Intracranial EEG Phantom for Brain Stimulation Studies

Date: 9/18/2025

Client: Dr. Raheel Ahmed

Alternative Contact: Dr. Arun Karumattu Manattu

Advisor: Dr. Paul Campagnola

Team:

Avery Schuda (Team Leader)

Lilly Mackenzie (Communicator)

Helene Schroeder (BSAC)

Orla Ryan (BWIG)

Corissa Hutmaker (BPAG)

Problem statement

Intracranial electroencephalography (iEEG) is routinely used in surgical planning for individuals with uncontrolled seizures. Transcranial magnetic stimulation (TMS) may provide complementary information for mapping out critical brain regions that should be avoided during surgery, however, there are still safety concerns around the use of TMS in patients with iEEG. The major safety concerns are the induction of electrical currents, heating, and displacement of the implanted electrodes. The goal of this project is to develop a phantom that can be used to simulate the effect of TMS on electrode currents, temperatures, and changes in position.

Brief status update

This week the team met with the clients to gain background information and discuss goals for the project. The team continued researching background information on TMS and iEEG, as well as other specifications. This helped to inform the writing of the initial product design specifications.

Difficulties / advice requests

Major team goals for the next week

- 1. Brainstorm preliminary design ideas
- 2. Construct design matrix for materials and other aspects of the design
- 3. Meet with clients and tour PNL

Next week's individual goals

- Avery
 - Continue researching materials and other design aspects
 - Work with team to create design matrices
 - o Brainstorm and mock up design ideas for phantom base
- Lilly
 - Research phantom hydrogel materials for initial prototyping
 - Work on design matrices and choose a direction (shape) for initial prototype
- Helene
 - Brainstorm phantom designs to discuss with the team to create our design matrix
 - Continue research into potential materials and existing brain phantoms
- Orla
 - Coordinate lab tour in the PNL space
 - Bring ideas to next team meeting to construct design matrix
 - Research electrode types used in iEEG
- Corissa
 - o Perform research to complete the design matrices
 - o Continue looking for defined standards to aim towards during testing

Timeline

Task	Sept			Oct					Nov				Dec		
idak	5	12	19	26	3	10	17	24	31	7	14	21	28	5	10
Project R&D															
Empathize	Χ	Χ													
Background		Χ	Χ												
Prototyping															
Testings															
Deliverables															
Progress Reports		Х	Х												
PDS			Χ												
Prelim Presentation															
Final Poster															
Final Report/Notebook															
Meetings															
Client		Х													

Advisor	Χ	Х	Х						
Website									
Update	Χ	Х	Х						

Filled boxes = projected timeline **X** = task was worked on or completed

Previous week's goals and accomplishments

- Avery
 - Worked with team to complete the PDS
 - Started researching 3D printed PMMA and other acrylic polymers, as well as hydrogels that could be used for the phantom
- Lilly
- Researched safety standards for iEEG and TMS protocols for PDS
- o Began further research into project background
- Helene
 - o Did background research into TMS, iEEG, and its use to treat epilepsy
 - Worked on the PDS with the team
- Orla
 - Attended client meeting to ask initial questions
 - o Researched background TMS studies, including those on pediatric populations
- Corissa
 - Did research to better understand the project/client needs
 - Completed the first PDS draft

Current design

N/A

Materials and expenses

Item	Description		Mft	Vendor	Vendor	Date	l#	Cost	Total	Link
		turer	Pt#		Cat#			Each		
Category 1										
									\$0.00	
									\$0.00	
Category 2										
									\$0.00	
									\$0.00	

	TOTAL:	\$0.00	
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