Multi-Shock Velocity Measurements: A technique to diagnose shock velocities in both indirect- and direct-drive cryogenic targets was developed and demonstrated at LLE. Efforts are now focused on using this technique to validate hydrocodes and to optimize spherical cryogenic implosions. Recent experiments have concentrated on drive laser pulses with two or more picket pulses to accurately control the adiabat of the imploding shell. Additional experiments using cone-in-sphere targets [Fig. 1(a)] were performed with these multi-picket pulses. Figure 1(b) shows the VISAR fringe data with the two-picket laser pulse superposed. Three shocks are readily evident in these data. The VISAR laser is absorbed in the CD shell, but its reflection off the first shock in D_2 is readily observed from 0.7 to 1.9 ns. The coalescence (catch up) of the shock from the second picket (1.9 ns) and that from the foot pulse (4 ns) are observed as the abrupt change in fringe position. After about 4.6 ns, the intensity of the fringes from the third shock (foot) appears to fade. This may be the result of optical blanking of the rear window on the cone. Beginning at ~4.9 ns, a bright V-shaped feature appears. This feature is likely the result of hot plasma produced by the shock striking the aperture of the gold cone. The V-shape is consistent with a converging mass that is either reflecting the VISAR laser or emitting light at ~532 nm. Simultaneous measurements of the shock timing are also made using a streaked optical pyrometer (SOP). Figure 2 plots the shock velocity from the VISAR data along with the SOP intensity. The shock coalescence features (i.e., shock timing) from the two instruments are in good agreement (~30 ps). The simulations predict the shock timing remarkably well.

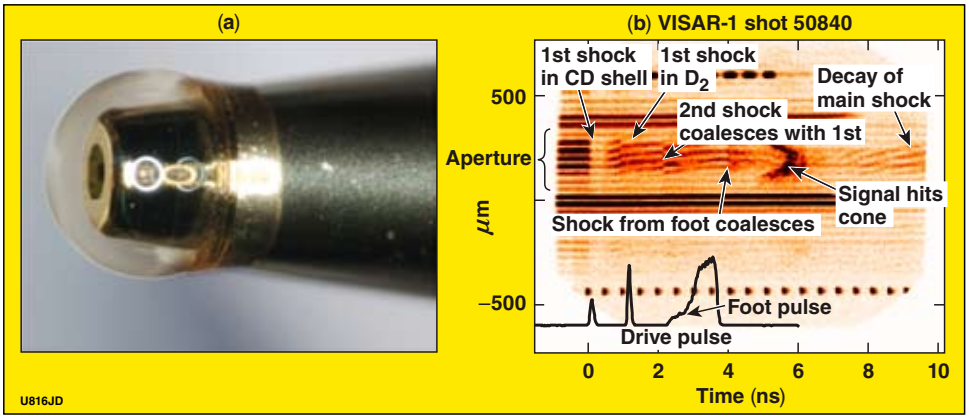

Figure 1. (a) A cone-in-sphere target comprising a 10-μm-wall, 900-μm-diam CD shell with a gold cone inserted. The shell and the entire cone are filled with liquid D_2 and irradiated with 36 beams on the hemisphere opposite the cone. VISAR and SOP data are acquired through the 250-μm aperture in the center of the cone. (b) VISAR fringe pattern as a function of time. Fringe position is proportional to shock velocity, which is acquired through only the aperture in the cone. Three shocks and two coalescences are readily apparent.

OMEGA Operations Summary: The OMEGA facility conducted 131 target shots in July with an overall experimental effectiveness of 92%. A total of 59 target shots (19 for the IDI and 40 for the DDI campaigns) were taken for the NIC program by several teams of scientists led by LLE and LLNL scientists. In addition, there was a total of 72 target shots conducted for other campaigns including 23 experiments carried out for CEA (France), 8 for AWE (United Kingdom), 23 for LLNL, 10 for an NLUF team led by MIT-PSFC, and 8 for an NLUF team led by the University of Michigan.

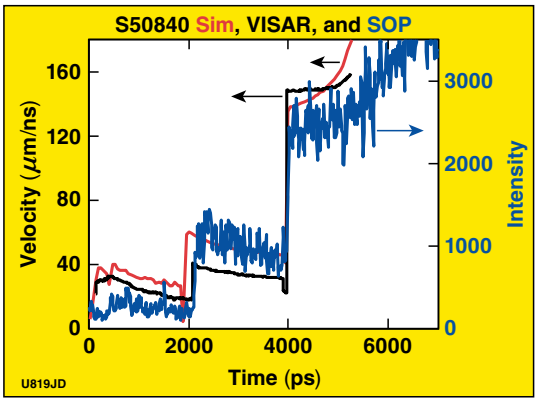

Figure 2. Shock velocities derived from the VISAR data (black), SOP emission intensity (blue), and the simulated shock velocity (red). Note that the shock coalescence times (i.e., shock timing) in all three agree quite well.

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