Multiple-Shock Timing: A series of shock-timing experiments was recently performed on OMEGA using empty, room-temperature spherical CH shells with 100-μm-thick walls driven by three 100-ps pulses. The objective was to acquire shock velocity and shock-coalescence times while the shocks traversed the thick CH shell. It was previously demonstrated[1] that shock velocities can be acquired in CH targets when short pulses are used. In such experiments, the target material ahead of the shock absorbs light (*blanks out*) because of x-ray photo-ionization,[2] but it *clears* after the pulse turns off. This makes it possible to acquire a semi-continuous record of shock velocity. Figure 1 shows the target configuration. The target was irradiated by 36 beams producing conditions on the hemisphere identical to a 60-beam implosion. The velocity interferometry system for any reflector (VISAR) and the streaked optical pyrometer (SOP) were used to measure velocity and the self-emission of the shocks, respectively, within the target shell. Figure 2(a) shows the VISAR data for a typical shot: the fringes are horizontal at a position of zero velocity before t = 0. This signal comes from the reflection of the stationary inner surface of the target. (The vertical bands are stray drive-laser light that enters the diagnostic and are very useful for absolute timing.) At about 0.5 ns, the reflection from the shock front is strong enough to be detected by VISAR and the fringes are observed to shift. Their motion represents the decaying velocity of the unsupported shock produced by the first 100-ps pulse. At 1.5 ns, x rays from the second pulse cause the CH ahead of the first shock to blank (absorb) the VISAR, and the signal is again dominated by the reflection of the stationary inner surface of the shell. At 2.9 ns, a set of brighter fringes with a distinct slope in time is apparent. These fringes are caused by the coalesced shock formed when the shock from the second pulse overtakes the first shock. Evidence of the third shock overtaking the second shock is seen at ~4 ns. Figure 2(b) shows the self-emission data for the same shot and the three shocks are readily evident. The first shock is seen as a bright signal at ~0.5 ns that quickly decays below the detection threshold for the SOP. (Shock brightness scales approximately as velocity squared.) At 2.65 ns, the second shock overtakes the first and the emission from this combined shock is bright enough to again be detected. The onset is so sharp in time because the first shock is opaque, and the second shock is not observed until it overtakes the first. Shock coalescence occurs again at 4 ns when the third shock overtakes this combined (first and second) shock. This experiment demonstrates the value of using both diagnostics for accurate shock timing.

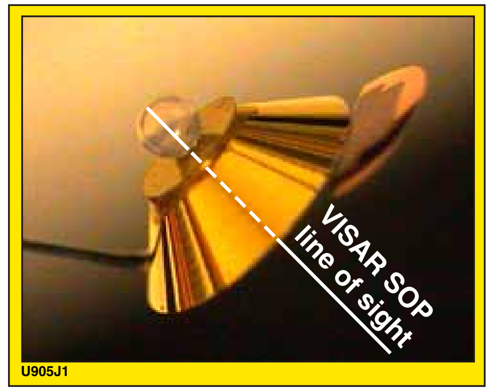

Figure 1. Photograph of a shock-timing target with a 950-μm-diam, 100-μm-thick CH shell. Cones are attached to shield the diagnostics from the drive laser.

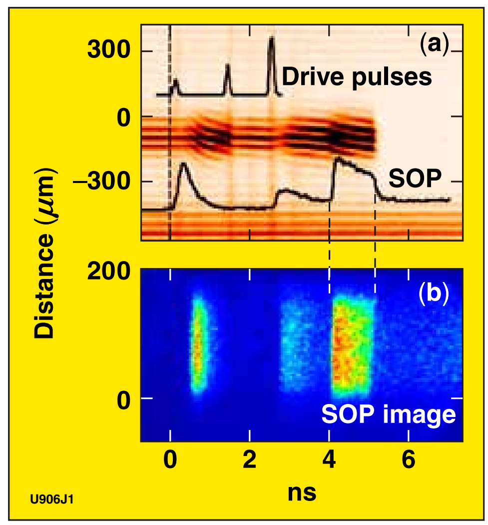

Figure 2. (a) The VISAR image for shot 54183 with intensity plots of the drive pulses and the SOP intensity. (b) The SOP image exhibits the shock-coalescence features observed in VISAR.

OMEGA Operations Summary: During May, the Omega Facility conducted 95 target shots with an overall effectiveness of 95.8% (71 shots on the OMEGA 60-beam laser and 24 on OMEGA EP with an effectiveness of 95.1% and 97.9%, respectively). Sixty target shots were taken for the NIC by teams lead by LLE scientists and ten shots were taken by LLNL-led teams for the HED program. Three NLUF teams led by scientists from MIT, the University of California, San Diego, and a joint team from Washington State University and Princeton University conducted a total of 20 shots. The CEA (France) carried out five target shots.

1. T. R. Boehly *et al*., Phys. Plasmas **13**, 056303 (2006).
2. W. Theobald *et al*., Phys. Plasmas **13**, 122702 (2006).