Simulating the signal of the AMIGA underground muon detector of the Pierre Auger Observatory

Executive Summary

A. M. Botti[a,b], F. Sánchez[a], M.Roth[c], A. Etchegoyen[a]

[a] Instituto de Tecnologías en Detección y Astropartículas (CNEA, CONICET, UNSAM), Buenos Aires, Argentina
[b] Department of Physics, FCEyN, University of Buenos Aires and IFIBA, CONICET, Buenos Aires, Argentina
[c] Karlsruhe Institute of Technology (KIT), Institute for Astroparticle Physics, Karlsruhe, Germany

What is this contribution about?

We present the signal simulation of the underground muon detector (UMD) at the Pierre Auger Observatory, an array of 219 buried plastic scintillators with an area of 10 m^2 each.

Why is it relevant/interesting?

The UMD simulation is of utmost importance to interpret the direct measurements of muons in air showers with energies between $\sim 10^{16.5}$ and $\sim 10^{19}$ eV, and to shed light on the muon puzzle.

What has been done?

The full-chain simulation of the detector response after an impinging muon, from the silicon photomultiplier to the digital output using laboratory data.

What is the result?

We developed and validated a simulation that accurately reproduces the signal features relevant to the reconstruction of the number of muons and obtained a detection efficiency of 98.5% for single muons and a saturation point of about 350 simultaneous muons.