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Studies with a Threshold Cherenkov Detector

Cosmic muons are capable of producing Cherenkov radiation, a form of electromagnetic radiation that is produced when a charged particle travels superluminal through a transparent dielectric medium. A Cherenkov detector which ignores the directionality of the radiation and solely integrates all particles moving above a set threshold velocity is known as a threshold Cherenkov detector. Since, the minimum particle energy required to produce Cherenkov radiation is a function of the index of refraction of the radiating material; the threshold particle energy can be varied if the radiating material is a gas. A gas threshold Cherenkov detector thus offers a direct and convenient means of measuring the integral intensity of cosmic ray muons at different energies by varying the pressure in the chamber.

To determine the shape of a portion of the cosmic ray muon energy distribution, we have constructed a threshold Cherenkov detector sensitive to muons with energies between 1 and 5 GeV. We are measuring the integral muon intensity at nitrogen pressures of 0.5 to 15 atm. The data is fitted on the prediction of the CORSIKA simulation package. Through this, we will be able to infer the feasibility of using a threshold Cherenkov detector to accurately measure the shape of the cosmic ray muon energy distribution from 1 to 5 GeV.

Field of contribution

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