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Sensors for very high fluences

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Rising the electric field so as to provoke charge multiplication of electrons has enabled silicon to provide measurable signals from sensors irradiated to unprecedented radiation levels up to $1.6 \times 10^{17} \text{ n}_{\text{eq}}/\text{cm}^2$. A simple scaling of collected charge vs. applied bias has been established experimentally for fluences above $10^{15} \text{ n}_{\text{eq}}/\text{cm}^2$ for planar strip sensors. Departure from linear scaling of leakage current vs. fluence has been observed. Despite these successes, operation of silicon sensor based detectors at extreme fluences is not to be taken for granted, as issues of the signal to noise ratio depend both on details of the readout as well as on the environmental conditions, dictated by engineering constraints. Special applications thus might favour alternative materials such as diamond.

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