

Development of a compact and portable muon detector to detect flux and angle distribution at the same time using scintillator plus fibers and SiPMs

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Abstract:

Primary cosmic radiation creates particle showers when they interact with the atoms of our atmosphere. The incoming protons that generates the muons detected at the earth surface can give information about the atmosphere and the lack of magnetic field present in the region of the South Atlantic Magnetic Anomaly (SAMA) where Paraguay is located. This work presents a new particle detector designed specifically to detect muons arriving from concurrently different directions by using a matrix of scintillation bars. It can detect vertical muons and different ranges of angles of the arrival particles up to 70° with respect to the azimuth. The detection system is built with 24 scintillation bars fill with optical fibers coupled to Silicon Photo Multipliers (SiPM) detectors. We describe in detail the electronics built to readout the detectors, the parallel processing made in a FPGA, and the results of the 15 screens that can be read in real time showing the muon flux from different directions, together with the vertical and total flux. We will present the results obtained for the vertical flux, showing that it is the expected for this region, as well as it's angular distribution. Finally, an example of a possible CME detection will be shown as well.

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References:

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