ABSTRACT
The purpose of this graduate research project is to design and fabricate a DC-to-DC converter for use in high-voltage capacitor charging applications. The primary goals include increasing the efficiency and reducing the cost of traditional methods used for this application. Traditional methods were not designed specifically for high-voltage capacitor charging and were thus very primitive and exhibited lower efficiency. Prior methods made use of a high voltage power supply and a current limiting resistor or control scheme. The power supply would often only operate efficiently at a single voltage and would thus function poorly over a range used in charging a capacitor. The resistor would also dissipate a fair amount of power, also limiting efficiency. Another requirement was to keep the power consumption of this design to a minimum. This design makes use of a traditional flyback topology partnered with a controller made specifically for this application. These aims are met by centering the design approach on the LT3750, thus taking full advantage of the efficiency improving control scheme it provides. Additionally, through the use of advanced techniques to eliminate noise and loss, the efficiency may be significantly improved. This project also seeks to provide a full, in depth mathematical analysis of the charger. The analysis will then be applied to optimization techniques and will provide mathematical relationships to find ideal component values for specific design criteria. This research endeavor not only explores and simulates this new method of charging, but will also produce the circuit hardware and experimentally verify that the design successfully meets the objectives.

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The public is welcome to attend.