Section 1
LASER SYSTEMS REPORT

1.A GDL Facility Report

The GDL facility continued operations during the fourth quarter of FY82 in support of interaction, x-ray, and damage test campaigns. Continuing support of the interaction experiment was interrupted in August because it became necessary to send the tripler crystals to Inrad for repolishing and to substitute Koolase™ for the former index-matching fluid, a halocarbon. The crystals have been re-installed, and on September 15, interaction experiments were resumed.

A total of 596 shots was delivered by the facility during the period of July 1 to September 30, 1982. The shot distribution was as follows:

Interaction	206	Shots
Damage Test Facility	265	
X-Ray	64	
Miscellaneous	61	
TOTAL	596	Shots

1.B OMEGA Facility Report

During the quarter July 1 to September 30, 1982, OMEGA activities were largely concerned with conducting the long-pulse (1 ns) campaign. July was spent in the activation and testing of the three-meter oscillator with a newly designed mode-locker. This oscillator demonstrated a very high degree of stability almost as soon as it was activated, and it is the con-

tinued stable performance of the oscillator/driver which has been the most important factor in the smooth, trouble-free administration of this experimental campaign.

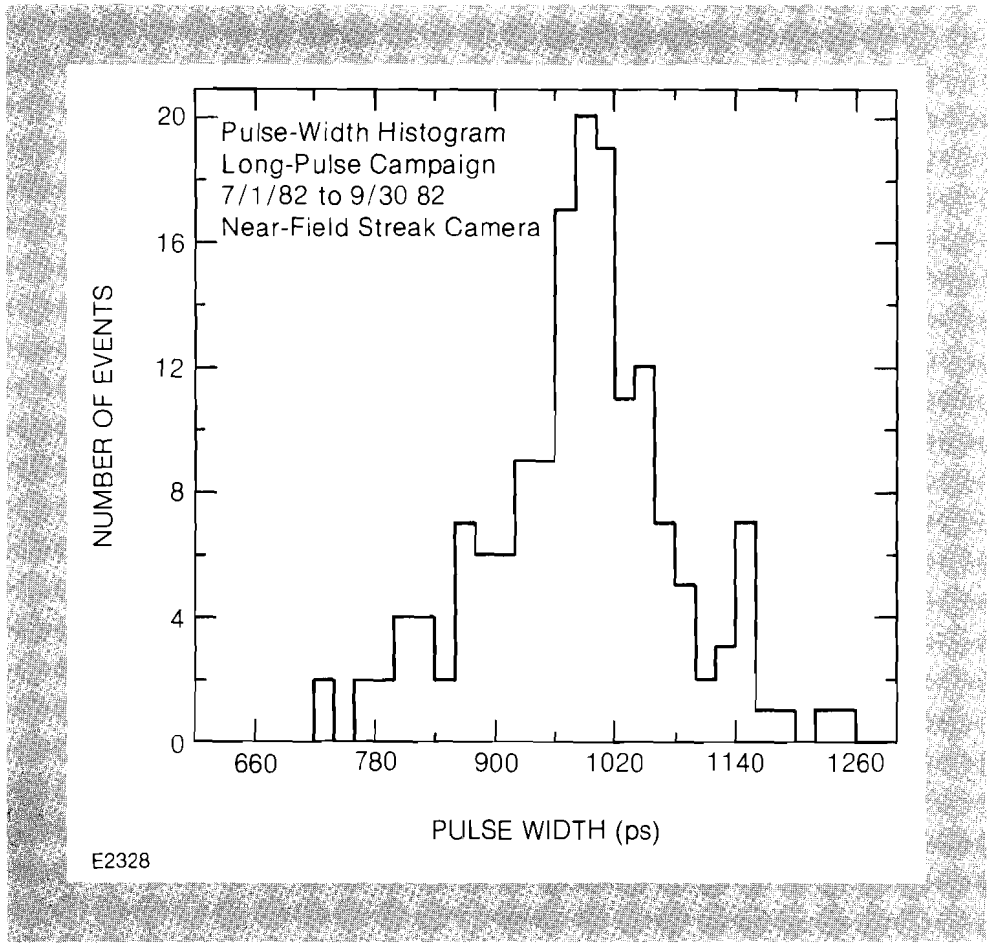
The target shots were begun in early August, following a series of calorimeter calibration shots, near-field photography shots, and equivalent target plane photography shots. The two experimental series run during the long-pulse campaign have emphasized (1) the study of irradiation uniformity, with the goal of providing data leading to a beam balance of ~1%, and substantial improvement in beam profile, and (2) transport with the goal of determining burn-through depth, and subsequent mapping of the heat front. Those campaigns have been quite successful, and they still continue.

The following is a summary of OMEGA system shots.

Target Shots	94
Driver Align and Test	112
Beamline c/o and Calibration	91
Miscellaneous	54
TOTAL	351

A very stable, reliable oscillator (see Fig. 1) contributed to the outstanding laser performance during this quarter. It is noteworthy that we

Fig. 1
Oscillator stability histogram.



have not lost a single scheduled day's shooting after being relieved of the oscillator/driver problems which plagued us in the past. During the campaign, beam balance has remained in the 7 to 8% vicinity, often dropping below 5% but not exceeding 12%. Total energy has usually been within 10% of that requested and, when it has dropped, energy levels have been restored on the same shooting day.

Beam profiles have generally been acceptable. However, some damage has been sustained by optics in the "A" splitter area, and quotes for replacement of these components are being evaluated. We are also currently investigating some "hot spots" observed near the center of the beam, arising from the driver.

A highlight of the campaign was a tune-up of the driver line including the changing of the oscillator dye concentration, the scrubbing of the laser rods, and the replacing of the glycol coolant to produce an output of 24 joules. This led to target shot number 8081 on September 28 with a total laser energy of approximately 3.2 kilojoules and a beam balance of 6.7%. (This was part of the uniformity series.) Inspection of the system after the shot revealed minor damage sites on the final turning mirrors and focusing lenses due to high-intensity edges on certain beams. However, and more importantly, no damage was observed on Pockels cells or spatial filter lenses, previously considered the weakest links in the system. This system performance does not completely agree with the design code *RAINBOW* (see Fig. 2). Improvements to the numerical model are being investigated. Differences in FWHM measurements of up to 200 ps in near- and far-field streak camera data are also being investigated.

The crystal spectrometers, which are the primary transport diagnostic, have performed during this campaign without the loss of any data. Both soft and NRC streak cameras have been reactivated during this campaign. The Von Hamos spectrometer has taken data during the series, but is currently out of operation for reconfiguration of both film transport and optical systems. The x-ray continuum spectrometer has been completely activated with appropriate k-edge foils, and has acquired its first meaningful data this quarter. A new diagnostic, activated this quarter, was the electron spectrometer. Data acquisition software for the x-ray continuum and the electron spectrometers have been installed, but data reduction software has yet to be implemented. Finally, two charge collectors for the measurement of ion velocities have been implemented.

The development of alignment system software has proceeded with the successful activation of a new, more realistic display of the OMEGA system. The operations task has been reworked somewhat, with work still continuing to make the calorimetry and shot report tasks easier.

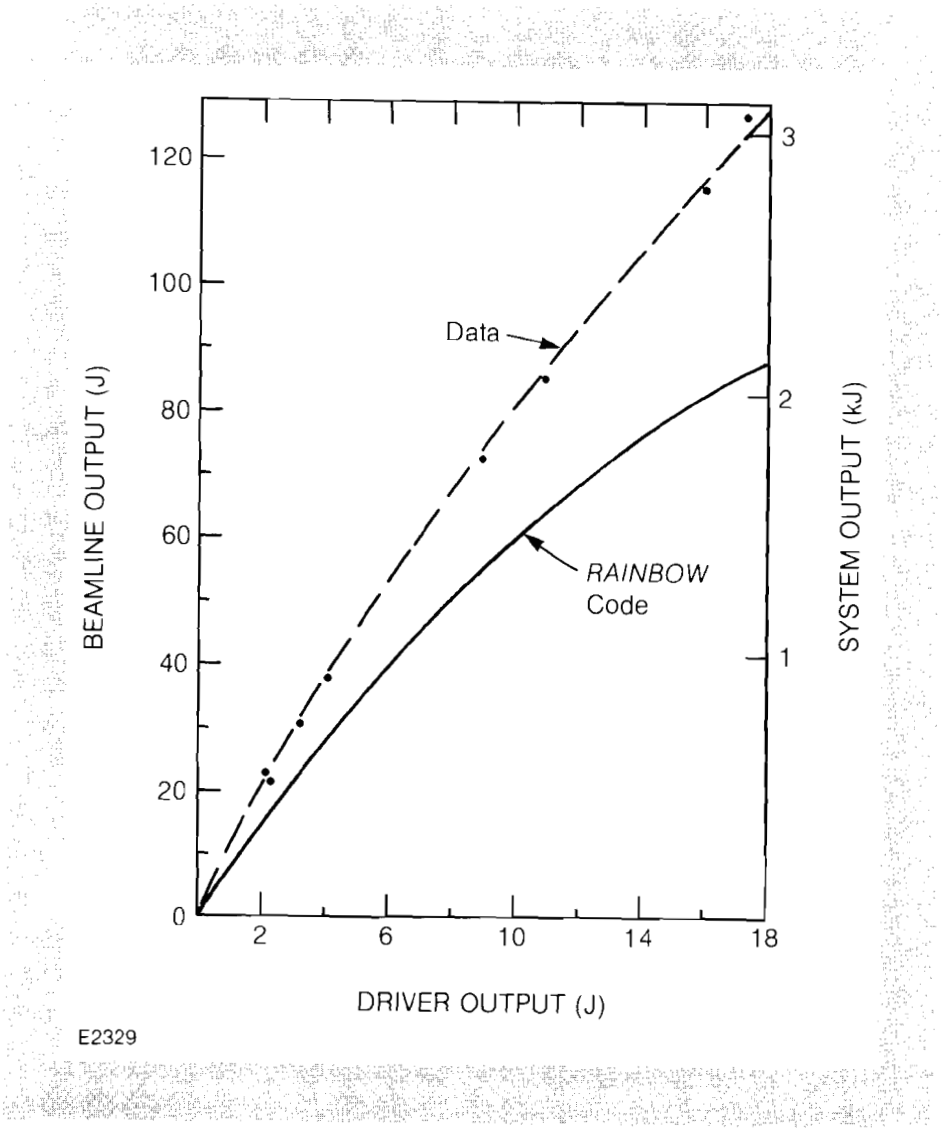


Fig. 2
Beam output versus driver output (actual and predicted).