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Contents

In Brief

This volume of the LLE Review, covering the period July–September 1999, features a theoretical analysis of a process that generates mass perturbations of an imploding target driven by modulated laser illumination. The process, referred to as "laser imprint," impacts the integrity of the shell during direct-drive implosions, potentially quenching target performance. In this article V. N. Goncharov, J. A. Delettrez, S. Skupsky, and R. P. J. Town present a model of the generation of mass perturbations and analyze the mass perturbation growth due to nonuniform ablation pressure. Stabilizing mechanisms of thermal conduction smoothing and mass ablation are shown to suppress the acceleration perturbation, and mass ablation is also shown to impact velocity perturbations. The model predicts that a direct-drive cryogenic NIF target will remain intact during the implosion when 1-Thz SSD beam smoothing is used.

Additional highlights of the research presented in this issue are

- R. W. Short describes modeling of the stability of self-focused filaments in laser-produced plasmas. Wave-equation treatment of the laser light combined with self-consistent filament equilibrium simulations indicates that only very small filaments, where one waveguide mode is propagating, may be considered to be stable. When two or more waveguide modes can propagate, the filament tends to break up within tens of microns.

- J. D. Zuegel, D. Jacobs-Perkins, J. A. Marozas, R. G. Roides, W. Bittle, E. M. R. Michaels, R. S. Craxton, J. H. Kelly, T. J. Kessler, W. Seka, and S. Skupsky present the implementation of broadband smoothing on OMEGA with two-dimensional smoothing by spectral dispersion. This article describes issues relevant to the architecture choices made during the design phase of the project, as well as measurements conducted to verify the laser bandwidth and ensure that FM to AM conversion is minimized.

- T. R. Boehly, V. N. Goncharov, O. Gotchev, J. P. Knauer, D. D. Meyerhofer, D. Oron, S. P. Regan, Y. Srebro, W. Seka, D. Shvarts, S. Skupsky, and V. A. Smalyuk discuss the effect of temporal pulse shape on laser imprint and beam smoothing. Preimposed modulations on planar-foil targets were used to calibrate the mass equivalence of features imprinted by the laser, and resulting growth rates are comparable to numerical simulations.

- A. Babushkin, M. J. Harvey, and M. D. Skeldon present a model for the output signal-to-noise ratio (SNR) of a regenerative amplifier (regen). Noise from a regen oscillator comes from amplified spontaneous emission and SNR of the injected pulse. Experimental results presented are in excellent agreement with theory.

- S. Arrasmith and S. D. Jacobs discuss the development of new magnetorheological fluids (MRF) used to extend the finishing technique to two soft, single-crystal, optical materials: CaF_2 and KDP. Material removal functions are characterized through analysis of polishing spots generated on a new research platform at the Center for Optics Manufacturing.

- This volume concludes with the 1999 Summer High School Program Report, the FY99 Laser Facility Report, and the National Laser Users' Facility News.

Samuel F. B. Morse
Editor