Contribution ID: **23** Type: **not specified**

Isolation Characteristics of Silicon Sensors Using Simulation Approach

Thursday 31 May 2012 14:40 (20 minutes)

Si sensors will be used in the extremely harsh radiation environment in the present and future generation nuclear and high energy physics experiments. In addition, the double sided silicon sensors and single sided sensors in n+-p- configurations will face an additional problem of shorting of n+ strips. There are several techniques, like p-spray and p-stop, which provide inter-strip isolation, but, they have an additional impact on other electrical characteristics like inter-strip capacitance and breakdown voltage. The shortcoming of p-spray and p-stop isolation techniques can be reduced by using the combination of these two techniques along with multiple p-stops and metal overhang over p-stops. A comprehensive 2-D device simulation approach (using Silvaco TCAD tools) is used to find an optimized configuration. Simulations are performed on a n-type substrate with uniform doping concentration of 7x1011 cm-3 and thickness 300μm. The n+ strips of width 18μm with pitch equal to 80μm are used. The electron concentration, potential and electric field distributions are used to investigating device characteristics and optimizing design parameters.

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Session Classification: Detector Characterization and Simulations

Track Classification: Detector Characterization