



# CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

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<b>Project Title</b> <b>Outlets Are Out: Light It Up without Wires</b>	
<b>Objectives/Goals</b> The purpose of my project was to show if energy can be transferred without using wires. My project used an air-core transformer that stepped up low DC voltage to a very high voltage and frequency. During this process, it created an electromagnetic field around the primary and secondary coil. The device closely followed the theory of the Tesla Coil and used the principles of electromagnetism, electromagnetic induction, and resonance. <b>Abstract</b> <b>Methods/Materials</b> A variation of a Tesla Coil was created using various electronic components. Multiple variables were used to identify the strength of the electromagnetic field that was being emitted by the secondary coil. The variables I used were the number of loops on the primary coil, the input voltage, the load (number of florescent light bulbs which lighted up without wires), and distance from secondary coil. The test was run 30 times with each variable. <b>Results</b> Input voltage of 3 volts and up lit up a light bulb with 8 or 12 primary coil loops. At 18 volts and with 8 and 12 primary coil loops, the electromagnetic field lit up two bulbs. Also, the farther the bulb is held from the secondary coil, the intensity of the light reduced. The best result was with 12 loops and 18 volts. The tests taken with 4 coil loops or 1.5 volts did not provide any result. <b>Conclusions/Discussion</b> Based on my experiments, my hypothesis was proved correct. In my experimental circuit, simple low voltage DC is fed into a transistor which switches on and off the power to the primary coil. The resulting electromagnetic field rapidly charges and collapses around the secondary coil, which induces the electromagnetic field in the secondary coil. The primary and secondary coils were also made to resonate at the same frequency.  The rapidly changing magnetic field emitted by the secondary coil energized electrons in the fluorescent bulbs wirelessly and emitted visible light. The magnetic field strength is inversely proportional to the distance from the secondary coil as tested with an EMF meter. The increase in load also reduces the intensity of the florescent bulbs.	
<b>Summary Statement</b> The objective of my experiment, with the device I constructed, was to verify if energy can be transferred wirelessly and can be used to illuminate fluorescent bulbs.	
<b>Help Received</b> My father helped me with the secondary coil winding. My mother helped me with the printouts and display of the science board.	