Demonstration Apparatus for a Driven Vibrating String with Nonlinearities

Overview

A former faculty member in the Acoustics Department used a 1m long apparatus to demonstrate the modes of a flexible wire driven by an electromagnetic force. A new apparatus was built recently to duplicate the original one. Because of the size and weight of the original apparatus, it was challenging to carry it around. Therefore, Tannis Hudson built an apparatus that had a length of only 0.5m. However, the 0.5m apparatus showed a non-linear behavior. Due to Tannis Hudson graduating and taking the apparatus with him, the PSU Acoustics Department no longer has a method to study this phenomenon. Therefore, our team was asked to design and build an apparatus capable of demonstrating the oscillation of the Nichrome wire using a strobe light and by looking at the wire itself in a safe manner.

Objectives

- Designing a demonstration apparatus that demonstrates the non-linear vibration of a wire

Approach

- We have met with our sponsor multiple times to determine we needed an apparatus that could demonstrate nonlinear behaviour in a wire at 0.5-1 lengths at 60Hz to 1kHz.
- Created a block diagram with 5 different potential methods to generate the input.
- After doing concept generation, we have decided on one approach.
- We have fabricated a prototype that meets the customer’s needs.
- We performed tests to prove that the apparatus demonstrate both linear and non-linear vibrations. We have showed the results to our sponsor.

Outcomes

- The project will help the sponsor study the non-linear vibration of a driven wire.