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MEASUREMENT OF MUON INTENSITY BY CERENKOV METHOD

Liu Z.H., Li G.J., Bai G.Z.
Liu J.G., Geng Q.X., Ling J.
Chongqing Institute of Architecture and Engineering
Chongqing, People's Republic of China

1. Introduction.

Optical detection is one of the important techniques in studies and observations of air showers, muons and relevant phenomena. In order to measure the muon intensity in a proper energy range and to study some problems about cerenkov radiation of cosmic rays, a muon-telescope with cerenkov detector has been operated.

2. Experimental arrangement and method.

The telescope consists of two scintillation counters, one cerenkov detector and coincidence circuits. The cerenkov detector is installed in a closed cylindrical shell and is composed of bare photomultiplier, parabolic mirror with diameter 500 mm and focal distance 260 mm, pre-amplifier etc.

The hollow cylinder is assembled in sections and so that its height may be changed. Near by the telescope, another scintillator has been operated simultaneously to determine the influence of showers on the intensity.

Signals of cerenkov radition from photomultiplier are amplified and analysed by a multichannel analyser gated "on" by the telescope coincident output.

Since the number(n) of cerenkov photons emitted within a region of wavelengths λ_1 and λ_2 for a particle with $\beta \sim 1$ is given by:

$$n = 2\pi\alpha l\left(\frac{1}{\lambda_2} - \frac{1}{\lambda_1}\right) \sin^2\theta$$

the number of cerenkov photons emitted in a unit of path length can be calculated. In observations, the actual number

of photons reflected from the mirror and collected by the photomultiplier will depend on various factors. It can be compared with the value of theoretically expected.

3. Results and discussion.

The muon intensity measured is in agreement with the integral energy spectrum of cosmic ray muons. Details of data analysis will be presented as more observations are completed.

In order to get correct analysis to the experimental process, fluctuations and influence factors, it is better to operate the apparatus in various conditions, such as, varied height of the hollow cylinder, different placement of photomultiplier with different area of photocathode etc.

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References.

(1) Gregry A.G. et al., 18th ICRC, Conference Papers, Vol.8, 145, 1983.

(2) Protheroe R.J., 18th ICRC, Conference Papers, Vol. 6, 240, 1983.

(3) Clay R.W. et al., 17th ICRC, Conference Papers, Vol.8, 130, 1981.