

The DEPFET Active Pixel Sensor for the ILC Environment

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A new generation of MOS-type DEPFET active pixel sensors in double metal/double polysilicon technology with $\sim 25\mu\text{m}$ pixel size has been developed to meet the requirements of the vertex detector at the ILC (International Linear Collider). The paper presents the design and technology of the new linear DEPFET pixel cells including a module concept and results of a feasibility study on how to build ultra-thin fully depleted sensors. One of the major challenges at the ILC is the dominant e^+e^- pair background from beam-beam interactions. The resulting high occupancy in the first layer of the vertex detector can be reduced by an extremely fast read out of the pixel arrays but the pair-produced electrons will also damage the sensor by ionization. Like all MOS devices, the DEPFET is inherently susceptible to ionizing radiation. The predominant effect of this kind of irradiation is the shift of the threshold voltage to more negative values due to the build up of positive oxide charges. The paper presents the first results of the irradiation of such devices with hard X-Rays and Gamma rays from a ^{60}Co source up to 1Mrad under various biasing conditions.

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