Engineering Test Facilities

Laboratory for Atmospheric and Space Physics
University of Colorado **Boulder**

(Courtesy LASP)

LASP engineering facilities are co-located with our scientific and technical resources. This collaborative environment enables dynamic interaction, problem-solving, and the exchange of ideas. Test facilities/ operations are available for use to external customers for an hourly rate. We are pleased to work with you regarding your test needs.

Having the facilities to develop and test spaceflight hardware onsite is a key ingredient to LASP's success. Our extensive test and calibration facilities enable our in-house engineers to work closely with scientists and mission operations staff in "test-like-you-fly" scenarios. Our ongoing legacy of in-house knowledge and focus on extensive testing before flight has contributed greatly to LASP's superior on-orbit performance record. The LASP Engineering Calibration & Test Group designs, builds, operates, and maintains these test facilities.

Thermal Vacuum Test Facilities

Engineering products that will endure the extremes of the space environment is a challenge. Engineers need to test and condition their instruments and components to ensure that they will function properly when exposed to the space environment. LASP has three thermal vacuum chambers that are used for mechanism performance, burn-in and life tests, as well as the more classic thermal balance and thermal cycling tests associated with flight integration and test programs. Rough vacuum is accomplished by oil-free rough pumps with cryo-pumps providing high vacuum. The cleanliness of all three chambers is monitored by dedicated residual gas analyzers and thermo-electric quartz crystal micro balances.

MOBI

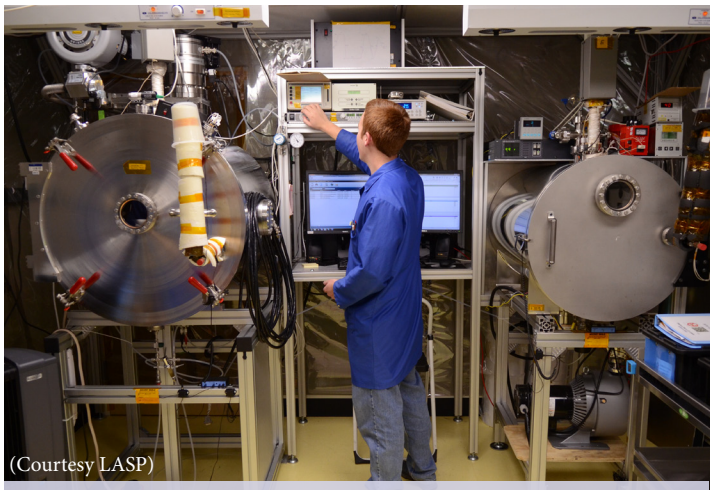
- Interior dimensions: 45" H x 36" W x 68" D
- Temperature range: -180 °C to +150 °C
- Base pressure: 1e-7 Torr

East and West BEMCO

- Interior dimensions: 20" H x 18" W x 35" D
- Temperature range: -75 °C to +80 °C
- Base pressure: 1e-7 Torr

Vacuum Bake-out Facilities

As part of the flight production cycle, LASP maintains three vacuum bake-out facilities. These facilities are used to provide the final vacuum bake of flight components in various stages of assembly and integration process to verify cleanliness and characterize outgassing properties as necessary. These facilities use

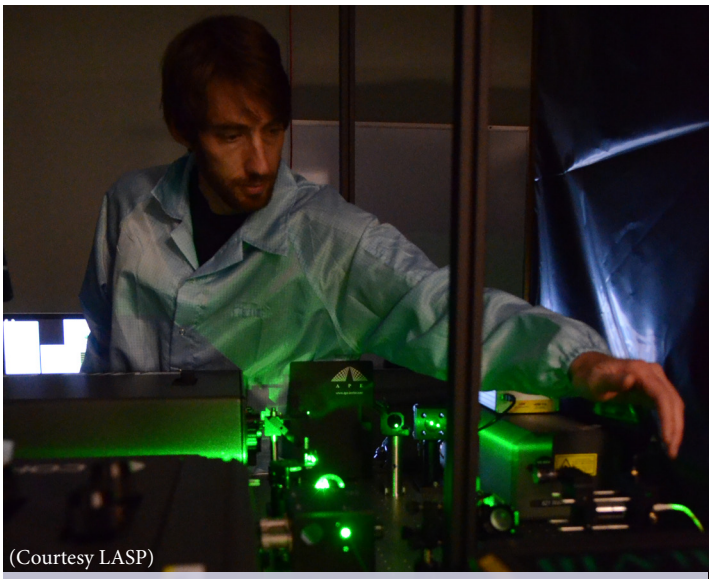

(Courtesy LASP)

A LASP engineer conducts operations in one of our three vacuum bake-out facilities.

oil-free turbo and rough pumps and are monitored with residual gas analyzers and thermo-electric quartz crystal micro balances.

Optical Vacuum Test Facilities

LASP has designed and built five vacuum chambers specifically for the optical characterization and calibration of detectors, optical components, and fully integrated instruments. Each chamber is optimized for a particular wavelength regime and all of them are pumped with oil-free high vacuum pumps and roughing pumps. Vacuum cleanliness is routinely monitored with dedicated residual gas analyzers.

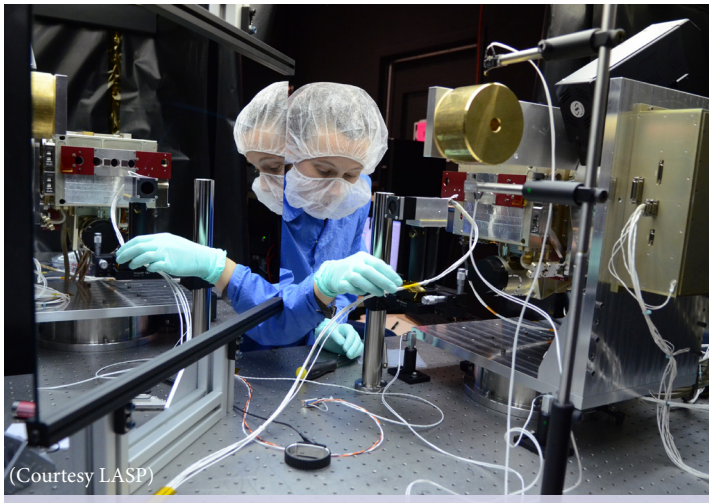

(Courtesy LASP)

A LASP test engineer aligns optics in the Spectral Radiometer Facility.

- Calibration and Test Equipment 3 (CTE3) covers that part of the electromagnetic spectrum from 0.1–200 nm. Depending on the needs of a particular experiment, the test configuration may include one of two monochromators (grazing or normal incidence) and four different light sources (iron-55, manson, hollow cathode, and a deuterium lamp).
- Calibration and Test Equipment 2 (CTE2) is optimized for 115–400 nm using a vacuum monochromator and a deuterium lamp. A NIST secondary standard detector is used in this facility to routinely calibrate detectors and detector subsystems.
- The Spectral Radiometer Facility (SRF) has a set of NIST provided tunable lasers producing light from 200–3000 nm as its source and a NIST traceable cryogenic radiometer as its reference detector providing calibrations over this entire spectral range.
- A truly unique capability exists at LASP in the form of the Total Solar Irradiance Radiometer Facility (TRF). The TRF is optimized to work at the integrated solar power level of the sun with its source being a 532 nm laser and a specialized cryogenic radiometer. This facility is the only calibration facility in the world able to characterize TSI instruments at the desired accuracy (0.01% absolute accuracy) and power levels under flight-like vacuum conditions.

Heliostat

LASP has a three-mirror system heliostat that pipes sunlight into a black lab with optical table space. A 4' x 8' optical table space is located in a Class 10,000 clean space providing a clean environment for instruments and detectors designed to look at the Sun. Solar tracking in the heliostat is achieved with an equatorial mount in a closed-loop control system that provides <10 arc-second (typical) tracking error.


(Courtesy LASP)

The heliostat facility is set up by a LASP engineer.

Environmental Test Chambers

LASP has four environmental test chambers that support ambient pressure temperature testing and thermal cycling of instrument component and subsystems. The thermal chambers temperature range is -73 °C to 200 °C, and they range in size from 13" x 16" x 17" to 30" x 32" x 36". All chambers have a dry N_2 purge available with an ESD environment supporting rigorous flight hardware handling. A thermal bath that maintains temperature uniformity on the order of 1 mK from -45 °C to +40 °C is available for careful characterization of temperature sensors. All of these chambers can be remotely controlled and automated, facilitating complex thermal profiles and thermal cycling.

To read more about Engineering Test Facilities at LASP, visit http://lasp.colorado.edu/home/engineering/facilities, call Ginger Drake at 303-492-5899, or email ginger.drake@lasp.colorado.edu.

The Laboratory for Atmospheric and Space Physics (LASP) combines all aspects of space exploration through our expertise in science, engineering, mission operations, and data management. As an institute at the University of Colorado Boulder, LASP includes students throughout our activities. Learn more at http://lasp.colorado.edu.

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