***National Ignition Campaign Hohlraum Energetics Experiments on OMEGA:*** Scientists at the Laboratory for Laser Energetics and Lawrence Livermore National Laboratory have demonstrated improved indirect-drive energy coupling using elliptical phase plates on OMEGA. Twenty beams, arranged in three cones and smoothed with phase plates, irradiated scale-1, Au halfraums [i.e., a hohlraum with a single-laser entrance hole (LEH)] with a ~7-kJ-shaped laser pulse (PS26). The cones have angles of incidence 21.4° (cone 1 with 5 beams), 42.0° (cone 2 with 5 beams), and 58.8° (cone 3 with 10 beams) to the hohlraum axis, which coincides with a pent axis on OMEGA. Laser-beam smoothing with phase plates significantly improved the coupling of laser energy to x-ray drive for gas-filled halfraums, consistent with earlier work on the Nova laser using circular phase plates and a single-cone beam geometry.[1] The 0.9-atm $C_5H_{12}$ gas fill, contained with a 0.6-$\mu$m-thick polyimide window over the LEH, forms a hohlraum plasma that inhibits movements of the laser absorption and x-ray emission region and prevents early axial stagnation of the high-$Z$ plasma blowoff. The absolute levels of x-ray flux were diagnosed with the DANTE diagnostic, and the levels of stimulated Raman scattering (SRS) and stimulated Brillouin scattering (SBS) were recorded back through the OMEGA focus lens with the full-aperture backscatter station (FABS). SBS outside of the lens was also monitored with the near-backscatter imaging (NBI) diagnostic. As shown in Fig. 1, the peak radiation temperature $T_r$ inferred from the measured levels of the x-ray flux increased by 17 eV when the laser beams were smoothed with phase plates. The improved coupling is a consequence of reduced laser scattering losses. As shown in Fig. 2, laser-beam smoothing with phase plates reduces the cone dependent FABS SRS and FABS SBS signals. The most energetically significant reductions occur for FABS SRS in cone 1 (23% to 10%) and cone 2 (17% to 4%). The total FABS scattering levels are higher for SRS than SBS (11% versus 5% without phase plates and 4% versus 2% with phase plates). The NBI SBS signal was 2% without phase plates and was negligible with phase plates. The NBI SRS signals are not available. The scattering losses accounted for with FABS SRS, FABS SBS, and NBI SBS were reduced by a factor of three with phase plates (18% without phase plates and 6% with phase plates). Phase plates reduce laser–plasma instabilities by controlling the on-target laser-intensity distribution and the modal power spectrum of the speckle. Elliptical phase plates are benefiting indirect-drive experiments on OMEGA.

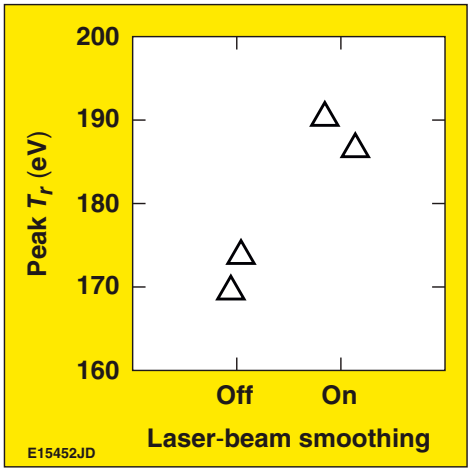


Figure 1. The peak radiation temperature inferred from the x-ray flux levels measured with the DANTE diagnostic as a function of laser-beam smoothing with phase plates.

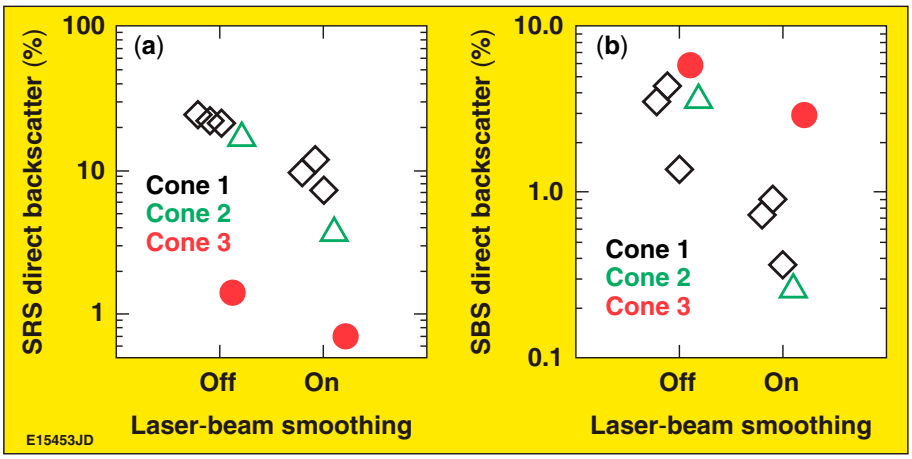


Figure 2. The laser scattering losses (a) FABS SRS and (b) FABS SBS for the three beam cones as a function of laser-beam smoothing with phase plates.

***OMEGA Operations Summary:*** OMEGA conducted 139 target shots in November as follows: LLE (84), LLNL (28), AWE (13), SNL (8), and 6 for an NLUF experiment conducted by the University of Nevada, Reno. NIC shots accounted for 76% of the month's target shots and the overall shot effectiveness (actual effective shots/scheduled shots) was 108.3%.

1. S. H. Glenzer et al., Phys. Rev. Lett. **80**, 2845 (1998).

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