

Non-Contact Sensor for Measurement of Small Tendon Samples

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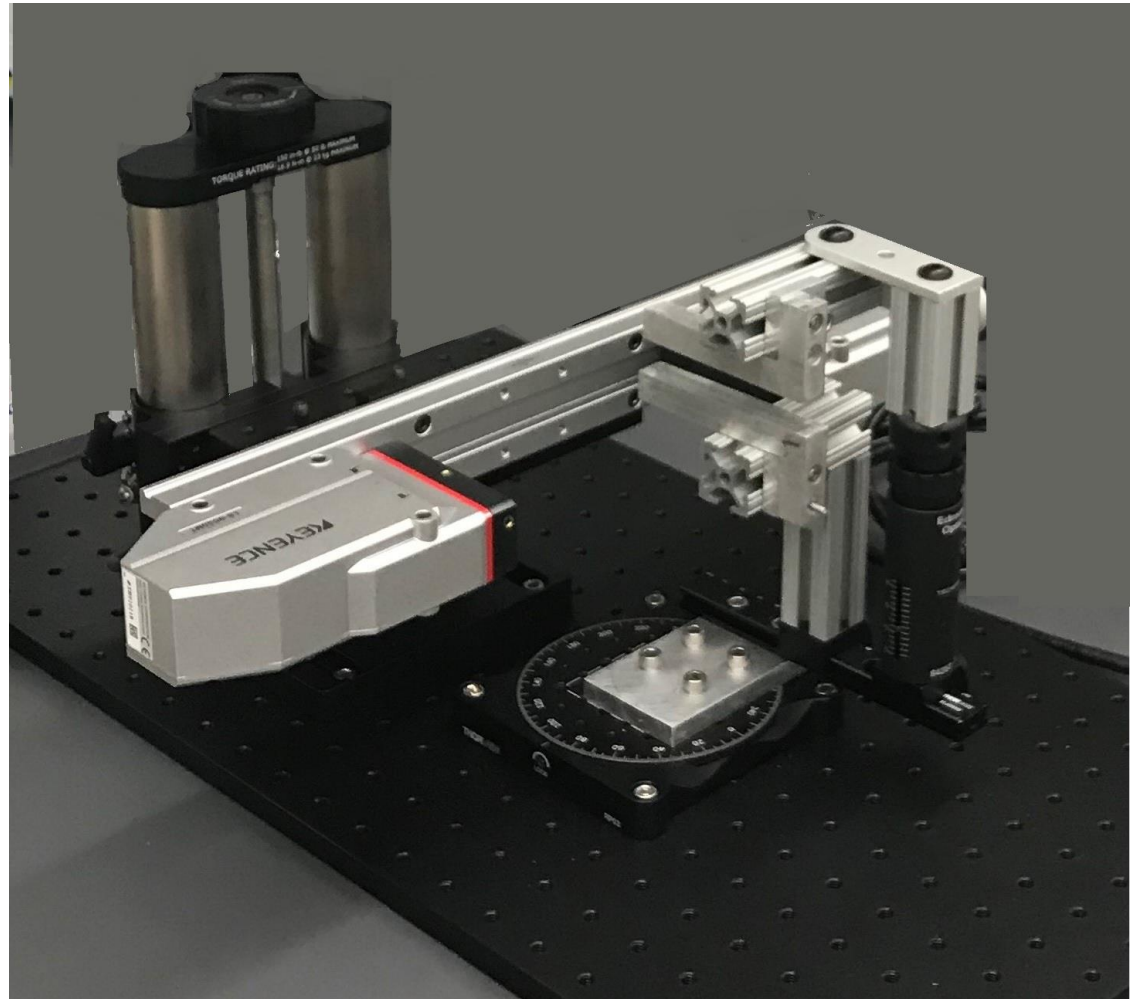
Sponsor: Spencer Szczesny

Biomedical Engineering

Mechanical Engineering

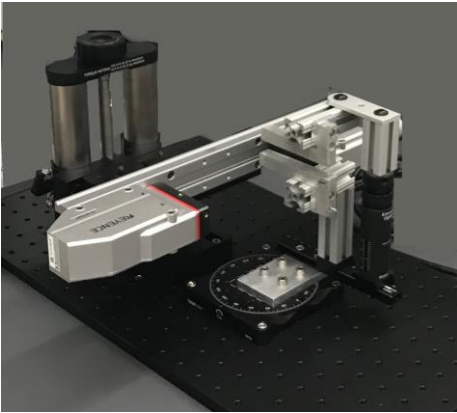
Pennsylvania State University

10 December 2019

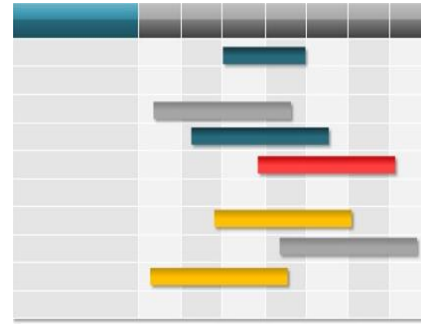


PennState
College of Engineering

This presentation focuses on the result of the semester long project.



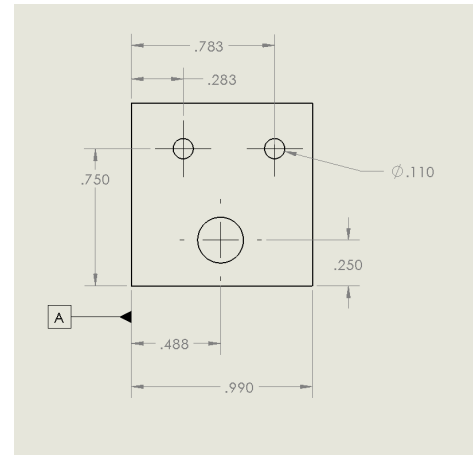
Final Design



Schedule



**Project
Finances**



Fabrication

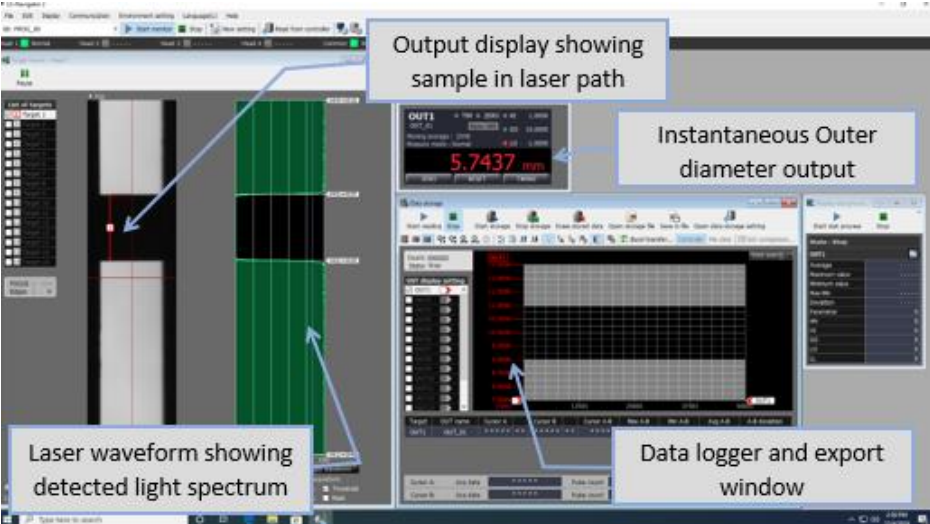
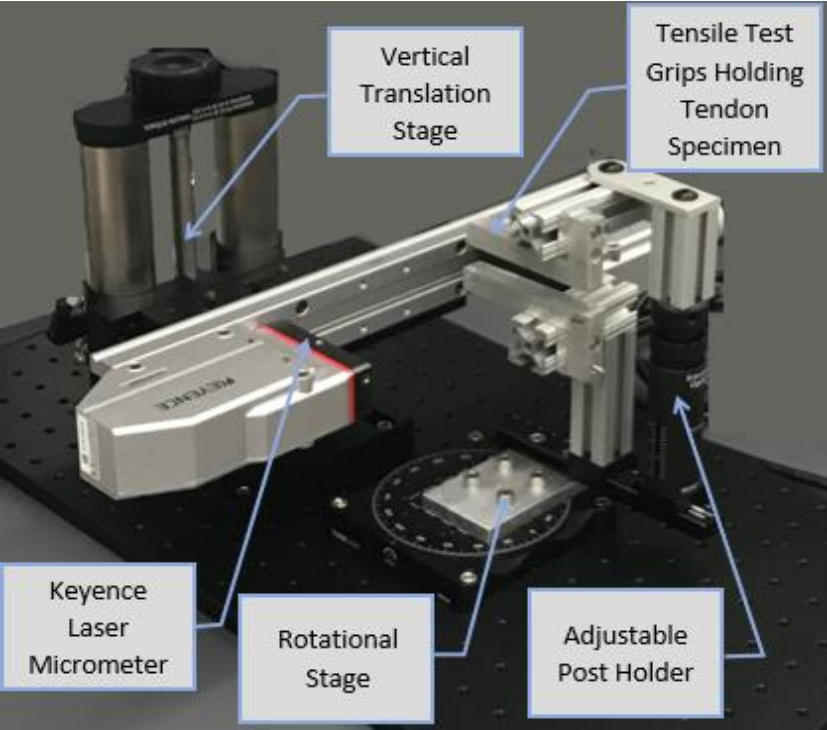


Testing

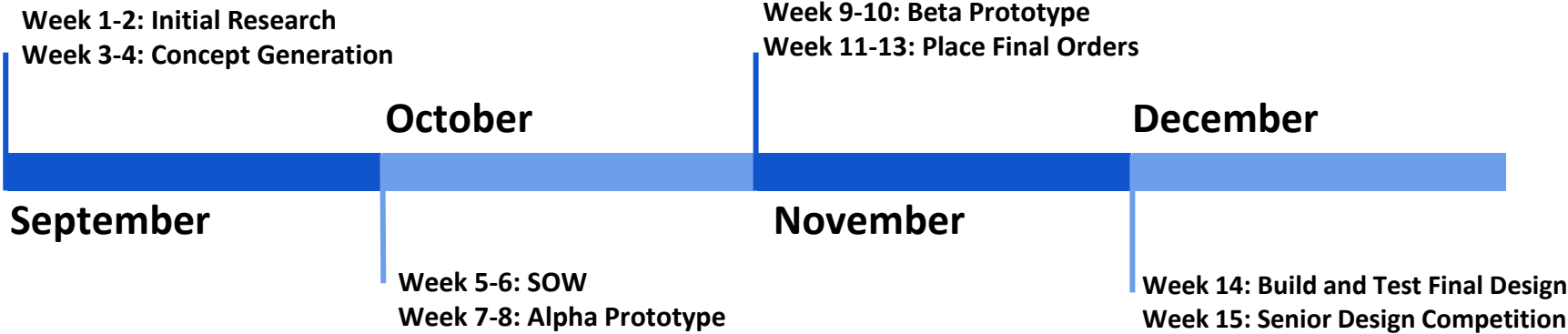


Conclusion

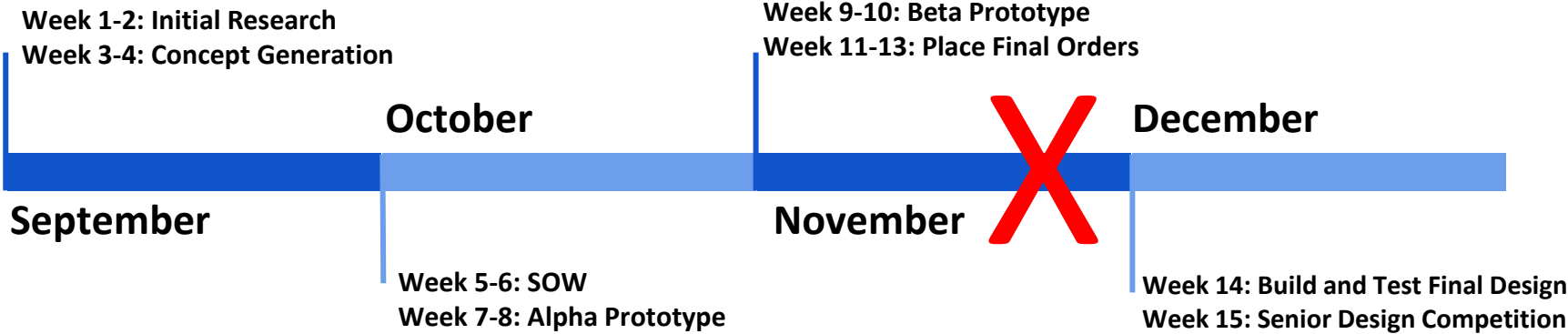
The final design comprised of a laser micrometer system and data processing program.



Our timeline shifted to account for changing customer needs and device lead times.



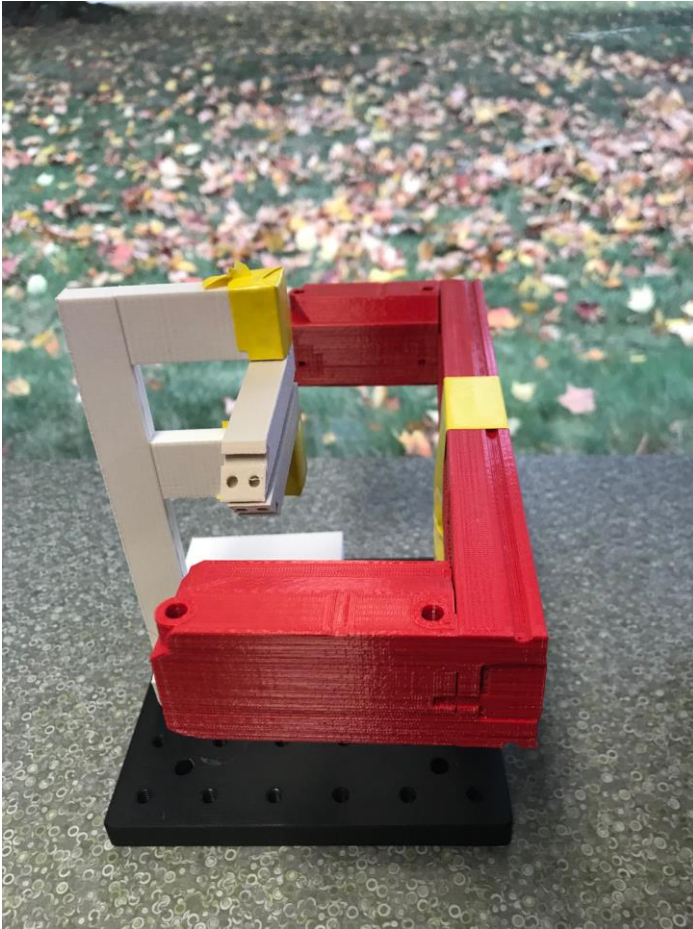
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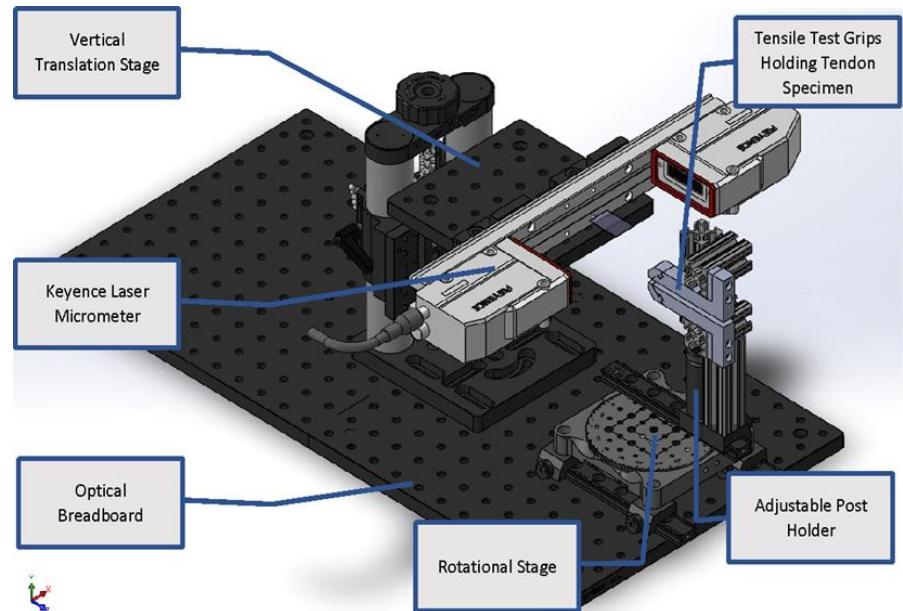
Our final budget includes the hardware and materials used for manufacturing.

Travel	\$0.00
Equipment Usage Time	\$0.00
Hardware - Keyence Laser Micrometer	\$10,017.50
Materials - Thorlabs, McMaster, and Manufactured Materials	\$1,942.55
Poster	\$64.24
Total	\$12,024.29

The final design was developed with the help of an alpha and beta prototype.

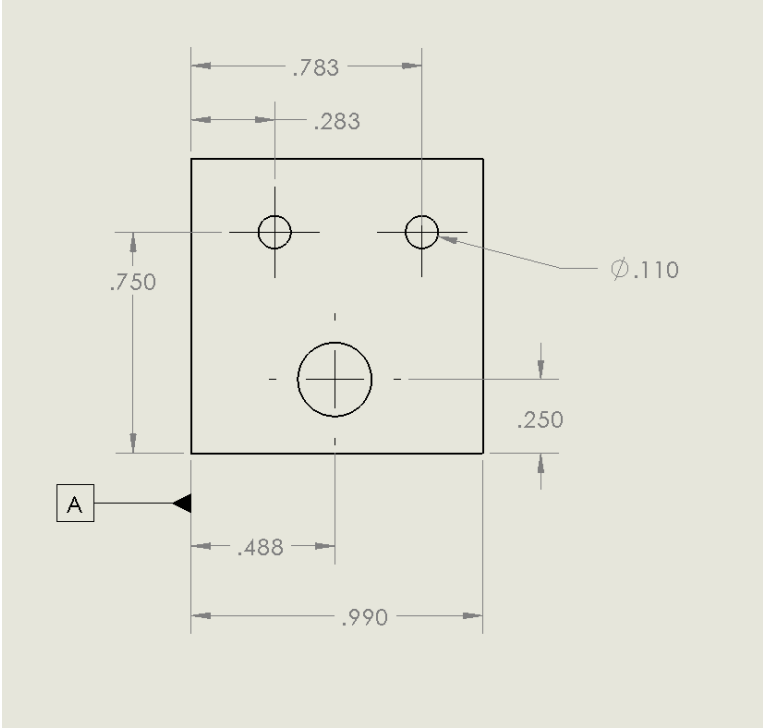
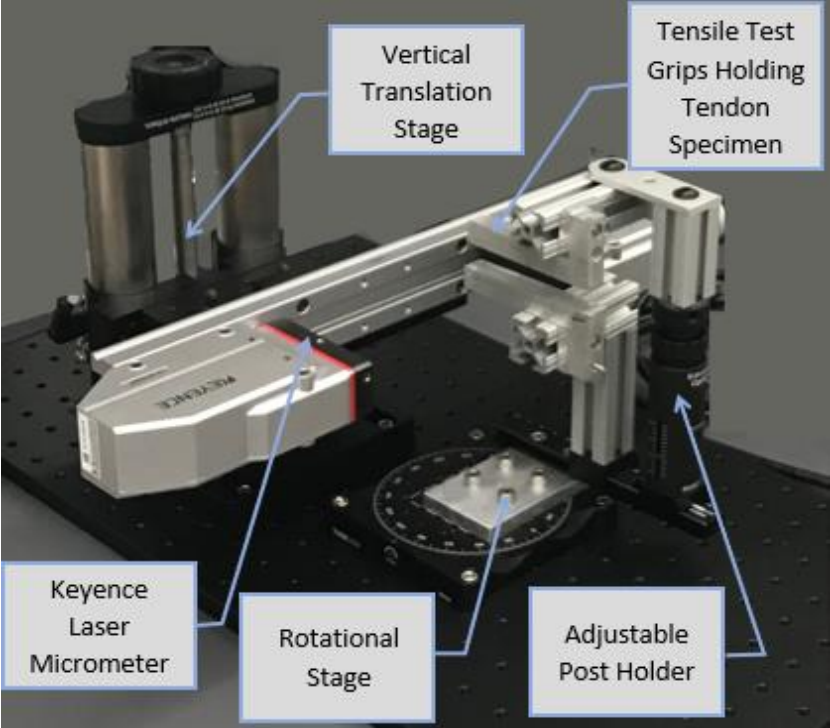


Alpha prototype

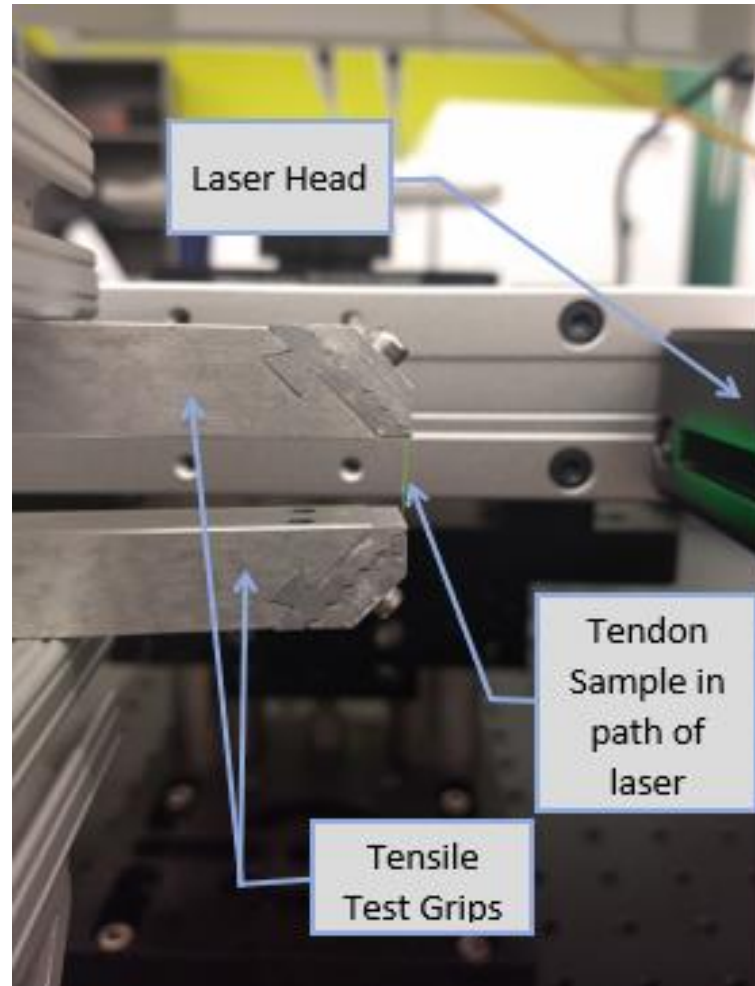


Beta prototype

The products used to assemble our system consisted of off the shelf and manufactured components



The final design was tested by measuring objects of known diameters and a translucent tendon sample.



The final design met the primary design specifications for a successful product.

Specification	Target Value	Tested Value
Accuracy of measurement for objects of known diameter	< 0.5% error	Maximum error of 0.38%
Reliability of measurement for tendon samples	< 5 μm deviation	1.28 μm deviation (n=42)
Speed of average operation to keep sample Hydrated	< 5 min	3 min 24 sec \pm 52 sec (n=15)
Speed of post-processing to calculate cross-sectional area	< 5 min	4 min 38 sec \pm 11 sec (n=15)

In summary, the design successfully measures the cross sectional area of tendon samples.

