Contribution ID: **2** Type: **Poster**

# Signal formation in irradiated silicon detectors

Radiation damage in silicon detectors results into three main changes of the detector performance: a variation of the effective doping concentration, an increase in the leakage current, and a decrease in the charge collection efficiency. These effects are the measurable consequences of the creation of defects in the silicon lattice, which act as either sources or sinks of charge carriers.
Deep defects acting as generation centres are responsible for the leakage current, while the trapping phenomena lowering the charge collection efficiency can be caused by any kind of defect, the most effective being the ones with a high capture cross section and detrapping time. The change in the effective doping concentration is a result of two processes: dopant removal and introduction of ionized defects.
All these effects contribute to distort the signal generated by impinging MIP particles, making the detailed studies of these changes very important in the design of future detectors and associated electronics.
We have implemented in the Weightfield2 simulation program the effect of charge trapping and the creation, for high doses, of the double junction effect. With this simulation program we have investigated the modifications of the signal from MIP particles for increasing doses.
We have applied this study to the Low-Gain Avalanche silicon Detectors (LGAD), and we have demonstrated how internal gain might compensate for the reduced charge collection efficiency.

**Primary authors:** BALDASSARRI, Bianca (CERN); CARTIGLIA, Nicolo (Universita e INFN Torino (IT))

**Co-authors:** SEIDEN, Abraham (University of California,Santa Cruz (US)); SADROZINSKI, Hartmut (SCIPP, UC santa Cruz); ARCIDIACONO, Roberta (Universita Del Piemonte Orientale (IT))

**Presenter:** BALDASSARRI, Bianca (CERN)

**Track Classification:** Semiconductor Detectors