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LLE Review

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Contents

In Brief

This volume of the LLE Review, covering the period October–December 1997, includes an article on a new electrical waveform generator based on aperture-coupled striplines. As described by Mark Skeldon, the waveform generator is capable of producing shaped electrical waveforms with 50- to 100-ps structure over a 1- to 5-ns envelope at voltage levels suitable for OMEGA pulse-shaping applications. The design is a significant simplification over existing technology and offers many performance enhancements. Other highlights of research presented in this issue are

- Development of the sweep deflection circuitry for the OMEGA multichannel streak camera, aided by a computer simulation model, is presented by Wade Biddle and David Lonobile. Good agreement between the model predictions and measurements shows that using the model is an efficient means for conducting initial design, performance optimization, and correction of performance deficiencies.

- A nuclear diagnostic for measuring the areal density of ICF targets is discussed by Radha Bahukutumbi and Stan Skupsky. This diagnostic is obtained by the addition of ^{3}He to the fuel and is based on the energy loss of the 14.7-MeV D-^{3}He proton in the target. This diagnostic will extend LLE's ability to measure areal density to the high-density regime expected for cryogenic DD targets on OMEGA.

- Riccardo Betti *et al.* describe a simple procedure to determine the Froude number Fr, the effective power index for thermal conduction ν, and the ablation front thickness L_0 of laser-accelerated ablation fronts. These parameters are determined by fitting the density and pressure profiles obtained from one-dimensional numerical simulations with the analytic isobaric profiles. These quantities are then used to calculate the growth rate of the ablative Rayleigh–Taylor instability using the theory developed by V. N. Goncharov *et al.*, Phys. Plasmas **3**, 4665 (1996).

- The indirect-drive approach to inertial confinement fusion involves laser beams that overlap as they enter the hohlraum. Because a power transfer between the beams adversely affects the implosion symmetry, it is important to understand the mechanisms that make such a power transfer possible. In a previous article [LLE Review **66**, 73 (1996)] Colin McKinstrie described a two-dimensional analysis of the power transfer between beams with top-hat intensity profiles in a homogeneous plasma. In this article, the power transfer between crossed laser beams made possible by an ion-acoustic wave is extended to include three dimensions and arbitrary intensity profiles.

- In an effort to identify an inexpensive shielding material to protect valuable laser optics from various forms of debris, Semyon Papernov screened perfluorinated polymer pellicles from various vendors. The optical-performance results of these tests (reported here) yielded the highest 351-nm-laser-damage thresholds ever recorded at LLE for 0.6-ns pulses.

- Subsurface damage induced by microgrinding of glass is an important feature of the resulting surface that must be removed in any subsequent finishing operation. John Lambropoulos *et al*. show how the depth of subsurface damage can be estimated from the measured surface roughness, how it can be correlated to the near-surface mechanical properties of the glass, and how ground-surface quality depends on the type of grinding process employed.

- Polishing abrasives that have been bound in a solid matrix can offer several potential advantages over loose-abrasive processes for finishing of optics. Birgit Gillman establishes the various criteria for a successful bound-abrasive polisher and reports results for six compositions used on a CNC generating machine to polish optical glass.

- Despite angle dependence and polarization selectivity, the color of cholesteric liquid crystal (CLC) polysiloxane films can be quantified by standard colorimetry. A new fractured form of the film called "flakes" makes it possible to use the Center of Gravity Color Mixing Principle to predict the chromaticity of CLC color mixtures. Eileen Korenic *et al*. show how a complete color gamut can be produced by layering CLC films, mixing CLC's physico-chemically, and mixing CLC flakes.

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