CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)
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Project Number
36532

Project Title
An Inexpensive Radiation Detector and Its Application to Cosmic Rays and Environmental Radiation

Abstract

Objectives/Goals
The goal of this project was build a scintillation counter using inexpensive, easily available materials and to demonstrate the applications of the scintillation counter in the fields of radiation and secondary atmospheric muon detection.

Methods/Materials
While researching radiation detector technologies to see if I could build a DIY detector, I learned that Japanese scientists had published a paper in 2011 demonstrating polyethylene naphthalate (PEN) plastic works as well as more expensive scintillator materials. PEN is widely available in consumer products. I also found a low-light detector circuit online that I might be able to use to detect the scintillation from the PEN plastic when detecting radiation. I constructed the detector, using an Arduino board to record the data and IDL to analyze the data. I tested my detector with Potassium Chloride (Morton Salt Substitute, which emits beta particles) and atmospheric muons produced by cosmic rays.

Results
My signal histograms showed signals detected from salt substitute at levels statistically significantly higher than background. Muon signals are still being analyzed.

Conclusions/Discussion
I was able to construct a radiation detector using inexpensive and widely available scintillation material and do-it-yourself electronics. Unlike cloud chambers, which have been used in science fair projects, this detector's only consumable is battery power. It is also easy to use, with data stored immediately on SD cards.

Summary Statement
My project was to create a cheap particle detector to use in radiation testing or in particle detection.

Help Received
My father, Dr. Allan Labrador, helped me with this project by teaching me electronics, programming, soldering, and how to interpret the data.