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Performance Studies of Capacitively Coupled HVCMOS Pixel Sensors Before and After Gamma Irradiation

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High voltage CMOS pixel sensors are a promising technology that is being considered for particle physics detectors such as the ATLAS Inner Tracker due to their potential to realize a fully monolithic design at considerable cost savings while not compromising on high track reconstruction efficiency, charge collection, and radiation hardness. HVCMOS sensors have circuitry built into each pixel cell that amplifies the signal from the collected charge increasing it enough where it can be read-out via capacitive coupling by a traditional front-end read-out chip. In the case of a fully monolithic sensor, the on-pixel circuitry includes discrimination and digitization. The H35DEMO is a prototype pixel sensor built using 350 nm technology that demonstrates multiple examples of HVCMOS technology including several amplification and digitization matrices. The radiation tolerance of the analog matrices was assessed using test beam data to measure the impact on track reconstruction performance after gamma irradiation.

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