

High Current Pulse Generator for the Application of Transcranial Magnetic Stimulation

Clients/ Advisors: 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 μ s

- Rise/fall time of 100 μ s

- 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, Triangle, Sine)

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 3:00-5:00 p.m. Durham

Rectification Circuit: Abdul, Yan, Brian

-Meets Thursdays 3:00-5:00 p.m. Durham

Power Circuit: Tania, Curtis, Abdul

-Meets Thursdays 3:00-5:00 p.m. Durham

Micro Controller: Jon, Brian

-Meets Thursdays 3:00-5:00 p.m. Durham

Weekly Summary:

- Power Circuit: The alligator clips were replaced with aluminum busses.

- Chassis Design: n/a (Will finish chassis after circuit is tested and complete.) The team will have the final chassis put together before thanksgiving.

- Microcontroller:
 - Worked on project documentation related to Microcontroller.
 - Started prepping for final IRP talk related to Microcontroller.

- Precision Electronics:

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 Wednesday at midnight

- II. Team Reports
 - a. Update your sub team sections accordingly

- III. Final Report and Poster to be Completed over Thanksgiving Break

New Business:

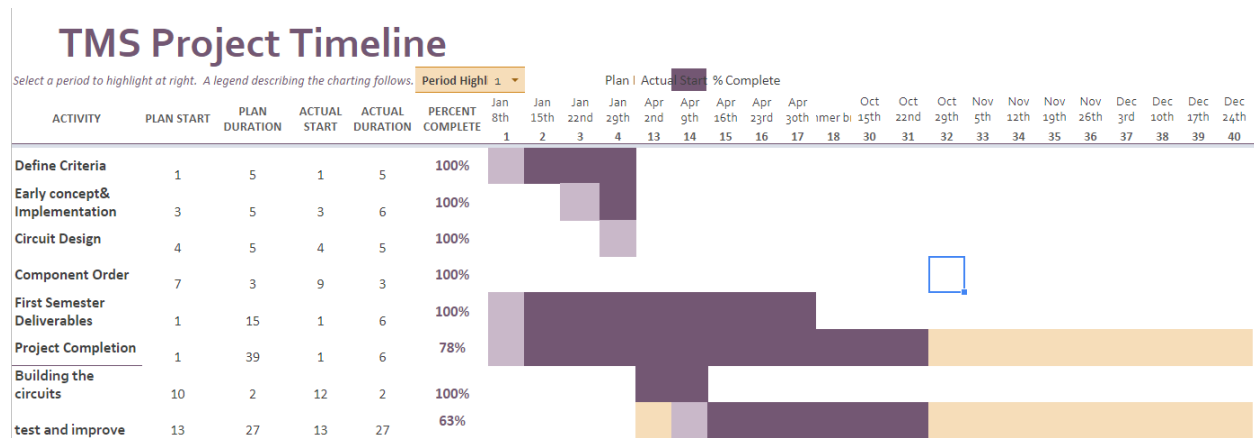
- I. Integrate the capacitor voltage sensing in with microcontroller and capacitors

Individual Contributions:

Group Member	Accomplishments	Time Worked This Week	Total Time Worked
Abdul	Worked on final report, simulations, and class presentation.	6	55
Yan	Worked on final report, prepare class presentation. Did calculation for current through the use of gauss meter and long solenoid approximation.	4	58.5

Jon	Worked on project documentation. Attended second PIRM meeting and wrote feedback to 2 teams. Started prepping for IRP talk.	5	64
Brian	Hooked up circuits to run simulation using the matlab GUI and verify system functionality.	5	60
Tania	Worked on class presentation and finishing the box set up to be able to close it off. Worked on final report	7	57
Chuck	worked on final report, poster, presentation, and final list of things to do to our tms machine	13	74

Current Progress:



Individual tasks to be completed before next meeting:

Everyone:

- PIRM Meeting 11/8
- Weekly reflection
- Senior Design Report
- Chuck find SPICE file for transistor.
- Abdul simulate circuit sweep for the inductor coil
- Test IGBT
- Electronic Measurements Team
 - Measure inductance of test coil
 - Additional Voltage measurement for Capacitors
 - Build Capacitor Charging Indicator Circuit
- Power Team

- Wire in the second Capacitor
 - Measure IGBT resistance
 - Wire in the Relay
- Chassis Team
 - IR Camera
- M.C.
 - Prepare for final IRP talk

Summary of Weekly Advisor Meeting:

Wrapping up the project. Poster is due tomorrow, and the final report shall be finished by this weekend.