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Simulation of a cost-affordable Cosmic Ray Muon Tomographer

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Cosmic rays arrive at Earth and produce particle showers, especially atmospheric muons, which can be used to image a volume due to multiple Coulomb scattering and absorption of different materials. In this work, we simulate the cosmic-ray flux and their showers using CORSIKA. Then, we perform a GEANT4 simulation of a prototype topographer composed of two detectors, each made of two planes of an array of sensors. The sensors are based on plastic scintillators and silicon photomultipliers targeting new and cost-affordable technology. In order to image a volume, we study the possibility to discriminate different materials (e.g. lead, concrete, iron, water, aluminium) by measuring the absorption and incoming and outgoing angles of muons passing through these materials. We evaluate a realistic scenario and optimize the geometry and angular resolution of the array using simulations with the aim to scan structures such as large buildings and natural formations with muon tomography.

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