

HIGH SPATIAL RESOLUTION NEUTRON IMAGING OF INERTIAL FUSION TARGET PLASMAS USING BUBBLE DETECTORS

**NLUF Program Progress Summary Report for the period
November 1, 2002 through July 31, 2003**

by

R.K. FISHER

CAUTION

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**Work prepared for the
Department of Energy under
Grant No. DE-FG03-03SF22693**

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GENERAL ATOMICS PROJECT 30175
AUGUST 2003

ACCOMPLISHMENTS

- Goal of FY03–FY04 research is to develop techniques to record the bubble spatial distribution in the high efficiency liquid bubble chamber required for NIF imaging.
- Given limited funds in FY03, plan is to study alternative bubble recording techniques, including light scattering and x-ray transmission, with goal of determining most promising method prior to initiating laboratory tests. Less than 10% of the \$20K of FY03 NLUF funds have been spent to date.
- Initial assessment of x-ray transmission appears very attractive:
 - Change in x-ray transmission allows measurements under expected NIF conditions since there will be many bubbles behind bubbles.
 - Photoelectric effect dominates x-ray attenuation, minimizing multiple scattering “cross-talk” issue inherent in light scattering approaches.
 - Should allow bubble distribution measurements over a wide range of NIF n-yields; can choose flash x-ray timing to optimize bubble radius and hence $\Delta(\rho x)$ along x-ray paths.

FUTURE PLANS

- Complete preliminary assessment of x-ray and light scattering approaches to bubble distribution measurements.
- Perform laboratory tests addressing important issues, e.g., effects of multiple scattering during light scattering/transmission measurements.
- Prepare for system tests/neutron imaging experiments testing bubble chamber and readout techniques on OMEGA in FY05 and later.
 - Bubble chamber used will depend on status of LLE and Russian research on bubble detector development for neutron imaging.