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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  $\mu\text{m}$  and 50  $\mu\text{m}$  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  $\mu\text{m}$  thick LGADs at  $-30^\circ\text{C}$  with a precision of  $14.3 \pm 1.5$  ps. The latest test results for AC-LGADs with 120 GeV proton beam might also be presented.

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