T 90: Experimentelle Methoden III

Zeit: Donnerstag 16:00–18:30 Raum: S01

T 90.1 Do 16:00 S01

Bau von small-diameter Monitored Drift Tube (sMDT)-Kammern für das ATLAS-Myonspektrometer — •Marian Rendel, Patrick Rieck, Verena Walbrecht, Oliver Kortner und Hubert Kroha — Max Planck Institut für Physik (Werner-Heisenberg-Institut)

Im Rahmen des zweiten Long Shutdown des Large Hadron Colliders, 2019-2020, wird die Hälfte der Monitored Drift Tube (MDT)-Kammern an den Enden der inneren Barrellage durch 16 neue small-diameter Monitored Drift Tube (sMDT)-Kammern mit dem halben Rohrdurchmesser ersetzt, die mit neuen thin-gap RPC-Triggerkammern integriert sind. Wie bei den MDT-Kammern muss auch beim Bau der sMDT-Kammern eine hohe Positioniergenauigkeit der Zähldrähte erreicht werden.

In diesem Vortrag wird über die Driftrohrproduktion und die Montage der Kammern berichtet.

T 90.2 Do 16:15 S01

Vermessung neuer small-diameter Monitored Drift Tube (sMDT)-Kammern für das ATLAS-Myonspektrometer — •Marian Rendel, Patrick Rieck, Verena Walbrecht, Oliver Kortner und Hubert Kroha — Max Planck Institut für Physik (Werner-Heisenberg-Institut), München

Im Rahmen des zweiten Long Shutdown des Large Hadron Colliders, 2019-2020, werden die Monitored Drift Tube (MDT)-Kammern an den Enden der inneren Barrellage durch 16 neue small-diameter Monitored Drift Tube (sMDT)-Kammern mit dem halben Rohrdurchmesser ersetzt, die mit neuen thin-gap RPC-Triggerkammern integriert sind. Um Richtung und Impuls der Myonen präzise messen zu können, müssen die mechanischen und elektrischen Eigenschaften der Kammern möglichst genau bestimmt werden.
In diesem Vortrag wird über die Vermessung der Kammerdeformation, der Positionierung der Alignierungsplattformen und die Messung der Gasleckraten berichtet.

T 90.3 Do 16:30 S01

Electrostatic deflector development — •Kirill Grigoryev and Christian Käseberg for the JEDI-Collaboration — Institut für Kernphysik, Forschungszentrum Jülich, Deutschland

The direct measurement of the proton or deuteron Electric Dipole Moment (EDM) has never been performed before. These experiments can be done at electrostatic storage ring. As a starting point the magnetic storage ring COSY at Forschungszentrum Jülich can be used. It will require implementation of the electrostatic or electromagnetic beam-bending elements. For testing the electrodes material, shape, surface treatment and high voltage, a real size large deflector is developed and will be checked in a magnetic field of a large-gap dipole magnet. The experimental setup and the laboratory test results will be presented.

T 90.4 Do 16:45 S01

Polyimide aging studies for the Mu3e experiment — •Thomas Theodor Rudzki for the Mu3e-Collaboration — Physikalisches Institut, Universität Heidelberg

The Mu3e experiment is searching for the lepton flavour violating decay $\mu^+ \rightarrow e^+e^-e^+$ with a sensitivity of 1 event in 10^{16} decays in phase II. Since the momentum resolution is limited by multiple Coulomb scattering low material budget is necessary. Therefore, the pixel tracker of Mu3e will use $50\,\mu m$ thin sensors glued on thin polyimide foils including all signal and power lines. This results in a radiation length of only $X/X_0 = 0.115\,\%$ per layer. The sensors will be cooled by gaseous helium, a low Z material.

There are indications from aerospace engineering that ionizing radiation in a dry and inert atmosphere gives rise to radiation damage, potentially impacting the mechanical structure. Potential instability of the support structure caused by decomposition of the polyimide foil would be a great danger for the whole experiment. The presence and time scale of the damaging process and its potential effect on the material properties and their relevance for the Mu3e experiment will be discussed in this talk. This includes simulation results of the energy deposited by low-momentum electrons in polyimide.

T 90.5 Do 17:00 S01

Power deposition in the wall of the helical undulator of the ILC positron source — •Khaled Alharbi — Hamburg University, Germany — DESY-Zeuthen, Germany — KACST,Saudi Arabia

The positron source of the International Linear Collider is based on a superconducting helical undulator passed by the high-energy electron beam to generate photons which hit a conversion target. Since the photons are circularly polarized the resulting positron beam is polarized.

At ILC250 (Ecm = 250GeV), the full active length of 231m (320m total length) is needed to produce the required number of positrons. To keep the power deposition in the undulator walls below the acceptable limit of 1W/m, masks must be inserted. The mask design requires a detailed study of the power deposition in the walls. The results of this study will be presented taking into account errors in the undulator magnetic field and period as well as misalignment of the electron beam.

T 90.6 Do 17:15 S01

Microscopic simulation of gaseous detectors — •Moritz Seidel, Thomas Hebbeker, Carsten Heidemann, Kerstin Hoepfner, Henning Keller, and Giovanni Mocellin — Physikalisches Institut III A, RWTH Aachen, Germany

Gaseous detectors are widely used in the field of particle physics research, such as at the main experiments of the LHC. Given the increasing demand of precision and reliability of the detectors for the discovery of new particles, it is essential to better understand the details of the already existing detectors and those of the next generation.

To achieve this, the generation and propagation of signals inside the detectors are studied on a microscopic scale. Simulations are performed using the Garfield++ package mainly focusing on GEM detectors.

Starting from ionizing particles, the ion-electron pairs are generated in the gas volume. The electrons are propagated towards the regions of high electric field where the electron multiplication takes place. Finally the collection of the signal on the electrodes is simulated.

The studies presented here cover the influence of environmental parameters, detector geometry, high voltage distribution and gas composition.

T 90.7 Do 17:30 S01

Scheduling algorithms in LHCb's upgrade trigger — •Niklas Nolte[1,2], Sascha Stahl[1], and Johannes Albrecht[2] — [1]CERN — [2]Experimentelle Physik 5, TU Dortmund

During the second long shutdown of the LHC, LHCb is undergoing a major upgrade, which involves the removal of the hardware trigger. With the prospect of reconstructing LHC proton bunch crossings at a rate of 30 MHz in LHCb's software trigger from 2021 onwards, an event scheduler must fulfill two important requirements. It needs to have sufficient versatility to handle the control and data flow of up to thousands of reconstruction and selection algorithms per event, while keeping the runtime overhead minimal. An static-order, inter-event parallel scheduler capable of configuring arbitrary dependency graphs via control flow trees is presented.

T 90.8 Do 17:45 S01

Test beam results of the prototype of the LHCb SciFi Tracker — Sebastian Bachmann, Daniel Berninghoff, Albert Comerma, Michal Dziewiecki, Xiaoxue Han, Blake Leverington, Hanna Malygina, Ulrich Uwer, and •Lukas Witola — Physikalisches Institut, Heidelberg, Germany

The LHCb Scintillating Fibre (SciFi) Tracker is designed to replace the current downstream tracking detectors in the LHCb Upgrade during the shutdown 2019 to 2020. It is based on 2.5 m long and 0.250 mm diameter scintillating fibres as the active medium. Silicon photomultiplier arrays with 128 channels and 0.25 mm channel width are used for readout. The front-end electronics are based on a custom ASIC chip, the PACIFIC, and an FPGA for the hit clustering with a readout rate of 40 MHz.

The prototype modules of the SciFi Tracker with the full readout chain have been studied at the CERN SPS test beam area. Performance results of the electronics as well as of the detector will be reported.

T 90.9 Do 18:00 S01

Optimization of a high-intensity positron source — •Manuel Formela[2], Sabine Riemann[1], Gudrid Moortgat-Pick[2], and Andriy Ushakov[2] — [1]DESY — [2]Universität Hamburg

The positron source of a future high-energy e+e- collider is challenging due to the high luminosity requests. Therefore CLIC as well as the International Linear Collider (ILC) have a design for an undulator based positron source, using an helical undulator and producing a high number of circularly polarized photons. However such a high number of photons generate a high termic stress on the target material producing the required high number of positrons.

This talk is about a mathematical study on the radiation behaviour of a helical undulator based on the equation for the radiated synchrotron energy spectral density per solid angle per electron in the relativistic, far field and pointlike charge approximation. From this starting point the resulting following undulator properties were examined: the deposited power in the undulator vessel, which can disrupt the functionality of the undulator*s electromagnets, the protectiv property of a mask on this disturbance and the number of positrons produced by the synchrotron radiation in a Ti-6%Al-4%V target. Those quantities were calculated for various values for parameters like the undulator period, undulator length and the magentic flux.

T 90.10 Do 18:15 S01

Calibrating the OSIRIS pre-detector - A radioactivity monitor for JUNO — •Alexandre Göttel[1,2], Yaping Chen[1], Christoph Genster[1,2], Philipp Kampmann[1,2], Livia Ludhova[1,2], Michaela Schever[1,2], Achim Stahl[1,2], Christopher Wiebusch[1,2], and Yu Xu[1,2] for the JUNO-Collaboration — [1]IKP-2, Forschungszentrum Jülich — [2]III Physikalisches Institut, RWTH Aachen University

The Jiangmen Underground Neutrino Observatory (JUNO) is a 20 kt liquid scintillator reactor neutrino experiment currently being built in the Guangdong province in southern China. Its energy resolution is designed to go below 3% at 1 MeV in order to reach a statistical significance of at least 3 sigma for the neutrino mass hierarchy. It is therefore imperative to closely monitor the radiopurity of the liquid scintillator. The Online Scintillator Internal Radioactivity Investigation System (OSIRIS) is being developed for this purpose. In order to achieve this goal a rigorous energy calibration of the OSIRIS pre-detector is necessary. In this talk the methods used for this calibration are discussed, as well as how they were optimized beforehand using a GEANT4-based Monte Carlo simulation.