CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)

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Project Number

J0820

Project Title

Constructing an Inductrack Maglev

Abstract

Objectives/Goals

In our project Constructing an Inductrack MAGLEV, our engineering goal was to construct a magnetically levitated train complete with a propulsion track.
The design criteria:
Chassis must be light as possible, must achieve levitation of at least 2 millimeters, transition speed must be lower than 10 m/sec, and must be durable.

Methods/Materials

The main components of the MAGLEV are inductor arrays, a fiberboard chassis, a propulsion circuit, and magnet arrays. The inductors were created by winding 18 AWG magnet wire around a 3x2 inch plastic brace 86 times. The chassis was made with fiberboard cut to 3x2 inches. Halbach arrays are a sequence of magnets created by orientating 5 neodymium magnets so that they are more powerful. This creates a strong field. The propulsion circuit uses an electrically charged coil to create an electromagnetic field that propels the chassis. Using a PVC gutter 8 feet long, we used a bungee cord to launch the chassis with the attached magnet arrays over the inductors. This was used to test our chassis for levitation. The electronic propulsion was tested separately from the levitation.

Results

From our results, we determined that levitation was not achieved.
Propulsion was achieved. The chassis was as light as possible (415g), with almost all of the mass belonging to the magnets. The chassis was durable. We could not achieve levitation because our chassis speed could not meet the transition speed. More issues were that there was a braking force on the chassis as it passed the coils, and also because there was too much coil resistance.

Conclusions/Discussion

Some reasons why our project did not work is because there was a braking force on the chassis and inductors were not the same size, so some inductors did not act on the chassis equally. In the future we would wind Litz-wire coils to increase coil efficiency and would find a method to measure the current in the inductors. We would obtain software modeling that determines the design to use based on the numerous variables such as wire size, number of winds, and coil dimensions, etc. We would also add a more stable track to test higher chassis speeds, add electronic parts that can sustain higher amps, have our coils professionally wound and purchase higher quality magnets.

Summary Statement

The purpose of the project was to design and construct a magnetically levitated train with electronic propulsion circuitry.

Help Received

Wesley's father supervised our construction of the Halbach arrays and the electronic propulsion circuit.