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Simulation of a Water Cherenkov Detector Response to the Background of Cosmic Rays at Pamplona Norte de Santander altitude (2300 m a.s.l.) for the LAGO Collaboration

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KEYWORDS:

Cosmic Rays, Water Cherenkov Detector, Monte Carlo Simulations.

ABSTRACT:

The studies of cosmic rays (CR) is mainly performed by using detectors installed at the ground; this detectors registered the secondary radiation produced by the interaction of CR with Earth atmosphere. Since 2010 Colombia is an active member of the large scale observatory LAGO (Latin American Giant Observatory). This observatory operated an array of Water Cherenkov Detectors (WCDs) spanned over Latin America in a wide range of latitudes. The installation of a new WCD requires the perform of a series of simulation, from the calculation of the flux of primaries that arrive to the Pamplona atmosphere until the WCD response to the secondary radiation. Here we show the signal expected at Pamplona, Norte de Santander city. For this we have use the AGO's toolkit ARTI, a framework of computational techniques and codes (CORSIKA, GEANT4, C++, Python) to estimate the WCD signals produced by cosmic radiation at ground. As main results, the spectrum of secondaries here calculated fits with the expected and the WCD response allows to us to separate the signal deposited by muons from the electrons/positron ones. In particular, our calculations shows the muon signal far away from the noise signal, so we expected that a WCD installed at Pamplona can works as a muon counting. As a final results, we have checked the capability of the WCD simulated to measure the muon half-life time, this implies that a WCD deployed at the University of Pamplona can be used as Lab equipment to teach particle physics.

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