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Measurements of NitroStrip detectors irradiated with protons and neutrons

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Silicon detectors for applications in future high energy particle physics experiments face the challenge to withstand increasing radiation doses, while stringent requirements are set on resolution and material budget. The RD50 collaboration strives to understand the effects of radiation defects in silicon detectors and investigates novel ideas for radiation-hard detector concepts. One promising approach for more radiation tolerant silicon detectors is the introduction of foreign atoms into the silicon bulk material. The NitroStrip project is a common RD50 effort that aims to understand the effect of nitrogen enrichment on the radiation tolerance of high resistivity float zone silicon.
Silicon wafers equipped with strip sensors and diodes were manufactured using high resistivity float zone silicon, diffusion oxygenated float zone silicon, nitrogen enriched float zone silicon or magnetic Czochralski silicon.
This presentation summarises the comparative results obtained from measurements on these processed diodes and strip detectors. The devices were electrically tested and irradiated to fluences between 1e13 and 1e15 n_eq/cm². Irradiation was done with 23MeV protons at the facilities in Karlsruhe (KIT), with 24GeV Protons at Cern (IRRAD) and 1MeV neutrons at Ljubljana. The measurements on the irradiated sensors include charge collection measurements using a beta source, measurements of the electric field distribution using a transient current technique laser setup, electrical measurements and defect characterization using the thermally stimulated current technique. Furthermore, the measurements were repeated after multiple annealing steps. Observations and possible next steps will be discussed.

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