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Investigation of the interstrip isolation of p-type strip sensors

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Nowadays silicon strip sensors in high luminosity experiments usually consist of a p-doped bulk with n-type strip implants. General consensus is that such a design requires an additional interstrip isolation structure like a p-stop implant. If no additional implant is implemented between the strips, it is expected that the interstrip resistance will be insufficient before and especially after irradiation. Before irradiation, impurities in the material lead to positive oxide charge inside the silicon dioxide surface which attracts electrons from the bulk. Those electrons accumulate just beneath the silicon dioxide surface and between the strip implants which decreases the interstrip resistance significantly. If the interstrip resistance decreases too much, the spatial resolution of the detector will eventually be lost. Ionising radiation introduces fixed charge inside the silicon dioxide which again decreases the interstrip resistance and the spatial resolution is lost. Contrary to that expectation, a high interstrip resistance was observed after heavy proton irradiation with a fluence of $1x10^{15} n_{eq}/cm^2$.

This talk presents the investigation of the interstrip isolation of n^+p strip sensors and how it is affected by radiation. Therefore, sensors without a specific interstrip isolation implant are used and irradiated with x-rays, neutrons and protons. A major focus is set on the dependence of the interstrip resistance. Moreover, the seed and cluster signal as well as the cluster size is investigated and compared to samples with a p-stop implant to visualise possible differences and the performance of the samples in a real use case.

Author: GOSEWISCH, Jan-Ole (KIT - Karlsruhe Institute of Technology (DE))

Co-author: DIERLAMM, Alexander (KIT - Karlsruhe Institute of Technology (DE))

Presenter: GOSEWISCH, Jan-Ole (KIT - Karlsruhe Institute of Technology (DE))

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