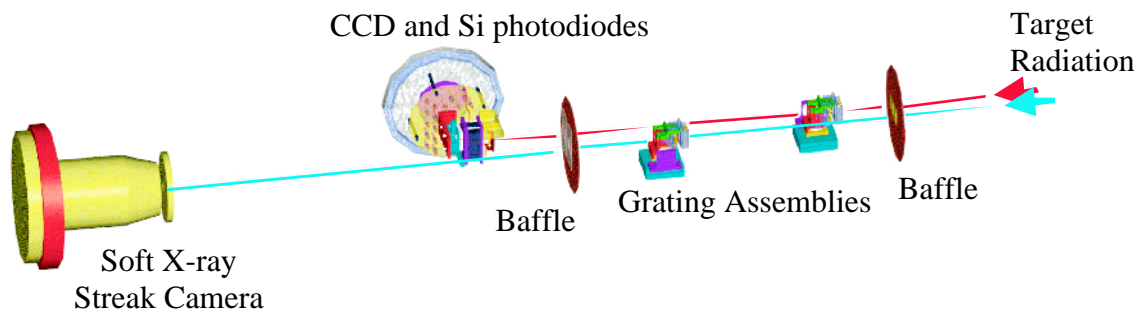


NRL LASER FUSION PROGRAM

March-April 2000 Bimonthly Highlights

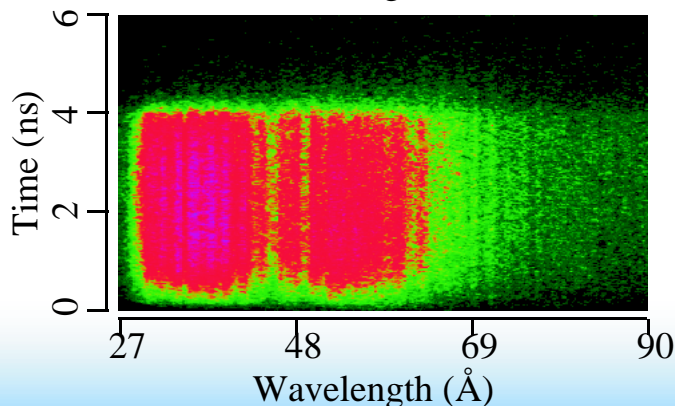
A Time-Resolving, Absolutely Calibrated Transmission Grating Spectrometer for Measurement of Soft X-rays at the Nike Laser Facility

In pellet designs proposed by the Nike group, soft x-ray emission from a high Z ablation layer heats an underlying compression layer prior to the main laser pulse. This preheating is intended to mitigate instability and improve compression efficiency during the main pulse. The development codes for this implosion scenario need to be verified experimentally. Since the wavelength range from 10 to 150 Å presents particular challenges for accurate intensity measurements, a new transmission grating spectrometer has been built to provide absolutely calibrated, time-resolved spectra from laser-irradiated targets.



Although similar spectrometers have previously been built at other laser facilities, the instrument developed for the Nike laser is distinguished by its use of two 2500 l/mm transmission gratings with two separate detector systems: a soft x-ray streak camera and a combination of absolutely calibrated Si photodiodes and a CCD camera. The photodiodes provide modest temporal resolution (~ 1 ns) and high sensitivity over discrete wavelength bands, $\Delta\lambda = 6.2$ Å. The image recorded by the CCD provides a time integrated spectrum that is used to determine the location and spectral coverage of each photodiode. The absolute calibration of the spectrometer components has been performed at the National Synchrotron Light Source at Brookhaven National Laboratories. Currently, the system is being used to measure the spatially integrated soft x-ray flux as a function of target material, laser power, and laser spot size. Modest spatial information will be obtained by the placement of small apertures near the target to restrict the observation region.

Soft X-ray Streak Camera Image
(W target)



CCD and Si Photodiode Arrangement

