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Performance of CMOS sensors for a digital electromagnetic calorimeter

We have developed monolithic silicon pixel sensors as study devices for a digital electromagnetic calorimetry application at future collider detectors, such as a linear collider. The motivation for a digital ECAL and the sensor requirements which arise from this are discussed.

We present results from the "TPAC" CMOS sensors produced using the 0.18 μ m INMAPS process. The sensors have 50 μ m pixel size and the technology is also applicable to tracking and vertexing applications where highly granular pixels with on-sensor readout is needed.

Several varieties of the TPAC sensors were fabricated with and without some of the various processing innovations available in INMAPS, specifically deep P-wells and high-resistivity epitaxial silicon. The performance of these sensor variants has been measured both in the laboratory and at beam tests. Comparisons of these sensors with each other and with simulation are presented, showing that the INMAPS innovations result in significant improvements in the sensor performance.

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