T 15: Halbleiter: Laufende Experimente 1

Zeit: Montag 14:00–16:00 Raum: K.12.20 (K2)

T 15.1 Mo 14:00 K.12.20 (K2)

Precision of MPX Detectors as LHC Luminosity Monitor — •Andre Sopczak[1], Babar Ali[1], Nedaa Asbah[2], Petr Benes[1], Benedikt Bergmann[1], Bartolomej Biskup[1], Michael Campbell[3], Davide Caforio[1], Erik Heijne[1], Edward Kladiva[4], Claude Leroy[2], Marzio Nessi[3], Stanislav Pospisil[1], Frank Seifert[1], Jaroslav Solc[1], Paul Soueid[2], Michal Suk[1], Daniel Turecek[1], and Zdenek Vykydal[1] — [1]IEAP CTU in Prague — [2]University of Montreal — [3]CERN — [4]IEP SAS Kosice

A network consisting of MPX detectors based on Medipix2 silicon pixel devices were originally adapted for measuring the composition and spectral characteristics of the radiation field in the ATLAS experiment and its surroundings. We demonstrate that the MPX network, which consists of 16 MPX detectors, is a self-contained luminosity monitor system. As the MPX detectors are collecting data independently of the ATLAS data-recording chain, they provide independent measurements of the bunch-integrated ATLAS/LHC luminosity. In particular, the MPX detectors close enough to the primary interaction point are used to perform van der Meer calibration scans with good precision. Results from the luminosity monitoring are presented for 2012 data taken at $\sqrt{s} = 8$ TeV proton-proton collisions. The characteristics of the LHC luminosity reduction are studied and the effects of beam-beam (burn-off) and beam-gas (single bunch) interactions are evaluated. The variations of the MPX luminosity measurements around the fitted curve lead to a relative uncertainty on the luminosity measurement below 0.3% for one minute time intervals.

T 15.2 Mo 14:15 K.12.20 (K2)

Vorbereitende Messungen zur Inbetriebnahme der neuen innersten Lage des ATLAS Pixel Detektors — •Karola Dette[1,2], Daniel Dobos[2], Claus Gössling[1], Reiner Klingenberg[1] und Heinz Pernegger[2] für die ATLAS experiment-Kollaboration — [1]TU Dortmund, Experimentelle Physik IV, Deutschland — [2]CERN, Genf, Schweiz

Der ATLAS Detektor am LHC enthält als innerste Komponente einen hybriden Silizium-Pixeldetektor, welcher als Vertexdetektor dient. Dieser wurde im Sommer 2014 um eine neue Lage ergänzt. Der sogenannte IBL (Insertable B-Layer) erweitert den Pixeldetektor auf vier Lagen und wurde zwischen dem bestehenden Pixeldetektor und einer neuen, dünneren Beampipe installiert. Im Vortrag wird eine Übersicht über die vor und nach der Installation des IBL vorgenommenen Messungen bezüglich IV Verhalten sowie Threshold, ToT und Noise Messungen präsentiert werden. Diese Messungen wurden zu verschiedenen Zeiten wiederholt, um die Unversehrtheit des Detektors vor und nach kritischen Operationen wie z.B. des Beampipe-Bakeouts zu überprüfen.

T 15.3 Mo 14:30 K.12.20 (K2)

Einfluss der Digitalisierung des SCT-Detektors auf die Tracking Perfromance — •Christoph Eckardt für die ATLAS-Kollaboration — DESY, Zeuthen

Infolge der Erhöhung der Luminosität im Run-2 ist der ATLAS-Detektor einer größeren Strahlungsbelastung als jemals zuvor ausgesetzt. Dies kann zur Veränderung der Detektoreigenschaften, insbesondere des Pixel- und des Siliziumstreifendetektors, führen. Durch die Variation von Detektorparametern in der Simulation werden mögliche Strahlungsschäden auf den Siliziumstreifendetektor durch Vergleich mit Daten analysiert. Insbesondere werden die Auswirkungen auf die rekonstruierten Cluster und Spuren betrachtet. Zudem kann diese Untersuchung zur Optimierung der Detektorsimulation verwendet werden.

T 15.4 Mo 14:45 K.12.20 (K2)

Preparation of the CMS tracker alignment for the LHC Run-2 — •Aleksandra Lelek, Rainer Mankel, Matthias Schröder, and Claus Kleinwort — DESY, Notkestraße 85, 22607 Hamburg

The CMS tracker is the world's largest silicon detector and consists of more than 25000 sensors. A precise knowledge of their position is crucial for an accurate reconstruction of higher-level objects such as particle trajectories (tracks) and jets. Using a track-based alignment procedure, which minimizes the residuals between the measured and predicted hit positions in the detector, the position and orientation of the sensors are determined to the level of 10 μm and 10 μrad, respectively.

In the presentation, the impact of the alignment precision on the object reconstruction is investigated and alignment strategies for the upcoming LHC Run-2 are discussed.

T 15.5 Mo 15:00 K.12.20 (K2)

Simultaneous alignment of the CMS Silicon Tracker using Millepede II — •Nazar Stefaniuk, Rainer Mankel, Matthias Schröder, Claus Kleinwort, and Andrii Gizhko — Deutsches Elektronen-Synchrotron (DESY), Notkestraße 85, Hamburg

The CMS tracker is the world's largest silicon detector, consisting of more than 25 000 sensors. A precise knowledge of their positions and orientations is crucial for the physics performance of the whole experiment. Track-based alignment procedure uses minimization of the residuals between the measured and expected hit position in the detector. An accuracy of 10 μm and 10 μrad for the module position and orientation, respectively, is achieved. Both tracks from pp-collision and cosmic-ray data are taken into account. In this way, more than 200 000 alignment parameters, describing the position, rotation and curvature of the sensors are determined simultaneously using the Millepede II program.

In the presentation, results of the CMS-tracker alignment with the data collected in 2012 are presented. The sensitivity of the procedure to a certain misalignment scenario is investigated, and foreseen improvements for the upcoming LHC Run-2 are discussed.

T 15.6 Mo 15:15 K.12.20 (K2)

Alignment of the CMS tracking detector with cosmic-ray tracks using Millepede II — •Juan Manuel Grados Luyando, Rainer Mankel, Matthias Schröder, and Claus Kleinwort — DESY, Hamburg, Germany

The physics performance of the CMS experiment depends crucially on its tracking detector, which consists of 25000 silicon sensors, making it the world's largest detector of this kind. In order to operate at the design precision, it is necessary to align the positions and orientations of the sensors at micrometer level. This is not a trivial task, since it requires the adjustment of approximately 200000 parameters. They are determined simultaneously in a track-based alignment procedure, using the MillePede II program, which minimizes the residuals between the measured and expected hit positions of the particle trajectories. In this presentation, alignment strategies for the early LHC Run-2 phase are outlined, and results obtained with cosmic-ray tracks are discussed.

T 15.7 Mo 15:30 K.12.20 (K2)

Test beam results of the first CMS double-sided strip module prototypes using the CBC2 read-out chip — •Ali Harb, Johannes Hauk, and Andreas Mussgiller — DESY-Hamburg

The CMS Binary Chip 2 (CBC2) is a prototype version of the front-end readout ASIC to be used in the silicon stripmodules of the CMS outer tracker during the high-luminosity phase of the LHC. The CBC2 is produced in a 130 nm CMOS technology and bump-bonded to the hybrid of the double layer silicon strip modules, the so-called 2S modules. It has 254 input channels and is designed to provide an on-board trigger with the capability of cluster-width discrimination and high-momentum track identification.

In November 2013 the first 2S module prototypes equipped with CBC2 were put under test at the DESY-II test beam facility. Data was collected exploiting a beam of positrons with an energy range of 2 to 4 GeV. The test setup, the event reconstruction, and the analysis results such as beam properties, alignment, clusters properties, and per-chip efficiency will be presented.

T 15.8 Mo 15:45 K.12.20 (K2)

Impact of the tracker alignment on physical object reconstruction at LHC under Run-2 conditions — •Patrick Connor, Matthias Schröder, Rainer Mankel, and Claus Kleinwort — DESY

The tracking system of the Cosmic Muon Solenoid detector consists of about 25 000 modules, whose position and orientation, among others, must be determined to a precision of 10μm and 10μrad respectively. Such an accuracy is reached through the track-based alignment technique, comparing predicted and measured data. Different data sets are used, for instance cosmic rays or collision data are analysed. In the talk, we will discuss the impact of the alignment on the measurement of physical observables under the conditions of the next run of the Large Hadron Collider.