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Investigation of Radiation Damage on Si e SiC Detectors

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The frontier activities of nuclear and subnuclear physics require devices with excellent performance in terms of stability and ability to operate at high fluxes of incident particles. Silicon carbide could be a good alternative to silicon devices due to its high resistance to radiation.

In this work we present the radiation damage study of a new, large area, p-n junction silicon carbide detectors. Several devices were irradiated in different experimental conditions to study their general performance as a function of fluence. Some detectors were collimated and irradiated with an oxygen beam, other devices instead were irradiated without collimation and with an aluminum beam. Both spectroscopies and electrical characteristics were investigated after the irradiation: the new detectors manifest excellent performance in terms of stability of the main parameters, linearity, defect distribution, charge collection efficiency, energy resolution, leakage current etc.

Moreover, a standard p-n junction silicon detector was also irradiated for comparison: SiC devices shown a radiation resistance more than two order of magnitude higher than Si devices.

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