

Senior Design 491 - May1629

**Development of "Triple Halo Coil" for Deep Transcranial
Magnetic Stimulation**

Weekly Report 10

Date: 11/10/2015

Members: Wentai Wang, Aashwath Agarwal, Dylan Jagger Rasmusson

Client: Dr. Ravi Hadimani / Dr. David Jiles

Advisor: Dr. Ravi Hadimani

Summary

Wentai has continued to contact Magstim to acquire all the information needed to use the magnetic stimulator units with the Triple Halo Coil. He has also reached out to several companies to order copper needed for coils, but the few that have responded cannot meet our requirements. Aashwath has simulated the three elliptical coils in SemCAD. Dylan has familiarized himself with SolidWorks and used it to successfully design an elliptical coil that will be imported to COMSOL for thermal and structural analysis.

Group Meeting Notes

- Distributed the work to complete the design document
- Reiterated individual tasks (see **Plans for Next Week**)
- Aashwath needs to do more research
- We must acknowledge the safety hazards of working with Magstim technology

Advisor Meeting Notes

(Meeting was held with Priyam only)

- Suggested reformatting reports
- Discussed new approach to finding provider for copper
- Requested more detailed COMSOL model of figure-of-eight coil for reference

Accomplishments

(Wentai)

- Getting manual from Magstim

(Aashwath)

- Designed actual triple halo coil in SemCAD

(Dylan)

- Efficient in using SolidWorks
- Designed elliptical coil

Plans for Next Week

(Wentai)

- Try contacting Magstim for their copper supplier
- Contact Chinese companies for copper
- Continue looking elsewhere for copper supplier
- Read Magstim Manuals

(Aashwath)

- Simulate different orientation of coils to produce the best results
- Consider 5mm insulated case for each coil in simulation
- Research

(Dylan)

- Design more accurate elliptical coils
- Learn the best way to import SolidWorks parts into COMSOL
- Study previous figure-of-eight COMSOL model and simulation

Pending Issues

Time is running short and we must all spend more time each week to meet our goals.

Individual Hourly Contribution

<u>Name</u>	<u>Hours this week</u>	<u>Work</u>
Wentai Wang	5.5	Fabrication prepare Weekly Report
Aashwath Agarwal	7	SemCAD, Weekly Report
Dylan Rasmusson	10+	COMSOL, SolidWorks, Weekly Report

(Wentai)

During last week, Wentai still focused on searching copper wire supplier. He found 11 companies and sent 7 emails. However none of those company have suitable wires. The group rejected the idea about asking Boyd Lab to cut one copper wire, because of lamination issues. He also contacted Magstim company and received several device Manuals.

(Aashwath)

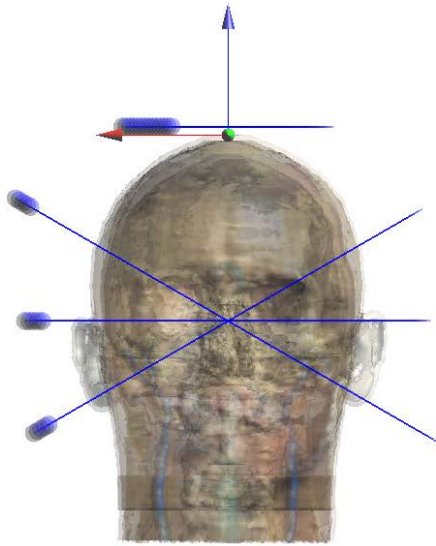
This week my job was to do the finite element analysis for actual Triple Halo Coil design on SemCAD. For this I made 15 elliptical coils with starting elliptical coordinates for $x = 110$, and $y = 150$, and further incrementing by 2.5 mm. This newly designed coil was able to provide better and deeper magnetic field inside the deep brain. The attached at the appendix is my actual triple halo coil design.

(see figure 1 in SemCAD section at the end of the document)

(Dylan)

This week I familiarized myself with SolidWorks. I learned of many techniques and tools within the program and spent quite some time figuring out the best way to make the most accurate elliptical coils. I was able to combine several techniques and simple mathematics to produce an elliptical coil that I will use to in the simulation of the “Triple Halo Coil”. There are only a few minor adjustments I must make before I can design two more coils based on my model. I will then combine the three and run structural and thermal analysis of the design.

SemCAD



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Figure 1

SolidWorks: Elliptical Coil

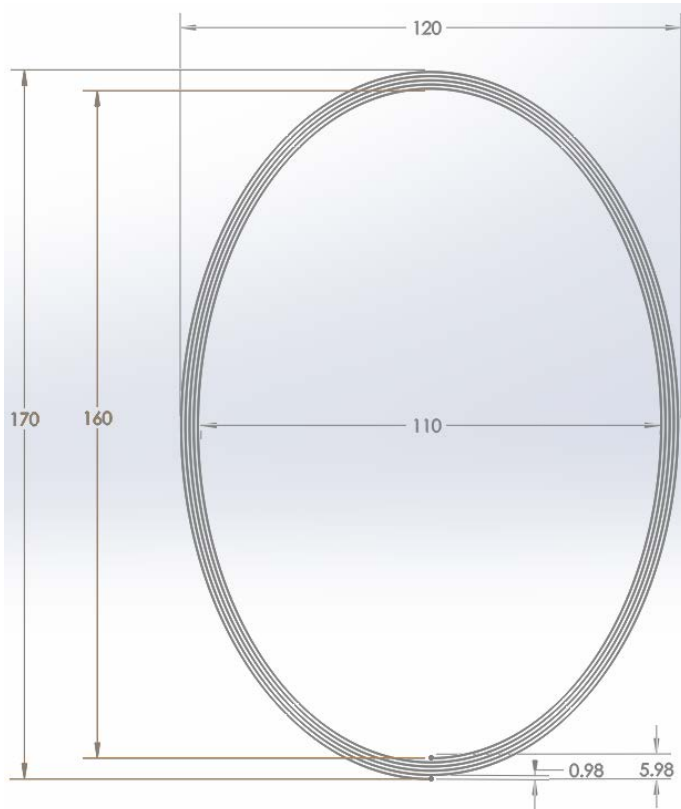


Figure 2: Top View – Lines only

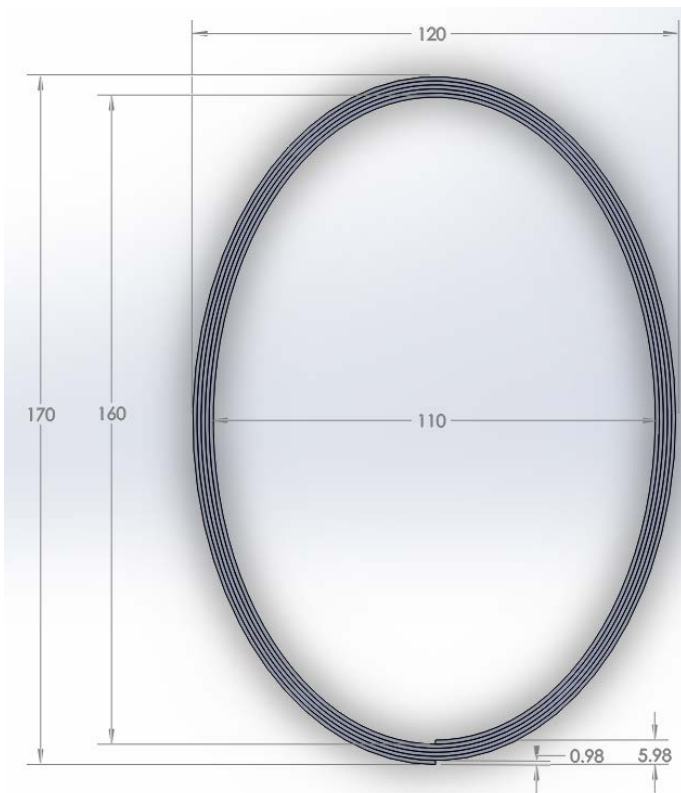


Figure 3: Top View – Copper Coil – minimal space between turns

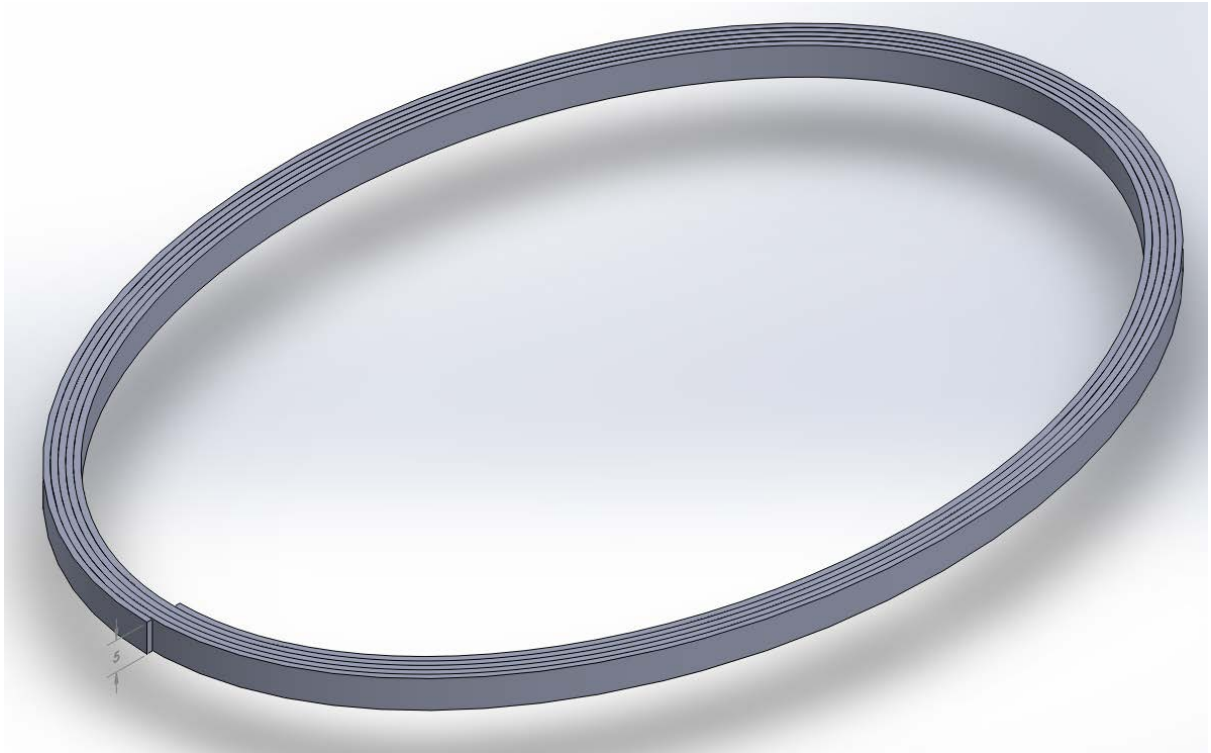


Figure 4: Isometric View