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Development of a SiPM-based Water-Cherenkov Detector for High-Energy Particle and Astrophysics Experiments

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A new photodetection device that uses Silicon Photomultipliers and a Cherenkov photon trap system will be presented, which was named C-Arapuca. We describe the construction of a tank containing 550 liters of ultra-pure water, where C-Arapuca and a photomultiplier tube were installed. Cherenkov photons produced by cosmic ray muons are trapped through the use of a dichroic filter on the optical window and an internal plate that performs wavelength shifting and guides photons to Silicon Photomultipliers. We present a comparison of the performance of C-Arapuca with the photomultiplier tube in detecting cosmic ray muons. Our results suggest that C-Arapuca could be a viable option for future Water-Cherenkov Detector designs and upgrades, providing a reliable solution for particle detection in high-energy physics and astrophysics experiments.

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