A study of silicon sensor for the ILD ECAL

The International Large Detector(ILD) is a proposed detector for the International Linear Collider(ILC). It has been designed to achieve an excellent Jet Energy Resolution by using Particle Flow Algorithms (PFA), which rely on the ability to separate nearby particles within jets. PFA requires calorimeters with high granularity. The ILD Electromagnetic Calorimeter(ECAL) is a sampling calorimeter with thirty tungsten absorber layers. The total thickness of this ECAL is about 20 centimeters, and it has between 10 and 100 million channels to make high granularity. Silicon sensors are a candidate technology for the sensitive layers of this ECAL. Present prototypes of these sensors have 256 5.5x5.5 mm^2 pixels in an area of 9x9cm^2.

We have measured various properties of these prototype sensors: the leakage current, capacitance, and full depletion voltage. We have also examined the response to an infrared laser to understand the sensor's response at its edge and between pixel readout pads, as well the effect of different guard ring designs. We will report on the results of these basic measurements of silicon sensor.

Summary

We have established a silicon sensor test bench system to measure leakage current and capacitance. The results of these measurements satisfy the requirements for the ILD ECAL. We have also studied the effects of the guard ring and inter-pixel gap by using a laser system.

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Track Classification: Sensors: 1a) Calorimetry