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Silicon sensors with internal gain: Optimizing for charged particle fast timing

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Internal Gain in Si timing sensors is needed to overcome the ~100 picosecond lower limit encountered by NA62 GTK and the CMS HGCal projects. We focus on 2 techniques, currently available for achieving internal gain- 1) “reachthrough” in which a high field region is limited to a superficial few micron thick layer and 2) “deep-depleted AD’s where it is deep and the distribution between “drift” and “gain” regions is less distinct.

We have studied deep-depleted avalanche detectors using SILVACO simulations and device characterization and report on the results.

Primary authors: LU, Changuo (Princeton University); Mr FERNANDEZ GARCIA, Marcos (IFCA-Santander); Dr MOLL, Michael (CERN); DALAL, Ranjeet (Delhi University); Dr WHITE, Sebastian (Princeton University); Ms OTERO UGOBONO, Sofia (Universidade de Santiago de Compostela, and CERN)

Presenter: Dr MOLL, Michael (CERN)

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