Abstract

Four muon detectors have been studied. Detectors were stacked in varying orders top to bottom. It seemed that as the detectors were at the top of the stack, counts increased relative to a lower level stacking order. Channel 2 consistently had shorter time over threshold values relative to the other detectors independent of stacking order. This seems to be an inherent characteristic of channel 2's PMT.

Introduction

Cosmic radiation consists of various types of particles and electromagnetic waves. One of the particles in cosmic radiation is the muon. Muons can be detected using a scintillator plastic block and a photomultiplier tube. Here we have investigated the use of four muon detectors stacked one on top of the other. Specifically, the order in which the detectors are stacked has been studied.

Procedures

Four muon detectors were stacked one on top of the other numbered 1 through 4 top to bottom. Data was taken overnight for double coincidence. Detectors were then reoriented 4 through 1 top to bottom. Data was then taken the next day double coincidence for comparison.

Detectors were then rearranged numbering 3, 4, 1, and 2 top to bottom and 2, 1, 4, and 3 top to bottom. Data was then taken double coincidence overnight and during the day respectively.

Results

It was difficult to draw conclusions from our data as only 2 days of data were taken. Furthermore, some of the data were only taken for approximately four hour increments and some of the data was unuseable. From the data that was gathered, it seems that as various detectors were moved to the top of the stack their counts increased. As an example, Ch 1 detector was at the top of the stack in figure 1, and on the bottom of the stack in figure 2. The graphs shows that the peak of the red line (channel 1) decreased from figure 1 to figure 2.

Channel 2 was consistently reading shorter time over threshold values for all data collections. This seems to be an inherent characteristic of channel 2's PMT.

Figures
Figure 1. Overnight capture with stacking 1, 2, 3, 4 top - down
Figure 2. Day capture with stacking 4, 3, 2, 1 top - down
Figure 3. Afternoon capture with stacking 3, 4, 1, 2 top - down
Discussion and Conclusions

The data presented here seems to indicate that as the detector is moved to the top of the stack of detectors, the counts are increased relative to its previous location.

Channel 2 detector consistently had a shorter time over threshold value than the other detectors measured. This seems to be an inherent characteristic of detector 2's PMT.
Changing the channel of this PMT would verify whether it is the channel or the PMT.

Further study can be done to investigate the ordering of detectors by further varying the position of detectors and the number of coincidence pulses detected. Longer count rate times would increase the reliability of the results.

**Bibliography**

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