# Intracranial EEG Phantom for Brain Stimulation Studies

Date: 10/16/2025

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 completed the preliminary report. The team has also made progress in creating testing protocols and inquiring about the equipment available within the university.

## Difficulties / advice requests

### Major team goals for the next week

- 1. Order agar for hydrogel
- 2. Meet with Dr. Ahmed for further project information
- 3. Plan testing on the rheometer
- 4. Inquire further about testing methods for thermal conductivity

## Next week's individual goals

- Avery
  - Meet with client and med student to update progress and discuss next steps for the project
  - Gather materials needed to execute testing protocols
- Lilly
  - Order materials and determine gel composition/additives
  - Meet with client to clarify points on project
- Helene
  - Meet with Dr. Ahmed and the team to discuss next steps in the project
  - Finalize materials and protocols for the fabrication of the hydrogel
- Orla
  - Continue to keep website updated as more deliverables are created
  - o Prioritize testing protocols and a plan for show and tell in two weeks
- Corissa
  - Send initial materials to Dr. Ahmed for ordering
  - o Begin Minitap simulations while waiting for hydrogel to arrive

#### **Timeline**

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

Advisor	Χ	Х	Χ	Х	Χ		Х				
Website											
Update	Χ	Х	Х	Х	Х	Х	Χ				

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

#### Previous week's goals and accomplishments

- Avery
  - Worked with team to complete the preliminary report
  - Drafted DOE to test material conductivity
  - Looked into test methods for hydrogels using a rheometer
- Lilly
  - Worked on completing preliminary report
  - Reached out to professors to help with testing methods and tools
- Helene
  - Completed the preliminary report with the team
  - o Researched more regarding materials to use for fabricating the hydrogel
- Orla
  - o Met with Dr Campagnola to get feedback on preliminary report
  - Conducted further research on materials and properties
- Corissa
  - Worked with the team to finish writing the preliminary report
  - Looked further into Minitab and Thermal Line Systems for testing

#### **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	

Category 2											
								\$0.00			
								\$0.00			
							TOTAL:	\$0.00			