Active Shock Breakout (ASBO) Upgrade: A year-long project to upgrade the ASBO diagnostic was completed in April 2006. The ASBO diagnostic was installed in 2000 by P. M. Celliers (LLNL) *et al.*[1] A second velocity interferometer system for any reflector (VISAR) and a streak camera were added in 2001. This diagnostic proved valuable for equation of state (EOS) and shock-timing experiments for many years; nevertheless, it was still a prototype system. An upgrade was deemed necessary to enable high-precision measurements and ease of operation. Using the existing system as a baseline, a new optical layout was conceived that used Rochester Optical Streak System[2] (ROSS) streak cameras as detectors for the two VISAR channels. The result is an outstanding optical device that provides excellent optical performance and smooth operation using the accurately calibrated ROSS cameras. The prototype system was decommissioned on 10 March 2006 when it was removed from the Target Bay. To facilitate meeting the tight schedule, the new ASBO optical tables were installed complete with all the optics except for the ROSS cameras. On 11 April 2006 the system was used for OMEGA shots and operated satisfactorily on the very first shot. Figure 1 shows an image of an isentropic compression experiment (ICE) performed on a four-step aluminum sample. The image shows the VISAR fringes whose position are proportional to the velocity of the rear surface of the sample. In these experiments the evolution of the compression wave through the four thicknesses of the Al sample (four horizontal regions in the image) is observed. If the measurement of the evolution of this compression wave is sufficiently precise (a few percent in velocity), the isentrope can be deduced. Figure 2 shows the reduced velocity history of a similar experiment performed on a single-thickness Al sample. The two VISAR channels intentionally have different velocity sensitivity to resolve any 2-π ambiguity that could occur at velocity discontinuities. The excellent agreement between the two channels is indicative of the high precision of this device. The ROSS systems were calibrated off-line and again *in situ* to provide temporal and geometrical distortion corrections. Eventually, optical calibration modules will be installed on the ROSS cameras so that calibration can be routinely performed. Many experiments are planned using the new ASBO system and scrutiny of those experiments will provide an evaluation of the system performance. Preliminary analysis indicates that the upgraded ASBO diagnostic is capable of the required precision.

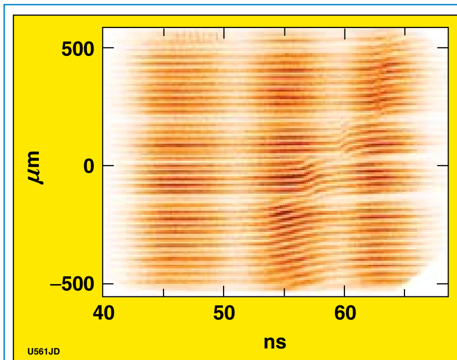

Figure 1. Image of VISAR data from upgraded ASBO system on shot 43384, an isentropic compression experiment on an aluminum sample having four steps (horizontal bands). The fringe position is proportional to the velocity of the rear surface. The thinnest step (bottom band) first signals the compression at 54 ns, the other steps show the arrival of the wave at successively later times.

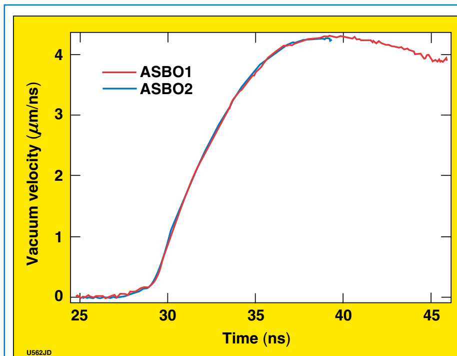

Figure 2. Comparison of velocities deduced from the two ASBO channels on shot 43369, an experiment on a thinner aluminum sample than that of shot 43384; the compression begins at 29 ns. The excellent agreement between channels is indicative of the stability and accuracy of this new system.

OMEGA Operations Summary: OMEGA conducted 110 shots in April 2006 for LLE, LLNL, LANL, CEA, and NLUF. Of these shots, 49 were for NIC experiments carried out by LLNL, LANL, and LLE. In addition, 19 target shots were carried out for two NLUF teams led by the University of Washington and the University of California, Berkeley, respectively, 18 shots for CEA, and 23 shots dedicated to several other LLE campaigns (DD, ISE, and RTI). The first week in April was a scheduled maintenance week. Preparations were initiated to support the OMEGA EP short-pulse beam-tube integration on port H9 planned for this coming June. Significant modifications were made to the Target Bay target-mirror-structure staircase to allow access once portions of the existing staircase are removed during the June maintenance week. Access to the focus lens and blast window assemblies will be compromised upon the installation of the short-pulse beam tube on port H9. Consequently, the focus lens assemblies for beams 48 and 49 were unbolted from the target chamber and interchanged (swapped) to improve access for future optics maintenance. The refurbished ASBO diagnostics were also installed during the maintenance week.

1. P. M. Celliers *et al.*, Rev. Sci. Instrum. **75**, 4916 (2004).
2. LLE Review Quarterly Report **87**, 109, Laboratory for Laser Energetics, University of Rochester, Rochester, NY, LLE Document No. DOE/SF/19460-397, NTIS Order No. PB2006-106658 (2001). Copies may be obtained from the National Technical Information Services, Springfield, VA 22161.

Contact: Wolf Seka (585) 275-3815; fax: (585) 275-5960; e-mail: seka@lle.rochester.edu
John M. Soures (585) 275-3866; fax: (585) 256-2586; e-mail: jsou@lle.rochester.edu