May1629 Hadimani

IOWA STATE UNIVERSITY
Department of Electrical and Computer Engineering

Advisor: R Hadimani

Senior Design Project Proposal Form

Client/Company/Organization: Iowa State University/Magstim

Submitter (name): Ravi Hadimani **Email**: hadimani@iastate.edu

Project Contact: Ravi Hadimani **Email**: hadimani@iastate.edu

Project Title:

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

Project Abstract (include **ALL project goal(s)**, design constraints, and technical approaches and tools):

A non-invasive, surgery-free treatment for many neurological diseases such as Parkison's Disease, Depression and Traumatic Brain Injury (TBI) has been recently developed using Transcranial Magnetic Stimulation (TMS). Food and Drug Administration (FDA) has approved this technology for the treatment of depression using standard coil which is capable of stimulating upper region of the brain.

David Jiles's lab has developed a new coil called as "Halo coil" which is capable of stimulating deeper regions of the brain. This coil is being tested in Walter Reed National Military Medical Center. It needs improvement in terms of better surface to deep brain magnetic field ratio in order to avoid excessive stimulation on the scalp. We will use finite element analysis to modeled electric and magnetic field in different regions of the brain using anatomically realistic head models. We will also fabricate the "Triple Halo Coil" in collaboration with Magstim LLC. When fully developed, this coil can be used in the treatment of many neurological disorders that originate from the deeper regions of the brain such as Post-Traumatic Stress Disorder (PTSD) and Parkinson's Disease.

Students will have an opportunity work with a company and hospital and to model, fabricate and measure different parameters related this newly designed "Triple Halo Coil".

Expected Deliverables (include expected schedule, cannot be open-ended, **must list at least one deliverable**):

Fabricated "Triple Halo Coil" that is mechanically and thermally stable and can be used with the Magstim Stimulator

Specialized Resources Provided by Client (be as specific as you can):

SIM4Life and COMSOL Finite Element Analysis packages, Magstim stimulators and other laboratory infrastructure.

Anticipated Cost: $5000 **Financial Resources Provided by Client** (if any): $4500

NOTE: General Resources Provided by ISU/ECpE: MSDNAA software, and access to resources in ECpE teaching and research labs, e.g., electronics, embedded systems, etc.

Enter # Students Preferred/Required:

- ☑ Electrical Engineering
- ☑ Computer Engineering
- ○ Software Engineering
- ○ Other (specify):

Special Skills Required of Students (be specific):

Complete reverse side of form

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Anticipated Client Interaction (estimate):

☐ 1 meeting per week
☐ phone, ☐ internet, ■ live
☐ 1 meeting per month
☐ phone, ☐ internet, ☐ live
☐ 2 or more meetings per month
☐ phone, ☐ internet, ☐ live
☐ 1 meeting per semester
☐ phone, ■ internet, ☐ live

Meeting ABET Criteria

Please rate the following statements as they relate to your proposed project:

0 – Not at all *1 – A Little* *2 – Somewhat* *3 – A Lot* *4 – Completely*

On this project, students will need to apply knowledge of mathematics, science, and engineering	☐ 0	☐ 1	■ 2	☐ 3	☐ 4
This project gives students an opportunity to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	☐ 0	☐ 1	☐ 2	■ 3	☐ 4
This project involves students from a variety of programs, i.e., SE, EE, and CprE	☐ 0	☐ 1	☐ 2	☐ 3	■ 4
This project requires students to identify, formulate, and solve engineering problems	☐ 0	☐ 1	☐ 2	■ 3	☐ 4
This project gives students an opportunity to use the techniques, skills, and modern engineering tools necessary for engineering practice	☐ 0	☐ 1	☐ 2	■ 3	☐ 4

Project Approval – *for use by ECpE Senior Design Committee*

☐ Approved ☐ Not Approved

☐ Faculty Advisor Assigned: _____

☐ Project Number Assigned: _____

Submit form electronically to Dr. Sumit Chaudhary, Senior Design Coordinator (sumitc@iastate.edu)