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Advancements in Drift Chamber Design and Particle Identification for the IDEA Experiment

The design of tracking chambers for future e^+e^- colliders presents several challenges in terms of achieving high precision while maintaining low material budget and efficient particle identification. This presentation focuses on the development of a novel helium-based drift chamber for the IDEA (Innovative Detector for an Electron-positron Accelerator) experiment. The chamber, featuring a 4 m length and 4 m diameter, offers exceptional tracking performance with an ultra-low of material budget of ~0.016X0 in the barrel region and ~0.05X0 in the end-caps. Key innovations include the application of Cluster Counting/Timing techniques for improved particle identification, providing better separation between pions and kaons over a wide momentum range. We will also discuss new advancements in materials for the drift chamber wires, soldering techniques, and gas mixture selection. Furthermore, the potential of cluster counting for achieving superior particle identification, with a resolution two times better than the traditional dE/dx method, will be explored through simulation results and beam test validation conducted at CERN.

Secondary track

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