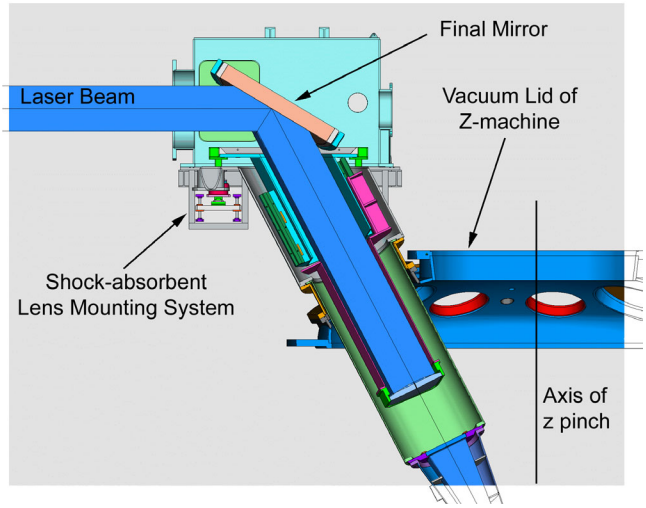
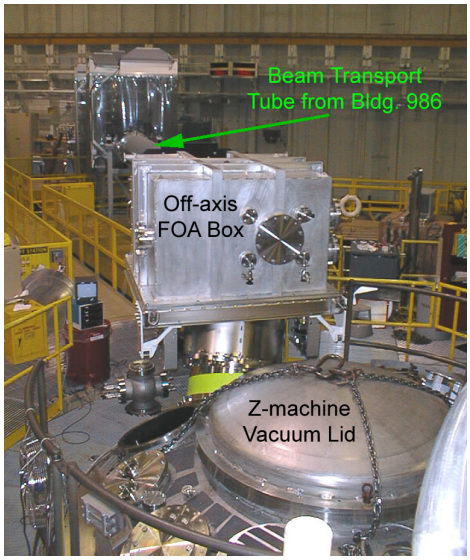
1673 News Notes: May 2002 Edition

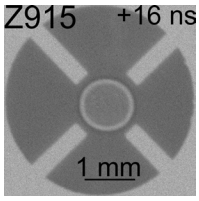


New Off-Axis Final Optics Assembly for Z Experiments

The original plans for Z-Beamlet (ZBL) called for a special final optics assembly (FOA) to bring the laser beam into the Z-machine vacuum chamber. It was called the "off-axis FOA", because the final optical components would lie off of the center axis of the z pinch, as seen in the diagram to the right. The design of the off-axis FOA was to be compatible with the axial diagnostic package of the Z-machine, which sits directly above the z pinch. As ZBL neared completion, however, it became clear that the construction of the off-axis FOA would not be completed in time. In order not to delay the use of the laser for experiments on the Z-machine, an "on-axis FOA" was constructed. The optical components in the on-axis FOA are mounted directly over the pinch and conflict with axial pinch diagnostics. Though backlighting experiments with the on-axis FOA were successful, work on the off-axis FOA continued.



The off-axis FOA has a number of advantages compared to the on-axis FOA that has been used until now, including (1) better spatial resolution in radiograph images (due to a lower magnification and a shorter focal-length focusing lens), (2) a more easily optimized beam focus onto the target due to a motorized gear for moving the final lens, (3) an irradiation angle onto the target foil that minimizes blurring due to plasma expansion, (4) better timing diagnostics to more accurately determine the time of the laser pulse relative to the z-pinch timing, (5) shock-absorbent mounting for the optics, and (6) compatibility with the on-axis diagnostic package.



Supervised by Shane Speas (Org. 1673), the assembly of the off-axis FOA has proceeded over a period of about 6 months, with testing of critical components occurring along the way. The first Z shots using the FOA were taken this May, and were extremely successful. A sample radiograph image from the first Z shot using the off-axis FOA is shown to the left. It is an image of a fusion capsule implosion similar to those discussed in the March 2002 News Notes. The radiograph image has much higher resolution than the previous experiments. The focal spot of the ZBL beam is 1 m from the z pinch with the off-axis FOA, compared to about 0.18 m using the on-axis FOA, resulting in a lower magnification for the same detector position. The off-axis FOA is presently being used in an ongoing series of backlighter experiments ending in July.

X-ray streak camera diagnostic for Z experiments

An x-ray streak camera diagnostic is now available for experiments on the Z facility. This diagnostic is mounted on line-of-sight 1/2 on the Z-machine. X-ray streak cameras are capable of generating one-dimensional images of x-ray sources with continuous time resolution. The unique feature of the x-ray streak camera setup on line-of-sight 1/2 is its use of grazing-incidence mirrors, which prevent x-ray photons with >1 keV energy from reaching the detector. This camera has successfully been used on several Z shots and is presently being calibrated using Z-Beamlet. Also being developed on LOS 1/2 is a framing pinhole camera diagnostic that uses an identical grazing-incidence mirror. For additional details, contact Keith Keller (klkelle@sandia.gov), David Wenger (dfwenge@sandia.gov), or Daniel Sinars (dbsinar@sandia.gov).

Recent Publications from 1673

1. D.L. Hanson *et al*., "Measurement of radiation symmetry in Z-pinch-driven hohlraums", Phys. Plasmas **9**, 2173 (2002).
2. M.E. Cuneo *et al*., "Double z-pinch hohlraum drive with excellent temperature balance for symmetric ICF capsule implosions", Phys. Rev. Lett. 88, 215004 (2002).

Edited by Daniel B. Sinars, dbsinar@sandia.gov ; Org. 1673 is managed by John L. Porter, jlporte@sandia.gov
Sandia National Laboratories, PO Box 5800, Albuquerque, NM 87185-1193.

Sandia is a multiprogram laboratory operated by the Sandia Corporation, a Lockheed Martin Co., for the United States Department of Energy under Contract No. DE-AC04-94AL85000.

Sandia National Laboratories