

Section 4

LASER SYSTEM REPORT

4.A GDL Facility Report

The glass development laser (GDL) was used by three target interaction groups during this quarter. Experiments were conducted in the Beta target irradiation facility and concentrated on x-ray laser studies, x-ray lithography, and the transmission of light through multilayered targets. The x-ray laser experiments were aimed at observing gain in collisionally pumped neon-like nickel and germanium. The x-ray lithography experiment measured the silicon content of corn, which may serve as a new source of ultra-pure silicon. The third campaign supports OMEGA experiments in an attempt to understand the temporal behavior of multilayered targets. In addition to the target interaction experiments, several shots were used to calibrate a new Kodak film.

A summary of GDL operations this quarter follows:

Beamline Test, Calibration, Tuning, and Laser Alignment Shots	348
Test Shots	
X-Ray Laser	105
X-Ray Lithography	45
Multilayer Experiments	<u>166</u>
TOTAL	664

4.B OMEGA Facility Report

The OMEGA laser and target systems have been active in target shooting and laser uniformity experiments during this quarter. X-ray laser campaigns dominated the target interaction programs, and several new approaches to laser uniformity were explored.

For the x-ray laser target shots, OMEGA was configured in an eight-beamline focus geometry. Cylindrical lenses were added to the final focusing elements, bringing each beam to a $100\text{-}\mu\text{m} \times 1500\text{-}\mu\text{m}$ spot. Several irradiation geometries were delivered to a variety of targets, including a superimposed, short-pulse IR beam from the GDL facility, synchronized to the peak of the OMEGA beams. After the x-ray laser experiments were completed, the system was reconfigured to 24-beam spherical geometry. Target and laser uniformity test shots filled out the remainder of this reporting period, with laser uniformity improvements taking top priority. The beam analysis table (BAT) was used to interferometrically measure the wave front of each of the 24 beams. The BAT can be positioned in any beam within 15 min., so pulsed and cw phase information can be easily obtained. Based on the data, adjustments were made to the collimation of the driver line prior to the 24-way split, using defocus at the input of the system to compensate for the spherical aberration of beamline components.

In September, a power balance campaign that uses both energy and pulse shape information to equalize the temporal history of the beams was begun on OMEGA. Two new techniques were developed to measure the pulse width: a high-speed photodiode coupled to a 6-GHz oscilloscope; and a multibeam system that uses optical fibers to couple four beams simultaneously into a streak camera.

A summary of OMEGA operations for this quarter follows:

Target Shots	
Line-Focus	86
Spherical	86
Driver Line Shot and Tests	73
Laser Test and Alignment Shots	<u>137</u>
TOTAL	382

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