CALICE presentations at LCWS – Calorimetry Session

SiW ECAL

Hadronic interactions in the SiW ECAL
Roman Pöschl, Naomi van der Kolk for the CALICE Collaboration

The highly granular calorimeters being developed by the CALICE collaboration for the application of Particle Flow Algorithms can provide an important comparison for the development of Monte Carlo modeling of hadronic showers because they provide a detailed measurement of hadronic interactions in terms of global shower observables.
We have studied interactions of negatively charged pions in the highly granular CALICE silicon-tungsten electromagnetic calorimeter (Si-W ECAL) prototype in the energy range of 2 to 10 GeV and compared various hadronic shower observables to different Monte Carlo models as contained in the simulation toolkit Geant4.
The Si-W ECAL is sensitive to the start of the hadronic shower and we have developed an algorithm optimised to find interactions at small hadron energies and can identify the interaction point with an accuracy of ± 2 layers at an efficiency of at least 49% at 2 GeV and at least 79% at 10 GeV. The studied low energy range allows to observe effects of the transition between the cascade and string models in the Monte Carlo descriptions.

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Study of the response of the CALICE Si-W ECAL physics-prototype to positrons
Yohei Miyazaki for the CALICE Collaboration

An electromagnetic calorimeter (ECAL) physics prototype for ILC was constructed and tested with positron beams at FNAL in 2008. The physics prototype for ECAL is high granularity silicon-tungsten sampling calorimeter. In this talk, we will report the response of the linearity and energy resolution with collected positron data.

DHCAL

Status of the CALICE Digital Hadron Calorimeter - DHCAL
Jose Repond for the CALICE Collaboration

The Digital Hadron Calorimeter (DHCAL) is a large scale

prototype of an imaging calorimeter, using Resistive Plate Chambers (RPCs) as active media. The calorimeter counts close to 500,000 readout channels (=world record in calorimetry) and is the first truly imaging hadron calorimeter ever built and tested.
In this talk we will review the current status of the project, providing an overview of the past test beam activities and summarizing the ongoing R&D.
This project is an integral part of the international CALICE collaboration.

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Calibration of the CALICE Digital Hadron Calorimeter - DHCAL
Burak Bilki for the CALICE Collaboration

The Digital Hadron Calorimeter (DHCAL) is a large scale prototype of an imaging calorimeter, using Resistive Plate Chambers (RPCs) as active media. The calorimeter counts close to 500,000 readout channels (=world record in calorimetry) and is the first truly imaging hadron calorimeter ever built and tested.
In this talk we will describe various approaches to calibrate the response of individual chambers in the stack, such that effects of varying efficiency and pad multiplicities are minimized.
Results on the linearity and resolution for pions in the 4 - 60 GeV range will be shown.
This project is an integral part of the international CALICE collaboration.

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Software Compensation Studies with the CALICE DHCAL
Lei Xia for the CALICE Collaboration

The Digital Hadron Calorimeter (DHCAL) is a large scale prototype of an imaging calorimeter, using Resistive Plate Chambers (RPCs) as active media. The calorimeter counts close to 500,000 readout channels (=world record in calorimetry) and is the first truly imaging hadron calorimeter ever built and tested.
For most of the energy range the response to electrons and hadrons differ in the DHCAL, leading to a degradation of the hadron energy resolution. The difference in response is in part due the saturation of the electron signal with increasing energy.
In this talk we will describe software compensation studies which aim at improving the hadron energy resolution. The technique is based on the assumption that the local density of hits is correlated to the number of particles contributing to the signal of a given pad.

The method is applied to simulated electron and pion showers in the DHCAL. The studies cover the configurations with both iron and tungsten absorber plates.
This project is an integral part of the international CALICE collaboration.

SDHCAL

Results of energy resolution of the SDHCAL technological prototype
Arnaud Steen for the CALICE Collaboration

The SDHCAL prototype that was completed in 2012 was exposed to beams of pions, electrons of different energies at the SPS of CERN for a total time period of 5 weeks. The data are being analyzed within the CALICE collaboration. Preliminary results indicate that a highly granular hadronic calorimeter conceived for PFA application is also a powerful tool to separate pions from electrons. The SDHCAL provides also a very good resolution of hadronic showers energy measurement. The use of multi-threshold readout mode shows a clear improvement of the resolution at energies exceeding 30 GeV with respect to the binary readout mode. Simulation of the pion interactions in the SDHCAL will be presented and new ideas to improve on the energy resolution using the topology of hadronic showers will be mentioned.

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Tracking in hadronic showers in the SDHCAL protoype using Hough Transform
Imad Laktineh for the CALICE Collaboration

High-granularity hadronic calorimeters such the semi-digital hadronic calorimeter (SDHCAL) developed by the CALICE collaboration and proposed do for the future ILD detector reveal hadronic shower with unprecedented details. A precise description of hadronic showers, allows a better application of the PFA algorithms and improve their energy estimation.
Traveling tracks in the calorimeter can be very useful for this purpose. They can also be used to control the detector during operation by providing a tool to estimate their efficiency. In this framework, a tracking method based on Hough Transform has been tested on hadronic events within the SDHCAL calorimeter and yield promising results.

WAHCAL

Analysis of CALICE W-AHCAL data at 1 - 100 GeV
Eva Sicking for the CALICE Collaboration

Results from the analysis of electron and hadron data with beam momenta from 1 to 100 GeV recorded at the CERN PS and SPS in 2010 and 2011 by the CALICE Scintillator-Tungsten HCAL will be presented. The detector response and the energy resolution will be discussed. The results are compared to Geant4 simulations.

WDHCAL

Calibration of the W-DHCAL test beam data
Christian Grefe for the CALICE Collaboration

The CALICE digital HCAL prototype using 54 RPC layers as active elements was tested at the CERN PS and SPS beam lines together with tungsten absorber plates, covering beam momenta from 1 GeV up to 300 GeV. We present the current status of the on-going data analysis and will discuss the quality of the data and the calibration procedure that is necessary to normalize the response of the different RPC modules.