

ICF Target Support Highlights

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General Atomics, with our partner Schafer Corporation, serves as the ICF Target Support Contractor, providing target development and fabrication and target system engineering development to support the ICF program at five ICF Labs — LLNL, LANL, NRL, SNL, and UR/LLE. This informal newsletter contains highlights of that support for June 1999.

GA/Schafer onsite staff at LLNL, LANL, and SNL fabricated, machined, assembled and characterized more than 500 targets of various kinds for experiments on Nova, Omega, Trident, and Z. We fabricated, characterized, and delivered almost 500 targets and target components, including micromachined hohlraums, witness plates, and foams to LLNL, LANL, and SNL for shots on Nova, Omega, and Z, plastic and glass microballoon capsules to LLNL, LANL, and UR/LLE for shots on Nova and Omega, and flat foil targets of various materials and configurations to NRL and UR/LLE for experiments on Nike and Omega.



Fig. 1. Shroud Puller System

The Omega Cryogenic Target system fills a cryogenic target and transports it to the laser focus point in the Omega target chamber. As part of this process, a mobile cryostat maintains the target at 18 K while it is in transit. A cooling shroud surrounds the target. The mobile cryostat rides in a transport cart for about 30 m (100 ft) from the target fill room to the area under the target chamber. The transport cart docks with a 400 mm (16 in.) diam. port that extends from the bottom of the target chamber. The mobile cryostat is then elevated out of the transport cart, rising 6.1 m (20 ft) to the target chamber's center, and locked in place. A shroud pulling system removes the mobile cryostat's upper cooling shroud, exposing the target so that the laser's beams have unobstructed access to it. After the laser shot, the shroud must be replaced onto the mobile cryostat in exactly the same location and orientation that it was in when it was removed. The shroud pulling system was described in the January 1999 ICF Target Support Highlights.

The equipment that will perform these cryostat transport and shroud handling processes for Omega was installed and tested at General Atomics from March through May 1999. The test apparatus closely represents the Omega installation. LLE provided much of the equipment that was used, including a 3 m (10 ft) long surrogate target tank that simulated the Omega target chamber. This unit was equipped with a target viewing system and a high speed camera capable of capturing 500 frames per second. Other equipment provided by LLE included a cryostat elevator system, transport cart, and the lower pylon, which locates the cryostat inside the target tank. Various LLE personnel were instrumental in the installation and checkout of the equipment. Karl Boline of GA led the testing activity. Figure 1 shows the upper portion of the test installation, including the shroud pulling system and the top segment of the surrogate target tank, which extends through the floor from below. Figure 2 shows the remainder of the surrogate target tank, the transport cart, cryostat elevator, and a work platform. The entire installation was about 9.2 m (30 ft) tall.

During the testing period, all system operational functions were repeatedly performed successfully. The transport cart was docked under the surrogate target tank, and the mobile cryostat was elevated into it and locked in place. The cryostat's fine positioner was used to position the target. The target was observed using the viewing system. Video recordings of the target's motion during shroud removal and replacement events were made. The shroud pulling system was used to remove the mobile cryostat's upper cooling shroud at full speed and replace it. Twenty shroud retraction cycles were performed with a target in place. Numerous shroud retractions were also performed without a target. The target was never dislodged during the trials, and the cooling shrouds did not incur significant signs of wear. The surrogate target tank, transport cart, and cryostat elevator vacuum chamber were operated at 2×10^{-5} Torr during the testing activity. All tests were performed with the mobile cryostat at ambient temperature.



Fig.2. Surrogate Target Tank, Transport Cart, and Cryostat Elevator

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