CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)

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Project Number

J1808

Project Title

Material Density and Charged Particle Occurrence in a Cloud Chamber

Abstract

Objectives/Goals

Build a cloud chamber and observe charged particles. Test how the density of various materials affects the number and type of charged particles observed.

Methods/Materials

Constructed a cloud chamber, in a dark room, consisting of crushed dry ice, a glass tank (made air-tight with window sealant), a heating pad, 99% isopropyl alcohol, a dark metal sheet pan. Recorded the number of charged particles seen in a cloud chamber for one minute, with and without a steel plate (1 cm thick) at different altitudes.

Results

More charged particles were seen at 700 meters above sea level than at 146 meters above sea level. The steel plate reduced the amount of charged particles seen at both altitudes. With a steel plate, the number of muons seen increased by 7%, but the number of particle decays and electrons was also decreased by 7%.

Conclusions/Discussion

The steel plate reduced the number of charged particles observed in a cloud chamber by a substantial amount, which leads to the conclusion that steel is an effective way to insulate against charged particles. At a lower altitude, fewer charged particles were seen, leading to the conclusion that air also functions as an insulation against charged particles. Air is much less dense than steel, so a much greater quantity was required to block a similar number of charged particles.

Summary Statement

Using a cloud chamber, we determined that both steel and air are effective insulators against charged particles.

Help Received

We adapted a design for a cloud chamber from Science Friday, improving on it considerably through many iterations. We performed the experiments ourselves.