



**CALIFORNIA STATE SCIENCE FAIR  
2007 PROJECT SUMMARY**

<b>Name(s)</b> <b>Jodi T. Loo</b>	<b>Project Number</b> <b>S0813</b>
<b>Project Title</b> <b>Sending and Receiving Information Using Photons</b>	
<b>Abstract</b> <b>Objectives/Goals</b> My goal is to demonstrate that photons can be used to send and receive information through optical fibers like how electrons travel through copper wires. <b>Methods/Materials</b> In order to achieve my objective, I built an optical transmitter, which converts a voice input from a microphone to photons. I also built an optical receiver which converts photons to voice. The materials used in this experiment were resistors, capacitors, amplifier, optical cables, transmitting and receiving circuit boards, soldering iron and power supplies. To test the photonic link, I also used an oscilloscope, a RF Transmitter and Receiver, TV monitors, and a frequency tuner. <b>Results</b> The FO link was successfully fabricated and tested. My voice was first converted to light which was then transmitted through an optical cable to the receiver where light was detected. It was then converted back to voice. An oscilloscope was used to monitor the electrical waveforms to detect signal distortions before and after voice signals at the transmitter and the receiver. Initially, the FO link was noisy. However, I was able to show that it was not due to the link because I was able to reduce the noise by placing a thick towel under the circuits. In my next experiment, I used a frequency tuner to produce a note at 440 Hz and verified that only this note was transmitted through the link. This was measured using an oscilloscope. I measured the wave cycle to be 2.25 ms at the receiver which matches the note frequency at the transmitter. My last experiment was to show the interference effect from a FO link versus a 2.4 GHz RF link by using two TVs and a microwave oven nearby. I took pictures of the receiving TV when the microwave oven was off versus when it was on. From the RF link, I saw a lot of signal disturbance from the receiving TV. There was no interference observed by the FO link. <b>Conclusions/Discussion</b> In this project, we can conclude that one can indeed send and receive information in the form of light. Since light has wavelengths shorter than RF, it has higher bandwidth and will provide higher data rate for communications. Today, photonic systems are being used in phones, cable TV, as well as providing the backbone for internet. It will gain even higher popularity if cost for FO link can be further reduced.	
<b>Summary Statement</b> My project is about building and testing a photonic link and knowing the underlying principles of how this link works.	
<b>Help Received</b> Father helped explain concepts.	