

Title: 3D Printed Respiratory Motion Phantom PgR 4

Date: 9/30/2026

Client: Dr. Andrew Shepard

Advisor: Prof. Mehmet Orman

Team:

Student 1: Matthew Niemuth - Team Leader

Student 2: Royal Swick - Communicator

Student 3: Drew Kruse - BSAC

Student 4: Natalie Waibel - BWIG

Student 5: Avi Ganti - Co-BPAG

Student 6: Jahan Ingraham - Co-BPAG

Problem statement: Design and Fabricate a 3D-printed respiratory motion phantom insert that simulates two lung lesions with realistic density and anatomy for evaluation of real-time tumor tracking during radiotherapy.

Brief status update: This week our team met with our client and got a better understanding of how the phantom integrates with the QUASAR system, and got many of our questions answered. We then created an updated design matrix and worked on the preliminary design presentation.

Difficulties / advice requests: N/A

Current design: Nesting Doll Design

Materials and expenses:

Item	Description	Manufac-turer	Mft Pt#	Vendo r	Vendo r Cat#	Date	#	Cost Each	Total	Link
Category 1										
									\$0.00	
									\$0.00	
Category 2										
									\$0.00	
									\$0.00	
								TOTAL:	\$0.00	

Goals

Major team goals for the next week

1. Meet with client to discuss preliminary designs and receive feedback about how they would like us to move forward
2. Finish Preliminary Report
3. Begin refining design based on client feedback and researching and buying materials to incorporate within our

Next week's individual goals

- Royal Swick
 - For next week I want to set up a quick meeting with our clients to get their feedback on our designs. I also will finish my section of the preliminary design report.
- Matthew Niemuth
 - Research materials to incorporate into the phantom design. Meet with clients to receive feedback on current preliminary designs. Work on getting the preliminary report done.
- Drew Kruse
 - Reflect on the feedback we get from our preliminary presentation and continue to flush out the design we chose. I will complete my part of the report and hold everyone accountable for their parts.
- Natalie Waibel
 - Meet with clients to discuss our preliminary designs. Focus on material selection. Finish sketching out our chosen design and CAD it. Work on the preliminary report!!
- Jahan Ingraham
 - After the preliminary presentation, decide on a design and start fabrication and deciding material specifics.
- Avi Ganti
 - Use feedback from our presentation to decide on a design and start the fabrication process, and complete my part of the preliminary report.

Timeline:

Task	Sep			Oct					Nov				Dec	
	12	19	26	3	8	17	24	31	7	14	21	28	5	10
Project R&D														
Research	X	X	X											
Design			X											
Prototyping														
Testings														
Deliverables														
Progress Reports	X	X	X											
PDS		X												
Design Matrix			X											
Prelim Presentation														
Prelim Report														
Final Poster														
Final Report														
Meetings														
Client		X												
Advisor	X	X	X											
Website														
Update														

Filled boxes = projected timeline

X = task was worked on or completed

Detailed accomplishments

Previous week's goals and accomplishments

- Royal Swick:
 - Previous Goals: Complete my portion of the preliminary design presentation, and help complete the new design matrix after meeting with our client.
 - Accomplishments: We met with the client and have a much better understanding of what our designs should feature and look like. After this we all came up with a couple designs and met Sunday afternoon to complete our design matrix, and split up the presentation. I then completed my section of the presentation which was future works, testing and results, acknowledgements, and references.
- Matthew Niemuth
 - Previous Goals: Continue to conduct more research on respiratory phantoms, radiotherapy techniques, and materials. Complete the preliminary presentation and meet with the team to practice presenting. Also begin thinking about the preliminary report.

- Accomplishments: I worked a lot on preliminary designs this week, spending lots of time brainstorming and thinking about ways to solve this problem that meet all the client requirements. I came up with 4 design ideas, helped the team brainstorm design matrix criteria, which designs should go in the design matrix, scoring those designs, and preparing for the preliminary presentation. I also briefly made a solidworks model to represent what a phantom is for the preliminary presentation, though this is not the final design by any means.
- Drew Kruse
 - Previous Goals: The client meeting is Friday, so we will take detailed notes on what we learn from him and being in the clinic. We will ask many questions as we need to in our meeting at the hospital to get the most out of our first time seeing the device in person. We will also work on our report and presentation.
 - Accomplishments: Did some more research on materials and competing designs for preliminary presentation. Also, we asked so many questions during our meeting with client, so we should be set for our preliminary presentation. I completed my part of the presentation and am ready to practice as a team. Met with our client, advisor, and our team twice.
- Jahan Ingraham
 - Previous Goals: Meet with the client and get a better understanding of the project and start preliminary presentation.
 - Accomplishments: Met with client for specifics, made the presentation, met with the group to discuss best ideas and how we will structure our presentation and designs. Met with Prof. Mehmet Orman to discuss designs and insight into our project.
- Natalie Waibel
 - Previous Goals: Meet with Dr. Shepherd to get dimensions of the phantom and a better understanding of the QUASAR system's role in medicine. Research materials to use in our design.
 - Accomplishments: Met with Dr. Shepherd, got the dimensions of the phantom and asked lots of questions, drew up improved design ideas and presented them to my team. Met with Advisor to go over our design matrix. 3D printed out a prototype for the presentation. Started CADing the design. Made the background slides for the preliminary design presentation.
- Avi Ganti
 - Previous Goals: Meet with Dr Shepard and begin to sketch out designs.
 - Accomplishments: Met with Dr. Shepard to get the dimensions of the phantom as well as a better understanding of the design parameters. Brainstormed a design using foam and met with the team to narrow down our top three designs for the presentation. Put the “nesting doll” design and the foam design in the presentation.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Matthew Niemuth	9/16/26	Spent significant time brainstorming designs and creating design and drawing	10	10	20

		them out, some time discussing design matrix criteria with team, discussing which designs go into the design matrix with team, scoring those designs with team, preparing for the preliminary presentation, and creating a Solidworks model to be printed out for the preliminary presentation on Friday. Also included time we will spend for practicing preliminary presentation before the end of the week (about 2 hours)			
Royal Swick	9/30/26	Met with the client, spent lots of time brainstorming designs and drawing them, spent time with the team to create our new design matrix, talk through our designs, and split up the presentation. Completed my section of the presentation and practiced for the presentation.	8	8	18
Drew Kruse	9/30/2026	- Brainstormed design ideas for design matrix and helped finalize designs and scoring - Conducted more research for presentation. - Completed preliminary presentation - Met with advisor and client - Met with group multiple times	6	6	15
Natalie Waibel	9/30/26	Met with Dr. Shepherd, got the dimensions of the phantom and asked lots of questions, drew up improved design ideas and presented them to my team. Met with Advisor to go over our design matrix. 3D printed out a prototype for the presentation. Started CADing the design. Made the background slides for the preliminary design presentation. Included prep time for presentation.	5	5	15
Avi Ganti	9/17/26	- Brainstormed design ideas and scored them in the design matrix - Finished my slides for the presentation - nesting doll and foam - Attended meeting with client to have a better foundation to draw up improved designs - Met again with advisor to get feedback on improved design matrix.	6	6	15
Jahan Ingraham	9/16/16	Work on preliminary presentation and meet with the client about needs and	4	4	12

		specifics for dimensions and materials.			
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