T 64: Gaseous detectors I

Time: Wednesday 16:30–18:00 Location: L-3.016

T 64.1 Wed 16:30 L-3.016

Bau einer Funkenkammer als mobiler Demonstrator — •Martin Serfling, Andreas Glatte und Arno Straessner — TU Dresden, Dresden, Deutschland

Historisch waren Funkenkammern beliebte Teilchendetektoren, welche in simplen bis komplexen Aufbauten den Nachweis elektromagnetischer Teilchen sowie deren Interaktion beleuchten. Unser Ziel ist die Konstruktion einer mobilen Funkenkammer, welche als Demonstrator im Rahmen der Wissenschaftsvermittlung für physikalische Vorträge, Ausstellungen oder den Lehrbetrieb genutzt werden kann und einen visuellen Nachweis atmosphärischer Myonen gibt. Diese einfache Erkenntnis bietet einen Einstieg zu teilchenphysikalischen Phänomenen sowie Überlegungen zur speziellen Relativitätstheorie. Somit baut die Kammer eine Brücke von simplen Beobachtungen hin zu komplexen physikalischen Zusammenhängen und soll auf die allgegenwärtigen Prozesse, welche unbemerkt stattfinden, hinweisen.

In dem Vortrag soll außerdem auf Probleme, Designentscheidungen sowie entscheidende Parameter eingegangen werden, welche unsere Konstruktion beeinflusst haben und für den generellen Nachbau einer solchen Kammer entscheidend sind, da dies erklärtes Ziel des Projekts ist.

T 64.2 Wed 16:45 L-3.016

Commissioning of a prototype for the SHiP Spectrometer Straw Tracker — •Morten Henken, Felix Bergholz, Daniel Bick, Stefan Bieschke, Caren Hagner, and Walter Schmidt-Parzefall — Institut für Experimentalphysik, Luruper Chaussee 149, 22761 Hamburg

The SHiP (Search for Hidden Particles) experiment is a proposed general purpose beam-dump experiment to be located at the CERN SPS North Area. It is designed to search for hidden particles at the intensity frontier as well as to study tau neutrino physics, utilizing the SPS's 400 GeV proton beam.

The SHiP hidden sector detector is designed to detect the decay products of hidden particles decaying inside it's ∼50 m long vacuum decay vessel. A crucial part is the determination of the trajectory and the momentum of charged particles produced in these decays. This is the purpose of the Spectrometer Straw Tracker (SST), consisting of roughly 16000 straw tubes, each one 5 m long and 2 cm in diameter.

A prototype, consisting of four straw tubes, has recently been set up at Hamburg University. The status of the commissioning and first results will be presented.

T 64.3 Wed 17:00 L-3.016

Concept of an inverted Ring Imaging Cherenkov detector — •Maximilian Rinnagel, Otmar Biebel, Bernhard Flierl, Maximilian Herrmann, Christoph Jagfeld, Felix Klitzner, Katrin Penski, Sebastian Trost, Chrysostomos Valderanis, Fabian Vogel, and Ralf Hertenberger — LMU München

The concept of this Ring Imaging Cherenkov detector consists of a lead glass volume inside which Cherenkov light is created by traversing particles. Afterwards Cherenkov photons are converted to electrons by a CsI photocathode. The created photoelectrons enter the drift gap of a Micro Pattern Gaseous Detector. Signals on the readout strips of the detector allow for the reconstruction of the momentum of a known particle by the size of ellipses illuminated by the Cherenkov light. Simulations for the efficiency of particle yield and their respective energy have been performed for cosmic muons to investigate the feasibility of this detector design. Furthermore studies of the detector components e.g. the photon spectrum of the lead glass are presented.

T 64.4 Wed 17:15 L-3.016

Development of a GridPix X-ray polarimeter — Klaus Desch, •Markus Gruber, Jochen Kaminski, and Leonie Richarz — Physikalisches Institut, Universität Bonn, Nußallee 12, 53115 Bonn

In our group there are several gaseous detectors in development based on a highly granular pixel ASIC (Timepix / Timepix3) and a MicroMegas gas amplification stage (InGrid). The MicroMegas is produced by photolithographic postprocessing techniques and can be aligned with the pixel structure so that one grid hole is directly above one pixel. The combination of the Timepix ASIC and the InGrid amplification stage is called "GridPix". The advantage of a GridPix is its high granularity combined with low noise which gives the possibility of high resolution tracking and single primary electron detection.

To build an X-ray polarimeter based on a GridPix one uses the correlation of the polarisation plane and the emission angle of photoelectrons. By tracking the photoelectrons with the GridPix with its high resolution one can identify the start and endpoints as well as the direction of the photoelectrons. It is also possible to resolve multiple scattering within the photoelectron track. By reconstruction of the emission angle one can reconstruct the polarisation plane of the incoming photons.

In this talk I will present the working principle of a GridPix X-ray polarimeter as well as measurements from recent testbeams at PETRA III and KARA. Furthermore I will give an outlook on our future plans for the development of such a detector.

T 64.5 Wed 17:30 L-3.016

Gaseous Detector Studies with the VMM3a ASIC — •Lucian Scharenberg[1,2], Klaus Desch[2], Hans Muller[1], Eraldo Oliveri[1], Dorothea Pfeiffer[3,1], and Leszek Ropelewski[1] — [1]CERN, Geneva, Switzerland — [2]Physikalisches Institut, University of Bonn, Germany — [3]ESS, Lund, Sweden

The VMM3a is a 64-channel Application-Specific Integrated Circuit (ASIC), which was specifically developed for the electronic read-out of Micro-Pattern Gaseous Detectors (MPGDs). It offers various features, like for example a high-rate (up to 4 MHz per channel) continuous read-out, a nanosecond time resolution, a 10-bit Analogue-to-Digital-Converter (ADC) for the charge signals, an integrated zero-suppression or a neighbouring-logic.

Recently this ASIC has been implemented into RD51's Scalable Readout System (SRS), enabling the usage of the VMM3a for small R&D laboratory set-ups to mid-scale experiments. In order to demonstrate the capabilities of this system for future applications, characterisation and test measurements are conducted, using a $10 \times 10\,\mathrm{cm}^2$ active area triple-GEM detector.

In this talk a short overview of the experimental set-up and the VMM3a/SRS structure is given, followed by the presentation of one example of the test measurements, exploiting several of the available features. It is shown that the rare case of fluorescence X-rays, also known as 'escape photons', interacting in the gas volume can be resolved. Furthermore these resolved X-rays are used to introduce a new method to determine the drift velocity in a gaseous detector.

T 64.6 Wed 17:45 L-3.016

Development of a testing system for the new ASD chips for the PhaseII upgrade of the ATLAS Muon Spectrometer — •Chrysostomos Valderanis, Otmar Biebel, Bernhard Flierl, Christoph Jagfeld, Maximilian Herrmann, Ralf Hertenberger, Felix Klitzner, Katrin Penski, Maximilian Rinnagel, Sebastian Trost, and Fabian Vogel — LMU München

The ATLAS Monitored Drift Tubes (MDT) muon barrel chambers will cope with higher background conditions in the next High Luminocity (HL) LHC program. An efficient trigger system is being designed for this purpose, taking into account the muon trajectory. This system will require the replacement of the MDT's front end electronics. The production prototypes for the Amplifier Shaper Discriminator (ASD) chip build in 130 nm GF CMOS technology are already available.

We report on the fully automated testing system developed to test the full production of the ASD chips. The performance characteristics of the tester and the first tests and their result are being presented.