Target Fabrication at the University of Michigan

Overview - Laboratory Astrophysics
We produce processes relevant to astrophysical phenomenon, such as supernovae, in a laboratory setting.

By precisely scaling our experiments to observed phenomena such as Supernova 1987a, we can create similar conditions as those found in the astrophysical systems.

This process allows laboratory data to improve our understanding of astrophysical phenomenon in a quantitative manner.

What We Build
Targets for High-Energy-Density Experiments are named according to the dynamics we plan to study.

How We Build Targets
Parts are either purchased from vendors, such as General Atomics, machined on our microdrill/microlathe, or manufactured by our in-house machinist, Robb Gillespie.

For orientation and assembly of parts, we use the Target Fabrication System.

The Fabrication System contains two sets of stages and allows for both linear and rotational movement. These movements are highly precise, accurate to within tens of microns.

This setup is used in both building and metrologizing the targets.

Deliver Documents
Examples of technical drawings showing target design specifications

Metrology and Target Characterization
The graduate student leading the design process metrologizes the targets to insure that the placement of components are within appropriate tolerances. These measurements are important in both quantifying experimental conditions and for target alignment on shot day.

Specific key features of the target geometry are used in the alignment process, so the target can be precisely oriented relative to the diagnostics and laser drive beams.

Target Components

Running the Experiment
Experiments are run every three to four months.
Targets are transported to the Omega Laser Facility in Rochester, NY.

The experiments are driven by lasers and diagnosed in a variety of ways, including VISAR, SOP, Thomson scattering, and X-ray radiography.

Examples of key parts used in the experiments:
- Shield
- Drive Disk
- Gold Wedge
- Stalk/Fill Tube

The experiments are run with various configurations to study the dynamics we plan to observe.

How We’ve Progressed
We have progressed through various stages of target fabrication.

July 2003
August 2005
August 2006
Present