EE/CPRE/SE 491 Weekly Report 7 Date: Week of March 19, 2018

Group Number 4

High Current Pulse Generator for the Application of Transcranial Magnetic Stimulation

<u>Clients/ Advisors</u>: Priyam Rastogi, Neelam Gaunkar, Jayaprakash Selvaraj, Dr. Mani Mina

Project Objective: Over the course of 2 semesters, design, fabricate, and test a high-current pulse generation device for use in TMS research.

• Objective of Circuit

Peak Current of 2 KA +10%

EMF feedback must be considered

Peak Current Sustained for 400 µs

Rise/fall time of 100 µs

Up to 36 Hz pulse frequency (Commercial Benchmark)

Circuit Input is 120 V wall outlet.

Range of Load - 5 micro-Henry (min) to Max(Undefined)

10 pulses a minute max

Circuit shall be monophasic;

If successfully completed then a biphasic version shall be built.

The device shall output multiple waveforms (Square, Sawtooth, etc.)

Team Members:

Brian Kirkpatrick: Head of Circuit Design

Jon Rothfus: Head of Micro-Controllers, Team Communications Leader, Webmaster

Tania Alvarado Carias: Head of Electrical Safety Abdul Bahashawn: Head of Rectification Circuits

Yan Wang: Head of Component Selection

Curtis Richards: Team Leader

Sub Teams:

Chassis Design: Tania, Curtis, Yan

-Meets Thursdays 2:00-2:30 p.m. Howe
Rectification Circuit: Abdul, Yan, Brian
-Meets Fridays 2:00-3:00 p.m. Marston
-Meets Fridays 11:15-12:00 p.m. TLA
-Meets Wednesdays 1:15-1:45 in TLA

Weekly Summary:

EE/CPRE/SE 491 Weekly Report 7 Date: Week of March 19, 2018 Group Number 4

• Power Circuit:

We checked over our design, and confirmed all parts ordered were present.

• Chassis Design:

Parts were delivered, and accounted for. We began the layout of the parts on the chassis base.

- Micro-Controller (M.C.):
 - Began experimenting with controlling power relays with Arduino. We will use two power relays in our circuit: 1 to control capacitor charging, and 1 to control emergency discharging of the capacitors.
- Rectification Circuit:

During this week's rectification meeting, we assigned spots on the chassis box to store our certain components. Also we wired up the transformer and used a multimeter to check the voltages flowing out of the transformer. Realizing the limits of the transformer, we are going to add some limiting resistors to fix that issue as another transformer would be costly.

Accomplishments of the Past Week:

Each member is to write up a reflection on their work throughout the week. The reflections can be found at https://iastate.app.box.com/folder/46145323949

Pending Issues:

- I. Due Dates
 - a. Weekly Report to be filled out by Saturday at midnight
- II. Team Reports
 - a. Update your sub team sections accordingly

New Business:

I. Layout your parts this week, so that the chassis may be finished this weekend.

Individual Contributions:

EE/CPRE/SE 491 Weekly Report 7 Date: Week of March 19, 2018

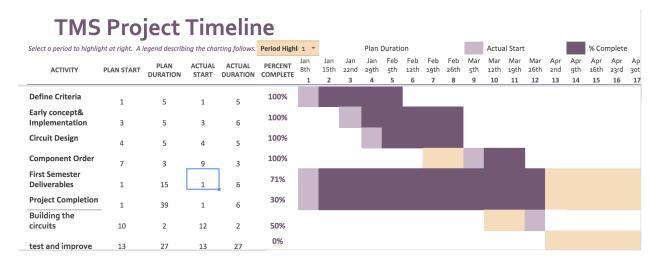
Group Number 4

Group	Accomplishments	Time	Total Time
Member		Worked This Week	Worked
Abdul	Did the paper layout for the project with the team. Checked the power and rectification parts to make sure they match what we ordered. Prepared for our class presentation. Read the data sheets for relays we ordered as well as the IGBT we obtained.	3	22
Yan	Looked through our parts and made sure everything was there. Update the Gantt chart for our weekly report. Assisted in the wiring of the transformer.	2.5	22.5
Jon	Read datasheet for power relay we are intending to use to control capacitor charging and emergency discharging. Connected relay to Arduino and wrote method to switch relay on command.	2	24
Brian	Received our parts from the shop, got together with team and did a paper layout to confirm everything would fit. Discussed some aesthetics with appearance and functionality.	4	27
Tania	Checked the parts received and helped in organizing the circuit, fitting the big resistors with the rest of the components efficiently.	2	21
Chuck	I added a second current limiting resistor to the rectification design, and redid the calculations to make sure that the circuit does not overload the transformer. I also did some chassis construction and wired the transformer.	4	55

Current Progress:

EE/CPRE/SE 491 Weekly Report 7 Date: Week of March 19, 2018

Group Number 4



Individual tasks to be completed before next meeting:

Everyone:

- Weekly reflection
- Rectification Team
- Power Team
 - IGBT Gate Voltage
 - o Abdul

LED for when there is charge in the capacitors.

- Chassis Team
 - o IR Camera
- M.C.
 - o Continue investigating method of measuring real time pulse current.
 - Test output waveforms with oscilloscope.

Summary of Weekly Advisor Meeting:

We took stock of all the components that came in. The plan for the week is to finalize a layout, so that the chassis may be finished. We decided that the building of the machine will take place in the Durham Lab. Our Advisor meeting will be by appointment only after this meeting. This is because the circuit has been finalized, and we will build it and test with our advisors desk 1 foot away. In the future our summary of weekly advisor reports will take more of a what problems our advisors helped us overcome in the past week vibe, unless told otherwise.