**National Ignition Campaign Hohlraum Energetics Experiments:** Scientists at LLE and LLNL are conducting hohlraum energetics experiments on OMEGA for the National Ignition Campaign (NIC). The primary objective of these experiments is to study the effect of laser beam smoothing with phase plates on the radiation temperature $T_r$ and scattering losses of the hohlraum. A new phase plate was designed and fabricated for these experiments; it produces an elliptical far field (200 $\mu$m $\times$ 300 $\mu$m) at normal incidence and a nearly circular spot at the plane of the 0.8-mm laser entrance hole (LEH). Thin-walled, scale-3/4 and scale-1 Au halfraums were irradiated with a 9.7-kJ, 1-ns square laser pulse delivered by twenty beams that were smoothed with the new phase plates and arranged in three cones, as shown in Fig. 1(a). A large suite of x-ray and backscattering diagnostics was used. Four shots were taken with phase plates in drive beams and three were taken with defocused beams without phase plates. The preliminary results are consistent with the predictions for these empty Au halfraums; small differences were observed in the $T_r$ with and without phase-plate drive, and a higher $T_r$ was observed for the scale-3/4 halfraum ($T_r$ = 270 eV versus $T_r$ = 230 eV). The comparison illustrated in Fig. 1(b) between a gated image taken at $t$ = 0.15 ns and the superimposed template of the laser beams and the halfraum confirms the accuracy of the laser-beam pointing and the target positioning. Backscattering levels and hard x-ray emissions are being analyzed.

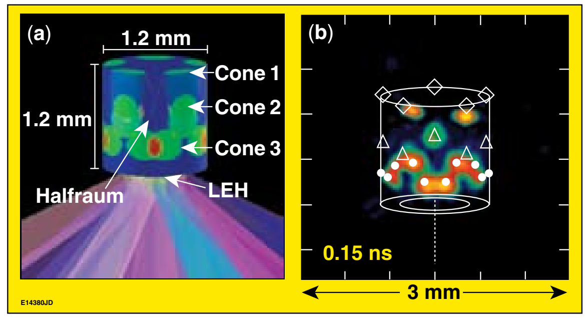


Figure 1. (a) VISRAD model of an empty scale-3/4 Au halfraum being irradiated with 20 laser beams that are smoothed with elliptical phase plates and arranged in 3 cones. (b) A gated ($\Delta t$ = 80 ps) hard x-ray (>8 keV) image generated at $t$ = 0.15 ns as the laser beams strike the inner wall of the halfraum. The plotting symbols represent the locations of the centers of the cone-1 beams (diamonds), cone-2 beams (triangles), and cone-3 beams (circles).

**Cryogenic Target Experiments:** The first direct-drive, ignition-scaled, cryogenic target containing tritium was imploded on the OMEGA laser in February 2006. The target contained 0.06% tritium by atom fraction. This implosion is the first in a series of planned experiments that will lead to a 50:50 DT cryogenic implosion in May 2006. Since there were no mechanical or controls issues identified during the filling process, the next target fill cycle will be done using an ~1% tritium fraction. A target from this fill will be imploded in early March 2006. This low-tritium experiment is quite interesting from a diagnostics standpoint in that the predicted primary yields for D + D and D + T fusion are similar. The capsule was imploded using a high-adiabat, 1-ns square pulse with 23.7 kJ (this drive gives the most predictable yields for diagnostic setup). The measured D + D yield was $6.7 \times 10^{10}$ or 66% of the clean 1-D calculated yield (yield over clean). The D + T yield, $2.2 \times 10^{10}$, was larger than the predicated 1-D yield and this discrepancy is being investigated. The D + D neutron yield is consistent with past cryogenic $D_2$ implosions. Figure 2 shows a D + $^3$He fusion proton spectrum measured using a wedged-range-filter spectrometer. There are clearly three components in the spectrum: (1) secondary protons from the fusion of D with primary $^3$He produced by the D + D fusion, (2) primary protons from the fusion of D with background $^3$He (present during the fill process from tritium decay), and (3) protons from the 14.1-MeV ($n$,2$n$) break up of deuterium. The energy loss (d$E$/d$x$) of the first component is used to infer the neutron-averaged areal density of the cryogenic fuel (35 mg/cm$^2$ or 85% of the predicted 1-D areal density). The second component can be used to infer the areal density as well and, as a line source at 14.7 MeV, may provide a cross-calibration between the standard d$E$/d$x$ technique and the tertiary neutron fraction (proportional to the square of the fuel density) measured using $^{12}$C activation. This cross-calibration should be possible with a tritium fraction of 10% or more.

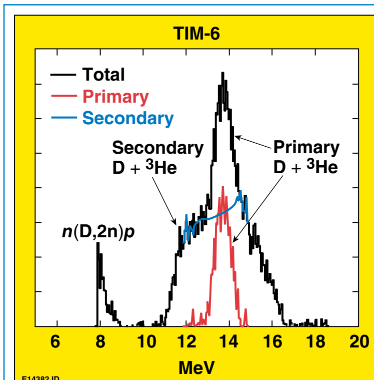


Figure 2. The measured proton spectrum shows three distinct components: a primary D + $^3$He fusion yield from background $^3$He, a secondary D + $^3$He fusion yield, and the 14.1-MeV ($n$,2$n$) breakup of deuterium.

**OMEGA Operations Summary:** A total of 134 target shots were taken on OMEGA in February 2006. IDI NIC experiments were conducted by SNL (17 shots), LLNL (15 shots), and LANL (3 shots). DDI NIC experiments were conducted by LLE (41 shots). LLNL also conducted 7 NWET and 11 HED experiments and LLE carried out 12 non-NIC shots. NLUF campaigns from Rice University, the University of Nevada, Reno, and MIT accounted for a total of 28 target shots.

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