October 1994 Highlights of the Light Ion Inertial Confinement Fusion Program

The first titanium sublimation getter pump has been assembled and is being tested in the PBFA-II Integrated Test Facility.

In October we attended a China-US-Japan workshop on laser plasmas and drivers in Beijing. We plan a major program decision in December, based on progress towards achieving 5 TW/cm^2 in December 1994 and 100 eV in a hohlraum by March 1995 by adopting the SABRE surface cleaning techniques on PBFA II.

The insulator stack and toroids on PBFA II were physically cleaned to remove oil, residue, and debris that could outgas in preparation for the surface cleaning series. Not oiling the stack and toroids is a major change to standard pulsed power procedure; however, no damage has been observed in ten shots. Heater cables, gas flow tubes, monitor cables, and chilled water piping have been installed. The residual gas analyzer and the cleaning and gettering hardware, including the titanium getter pump (see figure), are undergoing engineering testing. Simulations on SCREAMER, TWOQUICK, and QUICKSILVER are being used to plan the sequence of cleaning shots, scheduled to begin in November. Meanwhile, we have ordered new SABRE anode heating and cathode cooling hardware to see if further impurity removal, recontamination decrease, and cathode plasma formation control are possible.

Analysis of beam symmetry, position, and intensity on target is nearly complete based on time-integrated images of ion-induced x-rays from the titanium wire array that surrounded the cylindrical hohlraum in the August series. The peak intensity in quadrant 3, compared shot to shot for the last five shots, appears to be within 25%. This is much better than previously and should allow us to conduct high quality scaling experiments on PBFA II. Radiography of a sample target indicated no irregularities on a small scale, representing marked improvement compared to previous targets. Our radiation temperature of 63 eV is the highest so far with ion beams, and implementation of surface cleaning techniques on PBFA II should produce further increases. Several planning meetings were held to establish the hohlraum design criterion for the next target series, scheduled to begin February 1.

On Gamble II at NRL the observed instantaneous axial energy spread of the ion beam is being studied with time-resolved energy diagnostics. This phenomenon, also observed on PBFA II, may be coupled to the growth of beam microdivergence during transport in a gas.

An informal workshop is being organized at Sandia November 14 and 15. Invitations have been sent to U. S. and international laboratories where ion beam ICF research is done. Topics will include ion beam generation, focusing, and transport, beam target interactions, reactor concepts, and the synergy between light and heavy ion fusion.

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