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A Proton Irradiation Site at the Bonn Isochronous Cyclotron at University of Bonn

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A proton irradiation site for silicon detectors has been developed at Bonn University. The site is located at the Bonn Isochronous Cyclotron of Helmholtz Institut für Strahlen- und Kernphysik (HISKP) which provides protons with 14 MeV ($\approx$ 12 MeV on-device) kinetic energy. Light ions, such as deuterons, alphas up to ^{12}C, can also be produced with kinetic energies from 7 to 14 MeV per nucleon. On-site, beam currents of a few nA up to 1 ⊠A are available with adjustable beam diameters in between a few mm and 2 cm. Dedicated beam diagnostics have been developed for online beam-current and position monitoring at extraction which allow to measure the primary beam current with a relative precision of a few %. This enables the determination of the proton fluence ϕ_p at the device with an accuracy below 10%. Devices are irradiated in a thermally-insulated box to avoid uncontrolled annealing. Evaluation of irradiated silicon PiN-diodes yields a proton hardness factor κ_p which allows to irradiate up to $10^{16}\,\frac{n_{eq}}{cm^2}$ in approximately one hour. Typical irradiation parameters, characterization of the beam diagnostics for different light ions and proton hardness factor measurements are presented in this talk.

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