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Charge Collection Efficiency of micro-strip Silicon Sensors Designed for studying charge multiplication after hadron irradiation

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The signal induced by minimum ionising particles in silicon strip detectors specially designed to investigate the process of charge multiplication has been studied by research groups within the CERN RD50 collaboration. In particular, various geometries of the implanted strips have been implemented on miniature (˜1x1 cm^2) micro-strip sensors on a 6”wafer to observe the effect of these variations on the electric field strength. The sensors, produced by Micron Semiconductor Ltd, vary in strip pitch and strip width, in the use of intermediate biased or floating strips between the readout strips and also in sensor thickness. In addition to the standard implant process, the implant energy for the phosphorous doping (n-type strips) and the diffusion time were increased for some devices to study the possible impact of the depth junction profile on charge multiplication. Charge collection measurements were performed with the ALiBaVa readout setup before and after irradiation with a proton fluence of 1e15 neq/cm^2 and neutron fluences of 1e15 and 5e15 1MeV neq/cm^2 (neq/cm^2). Several sensors exhibit enhancement of the collected charge compared to the standard sensor (pitch 80µm, width 25µm) after neutron irradiation of 5e15 neq/cm^2. Results of ongoing room temperature annealing studies, as well as TCT/eTCT (Transient Current Technique / edge TCT) studies will be presented.

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