

Publications and Conference Presentations

Publications

- N. Acharya, H. Aluie, and J. K. Shang, “Numerical Investigation of Laser-Driven Shock Interaction with a Deformable Particle,” *Phys. Plasmas* **29**, 052302 (2022).
- S.-W. Bahk, I. A. Begishev, R. Roides, C. Mileham, R. Cuffney, C. Feng, B. M. Webb, C. Jeon, M. Spilatro, S. Bucht, C. Dorrer, and J. Bromage, “Effect of the Pump Beam Profile and Wavefront on the Amplified Signal Wavefront in Optical Parametric Amplifiers,” *Opt. Express* **30**, 12,995 (2022).
- A. Bose, J. Peebles, C. A. Walsh, J. A. Frenje, N. V. Kabadi, P. J. Adrian, G. D. Sutcliffe, M. Gatu Johnson, C. A. Frank, J. R. Davies, R. Betti, V. Yu. Glebov, F. J. Marshall, S. P. Regan, C. Stoeckl, E. M. Campbell, H. Sio, J. Moody, A. Crilly, B. D. Appelbe, J. P. Chittenden, S. Atzeni, F. Barbato, A. Forte, C. K. Li, F. H. Séguin, and R. D. Petrasso, “Effect of Strongly Magnetized Electrons and Ions on Heat Flow and Symmetry of Inertial Fusion Implosions,” *Phys. Rev. Lett.* **128**, 195002 (2022).
- A. F. A. Bott, L. Chen, P. Tzeferacos, C. A. J. Palmer, A. R. Bell, R. Bingham, A. Birkel, D. H. Froula, J. Katz, M. W. Kunz, C.-K. Li, H.-S. Park, R. Petrasso, J. S. Ross, B. Reville, D. Ryu, F. H. Séguin, T. G. White, A. A. Schekochihin, D. Q. Lamb, and G. Gregori, “Insensitivity of a Turbulent Laser-Plasma Dynamo to Initial Conditions,” *Matter Radiat. Extremes* **7**, 046901 (2022).
- S. J. Burns, J. R. Rygg, D. Polsin, B. Henderson, M. Marshall, S. Zhang, S. X. Hu, and G. Collins, “Planar, Longitudinal, Compressive Waves in Solids: Thermodynamics and Uniaxial Strain Restrictions,” *J. Appl. Phys.* **131**, 215904 (2022).
- D. A. Chin, J. J. Ruby, P. M. Nilson, D. T. Bishel, F. Coppari, Y. Ping, A. L. Coleman, R. S. Craxton, J. R. Rygg, and G. W. Collins, “Emission Phases of Implosion Sources for X-Ray Absorption Fine Structure Spectroscopy,” *Phys. Plasmas* **29**, 052702 (2022).
- A. Diaw, S. J. Coleman, N. M. Cook, J. P. Edelen, E. C. Hansen, and P. Tzeferacos, “Impact of Electron Transport Models on Capillary Discharge Plasmas,” *Phys. Plasmas* **29**, 063101 (2022).
- C. Dorrer and J. L. Shaw, “Single-Shot Cross-Correlation of Counter-Propagating, Short Optical Pulses Using Random Quasi-Phase-Matching,” *Opt. Express* **30**, 16,677 (2022).
- R. K. Follett, H. Wen, D. H. Froula, D. Turnbull, and J. P. Palastro, “Independent-Hot-Spot Approach to Multibeam Laser-Plasma Instabilities,” *Phys. Rev. E* **105**, L063201 (2022).
- G. W. Jenkins, C. Feng, and J. Bromage, “Simultaneous Contrast Improvement and Temporal Compression Using Divided-Pulse Nonlinear Compression,” *Opt. Express* **30**, 13,968 (2022).
- D. Kim, R. F. Smith, I. K. Ocampo, F. Coppari, M. C. Marshall, M. K. Ginnane, J. K. Wicks, S. J. Tracy, M. Millot, A. Lazicki, J. R. Rygg, J. H. Eggert, and T. S. Duffy, “Structure and Density of Silicon Carbide to 1.5 TPa and Implications for Extrasolar Planets,” *Nat. Commun.* **13**, 2260 (2022).
- Y.-J. Kim, B. Militzer, B. Boates, S. Bonev, P. M. Celliers, G. W. Collins, K. P. Driver, D. E. Fratanduono, S. Hamel, R. Jeanloz, J. R. Rygg, D. C. Swift, J. H. Eggert, and M. Millot, “Evidence for Dissociation and Ionization in Shock Compressed Nitrogen to 800 GPa,” *Phys. Rev. Lett.* **129**, 015701(2022).
- R. K. Kirkwood, P. L. Poole, D. H. Kalantar, T. D. Chapman, S. C. Wilks, M. R. Edwards, D. P. Turnbull, P. Michel, L. Divol, N. J. Fisch, P. Norreys, W. Rozmus, J. Bude, B. E. Blue, K. B. Fournier, B. M. Van Woutherghem, and A. MacKinnon, “Production of High Fluence Laser Beams Using Ion Wave Plasma Optics,” *Appl. Phys. Lett.* **120**, 200501 (2022).
- T. Z. Kosci, H. Huang, T. J. Kessler, and S. G. Demos, “Angular Dependence of the Transverse Raman Scattering in KDP and DKDP in Geometries Suitable for Beam Polarization Control,” *Opt. Express* **30**, 12,918 (2022).
- L. S. Leal, A. V. Maximov, E. C. Hansen, J. R. Davies, D. H. Barnak, J. L. Peebles, K. M. Woo, P. V. Heuer, A. B. Sefkow, and R. Betti, “Effect of Laser Preheat in Magnetized Liner Inertial Fusion at OMEGA,” *Phys. Plasmas* **29**, 042703 (2022).

- S. Malko, W. Cayzac, V. Ospina-Bohórquez, K. Bhutwala, M. Bailly-Grandvaux, C. McGuffey, R. Fedosejevs, X. Vaisseau, An. Tauschwitz, J. I. Apiñaniz, D. De Luis, G. Gatti, M. Huault, J. A. Perez Hernandez, S. X. Hu, A. J. White, L. A. Collins, K. Nichols, P. Neumayer, G. Faussurier, J. Vorberger, G. Prestopino, C. Verona, J. J. Santos, D. Batani, F. N. Beg, L. Roso, and L. Volpe, “Proton Stopping Measurements at Low Velocity in Warm Dense Carbon,” *Nat. Commun.* **13**, 2893 (2022).
- O. M. Mannion, A. J. Crilly, C. J. Forrest, B. D. Appelbe, R. Betti, V. Yu. Glebov, V. Gopalaswamy, J. P. Knauer, Z. L. Mohamed, C. Stoeckl, J. P. Chittenden, and S. P. Regan, “Measurements of the Temperature and Velocity of the Dense Fuel Layer in Inertial Confinement Fusion Experiments,” *Phys. Rev. E* **105**, 055205 (2022).
- K. L. Marshall, K. R. P. Kafka, N. D. Urban, J. U. Wallace, and S. G. Demos, “Multiparameter Laser Performance Characterization of Liquid Crystals for Polarization Control Devices in the Nanosecond Regime,” *Sci. Rep.* **12**, 10969 (2022).
- J. Musgrave and J. Bromage, “Impact of the Optical Parametric Amplification Phase on Laser Pulse Compression,” *Appl. Opt.* **61**, 3838 (2022).
- R. W. Paddock, H. Martin, R. T. Ruskov, R. H. H. Scott, W. Garbett, B. M. Haines, A. B. Zylstra, E. M. Campbell, T. J. B. Collins, R. S. Craxton, C. A. Thomas, V. N. Goncharov, R. Aboushelbaya, Q. S. Feng, M. W. von der Leyen, I. Ouatu, B. T. Spiers, R. Timmis, R. H. W. Wang, and P. A. Norreys, “Pathways Towards Break Even for Low Convergence Ratio Direct-Drive Inertial Confinement Fusion,” *J. Plasma Phys.* **88**, 905880314 (2022).
- D. N. Polsin, A. Lazicki, X. Gong, S. J. Burns, F. Coppari, L. E. Hansen, B. J. Henderson, M. F. Huff, M. I. McMahon, M. Millot, R. Paul, R. F. Smith, J. H. Eggert, G. W. Collins, and J. R. Rygg, “Structural Complexity in Ramp-Compressed Sodium to 480 GPa,” *Nat. Commun.* **13**, 2534 (2022).
- D. Ramsey, B. Malaca, A. Di Piazza, M. Formanek, P. Franke, D. H. Froula, M. Pardal, T. T. Simpson, J. Vieira, K. Weichman, and J. P. Palastro, “Nonlinear Thomson Scattering with Ponderomotive Control,” *Phys. Rev. E* **105**, 065201 (2022).
- G. F. Swadling, C. Bruulsema, W. Rozmus, and J. Katz, “Quantitative Assessment of Fitting Errors Associated with Streak Camera Noise in Thomson Scattering Data Analysis,” *Rev. Sci. Instrum.* **93**, 043503 (2022).
- K. Weichman, A. P. L. Robinson, M. Murakami, J. J. Santos, S. Fujioka, T. Toncian, J. P. Palastro, and A. V. Arefiev, “Progress in Relativistic Laser–Plasma Interaction with KiloTesla-Level Applied Magnetic Fields,” *Phys. Plasmas* **29**, 053104 (2022) (invited).
- H. Wen, C. Ren, E. C. Hansen, D. Michta, Y. Zhang, S. Langendorf, and P. Tzeferacos, “Particle-in-Cell Modeling of Plasma Jet Merging in the Large-Hall-Parameter Regime,” *Phys. Plasmas* **29**, 062706 (2022).
- J. Zhang, W. R. Donaldson, and G. P. Agrawal, “Temporal Reflection of an Optical Pulse from a Short Soliton: Impact of Raman Scattering,” *J. Opt. Soc. Am. B* **39**, 1950 (2022).

Forthcoming Publications

- A. F. Antoniadis, D. Drikakis, P. S. Farmakis, L. Fu, I. Kokkinakis, X. Nogueira, P. A. S. F. Silva, M. Skote, V. Titarev, and P. Tsoutsanis, “UCNS3D: An Open-Source High-Order Finite-Volume Unstructured CFD Solver,” to be published in *Computer Physics Communications*.
- Z. Chen, S. X. Hu, and N. P. Bigelow, “Imprinting a Three-Dimensional Skyrmion in a Bose–Einstein Condensate Via a Raman Process,” to be published in the *Journal of Low Temperature Physics*.
- V. Gopalaswamy, R. Betti, P. B. Radha, A. J. Crilly, K. M. Woo, A. Lees, C. Thomas, I. V. Igumenshev, S. C. Miller, J. P. Knauer, C. Stoeckl, C. J. Forrest, O. M. Mannion, Z. L. Mohamed, H. G. Rinderknecht, and P. V. Heuer, “Analysis of Limited Coverage Effects on Areal Density Measurements in Inertial Confinement Fusion Implosions,” to be published in *Physics of Plasmas*.
- S. S. Harilal, M. C. Phillips, D. H. Froula, K. K. Anoop, R. C. Issac, and F. N. Beg, “Optical Diagnostics of Laser-Produced Plasmas,” to be published in the *Reviews of Modern Physics*.
- P. V. Heuer, L. S. Leal, J. R. Davies, E. C. Hansen, D. H. Barnak, J. L. Peebles, F. García-Rubio, B. Pollock, J. Moody, A. Birkel, and F. H. Séguin, “Diagnosing Magnetic Fields in

Cylindrical Implosions with Oblique Proton Radiography,” to be published in *Physics of Plasmas*.

M. P. Jeske, W. Zhang, and M. Anthamatten “Two-Photon Printing of Shape-Memory Microstructures and Metasurfaces via Radical-Mediated Thiol-Vinyl Hydrothiolation,” to be published in *Advanced Materials Technologies*.

K. R. P. Kafka, T. Z. Kosc, and S. G. Demos, “Methods and Apparatus for Comprehensive Characterization of Performance Attributes and Damage Thresholds of Ultrafast Laser Optics,” to be published in *Optical Engineering*.

H. Poole, D. Cao, R. Epstein, I. Golovkin, T. Walton, S. X. Hu, M. Kasim, S. M. Vinko, J. R. Rygg, V. N. Goncharov, G. Gregori, and S. P. Regan, “A Case Study of Using X-Ray Thomson Scattering to Diagnose the In-Flight Plasma Condition of DT Cryogenic Implosions,” to be published in *Physics of Plasmas*.

A. K. Schwemlein, C. Stoeckl, C. J. Forrest, W. T. Shmayda, S. P. Regan, W. U. Schröder, “First Demonstration of a Triton Beam Using Target Normal Sheath Acceleration,” to be published in *Nuclear Instruments and Methods in Physics Research B*.

R. C. Shah, D. Cao, L. Aghaian, B. Bachmann, R. Betti, E. M. Campbell, R. Epstein, C. J. Forrest, A. Forsman, V. Yu. Glebov, V. N. Goncharov, V. Gopalaswamy, D. R. Harding, S. X. Hu, I. V. Igumenshchev, R. T. Janezic, L. Keaty, J. P. Knauer, D. Kobs, A. Lees, O. M. Mannion, Z. L. Mohamed, D. Patel, M. J. Rosenberg, W. T. Shmayda, C. Stoeckl, W. Theobald, C. A. Thomas, P. Volegov, K. M. Woo, and S. P. Regan, “Bound on Hot-Spot Mix in High-Velocity, High-Adiabatic Direct-Drive Cryogenic Implosions Based on

Comparison of Absolute X-Ray and Neutron Yields,” to be published in *Physical Review E*.

S. Singh, A. L. Coleman, S. Zhang, F. Coppari, M. G. Gorman, R. F. Smith, J. H. Briggs, and D. E. Fratanduono, “Quantitative Analysis of Diffraction by Liquids Using a Pink-Spectrum X-Ray Source,” to be published in the *Journal of Synchrotron Radiation*.

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

D. Turnbull, J. Katz, D. E. Hinkel, P. Michel, T. Chapman, L. Divol, E. Kur, S. MacLaren, A. L. Milder, M. Rosen, A. Shvydky, G. B. Zimmerman, and D. H. Froula, “Beam Spray Thresholds in ICF-Relevant Plasmas,” to be published in *Physical Review Letters*.

N. D. Urban, K. R. P. Kafka, K. L. Marshall, and S. G. Demos, “Laser-Induced Damage Characteristics of Fused Silica Surfaces Polished to Different Depths Using Fluid Jet Polishing,” to be published in *Optical Engineering*.

K. M. Woo, R. Betti, C. A. Thomas, C. Stoeckl, K. Churnetski, C. J. Forrest, Z. L. Mohamed, B. Zirps, S. P. Regan, T. J. B. Collins, W. Theobald, R. C. Shah, O. M. Mannion, D. Patel, D. Cao, J. P. Knauer, V. Yu. Glebov, V. N. Goncharov, P. B. Radha, H. G. Rinderknecht, R. Epstein, V. Gopalaswamy, F. J. Marshall, S. T. Ivancic, and E. M. Campbell, “Analysis of Core Asymmetries in Inertial Confinement Fusion Implosions Using Three-Dimensional Hot-Spot Reconstruction,” to be published in *Physics of Plasmas*.

D. Zhang, J. Li, J. Xin, R. Yan, Z. Wan, H. Zhang, and J. Zheng, “Self-Generated Magnetic Field in Ablative Rayleigh–Taylor Instability,” to be published in *Physics of Plasmas*.

Conference Presentations

The following presentations were made at the 2022 Panchanatan Visit, Rochester, NY, 11 April 2022:

C. Deeney, “An Overview of the Laboratory for Laser Energetics: Always ‘Reaching for the Brightest Light.’ ”

V. Gopalaswamy, “Data-Driven Experimental Design at LLE.”

E. M. Hill, “LLE is a Word Leader for Designing, Innovating, and Constructing State-of-the-Art Lasers for a Wide Range

of Scientific Applications for Ourselves and the Broader Scientific Community.”

M. F. Huff, “Measuring Sound Speed in Shocked Iron.”

J. Katz, “Diagnostic Development and Advanced Instrumentation for Fundamental Physics.”

Z. K. Sprowal, L. E. Hansen, M. F. Huff, D. N. Polsin, T. R. Boehly, J. R. Rygg, G. W. Collins, and D. G. Hicks, “Accessing High-Density States in D₂ Using Double Shocks.”

M. S. Wei, “User Community.”

C. A. Williams, “Convergence Research in Inertial Confinement Fusion.”

J. D. Zuegel, “Laser Materials Technology Division and Major Projects,” presented at the NNSA–OES Visit, virtual, 12 April 2022.

R. B. Spielman, “The Design of Self-Magnetically Insulated Transmission Lines for a 10-MA Intermediate-Scale Facility,” presented at the Cornell University Seminar, Cornell, NY, 13 April 2022.

J. Bromage, S.-W. Bahk, M. Bedzyk, I. A. Begishev, S. Bucht, C. Dorrer, 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, “Development of Ultra-Intense OPCPA Technologies on the MTW-OPAL System,” presented at the 11th Advanced Lasers and Photon Sources, Yokohama, Japan, 18–21 April 2022 (invited).

S. X. Hu, P. M. Nilson, D. T. Bishel, D. A. Chin, V. V. Karasiev, D. I. Mihaylov, N. R. Shaffer, S. Zhang, V. Recoules, N. Brouwer, M. Torrent, I. E. Golovkin, M. Gu, T. Walton, and S. B. Hansen, “Probing Atomic Physics at Extreme Conditions,” presented at the International Conference on High-Energy-Density Sciences, Yokohama, Japan, 18–22 April 2022 (invited).

J. D. Zuegel, J. Bromage, D. H. Froula, E. M. Hill, J. P. Palastro, J. C. Puth, H. G. Rinderknecht, J. L. Shaw, C. J. Forrest, and L. J. Waxer, “Proposed EP-OPAL Laser Facility,” presented at the MP3 Workshop, Paris, France, 20–22 April 2022.

C. Deeney, “Pulsed-Power Research at LLE,” presented at the ZNetUS Workshop, virtual, 21–22 April 2022.

The following presentations were made at the 2022 ARPA-E Fusion Programs Annual Meeting, San Francisco, CA, 26–27 April 2022:

J. R. Davies, H. Berger, C. J. Forrest, V. Yu. Glebov, H. McClow, M. Sharpe, and W. T. Shmayda, “The LLE Diagnostic Resource Team for Innovative Fusion Concepts.”

V. N. Goncharov, I. V. Igumenshchev, W. Trickey, R. K. Follett, N. Shaffer, A. Pineau, Y. Lawrence, M. Tobin, W. Meier, S. Woodruff, C. Dorrer, and J. D. Zuegel, “Advanced Inertial Fusion Energy Target Designs with Next-Generation Laser Technologies.”

P. Tzeferacos, A. Sefkow, C. Ren, R. Betti, J. R. Davies, H. Wen, J. G. Shaw, E. C. Hansen, D. Michta, F. García-Rubio, and K. M. Woo, “A Simulation Resource Team for Innovative Fusion Concepts in the BETHE Program.”

The following presentations were made at the 2022 Omega Laser Facility Users Group, Rochester, NY, 27–29 April 2022:

A. Armstrong, A. Reyes, M. B. P. Adams, P. Farmakis, E. C. Hansen, Y. Lu, D. Michta, K. Moczulski, D. Q. Lamb, and P. Tzeferacos, “Implementation and Verification of Spitzer Viscosity in the *FLASH* Code.”

D. H. Barnak, “Self-Optimizing Savitzky–Golay Filter for Generalized Signal Denoising.”

D. H. Barnak, R. Betti, V. Gopalaswamy, A. Lees, and A. Shvydky, “Numerical Simulations of the VISAR Diagnostic.”

D. H. Barnak, J. R. Davies, J. P. Knauer, and P. M. Kozłowski, “*FIDUCIA*: A New User’s Course into the Wonderful World of Cubic Spline Unfolding.”

G. Bruhaug, H. G. Rinderknecht, M. S. Wei, B. Brannon, D. Guy, R. Peck, N. Landis, G. Brent, R. Fairbanks, C. McAtee, T. Walker, T. Buczek, M. Krieger, M. Romanofsky, Y. E. K. Garriga, X. C. Zhang, G. W. Collins, and J. R. Rygg, “High-Power, High-Energy THz Generation Using Joule- and Kilojoule-Class Lasers.”

C. Deeney, “The Next Cooperative Agreement: FY24–FY28.”

P. Farmakis, M. McMullan, A. Reyes, J. Laune, M. B. P. Adams, A. Armstrong, E. C. Hansen, Y. Lu, D. Michta,

K. Moczulski, D. Lamb, and P. Tzeferacos, “Expanding the Tabulated Equation-of-State Implementations in the *FLASH* Code for the *SESAME* Database.”

D. H. Froula, “Fourth-Generation Laser for Ultra-Broad-band Experiments.”

E. C. Hansen, P. Farmakis, D. Michta, C. Ren, A. C. Reyes, H. Wen, S. Langendorf, and P. Tzeferacos, “Simulating the Plasma Liner Experiment (PLX) with the *FLASH* Code.”

P. V. Heuer, J. R. Davies, D. Stanczak, E. Everson, and N. Murphy, “Synthetic Diagnostics for High-Energy-Density Physics in *PlasmaPy*.”

S. T. Ivancic, “Gas-Jet System on OMEGA and OMEGA EP.”

T. J. Kessler and M. Romo-Gonzalez, “Inclusion, Diversity, and Equity at the Laboratory for Laser Energetics.”

Y. Lu, S. Feister, J. Meinecke, F. Miniati, G. Gregori, A. Bott, A. Reyes, E. C. Hansen, J. T. Laune, B. Reville, J. S. Ross, D. Q. Lamb, and P. Tzeferacos, “Numerical Modeling of Laser-Driven Plasma Experiments Aiming to Study Turbulent Dynamo and Thermal Conduction at the National Ignition Facility.”

D. Michta, P. Tzeferacos, S. Bolanos, and M. Manuel, “*FLASH* Simulations of the Magnetized Quasi-Parallel Collisionless Shock Experiments on OMEGA EP.”

K. Moczulski, A. Reyes, M. B. P. Adams, A. Armstrong, P. Farmakis, E. C. Hansen, Y. Lu, D. Michta, D. Q. Lamb, and P. Tzeferacos, “Implementation and Verification of LC Circuit for Z-Pinch *FLASH* Simulations.”

S. F. B. Morse, “Omega Facility OLUG 2022 Update: Progress on Recommendations and Items of General Interest.”

S. F. B. Morse, “The Sustainment Plan for the Omega Laser Facility.”

J. L. Peebles, “Generating Magnetic Fields Using MIFEDS on Your Campaign at OMEGA/OMEGA EP.”

A. Reyes, M. B. P. Adams, A. Armstrong, K. Moczulski, P. Farmakis, E. C. Hansen, Y. Lu, D. Michta, J. Grove, and P. Tzeferacos, “Volume-of-Fluid Representation of Multifluid Compressible Hydrodynamics in the *FLASH* Code.”

P. Tzeferacos, “Big Lasers and Big Computers: The Flash Center for Computational Science and the *FLASH* Code at UR.”

A. Bowman, M. Burns, A. Poudel, S. Zhai, S. Dwarkadas, A. B. Sefkow, and S. Pai, “Cross-Beam Energy Transfer on Graphics Processing Units,” presented at Senior Design Day, Rochester, NY, 29 April 2022.

D. Mihaylov, “Improving the Accuracy of Density Functional Theory Simulations of Warm Dense Matter by Including Exchange-Correlation Thermal Effects,” presented at the Center for Advanced Systems Understanding Seminar, virtual, 3 May 2022.

The following presentations were made at the 17th Direct Drive and Fast Ignition Workshop, Madrid, Spain, 3–5 May 2022:

E. M. Campbell, “Perspective on Inertial Fusion Energy.”

L. Ceurvorst, W. Theobald, M. J. Rosenberg, P. B. Radha, S. P. Regan, C. Stoeckl, R. Betti, K. S. Anderson, J. A. Marozas, V. N. Goncharov, E. M. Campbell, C. M. Shulberg, R. W. Luo, W. Sweet, L. Aghaiain, D. N. Kaczala, B. Bachmann, T. Döppner, M. Hohenberger, K. Glize, R. H. H. Scott, and A. Colaïtis, “Laser-Direct-Drive Energy-Coupling Experiments Using Solid Spheres at the National Ignition Facility.”

V. N. Goncharov, W. Trickey, I. V. Igumenshchev, N. Shaffer, Y. Lawrence, S. Atzeni, and L. Savino, “Advanced Target Designs for Laser-Direct-Drive Inertial Confinement Fusion.”

S. X. Hu, L. Ceurvorst, J. L. Peebles, V. N. Goncharov, Y.-F. Lu, A. Pineau, G. Duchateau, K. R. P. Kafka, S. G. Demos, W. Theobald, S. P. Regan, A. Shvydky, T. J. B. Collins, V. V. Karasiev, S. Zhang, D. R. Harding, R. C. Shah, E. M. Campbell, and C. Deeney, “Review on Laser Imprint for Direct-Drive Inertial Confinement Fusion Implosions.”

S. P. Regan, V. N. Goncharov, E. M. Campbell, R. Betti, P. Adrian, K. S. Anderson, B. Appelbe, J. Baltazar, D. H. Barnak, J. Bates, K. A. Bauer, R. Boni, M. J. Bonino, D. Cao, A. Colaïtis, D. Canning, K. Churnetski, T. J. B. Collins, G. W.

Collins, A. J. Crilly, J. R. Davies, S. G. Demos, C. Dorrer, R. F. Earley, R. Epstein, M. Farrell, R. K. Follett, C. J. Forrest, J. A. Frenje, D. H. Froula, M. Gatu-Johnson, V. Yu. Glebov, V. Gopalaswamy, A. M. Hansen, D. R. Harding, P. V. Heuer, E. M. Hill, S. X. Hu, H. Huang, J. Hund, I. V. Igumenshchev, S. T. Ivancic, D. W. Jacobs-Perkins, R. T. Janezic, M. Karasik, J. Katz, J. P. Knauer, B. Kruschwitz, J. Kunimune, M. Labuzeta, A. Lees, O. M. Mannion, J. A. Marozas, P. W. McKenty, S. F. B. Morse, P. M. Nilson, J. P. Palastro, D. Patel, J. L. Peebles, P. B. Radha, H. G. Rinderknecht, M. J. Rosenberg, J. R. Rygg, S. Sampat, T. C. Sangster, R. C. Shah, M. Sharpe, W. T. Shmayda, M. J. Shoup III, C. Shulberg, A. Shvydky, A. A. Solodov, Z. K. Sprowal, C. Sorce, A. Sorce, C. Stoeckl, C. A. Thomas, W. Theobald, D. Turnbull, L. J. Waxer, M. D. Wittman, K. M. Woo, and J. D. Zuegel, "Accomplishments of the 100-Gbar Campaign on OMEGA."

R. C. Shah, S. X. Hu, I. V. Igumenshchev, J. Baltazar, D. Cao, C. J. Forrest, V. N. Goncharov, V. Gopalaswamy, D. Patel, W. Theobald, S. P. Regan, and F. Philippe, "Anomalous X-Ray Emission at Early Stages of Hot-Spot Formation in Deuterium-Tritium Cryogenic Implosions."

W. Trickey, V. N. Goncharov, E. M. Campbell, Y. Lawrence, M. J. Rosenberg, N. Shaffer, W. Theobald, R. C. Shah, A. Shvydky, I. V. Igumenshchev, A. Colaïtis, S. Atzeni, and L. Savino, "Multidimensional Modeling of Low-Mode Perturbations in the Dynamic-Shell Inertial Confinement Fusion Design."

The following presentations were made at the 2022 Center for Matter at Atomic Pressures, Rochester, NY, 5–6 May 2022:

D. Bishel, P. M. Nilson, D. A. Chin, E. Smith, S. X. Hu, V. V. Karasiev, J. R. Rygg, G. W. Collins, J. J. Ruby, and E. V. Marley, "Interrogating the Atomic Structure of Dense Plasmas by X-Ray Absorption Spectroscopy of Implosion Shells."

D. A. Chin, P. M. Nilson, D. T. Bishel, R. Paul, E. Smith, X. Gong, M. K. Ginnane, B. J. Henderson, D. N. Polsin, S. X. Hu, J. R. Rygg, G. W. Collins, D. Trail, A. Amouretti, M. Harmand, O. Mathon, R. Torchio, J. J. Ruby, F. Coppari, A. Coleman, and Y. Ping, "X-Ray Fine Absorption Fine Structure Spectroscopy Measurements of High-Energy-Density Matter."

Z. K. Sprowal, L. E. Hansen, M. F. Huff, D. N. Polsin, D. G. Hicks, T. R. Boehly, J. R. Rygg, and G. W. Collins, "Accessing High-Density States in D₂ Using Double Shock."

S. Zhang, "Isentrope and Equation of State of Solid Hydrogen."

C. Jeon, "Smart Cities and Lasers: Connecting the Dots," presented at the Han Yang University Seminar, virtual, 6 May 2022.

The following presentations were made at the 2022 Materials Research Society Spring Meeting, Honolulu, HI, 8–25 May 2022:

S. M. Fess, D. R. Harding, M. J. Bonino, R. F. Earley, P. Fan, X. Huang, Y.-F. Lu, S. P. Regan, and E. M. Campbell, "Fabrication of Shells and Foams via Two-Photon Polymerization for Laser-Fusion Experiments."

D. R. Harding, S. M. Fess, M. Bonino, R. F. Earley, Y.-F. Lu, X. Huang, P. Fan, S. P. Regan, and E. M. Campbell, "Multiphoton Applications in Laser Fusion Research: From Printing Fusion-Fuel Targets with Sub-150-nm Features to Acquiring Three-Dimensional Structural and Elemental Information of the Target."

M. P. Jeske and M. Anthamatten, "Thermally Responsive Resins for Free-Radical and Base-Catalyzed Two-Photon Polymerization."

P. Tzeferacos, "FLASH for Z-Pinch Experiments and Extended MHD," presented at the 2022 Center for Matter Under Extreme Conditions Review, San Diego, CA, 10–11 May 2022.

The following presentations were made at the 24th High-Temperature Plasma Diagnostic Conference, Rochester, NY, 15–19 May 2022:

J. Baltazar, R. Betti, K. Churnetski, V. Gopalaswamy, J. P. Knauer, D. Patel, H. G. Rinderknecht, R. C. Shah, C. Stoeckl, C. A. Williams, and S. P. Regan, "Diagnosing Low-Mode ($\ell < 6$) and Mid-Mode ($6 \leq \ell \leq 20$) Asymmetries in the

Explosion Phase of Laser-Direct-Drive Deuterium–Tritium Cryogenic Implosions on OMEGA.”

G. Bruhaug, H. G. Rinderknecht, M. S. Wei, B. Brannon, D. Guy, R. G. Peck, N. Landis, G. Brent, R. Fairbanks, C. McAtee, T. Walker, T. Buczek, M. Krieger, M. Romanofsky, Y. E. K. Garriga, X. C. Zhang, G. W. Collins, and J. R. Rygg, “Development of a Hardened THz Energy Meter for Use on the Kilojoule-Scale, Short-Pulse OMEGA EP Laser.”

L. Ceurvorst, W. Theobald, M. J. Rosenberg, P. B. Radha, S. P. Regan, C. Stoeckl, R. Betti, K. S. Anderson, J. A. Marozas, V. N. Goncharov, E. M. Campbell, C. M. Shulberg, R. W. Luo, W. Sweet, L. Aghaian, D. N. Kaczala, B. Bachmann, T. Döppner, M. Hohenberger, K. Glize, R. H. H. Scott, and A. Colaitis, “Development of an X-Ray Radiography Platform to Study Laser-Direct-Drive Energy Coupling at the National Ignition Facility.”

J. Cheng, G. Chen, D. Chakraborty, S. Kutcher, J. Wen, H. Chen, S. Trivedi, and R. Sobolewski, “(Cd,Mg)Te for Picosecond Response Optical to X-Ray Radiation Detectors.”

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. Stoeckl, C. A. Thomas, and S. P. Regan, “Three-Dimensional Hot-Spot X-Ray Emission Tomography from Cryogenic Deuterium–Tritium Direct-Drive Implosions on OMEGA.”

R. Cuffney, J. Shamlan, M. Sharpe, T. Lewis, M. J. Shoup III, J. Bromage, B. Golick, N. Palmer, A. Golod, B. Hatch, and M. Miller, “4 ω Fiducial Generator: Provides Optical Timing Reference Marks for Streak Cameras.”

D. H. Edgell, J. Katz, R. Raimondi, D. Turnbull, and D. H. Froula, “Scattered-Light Uniformity Imager for Diagnosing Laser Absorption Asymmetries on OMEGA.”

T. Filkins, M. J. Rosenberg, R. Bahr, J. Katz, and S. T. Ivancic, “Calibration of the Sub-Aperture Backscatter System on OMEGA EP.”

C. J. Forrest, R. Betti, J. P. Knauer, V. Yu. Glebov, V. Gopalaswamy, O. M. Mannion, Z. L. Mohamed, P. B. Radha, S. P. Regan, A. Schwemlein, C. Stoeckl, W. Theobald, J. A. Frenje, M. Gatu Johnson, B. Appelbe, and A. J. Crilly, “Measurements of Low-Mode Asymmetries in Areal Density of Laser-Direct-Drive DT Cryogenic Implosions on OMEGA Using Neutron Spectroscopy” (invited).

V. Yu. Glebov, C. J. Forrest, J. Kendrick, J. P. Knauer, H. McClow, S. P. Regan, C. Stoeckl, B. Stanley, W. Theobald, and O. M. Mannion, “A New Neutron Time-of-Flight Detector for D₂ Yield and Ion-Temperature Measurements on OMEGA.”

D. Haberberger, A. Shvydky, and D. H. Froula, “Fresnel Zone Plate Calculations for the Application to Laser-Plasma Experiments.”

P. V. Heuer, D. Stanczak, E. T. Everson, N. A. Murphy, and J. R. Davies, “Open-Source Analysis Software for High-Temperature Plasma Diagnostics.”

S. T. Ivancic, W. Theobald, K. Churnetski, M. Michalko, D. Willistein, W. Bittle, S. P. Regan, A. Carpenter, C. Trosseille, J. D. Kilkenny, A. Raymond, J. D. Hares, A. K. L. Dymoke-Bradshaw, G. Rochau, and D. Garand “Design of the High-Yield Time-Gated X-Ray Hot-Spot Imager (XRHSI) for OMEGA.”

T. R. Joshi, R. C. Shah, W. Theobald, K. Churnetski, P. B. Radha, D. Cao, C. A. Thomas, J. Baltazar, and S. P. Regan, “Diagnosis of the Imploding Shell Asymmetry in Polar-Direct-Drive DT Cryogenic Target Implosions on OMEGA.”

J. Katz, D. Turnbull, S. T. Ivancic, A. L. Milder, and D. H. Froula, “Measurement of Laser Absorption in Underdense Plasmas Using Near-Field Imaging of the Incident and Transmitted Beams.”

J. P. Knauer, C. J. Forrest, V. Gopalaswamy, and Z. L. Mohamed, “Normalized Time Axis for Neutron Time-of-Flight Analysis.”

S. Kostick, M. J. Rosenberg, W. Theobald, J. Katz, N. Lemos, E. Tubman, J. S. Ross, N. Butler, G. Swadling, R. Sommers, J. D. Moody, R. S. Craxton, A. Sharma, and S. P. Regan, “Assessment of the Calibration of the Scattered-Light Time-History Diagnostic at the National Ignition Facility.”

H. McClow, H. Berger, J. R. Davies, C. J. Forrest, G. Gates, S. T. Ivancic, J. Katz, J. Ruby, A. Sorce, and W. Theobald, “First Measurements with a Single-Hit Neutron Spectrometer.”

S. F. Nwabunwanne and W. R. Donaldson, “Tunable, Picosecond AlGaIn UV Photodiodes.”

H. Poole, M. K. Ginnane, J. Topp-Mugglestone, R. Saha, D. N. Polsin, G. W. Collins, S. X. Hu, T. White, S. P. Regan,

G. Gregori, and J. R. Rygg, “Measurements of Warm-Dense-Matter Silicon Based on Angularly and Spectrally Dispersed X-Ray Scattering.”

H. G. Rinderknecht, P. V. Heuer, V. Gopalaswamy, J. P. Knauer, C. A. Williams, W. Theobald, R. Fairbanks, B. Brannon, V. Kobilansky, R. Peck, J. Armstrong, M. Weisbeck, J. Brown, L. Ceurvorst, P. B. Radha, S. P. Regan, J. Kunimune, P. Adrian, M. Gatu Johnson, J. A. Frenje, F. Séguin, A. J. Crilly, B. Appelbe, and B. Bachmann, “A Knock-On Deuteron Imager for Measurements of Fuel and Hot-Spot Asymmetry in Direct-Drive Inertial Confinement Fusion Implosions” (invited).

M. Romo-Gonzalez and R. Boni, “Free-Standing Thin Membrane Zero B -Integral Beam Splitters.”

B. Stanley, C. J. Forrest, and S. T. Ivancic, “Nuclear Activation Analysis of Zirconium-90 Isomeric and Ground-State Reactions at the Omega Laser Facility.”

C. Stoeckl, D. Cao, L. Ceurvorst, A. Kalb, J. Kwiatkowski, A. Shvydky, and W. Theobald, “Beam Pointing Verification Using X-Ray Pinhole Cameras on the 60-Beam OMEGA Laser.”

The following presentations were made at CLEO 2022, San Jose, CA, 15–20 May 2022:

C. Dorrer and J. L. Shaw, “Single-Shot Cross-Correlation of Counter-Propagating Pulses in a Disordered Nonlinear Crystal.”

C. Dorrer and M. A. Spilatro, “Spectral and Temporal Shaping of Spectrally Incoherent UV Pulses by Sum-Frequency Generation.”

G. W. Jenkins, C. Feng, and J. Bromage, “Energy Scaling Beyond Gas-Ionization Thresholds with Divided-Pulse Nonlinear Compression.”

J. P. Palastro, “Laser-Plasma Interactions Driven by Flying Focus Pulses.”

J. Zhang, W. R. Donaldson, and G. P. Agrawal, “Theory and Applications of Temporal Reflection in a Dispersive Medium.”

The following presentations were made at the 49th International Conference on Plasma Science, Seattle, WA, 22–26 May 2022:

C. Deeney, E. M. Campbell, V. N. Goncharov, R. Betti, J. D. Zuegel, S. P. Regan, G. W. Collins, S. F. B. Morse, C. Sorce, D. H. Froula, and M. S. Wei, “Laboratory for Laser Energetics: Progress in Science and Technology.”

J. Katz, R. Boni, A. L. Milder, D. Nelson, K. Daub, and D. H. Froula, “A High-Numerical-Aperture, Angularly Resolved Thomson-Scattering Spectrometer” (invited).

V. N. Goncharov, W. Trickey, N. Shaffer, A. Peneau, I. V. Igumenshchev, R. K. Follett, T. J. B. Collins, C. Dorrer, J. D. Zuegel, M. Tobin, W. Meier, and Y. Lawrence, “Advanced Inertial Fusion Energy Target Designs with Next-Generation Laser Technologies,” presented at the ARPA-E Summit, Denver, CO, 23–25 May 2022.

V. N. Goncharov, W. Trickey, I. V. Igumenshchev, N. Shaffer, T. J. B. Collins, R. K. Follett, C. Stoeckl, R. C. Shah, C. Dorrer, J. D. Zuegel, D. R. Harding, S. Fess, E. M. Campbell, C. Deeney, S. Atzeni, L. Savino, F. Barbato, and A. Colaitis, “Direct-Drive Designs and Experiments on OMEGA,” presented at the EUROfusion Science Meeting, virtual, 27 May 2022.

The following presentations were made at the 50th Anomalous Absorption Conference, Skytop, PA, 5–10 June 2022:

Z. Barfield, J. L. Peebles, P. Tzeferacos, D. Mastrosimone, J. Katz, P. V. Heuer, and D. H. Froula, “Measurements of Anisotropic Temperatures in Magnetized Gas-Jet Plasmas.”

S. H. Cao, D. Patel, A. Lees, V. Gopalaswamy, C. Stoeckl, M. J. Rosenberg, H. Wen, H. Huang, A. Shvydky, R. Betti, and C. Ren, “Predicting Hot-Electron Generation in Inertial Confinement Fusion with Particle-in-Cell Simulations.”

D. H. Edgell, A. Colaitis, M. J. Guardalben, A. Kalb, J. Katz, J. Kwiatkowski, O. M. Mannion, A. Shvydky, C. Stoeckl, D. Turnbull, and D. H. Froula, “Cross-Beam Energy Transfer-Induced Nonuniformity in Direct-Drive Implosions on OMEGA.”

R. Epstein, V. N. Goncharov, S. X. Hu, D. Cao, A. Shvydky, P. W. McKenty, G. W. Collins, and D. Haberberger, “Assessment of Radiation Trapping in Inertial Confinement Fusion Implosion Experiments with High-Z-Lined, Single-Shell Targets.”

V. N. Goncharov, W. Trickey, I. V. Igumenshchev, N. Shaffer, T. J. B. Collins, R. K. Follett, W. Theobald, C. Stoeckl, R. C. Shah, C. Dorrer, J. D. Zuegel, D. R. Harding, S. Fess, E. M. Campbell, C. Deeney, S. Atzeni, L. Savino, F. Barbato, and A. Colaitis, “Physics Requirements for High-Gain Inertial Confinement Fusion Target Designs.”

D. Haberberger, A. Shvydky, C. Stoeckl, V. N. Goncharov, and D. H. Froula, “Schlieren Refraction Imaging for Cryo Implosions.”

L. S. Leal, A. V. Maximov, F. García-Rubio, R. Betti, and V. V. Ivanov, “Modeling of Laser-Driven Ablative Magneto-thermal Instability.”

A. V. Maximov, D. Turnbull, D. H. Edgell, R. K. Follett, H. Wen, J. P. Palastro, and D. H. Froula, “Nonlinear Laser-Plasma Coupling Caused by Two-Plasmon Decay and Cross-Beam Energy Transfer.”

K. L. Nguyen, A. M. Hansen, D. Turnbull, R. K. Follett, D. H. Edgell, D. H. Froula, J. P. Palastro, L. Yin, and B. J. Albright, “Cross-Beam Energy Transfer Saturation by Ion-Trapping-Induced Detuning.”

J. P. Palastro, D. Ramsey, M. Ambat, P. Franke, D. H. Froula, J. Pigeon, J. L. Shaw, T. T. Simpson, K. Weichman, B. Barbosa, B. Malaca, M. Pardal, J. Vieira, M. Vranic, M. Formanek, A. Di Piazza, J. Pierce, and W. Mori, “Nonlinear Thomson Scattering with Ponderomotive Control.”

D. Ramsey, A. Di Piazza, M. Formanek, P. Franke, D. H. Froula, W. Mori, J. Pierce, T. T. Simpson, K. Weichman, and J. P. Palastro, “Exact Analytic Solutions Yielding Flying Focus Pulses (EASYFFP).”

H. G. Rinderknecht, G. Bruhaug, K. Weichman, M. Van Dusen-Gross, J. P. Palastro, M. S. Wei, A. Arefiev, T. Wang, T. Toncian, A. Laso Garcia, D. Doria, K. Spohr, H. J. Quevedo, T. Ditmire, J. Williams, A. Haid, and D. Stutman, “Relativistically Transparent Magnetic Filaments: a Short-Pulse Path to MegaTesla Fields and Efficient Gamma Radiation.”

N. R. Shaffer, V. N. Goncharov, A. V. Maximov, and M. Sherlock, “An Extended Vlasov–Fokker–Planck Approach to Laser Absorption and Ponderomotive Effects.”

T. T. Simpson, J. Pigeon, M. Lim Pac Chong, D. Ramsey, K. Weichman, D. H. Froula, and J. P. Palastro, “High-Energy Two-Color Terahertz Generation.”

A. A. Solodov, M. J. Rosenberg, M. Stoeckl, R. Betti, W. Seka, R. Epstein, C. Stoeckl, R. K. Follett, P. B. Radha, S. P. Regan, D. H. Froula, J. P. Palastro, E. M. Campbell, V. N. Goncharov, A. R. Christopherson, B. Bachman, M. Hohenberger, P. Michel, and J. F. Myatt, “Hot-Electron Preheat and Mitigation in Polar-Direct-Drive Experiments at the National Ignition Facility.”

D. Turnbull, J. Katz, A. L. Milder, A. Shvydky, D. H. Froula, D. E. Hinkel, P. Michel, T. Chapman, L. Divol, E. Kur, S. MacLaren, M. Rosen, and G. B. Zimmerman, “Beam Spray Thresholds in ICF-Relevant Plasmas.”

K. Weichman, J. P. Palastro, A. P. L. Robinson, and A. V. Arefiev, “Relativistically Thermal Plasma Generation by Magnetically Assisted Direct Laser Acceleration.”

H. Wen, R. K. Follett, A. V. Maximov, and J. P. Palastro, “Mitigation of Inflationary Stimulated Raman Scattering with Laser Bandwidth.”

The following presentations were made at the 24th Target Fabrication Specialist meeting, virtual, 6–9 June 2022:

J. M. García-Figueroa and D. R. Harding, “Observations on Smooth Diamond-Like Composition Films Deposited at Low Temperature via an Electron Cyclotron Resonance-Microwave-Chemical Vapor Deposition One-Step Process.”

M. Wang and D. R. Harding, “Mechanical Properties of Micrometer-Size Foam Structures.”

C. Deeney, “LLE Strategy,” presented at the Office of Experimental Sciences Executives Meeting, Washington, DC, 8–9 June 2022.

The following presentations were made at Technology of Fusion Energy, Anaheim, CA, 12–16 June 2022:

M. Sharpe, C. Fagan, and W. T. Shmayda, “Influence of Microstructure on the Absorption of Tritium into Gold-Plated 316 Stainless Steel.”

W. T. Shmayda, E. Dombrowski, and H. K. Mutha, “Pumping and Purifying the SPARC Tokamak Exhaust.”

D. A. Chin, P. M. Nilson, J. J. Ruby, D. T. Bishel, R. Paul, M. Signor, A. Amouretti, A. Coleman, F. Coppari, M. K. Ginnane, X. Gong, M. Harmand, B. J. Henderson, S. X. Hu, O. Mathon, D. N. Polsin, E. Smith, R. Torchio, D. Trail, Y. Ping, J. R. Rygg, and G. W. Collins, “X-Ray Absorption Fine Structure Spectroscopy of Iron Compounds at High-Energy-Density Conditions,” presented at the DOE NNSA Stewardship Science Graduate Fellowship, Santa Fe, NM, 20–23 June 2022.

E. M. Campbell, “Overview of Inertial Confinement Fusion History, Challenges, and Prospects for Driver-Target Concepts,” presented at the Basic Research Needs Workshop, virtual, 21–23 June 2022.

R. B. Spielman and T. Joshi, “Annual Technical Review,” presented at the Materials Science in Extreme Environments Annual Technical Review Meeting, Baltimore, MD, 22–24 June 2022.

C. Deeney, “The Laboratory for Laser Energetics: Progress in Science and Technology,” presented at the Washington State University Institute for Shock Physics, Pullman, WA, 27 June 2022 (invited).

R. Betti, A. Casner, X. Ribeyre, and W. Theobald, “Progress in Laser Direct Drive: Conventional and Shock Ignition,” presented at the 48th European Physical Society Conference on Plasma Physics, virtual, 27 June–1 July 2022.