The Berkeley Lab Cosmic Ray Detector*

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A few years ago, the Nuclear Science Educational Committee received a grant to design and build several portable Cosmic Ray Detectors. We received this generous grant from the Meggers Foundation through the American Physical Society

After the project was completed, we had 9 completed detectors and extra circuit boards. Since the detector is small and light, it can easily be carried. Its electrical power requirements are small, so a small battery can power it.

While this device is simple, a number of Nuclear Physics principles can be demonstrated. First, we can measure the rate and direction of cosmic rays. With a set of absorbers, we can demonstrate the range of muons. By taking the detector to places at different altitudes, we can measure the effect of elevation.

As there is no commercial way to buy such a device, many groups around the United States have expressed interest in replicating it. Requests have come from students wanting to create a science project, teachers desiring class activities, and teacher workshops. So far we have distributed 37 circuit boards. We have even sent our design to BNL so that BNL can manufacture new ones.

An example of the board's use occurred last summer at Southern Methodist University (SMU). Several faculty members ran a QuarkNet workshop for 18 teachers. They used one of our boards to build a functioning detector.

We have had many requests to borrow the detectors. Uses of the detectors have varied. A student wanted to use the detector as his science projects. Other times, teachers desired to demonstrate the principles of radiation to their classes. At LBL, we have run workshops to teachers and students. Sometimes, we have them use the detectors as if they were doing a college physics lab.

Last year, we loaned one cosmic ray detector to the QuarkNet Workshop at the 2001 High Energy Physics Snowmass Conference. They used it as part of their curriculum. Some teachers became so enthused about measuring cosmic rays, that they took the detector on a cross-country trip. While at Snowmass, they arranged a high altitude balloon trip and measured the cosmic ray flux during their assent and decent. Figure 1 shows the results obtained by a team of QuarkNet teachers. The graph shows the well-known phenomena that cosmic ray flux increases as a function of elevation.

We have just sent a detector to Zimbabwe. The detector will take a safari to either the highest peak in Zimbabwe (2592 m) or to Nyanga Mountain in Mozambique. During its journey, a group will measure the cosmic ray flux as a function of elevation.

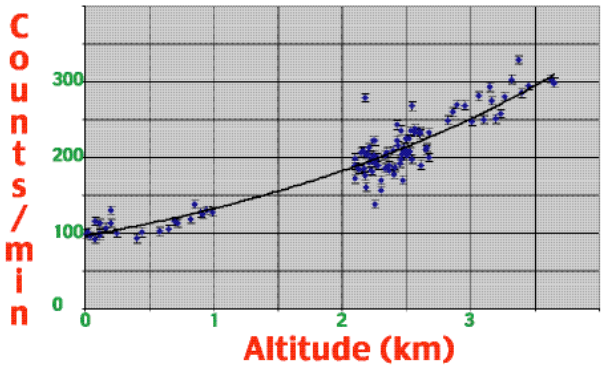

Fig. 1. Several teachers from the 2001 Snowmass QuarkNet meeting measured the cosmic ray flux on land and in the air. This plot shows the cosmic ray flux into our detector from sea level to more that 3.5 km high.

Footnotes and References

*This work is described in more detail at http://www.lbl.gov/abc/cosmic/