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Study of LGAD for Timing Measurements in ILC Detectors

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The International Linear Collider (ILC) is an electron-positron collider planned to be constructed in Japan. The ILC detectors are designed with particle flow concept, which utilizes highly-granular calorimeters to separate showers in jets. We are studying to use Low Gain Avalanche Detectors (LGADs) for the sensitive layer of the electromagnetic calorimeter of ILC detectors. Timing resolution of a few 10 psec per hit, possible to be obtained with LGADs, enables particle identification of hadrons (pi/K/p separation) by Time-of-Flight method, and also improves shower clustering which is critical to the performance of particle flow. As the calorimeter application we need flat response over surface of multi-cell LGAD detectors. We are investigating possible usage of LGADs with gain layer at the opposite side of sensitive region, with which more uniform response than usual LGADs (with gain layer just below the readout electrodes) is expected. We will report the measurements with test sensors, including responses of charge and timing correlation with multiple sensors by penetrating positron beam.

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