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LLE Review

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Contents

In Brief

This volume of LLE Review 168 covers the period from July–September 2021. Articles appearing in this volume are the principal summarized results for long-form research articles. Readers seeking a more-detailed account of research activities are invited to seek out the primary materials appearing in print, detailed in the publications and presentations section at the end of this volume.

Highlights of research presented in this volume include:

- S. Zhang *et al.* show that species separation during CH shock release leads to hydrogen streaming and longer scale-length plasmas than those predicted by single-fluid hydrodynamic simulations (p. 189).
- D. H. Edgell *et al.* quantify scattered-light nonuniformity from individual beams and trace the source of nonuniformity back to OMEGA's polarization smoothing (p. 192).
- J. Baltazar *et al.* use brightness profiles of coronal plasma and hot-spot emissions to quantify shell decompression caused by laser-imprint–induced Rayleigh–Taylor instability (p. 195).
- R. H. H. Scott *et al.* use a shallow-cone target to create National Ignition Facility (NIF)-scale ablation plasma densities and show that the dominant instability is convective stimulated Raman scattering (SRS) at densities and intensities relevant for shock ignition (p. 200).
- A. A. Solodov *et al.* present measurements on hot-electron preheat in NIF-scale implosions and show that thin layers of mid-*Z* material buried within the ablator can reduce both SRS and hot-electron preheat (p. 205).
- N. V. Kabadi *et al.* quantify the level of thermal decoupling in deuterium and tritium using data from both OMEGA cryogenic DT experiments and NIF indirect-drive exploding-pusher experiments (p. 208).
- W. Theobald *et al.* measure an energy-coupling increase of (11±4)% using the new small-spot SG-650 distributed phase plates; however, the smaller spots come at the expense of increased instabilities and lower yield and areal density (p. 210).
- G. Bruhaug and A. Kish propose the use of spin-polarized fuels for fusion-based spacecraft propulsion systems and calculate reductions in required shielding mass and ignition requirements and a >30% increase in propulsive efficiency (p. 213).
- X. Bian *et al.* use magnetohydrodynamic simulations to derive a scale-dependent turbulent magnetic Prandtl number and infer a power-law scaling (p. 216).
- A. K. Schwemmlein *et al.* present the first experimental demonstration of triton beam production using target normal sheath acceleration and react the triton beam with a secondary CD target to produce 14.2-MeV DT neutrons (p. 218).
- T. T. Simpson *et al.* propose using cross-phase modulation to produce "flying-focus" spatiotemporally shaped pulses without the constraints on far-field pulse duration, transverse profile, or orbital angular momentum that are inherent in previously developed schemes (p. 220).
- D. I. Mihaylov *et al.* present an improved first-principles equation of state for deuterium, which includes density functional theory-driven molecular dynamics, universal treatment of exchange-correlation thermal effects, and quantum treatment of ions (p. 223).

- P. J. Adrian *et al.* present experimental results using a new x-ray penumbral imager and show the electron-temperature profile measurements are in good agreement with *HYADES* calculations (p. 226).
- I. A. Begishev *et al.* describe the design and capabilities of the Multi-Terawatt (MTW) Laser at LLE (p. 229).
- S.-W. Bahk derives absolute analytic phase solutions for three-wave interactions and shows that for parameters relevant to amplification on MTW-OPAL (optical parametric amplifier line), the signal beam has a pump-beam intensity-dependent phase profile (p. 237).
- G. W. Jenkins, C. Feng, and J. Bromage present an experimental demonstration of divided pulse nonlinear compression and measure a compression factor of 13.4 using 10-mJ input into a four-pulse-division setup (p. 240).
- H. Huang, K. R. P. Kafka, and S. G. Demos simulate electric-field enhancement within subwavelength-scale particles on an optical surface and within the nearby multilayer dielectric coating stack, and show that particles as small as 1/4 the laser wavelength can induce field strengths exceeding coating design parameters (p. 243).
- W. Trickey *et al.* show an increased convergence ratio in simulations of dynamic in-flight shell formation via the use of an extended series of picket pulses. Separate simulations also show the optimal beam-port configurations for mitigation of low-mode perturbations (p. 245).
- C. A. Williams *et al.* present modified cryogenic DT target designs using thin-ice DT liners and predict fusion yields in excess of 1 kJ for a 30-kJ laser drive (p. 248).
- R. S. Craxton summarizes the 32nd LLE Summer High School Research Program. Eight students were invited from Rochester-area high schools to participate in the lab's state-of-the art research environment (p. 251).
- J. Puth *et al.* summarize operations of the Omega Laser Facility during the fourth quarter of FY21 (p. 253).

Erik Power
Editor