GA–C24422

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

This is an informal progress report prepared for the contracting agency. The results and data may be preliminary or tentative and therefore subject to revision or correction. This report may contain patentable material in which patent applications have not yet been filed and further distribution of this report should not be made without the prior approval of the contracting agency or contractor.

DISCLAIMER

Work prepared for the
Department of Energy under
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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.