Low Frequency Actuator for Magnetic Resonance Elastography Applications

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Poster #258

Introduction

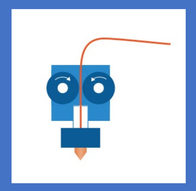
- Magnetic Resonance Elastography (MRE) is a technique to measure mechanical properties of tissues
- Utilizes a Nuclear Magnetic Resonance (NMR) spectrometer under a dynamic stimulation [1]
- Current MRE frequencies occur at >50Hz

Goals

- To vibrate an agarose gel to measure the material's stiffness (modulus of elasticity) at 20Hz
- A distant goal is to complete the MRE at 20Hz on brain tissue

Fabrication

Laser Cutter



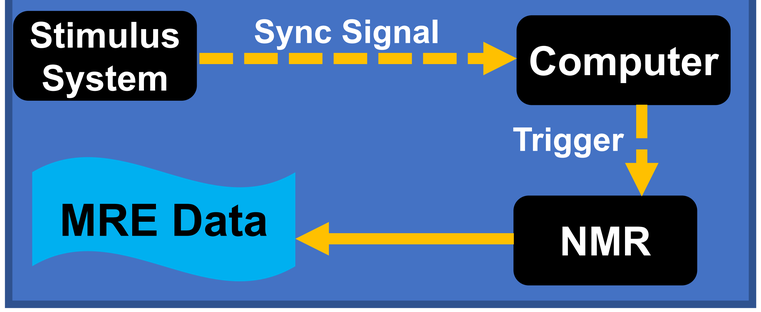
Fused Deposition Modeling (FDM)

Non-Magnetic Hardware

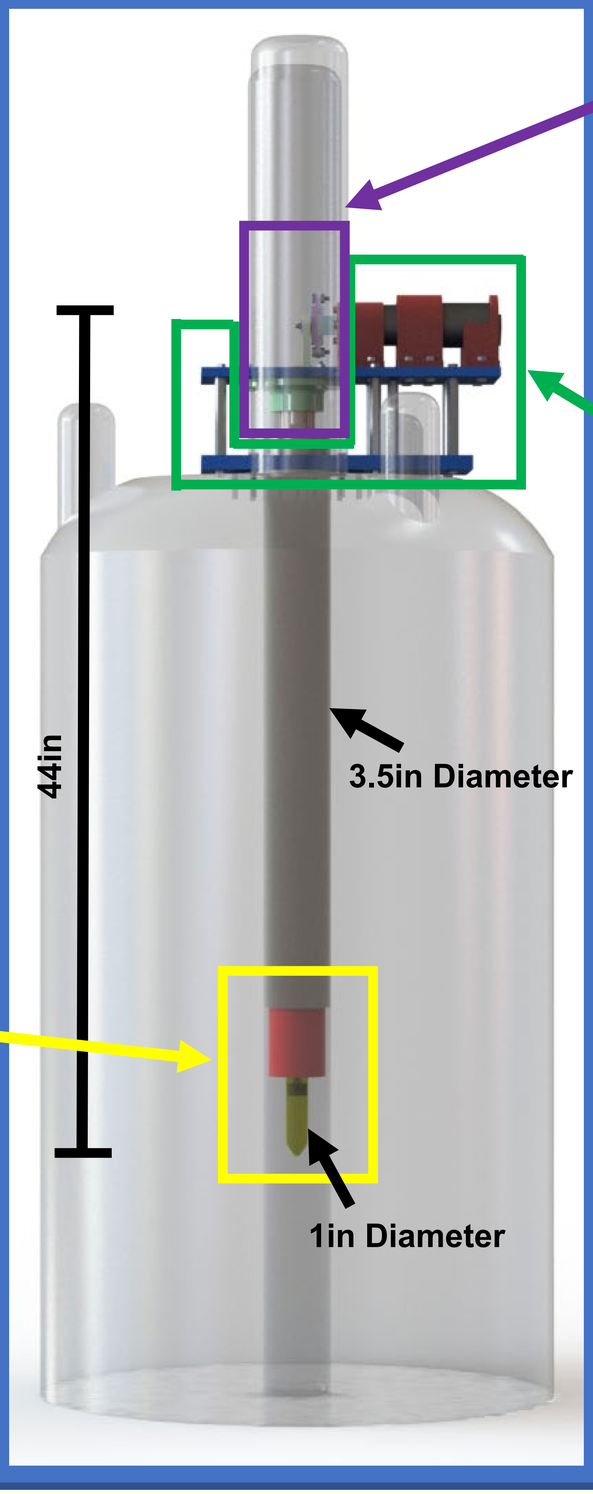
Plunger Module

Plunger connected to crank module is inside Falcon tube

Instrumentation

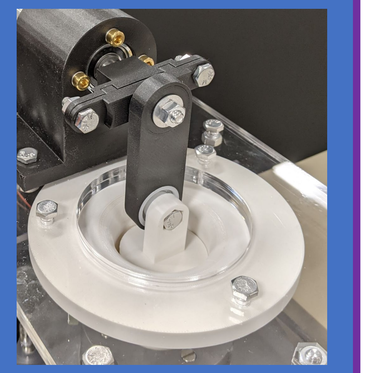


CAD Model of the Low Frequency Actuator in the NMR Instrument

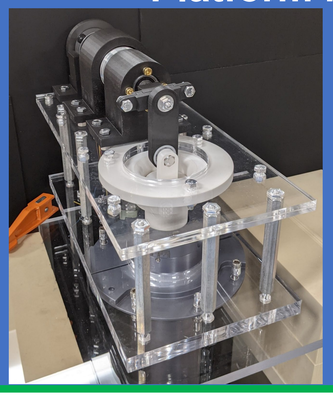


Crank Module

Crank transfers rotational energy to linear energy



Platform Module



Motor mounted onto NMR makeshift

Future Work

- Setup the instrumentation for the motor control and trigger signal
- Test the final design in the NMR instrument on agarose gel
- Distant Future: Test the actuator on brain tissue

Acknowledgments

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References

[1] Y. Mariappan, K. Glaser and R. Ehman, "Magnetic Resonance Elastography: A review", *Clinical Anatomy*, vol. 23, no. 5, pp. 497-511, 2010. Available: 10.1002/ca.21006.