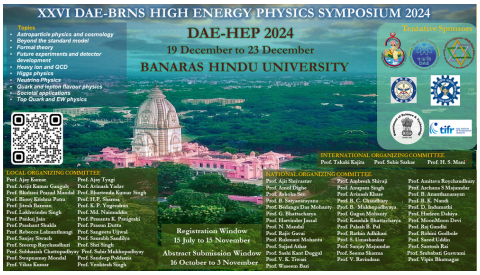

Contribution ID: **229** Type: **Postar**

Electric Field Simulation of the GRAPES-3 Proportional Counter

The GRAPES-3 experiment in Ooty, Tamil Nadu, operates the world's largest muon telescope, consisting of 3,776 proportional counters (PRCs) as its primary detectors. These PRCs are cuboidal iron tubes filled with P10 gas, a mixture of 90% Argon and 10% Methane. Each PRC has dimensions of 6mx 0.1m x 0.1m and contains a 100-micron diameter tungsten wire anode, placed exactly at the centre of the cathode maintained at 3000 V. This configuration creates a strong electric field within the tubes, leading to an avalanche of electrons and ions whenever an ionizing particle passes through, enabling precise detection of cosmic ray muons. Studying the electric field inside the PRCs provides deeper insights into the detector's response to different particles, enhancing our understanding of how the GRAPES-3 collaboration measures various cosmic ray components. It also helps optimize the detector's performance and accuracy in particle identification and energy measurement. In this contribution, we will present a study on the reconstruction of a GRAPES-3 PRC and its electric field simulation using Python libraries such as SciPy, NumPy, Matplotlib, and MayaVi-3D. We will present the effects of electric field strength as a function of radial distance from the centre of the counter in the transverse plane, along with the longitudinal variation of the electric field strength. We will present how the electric field strength varies with changes in the anode radius and the calculation capacitance per unit length of the PRC. The results are then compared with the electric field simulation results of Geant4 interfaced with Garfield++. This analysis provides a critical insight into the operational characteristics of the PRCs in GRAPES-3, influencing their efficiency and accuracy in detecting and measuring cosmic ray particles.

Field of contribution

Experiment

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Track Classification: Future experiments and detector development