EE / CprE / SE 492 – sdmay20-10
Power Scraping Module
Week 1 Report
1/28/2020 -2/13/2020
Client: Honeywell FM&T
Faculty Advisor: Gary Tuttle

Team Members/Role:

Jordan Fox — Chief Engineer
Xiangyu Cao — Design Engineer
Andesen Ande — Design Engineer
Ahmed Salem — Test Engineer
Ben Yoko — Test Engineer
Shahzaib Shahid — *Team Leader*

Weekly Summary

The objective of this past week was to look into booster designs and finish rectifier testing. This week we finished looking into booster designs and made conclusions about this part of our circuit. We have just received the booster modules we ordered and are ready to begin testing. Our initial plan was to simultaneously test the booster module while attempting to build one ourselves. We were advised to put all our focus on the booster module and find out if it works as soon as possible. Creating a PCB was determined to be a stretch goal and will be revisited later in the semester.

Past Week Accomplishments

Rectifier Testing

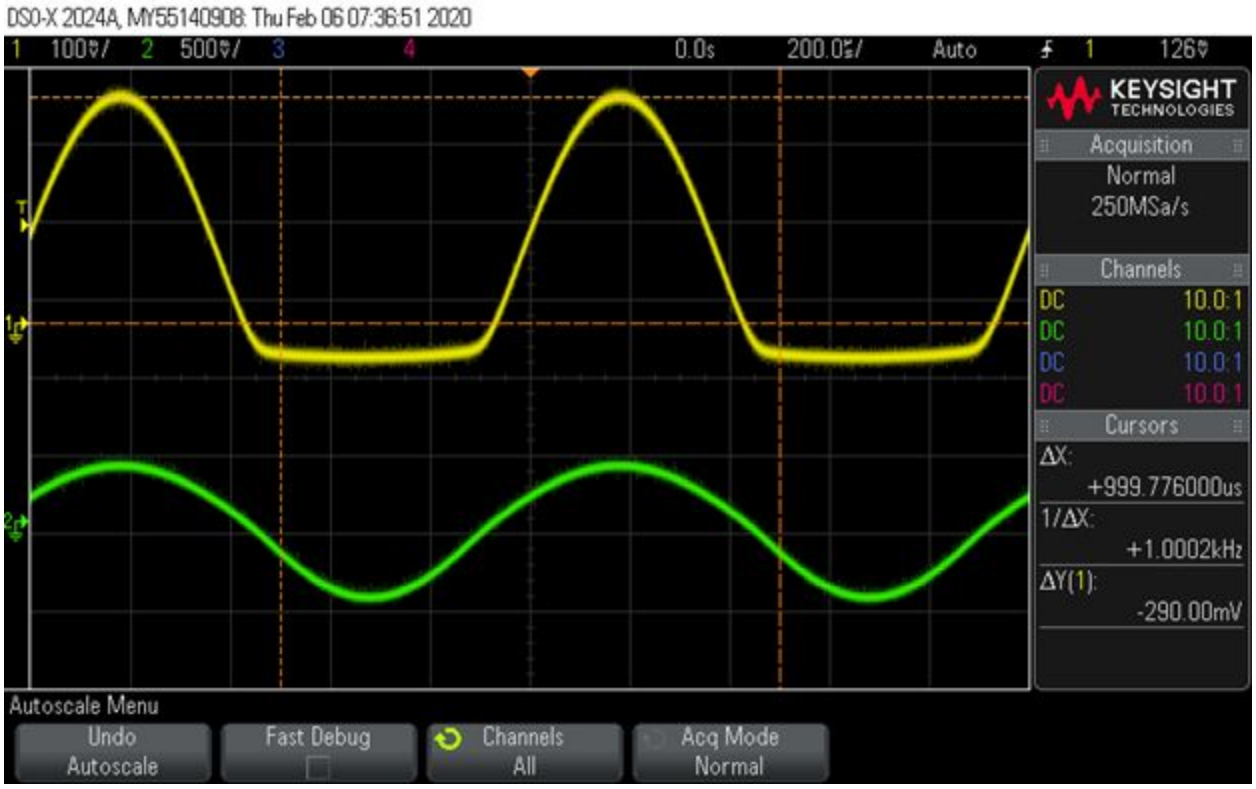

Figure 1: Half-Wave Rectifier Testing at a frequency of 1 kHz, resistance of 100 ohms, and input voltage of 1 Vpp

Figure 2: Full-wave rectifier testing at a frequency of 1 kHz, resistance of 10 kohms, and input voltage of 1.1 Vpp

The above graphs are just two samples of several measurements that we made during these past two weeks. For each rectifier circuit was tested using variable input of .8-1.1 Vpp and resistances that range from 22-1000 ohms. What we found is that we were previously testing loads that were not representative of the loads in our application. As a result the negative half-cycle was not rectified properly. An issue that our advisor made us aware of was factoring in the resistance of the function generator. After looking at our results our advisor said that our half-wave results were unusual. However we were told that our full-wave rectifier results looked good and with high confidence we could use it for our circuit. Our advisor will confirm the results and get back to us next meeting.

Booster Search

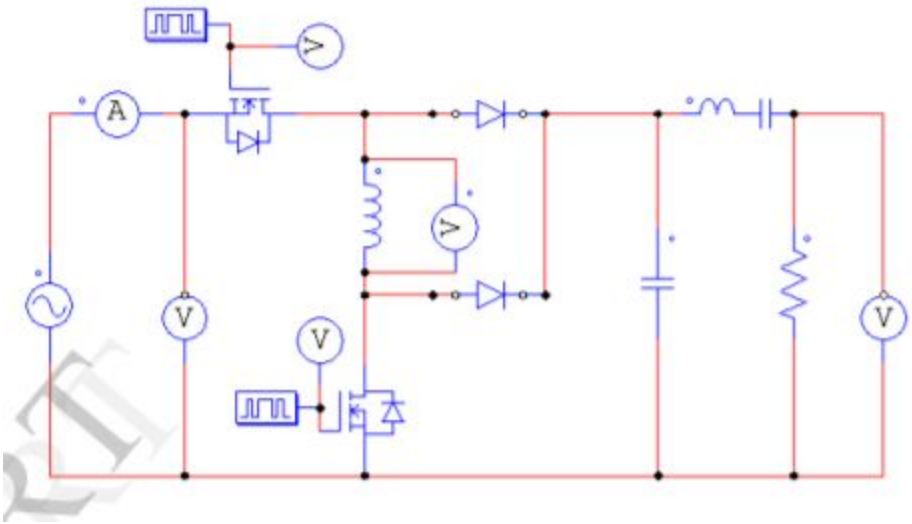

Figure 3: Self Powered Buck Boost Converter

Figure 4: EH4295 module

Figure 5: EH4205 module

Figure 3 shows a self powered booster design that we were interested in making. This design is able to take .4 V at 100 Hz and produce 3.3V which meet our criteria. The issue we came across was the switching frequency for the transistors is 50 kHz which would require a separate power supply to power an oscillator IC chip. We found that several booster designs require an oscillator and we have yet to discover how to do that within a single power supply of 1.1 Vpp. For now we were advised to set aside trying to build our own and focus our efforts on testing the boosting modules seen in figures 4 and 5. Both of these booster modules claim to work at voltages as low as 0.1 V and have a startup voltage of less than .5 V. The only main differences are the power efficiency and input impedance. This module was designed with energy harvesting in mind which fits within the context of our application.

Individual Contributions

Name	Estimated Hours this week	Estimated Hours Cumulative
Jordan Fox	5	7.5
Xiangyu Cao	6	8.5
Andesen Ande	5	7.5
Ahmed Salem	5	7.5
Ben Yoko	6	8.5
Shahzaib Shahid	6	8.5

These times reported are estimates based on 3 hours of group work done each week in addition to work done alone. The time spent is over the course of two weeks in which meetings with our advisor and client are not factored in. Our project plan showing our work schedule can be made available upon request.

Plans for the upcoming week

1. Test booster module EH4295-Shahzaib, Ben, Ahmed
2. Test booster module EH4205-Cao, Jordan, Andesen
3. Meeting with client - all team members
    a. Discuss new booster testing results and determine if it we are using it for our prototype
4. Begin planning peer evaluation video- all team members
5. Being updating design document - Andesen and Ahmed

Summary of weekly advisor meeting

We are currently testing the booster module and have decided on an appropriate way to rectify our circuit. The booster is the last individual part of the circuit that needs to be tested. If we verify this module works as stated we can move on to integration testing. We discussed that building a booster would involve clock or reference voltage that is extremely difficult to design at such low voltage. We know that the booster we ordered works using an oscillator and transformer at extremely low voltages so it is possible. We will consider looking into this after testing.