

*May 1999 Progress Report on the Laboratory for Laser Energetics
Inertial Confinement Fusion Program Activities*



SSD Smoothing Rate: Ultraviolet equivalent-target-plane (UVETP) images of a single OMEGA laser beam were recorded on a CCD camera to quantify the single-beam irradiation nonuniformity. The smoothing rate of 2-D SSD at 0.25 THz was determined by analyzing the measured power spectra of 100-ps, 700-ps, 1-ns, 2-ns, 3-ns, and 3.5-ns laser pulses with constant peak power. In Fig. 1(a) the measured σ_{rms} is plotted as a function of pulse duration for a compilation of over 160 shots, along with the predicted level from 2-D SSD at 0.25 THz. The σ_{rms} is defined as the square root of the ratio of the power in the high wave numbers, up to the cutoff wave number, to the power in the low wave numbers (e.g., $k < 0.04 \mu\text{m}^{-1}$). The lineout in Fig. 1(b) shows a highly modulated spatial intensity profile for the pulse without 2-D SSD, while the 3.5-ns laser pulse with 2-D SSD shows a smooth spatial intensity envelope [see Fig. 1(c)]. The theoretical predictions of 2-D SSD laser beam smoothing are in good agreement with the measured temporal rate of SSD beam smoothing for a single high-power OMEGA beam.

DMX Installed on OMEGA: The CEA-DAM (the Military Applications Division of the French Atomic Energy Commission) together with the OMEGA Experimental Operations Group has begun to install and align a wideband soft x-ray spectrometer on OMEGA. This spectrometer will cover the 50-eV to 5-keV range with 14 channels at a spectral resolution of $E/\Delta E \sim 5$ and a temporal resolution of ~ 100 ps. This instrument will be calibrated absolutely *in situ* and will determine hohlraum radiation temperatures relevant to indirect-drive ICF experiments as well as x-ray conversion studies. It is an alternative to LLNL's

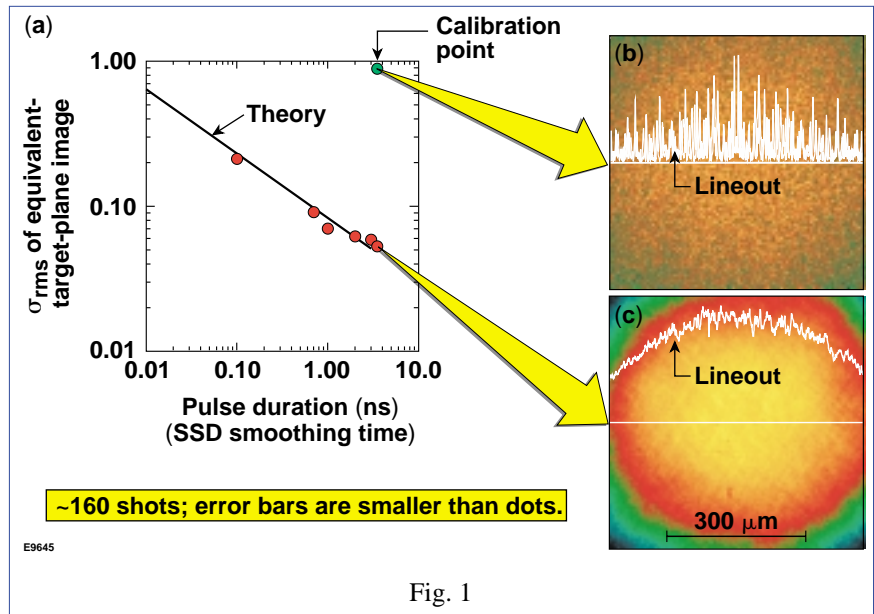


Fig. 1

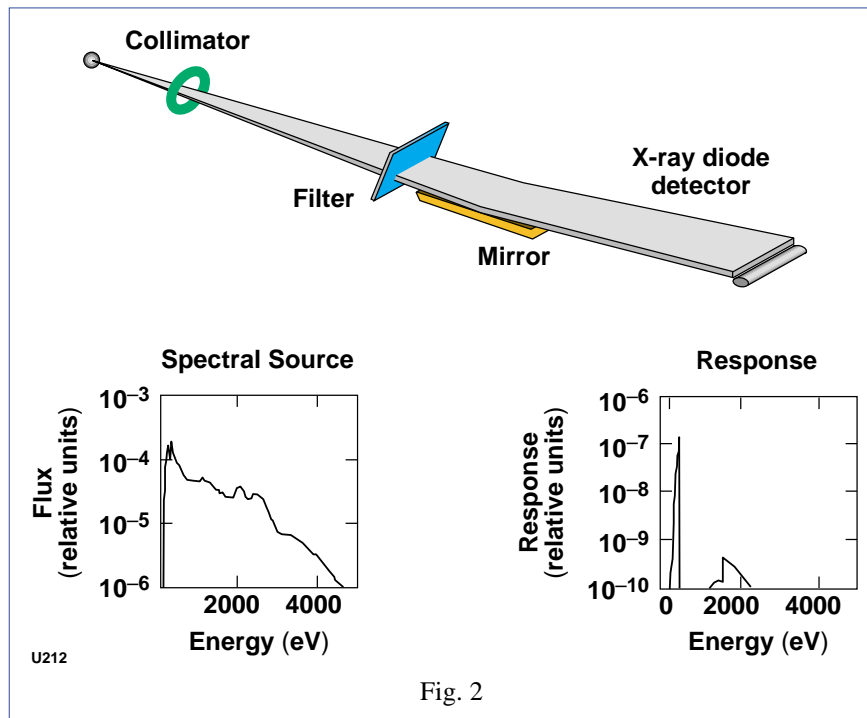


Fig. 2

DANTE and will be deployed on France's LIL and LMJ laser facilities and possibly on the NIF. A schematic representation of one channel is shown in Fig. 2. Sensitivity and temporal resolution have already been tested on OMEGA. The instrument is expected to be fully operational in FY00 for CEA-LLNL experiments under the CEA-DOE collaborative agreement.

OMEGA Operations Summary: For the month of May a total of 70 shots were conducted during three weeks of target shots. The shots were split between internal RTI campaigns (38 shots) and an LANL campaign investigating direct-drive cylinders (DD-CYL) (32 shots). During May a quarterly maintenance week was used to implement a major software update to all operations applications and the database backbone for OMEGA.