August 2004 Progress Report on the Laboratory for Laser Energetics
Inertial Confinement Fusion Program Activities

OMEGA Imprint Growth Measurements on Foam Targets: Imprint growth measurements were performed in planar foam targets driven with shaped laser pulses in support of spherical cryogenic implosion experiments. Figure 1(a) shows a schematic of the target consisting of a 5-μm-thick plastic foil followed by a 100-μm-thick foam foil (with a density of 180 mg/cc). This planar target mimics the spherical cryogenic D_2 target, where the foam (having the same density and thickness as D_2 ice) is used instead of D_2. These planar targets were driven with two types of laser pulses; one included a picket [see Fig. 1(b)]. The picket was designed to put the ablation front of the target on a higher adiabat while maintaining the inner part at the same low adiabat as the pulse without the picket. The adiabat is the ratio of the Fermi-degenerate pressure to the pressure in the compressed gas. The picket pulse was expected to produce lower imprint levels compared to the pulse without a picket.[1] The imprinting growth experiments were performed with standard through-foil radiography using ~1.3-keV x rays. Special two-dimensional phase plates were used to produce sinusoidal intensity modulations at 30-, 60-, and 120-μm wavelengths. These features were imprinted into the targets and magnified by the Rayleigh–Taylor instability during the acceleration phase. Figure 1(c) shows optical-depth images of target modulations taken at times when the targets traveled ~100 μm. The imprinted 2-D modulation at 30-, 60-, and 120-μm wavelengths are easily seen. The radiographs taken with the picket pulse are clearly smoother than without a picket. The imprint reduction in optical depth is about a factor of 10 at 30- and 60-μm wavelengths, while there is no reduction at 120-μm wavelength, as expected from theoretical modeling.[2]

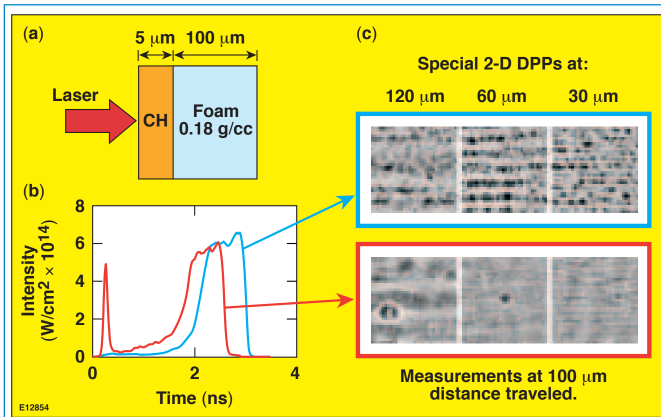

Figure 1. (a) Schematic of the target consisting of a 5-μm-thick plastic foil followed by a 100-μm-thick foam foil with density of 180 mg/cc. (b) On-target laser intensity as a function of time for two pulse shapes with and without picket. (c) Optical-depth radiographs of the targets driven without picket (upper three images) and with picket (lower three images) with 2-D imprinted features at 120-, 60-, and 30-μm wavelengths.

Defense Programs Award of Excellence: On 18 August, Capt. Steven J. Loucks (USN Ret.), LLE Deputy Director and the Director of the LLE Engineering and Administrative Divisions, received the Defense Programs Award of Excellence from Dr. Everet H. Beckner, Deputy Administrator for Defense Programs of the Department of Energy National Nuclear Security Administration (NNSA) (Fig. 2). The Award was presented to Capt. Loucks for outstanding project management and operational performance of the OMEGA laser facility. This prestigious award is usually given to someone from a national laboratory. Only one or two such awards are given annually.

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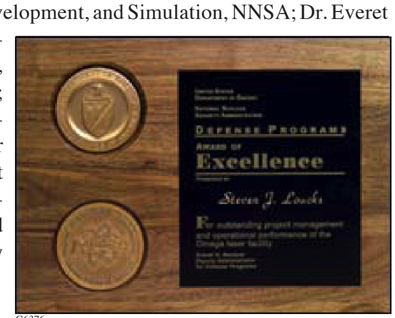

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Figure 2. Attending the presentation of the Defense Programs Award of Excellence shown above (left to right): Dr. David H. Crandall, Assistant Deputy Administrator for Research, Development, and Simulation, NNSA; Dr. Everet H. Beckner, Deputy Administrator for Defense Programs, NNSA; Capt. Steven J. Loucks; Prof. Robert L. McCrory, Director, LLE; and Dr. Christopher J. Keane, Acting Assistant Deputy Administrator for Inertial Confinement Fusion and the National Ignition Facility Project, NNSA.

OMEGA Operations Summary: OMEGA conducted a record high 166 target shots during August for campaigns for LLE, LLNL, CEA, and NLUF. A total of 77 target shots were provided for LLE experiments including Astro, LPI, ISE, CRYO, SSP, and power balance. The LLNL campaigns used 68 shots, 3 shots were provided to CEA, and 18 shots were carried out for NLUF experiments for a team led by the University of Michigan.

1. T. J. B. Collins and S. Skupsky, Phys. Plasmas **9**, 275 (2002).
2. V. N. Goncharov *et al.*, Phys. Plasmas **10**, 1906 (2003).

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