



CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

Name(s) Bryan E. Carbaugh	Project Number S0905
Project Title A Virtual Thunderstorm: Experimenting with a Kelvin Electrostatic Generator	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project was to determine whether variation of water flow rate on a Kelvin Electrostatic Generator has a significant impact on the DC voltage as well as the time in between each spark produced by the generator. My hypothesis was that an increase or decrease in water flow rate would have no significant effect on the DC voltage output of the generator, but would result in considerable differences between the spark times, with higher flow rates resulting in less time in between each spark, and vice versa.</p> <p>Methods/Materials The generator utilizes a standard PVC pipe assembly design modified for stability. A water jug at the top of the generator supplies water to two polyethylene droppers. The water flow rate of these two droppers is controlled by a polypropylene valve containing 5 distinct markings designating 5 different flow rates, which I measured using a graduated cylinder. The droppers effectively distribute oppositely charged water streams in between two metal inducers, made of tomato cans, and into two adjacent coffee cans, where opposite charges are utilized in the formation of a spark between two nails, which serve as electrode "probes". I acquired my DC voltage data by connecting the two electrodes on the generator to the probes on a digital multimeter, taking the first 40 voltage readings of each of the 5 flow rates for a total of 200 voltage readings. Using a stopwatch, I also measured the time in between the first 40 sparks produced by each flow rate, for a total of 200 time readings.</p> <p>Results My data showed that the direct current voltage changed contiguously with the flow rate, exhibiting a discernible change between each flow rate. My data also showed that an increase in flow rate is accompanied by a significant increase in spark generation frequency.</p> <p>Conclusions/Discussion Ultimately, my results did satisfy my objective in carrying out this experiment. My first hypothesis was disproven, which I accredit to my initial lack of understanding of voltage. My second hypothesis, however, was proven to be correct. In experimenting with this generator, I found that varying humidities often produced inconsistent results, and that it took several tries to ensure that my tests ran smoothly. Hopefully, with further experimentation with this apparatus, scientist can find ways to obtain massive amounts of clean energy from electrostatic sources, such as lightning.</p>	
Summary Statement I built and experimented with an electrostatic generator to ultimately determine that variation in water flow rate of this generator has a significant impact on both the DC voltage and the time in between each spark produced by the device.	
Help Received My mother and father helped to purchase all of the parts and tools required to build the generator. My father also assisted me in the assembly of the generator.	