

Target Fabrication for Sandia's Z-pinch Accelerator*

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Sandia's Z-pinch accelerator is used to study stockpile stewardship, high energy density physics, equation of state (EOS) experiments, and fast ignition studies by driving 20 MA of electricity to create either high temperature plasma (>1 keV), or high magnetic fields (>1000 T), and high pressures (megabar to gigabar). The Z targets are designed to study the same physical concepts as the targets used for the laser drivers, such as Omega at the University of Rochester, but the differences between the drivers could make the Z target unrecognizable to a laser experimenter. The targets do not have laser entrance holes; instead the target is designed to be bathed in soft x-rays produced by nested wire arrays or driven by the strong magnetic field. There is a notable difference in the size, Z-pinch hohlraum targets are 10 to 20 mm long and 4 to 6 mm wide. The EOS targets vary greatly in size, but the smallest panel is roughly 20 mm wide and 30 mm tall. Furthermore, multiple EOS samples are tested simultaneously on Z shots as there are two to four panels per experiment and each panel contains one to five samples.

The differences in the targets present unique challenges and opportunities for target fabrication. The larger scale lends itself to micromanipulators and bench top presses, but assembly tolerances are not scaled with the larger size so precision is required. Characterization of these larger targets to high precision is also problematic.

Examples of the targets that have been fabricated for Z will be presented along with details of their fabrication and characterization. Potential targets for a future Z-pinch device to be used for fusion energy will also be presented.

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