

Performance of radiation hard 3D pixel sensors for the upgrade of the ATLAS Inner Tracker

Thursday, May 27, 2021 9:48 AM (18 minutes)

The inner detector of the ATLAS experiment will be replaced by a completely new Inner Tracker (ITk) to exploit the performance of the High Luminosity upgrade of the LHC accelerator (HL-LHC). The new detector will have to operate in an unprecedented radiation environment. In particular, the hybrid pixel detectors of the innermost layer of the ITk will be exposed to a particle fluence of about $2 \times 10^{16} \text{ n}_{\text{eq}}/\text{cm}^2$ before being replaced.

A novel 3D pixel sensor technology featuring thin active substrates and small pixel cells has been selected to instrument the innermost barrel layer and rings of the ATLAS ITk.

Prototypes of these 3D pixel sensors produced at CNM in Barcelona, Spain have been irradiated with protons and neutrons up to the radiation doses expected at HL-LHC. Results obtained from the characterisation of 3D pixelated test structures as well as half-size sensors coupled to the RD53A ASICS prototype for HL-LHC will be presented.

TIPP2020 abstract resubmission?

No, this is an entirely new submission.

Funding information

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Session Classification: Sensors: Solid-state sensors for tracking

Track Classification: Sensors: Sensors: Solid-state position sensors