

Trainee's Project Report

Job Code	PH102
Department	PH
Discipline	Experimental Physics
Supervisor	MOLL Michael

Description

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Background: ===== Detector components for the experiments at the CERN Large Hadron Collider will be exposed to very high levels of radiation during operation. The absolute radiation level and the particle composition of the radiation field (gammas, electrons, protons, μ) will be very different for the various sub-detector components of the experiments. In order to measure the radiation field and in order to predict and/or analyze the possible failure of components due to radiation damage the radiation has to be monitored. Presently, a working group is developing and characterizing radiation sensors to measure the various components of the radiation field. Among the devices that will be integrated into the radiation monitoring system are commercial p-i-n photodiodes and special Field Effect Transistors, so called Radiation Detection Field Effect Transistors (RADFETs). The commercial p-i-n diodes, used in industry for infrared remote control applications, are able to measure the non-ionizing radiation dose. In particular, they show an increase of their leakage current when biased reversely, and a linear increase of their resistivity when powered forward. Both parameters can be used to monitor the radiation level very accurately over a wide particle fluence range. =====
Project: ===== During the project the student will irradiate RADFETs and p-i-n diodes with high energetic protons and neutrons and analyze the response of the devices to the irradiation. The annealing of the devices will be investigated in detail by means of isothermal and isochronal annealing studies, which will expose the microscopic solid-state mechanisms that underlay the annealing behavior. Afterwards, the data will be analyzed and a parameterization for the annealing behavior will be produced that later on can be used in the LHC experiments to correct for annealing effects during operation.

Special Requirements

Hardware oriented. Basic knowledge in interaction of radiation with matter. Good team spirit. Basic knowledge of Labview would be helpful but is not required.

Training Value



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In the project "Radiation Monitoring for the LHC with RADFETs and p-i-n diodes" the student will learn the basics of the interaction of radiation with matter and various methods how to monitor radiation and radiation fields. In particular he will work with two types of devices: Radiation Field Effect Transistors and forward biased silicon diodes.