CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

J1301

Project Title

Can You Hear Me Now? A Project on Acoustic Physics with Household Materials

Abstract

Objectives/Goals

A sound wave is the pushing and pulling of air, creating vibration and projecting it. The human ear receives these #waves# of vibration using the eardrums, and sends signals to the brain to interpret. I did an experiment on how well different materials can project these sound waves. The question I asked was which homemade speaker design would produce the loudest sound in decibels.

Methods/Materials

I gathered materials to make an array of speakers using the same design, but using different materials to actually produce the sound. The tested materials included potato chips, bubble wrap, styrofoam, cardboard, and rigid plastic. All speakers used a stack of cylindrical refrigerator magnets, magnet wire, and glue. I played the same song from a boombox for a 30 second timespan using each speaker. Using a sound level meter, I took measurements to determine the average, maximum, and minimum sound pressure levels to see which produced the loudest sound. For comparison, I also tested a similar sized commercial speaker, removed from an old bluetooth phone speaker.

Results

My measurements determined that the styrofoam speaker consistently produced the highest average, maximum, and minimum sound pressure level of any of the homemade speakers. The average sound pressure level for the styrofoam speaker, for example, was 59.3 dB. This is significantly higher than that of the cardboard speaker (55.7 dB), the plastic speaker (52.3 dB), or the Pringles potato chip (51.3 dB). The commercial speaker produced a significantly louder sound than any of the homemade speakers. Qualitatively, though, the homemade speakers seemed to produce better sound quality, particularly at the high frequencies, compared to the commercial speaker.

Conclusions/Discussion

I can make loudspeakers out of household materials, but they are much quieter than a commercial speaker. My hypothesis was proved correct, in the sense that the speakers worked, but incorrect, in the sense that the styrofoam speaker performed better than the plastic speaker.

Summary Statement

I constructed loudspeakers out of household materials, tested the acoustic properties of those speakers, and determined which materials produced the loudest sounds.

Help Received

I did the experiments myself with some help from my parents. They helped with the hot glue gun during construction and by starting/stopping the music during data collection.