***Implosions on OMEGA Exceed 50-Gbar Hot-Spot Pressures*:** Direct-drive–ignition target designs for the National Ignition Facility (NIF) require hot-spot pressures in excess of 100 Gbar. Only one-third of the required pressure was inferred in earlier experimental campaigns conducted on the 60-beam, 30 kJ, 351-nm OMEGA laser with direct-drive implosions of layered DT cryogenic targets.[1] Laser and target improvements were implemented on OMEGA to increase the stagnation pressure, including a set of phase plates to increase the laser irradiation uniformity on target and a purified fuel with the DT isotope composition reaching 50:50. Diagnostic improvements were made for a neutron burnwidth measurement with a 40-ps impulse response and a 16-channel Kirkpatrick–Baez (KB) microscope coupled to a four-strip x-ray framing camera to measure gated x-ray images of the core near peak compression with 6-μm resolution and interframe timing as short as 15 ps. Figure 1 shows a comparison of the measured and simulated neutron burnwidth for shot 77064; and Fig. 2 shows the sequence of KB-gated x-ray images recorded near the time of stagnation for the same shot. A comparison of the measured hot-spot pressure in DT cryogenic implosions with simulated pressure using the 1-D hydrodynamics code *LILAC* is shown in Fig. 3. The highest inferred volume-averaged, peak pressure in the current campaign almost doubled to 55±7 Gbar with a neutron yield approaching 5×10^{13}. Further target performance improvements to reach ignition hydrodynamic equivalence on OMEGA require mitigation of cross-beam energy transfer (CBET, which reduces the laser coupling) and a reduction in low-mode laser drive nonuniformity to achieve a more-symmetric implosion. The current campaign investigated a technique to reduce CBET by driving the spherical target with overlapping laser beams having individual focal spots smaller than the outside diameter of the target that was investigated. The diameter of the target was varied from 800 to 1000 μm, while the laser focal spot size was kept constant at 820 μm. The larger targets driven with up to 30 kJ of laser energy used dynamic bandwidth reduction, where the smoothing by spectral dispersion (SSD) is only applied to the pickets. The smaller targets driven with 26 kJ of laser energy had SSD on the entire pulse. The performance of the larger targets was found to be limited by a higher level of drive nonuniformity associated with increasing the target diameter relative to the laser beam size. Future experiments will explore beam zooming to mitigate CBET and the impact of improved laser drive uniformity on target.

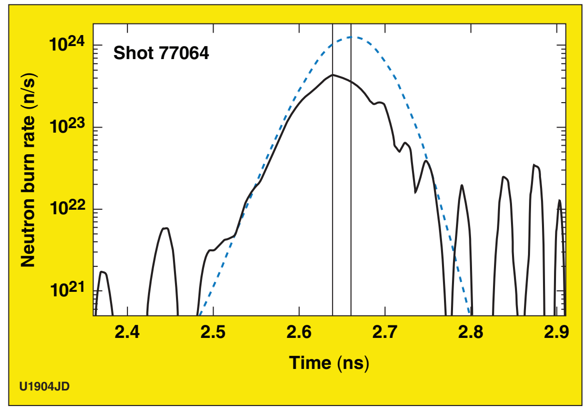

Figure 1. A comparison between the neutron burn rate measured with the P11 NTD diagnostic (solid black line) and the 1-D simulation (dashed blue line). The P11 NTD instrument response function has been applied to the 1-D simulated neutron burn rate.

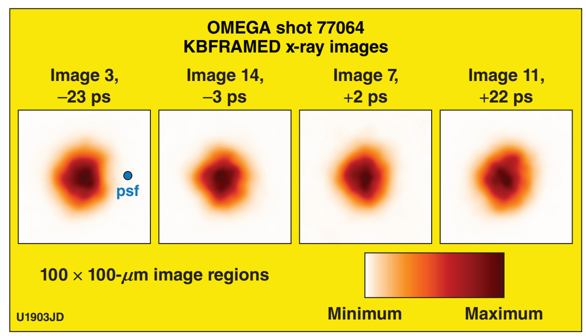

Figure 2. Gated x-ray images of a DT cryogenic implosion in the 4- to 8-keV photon energy range measured with the 16-channel Kirkpatrick–Baez microscope recorded at stagnation for shot 77064. The point spread function (psf) is indicated by the blue circle (~6 μm).

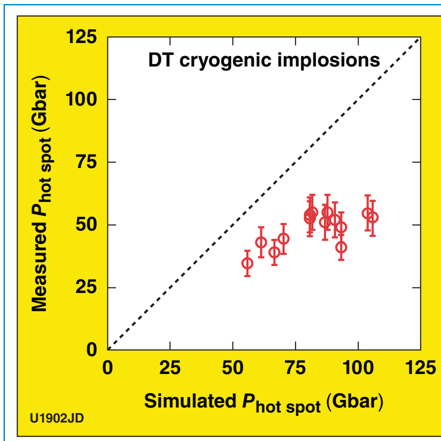

Figure 3. A comparison of the measured hot-spot pressure in DT cryogenic implosions with simulated values.

***Omega Facility Operations Summary*:** During April, the Omega Laser Facility conducted 243 target shots with an average experimental effectiveness of 97.5% (148 on OMEGA with experimental effectiveness of 96% and 95 on OMEGA EP with an experimental effectiveness of 100%). The ICF program accounted for 121 target shots for experiments led by LLE and Sandia National Laboratories. Ninety-five target shots were taken for the HED program for experiments led by LANL, LLNL, and LLE. Two NLUF experiments led by the University of Michigan and MIT accounted for 27 target shots.

1. V. N. Goncharov *et al.*, Phys. Plasmas **21**, 056315 (2014).