T 8: Myondetektoren I

Zeit: Montag 11:00–12:30 Raum: VMP6 HS E

T 8.1 Mo 11:00 VMP6 HS E

MMSW - a large-size micromegas quadruplet prototype: Design and Construction — •Fabian Kuger[1,2], Michele Bianco[2], Hans Danielson[2], Jordan Degrange[2], Rui de Oliveira[2], Eduardo Farina[2], Paolo Iengo[2], Francisco Perez Gomez[2], Givi Sekhniaidze[2], Federico Sforza[2], Ourania Sidiropoulou[1,2], Maurice Vergain[2], Joerg Wotschack[2], Andreas Düdder[3], Tai-Hua Lin[3], and Matthias Schott[3] — [1]Julius Maximilians Universität, Würzburg (Germany) — [2]CERN, Geneva (Switzerland) — [3]Johannes Gutenberg-Universität, Mainz (Germany)

Two micromegas detector quadruplets with an area of 0.5m^2 (MMSW) have been recently constructed and tested at CERN and University of Mainz. They serve as prototypes for the planned upgrade project of the ATLAS muon system.

Their design is based on the resistive-strip technology and thus renders the detectors spark tolerant. The applied ḿechanically floatingḿesh design allows for large area Micromegas construction and facilitates detector cleaning before assembly.

Each quadruplet comprises four detection layers with 1024 readout strips and a strip pitch of 415 μm. In two out of the four layers the strips are inclined by $\pm 1.5°$ to allow for the measurement of a second coordinate. We present the detector concept and report on the experience gained during the detector construction.

T 8.2 Mo 11:15 VMP6 HS E

MMSW - A large-size micromegas quadruplet prototype: Mechanical Accuracy and Basic Performance Parameters — •Ourania Sidiropoulou[1,2], Michele Bianco[1], Hans Danielsson[1], Jordan Degrange[1], Rui De Oliveira[1], Edoardo Farina[4], Fabian Kuger[1,2], Paolo Iengo[1], Francisco Perez Gomez[1], Givi Sekhniaidze[5], Federico Sforza[1], Maurice Vergain[1], Joerg Wotschack[1], Andreas Düdder[3], Tai-Hua Lin[3], Matthias Schott[3], and Chrysostomos Valderanis[3] — [1]CERN, Switzerland — [2]University of Wuerzburg, Germany — [3]University of Mainz, Germany — [4]University of Pavia, Italy — [5]INFN and University of Naples, Italy

Two Micromegas quadruplet prototypes chambers (MMSW) following the general design foreseen for the ATLAS forward muon spectrometer upgrade were constructed and tested at CERN and the University of Mainz. These are the first Micromegas quadruplets ever built.

We report on the mechanical accuracy comprising measurements of the planarity and the alignment of the two faces of a panel as well as panel to panel alignment. Furthermore basic performance parameters such as gain homogeneity after assembly have been tested with cosmic muons and X-ray measurements. These testing procedures, established with the MMSW prototypes, will become part of the quality control and validation procedure for the mass production of the Micromegas New Small Wheel detectors.

T 8.3 Mo 11:30 VMP6 HS E

MMSW - a large-size micromegas quadruplet prototype: Reconstruction Efficiency and Spatial Resolution — •Tai-Hua Lin[1], Andreas Düdder[1], Matthias Schott[1], Chrysostomos Valderanis[1], Michele Bianco[2], Hans Danielsson[2], Jordan Degrange[2], Rui De Oliveira[2], Edoardo Farina[2], Fabian Kuger[2], Paolo Iengo[2], Francisco Perez Gomez[2], Givi Sekhniaidze[2], Ourania Sidiropoulou[2], Maurice Vergain[2], and Jörg Wotschack[2] — [1]Johannes Gutenberg-Universität, Mainz, Germany — [2]CERN, Geneva, Switzerland

One of the upgrades of the ATLAS detector for Run III and beyond is the replacement of the inner part of end cap muon tracking spectrometer with eight layers of resistive micromegas detectors.

The performance of two prototype detectors, MMSW (MicroMegas Small Wheel), that adopt the design foreseen for this upgrade was studied. The prototype detectors were tested at the Mainz Microtron for the spatial resolution, with cosmic rays for the reconstruction efficiency and for high rate tests in the new Gamma Irradiation Facility (GIF++) at CERN. These measurements with analysis methods and results will be presented. First performance results are consistent with the ATLAS New Small Wheel requirements.

T 8.4 Mo 11:45 VMP6 HS E

Improvement of surface planarity measurements by temperature correction and structural simulations — •Maximilian Herrmann[1], Otmar Biebel[1], Jonathan Bortfeldt[1], Bernhard Flierl[1], Ralf Hertenberger[1], Philipp Loesel[1], Ralph Mueller[1], and Andre Zibell[2] — [1]LMU München — [2]JMU Würzburg

Novel micro pattern gaseous detectors, like Micromegas, for particle physics experiments require precise flat active layers of 2-3 m^2 in size. A construction procedure developed at LMU for 2 m^2 sized Micromegas achieves surface planarities with a RMS below 30 μm. The measurements were performed using a laser distance sensor attached to a coordinate measurement machine.
Studies were made to investigate the influence of temperature variations on these measurements. The temperature is monitored by several sensors. We present results containing corrections of the measurements in respect to temperature changes.
In addition simulations with the FEM program ANSYS are compared to measured detector panel deformations introduced by forces, in order to study their effect on the surface planarity.

T 8.5 Mo 12:00 VMP6 HS E

Planarity Certification of ATLAS Micromegas Detector Panels — •Ralph Müller[1], Otmar Biebel[1], Jonathan Bortfeldt[1], Bernhard Flierl[1], Ralf Hertenberger[1], Philipp Lösel[1], Maximilian Herrmann[1], and Andre Zibell[2] — [1]LMU München — [2]JMU Würzburg

During the second long LHC shutdown, 2019/20, the precision tracking detectors of the ATLAS muon spectrometer in the inner end caps will be replaced using Micromegas, a planar gas-detector technology. Modules of 2 m^2 area are built in quadruplets from five precisely planar sandwich panels that define the anodes and the cathodes of the four active detector planes. A panel is composed of three consecutive layers FR4 - aluminum honeycomb - FR4. Single plane spatial particle resolution below 100 μm is achievable when the deviations from planarity of the strip-anodes do not exceed 80 μm RMS over the whole active area and the parallelism of the readout strips is within 30 μm. In order to measure the dimensional accuracy of each panel, laser distance sensors combined with a coordinate measurement system have been investigated. The sensor requirements to measure the planarity of the panels are a resolution of 0.3 μm and a beam spot diameter of ≈ 20 μm, well below 100 μm the size of the smallest structures.
We report on achieved planarities of the panels and the performance of the laser sensor system. A panel with an RMS better than 30 μm was build and the evolution of its planarity due to humidity and temperature effects is shown.

T 8.6 Mo 12:15 VMP6 HS E

Study of APV preamplifier circuits for Micromegas detectors — •Quirin Steinbacher, Otmar Biebel, Jonathan Bortfeldt, Ralf Hertenberger, Philipp Lösel, Ralph Müller, and André Zibell — LMU München

Micromegas detectors are high-rate capable planar gaseous particle detectors with micro structured readout-anodes. The electronic signals are often read out using the analogue frontend chip APV25. An APV25 chip amplifies, buffers in a pipeline and multiplexes 128 analogue output channels on a single analogue output channel which is subsequently digitized by an ADC. A quantitative analysis of data enables the study of potential signal distortion as signal induced global baseline shifts or signal induced cross talk. The combination of two APVs into a pair of master and slave leads to different phases in the transmitted signal which affects the subsequent digitization. Possible signal corrections are deduced and tested for improvement of spatial resolution on experimental data acquired at the Garching Tandem accelerator and the LMU cosmic ray facility.