1 INTRODUCTION

Caroline Robson

The aim of this project was to build a simple cosmic ray detector suitable for school-based demonstrations. The original project brief detailed a prototype of a small neon tube array built by scientists at CERN. The stated objective was to investigate this apparatus and, if successful, develop it into a larger array for the detection of through-going muons. However the neon tube equipment was shown to perform poorly and the emphasis of the project was shifted to the development of a different method for the same purpose.

After extensive research it was concluded that a scintillator-based detector would be the most practical method. The basic principle of this technique lies in the fact that a scintillating fluor in the material emits a photon when traversed by a charged particle such as a muon. It is this photon that we detect via a photomultiplier tube. The group carried out investigations using a test stand in order to establish a working knowledge of the detection process and to obtain data upon which a design for a portable detector was based. Many problems were experienced during this phase due to background noise caused by the electronics. After investigating methods to reduce the noise, the scintillator geometry for a portable barrel-type detector was designed. The plans were developed to include a visual LED array to show the paths of the through-going muons. There were many constraints on the design including time, money and the safety issues of working with sensitive equipment and high voltages. In particular it was important to ensure the safety of students using the detector.

The final part of the brief was to produce educational materials for schools, including posters on the physics of cosmic rays and the techniques of particle detection. These were developed with the aim of being eye-catching and informative to sixth formers. The designs were implemented such that the posters could double as handouts when reproduced in A4 format. A website was developed with two aims in mind. The first was that it would be an easily accessible resource for the group to use in order to keep each other informed and the second was that it would be an educational tool for students.