Abstract

An experiment was carried to investigate cosmic ray showers. We collected data for triple and quadruple coincidence events. We found that triple coincidence events occurred about 5 times as often as quadruple coincidence events. More studies are required to determine what is the optimal coincidence level (i.e. whether triple or quadruple) for shower studies.

Introduction

We were interested in the effect that different coincidence level requirements would have on the data gathered from a detector in unstacked formation. That is, in order to detect showers, should the detector be run in triple- or quadruple-coincidence mode?

Procedures

We set up the detector in unstacked configuration, with edges of the four counters nearly touching each other (that is, as close as they could get without overlapping.) We collected data overnight (approx. 16 hours) with a trigger requirement of quadruple coincidence. We then collected a new set of data (for only about 5 hours) with a trigger requirement of triple coincidence. The counters were not moved at all, and no other changes were made to the configuration or data collection.
The quadruple-coincidence run produced a rate of 39 events/hour [626 events in 16.0 hours], while the triple-coincidence run produced a rate that was five times larger: 205 events/hour [1031 events in 5.04 hours].

As expected, the more restrictive condition of quadruple coincidence produced a significantly lower count rate, by a factor of about 1/5. Attempts to run the data through the e-Lab Shower Study proved frustrating, as the investigators were unsure about how to interpret the data. It may be that using just a single detector, with the counters placed so close together, is an inappropriate usage of that analysis tool.