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# The Eighth Omega Laser Facility Users Group Workshop

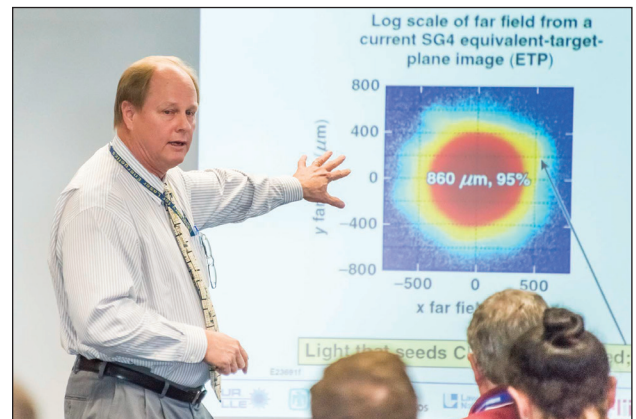
## Introduction

The Eighth Omega Laser Facility Users Group (OLUG) Workshop was held at the Laboratory for Laser Energetics (LLE) on 27–29 April 2016. More than 110 scientists, postdoctoral fellows (postdocs), and students from institutions in the U.S. and abroad attended the workshop. As has been the case in previous workshops, postdocs and students received travel support for the workshop from the Department of Energy’s (DOE’s) National Nuclear Security Administration (NNSA).

## The Workshop Program

The workshop program included an overview on the National Inertial Confinement Fusion (ICF) Program presented by Keith LeChien from NNSA; four review and science talks by Craig Sangster (National ICF Direct-Drive Program), Carlo Graziani (Inferring Morphology and Strength of Magnetic Fields from Proton Radiographs), Philip Nilson (High-Resolving-Power, Ultrafast Streaked X-Ray Spectroscopy on OMEGA EP), and Jonathan Davies (An Overview on Laser-Driven Magnetized

Liner Inertial Fusion on OMEGA); one Omega Laser Facility talk given Samuel Morse (Progress on Recommendations and Items of General Interest); three poster sessions including a total



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Figure 148.26  
Craig Sangster (LLE) discussed the National ICF Direct-Drive Program.



U2045JR

Figure 148.27  
Attendees at the Eighth Omega Laser Facility Users Group Workshop.

of 76 research posters and 15 Omega Laser Facility posters (the majority of the contributed posters were presented by postdocs and students) two mini-workshop sessions dedicated to streak cameras (organized by Charles Sorce) and magneto-inertial fusion electrical discharge system (MIFEDS) (organized by Gennady Fiksel); a students and postdocs panel discussion; a discussion and presentation of the **Findings and Recommendations** (p. 197); and research and career opportunity talks by representatives from Lawrence Livermore National Laboratory (LLNL) (Robert Heeter), Los Alamos National Laboratory (LANL) (S. Batha), Sandia National Laboratories (SNL) (P. Knapp), and LLE (Michael Campbell).

### Student and Postdoctoral Poster Awards

In an effort to motivate and reward excellence in young researchers, the posters presented at the OLUG Workshop by students and postdocs are reviewed and ranked by a committee of scientists. As a result, prizes and honorable mentions are given to those posters at the top of the ranking. The following are the awards granted at this OLUG Workshop:

#### Student Awards

1st prize: Scott Feister, Ohio State University, "Acquisition and Analysis for High-Repetition-Rate HEDP (10 Hz to 1 kHz)"



U2047JR

Figure 148.28  
Carlo Graziani (University of Chicago) gave a talk on inferring morphology and the strength of magnetic fields from proton radiographs.



U2054JR

Figure 148.30  
Patrick Knapp discussed research and career opportunities at Sandia National Laboratories.



U2048JR

Figure 148.29  
Philip Nilson (LLE) gave a talk on high-resolving-power, ultrafast streaked x-ray spectroscopy on OMEGA EP.



U2053JR

Figure 148.31  
Michael Campbell discussed research and career opportunities at LLE.

2nd prize: Jeffrey Fein, University of Michigan, “Modeling of OMEGA EP Experiments Studying Z Dependence of the Two-Plasmon–Decay Instability”

3rd prize: Samuel Totorica, Stanford University, “Non-Thermal Electron Energization from Magnetic Reconnection in Laser-Driven Plasmas”

Honorable-Mention Awards

Kevin George, Ohio State University, “Modifying the TNSA Ion Spectrum with Front-Surface Microstructures”

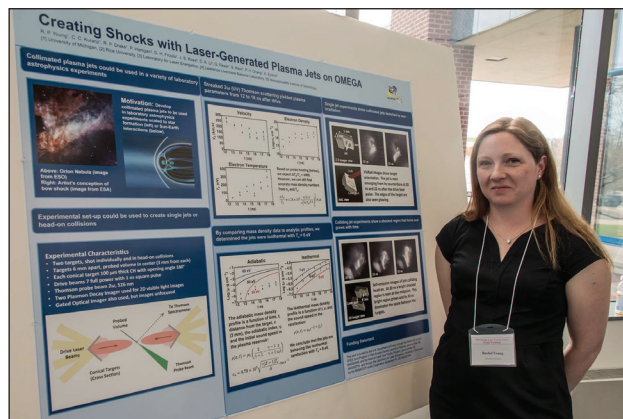
Amina Hussein, University of Michigan, “Optimization of Cold K-alpha Emission Using Copper Foams”



U2055JR

Figure 148.32

Student and postdoc poster awardees. From left to right, back row: Hans Rinderknecht, Alex Zylstra, Scott Feister, Jeffrey Fein, Samuel Totorica, and Hong Sio; front row: Willow Wan, Theodore Lane, and Amina Hussein. Also on the far right, front row are Maria Gatu Johnson and Craig Sangster who led the poster awardees selection process.



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Figure 148.33

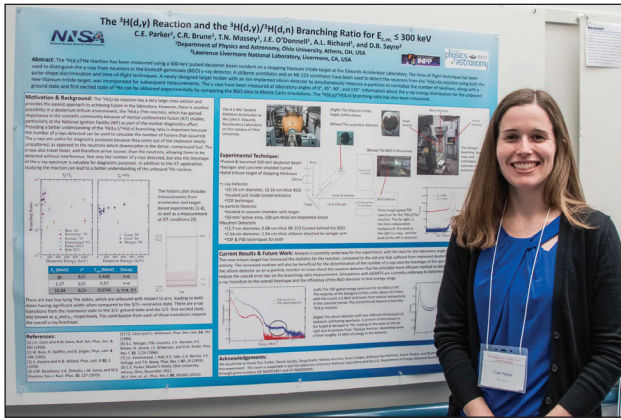
Rachel Young (University of Michigan) presented a poster on laser-generated plasma jets.



U2050JR

Figure 148.34

Federica Coppari (LLNL) discusses her poster on equation-of-state measurements on OMEGA.



U2051JR

Figure 148.35

Cody Parker (Ohio State University) presented a poster on nuclear reactions with application for ICF diagnostics.

Theodore Lane, West Virginia University, “Improving the Fidelity of Interpreting Time-Averaged Spectra on Z for Development of a Multi-Element Stark-Broadening Diagnostic”

Mary Kate Ginnane and Ethan Turner, State University of New York at Geneseo, “Time-Resolved Tandem Faraday Cup Development for High-Energy TNSA Particles”

Willow Wan, University of Michigan, “Observation of Vortex Merger and Growth Inhibition in a Dual-Mode, Supersonic Kelvin–Helmholtz Instability Experiment”

Hong Sio, Massachusetts Institute of Technology, “Studies of Kinetic/Multi-Ion–Fluid Effects and Ion–Electron Equilibration in ICF Plasmas Using Multiple Nuclear and X-Ray Emission Histories”

Postdoctoral Fellow Awards

1st prize: Hans Rinderknecht, Lawrence Livermore National Laboratory, “Studies of Ion Species Separation in ICF-Relevant Plasmas at Omega”

2nd prize: Alex Zylstra, Los Alamos National Laboratory, “Studying Astrophysical Nucleosynthesis Using Inertially Confined Plasmas at Omega”

3rd prize: Siddarth Patankar, Lawrence Livermore National Laboratory, “Initial Results of Short-Pulse Laser Interactions with Optically Levitated Microdroplets”

**Bylaws, Nominations, and Election**

In the fall of 2015, members of OLUG approved the first set of bylaws for OLUG. Paul Drake (University of Michigan) gave a presentation on the bylaws and the approval process. Based on the guidelines established by the bylaws, Roberto Mancini (University of Nevada, Reno) led in the winter of 2016 the first nomination and election to select two new members for OLUG’s Executive Committee (EC): one representative from a U.S. university/small business and one representative from a national laboratory/major business. To this end, a nominations committee was set up comprised of Roberto Mancini (Chair),



U2056JR

Figure 148.36

Paul Drake (University of Michigan) discussed the OLUG bylaws approved in the fall of 2015.



U2057JR

Figure 148.37

Roberto Mancini (University of Nevada, Reno) explained the nomination and election process carried out in the winter of 2016.

Tammy Ma (LLNL), and Farhat Beg (University of California, San Diego). This committee requested nominations from OLUG members from mid-January through mid-February of 2016. The election, which followed in February and March, resulted in the selection of Johan Frenje (MIT) and Mingsheng Wei (GA) as new members of the EC. Current members of OLUG's EC for April 2016–April 2017 include the following:

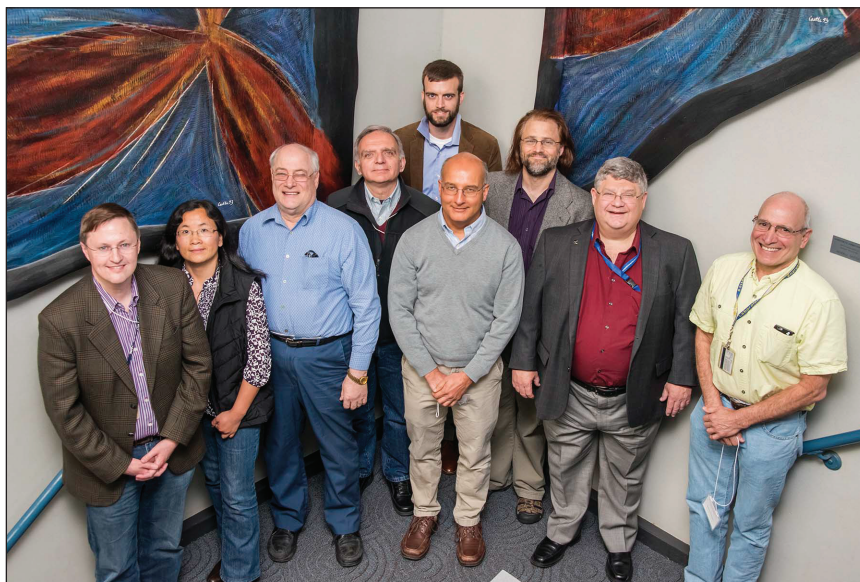
- Chair: Roberto Mancini (University of Nevada, Reno)
- University/small business: Paul Drake (University of Michigan), Johan Frenje (MIT), and Mark Koepke (West Virginia University)
- National laboratory/major business: Peter Celliers (LLNL), Kirk Flippo (LANL), and Mingsheng Wei (GA)
- Junior researcher: Alex Zylstra (LANL)
- Non-U.S. researcher: Peter Norreys (Rutherford Laboratory, U.K.)
- LLE, ex-officio: James Knauer

The first chairperson of OLUG, Richard Petrasso, has stepped down after leading OLUG for the eight years since its creation. The EC and the members of OLUG are very grateful to Richard Petrasso for his leadership, commitment, and generous dedication to making OLUG a success and serving as a role model for other facility users groups in the U.S. in the area of high-energy-density science.

### Summary of Findings and Recommendations

An important outcome of OLUG's annual workshop is the list of Findings and Recommendations that OLUG submits for consideration to LLE's management. The list of 2016 Recommendations is summarized below, including those put forward by the postdocs and student panel.

1. A two-step upgrade of the magnetic-field capability on OMEGA: first, increase the magnetic field to 30 T within the next two years; second, a future enhancement to increase to 50 T.
2. Investigate the “straight-through” issue with the streaked x-ray spectrometer (SXS-SSCA) including the option of replacing the TIM-based streak camera (SSCA) with a newer/better camera.



U2058JR

Figure 148.38

OLUG Executive Committee for April 2016–April 2017. From left to right: Johan Frenje (MIT), Mingsheng Wei (GA), James Knauer (LLE), Roberto Mancini (University of Nevada, Reno, Chair), Alex Zylstra (LANL), Peter Celliers (LLNL), Kirk Flippo (LANL), Paul Drake (University of Michigan), and past-chair Richard Petrasso (MIT). Not shown in the photo: Mark Koepke (West Virginia University) and Peter Norreys (Rutherford Laboratory, U.K.).



U2059JR

Figure 148.39  
Paul Drake led the discussion on the **Findings and Recommendations**.



U2052JR

Figure 148.40  
Students and postdocs are shown during their panel discussion session.

3. Make a second x-ray streak camera available on OMEGA with capabilities similar to those of SSCA.
4. Implement a Rochester Optical Streak System (ROSS) streak camera on OMEGA for the particle and x-ray temporal diagnostic (PXTD).
5. Use charge-coupled-device (CCD) detectors with the x-ray framing cameras on OMEGA EP.
6. Implement a standardized calibration procedure of the OMEGA optical Thomson-scattering system.
7. Implement faster framing cameras for Thomson-scattering measurements on OMEGA.
8. Undertake the necessary modifications on frequency conversion, final focusing optics, and distributed phase plates to enable a  $2\omega$  operation on one of the long-pulse beams of OMEGA EP.
9. Implement near-backscatter-imager (NBI) and time-integrated scatter calorimeter (SCAL) diagnostics on OMEGA EP.
10. Reconfigure the spherical-crystal-imaging (SCI) diagnostic hardware on OMEGA EP to a design similar to the SCI operational on OMEGA, where the line-of-sight block is a component held by the same ten-inch manipulator (TIM) and the detector is outside of the TIM.
11. Improve the projection capability of the OLUG Workshop conference room so that material being used in the discussion sessions can be projected from any Windows laptop or MacBook in the room.
12. Make several improvements to OMEGA's capability to measure low-energy neutron spectra in a DT background.
13. Enhance the active shock breakout (ASBO)/streaked optical pyrometer (SOP) diagnostic.
14. Install a planar cryogenic system on OMEGA EP to provide an additional capability that could complement the National Ignition Facility (NIF) capability and significantly broaden the possibilities for experiments in this area of study.
15. Consider adding plasma sacrificial mirrors to OMEGA EP.
16. Investigate the implementation of an enhanced laser pulse-shaping capability on OMEGA.
17. Allocate more resources to the CR39 etch/lab group to better support the increasing demand of this detector system on OMEGA and OMEGA EP experiments.
18. Consider making gas jet targets available for OMEGA and OMEGA EP.
19. Consider the development of a high-spectral-resolution x-ray spectrometer for OMEGA.

20. If possible, avoid parallel OLUG Workshop sessions in the future. We recommend that next year's evening session focus on x-ray imaging techniques. We appreciate the reinstatement of the national labs session on Friday and recommend additional opportunities for career-oriented interaction between young researchers and representatives of the laboratories—for example, during lunch or by creating an employment-opportunities board. The student/postdoc representative will organize these events at the 2017 workshop in consultation with the rest of the executive committee.
  
21. Continue the effort to improve and modernize web-based resources. We also recommend that LLE commits resources to development in two new areas: first, enhance the data downloading capability: exporting shot request form (SRF) configuration data as a “parseable file” (e.g., XML), providing diagnostic characterization information, and moving all results and analysis to the Principal Investigator (PI) computer; second, overhaul the data access permissions so that they are more reliable and potentially more granular, rather than blanket institution-based access.

#### ACKNOWLEDGMENT

This Omega Laser Facility Users Group Workshop was made possible in part by the generous support of the National Nuclear Security Administration of the U.S. Department of Energy for travel expenses of students and postdocs; by the MIT/Plasma Science and Fusion Center; and by the Laboratory for Laser Energetics for the use and availability of critical resources and support. In addition, OLUG thanks the LLE management for their responsiveness to our Findings and Recommendations. For capturing through his lens the workshop ambiance, OLUG thanks Eugene Kowaluk.

Submitted by Roberto Mancini, OLUG Chair.