

Executive Summary

Study of water Cherenkov detector designs for the SWGO experiment

Francesca Bisconti¹ and Andrea Chiavassa¹ for the SWGO Collaboration

¹ University of Turin, Italy

Poster and Proceedings PoS(ICRC2021)895

What is this contribution about?

The Southern Wide-field Gamma-ray Observatory (SWGO) is a next-generation ground-based gamma-ray detector under development, to be installed in South America. The experiment design is under investigation. One configuration option is an array of water Cherenkov detectors (tanks). This contribution is about a detailed study to compare the performance of circular and square double-layer tanks.

Why is it relevant / interesting?

The comparison of tanks with different characteristics is important in the designing phase of an experiment, to understand the possible detection capabilities. For the final design of the experiment, costs/benefits of each configuration has to be taken into account, as well as the fill factor achievable depending on the size and the shape of the tanks.

What have we done?

We performed simulations of circular and square double-layer tanks with several sizes and number of PMTs, crossed by muons, electrons, and gamma-rays with energies typical of extensive air showers particles. The tank response was evaluated considering the particle detection efficiency, the number of photoelectrons produced by the PMTs, and the time resolution of the measurement of the first photon.

What is the result?

The tank performance worsen increasing the size of the tank, and Circular-DLTs have slightly better performance with respect to Square-DLTs. Reflective walls in the upper layers increases the detection efficiency and widens the time resolution of the measurement of the first photon, in particular for particle with low energy. The two configurations of PMTs in both levels allow for similar performance.