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The DEPFET Prototype System for the ILC Vertex detector: Test beam Measurements

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By incorporating a field effect transistor into a fully depleted sensor substrate the DEPFET sensor combines radiation detection and amplification allowing for low noise measurements and high spatial resolution. This makes DEPFET sensors an auspicious technology for the vertex detector of the planned International Linear Collider (ILC). The demands on the vertex detector are high, including small pixels (20-30 μm) and fast readout of almost a giga pixel in 50 μs . Aiming to meet these high demands a prototype system with fast steering chips, a current based readout chip and a 64x128 pixel matrix has been build. Lab measurements of the system with ^{55}Fe show excellent behavior with noise less than 250 e $^-$ (ENC).

In order to study the systems behavior under more realistic conditions and with regards to the detection of MIPs a test beam period at the DESY Synchrotron in January and February 2004 has been carried out. Modifications concerning hardware and read out mode were necessary to ensure compatibility of the DEPFET system with the Bonn microstrip telescope (used before for ATLAS) which was employed for particle tracking. The DAQ- and offline software had to be written largely from scratch as this is the first time for the DEPFET system to be operated under test beam conditions. Two different matrices have been characterized with an emphasis on charge collection efficiency. The talk will give a short description of the system and its performance in the lab and then focus on the test beam setup and its results

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