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Improved spatial resolution analysis of micron resultion silicon pixel detectors based on beam and laser tests

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A new generation of track detectors for high energy physics are being designed for track recognition with submicron precision. Pixel detectors with micron resolution are a basic pre-requisite of such designs. With such precise detectors, however, the determination of spatial resolution becomes complicated because both multiple scattering and intrinsic detector errors contribute equally significantly to tracking errors.

This note is based on laser tests using pulsed 682 nm laser light and on data of DEPFET beam tests at CERN in 2006 and 2007. We used a new method to separate the contributions of intrinsic resolution, multiple scattering and track uncertainty to impact point prediction error, and used it in track analysis of beam tests. We compared several methods of impact point prediction correction (eta-correction) based either on beam test tracks or on laser matrix scans for a range of laser pulse energies. We show about 20% improvement in the resolutions calculated from the data of two DEPFET beam tests with different detector setup. We also show that eta-correction derived from laser tests can be applied in tracking.

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