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Development of N-on-P planar technology at SINTEF MiNaLab

SINTEF MiNaLab has a long-standing experience in the production of planar radiation detectors on N-type silicon substrates. In recent years, a growing interest in sensors produced on P-type substrates was demonstrated on many fronts. N-on-P sensor technology is now becoming the “to-go choice”, especially in fields where radiation hardness is crucial (e.g. CERN experiments) and/or a faster response time is needed.

In the past two years SINTEF MiNaLab has invested heavily in the development of its own N-on-P silicon sensors technology. Great effort was put into assessing different layout implementations that would optimize the sensor’s electrical characteristics while achieving the desired surface radiation hardness.

We have recently completed a new prototyping fabrication run of N-on-P silicon sensors. The device of reference for the development of the technology was the standard SINTEF test diode. Many geometrical implementations were included, featuring variable numbers of guard-rings and field-plate designs. Two different sets of pixels detectors were also included together with other test structures for technology evaluation. Surface isolation was realized with P-spray and a total of 6 different implantation doses were tested to understand their impact on the electrical characteristics of the sensors and identify a dose that can provide a good isolation before and after irradiation. This work will briefly describe the wafer layout, the fabrication process and will focus on the electrical characterization results, finally outlining the plans for irradiation tests. Conclusions will be drawn on the status of the technology and the capability for future sensor production will be discussed.

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