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Time measurements using ultra fast silicon detectors with a 120 GeV Proton Beam for the TOPSiDE Detector Concept at The Electron-Ion Collider

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The Timing Optimized PID Silicon Detector for the EIC (TOPSiDE) is Argonne's proposed central detector concept for the Electron-Ion Collider, with its physics goals of perturbative and non-perturbative Quantum ChromoDynamics (QCD) studies of the structure of nucleons and nuclei. It requires high precision tracking, good vertex resolution, and excellent particle identification with a timing resolution of around 10 ps or better. TOPSiDE uses Ultra-Fast Silicon Detectors (UFSD) based on the Low-Gain Avalanche Detector (LGAD) technology. The LGADs are proven to provide timing resolutions of a few 10s of picoseconds. The speaker will present the results of 35 μm and 50 μm thick LGAD tests at Fermilab Test Beam Facility with 120 GeV proton beam. The best timing resolution of UFSDs in a test beam to date is achieved using three combined planes of 35 μm thick LGADs at -30°C with a precision of 14.3 ± 1.5 ps. The latest test results for AC-LGADs with 120 GeV proton beam might also be presented.

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