T 70: Kalorimeter II

Zeit: Mittwoch 16:45–18:30 Raum: VMP6 HS E

T 70.1 Mi 16:45 VMP6 HS E

Vergleich von hoch-granularen hadronischen Kalorimeter-Konzepten — •Coralie Neubüser für die CALICE-D-Kollaboration — Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, 22607 Hamburg — Universität Hamburg, Institut für Experimentalphysik, Luruper Chaussee 149, 22761 Hamburg

Innerhalb der CALICE (Calorimeter for International Linear Collider) Kollaboration werden verschiedene Kalorimeter-Konzepte, optimiert für Particle Flow Algorithmen, für einen zukünftigen e^+e^- Linearbeschleuniger getestet. Zwei der hadronischen Kalorimeter Konzepte, das auf Widerstandsplattenkammern (RPCs) basierende digitale hadronische Kalorimeter DHCAL mit einer Granularität von (1x1) cm^2 und digitaler Datenauslese, sowie das analoge hadronische Kalorimeter AHCAL welches Plastik-Szintillatoren analog mit einer Granularität von (3x3) cm^2 ausliest, werden hier vorgestellt. Energierekonstruktions-Methoden und Gewichtungs-Prozeduren werden anhand aufgenommener Teststrahl-Daten der Prototypen verglichen und deren Kalibration und Energieauflösung analysiert. Die Ergebnisse und das Verständnis der Technologien werden mit GEANT4 Simulationen untermauert.

T 70.2 Mi 17:00 VMP6 HS E

Studies towards optimisation of the Analog Hadronic Calorimeter for future linear collider detectors — •Huong Lan Tran for the CALICE-D-Collaboration — Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, 22607 Hamburg

The Analog Hadronic Calorimeter (AHCAL) is a highly granular calorimeter developed in the CALICE collaboration for future linear collider detectors. Its design concept is based on 3×3 cm^2 scintillator tiles readout by Silicon Photomultipliers (SiPM). With this design the ambitious required jet energy resolution of 3-4 % can be achieved using the Pandora Particle Flow Algorithm (PandoraPFA). Recent discussions concerning the overall size and cost of the ILD detector has triggered new studies to optimise AHCAL cell size. A smaller number of cells can reduce the detector cost but the corresponding larger cell size can lead to a degradation of the jet energy resolution. The AHCAL optimisation study therefore has to achieve the best balance between physics performance and cost.

Recent studies using the latest version of PandoraPFA with improved pattern recognition have shown significant improvement of jet energy resolution. Moreover, a better energy reconstruction of single particles, in which software compensation plays an important role, can lead to further improvements. This talk will discuss the software compensation technique and its impact on the final cell size optimisation.

T 70.3 Mi 17:15 VMP6 HS E

The Time Structure of Hadronic Showers in Calorimeters with Gas and Scintillator Readout — •Philipp Goecke for the CALICE-D-Collaboration — Max-Planck-Institut für Physik , Munich, Germany

The focus of the CALICE collaboration is R&D of highly granular calorimeters. One of the possible applications is in a future TeV-scale linear e^+e^- collider for precision SM studies and for direct and indirect the search of new physics. For the hadronic sampling calorimeters subsystem, several absorbers and active material technologies are being investigated.

In this frame, two similar experiments have been conducted to study the time structure of hadronic showers: FastRPC uses resistive plate chambers technology for the active layers whereas T3B is based on scintillating tiles coupled to SiPMs. The high sampling frequency of the readout, coupled to deep memory buffers, allows to carefully investigate the intrinsic time structure of hadronic showers with its prompt and delayed components. This study presents a detailed GEANT4 Montecarlo simulation of the FastRPC and T3B setups. It is aimed to reproduce test beam data acquired at CERN SPS where the setups were installed after 5λ of instrumented tungsten-based calorimeter prototypes. The main focus of the simulation lies on the physical processes involved in the time development of an hadronic showers, to asses the discrepancy that emerged in data for the two setups in the intermediate time range of 10 - 50 ns of shower development that can be explained with the neutron interactions in the medium.

T 70.4 Mi 17:30 VMP6 HS E

Timing measurement in the CALICE AHCAL. — •Eldwan Brianne for the CALICE-D-Collaboration — Deutsches Elektronen-Synchrotron DESY, Notkestraße 85, 22607 Hamburg — Universität Hamburg, Institut für Experimentalphysik, Luruper Chaussee 149, 22761 Hamburg

The CALICE Collaboration is developing highly granular calorimeters for a future e^+e^- linear collider. The development of the calorimeters is driven by the Particle Flow (PFA) concept in order to achieve a jet energy resolution of 3-4 %. The Analog Hadronic Calorimeter (AHCAL) is one of the detector concepts based on 3x3 cm^2 scintillating tiles read out by Silicon Photomultipliers and processed by an ASIC (SPIROC2B) capable to measure timing.
A second generation engineering prototype of the AHCAL is developed to focus on the full scalabilty of the detector and features, in addition to amplitude measurements, timing measurements at a single cell level. It was tested at the CERN SPS in summer 2015 with two different absorber materials, steel and tungsten, in muon, electron and hadron beams. This talk will focus on the timing capabilities of the AHCAL prototype and the possible influence on PFA reconstruction.

T 70.5 Mi 17:45 VMP6 HS E

Calibration of the hadronic calorimeter prototype for a future lepton collider — •Sarah Schröder und Erika Garutti für die CALICE-D-Kollaboration — Institute for Experimental Physics, Hamburg University, Luruper Chaussee 149, D-22761 Hamburg, Germany

The CALICE AHCAL technological prototype is a hadronic calorimeter prototype for a future e^+e^- - collider. It is designed as a sampling calorimeter alternating steel absorber plates and active readout layers, segmented in single plastic scintillator tiles of $3 \times 3 \times 0.3\,\mathrm{cm}^3$ volume. Each tile is individually coupled to a silicon photomultiplier, read out by a dedicated ASIC with energy measurement and time stamping capability. The high granularity is meant to enable imaging and separation of single showers, for a Particle Flow approach to the jet energy measurement. The prototype aims to establish a scalable solution for an ILC detector. A total of 3456 calorimeter cells need to be inter-calibrated, for this the response to muons is used. The calibration procedure will be presented and the statistic and systematic uncertainties will be discussed, which have a direct impact on the constant term of the calorimeter energy resolution.

Additionally, the MIP yield in number of fired SiPM pixels can be compared between the muon calibration and a test bench calibrations obtained using a Sr source on the single tiles before the assembly of the calorimeter. A good correlation would enable pre-calibation of the single channels on the test bench to be portable to the assemble detector. This hypothesis is checked with the present work.

T 70.6 Mi 18:00 VMP6 HS E

Energy Corrections from Dijet balance at CMS at 13TeV — •Nataliia Kovalchuk, Marc Stoever, Hartmut Stadie, and Peter Schleper — Universität Hamburg, Institut für Experimentalphysik (Hamburg)

This contribution describes the jet energy correction used by the CMS experiment at the Large Hadron Collider (LHC). Due to colour-confinement, high-energy quarks and gluons emerging from hard interactions undergo hadronisation and lead to the formation of hadronic jets. In order to use hadron jets as probe of a hard process, it is crucial to measure precisely the jet energy. A factorised approach is used to correct reconstructed jets for detector effects. In particular the pseudorapidity dependence of the jet energy response is removed. This study uses pp collision data at center-of-mass energy of 13 TeV, corresponding to an integrated luminosity of 2.11/fb.

T 70.7 Mi 18:15 VMP6 HS E

NA62 Hadronic calorimeters performance in 2015 data taking — •Letizia Peruzzo for the NA62-Collaboration — Institut für Physik JGU Mainz

In June 2015 the NA62 experiment at CERN began its physics data taking with the aim to collect in three years around 100 $K^+ \to \pi^+\nu\bar{\nu}$ events and measure the branching ratio with a precision about 10%. Well predicted inside the Standard Model, $Br(K^+ \to \pi^+\nu\bar{\nu}) = (9.11 \pm 0.72) \cdot 10^{-11}$, this decay is closely related to the CKM matrix elements $|V_{td}|$ and $|V_{ts}|$ and any deviation from the theoretical *Br* could open many scenarios of physics beyond the Standard Model. Only 7 candidates with large background were detected by a previous experiment at BNL. For this reason the NA62 experiment will reduce the background coming from the main K^+ decays as much as possible. In particular the misidentification of μ^+ as π^+ needs to be minimized. The NA62 hadronic calorimeters, called *Muon Veto1&2*, have then a double task: suppressing those decays with muons in the final state at trigger level and taking part in the full particle identification system. This talk describes and presents the results from the *MUV1&2* detectors in the 2015 NA62 data taking.