Section 1
LASER SYSTEM REPORT

1.A GDL Facility Report

The GDL laser system upgrade was completed in July. The new actively mode-locked, Q-switched (AMQ) oscillator, predriver, zoom spatial filters, and active mirror amplifiers were installed, and the system configuration improved. The system became operational in August as an experimental facility and provided target shots for the National Laser Users Facility (UCLA) and LLE experimenters. A highlight of the GDL campaign, during this quarter, has been the excellent performance of the active mirror amplifiers, which have driven the GDL output energy to over 642 J, in the IR (1054 nm) with a 1-ns pulse width, and the achievement of over 236 J at the second harmonic. GDL is scheduled to be converted to the third harmonic during the month of October. A diagram of the upgraded GDL laser appears in Fig. 24.1.

A summary of GDL operations this quarter follows:

System-Pointing, Activation Shots	128
Calorimetry Calibration and Test Shots	101
Target Shots	45
TOTAL	274

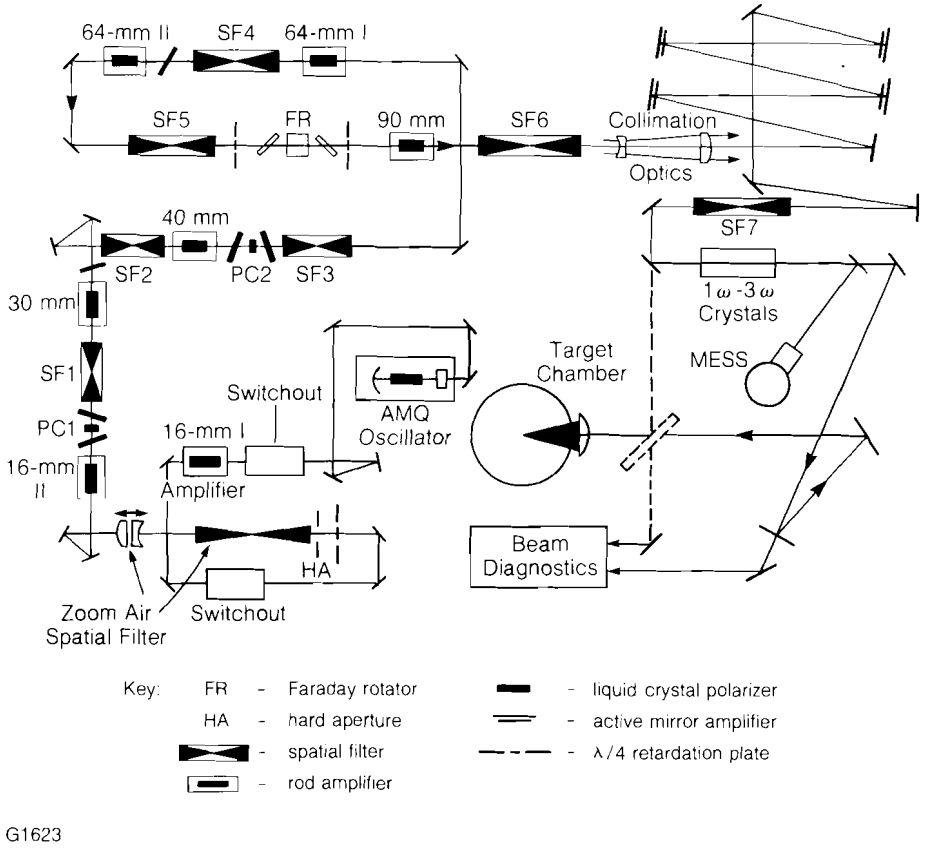

Fig. 24.1
Diagram of the GDL layout.

ACKNOWLEDGMENT

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1.B OMEGA Facility Report

Operations of the OMEGA laser system this quarter consisted of the conclusion of the first 24-beam UV irradiation experiments, and the complete changeover of the oscillator and driver front end of the laser system to a new configuration.

Experiments were conducted in laser-matter interaction, thermal transport, diagnostic development and activation, and implosion studies. Collaborative experiments with the Los Alamos National Laboratory and the Lawrence Livermore National Laboratory involved x-ray conversion

studies and radiation chemistry experiments. Experiments for the National Laser Users Facility were performed by the University of Florida, the University of Maryland, the Naval Research Laboratory, and the Lawrence Berkeley Laboratory. The laser operated routinely at the 2-kJ level, with an energy beam balance of ±5%.

New diagnostic instruments were activated during this period, including several x-ray streak cameras, some with UV (250-nm) time fiducials correlated to laser-on-target time. The fiducial was provided by a small amount of leakage from the final 64-mm amplifier in the driver, which was transported to the target chamber, frequency quadrupled to the fourth harmonic, and coupled via fiber optic to the streak camera's photocathode.

A summary of OMEGA operations this quarter follows:

Driver Test Shots		51
Laser Diagnostic Shots		2
Target Shots		88
	TOTAL	141

Since February, 628 system shots have been taken, corresponding to approximately 25 shots per week. Some highlights of the period include (a) most energy on target: 2.4 kJ with 4.8% beam balance; (b) best beam balance for 24 beams: 3.5% with 2.3 kJ on target; and (c) highest neutron yield: 2×10^{11} with 2.4 kJ on target at 6% beam balance. Operation as a target facility was suspended in late July for front-end conversion.

The conversion consists of installation and activation of a new AMQ oscillator, predriver, and zoom spatial filter into the OMEGA driver. Work is scheduled for completion at the beginning of the first quarter of FY86. The oscillator employs a Nd:YLF rod, which is a departure from the Nd:glass used until now. This oscillator will allow a much higher repetition rate, especially useful for small signal tuning of frequency conversion cells, and for synchronization with a similar oscillator in GDL, which will be critical for 25th-beam x-ray backlighting on OMEGA (scheduled for late fall activation). A new switchout system, employing hard-tube pockels cell drivers (which receive their triggers from within the AMQ electronics) has also been installed. The zoom will allow beam profile control, via various fill factors presented to the amplifiers in the driver line. A diagram of the new driver configuration appears in Fig. 24.2.

After shutdown, all of the plasma calorimeters were removed from the target chamber and recalibrated, with some rebuilt for return to service. A full complement of 20 calorimeters will be operational during the next experimental campaign. Two new auxiliary vacuum pumps have been installed, increasing the roughing speed for the main target chamber by a factor of 2, and providing increased capability for peripheral vacuum diagnostics. A new task scheduler has been implemented in the experimental control room, allowing computer control of various control functions such as fast and slow timing, film advance, vacuum control, high voltage, and oscilloscope camera control.

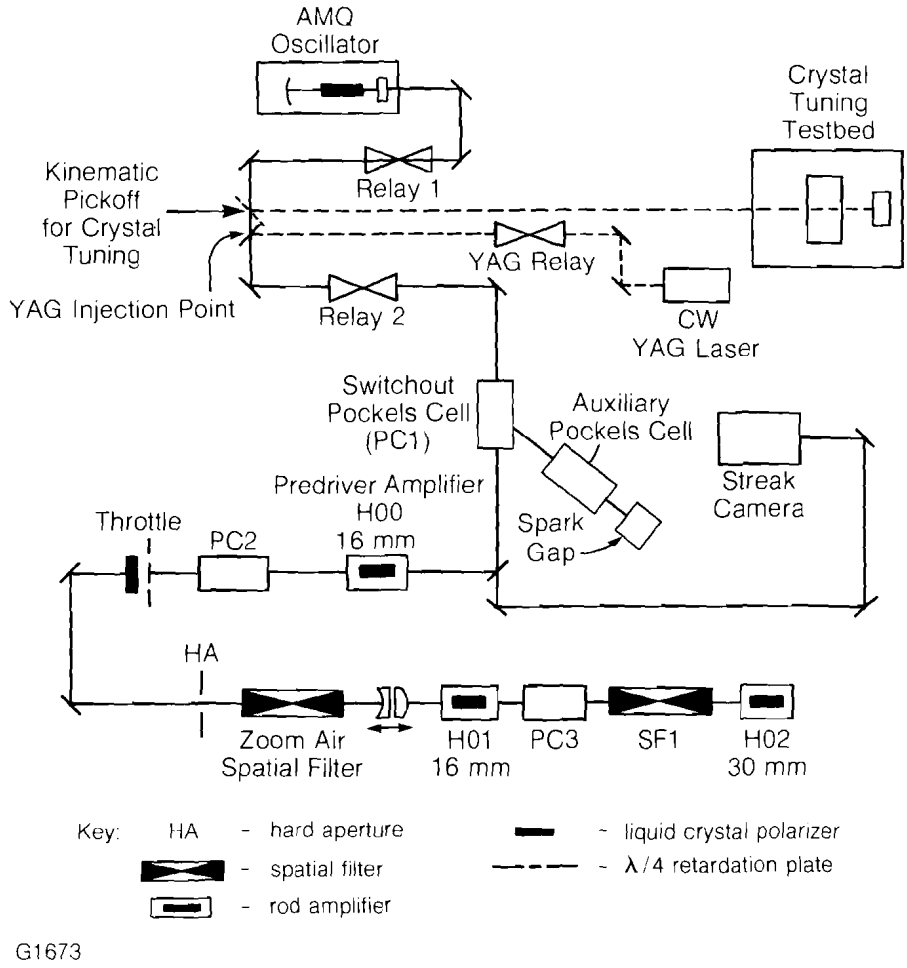

Fig. 24.2
Diagram of the OMEGA driver line, including the new AMQ oscillator, switchout predriver amplifier, and zoom spatial filter.

Engineering of the 25th-beam project is near completion. Beam transport components and frequency conversion supports are being installed, with the anticipated completion date in mid-October. The communications protocol, which allows control of the GDL laser from OMEGA control, will be tested at that time.

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