OPCPA

LIGHT CONVERSION

Custom Optical Parametric Chirped Pulse Amplification Systems

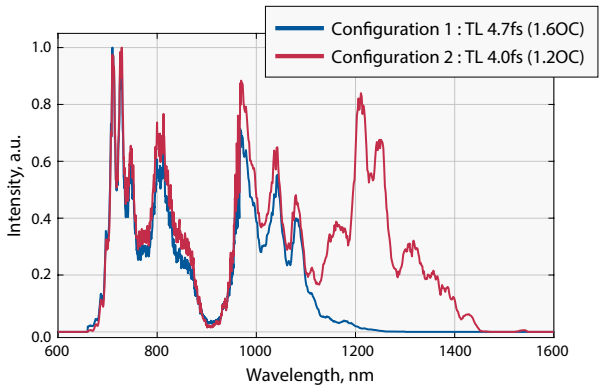
Optical parametric chirped pulse amplification is the only currently available laser technology simultaneously providing high peak and average power, as well as few cycle pulse duration required by the most demanding scientific applications. Light Conversion's answer to these demands is a portfolio of cutting-edge OPCPA products that are based on years of experience in developing and manufacturing of Optical Parametric Amplifiers and Femtosecond Lasers.

FEATURES

- Front end is based on field-proven PHAROS laser
- Passive CEP stabilization is done employing a temperature controlled Optical Parametric Amplifier (OPA)
- White light continuum (WLC) generation provides background free broadband seed, ensuring excellent temporal pulse contrast
- Reliable direct optical synchronization: the PHAROS laser provides options for directly seeding a variety of Yb- or Nd- based high energy picosecond lasers, allowing to combine our frontend and OPCPA technologies with all common types of high energy and/or high power picosecond pump lasers

OPCPA frontends

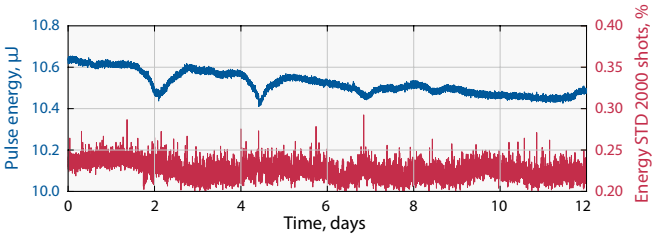
Our OPCPA frontend technology marks a solid step up from seeding an OPCPA directly from a Ti:Sapphire oscillator. The OPCPA frontend setups are based on the industrial-grade PHAROS laser and femtosecond optical parametric amplification technology. We use passive CEP stabilization and take advantage of the femtosecond pulse duration of the PHAROS laser to produce extremely clean broadband OPCPA seed pulses.



Spectra of pulses produced by OPCPA frontends, two configurations are available

FEATURES

- Scalable in repetition rate from < 1 kHz to 100 kHz and above
- High pulse energy (up to 100 µJ pulse energy at 1 – 10 kHz) improves contrast of OPCPA output
- Intrinsically free from ASE background; postpulse-free versions available
- Passive CEP stabilization eliminates complex electronics
- Sub-200 mrad CEP noise
- Bandwidths down to the near-single-cycle regime in the NIR
- Output spectra can be engineered to maximize energy in a desired spectral range
- Can also be used as reliable high energy, high contrast seed source for Ti:Sa amplifiers



Energy and energy stability of the passively CEP stabilized pulses generated in an OPCPA frontend measured over 12 days

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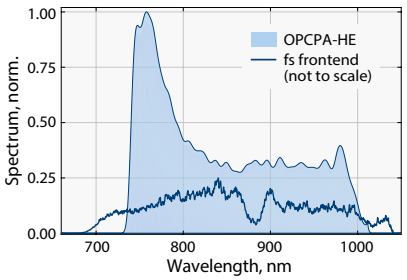
OPCPA-HE

Driving low efficiency nonlinear processes, such as high harmonic generation laser-driven THz generation, requires high pump energies. For applications of this type, Light Conversion produces OPCPA systems delivering up to 50 mJ pulse energy, combined with exceptional energy and CEP stability, as well as temporal contrast, owing to the advanced front-end technology and favourable properties of the OPCPA process.

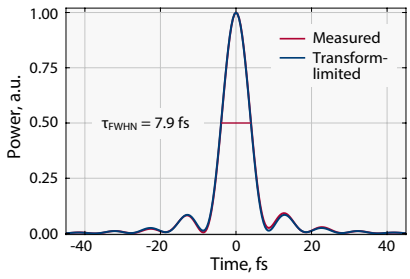
Light Conversion and Ekspla consortium has recently set a new standard in the field by delivering a 5.5 TW, 1 kHz few cycle OPCPA system to ELI-ALPS. Besides the record-setting output parameters, the system also exhibits excellent short-and-long-term stability and reliability. More information about this system can be found in: *https://doi.org/10.1364/OE.25.005797*.

FEATURES

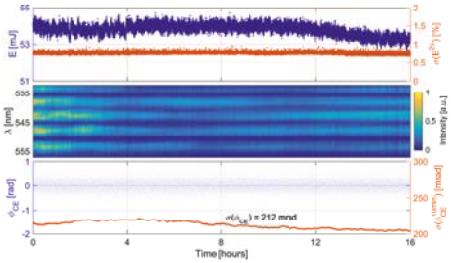
- Multi-TW peak power pulses produced at up to 1 kHz repetition rate
- Pre-pulse contrast exceeding 1012 achievable without complex and lossy nonlinear pulse cleaning techniques
- Sub-220mrad CEP noise and < 1 % energy stability maintained throughout full day of operation
- Pulse duration down to < 9 fs
- Safe and simple spectral-temporal shaping of output pulses possible
- Integrated control and diagnostics system
- Less than 1 hour warm-up time



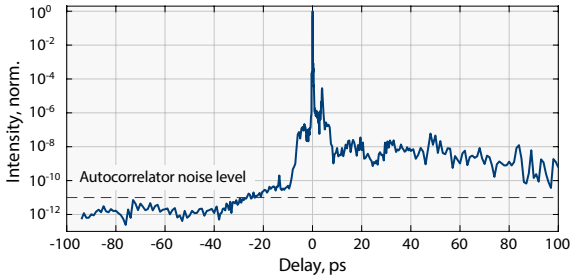
OPCPA-HE output spectrum



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



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



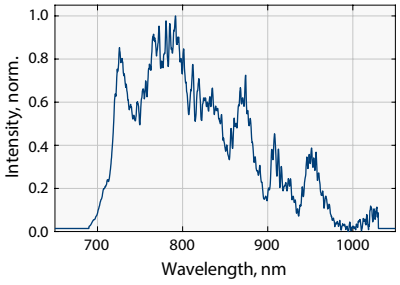
High dynamic range third order autocorrelation measurement of an OPCPA-HE system

OPCPA-HR

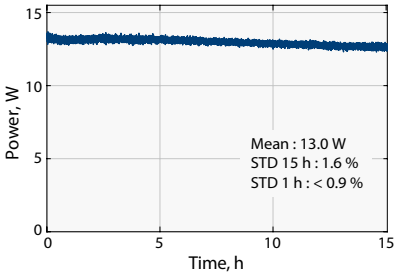
The technology developed by Light Conversion can be readily integrated with high repetition rate pump lasers to create high average power OPCPA systems. In this regime, few cycle pulses can be produced at repetition rates up to 200 kHz. A special dual pulse picker system in the Pharos laser can be used to adjust the repetition rate of the frontend independently of the pump laser. This allows to conveniently reduce the output power for alignment of experimental setups without affecting pulse energy or beam direction. Furthermore, residual pump beams can readily be used, for example, to generate photoelectron bunches synchronized with OPCPA output for advanced experiments.

FEATURES

- Pulse repetition rates up to 200 kHz
- Average power > 15 W at 100 kHz
- Passive CEP stabilization available
- Pulse duration down to < 8 fs
- Arbitrary division of OPCPA pulse repetition rate possible
- Convenient integrated control and monitoring software
- Compact footprint



OPCPA-HR pulse spectrum



Output power of OPCPA-HR measured over 15 hours

SPECIFICATIONS

Products	Output Energy	Output power	Output pulse duration	Max. Peak Power	Repetition rates
OPCPA-HE	1 – 50 mJ	up to 50 W	< 10 fs	up to 5 TW	up to 1 kHz
OPCPA-HR	10 uJ – 1 mJ	up to 100 W	< 10 fs	up to 100 GW	up to 200 kHz

Different pulse repetition rates, output energies, pulse durations and wavelengths are also available – please contact Light Conversion for more information.