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Punch through protection and p-stop ion concentration in HPK strip mini-sensors

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Protection of AC coupling capacitors from beam splashes has been studied on the HPK ATLAS07 mini-sensors with special structures, BZ4A,B,C and D, for p-stop ion concentrations 2e12, 4e12 and 1e13 ion/cmˆ2. Punch through voltage was measured by DC methods on both ends of strips and it was found that voltage dominantly depends on ion concentration for all punch through structures. Minimum PT voltage was found for p-stop concentration 2e12 ion/cmˆ2 and the voltage is growing with concentration. IV characteristics have been measured for whole sample of 74 sensors. All sensors with p-stop isolation were successfully operating up to 1000V and sensors with p-stop plus p-spray 2e12 ion/cmˆ2 -up to 920V only. Full depletion voltage deduced from CV characteristics is in the range 180V –290V. An inter-strip capacitance, Cint, is constant for bias voltages higher than respective full depletion voltages and Cint does not depend on ion concentration within of ±20fE. First sample of 12 sensors has been irradiated in reactor in Rez near Prague to 4e14, 2e15 and 1e16neq/cmˆ2 and sensors will be investigated soon.
Next study concerns a thermal dependence of poly-silicon bias resistors of non-irradiated and irradiated sensors up to 4E14neq/cmˆ2. The respective temperature coefficients are -6.7kΩ/centigrade for non-irradiated sensors and -10.1 kΩ/centigrade for fluency 4e14neq/cmˆ2 .

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