EE/CPRE/SE 491 Weekly Report 9 Meeting Time 2:00 – 4:00 P.M. Monday in Durham
Date: Week of April 2, 2018
Group Number 4

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 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
Power Circuit: Tania, Curtis, Abdul	-Meets Fridays 11:15-12:00 p.m. TLA
Micro Controller: Jon, Brian	-Meets Wednesdays 1:15-1:45 in TLA

Weekly Summary:

- Power Circuit:

A testing plan was developed for the IGBT. We will begin testing A.S.A.P., but priority is given to the chassis mounting of our components.

- Chassis Design:

Drilled holes on the base for each of the components. Went to buy screws of different sizes for every component. Started installing components on the base.

- Micro-Controller (M.C.):

N/A this week.

- Rectification Circuit:

The soldering work is done and the connection has been tested using a multimeter and we have created a spare circuit in the chance of mishaps with the other two circuits.

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:

1. Circuit construction should be finished by Friday, so that individual circuit testing may begin Monday.

Individual Contributions:

Group Member	Accomplishments	Time Worked This Week	Total Time Worked

Abdul	Mainly, worked on cost analysis for the product if it were to go to production	1.5	27.5
Yan	Attached rectification circuit onto Chassis "box", went on a Lowe's run with a few member of our team. Assisted in sawing of a few pieces of wood to keep the capacitor from moving around too much. Spent some time to enlarge some of the drill holes on the resistors. Used multimeter to check connection of the rectification circuit. Discussed the layout of the Chassis design as well as assisted in drilling in the resistors and diodes. As well as updated the Gantt chart.	9	38
Jon	Investigated and selected ACS772 hall effect current sensing IC from *Allegro MicroSystems* as a likely option to allow monitoring and plotting of the load current by the microcontroller. Spent time working with Chuck and Yan testing charging and discharging of the capacitors and monitoring voltages. Worked with Chuck and Tania to connect IGBT to device and prepare for early testing. Spent time looking for automatic voltage switching device to allow for charging capacitors at higher than nominal voltage with auto shutoff when capacitor limit is reached.	5	33
Brian	Went to Lowes to pick up some fasteners for our chassis. Drilled mounting holes for components. Assisted team member with soldering rectifier. Met with microcontroller team to discuss some additional functions.	7	41
Tania	Worked on fixing the Project Plan with the suggestions our advisors gave us. Went to Lowe's with some other team members to pick up some tools to assemble the chassis components. Assisted in drilling holes for the components and installing them.	8	35
Chuck	Construction of our machine continued. I assisted in the installation of our resistors, diodes, and IGBTs.	14	77

Current Progress:

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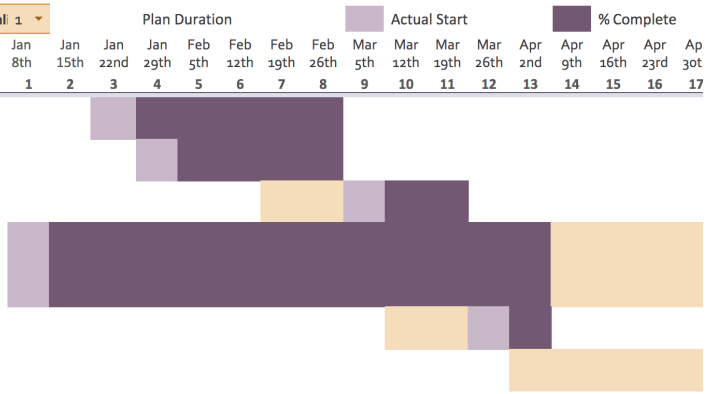
TMS Project Timeline

Select a period to highlight at right. A legend describing the charting follows. Period Highl 1 — Plan Duration — Actual Start — % Complete

ACTIVITY	PLAN START	PLAN DURATION	ACTUAL START	ACTUAL DURATION	PERCENT COMPLETE
Early concept& Implementation	3	5	3	6	100%
Circuit Design	4	5	4	5	100%
Component Order	7	3	9	3	100%
First Semester Deliverables	1	15	1	6	77%
Project Completion	1	39	1	6	33%
Building the circuits	10	2	12	2	90%
test and improve	13	27	13	27	0%



Individual tasks to be completed before next meeting:

Everyone:

- Weekly reflection
- Rectification Team
  - Develop Rectification Testing Plan
- Power Team
  - IGBT Gate Voltage
  - Develop IGBT Testing Plan
  - Abdul
    LED for when there is charge in the capacitors
- Chassis Team
  - IR Camera
- M.C.
  - Connect IGBT to microcontroller and test switching at low levels

Summary of Weekly Advisor Meeting: