



**CALIFORNIA STATE SCIENCE FAIR  
2012 PROJECT SUMMARY**

<b>Name(s)</b> <b>Ryan Y. Nguyen</b>	<b>Project Number</b> <b>S0910</b>
<b>Project Title</b> <b>The Effect of a Step Down DC-DC Converter on Supercapacitor Voltage Output Time</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My experiment's objective is to determine if a step down DC- DC converter can extend the useful time power can be extracted from supercapacitors. First, I established a baseline discharge time with and without a step down DC-DC converter. Then, I varied the charging voltage and output load. It was expected that adding a converter would increase the discharge time and that the discharge time would vary proportionally with the charging voltage and load.</p> <p><b>Methods/Materials</b> The test hardware consisted of a set of eight supercapacitors, a step down DC-DC converter, and two LED loads which were constructed from off the shelf components. Support equipment consisted of a power supply and two digital multimeters. The capacitor voltage into the converter and output voltage into the load were measured every five minutes until the capacitors were discharged.</p> <p><b>Results</b> The data shows the LEDs remained lit significantly longer when the converter was present. The next step doubled the LED load from 5 to 10 LEDs, and I retook the measurements. Interestingly, the discharge time did not decrease proportionally as expected. I expected the discharge time to decrease by 50%, but the data only shows a decrease of approximately 20%.</p> <p><b>Conclusions/Discussion</b> The unexpected 20% drop in discharge time when the number of LEDs was doubled should be explored further. This could be caused by several factors, such as nonlinear converter effects or visual perception of the red LED's brightness. Regardless of cause, this observation can potentially be exploited to improve energy efficiency.</p>	
<b>Summary Statement</b> My experiment's objective is to determine if a step down DC- DC converter can extend the useful time power can be extracted from supercapacitors	
<b>Help Received</b> Used lab equipment and received technical assistance at Buu Nguyen's (Father) company Sigma Test Labs.	