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ATLAS Silicon Microstrip Tracker Operation and Performance

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The Semi-Conductor Tracker (SCT), is a silicon strip detector and one of the key precision tracking devices in the Inner Detector of the ATLAS experiment at CERN LHC.

The SCT is constructed of 4088 silicon detector modules for a total of 6.3 million strips. Each module is designed, constructed and tested to operate as a stand-alone unit, mechanically, electrically, optically and thermally. The modules are mounted into two macro-structures: one barrel and two end-cap.

The SCT silicon micro-strip sensors are processed in the planar p-in-n technology. The signals from the strips are processed in the front-end ASICS ABCD3TA, working in the binary readout mode. Data is transferred to the off-detector readout electronics via optical fibers.

The completed SCT has been installed inside the ATLAS experimental cavern since 2007 and has been operational since then. Calibration data has been taken regularly and analyzed to determine the noise performance of the system. Extensive commissioning with cosmic ray events has been performed both with and without magnetic field. The sensor behavior in the 2 Tesla solenoidal magnetic field was studied by measurements of the Lorentz angle. We find 99.3% of the SCT modules are operational, 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.

In the talk the current status of the SCT will be reviewed, including results from the latest data-taking periods in 2009 and 2010, and from the detector alignment. We will report on the operation of the detector including overviews on services, connectivity and observed problems. The main emphasis will be given to the performance of the SCT with the LHC in collision mode and to the performance of individual electronic components. The SCT commissioning and running experience will then be used to extract valuable lessons for future silicon strip detector projects.

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