Improved Cryogenic-DT Target Performance: Since achieving 1-D areal-density performance (0.3 g/cm^2) in low-adiabat cryogenic-DT implosions,[1] LLE has been working to reduce the sources of nonuniformity that impact the neutron-yield performance. These sources include the roughness of the DT-ice surface inside the capsule, the roughness of the outer ablator surface, and the offset from target chamber center (TCC). Figure 1 shows a summary of the requirements and current capabilities for these sources based on 2-D *DRACO* simulations.[2] The inner-surface DT ice routinely meets the 1-μm-rms roughness specification for ignition targets (c.f. the July 2010 Progress Report). The offset requirement is being addressed with the development of new Moving Cryostat and Transfer Carts, where the goal is to have 50% of the targets within 10 μm of TCC (these carts are being qualified now). The ablator surface finish has proven to be a particular challenge because of condensed gases on the surface of the capsule. Figure 2(a) shows a surface-focused image of a DT target in the Characterization Station. A number of surface features can be identified. Extensive testing confirmed that these features are associated with frozen gases introduced during the fill and target-transfer processes. The size of these features lead to significant degradation in the primary yield because of hot-spot disruption from jets formed during the deceleration phase. Modifications to the fill and transfer processes have significantly reduced the number and size of these features [Fig. 2(b)]. In May, three targets with substantially reduced surface features were imploded with the standard 25-kJ, $\alpha \sim 2$ triple-picket drive pulse. These targets produced a yield 2× higher than earlier targets with "historical" levels of surface contaminants. Figure 3 shows a plot of the neutron yield as a function of offset from TCC for all of the cryogenic-DT implosions since early 2010. The three relatively defect-free target shots from May are the red points; the blue points are the remaining targets. The yield degradation with offset is clear and suggests that ultimate cryogenic-DT yields could go above 1×10^{13} for defect-free targets and offsets of 10 μm or less.

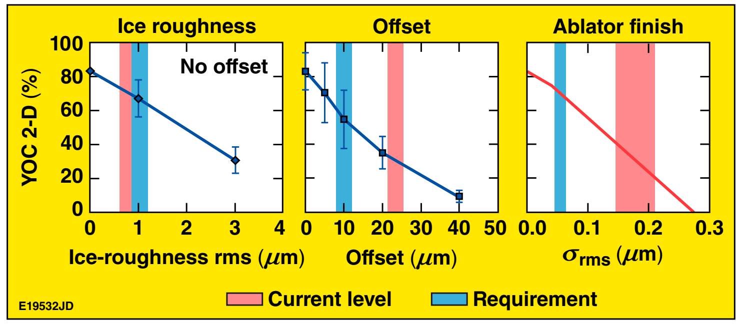

Figure 1. The 2-D yield over clean is plotted as a function of perturbation magnitude for the inner-ice roughness, the offset from TCC at shot time, and the outer surface ablator finish. The red bars represent current capability while the blue bars are the requirements based on the simulations. The "zero" points on each plot represent only the degradation from long wavelength laser nonuniformity (pointing, power balance, and beam timing). The degradation in each plot is caused solely by that particular perturbation source.

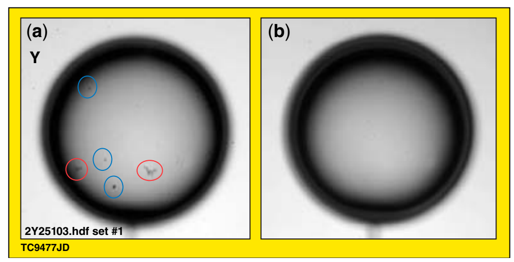

Figure 2. (a) Surface-focused image of a cryogenic-DT target in characterization shows several significant features that have been identified as frozen gas on the surface of the capsule. (b) Careful process control has significantly reduced the number and size of these features with the most recent DT fills (image of target that produced the highest neutron yield in Fig. 3).

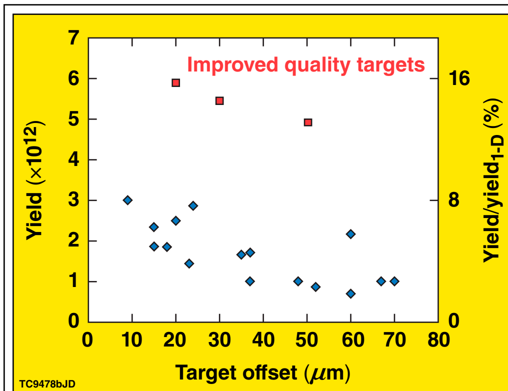

Figure 3. A plot of the measured yield as a function of the offset from TCC shows that targets with reduced surface features [Fig. 2(b)] perform significantly better than targets such as the one shown in Fig. 2(a).

Omega Facility Operations Summary: During May, the Omega Facility conducted 161 target shots: 117 on the OMEGA 60-beam laser and 44 on the OMEGA EP laser. The overall average experimental effectiveness was 93.8% (93.6% on OMEGA and 94.3% on OMEGA EP). The National Ignition Campaign accounted for 49 of the target shots taken by teams from LLE and LLNL. The HED program received 36 shots for experiments led by scientists from LLNL and LANL. Two NLUF experiments led by scientists from the University of Michigan and Princeton University accounted for 11 target shots and two experiments with 20 target shots were carried out under the LBS program by scientists from LLE. The AWE and CEA programs took 29 and 16 target shots, respectively.

1. V. N. Goncharov *et al*., Phys. Rev. Lett. **104**, 165001 (2010).
2. S. X. Hu *et al*., Phys. Plasmas **17**, 102706 (2010).