

Development of an MRI- Compatible Dynamic and Deformable Imaging Phantom

Group 29

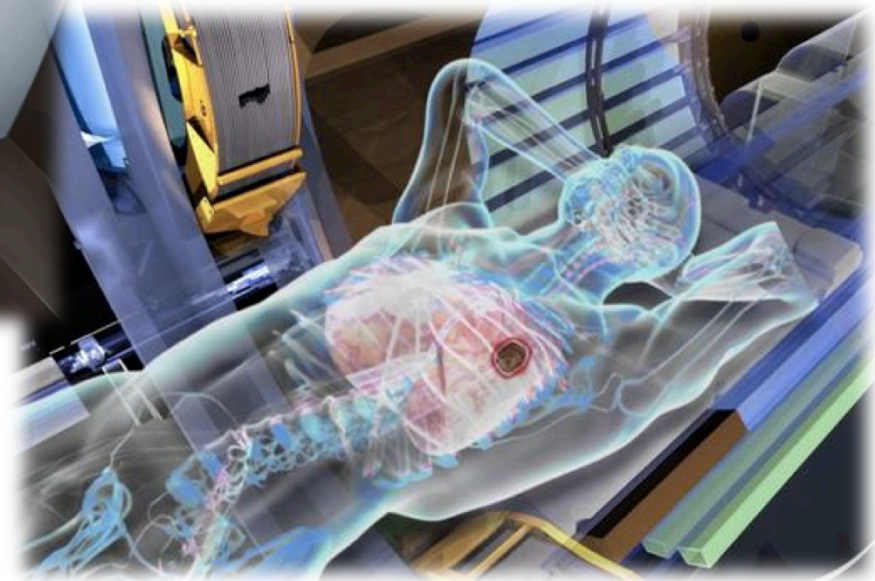
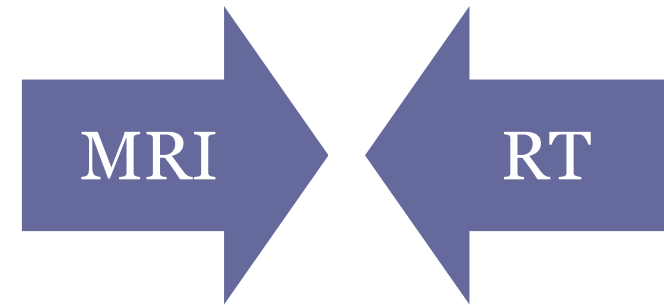
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ViewRay System



viewray.com



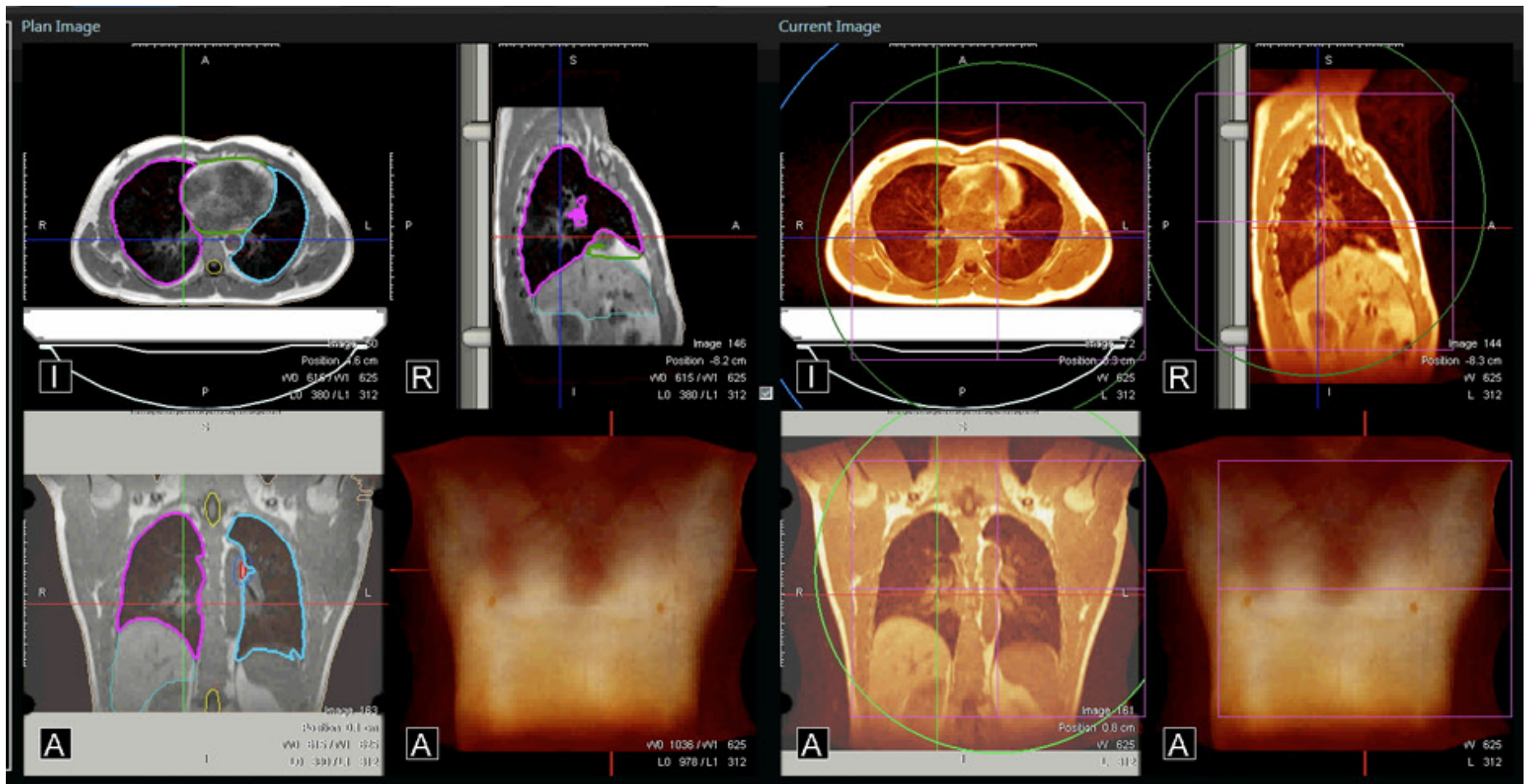
-Introduction-

Design Alternatives

Chosen Design

Organization

ViewRay Software



-Introduction-

Design Alternatives

Chosen Design

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Project Scope

- Design an imaging phantom that can be used to assess the accuracy of the ViewRay software in calculating the deformation of moving organs in an MRI scanner
- Capable of:
 - Translating in 3 dimensions
 - Deforming in 3 dimensions
 - Rotating in 3 dimensions

Project Specifications

Translation	Deformation	Rotation	Volume Change
x, y, and z directions	x, y, and z directions	about x, y, and z axes	Known pre and post deformation volumes
5 ± 0.5 cm	2 ± 0.5 cm	$\pm 0.5^\circ$	25%

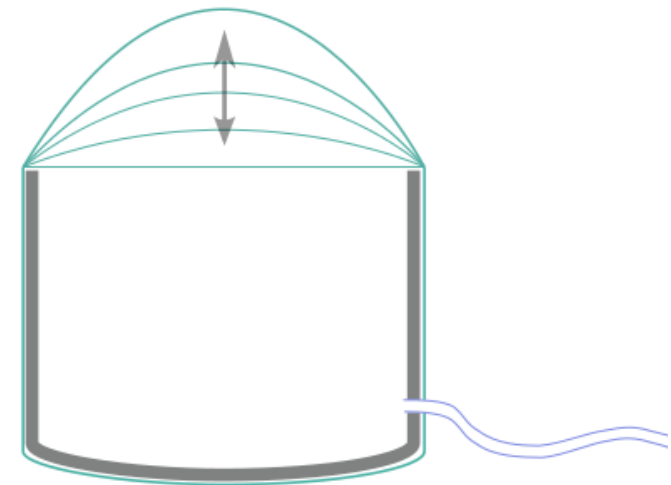
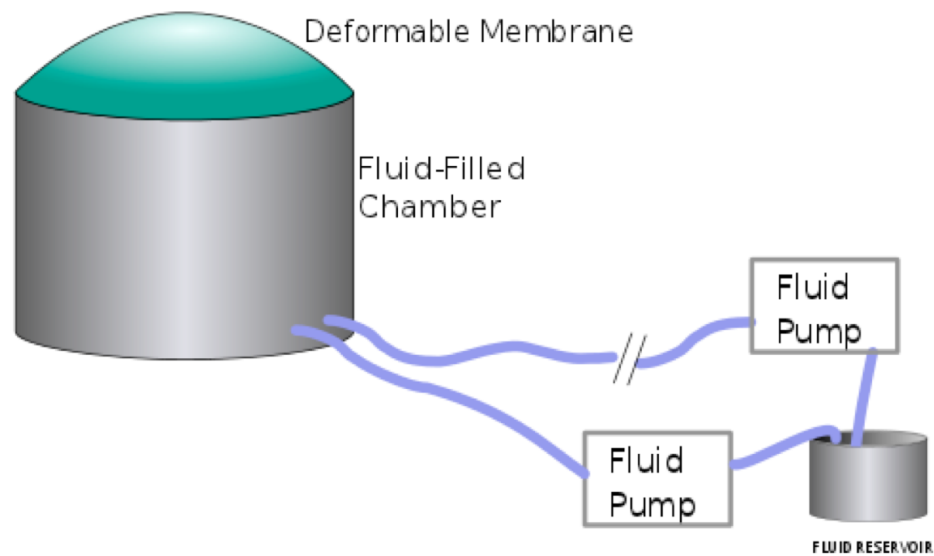
Motion must be:

- Reproducible and stable
- Precisely known
- (Binary controllable)

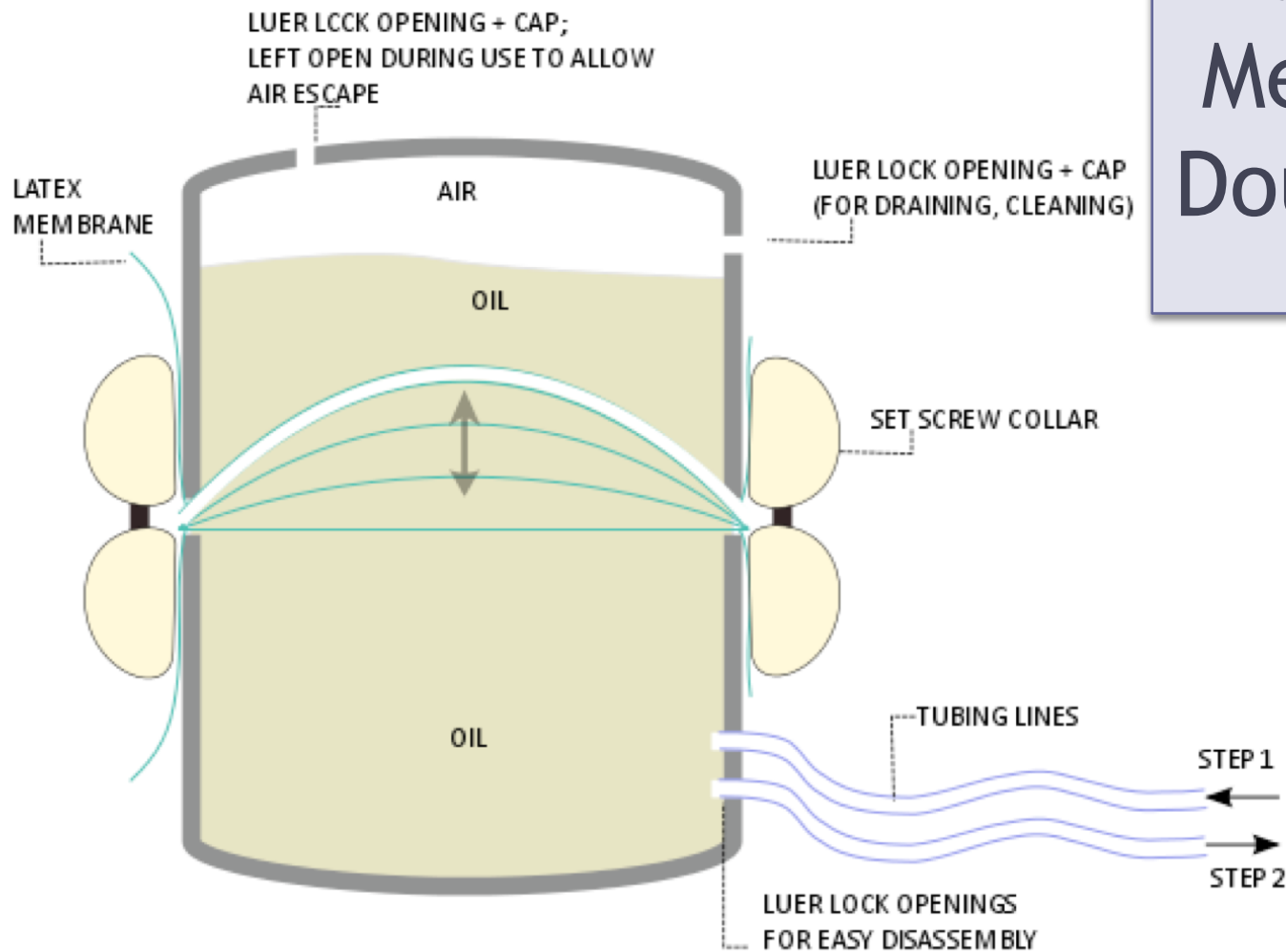
Physical Characteristics:

- Weight ≤ 150 lbs
- Dimensions: $\leq 50 \times 30 \times 50$ cm
- Maximum price: \$10,000 – \$30,000

Fluid Pump Mechanism

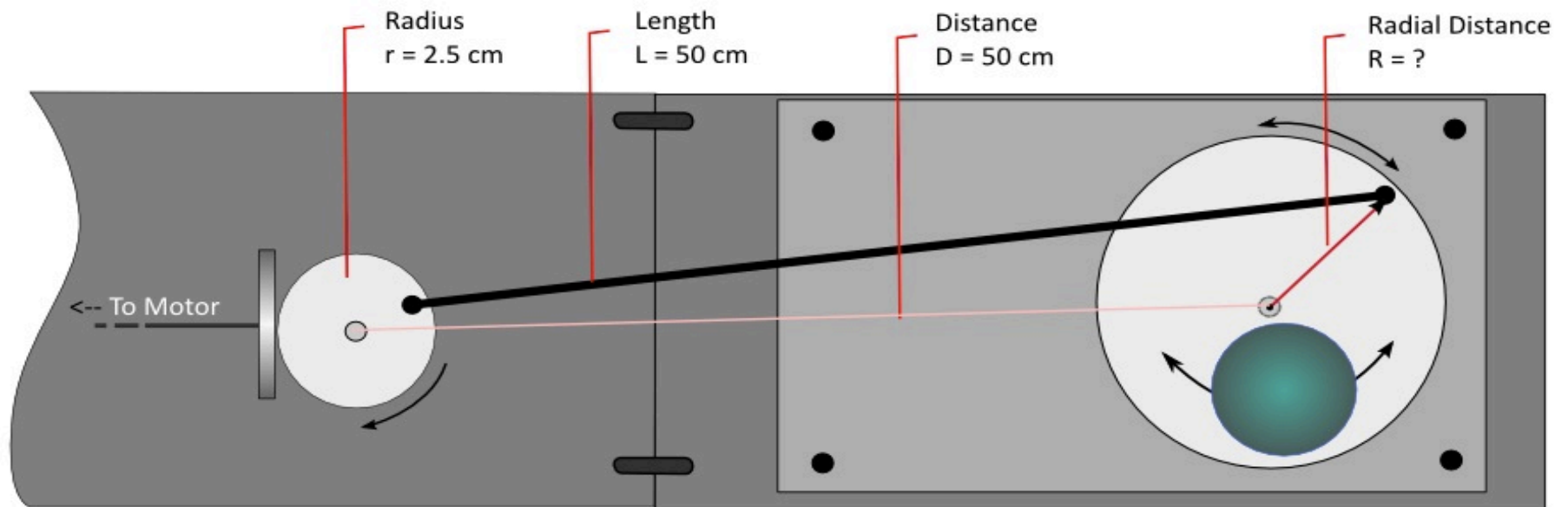


Fluid Pump Mechanism- Double Layer



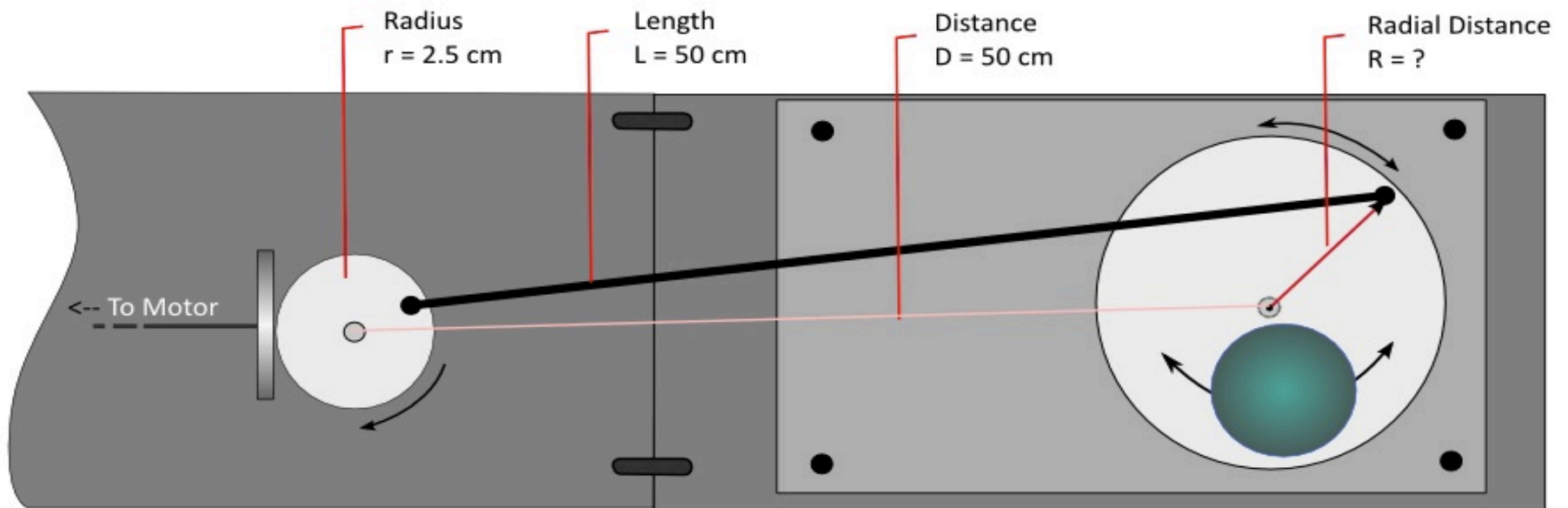
Motion Stage

XY Motion Plate- Top View

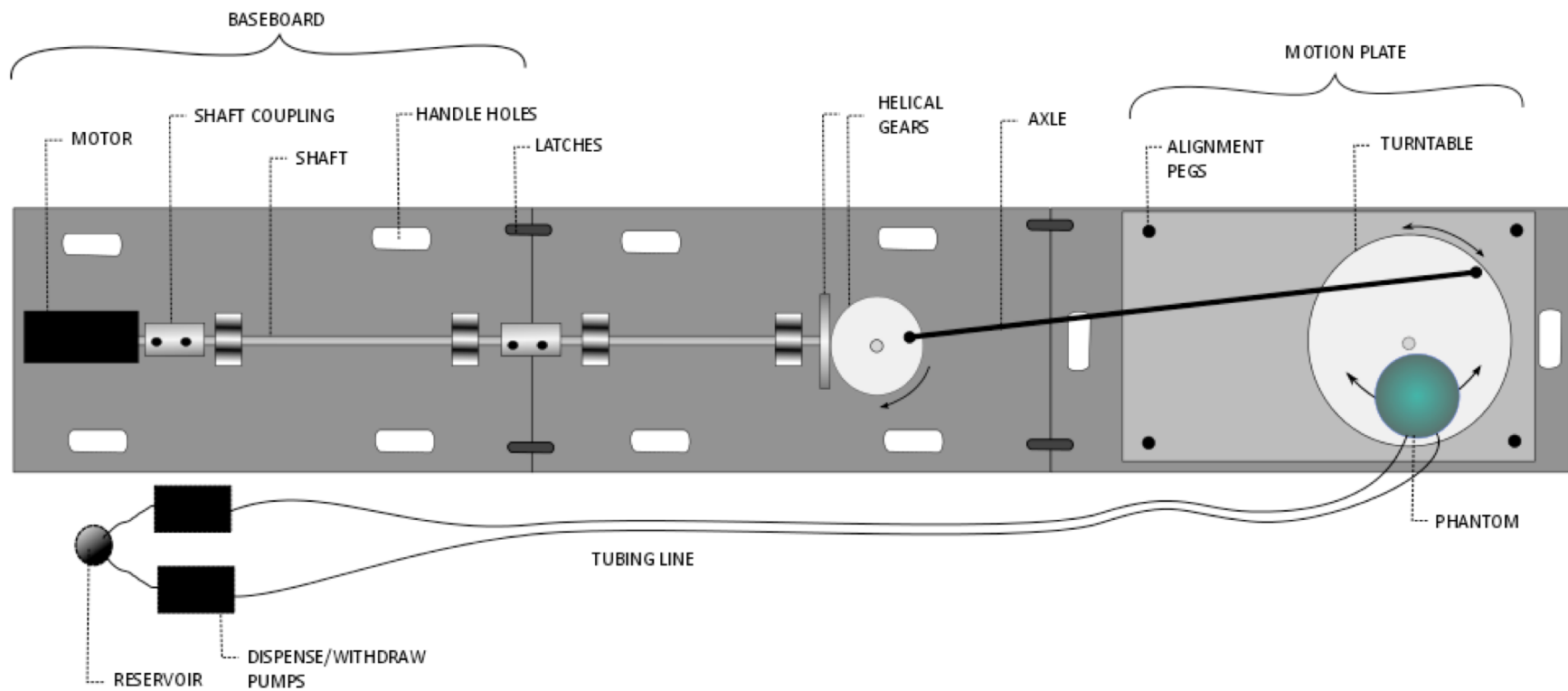


Motion Stage- Motor Torque

XY Motion Plate- Top View



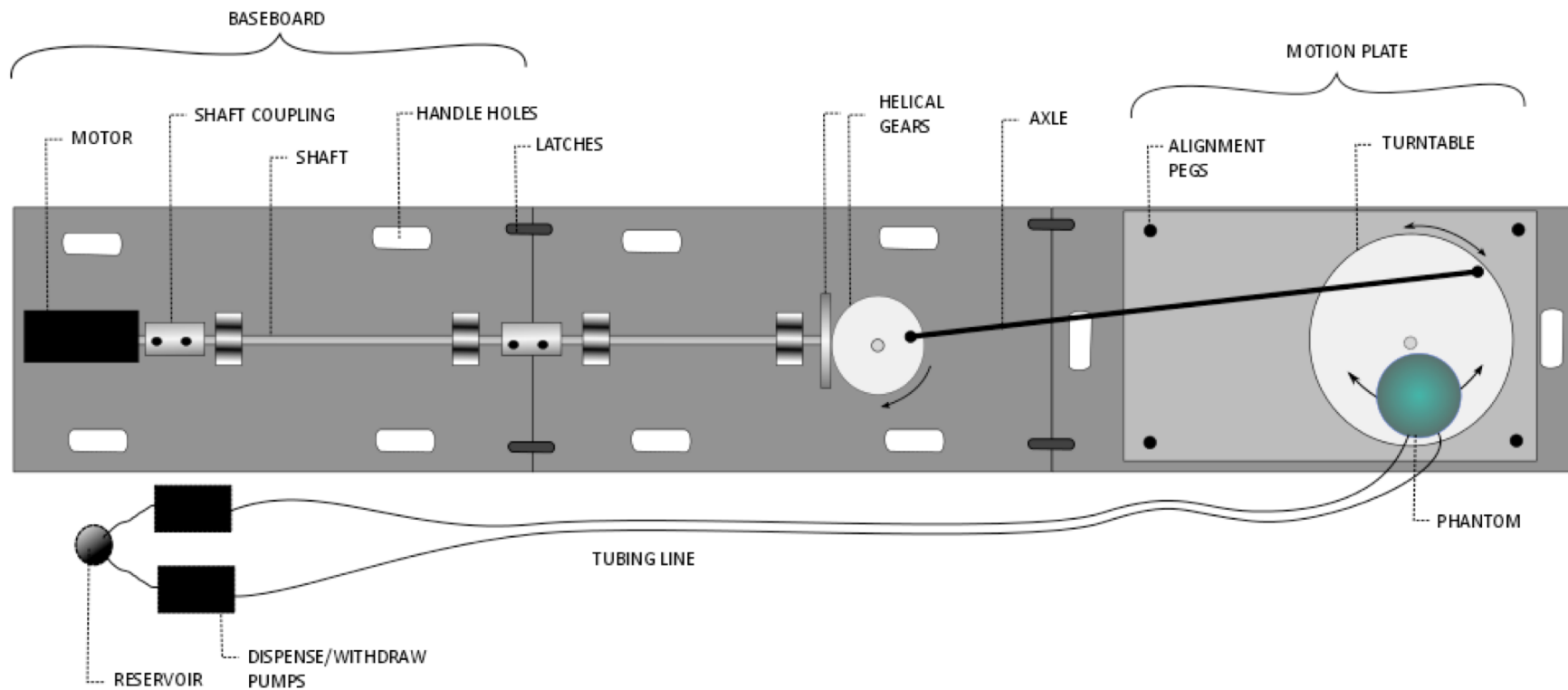
Motion Stage-Modular



Motion Stage- Parts and Manufacturing

- Costly Components
- Baseboards
- Power Transmission
- Axle
- Turntable

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Conclusions

- Met a subset of client needs
- Client Interaction
 - Specifications
 - Need
- Mechanical Knowledge
 - Power Transmission
 - Motors
 - Hydraulics
 - Gearing Systems
 - Belts and Pulleys

Questions?