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High Granularity Readout TPC R&D for Tera-Z at the Future e+e- Collider

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The future linear and circular electron positron colliders were been proposed as a Higgs and a high luminosity Z factory in last few years. The detector conceptual design of a updated detector consists of a tracking system, which is Time Projection Chamber (TPC) detector as the main track with the high precision (about $100\mu\text{m}$ overall drift length at 3T magnetic field) spatial resolution device in the large 3D volume, especially for the case of the machine operating at the high luminosity Z pole (Tera-Z at 2T magnetic field). Aimed to Higgs and the flavor physics requirements, the tracking system required the high precision performance, including the spatial resolution, the momentum resolution and the good particle identification detection (PID).

TPC detection technology also required the longitudinal time resolution of about 100ns and the physics goals require the very good separation power with the cluster counting to be considered. The simulation and PID resolution show TPC technology potential to extend Tera-Z at the future e+e- collider. In this talk, the feasibility and status of high precision TPC as the main track detector for e+e collider will be presented. The simulation results of the pad/pixelated TPC technology for e+e- collider will be given. Compared with the pad readout using the simulation, the high granularity readout TPC option will obtain the better spatial resolution of single electrons, the very high detection efficiency in excellent tracking and good PID performance (less than 3σ).

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