Indirect-Drive Ablator Shock Propagation: The achievement of indirect-drive ignition of a NIF capsule requires capsule shock timing precision of ~150 ps and prediction of ablator burn-through timing to within a few percent. Recent OMEGA hohlraum-driven target experiments were conducted to address the DOE IDI-3 milestones for ICF ablator shock propagation measurements and comparison to code predictions. A second set of experiments was also performed in support of IDI-3 milestones for ablator burnthrough timing. The experiments (a collaborative effort involving SNL, LLNL, and LANL) are the first attempts to time resolve the coalescence of two shocks (at pressures of ~10 and 60 Mbar, respectively) in Be+0.9%Cu wedge ablator samples (supplied by the Target Fabrication Group at LANL).

The experimental arrangement used for these experiments is shown in Fig. 1; the principal diagnostic was the LANL Streaked Optical Pyrometer (SOP)*. The hohlraum drive for this experiment consisted of a 2-ns square pulse in six beams followed by a 1-ns square pulse in nine beams delayed by 1 ns. According to the pre-shot calculations, this laser input would result in a two-step hohlraum x-ray drive that would set up shocks of ~10 Mbar and ~60 Mbar coalescing in approximately the center of the Be+0.9%Cu wedge. The SOP shock breakout image obtained from OMEGA shot 25964 is shown in Fig. 2. Initial data analysis indicates a shock coalescence occurring within about 300 ps of the pre-shot calculation. Post-shot analysis that includes detailed information on actual wedge dimensions and laser power measurements is in progress.

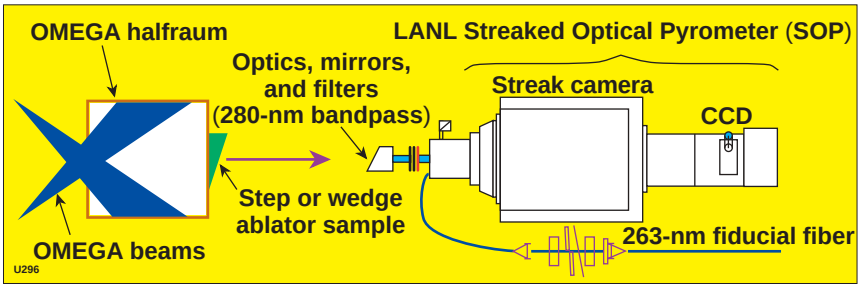

Figure 1. Schematic of shock propagation experiments. An ablator sample in the form of a wedge is placed on the back of a half-hohlraum cylinder (halfraum). The SOP resolves the shock breakout signature along the wedge. UV (263-nm)-laser, 100-ps pulses are used as a timing fiducial.

OMEGA Operations Summary: During February, a total of 119 target shots were taken on OMEGA for experiments by Lawrence Livermore National Laboratory (LLNL), the National Laser Users' Facility (NLUF), and LLE programs. The LLNL series (total of 28 target shots) included experiments to examine the interaction of shock waves with target features (Features), high-Z and low-Z equation-of-state measurements (EOS), continuous (shockless) pressure generation (IDrive), and NIF symmetry experiments. The NLUF experiments (total of 4 target shots) studied dynamic x-ray diffraction in materials undergoing phase transformation. The LLE experiments (a total of 87 target shots) included shots for the integrated spherical (ISE), Rayleigh–Taylor instability (RTI), SSP, and cryogenic fuel layer target campaigns.

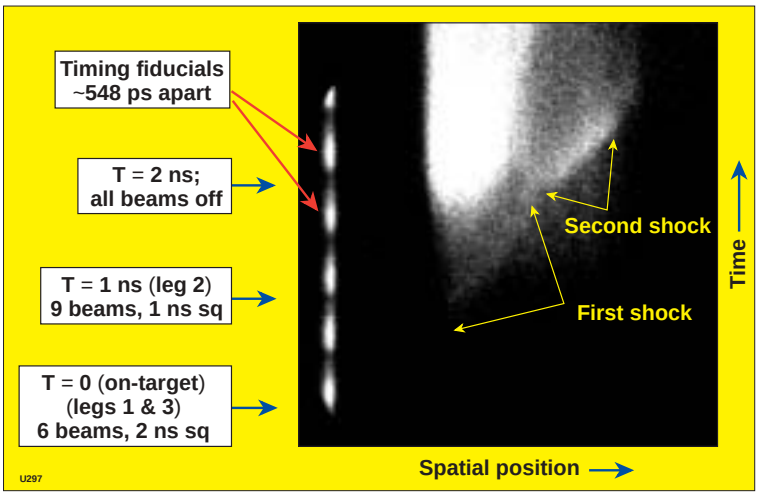

Figure 2. SOP data for a Be wedge experiment on OMEGA shot 25964. The narrow side of the wedge is on the left. The SOP image shows the first shock merging with the second shock near the center of the image. The target and hohlraum drive were designed to provide shock coalescence near the center of the SOP image.

*J. A. Oertel, T. J. Murphy, R. R. Berggren, J. Faulkner, R. Schmell, D. Little, T. Archuleta, J. Lopez, J. Verlarde, and R. F. Horton, "Multipurpose 10 in. Manipulator-Based Optical Telescope for OMEGA and the Trident Laser Facility," Rev. Sci. Instrum. **70**, 803–805 (1999).

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