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# LLE Review

## Quarterly Report

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## Contents

# In Brief

This volume of the LLE Review, covering the period of July–September 1994, contains articles on efficient generation of second-harmonic radiation from short-pulse lasers; calculation of the stabilization cutoff wave numbers for the Rayleigh-Taylor instability; a high-frequency silicon optical modulator; the angular dependence of stimulated Brillouin scattering; and femtosecond dynamics of ladder polymers. Three of these articles—second-harmonic generation, Rayleigh-Taylor cutoff wave numbers, and angular dependence of Brillouin scattering—are directly related to the OMEGA Upgrade, currently under construction. A summary of the status of the OMEGA Upgrade laser facility and the NLUF News for FY94 are included in this volume.

Highlights of the research presented in this issue are

- Second-harmonic conversion efficiency of 80% has been demonstrated with 0.5-ps, 1.053-$\mu$m laser pulses. The experimental data are in generally good agreement with simulations and indicate that self-phase modulation and cross-phase modulation may be important.

- The cutoff wave number of the incompressible ablative Rayleigh-Taylor instability is calculated using the physical optics approximation of the WKB theory. A single value for the cutoff wave number can correspond to multiple modes with different eigenfunctions and growth rates.

- The carrier-refraction effect is used to modulate the refractive index of silicon. This should allow one to construct an all-silicon, light-intensity modulator for use as a transmitter of integrated-circuit optical communication. The bandwidth of the proposed modulator will be limited only by the RC time constant and is calculated to be about 40 GHz.

- The threshold of the absolute SBS instability and its steady-state spatial growth rate are independent of the scattering angle for homogenous plasmas of relevance to inertial confinement fusion. However, the saturation time of the convective instability does exhibit a strong inverse dependence on the scattering angle.

- Transient photoinduced bleaching of the $\pi$-$\pi^*$ transition accompanied with photoinduced absorption in the optical gap was observed for a thin-film conjugated-ladder polymer. Femtosecond time-resolved measurements of both a 2-eV (620-nm) optical pump and a white-light-continuum probe show an absorption decay with a fast subpicosecond component and a slow, ~20-ps component.

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*Editor*