T 70: Myondetektoren

Zeit: Dienstag 16:45–18:25 Raum: VSH 06

Gruppenbericht T 70.1 Di 16:45 VSH 06

CMS DT muon chambers upgrade — •Daniel Teyssier — III Phys. Inst. A, RWTH Aachen

The CMS Drift Tubes (DT) muon chambers in the barrel will cope with higher pile-up as well as higher background conditions in the next High Luminosity (HL) LHC program. The failure rate of the components inside the gas volume is very low and there is no need to replace the chambers themselves for HL-LHC. But the increase of the trigger rate and the radiation environment requires an exchange of the on-board electronics in the detector. A new mini crate (MiC) is currently studied in order to keep the minimal functionality inside the detector and transfer the trigger level-1 to the service cavern area, which is accessible at any time in case of replacement of one component. Some longevity studies are also performed using the Gamma Irradiation Facility (GIF++) to simulate three times the HL-LHC equivalent dose. The new MiC will be tested in the same way before to be installed in the experimental cavern.

T 70.2 Di 17:05 VSH 06

PoSSuMuS - Position Sensitive Scintillating Muon Detector with SiPM Readout — •Ralph Müller[1], Otmar Biebel[1], Ralf Hertenberger[1], Bernhard Flierl[1], Maximilian Herrmann[1], Philipp Lösel[1], Chrysostomos Valderanis[1], Isabel Frank[1], Felix Klitzner[1], Andre Zibell[2], Thorben Swirski[2], and Jonathan Bortfeldt[3] — [1]LMU München — [2]JMU Würzburg — [3]CERN

A modularized plastic scintillating detector consisting of two optically separated trapezoids is investigated for two dimensional spatial resolution with trigger capability with 160 GeV Muons. Scintillation light is collected by wavelength shifting fibers (WLSFs) and guided to Silicon Photo-Multiplieres (SiPMs). The position resolution in one direction is achieved by comparing the light yield of the two detector halves which is proportional to the path length of the muon in the trapezoid. The second coordinate is calculated by the propagation time of light from the point of creation to the SiPMs on both sides of the module.
Since the spatial resolution depends on the amount of scintillation light detected by the SiPMs, a new trapezoidal shape and an increased fiber diameter was used, compared to former prototypes. Those optimization's lead to a factor three increased light yield and spatial resolution better than 1 *cm*.
We report on optimization of light-output and the spatial resolution of the detector, as well as its dependence on the length of the scintillator, which was studied using 10 *cm* and 30 *cm* long trapezoids.

T 70.3 Di 17:20 VSH 06

Aging Studies of the CMS Drift Tube System — •Cemali Kilinc, Thomas Hebbeker, Carsten Heidemann, Markus Merschmeyer, and Daniel Teyssier — III. Physikalisches Institut A, RWTH Aachen University

In the second phase of the Large Hadron Collider (LHC), the luminosity will be increased by a factor of 5. This means that the CMS Drift Tube (DT) system will be exposed to large integrated radiation dose. The aging of the DT system becomes an important challenge that will be met during phase 2 upgrade. In order to confirm that the DT chambers will be efficient enough for muon reconstruction in these conditions, irradiation tests at high luminosity LHC level and aging simulations are performed.

T 70.4 Di 17:35 VSH 06

Monte Carlo Studies on the Impact of Strip Misalignment on the Resolution of the ATLAS New Small Wheel Micromegas Detectors — •Patrick Scholer, Ulrich Landgraf, and Stephanie Zimmermann — Physikalisches Institut, Universität Freiburg

In the next long shutdown of the LHC in 2019/20, the innermost part of the end cap muon spectrometer of the ATLAS detector will be replaced. The new system is called New Small Wheel (NSW). It will use Micro Mesh Gaseous Detectors(Micromegas, MM) as one of its detector technologies; MMs have a high intrinsic spatial resolution and rate capability of $>15\text{kHz/cm}^2$.

The NSW MM system consists of 64 chambers per wheel. Each chamber has 4 active detection layers, and is build from 3-5 PCBs containing the readout-strips per layer. Therefore the mechanical precision with which readout PCBs can be positioned is a critical factor for the overall position resolution.

In this talk, the spatial resolution of the NSW MMs is investigated via a geometric Monte Carlo simulation by varying the position of the PCBs within the foreseen mechanical tolerances. Also non conformities of the strip pattern on the PCBs are taken into account. Furthermore a contactless position measurement tool will be presented. It uses a high resolution camera mounted on a CMM, which allows multi pattern recognition with a spatial resolution of 30 μm, i.e. to measure large area readout planes.

T 70.5 Di 17:50 VSH 06

Muon Tomography with a Detector Test Facility — •Maximilian Herrmann[1], Otmar Biebel[1], Bernhard Flierl[1], Isabel Frank[1], Ralf Hertenberger[1], Felix Klitzner[1], Philipp Lösel[1], Ralph Müller[1], Chrysostomos Valderanis[1], and André Zibell[2] — [1]LMU München — [2]JMU Würzburg

Cosmic muons are well suited for the calibration of gaseous detectors used for the tracking of minimum ionizing particles. The LMU cosmic ray facility in Garching, built for the calibration of Monitored Drift Tube (MDT) chambers for the ATLAS muon spectrometer, is meanwhile used to calibrate large area micropattern detectors. Two reference MDT chambers are sandwiching the detector under investigation. The track prediction of both MDT chambers is then compared to the hit position reconstructed by the detector under investigation. Using muon entrance angles between 0° and 30° allows for the detection of deviations in the detector geometry from design values in 3D.
In this talk the capability of the cosmic ray facility to detect multiple scattering will be used for muon tomography. Geometrical properties and positions of material between the two MDT chambers can be detected by the reconstruction of the cosmic muon track in both detectors. The intersection of both tracks, when having a relative angle close to the multiple scattering prediction, allows to reconstruct complex objects. This will be demonstrated on the example of a large area Micromegas detector being under investigation between the two reference chambers.

Gruppenbericht T 70.6 Di 18:05 VSH 06

On chamber verification of new TDCs for CMS (DT) muon chamber upgrade — •Carsten Heidemann and Thomas Hebbeker — III. Physikalisches Institut A RWTH Aachen University, Aachen

During the Phase II Upgrade of CMS the on chamber electronics of the CMS (DT) muon chambers will be replaced. Most of the on chamber logic is relocated to the service cavern, allowing access also during data taking periods. Only the time to digital conversion will still be located on the chambers. After testing the FPGA based TDC in the lab, now the required verification is done on a spare chamber. Measurements done on the demonstrator set-up will be presented.