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Timing Resolution Measurements on Utra-fast Silicon Detectors

Thursday 14 December 2017 09:00 (20 minutes)

Timing Resolution Measurements of Ultra-Fast Silicon Detectors vs. Temperature, Fluence, Thickness Hartmut F.W. Sadrozinski representing the UFSD Collaboration (UC Santa Cruz, INFN Torino, IJS Ljubljana, CNM Barcelona, LPNHE Paris)

We report on the performance of UFSD (Ultra-Fast Silicon Detectors) from two vendors CNM (LGAD thickness $45\mu m$) and HPK (LGAD thickness 50 and $80\mu m$). UFSD are segmented thin silicon sensors with internal gain.

We will report measurements pre-rad and post-rad with neutron fluences between 1e14 and 6e15 n/cm² of: the leakage current, gain, time jitter, time resolution and the value of Landau fluctuations. The pre-rad measurements were performed at three temperatures (+20 deg C, 0 deg C, -20 deg C) and the post-rad measurements at -20 deg C and -30 deg C.

A few of the findings:

• LGAD with higher initial doping concentration in the gain layer achieve post-rad higher gain and better time resolution.

• An advantage of using thinner LGAD is the reduced contribution of the Landau Fluctuation to the time resolution.

• A decrease of gain due to irradiation is partially compensated by a decrease in the rise time. Potential applications of UFSD will be discussed.

Primary author: SADROZINSKI, Hartmut (SCIPP, UC Santa Cruz)

Presenter: SADROZINSKI, Hartmut (SCIPP, UC Santa Cruz)

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