
Publications and Conference Presentations

Publications

- M. Anthamatten, J. J. Ou, J. A. Weinfeld, and S. H. Chen, "Enthalpy Versus Entropy: What Drives Hard-Particle Ordering in Condensed Phases?" *Chem. Phys. Lett.* **660**, 18 (2016).
- P. X. Belancourt, W. Theobald, P. A. Keiter, T. J. B. Collins, M. J. Bonino, P. M. Kozlowski, S. P. Regan, and R. P. Drake, "Demonstration of Imaging X-Ray Thomson Scattering on OMEGA EP," *Rev. Sci. Instrum.* **87**, 11E550 (2016).
- A. Bose, K. M. Woo, R. Betti, E. M. Campbell, D. Mangino, A. R. Christopherson, R. L. McCrory, R. Nora, S. P. Regan, V. N. Goncharov, T. C. Sangster, C. J. Forrest, J. Frenje, M. Gatu Johnson, V. Yu. Glebov, J. P. Knauer, F. J. Marshall, C. Stoeckl, and W. Theobald, "Core Conditions for Alpha Heating Attained in Direct-Drive Inertial Confinement Fusion," *Phys. Rev. E* **94**, 011201(R) (2016).
- B. P. Chock, T. B. Jones, and D. R. Harding, "Effect of a Surfactant on the Electric-Field Assembly of Oil-Water Emulsions for Making Foam Targets," *Fusion Sci. Technol.* **70**, 206 (2016).
- P. S. Datte, J. S. Ross, D. H. Froula, K. D. Daub, J. Galbraith, S. Glenzer, B. Hatch, J. Katz, J. Kilkenny, O. Landen, D. Manha, A. M. Manuel, W. Molander, D. Montgomery, J. Moody, G. F. Swadling, and J. Weaver, "The Design of the Optical Thomson Scattering Diagnostic for the National Ignition Facility," *Rev. Sci. Instrum.* **87**, 11E549 (2016).
- P. Datte, J. S. Ross, D. Froula, J. Galbraith, S. Glenzer, B. Hatch, J. Kilkenny, O. Landen, A. M. Manuel, W. Molander, D. Montgomery, J. Moody, G. Swadling, J. Weaver, G. Vergel de Dios, and M. Vitalich, "The Preliminary Design of the Optical Thomson Scattering Diagnostic for the National Ignition Facility," *J. Phys.: Conf. Ser.* **717**, 012089 (2016).
- A. K. Davis, D. T. Michel, R. S. Craxton, R. Epstein, M. Hohenberger, T. Mo, and D. H. Froula, "X-Ray Self-Emission Imaging Used to Diagnose 3-D Nonuniformities in Direct-Drive ICF Implosions," *Rev. Sci. Instrum.* **87**, 11E340 (2016).
- W. R. Donaldson, J. Katz, T. Z. Kosc, J. H. Kelly, E. M. Hill, and R. E. Bahr, "Enhancements to the Timing of the OMEGA Laser System to Improve Illumination Uniformity," *Proc. SPIE* **9966**, 996607 (2016).
- R. K. Follett, J. A. Delettrez, D. H. Edgell, R. J. Henchen, J. Katz, J. F. Myatt, and D. H. Froula, "Plasma Characterization Using Ultraviolet Thomson Scattering from Ion-Acoustic and Electron Plasma Waves," *Rev. Sci. Instrum.* **87**, 11E401 (2016) (invited).
- C. J. Forrest, V. Yu. Glebov, V. N. Goncharov, J. P. Knauer, P. B. Radha, S. P. Regan, M. H. Romanofsky, T. C. Sangster, M. J. Shoup III, and C. Stoeckl, "High-Dynamic-Range Neutron Time-of-Flight Detector Used to Infer the $D(t,n)^4\text{He}$ and $D(d,n)^3\text{He}$ Reaction Yield and Ion Temperature on OMEGA," *Rev. Sci. Instrum.* **87**, 11D814 (2016).
- D. R. Harding, D. C. Whitaker, and C. Fella, "Growth of a Solid DT Crystal from the Liquid Inside Inertial Confinement Fusion Targets," *Fusion Sci. Technol.* **70**, 173 (2016).
- M. Hohenberger, A. Shvydky, J. A. Marozas, G. Fiksel, M. J. Bonino, D. Canning, T. J. B. Collins, C. Dorrer, T. J. Kessler, B. E. Kruschwitz, P. W. McKenty, D. D. Meyerhofer, S. P. Regan, T. C. Sangster, and J. D. Zuegel, "Optical Smoothing of Laser Imprinting in Planar-Target Experiments on OMEGA EP Using Multi-FM 1-D Smoothing by Spectral Dispersion," *Phys. Plasmas* **23**, 092702 (2016).
- S. X. Hu, B. Militzer, L. A. Collins, K. P. Driver, and J. D. Kress, "First-Principles Prediction of the Softening of the Silicon Shock Hugoniot Curve," *Phys. Rev. B* **94**, 094109 (2016).
- O. A. Hurricane, D. A. Callahan, D. T. Casey, E. L. Dewald, T. R. Dittrich, T. Döppner, S. Haan, D. E. Hinkel, L. F. Berzak Hopkins, O. Jones, A. L. Kritcher, S. Le Pape, T. Ma, A. G. MacPhee, J. L. Milovich, J. Moody, A. Pak, H.-S. Park, P. K. Patel, J. E. Ralph, H. F. Robey, J. S. Ross, J. D. Salmonson,

B. K. Spears, P. T. Springer, R. Tommasini, F. Albert, L. R. Benedetti, R. Bionta, E. Bond, D. K. Bradley, J. Caggiano, P. M. Celliers, C. Cerjan, J. A. Church, R. Dylla-Spears, D. Edgell, M. J. Edwards, D. Fittinghoff, M. A. Barrios Garcia, A. Hamza, R. Hatarik, H. Herrmann, M. Hohenberger, D. Hoover, J. L. Kline, G. Kyrala, B. Kozioziemski, G. Grim, J. E. Field, J. Frenje, N. Izumi, M. Gatu Johnson, S. F. Khan, J. Knauer, T. Kohut, O. Landen, F. Merrill, P. Michel, A. Moore, S. R. Nagel, A. Nikroo, T. Parham, R. R. Rygg, D. Sayre, M. Schneider, D. Shaughnessy, D. Strozzi, R. P. J. Town, D. Turnbull, P. Volegov, A. Wan, K. Widmann, C. Wilde, and C. Yeamans, "Inertially Confined Fusion Plasmas Dominated by Alpha-Particle Self-Heating," *Nat. Physics* **12**, 800 (2016).

S. T. Ivancic, C. R. Stillman, D. Nelson, I. A. Begishev, C. Mileham, P. M. Nilson, and D. H. Froula, "Design of an Extreme Ultraviolet Spectrometer Suite to Characterize Rapidly Heated Solid Matter," *Rev. Sci. Instrum.* **87**, 11E538 (2016).

J. Katz, R. Boni, R. Rivlis, C. Muir, and D. H. Froula, "A Pulse-Front-Tilt-Compensated Streaked Optical Spectrometer with High Throughput and Picosecond Time Resolution," *Rev. Sci. Instrum.* **87**, 11E535 (2016).

A. S. Moore, J. Benstead, M. F. Ahmed, J. Morton, T. M. Guymmer, R. Soufli, T. Pardini, R. L. Hibbard, C. G. Bailey, P. M. Bell, S. Hau-Riege, M. Bedzyk, M. J. Shoup III, S. P. Regan, T. Agliata, R. Jungquist, D. W. Schmidt, L. B. Kot, W. J. Garbett, M. S. Rubery, J. W. Skidmore, E. Gullikson, and F. Salmassi, "Two-Color Spatial and Temporal Temperature Measurements Using a Streaked Soft X-Ray Imager," *Rev. Sci. Instrum.* **87**, 11E313 (2016).

P. M. Nilson, F. Ehrne, C. Mileham, D. Mastro Simone, R. K. Jungquist, C. Taylor, C. R. Stillman, S. T. Ivancic, R. Boni, J. Hassett, D. J. Lonobile, R. W. Kidder, M. J. Shoup III, A. A. Solodov, C. Stoeckl, W. Theobald, D. H. Froula, K. W. Hill, L. Gao, M. Bitter, P. Efthimion, and D. D. Meyerhofer, "High-Resolving-Power X-Ray Spectrometer for the OMEGA EP Laser," *Rev. Sci. Instrum.* **87**, 11D504 (2016) (invited).

S. P. Regan, V. N. Goncharov, I. V. Igumenshchev, T. C. Sangster, R. Betti, A. Bose, T. R. Boehly, M. J. Bonino, E. M. Campbell, D. Cao, T. J. B. Collins, R. S. Craxton, A. K. Davis, J. A. Delettretz, D. H. Edgell, R. Epstein, C. J. Forrest, J. A. Frenje, D. H. Froula, M. Gatu Johnson, V. Yu. Glebov,

D. R. Harding, M. Hohenberger, S. X. Hu, D. Jacobs-Perkins, R. Janezic, M. Karasik, R. L. Keck, J. H. Kelly, T. J. Kessler, J. P. Knauer, T. Z. Kosci, S. J. Loucks, J. A. Marozas, F. J. Marshall, R. L. McCrory, P. W. McKenty, D. D. Meyerhofer, D. T. Michel, J. F. Myatt, S. P. Obenshain, R. D. Petrasso, P. B. Radha, B. Rice, M. J. Rosenberg, A. J. Schmitt, M. J. Schmitt, W. Seka, W. T. Shmayda, M. J. Shoup III, A. Shvydky, S. Skupsky, A. A. Solodov, C. Stoeckl, W. Theobald, J. Ulreich, M. D. Wittman, K. M. Woo, B. Yaakobi, and J. D. Zuegel, "Demonstration of Fuel Hot-Spot Pressure in Excess of 50 Gbar for Direct-Drive, Layered Deuterium-Tritium Implosions on OMEGA," *Phys. Rev. Lett.* **117**, 025001 (2016).

J. S. Ross, P. Datte, L. Divol, J. Galbraith, D. H. Froula, S. H. Glenzer, B. Hatch, J. Katz, J. Kilkenny, O. Landen, A. M. Manuel, W. Molander, D. S. Montgomery, J. D. Moody, G. Swadling, and J. Weaver, "Simulated Performance of the Optical Thomson Scattering Diagnostic Designed for the National Ignition Facility," *Rev. Sci. Instrum.* **87**, 11E510 (2016).

M. Sharpe, W. T. Shmayda, and W. U. Schröder, "Tritium Migration to the Surfaces of Type 316 Stainless Steel; Aluminum 6061; and Oxygen-Free, High-Conductivity Copper," *Fusion Sci. Technol.* **70**, 97 (2016).

W. T. Shmayda, M. D. Wittman, R. F. Earley, J. L. Reid, and N. P. Redden, "The Laboratory for Laser Energetics' Hydrogen Isotope Separation System," *Fusion Eng. Des.* **109**, 128 (2016) (invited).

C. R. Stillman, P. M. Nilson, S. T. Ivancic, C. Mileham, I. A. Begishev, R. K. Junquist, D. J. Nelson, and D. H. Froula, "A Streaked X-Ray Spectroscopy Platform for Rapidly Heated, Near-Solid Density Plasmas," *Rev. Sci. Instrum.* **87**, 11E312 (2016) (invited).

C. Stoeckl, W. Theobald, S. P. Regan, and M. H. Romanofsky, "Calibration of a Time-Resolved Hard-X-Ray Detector Using Radioactive Sources," *Rev. Sci. Instrum.* **87**, 11E323 (2016).

M. P. Valdivia, D. Stutman, C. Stoeckl, C. S. Mileham, I. A. Begishev, J. Bromage, and S. P. Regan, "A Talbot-Lau X-Ray Deflectometer as a High-Energy Density Plasma Diagnostic," *IEEE Trans. Plasma Sci.* **44**, 1592 (2016).

N. D. Viza, M. H. Romanofsky, M. J. Moynihan, and D. R. Harding, "The Effects of a Surfactant on the Operation of

T-Junctions for Mass-Producing Foam Targets,” *Fusion Sci. Technol.* **70**, 219 (2016).

H. Wen, A. V. Maximov, R. W. Short, J. F. Myatt, R. Yan, and C. Ren, “Two-Plasmon Decay Instability in Inhomogeneous Plasmas at Oblique Laser Incidence,” *Phys. Plasmas* **23**, 092713 (2016).

A. B. Zylstra, H. W. Herrmann, M. Gatu Johnson, Y. H. Kim, J. A. Frenje, G. Hale, C. K. Li, M. Rubery, M. Paris, A. Bacher, C. R. Brune, C. Forrest, V. Yu. Glebov, R. Janezic, D. McNabb, A. Nikroo, J. Pino, T. C. Sangster, F. H. Séguin, W. Seka, H. Sio, C. Stoeckl, and R. D. Petrasso, “Using Inertial Fusion Implosions to Measure the $T + {}^3\text{He}$ Fusion Cross Section at Nucleosynthesis-Relevant Energies,” *Phys. Rev. Lett.* **117**, 035002 (2016).

Forthcoming Publications

S. G. Demos and R. A. Negres, “Morphology of Ejected Particles and Impact Sites on Intercepting Substrates Following Exit-Surface Laser Damage with Nanosecond Pulses in Silica,” to be published in *Optical Engineering*.

C. Dorrer, W. A. Bittle, R. Cuffney, M. Spilatro, E. M. Hill, T. Z. Kosc, J. H. Kelly, and J. D. Zuegel, “Time-Multiplexed Pulse Shaping,” to be published in the *Journal of Lightwave Technology*.

C. Dorrer and J. Hassett, “Model-Based Optimization of Near-Field Binary Pixelated-Beam Shapers,” to be published in *Applied Optics*.

R. Epstein, S. P. Regan, B. A. Hammel, L. J. Suter, H. A. Scott, M. A. Barrios, D. K. Bradley, D. A. Callahan, C. Cerjan, G. W. Collins, S. N. Dixit, T. Döppner, M. J. Edwards, D. R. Farley, K. B. Fournier, S. Glenn, S. H. Glenzer, I. E. Golovkin, A. Hamza, D. G. Hicks, N. Izumi, O. S. Jones, M. H. Key, J. D. Kilkenny, J. L. Kline, G. A. Kyrala, O. L. Landen, T. Ma, J. J. MacFarlane, A. J. Mackinnon, R. C. Mancini, R. L. McCrory, D. D. Meyerhofer, N. B. Meezan, A. Nikroo, H.-S. Park, P. K. Patel, J. E. Ralph, B. A. Remington, T. C. Sangster, V. A. Smalyuk, P. T. Springer, R. P. J. Town, and J. L. Tucker, “Applications and Results of X-Ray Spectroscopy in Implosion Experiments on the National Ignition Facility,” to be published in *Proceedings of Atomic Processes in Plasmas* (invited).

C. Fagan, M. Sharpe, W. T. Shmayda, and W. U. Schröder, “The Impact of Acid Treatments and Electropolishing Stainless-Steel Surfaces on Tritium Inventories,” to be published in *Fusion Science and Technology*.

M. C. Gregor, R. Boni, A. Sorce, J. Kendrick, C. A. McCoy, D. N. Polsin, and T. R. Boehly, “Absolute Calibration of the

OMEGA Streaked Optical Pyrometer for Temperature Measurements of Compressed Materials,” to be published in *Review of Scientific Instruments*.

S. X. Hu, D. T. Michel, A. K. Davis, R. Betti, P. B. Radha, E. M. Campbell, D. H. Froula, and C. Stoeckl, “Understanding the Effects of Laser Imprint on Plastic-Target Implosions on OMEGA,” to be published in *Physics of Plasmas*.

C. K. Li, P. Tzeferacos, D. Lamb, G. Gregori, P. A. Norreys, M. J. Rosenberg, R. K. Follett, D. H. Froula, M. Koenig, F. H. Séguin, J. A. Frenje, H. G. Rinderknecht, H. Sio, A. B. Zylstra, R. D. Petrasso, P. A. Amendt, H. S. Park, B. A. Remington, D. D. Ryutov, S. C. Wilks, R. Betti, A. Frank, S. X. Hu, T. C. Sangster, P. Hartigan, R. P. Drake, C. C. Kuranz, S. V. Lebedev, and N. C. Woolsey, “Scaled Laboratory Experiments Explain the Kink Behaviour of the Crab Nebula Jet,” to be published in *Nature Communications*.

J. B. Oliver, “Analysis of a Planetary Rotation System for Evaporated Optical Coatings,” to be published in *Applied Optics*.

J. B. Oliver, “Impact of Deposition-Rate Fluctuations on Thin-Film Thickness and Uniformity,” to be published in *Optics Letters*.

S. Papernov, A. A. Kozlov, J. B. Oliver, C. Smith, L. Jensen, S. Günster, H. Mädebach, and D. Ristau, “Role of $\text{HfO}_2/\text{SiO}_2$ Thin-Film Interfaces in Near-Ultraviolet Absorption and Pulsed Laser Damage,” to be published in *Optical Engineering*.

B. W. Plansinis, W. R. Donaldson, and G. P. Agrawal, “Spectral Splitting of Optical Pulses Inside a Dispersive Medium at a Temporal Boundary,” to be published in *IEEE Journal of Quantum Electronics*.

S. Salzman, H. J. Romanofsky, G. West, K. L. Marshall, S. D. Jacobs, and J. C. Lambropoulos, "Acidic Magnetorheological Finishing of Infrared Polycrystalline Materials," to be published in *Applied Optics*.

A. A. Solodov, B. Yaakobi, D. H. Edgell, R. K. Follett, J. F. Myatt, C. Sorce, and D. H. Froula, "Measurements of Hot-Electron Temperature in Laser-Irradiated Plasmas," to be published in *Physics of Plasmas*.

Conference Presentations

V. N. Goncharov, S. P. Regan, E. M. Campbell, T. C. Sangster, P. B. Radha, J. F. Myatt, D. H. Froula, R. Betti, T. R. Boehly, J. A. Delettrez, D. H. Edgell, R. Epstein, C. J. Forrest, V. Yu. Glebov, D. R. Harding, S. X. Hu, I. V. Igumenshchev, F. J. Marshall, R. L. McCrory, D. T. Michel, W. Seka, A. Shvydky, C. Stoeckl, W. Theobald, and M. Gatu-Johnson, "National Direct-Drive Program on OMEGA and the National Ignition Facility," 43rd European Physical Society Conference on Plasma Physics, Leuven, Belgium, 4–8 July 2016 (invited).

J. D. Zuegel, J. Bromage, E. M. Campbell, W. Krupke, T. Y. Fan, D. H. Martz, P. Reeves-Hall, and W. Leemans, "High-Average-Power, Ultra-Intense Laser Technology for Laser-Plasma Acceleration," 17th Advanced Accelerator Concepts Workshop, National Harbor, MD, 31 July–5 August 2016.

D. Polsin, T. R. Boehly, J. A. Delettrez, M. C. Gregor, C. A. McCoy, B. Henderson, D. E. Fratanduono, R. Smith, R. Kraus, J. H. Eggert, R. Collins, F. Coppari, and P. M. Celliers, "Observation of Solid-Solid Phase Transitions in Pump-Compressed Aluminum," High-Pressure Research, Holderness, NH, 17–22 July 2016.

W. T. Shmayda, J. Ulreich, R. Earley, and M. D. Wittman, "Filling Inertial Confinement Fusion Targets with DT Using Palladium Tritide," The 22nd Topical Meeting on the Technology of Fusion Energy (TOFE 2016), Philadelphia, PA, 22–25 August 2016.

J. B. Oliver, C. Smith, B. Taylor, J. Spaulding, S. MacNally, and T. Shea, "Characterization of Glancing-Angle-Deposited Magnesium Oxide Films," Novel Optical Materials and Applications, Vancouver, British Columbia, Canada, 18–20 July 2016.

W. R. Donaldson, J. Katz, T. Z. Kosc, J. H. Kelly, E. M. Hill, and R. E. Bahr, "Enhancements to the Timing of the OMEGA Laser System to Improve Illumination Uniformity," 2016 Optical Engineering and Applications, San Diego, CA, 28 August–1 September 2016.

D. H. Froula, P. M. Nilson, S. T. Ivancic, C. R. Stillman, C. Mileham, I. A. Begishev, A. A. Solodov, R. K. Jungquist, R. Boni, D. Hassett, C. Stoeckl, W. Theobald, F. Ehrne, D. Mastrosimone, D. Nelson, C. Taylor, D. J. Lonobile, R. W. Kidder, M. J. Shoup III, K. W. Hill, L. Gao, M. Bitter, and P. C. Efthimion, "Understanding the Material Response to Powerful Energy Fluxes Driven by Picosecond Lasers at the Laboratory for Laser Energetics," JOWOG37, Aldermaston, UK, 18–22 July 2016.

E. M. Campbell, "Symmetric Illumination and Direct Drive at the National Ignition Facility," Symmetric Direct-Drive Study, Livermore, CA, 7–8 September 2016.

The following presentations were made at the 7th International Conference on Ultrahigh Intensity Lasers, Montebello, Quebec, Canada, 11–16 September 2016:

S.-W. Bahk, J. B. Oliver, R. K. Jungquist, J. Bromage, E. M. Schiesser, and J. P. Rolland "Beam-Transport Systems for Ultra-Broadband Lasers."

I. A. Begishev, S.-W. Bahk, R. Cuffney, C. Dorrer, D. Haberberger, D. H. Froula, C. Mileham, P. M. Nilson, C. Stoeckl, J. D. Zuegel, and J. Bromage, “Extensions to the Multi-Terawatt Laser for Laser Development and Plasma Physics Studies.”

S. Bucht, D. Haberberger, J. Bromage, and D. H. Froula, “Transforming the Idler-to-Seed Raman Amplification.”

C. Dorrer, L. J. Waxer, A. Kalb, E. M. Hill, and J. Bromage, “Temporal Characterization of Optical Pulses by Spectral Phase Diversity.”

D. Haberberger, A. Davies, S. Bucht, J. Bromage, J. D. Zuegel, D. H. Froula, R. Trines, R. Bingham, and P. A. Norreys, “Plans for a Tunable Raman Amplifier at The Laboratory for Laser Energetics.”

R. Betti, “Status and Prospects for Demonstrating Ignition via Laser Fusion,” The 3rd International Conference on High Energy Density Physics (ICHEDP-3), Shenzhen, China, 23–26 September 2016.

The following presentations were made at the XLVIII Annual Symposium on Optical Materials for High-Power Lasers, Boulder, CO, 25–28 September 2016:

S. G. Demos, C. W. Carr, and D. A. Cross, “Electrostatic Effects Following Irradiation of Fused Silica Surfaces with Nanosecond Laser Pulses.”

A. A. Kozlov, S. Papernov, J. B. Oliver, A. L. Rigatti, B. Taylor, B. Charles, and C. Smith, “Study of the Picosecond Laser Damage in $\text{HfO}_2/\text{SiO}_2$ -Based Thin-Film Coatings in Vacuum.”