



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

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Project Title Scientific and Technical Study on Dependent Factors for Wireless Power Transfer	
Objectives/Goals Design and development of Wireless Power Transfer (WPT) system is a recent field of research. The goal of my research was to learn about the scientific principles and technical designs for an WPT system. The objective was to experimentally identify dependent factors and involved parameters for an WPT system. Prior to conducting the experiment, I made hypotheses that Power Transfer Efficiency (PTE) depends only on engineering design, 100% PTE is impossible, and PTE depends on source power. Abstract Methods/Materials Magnet wire to prepare coils (# 22 AWG, nylon coating); Spools for the coils; Soft iron sheets for the preparation of cores for the coils; Connecting wires; Center-tapped step-down transformer; Multi-meter; Needle-nose pliers; Calculator; and LED. The methods and procedure follows three phases: the offline design phase to prepare the coils and the cores, the set-up and measurement phase to record data, and the computation and data analysis phase for reporting the results. Results The identified scientific and technical dependent factors are source voltage, number of turns in the coil, rate of change of magnetic flux, and the distance between transmitter and receiver. Scientific theory was established and a demonstration platform was developed for experimentation. The experimental results show that (1) the received power increases as the source voltage increases; (2) keeping the number of turns and rate of change of magnetic flux constant, the received power decreases as distance increases. The power at distance D3 is higher than at D2 (D3>D2) contradicting the theory. The rise in power at D3 is due to the effect of the structure of the coil and core, a dependent factor that significantly affects the effectiveness and efficiency of the WPT. Conclusions/Discussion Effective and efficient delivery of power plays a vital role. The underlying principles, methods, and procedure along with aspects of technical designs were studied, experimented, and demonstrated. The concluding remarks are based on observed experimental results: PTE depends on engineering design; PTE of 100% is impossible because the radiated magnetic flux at the source is omnidirectional. It is impossible to bring all the magnetic flux together; and it was confirmed that PTE depends on source power.	
Summary Statement The underlying principles, scientific theory, methods and procedures, and an experimental demonstration platform for the study of dependent factors for wireless power transfer system were established and validated.	
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