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Construction of the ATLAS SCT Endcap Modules

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The ATLAS Semi-Conductor Tracker (SCT) uses silicon strip detectors to measure trajectories of charged particles coming from 14 TeV proton-proton collisions at the Large Hadron Collider at CERN. The SCT provides at least four precise space points, in the radial range of 27 to 50 cm from the beam, for tracks within the angular acceptance $|\eta| < 2.5$. The SCT is built up of 4088 modules, each consisting of two or four silicon detectors, a hybrid carrying several readout ASICs, and components to support, cool and align the detectors.

We report on construction of the endcap part of the SCT, which is built up from 1976 modules of four different flavours. A group of 16 institutes from 7 countries is nearing completion of an intensive 18 months of building all these modules. At the outset we assumed a module assembly yield of 85% and we procured components accordingly. In fact we have comfortably exceeded 85% yield and this paper aims to explain how it was done. First the module specifications are summarised, then we describe our module assembly techniques. We detail the tests that we used for quality control of module components and of completed modules. A key aspect of the project was to fully standardise the final module tests and to insist that test data from all institutes was stored in a single central database, while leaving institutes a lot of freedom to vary their module assembly methods to suit local circumstances. Finally we report our experience in terms of component quality, assembly rates and testing rates, yield of good modules and causes of lost modules

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