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A new muon observation using the SciBar detector in Mexico I: Performance evaluation with a proto-type detector

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We plan to fill a gap existing in viewing directions of the Global Muon Detector Network (GMDN) by adding a new detector at Sierra Negra, a high altitude (4600 m a.s.l.) mountain in Mexico. The detector will be installed primarily for observing solar neutrons, but we plan to use it also as a muon detector. The detector (SciBar) consisting of ~15000 scintillator strips (2.5x1.3 x 300 cm^3 each) viewed by ~250 multi-anode photomultipliers is capable for precisely measuring particles produced by various interactions of the primary cosmic rays with the atmospheric nuclei. The detector forms about 130 vertical layers of scintillator strips which are aligned in X or Y direction in each layer alternatively. In order to keep the dead time due to the muon measurement as small as possible, we plan to trigger the muon detection with the 4-fold coincidence between 4 layers forming the top and bottom X-Y pairs and indentify the muon incident direction from X-Y positions in the top and bottom pairs. In this paper, we evaluate the performance of this new muon detector based on the preliminary experiment carried out with a small proto-type detector at Sierra Negra. We also demonstrate performances of this new detector in observing the space weather as an important component of the GMDN.

Keywords: global muon detector network, space weather, galactic cosmic rays