***Polar-Drive Experiments with Shimmed Shells:*** OMEGA and NIF polar-drive experiments are being used to prepare for future ignition experiments. Previous OMEGA experiments with precision machined shells manufactured by General Atomics have demonstrated improved implosion symmetry compared to uniform shells. Targets thinner at the equator than at the poles (i.e., shimmed-shell thickness) partially compensate for decreased drive at the equator inherent to polar-drive illumination. The first results of these experiments were shown in the *March 2012 DOE Report*. Because of the unavailability of a gas-retention barrier, previous shimmed-target experiments suffered from relatively low and highly variable neutron yields that did not allow for a good measure of the yield difference between spherical and shimmed shells. All past spherical shells and the current shimmed shells had a 0.1-$\mu$m Al barrier layer to retain the 10-atm $D_2$-gas fill.

The most-recent experiments also used a set of CH shells manufactured at the General Atomics (GA) target facility by precision machining. The same ideal profile referred to in the *March 2012 DOE Report* was used as the desired profile and both the accuracy of the machining and the measurement of the shape were improved. Figure 1 shows one such measured shell shape. The values of the shell thickness as a function of angle to the target pole were determined using x-radiography and have an accuracy of ~0.1 $\mu$m. The shape of this example target profile is within ~0.1 $\mu$m for nearly the entire surface.

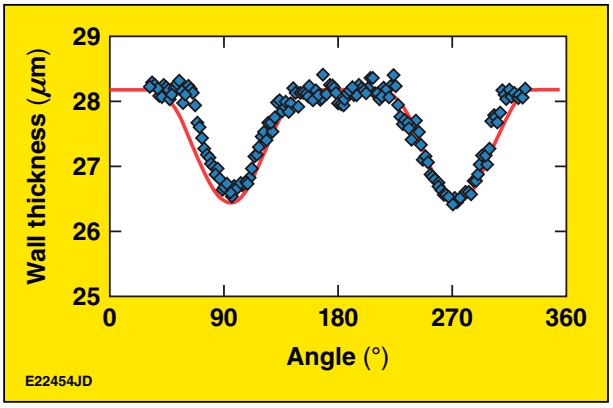


Figure 1. X-ray radiographic-determined shell thickness of contoured shell plotted as a function of angle to the capsule's pole (blue diamonds) compared to specified shape (red solid line).

Four such targets with this level of profile accuracy were imploded with 14 kJ of UV light from 40 OMEGA beams using a triple-picket, high-convergence-ratio pulse shape. As in previous experiments described in the *September 2012 DOE Report*, a beam pointing of 0-, 120-, and 140-$\mu$m offsets for Rings 1, 2, and 3 was chosen to compensate for the lack of beams at the equator and improve the drive symmetry for shimmed shells. The results were compared to polar-driven spherical shells with identical beam pointing and with the beam pointing optimized to drive a spherical shell using polar drive (90-, 150-, and 150-$\mu$m offsets for Rings 1, 2, and 3) as described in Marshall *et al.*[1] Figure 2 shows the neutron yields resulting from the shimmed targets compared to the polar-driven spherical shells and to symmetrically driven shells (60-beam implosions), all imploded with the same pulse shape and total energy on target. The shimmed targets had an imploding shell symmetry, as measured by x-ray backlighting, comparable to that shown in the *September 2012 DOE Report*. The shimmed-shell implosions achieved neutron yields ~2× greater than the polar-driven spherical shells and within ~70% of the yields obtained by the symmetrically driven shells. These experiments demonstrate that both the imploding-shell symmetry and the target-fusion performance can be improved by using a shimmed shell for polar-drive implosions.

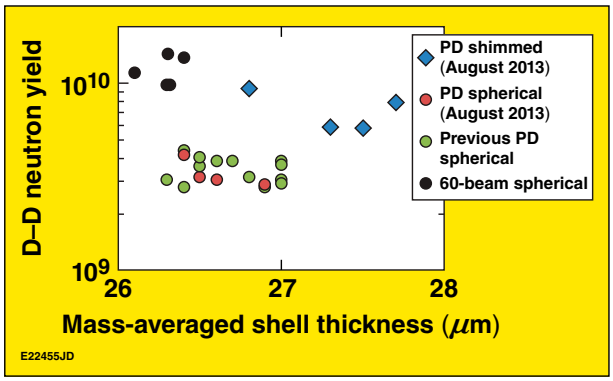


Figure 2. D–D neutron yield from shimmed and spherical capsule polar-drive (PD)–implosion experiments. All experiments used identical shell diameters, 10-atm $D_2$ fills, and 14 kJ of UV light delivered in a triple-picket pulse.

***Omega Facility Operations Summary:*** The Omega Laser Facility conducted 246 target shots in August with an average experimental effectiveness of 95.9% (148 on OMEGA with 96.3% effectiveness and 98 on OMEGA EP with 95.4% effectiveness). LANL, LLE, and LLNL led teams carried out 88 ICF and 70 HED targets shots. MIT- and the University of Michigan-led teams conducted 33 NLUF experiments, and LLE and LLNL scientists carried out 55 shots for the LBS program.

1. F. J. Marshall *et al.*, Phys. Rev. Lett. **102**, 185004 (2009).

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