



FACT SHEET

UNITED STATES AIR FORCE

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LASER EFFECTS TEST FACILITY



The Laser Effects Test Facility of the Air Force Research Laboratory's Directed Energy Directorate conducts experiments for the Laboratory, Department of Defense, Department of Energy, as well as other government agencies, U.S. industry, and universities. The facility's primary objective is to perform research to better understand the physics of laser interactions on various materials.

The test facility has a variety of unique test equipment to support experiments, to include the most powerful continuous-wave laser at the Laboratory's Phillips Research Site—a 50,000 watt, carbon dioxide electric discharge coaxial laser (pictured above). Many other lasers are also available, spanning the electromagnetic spectrum from ultra-violet to far infra-red wavelengths.

Laser Type	Wavelength (μm)
Excimer	0.308
Ar Ion	0.514
Nd:YAG	1.06
Nd:YAG	1.31
Ho:YAG	2.1
HF/DF	2.7/3.8
CO ₂	10.6

The lasers available at the Laser Effects Test Facility span the electromagnetic spectrum from the ultraviolet to the far infrared.

The Laser Effects Test Facility's extensive optics inventory enables tailoring of the laser beam spot size and irradiance profile to a variety of configurations. Data acquisition systems are capable of recording more than 64 channels of data per computer at rates in excess of 300 kilohertz (kHz) per channel. The data acquisition computers are complimented by state-of-the-art diagnostic equipment such as infrared cameras which measure spatial and temporal temperature distributions of the target of interest.

Capability	Description
<i>Vacuum Chambers</i>	Three chambers, up to 1500 ft ³ , capable of 10 ⁻⁷ Torr
<i>Data Acquisition Systems</i>	Capable of recording 64 data channels in excess of 300 kHz per channel
<i>IR Cameras</i>	Spatial and temporal temperature profiles to 1500 °C
<i>Pyrometers</i>	Measure temperature ranges of 50 - 5000 Kelvin
<i>Beam Diagnostics</i>	Beam spatial profilers, power heads
<i>High Speed Cameras</i>	Frame rates up to 10,000 kHz
<i>Wind Tunnel</i>	Enables simulated flight conditions experiments
<i>Reflectance Laboratory</i>	Dedicated laboratory capable of determining temperature-dependent laser coupling.
<i>"Weld Vision"</i>	Unique ultra-violet-laser synchronized video system capable of monitoring material ablation/pyrolysis under high laser irradiance.
<i>Underground Test Tunnel</i>	An 80-meter tunnel allowing downrange laser effects experiments
<i>SLAB--SecureLAB</i>	Laboratory certified for open storage of classified test assets

Some of the unique capabilities of the Laser Effects Test Facility.

One of the most unique capabilities at the test facility is the Reflectance Laboratory. The amount of laser energy thermally coupled, or transferred, into a target material is a fundamental parameter for analyzing and understanding the physics laser-material interactions. While room-temperature laser coupling may be determined with relative ease, the Reflectance Laboratory enables the acquisition of accurate coupling data during the actual laser interaction and resulting target surface property changes. The Reflectance Laboratory is also capable of performing coupling measurements in vacuum, which mitigates target surface oxidation during laser interactions.



Hemi-ellipsoid reflectometer , one of the critical hardware items of the Reflectance Laboratory

Testing at the facility is available to all government agencies and through cooperative agreements to U.S. industries. If interested in finding out more information on how the test facility may fulfill experimental or testing requirements, contact the Air Force Research Laboratory.

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