X-Ray Framing-Camera Characterization: Recent experiments were conducted on OMEGA to improve the performance of the facility's x-ray framing cameras (XRFC's). These diagnostics are used in a variety of configurations on a weekly basis at the Omega Laser Facility. To produce the highest-quality data, each XRFC's gain and temporal characteristics must be well understood. In the past, collecting this data required either dedicated shot time or off-site testing. LLE now has the capability to characterize these parameters in house in a ride-along mode on OMEGA and on the Multi-Terawatt laser (MTW).

The OMEGA XRFC experiments were based on the standard beam-pointing shot typically taken at the start of a spherical experimental campaign. Using the precision beam-timing flexibility of OMEGA, an experimental configuration was implemented for precision temporal calibration of gated XRFC's. For these shots the individual beams around each XRFC's field of view were delayed in increments of 25 to 50 ps to produce x-ray emission "turn on" in a range of controlled times (Fig. 1). The targets were 4-mm-diam Delrin spheres overcoated with 1 μm Au and all 60 beams were operated with 1-ns-square pulse focused on the surface of the sphere. Each XRFC was outfitted with a 16-hole-array pinhole imager and beryllium filtered. Using the individual beam laser diagnostics, the absolute timing reference of each camera could be determined to better than 50 ps. This use of 1-ns beams provides x-ray emission later in time that is suitable for flat-field data collection (Fig. 2); this is not possible on dedicated timing shots that use 100-ps pulses. The recent commissioning of two new fixed x-ray pinhole cameras on OMEGA allows a ten-inch manipulators (TIM's) to be configured with an XRFC on future pointing shots, providing an ongoing maintenance platform for these core diagnostics. Data collected on these shots are readily available to all users.

Synchronization of an XRFC's four individual strip lines has been measured in x rays on an infrequent basis since it required off-site testing. Recently, the MTW laser was configured to allow the XRFC synchronization measurement to be made in house. On MTW, a gold foil was irradiated with an 8-J, 10-ps-long pulse of 1054-nm light. The XRFC was run with a 0.5-mm-thick beryllium filter to cut off the lowest-energy x rays that may persist after the pulse ends. XRFC 1's strip line synchronization was verified through measurement of the x-ray "turn off" to be <10 ps (Fig. 3). Additional experiments are being scheduled on MTW to characterize the synchronization of the other two XRFC's currently in use.

Omega Facility Operations Summary: During the reporting period, the Omega Laser Facility conducted 138 target shots (124 planned shots) with an average experimental effectiveness of 98.6% (98.4% for 124 shots on OMEGA and 100.0% for 14 shots on OMEGA EP). The NIC accounted for 83 shots taken by LANL- and LLE-led teams; 32 shots were taken for the HED program by LLNL- and LANL-led teams; one NLUF campaign led by Princeton University took 12 shots; one LBS campaign led by LLE conducted 5 shots; and 6 target shots were carried out by the Center of Radiative Shock Hydrodynamics of the University of Michigan.

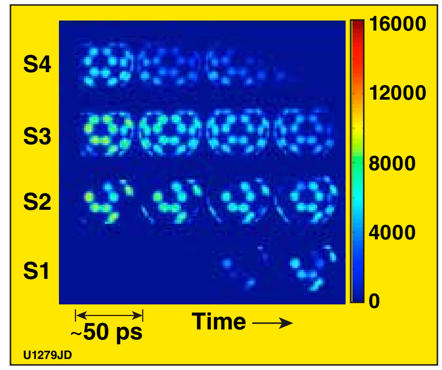

Figure 1. OMEGA gated XRFC output on a pointing shot with a spherical target. Here the individual strip lines (S1–S4) are staggered in increments of 200 ps.

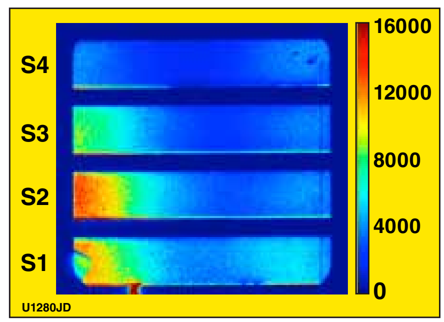

Figure 2. An XRFC flat-field image recently acquired on a modified pointing shot. This data is used to correct for defects and gain variation of the camera's microchannel plate and phosphor.

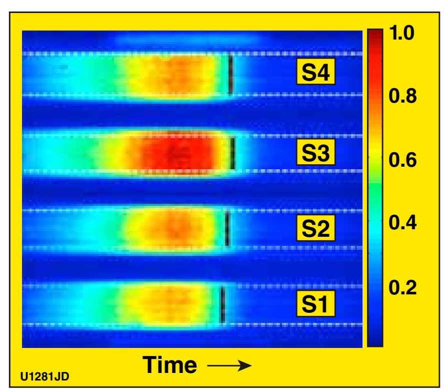

Figure 3. Image of XRFC display on a strip line synchronization test. The strip line-to-strip line variation was determined to be less than 10 ps.