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Analysis of I-V characteristics as a method in the study of radiation degradation of Si detectors

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Generation of the current by radiation-induced defects in Si p-n junction detectors is one of the processes responsible for their radiation degradation. In the study, analysis of the I-V characteristics is performed for the profiling of radiation defects acting as current generation centers. The experimental results are obtained for the Si p⁺-n-n⁺ diodes with a nonuniform defect distribution induced by radiation with Ar ions that form heavily damaged cluster-rich region produced by silicon recoils in the track end. Processing of the I-V characteristics showed that the current generation rate distribution along the track is nonmonotonous and its maximum is shifted from the track end towards the p⁺ contact. This evidences that formation of radiation defects related to the impact of recoils significantly suppresses the current generation.

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