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## The Simulation for the Next-Generation Ultra-High Energy Air Shower Lake Array for SWGO

The Southern Wide-field Gamma-ray Observatory (SWGO) is a next-generation gamma-ray survey experiment designed to achieve high sensitivity and wide-field coverage of the southern sky. Simulating air showers and detector responses is crucial for optimizing the detector layout and observational strategies. However, traditional simulation methods (e.g., GEANT4) are computationally expensive due to the complexity of particle interactions within the detectors, particularly at high energies. To address this challenge, we implement a look-up table interpolation-based method to accelerate simulations of the lake array, an important component of the ultra-high-energy array design proposed for SWGO. We validate this fast simulation by comparing its results with those from the conventional Corsika-GEANT4 full simulation chain. Our comparison demonstrates that the proposed method maintains similar accuracy while achieving a significant speedup, making it a promising approach for large-scale simulations in very-high-energy and ultra-high-energy gamma-ray observatories.

## Collaboration(s)

SWGO

**Authors:** LI, Tianyang; TORRES-ESCOBEDO, Ramiro (Shanghai Jiao Tong University); HERNÁNDEZ CA-DENA, Sergio (Tsung Dao Lee Institute, Shanghai Jiao Tong University); ZHOU, Hao (Tsung-Dao Lee Institute & School of Physics and Astronomy, Shanghai Jiao Tong University)

**Presenter:** LI, Tianyang

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