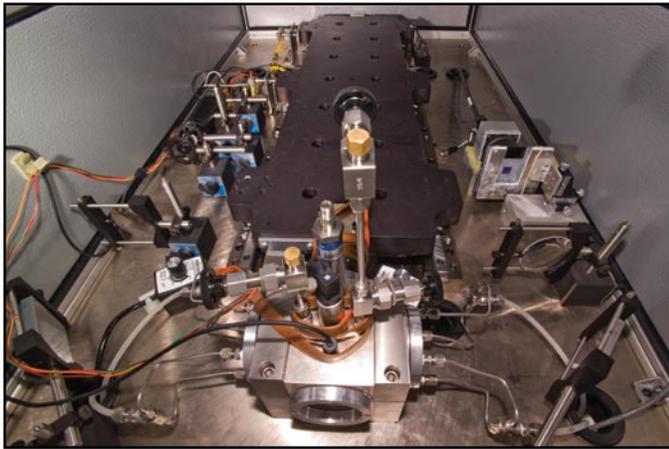


About the Cover:

A high-spatial-resolution neutron detector, based on a high-pressure freon bubble chamber, is being developed at LLE to image the 14-MeV neutrons emitted from the hot-spot region of fusion experiments on the OMEGA Laser System (see **Aperture Tolerances for Neutron-Imaging Systems in Inertial Confinement Fusion** on p. 203). As high-energy neutrons scatter in the supercritical freon, the ion recoil deposits energy locally (within a few microns of the scatter site), raising the temperature above the boiling point and forming a single bubble that quickly grows to more than 100 μm in diameter. The density distribution of these bubbles reflects the spatial distribution of the incident neutron flux. Graduate student Marian Ghilea is shown pointing to connectors and valves used to pressurize and fill the chamber with freon, while LLE Senior Scientist Craig Sangster looks on. A series of pressure and temperature sensors and the overpressure relief valve are found on top of the custom aluminum block that houses the bubble chamber. Water heated to 60°C is circulated within the aluminum housing and around the bubble chamber to maintain a uniform temperature throughout the freon.



This report was prepared as an account of work conducted by the Laboratory for Laser Energetics and sponsored by New York State Energy Research and Development Authority, the University of Rochester, the U.S. Department of Energy, and other agencies. Neither the above named sponsors, nor any of their employees, makes any warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, mark, manufacturer, or otherwise, does not necessarily con-

A top-down view of the bubble chamber and the imaging optics is shown. The linear motor used to drive the chamber expansion mechanism (to rapidly adjust the pressure in the freon at shot time) dominates the central area of the optical table. A 653-nm laser is used to probe the bubble density distribution using the Schlieren technique (the bubble density will be too high to count them individually). With proper timing, it should be possible to image the bubble distribution when the bubbles have grown to approximately 100 μm in diameter. The anticipated spatial resolution will be significantly better than more-conventional pixelated scintillator arrays that have a typical resolution of one millimeter. The higher detector spatial resolution will reduce the magnification requirements for neutron-imaging systems on OMEGA and the NIF. Lower magnification requirements relax some of the more costly design constraints for these ignition-relevant diagnostics.

stitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or any other sponsor. Results reported in the LLE Review should not be taken as necessarily final results as they represent active research. The views and opinions of authors expressed herein do not necessarily state or reflect those of any of the above sponsoring entities.

The work described in this volume includes current research at the Laboratory for Laser Energetics, which is supported by New York State Energy Research and Development Authority, the University of Rochester, the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No. DE-FC52-92SF19460, and other agencies.

For questions or comments, contact Tanya Kosc, Editor, Laboratory for Laser Energetics, 250 East River Road, Rochester, NY 14623-1299, (585) 273-3185.

Worldwide-Web Home Page: <http://www.lle.rochester.edu/>

Printed in the United States of America

Available from

National Technical Information Services

U.S. Department of Commerce

5285 Port Royal Road

Springfield, VA 22161

Price codes: Printed Copy A05

Microfiche A01