

Performance and operation experience of the Atlas Semiconductor Tracker

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We report on the operation and performance of the ATLAS Semi-Conductor Tracker (SCT), which has been functioning for 3 years in the high luminosity, high radiation environment of the Large Hadron Collider at CERN. The SCT is constructed of 4088 silicon detector modules, for a total of 6.3 million strips. Each module operates as a stand-alone unit, mechanically, electrically, optically and thermally. The modules are mounted into two types of structures: one barrel, made of 4 cylinders, and two end-cap systems made of 9 disks. The SCT silicon micro-strip sensors are processed in the planar p-in-n technology. The signals are processed in the front-end ABCD3TA ASICs, which use a binary readout architecture. Data is transferred to the off-detector readout electronics via optical fibres. We find 99.3% of the SCT modules are operational, the noise occupancy and hit efficiency exceed the design specifications; the alignment is very close to the ideal to allow on-line track reconstruction and invariant mass determination. We will report on the operation and performance of the detector including an overview of the issues encountered. We observe a significant increase in leakage currents from bulk damage due to non-ionizing radiation and make comparisons with the predictions. We will also cover the time evolution of the key parameters of the strip tracker, including the evolution of noise and gain, the measurement of the Lorentz angle and the tracking efficiency in the harsh LHC environment. Valuable lessons for future silicon strip detector projects will be presented.

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