IN BRIEF

This volume of the LLE Review, covering the period July–September 1990, contains articles in two main sections: (1) the OMEGA Upgrade and (2) Advanced Technology Developments. The first article in Section 1 describes the changes in the overall system design of the 60-beam OMEGA Upgrade since the release of the OMEGA Upgrade Preliminary Design Document in October 1989. It is followed by an article that presents results of an investigation into stimulated rotational Raman scattering as it relates to the propagation of high-fluence ultraviolet laser beams in the OMEGA Upgrade. The third article is a report on the energy-transport measurements made on the multisegmented amplifier (MSA), built as a prototype amplifier for the original OMEGA Upgrade system configuration. The final article in Section 1 describes the design of the 20-cm-clear-aperture, single-segmented amplifier (SSA), which will be the final amplifier in the current OMEGA Upgrade system configuration. Section 2 presents the results to date of an intensive in-house effort at LLE to develop the various optical coatings required for the OMEGA Upgrade.

The highlights of this issue are

- The OMEGA Upgrade Preliminary Design Document (Title I document) set forth the design objectives and specifications for a laser system capable of delivering approximately 30 kJ of energy onto a fusion target, and presented a design that would meet them. Since that

document was issued, the design of the OMEGA Upgrade has undergone several changes, primarily in the configuration of the beam-transport system. We present a description of the configuration changes and an update on the design concepts.

- Laser-fusion drivers, such as the OMEGA laser, require the propagation of many high-power laser beams over long paths in air to a target chamber. The threshold for certain nonlinear optical processes such as stimulated rotational Raman scattering (SRRS) in air depends on the product of the laser intensity times the air-interaction length. We present the results of preliminary experiments performed on OMEGA to determine the threshold intensity-length product for the generation of SRRS with various types of bandwidth, including smoothing by spectral dispersion (SSD).
- During the last quarter of 1989 final assembly and checkout were performed on the 24-cm-aperture MSA. The amplifier consists of two pairs of disk amplifiers, each five disks deep, that share a common central flash-lamp array. We report on the energy-transport measurements made on the MSA during the first and second quarters of 1990.
- The OMEGA Upgrade will use as its final amplifier a disk amplifier with a single 20-cm clear aperture. A prototype amplifier has been designed that incorporates the best aspects of existing disk-amplifier designs. In addition, the design emphasizes superior wave-front and polarization characteristics, gain over efficiency, and minimum maintenance over a lifetime in excess of 20,000 shots. This article describes that amplifier and its projected performance.
- The OMEGA Upgrade has dictated development of improved coating technologies at LLE. We report on coatings using standard evaporation methods and on those using an ion-assisted deposition (IAD) technique. Development of a sol-gel coating capability and related damage-test results are also reported for various substrates. Finally, development of an etching technique for distributed phase plates (DPP's) that can handle substantially higher fluences than previous designs is described.

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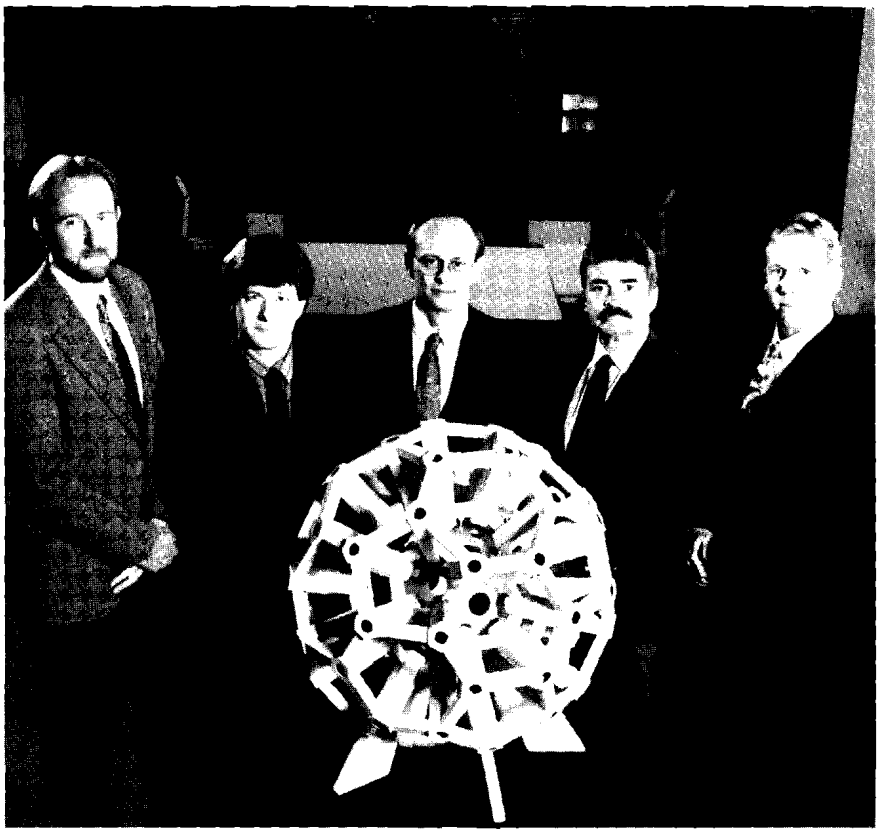

The OMEGA Upgrade Project will formally begin in FY91. The management team is shown standing behind a 1/12 scale model of the 60-beam, soccerball-shaped, target-mirror structure. From left to right they are: Dr. Thomas Boehly, Chief Engineer; Terrance Kessler, Requirements Review Board Chairperson; Steven A. Kumpan, Project Director; Robert Hutchison, Segment Manager for Beam Transport and Control Systems; and Samuel Morse, Segment Manager for Laser Systems.