UNIVERSITY OF ROCHESTER
LABORATORY FOR LASER ENERGETICS

Volume 58
January–March 1994
DOE/SF/19460-17

LLE Review

Quarterly Report

UR LLE

Contents

In Brief

This volume of the LLE Review, covering the period January–March 1994, contains articles on backlighting diagnostics; the effect of electron collisions on ion-acoustic waves and heat flow; using PIC code simulations for analysis of ultrashort laser pulses interacting with solid targets; creating a new instrument for characterizing thick cryogenic layers; and a description of a large-aperture ring amplifier for laser-fusion drivers. Three of these articles—backlighting diagnostics; characterizing thick cryogenic layers; and large-aperture ring amplifier—are directly related to the OMEGA Upgrade, now under construction.

Highlights of the research reported in this issue are

- The expected backlighting and self-emission images of a particular CH target to be imploded on the OMEGA Upgrade are calculated. To overcome the problem of target self-emission, the image should be monochromatized with a diffracting crystal. A computer study delineates the interesting images that may be expected.
- Previous calculations of the damping rate of ion-acoustic waves were based on inclusion of ion-electron collisions alone. Here, a Fokker-Planck code allows us to include electron-electron collisions as well. Significant corrections can occur for low-Z plasmas in the moderate collisional range. The effect on the thermal conductivity is also determined.
- PIC code simulations of the interaction of a short-pulse laser with a plasma have been carried out. A very short scale-length regime, with vacuum heating, and a long scale-length regime, with classic resonance absorption, have been identified. In between, there is an interesting and complex transition regime.
- Future OMEGA Upgrade targets will have much thicker cryogenic fuel layers than those dealt with here in the past. Improved interferometric methods are necessary for accurate characterization. In response, a convergent beam interferometer has been developed, and its properties are described.
- A large-aperture ring amplifier (LARA) has been developed, with a clear aperture of 37 mm, that delivers output energies in excess of 15 J in a 1-ns pulse at a wavelength of 1.053 μm.

Albert Simon
Editor