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The LHCb Silicon Tracker: lessons learned (so far)

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The LHCb Silicon Tracker is part of the main tracking system of the LHCb detector. It covers the full acceptance angle in front of the dipole magnet in the Trigger Tracker station and the innermost part in the three Inner Tracker stations downstream of the magnet.

We report on final elements of the production, the installation and commissioning process in the experiment. Focusing on electronic and hardware issues we describe the lessons learned and the pitfalls encountered. First experience of detector operation is presented.

Summary

The LHCb Silicon Tracker is part of the LHCb main tracking system and provides data for region of high track densities. For the tracking station TT in front of the main dipole magnet, the Silicon Tracker covers the full acceptance angle of the experiment, while for the stations T1-T3 after the magnet, the Silicon Tracker only covers the region directly around the beam pipe. The analogue hit information of the silicon strip detectors, which is amplified by the Beetle readout chip, is transmitted via copper cables to the Services Boxes, which are located outside the acceptance area. This does not only reduce the amount of material inside the detector but in addition relaxes the requirements to the Service Box electronics concerning radiation tolerance. The Service Boxes hold the Digitizer Boards, on which the analogue signals from the Beetle frontend chips is digitized and encoded into a Gigabit data stream for transmission via VCSEL diodes and 120 m of multi-ribbon optical fibre to the counting house. In the counting house, the optical ribbons can be directly connected to TELL1 preprocessor boards equipped with two multi-channel optical receiver cards.

We present final results from the production of the detector modules and the readout electronic boards. At this point, problems encountered during the production and lessons learned for future projects are shown. After describing the installation procedure, we report on the commissioning of the Silicon Tracker with particular focus on hardware and electronic issues.

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