OMEGA High-Resolution Velocimeter: The OMEGA high-resolution velocimeter (OHRV) was developed by P. M. Celliers[1] at Lawrence Livermore National Laboratory (LLNL) to study the effect of material structure on the uniformity of shock waves in the ablators for National Ignition Facility (NIF) ignition targets. LLE, in collaboration with LLNL, is using the OHRV to study laser imprinting. In direct drive, laser beam nonuniformities produce modulated shock waves that create mass modulations as they propagate through the ablator. It is important to characterize this process for direct-drive inertial confinement fusion (ICF) ignition designs; initial experiments demonstrated that this platform has sufficient sensitivity to discriminate between single and multibeam imprint. Figure 1 shows a 2-ps duration, two-dimensional OHRV "image" of the shock velocity in a CH target driven by two OMEGA beams with a 100-ps UV drive pulse. The high-frequency structure is a result of the speckle produced by the distributed phase plates in the drive beams. As more beams are added, the interference of multiple speckle patterns smooth the irradiation uniformity and nonuniformities in shock velocity decreases. Figure 2 shows the power spectra (from Fourier analysis) for this two-beam shot along with those from one- and five-beam shots (all taken at 900 ps from the laser pulse), showing the expected decrease in shock nonuniformity as the numbers of beams increase. Experiments on cryogenic deuterium were also performed, showing how shock nonuniformities are conveyed from the ablator into the fuel. This data is still being analyzed and will be reported soon.

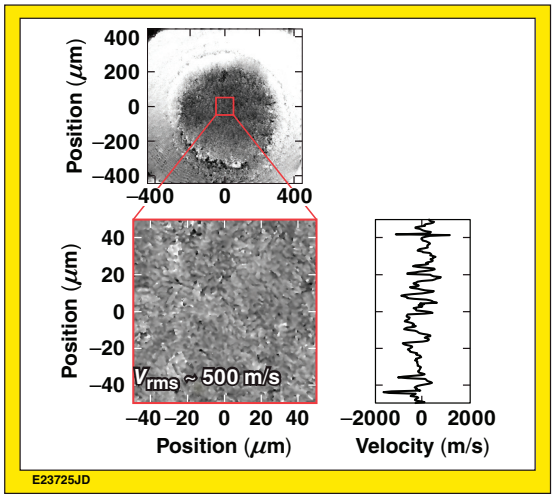

Figure 1. OMEGA high-resolution velocimeter (OHRV) interferometry data for a shock wave in a CH target driven by two OMEGA beams with 100-ps drive pulse. Modulations in image intensity are proportional to shock velocity. The insets show a magnification of the central 100-μm square of the image and a lineout of that region.

Omega Facility Operations Summary: The Omega Facility conducted a total of 224 target shots with an average experimental effectiveness of 90.0%. This total included 135 shots on OMEGA and 89 shots on OMEGA EP, with an experimental effectiveness of 88.5% and 92.1%, respectively. The ICF program accounted for 54 target shots while 69 target shots were carried out for the HED program by LLNL, LANL, and LLE teams. Eight NLUF experiments led by Princeton University, the University of Michigan, General Atomics, and the University of California, San Diego accounted for 62 target shots and three LBS experiments led by LLNL had 39 target shots.

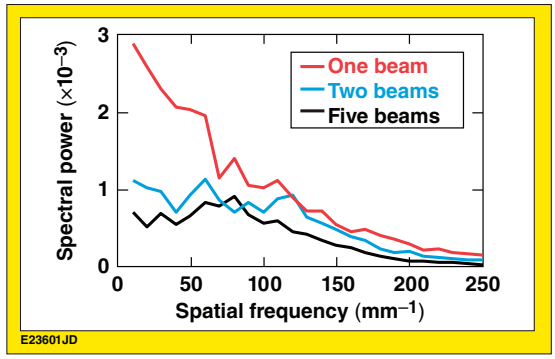

Figure 2. Power spectra of shock-velocity perturbations as a function of spatial frequency for three irradiation conditions: one, two, and five beams. As more beams are added, the drive uniformity increases and perturbations in shock velocity decrease.

LLE Graduate Student Receives DOE NNSA Fellowship: Collin Stillman has been awarded a 2014–2015 DOE NNSA Stewardship Science Graduate Fellowship. Collin is finishing his first year of graduate school in the Physics and Astronomy Department and has been conducting research in high-energy-density science as part of the Plasma and Ultrafast Physics Group at LLE. Collin's research focuses on high-precision, equation-of-state measurements using a novel technique to observe shock-wave propagation within solid targets.

1. P. M. Celliers *et al.*, Rev. Sci. Instrum. **81**, 035101 (2010).