

Development of Microstrip Detectors Made on P-type Silicon Substrates for Tracking at the SLHC.

P.P. Allport, G. Casse

Abstract

The summary of a several years of research, exploring the application of microstrip sensors made by implanting n-type doped strips on p-type substrates, is reported. These detectors have been developed for high energy physics applications where extreme radiation hardness is required. These studies have demonstrated the suitability of p-type substrates to exploit the improvements obtained by segmenting the n-type electrodes so as to read out an electron signal. This is in contrast to the 'standard' design with p-doped strips reading out a hole signal.

The advantages of using p-type substrates to achieve n-strip read-out in terms of cost and ease to handle the sensors for module production are reiterated. The studies performed on the direct measurement of minimum ionizing particle signal degradation with radiation are summarised, including several recent studies on accelerated annealing and new results using commercially produced devices. We show that the charge collection does not significantly degrade with time after irradiation (where the doses range from 1 to 7 $10^{15}/\text{cm}^2$) for accelerated annealing corresponding to many years of room temperature operation. This leads to the prediction of reliable performance of p-type Si detectors for many years in the SLHC inner tracker environment.