REMOTE HANDLING OF CRYOGENIC TARGETS FOR THE OMEGA LASER SYSTEM

G.W. Silke and C.R. Gibson
General Atomics. P.O. Box 85608, San Diego, California 92186-5608

General Atomics has designed and fabricated a system for the handling and processing of cryogenic targets for inertial confinement fusion (ICF) experiments on the University of Rochester's OMEGA laser system. This equipment provides the capability to routinely fill 1 mm diameter, hollow spherical plastic targets with up to 1500 atm of a 50/50 mix of deuterium and tritium (DT) gas. It then cools them to ~20 K to freeze the DT gas to a solid, and transfers them to a moving cryostat which places the targets into the target chamber at the focal spot of Omega's 60 laser beams. The handling of these delicate targets at temperatures down to 16 K and a vacuum of 10^{-6} Torr presents some unique challenges for remotely operated mechanisms. The remotely controlled target filling process takes place in a specially designed fill/transfer cryostat housed within a glove box. This paper discusses the process of filling and transferring these targets within the fill/transfer cryostat. Three of the remote mechanisms used in this process are discussed in detail. These mechanisms include a target manipulator, a shroud cooler lift and a stalk aligner. The technical requirements for such devices are reviewed along with the approach selected for this application. Considerations in the approach to actuation, bearings, compliance, cooling and control under operating conditions are discussed in detail. The fill/transfer station was assembled and tested at General Atomics in San Diego. It has been shipped to Rochester for installation and final integration.

Principal author:
Gerald Silke
General Atomics
3550 General Atomics Court
San Diego, CA 92121
Phone: (619) 455-2270
Fax: (619) 455-3521
E-mail: silkegw@gat.com

Second Contact:
Chuck Gibson
General Atomics
3550 General Atomics Court
San Diego, CA 92121
Phone: (619) 455-4071
Fax: (619) 455-2399
E-mail: gibsonc@gav.gat.com

Work done for the U.S. DOE under Contract DE-AC03-95SF20732