Oxygen Sensor System for Fire Environment

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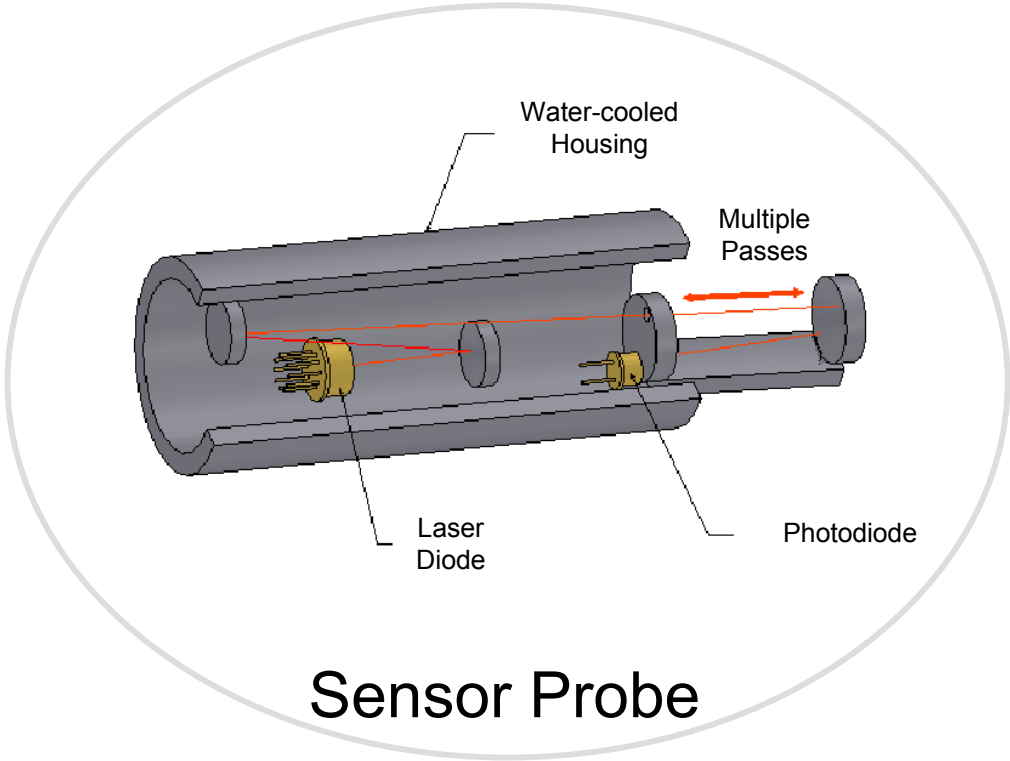

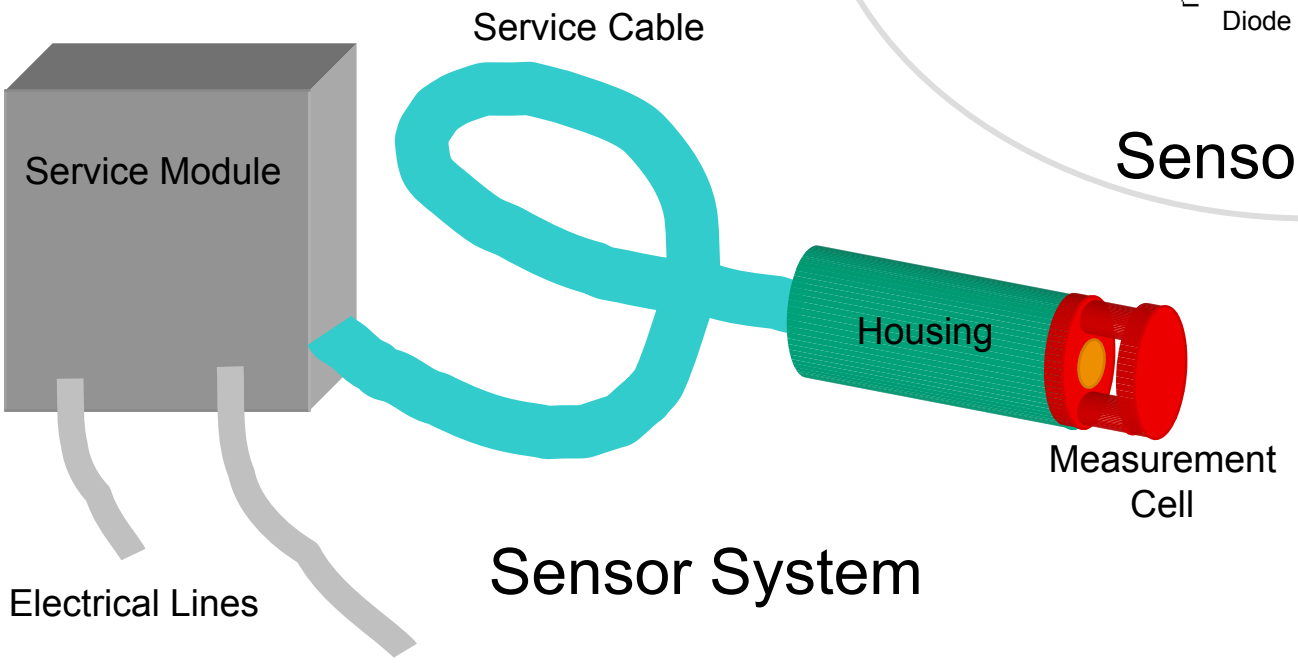

Modified Herriott Cell with Expected Sensitivity

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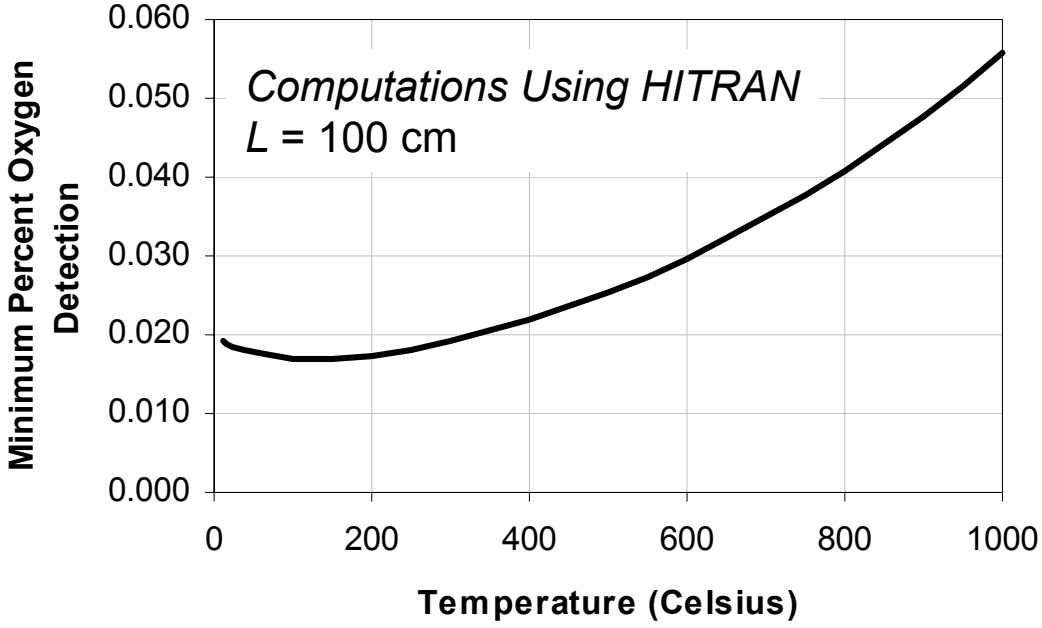
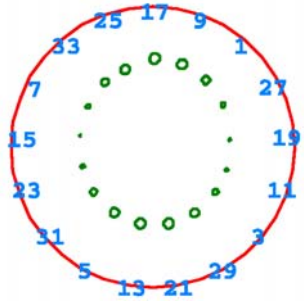
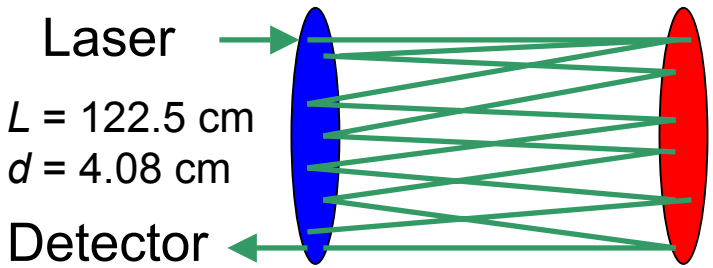
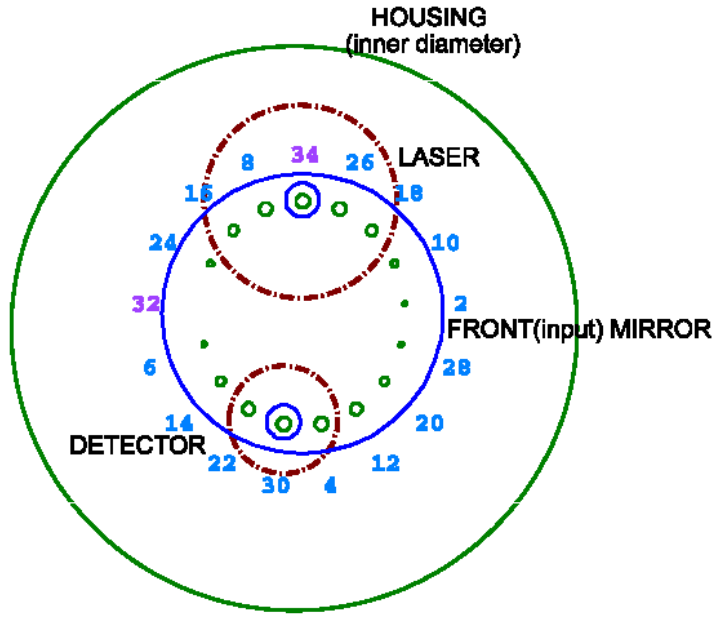


Spherical Mirror





Flat Mirror



Prevention of Soot and Particulate Deposits

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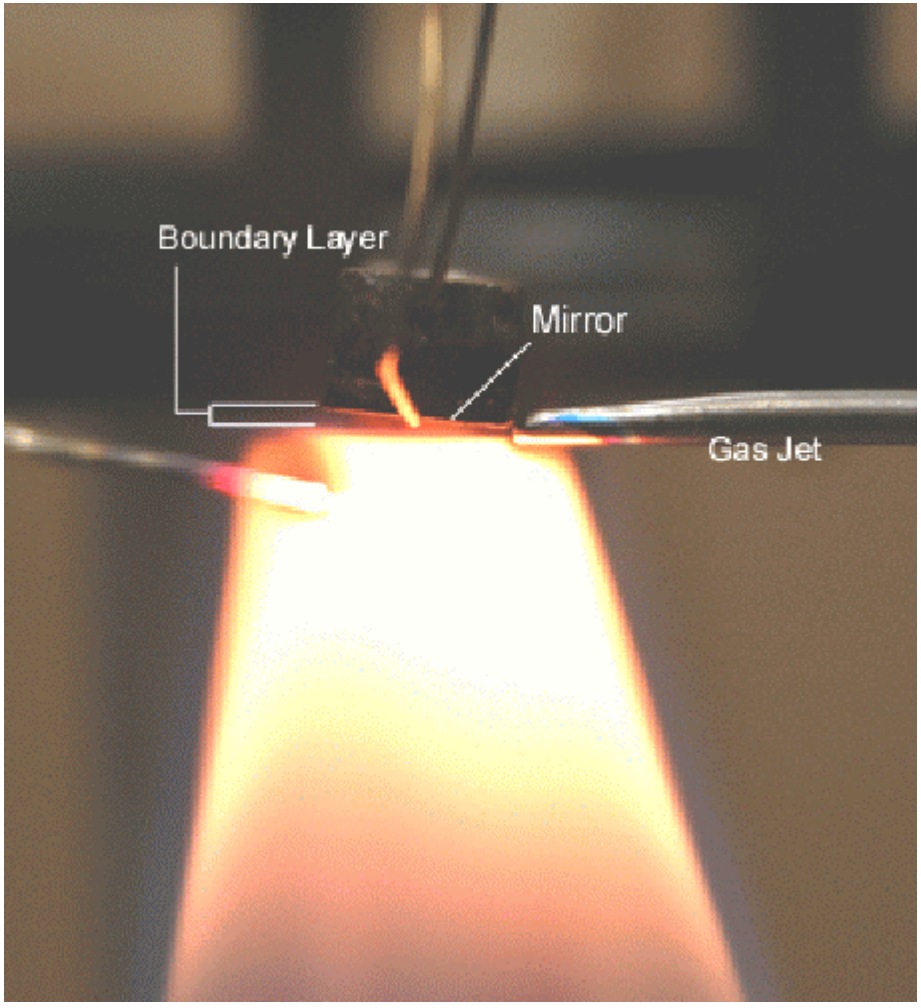

- No Water Condensation
- No Soot or Particulates Deposits
- Additional Cooling of Mirror Surfaces

Furnace Tests of Probe Components

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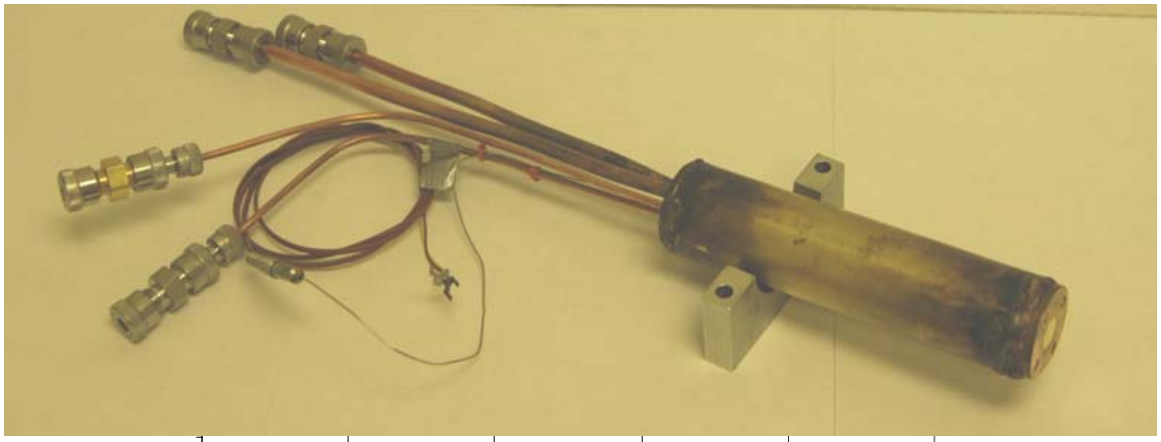
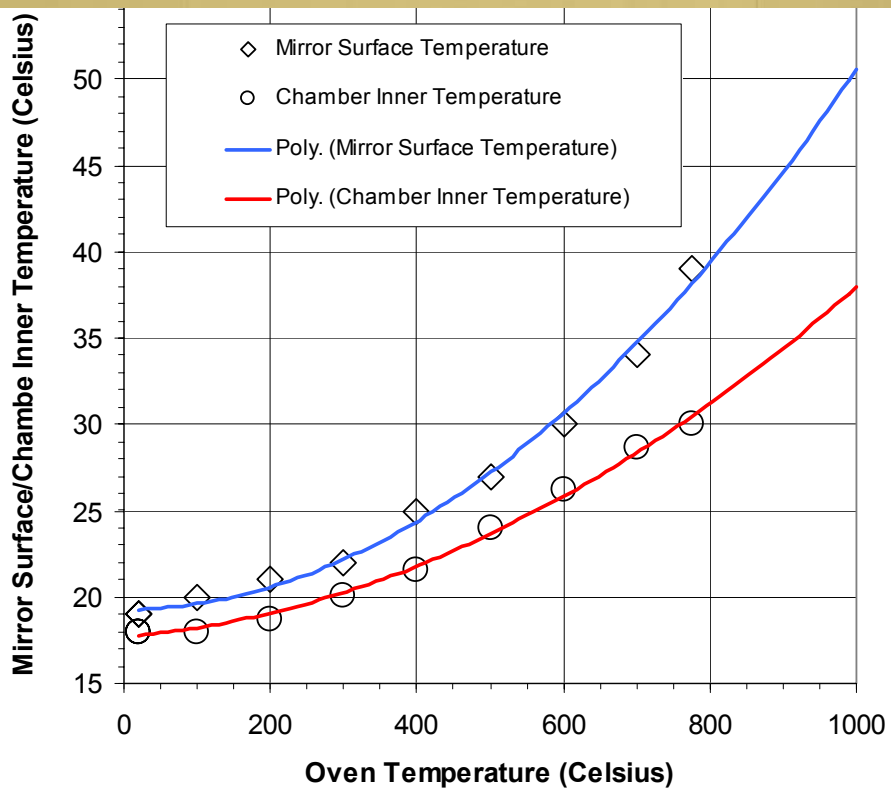
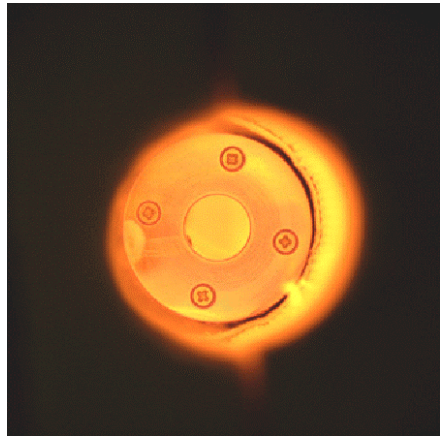
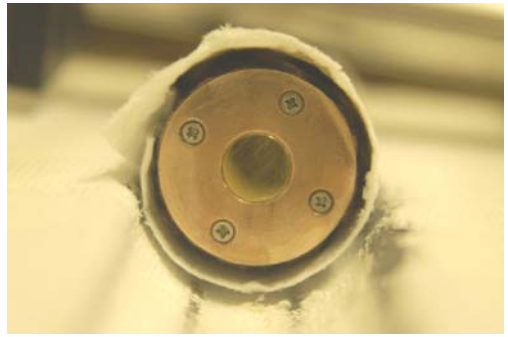






At T = 775 °C



After 1.5 hrs in T > 500 °C

Summary of Key Results

- An oxygen sensor system based on a laser diode can be used in fires.
- A measurement cell with $L \approx$ 50-100 cm and $d \approx$ 1-3 cm was designed.
- Water-cooled optical surfaces and probe body withstood T = 1000 °C.
- Film cooling of optics prevented deposits of soot and particulates.
- The sensor withstood temperatures above 500 °C for at least 1.5 hours.
- The sensor can withstand heat fluxes of 40 kW/m^2 or more.
- A range of 1 to 21 percent oxygen concentration can be achieved.
- Minimum detection of 0.02 to 0.05 percent O_2 is possible with L = 100 cm.

Oxygen Sensor System for Aircraft Ullage

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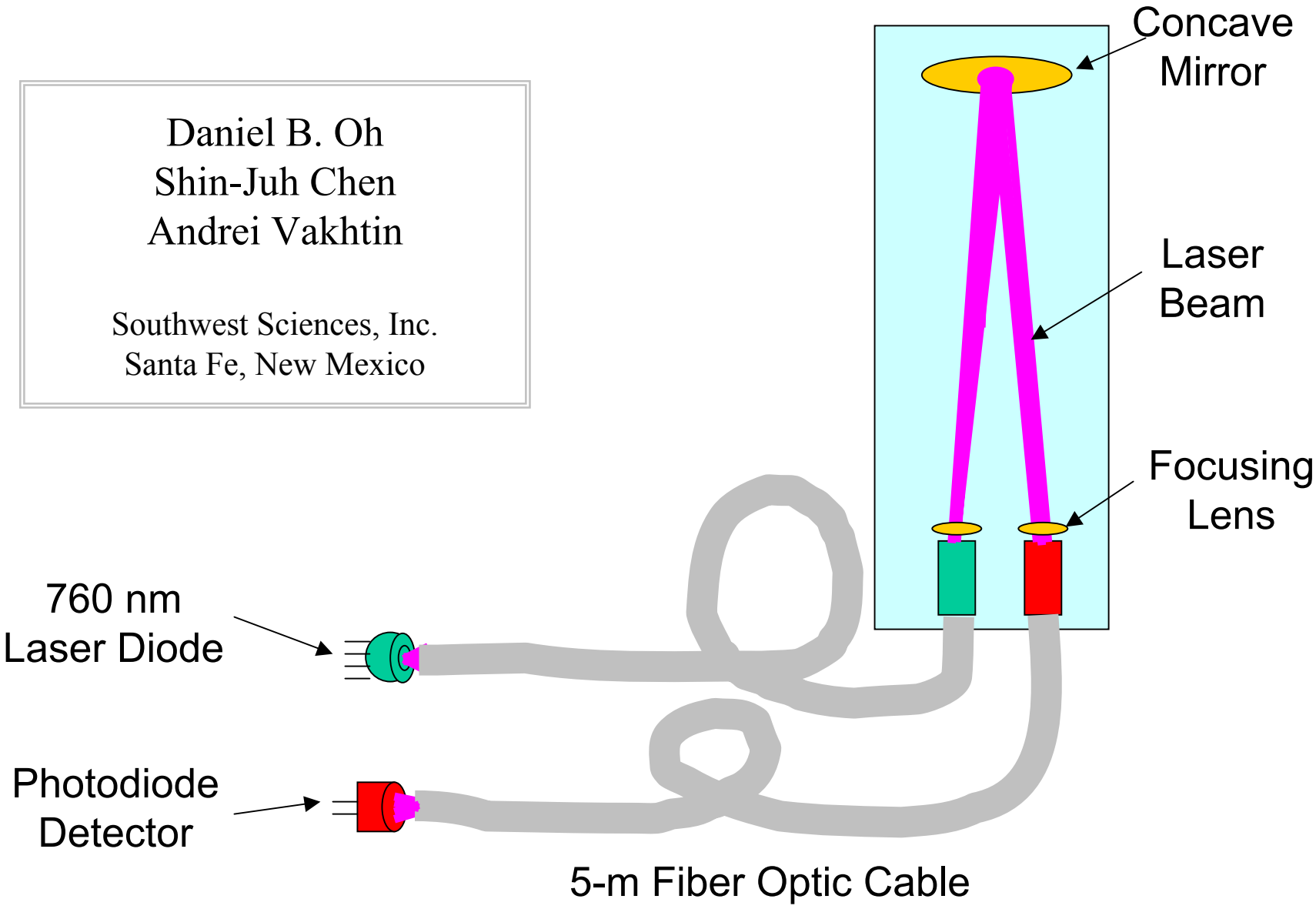

Ambient Condition Test

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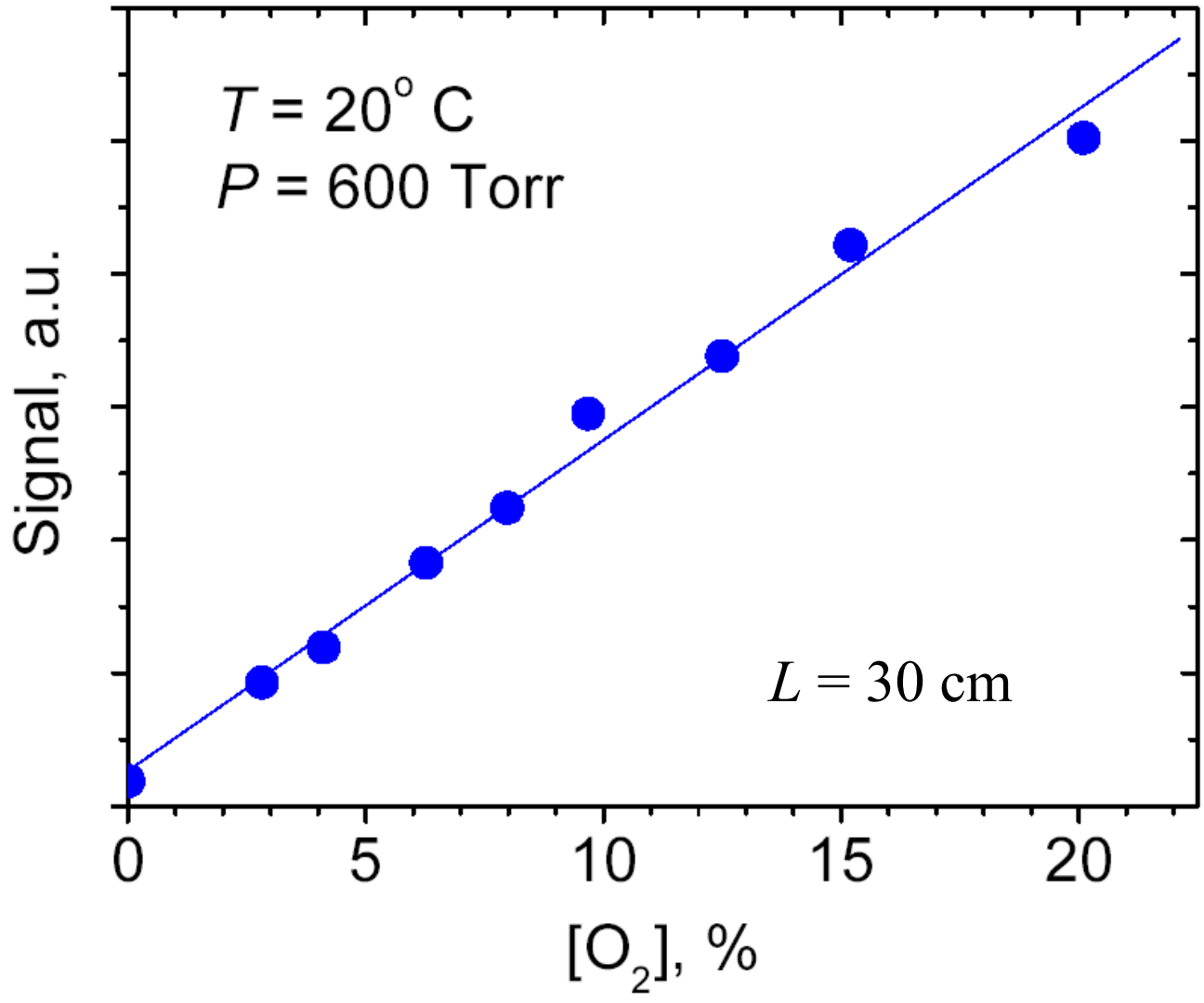

Altitude Tests

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