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Collana	Springer Theses, Recognizing Outstanding Ph.D. Research, , 2190-5053
Disciplina	539.72167
Soggetti	Particle acceleration Quantum field theory String theory Physical measurements Measurement Particle Acceleration and Detection, Beam Physics Quantum Field Theories, String Theory Measurement Science and Instrumentation
Lingua di pubblicazione	Inglese
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Note generali	"Doctoral Thesis accepted by the University of Hamburg, Germany."
Nota di bibliografia	Includes bibliographical references at the end of each chapters.
Nota di contenuto	Introduction to Particle Physics at Hadron Colliders -- The CMS Experiment at the LHC -- Basic Concepts of Semiconductor Tracking Detectors -- The CMS Pixel Detector for Phase I -- Simulation of CMS Pixel Detector Modules -- The pixar Data Acquisition and Calibration Framework -- Test Beams at the DESY-II Synchrotron -- Qualication of the Phase I Readout Chip -- Improving the Position Resolution Using the Cluster Skewness -- Introduction to Top Quark Physics and the Measurement -- Simulation of Collision Events -- Object Reconstruction and Event Selection -- Systematic Uncertainties -- Measurement of the Top Quark Mass from the S Distribution of tt+jet Events -- Measurement of the Top Quark Mass from Dierential tt+jet Cross Sections -- Summary and Prospects.
Sommario/riassunto	This thesis addresses two different topics, both vital for implementing

modern high-energy physics experiments: detector development and data analysis. Providing a concise introduction to both the standard model of particle physics and the basic principles of semiconductor tracking detectors, it presents the first measurement of the top quark pole mass from the differential cross-section of tt+J events in the dileptonic tt decay channel. The first part focuses on the development and characterization of silicon pixel detectors. To account for the expected increase in luminosity of the Large Hadron Collider (LHC), the pixel detector of the compact muon solenoid (CMS) experiment is replaced by an upgraded detector with new front-end electronics. It presents comprehensive test beam studies conducted to verify the design and quantify the performance of the new front-end in terms of tracking efficiency and spatial resolution. Furthermore, it proposes a new cluster interpol ation method, which utilizes the third central moment of the cluster charge distribution to improve the position resolution. The second part of the thesis introduces an alternative measurement of the top quark mass from the normalized differential production cross-sections of dileptonic top quark pair events with an additional jet. The energy measurement is 8TeV. Using theoretical predictions at next-to-leading order in perturbative Quantum Chromodynamics (QCD), the top quark pole mass is determined using a template fit method.