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Exploring the High-Energy Universe with Novel Photodetectors

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Water Cherenkov detectors (WCDs) are key in exploring high-energy astrophysical phenomena, offering a lower-cost and accessible alternative to space-based instruments for detecting high-energy particles. In this contribution, I will introduce a novel photodetector technique, a smaller and cost-effective alternative to the traditionally used large photomultiplier tubes (PMTs). We present the tests performed at the University of Leicester, employing a custom-built water Cherenkov detector—an IBC tank filled with de-ionised water, featuring downward-facing 3-inch PMT coupled with wavelength-shifting (WLS) plates.

In parallel, GEANT4 Monte Carlo simulations are being conducted to model the performance of this new configuration. The unit is designed as an alternative to conventional larger PMTs to identify hadronic events while offering significant cost savings, for WCDs like those envisaged for the Southern Widefield Gamma Ray Observatory (SWGO)

Primary experiment

SWGO

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