

Simulation and investigation of the gaseous detector module for CEPC TPC

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Compared with the International Linear Collider (ILC), the beam structure of the future Circular Electron Positron Collider (CEPC) is very different without the ‘power-pulsing’ mode. In this paper, some simulation and estimation results of the Time Projection Chamber (TPC) as one tracker detector option for CEPC were given. The optimized operation gas (Ar:CF₄:C₂H₆=92:7:1) with the fast velocity, low diffusion and low attachment was simulated used Garfield/Garfield++, and the performance of the selection gas was compared with the T2K (Ar:CF₄:iC₄H₁₀=95:3:2) working gas. The position resolution of deviation was calculated by the space charge caused the track distortions in the drift chamber at Z pole run in CEPC, and the value was less than 10μm in the inner diameter of TPC detector. To meet the critical physics requirements of the tracker detection at CEPC, the new concept structure gaseous detector module as one option for the tracer detector has been developed and experimental measured. Some performance of the concept detector module was obtained. The energy resolution is better than 20% for 5.9 keV X-rays and it indicated that the continuous suppression ions backflow ratio better than 0.1% can be reached at a gain of about 5000. The preliminary results could be compared with simulation and satisfied with the ions suppression requirements of the TPC detector module.

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