Mission Statement

The Laboratory for Laser Energetics (LLE) of the University of Rochester is a unique national resource for research and education in science and technology. The Rochester area has a history of innovation and provides a unique setting for LLE within a technologically sophisticated community. Established in 1970 as a center for the investigation of the interaction of intense radiation with matter, the Laboratory has a five-fold mission:

1. to conduct implosion experiments and basic physics experiments in support of the National Inertial Confinement Fusion (ICF) Program;

2. to develop new laser and materials technologies;

3. to provide graduate and undergraduate education in electro-optics, high-power lasers, high-energy-density physics, plasma physics, and nuclear fusion technology;

4. to operate the National Laser Users’ Facility (NLUF); and

5. to conduct research and development in advanced technology related to high-energy-density phenomena.

The 2014 LLE Calendar contains information about many of the Laboratory’s programs. We hope that you enjoy using your copy of the LLE Calendar and wish you a productive and fulfilling 2014.

LLE is funded by the National Nuclear Security Administration (NNSA) to support its Stockpile Stewardship Missions.

Photography by Eugene Kowaluk
Welcome to 2014

LLE Vision

LLE envisions a secure, environmentally neutral, and inexhaustible energy source for mankind. This future energy source—fusion—is the basis of the sun’s energy and is carbon and radioactive-waste free.

2014 will be a year of challenges and opportunities

- Ongoing pursuit of ignition and the development of ignition alternatives
- Polar-drive cryogenic implosions on OMEGA!
- Omega will remain the premier high-energy-density user facility
- Education and training of students (high school through Ph.D.) is a high priority

Prof. Robert L. McCrory
Vice President and Vice Provost, University of Rochester
Director, Laboratory for Laser Energetics
A channel dug into a preformed plasma with a high-intensity OMEGA EP laser beam (outlined with white dashed lines) is imaged using the new OMEGA EP fourth-harmonic probe and an angular filter refractometer.
Jake Bromage and Rick Roides align an ultra-broadband front end developed for an upgrade to the MTW Laser Facility that will advance high-energy-density plasma physics and ultrafast laser science.

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<td>JANUARY</td>
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FEBRUARY 2014
A new generation of x-ray framing cameras developed by Sydor Instruments of Rochester, NY is being used on OMEGA. Ray Bahr is shown assembling the Sydor x-ray framing camera (SFC) prior to its first use.
The fifth OLUG workshop held on 24–26 April 2013 attracted researchers from all over the world who have an interest in participating in Omega Laser Facility experiments.
A snapshot of the Langmuir wave spectrum obtained with the ZAK3D code compared with semi-analytic calculations when the growth is still in the linear phase. The Langmuir waves grow as a result of the two-plasmon–decay instability driven by four overlapped laser beams having angles and polarizations consistent with OMEGA EP.
Neutron temporal diagnostic (NTD)

The NTD measures the time history of the neutrons produced in a fusion-target experiment. The photographs show a new high-precision NTD system being installed on OMEGA. The system uses a ROSS Sydor streak camera, replacing the old Nova NTD system.

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**JUNE 2014**
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<th>March 5th nTOF Analysis</th>
<th>Yield</th>
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<tr>
<td>#68951: $\rho R = 160 \text{ mg/cm}^2$</td>
<td>$3.36 \times 10^{13}$</td>
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<td>#68952: $\rho R = 83 \text{ mg/cm}^2$</td>
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<td>#68954: $\rho R = 110 \text{ mg/cm}^2$</td>
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**Diagram Description:**
- **nTOF detector** is placed 1 meter from the **Mid-beam collimator**.
- The **Mid-beam collimator** is 13.4 meters from the **OMEGA target chamber**.
- The **Signal (V)** is measured over time (ns) with **DD peak**, **nT edge**, and **nD edge** indicated on the graph.
The nTOF detector measures the neutron spectrum emitted from deuterium–tritium (DT) fusion reactions in cryogenic implosions. Analysis of the spectrum provides important information on the implosion performance, including the compressed shell's areal density.
Participants in the 2013 Summer High School Research Program. The program provides unique research opportunities to talented regional high school students. The program director is Dr. Steven Craxton (center).
Steve Jacobs and Brittany Taylor examine a color-coded amplitude map of optical rotatory power taken of a striped distributed polarization rotator. The device consists of a liquid crystal fluid confined between 100-mm-diam glass substrates.
Glancing-angle–deposited (GLAD) coatings are evaluated on a Zeiss 1530 scanning electron microscope by Jim Oliver and Chris Smith. The birefringent film structure created by the GLAD process enables the vacuum deposition of wave-plate coatings.
Proton radiography is a powerful diagnostic tool that has been applied on a variety of experimental investigations at the Omega Laser Facility. A face-on proton radiographic image of a driven foil shows magnetic fields generated by the nonlinear stage of the Rayleigh–Taylor instability.
MIFEDS Cu foil
Magnetic field from foil current
CH ablator
OMEGA EP long-pulse lasers
Laser-produced plasma
Current sheet
Shot 14250
Collision of counter-streaming magnetized plasmas

Proton radiographic image of a magnetized counter-streaming plasma from an NLUF experiment led by W. Fox of the University of New Hampshire.