Cryogenic D_2 Layer Characterization: The characterization of OMEGA cryogenic targets is based on shadowgraphs of the targets obtained from multiple angular views taken while the target is rotated inside the layering sphere. The deuterium ice has been observed to relayer inadvertently during these rotations, as illustrated in Fig. 1, where the radial location of the bright ring due to the D_2 ice layer is shown for three different conditions: before any rotation of the target (blue), after a full 360° rotation during which 24 shadowgrams were taken over a period of 40 min (red), and after staying in the final position for 3.5 h (black). The black and the blue curves are essentially identical, implying a relayering to the original ice layer has occurred. A good estimate for the relayering time constant is obtained from a sequence of shadowgrams taken over a 70-min period starting after a 180° rotation of a target that had previously been well-layered and stabilized. The radius of the bright ring was determined for each shadowgram as a function of angle, as in Fig. 1. Using the last image of this series as a reference for the stabilized layer, the radius of this image (as a function of angle) was subtracted from the corresponding radii of all the preceding images. Plotting the rms values (σ_{SD} in Fig. 2) for each of these (difference) traces clearly shows the exponential evolution toward the final layer with a time constant of τ ~18 min.

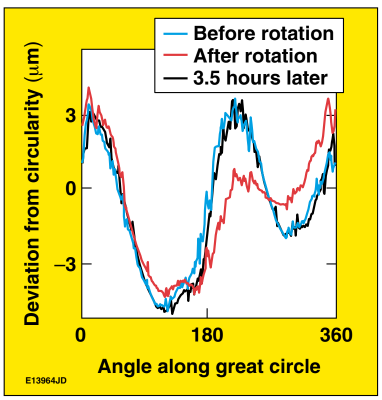

Figure 1. Angular traces of the radius of the bright ring obtained with a cryogenic target prior to rotation (blue), after a 40-min rotation (red) and 3.5 h later. Relayering of the ice during the slow rotation is evident, as is the return to the original layer quality after an appropriate waiting period.

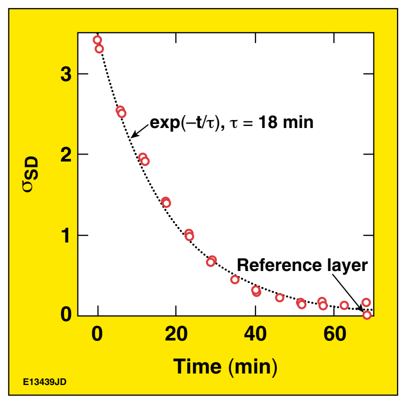

Figure 2. Temporal evolution of the relayering of the ice after an initial angular relocation of the target. For each time, the value σ_{SD} is obtained as the rms difference (averaged over angle) between the instantaneous ice-layer trace and the final trace (analogous to the black line in Fig. 3).

On the basis of these observations, a scheme for obtaining an accurate series of angular views of the ice layer uniformity has been developed and verified, as shown in Fig. 3. Choosing a home position, different angular images are obtained via short excursions to the desired angular positions. Comparing the ice layer uniformity trace for the "home" position of the target before rotation (blue trace in Fig. 3) with one taken right after the angular excursion (red) and another one 20 min later, it is evident that all traces are practically identical. This operational method ensures the acquisition of images well suited for good ice layer characterization.

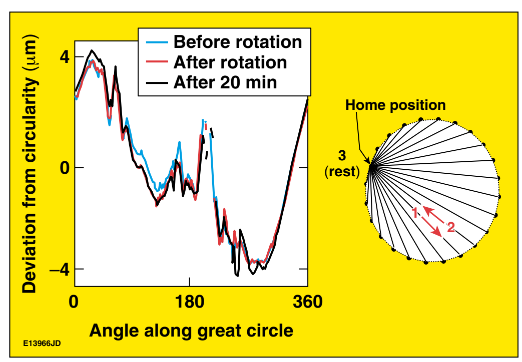

Figure 3. Improved shadowgraphic image acquisition method that avoids relayering through short excursions to the desired angular position followed by a return to the "home" position. The resulting bright ring traces before and after the angular excursion as well as 20 min later show no evidence of relayering (a). The scan pattern for acquiring the data is shown in (b).

OMEGA Operations Summary: During July 2005, OMEGA conducted a total of 106 target shots for LLE, LLNL, LANL, CEA, and NLUF. The LLE experiments included 25 shots for the ISE, SSP, and RTI campaigns; LLNL had 19 shots for the cocktail hohlraum, DDP-S, and IDrive campaigns; LANL conducted 33 shots for the neutron imaging, DTRAT, time-dependent mix, Be defect, and double-shell target campaigns; CEA carried out 12 shots for the feedthrough and shock-breakout campaigns, and NLUF included 12 shots for MIT experiments on proton radiography and 5 shots for the University of Nevada, Reno, for experiments on analysis of the spatial structure of direct-drive implosion cores.

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