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Operational Experience and Performance with the ATLAS Pixel detector at the Large Hadron Collider at CERN

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The tracking performance of the ATLAS detector relies critically on its 4-layer Pixel Detector. As the closest detector component to the interaction point, this detector is subjected to a significant amount of radiation over its lifetime. By the end of the LHC proton-proton collision RUN2 in 2018, the innermost layer IBL, consisting of planar and 3D pixel sensors, had received an integrated fluence of approximately $\Phi = 9 \times 10^{14} \text{ 1 MeV neq/cm}^2$.

The ATLAS collaboration is continually evaluating the impact of radiation on the Pixel Detector. During the LHC long shutdown 2 LS2 dedicated data taking of cosmic rays have been taken at this purpose.

In this talk the key status and performance metrics of the ATLAS Pixel Detector are summarised, and the operational experience and requirements to ensure optimum data quality and data taking efficiency will be described, with special emphasis to radiation damage experience. A quantitative analysis of charge collection, dE/dX , occupancy reduction with integrated luminosity, under-depletion effects, effects of annealing will be presented and discussed, as well as the operational issues and mitigation techniques adopted during the LHC Run2 and the ones foreseen for Run3.

Collaboration

ATLAS Collaboration

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