

Acknowledgements:
Dr. Eltahry Elghandour

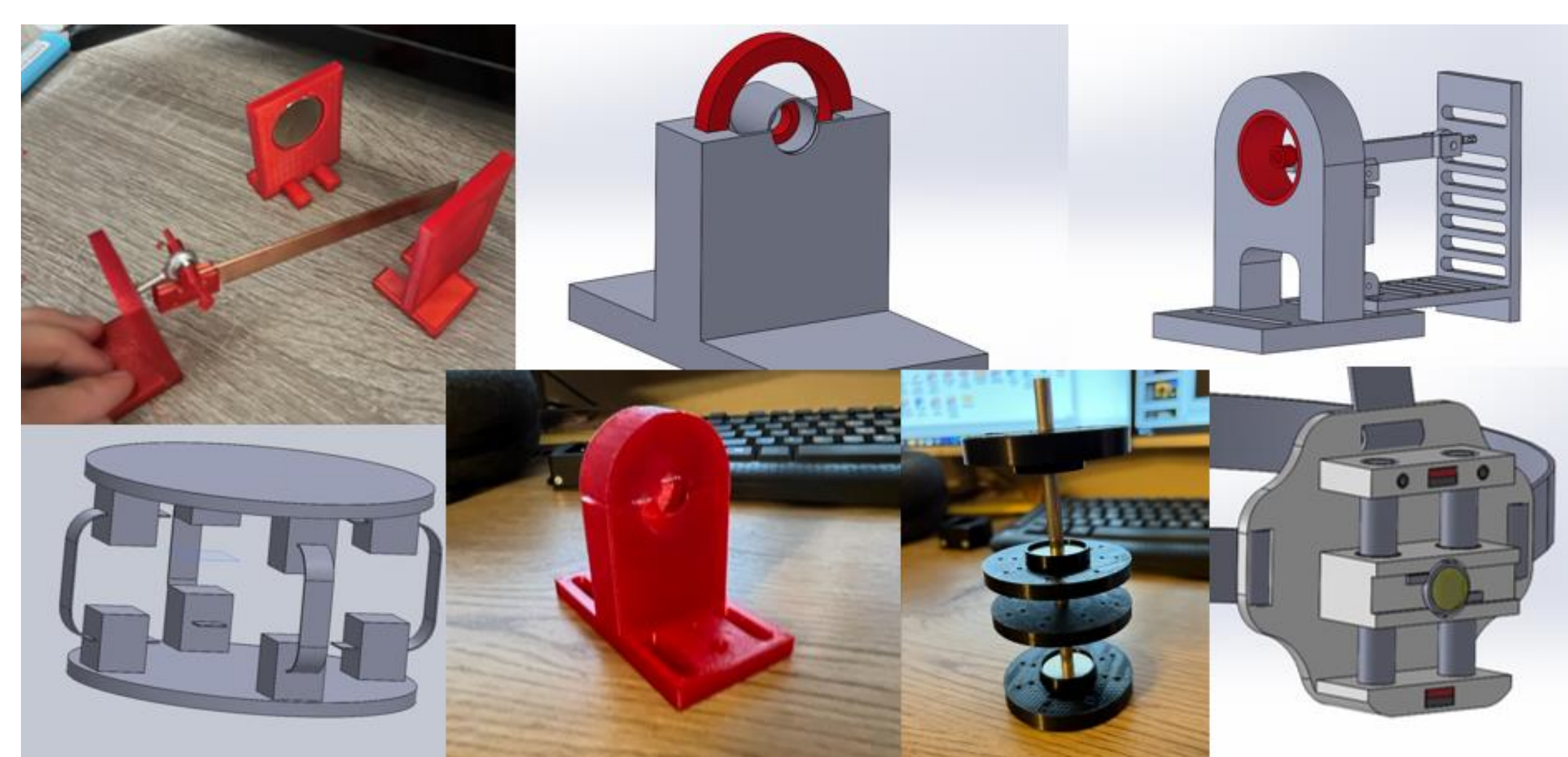
Background

Entrepreneurial idea turned Senior Project with the goal of creating a low-cost, competitive product that can be mass manufactured. The focus is to take a directed light, like a head lamp, and provide a damping system that will prevent the light from shaking when used in active activities. The main customer base would be outdoors people.



Design Process

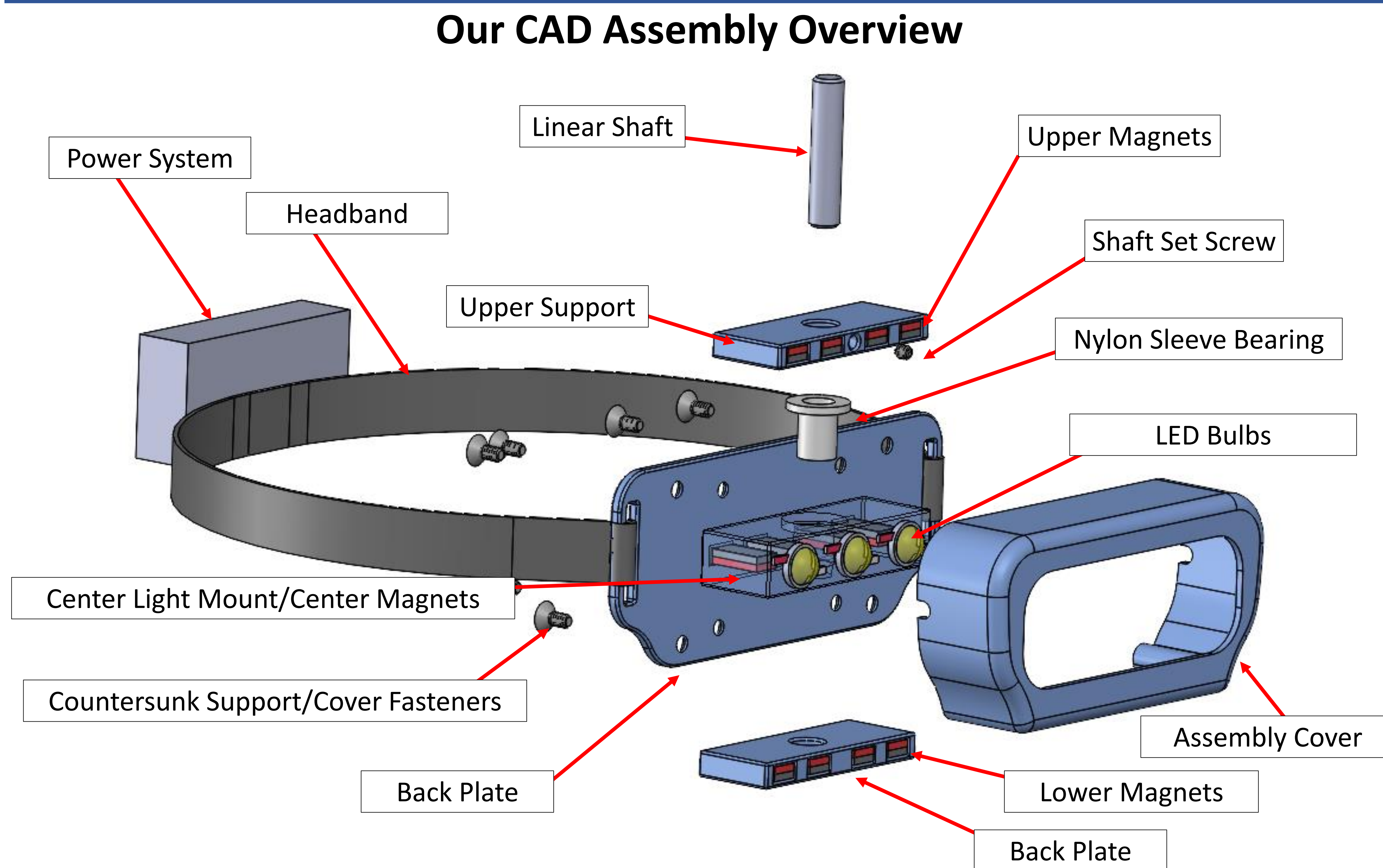
The team first brainstormed as many ideas as possible with several types of damping that could be used. Magnetic was chosen because of its small and inexpensive way to obtain a damped system. The next steps included designing the actual housing. This went through many iterations and eventually landed on the single shaft design. Small iterations were made throughout the design process to end up with the final optimal design



STABLE LIGHT

Passive Magnetic Light Damping System

Ethan Clark, Alec Stonehouse, Omeed Ostry, Mitchel Anderson



Manufacturing Process



Main 3D Printed Components:

- Upper Support
- Lower Support
- Center Light Mount
- Back Plate
- Assembly Cover

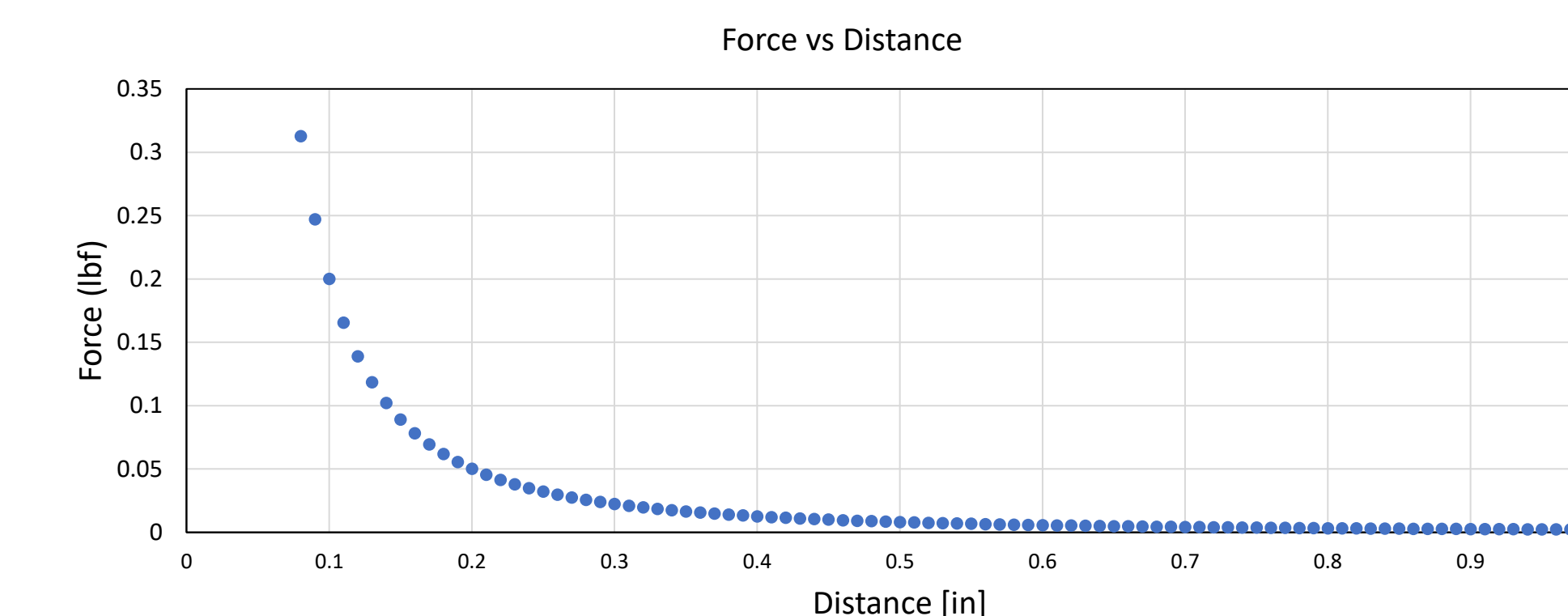
Outsourced Components:

- Rectangular Magnets
- Linear Shaft
- LED Bulbs
- Countersunk Fasteners
- Nylon Sleeve Bearing
- Set Screw
- Headband

Sponsored By: Tony Emanuel



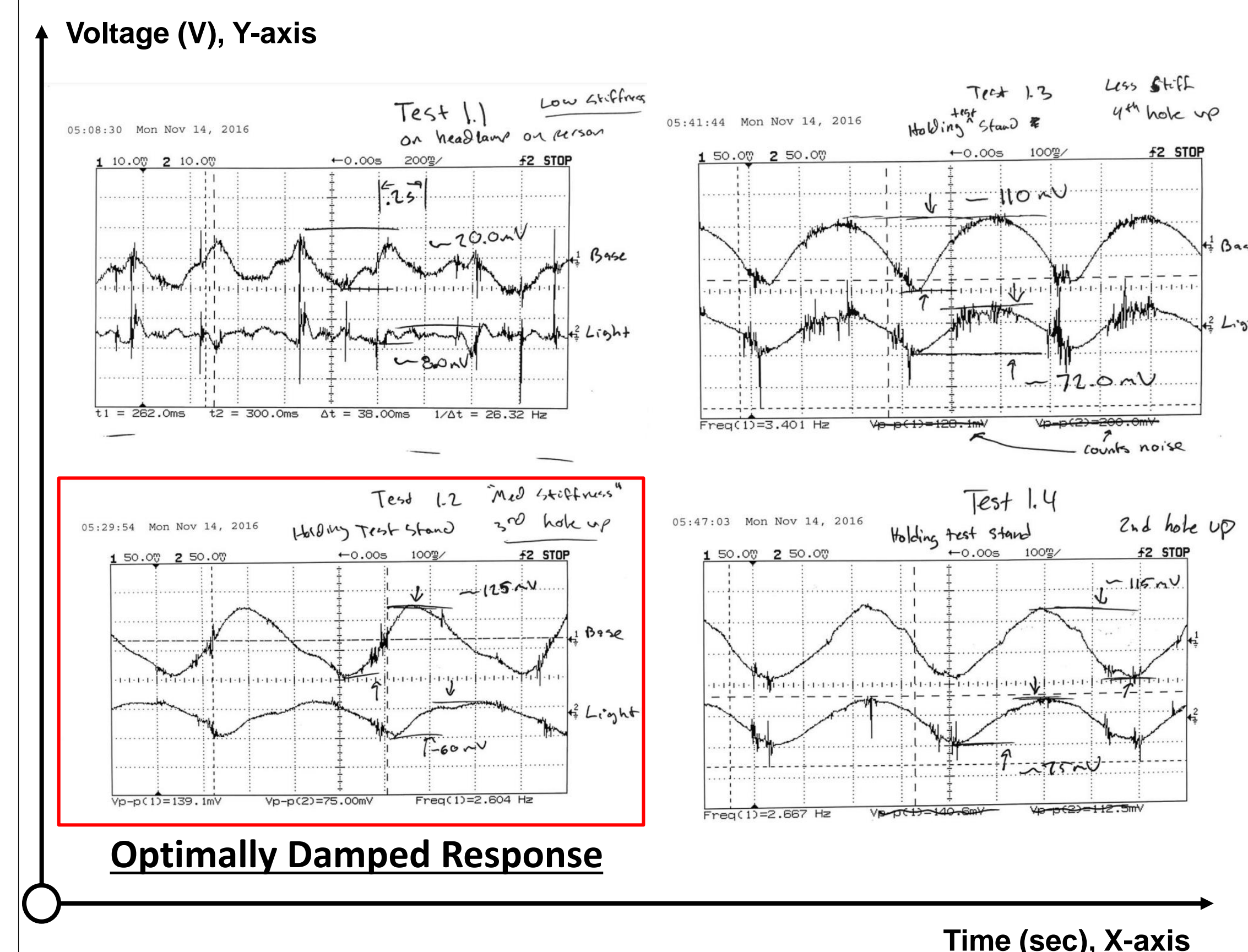
Analysis



- Approximate magnet force vs distance curve
- Curve is based on the general relationship $F \propto \frac{1}{d^2}$
- The optimal distance should be in the middle of the large slope and low slope sections

Experimental Testing

- Vibration response using accelerometers, oscilloscope, PCB.
- Motion testing by running in place with verification prototype.



Conclusion

With the conclusion of our design process and testing, we selected magnetic passive damping as our most efficient and cost-effective. The goal of our project was to create a competitive product that was not yet on the market, and this we have accomplished.

Future Recommendations

- Design mount for bike handlebars
- Design components for injection molding
- Utilize heat set inserts/co-molded inserts for more secure connections