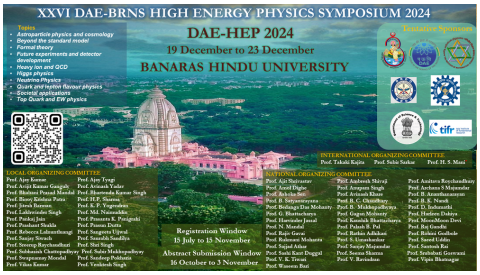

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Reconstruction of Cherenkov ring from the first test beam data of dRICH detector of the Electron-Ion Collider (EIC) experiment

Understanding the internal structure of the nucleons and the fundamental interactions that govern the particle behavior such as mass, spin, and distribution of momentum among quarks and gluons is crucial to reveal a clearer picture of the Standard Model of Particle Physics. To probe these, an Electron-Ion Collider (EIC) experiment will be built, which will unlock the secrets of the strong force in nature, by colliding electron-proton and electron-ion at Brookhaven National Laboratory (USA). To identify various particles (such as protons, kaons, and pions) created in high energy collisions at EIC; accurate Particle Identification (PID) is pivotal. To achieve precise PID across a broad range of momenta, a dual-radiator Ring Imaging Cherenkov (dRICH) detector will be employed in the EIC.

As the Part of R&D for dRICH; in October 2023, a test beam was performed at CERN to validate the performance of various components of the detector. In the test beam, a polarized beam of $\pi-$ (pions) with collision energy of 10GeV was projected. PID was done using a dual-radiator Ring Imaging Cherenkov detector with Aerogel (n = 1.02) and C2F6 (n=1.0008) acting as the two radiators.

This work presents a comprehensive analysis of the Cherenkov ring detected by the dRICH detector within the test beam setup with a primary objective to study the ring parameters, the background noise/dark count rate, and the intensity of photons that are striking individual SiPMs. The estimated parameters are validated for accuracy and reliability by employing various fitting techniques.

Field of contribution

Experiment

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Track Classification: Heavy ion and QCD