OPCPA

Optical Parametric Chirped Pulse Amplification Systems

FEATURE OVERVIEW

- Customizable light sources for applications requiring the shortest pulses and extreme peak and average powers
- Wavelengths from 800 nm to 3 µm (Mid-IR extensions available)
- Peak powers up to > 5 TW
- Pulse duration down to 6.5 fs
- Repetition rates: 100 Hz to 200 kHz
- CEP stability < 250 mrad even in multi-TW peak power systems

Optical parametric chirped pulse amplification is the only currently available laser technology simultaneously providing high peak and average power, as well as few-cycle pulse duration required by the most demanding scientific applications.

LIGHT CONVERSION's answer to these demands is a portfolio of cutting-edge OPCPA products that are based on years of experience in developing and manufacturing Optical Parametric Amplifiers and Femtosecond Lasers.

OPCPA system delivering 5.5 TW peak power (6.6 fs, 36 mJ) pulses.

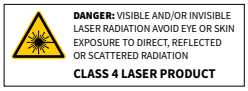
Built for ELI-ALPS in collaboration with Ekspla.

ORPHEUS | OPCPA

Pumped by PHAROS or CARBIDE Lasers

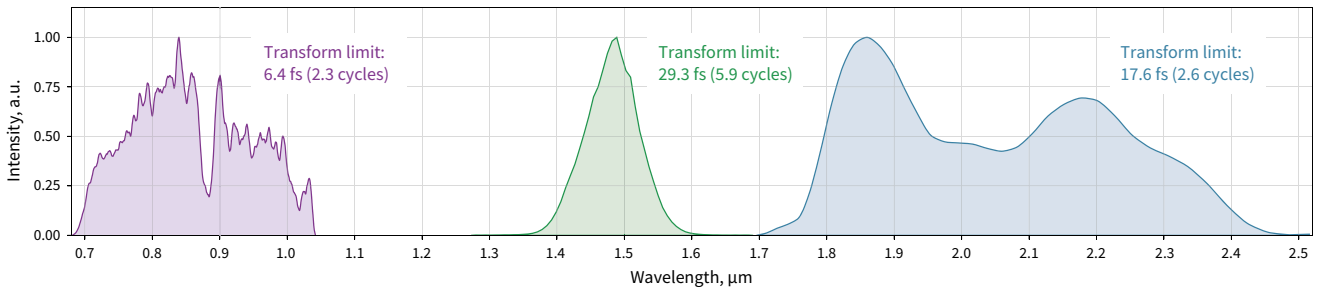
Benefitting from the industrial-grade stability and reliability of the PHAROS and CARBIDE series lasers, ORPHEUS-OPCPA delivers few-cycle, CEP-stable pulses in a package as compact as our standard parametric amplifiers. The different ORPHEUS-OPCPA models all use the same base architecture to produce CEP-stable, few-cycle pulses in one of the four wavelength ranges. ORPHEUS-OPCPA is available in versions with pulse compressors for direct use in applications, or, when intended as seed sources for larger amplifiers, versions delivering background-free pulses with near-single-cycle bandwidths, excellent spectral phase coherence, and CEP stability.

ORPHEUS-OPCPA-HR

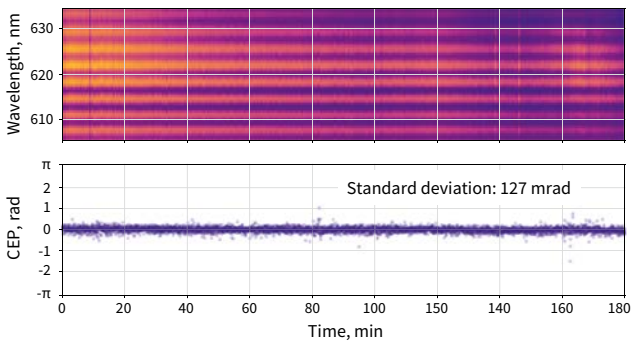


CONFIGURATIONS EXAMPLES

Wavelength		800 nm	1.6 µm	2 µm	3 µm
Pulse duration (compressed)		< 10 fs	< 40 fs	< 25 fs	< 45 fs
Transform-limited pulse duration (uncompressed, for seeding larger amplifiers)		< 6 fs	< 30 fs	< 15 fs	< 35 fs
	Repetition rate	**Pulse energy / Output power**			
ORPHEUS-OPCPA	10 kHz	120 µJ / 1.2 W	240 µJ / 2.4 W	180 µJ / 1.8 W	120 µJ / 1.2 W
ORPHEUS-OPCPA-HE		0.55 mJ / 5.5 W	1.1 mJ / 11 W	0.8 mJ / 8 W	0.5 mJ / 5 W
ORPHEUS-OPCPA-HR	100 kHz	25 µJ / 2.5 W	55 µJ / 5.5 W	40 µJ / 4 W	30 µJ / 3 W
ORPHEUS-OPCPA-HP		100 µJ / 10 W	220 µJ / 22 W	150 µJ / 15 W	120 µJ / 12 W

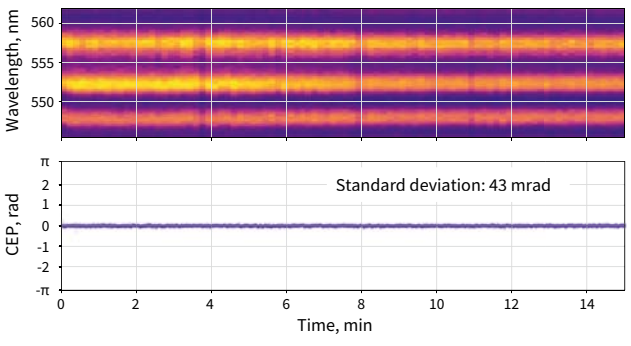


Example spectra of three models of ORPHEUS-OPCPA



ORPHEUS-OPCPA CEP stability (800 nm, 100 kHz version)

All CEP values calculated from unaveraged, single-shot measurements!



ORPHEUS-OPCPA CEP stability (3 µm, 1 kHz version)

All CEP values calculated from unaveraged, single-shot measurements!

OPCPA | HR

Pumped by InnoSlab or Thin-Disk Lasers, Optionally Seeded by ORPHEUS-OPCPA

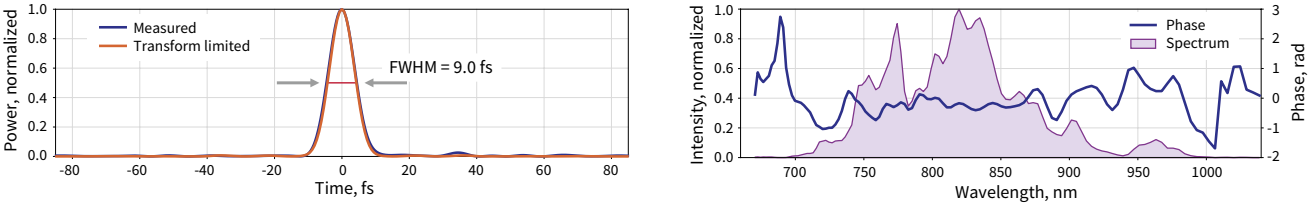
InnoSlab and thin-disk lasers based on Yb:YAG are the state-of-the-art high average power lasers of today. These lasers lend themselves extremely well to pumping OPCPA systems, and LIGHT CONVERSION is happy to offer OPCPA solutions designed to work with these lasers. Available either bundled with state-of-the-art multi-100 W lasers or as standalone modules designed to work with your laser.

- Wavelength(s), pulse durations and energy are customizable – contact sales@lightcon.com for more details.
- A single pump laser can be combined with more than one OPCPA option in either switchable or split-energy operation.

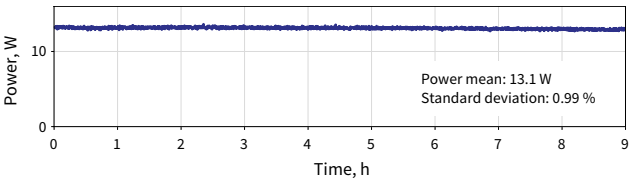
CONFIGURATIONS EXAMPLES

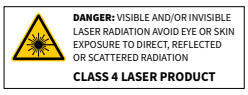
Wavelength	800 nm	1.6 µm	2 µm	3 µm
Pulse duration	< 9 fs	< 35 fs	< 25 fs	< 35 fs

	Repetition rate	**Pulse energy / Output power**			
HR-20	20 kHz	0.8 mJ / 16 W	1.6 mJ / 32 W	1.3 mJ / 26 W	0.8 mJ / 16 W
HR-200	200 kHz	110 µJ / 22 W	270 µJ / 54 W	200 µJ / 40 W	130 µJ / 26 W



OPCPA-HR output pulse measurement



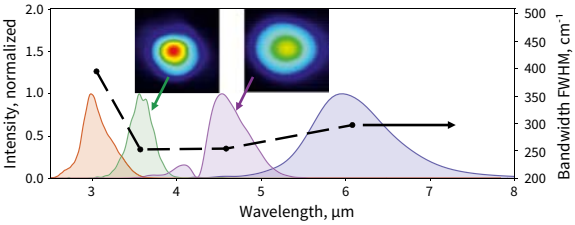


9-hour measurement of a 100 kHz, 800 nm OPCPA-HR power.
Standard deviation: < 1 %

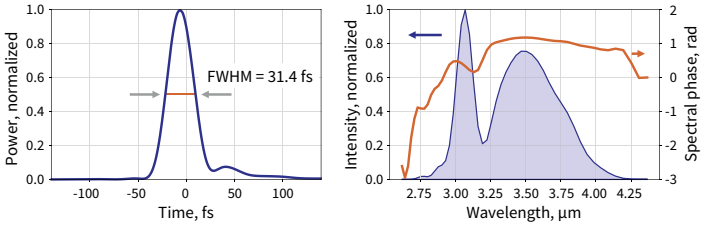
Mid-Infrared Wavelength Extensions for OPCPA

For ORPHEUS-OPCPA and OPCPA-HR

2 µm models of ORPHEUS-OPCPA and OPCPA-HR can be equipped with an extra module for efficiently generating tunable broadband MIR pulses. Contact sales@lightcon.com for more details.



Example spectra measured from ORPHEUS-OPCPA DFG module



ORPHEUS-OPCPA DFG output spectrum and pulse at 3.4 µm

OPCPA | HE

Pumped by Picosecond Nd:YAG Lasers, Seeded by ORPHEUS-OPCPA

Applications like high energy attosecond pulse generation, generation of high harmonics from solid targets, and laser electron acceleration all benefit from few-cycle pulse durations and excellent pulse contrast while requiring multi-millijoule pulse energy. Our most powerful systems, scalable to multi-TW peak powers at kHz repetition rate while maintaining few-cycle pulse durations, will fit the most demanding requirements, while providing stability and reliability unprecedented for systems of this scale.

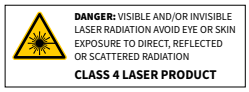
SYLOS has been launched in ELI-ALPS facility in Hungary on 15th of May, 2019

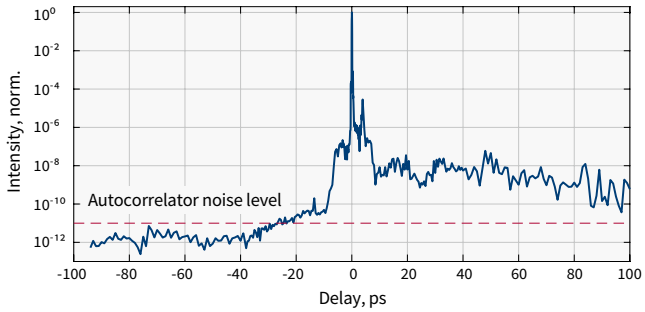
CONFIGURATIONS EXAMPLES

Wavelength		800 nm	900 nm	1.6 µm	2 µm
Pulse duration		< 9 fs	< 6.5 fs	< 50 fs	< 30 fs
	Repetition rate	**Pulse energy / Output power**			
HE-100 [1]	100 Hz	50 mJ	35 mJ	100 mJ	50 mJ
HE-1000 [2]	1 kHz	50 mJ / 50 W	35 mJ / 35 W	100 mJ / 100 W	50 mJ / 50 W

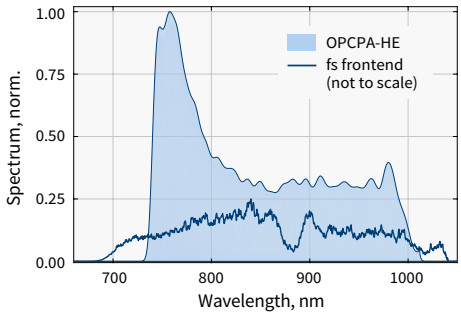
[1] Cost-effective highly-stable multi-TW source.

[2] Cutting-edge combination of peak and average power.

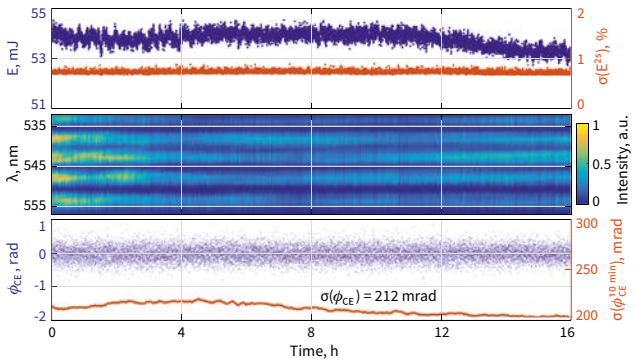




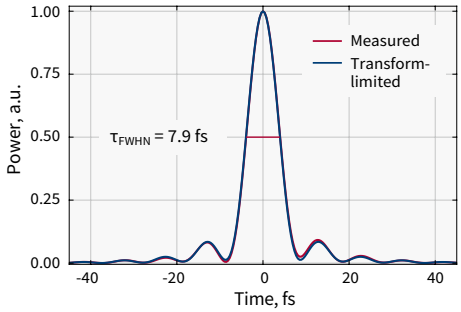
High-dynamic-range third order autocorrelation measurement of an OPCPA-HE system



OPCPA-HE output spectrum



OPCPA-HE pulse energy, f-2f interferogram and CEP stability measured during a 16-hour test run



Temporal profile of OPCPA-HE output pulses measured with a self-referenced spectral interferometry device