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Radiation Damage to D0 Silicon Microstrip Detector

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A Silicon Microstrip Tracker (SMT) has been operating at the D0 Run II experiment at the Fermilab Tevatron collider since 2001. The silicon sensor leakage currents, full depletion voltages as well as signal to noise ratio are monitored for radiation damage. During this monitoring process a bulk carrier-type reversal was observed in the inner layers of silicon sensors. The lifetime of the SMT is primarily constrained by the maximum bias voltage that can be applied to the double-sided sensors without local avalanches around the edges of sensor implants. Sensitivity of such avalanches to magnetic field was observed and investigated. Studies were also performed on the impact of humidity on the avalanches to explore the possibility to increase the maximum bias voltage. We discuss the results of each of the above-mentioned studies in this presentation.

Author: Dr YE, Zhenyu (Fermi National Accelerator Lab)

Presenter: Dr YE, Zhenyu (Fermi National Accelerator Lab)

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