

Section 4

LASER SYSTEM REPORT

4.A GDL Facility Report

In the first half of the fourth quarter of FY90, GDL was dedicated to only three user efforts: the x-ray laser experiments, the University of Illinois experiments, and the OMEGA Upgrade development studies. The x-ray laser shots were the last of a series devoted to resonantly photo-pumped x-ray lasers. **G. Banas** from the University of Illinois, in collaboration with **H. E. Elsayed-Ali** (LLE), performed NLUF experiments on laser hardening of materials. The upgrade development was the study of a prototype frequency-conversion crystal (FCC) that will be used in the OMEGA Upgrade. In the second half of the quarter, GDL was devoted (excluding laser shots) to the development of pulse-shaping technology, which will ultimately be used on OMEGA.

A summary of GDL operation this quarter follows:

Beamline Test, Calibration, Tuning, and Laser Alignment Shots	66
Target Shots	
X-Ray Laser	19
NLUF User	43
OMEGA Upgrade FCC Tests	<u>47</u>
TOTAL	175

ACKNOWLEDGMENT

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4.B OMEGA Facility Report

The OMEGA oscillator was converted to 50-MHz operation during the fourth quarter of FY90. This conversion enables it to be synchronized to either the GDL oscillator or the probe-beam oscillator. The conversion also incorporates an oscillator that is well baffled and shielded from air currents and has proved to be more stable than the previous 66-MHz oscillator.

Progress was made on the new temporal fiducial beam used to provide a timing reference for the OMEGA target diagnostics. This fiducial uses a 16-mm amplifier after the oscillator as a three-pass regenerative amplifier. The output of the amplifier is converted to the fourth harmonic of YLF and is then transported to the OMEGA target chamber. This fiducial is being optimized and readied for injection into the fiber-optic bundle coupled to the streak cameras on the target chamber.

Target shots were undertaken in support of laser-plasma interaction experiments, gas-filled plastic-shell implosion experiments, and surrogate-cryogenic-shell implosion experiments. The OMEGA system had to be converted from a spherical-target facility to a flat-target facility for the laser-plasma interaction experiments. This required setting up the optics to redirect one of the OMEGA beams to act as an interaction beam, retiming of several OMEGA beams to optimize the formation of the plasma needed for the measurement, and synchronization of the OMEGA oscillator with the probe-beam oscillator. Both the gas-filled plastic shells and the CD (cryogenic surrogate) shell targets are in support of the ongoing yield/density programs.

A shot summary for the OMEGA laser this quarter is as follows:

Driver Line	90
Laser Test	72
Target	202
Software	<u>9</u>
TOTAL	373

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