CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
S0704

Project Title
Is Your Body Exposed to Potentially Harmful 60 Hz Magnetic Fields?

Abstract

Objectives/Goals
The objective of this project is to measure Extremely Low Frequency (ELF) magnetic fields emitted by household electrical appliances and compare them to values found in epidemiologic studies to determine whether they are potentially harmful to the human body.

Methods/Materials
The measurements are made using a high resolution 3-axis ELF Magnetic Field Meter (or gaussmeter). The gaussmeter was used to measure the 60 Hz magnetic field emissions for the following appliances: vacuum cleaner, microwave oven, electric oven, television, blender, toaster, hairdryer, washing machine, and fluorescent light. We also measured magnetic emissions in the presence of the following shielding materials: mu metal foil, copper plate, and a wood board. The measurements were performed by dividing the area in front of a given appliance into a grid of regularly spaced intervals extending away from the appliance and recording the magnetic fields along each line from 0" to 36".

Results
The results indicate that at close distances all appliances have significant 60 Hz magnetic emissions, which generally exceed the value of 4 milligauss (mG) linked to childhood cancer in epidemiological studies. The levels of these emissions decrease with distance at different rates depending on the appliance.

Conclusions/Discussion
After recording all the data, I identified four main groups. For Group 1 (washing machine), exposure to 5 mG or more occurs within 4 feet of the appliance. For Group 2 (microwave oven and fluorescent light), exposure occurs within 3 feet. Group 3 (electric oven, kitchen blender, toaster, vacuum cleaner) has an exposure range of 2 feet. For Group 4 (hairdryer and television), exposure range is 0.5-1 foot around the appliance. For the shielding experiments, the data clearly show that wood and copper shields have little effect on the magnetic emissions. However, the mu metal shield has a big effect on 60 Hz field, reducing it by as much as a factor of 10.

Summary Statement
This project investigates whether the human body is exposed to potentially harmful 60 Hz magnetic fields emitted from household electrical appliances.

Help Received
Mother helped set up display board. Father supervised the experiments and guided me through project.