NIF Polar-Driven, Direct-Drive Activation Shot Tests: A series of target shots were taken on OMEGA in preparation for target experiments at the National Ignition Facility (NIF) that will be used to activate NIF nuclear diagnostics. The NIF target experiments will be performed in the polar-drive configuration with the beams re-aimed to symmetrically drive a target implosion.[1] The OMEGA target campaign verified that near-symmetric implosion yields can be obtained in the polar-drive configuration. These experiments were performed in a polar-drive, 40-beam configuration to emulate the polar-drive configuration on the NIF, as well as a standard OMEGA 60-beam symmetric configuration. Figure 1 shows a typical target used for these experiments. The target consists of a 10-atm-D_2-gas–filled, 5-μm-thick, 1600-μm-diam glass shell, held in place with a 17-μm-diam boron fiber. On the NIF, D_2-filled targets are expected to be used in the initial shots and then followed by DT-filled targets. The 60-beam symmetric and 40-beam polar-drive target experiments were performed on OMEGA with a mean energy on target of 15.4 kJ in a 1-ns square pulse. The average D–D fusion yield obtained from the 60-beam symmetric shots was $4.6\pm0.5 \times 10^9$ neutrons. The three polar-drive implosions produced an average yield of $3.5\pm0.2 \times 10^9$. Figure 2 shows a comparison of the yields obtained for the symmetric and polar-drive cases, and for both compared to the 1-D hydrodynamics simulation code *LILAC*. The 60-beam symmetric-drive implosions obtained on average 88% of the neutron yield predicted by 1-D simulations [yield over calculated (YOC)], while the polar-drive implosions obtained on average a YOC of 61%. Time-integrated and time-gated x-ray images of typical polar-drive implosions are shown in Fig. 3. These tests indicate that near 1-D simulated yields can be expected to be obtained on the NIF when the activation experiments are performed.

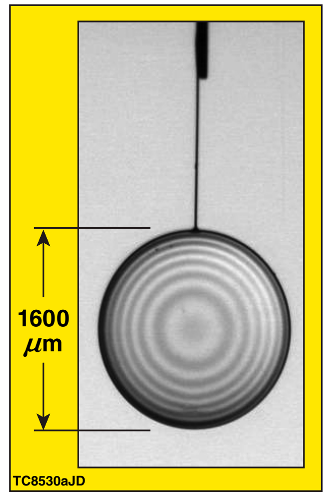

Figure 1. Photograph of target used on OMEGA polar-drive experiments.

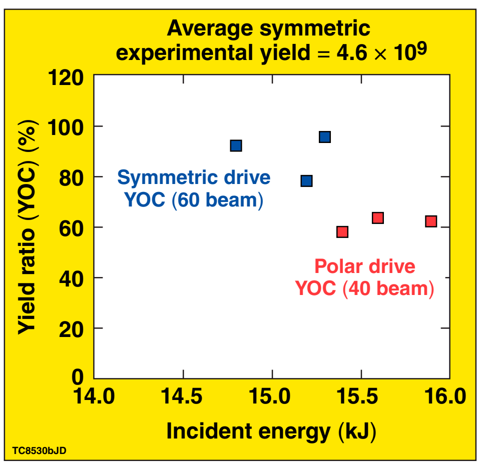

Figure 2. Ratio of measured neutron yield to calculated clean 1-D yield (YOC) (in %) for symmetric implosions (60 beams, blue squares) and polar-drive (40 beams, red squares) implosions at nearly equal laser energy (~15.4±0.7 kJ).

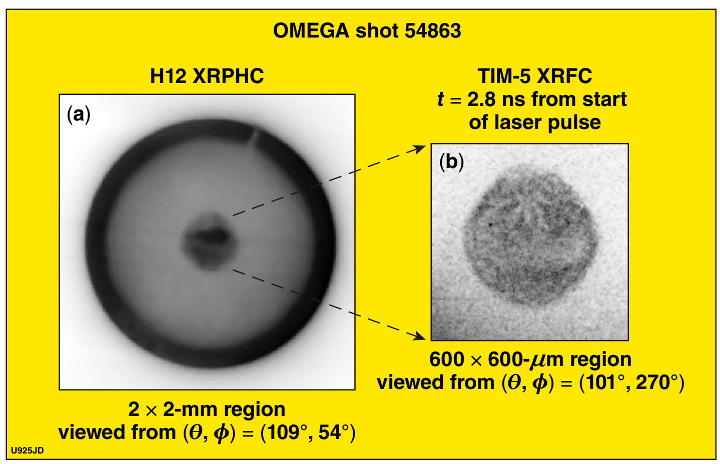

Figure 3. (a) Time-integrated x-ray pinhole camera (XRPHC) image (2 to 7 keV) of polar-drive implosion. (b) Time-gated x-ray framing camera (XRFC) image of implosion core taken near stagnation (t = 2.8 ns from start of laser pulse). In these images, the polar axis is vertical.

OMEGA Operations Summary: The OMEGA EP Grating Compression Chamber was opened in July for the installation of the Grating Inspection System. During this period, beams 3 and 4 of the laser were activated in a new configuration for long-pulse UV operations. The Omega Laser Facility conducted 111 target shots with an average experimental effectiveness of 96.4%. Seventy-five of the target shots were conducted for NIC by teams led by LLE. Three NLUF experiments conducted by teams led by the University of California, Berkeley, the University of Michigan, and the University of Washington accounted for 36 target shots.

1. A. M. Cok, R. S. Craxton, and P. W. McKenty, Phys. Plasmas **15**, 082705 (2008).