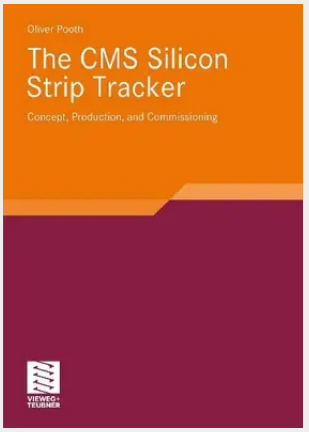
Pooth

The CMS Silicon Strip Tracker

Concept, Production and Commissioning



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With the start of the Large Hadron Collider LHC at CERN near Geneva, Switzerland, and the huge detectors along this particle accelerator, the largest high energy physics experiments ever are underway. One of the experiments is the CMS detector (Compact Muon Solenoid). With this experiment over 3,000 scientists and engineers worldwide will search for answers to fundamental questions in high energy physics.
Oliver Pooth describes the silicon strip tracker of the CMS detector. With a sensitive silicon area of 200 m² it is a central part of the experiment and able to precisely measure charged particles originating from high energy proton collisions at the LHC. In total, more than 15,000 individual silicon strip detector modules were built and tested before they were integrated on larger substructures of the silicon strip tracker. The author discusses methods of quality control that are new to the field of particle detector physics. These methods were established to guarantee a uniform behaviour of all detector modules which were built and tested in various places worldwide. After integration into the CMS experiment and commissioning, the silicon strip tracker is now ready to operate for at least ten years of LHC running.

When the experiments at the Large Hadron Collider (LHC) at CERN begin data taking the biggest high energy physics experiments ever will be underway. One of these experiments is the Compact Muon Solenoid (CMS) with more than 3,000 collaborators working at the energy frontier of particle physics. The silicon strip tracker of the CMS experiment is the largest silicon based track- 2 ing detector system worldwide. A sensitive silicon surface of about 200 m is - alised on more than 15,000 individual detector modules. The silicon strip tracker is one of the central subdetector components inside the CMS experiment at the LHC. The CMS experiment is conceived to study proton-proton collisions at a centre- 34 ?2 ?1 of-mass energy of 14 TeV at luminosities up to 10 cm s . To deliver best possible particle track identi?cation in the very harsh radiation environment - side the CMS detector a tracking device with high granularity, high readout speed and radiation hardness is needed. The construction of the CMS silicon tracker required production methods and quality control mechanisms that are new to the ?eld of particle physics: An easy to use detector module test system that was used by the entire CMS community and partners in industry, and specialised tests for larger subdetector structures where detector modules were tested together with- nal optical readout components in cold environment.

Kundenservice Verlag Dr. Otto Schmidt KG
Neumannstraße 10, 40235 Düsseldorf | kundenservice@otto-schmidt.de | 0221-93738-997 (Inland)