Contribution ID: **116** Type: **Poster**

Design of the CEPC Gaseous Tracking Detector and Research on Particle Identification

The Circular Electron Positron Collider (CEPC) aims to precisely measure the properties of the Higgs, W, and Z bosons, thereby imposing higher requirements on tracking detectors. This study presents a comprehensive optimization of a Pixelated Readout Time Projection Chamber (Pixelated-TPC) with 100 μm spatial resolution, selected as the baseline tracking detector in the CEPC Technical Design Report (TDR). The ultra-lightweight design, based on a carbon fiber structure, features a large-scale cylindrical geometry (5.8 m length, 3.6 m outer diameter) while maintaining minimal material budget. A full simulation framework, developed using COMSOL and Garfield++, enabled detailed performance studies, including an innovative Cluster Counting Method (dN/dx) for primary ionization reconstruction, Two reconstruction algorithms—dN/dx and dE/dx—were implemented and compared, demonstrating superior PID performance compared to conventional pad readout. With a pixel size of 500 μm × 500 μm, the dN/dx method achieved a π/K separation power of 3.48 σ at 20 GeV, significantly exceeding traditional techniques. Key detector components, including the field cage, readout modules, and cooling system, were experimentally validated through prototype tests. This study conclusively establishes the superior detection performance of pixelated readout technology.

Primary authors: ZHENG, Jianbo (IHEP); CHANG, Yue (College of Physical Science and Technology, Central China Normal University)

Co-authors: QI, Huirong (IHEP); SHE, Xin (IHEP); ZHANG, Jinxian (IHEP); ZHAO, Guang (IHEP); WU, Linghui (IHEP); SHI, Haoyu (IHEP); FU, Chengdong (IHEP); LI, Gang (IHEP); RUAN, Manqi (IHEP); WANG, Jianchun (IHEP)

Presenter: ZHENG, Jianbo (IHEP)

Session Classification: Gaseous Detector

Track Classification: Detector and System: 14: Gaseous detector