

Radiation Hard 3D Silicon Pixel Sensors for use in the ATLAS Detector at the HL-LHC

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The High Luminosity LHC (HL-LHC) upgrade requires the planned Inner Tracker (ITk) of the ATLAS detector to tolerate extremely high radiation doses. Specifically, the innermost parts of the pixel system will have to withstand radiation fluences above $1 \times 10^{16} \text{ n}_{eq} \text{ cm}^{-2}$. Novel 3D silicon pixel sensors offer a superior radiation tolerance compared to conventional planar pixel sensors and are thus excellent candidates for the innermost parts of the ITk.

The University of Bergen (UiB) is actively collaborating with the Norwegian ATLAS project and has a research group which is also a part of the ITk project. At UiB, we are testing irradiated modules, and building a facility to perform Quality Assurance (QA) and Quality Control (QC) qualifications on production modules for installation in the ITk.

Results from the electrical characterisation of 3D pixel samples done at the testing facility at UiB will be shown. Sensors have also been mounted on the RD53A prototype readout chip. Test Beam results are presented for unirradiated as well as heavily irradiated sensors. For particles passing at perpendicular incidence, it is shown that average efficiencies above 96% are reached for sensors exposed to fluences of $1 \times 10^{16} \text{ n}_{eq} \text{ cm}^{-2}$ when biased to 80 V.

The talk is on behalf of the Norwegian ITk group.

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