

The 2024 International Workshop on the High Energy Circular Electron Positron Collider

Contribution ID: 301

Type: **Poster**

CEPC stereo ECAL muon momentum reconstruction

Wednesday, 23 October 2024 22:23 (1 minute)

This research focuses on the particle reconstruction algorithm of the stereo crystal electromagnetic calorimeter for the Circular Electron Positron Collider (CEPC). The stereo crystal structure, as one of the design options for the CEPC electromagnetic calorimeter, possesses unique properties. It not only provides information on the energy deposition location but also reconstructs 3D cluster information from 2D plane information with minimal dead zones. Taking muon momentum reconstruction as an example, based on the CEPC Software (CEPCSW) framework, this study simulates and reconstructs single muon events emitted from the particle gun. For the first time, this research analyzes the energy deposition distribution of single muon events within the stereo crystal electromagnetic calorimeter up to 10 GeV, allowing for a direct determination of the particle's charge information. Furthermore, based on the motion of charged particles in a magnetic field, the relationship between particle deflection and transverse momentum is derived. The resolution of this particle momentum reconstruction algorithm is less than 20%, laying a foundation for subsequent clustering algorithms.

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Session Classification: Poster

Track Classification: Detector and System: 13: Calorimeter