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LLE Review

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Contents

In Brief

This volume of the LLE Review, covering the period April–June 1997, includes an article discussing the results from recent experiments performed on OMEGA. These experiments used a new beam-smoothing device—distributed polarization rotators—in concert with existing techniques (distributed phase plates and 2-D smoothing by spectral dispersion) to improve the on-target uniformity of each beam. The result of this improved radiation uniformity was a substantive reduction in imprinting—the nonuniformity caused by the laser. A novel way to study the time dependence of this imprinting is also presented in this article.

Additional highlights of the research presented in this issue are

- A study of the growth of mass perturbations due to the Rayleigh–Taylor hydrodynamic instability at the ablation interface. The observed growth of well-defined sinusoidal mass perturbations agreed well with data from the 2-D numerical simulation obtained using the hydrodynamic code *ORCHID*. The detailed analysis of these experiments showed that the determination of the Rayleigh–Taylor growth rate from the experimental x-ray radiograph data is problematic due to the evolution of the target density.

- A technique for fabricating polyimide target shells, together with preliminary material property data for the shells. This study represents the first successful attempt to make shells from polyimide. Polyimide shells withstand greater buckling and bursting pressures, and are more permeable, than existing hydrocarbon shells.

- A theoretical investigation of the spatiotemporal evolution of sideward stimulated Raman scattering in a plasma channel created by the ponderomotive expulsion of the plasma from the region of the laser-pulse axis. The partial reflection of Stokes light by the channel walls enhances the instability by allowing a spatial eigenmode to form in the laser pulse, which grows exponentially in time during the remainder of the pulse. The dependence of the growth rate of sideward SRS on the physical parameters is discussed.

- An experimental examination of the photoconductive impulse response in small-grain-polysilicon thin-film switches. The response was measured to have an upper limit of 3 and 36 ps at 0.8 and 1.55 μm, respectively. Understanding how to optimize this response time will improve the photoconductive switches used in the OMEGA electro-optic pulse-shaping system.

- A study of thermal distortion in xenon-flash-lamp– and laser-diode–pumped Nd:YLF laser rods using interferometric measurements. The thermal distortion was greatest in the flash-lamp–pumped rod; the dominant thermal distortions were astigmatism and defocus.

- A detailed engineering description of the design and operation of the OMEGA target positioner. This equipment allows a target to be precisely aligned using up to 4° of freedom: X, Y, Z, and ω; a two-axis stage is available to provide θ and ϕ rotation.

David Harding
Editor