Beam Imprinting: Spatial nonuniformities in the incident laser radiation can "imprint" undesirable perturbations into direct-drive ICF targets. The effect of beam mistiming on beam imprinting was measured in recent OMEGA experiments using 20-μm-thick planar plastic targets driven by a 3-ns square pulse at an intensity of ~1×10^{14} W/cm^2. Figure 1(a) illustrates the beam configuration used in the experiment. Six beams drive a planar target, five of which have distributed phase plates (DPP's) and polarization smoothing (PS), while one beam (used as a probe) has a special DPP that produces a 2-D, sinusoidal, 60-μm-wavelength intensity modulation on a target. The spatial 2-D modulation is used to distinguish it from the broadband modulations of the five other drive beams. By varying the timing of this probe beam with respect to the timing of the five drive beams, the effect of beam mistiming on imprinting was measured. The growth of imprinted modulations was measured with through-foil radiography using x rays from a uranium backlighter.[1] The target had a preimposed, 2-D, sinusoidal, 60-μm-wavelength modulation (orthogonal to that of the probe-beam-imposed modulation) that is used to normalize the imprinted modulation. Figure 1(b) shows the dependence of the imprint "efficiency" on the probe-beam delay. The diamonds show the experimental data, while the solid line shows the prediction of an analytical imprinting model.[2] The imprinting is very sensitive to the mistiming. Even a 5- to 10-ps advance of the probe beam results in a several-times increase in imprinting. The imprinting efficiency levels out at its maximum level when the probe beam is ahead of the rest of the drive beams by more than ~50 ps. When the probe beam is delayed with respect to the other drive beams, the imprinting decreases exponentially as a function of beam delay.

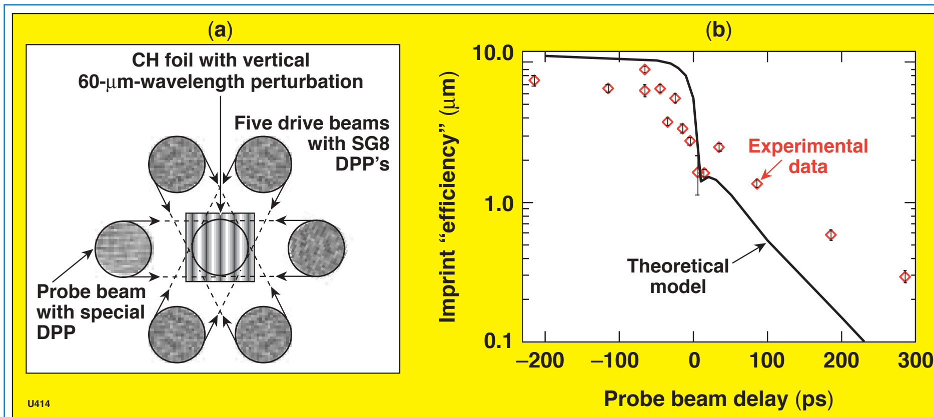

Figure 1. (a) Beam configuration for imprint measurements. (b) The dependence of the imprint efficiency on probe-beam timing.

OMEGA 60-Beam UV Spectrometer: A new UV spectrometer that can measure the SSD spectra of all 60 OMEGA beams on every shot has been installed. The new spectrometer has a maximum resolution of 2.5×10^{-3} nm (0.025 Å), a 3× improvement over the previous spectrometer. The shape of the UV spectrum has been shown to depend on the angular tuning of the KDP frequency-conversion crystals with SSD. The new instrument will help to determine the tuning state of all the crystals on a single shot and to correct any misaligned crystals (see Fig. 2). This should improve the power balance on OMEGA. The spectrometer is also being used to determine the accumulated *B*-integral in the laser amplifiers during short-pulse propagation.

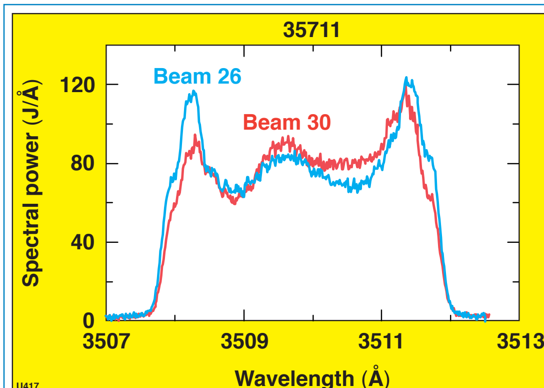

Figure 2. The spectra of two beams obtained using the new 60-beam UV spectrometer on a single shot. The spectra can be quite different. Based on empirical data from deliberately detuned beams, the frequency-tripling crystals of the two beams shown above were detuned by ~100 μrad.

OMEGA Operations Summary: A total of 152 targets were produced by OMEGA in April. LLE experiments accounted for 56 of these shots for several campaigns including direct-drive implosions (both warm and cryogenic, including eight spherical-cryogenic-target shots in one week), shock timing, laboratory astrophysics, fast ignition, Rayleigh–Taylor instability, and equation-of-state studies. Experiments were also conducted for LLNL (52 shots), LANL (31 shots), CEA (6 shots), and an NLUF experiment led by the University of Michigan (7 shots).

1. T. R. Boehly *et al.*, Phys. Plasmas **8**, 2331 (2001).
2. V. N. Goncharov *et al.*, Phys. Plasmas **7**, 2062 (2000).

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