Progress in Cryogenic Target Implosions: Cryogenic-DT-target surface defects induced during the permeation fill have significantly impacted target performance on OMEGA. The *April 2012 LLE Monthly* reported that the first attempts to reduce debris (beginning in May 2011) led to significantly improved yields. Figure 1 shows a current example of debris size and distribution; the total estimated number of defects is close to 100 and the total area of the defects exceeds 10,000 μm^2. Simulations have shown that these defects can lead to ablation-front "jets" that grow rapidly and carry ablator material from the surface into the core. The result is lower yields as the ablator material cools the core and lower areal densities (ρR) as the imploding shell is essentially broken up during acceleration. Since May, LLE has been exploring a broader range of target design space. The primary design parameters are the implosion velocity (V_{imp}) and the fuel adiabat (α). For a fixed laser energy, the V_{imp} is controlled by adjusting the mass of the target shell by changing either the ice and/or the ablator thickness. The fuel α is controlled by the strength of the leading shock and the radial position of the trailing shock coalescence. Raising the α at the ablation front was predicted to stabilize the defect growth rate, raising the yield but lowering the ρR (raising the pressure in the shell reduces the final compression for a fixed fuel mass and V_{imp}). During a series of implosions beginning in June 2012, LLE has simultaneously raised V_{imp} (mostly by thinning the ice, which has been as thin as 45 μm) and raised the adiabat to reduce the ablation-front growth. The experimental results (higher yields and lower ρR's) have exactly followed 1-D predictions. Figure 2 shows the data from the *May 2012 LLE Monthly* updated with the results of nine cryogenic-DT implosions in late July and August. The yields have routinely exceeded 1×10^{13} with a highest yield to date of 1.7×10^{13}. The ion temperatures (T_i) of these implosions ranged from 2.4- to 3.0-keV, while the ρR's ranged from 130 to 180 mg/cm^2 (generally both the T_i and ρR average 80% of the 1-D prediction). These results show that progress can be made toward the goal of demonstrating ignition hydro-equivalent performance while a solution for the target surface debris issue is being developed. The source of the debris may be organic gas contamination of the fill gas that condenses on the capsule's surface during the fill process. Three independent mitigation processes have been identified and the targets being filled for implosions in mid-October will show the results of the first mitigation process.

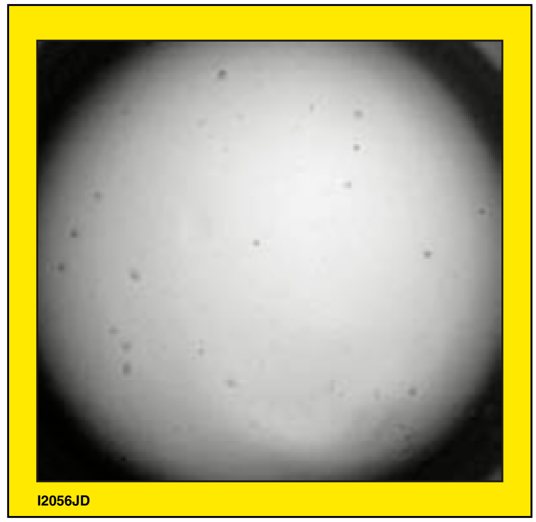

Figure 1. A pre-shot target shadowgraph shows the number and size of the isolated defects on the surface of the capsule.

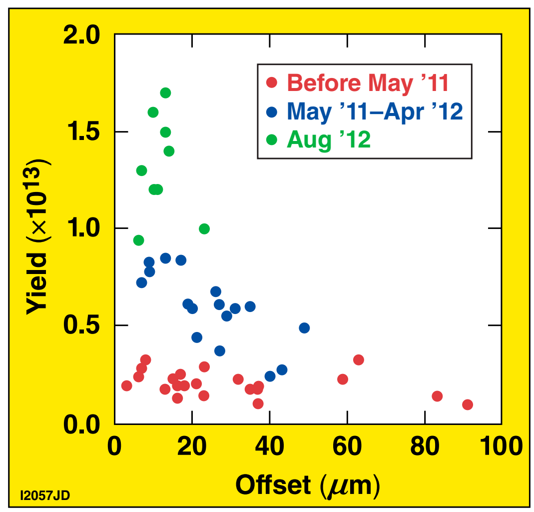

Figure 2. The primary DT yield is plotted as a function of the capsule offset from target chamber center. The red points are shots prior to May 2011 when surface-debris mitigation efforts began. The blue points show the progress between May 2011 and April 2012. The green points show that the debris yield impact can be mitigated through target design.

Omega Facility Operations Summary: The Omega Facility conducted 208 target shots in August—142 on the OMEGA laser and 66 on the OMEGA EP laser. The experimental effectiveness averaged 95.4% on OMEGA and 97.7% on OMEGA EP. LANL, LLNL, and LLE scientists carried out 78 target shots for NIC, and LANL and LLNL teams conducted 65 shots for the HED program. Four LBS experiments led by LLNL and LLE scientists accounted for 44 shots and two NLUF experiments carried out by MIT and the University of Michigan had 21 target shots.