T 28: Myondetektoren II

Zeit: Montag 16:45–19:00 Raum: VMP6 HS E

T 28.1 Mo 16:45 VMP6 HS E

Messung der Nachweiseffizienz von Myonen am ATLAS-Detektor im LHC-Run-2 — •Nicolas Köhler, Maximilian Goblirsch-Kolb, Oliver Kortner und Hubert Kroha — Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), München

Das Myonspektrometer des ATLAS-Detektors dient dem effizienten Nachweis von Myonen und der präzisen Impulsmessung über einen großen Raumwinkel- und Energiebereich. Für viele Messungen beim ATLAS-Experiment ist eine genaue Bestimmung der Myonnachweiseffizienz notwendig.

Dazu wird die sogenannte Tag-and-Probe-Methode unter Verwendung von gemessenen $J/\psi \to \mu^+\mu^-$ und $Z \to \mu^+\mu^-$-Zerfällen herangezogen. Die Methode und die Ergebnisse für die 2015 bei einer Schwerpunktsenergie von $\sqrt{s} = 13\,\text{TeV}$ aufgezeichneten Daten werden vorgestellt. Die Nachweiseffizienz für Myonen mit Transversalimpulsen zwischen 4 und einigen hundert GeV wurde mit einer Genauigkeit im Promillbereich bestimmt.

T 28.2 Mo 17:00 VMP6 HS E

Untersuchungen zu MicroMegas für das Atlas New Small Wheel Upgrade — •Thorwald Klapdor-Kleingrothaus, Ulrich Landgraf und Stephanie Zimmermann — Institut für Physik, Freiburg, Deutschland

Die Micro Mesh Gasous Detectors (MicroMegas, MM) sind flache und hochratenfeste Detektoren.Die MM Technologie wurde in den vergangenen Jahren intensiv von der New Small Wheel Group (ATLAS) untersucht und verbessert, um das aktuelle Small Wheel des ATLAS Detektors mit großflächigen MicroMegas, zusammen mit sTGC's, während des Long Shutdowns (LS2) zu ersetzen. In diesem Zusammenhang wurden kleinere MicroMegas-Prototypen (10x10cm) hergestellt, deren genauere Untersuchung Einfluss auf die Betriebsparameter der großen, endgültigen Detektoren hat. In diesem Vortrag sollen die bisherigen Studien zusammengefaßt werden und ein Ausblick auf die Messungen mit dem neu entwickelten Aufbau in Freiburg gegeben werden. Des Weiteren wird die Auslese mittels Zebra Connectors (Elastomeric Connectors) vorgestellt und deren Kontaktivität untersucht.

T 28.3 Mo 17:15 VMP6 HS E

Production facility for ATLAS New Small Wheel Drift Panels at JGU Mainz — •Andreas Düdder, Tai-Hua Lin, and Matthias Schott — Johannes Gutenberg-Universität Mainz

The ATLAS Phase-I Upgrade in 2018 includes the replacement of the ATLAS Muon Small Wheel by the so-called New Small Wheel (NSW). Large-scale Micromegas detectors will serve as tracking detectors in the NSW. Parts of these detectors will be constructed at the Johannes Gutenberg University Mainz (JGU).

In order to fulfill the requirements of the envisioned detector performance, a high precision detector construction is crucial. Especially the surface planarity of the produced detector panels has to better than 30 μm over an area of 2 m^2.

Methods for the quality control of the raw material and the constructed parts have been developed and implemented. This talk gives an overview of the production facility at JGU Mainz which is used during the mass production of NSW components in coming years.

T 28.4 Mo 17:30 VMP6 HS E

Construction and Test of sMDT Chambers for the ATLAS Muon Spectrometer — •Eric Takasugi, Korbinian Schmidt-Sommerfeld, Oliver Kortner, and Hubert Kroha — Max-Planck-Institut für Physik, München

In the ATLAS muon spectrometer, Monitored Drift Tube chambers (MDTs) are used for precise tracking measurements. In order to increase the geometric acceptance and rate capability, new chambers have been designed and are under construction to be installed in ATLAS during the winter shutdown of 2016/17 of the LHC. The new chambers have a drift tube diameter of 15 mm (compared to 30 mm of the other MDTs) and are therefore called sMDT chambers. This presentation reports on the progress of chamber construction and on the results of quality assurance tests.

T 28.5 Mo 17:45 VMP6 HS E

Grossflaechige Mikrogitter für ATLAS Micromegas Detektoren — •Andre Zibell, Raimund Ströhmer und Giovanni Siragusa — Julius-Maximilians-Universität Würzburg

Im Zuge der zweiten langen Wartungspause des LHC Beschleunigers 2019/2020 werden die 'Small Wheel' Myonkammern des ATLAS Detektors unter anderem gegen grossflächige und hochratenfeste Micromegas Detektoren ausgetauscht. Die Gesamtmenge dieser Detektoren ist in vier unterschiedliche Modultypen aufgeteilt, deren Serienproduktion 2016 beginnt.

Eine der Schlüsselkomponenten dieser Detektortechnologie sind vollflächige Edelstahl-Mikrogitter. Am Standort Würzburg werden für einen der vier Modultypen die 128 nötigen, je etwa 3 Quadratmeter grossen Mikrogitter auf Transferrahmen gespannt, und im Anschluss auf die Detektormodule umgeklebt.

Es werden die Entwicklung und der Aufbau der nötigen Infrastruktur vorgestellt, sowie die Ergebnisse der Modul0- und frühen Serienproduktion hinsichtlich Homogenität der mechanischen Spannung, Stabilität, Verfahren und Ausbeute präsentiert. Die von ATLAS vorgegebenen Anforderungen wurden bereits bei den ersten Testgittern erfüllt.

T 28.6 Mo 18:00 VMP6 HS E

Quality Control of a 2 m^2 Micromegas Detector for the ATLAS Muon Spectrometer Upgrade Project Using Contact CCDs — Otmar Biebel[1], Ralf Hertenberger[1], •Jeannine Wagner-Kuhr[1], and Hermann Wellenstein[2] — [1]LMU, Munich, Germany — [2]Brandeis University, Waltham, USA

The inner endcap region of the ATLAS muon spectrometer, the Small Wheel, will be upgraded in 2019 using Micromegas detectors to retain the tracking performance after the LHC luminosity upgrade. In the new Small Wheel Micromegas detectors will be arranged in trapezoidal quadruplets of four active layers each and 2-3 m^2 in size. Guaranteeing the design spatial resolution of 100 μm poses a huge challenge for the mechanical precision of each readout plane and the alignment between the 4 planes. We report about a novel optical alignment tool based on Contact CCDs and coded masks which will be used for the quality control during the construction of the Micromegas detectors. Using pictures of an arbitrary cutout of a coded mask on a readout board taken by a Contact CCD the relative position of the mask with respect to the center of the Contact-CCD can be determined on sub μm accuracy. Together with a calibrated reference device the position of masks within a single plane but also within a quadruplet can be measured with high precision allowing to monitor the relative position of the 3 PowerCircuitBoards within a single plane and the relative alignment between the different planes in a quadruplet. In this presentation the ideas of this new optical alignment tool are shown as well as first quality control studies using a Contact-CCD.

T 28.7 Mo 18:15 VMP6 HS E

Calibration of Large Area Micromegas Using Cosmic Rays — •Philipp Lösel[1], Otmar Biebel[1], Jonathan Bortfeldt[1], Bernhard Flierl[1], Ralf Hertenberger[1], Ralph Müller[1], and Andre Zibell[2] — [1]LMU München, Germany — [2]JMU Würzburg, Germany

The high luminosity upgrade of the LHC storage ring implies an upgrade of the Muon Spectrometer of the ATLAS experiment. The presently installed detectors of the inner end-cap region cannot cope with the increased background situation and will be replaced by Micromegas and sTGC detectors. Before installation at CERN, the 2 m^2 sized Micromegas quadruplets (SM2) built in Germany will be calibrated.

The LMU Cosmic Ray Measurement Facility (CRF) consists of two Monitored Drift Tube chambers (MDT) with an active area of about 9 m^2 for muon tracking and two trigger hodoscopes with sub-ns time-resolution and with additional position information along the wires of the MDTs. With an angular acceptance of -30° to +30° the CRF allows for centroidal or μTPC position determination and thus for calibration in three dimensions. Of particular interest are potential deviations in the micro pattern readout structures or potential deformations of the whole detector.

The Performance of the CRF is presently investigated using a telescope of a 1 m^2 and three 100 cm^2 resistive strip Micromegas. We report on the differences in performance between large and small detectors, report on homogeneity of efficiency and pulse height, and present results on deformation and performance of the 1 m^2 Micromegas.

T 28.8 Mo 18:30 VMP6 HS E

A TPC-like Readout Method for High Precision Muon-Tracking using GEM-Detectors — •Bernhard Flierl[1], Otmar Biebel[1], Jonathan Bortfeldt[1], Ralf Hertenberger[1], Felix Klitzner[1], Phillipp Loesel[1], Ralph Mueller[1], and Andre Zibell[2] — [1]Ludwig-Maximilians-Universität München — [2]Julius-Maximilians-Universität Würzburg

Gaseous electron multiplier (GEM) detectors are well suited for tracking of charged particles. Three dimensional tracking in a single layer can be achieved by application of a time-projection-chamber like readout mode ($/mu$TPC), if the drift time of the electrons is measured and the position dependence of the arrival time is used to calculate the inclination angle of the track. To optimize the tracking capabilities for ion tracks drift gas mixtures with low drift velocity have been investigated by measuring tracks of cosmic muons in a compact setup of four GEM-detectors of $100\times100\times6$ mm^3 active volume each and an angular acceptance of -25 to 25°. The setup consists of three detectors with two-dimensional strip readout layers of 0.4 mm pitch and one detector with a single strip readout layer of 0.25 mm pitch. All strips are readout by APV25 frontend boards and the amplification stage in the detectors consists of three GEM-foils. Tracks are reconstructed by the μTPC-method in one of the detectors and are then compared to the prediction from the other three detectors defined by the center of charge in every detector. We report our study of Argon and Helium based noble gas mixtures with carbon-dioxide as quencher.

T 28.9 Mo 18:45 VMP6 HS E

Optimization of the ATLAS (s)MDT readout electronics for high counting rates — Oliver Kortner, Hubert Kroha, Sebastian Nowak, and •Korbinian Schmidt-Sommerfeld — Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), Föhringer Ring 6, 80805 München

In the ATLAS muon spectrometer, Monitored Drift Tube (MDT) chambers are used for precise muon track measurement. For the high background rates expected at HL-LHC, which are mainly due to neutrons and photons produced by interactions of the proton collision products in the detector and shielding, new small-diameter muon drift tube (sMDT)-chambers with half the drift tube diameter of the MDT-chambers and ten times higher rate capability have been developed. The standard MDT readout electronics uses bipolar shaping which causes a deterioration of signal pulses by preceding background hits, leading to losses in muon efficiency and drift tube spatial resolution. In order to mitigate these so-called signal pile-up effects, new readout electronics with active baseline restoration (BLR) is under development. Discrete prototype electronics with BLR functionality has been tested in laboratory measurements and in the Gamma Irradiation Facility at CERN under high γ-irradiation rates. Results of the measurements will be presented.