A Simple Cosmic Ray Detector

PHYS3C41 Project Proposal 2002/2003

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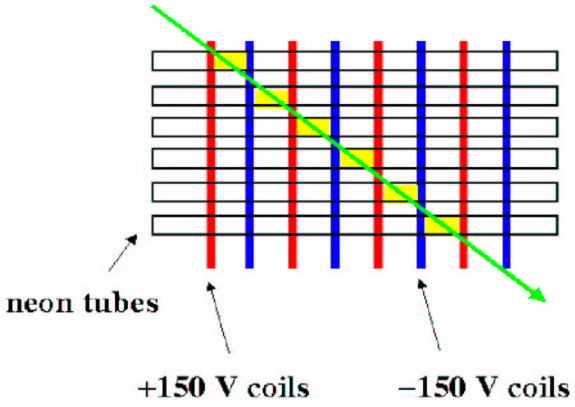
Outline :

The goal of this project is to establish the feasibility of a simple cosmic ray detector, suitable for school−based demonstrations. The detector, employing the simple components indicated in the figure below, has been proposed and partially prototyped by scientists based at CERN (http://teachers.web.cern.ch/teachers/archiv/HST2000/teaching/expt/sascha/sascha.htm). This project will begin with practical investigations of the principle and the apparatus involved. If successful, the project will then move on to the design and construction of a larger array suitable for the identification of through−going muons. Accompanying school−level educational materials will be prepared.



Schedule & Work Breakdown :

1. Demonstrate the basic principle and establish the operating parameters for a single neon tube. Investigate the longitudinal segmentation that can be achieved.
2. Investigate designs for a several tube array suitable for detecting through−going muons, subject to cost and resource constraints.
3. Construct and operate a several tube array. Investigate the impact of noise and the ability to isolate a through−going muon signature. If the noise levels are too high, investigate the possibility of "triggering" the array using scintillator planes.
4. Providing that a several tube array has been successfully constructed, investigate the stability of the apparatus and reproducibility of the results.
5. Assess the modifications to the apparatus that will be needed to make a portable and easy to use demonstrator for schools.
6. Prepare accompanying materials for schools, including posters on the techniques of particle detection and the physics of cosmic rays.

Risks :

The apparatus may perform poorly. In particular a coincidence signature for muon traversal may be difficult to establish. In this case, the bulk of the project would be devoted to the investigation of alternative constructions for the same purpose, including computer simulations and estimates of performance based on cosmic ray flux data.