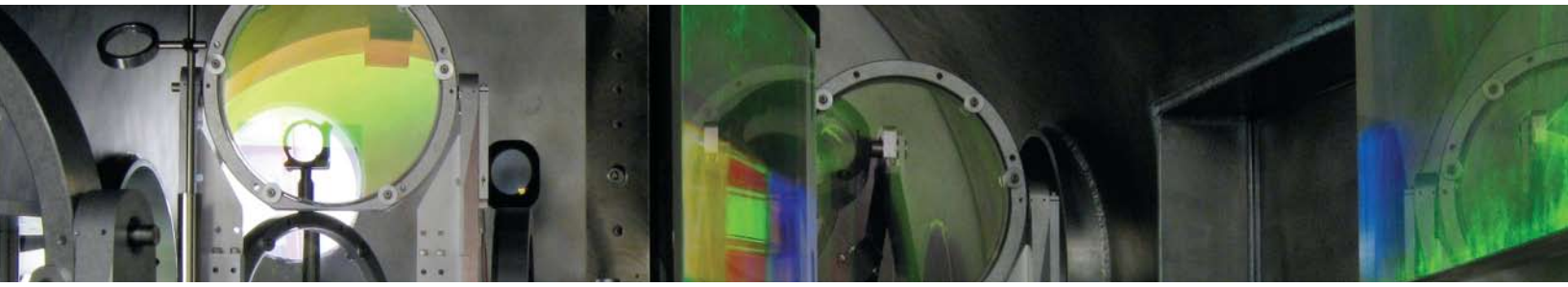
NATIONAL ENERGETICS™



THE WORLD'S MOST POWERFUL FEMTOSECOND LASER SYSTEMS

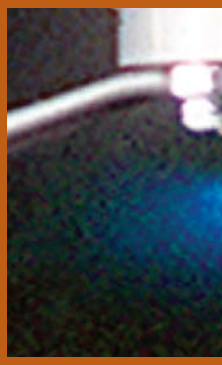
A DYNAMIC TEAM

National Energetics has been formed by a team of scientists from the University of Texas. This team, led by Todd Ditmire, Erhard Gaul and Mikael Martinez is joined by select scientists and engineers who bring years of experience in the design and construction of CPA lasers at power levels from terawatts to petawatts. Together they have developed CPA lasers in many media including Ti:Sapphire, Nd:Glass, OPCPA and Cr:LiSAF over the past 15 years, including the Texas Petawatt laser and the current University of Texas project boosting the THOR Ti:Sapphire laser to 1 PW.

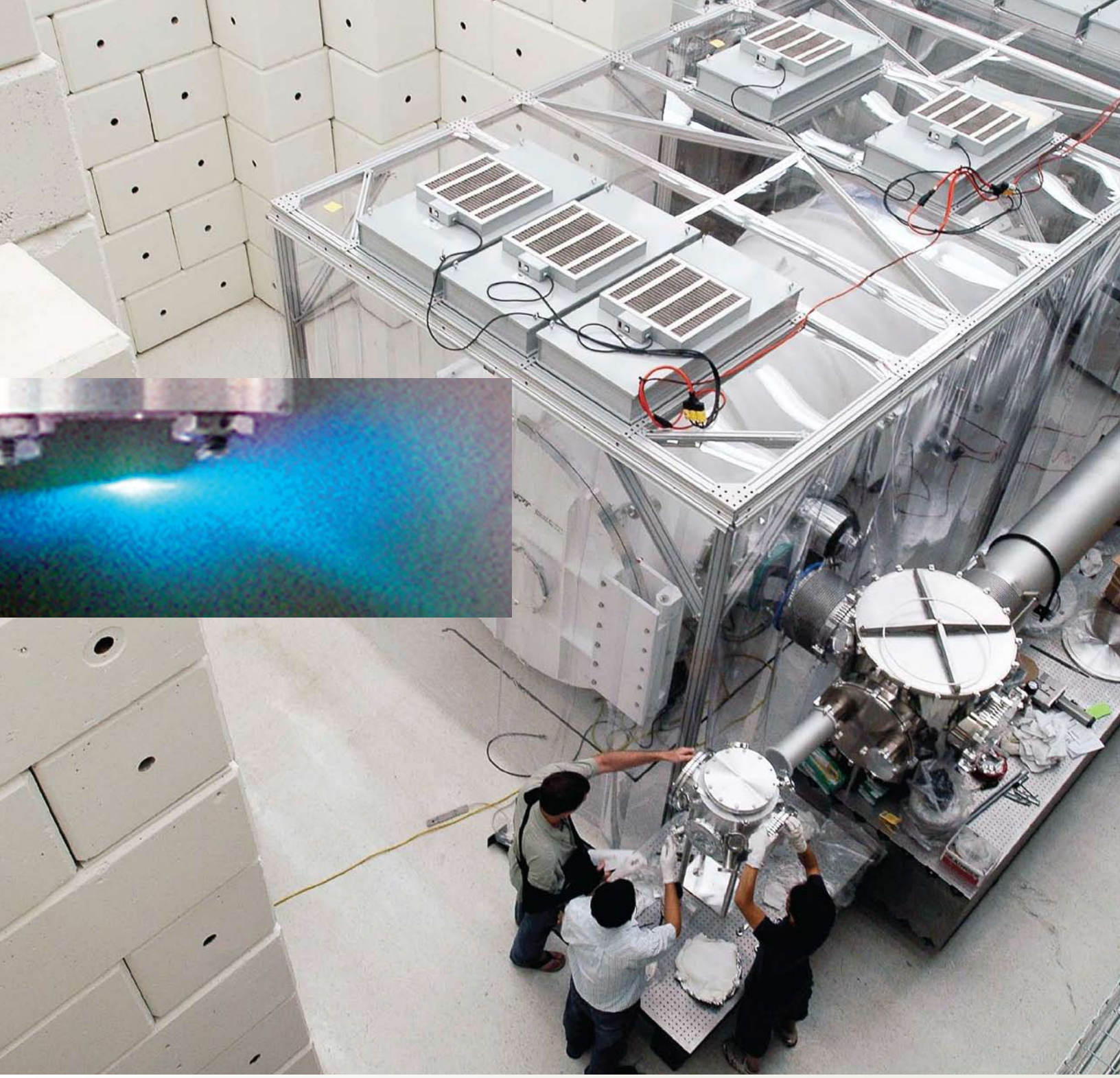
National Energetics is uniquely qualified in the design and construction of high energy CPA lasers. The Texas Petawatt laser in Austin is presently the highest power femtosecond laser in the world. As such, National Energetics is the only commercial company in the world composed of a team of people who have demonstrated the successful construction of a Petawatt-class laser.

Focus On The User

We have many years' experience as users of CPA lasers in a variety of different high field plasma and atomic physics experiments. This gives us the ability to design a laser system which not only meets the initial desired specifications but also serves as a long term, reliable, easy-to-use target shooter in the lab.



The importance of this aspect of our laser system designs can not be overstated. There is an enormous gulf between the performance of a laser which simply meets the desired specifications upon delivery, and a laser which is a useful tool for research day in and day out. We can deliver a laser system which will get work done.



NATIONAL ENERGETICS™

Continuum®

THE NATIONAL ENERGETICS–CONTINUUM PARTNERSHIP

Continuum is committed to the high energy laser community, bringing decades of experience in high energy pump lasers. By teaming with National Energetics, the community benefits. National Energetics contributes novel high energy design platforms that are proven to work. Continuum provides specialized laser sources and control systems as well as global service and support of these components to these new design platforms. Together this results in the highest quality and reliability, plus the best technical approach to next-generation high energy femtosecond laser systems.

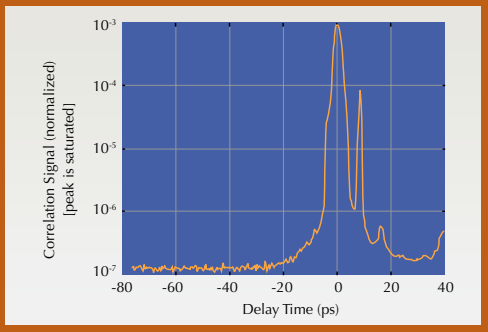
A FOCUSED OBJECTIVE

National Energetics is devoted to the design, construction and commercialization of high energy laser systems with peak power from 1 TW up to greater than 1 PW. Using Chirped Pulse Amplification (CPA) technology perfected in lasers at the University of Texas, our systems offer the best in performance, pulse energy and pulse contrast for ease of use in real experiments.

We offer our lasers in partnership with Continuum. By using Continuum pump lasers as the heart of our CPA systems, we combine the proven technology of one of the best known high energy laser manufacturers in the world with our novel system architectures, creating an unmatched combination of performance, reliability and value for our customers.

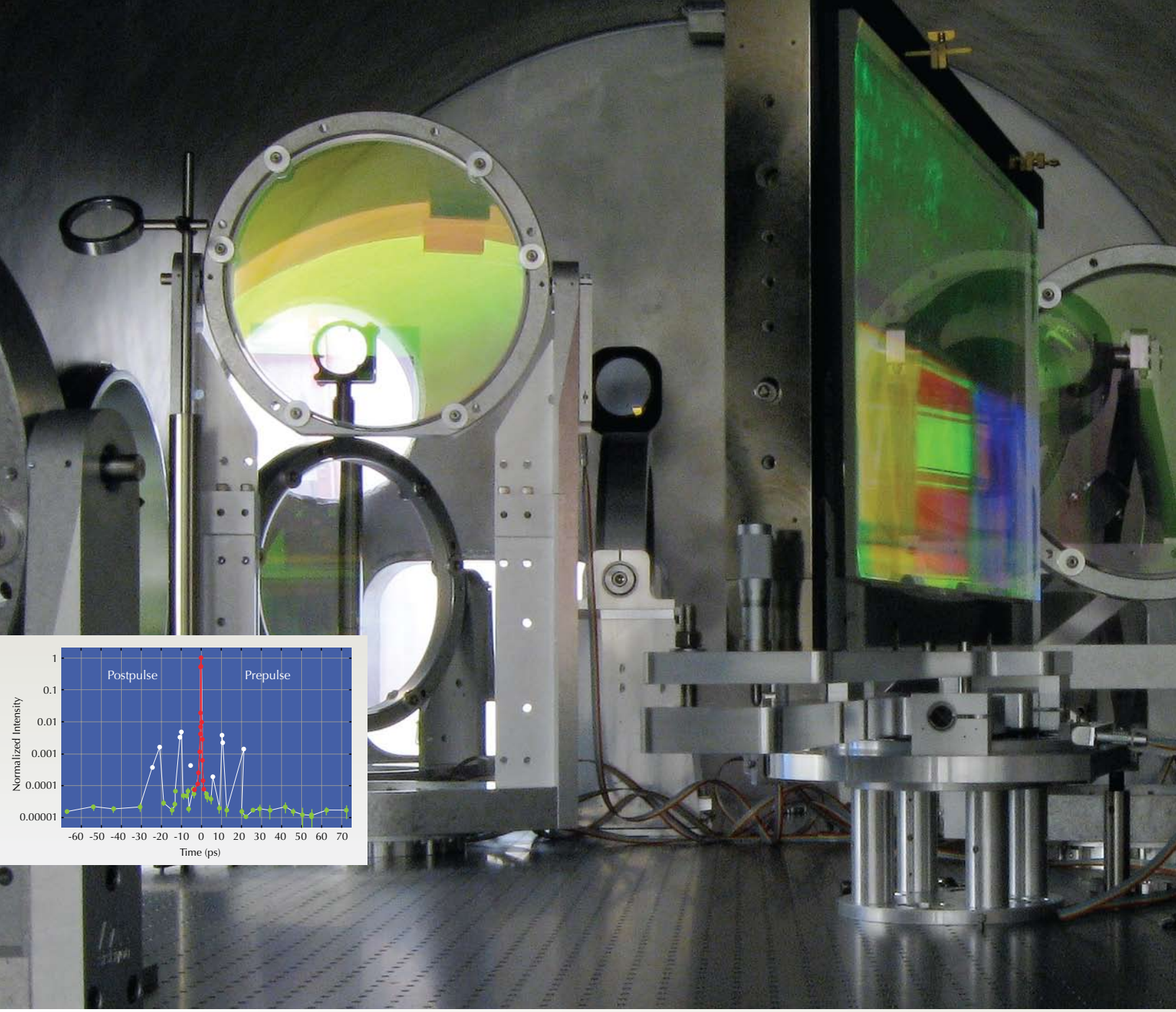
Unique Approach

A salient aspect of the technology we deploy is the active implementation of Optical Parametric Chirped Pulse Amplification (OPCPA) in our designs. OPCPA has become the technology of choice in high power CPA research lasers worldwide. In fact, every major petawatt laser project around the world now employs OPCPA to some extent in the front end of the system.



Single-shot, high dynamic range pulse contrast measurement on the GHOST OPCPA/Glass hybrid 20 TW laser at the University of Texas compared with a high dynamic range pulse contrast area on a typical Ti:Sapphire laser

The use of OPCPA in our designs yields a number of important advantages in performance as well as promoting simplicity, reliability and ease of use in both applications and experiments.

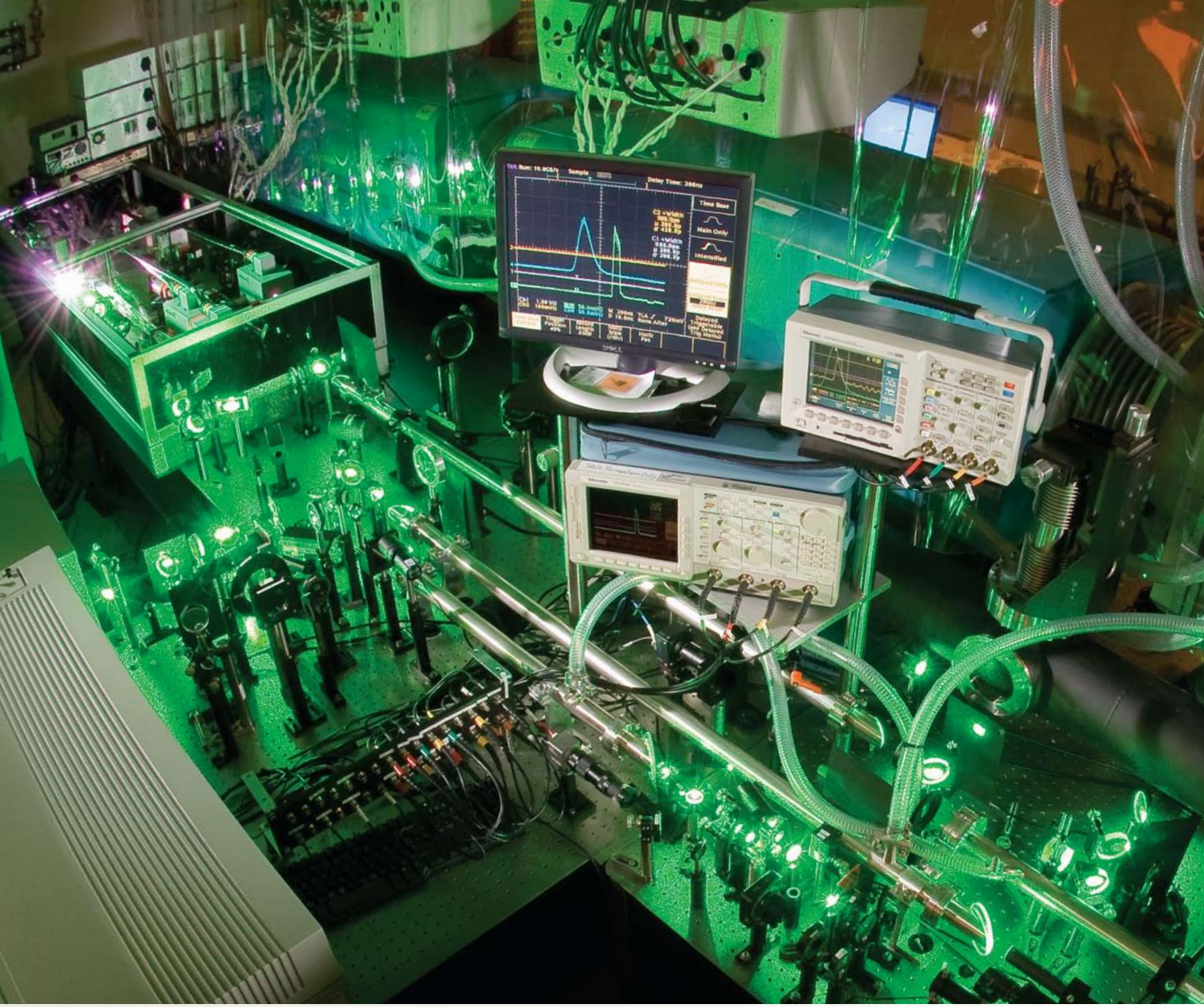


Advantages of National Energetics OPCPA based lasers:

- *Front end amplification in OPCPA eliminates the need for complex regenerative amplifiers, replacing CPA front ends with a very simple, high gain, single pass amplifier*
- *OPCPA has inherent high pulse temporal contrast*
- *OPCPA exhibits lower B-integral and the subsequent formation of mirror prepulses as seen in traditional Ti:Sapphire front end architectures*
- *OPCPA offers wavelength flexibility, enabling new wavelengths beyond the traditional 800 nm band of Ti:Sapphire, including near to mid IR CPA systems such as at 1.5 µm*

Advantages of Continuum pump lasers:

- *Over 30 years' experience in high energy laser design for excellent reliability and performance*
- *Global service and support with trained service technicians located worldwide to keep your system components running smoothly*
- *Modern digital electronics and controls with the ability to integrate system diagnostics*
- *Sophisticated systems control design team, delivering a customized control architecture with every system*



	DALLAS ARCHITECTURE	HOUSTON ARCHITECTURE
Wavelength	*1057 nm,* *Wavelength agile capability*	*800 nm*
Pulse Duration	*100 –150 fs*	*25 – 50 fs*
Pulse Energy	*1 J – 30 J*	*0.1 J – 30 J*
Repetition Rate	*0.1 Hz @ 1– 3 J pulse energy* *1 shot/5 min @ 30 J*	*10 Hz @ 0.1 – 3 J* *0.1 – 2 Hz @ 3 – 30 J*
Pump Laser Requirements	*Low energy only for front end;* *None needed for power amp*	*2 – 10 Hz Nd:YAG for high rep. rate option* *0.1 Hz Nd:Glass for low rep. rate option*
Compressor Diffraction Gratings	*High diffraction efficiency dielectric*	*Traditional gold coated*
Advantages	• *Much lower cost for comparable energy* • *No need for pump laser at high energy; simplicity by design* • *Very high beam quality associated with glass amps* • *Very compact with small beam aperture for given energy*	• *Shortest possible pulses down to 25 fs* • *Multi-Hz repetition rate possible at pulse energy ≤ 5 J*

TWO PRINCIPAL ARCHITECTURES

We base our designs on two principal architectures; each can be tailored to meet the energy, pulse duration and contrast requirements of the application. Both designs are modular, allowing expansion into higher energies as budgets permit.

The Dallas Architecture

The Dallas Architecture represents a unique approach to high energy CPA lasers, offered only by National Energetics. It is a derivative of the successful technology that our team developed in the Texas Petawatt Laser and the GHOST 20 TW laser.

The Dallas Architecture achieves high power by broadband amplification in OPCPA amplifiers at a wavelength of 1057 nm, followed by amplification of the pulse in a mixture of Silicate and Phosphate Nd:Glass amplifiers. No Ti:Sapphire is used. This architecture delivers pulses at energies of 1 J to 30 J, with pulse durations of 100–150 fs. Moving to different doped glass opens designs at 1.5 μm and beyond. The final pulse compression utilizes very high diffraction efficiency, high damage threshold, dielectric coated gratings.

The Dallas Architecture is a very compact design with a low beam aperture when compared to Ti:Sapphire lasers of comparable energy. The great advantage of the Dallas Architecture is that high energy, high contrast pulses can be achieved with the simplicity, low cost and proven reliability of flashlamp pumped Nd:Glass amplifiers, while still permitting femtosecond pulse compression at reasonable repetition rates.

The Houston Architecture

The Houston Architecture is our improvement to traditional Ti:Sapphire based CPA systems operating at 800 nm. It has the advantage of yielding pulses with duration as short as 25 fs with energy from 100 mJ to 30 J.

This design employs broadband OPCPA followed by amplification in a series of Ti:Sapphire amplifiers, with ultimate compression in a set of gold-coated diffraction gratings. The use of OPCPA at 800 nm insures the high temporal pulse contrast inherent in OPCPA systems, while retaining the 25 fs pulsewidth capability enabled by the use of Ti:Sapphire in the power amplifiers.

Your Team

National Energetics commercializes two emerging technologies that have the potential to have a large impact for you.

- OPCPA front ends offer significant advantages to classic Ti:Sapphire amplification schemes. They improve performance with better contrast ratios and no pre-pulse formation. The result is better data and better research.

- The Dallas Architecture opens a new way to achieve high energy while directly amplifying the seed source and eliminating secondary pumping. This dramatically simplifies system designs and lowers costs. It also opens up the possibility of exploring new wavelength regimes. The opportunities are endless.

We are a team of high energy laser users–and your colleagues. Our goal is to bring the highest quality and reliability, plus the best technical approach, to next-generation high energy laser development. Talk to us about where you want your research to be in 10 years. We will listen and work with you to design your final system optimized for your research requirements. We will present you with a logical solution not only for today, but one that can grow with you for years to come.

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