# Section 4
# LASER SYSTEM REPORT

## 4.A GDL Facility Report

GDL continued operation this quarter as a target interaction facility and as the ALPHA backlighting beam. It was also used to study a possible technique to improve on-target laser uniformity. This technique involves firing the beam through a low-pressure inert gas, which fills the BETA target chamber. The results of these experiments are undergoing analysis. The active mirrors were removed from the system this quarter for coating refurbishment and pump module repairs.

A summary of GDL operations for this quarter follows:

| | |
|---|---|
| Target Shots (BETA) | 191 |
| ALPHA Shots | 31 |
| Pointing Shots | 89 |
| Beamline Test and Calibration Shots | 132 |
| TOTAL | 443 |

ACKNOWLEDGMENT

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# 4.B OMEGA Facility Report

During the second quarter of FY87, OMEGA activities included continuing improvements of the laser system characterization. This effort has focused on quantification of beam profile and attempts to improve it. An extensive series of tests was carried out on the test beam (beamline 6-2) to measure wave-front and phase-front characteristics, to analyze the near, far, and quasi-far field, and to determine on-target beam uniformity at 351 nm. The results of these tests suggested modifications to improve near-term uniformity without disturbing the high-density series of experiments. The tests results also led to long-term plans for better control of the quality of the beam profiles.

Beam characterization has been made more efficient by using x-ray images of the OMEGA beams rather than the cumbersome equivalent-target-plane photographs. X-ray target-plane images were obtained by focusing single beams on large-diameter, gold-coated targets. The x-ray images were then compared to equivalent-target-plane photographs of the test beam. Using x-ray target-plane images has led to more accurate beam profile control from the predriver stage of OMEGA and has permitted the tailoring of the beam profile for improved far-field images of the beam.

All the frequency-conversion crystals of OMEGA have been operated under a new thermal sensing system, in which the phase-matching angle of the cell is adjusted for changes in the ambient laser bay temperature. This new system has led to an overall improvement in the conversion reliability of the conversion cells. This improvement, coupled with the liquid-crystal polarizers positioned before each amplification stage to produce a 1,000:1 contrast circular polarization, has resulted in routinely achieving beam balances of the order of 3%. With an improved scheme for measuring transport optics losses, the same level of beam balance can be achieved on target.

During the quarter a large number of target shots was dedicated to the following internal experimental programs: on-target uniformity; energy partition; coronal physics; high-yield, high-density dot spectroscopy; time-resolved ionization; and through-focus uniformity. External programs for NLUF were also supported.

The ALPHA backlighting beam has undergone further development during this quarter. Synchronism to within 50ps with the OMEGA laser and control over the coincidence time with OMEGA have been achieved. The ALPHA beam has been characterized for profile and focus position on spherical targets within the OMEGA target chamber. Backlighting tests were begun with the ALPHA beam in the shorter ($<$200-ps) pulse mode.

A summary of OMEGA operations this quarter follows:

| | |
|---|---|
| Driver Shots | 51 |
| Beamline Test Shots | 107 |
| Target Shots | 248 |
| ALPHA Shots | 22 |
| TOTAL | 428 |

## ACKNOWLEDGMENT

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