

12th Beam Telescopes and Test Beams Workshop



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Beam test of a baseline vertex detector prototype for CEPC

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The Circular Electron Positron Collider (CEPC) has been proposed to enable more thorough and precise measurements of the properties of Higgs, W and Z bosons, as well as to search for new physics. In response to the stringent performance presented by the vertex detector for the CEPC, a baseline vertex detector prototype was designed and tested using a 6 GeV electron beam at DESY Test Beam Line 21. The baseline vertex detector prototype is designed with a cylindrical barrel structure that houses six double-sided ladders. Each side of the ladder includes TaichuPix-3 sensors based on Monolithic Active Pixel Sensor (MAPS) technology, a flex printed cable and a carbon fiber support structure. Additionally, the readout electronics and the Data Acquisition (DAQ) system were verified during this beam test. The performance of the prototype was evaluated using an electron beam that traversed directly the six ladders from one side. Offline data analysis indicates a spatial resolution of about $\sim 5\ \mu\text{m}$, with a detection efficiency exceeding $\sim 99\%$ and an impact parameter resolution also near $\sim 5\ \mu\text{m}$. The promising results from this baseline vertex detector prototype mark a significant step toward realizing the optimal vertex detector for the CEPC.

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