

Plasma Physics Seminar

Physics & Astronomy Building (PAB) Room 4-330

Via Zoom: <https://ucla.zoom.us/j/92785449357?pwd=SVBTSko3bTdEUW03dzQwNks1Q2IKZz09>

Friday, February 16, 2024 at 12:30PM

Lunch will be served at 12:00PM

Bigger is Better: NLO-Boosted Excimer Lasers for Inertial Fusion Energy

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Abstract: The National Ignition Facility achieved scientific breakeven in December 2022. While this was a major accomplishment, many challenges remain in making Inertial Fusion Energy (IFE) a reality. In particular, reliable commercial IFE will require a laser system that is much more efficient, lower cost, and higher energy, with superior spatio-temporal control of laser radiation. To accomplish this, Xcimer Energy is combining χ^3 nonlinear optical (NLO) gas amplifiers with high-energy excimer amplifiers in a highly flexible architecture that can scale to tens of megajoules of laser energy on-target with an efficiency of 5% to 7% and cost of tens of dollars per joule, and the ability to deliver energy to-target from a very small solid angle ($<10e-3$ sr). This will provide a practical path to rapidly demonstrate and commercialize IFE by allowing the use of simpler fusion targets that can achieve high gain robustly, and allowing repetition rates for electrical power production of under 1 Hz which relaxes requirements throughout the plant. Furthermore, this laser architecture enables the well-studied HYLIFE reactor concept utilizing thick liquid FLiBe molten salt flows to protect the first structural wall, allowing a 30-year lifetime from existing low-activation steel and eliminating the need to develop and qualify new first-wall materials.

[Xcimer Energy](#) has raised funds from leading clean-tech venture firms, and is beginning construction of the “Phoenix” prototype laser facility in Denver, Colorado. Phoenix will be a kilojoule-scale testbed for low-pressure gas NLO (Brillouin and Raman) amplifier development, and will be online in early 2026. Xcimer is currently recruiting for scientific and engineering positions including nonlinear optical physics, low density plasma chemistry and kinetics, plasma physics, pulsed-power, ML optimization and control, and laser & fusion engineering.