



Medical Fine Wire Testing Standardization

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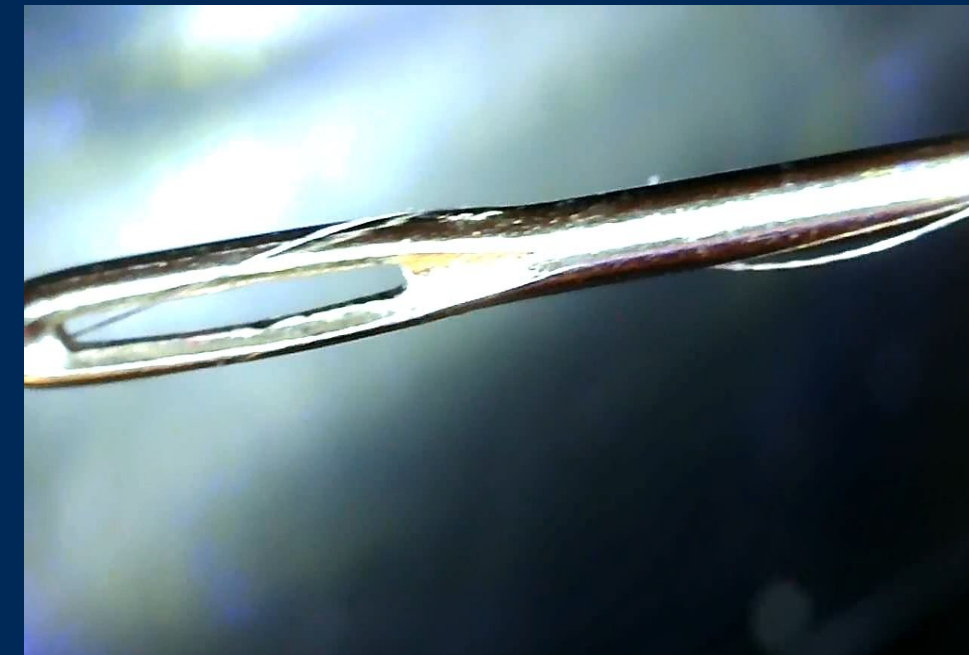
The purpose of this project is to propose a standardizable method to quantitatively compare the mechanical attributes of a fine wire against its competitors while preserving the electrical integrity of the wire.

W.L. Gore & Associates, Inc

- International materials company that manufactures medical implants, cables, and biotechnology.
- Developed expanded polytetrafluoroethylene (ePTFE) called GORE-TEX [1].

Medical Fine Wire

- Flexible, cylindrical rod of biocompatible material
- Generally composed of an 80/20 Platinum-Iridium alloy [2].
- Diameters from 25-100 micrometers.



- Catheter monitors patients and administers medications.
- Wires threaded through catheter lumens for electrical signalling.

Design Proposal

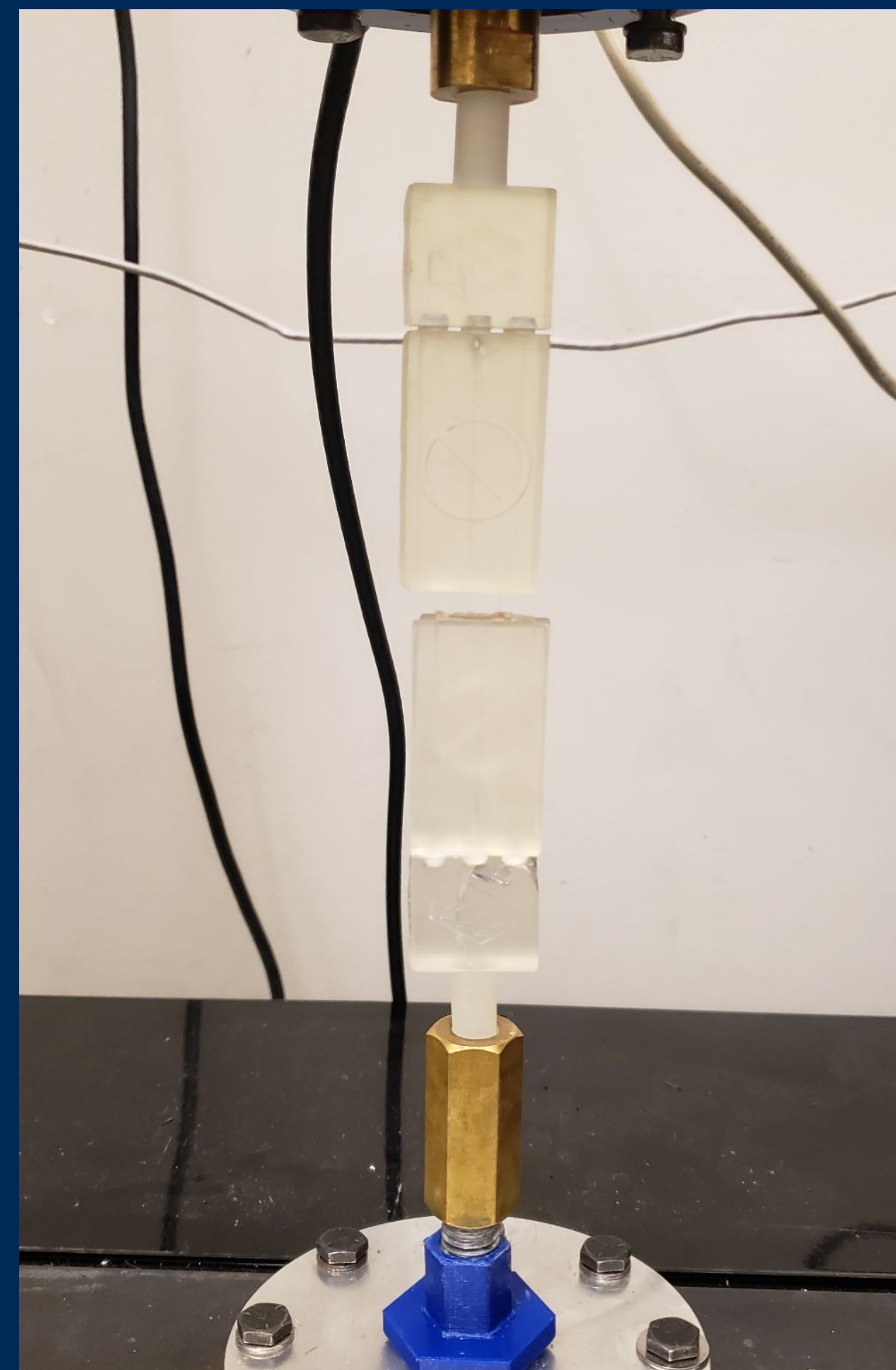
- Mechanical:
 - Overcoming high flexibility of the wire.
 - Size compatibility for MTI 10K machine.
- Software:
 - Serial PC-Multimeter connection.



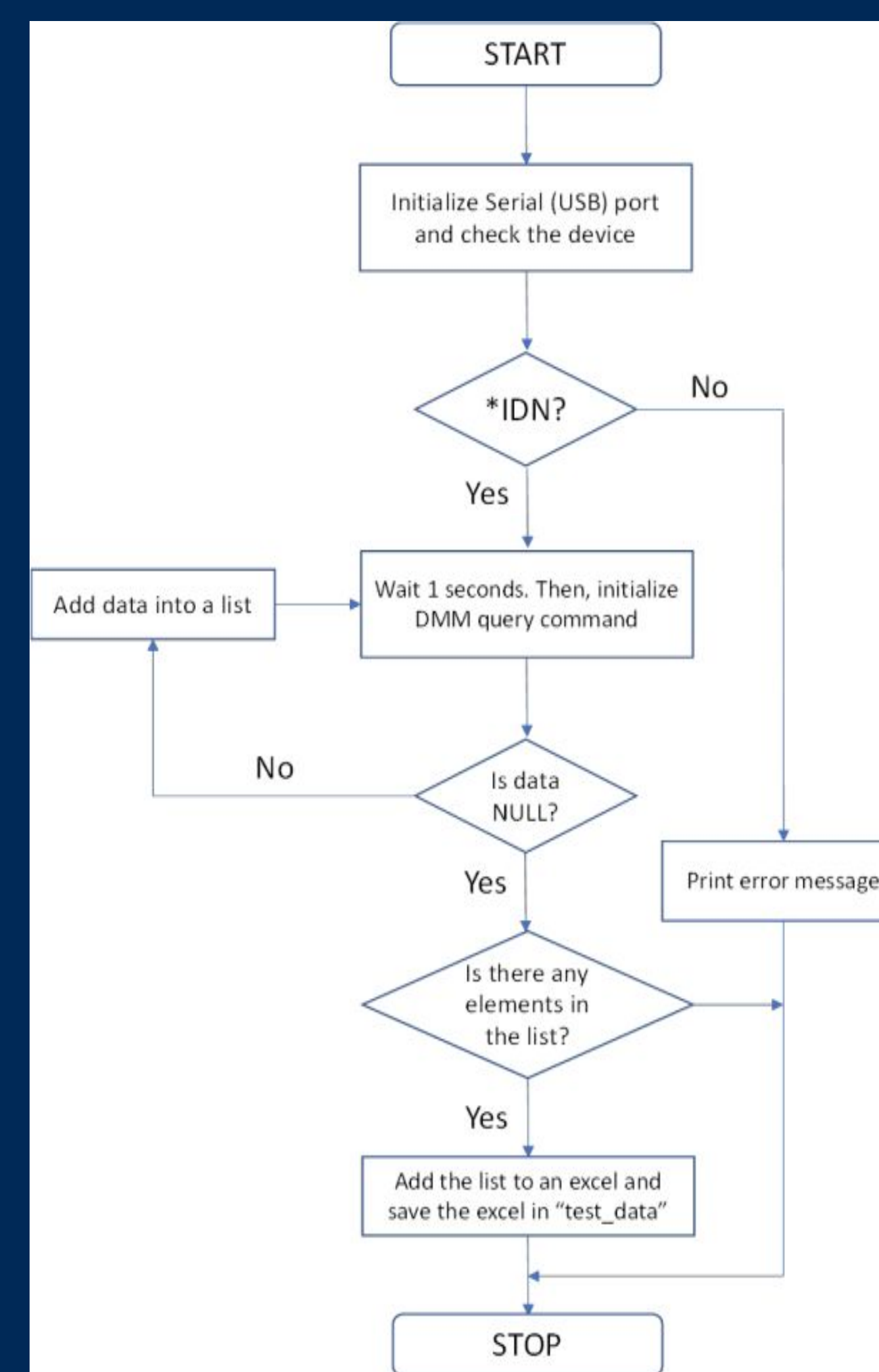
Acknowledgments

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- Dr. A. Kobb, PhD, PEng - Supervisor

Fixture Testing

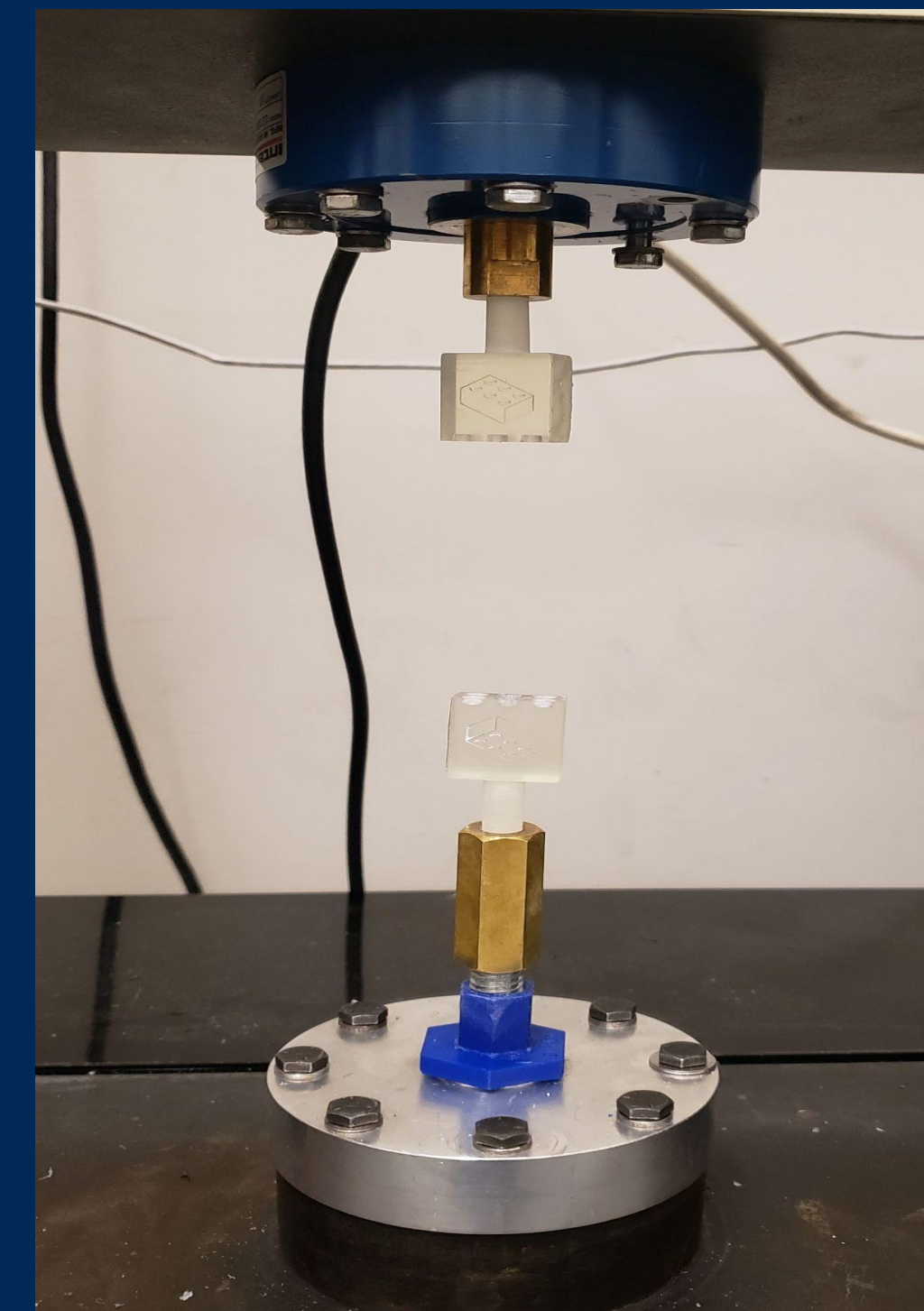


Data Collection Algorithm

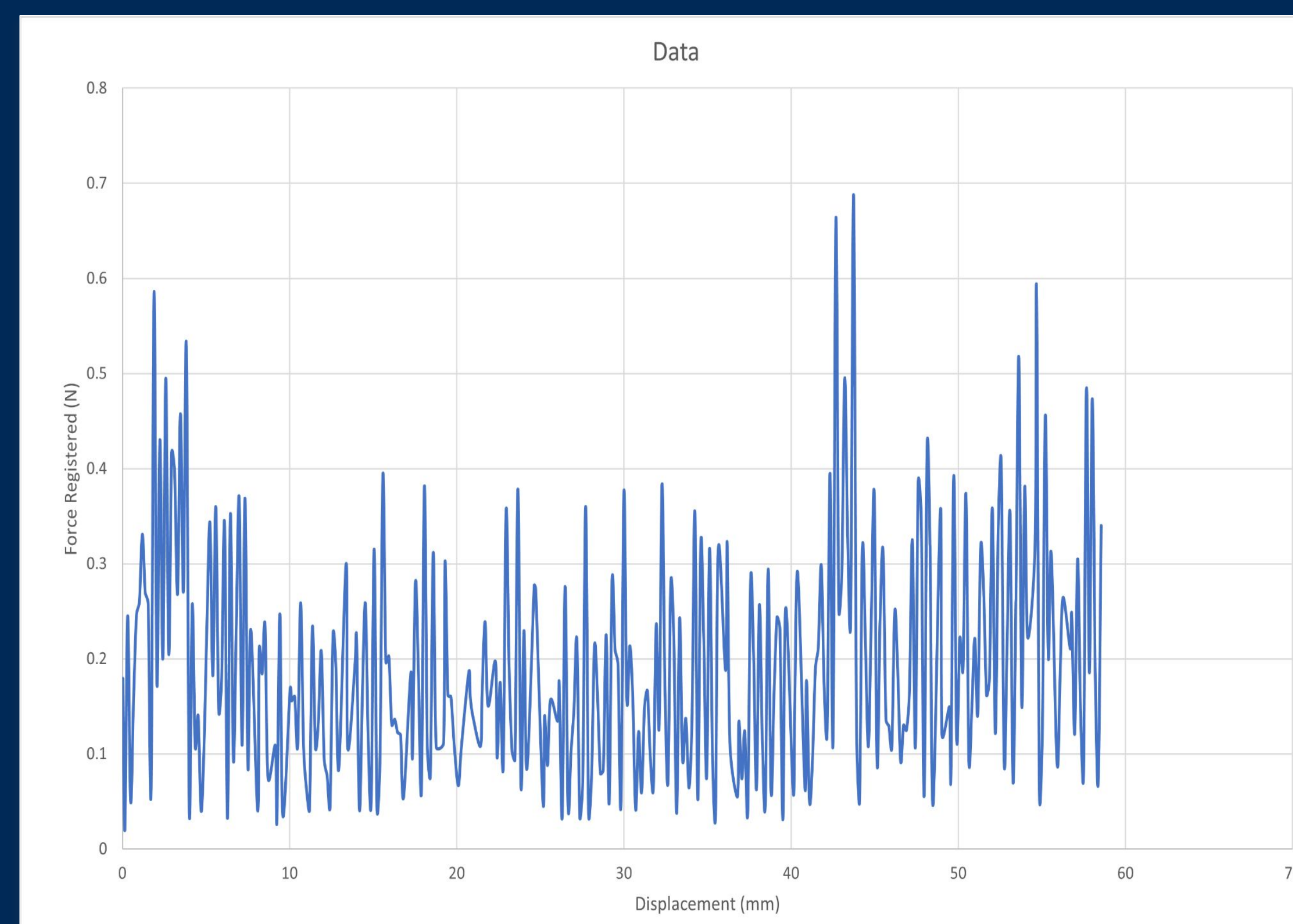


- Serial Communication:
 - Agilent 34405A Multimeter - PC.
 - Real-time.
- Implemented in Python programming Language.

Result & Discussion



- Successful implementation of Jakob's Law [4].
- Maintained alignment of fine wire.
- Resin was able to be placed on apparatus.
- Withstood the forces that are required to break the wire.
- Ergonomic to place wire in fixture.
- Intuitive assembly



- Resin was able to be placed in MTI 10K.
- Withstood the forces that are required to break the wire.
- Ergonomic to place wire in fixture.

#1	#2	#3	#4	#5	#6	#7
465	464.9	464.7	464.7	464.6	464.5	464.6
465	464.8	464.7	464.6	464.5	464.6	464.6
464.9	464.8	464.7	464.6	464.6	464.6	464.5
464.9	464.9	464.7	464.6	464.6	464.6	464.5
465	464.8	464.7	464.6	464.6	464.5	464.6
464.9	464.9	464.7	464.6	464.6	464.6	464.6
464.9	464.9	464.8	464.6	464.6	464.5	464.6
464.9	464.9	464.7	464.6	464.6	464.5	464.6
464.9	464.9	464.7	464.6	464.6	464.5	464.6
464.9	464.9	464.7	464.6	464.6	464.5	464.6
464.9	464.9	464.7	464.6	464.6	464.5	464.6
464.9	464.9	464.7	464.6	464.6	464.5	464.6
464.9	464.9	464.7	464.6	464.6	464.5	464.6
464.9	464.9	464.7	464.6	464.6	464.5	464.6

- 15 Iterations with 50 measurements.
- Ranging from 464.5 to 464.9 ohms.
- Average of 464.6 ohms.
- Consistent and Reliable

Conclusion

Precise	Convenient	Secure	Resourceful	Ergonomic
Vertical alignment of wire depends on machine calibration	Interchanges components for ease of use	Withstands compressive forces	Manufactured with accessible materials	Reduces demand on user's manual dexterity

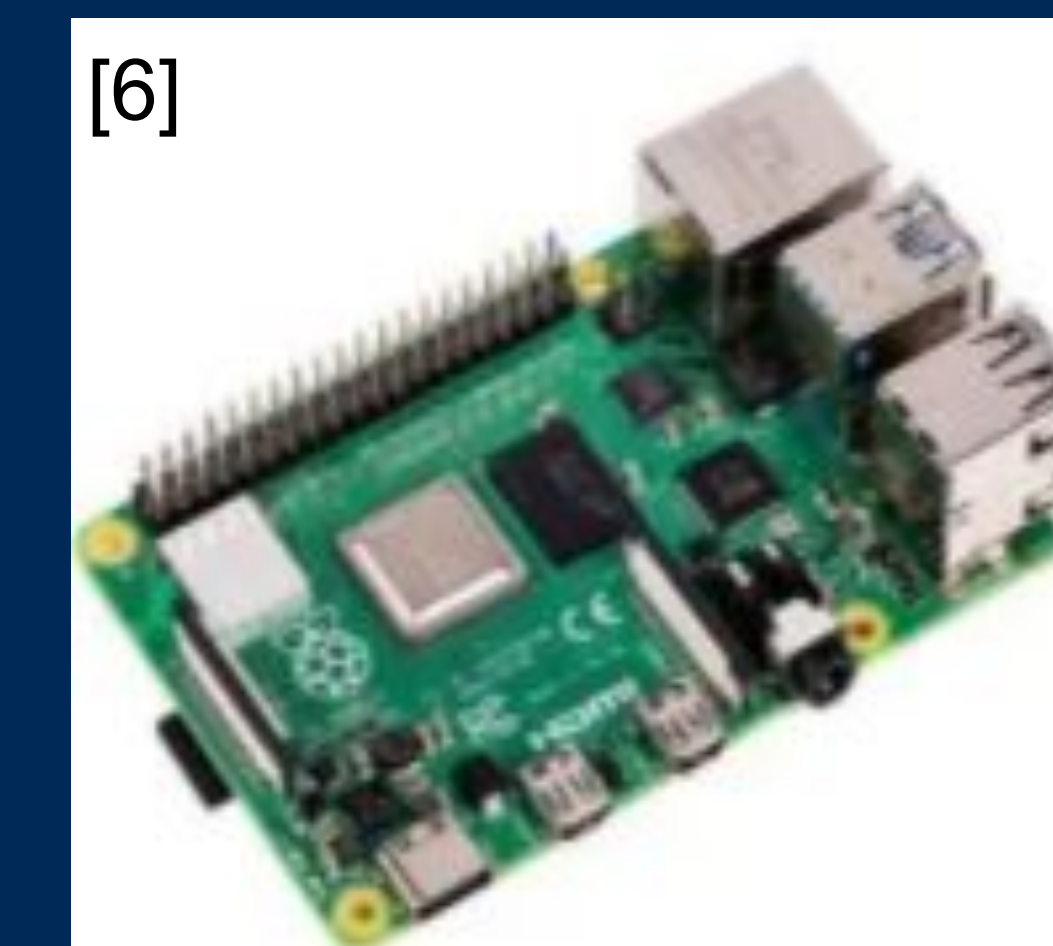
- Testing of 3D printed fixture using MTI 10K:
 - Precision Issue.
 - Compression tests inconclusive.
 - MTI 10K can not detect the small forces.
- Data Collection Algorithm:
 - Very reliable and consistent.

Future Work



Requires more R&D from a mechanical and software perspective.

- Solution 1 - Iterate on current fixture design:
 - Ductile Material.
 - Better Clamping (Glue / Fasteners).
 - Machined Threads / Post Processing.
- Solution 2 - Tabletop compression testing device for fine wires:
 - Self Contained.
 - Customizable.



- RaspberryPi4 as a mediator between PC and digital multimeter.
- Enhancing portability of the implemented data collection methodology.
- Requires testing with compression testing:
 - length of the wire changes.

References

- [1] "The Gore Story", 2021. [Online]. Available: <https://www.gore.com/about-the-gore-story?view=overview>.
- [2] W.L. Gore & Associates, "Design and Manufacturing Engineering Considerations for Miniaturized Bioelectric Devices" 2019 [Confidential]
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