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The measurement of cosmic-ray muon

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Cosmic-ray muons are produced in the atmosphere as results of the collision of incoming high-energy particles, i.e. cosmic rays, from outer space with atmospheric particles. In this work, a simple detector has been built to measure the speed of cosmic-ray muons. The detector is composed of two scintillation bars of a rectangular cross-sectional area of $4 \times 6 \text{ cm}^2$ and a length of 127.5 cm, with photomultiplier tubes (PMTs) attached at both ends of each scintillation bar. The two bars are vertically aligned in the parallel positions with a distance of 76 cm apart. When a cosmic-ray muon passes through the scintillator, it creates scintillation light. The light will be collected by the PMTs and converted to electrical signals which will be measured using a 4-channel oscilloscope. The time delay between the observed signals obtained from the 4 PMTs are recorded and used to calculate the speed of cosmic-ray muon.

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