



What Causes Bat Sting in Softball Bats?

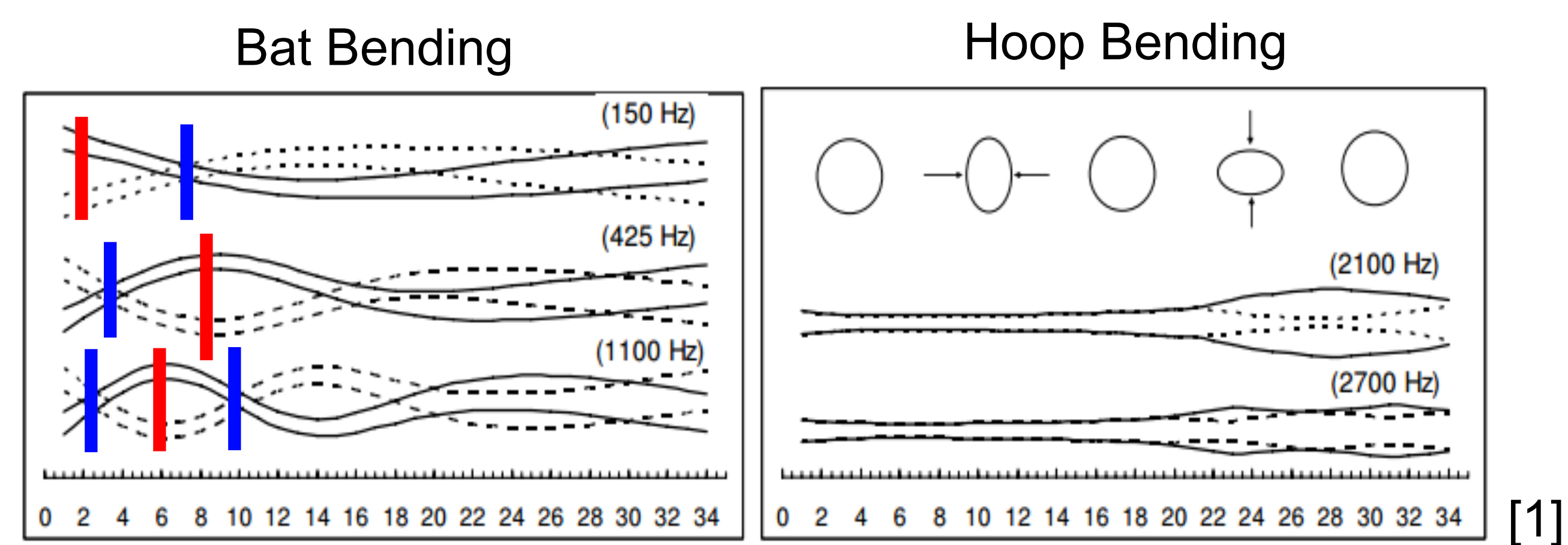
Toria Yan

2.671 Instrumentation and Measurement

Abstract

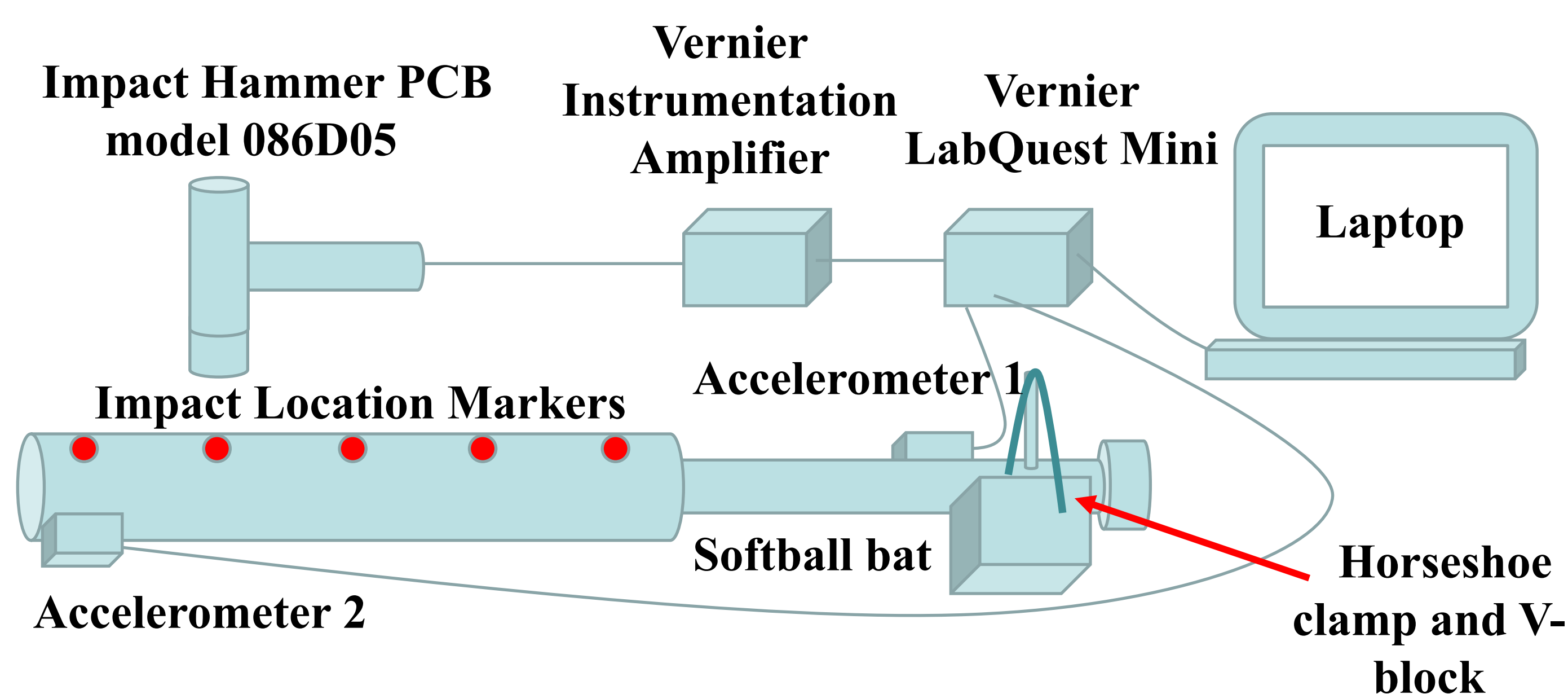
Bat sting is a very painful stinging sensation in the hands that can occur after a hit. To determine the location of minimal bat sting felt, an impact hammer was used to hit a bat barrel at various increments and the acceleration response was measured. Impact locations farther from the “sweet spot” of the bat (between 0.1m to 0.2m from the bat tip) produced a more intense acceleration response as well as a higher Gain magnitude. An impact location in the “sweet spot” range resulted in a very small bending amplitude in the acceleration response as well as a very small Gain magnitude. This suggests a correlation between the impact location on the bat barrel and the resulting output response by the bat as well as the resulting bat sting felt in the handle.

Introduction



The numerous vibrational bending modes a softball bat experiences after a collision with a softball affect the perception of bat sting felt [2]. Hands located at **anti-nodes** at high frequencies will feel more vibrations and more bat sting than hands located at **nodes**.

Experiment Setup



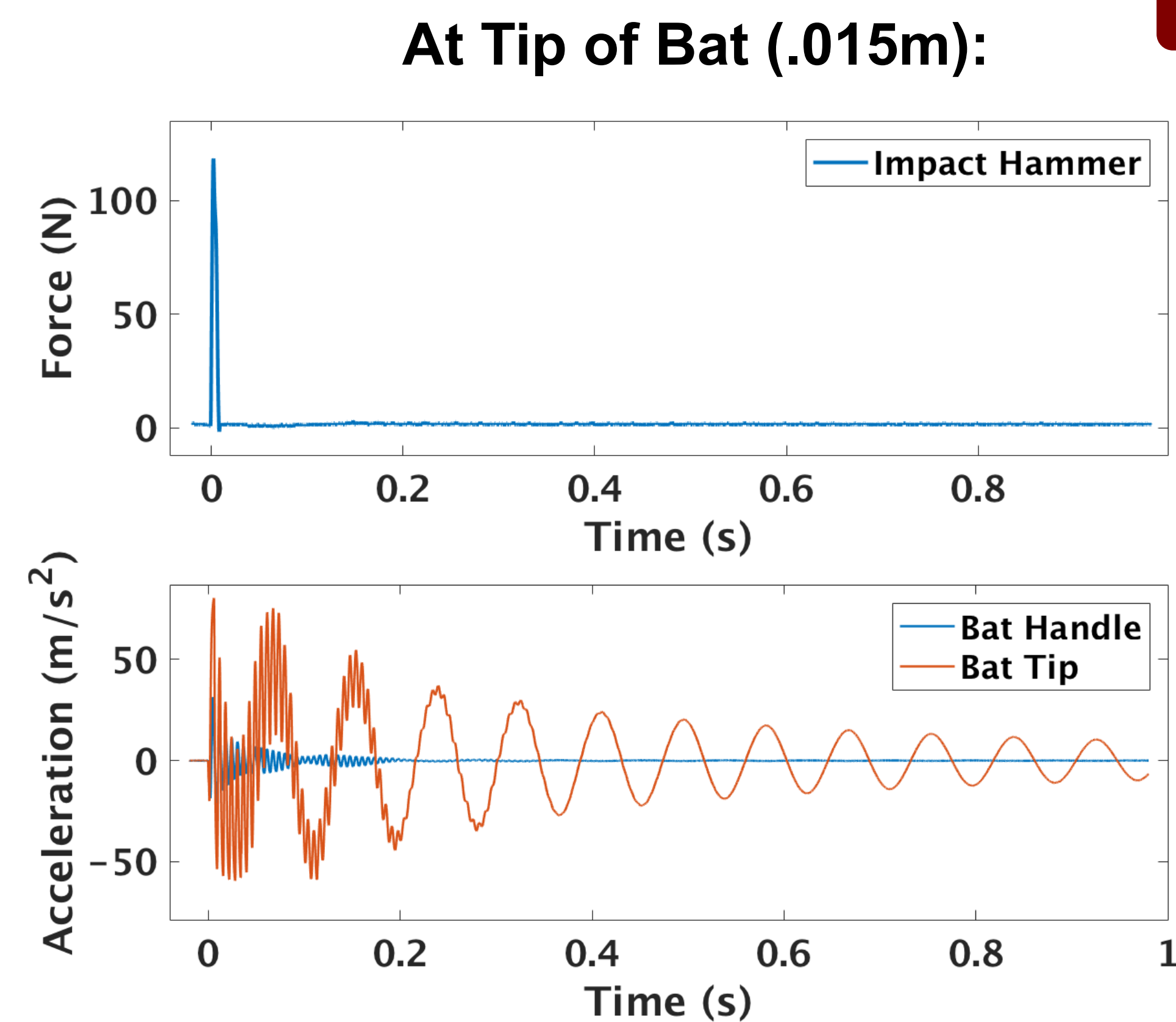
Acknowledgements

Thank you to Dr. Hughey, Professor So, and Ashin Modak for the guidance and advice, and the Pappalardo staff for the borrowed equipment and support.

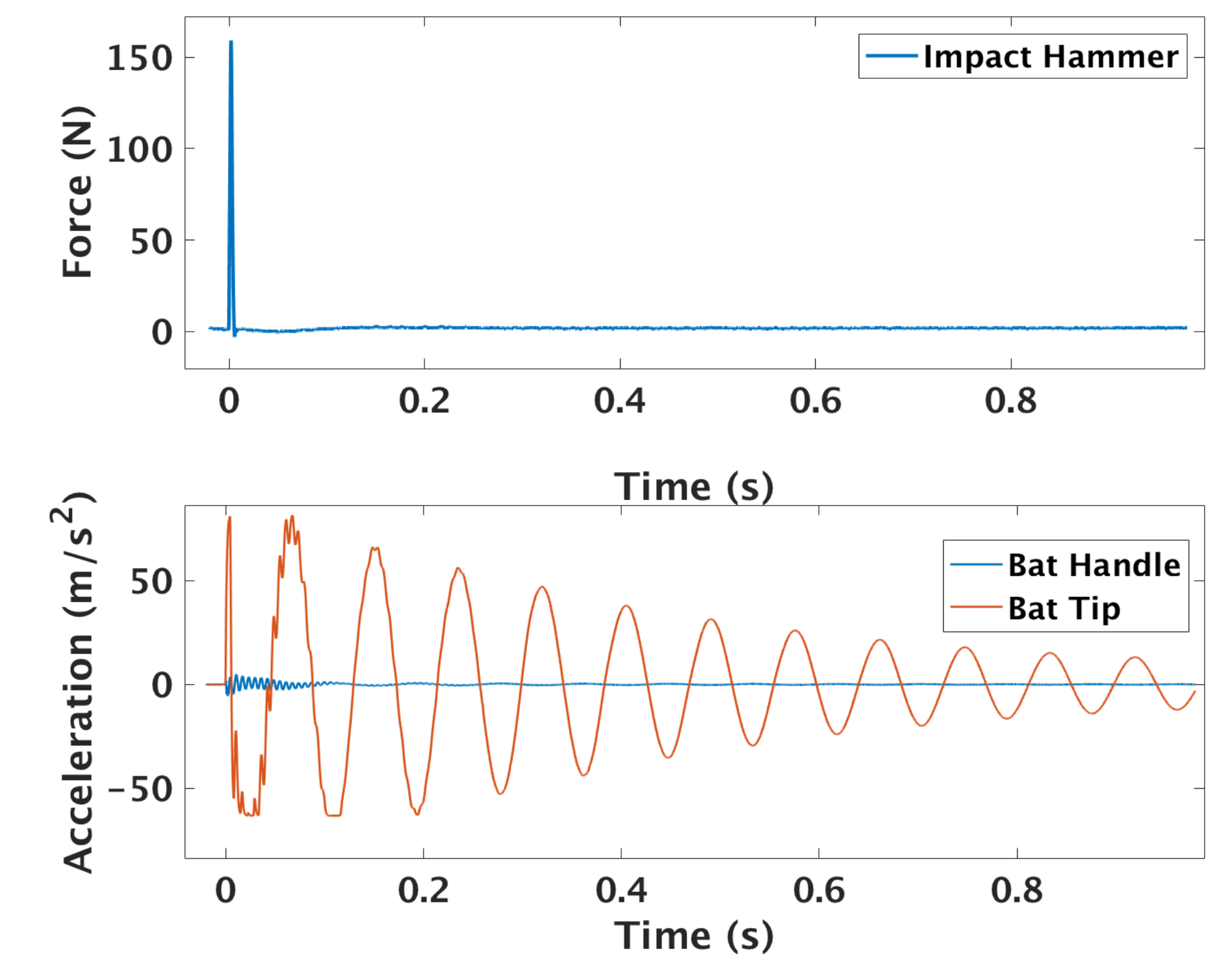
References

- [1] Sutton, A. D., and Sherwood, J. A., 2010, “Using vibrational analysis to investigate the batted-ball performance of baseball bats,” *Procedia Eng.*, 2(2), pp. 2687–2692.
 [2] Russell, Daniel A., “Why Do Bats Sting for Bad Hits?”

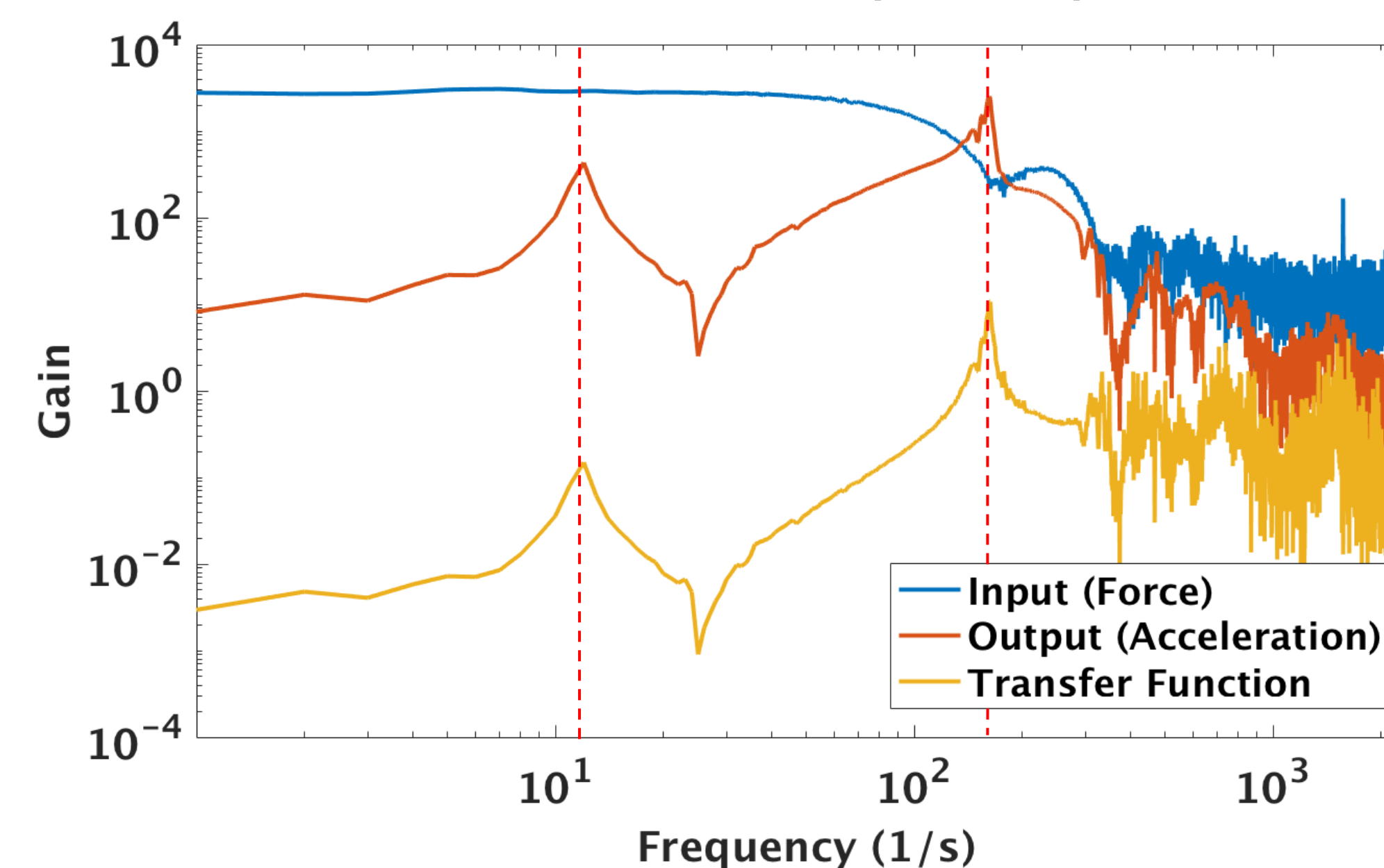
Results



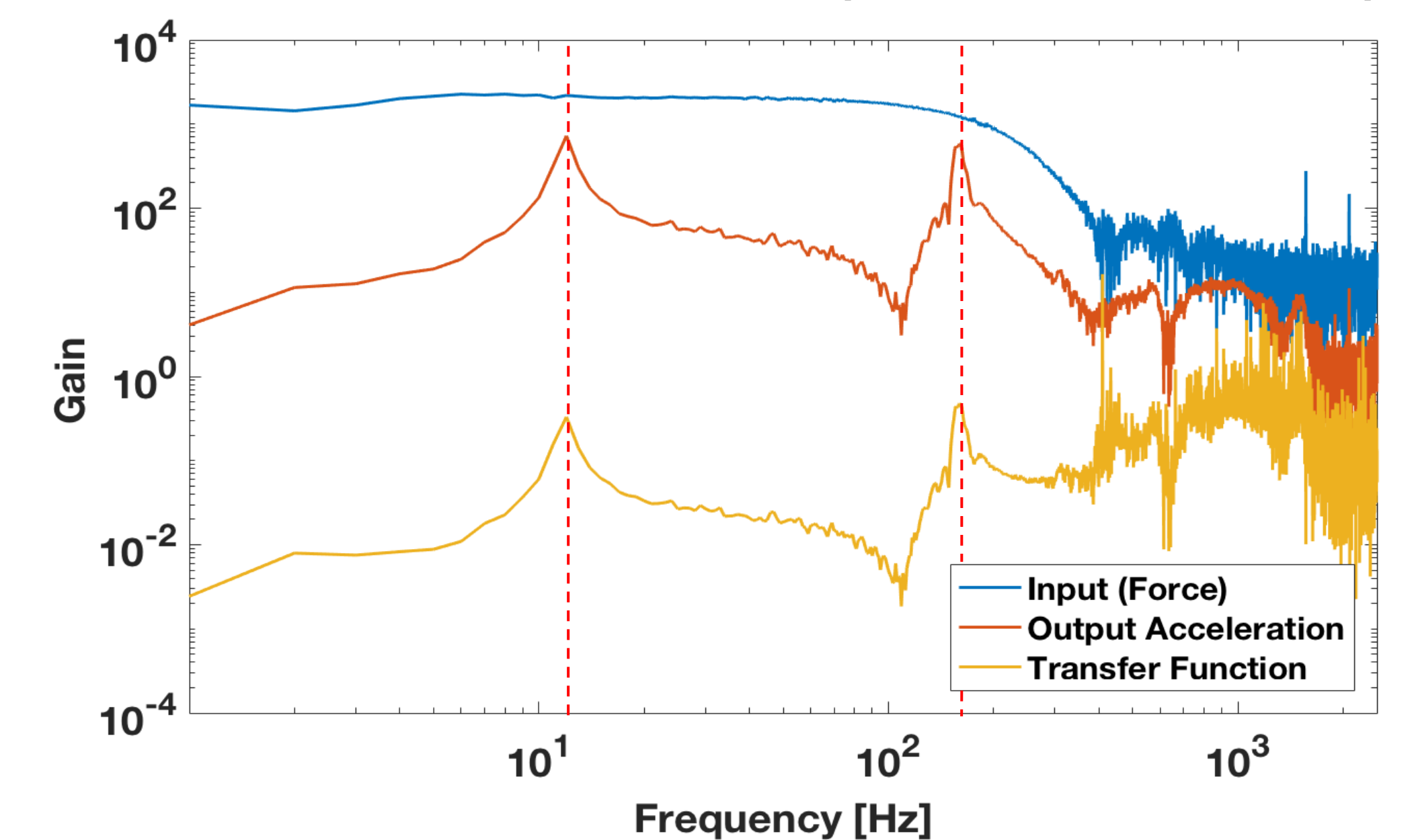
Near Sweet Spot (.175m):



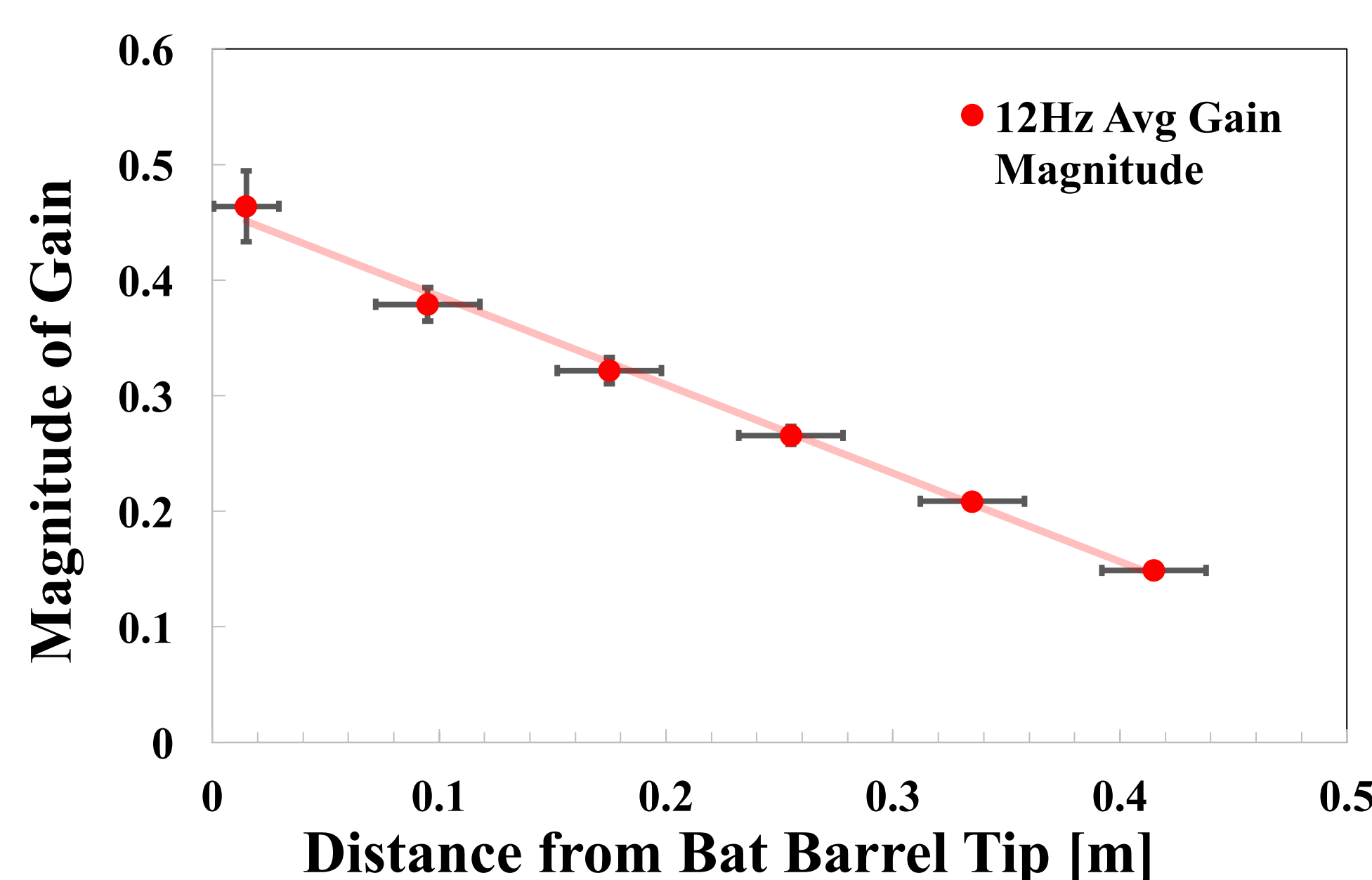
Transfer Function Gain Plot (At Tip):



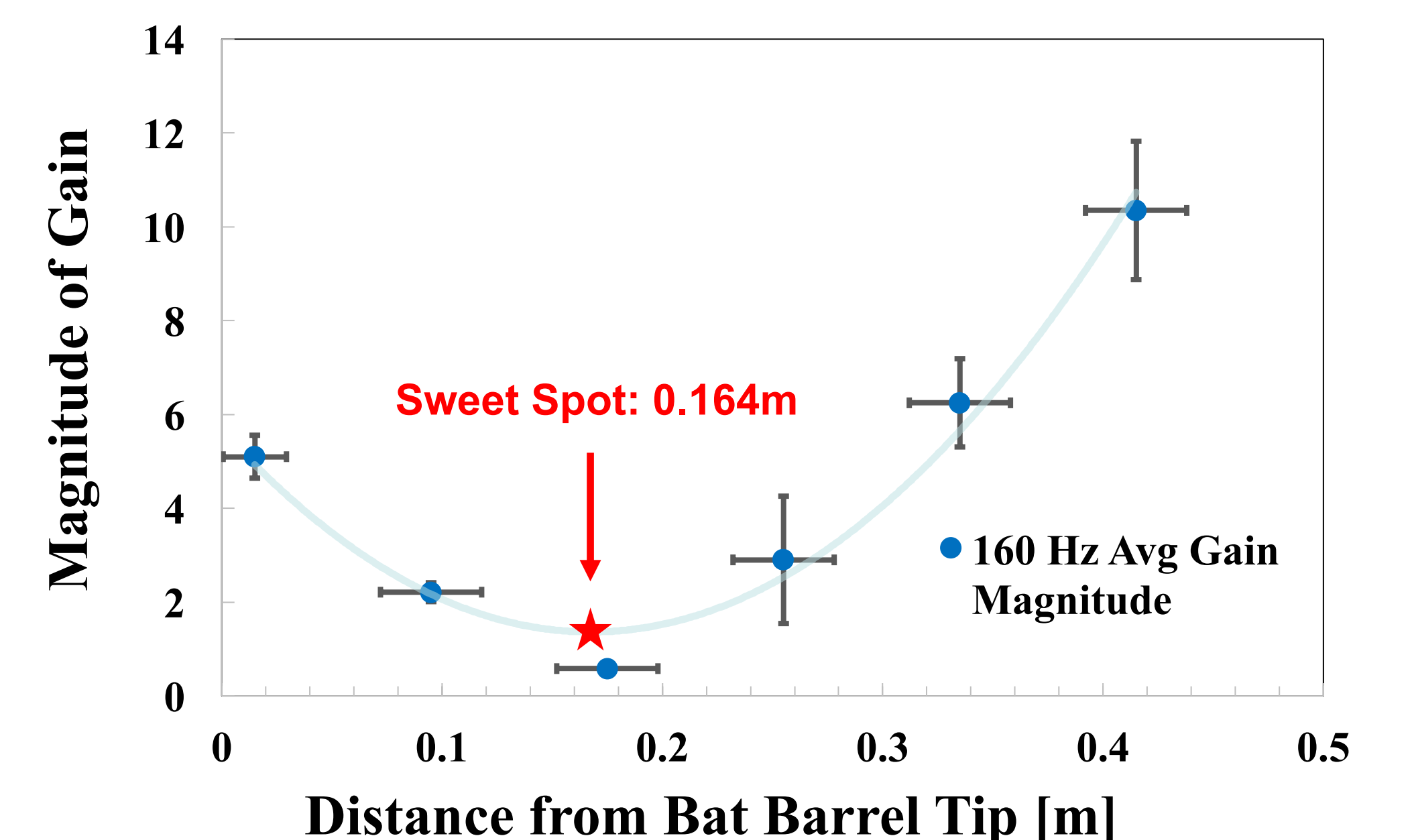
Transfer Function Gain Plot (Near Sweet Spot):



12 Hz Gain Magnitude Averages:



160 Hz Gain Magnitude Averages:



Conclusion

- The Sweet Spot of the bat is located at 16.4 cm \pm 12cm
- There are two resonant frequencies (12 Hz and 160 Hz), but only the 160 Hz resonance frequency contributes to the bat sting felt in a hitter’s hands
- Impact Locations further from the sweet spot of a bat result in an increase in bat sting felt in a hitter’s hands
- There is more bat sting for impacts at the bat handle compared to impacts at the bat tip