OMEGA EP VISAR Diagnostic: There is considerable demand for high-pressure experiments on OMEGA EP (~25% of OMEGA EP-only days). The velocity interferometry system for any reflector (VISAR)[1] is the key instrument for these experiments. VISAR has been in operation on OMEGA for nearly ten years[2] and during that time significant upgrades and refinements have been implemented. In 2006, the OMEGA VISAR system was completely redesigned to accommodate two Rochester optical streak camera systems (ROSS)[3] as the primary detectors. This redesign includes the capability to align the interferometers *in situ*, to view the image at the streak-camera slit, and other enhancements. The VISAR system for OMEGA EP (see Fig. 1) is based on this current OMEGA system and has additional upgrades. The OMEGA EP system can be run remotely. Optical filters are on rotary stages and all six optics in each interferometer (there are two) have motors on their alignment actuators. These allow operators to control the VISAR system from outside the target bay. This will ease intershot adjustments and optimize performance. In addition, the various control settings are logged and can be tracked to allow monitoring of performance. The latter can be used to sense and avert failures. On 24 June OMEGA EP shots were performed to activate the new VISAR system. It worked as designed on the first shot. The system is now available for the high-pressure experiments scheduled on OMEGA EP in FY10.

Figure 1. Photograph of OMEGA EP VISAR diagnostic system.

Liquid-Scintillator nTOF Detector: In integrated fast-ignition (FI) experiments with re-entrant cone targets at the Omega/Omega EP Laser Facility, the interaction of an ultrahigh-intensity laser with the gold cone creates a very intense γ-ray pulse. To infer the neutron yield, a small neutron signal must be recorded in a neutron time-of-flight (nTOF) detector after a very large γ-ray signal. Several nTOF detectors with plastic and liquid scintillators were developed and tested on OMEGA for this application. A gated photomultiplier tube was used to eliminate the large γ-ray signal in these nTOF detectors. However, all commercially available solid scintillators have, in addition to a fast-scintillation component, a long afterglow component that creates a large residual background to the delayed neutron signal. LLE designed and built a new liquid-scintillator detector with a very low afterglow. This scintillator was based on the work of Lauck *et al.*[4] It consists of 0.4% 2.5-diphenyloxazole (PPO), 0.04% p-bis-(o-methylstyryl)-benzene (MSB) dissolved in xylene and saturated with oxygen. This scintillator detector was tested during joint shots on OMEGA in the presence of a very high γ-ray burst from the interaction of the OMEGA EP laser beams with the gold cone target. Figure 2 shows the comparison of signals from the plastic and liquid scintillator detectors from identical FI shots. The neutron signal from a low-yield implosion was recorded without any residual scintillator background. The new liquid-scintillator nTOF detector allows neutron-yield measurements in FI experiments at the Omega/Omega EP Laser Facility.

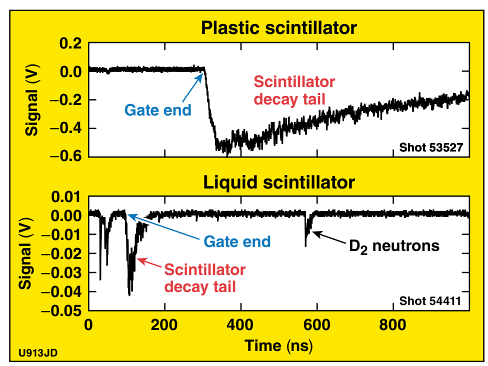

Figure 2. Response of plastic scintillator nTOF detector (top) compared to the response of new liquid-scintillator nTOF (bottom) on nearly identical FI target shots.

OMEGA Operations Summary: The Omega Laser Facility conducted 119 target shots in June including 77 shots on the OMEGA 60-beam laser and 42 on OMEGA EP. There were 13 joint OMEGA/OMEGA EP target shots conducted during the reporting period. Experimental effectiveness averaged 98.1% on OMEGA and 100% on OMEGA EP. The NIC program accounted for 70 of the total shots (26 led by LLNL and 44 by LLE). Other users included 19 target shots by LLNL HED, 6 shots by LANL HED, and 24 by CEA.

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