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A proposal for a multiPMT detector in the Southern Wide Field Gamma-Ray Observatory (SWGO)

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The SWGO collaboration proposes constructing a wide-field-of-view observatory to explore the southern hemisphere sky in the 100 GeV - 1 PeV energy range. The selected site is the Atacama Astronomical Park in Chile. Currently, the HAWC and LHAASO experiments are the only ground-based arrays for gamma-ray detection operating in this energy range, and both are located in the northern hemisphere. The detector will be based on water Cherenkov detector units, with an inner array with a high fill factor (>60%) and a large (about 1 km² square) outer array with a much lower fill factor (<5%) to explore the highest energies. In this contribution, we describe one of the proposed photodetectors for the Cherenkov detector unit, the multiPMT, an enclosed waterproof vessel embedding seven 3" photomultipliers with the electronics to control and acquire the photosensors signals. Each PMT is equipped with a high-voltage board plus a front-end board, and a main board manages the DAQ for all seven channels. Similar solutions have already been proven feasible and largely implemented in other experiments, such as Km3Net and HyperKamiokande. Among the many advantages of this device compared to a large area PMT are the increased dynamic range, a better timing resolution, and an intrinsic directional sensitivity. Simulations show these factors can improve event reconstruction and discrimination between gamma-ray-initiated showers and the hadronic background. A first multiPMT has been deployed in a prototype SWGO Cherenkov detector unit at CBPF in Rio de Janeiro, and the first data are presented here. Two additional prototypes are planned to be installed at the SWGO pathfinder.

Collaboration(s)

SWGO

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