
Publications and Conference Presentations

Publications

- D. H. Barnak, J. R. Davies, G. Fiksel, P.-Y. Chang, E. Zabir, and R. Betti, "Increasing the Magnetic-Field Capability of the Magneto-Inertial Fusion Electrical Discharge System Using an Inductively Coupled Coil," *Rev. Sci. Instrum.* **89**, 033501 (2018).
- R. Boni, J. Kendrick, and C. Sorce, "An Optically Passive Method that Doubles the Rate of 2-GHz Timing Fiducials," *Proc. SPIE* **10390**, 1039003 (2017).
- B. P. Chock, D. R. Harding, and T. B. Jones, "Using Digital Microfluidics to Dispense, Combine, and Transport Low-Surface-Energy Fluids," *Fusion Sci. Technol.* **73**, 237 (2018).
- A. R. Christopherson, R. Betti, A. Bose, J. Howard, K. M. Woo, E. M. Campbell, J. Sanz, and B. K. Spears, "A Comprehensive Alpha-Heating Model for Inertial Confinement Fusion," *Phys. Plasmas* **25**, 012703 (2018).
- K. Falk, M. Holec, C. J. Fontes, C. L. Fryer, C. W. Greeff, H. M. Johns, D. S. Montgomery, D. W. Schmidt, and M. Šmíd, "Measurement of Preheat Due to Nonlocal Electron Transport in Warm, Dense Matter," *Phys. Rev. Lett.* **120**, 025002 (2018).
- P. Fiala, Y. Li, and C. Dorrer, "Investigation of Focusing and Correcting Aberrations with Binary Amplitude and Polarization Modulation," *Appl. Opt.* **57**, 763 (2018).
- R. K. Follett, J. G. Shaw, J. F. Myatt, J. P. Palastro, R. W. Short, and D. H. Froula, "Suppressing Two-Plasmon Decay with Laser Frequency Detuning," *Phys. Rev. Lett.* **120**, 135005 (2018).
- S. X. Hu, "Electron-Electron Correlation in Two-Photon Double Ionization of He-Like Ions," *Phys. Rev. A* **97**, 013414 (2018).
- K. R. P. Kafka, B. Hoffman, S. Papernov, M. A. DeMarco, C. Hall, K. L. Marshall, and S. G. Demos, "Methods for Improving the Damage Performance of Fused Silica Polished by Magnetorheological Finishing," *Proc. SPIE* **10447**, 1044709 (2017).
- K. R. P. Kafka, S. Papernov, and S. G. Demos, "Enhanced Laser Conditioning Using Temporally Shaped Pulses," *Opt. Lett.* **43**, 1239 (2018).
- V. V. Karasiev, J. W. Dufty, and S. B. Trickey, "Nonempirical Semilocal Free-Energy Density Functional for Matter Under Extreme Conditions," *Phys. Rev. Lett.* **120**, 076401 (2018).
- R. K. Kirkwood, D. P. Turnbull, T. Chapman, S. C. Wilks, M. D. Rosen, R. A. London, L. A. Pickworth, W. H. Dunlop, J. D. Moody, D. J. Strozzi, P. A. Michel, L. Divol, O. L. Landen, B. J. MacGowan, B. M. Van Wonterghem, K. B. Fournier, and B. E. Blue, "Plasma-Based Beam Combiner for Very High Fluence and Energy," *Nat. Phys.* **14**, 80 (2018).
- T. Z. Kosc, K. L. Marshall, A. A. Kozlov, S. Papernov, and S. G. Demos, "Damage Testing of Nematic Liquid Crystalline Materials for Femtosecond to Nanosecond Pulse Lengths at 1053 nm," *Proc. SPIE* **10447**, 104471G (2017).
- J. A. Marozas, M. Hohenberger, M. J. Rosenberg, D. Turnbull, T. J. B. Collins, P. B. Radha, P. W. McKenty, J. D. Zuegel, F. J. Marshall, S. P. Regan, T. C. Sangster, W. Seka, E. M. Campbell, V. N. Goncharov, M. W. Bowers, J.-M. G. DiNicola, G. Erbert, B. J. MacGowan, L. J. Pelz, and S. T. Yang, "First Observation of Cross-Beam Energy Transfer Mitigation for Direct-Drive Inertial Confinement Fusion Implosions Using Wavelength Detuning at the National Ignition Facility," *Phys. Rev. Lett.* **120**, 085001 (2018).
- D. T. Michel, I. V. Igumenshchev, A. K. Davis, D. H. Edgell, D. H. Froula, D. W. Jacobs-Perkins, V. N. Goncharov, S. P. Regan, A. Shvydky, and E. M. Campbell, "Subpercent-Scale Control of 3-D Low Modes of Targets Imploded in Direct-Drive Configuration on OMEGA," *Phys. Rev. Lett.* **120**, 125001 (2018).
- M. Millot, S. Hamel, J. R. Rygg, P. M. Celliers, G. W. Collins, F. Coppari, D. E. Fratanduono, R. Jeanloz, D. C. Swift, and

J. H. Eggert, "Experimental Evidence for Superionic Water Ice Using Shock Compression," *Nat. Phys.* **14**, 297 (2018).

J. P. Palastro, D. Turnbull, S.-W. Bahk, R. K. Follett, J. L. Shaw, D. Haberberger, J. Bromage, and D. H. Froula, "Ionization Waves of Arbitrary Velocity Driven by a Flying Focus," *Phys. Rev. A* **97**, 033835 (2018).

B. W. Plansinis, W. R. Donaldson, and G. P. Agrawal, "Cross-Phase-Modulation-Induced Temporal Reflection and Waveguiding of Optical Pulses," *J. Opt. Soc. Am. B* **35**, 436 (2018).

S. P. Regan, V. N. Goncharov, T. C. Sangster, E. M. Campbell, R. Betti, K. S. Anderson, T. Bernat, A. Bose, T. R. Boehly, M. J. Bonino, D. Cao, R. Chapman, T. J. B. Collins, R. S. Craxton, A. K. Davis, J. A. Delettrez, D. H. Edgell, R. Epstein, M. Farrell, C. J. Forrest, J. A. Frenje, D. H. Froula, M. Gatu Johnson, C. Gibson, V. Yu. Glebov, A. Greenwood, D. R. Harding, M. Hohenberger, S. X. Hu, H. Huang, J. Hund, I. V. Igumenshchev, D. W. Jacobs-Perkins, R. T. Janezic, M. Karasik, R. L. Keck, J. H. Kelly, T. J. Kessler, J. P. Knauer, T. Z. Kosc, 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. Obenschain, R. D. Petrasso, N. Petta, P. B. Radha, M. J. Rosenberg, A. J. Schmitt, M. J. Schmitt, M. Schoff, W. Seka, W. T. Shmayda, M. J. Shoup III, A. Shvydky, A. A. Solodov, C. Stoeckl, W. Sweet, C. Taylor, R. Taylor, W. Theobald, J. Ulreich, M. D. Wittman, K. M. Woo, and J. D. Zuegel, "The National Direct-Drive Program: OMEGA to the National Ignition Facility," *Fusion Sci. Technol.* **73**, 89 (2018).

H. G. Rinderknecht, H.-S. Park, J. S. Ross, P. A. Amendt, D. P. Higginson, S. C. Wilks, D. Haberberger, J. Katz, D. H. Froula, N. M. Hoffman, G. Kagan, B. D. Keenan, and E. L. Vold, "Highly Resolved Measurements of a Developing Strong Collisional Plasma Shock," *Phys. Rev. Lett.* **120**, 095001 (2018).

M. J. Rosenberg, A. A. Solodov, J. F. Myatt, W. Seka, P. Michel, M. Hohenberger, R. W. Short, R. Epstein, S. P. Regan, E. M. Campbell, T. Chapman, C. Goyon, J. E. Ralph, M. A. Barrios, J. D. Moody, and J. W. Bates, "Origins and Scaling of Hot-Electron Preheat in Ignition-Scale Direct-Drive Inertial Confinement Fusion Experiments," *Phys. Rev. Lett.* **120**, 055001 (2018).

S. Sampat, J. H. Kelly, T. Z. Kosc, A. L. Rigatti, J. Kwiatkowski, W. R. Donaldson, M. H. Romanofsky, L. J. Waxer, R. Dean, and R. Moshier, "Power Balance on a Multibeam Laser," *Proc. SPIE* **10511**, 105110P (2018).

J. L. Shaw, N. Lemos, K. A. Marsh, D. H. Froula, and C. Joshi, "Experimental Signatures of Direct-Laser-Acceleration-Assisted Laser Wakefield Acceleration," *Plasma Phys. Control. Fusion* **60**, 044012 (2018).

D. Turnbull, S. Bucht, A. Davies, D. Haberberger, T. Kessler, J. L. Shaw, and D. H. Froula, "Raman Amplification with a Flying Focus," *Phys. Rev. Lett.* **120**, 024801 (2018).

M. P. Valdivia, D. Stutman, C. Stoeckl, C. Mileham, I. A. Begishev, J. Bromage, and S. P. Regan, "Talbot-Lau X-Ray Deflectometry Phase-Retrieval Methods for Electron Density Diagnostics in High-Energy Density Experiments," *Appl. Opt.* **57**, 138 (2018).

N. D. Viza and D. R. Harding, "Performance of Different 'Lab-on-Chip' Geometries for Making Double Emulsions to Form Polystyrene Shells," *Fusion Sci. Technol.* **73**, 248 (2018).

J. U. Wallace, A. Shestopalov, T. Kosc, and S. H. Chen, "Scalable Synthesis of Cholesteric Glassy Liquid Crystals," *Ind. Eng. Chem. Res.* **57**, 4470 (2018).

L. J. Waxer, C. Dorrer, A. Kalb, E. M. Hill, and W. Bittle, "Single-Shot Temporal Characterization of Kilojoule-Level, Picosecond Pulses on OMEGA EP," *Proc. SPIE* **10522**, 105221E (2018).

M. Yuly, T. Eckert, G. Hartshaw, S. J. Padalino, D. N. Polsin, M. Russ, A. T. Simone, C. R. Brune, T. N. Massey, C. E. Parker, R. Fitzgerald, T. C. Sangster, and S. P. Regan, " $^{12}\text{C}(n, 2n)11\text{C}$ Cross Section from Threshold to 26.5 MeV," *Phys. Rev. C* **97**, 024613 (2018).

H. Zhang, R. Betti, V. Gopalaswamy, R. Yan, and H. Aluie, "Nonlinear Excitation of the Ablative Rayleigh-Taylor Instability for All Wave Numbers," *Phys. Rev. E* **97**, 011203(R) (2018).

Forthcoming Publications

S.-W. Bahk, C. Dorrer, and J. Bromage, “Chromatic Diversity: A New Approach for Characterizing Spatiotemporal Coupling of Ultrashort Pulses,” to be published in *Optics Express*.

I. A. Begishev, J. Bromage, S. T. Yang, P. S. Datte, S. Patankar, and J. D. Zuegel, “Record Fifth-Harmonic-Generation Efficiency Producing 211-nm, Joule-Level Pulses Using Cesium Lithium Borate,” to be published in *Optics Letters*.

A. Bose, R. Betti, D. Mangino, K. M. Woo, D. Patel, A. R. Christopherson, V. Gopalaswamy, S. P. Regan, V. N. Goncharov, C. J. Forrest, J. A. Frenje, M. Gatu Johnson, V. Yu. Glebov, J. P. Knauer, F. J. Marshall, R. Shah, C. Stoeckl, T. C. Sangster, and E. M. Campbell, “Analysis of Trends in Implosion Observables for Direct-Drive Cryogenic Implosions on OMEGA,” to be published in *Physics of Plasmas*.

L. Ceurvorst, A. Savin, N. Ratan, M. F. Kasim, J. Sadler, P. A. Norreys, H. Habara, K. A. Tanaka, S. Zhang, M. S. Wei, S. Ivancic, D. H. Froula, and W. Theobald, “Channel Optimization of High-Intensity Laser Beams in Millimeter-Scale Plasmas,” to be published in *Physical Review E*.

J. A. Fooks, L. C. Carlson, P. Fitzsimmons, E. Giraldez, D. N. Kaczala, M. Wei, N. Alexander, M. P. Farrell, J. Betcher, A. Harvey-Thompson, and T. Nagayama, “Evolution of Magnetized Liner Inertial Fusion (MagLIF) Targets,” to be published in *Fusion Science and Technology*.

C. J. Forrest, J. P. Knauer, W. U. Schroeder, V. Yu. Glebov, P. B. Radha, S. P. Regan, T. C. Sangster, M. Sickles, C. Stoeckl, and J. Szczepanski, “Nuclear Science Experiments with a Bright Neutron Source from Fusion Reactions on the Omega Laser System,” to be published in *Nuclear Instruments and Methods in Physics Research A*.

D. H. Froula, D. Turnbull, A. S. Davies, T. J. Kessler, D. Haberberger, J. P. Palastro, S.-W. Bahk, I. A. Begishev, R. Boni, S. Bucht, J. Katz, and J. L. Shaw, “Spatiotemporal Control of Laser Intensity,” to be published in *Nature Photonics*.

M. Gatu Johnson, D. T. Casey, M. Hohenberger, A. B. Zylstra, A. Bacher, C. R. Brune, R. M. Bionta, R. S. Craxton, C. L. Ellison, M. Farrell, J. A. Frenje, W. Garbett, E. M. Garcia, G. P. Grim, E. Hartouni, R. Hatarik, H. W. Herrmann, M. Hohensee, D. M. Holunga, M. Hoppe, M. Jackson, N. Kabadi, S. F. Khan,

J. D. Kilkenny, T. R. Kohut, B. Lahmann, H. P. Le, C. K. Li, L. Masse, P. W. McKenty, D. P. McNabb, A. Nikroo, T. G. Parham, C. E. Parker, R. D. Petrasso, J. Pino, B. Remington, N. G. Rice, H. G. Rinderknecht, M. J. Rosenberg, J. Sanchez, D. B. Sayre, M. E. Schoff, C. M. Shulberg, F. H. Séguin, H. Sio, Z. B. Walters, and H. D. Whitley, “Optimization of a High-Yield, Low-Areal-Density Fusion Product Source at the National Ignition Facility with Applications in Nucleosynthesis Experiments,” to be published in *Physics of Plasmas*.

E. C. Hansen, D. H. Barnak, R. Betti, E. M. Campbell, P.-Y. Chang, J. R. Davies, V. Yu. Glebov, J. P. Knauer, J. Peebles, S. P. Regan, and A. B. Sefkow, “Measuring Implosion Velocities in Experiments and Simulations of Laser-Driven Cylindrical Implosions on the OMEGA Laser,” to be published in *Plasma Physics and Controlled Fusion*.

D. R. Harding, J. Ulreich, M. D. Wittman, R. Chapman, C. Taylor, R. Taylor, N. P. Redden, J. C. Lambropoulos, R. Q. Gram, M. J. Bonino, and D. W. Turner, “Requirements and Capabilities for Fielding Cryogenic DT-Containing Fill-Tube Targets for Direct-Drive Experiments on OMEGA,” to be published in *Fusion Science and Technology*.

S. X. Hu, L. A. Collins, T. R. Boehly, Y. H. Ding, P. B. Radha, V. N. Goncharov, V. V. Karasiev, G. W. Collins, S. P. Regan, and E. M. Campbell, “A Review of *Ab Initio* Studies of Static, Transport, and Optical Properties of Polystyrene Under Extreme Conditions for Inertial Confinement Fusion Applications,” to be published in *Physics of Plasmas*.

E. V. Ludeña, E. X. Salazar, M. H. Cornejo, D. E. Arroyo, and V. V. Karasiev, “The Liu–Parr Power Series Expansion of the Pauli Kinetic Energy Functional with the Incorporation of the Shell-Inducing Traits: Atoms,” to be published in the *International Journal of Quantum Chemistry*.

J. A. Marozas, M. Hohenberger, M. J. Rosenberg, D. Turnbull, T. J. B. Collins, P. B. Radha, P. W. McKenty, J. D. Zuegel, F. J. Marshall, S. P. Regan, T. C. Sangster, W. Seka, E. M. Campbell, V. N. Goncharov, M. W. Bowers, J.-M. G. Di Nicola, G. Erbert, B. J. MacGowan, L. J. Pelz, J. Moody, and S. T. Yang, “Wavelength-Detuning Cross-Beam Energy Transfer Mitigation Scheme for Direct Drive: Modeling and Evidence from National Ignition Facility Implosions,” to be published in *Physics of Plasmas* (invited).

S. A. Muller, D. N. Kaczala, H. M. Abu-Shawareb, E. L. Alfonso, L. C. Carlson, M. Mauldin, P. Fitzsimmons, D. Lamb, P. Tzeferacos, L. Chen, G. Gregori, A. Rigby, A. Bott, T. G. White, D. Froula, and J. Katz, "Evolution of the Design and Fabrication of Astrophysics Targets for Turbulent Dynamo (TDYNO) Experiments on OMEGA," to be published in *Fusion Science and Technology*.

S. Papernov, M. D. Brunsman, J. B. Oliver, B. N. Hoffman, A. A. Kozlov, S. G. Demos, A. Shvydky, F. Cavalcante, L. Yang, C. S. Menoni, B. Roshanzadeh, S. T. P. Boyd, L. A. Emmert, and W. Rudolph, "Optical Properties of Oxygen Vacancies in HfO₂ Thin Films Studied by Absorption and Luminescence Spectroscopy," to be published in *Optics Express*.

M. D. Sharpe, C. Fagan, W. T. Shmayda, and W. U. Schröder, "Partitioning of Tritium Between Surface and Bulk of 316 Stainless Steel at Room Temperature," to be published in *Fusion Engineering and Design*.

R. F. Smith, D. E. Fratanduono, D. G. Braun, T. S. Duffy, J. K. Wicks, P. M. Celliers, S. J. Ali, A. Fernandez-Pañella, R. G. Kraus, D. C. Swift, G. W. Collins, and J. H. Eggert, "Equation of State of Iron Under Core Conditions of Large Rocky Exoplanets," to be published in *Nature Astronomy*.

D. Turnbull, A. Colaïtis, R. K. Follett, J. P. Palastro, D. H. Froula, P. Michel, C. Goyon, T. Chapman, L. Divol, G. E. Kemp, D. Mariscal, S. Patankar, B. B. Pollock, J. S. Ross, E. R. Tubman, N. C. Woolsey, and J. D. Moody, "Cross-Beam Energy

Transfer: Polarization Effects and Evidence of Saturation," to be published in *Plasma Physics and Controlled Fusion*.

P. Tzeferacos, A. Rigby, A. F. A. Bott, A. R. Bell, R. Bingham, A. Casner, F. Cattaneo, E. M. Churazov, J. Emig, F. Fiuza, C. B. Forest, J. Foster, C. Graziani, J. Katz, M. Koenig, C.-K. Li, J. Meinecke, R. Petrasso, H.-S. Park, B. A. Remington, J. S. Ross, D. Ryu, D. Ryutov, T. G. White, B. Reville, F. Miniati, A. A. Schekochihin, D. Q. Lamb, D. H. Froula, and G. Gregori, "Laboratory Evidence of Dynamo Amplification of Magnetic Fields in a Turbulent Plasma," to be published in *Nature Communications*.

F. Weilacher, P. B. Radha, and C. J. Forrest, "Three-Dimensional Modeling of the Neutron Spectrum to Infer Plasma Conditions in Cryogenic Inertial Confinement Fusion Implosions," to be published in *Physics of Plasmas*.

M. D. Wittman, M. J. Bonino, D. H. Edgell, C. Fella, D. R. Harding, and J. Sanchez, "Effect of Tritium-Induced Damage on Plastic Targets from High-Density DT Permeation," to be published in *Fusion Science and Technology*.

K. M. Woo, R. Betti, D. Shvarts, A. Bose, D. Patel, R. Yan, P.-Y. Chang, O. M. Mannion, R. Epstein, J. A. Delettrez, M. Charissis, K. S. Anderson, P. B. Radha, A. Shvydky, I. V. Igumenshchev, V. Gopalaswamy, A. R. Christopherson, J. Sanz, and H. Aluie, "Effects of Residual Kinetic Energy on Yield Degradation and Ion Temperature Asymmetries in Inertial Confinement Fusion Implosions," to be published in *Physics of Plasmas*.

Conference Presentations

C. Z. R. Huang, R. W. Wood, and S. G. Demos, "Microscopy with Ultraviolet Surface Excitation (MUSE) for Enhancing K-12 and Undergraduate Education in Life Sciences," presented at SPIE Photonics West, San Francisco, CA, 27 January–1 February 2018.

The following presentations were made at LASE, San Francisco, CA, 27 January–1 February 2018:

S. Sampat, J. H. Kelly, T. Z. Kosc, A. L. Rigatti, J. Kwiatkowski, W. R. Donaldson, M. H. Romanofsky, L. J. Waxer, R. Dean, and R. Moshier, "Power Balance on a Multibeam Laser."

L. J. Waxer, C. Dorrer, A. Kalb, E. M. Hill, and W. Bittle, "Single-Shot Temporal Characterization of a Kilojoule-Level, Picosecond Pulses on OMEGA EP."

M. J. Rosenberg, A. A. Solodov, W. Seka, R. K. Follett, S. P. Regan, A. V. Maximov, T. J. B. Collins, V. N. Goncharov, R. Epstein, R. W. Short, D. Turnbull, D. H. Froula, P. B. Radha, J. F. Myatt, P. Michel, M. Hohenberger, G. Swadling, J. S. Ross, T. Chapman, L. Masse, C. Goyon, J. E. Ralph, J. D. Moody, J. W. Bates, and A. J. Schmitt, "Planar Laser-Plasma Interaction Experiments at the Direct-Drive Ignition-Relevant

Scale Lengths at the National Ignition Facility," presented at the NIF User Group Meeting, Livermore, CA, 5–7 February 2018.

The following presentations were made at the 14th Direct-Drive and Fast-Ignition Workshop, York, United Kingdom, 20–22 March 2018:

I. V. Igumenshchev, "Three-Dimensional Simulations of Direct-Drive Implosions on OMEGA."

R. C. Shah, D. Cao, S. P. Regan, R. Epstein, C. Sorce, W. Theobald, B. Kraus, K. Hill, L. Gao, B. Stratton, P. Efthimion, H. Sio, N. Kabadi, J. A. Frenje, D. Thorn, B. Bachmann, C. Jarrot, P. K. Patel, M. B. Schneider, and J. D. Kilkenny, "Hot-Spot Electron Temperature Inferred from X-Ray Continuum Emission."

J. P. Palastro, D. Turnbull, S.-W. Bahk, R. K. Follett, J. L. Shaw, D. Haberberger, A. Davies, J. Viera, N. Vafaei-Najafabadi, J. Bromage, and D. H. Froula, "Spatiotemporal Control of Laser Intensity for Plasma-Based Applications," presented at the 2018 U.S.-Japan Workshop on Theory and Simulations of High-Field and High Energy Density Physics, Hiroshima, Japan, 27–28 March 2018.

