

HiTEMS

High-Temperature Emissivity Measurement System

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About

- The High-Temperature Emissivity Measurement System (HiTEMS) measures spectral and total near normal emittance
 - Capable of a range of incident angles from 0° to 180°
 - Record supplemental data of laser power, blackbody and sample temperature, tolerance, and signal

System Capabilities

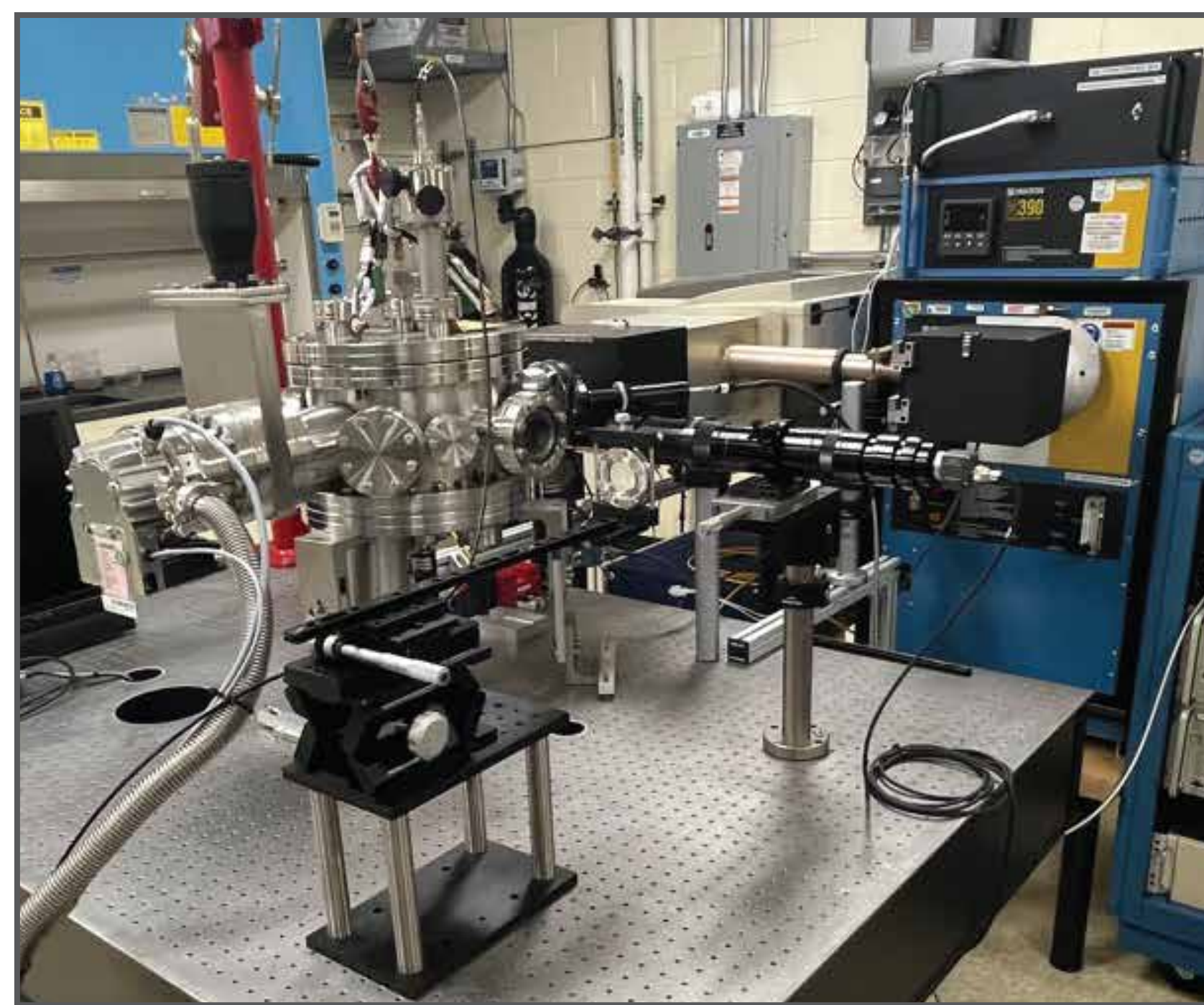
- Temperature range: approximately 600°C – 2,600°C
 - Depends on sample size and treatment
- Vacuum levels: as low as approximately 10^{-7} Torr
- Wavelength range:
 - 600°C to 1,500°C: approximately 2 μm to 24.9 μm
 - 1,600°C+: approximately 0.67 μm to 1.04 μm

Test Set-Up

- Typical sample size: 3/8" $\times$ 3/8"
 - Circular samples preferred for uniform heating
 - Flexible on sample dimensions
 - Sample mounted on a stem in the HiTEMS chamber

Equipment

- Utilizes a Mikron M390 Blackbody Calibration Source
- FAR 12257-1 Pyrometer
- FTIR: Nicolet 6700
- Laser: 400 W 1,070 nm Ytterbium fiber laser
 - IPG Photonics
- Laser uses a beam expander to provide uniform heating
 - With beam expander: beam diameter of 5 mm
 - Without beam expander: beam diameter of 3 mm



Upcoming HiTEMS Enhancements

- Starting Summer 2023
 - Begin upgrade to a hemispherical emittance capability through remote operation/rotation of the sample mount in-vacuum
 - Also provides ability to rotate to specific incident angles without re-pressurizing
 - Near normal still available
- Following hemispherical emittance upgrade:
 - Combine the HiTEMS and Low-Temperature Emissivity Measurement System (LoTEMS) systems to enable temperature range from ambient to 2,600°C

Previous Tests

- HiTEMS tungsten emittance measurements were requested by ER64 Propulsion Research and Tech Branch
- Measured smooth and bead blasted W samples
 - Examined change in bead blasted tungsten emittance following multiple HiTEMS tests
- Completed as a follow-up to high temperature Mo emittance measurements

