OMEGA Cryogenic Targets: Following the successful implosion of two fully β-layered cryogenic-DT (13%) capsules (see the DOE *March 2006 Monthly Progress Report* for details), the fraction of tritium in the DT-fuel inventory was raised to 55%. The first target from the first fill was imploded in June 2006; to date, four cryogenic-DT (55%) implosions have been performed on the OMEGA laser. The quality of the inner ice surface of the most recent implosion in July—shot 44240—met the requirements for direct-drive ignition on the NIF[1] (<0.25 μm for $\ell > 10$ and <1-μm rms for all modes). The 3-D ice characterization based on multiple shadowgraphs (see the DOE *September 2003 Monthly Progress Report* for details) indicated an inner-ice-surface roughness of 0.72-μm rms (all modes) at the triple point. This is well below the smoothness required for direct-drive ignition on the National Ignition Facility. Figure 1 shows the 3-D representation of the ice for this target and one of the better individual shadowgraphs used to construct the 3-D representation. Figure 2 shows the modal spectrum of this target overlaid with the ignition requirement.

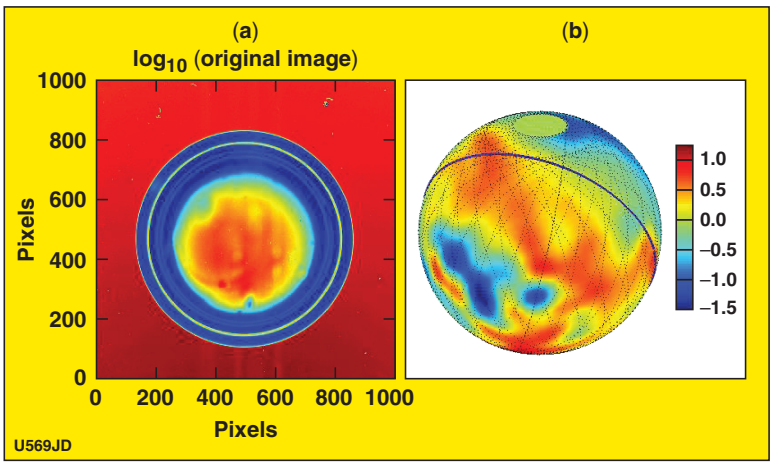

Figure 1. (a) A sample shadowgraph used to construct 3-D representation. (b) The 3-D inner ice surface based on 48 independent shadowgraphs. Note the peak-to-valley of the mid-mode features is only 2 to 3 μm.

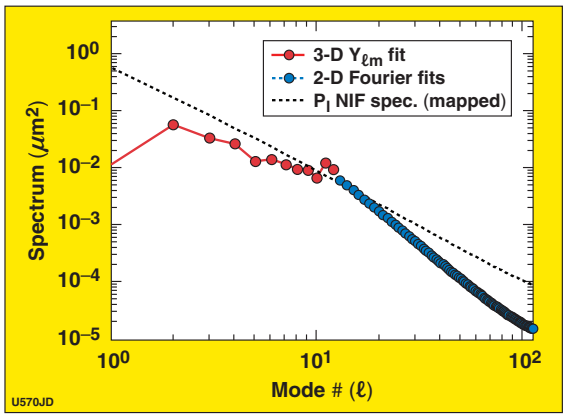

Figure 2. The modal power spectrum of the surface shown in Fig. 1 meets the requirements for direct-drive ignition.

Prior to imploding this target, the ice was cooled ~250 mK below the triple point. The preshot characterization indicated that the layer quality at shot time was 1.0-μm rms (additional work will be required to demonstrate ignition-quality ice roughness well below the triple point). This is the first target imploded on any laser facility that scales to ignition on the NIF. The data from this implosion are currently being analyzed and compared with both 1-D and 2-D hydrocode simulations. The offset from target chamber center at shot time was measured to be 10 μm. Finally, a technique developed over ten years ago to infer fuel areal density based on x-ray absorption[2,3] was tested on this shot and generated very promising data. The technique will be employed on cryogenic D_2 and DT implosions in August and cross-calibrated against the standard charged-particle-spectroscopy measurements from the D_2 implosions (see the *DOE September 2002* and *December 2004 Monthly Progress Reports* for more details on the D_2 areal-density measurements). These results will be reported in the coming months.

OMEGA Operations Summary: OMEGA conducted 101 target shots during July 2006 for experiments led by LLE (58 shots), LLNL (14), NLUF (11), CEA (12), and the Defense Threat Reduction Agency (DTRA) (6). The NLUF experiments were conducted by a team headed by the University of California at Davis. Significant work was also carried out to achieve the stringent pulse-shaping demands for the LLE cryogenic campaign. This included one day of laser shots on 24 July and a large number of front-end testing and pulse-shaping system modifications.

1. LLE Review Quarterly Report **79**, 121, Laboratory for Laser Energetics, University of Rochester, Rochester, NY, LLE Document No. DOE/SF/19460-317, NTIS Order No. DE200276802 (1999). Copies may be obtained from the National Technical Information Services, Springfield, VA 22161.
2. B. Yaakobi, R. Epstein and F. J. Marshall, Phys. Rev A **44**, 8429 (1991).
3. F. J. Marshall *et al*., Phys. Rev E **49**, 4381 (1994).

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