

Photoacoustic System for Spinal Surgery Project Update

Group 03

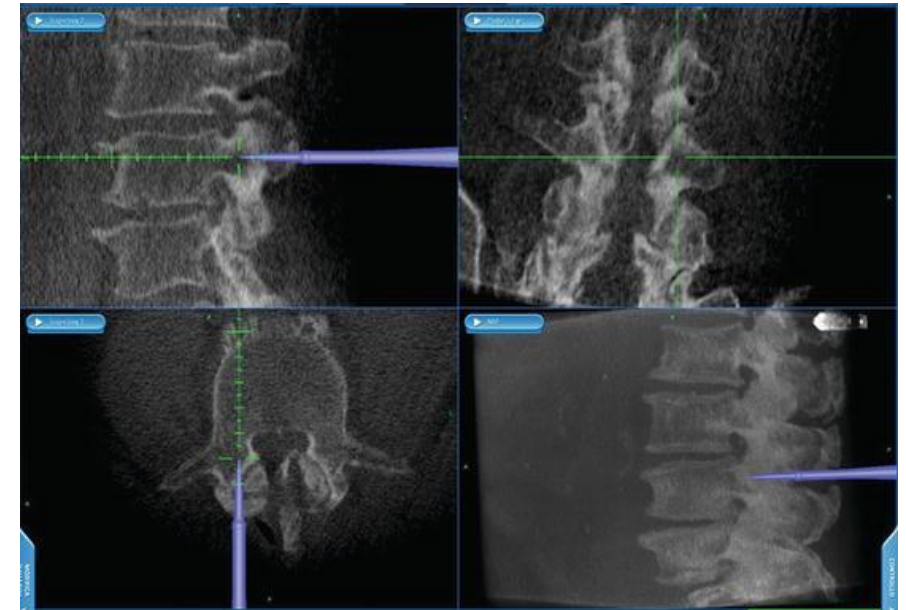
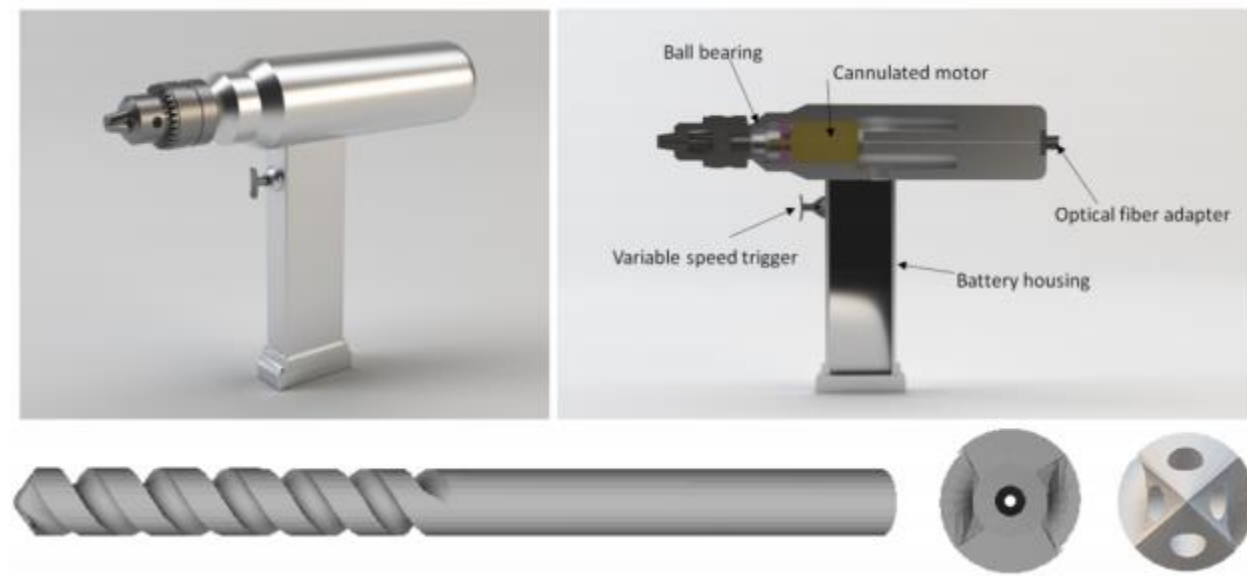
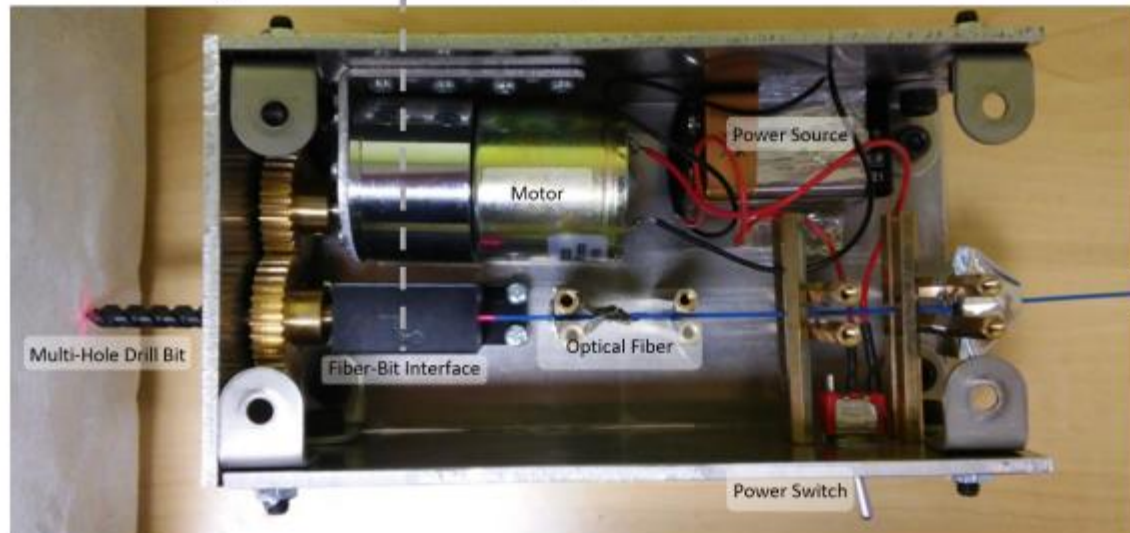
Mentor: Muyinatu A Bell

Team Member: Blackberrie Eddins

Project Summary

- Goals

- Proof of Concept
- Drill Tracking
- Image Processing



Dependencies: Experiments

Dependency	Solution	Progress
Drill Prototype	Search Lab, Drill existing piece	Solved
Blood	IRB protocol	Solved
IRB Protocol	Talk to Dr. Bell	Solved
Lab Access	Talk to Dr. Bell	Solved
Experiment holder for vertebra	Design/build one	Solved
OPO Laser	Maintain OPO in Lab	Solved
MATLAB scripts	Talk to grad students	In Progress

Dependencies: Tracking

Dependency	Solution	Progress
Phantom with pre-drilled hole(s)	Design/build	Have one without blood
CT Access/ training	Talk to Dr. Bell, grad students	Not started
CT Registration Algorithm	Use Eduardo's, or other existing	Not started

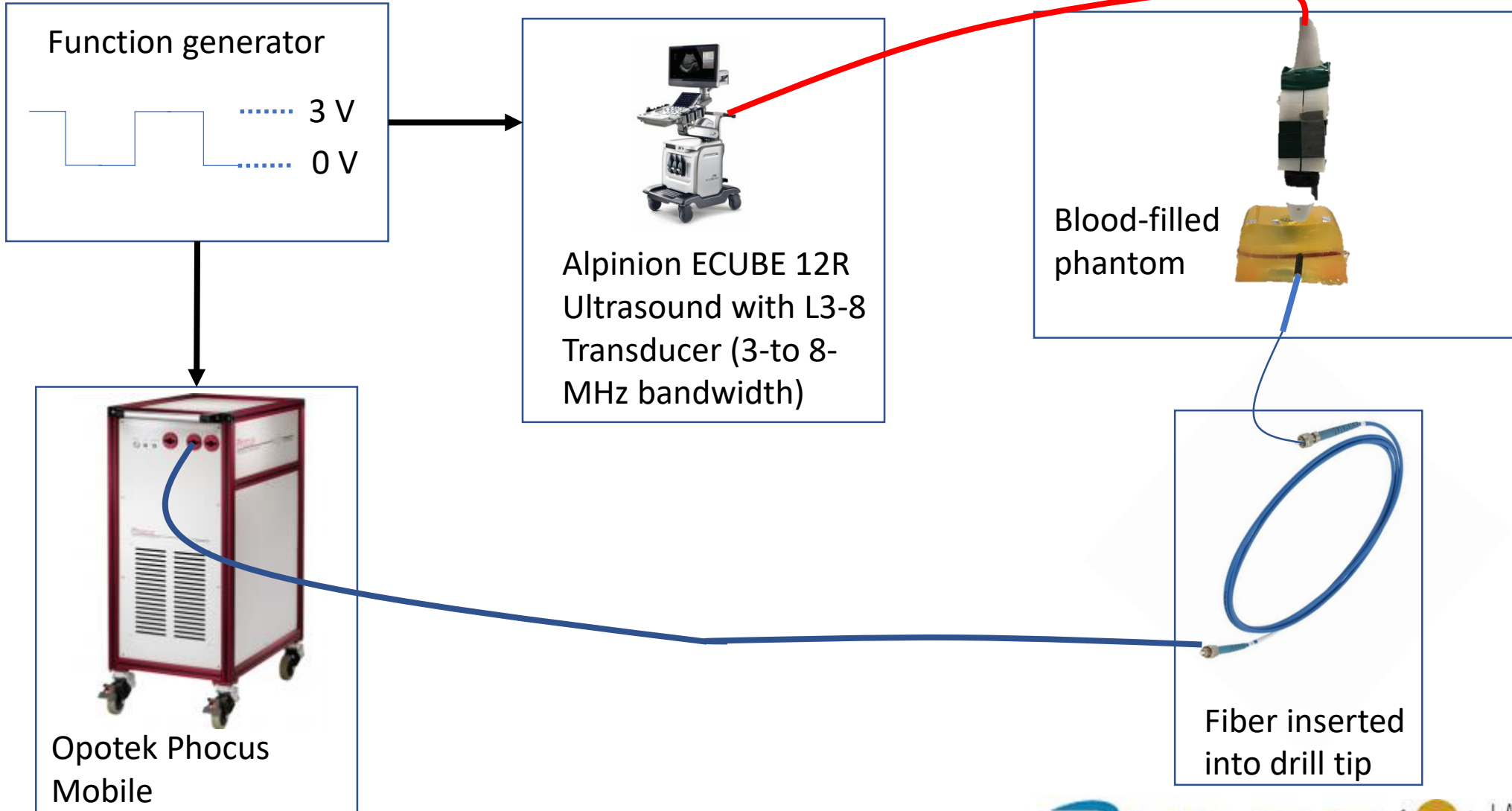
Dependencies: Image Processing

Dependency	Solution	Progress
Knowledge of SLSC Imaging	Read papers, Dr. Bell	Read some
PA image data	Experiments	Started

Dependency Updates

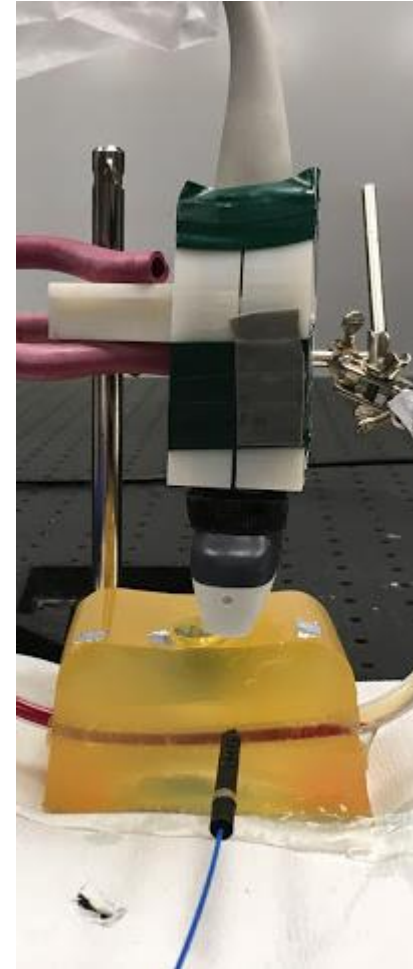
- Opotek Phocus OPO was misaligned
 - Weak and variable output
 - Hours of manual alignment
 - Technician secured loose part
- Blood samples easily acquired during week
- Have dry lumbar and thoracic vertebrae, as well as frozen whole spine samples with blood and tissue
- Data processing scripts were less accessible than anticipated
 - Just got scripts for the linear probe
 - In process of getting scripts for phase array

Technical Approach: Blood Experiments

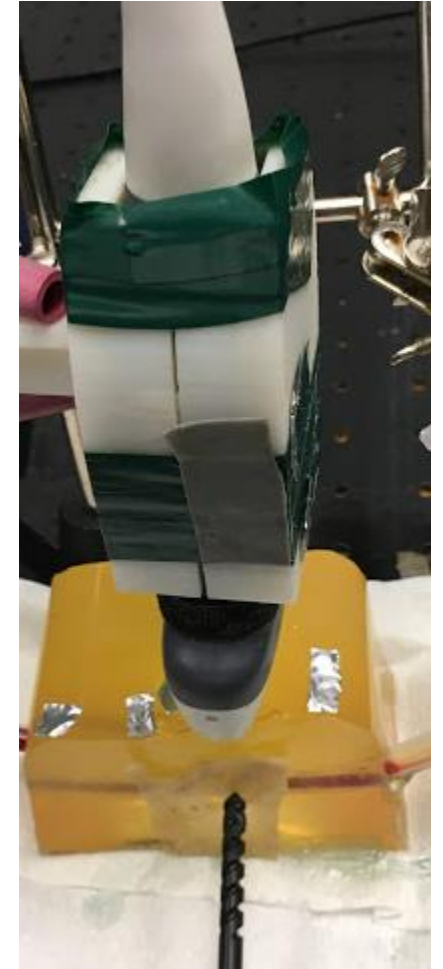


Blood Visualization

- Very weak
 - Low energy
 - Small fiber
- Best visualization with multi hole drill tip
 - Widens beam

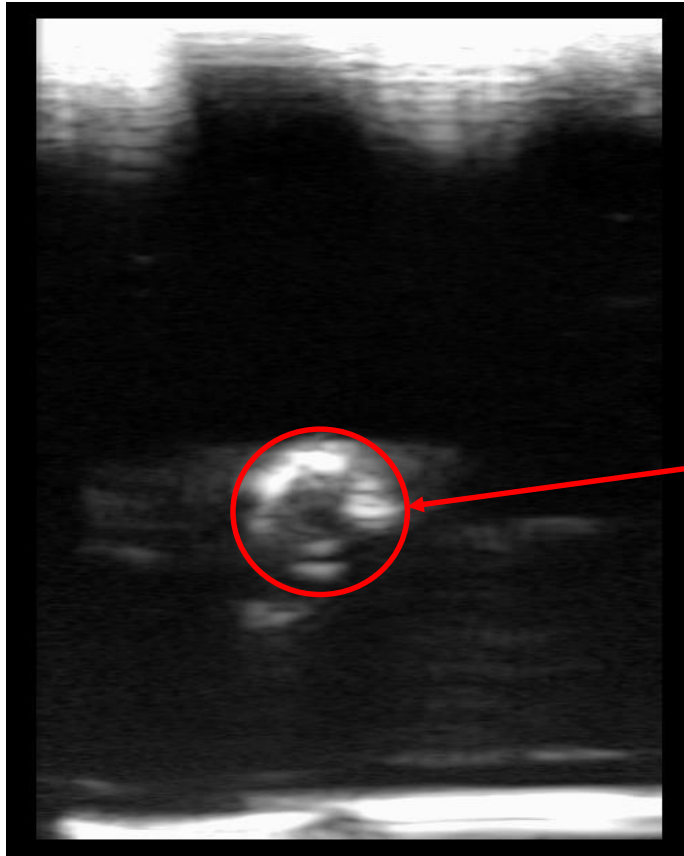


No bone



1 mm bone chip

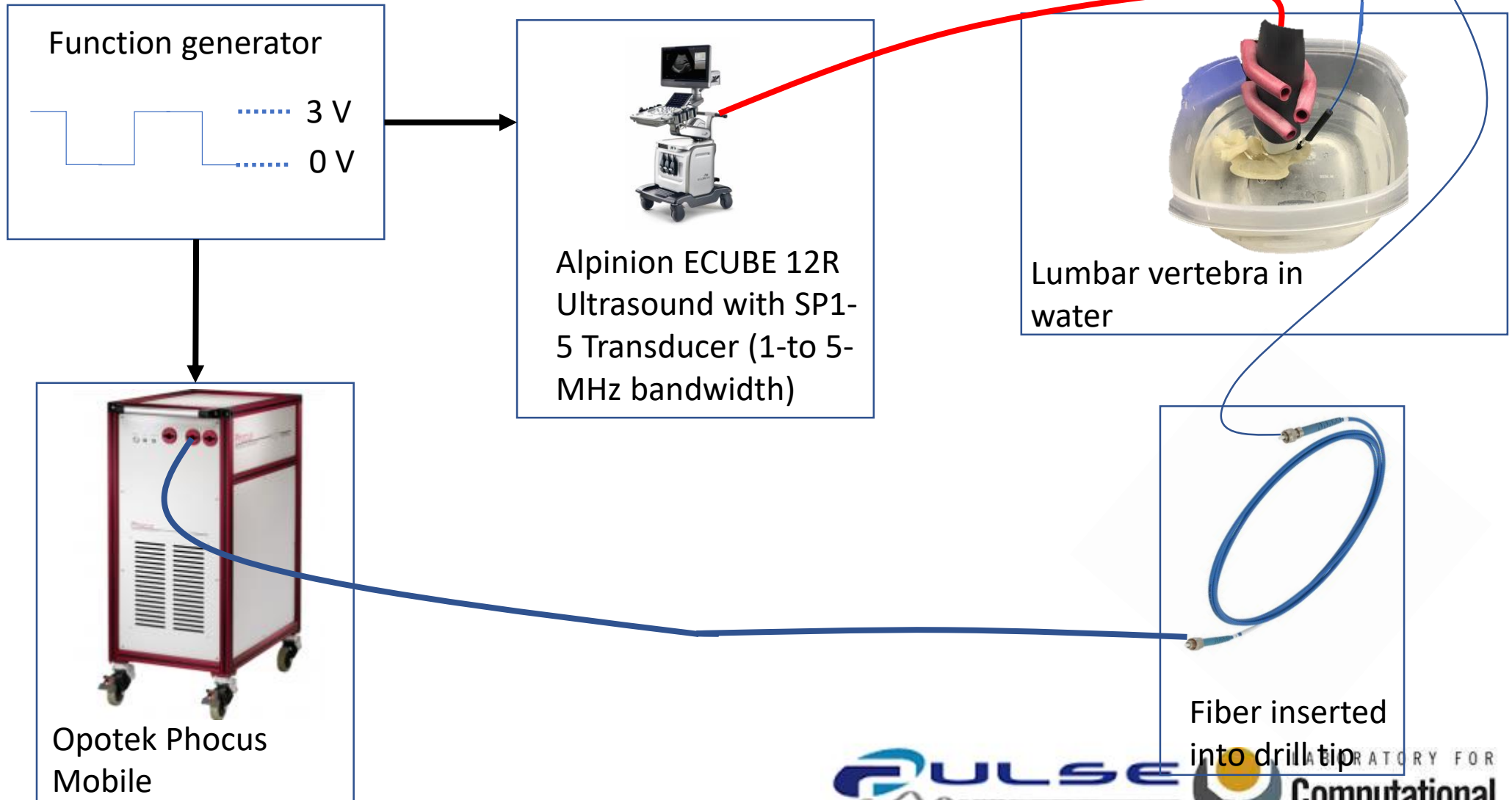
Matched US Image



Blood vessel

- Image taken with L3-8 Probe
- Difficult to see blood vessel boundaries with PA imaging

Technical Approach: Bone Experiments



Data Collection

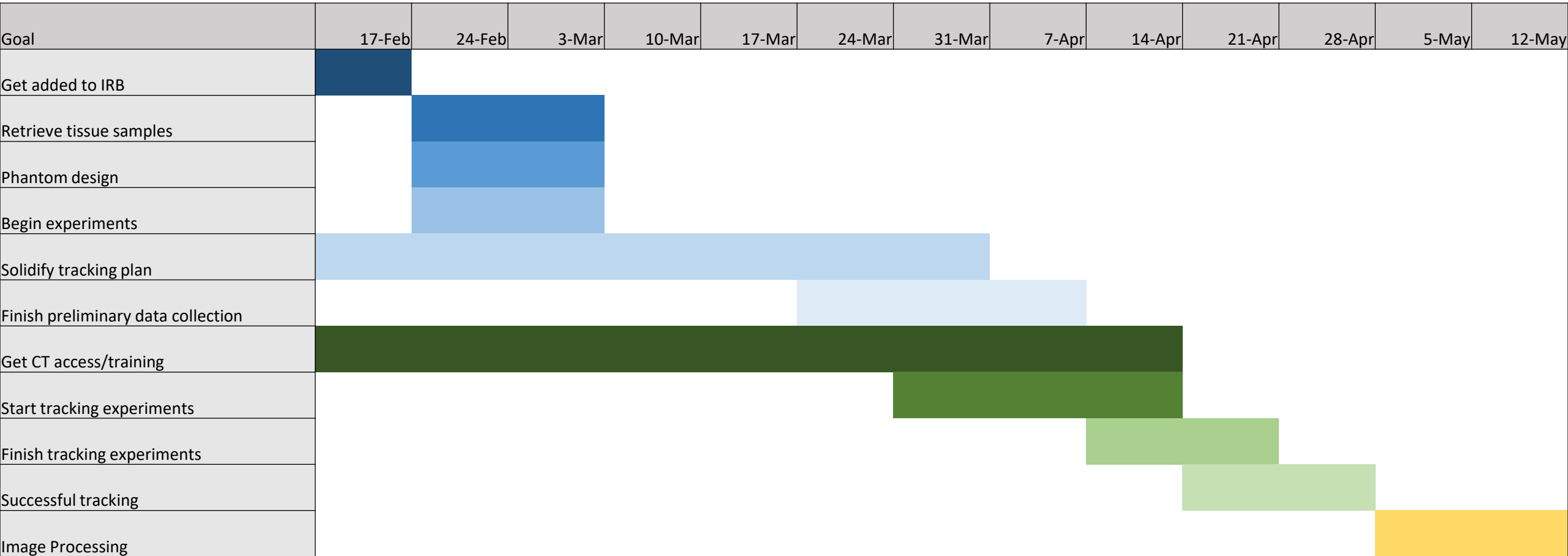
- Phased array
- Fifteen frames taken as fiber moves through pre-drilled hole in bone



Deliverables

- Minimum
 - ~~See blood in PA image with fiber inserted into multiple drill tips.~~
 - Show how blood is visualized with different drill tips
- Expected
 - Tracking the drill tip as it is inserted into the spine (phantom).
- Maximum
 - Novel image processing methods to enhance PA images.

Project Schedule



Key Dates

1. Feb 24: Phantom Design finished
2. March 3: begin experiments
3. ~~March 31~~ April 8: finish preliminary data collection
4. ~~April 7~~ April 2: begin tracking experiments
5. April 28: tracking achieved
6. May 12: finish ALL experiments and image processing
7. May 16: project presentation