

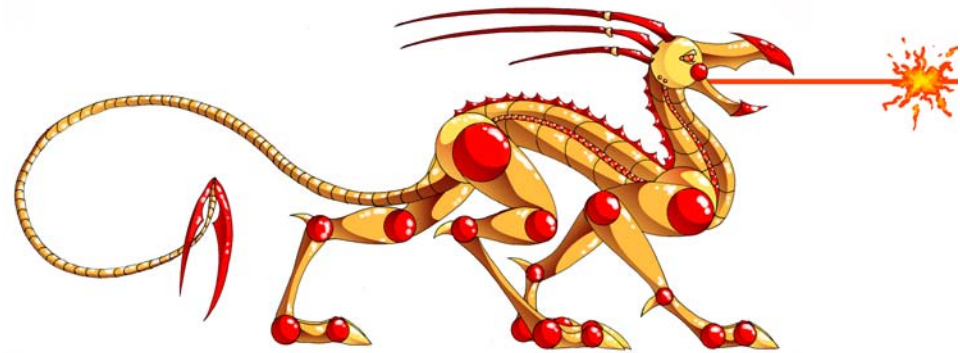
Progress in Chamber Simulation Experiments At UCSD Laser Facility

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HAPL Meeting

February 5-6, 2004

Georgia Institute of Technology



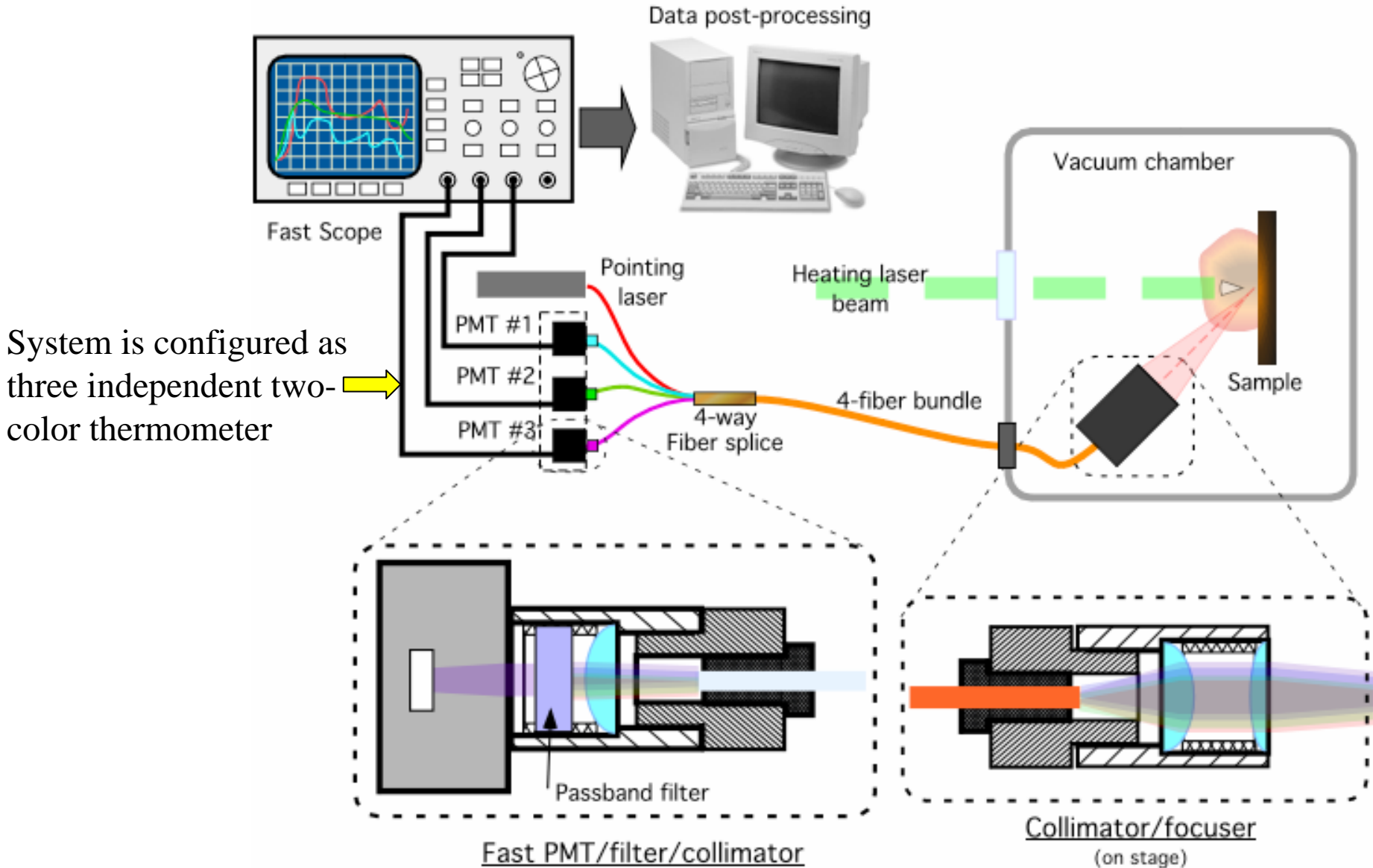
Status of Diagnostics Development and Fielding

From last HAPL Meeting:

- High temperature sample holder has been operational for quite some time.
- RGA system was installed on the chamber and is routinely used to monitor chamber environment.
 - ✓ No trace of W was found in the chamber (from heating filament of the high-temperature sample holder).
- QMS was tested but has been removed from the chamber until we are ready for test runs.
- Fast Optical Thermometer:
 - ✓ Proof-of-principle was demonstrated about Last Feb.
 - ✓ **Focus of our effort has been on improving system reliability and user friendliness: Major progress, unexpected problem.**

➔ We have developed a highly reliable, fast optical thermometer!

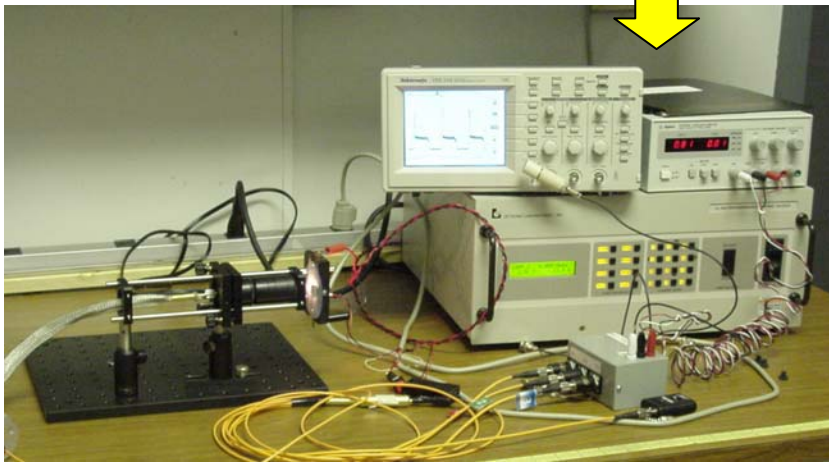
Schematic of Multi-Color Fiber Optical Thermometer



Calibration of Thermometer

- Temperature is calculated from measurement of radiated energy at two wavelengths:

$$T = \frac{\left[c_2 \left(\frac{1}{\lambda_1} - \frac{1}{\lambda_2} \right) \right]}{\left\{ \ln \left[\left(\frac{\lambda_2}{\lambda_1} \right)^5 \frac{L_{\lambda_2}}{L_{\lambda_1}} \right] \right\}} = \frac{\left[c_2 \left(\frac{1}{\lambda_1} - \frac{1}{\lambda_2} \right) \right]}{\left\{ \ln \left[\left(\frac{\lambda_2}{\lambda_1} \right)^5 \frac{C_2 V_2}{C_1 V_1} \right] \right\}}$$



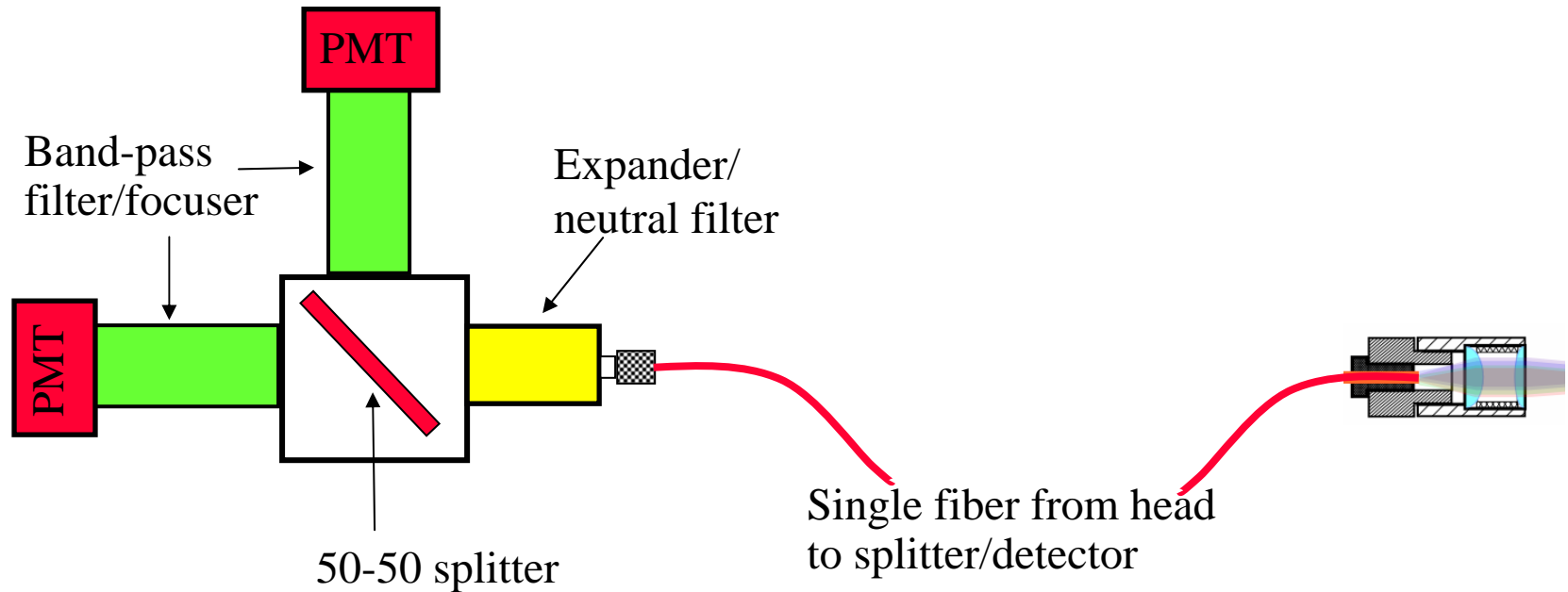
Thermometer is calibrated with a tungsten lamp

From last HAPL Meeting:

- Test 1: Successive calibration: the basis for developing calibration protocol.
- Test 2: Chamber installation test: thermometer is removed from calibration stand, mounted in the chamber, returned to calibration stand.
 - ✓ Calibration held in repeated tries
- Test 3: Long-term reliability, i.e., how long the calibration is holding.
 - ✓ Calibration was lost in the hour time scale: limited set of data; maximum deviation is ~20%, data is stochastic.
 - ✓ **Likely problem are the PMTs.**

➔ **NO! Fibers!**

The New Design Uses a Single Fiber Coupler Between the Head and Splitter/Detector Assemblies



- The optical signal is split in the detector assemblies as opposed to the head.
- We have achieved excellent reliability!
- Bonus: A factor of 2-4 reduction in fiber insertion loss!

Thermometer Held Its Calibration Over a 12-day Reliability Test Run!

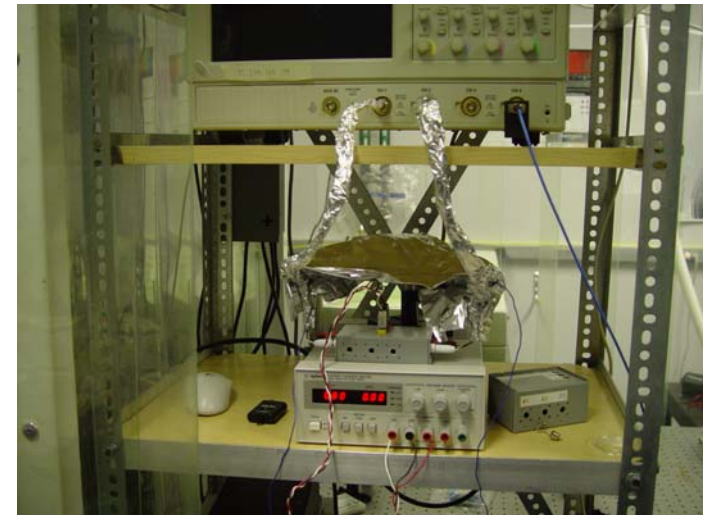
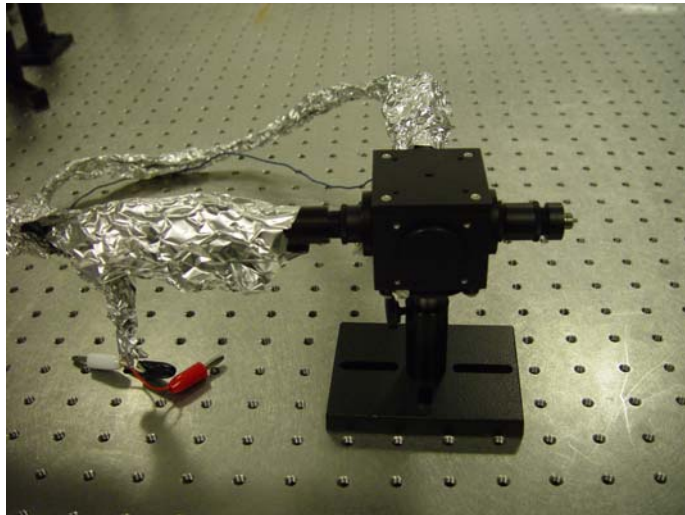
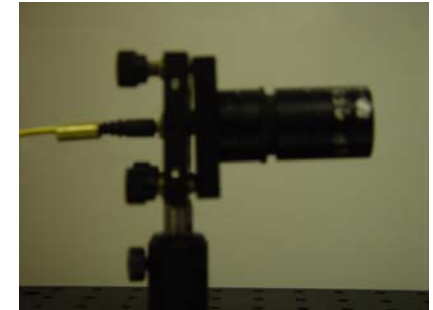
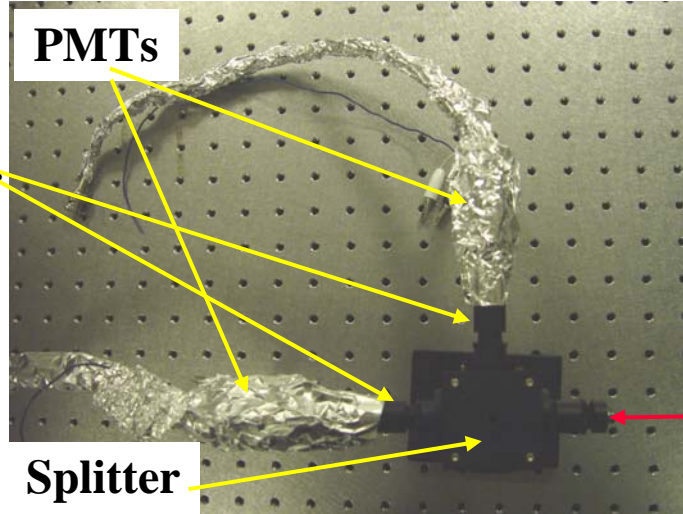
Partial Assembly/disassembly



- Over 100 measurements over a 12 day period including a partial assembly/disassembly!
- Less than $\pm 1\%$ change in calibration constant

The Head and Splitter/Detector Assemblies Are Packaged in Robust, Low-Profile “Packages”

Band-pass filter/
Collimator/focuser



Armor Irradiation Test Will Begin in Late February in Our New Laboratory

- Armor Irradiation tests has been deferred because of the failure injection seeding system of our laser. **For the same laser energy:**
 - ✓ With no injection seeding, temporal profile of target temperature fluctuates by 10% due to ns temporal variation in laser pulse.
 - ✓ With no injection seeding, peak target temperature varies by ~10-15% (shot to shot).
- We will begin armor testing after installation of new injection seeder in our new laboratory.

From a Vivarium to a Laser Lab – An Odyssey!



After animals were removed. What a smell!



**6 Months Later!
Demolition is over and
construction has begun!**



**One of the construction
crew hanging around!
(Construction was
completed 3 months
behind schedule!)**



Finally!

