Polar-Drive Experiments: Recent directly driven polar-drive-implosion experiments on OMEGA have been performed using a pulse shape (LA1501) designed to keep the shell on a low adiabat (~3), closer to the ideal conditions needed for ignition on the NIF. Marozas *et al*.,[1] have shown that the gain of a directly driven polar-drive target on the NIF can be optimized by a judicious choice of beam pointing, beam shape, and pulse shape. While not as optimum, it has been demonstrated[2] that symmetry of the polar-drive implosions can be reasonably well-controlled with beam pointing alone. Example radiographs of low-adiabat polar-drive implosions performed on OMEGA are shown in Fig. 1. The targets are 865-μm-diam, 15-atm-D_2-filled, 24-μm-thick CH shells imploded with 40 beams in the polar-drive configuration using the LA1501 pulse shape (1.5-ns long with a 1 to 3 foot-to-main pulse contrast) and ~15 kJ total energy at 351 nm with 1-THz SSD with polarization smoothing. The radiographs depict the implosion of a standard and Saturn target implosion just before and at stagnation (~2.2 ns). The dark rings in the first two frames of both implosions are caused by the shell absorbing the backlighter x rays. The bright central regions in the third frames are caused by x-ray emission from the core at stagnation. The standard target was imploded with beams offset to give the most symmetric core (90-, 150-, and 150-μm offsets for rings 1, 2, and 3), while the Saturn target was imploded with a slightly different beam pointing (90-, 120-, and 120-μm offsets for rings 1, 2, and 3). In addition to implosion symmetry, the radiographs are being analyzed to measure the time-dependent areal density. The areal density is estimated by assuming that the masses of the unablated part of the shell and the fill gas are conserved. These values can be compared to areal densities determined from the slowing down of D-^{3}He fusion protons produced at stagnation (Séguin *et al*.).[3] This has been applied to the standard target radiographs where the areal density (fuel + shell) is determined to be 55±5 mg/cm^2 at t = 2.31 ns and 61±5 mg/cm^2 at t = 2.37 ns (subsequent frame). The value determined from the proton measurements (time-integrated weighted to the time of fusion production) is 58±7 mg/cm^2 averaged over three lines of sight. The different techniques are in good agreement within the stated errors. For comparison, the 1-D hydrocode *LILAC* predicted a neutron-averaged value of 88 mg/cm^2. This analysis is continuing with the goal to improve the accuracy of the areal-density determination from the radiographs.

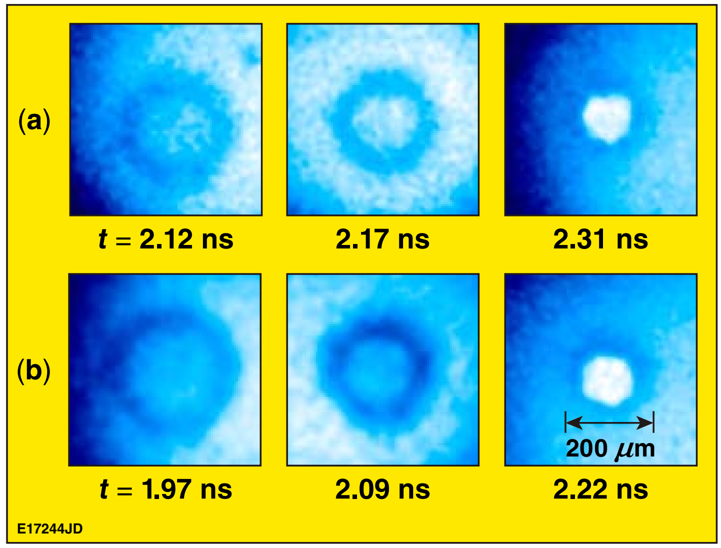

Figure 1. Time-framed x-ray radiographs of two polar-drive implosions: (a) Shot 49331—standard polar-drive target (Ti backlighter at 4.7 keV); (b) Shot 52135—Saturn polar-drive target (Sc backlighter at 4.3 keV). The last image in each series is near peak compression. The frame times are accurate to ±30 ps.

OMEGA Operations Summary: The OMEGA 60-beam laser conducted a total of 106 target shots in September with an overall shot effectiveness of 99%. The NIC IDI and NIC DDI campaigns accounted for 15 and 16 shots, respectively. The NLUF program received 18 shots for two experiments led by teams from the University of California, Berkeley and Rice University, respectively. LANL and LLNL scientists carried out 21 and 23 target shots, respectively, for HED campaigns, and AWE conducted a total of 13 target shots. Improvements in operating performance of the OMEGA EP Laser System are continuing. On 16 September 2008, a single OMEGA EP beamline generated 1.4 kJ of infrared light in a 10.5-ps laser pulse. This energy is more than a factor of 2 higher than has ever been achieved with a high-energy, short-pulse laser system. Finally, as a result of damage observed on the OMEGA EP beam-combining mirror, the March 2009 maintenance schedule was advanced to September 2008 to accommodate replacement of the damaged mirror.

1. J. A. Marozas *et al*., Phys. Plasmas **13**, 056311 (2006).
2. F. J. Marshall *et al*., J. Phys. IV France **133**, 153 (2006).
3. F. H. Séguin *et al*., Phys. Plasmas **9**, 2725 (2002).

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