

The 12th Omega Laser Facility Users Group Workshop

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The 12th Omega Laser Facility Users Group (OLUG) Workshop was held virtually 27–30 April 2021. Over 200 researchers from 40 institutions in the U.S., China, France, Germany, Italy, Japan, Russia, and the UK registered for the meeting. This all-time attendance record for the OLUG Workshop was due to the absence of the on-site space limitations at LLE. The main goal of every OLUG Workshop is to facilitate a continuing dialog among OMEGA users; between the Users and LLE management; and between the Users and the broader scientific community. A major part of OLUG’s responsibility is to also enhance the Omega Facility and its capabilities by defining a set of Findings and Recommendations (F&R’s) each year. In addition, the workshop offers opportunities for students and young researchers to present their research in an interactive, yet informal, setting. This OLUG Workshop program included talks, posters, students and postdoc sessions, and a discussion of F&R’s. In total, OLUG collectively submitted 29 F&R’s to LLE management. The 13th OLUG Workshop will be held at LLE on 27–29 April 2022.

Introduction

The impact of the Omega Laser Facility on the fields of high-energy-density physics and inertial confinement fusion (ICF) is substantial in terms of both breadth and depth. Omega offers tremendous opportunities for programmatic and basic-science research through NNSA’s National Laser User Facility (NLUF) and Laboratory Basic Science (LBS) programs. These programs play central roles in providing researchers with unique opportunities to conduct science in the areas of laboratory astrophysics, hydrodynamics and atomic physics, hydrodynamic instabilities and radiation hydrodynamics, materials physics and behavior of the equation-of-state under extreme conditions, relativistic laser–plasma interactions and magnetized plasmas, advanced/alternative inertial fusion concepts, nuclear physics, atomic physics and spectroscopy, and advanced diagnostics capabilities. Additionally, these programs play an important role in the student and postdoc training. The annual OLUG Workshop brings users together from all over the world, facilitating a vibrant dialog among them about their experiences running experiments through the NLUF and LBS Programs at the Omega Laser Facility. It also facilitates a dialog between users and the LLE management focused on enhancing the Omega Facility and its capabilities, resulting in a set of well-defined F&R’s each year, thus encouraging collaborations that could be undertaken.

The Workshop Program

The OLUG Program included the following invited science talks: “JASRI Experimental Platforms Using High-Power Optical Lasers at X-Ray Free Electron” (Toshinori Yabuuchi), “Overview of 2020 Royal Society Meeting to Update the EU/UK Roadmap for Inertial Fusion Energy” (Peter Norreys), “Findings from the Brightest Light Initiative Workshop” (Roger Falcone), “NNSA Internal 2020 Review of the Different ICF Approaches and Where We Are on the Road to Ignition” (Sean Regan), “Where’s the Fusion? Overcoming Unexpected Challenges and the Road to Solutions for Ignition and Beyond” (Sean Finnegan), “Exploring Stellar Nucleosynthesis and Basic Nuclear Science Using High-Energy-Density Plasmas at OMEGA and the NIF” (Maria Gatu

Summary of Findings and Recommendations

An important outcome of the annual workshop is the list of F&R's that OLUG submits to the LLE management. The 2021 F&R's are summarized below, categorized as Documentation (#1–#5), Calibration (#6–#9), Diagnostics (#10–#22), Target Capability (#23), Laser Systems (#24–#28), and Codes (#29). An update on the implementation of these F&R's will be presented by the LLE management at the OLUG satellite meeting on 9 November 2021 at the APS–DPP conference in Pittsburgh.

1. Ensure that users have access to detailed and up-to-date documentation on diagnostics.
2. Improve navigation on the diagnostic usage page (add links to the shot days for easier navigation to RID's with diagnostic setups).
3. Make OMEGA EP UV optics transmission measurements readily available to Users.
4. Improve Dante maintenance and documentation.
5. Make calibration data readily available on the PI portal.
6. Characterize gas-jet nozzles.
7. Characterize standard proton source on OMEGA EP.
8. Calibrate CPS1, CPS2, and MagSPEC with a Ra-221 source.
9. Bragg crystal inventory and characterization for streaked x-ray spectrometer.
10. Add a timing fiducial to Dante.
11. Fix SIM streak camera A (SSCA) UV timing fiducial.
12. Add an active shock breakout diagnostic (ASBO)/streak optical pyrometer on OMEGA EP TIM-14.
13. Add an optical Thomson scattering (OTS) diagnostic to OMEGA EP.
14. Provide more streak camera options for time-resolved x-ray spectroscopy.
15. Upgrade detector-finger holders for CPS1 and CPS2.
16. Time-resolved x-ray history measurements in high-neutron-yield environments.
17. Add the capability to infer directional flow vector on D₂-gas-filled or low-DT-yield implosions.
18. Add a third VISAR leg on ASBO on OMEGA EP and/or OMEGA.
19. Add photocathode options for PJX2 and PJX3.
20. Improve accuracy of SSCA data acquisition time.
21. Provide a new sector-magnet electron–positron–proton spectrometer for use in a wide-range of HEDS experiments on OMEGA/OMEGA EP.
22. Implement quick-look for CR-39–based proton radiography.
23. Add planar cryo on OMEGA EP.
24. Increase UV power on OMEGA EP.
25. OMEGA: Any beam, any delay (or at least a third leg).
26. Add opposing OMEGA EP beams.
27. Add smaller distributed phase plates on OMEGA EP.
28. Add smoothing by spectral dispersion on OMEGA EP.
29. Shared VisRad license.

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