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## Simulation of High-Energy Particle Showers for SWGO

The reconstruction of atmospheric showers produced by high-energy gamma rays is an essential point in order to determine the effectiveness and optimize the design and layout of the Southern Wide-field Gammaray Observatory (SWGO). While SWGO is dedicated to studying gamma rays from astrophysical sources, cosmic rays introduce significant noise into the data, making it essential to accurately distinguish them. This work focuses on simulating the interactions of various particles with SWGO's Cherenkov detectors, which use photomultiplier tubes (PMTs), to model the expected light signals produced by them.

At very high energies, simulation of the detector response due to the entire particle shower is computationally expensive. To address this, we simulate the arrival of particles at the detectors and construct a lookup table of detector responses. This table serves as a resource-efficient tool to predict Cherenkov light signals under various conditions. Comparisons between this method and full shower simulations will be discussed, along with potential impacts on gamma-to-cosmic ray separation.

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