

2014



LABORATORY *for* LASER ENERGETICS

University of Rochester • Laboratory for Laser Energetics

www.lle.rochester.edu



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



The background of the page is a photograph of the exterior of the Laboratory for Laser Energetics building. The building is a large, multi-story structure with a prominent brick facade. On the right side of the brick wall, the words "LABORATORY for LASER ENERGETICS" are inscribed in large, dark, sans-serif capital letters. Below this, "UNIVERSITY of ROCHESTER" is written in smaller letters. To the right of the university name is the LLE logo, which consists of the letters "UR" stacked above "LLE" next to a stylized sunburst or starburst symbol. The building has a modern architectural style with large windows and a flat roof. In the foreground, there is a paved walkway and some greenery, including bushes and a small tree.

Welcome to 2014



LLE Vision

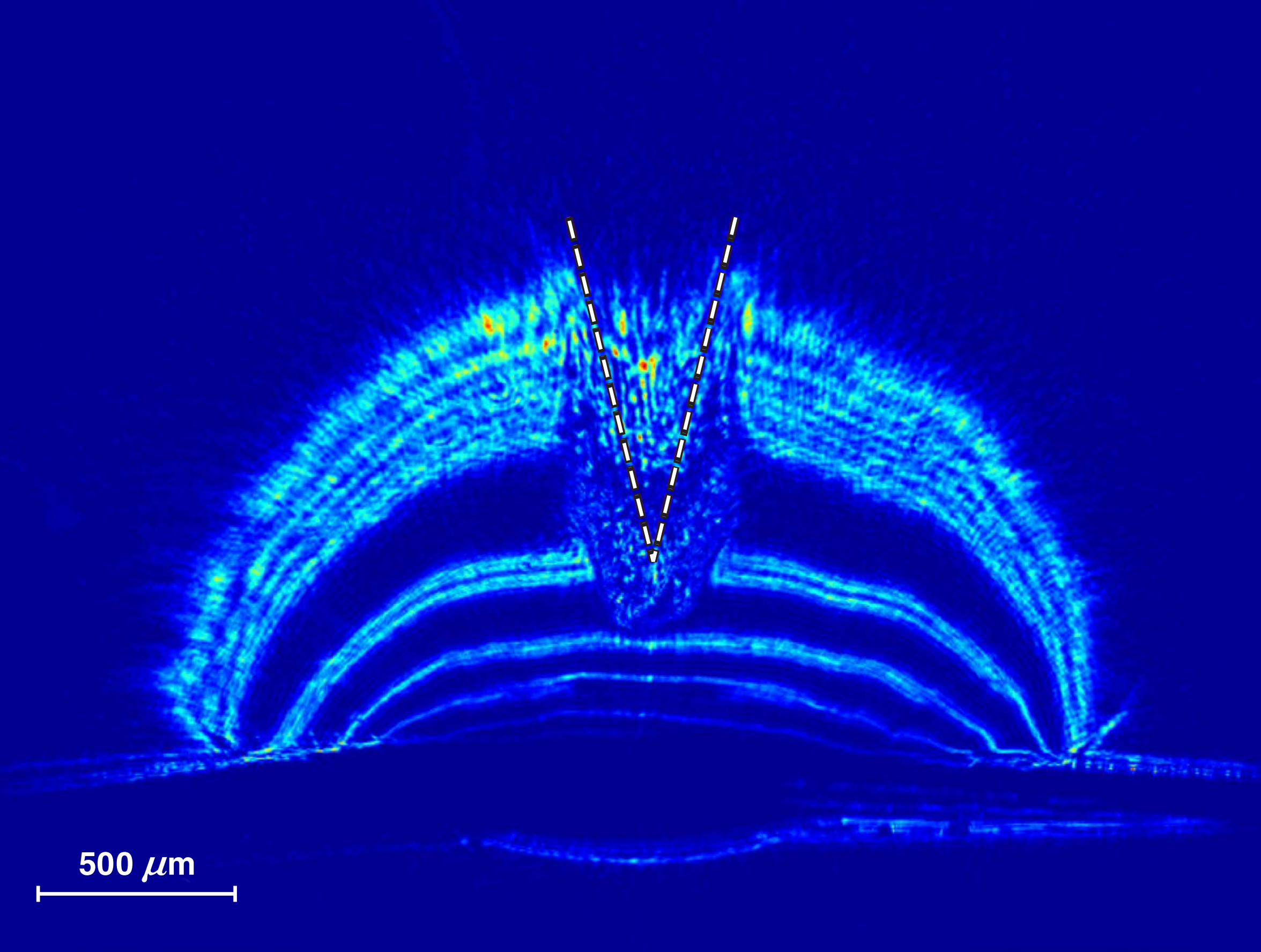
LLE envisions a secure, environmentally neutral, and inexhaustible energy source for mankind. This future energy source—fusion—is the basis of the sun's energy and is carbon and radioactive-waste free.

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



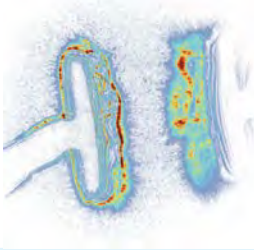
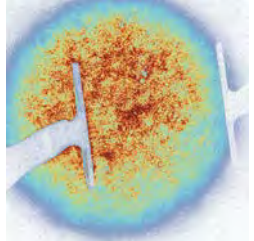
Prof. Robert L. McCrory
Vice President and Vice Provost, University of Rochester
Director, Laboratory for Laser Energetics



500 μm

OMEGA EP fourth-harmonic probe beam

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.

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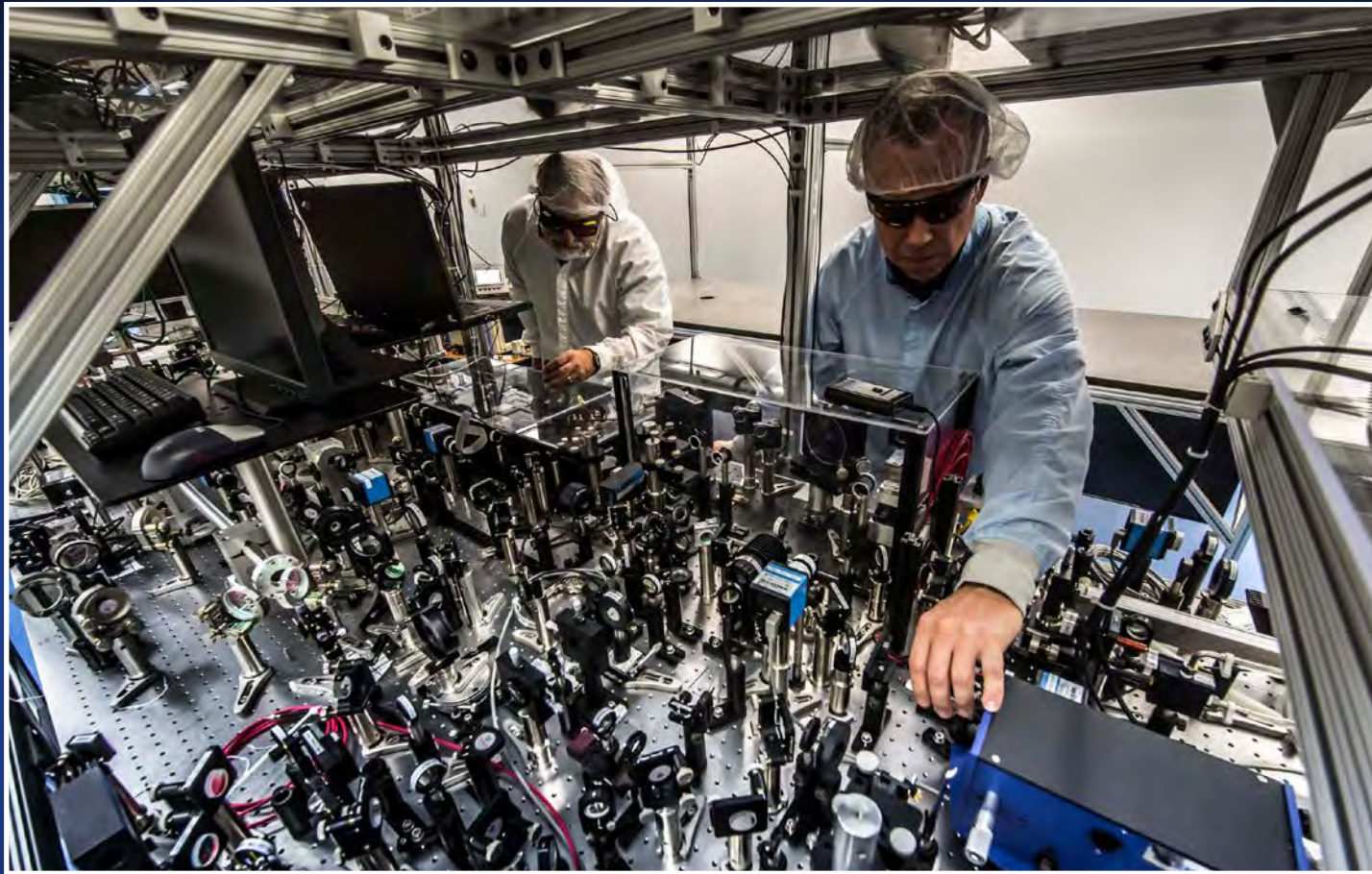
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2014

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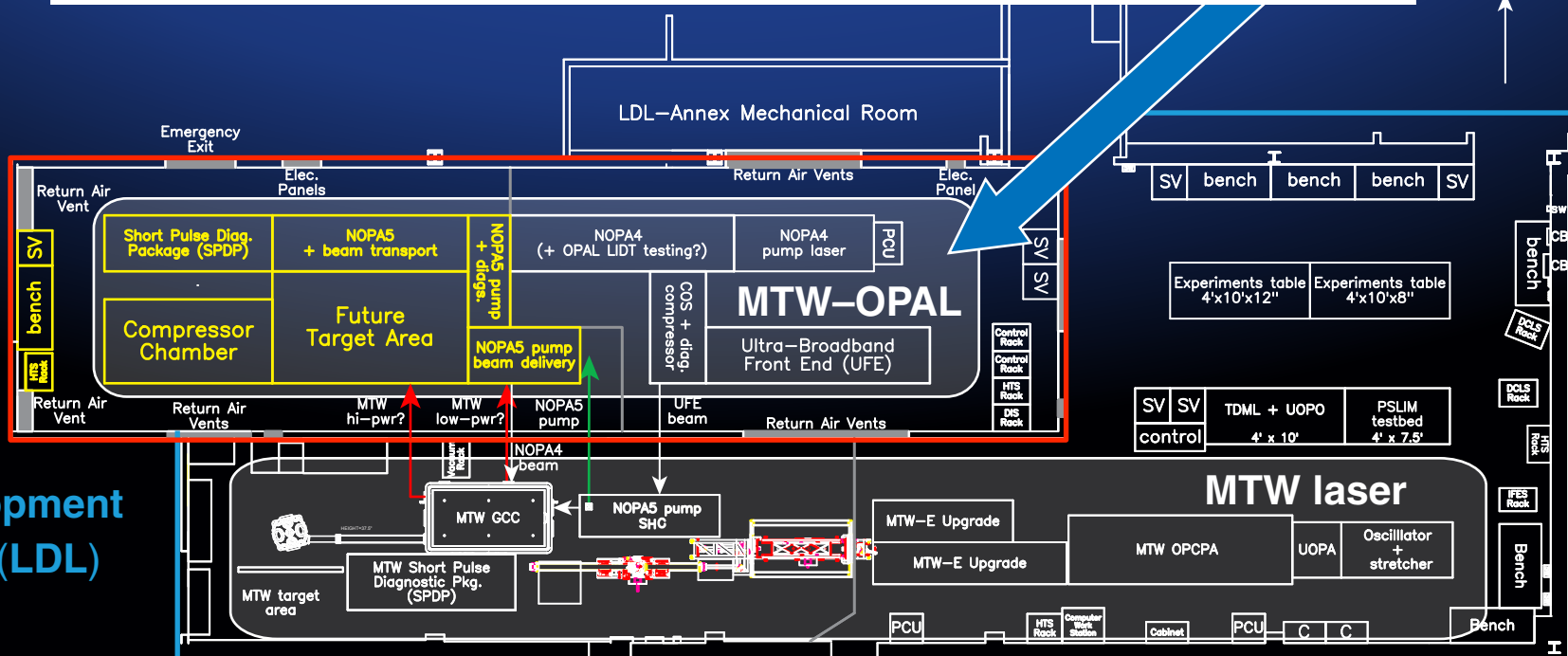




North

LDL-Annex

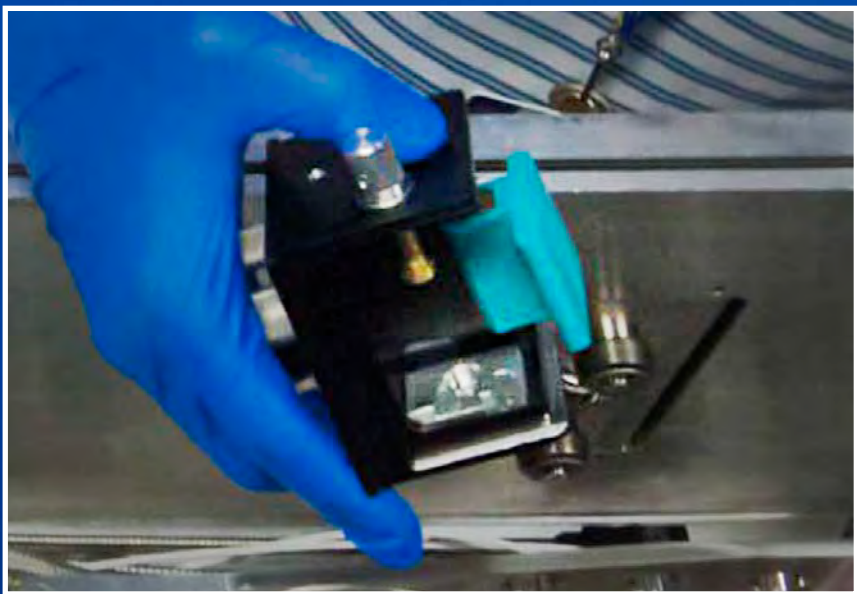
Laser Development
Laboratory (LDL)



Multi-Terawatt (MTW) laser upgrade

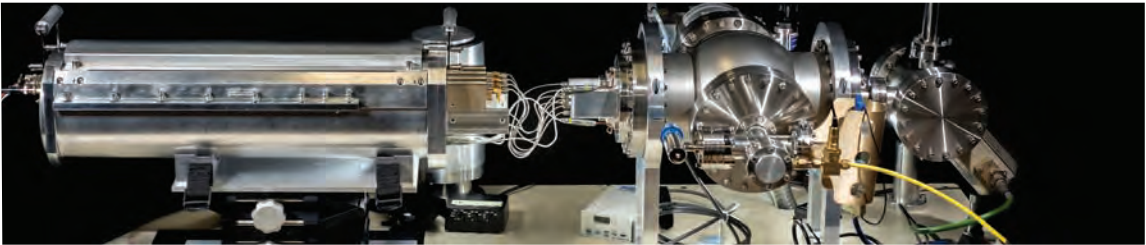
Jake Bromage and Rick Roides align an ultra-broadband front end developed for an upgrade to the MTW Laser Facility that will advance high-energy-density plasma physics and ultrafast laser science.

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Sydor framing camera

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.

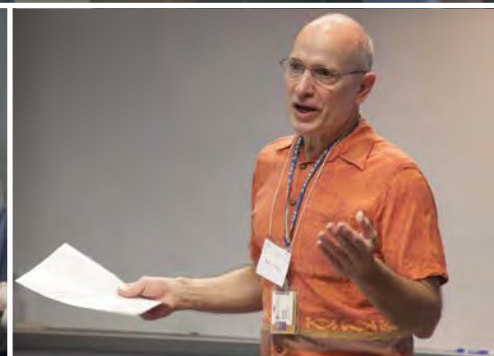
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MARCH 2014

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Omega Laser Facility Users Group (OLUG)

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.

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APRIL 2014

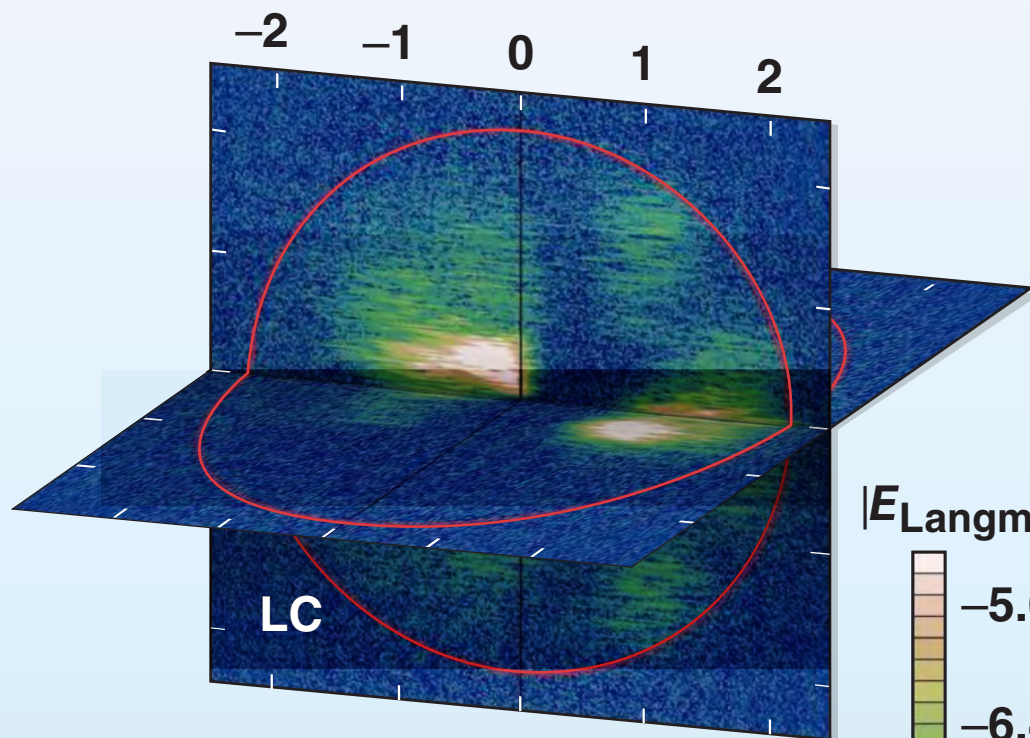
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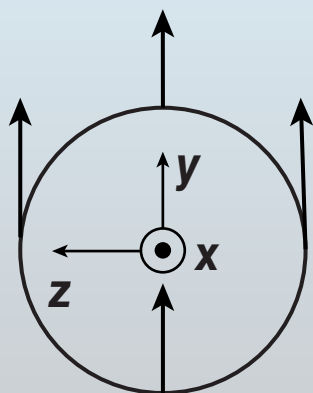
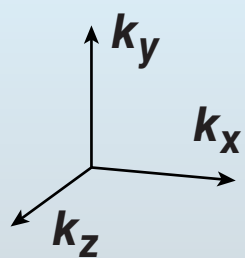
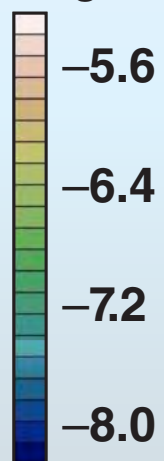


ZAK3D

k_x/k_0

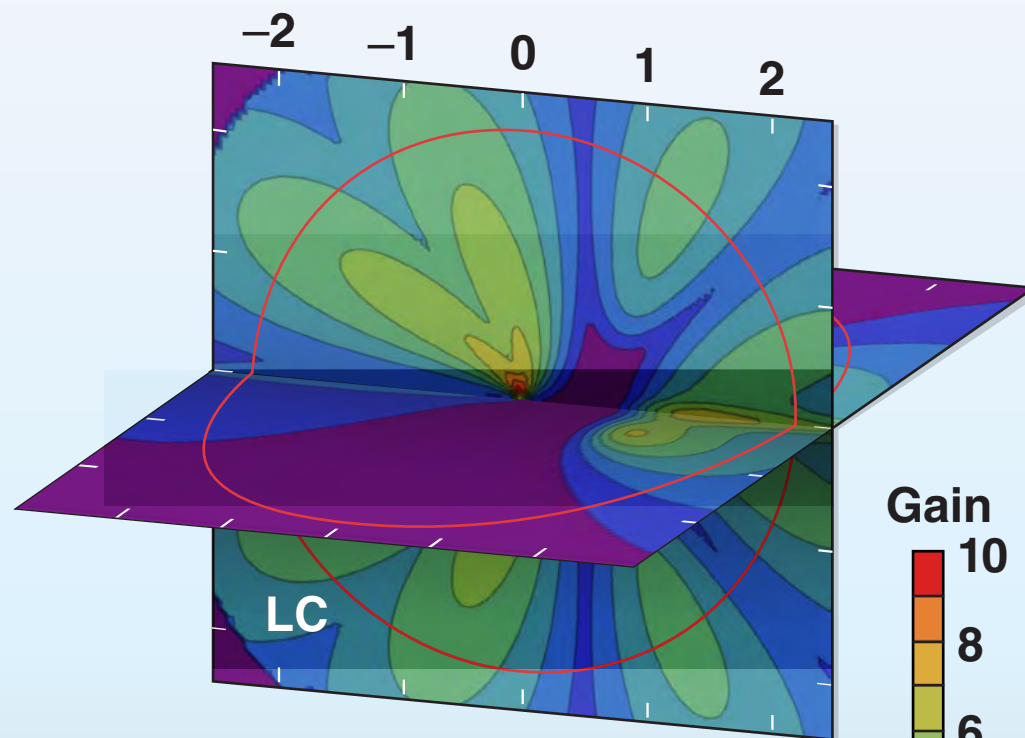


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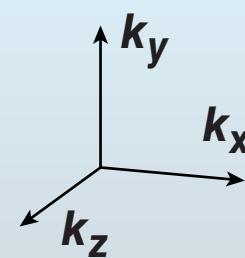
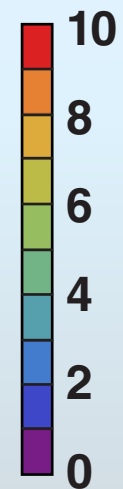


Analytic model

k_x/k_0



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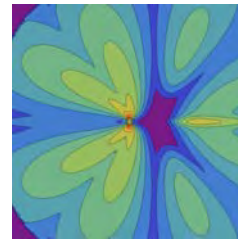
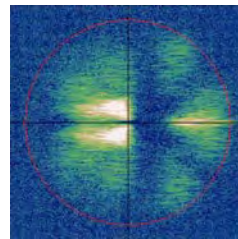
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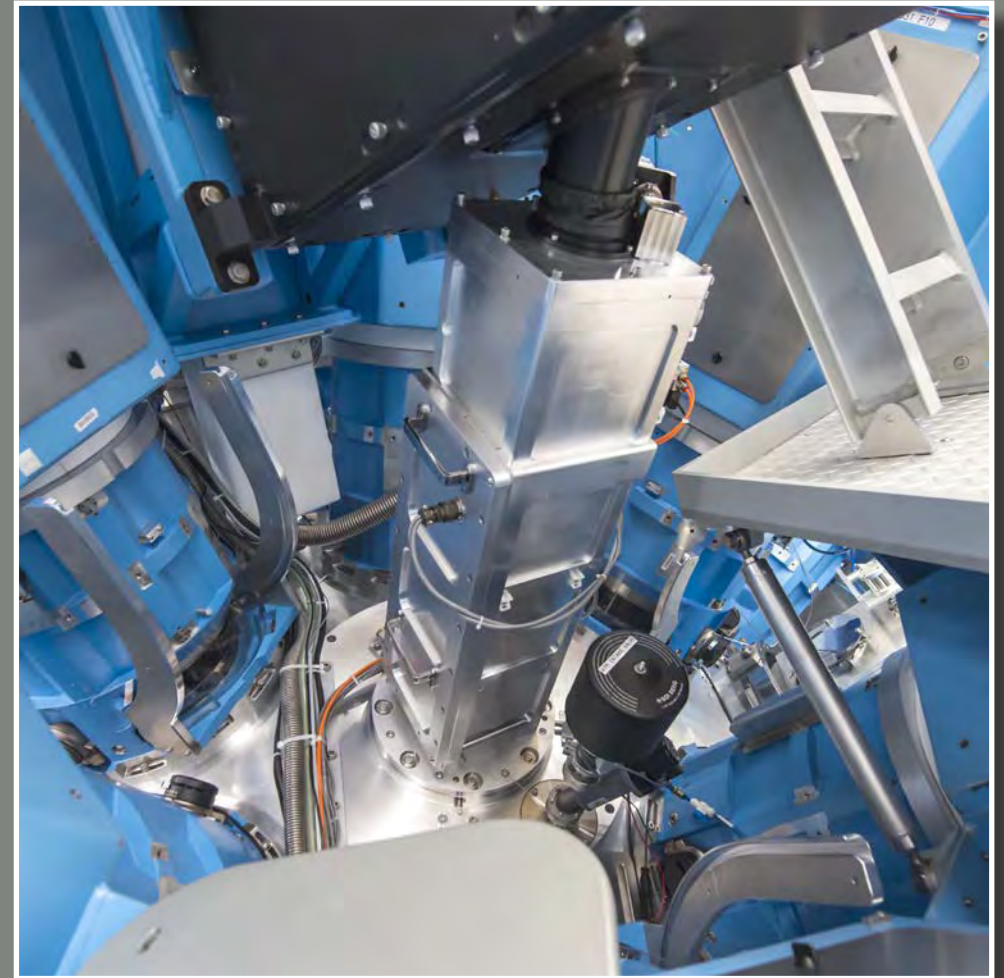
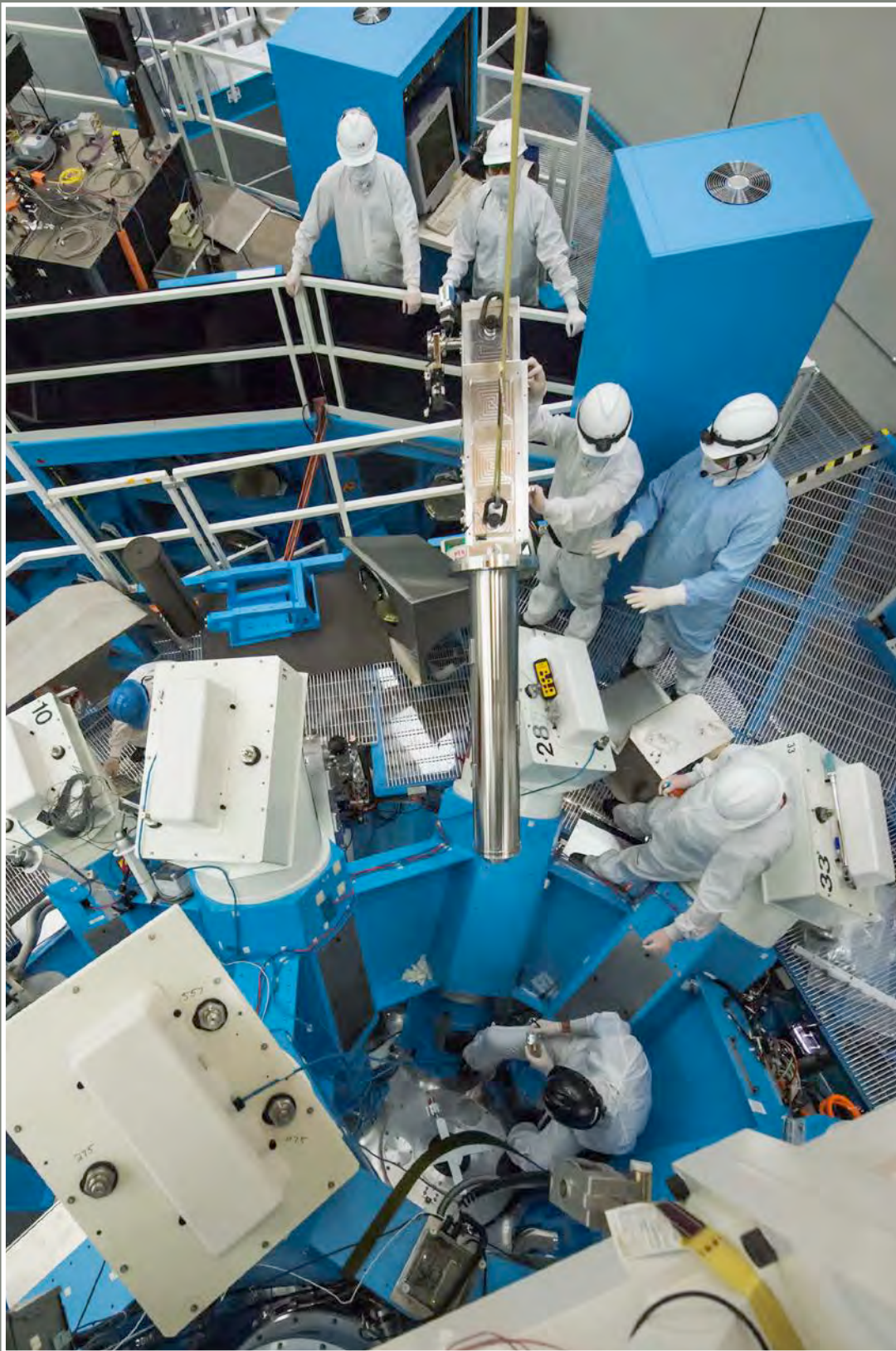
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31

MEMORIAL DAY
UNIVERSITY HOLIDAY

MAY

2014



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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LLE GOLF TOURNAMENT
AT BLUE HERON HILLS

SUMMER SOLSTICE

MAY

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JULY

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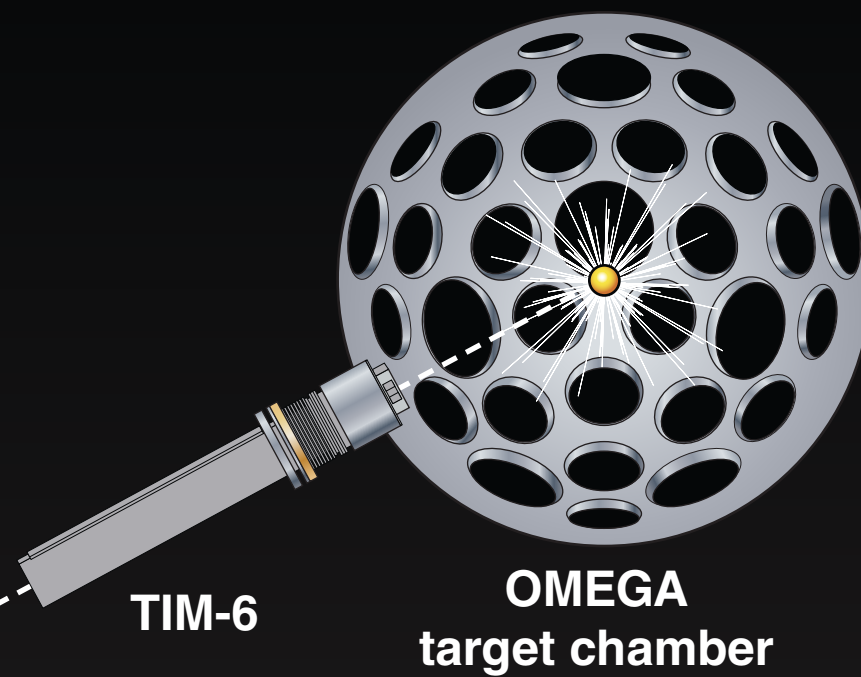
JUNE

2014

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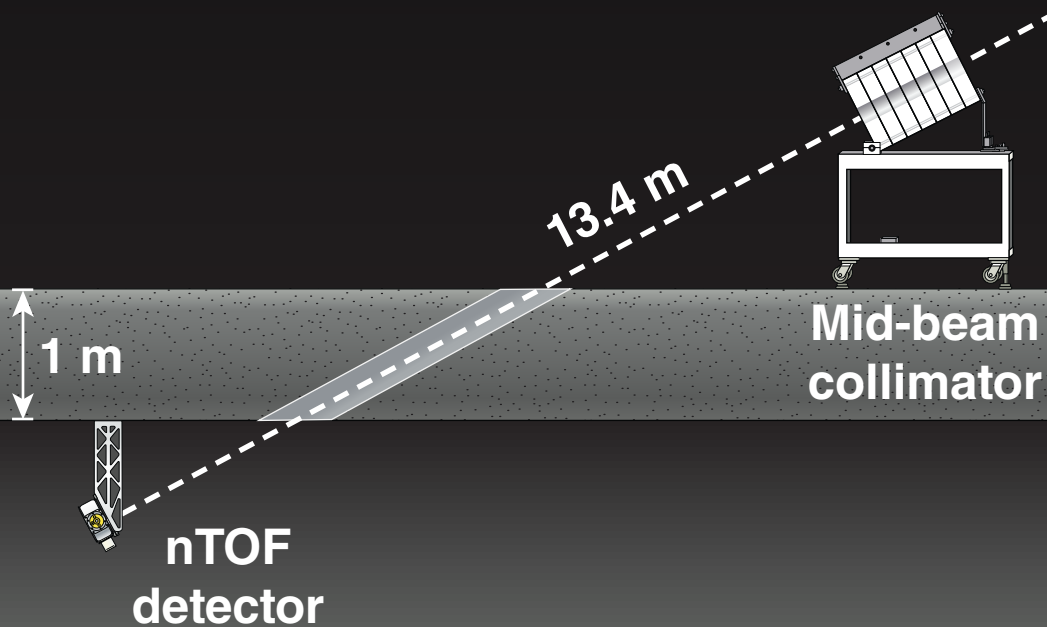
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TIM-6

OMEGA
target chamber

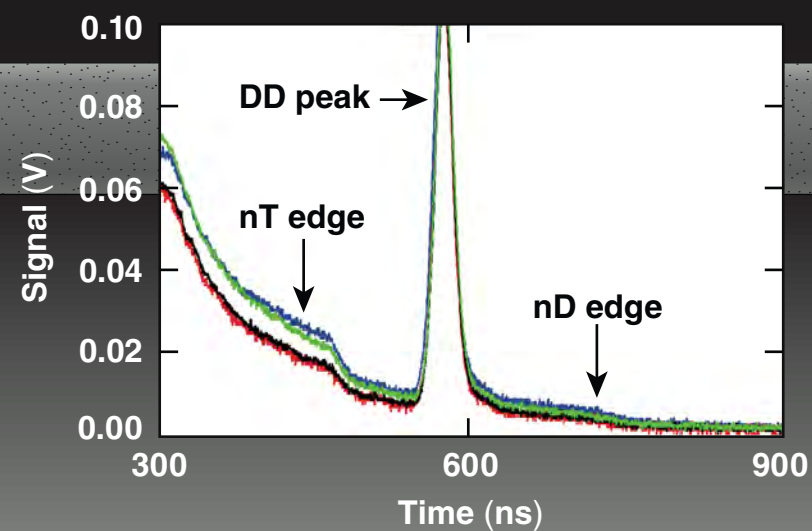


13.4 m

Mid-beam
collimator

nTOF
detector

March 5th nTOF Analysis	Yield
#68951: $\rho R = 160 \text{ mg/cm}^2$	3.36×10^{13}
#68952: $\rho R = 83 \text{ mg/cm}^2$	1.39×10^{13}
#68953: $\rho R = 83 \text{ mg/cm}^2$	1.39×10^{13}
#68954: $\rho R = 110 \text{ mg/cm}^2$	1.98×10^{13}



Neutron time-of-flight detector (nTOF)

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.

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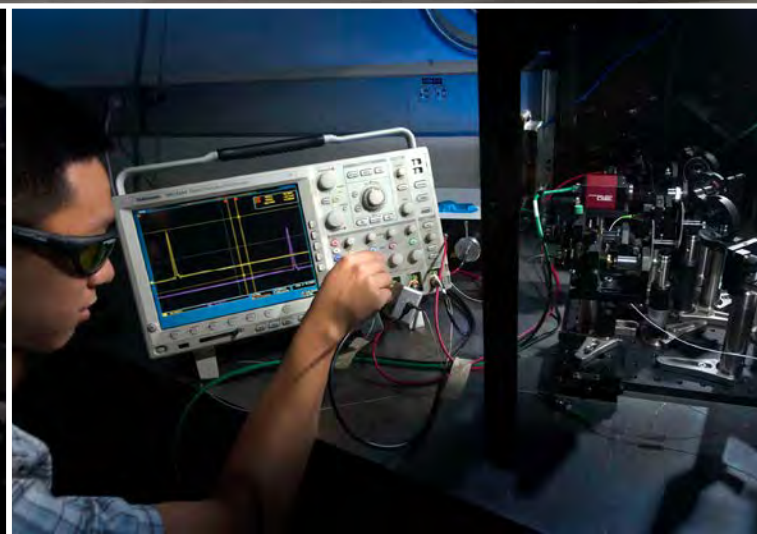
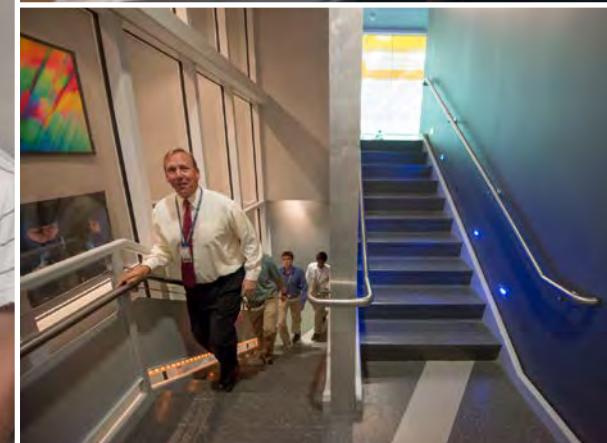
JULY

2014

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Summer High School Research Program

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).

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AUGUST

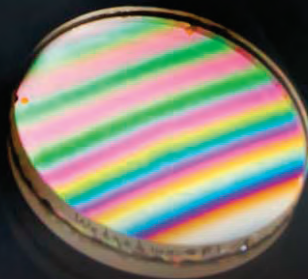
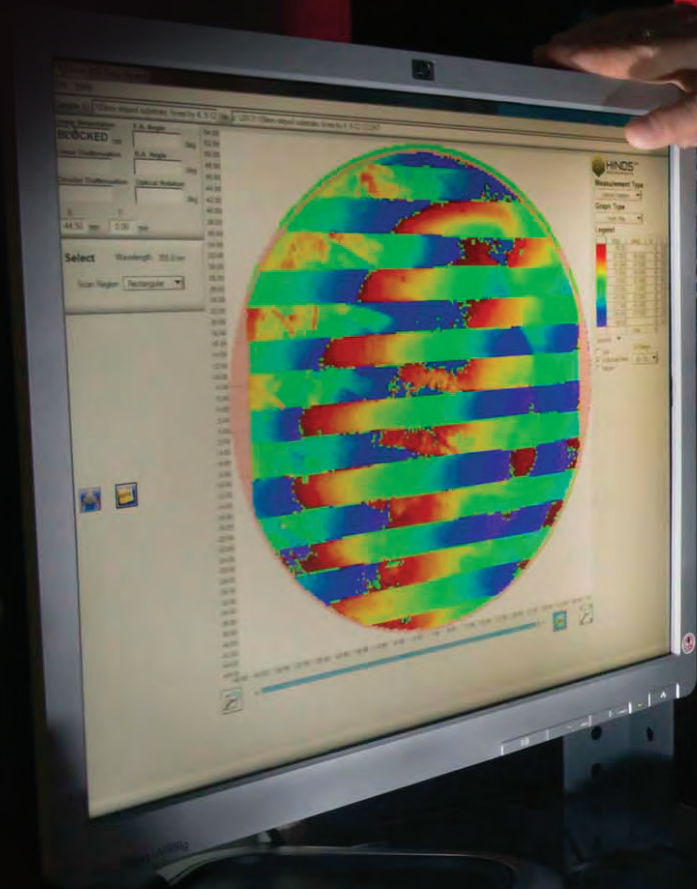
2014

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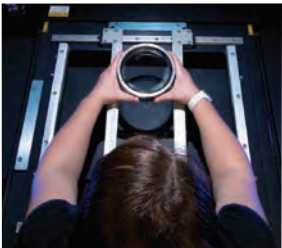


EXICOR[®]
EXCELLED IN THE POLARIZER



Distributed polarization rotator

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.

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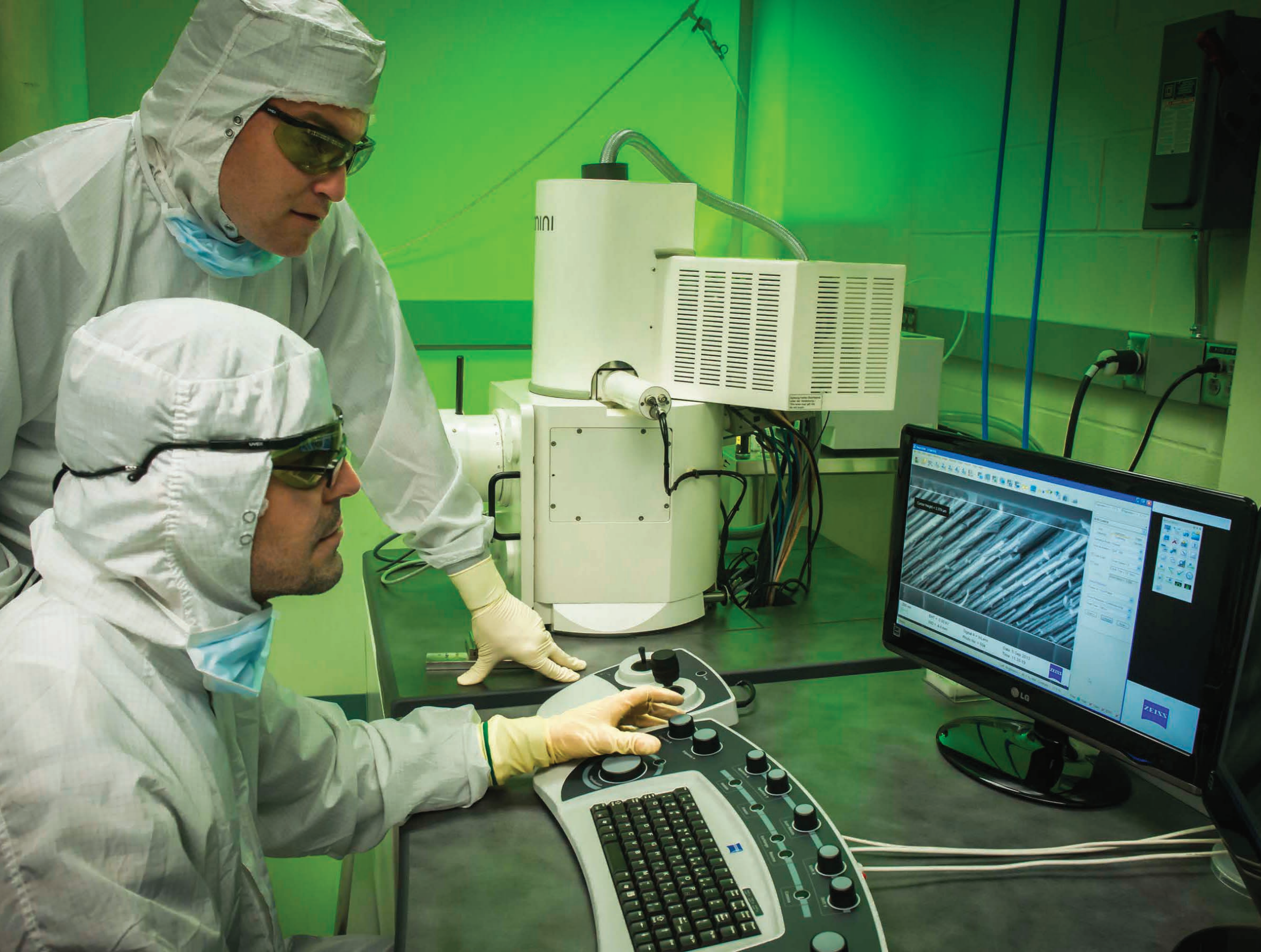
SEPTEMBER

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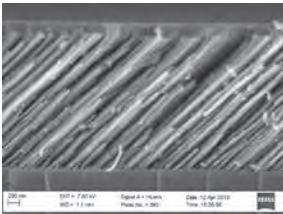
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Glancing-angle-deposited (GLAD) coatings

Glancing-angle-deposited (GLAD) films 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.

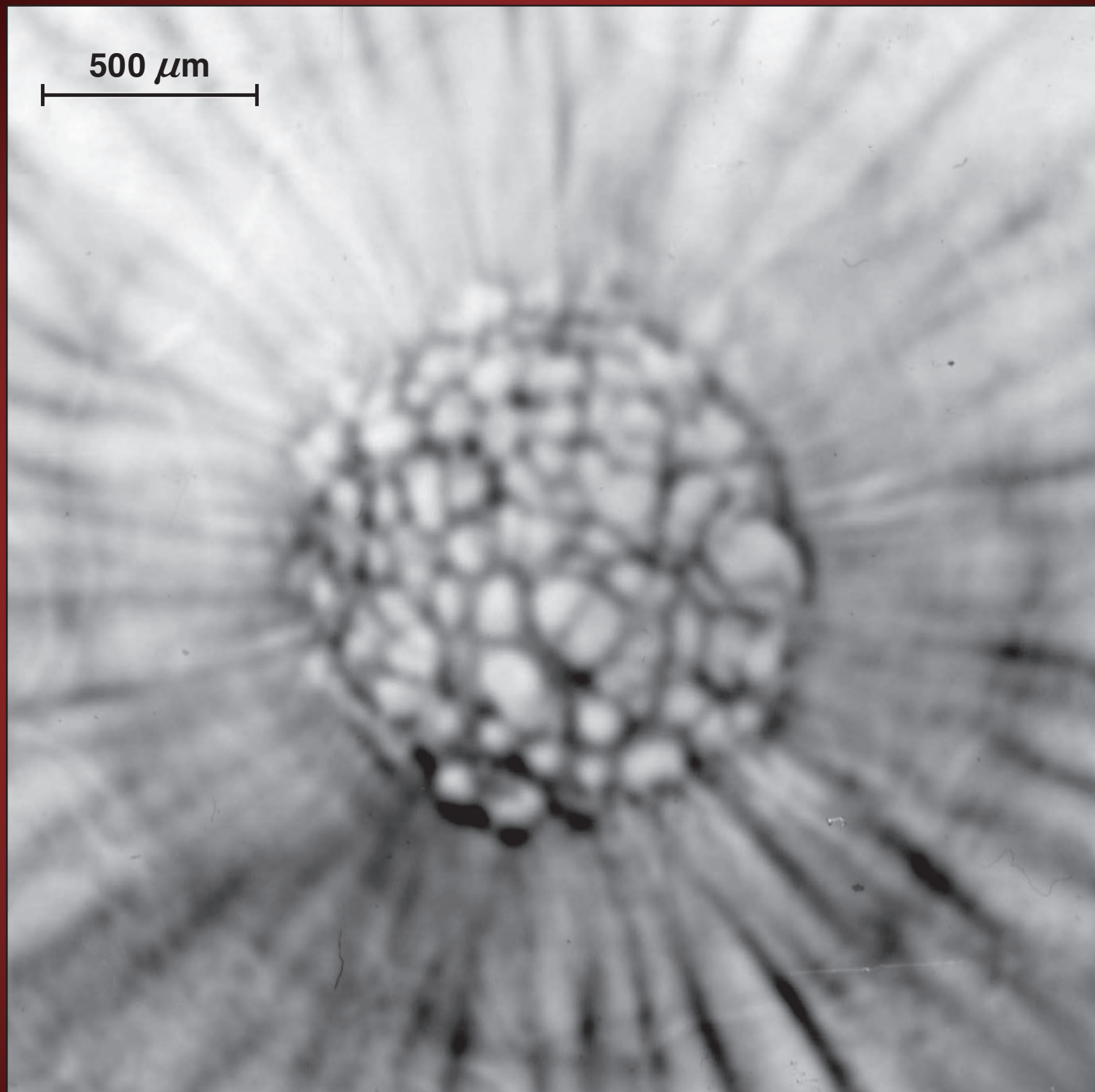
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← 56TH ANNUAL MEETING OF THE APS DIVISION OF PLASMA PHYSICS IN NEW ORLEANS, LA →						

OCTOBER 2014

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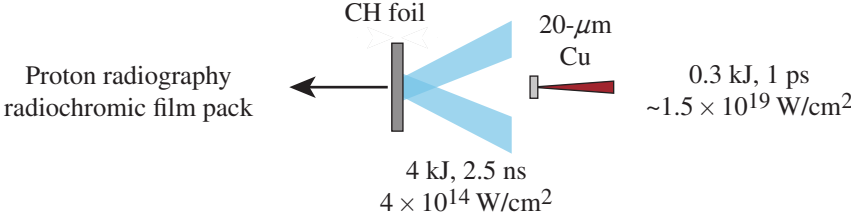
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Proton radiography

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.

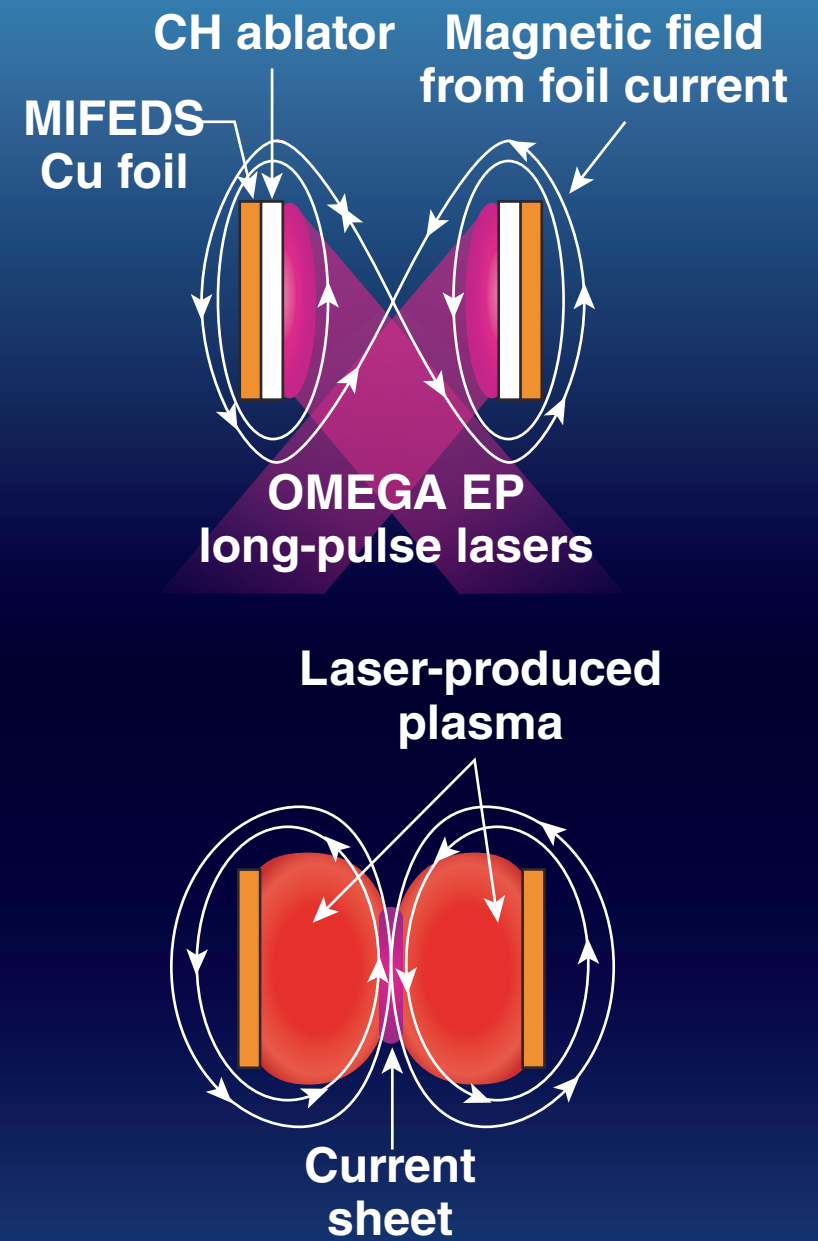
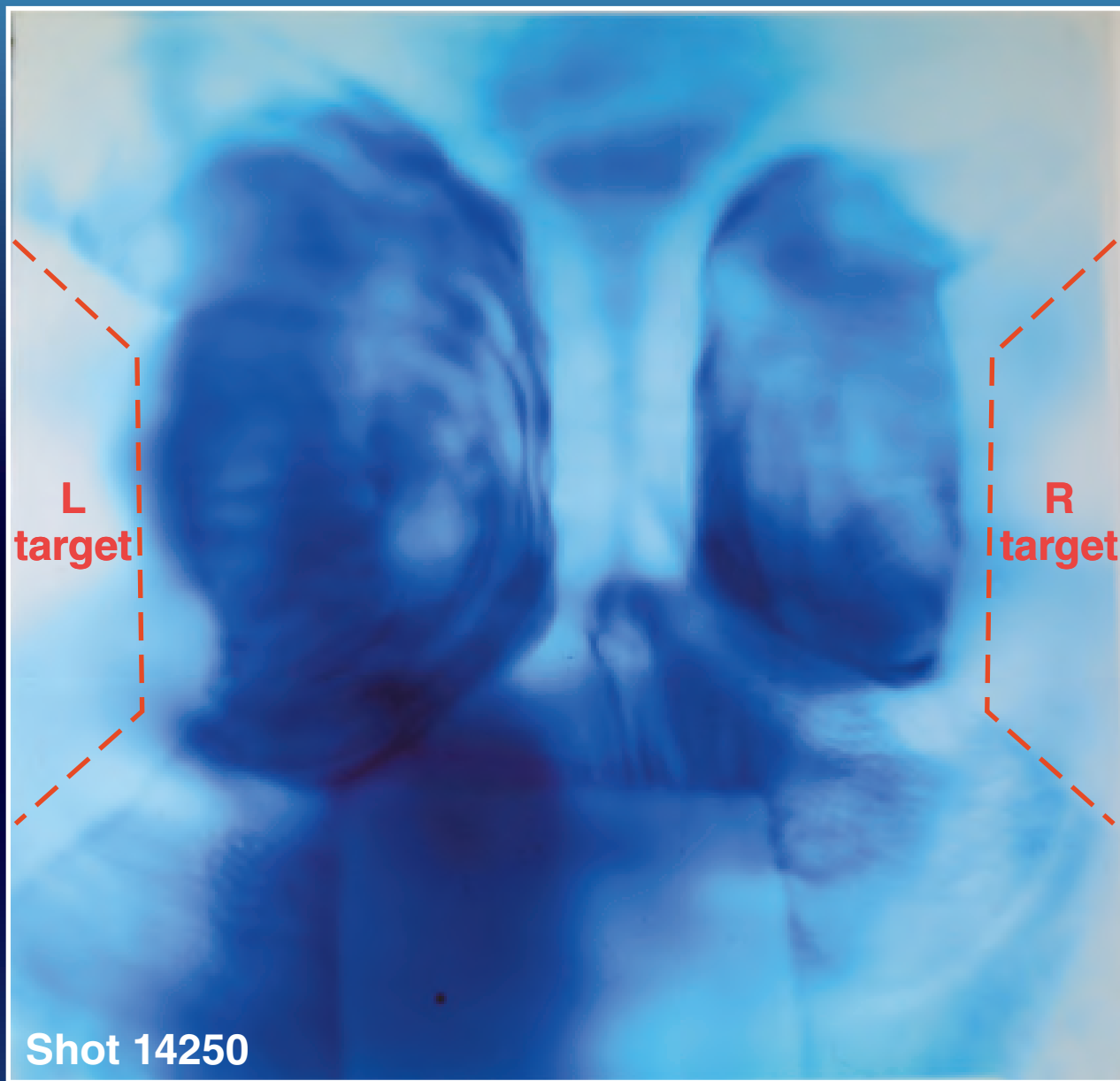
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NOVEMBER 2014

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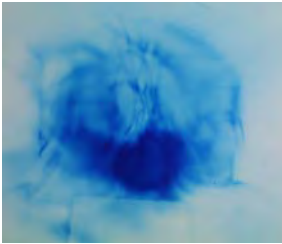
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Collision of counter-streaming magnetized plasmas

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

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DECEMBER

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2015

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