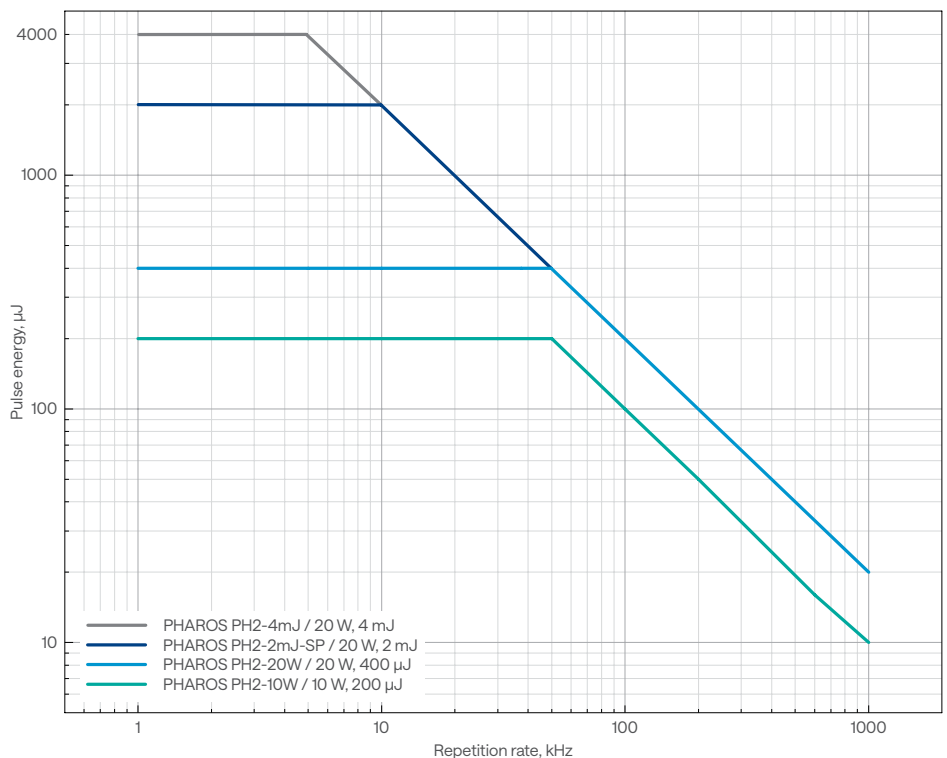
PHAROS-PH2-UP
Typical pulse duration



PHAROS-PH2-UP
Typical spectrum



PHAROS
Pulse energy vs fundamental repetition rate



Specifications

Model	PH2-10W	PH2-20W-SP			PH2-4mJ	PH2-UP	
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OUTPUT CHARACTERISTICS

Center wavelength ¹⁾	1030 ± 10 nm						
Maximum output power	10 W	20 W					
Pulse duration ²⁾	< 290 fs	< 190 fs			< 450 fs ³⁾	< 100 fs	
Pulse duration tuning range	290 fs – 10 ps (20 ps on request)	190 fs – 10 ps (20 ps on request)			450 fs – 10 ps	100 fs – 10 ps	
Maximum pulse energy	0.2 mJ	0.4 mJ	1 mJ	2 mJ	4 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 ⁴⁾	3.3 ± 0.5 mm	4.0 ± 0.5 mm	4.5 ± 0.5 mm	6.8 ± 0.7 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, 24 h ⁵⁾	< 0.5%						
Long-term power stability, 100 h ⁵⁾	< 0.5%						

MAIN OPTIONS

Oscillator output ⁶⁾	1 – 7 W, 50 – 250 fs, ≈ 1035 nm, ≈ 76 MHz						
Harmonic generator ⁷⁾	515 nm, 343 nm, 257 nm, or 206 nm						
Optical parametric amplifier ⁸⁾	320 – 10000 nm; see page 6						
BiBurst option	Tunable GHz and MHz burst with burst-in-burst capability						
CEP stabilization	See page 37						
Repetition rate locking							

PHYSICAL DIMENSIONS

Laser head (L × W × H) ⁹⁾	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) ⁹⁾	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	
	Chiller	100 – 230 V AC, 50 – 60 Hz	
Rated power	Laser	1000 W	
	Chiller	1400 W	
Power consumption	Laser	600 W	
	Chiller	1000 W	

¹⁾ Precise wavelengths for specific models are available upon request.

²⁾ Assuming Gaussian pulse shape.

³⁾ Pulse duration can be reduced to < 250 fs if pulse peak intensity of > 50 GW/cm² is tolerated by the customer setup.

⁴⁾ FW 1/e², measured at laser output, using maximum pulse energy.

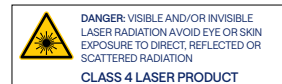
⁵⁾ Under stable environmental conditions. Expressed as normalized root mean squared deviation (NRMDS).

⁶⁾ Available simultaneously. Contact sales@lightcon.com for more details or customized solutions.

⁷⁾ Integrated. For external harmonic generator, refer to HIRO.

⁸⁾ Integrated. For more options and OPAs for -4mJ and -UP models, refer to www.lightcon.com.

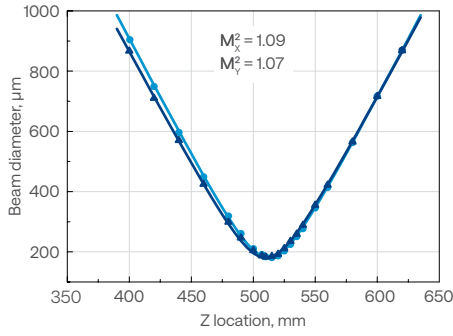
⁹⁾ Dimensions depend on laser configuration and integrated options.



Beam properties

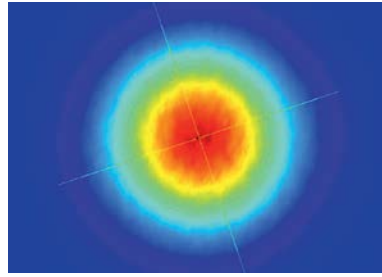
PHAROS

Typical M^2 measurement data



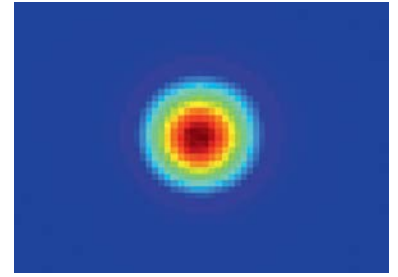
PHAROS

Typical near-field beam profile



PHAROS

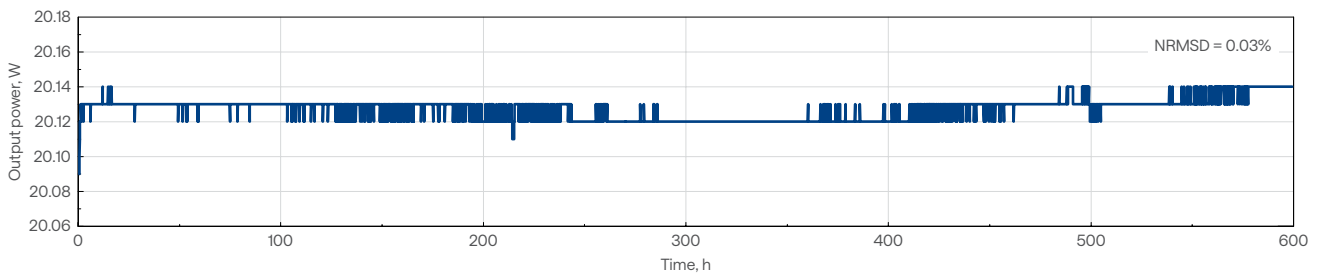
Typical far-field beam profile



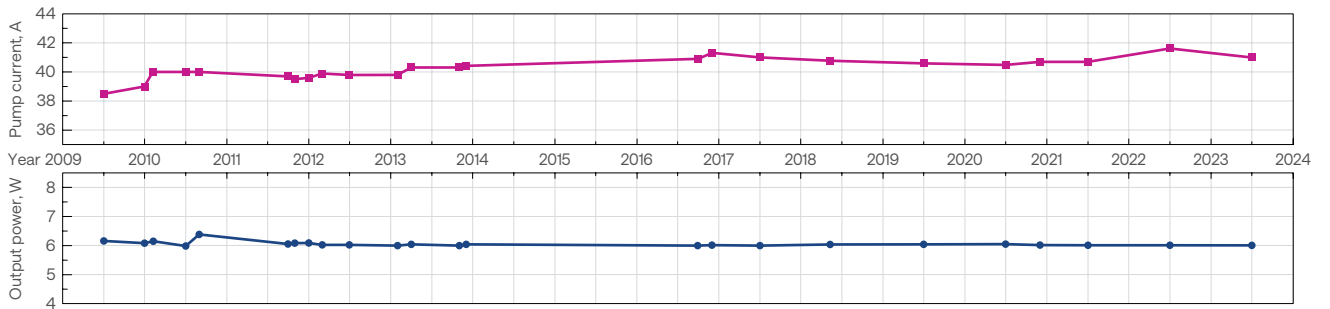
Stability measurements

PHAROS

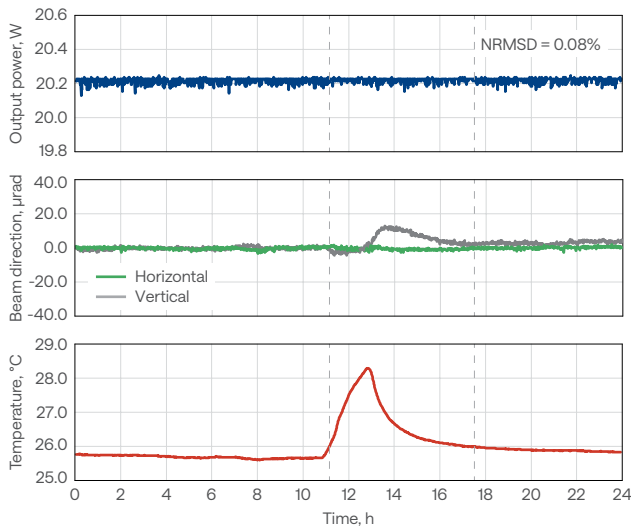
Long-term power stability



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

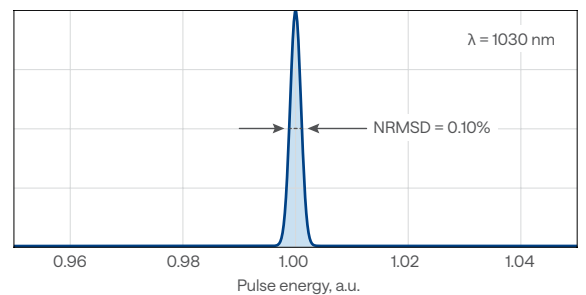


PHAROS output power and the stability of beam direction with power lock enabled, across varying environmental conditions



PHAROS

Typical pulse-to-pulse energy stability



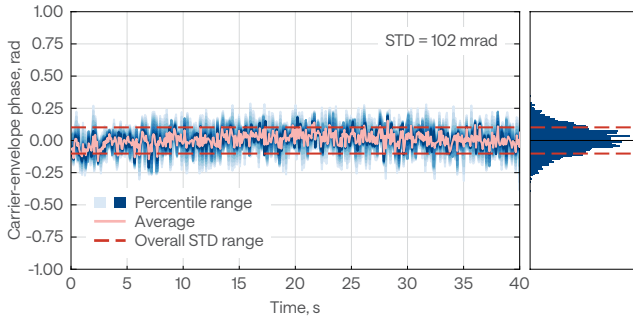
CEP stabilization

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.

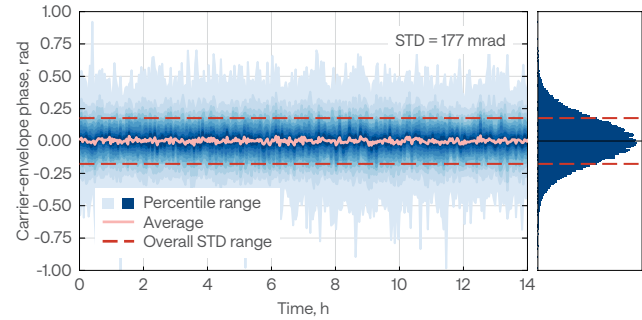
PHAROS

Short-term CEP stability operating at 200 kHz repetition rate



PHAROS

Long-term CEP stability operating at 200 kHz repetition rate

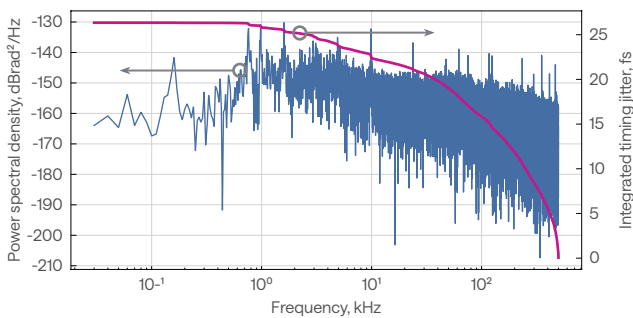


Repetition rate locking

The oscillator of PHAROS laser can be customized for repetition rate locking applications. Coupled with the necessary feedback electronics, the repetition rate is synchronized to an external RF source using the two piezo stages installed inside the cavity.

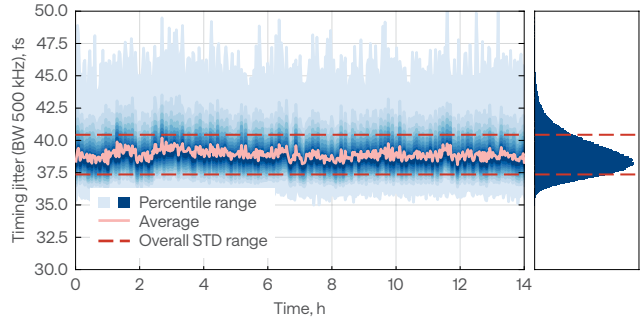
The repetition rate locking system can assure an integrated timing jitter of less than 200 fs for RF reference frequencies larger than 500 MHz. Continuous phase shifting is available on request.

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



Timing jitter stability over 14 h

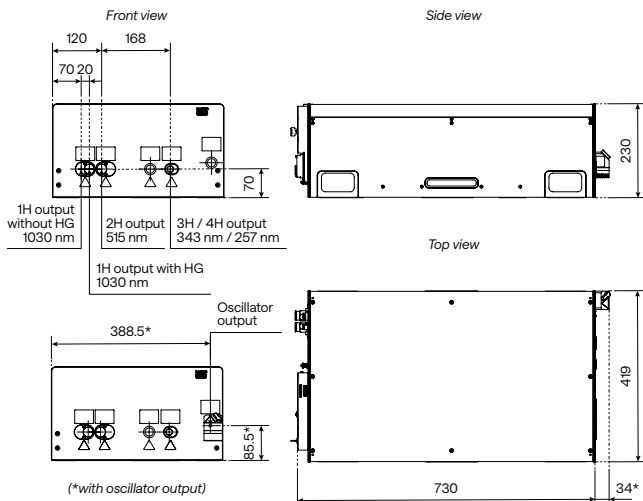
PHAROS oscillator locked to a 2.8 GHz RF source



Drawings

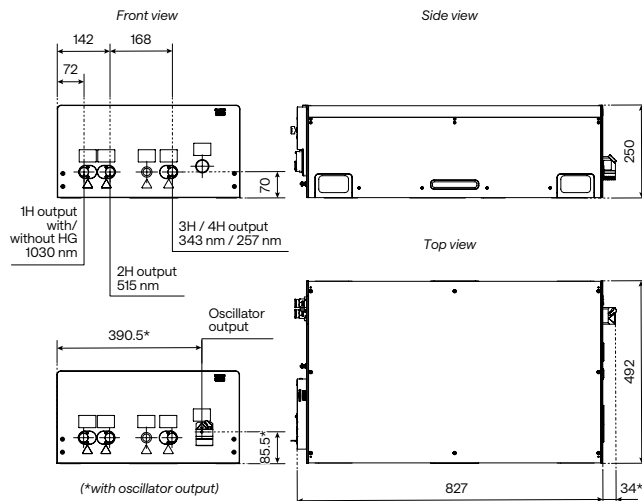
PHAROS-PH2-730 drawing.

PH2 or PH2-SP with FEC, BiBurst, or harmonics; also, PH2-UP without harmonics



PHAROS-PH2-827 drawing

PH2 with -HE harmonics, PH2-4mJ, or PH2-UP with harmonics



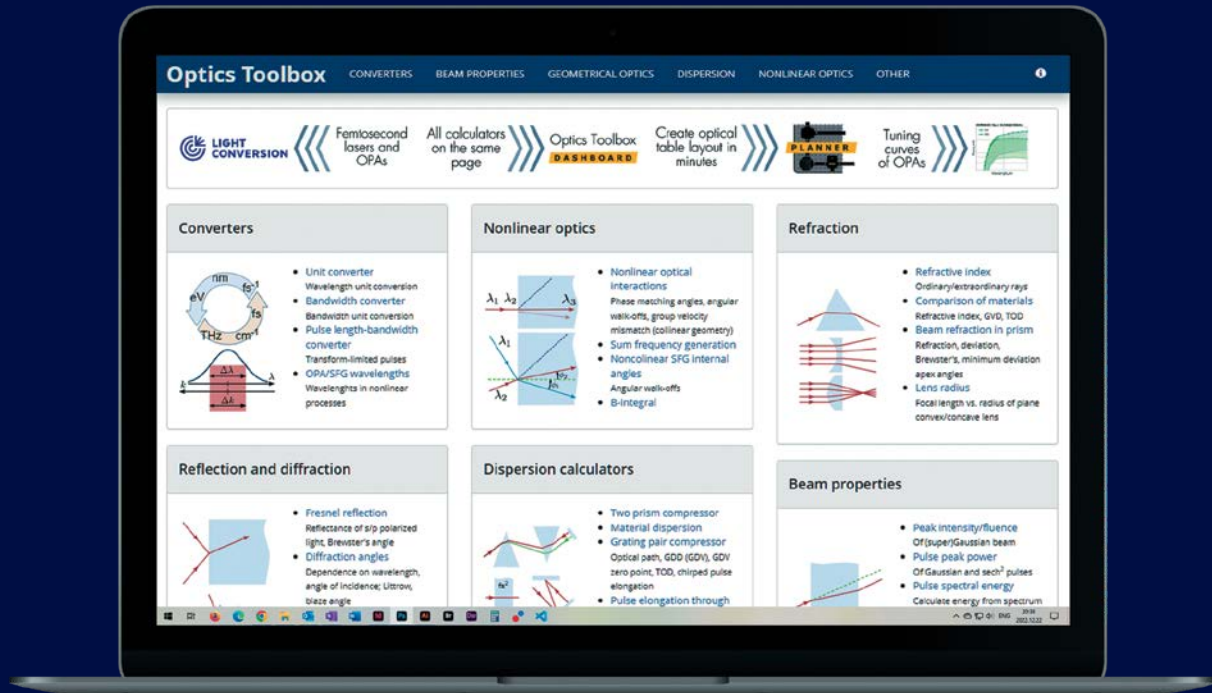
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