Contribution ID: **169**   Type: **Oral Presentations**

Cosmic Muon Momentum Spectra at Madurai

Tuesday, 5 September 2023 16:00 (20 minutes)

The INO-ICAL collaboration has built a prototype detector called mini-ICAL at IICHEP, Madurai, India, as part of their research and development efforts. This module serves to investigate detector performance, and engineering challenges in constructing large-scale magnets and magnetic field measurement systems, and to test ICAL electronics in the presence of a magnetic field. Additionally, mini-ICAL is being used to measure charge-dependent cosmic muon flux at the earth's surface and also to study the feasibility of a cosmic muon veto for a shallow-depth neutrino experiment. Mini-ICAL is a magnetised detector, composed of 11 layers of iron plates (measuring $4\,m \times 4\,m \times 0.056\,m$) with 45 mm gaps between each layer. Resistive plate chambers ($2\,m \times 2\,m$) with $30\,mm$ strip width are placed between each iron layer to track cosmic ray muons. The iron is magnetised to a maximum field of $1.5\,T$ by applying a current of $900\,A$. A Kalman filter-based track fitting algorithm is used to reconstruct muon tracks. The simulation includes CORSIKA event generator, Geant4 toolkits for the detector geometry and muon interactions as well as detector noise and inefficiency, which eventually used in the unfolding technique to obtain muon spectrum at the earth's surface from the observed distributions. This talk presents the results of the momentum spectrum of cosmic muons obtained from mini-ICAL and compares them with the extensive air shower (EAS) simulation results in the range of ∼1 to 3 GeV/c

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Session Classification: C4