T 93: Detektorsysteme 3 (Kalorimeter, Myonsysteme)

Zeit: Mittwoch 16:45–19:00 Raum: JUR 372

T 93.1 Mi 16:45 JUR 372

Monte Carlo Simulations and Investigation of the Muon-induced Background of the DLB — •Marcel Gerhardt, Claus Gössling, Kevin Kröninger, and Christian Nitsch — TU Dortmund, Physik EIV, D-44221 Dortmund

The Dortmund Low Background Facility (DLB) is a low-background gamma-ray spectrometry system built at ground level. It uses a high-purity germanium detector with a relative efficiency of 60 %, which is set up within an artificial overburden. This overburden consists of a massive outer shielding made of barite concrete and cast iron, corresponding to ten meters of water equivalent. It houses a multi-layer lead castle to shield against environmental radioactivities and uses borated polyethylene as a neutron absorber. Additionally, an active muon veto is installed to reduce the cosmic-induced muon contributions to the spectrum.

The remarkably low background level of the DLB allows radio-purity screening measurements for material preselection and the detection of radionuclides with short halflifes for activation analysis, with sensitivities well below the Bq/kg-level, which is comparable to laboratories located underground.

In this talk the recently completed muon veto of the DLB is presented and estimations of the influence of the residual muonic contribution to the background spectrum using Monte Carlo simulations are given. These are most likely induced by the inefficiency of the used thin plastic scintillators. Therefore, most of them will be replaced by thicker plastic scintillators with a larger sensitive area.

T 93.2 Mi 17:00 JUR 372

Analysis of CERN 2015 Test Beam data of the CALICE Analog Hadronic Calorimeter technological prototype — •Ambra Provenza for the CALICE-D-Collaboration — DESY — Hamburg University

The goal of the CALICE Collaboration is to develop calorimeters for a future e^+ e^- linear collider.

The Analog Hadronic Calorimeter (AHCAL) is a high granularity calorimeter, developed to use the Particle Flow method, to reach a good jet energy resolution. The AHCAL technological prototype, scalable to a full collider detector, is composed of 3×3 cm^2 scintillator tiles read out by Silicon Photomultipliers.

During the year 2015 two periods of test beams at CERN have been performed, to validate the detector calibration with muon and electron beams and to study the shower evolution with hadron beams. In fact a very important and new feature of this prototype is the possibility to have time information of the hits in the detector. The talk will start with an overview of the AHCAL technological prototype and its development.

It will then focus on the analysis of the test beam data taken at CERN with a steel absorber structure. In particular a detailed look into the electrons data will presented. Due to the well known physics of electromagnetic showers, this analysis allows us to understand the behaviour and the performance of the prototype.

This analysis will also allow the validation of the prototype implementation in the Monte Carlo simulation.

T 93.3 Mi 17:15 JUR 372

Time Measurements with the CALICE Analoge Hadronic Calorimeter — •Christian Graf for the CALICE-D-Collaboration — Max-Planck-Institut für Physik, München, Deutschland

The Particle Flow concept (PFA) gives a possibility to enhance the jet energy resolution of multi purpose detectors at future e^+e^- colliders as ILC or CLIC. One requirement for a detector that is optimized for the Particle Flow approach is a calorimeter with a high spatial resolution.

The CALICE Collaboration is developing concepts of highly granular calorimeters. For this purpose, prototypes with different technologies are designed and investigated in various test-beam campaigns. One of these detector concepts is the Analoge Hadronic Calorimeter (AHCAL), which is based on scintillators and Silicon Photomultipliers. The signals are processed by an ASIC that provides the signal amplitude as well as a time measurement. The time information may help to improve the performance of the Particle Flow algorithm, enhance the energy reconstruction and reduce the background. Furthermore, the time structure of hadronic showers can be investigated.

This talk presents an analysis of the time measurements taken in a test-beam run at CERN. Emphasize will be put on the time calibration.

T 93.4 Mi 17:30 JUR 372

Myonen nahe an Jets - Nachweiseffizienz und Unterdrückung von Untergrund durch Sekundärzerfälle am ATLAS-Detektor im LHC-Run-2 — •Johannes Junggeburth, Nicolas Köhler, Hubert Kroha und Oliver Kortner — Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), München

Endzustände mit kollimierten Jets und Myonen sind bei vielen Suchen nach neuer Physik jenseits des Standardmodells ein charakteristisches Element des Endzustandes. Für diese Analysen ist eine genaue Kenntnis der Nachweiseffizienz von Myonen nahe an Jets erforderlich. Da bei der Selektion oftmals die Kriterien an die Isolierung der Objekte abgeschwächt werden, um die Akzeptanz nicht zu verringern, können Untergrundbeiträge von B-, K- oder π-Meson Zerfällen nicht mehr vernachlässigt werden. Um diesen Untergrund zu minimieren werden die Stoßparameter als diskriminierende Variablen verwendet. Der Vortrag diskutiert sowohl die Messung der Nachweiseffizienz von Myonen nahe an Jets als auch die Messung der Effizienz der Schnitte auf die Stoßparametereigenschaften mit Hilfe einer *Tag&Probe*-Messung.

T 93.5 Mi 17:45 JUR 372

Hadronic energy reconstruction in the CALICE combined calorimeter — •Yasmine Israeli for the CALICE-D-Collaboration — Max Planck Institute for Physics, Munich, Germany

The CALICE collaboration develops high granularity calorimeters for future linear electron-positron colliders, ILC and CLIC. These calorimeters aim at detailed reconstruction of the beam interaction final states.

A prototype consisting of three sampling calorimeters, a SiW electromagnetic calorimeter, a scintillator steel hadronic calorimeter and a tail catcher, was tested with hadronic beams at CERN as well as at Fermilab. Due to the sub detectors different geometry, three different calibration factors are being used for the energy reconstruction. These factors are obtained via the use of a χ^2 minimization on data.

Furthermore, in order to improve the calorimeter energy and to compensate for the different energy deposit of hadronic and electromagnetic showers resolution, software compensation methods are implemented. This contribution presents the energy reconstruction and resolution for the full calorimeter system with and without software compensation.

T 93.6 Mi 18:00 JUR 372

Performance tests of GEM chambers for the CMS detector at CERN — •Henning Keller, Thomas Hebbeker, Carsten Heidemann, and Kerstin Hoepfner — III. Physikalisches Institut A, RWTH Aachen University

Gas electron multiplier detectors (GEMs) belong to the category of Micro-Pattern Gas Detectors. They are part of the foreseen upgrade of the CMS muon system targeting the high-luminosity phase of the LHC. In the forward region, large-area GEM chambers will be installed in order to be able to handle high particle rates and increase the geometrical acceptance for physics searches. A special challenge concerning the chamber production is the necessary large (square meter) size to be fabricated with high uniformity and efficiency. Before integration into CMS, the performance parameters of the GEM chambers have to be verified by undergoing several tests. One of the sites performing these tests is located at Aachen. This talk gives an introduction of the design of GEM detectors and discusses the status and results of the performance tests.

T 93.7 Mi 18:15 JUR 372

Betrachtung von Elektronenschauern in einem Hadronen-Kalorimeter-Prototypen für einen zukünftigen Linearbeschleuniger — •Anna Rosmanitz für die CALICE-D-Kollaboration — Institut für Physik, Johannes Gutenberg-Universität Mainz

Die CALICE-Kollaboration entwickelt Kalorimeter für zukünftige Linearbeschleuniger wie das ILC. Diese Kalorimeter sollen möglichst hochgranular sein, um die Anwendung von Particle Flow Algorithmen zu ermöglichen und so die Rekonstruktion von Jets und die Identifi-

kation einzelner Teilchen zu verbessen. Im ILC sollen Elektronen und Positronen in Trains von 1 ms beschleunigt werden, die von strahlleeren Zeiten von 199 ms unterbrochen werden. Deswegen soll auch das Auslesesystem nicht durchgängig betrieben werden, sondern es soll das sogenannte Powerpulsing verwendet werden, bei dem nicht benötigte Komponenten des Detektors auf inaktiv geschaltet werden. Dadurch können z.B. die Kühlsysteme und der Energieverbrauch im Detektor minimiert werden.

Ein von CALICE entwickelter hadronischer Kalorimeterprototyp wurde 2016 erstmals in einem Testbeam am DESY mit Elektronenstrahlen unterschiedlicher Energien mit Powerpulsing verwendet. In diesem Vortrag wird die Analyse dieser Daten vorgestellt, wobei die Schauerform und der Einfluss des Powerpulsing untersucht werden.

T 93.8 Mi 18:30 JUR 372

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

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 were designed and constructed in Munich, then installed in ATLAS over the past few months. 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 results of quality assurance tests both during and after construction, as well as the commissioning and installation of the chambers at the ATLAS detector.

T 93.9 Mi 18:45 JUR 372

Light yield characterization of single channels for the AHCAL — •Saiva Huck for the CALICE-D-Collaboration — Universität Hamburg

The light yield of the active single channels for the Analog Hadron Calorimeter (AHCAL) was characterized and compared.
The AHCAL is a highly granular prototype hadron calorimeter with 8 million single channels designed by the collaboration Calorimeter for Linear Collider Experiment (CALICE) for the International Linear Collider (ILC). One channel consists of a $29.60 \times 29.60 \times 2.98\,\mathrm{mm}^3$ plastic scintillator tile which is wrapped in reflective material and read out via a Silicon Photomultiplier (SiPM).
The light yield of scintillator tiles from different producers, wrapped in different materials and read out by SiPMs from 3 producers was measured as function of SiPM voltage using electrons from a ^{90}Sr source at the Institute for Experimental Physics of the University of Hamburg. The results were evaluated with respect to the requirements of the ILC.
A number of combinations were found which fulfill the light yield goal of the CALICE collaboration and can be used in the AHCAL prototype.