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Design of AC-LGAD for CEPC OTK

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The CEPC plans to deploy a time-of-flight (ToF) detector using AC-LGAD technology to advance its flavor physics research capabilities. AC-LGAD detectors with 100% fill factor, are designed to deliver high-precision measurements of both spatial coordinates and timing for detected particles.

AC-LGADs for CEPC will be implemented as strip-type, single-layer structures and will be installed in both the barrel and endcap regions. The sensors in the barrel region will be the longest of their kind globally, while the endcap sensors will feature a non-parallel strip design. IHEP's expertise in LGAD technology will be crucial for optimizing aspects such as radiation hardness, gain layer design, and epitaxial layer growth.

The AC-LGAD-based ToF detector is expected to achieve a time resolution of 50 picoseconds and a spatial resolution of 10 micrometers in the bending direction. Simulation results indicate that this design will greatly enhance the separation of kaons from pions and kaons from protons within the 1-2 GeV energy range. The incorporation of this advanced detector will provide the CEPC with four-dimensional detection capabilities—offering precise timing and positional information for charged particles—thus significantly improving measurement precision and broadening the scope of flavor physics research.

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