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Simulation and Experimental Implementation of a Portable Atmospheric Muon Detector.

Muography, based on the detection of atmospheric muons generated by interactions between primary cosmic rays and the Earth's atmosphere, is a non-invasive technique for structural imaging. This work presents the computational simulation and experimental implementation of a portable atmospheric muon detector based on the Cosmic Watch design. The computational study employed CORSIKA to simulate the atmospheric muon flux and angular distribution at sea level, GEANT4 to investigate energy deposition in BC408 plastic scintillator, and ROOT for data processing and analysis. In the experimental phase, the detector was implemented using BC408 scintillator coupled to silicon photomultipliers (SiPMs), and coincidence measurements between detectors were performed to investigate their response to atmospheric muons. The simulation results characterize the expected muon flux, angular distribution, and energy deposition, while the experimental coincidence measurements provide a basis for evaluating the detector's performance. This work establishes a practical experimental setup for atmospheric muon detection and lays the groundwork for further detector characterization and its potential application in muography.

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