

3D silicon sensors for ATLAS ITk pixel detector

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The HL-LHC upgrade will set strong requirements on the radiation hardness of the innermost layer of the new ITk pixel detector of ATLAS due to the large particle fluence.

At the same time the high particle multiplicity will require to reduce the hit occupancy, especially in the large pseudo-rapidity regions of the detector.

The sensor technology that has proven its compliance with the requisites for the innermost layer of ITk is 3D silicon sensors, which has been selected as baseline given its superior radiation hardness.

New 3D silicon sensors have been produced at CNM (Barcelona) with a Silicon On Insulator (SOI) single sided technology. They feature geometries with small pixel cells of $50 \times 50 \mu\text{m}^2$ or $25 \times 100 \mu\text{m}^2$ and active substrates of $150 \mu\text{m}$ and $100 \mu\text{m}$ of thickness. The sensors have been flip-chipped and assembled at iFAE to the novel RD53A ASIC prototypes designed for HL-LHC. The full modules have been irradiated with protons to fluences foreseen for the innermost layer of ITk.

A characterisation before and after irradiation has then been performed in beam tests at CERN SPS with 120 GeV pions. Results will be reported in this contribution.

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