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Contents

In Brief

This volume of the LLE Review, covering July–September 2007, features "Aperture Tolerances for Neutron-Imaging Systems in Inertial Confinement Fusion," by M. C. Ghilea, T. C. Sangster, and D. D. Meyerhofer, along with R. A. Lerche (Lawrence Livermore National Laboratory) and L. Disdier (Commissariat à L'Énergie Atomique). Neutron-imaging systems are being considered as an ignition diagnostic, which is vital to the inertial confinement fusion effort (p. 203). Given the importance of these systems, a neutron-imaging design tool is being used to quantify the effects of aperture fabrication and alignment tolerances on reconstructed neutron images for inertial confinement fusion. The simulations indicate that alignment tolerances of more than 1 mrad would introduce measurable features in a reconstructed image for both pinholes and penumbral aperture systems. Simulated fabrication errors suggest that penumbral apertures are several times less sensitive to these errors than pinhole apertures.

Additional highlights of recent research presented in this issue include the following:

- S. P. Regan, T. C. Sangster, D. D. Meyerhofer, W. Seka, R. Epstein, S. J. Loucks, R. L. McCrory, C. Stoeckl, and V. Yu. Glebov, along with O. S. Jones, D. A. Callahan, P. A. Amendt, N. B. Meezan, L. J. Suter, M. D. Rosen, O. L. Landen, E. L. Dewald, S. H. Glenzer, C. Sorce, S. Dixit, R. E. Turner, and B. J. MacGowan (LLNL) discuss hohlraum energetics and implosion-symmetry experiments conducted using laser beams arranged in three cones and smoothed with elliptical phase plates (p. 212). A shift in symmetry was observed between vacuum and gas-filled hohlraums having identical beam pointing. The ratio of x-ray drive at the poles of the capsule relative to the waist increased for the gas-filled hohlraum.

- B. Yaakobi presents an improved measurement of preheat in cryogenic targets (p. 216). A reformulated and more consistent analysis of preheat measurements is performed, and the sensitivity of the results to the assumptions made in the analysis is discussed. The results are applied to both cryogenic as well as to CH targets.

- G. Li, R. Yan, and C. Ren, along with T.-L. Wang, J. Tonge, and W. B. Mori (University of California, Los Angeles) used two-dimensional particle-in-cell simulations to show that laser channeling in millimeter-scale underdense plasmas is a highly nonlinear and dynamic process (p. 222). This process involves laser self-focusing and filamentation on the electron time scale, ponderomotive plasma blowout in the filaments, eventual whole beam blowout that transversely launches high-mach-number shocks, longitudinal plasma snowplowing, laser hosing, and channel bifurcation and self-correction.

- B. Ashe, C. Giacofei, G. Myhre, and A. W. Schmid describe the development and the optimization of the cleaning process that removes a wide variety of organic (photoresist) materials, metals, and metal oxides, which commonly remain on the surface of multilayer dielectric (MLD) diffraction gratings (p. 228). The removal of such contaminants, a number of which have a significant optical absorbance and can lead to laser-induced damage, is critical to the performance of the OMEGA EP Laser System.

- R. Betti, W. Theobald, C. D. Zhou, K. S. Anderson, P. W. McKenty, S. Skupsky, D. Shvarts, V. N. Goncharov, J. A. Delettrez, P. B. Radha, T. C. Sangster, C. Stoeckl, and D. D. Meyerhofer (LLE and the Fusion Science Center for Extreme States of Matter and Fast Ignition Physics) researched the shock ignition of thermonuclear fuel with high areal densities (p. 234). In direct-drive inertial confinement fusion (ICF), the "ignitor" shock can be launched by a power spike at the end of the laser pulse. For targets with the same adiabat and implosion velocities, the laser energy required for ignition is significantly lower for shock-ignition ICF than for standard ICF.

- This volume concludes with a summary of LLE's Summer High School Research Program (p. 238), the FY07 Laser Facility Report (p. 240), and the National Laser Users' Facility and External Users' Programs (p. 242).

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Editor