



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

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| Name(s) Shay C. Edwards | Project Number J1509 |
| Project Title Experimental Investigation of High Frequency Plasma in the Infrared Spectrum | |
| <p style="text-align: center;">Abstract</p> <p>Objectives/Goals My main objective was to observe the infrared spectrum through electrically charged gas resulting in a plasma. I will be studying the transmission of infrared light through the plasma. I hypothesized that the plasma would not affect infrared viewing.</p> <p>Methods/Materials To test my hypothesis I designed a 4" x 24" plasma chamber constructed from Pyrex. On each end of the chamber is a tungsten electrode. Directly in the center on each side of the chamber is a 2" opening. One opening has a 16 gauge steel plate which is coated with flat black high heat paint. On the other opening is a 2" germanium window. The steel plate was heated by a hand warmer reaching 130 degrees attached directly to the outside. Another heat source I used was a rectangular one gallon metal can that was filled with water and heated by a fish tank heater. I used a Spectroradiometer, which operates in the spectral range from 2.5 to 14.5 um, and an 8-12 micron infrared camera with digital imagery. Testing was performed on Argon, Helium, and Neon plasmas. Before each test, the chamber was evacuated and held at 0 Torr for 6 minutes. Each gas was then inserted through the same vacuum hose to exactly 7 Torr. The power supply was a 5.5kV with 2.0 Amps current, and a frequency of 20 kHz. Clips were attached to the tungsten leads and power was turned on by a pull switch. The plasmas were tested in a controlled environment and photographed before and during the testing.</p> <p>Results Using the SR5000 Spectroradiometer wide range capabilities, I was able to look at one micron at a time with each plasma tested. After the SR5000 testing, I was the able to proceed using the information that I had gathered and test with the infrared imaging system on the same plasma to visually look for change in transmission.</p> <p>Conclusions/Discussion The data from both types of test supports my hypothesis that Argon, Helium and Neon plasma had no affect on the transmissivity in the infrared spectrum.</p> | |
| Summary Statement This project was an experimental investigation of high voltage, low current and high frequency observation of plasma in the infrared spectrum. | |
| Help Received Testing done at NAVSEA in Corona was under the supervision of Ed Trovato; SoCal Edison testing supervised by Chris Perez; Cal Glass Reaearch manufactured chamber according to my design; chamber evacuated under the supervision of Andy Vega; mentored by James Seffrin of Irinfo, New Jersey. | |