



CALIFORNIA STATE SCIENCE FAIR 2008 PROJECT SUMMARY

Name(s) David A. Zarrin	Project Number J0841
Project Title Designing a Laser Communication Device	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Laser communication has many advantages over wired devices. Lasers can carry messages near the speed of light with little interference whereas electrical signals travel at 60%-90% of speed of light. The goal of my project was to build a low cost device to transmit my voice a long distance in open air using lasers and learn as much as I can about the related technologies.</p> <p>Methods/Materials I researched, brainstormed, and conducted a series of experiments in 2007 through Feb'08 to understand the concepts and built devices for sending my voice in open air using lasers. I video taped diaphragms of speakers playing sounds, examining the motion frame-by-frame, and learned the basics of speakers, sound, waves, frequency, microphones, lasers, solar cells, Doppler effect, simple circuits, and analysis /computer tools. In my first series of experiments, I connected small mirrors to speakers and eventually headphones. I shone laser beams onto mirrors while playing music. I pointed the reflected beams into solar cells connected to MIC input of a laptop and used Adobe SoundBooth to capture and analyze the received signals. In my second set of experiments, I used carbon-dust microphone to modulate my voice onto laser beams. I built my own carbon-dust microphone from pencil led (which I learned from a Nova science program on telephones). I connected the carbon microphone in series with the laser pointer batteries. I shone the beam onto a solar cell 200 feet away connected to the MIC input of a laptop, and captured /amplified the AC signal generated by variations in laser photon intensity. In my final set of experiments, I attached a mirror to the bottom of coffee cans and shone lasers onto the mirror while talking into coffee cans. I pointed the reflected beams onto a solar cell connected to MIC input of a laptop.</p> <p>Results I achieved my goals of building a device capable of transmitting my voice with great clarity for \$32 and learn many new concepts in the process. The carbon MIC had medium sound quality and cost \$24. The coffee can designs cost \$21 with 30% of transmitted words recognizable.</p> <p>Conclusions/Discussion Audio signals can be transmitted long distances using the techniques in my experiment. I also discovered other practical uses of my experiments including recreation of audio signals using lasers reflected off of vibrating windows acting as diaphragms far away, detecting earthquakes, and ground movements.</p>	
Summary Statement Building a low cost device to transmit audio a long distance in open air over a laser beam.	
Help Received I received help on handling power tools and the laser device from my advisor.	