Cosmic Radiation Variation throughout the Day

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I.   Physics Justification

Potentially there are many different sources of cosmic radiations. In addition to the Sun and the distant galaxies, there are other non-thermal sources known to generate cosmic radiations.[1] Given periodic news reports of solar flares and personal encounters with ultraviolet radiation, it is surmised that most students would believe that the majority of cosmic radiation (secondary) comes from the Sun. If this were true, the level of cosmic radiations during the day-time should be higher than cosmic radiation levels at night-time.

Numerous studies have rejected the above claim. Cosmic radiation levels measured at the surface of the Earth do not change considerably from day to night. Mok and Cheng and others[2] have shown that cosmic radiation does not vary significantly from day to night. It is our intention to examine the correlation between cosmic radiation intensity and the time of the day. These studies will shed light on the plausible sources of radiations and the physical mechanisms that generate these radiations.

II. Goals of the Proposed Experiment

The chief objective of the proposed studies is to collect, analyze, and interpret the data on cosmic ray intensity collected during twenty-four hour duration. It is hypothesized that the variation in the secondary cosmic radiation intensity will be insignificant during the time of observations.

III.   Experimental Details

Data will be collected during the intervals when the position of the Sun changes significantly in the sky. To be specific, the observations will be recorded at 9 PM, 5AM, and 1PM within a 24 hour period of time. The schematics of The cosmic ray detector to be used are shown in the figure 1.
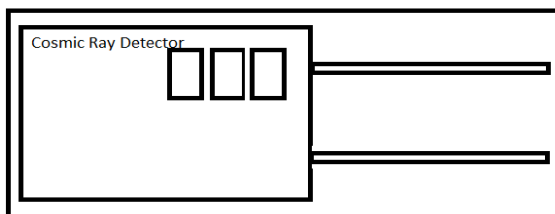
Upper and lower scintillating paddle

Figure 1

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The recorded data will be tabulated as follows:

9:00 PM Time (07/31/12)	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10
Number of Counts										
Count Rate (counts/sec)										
Error in Count Rate (+/- counts/sec)										

5:00 AM Time (08/01/12)	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10
Number of Counts										
Count Rate (counts/sec)										
Error in Count Rate (+/- counts/sec)										

1:00 PM Time (08/01/12)	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Trial 9	Trial 10
Number of Counts										
Count Rate (counts/sec)										
Error in Count Rate (+/- counts/sec)										

Based on the preliminary studies, the percentage error is likely to be around 5%. However, increasing the data points and taking the mean value will decrease this error. The above data will be analyzed using appropriate techniques. More advanced error analysis will be carried out using the following formula. These studies will lead us to further explore the source mechanisms of these radiations.

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$$\sigma_{cr} = \frac{\sqrt{N}}{t}$$

IV. Bibliography

1 http://en.wikipedia.org/wiki/Cosmic_ray
2. http://arxiv.org/ftp/physics/papers/0105/0105005.pdf