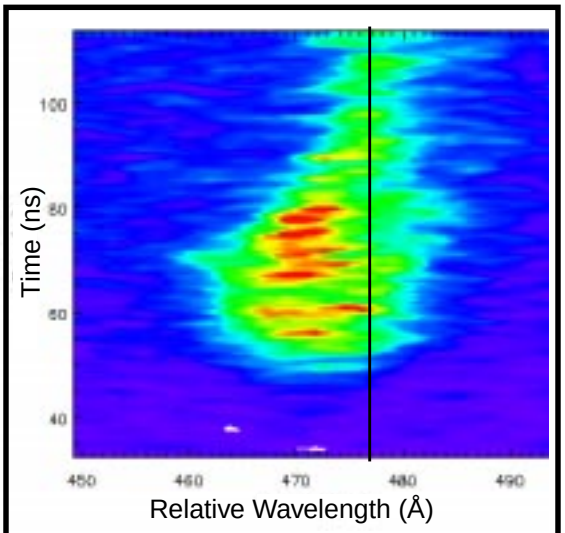
August 1993 Highlights of the Light Ion Inertial Confinement Fusion Program



Streaked line emission 200 μm from anode shows Stark shifting to left of black line. Shift indicates ~8 MV/cm field at anode.

The draft technical contract was presented to the Inertial Confinement Fusion Advisory Committee (ICFAC). Our program plan prioritizes tasks required to achieve our FY94 milestone of three-digit hohlraum temperatures. The FY94 budget of $27.9M is 15% less than requested. The ICFAC are sensitive to our need to adjust deliverables to be consistent with actual funding. We expect the final ICFAC report to be released in October.

We completed the ion source series on PBFA II and started the two-stage diode series. Initial downline tests for the first stage of the two-stage diode have been done. Improvement to source and diode theories continues. Visible spectroscopy data (see figure) indicate the electric field does not vanish at the anode in LiF source tests. An improved field emission model has been developed, and suggestions have been made for decreasing LiF source divergence, a potential high leverage item to increase beam intensity.

We have formulated an aggressive light ion target program that includes one series in February and one beginning in July. Cylindrical targets being designed for the series have radii between 2 and 3 mm. We are developing new diagnostics to characterize the beam as it arrives at the target and to measure the hohlraum temperature. Analysis of the second series of SNL/LLNL collaborative internal pulse shaping proof-of-principle experiments on Nova continued during August. The anticipated shocks were observed.

The reliability of the SABRE electrically-triggered switches is being increased without resorting to laser triggering. A new magnetically-insulated transmission line is being designed, based on a new model of electron flow in positive adders. The VUV spectroscopic diagnostic is being improved. This diagnostic will be the first direct measurement of transverse lithium ion velocities at the source. Presently, we measure lithium neutral velocities with visible spectroscopy and postulate that the ion source temperature is equivalent to the lithium neutral temperature. The normal insulator stack reconditioning on PBFA II was extended to replace insulators that were irreparably damaged during the 25-day shooting schedule. Such damage is correlated with poor machine synchrony that can cause free electrons in the vacuum section to impact and damage the acrylic rings.

Progress continued on the conceptual design of the National Ignition Facility. The baseline power conditioning system is nearly finished, and design of a backup system has begun. Preliminary stress calculations for the target chamber have been completed, and we are developing a robust design.

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