T 81: Myondetektoren 2

Zeit: Mittwoch 16:45–18:45 Raum: P12

T 81.1 Mi 16:45 P12

High-Rate Capable and Discharge Tolerant Floating Strip Micromegas — •Jonathan Bortfeldt, Michael Bender, Otmar Biebel, Helge Danger, Bernhard Flierl, Ralf Hertenberger, Philipp Lösel, Samuel Moll, Ralph Müller, and André Zibell — LS Schaile, LMU München

Micromegas are high-rate capable micro-pattern gaseous detectors. Charge densities exceeding 1.8×10^8 e/mm^2 can trigger non-destructive discharges in the detector, creating dead time. The impact of discharges can be reduced to a negligible level by supplying all anode strips individually with high-voltage. The discharge behavior in a novel floating strip Micromegas has been investigated in depth. We demonstrate, that the overall voltage drop after a discharge is negligible and we discuss the microscopic structure of discharges.

A floating strip Micromegas doublet with 2×128 strips and low material budget has been successfully tested in a 550 kHz 20 MeV proton beam at the tandem accelerator in Garching. We discuss the performance with respect to TPC-like single plane angular resolution, efficiency and high-rate capability.

A 48 cm×50 cm floating strip Micromegas has been tested in 120 GeV pion beams at the H6 beamline at SPS/CERN. It showed a spatial resolution of $(48 \pm 2)\,\mu$m, efficiencies above 97% and a homogenous gas gain with variations on the order of 15%.

T 81.2 Mi 17:00 P12

GEM-Detector for tracking of X-Rays and Thermal Neutrons — •Bernhard Flierl, Otmar Biebel, Jonathan Bortfeldt, Ralf Hertenberger, and Andre Zibell — LS Schaile - LMU München

Micropattern Detectors like GEM (gaseous electron multiplier) or Micromegas (micro mesh gaseous structure) are well suited for tracking charged particles. To improve their capability to track neutral particles, converter foils may be utilized as cathodes. In this experiment a GEM detector with an active volume of 90×100×10 mm^3 and one-dimensional strip readout is used. For detection of X-rays high-Z materials are advantageous. Tracking the photoelectrons created in a 460 nm gold conversion layer allows for reconstruction of the interaction point in the Au-foil and by use of a Time Projection Chamber (TPC) like detection mode with time resolving electronics for the determination of the incoming direction. For thermal neutrons a similar approach is chosen: a boron-rich layer will create MeV beta particles, which can also be detected in the active gas volume of the detector. The design principle will be presented as well as interaction efficiencies and first tracking results.

T 81.3 Mi 17:15 P12

Sandwich Structures as Basic Material for Large Area Micromegas Detectors — •Elias Pree, Otmar Biebel, Ralf Hertenberger, Ulrich Landgraf, and Ralph Müller — LMU München

The small wheel upgrade (NSW) of the ATLAS detector requires large area micromegas detectors of high planarity. Their drift cathodes and readout panels will be based on m^2 sized sandwich panels of 0.5 mm FR4 printed circuit board (pcb) material as skins and 10 mm aluminum-honeycomb.

The non-trivial production process will be discussed allowing for planarities below 0.1 mm for the whole surface. Results using different metrological methods to determine the planarity and parallelism will be presented.

Sagging curves measured after application of a defined weight allow for determination of the Young-modulus needed to calculate the bending of the detectors under stress.

Consequences for the application in the NSW will be discussed.

T 81.4 Mi 17:30 P12

Studies on the Optimal Working Point for Micromegas Detectors with Two-Dimensional Readouts — •Laura Wehner, Tai-Hua Lin, Chrysostomos Valderanis, and Matthias Schott — Johannes Gutenberg-Universität Mainz ,Germany

A 10 × 10 cm^2 resistive Micromegas (MICRO MEsh GAseous Structure) detector with two-dimensional readout system consisting of 360 stripes per axis and 4 stripes per millimeter density has recently been tested in Mainz.

Measurements were performed under a variety of operating conditions, different Ar/CO2 gas mixtures, working pressure and working voltage using cosmic muons and a variable energy x-ray source as probes. We report on the performance of the detector under these operating conditions and we discuss the optimal operating point.

T 81.5 Mi 17:45 P12

The Performance Studies of Micromegas Detectors at the Mainz Microtron (MAMI) and with Cosmic Rays — •Tai-Hua Lin, Chrysostomos Valderanis, Robert Westenberger, and Matthias Schott — Johannes Gutenberg-Universität Mainz, Germany

A 10 × 10 cm^2 resistive Micromegas (MICRO MEsh GAseous Structure) detector with two-dimensional readout system was tested at the Mainz Microtron MAMI electron beam. The detector spatial resolution with respect to different incident angles of the beam line was tested. The related data of clusterization and time resolution have been studied to determine the performance of the detector. In addition, a large scale 1.0×0.5 m^2 Micromegas prototype with two-dimensional readout system was been constructed and preliminary tests with cosmic muons have been performed. The corresponding results will be presented and discussed.

T 81.6 Mi 18:00 P12

Understanding avalanches in a Micromegas using Single-Electron Response * Simulation aspects — •Fabian Kuger[1], Rob Veenhof[2], Thomas Zerguerras[3], Bernard Genolini[3], Miktat Imré[3], Michael Josselin[3], Alain Maroni[3], Thi Nguyen Trung[3], Joel Pouthas[3], Emmanuel Rindel[3], Philippe Rosier[3], Daisuke Suzuki[3], Lucien Séminor[3], Claude Théneau[3], Thomas Trefzger[1], Raimund Ströhmer[1], and Özkan Sahin[2] — [1]Julius-Maximilians-Universität Würzburg (Germany), — [2]Uludag University (Turkey) — [3]CNRS/IN2P3-Université Paris-Sud (France)

Micro-pattern-gaseous detectors as e.g. Micromegas are a fast developing and increasingly used technology. Accordingly there is a growing interest in an enhanced understanding of the formation process of electron avalanches. Especially the variance in electron amplification is influencing the detector performances but is rarely measured and hardly understood.

Using a Single-Electron-Response (SER) setup the variance of the electron amplification process has become experimental accessible. The huge contribution on the total ionization by energy transfer from excited states on quencher molecules (penning effect) and the impact of secondary avalanches have been estimated using Townsend based model calculations. To compare experimental gain variances with the theory driven prediction, simulations have been designed and tuned, simulating avalanche formation on microscopic electron tracking level in Garfield++. This presentation is dedicated to the simulation part.

T 81.7 Mi 18:15 P12

Ageing and Charge Up Measurements for a Micromegas Detector with Resistive Strip Anode — •Helge Danger, Otmar Biebel, Jonathan Bortfeldt, and Ralf Hertenberger — LS Schaile, LMU München

A resistive strip Micromegas Detector (MICRO MEsh GAseous Structure) with 9 cm × 9 cm active area and two-dimensional x-y-strip readout was investigated for radiation damages. The upper anode layer, used for readout, is covered by resistive strips with a resistivity of 100 MΩ/cm. It is formed by 358 copper strips of 150 μm width and 250 μm pitch.

This detector irradiated locally with 7 nA of 20 MeV protons at the Tandem Accelerator in Garching for eleven hours. The proton induced current between mesh and anode was 11 μA. After irradiation the current returned instantaneously to the standard dark-current of a few nA. A total charge of 0.2 C/cm^2 was accumulated in the irradiated area. The gas-gain measured before and after the ageing at 25 reference-positions is compared.

We present results on the comparison of gas-gains for non-irradiated and irradiated areas, on ion back diffusion and on the time dependent behaviour of the mean pulse height at several irradiation rates.

T 81.8 Mi 18:30 P12

Setup and Validation of a Measuring and Calibration Facility for Large Area Micromegas — •Philipp Lösel, Otmar Biebel, Jonathan Bortfeldt, Ralf Hertenberger, Ralph Müller, and Andre Zibell — LS Schaile - LMU München

The LMU Cosmic Ray Facillity (CRF) in Garching consists of two 4 $\times$ 2.2 m^2 large Monitored Drift Tube (MDT) reference chambers for cosmic muon track monitoring with a resolution of about 40 μm. They sandwich a m^2 sized Micromegas detector under investigation, which has 2048 resistive strips with a pitch of 450 μm. Its data is read out with a Scalable Readout System and merged with the MDT reference data. The experimental track position of the Micromegas is compared to the reference track position. With these measurements Micromegas deformations, bending, twist and rotation are determined and will be presented.