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Status and progress of the pad readout TPC prototype on CEPC

The Circular Electron Positron Collider (CEPC) has been proposed as a Higgs and a high luminosity Z factory by the Chinese high-energy physics community in the last few years. In the CEPC baseline detector concept, the Time Projection Chamber (TPC) is a candidate for the main tracker, which needs the high precision spatial resolution of approximately 100 μm in $r\varphi$ direction over the whole drift length. To meet the physics requirements for the tracker detector in CEPC, a TPC prototype integrated with an ultraviolet laser track system has been developed. The UV laser can generate tracks (MIPs as the charged particles) through two-photon ionization mechanisms at predefined position. The prototype consists of several horizontal laser tracks around the TPC detector chamber with a drift length of 500 mm, the fast electronics readout of 1280 channels, a 20000 V field-cage, a double-layer GEM detector with 200 mm $\times$ 200 mm active area, and a DAQ system. The laser tracks have the characteristics of good repeatability, strong stability, minor ionization fluctuations and easy to setup.

All of the readout pads are designed with 1 mm $\times$ 6 mm pad readout and arranged along the laser track direction. The spatial resolution, dE/dx resolution and the position correction were studied and analyzed using the TPC prototype integrated with the 266 nm UV laser tracks. Using the pseudo full-length track to evaluate the full-size TPC with 220 layers at CEPC, the dE/dx resolution was estimated to be about 3.4%. All results indicate that this TPC prototype integrated with UV laser tracks has been successfully developed to meet the updated CEPC physics requirements. In this talk, some updated experimental results will be reported, especially the position correction method using the 266nm UV laser tracks.

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