

## **Simulation of the response and calibration of a Water Cherenkov Detector using Geant4**

Water Cherenkov Detectors (WCDs) are widely used for the study of the secondary cosmic rays flux at ground level and other high energy particles. Their performance is based on the emission of Cherenkov radiation in the active volume of the detector. This kind of radiation is emitted whenever a charged particle travels faster than the speed of light inside the medium. LAGO (Latin American Giant Observatory) is an array of WCDs deployed in a wide range of latitudes, from Mexico to the Antarctica; and at different altitudes, from the sea level to above 5200 m.a.s.l. This work presents a GEANT4 simulation of the response of WCDs to the secondary flux of cosmic rays at ground level, the flux is obtained from a detailed CORSIKA simulations. We use this results to test a semi-analytical method to reconstruct the Vertical Muon Event spectrum, in order to calibrate the detectors response. Finally, we reanalyze old data to probe the new calibration method capability against the current calibration method used in the collaboration.

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