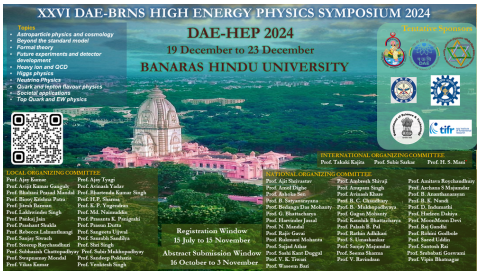

Contribution ID: **16** Type: **Oral**

Charge dependent cosmic muon flux at Madurai, India

The INO-ICAL collaboration has developed a prototype detector called mini-ICAL at IICHEP, Madurai, India ($9^\circ\ 56'$ N, $78^\circ\ 00'$ E) to evaluate detector performance and address the engineering challenges associated with constructing a large-scale INO-ICAL detector. The mini-ICAL consists of 11 layers of iron plates, each measuring $4\,\text{m} \times 4\,\text{m} \times 5.6\,\text{cm}$, with 45 mm gaps between each layer to accommodate the Resistive Plate Chambers (RPCs) with dimension $2\,\text{m} \times 2\,\text{m}$ as tracking devices. Located on the surface, the detector collects cosmic muon events generated by air showers resulting from the interaction of primary cosmic rays with the upper atmosphere. The iron is magnetized to a maximum field of 1.5 T by applying a current of 900 A through 36 copper coils, enabling the identification of muon particle types as μ^+ or μ^-. A Kalman filter-based track fitting algorithm is employed to reconstruct the charge and 4-vector of charged particles within the RPC stack.

The simulation utilizes the CORSIKA event generator and Geant4 toolkits for detector geometry and muon interactions, along with considerations for detector noise and inefficiency, etc. The Monte Carlo simulation is then used in the unfolding technique to derive the muon spectrum at the Earth's surface from the observed data. This talk presents the analysis results as a function of momentum and azimuthal angle, ranging from $\sim$ 1 GeV/c to 3 GeV/c across different zenith angle ranges up to 50°. The data is also compared with predictions from various hadronic models within the CORSIKA event generator.

Field of contribution

Experiment

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Track Classification: Future experiments and detector development