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## High Spatial Resolution Time Projection Chamber Technology R&D for the Future Circular e+e- Collider

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High Spatial Resolution Time Projection Chamber Technology R&D for the Future Circular e+e- Collider  
The future linear and circular electron positron colliders were been proposed as a Higgs and a high luminosity Z pole factory in last few years. The Circular Electron Positron Collider (CEPC) accelerator Technology Design Report (TDR) has been released in 2023. The baseline design of a detector concept consists of a large 3D tracking system, which is a high precision (about 100 $\mu$ m) spatial resolution Time Projection Chamber (TPC) detector as the main track embedded in a 3.0T solenoid field, especially for the accelerator operating at Tera-Z. TPC requires the longitudinal time resolution (<100ns) and the physics goals require PID resolution (<3%). A number of critical issues are still remaining regarding the TPC research. The simulation and Particle Identification (PID) resolution show TPC technology potential to extend Tera Z at the future e+e- collider.

In this talk, we will present the feasibility and status of high precision TPC as the main track detector for e+e- collider. The traditional pad readout is designed about 1mm x 6mm and the pixelated readout is designed about 55 $\mu$ m x 55 $\mu$ m or bigger size. Compared with the pad readout, the pixelated readout option will obtain the better spatial resolution of single electrons, the very high detection efficiency in excellent tracking and good dE/dx performance. A smaller prototype TPC has been developed with a drift length of 500 mm, gaseous chamber, 20000V field-cage, the low power consumption FEE electronics and DAQ have been commissioned and some studies have been finished. Some updated experimental results including the spatial resolution, the gas gain, the laser track reconstruction and dE/dx will be reported. The track performance results and summarize the next steps of the pad/pixelated TPC technology for e+e- collider will presented in this talk. Finally, we will review the track reconstruction performance results and summarize the next steps towards TPC construction for CEPC physics and detector TDR.

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