T 64: Halbleiter 4

Zeit: Dienstag 16:45–19:00 Raum: P105

T 64.1 Di 16:45 P105

Luminosity Monitoring in ATLAS with MPX Detectors — •Andre Sopczak[1], Babar Ali[1], Nedaa Asbah[2], Petr Benes[1], Benedikt Bergmann[1], Bartolomej Biskup[1], Michael Campbell[3], Erik Heijne[1], Jan Jakubek[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

The ATLAS-MPX detectors are based on the Medipix2 silicon devices designed by CERN for the detection of multiple types of radiation. Sixteen such detectors were successfully operated in the ATLAS detector at the LHC and collected data independently of the ATLAS data-recording chain from 2008 to 2013. Each ATLAS-MPX detector provides separate measurements of the bunch-integrated LHC luminosity. An internal consistency for luminosity monitoring of about 2% was demonstrated. In addition, the MPX devices close to the beam are sensitive enough to provide relative-luminosity measurements during van der Meer calibration scans, in a low-luminosity regime that lies below the sensitivity of the ATLAS calorimeter-based bunch-integrating luminometers. Preliminary results from these luminosity studies are presented for 2012 data taken at $\sqrt{s} = 8$ TeV proton-proton collisions.

T 64.2 Di 17:00 P105

Upgraded Fast Beam Conditions Monitor for CMS online luminosity measurement — •Jessica L Leonard[1], Piotr Burtowy[2], Anne Dabrowski[3], Maria Hempel[1,4], Hans Henschel[1], Wolfgang Lange[1], Wolfgang Lohmann[1,4], Nathaniel Odell[5], Marek Penno[1], David Stickland[6], Roberval Walsh[7], and Agnieszka Zagozdzinska[8] — [1]DESY, Zeuthen, Germany — [2]Gdansk U of Tech, Gdansk, Poland — [3]CERN, Geneva, Switzerland — [4]Brandenburg Tech U, Cottbus, Germany — [5]Northwestern U, Evanston, IL, USA — [6]Princeton U, Princeton, NJ, USA — [7]DESY, Hamburg, Germany — [8]Warsaw U of Tech, Warsaw, Poland

The Run I CMS beam conditions monitoring subsystem BCM1F consisted of 8 individual diamond sensors situated around the beam pipe within the pixel detector volume, for the purpose of fast bunch-by-bunch monitoring of beam background and collision products. Effort is ongoing to develop the use of BCM1F as an online luminosity monitor. BCM1F will be running whenever there is beam in LHC, and its data acquisition is independent from the data acquisition of the CMS detector, hence it delivers luminosity even when CMS is not taking data. In order to match the requirements due to higher luminosity and 25 ns bunch spacing, several changes to the system must be implemented. These include using more sensors and upgraded electronics. New back-end instrumentation was developed, in particular dedicated fast logic and a real-time digitizer with large memory, and is being integrated into a multi-subsystem framework for luminosity measurement. Current results from Run II preparation will be shown.

T 64.3 Di 17:15 P105

Upgrade of the Beam Condition Monitor in CMS — •Maria Hempel[1,2], Alan Bell[3], Anne Dabrowski[3], Olena Karacheban[1,2], Wolfgang Lange[1], Wolfgang Lohmann[1,2], Dominik Przyborowski[3], Vladimir Ryjov[3], and David Stickland[4] — [1]DESY, Zeuthen, Germany — [2]BTU Cottbus, Cottbus, Germany — [3]CERN, Geneva, Switzerland — [4]Princeton University, Princeton, Amerika

The fast beam condition monitor BCM1F is a diamond based particle detector located inside the CMS experiment. A total of 8 diamond sensors with front-end ASICs are positioned on each side of the CMS interaction point to implement online luminosity and halo monitoring. The system was operated during the first running period of the LHC from 2008 until 2012. The particle fluence was 3.5*10e12 cm-2 proton equivalent per fb-1. The sensor performance before and after the irradiation will be compared. In order to meet the enhanced requirements of the LHC after the shutdown due to increased luminosity and a decreased bunch spacing of 25 ns, an upgrade of the system was needed. The new system will comprise 24 single crystal diamond sensors and dedicated front-end ASICs, positioned in a ring on both sides of the interaction point. The characteristics of the diamond sensors and the performance of the full system measured in a test-beam will be presented.

T 64.4 Di 17:30 P105

Moduldefekte im ATLAS Pixel-Detektor und Auswirkung auf die Detektor Effizienz — Jörn Grosse-Knetter[1], Silvia Miglioranzi[3], Arnulf Quadt[1], •Andre Lukas Schorlemmer[1,2] und Jens Weingarten[1] — [1]2. Physikalisches Institut, Georg-August-Universität Göttingen — [2]CERN — [3]Aristotle Univ. of Thessaloniki

Mit wachsender Laufzeit des LHCs erhöht sich die Anzahl defekter Module im ATLAS Pixel-Detekor. Um die Effekte von Moduldefekten zu minimieren, werden während der aktuellen Wartungspause Verbesserungen am Detektor vorgenommen. Im Rahmen des "Insertable b-Layer" Projektes (IBL) wird eine zusätzliche Pixel-Lage in den bestehenden Detektor eingebaut. Weiterhin werden "new Service Quarter Panels" (nSQPs) eingebaut um die Modulausfallrate zu verringern. Auf Basis der beobachteten Defektrate wurden verschiedene Szenarien von Modulausfällen erstellt. In diesem Vortrag wird die zeitliche Entwicklung von Modulausfällen vorgestellt, sowie der Effekt von Modulausfällen auf die b-tagging Effizienz untersucht.

T 64.5 Di 17:45 P105

Test of the optical links for ATLAS IBL — •Rouhina Behpour, Peter Maettig, Tobias Flick, and Marius Wensing — Wuppertal University,Gaussstrasse 20, 42119 Wuppertal

An important sub-system of the ATLAS detector at the LHC is the pixel detector which is presently being upgraded with a new layer called Insertable B-layer (IBL). The readout data from the detector and the command messages are transmitted via optical links. To increase the bandwidths, improved read-out components have to be developed. Between the Back of Crate card at the off-detector side and the optoboard at the on-detector side signals are transmitted via optical fibers at up to 160 Mb/s. To test the signal quality and reliability of the optical transmission path, a test system has been constructed at Wuppertal university. The test system, the test requirements and the results will be presented.

T 64.6 Di 18:00 P105

Simultaneous alignment in the CMS Silicon Tracker using Millepede II — Nazar Bartosik, •Andrii Gizhko, Gregor Hellwig, Claus Kleinwort, Rainer Mankel, and Matthias Schröeder — Deutsches Elektronen-Synchrotron (DESY), Notkestraße 85, Hamburg

The CMS tracker is the world's largest silicon detector, consisting of more than 25 000 sensors. An accurate determination of their positions and orientations with a precision of the order of 10 μm and 10μrad, respectively, is crucial for the physics performance of the whole experiment. This is achieved by a track-based alignment procedure which makes use of the residuals between the measured and the expected hit-positions of particle trajectories in the detector. Both tracks from pp collisions and cosmic ray muons are taken into account. In this way, approximately 200 000 alignment parameters are determined simultaneously using the Millepede-II programme.

In the presentation, the latest status of the CMS-tracker alignment with the data collected in 2012 is presented, and foreseen improvements for the upcoming data taking at 14 TeV are discussed.

T 64.7 Di 18:15 P105

Lorentz angle measurement on ATLAS silicon microstrip sensors — •Eda Yildirim[1,2], Kerstin Tackmann[1], and Ingrid Maria Gregor[1] — [1]DESY, Hamburg, Germany — [2]Universität Hamburg, Hamburg, Germany

The Large Hadron Collider (LHC) at CERN in Geneva is scheduled to run in its present form until 2021. After that, an upgrade to a higher instantaneous luminosity of $5\times10^{34}\,\mathrm{cm}^{-2}\mathrm{s}^{-1}$ (High-Luminosity LHC) is planned. At the same time, the current ATLAS tracking system which consists of silicon pixel detector, silicon strip detector and transition radiation tracker, will be replaced by an all-silicon tracker (pixels and strips). During High-Luminosity LHC running, they will be subject to high radiation levels. The silicon microstrip detector will have to withstand radiation doses up to 10^{15} neq/cm^{-2}. As a result of the radiation damage, the Lorentz angle of the strip sensors is expected to change. In this talk, a test beam setup prepared to measure the Lorentz angle of highly irradiated future ATLAS silicon microstrip sensors will be presented and first preliminary results will be shown.

T 64.8 Di 18:30 P105

3-dimensional Charge Collection Efficiency (3DCCE) Measurement of ATLAS-IBL and HL-LHC Tracking Detector Sensor Candidates — •Jennifer Jentzsch — CERN, Switzerland/TU Dortmund, Germany

Measurements of spatial charge collection efficiency (CCE) of irradiated and un-irradiated vertex detectors are used to characterize their radiation resistance. The 2-dimensional CCE is a standard measurement to study inefficiency regions and design impacts of different sensor designs. New sensor materials, like polycrystalline Chemical Vapor Deposition (pCVD) diamond, and new sensors layouts, like 3D patterned silicon, are candidates to provide radiation resistances needed for challenging particle fluxes in the next generation of high luminosity collider experiments. Measuring their 3-dimensional CCE with a tomography method, can provide an excellent tool to study local inefficiencies, spatial trapping effects and design impacts of these sensors. It can also allow to verify (e.g. for planar sensors) existing 3D electric field simulations. A method for 3D CCE measurement with high energetic particle beams using radial scans and 3D volumetric reconstruction methods is described. Simulation studies and first results of measurements from testbeam experiments at CERN will be shown.

T 64.9 Di 18:45 P105

A method for precise single pixel charge reconstruction for fast hybrid pixel detectors — •David-Leon Pohl, Fabian Hügging, Jens Janssen, and Norbert Wermes — Physikalisches Institut der Universität Bonn

The increasing luminosity in high energy physics requires progressively faster pixel detectors that are able to cope with high pixel occupancies. This is usually achieved by trading the charge resolution of the Front-End electronics for fast counting capabilities. With a poor charge resolution a calibration of the pixel detector or a sensor characterization is challenging. Hence a new method was developed to reconstruct the charge in single pixels with a resolution mainly limited by the electronic noise of the Front-End. The method makes use of the capability to change the hit detection threshold of the detector in small steps, while counting hits from a particle source with constant rate. During the talk the method will be presented in detail and the performance will be shown based on measurements with the ATLAS FE-I4 read out chip.