



Calibration and Use of ALTP Sensors at NASA Langley

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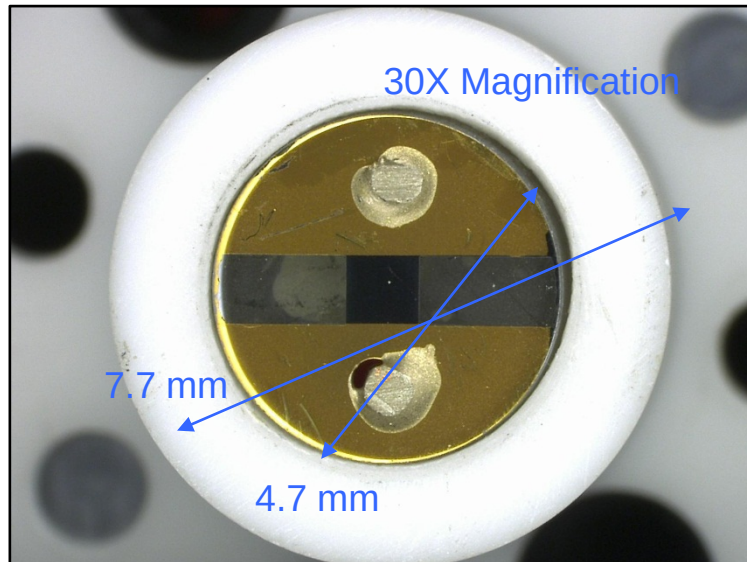
- Objective

- Extend the ability to characterize boundary layer phenomena (such as 2nd mode instabilities and transition) through the use of high frequency heat flux gauges in the Langley Hypersonic Aerothermodynamics Facilities.

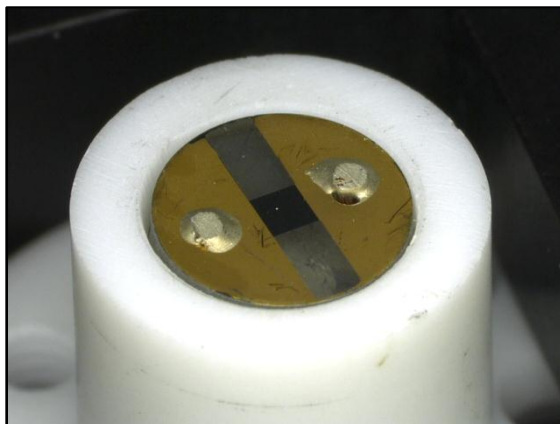
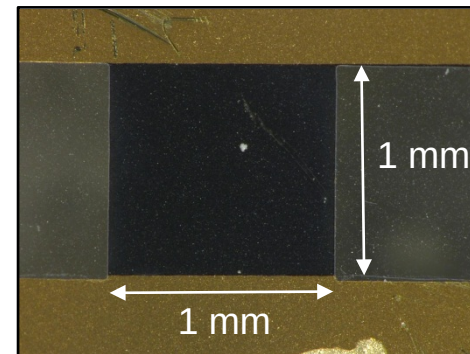
- Approach

- Test sensors for robustness, repeatability, frequency range, etc.
 - Laser-based dynamic calibration will be performed
 - Scheduled for 1 week of testing in the 20-Inch Mach 6 Tunnel
- Compare results with those obtained using off-body measurement techniques (FLDI), thermocouples, and stability calculations
 - Preliminary linear stability calculations have been performed by P. Balakumar

Atomic Layer Thermopile (ALTP) Sensor



150X Magnification
Close-up of sensor area

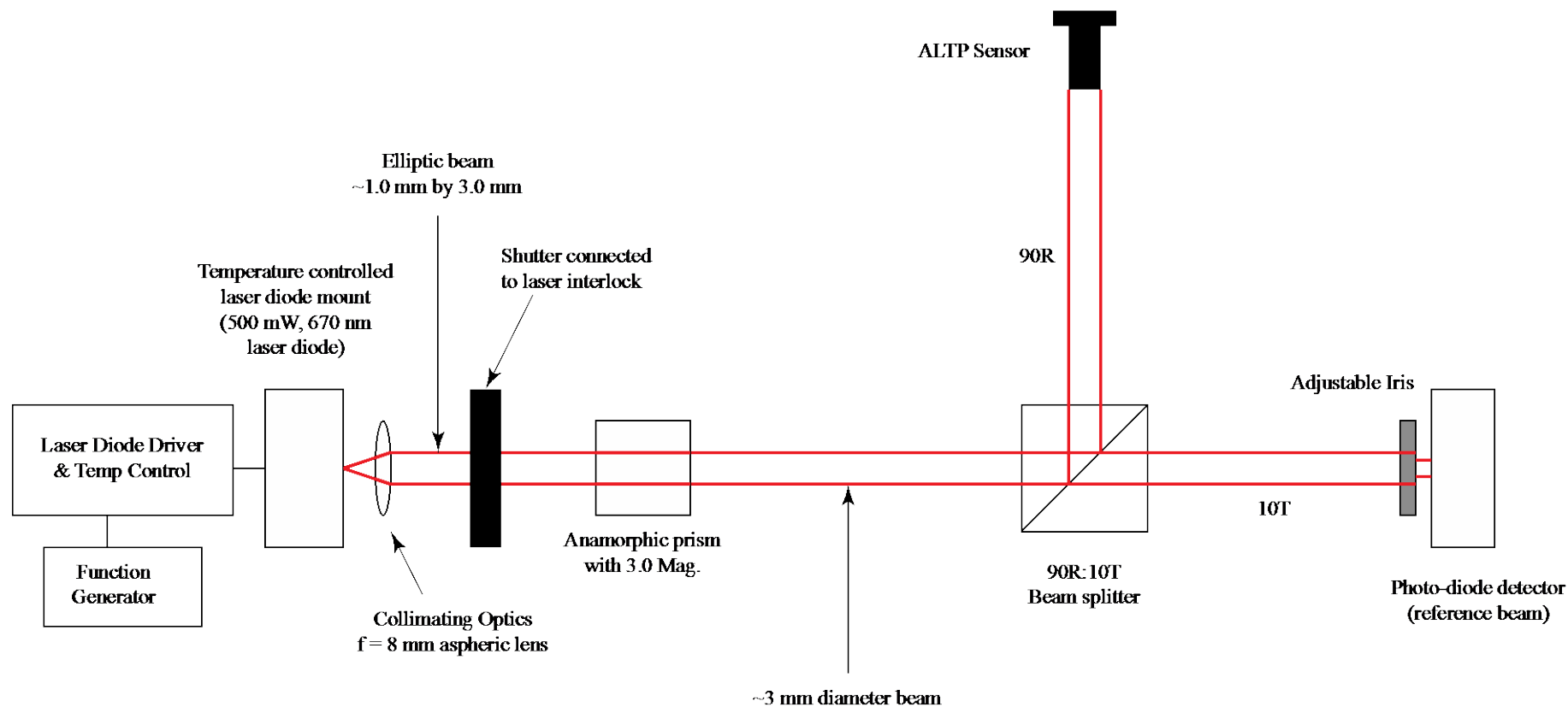


Fortech HTS*

- Purchased 6 sensors and amplifiers
- Scheduled to arrive late April

*See Tim Rödiger's thesis for details (The Atomic Layer Thermopile – A New Heat Transfer Measurement Technique in Fluid Mechanics and Thermodynamics)

Experimental Setup for Measurement of ALTP Frequency Response Function



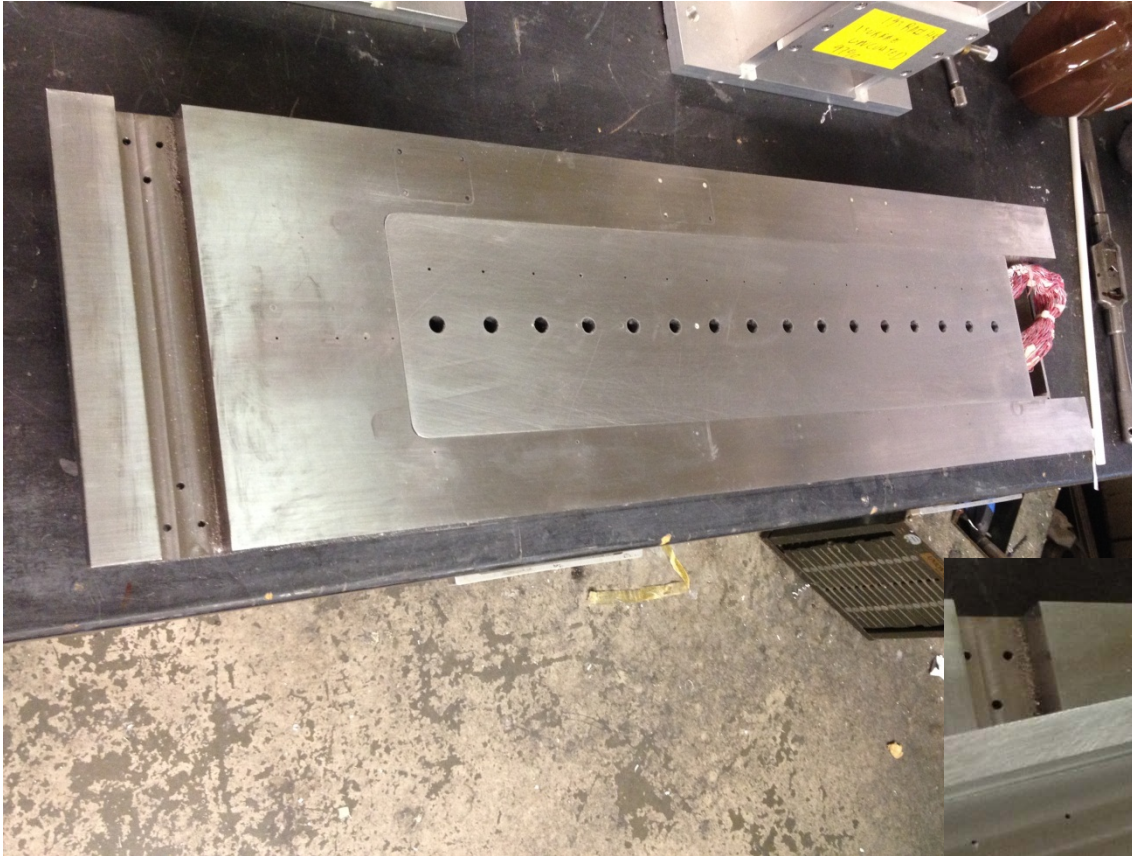
Preliminary checkout of setup complete – initial calibrations on-going

Wind Tunnel Model

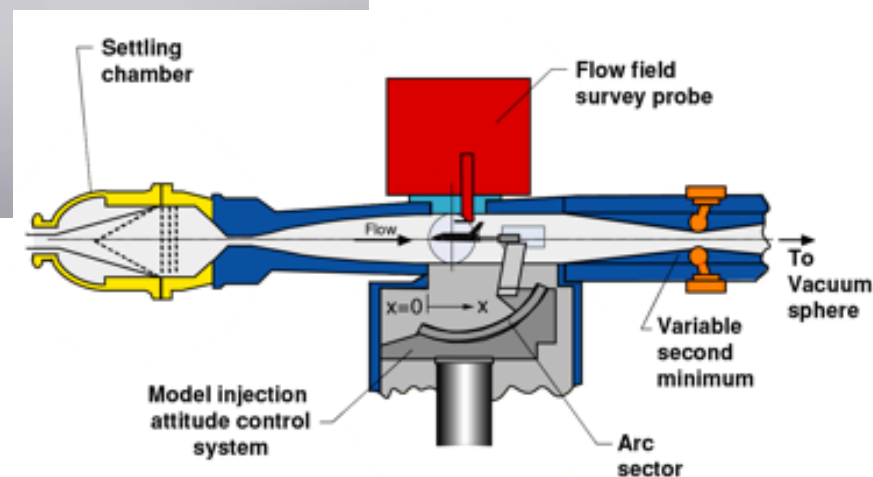
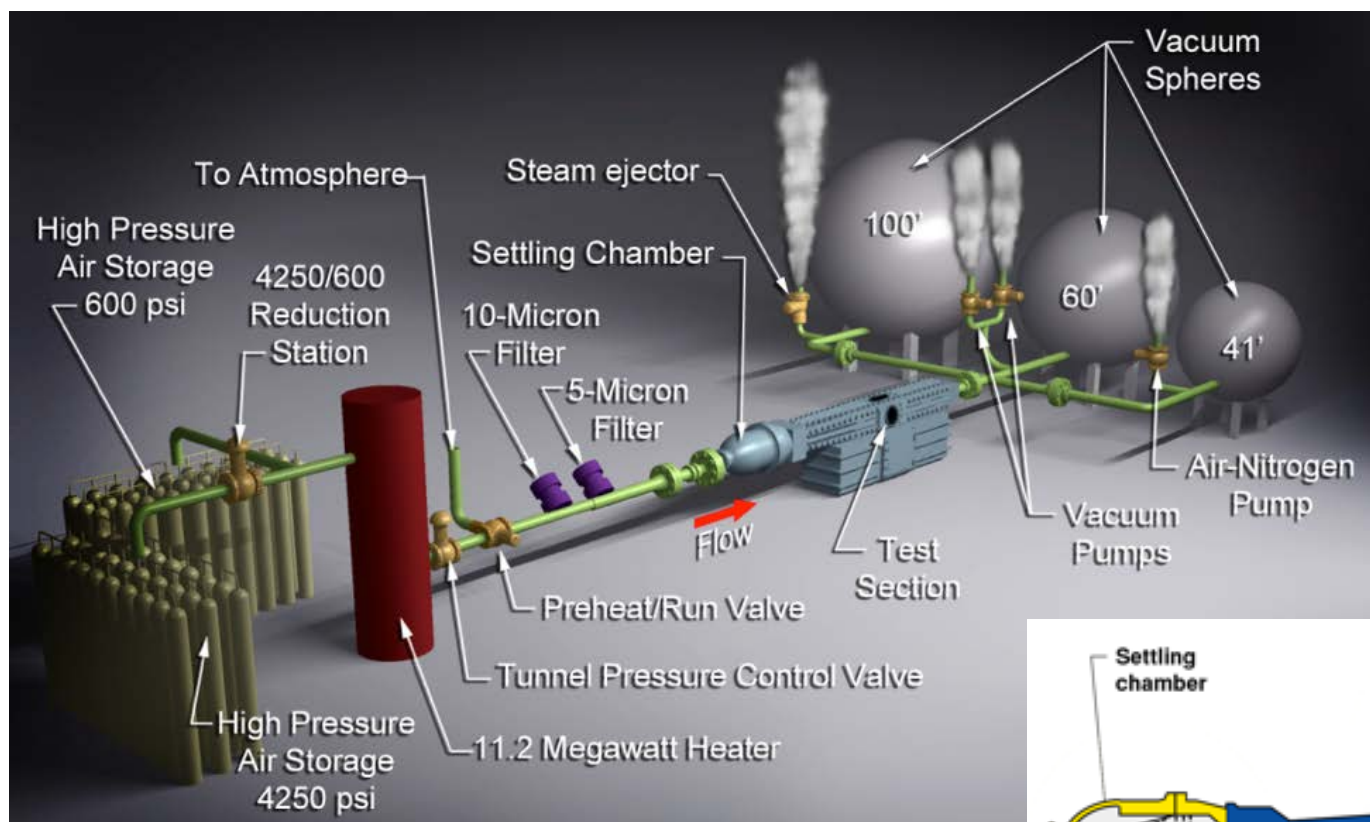
Multiple leading edges

Total length = 28 inches

- 1st sensor located 8.25" from leading edge
- 16 ports located 1.1" apart along centerline



20-Inch Mach 6 Air Tunnel



Mach number	6
Reynolds number, per foot	$0.5 \text{ to } 8.3 \times 10^6$
Shock Density Ratio	5.3
Test Core Size (in)	14 by 14
Stag. Temp. (R)	840 to 940



Questions