

Intracranial EEG Phantom for Brain Stimulation Studies

Date: 11/06/2025

Client: Dr. Raheel Ahmed

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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

At last week's Show and Tell, the team got advice from peers on testing components and the final prototype, processing CT scans, and other advice. After successfully calibrating the rheometer and familiarizing ourselves with the machine, an updated testing plan was created. Additionally, the team received CT scans that will be able to be processed into a CAD model in the coming weeks.

Difficulties / advice requests

Major team goals for the next week

1. Process CT scans into a workable CAD file
2. Fabricate gels and test on the rheometer
3. Finalize activity for outreach
4. Create a temperature measurement system

Next week's individual goals

- Avery
 - Begin processing CT scans into workable CAD file
 - Create new gels and test them on the rheometer
- Lilly
 - Work on processing CT scans into CAD files for printing
 - Further prototyping with agar gels
- Helene
 - Test the agar gels using the rheometer
 - Begin to process the CT scans into files to use for printing
- Orla
 - Start work on final report
 - Work on conductivity testing protocol
 - Make significant progress on outreach activity proposal
- Corissa
 - Try new testing protocol for gel mechanical properties
 - Solidify testing methods for electrical gel properties

Timeline

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

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	