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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, with a sensitive area of ~1.9 m2 and 92 million pixels. Its original part, consisting in 3 layers of planar pixel sensor is continuously operating since the start of LHC collisions in 2008, while Its innermost layer, the Insertable B Layer (IBL) at about 3 cm from the beam line, was installed in 2015 before the start of LHC Run2 and consists of both planar and 3D pixel sensors, with FE-I4 readout frontends at 130nm CMOS technology.
As the closest detector component to the interaction point, this detector is subjected to a significant amount of radiation over its lifetime. At present, before the start of 2025 Run 3 LHC collisions, ATLAS Pixel Detector on innermost layers is operating after integrating fluence of O(10**15) 1 MeV n_eq cm^(-2). In this talk the key status and performance metrics of the ATLAS Pixel Detector are summarised, putting focus on performance and operating conditions at a over performing LHC, with special emphasis to radiation damage and mitigation techniques adopted, with prediction of their evolution until the end of LHC Run3 in 2026.
These results provide useful indications for the optimisation of the operating
conditions for the new generation of pixel trackers under construction for HI-LHC
upgrades.

Secondary track

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