NIF Polar-Driven, Direct-Drive Activation Shot Tests: A second series of experiments were performed on OMEGA to validate the performance of DT-filled glass-shell implosions for nuclear diagnostic commissioning experiments on the National Ignition Facility (NIF). The targets were 10-atm-DT-gas-filled, 4-μm-thick, 1600-μm-diam glass shells mounted on 17-μm-diam boron fibers, similar to D_2 glass-shell targets imploded last year.[1] The DT filling was accomplished in a newly commissioned DT-glass-target-filling system at LLE.

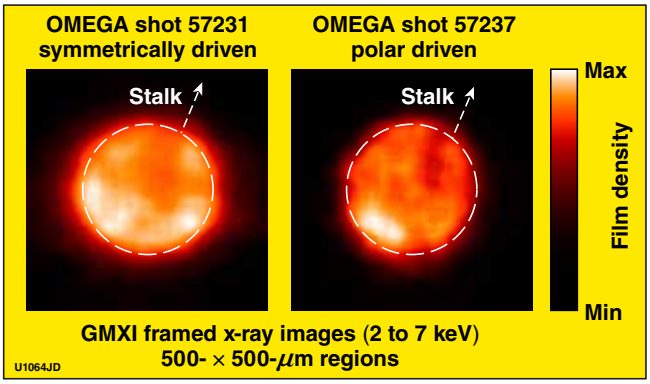

Figure 1. Film recorded framed x-ray images of the DT-filled glass-target implosion obtained with the GMXI near the time of stagnation (~2.6 ns after the start of the laser pulse), for both (a) a symmetrically driven target and (b) a polar-driven target. The target stalk direction is indicated by the dashed arrows.

These experiments consisted of both 60-beam symmetric and 40-beam polar-driven implosions. The nominal laser conditions were: 15.3 kJ of UV 351-nm light in a 1-ns-ramp-to-1-ns-flat-top pulse. This pulse makes it possible for a plasma to form on the outside of the target before significant power is applied, enabling higher absorption of off-axis light. It is expected that on the NIF the ramp pulse shape will be easier to power balance through a range of power settings. Figure 1 shows framed x-ray images of implosion cores for both a symmetrically driven and a polar-driven target. The images were taken with the gated monochromatic x-ray imager (GMXI) operating in a broad-band, framed mode. Frame times are near the beginning of stagnation at ~2.6 ns. Both targets appear to have a nearly spherical core, although the polar-driven core appears to be slightly more elongated (~3%) along the polar axis. Figure 2 shows the DT-neutron yields obtained with both the symmetrically driven and the polar-driven targets compared to the predictions of the 1-D hydrodynamics simulation code *LILAC*. The symmetrically driven implosions produced a near-1-D neutron-yield performance, while the polar-driven implosions produced, on average, 69% of the predicted yield. The absolute yield averaged ~6×10^{11} DT neutrons for the polar-driven targets.

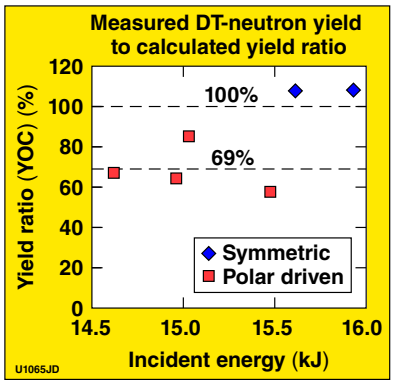

Figure 2. Ratio of measured DT-neutron yield to calculated 1-D yield (YOC) (in %) for symmetrically driven implosions (60 beams, blue diamonds) and polar-driven (40 beams, red squares) implosions at nearly equal laser energy(~15.3±0.5 kJ).

OMEGA Operations Summary: During March, the Omega Laser Facility conducted a new record total of 200 target shots with an overall effectiveness of 94.8%. The OMEGA 60-beam laser carried out 137 target shots with an average effectiveness of 94.5%, while the Omega EP Facility conducted 63 shots with an effectiveness of 95.2%. Of these shots, 123 were taken by teams led by LLE and LLNL for the National Ignition Campaign. Teams led by LLNL carried out a total of 34 target shots for the LBS program; 14 shots were taken for CEA and AWE programs; HED programs accounted for 7 target shots; and two NLUF teams led by MIT and the University of Michigan conducted a total of 22 target shots. Scheduled maintenance was conducted on both laser systems during the week of 22 March 2010. Highlights of the maintenance week activities included the following: on OMEGA—integration and testing of the three-color-cycle SSD pre-delay arm; integration testing of MCTC #7; and optics refurbishments including recoating the top 20 SG4 DPP's. On OMEGA EP—installing new, long-pulse apodizers on sources 3 and 4; integrating the high-contrast diagnostic control system; and replacing the SPHR 10 mirror.

1. Progress Report on the Laboratory for Laser Energetics, University of Rochester (July 2009).

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