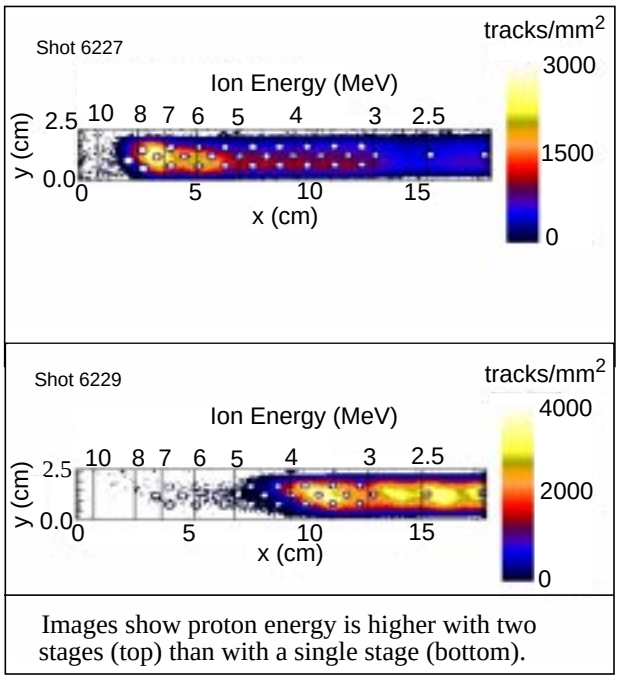
September 1993 Highlights of the Light Ion Inertial Confinement Fusion Program



Images show proton energy is higher with two stages (top) than with a single stage (bottom).

We fielded 12 two-stage diode experiments on PBFA II, with half the power delivered to each stage. The increased shot rate on this series is related to diode hardware design changes that permit rapid part replacement and to improvements in planning and operational procedures. Analysis of magnetic spectrometer data indicates that post acceleration occurred in the second stage (see figure). Using the second stage as an ion current monitor suggests a large, low-energy ion component may be the parasitic load. We are investigating methods to reduce LiF source divergence through smoother LiF anode coatings. Our goal is to deliver the first set of improved anodes for PBFA II experiments by December.

Cylindrical targets for the February targets series have a CH-coated gold hohlraum containing undoped CH_2 foam. An aluminum shock breakout plate will be used to corroborate hohlraum temperatures based on radiation diagnostic methods. A more rigid target holder must be designed since the present holder is too flexible to allow the hohlraum to survive being glued in place.

Code simulations are being used to improve extraction diode operation. TWOQUICK results indicate that electron emission from the outer cathode tip can reduce the feed electron contribution to ion current loss. A magnetically-insulated-transmission-line (MITL) insert designed with TWOQUICK decreases the precursor voltage by a factor of six to eight.

The jitter with the new SABRE electrically-triggered gas switches is below 2.5 ns; hence, time synchrony between the modules will provide good voltage addition and power flow. The data acquisition system and MITLs have been improved in preparation for the next shot series. Planned experiments using inductive heating with LiF could reduce beam divergence and mitigate parasitic loads. New detectors to investigate parasitic loads are being developed on SABRE for future PBFA II experiments. These SABRE experiments will be preceded by a shot series with the exploding metal film active anode plasma source that was developed at Cornell University.

Progress continued on the conceptual design of the National Ignition Facility. Design of the electrical system for the baseline concept is nearing completion. Stress and buckling calculations suggest a target chamber radius between three and seven meters may be possible. Work to specify the vacuum system has begun; gas loads will be defined by adjusting data from the Nova glass laser for a larger-radius chamber.

Contact: Jeff Quintenz, Inertial Confinement Fusion Program, Dept. 1202, 505-845-7245, fax: 505-845-7464, email: jpquint@sandia.gov.
Highlights are prepared by Mary Ann Sweeney, Dept. 1241, 505-845-7307, fax: 505-845-7890, email: masween@sandia.gov.
Archived copies of the *Highlights* beginning July 1993 are available at http://www.sandia.gov/pulspowr/hedicf/highlights.