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In Brief

This volume of LLE Review 169 covers the period from October–December 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:

- R. C. Shah *et al.* report on a new continuum x-ray measurement to characterize hot-spot x-ray yield and hot-spot electron temperature of a series of implosions typical of current best cryogenic designs, comparing x-ray production relative to neutron production and assessing the ratio of hot-spot mix (p. 1).
- Y. Lawrence *et al.* show lowering the central density by a factor of 5 or more compared to the vapor density of deuterium–tritium (DT) at triple point can aid in achieving small hot-spot size without excessive amplification of deceleration-phase Rayleigh–Taylor instability, possibly enabling ignition and high gains in laser-direct-drive designs using lower energies (p. 5).
- D. A. Chin *et al.* experimentally identify three x-ray phases consisting of the corona, core stagnation, and afterflow using temporal, spatial, and spectral x-ray emission of implosion glow-discharge polymerization shells on OMEGA EP (p. 9).
- K. Weichman *et al.* demonstrate that the generation of underdense, relativisitically thermal plasma can be realized with currently available laser and magnetic-field–generation capabilities by leveraging two regimes of magnetically assisted direct laser acceleration (p. 12).
- R. K. Follett *et al.* create an independent-hot-spot model to predict multibeam instability behavior (p. 16). The model is applied to the absolute two-plasmon–decay instability and is shown to provide an improved description of laser–plasma instability behavior over the common-wave approach.
- S. Ressel *et al.* present the full uncertainty distributions inferred from radiography analysis in high-energy-density systems (p. 20). They demonstrate the importance of a full treatment of uncertainties, done here through Bayesian analysis, which is critical to avoid overconfidence in parameter estimates in this system due to the correlations between parameters and multiple maxima in the likelihood function introduced by typical experimantal noise sources.
- M. C. Marshall *et al.* use data from two OMEGA EP experiments to demonstrate that the chemical and thermodynamic conditions inside ice giant planets, which have inner ice layers dominated by CH_4, NH_3, and H_2O, are suitable for diamond formation (p. 23).
- V. V. Karasiev, D. I. Mihaylov, and S. X. Hu address exchange-correlation (XC) dependence thermal modeling in density-functional-theory simulations of warm dense matter and high-energy-density plasma effects by developing a thermalization framework for XC functionals and XC additive correction at the GGA level, improving simulation accuracy and agreement to experimental results (p. 26).
- S. Zhang *et al.* perform simulations from first principles and analyzed the structure, electron density, and thermodynamic properties of liquid SiO_2 at high-energy conditions to gain insights into the nature of the bonded-to-atomic transition (p. 29).
- H. Poole *et al.* conduct a feasibility study of using spatially integrated, spectrally resolved, x-ray Thomson-scattering measurements to diagnose the temperature, density, and ionization of the compressed DT shell of a cryogenic DT implosion at two-thirds convergence for both low- and high-adiabat implosions (p. 31).

- S. F. Nwabunwanne and W. R. Donaldson discuss the design and fabrication of $Al_xGa_{1-x}N$-based photodetectors with rectangular and circular asymmetric, interdigitated electrode geometries GaN/AlGaN semiconductors with an interest in high-efficiency detectors targeting semiconductor-driven ultrafast laser pulse characterization and plasma diagnostics (p. 34).
- J. Musgrave and J. Bromage investigate signal phase accumulation from pump wavefront errors and the potential impact on signal pulse compression, offering an approach to determine the suitability of a given pump laser to ensure there are no spatiotemporal pulse-broadening effects that degrade the laser's peak intensity (p. 37).
- G. W. Jenkins, C. Feng, and J. Bromage demonstrate a new method of contrast improvement that allows both contrast improvement and temporal compression in a single step—divided-pulse nonlinear compression (p. 40).
- C. Feng *et al*. develop a simple and cost-effective tool to reduce pump-induced temporal contrast degradation up to 15 dB by applying a pump-seed delay optimization and pump-to-signal noise transfer of a two-stage ultra-broadband optical parametric chirped-pulse amplifier (p. 43).
- C. Dorrer and M. Spilatro demonstrate broadband, spectrally incoherent nanosecond pulses with closed-loop pulse shaping, inspired by laser–plasma instability mitigation and improving target to high-energy laser pulse interactions (p. 46).
- S.-W. Bahk *et al*. analyze the effect of the pump beam wavefront phase and amplitude transferred to the idler and signal beam phase and amplitude using the analytic optical parametric amplifier (OPA) phase solution, wave-vector picture, and experimentally measured OPA phase using the MTW-OPAL laser (p. 50).
- T. Z. Kosc *et al*. develop and experimentally validate a modeling capability to evaluate large-aperture optics, applicable for minimizing transverse stimulated Raman scattering gain during crystal-cut optimization, predicting maximum operational fluence, and helping to develop novel designs with complex polarization control (p. 56).
- T. J. Kessler reports on the BEST Program, designed to engage underrepresented high school students and their teachers in various aspects of science and technology that support LLE's laser science and applications research (p. 58).
- J. Puth *et al*. summarize operations of the Omega Laser Facility during the first quarter of FY22 (p. 63).

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Editor