

Publications and Conference Presentations

Publications

- X. Bian, J. K. Shang, E. G. Blackman, G. W. Collins, and H. Aluie, “Scaling of Turbulent Viscosity and Resistivity: Extracting a Scale-Dependent Turbulent Magnetic Prandtl Number,” *Astrophys. J. Lett.* **917**, L3 (2021).
- A. R. Christopherson, R. Betti, C. J. Forrest, J. Howard, W. Theobald, J. A. Delettrez, M. J. Rosenberg, A. A. Solodov, C. Stoeckl, D. Patel, V. Gopalaswamy, D. Cao, J. L. Peebles, D. H. Edgell, W. Seka, R. Epstein, M. S. Wei, M. Gatu Johnson, R. Simpson, S. P. Regan, and E. M. Campbell, “Direct Measurements of DT Fuel Preheat from Hot Electrons in Direct-Drive Inertial Confinement Fusion,” *Phys. Rev. Lett.* **127**, 055001 (2021).
- D. H. Edgell, P. B. Radha, J. Katz, A. Shvydky, D. Turnbull, and D. H. Froula, “Nonuniform Absorption and Scattered Light in Direct-Drive Implosions Driven by Polarization Smoothing,” *Phys. Rev. Lett.* **127**, 075001 (2021).
- G. Fiksel, W. Fox, M. J. Rosenberg, D. B. Schaeffer, J. Matteucci, and A. Bhattacharjee, “Electron Energization During Merging of Self-Magnetized, High-Beta, Laser-Produced Plasmas,” *J. Plasma Phys.* **87**, 905870411 (2021).
- L. E. Hansen, D. E. Fratanduono, S. Zhang, D. G. Hicks, T. Suer, Z. K. Sprowal, M. F. Huff, X. Gong, B. J. Henderson, D. N. Polsin, M. Zaghoo, S. X. Hu, G. W. Collins, and J. R. Rygg, “Melting of Magnesium Oxide up to Two Terapascals Using Double-Shock Compression,” *Phys. Rev. B* **104**, 014106 (2021).
- C. J. Horsfield, M. S. Rubery, J. M. Mack, H. W. Herrmann, Y. Kim, C. S. Young, S. E. Caldwell, S. C. Evans, T. S. Sedillo, A. M. McEvoy, N. M. Hoffman, M. A. Huff, J. R. Langenbrunner, G. M. Hale, D. C. Wilson, W. Stoeffl, J. A. Church, E. M. Grafil, E. K. Miller, and V. Yu. Glebov, “First Spectral Measurement of Deuterium-Tritium Fusion γ Rays in Inertial Fusion Experiments,” *Phys. Rev. C* **104**, 024610 (2021).
- H. Huang, K. R. P. Kafka, and S. G. Demos, “Electric-Field Enhancement Caused by Subwavelength-Sized Particles Located on the Surface of Multilayer Dielectric Mirrors,” *Opt. Express* **29**, 27,031 (2021).
- N. V. Kabadi, R. Simpson, P. J. Adrian, A. Bose, J. A. Frenje, M. Gatu Johnson, B. Lahmann, C. K. Li, C. E. Parker, F. E. Séguin, G. D. Sutcliffe, R. D. Petrasso, S. Atzeni, J. Eriksson, C. Forrest, S. Fess, V. Yu. Glebov, R. Janezic, O. M. Mannion, H. G. Rinderknecht, M. J. Rosenberg, C. Stoeckl, G. Kagan, M. Hoppe, R. Luo, M. Schoff, C. Shuldberg, H. W. Sio, J. Sanchez, L. Berzak Hopkins, D. Schlossberg, K. Hahn, and C. Yeamans, “Thermal Decoupling of Deuterium and Tritium During the Inertial Confinement Fusion Shock-Convergence Phase,” *Phys. Rev. E* **104**, L013201 (2021).
- M. Kaloyan, S. Ghazaryan, C. G. Constantin, R. S. Dorst, P. V. Heuer, J. J. Pilgram, D. B. Schaeffer, and C. Niemann, “Raster Thomson Scattering in Large-Scale Laser Plasmas Produced at High Repetition Rate,” *Rev. Sci. Instrum.* **92**, 093102 (2021).
- C. F. Kawaguchi, K. A. Flippo, A. M. Rasmus, B. Tobias, T. Byvank, C. A. Di Stefano, E. C. Merritt, F. W. Doss, K. V. Kelso, N. N. Vazirani, C. Stoeckl, M. Bedzyk, R. Jungquist, and C. Mileham, “Improved Imaging Using Mn He- α X Rays at OMEGA EP,” *Rev. Sci. Instrum.* **92**, 093508 (2021).
- A. Lees, R. Betti, J. P. Knauer, V. Gopalaswamy, D. Patel, K. M. Woo, K. S. Anderson, E. M. Campbell, D. Cao, J. Carroll-Nellenback, R. Epstein, C. Forrest, V. N. Goncharov, D. R. Harding, S. X. Hu, I. V. Igumenshchev, R. T. Janezic, O. M. Mannion, P. B. Radha, S. P. Regan, A. Shvydky, R. C. Shah, W. T. Shmayda, C. Stoeckl, W. Theobald, and C. Thomas, “Experimentally Inferred Fusion Yield Dependencies of OMEGA Inertial Confinement Fusion Implosions,” *Phys. Rev. Lett.* **127**, 105001 (2021).
- B. J. MacGowan, O. J. Landen, D. T. Casey, C. V. Young, D. A. Callahan, E. P. Hartouni, R. Hatarik, M. Hohenberger, T. Ma, D. Mariscal, A. Moore, R. Nora, H. G. Rinderknecht, D. Schlossberg, and B. M. Van Wonterghem, “Trending Low Mode Asymmetries in NIF Capsule Drive Using a

Simple Viewfactor Metric,” *High Energy Density Phys.* **40**, 100944 (2021).

M. C. Marshall, M. Millot, D. E. Fratanduono, D. M. Sterbentz, P. C. Myint, J. L. Belof, Y.-J. Kim, F. Coppari, S. J. Ali, J. H. Eggert, R. F. Smith, and J. M. McNaney, “Metastability of Liquid Water Freezing into Ice VII Under Dynamic Compression,” *Phys. Rev. Lett.* **127**, 135701 (2021).

A. L. Milder, J. Katz, R. Boni, J. P. Palastro, M. Sherlock, W. Rozmus, and D. H. Froula, “Statistical Analysis of Non-Maxwellian Electron Distribution Functions Measured with Angularly Resolved Thomson Scattering,” *Phys. Plasmas* **28**, 082102 (2021) (invited).

K. L. Nguyen, L. Yin, B. J. Albright, A. M. Hansen, D. H. Froula, D. Turnbull, R. K. Follett, and J. P. Palastro, “Cross-Beam Energy Transfer Saturation by Ion Trapping-Induced Detuning,” *Phys. Plasmas* **28**, 082705 (2021).

J. L. Peebles, G. Fiksel, M. R. Edwards, J. von der Linden, L. Willingale, D. Mastrosimone, and H. Chen, “Magnetically Collimated Relativistic Charge-Neutral Electron-Positron Beams from High-Power Lasers,” *Phys. Plasmas* **28**, 074501 (2021).

A. Pineau, B. Chimier, S. X. Hu, and G. Duchateau, “Improved Modeling of the Solid-to-Plasma Transition of Polystyrene Ablator for Laser Direct-Drive Inertial Confinement Fusion Hydrocodes,” *Phys. Rev. E* **104**, 015210 (2021).

S. Rai, M. Hecht, M. Maltrud, and H. Aluie, “Scale of Oceanic Eddy Killing by Wind from Global Satellite Observations,” *Sci. Adv.* **7**, eabf4920 (2021).

S. P. Regan and E. M. Campbell, “Inertial Confinement Fusion—Experimental Physics: Laser Drive,” in *Encyclopedia of Nuclear Energy*, edited by E. Greenspan (Elsevier, Oxford, 2021), pp. 713–723.

H. G. Rinderknecht, T. Wang, A. Laso Garcia, G. Bruhaug, M. S. Wei, H. J. Quevedo, T. Ditmire, J. Williams, A. Haid, D. Doria, K. M. Spohr, T. Toncian, and A. Arefiev,

“Relativistically Transparent Magnetic Filaments: Scaling Laws, Initial Results and Prospects for Strong-Field QED Studies,” *New J. Phys.* **23**, 095009 (2021).

R. H. H. Scott, K. Glize, L. Antonelli, M. Khan, W. Theobald, M. Wei, R. Betti, C. Stoeckl, A. G. Seaton, T. D. Arber, D. Barlow, T. Goffrey, K. Bennett, W. Garbett, S. Atzeni, A. Casner, D. Batani, C. Li, and N. Woolsey, “Shock Ignition Laser-Plasma Interactions in Ignition-Scale Plasmas,” *Phys. Rev. Lett.* **127**, 065001 (2021).

A. Shvydky, D. Haberberger, A. V. Maximov, R. Boni, D. Cao, J. Carroll-Nellenback, D. H. Froula, V. N. Goncharov, S. X. Hu, I. V. Igumenshchev, S. T. Ivancic, V. V. Karasiev, J. P. Knauer, P. M. Nilson, P. B. Radha, S. P. Regan, J. R. Rygg, T. C. Sangster, M. D. Rosen, and V. A. Smalyuk, “Density Evolution After Shock Release from Laser-Driven Polystyrene (CH) Targets in Inertial Confinement Fusion,” *Phys. Plasmas* **28**, 092703 (2021).

C. Stoeckl, M. J. Bonino, C. Mileham, S. P. Regan, W. Theobald, T. Ebert, and S. Sander, “Optimization of a Short-Pulse-Driven Si He $_{\alpha}$ Soft X-Ray Backlighter,” *High Energy Density Phys.* **41**, 100973 (2021).

J. von der Linden, G. Fiksel, J. Peebles, M. R. Edwards, L. Willingale, A. Link, D. Mastrosimone, and H. Chen, “Confinement of Relativistic Electrons in a Magnetic Mirror en Route to a Magnetized Relativistic Pair Plasma,” *Phys. Plasmas* **28**, 092508 (2021).

J. Zhang, W. R. Donaldson, and G. P. Agrawal, “Impact of the Boundary’s Sharpness on Temporal Reflection in Dispersive Media,” *Opt. Lett.* **46**, 4053 (2021).

J. Zhang, W. R. Donaldson, and G. P. Agrawal, “Time-Domain Fabry–Perot Resonators Formed Inside a Dispersive Medium,” *J. Opt. Soc. Am. B* **38**, 2376 (2021).

Y. Zhang, J. R. Davies, P. V. Heuer, and C. Ren, “Kinetic Simulation Study of Magnetized Collisionless Shock Formation on a Terawatt Laser System,” *Phys. Plasmas* **28**, 072111 (2021).

Forthcoming Publications

S.-W. Bahk, “Analytic Phase Solutions of Three-Wave Interactions,” to be published in *Optics Letters*.

J. Bromage, S.-W. Bahk, M. Bedzyk, I. A. Begishev, S. Bucht, C. Dorrer, C. Feng, C. Jeon, C. Mileham, R. G. Roides, K. Shaughnessy, M. J. Shoup III, M. Spilatro, B. Webb, D. Weiner, and J. D. Zuegel, “MTW-OPAL: A Technology Development Platform for Ultra-Intense Optical Parametric Chirped-Pulse Amplification Systems,” to be published in *High Power Laser Science and Engineering*.

A. Colaïtis, I. Igumenshchev, J. Mathiaud, and V. N. Goncharov, “Inverse Ray Tracing on Icosahedral Tetrahedron Grids for Nonlinear Laser Plasma Interaction Coupled to 3-D Radiation Hydrodynamics,” to be published in the *Journal of Computational Physics*.

S. Heidtfeld, R. Adam, T. Kubota, K. Takanashi, D. Cao, C. Schmitz-Antoniak, D. E. Bürgler, F. Wang, C. Greb, G. Chen, I. Komissarov, H. Hardtdegen, M. Mikulics, R. Sobolewski, S. Suga, and C. M. Schneider, “Generation of Terahertz Transients from $\text{CO}_2\text{Fe}_{0.4}\text{Mn}_{0.6}\text{Si}$ -Heusler-Alloy/Normal-Metal Nanobilayers Excited by Femtosecond Optical Pulses,” to be published in *Physical Review Research*.

G. W. Jenkins, C. Feng, and J. Bromage, “Alignment Tolerance Analysis for Divided-Pulse Nonlinear Compression,” to be published in the *Journal of the Optical Society of America B*.

V. V. Karasiev, J. Hinz, S. X. Hu, and S. B. Trickey, “On the Liquid–Liquid Phase Transition of Dense Hydrogen,” to be published in *Nature*.

D. I. Mihaylov, V. V. Karasiev, S. X. Hu, J. R. Rygg, V. N. Goncharov, and G. W. Collins, “Improved First-Principles Equation-of-State Table of Deuterium for High-Energy-Density Applications,” to be published in *Physical Review B*.

S. Nwabunwanne and W. R. Donaldson, “Boosting the External Quantum Efficiency of AlGaIn-Based Metal–Semiconductor–Metal Ultraviolet Photodiodes by Electrode Geometry Variation,” to be published in the *IEEE Journal of Quantum Electronics*.

A. M. Saunders, C. V. Stan, K. K. Mackay, B. Morgan, J. A. K. Horwitz, S. J. Ali, H. G. Rinderknecht, T. Haxhimali, Y. Ping, F. Najjar, J. Eggert, and H.-S. Park, “Experimental Observations of Laser-Driven Tin Ejecta Microjet Interactions,” to be published in *Physical Review Letters*.

A. Shvydky, A. V. Maximov, V. V. Karasiev, D. Haberberger, S. X. Hu, and V. N. Goncharov, “Ionization State and Dielectric Constant in Cold Rarefied Hydrocarbon Plasmas of Inertial Confinement Fusion,” to be published in *Physical Review E*.

R. Sobolewski, “Optical Detectors and Sensors,” to be published in the *Handbook of Superconducting Materials*.

A. Tentori, A. Colaitis, W. Theobald, A. Casner, D. Raffestin, A. Ruocco, J. Trela, E. Le Bel, K. Anderson, M. Wei, B. Henderson, J. Peebles, R. Scott, S. Baton, S. A. Pikuz, R. Betti, M. Khan, N. Woolsey, S. Zhang, and D. Batani, “Experimental Characterization of Hot-Electron Emission and Shock Dynamics in the Context of the Shock-Ignition Approach to Inertial Confinement Fusion,” to be published in *Physics of Plasmas*.

Conference Presentations

E. M. Campbell, “A Vision of the Future for High-Power Laser Research and Its Applications,” presented at Frontiers in Lasers and Applications, virtual, 5–29 July 2021.

E. M. Campbell, “Inertial Confinement Fusion: Present State of Research for Energy Demonstration and Potential Spin-Offs,” presented at Curso de Verano de la Universidad Complutense de Madrid (UCM) El Escorial, virtual, 12–13 July 2021.

W. T. Shmayda, “Overview of Tritium Handling,” presented at the Nevada National Security Site, virtual, 14 July 2021.

K. L. Marshall, B. E. Ugur, and W. Scullin, “Toward High-Performance Terahertz-Region Liquid Crystals: Computational Modeling of Fused-Ring Nematic and Discotic Mesogens,” presented at Liquid Crystals XXV, virtual, 1–5 August 2021 (invited).

K. Churnetski, K. M. Woo, W. Theobald, P. B. Radha, R. Betti, V. Gopalaswamy, I. V. Igumenshchev, S. T. Ivancic, M. Michalko, R. C. Shah, C. A. Thomas, and S. P. Regan, “Three-Dimensional Hot-Spot Reconstruction from Cryogenic Deuterium–Tritium Polar-Direct-Drive Implosions on OMEGA,” presented at High-Energy-Density Science Summer School, virtual, 2–6 August 2021.

D. Mihaylov, V. V. Karasiev, S. X. Hu, J. R. Rygg, V. N. Goncharov, and G. W. Collins, “Improved First-Principles Equation-of-State Table of Deuterium,” presented at the American Physical Society Topical Group on Shock Compression of Condensed Matter Early Career Symposium, virtual, 3–4 August 2021.

C. Dorrer, “Parametric Amplification of Spectrally Incoherent Signals,” presented at the Nonlinear Optics Topical Meeting, virtual, 9–13 August 2021.

The following presentations were made at the 2021 Laser-NetUS User Meeting, virtual, 17–19 August 2021:

S.-W. Bahk, I. A. Begishev, S. Bucht, C. Dorrer, C. Feng, B. N. Hoffman, C. Jeon, C. Mileham, J. B. Oliver, R. G. Roides, M. J. Shoup III, M. Spilatro, B. Webb, J. D. Zuegel, and J. Bromage, “ ‘First Light’ Results from MTW-OPAL: An All-OPCPA Platform for Laser Development and Petawatt Science.”

E. M. Campbell, “Inertial Fusion Energy (IFE): Opportunities and Challenges.”

E. M. Campbell, “NAS Study on High Energy Density Science,” presented at the National Academy of Sciences Site Visit, virtual, 26 August 2021.

D. H. Froula, “Taming Plasmas and Controlling Laser Beams for Grand Challenge Applications,” presented at the Fusion Energy Sciences Advisory Committee Meeting, virtual, 30 August 2021.

E. M. Campbell, “Laboratory for Laser Energetics (LLE) Comments on HIBEF Dedication,” presented at the HIBEF Inauguration, virtual, 31 August 2021.

R. B. Spielman, “Pulsed-Power Innovations Needed for Next-Generation, High-Current Drivers,” presented at the 48th IEEE International Conference on Plasma Science, virtual, 12–16 September 2021.

L. Savino, S. Atzeni, V. N. Goncharov, and I. V. Igumenshchev, “Studies on Dynamical Shell Formation for Direct-Drive Laser Fusion,” presented at the 107th Italian Physical Society Conference, virtual, 13–17 September 2021.

J. D. Zuegel, “2021 Multi-Petawatt Physics Prioritization (MP3) Workshop,” presented at the 4th Extremely High Intensity Laser Physics Conference, virtual, 13–17 September 2021.

E. M. Campbell, “Inertial Fusion Energy (IFE): Opportunities and Challenges,” Fusion Energy Council of Canada Annual General Meeting, virtual, 15 September 2021.

S. Zhang, R. Paul, M. Ghosh, S. X. Hu, L. E. Hansen, J. R. Rygg, G. W. Collins, M. Morales, F. Malone, and D. E. Fratanduono, “Multi-Megabar Phase Transitions from First-Principles Examples in MgO and Fe,” presented at the Center for Matter at Atomic Pressures Seminar, virtual, 17 September 2021.

C. Dorrer, J. Bromage, S.-W. Bahk, M. Bedzyk, I. A. Begishev, S. Bucht, C. Feng, B. N. Hoffman, C. Jeon, C. Mileham, J. B. Oliver, R. G. Roides, E. M. Schiesser, K. Shaughnessy, M. J. Shoup III, M. Spilatro, B. Webb, D. Weiner, and J. D. Zuegel, “MTW-OPAL: A Technology Development Platform for Ultra-Intense OPCPA Systems,” presented at Topical Problems of Nonlinear Wave Physics, virtual, 19–22 September 2021.

S. Zhang, “Molecular to Atomic Transition in Liquid Silica at Extreme Conditions,” presented at the Emerging Leader Celebration, virtual, 20–21 September 2021.

The following presentations were made at the 5th Asia Pacific Conference on Plasma Physics, virtual, 26 September–1 October 2021:

S. X. Hu, P. M. Nilson, V. V. Karasiev, D. Bishel, V. Recoules, N. Brouwer, M. Torrent, I. E. Golovkin, M. Gu, T. Walton, and S. B. Hansen, “Probing Extreme Atomic Physics of Warm and Superdense Plasmas” (invited).

P. Tzeferacos, “TDYNO: Laser-Driven Laboratory Plasma Astrophysics Experiments of Magnetized Turbulence and Fluctuation Dynamo.”

K. Weichman, A. V. Arefiev, H. Mao, F. N. Beg, J. P. Palastro, A. P. L. Robinson, M. Murakami, S. Fujioka, J. J. Santos, T. Toncian, Y. Shi, T. Ditmire, H. Quevedo, and V. V. Ivanov, “Effects of KiloTesla-Level Magnetic Fields on Relativistic Laser–Plasma Interactions” (invited).

C. J. Forrest, A. Crilly, B. Applebe, V. Yu. Glebov, J. P. Knauer, O. M. Mannion, Z. L. Mohamed, P. B. Radha, S. P. Regan, A. K. Schwemmlin, and C. Stoeckl, “Inferring Absolute Neutron Energy Spectra from Time-of-Flight Spectrometers Operating in Current Mode,” presented at the Neutron Detector Workshop, Knoxville, TN, 30 September–2 October 2021.