Cryogenic DT Target Research: Cryogenic DT targets that meet the OMEGA ice-quality-surface specification are routinely provided. Since the inception of tritium cryogenic operations in the Spring of 2006 a total of 36 cryogenic DT targets have been imploded, and approximately triple this number have been produced for ice-layering studies. Tritium emissions were well below the regulatory limits. The median rms ice roughness for the entire surface (all modes) of the DT targets was 1.0 μm and the average value was 1.1±0.4 μm. This range is primarily due to the time available for the ice layer to form; in practice there is a 60% probability of forming an ice layer of 1 μm or better within 24 h and the typical time for fully forming the ice layer is 12 h. (These statistics include the earliest ice layers produced when the protocol was still in development.) The ice-layering process was observed to be very repeatable: multiple attempts to form ice layers in the same capsule yielded layers with a comparable roughness (0.15-μm standard deviation). There is a variation in the ice-thickness distribution pattern in each of the attempted layers; that variation is attributed to the inherent variability in the ice solidification and growth process (see Fig. 1). One issue of concern with DT targets is how the ice layer withstands the decay of tritium: effects that result from the production of ^{3}He atoms and the rupture to the ice-crystal structure caused by energetic β-electrons re-depositing their energy in the ice. After two days there was no quantifiable change in the roughness of the ice layer. After 14 days the ice roughness increased from 1.0 μm to 1.4 μm (measured for all modes and representative of the entire surface). After an additional five days the roughness increased to 2.0-μm rms (see Fig. 2). There was no evidence of ^{3}He bubbles present in the ice.

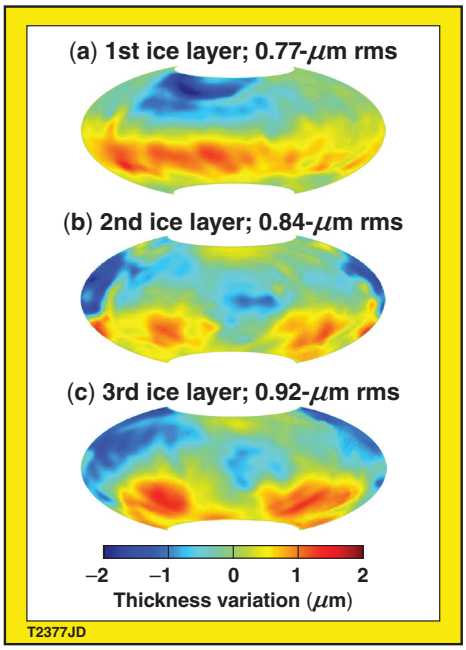

Figure 1. The variation in the thickness of a 95-μm ice layer is shown using Aitoff projection of the analyzed shadowgrams. Three separate ice layers, formed in the same plastic capsule [(a)–(c)] demonstrate the repeatability of the process: the rms roughness of each layer is comparable.

OMEGA Operations Summary: OMEGA conducted 81 target shots during December 2007, with an average effectiveness of 97.5%. Of these shots, 52 supported the NIC campaign and were carried out by teams led by LLNL (22 shots) and LLE (30 shots). The non-NIC shots included LANL (12) and LLNL (10) HED experiments and 7 laboratory basic science experiments conducted by LLE. The last week in December was a scheduled maintenance week including the following activities: selective optics replacements, integration of the OMEGA EP short-pulse beam-transport tube to the OMEGA target chamber, and modifications and improvements to the fiducial laser system.

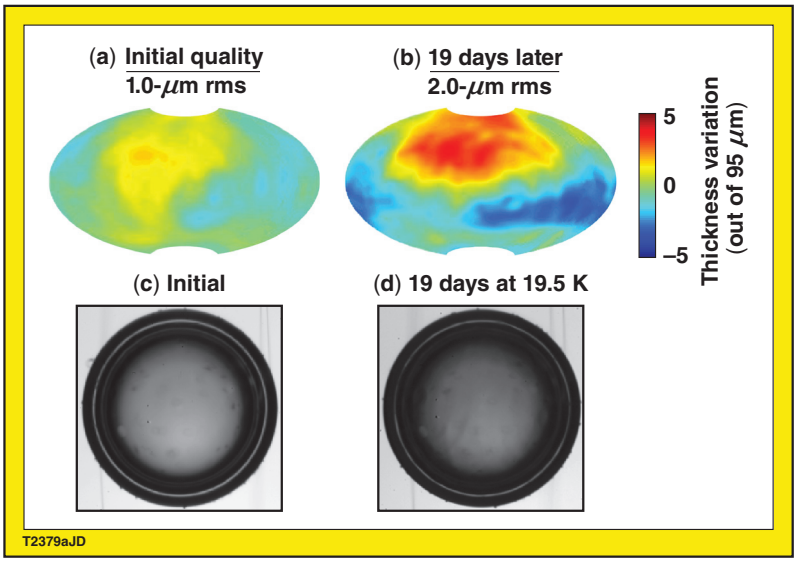

Figure 2. The increase in roughesss of an ice layer that was allowed to age for 19 days is shown using Aitoff projection [Figs. 2(a) and 2(b)] and shadowgrams [Figs. 2(c) and 2(d)]. The latter images show no evidence of ^{3}He bubbles forming within the ice.

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