

THERMAL NUCLEAR BLAST SIMULATION AT THE NATIONAL SOLAR THERMAL TEST FACILITY

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The National Solar Thermal Test Facility (NSTTF) is operated by Sandia National Laboratories and located on Kirtland Air Force Base in Albuquerque, New Mexico. The facility includes a heliostat field and associated receiver tower, two solar furnaces, and two point-focus parabolic concentrators. All can be used for simulating thermal nuclear blasts.

The heliostat field contains 222 computer-controlled mirrors which reflect concentrated solar energy to the test stations of a 61 m tower. The field produces a peak flux density of 250 W/cm² over a 15 cm diameter with a total beam power of over 5 MWt. Thermal nuclear blasts have been simulated using a high speed shutter (opening and closing time of 0.15 sec over a 1m wide aperture) in combination with heliostat control to produce square or shaped pulses. The shutter can accommodate samples up to 1x1 m and has been used by several U.S. and Canadian agencies. A glass-window wind tunnel located behind the shutter can accommodate samples up to 48x76 cm with simultaneous exposure to the thermal flux and air flow at velocities up to 120 m/s.

Each solar furnace includes a heliostat, a non-tracking parabolic concentrator, and an attenuator. One solar furnace produces flux levels of 270 W/cm² over 6 mm diameter and total power of 16 KWt. A second furnace, currently under construction, will produce flux levels up to 1000 W/cm² over a 4 cm diameter and total power of 65 KWt. Both furnaces include shutters and attenuators which can provide square or shaped pulses.

The two 11 m diameter tracking parabolic point-focusing concentrators at the facility can each produce peak flux levels of 1500 W/cm² over 2.5 cm diameter and total power of 75 KWt. High speed shutters have been used to produce square pulses.