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Development and testing of AC-LGAD sensors for future 4D-trackers

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Precise timing information will play a critical role in the performance of future tracking detectors and currently poses a profound challenge to their development. Tracking detectors capable of achieving 5-25 ps timing resolution and 5-30 μm position resolution are needed for many proposed future colliders. The new technology of AC-coupled LGADs has been demonstrated as a good candidate for such a detector. Detailed characterization of sensors fabricated by the BNL and HPK have been carried out at the Fermilab Test Beam Facility to study these sensors performances with unparalleled level of details. We present a world's first demonstration of silicon sensors in a test beam that simultaneously achieve better than 5–10 μm position and 30 ps time resolution. We also report studies of large-area AC-LGAD sensors, which serve as prototypes for future 4D-tracker applications.

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