

Intracranial EEG Phantom for Brain Stimulation Studies

Date: 10/23/2025

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 Dr. Ahmed and Dr. Manattu to discuss the team's progress and ask clarifying questions regarding purchasing and the specific age range within pediatrics to base the phantom off of. The team also purchased the agar that will be used to create the brain portion of the phantom. The team also met with Dr. Nimunkar to discuss thermal conductivity testing.

Difficulties / advice requests

Major team goals for the next week

1. Fabricate a sample of agar to refine the protocol and conduct testing on
2. Prepare for Show and Tell
3. Plan testing on the rheometer
4. Plan testing for thermal conductivity

Next week's individual goals

- Avery
 - Begin material testing on fabricated gel
 - Finalize CAD file and prepare box phantom to be 3D printed
 - Prepare questions for peers for Show and Tell
- Lilly
 - Meet with Dr. N to discuss testing thermal conductivity
 - Fabricate initial hydrogel
 - Begin developing 3D CAD models of skull
- Helene
 - Continue fabrication of the phantom and begin testing where applicable
 - Attend Show and Tell with the team to receive feedback from peers
- Orla
 - Assist in initial hydrogel fabrication
 - Stay in contact with Dr. Manattu about team needs/deadlines
- Corissa
 - Finish initial fabrication of hydrogel
 - Research thermal conductivity testing further after meeting with Dr. Nimunkar
 - Prepare for Show and Tell

Timeline

[illegible]

Meetings															
Client		X			X			X							
Advisor	X	X	X	X	X		X	X							
Website															
Update	X	X	X	X	X	X	X	X							

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

Previous week's goals and accomplishments

- Avery
 - Attended meeting with Dr. Ahmed and Dr. Manattu
 - Started planning testing for when gel fabrication is complete
- Lilly
 - Met with clients, got preliminary materials ordered
 - Continued research into testing and fabrication
- Helene
 - Attended the meeting with Dr. Ahmed and Dr. Manattu
- Orla
 - Caught up on the second client meeting
 - Continued to update website with team progress
- Corissa
 - Met with Dr. Ahmed and Dr. Manattu to get a better understanding of project specifics
 - Looked into agar fabrication methods

Current design

N/A

Materials and expenses

Item	Description	Manufac-turer	Mft Pt#	Vendor	Vendor Cat#	Date	#	Cost Each	Total	Link
3D prints										
Formlabs BioMed Clear Sample Swatch	Step wedge with thicknesses of 0.1, 0.2, and 0.3 inches for prelim presentation prop	UW Design and Innovation Lab	N/A	N/A	N/A	10/1	1	\$7.14	\$7.14	

									\$0.00	
Hydrogel Materials										
Agar Powder, 500g	500g of agar powder for initial brain phantom fabrication	Thermo Fisher Scientific	A10752.36	Thermo Fisher Scientific	A10752.36	10/20	1	\$128.65	\$149.15	https://www.thermofisher.com/order/catalog/product/A10752.36
									\$0.00	
								TOTAL:	\$156.29	