Polar-Drive Experiments with Shimmed Shells: Polar-drive experiments are being performed on OMEGA in preparation for future ignition attempts using the same method on the National Ignition Facility. Recent experiments have shown that shimmed shells with the wall at the equator thinner than at the poles, can be used to control low mode drive asymmetry using the polar-drive configuration. The first results of these experiments were shown in the March 2012 DOE report.

The most recent shimmed target experiments used a set of CH capsules manufactured by precision machining at the General Atomics (GA) Target Facility. Targets were imploded with 14 kJ of UV light from 40 OMEGA beams using a triple-picket, high-convergence-ratio pulse shape. The beam aiming was chosen by using the ideal capsule thickness variation as input to a series of *DRACO* 2-D hydrocode simulations with varying beam pointing. The pointing chosen (0-, 120-, and 140-μm offsets for Rings 1, 2, and 3) resulted in the most-symmetric implosion in the simulations. This beam offset case is less than the optimum case found for spherical shells (without shimming) with polar drive on OMEGA as described by Marshall *et al.*[1] (90-, 150-, and 150-μm offsets for Rings 1, 2, and 3).

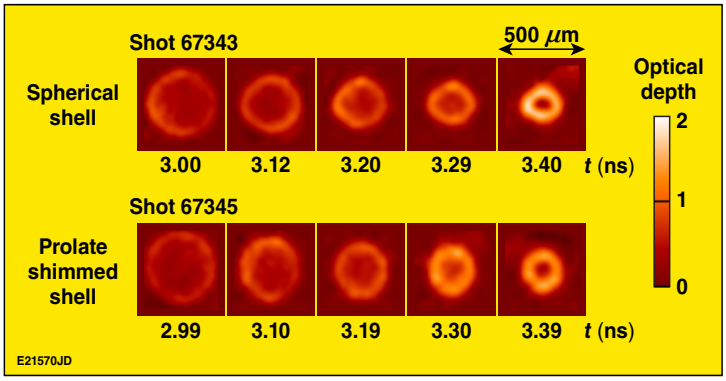

Figure 1. Sample framed x-ray radiographs from a spherical and a shimmed CH shell. The radiographs have been processed to remove noise and backlighter variation. The values correspond to the optical depth through the plasma as a function of position as indicated by the color bar.

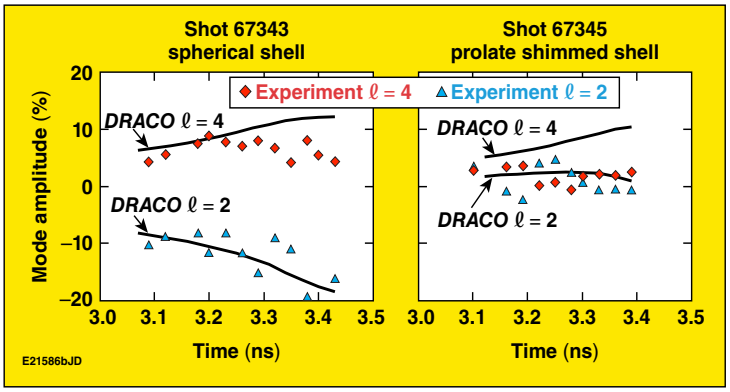

Figure 2. The measured Legendre mode amplitudes as a function of time for the lowest even modes, $\ell = 2$ and 4, determined from fits to the radiographs for a spherical shell and a shimmed shell. The mode amplitudes predicted by *DRACO* simulations are shown as solid lines.

The implosions were diagnosed with framed x-ray backlighting using a Ti backlighter ($E \sim 4.7$ keV) illuminated by eight of the 20 OMEGA beams not used for PD illumination. The framing camera had pinholes spaced to provide backlit images every 30 ps. Figure 1 shows sample radiographs from a spherical and a shimmed shell implosion from ~3.0 ns to 3.4 ns, corresponding to the time interval from just after the end of the laser pulse to just before stagnation. The shimmed shell implodes with a more-spherical shape for this beam pointing. Figure 2 shows the Legendre mode amplitudes ($\ell = 2$ and 4) determined from fits to the radiographs and comparisons to mode amplitudes predicted by *DRACO*. At the latest times the spherical shell exhibits an $\ell = 2$ of –20% (oblate shape) and an $\ell = 4$ of ~+5%, whereas the amplitudes are much reduced for the shimmed shell ($\lesssim$2%). The results of these experiments demonstrate that shimmed targets can be used to control low-mode amplitudes in PD implosions.

Omega Facility Operations Summary: The Omega facility conducted 132 target shots in September including 97 on OMEGA and 35 on OMEGA EP with average experimental effectiveness of 97.7% (97.9% on OMEGA and 97.1% on OMEGA EP). Thirty-four target shots were conducted for the NIC program by teams from LLNL and LLE. Twenty-one HED shots were carried out by LLNL. Three NLUF teams led by the University of Michigan, Rice University and the University of California at Berkeley carried out 41 target shots. Two LBS experiments accounted for 14 shots and the CEA carried out four experiments with a total of 22 target shots.

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

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