



DALLAS ARCHITECTURE

A unique approach to ultra-high energy femtosecond laser designs, the Dallas Architecture is based on the Texas Petawatt laser system at the University of Texas and the GHOST 20 TW system.

Designed for operation at 1057 nm, the Dallas Architecture achieves high power by broadband amplification in multiple OPCPA amplifiers followed by a series of mixed glass amplifiers. No Ti:Sapphire is used. The National Energetics team has demonstrated this design to above 1 PW output power. Delivering pulses of near 100 fs duration, a Dallas based laser offers femtosecond pulse performance at high pulse energy in a much more compact, cost efficient package than traditional Ti:sapphire systems.



1053 nm

100 to 150 fs

1 to 30 J

OPCPA

No Ti:Sapphire

Advantages

- *Modular design, scaleable to higher energy with additions of mixed glass amplifiers without major redesign of existing components*
- *OPCPA front end, higher contrast ratio and no prepulses—output spectrum shaped by temporal control of the pump laser*
- *Direct amplification, no pump lasers and no separate amplifier crystals for majority of gain—lower cost, more efficient power generation*
- *High diffraction efficiency dielectric compressor grating—higher damage threshold, lower loss versus gold*
- *Ability to operate in different wavelength regimes than standard Ti:Sapphire designs*

Modular Design

The Dallas Architecture consists of four major components:

Pulse Shaping: The initial seed pulse is taken from a standard femtosecond seed laser. The pulse shaping component of the system slices and preamplifies a single laser pulse before stretching it in a classic 4-pass reflective grating stretcher. The system is designed to minimize aberration and remove beam spatial irregularities before moving to the second stage of the system.

OPCPA: The OPCPA system is a multi-element broad bandwidth amplifier based on BBO. This stage provides high gain, boosting pulse energy up to a fraction of a Joule. The output bandwidth of the pulse is broadened over the input bandwidth due to saturation. In addition, the output spectrum of the pulse is shaped by temporal control of the pump laser. No regenerative amplifier is used, eliminating prepulse formation. The simplicity of single pass OPCPA amplification makes the system robust and easy to align.

Mixed Glass Amplification: Direct amplification in Nd:Glass rods provides the final 90–99% of the pulse energy. There are no Ti:Sapphire crystals necessary, and no external pump lasers to excite the gain media. The system is simple, and compact. Multiple glass types are used, increasing the gain bandwidth in the amplifiers. The amplifier gain is matched to the OPCPA spectral output to optimize the spectral output of the final pulse for best compression. Amplifier modules can be added over time, increasing system power as budgets allow.

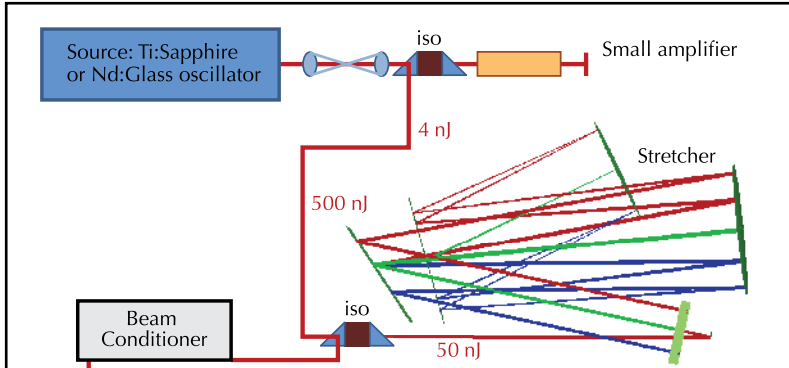
Compression: The Dallas Architecture uses multilayer dielectric gratings developed for near IR wavelengths. These gratings have higher efficiency and higher damage thresholds when compared to traditional gold grating designs used in Ti:Sapphire systems. This allows a more compact design with smaller beam diameters.



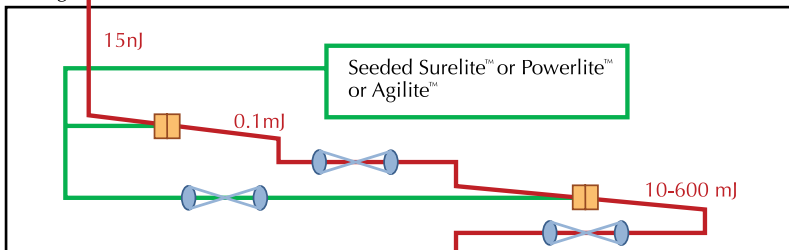


Typical Dallas Architecture System

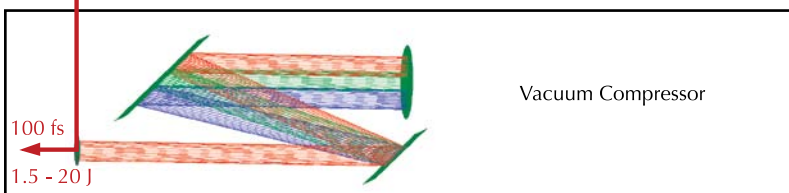
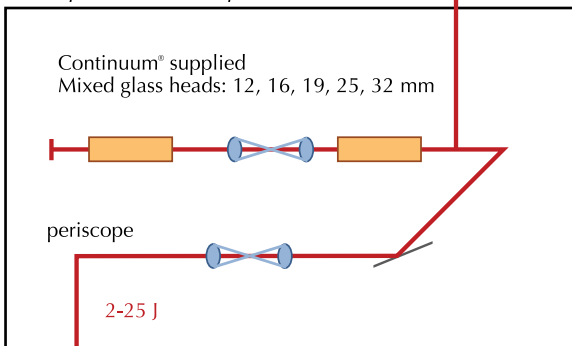
Pulse Shaping and Conditioning



2 stage OPCPA



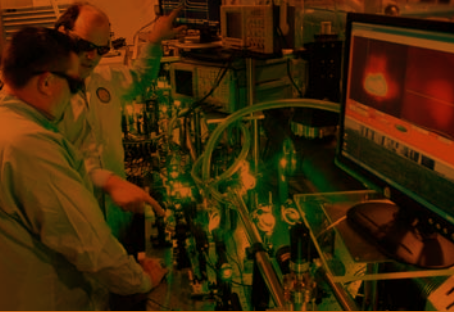
Multi-pass Power Amp 1 and 2



Build Your System

National Energetics is a dedicated team of experts in ultra-high energy femtosecond laser system design. We are also users of these systems. We will listen to you about your research goals and help you design a system tailored to your needs. We offer our systems with Continuum® pump lasers and components, and include a custom Graphical User Interface (GUI) to control them. We leverage Continuum's global service and support presence to insure you are satisfied today and tomorrow.

For more information on the Dallas Architecture and how it can benefit you, please contact National Energetics.



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 prepulse 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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