The 11th Omega Laser Facility Users Group Workshop

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The purpose of the Omega Laser Facility Users Group (OLUG) is to facilitate communication and exchanges among the users: from the users as a group to the facility and from the users to the broader scientific community. As a major part of OLUG's responsibility, it organizes an annual 2.5-day workshop at the end of April. The 11th OLUG Workshop was held at the Laboratory for Laser Energetics (LLE) on 24–26 April 2019. It was attended by 110 researchers, including scientists, postdoctoral fellows, and students (Fig. 1). The attendees represented institutions from four countries, including the U.S., Canada, the U.K., and

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Figure 1
Group photo of the 11th Omega Laser Facility Users Group Workshop attendees.

France. Postdocs and students received travel support to attend the workshop from the Department of Energy's National Nuclear Security Administration. The program included talks, posters, an evening tutorial, student and post-doc sessions, and a discussion of Findings and Recommendations.

The Workshop Program

The OLUG program included the following five science talks from newly funded National Nuclear Security Administration (NNSA) Centers: "Multi-University Center for Pulsed-Power–Driven HED Science" (Cornell University), "Center for Astrophysical Plasma Properties" (University of Texas, Austin), "Center for Matters under Extreme Conditions" (University of California, San Diego), "Center for Advanced Nuclear Diagnostics and Platforms for ICF and HED Physics at Omega, NIF, and Z" [Massachusetts Institute of Technology (MIT)], and "Center for Laboratory Astrophysics" (University Michigan). The Department of Energy's (DOE's) NNSA perspective was presented by Sarah Wilk, Deputy Director of NNSA's Office of Experimental Sciences (NA-113). Other highlights included an evening tutorial session, "Non-standard Targets," offered by Chuck Sorce (LLE) and the LLE engineering team; a facility talk, "Omega Facility Update and Progress on OLUG Recommendations," by Sam Morse (LLE); a summary of the OLUG ExCom election results by Johan Frenje (MIT); summaries of the EP-OPAL Proposal Workshop (Hans Rinderknecht, LLE) and MTW-OPAL (Jake Bromage, LLE); an update on the American Physical Society's Division of Plasma Physics (APS-DPP's) Community Planning Process by Carolyn Kuranz (University of Michigan); the student and postdoc discussion panel [Michelle Marshall, Lawrence Livermore National Laboratory (LLNL)]; and a discussion of OLUG's Findings and Recommendations with LLE management, led by Maria Gatu Johnson (MIT) and Liz Merritt [Los Alamos National Laboratory (LANL)]. In addition, LLE staff organized tours of the Omega Laser Facility.

Student, postdoc, scientist, and facility posters comprised a total of 68 poster presentations that were organized in three sessions. Of the total number, 44 posters were presented by graduate students, postdocs, and undergraduate students. Two additional posters were presented by high school students who had participated in LLE's 2018 Summer High School Research Program. Although OLUG was established in 2009, the Omega Laser Facility has been building a community of science users for more than 35 years. For example, since 1979 the Omega Laser Facility has had a vigorous National Laser User Facility (NLUF) program, funded through DOE, which permits access to external users through a proposal and review process. NLUF is the oldest, continuously running DOE program to support high-energy-density (HED) science research in universities and small businesses.

Nominations and Election

In November 2018, a nominating committee formed to request January nominations for the February election of one new executive committee (EC) member. Johan Frenje (Chair, MIT), Patrick Knapp (Sandia National Laboratories), and Ryan Rygg (LLE) formed the committee. Elected from the three-candidate ballot were Sean Finnegan (LANL) to a three-year term to replace Mingsheng Wei [formerly of General Atomics (GA)] and Mario Manuel (GA) to a special one-year term to replace Channing Huntington (LLNL) who withdrew from the OLUG ExCom after the election process began. The May 2019–May 2020 EC membership of OLUG includes (a) four from U.S. university/small business: Mark Koepke (West Virginia University, Chair), Maria Gatu Johnson (MIT), Johan Frenje (MIT, Vice Chair), and Petros Tzeferacos (University of Chicago); (b) three from national laboratory/major business: Liz Merritt (LANL), Sean Finnegan (LANL), and Mario Manuel (GA); (c) one non-U.S. researcher: Alexis Casner (University of Bordeaux); (d) one from the junior researcher list: Suzanne Ali (LLNL); and (e) LLE, ex-officio: Jim Knauer. The OLUG EC is very grateful to Mingsheng Wei and Channing Huntington for their service in the EC and their contributions to the success of OLUG.

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 every year. The 2019 Findings and Recommendations are summarized below.

1. Implement a Shot Request Form that "auto-saves" the entered text.
2. Add diagnostic and beam information documentation to the PI (Principal Investigator) Portal.
3. Provide tools for estimating diagnostic signal levels.
4. Extend image-plate calibrations at <10 keV and 200 keV to 1 MeV.

5. Provide calibrations for spectrometer crystals.
6. Increase Dante filter and part availability.
7. Implement γ-ray spectroscopy for nuclear science.
8. Allow velocity interferometer system for any reflector (VISAR)/streaked optical pyrometer (SOP) capability on ten-inch manipulator TIM-14 (OMEGA EP).
9. Upgrade/improve VISAR/SOP.
10. Implement hardware mitigation for early-time radiation artifact on x-ray framing cameras.
11. Add CR-39 processing capability.
12. Ensure that Shot Request Form selectable setups for the streaked x-ray imager match the actual inventory.
13. Add charged-particle signal mitigation to multiple diagnostics.
14. Modify the electron–positron–proton spectrometer to measure higher-energy electrons ($E_{max} \sim$ GeV).
15. Add a single line of sight for multiframe single-pinhole imaging.
16. Improve framing-camera pointing procedures for x-ray imaging.
17. Make Thomson scattering on DT shots compatible with the DT^{3}He backlighter.
18. Provide a second and/or third Thomson parabola ion energy (TPIE) analyzer.
19. Implement a more-sensitive neutron time-of-flight detector for secondary DT-n measurements.
20. Investigate upgrades to fixed x-ray pinhole cameras.
21. Provide Thomson-scattering capability on OMEGA EP.
22. Add tritium gas-fill capability into a warm spherical capsule.
23. Provide special gas fills using a variable fuel mixture, with or without tritium.
24. Install a planar cryogenics system on OMEGA EP.

The impact within the HED field of the Omega Laser Facility is broad and deep and is encountered early in one's researcher career. Omega offers tremendous opportunities for programmatic-science and basic-science research. NNSA's NLUF and Laboratory Basic Science Programs play a key student and postdoc training role at Omega. Students and postdocs publish in peer-reviewed, high-impact journals on subjects including OMEGA research on laboratory astrophysics, hydrodynamics and atomic physics, hydrodynamic instabilities, radiation hydrodynamics, materials physics and behavior of the equation of state under extreme conditions, relativistic laser–plasma interactions, magnetized plasmas, advanced/alternative inertial fusion concepts, nuclear physics, atomic physics and spectroscopy, and new diagnostics and instrumentation.

The next OLUG Workshop will be held at LLE from 29 April–1 May 2020.

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