CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
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Project Number
35812

Project Title
How Does the Size of a Speaker Affect Its Frequency Response?

Abstract

Objectives/Goals
The objective of this project is to learn about speakers and how they work, understand the movement and characteristics of sound waves and how they affect the speaker, how frequency and loudness of sound waves are measured, and understand how to conduct and complete a valid, successful experiment. It will test how different sized speakers (drivers) produce different frequency responses.

Methods/Materials
The independent variables used in this experiment are the size of the speaker (driver) and audio frequency of the test tones used. The dependent variable is the frequency response of the speaker being tested. The readings are measured using a microphone and a computer based audio spectrum analyzer. The constants (control variables) are the amplifier, the measurement microphone, physical location and layout of the different components of this test, including the distance from the microphone to the speaker. The different sized speakers, which are all required to be have the same electrical impedance and cone material, are connected to an amplifier in order for the test tone to be audible. This amplifier is connected to the computer which has the TrueRTA software to generate the test tones and record the data. There is a measurement microphone connected to the computer such that when the test tone is played, the microphone will send the response back to the computer to be analyzed.

Results
In this experiment, the speakers responded as predicted. The larger speaker produced lower frequencies louder than the smaller speaker, and the smaller speaker produced higher frequencies louder than the larger speakers. However, the higher frequencies all responded similarly, which was very surprising.

Conclusions/Discussion
Overall, the experiment was designed well and therefore the hypothesis was properly tested though there were some parts of the experiment that could have been conducted better. The way the experiment was performed was very efficient, and was necessary to retrieve accurate data. The only issue was controlling the various variables. Controlling background noise is very challenging, especially since the experiment was not done in an anechoic room. Also, more sophisticated software and measuring instruments would have produced more data points with higher accuracy.

Summary Statement
An experiment to determine how the size of a speaker may affect its ability to reproduce sound frequencies across the audible spectrum.

Help Received
Parent helped with the conducting of the experiment.