21st International Conference on Computing in High Energy and Nuclear Physics **CHEP2015** Okinawa Japan: April 13 - 17, 2015

Contribution ID: **83** Type: **oral presentation**

Energy Reconstruction using Artificial Neural Networks and different analytic methods in a Highly Granularity Semi-Digital Hadronic Calorimeter.

Tuesday 14 April 2015 18:15 (15 minutes)

The Semi-Digital Hadronic CALorimeter(SDHCAL) using Glass Resistive Plate Chambers (GRPCs) is one of the two hadronic calorimeter options proposed by the ILD (International Large Detector) project for the future (ILC) International Linear Collider experiments.

It is a sampling calorimeter with 48 layers. Each layer has a size of 1 m^2 and finely segmented into cells of 1 cm^2 ensuring a high granularity which is required for the application of the Particle Flow Algorithm (PFA) in order to improve the jet energy resolution which is the corner stone of ILC experiments.

The electronic of SDHCAL provide 2-bit readout. It is equiped with power pulisng mode reducing the power consumption and thus heating related problems.

The performance of the SDHCAL technological prototype was tested successfully in beam tests at CERN during 2012. The next beam test will take place at CERN in December 2014 with new improvements in hardware developments. Results of this test beam will be shown.

One of the main points to be discussed concerns the energy reconstruction in SDHCAL.

Based on Monte Carlo Simulation of the SDHCAL prototype with Geant4, we will show different analytic energy reconstruction methods. We will present the single particle energy resolution and the linearity of the detecor response to hadrons obtained with these methods.
In particular, we will highlight a new approch based on the Artificial Neural Networks used in the energy reconstruction and giving promising results compared to the classical analytic methods.
Results will be presented for both simulation and real data in the aim to compare them.
In the same context, we will discuss the application of The Artifical Neural Network to purify the beam test data from contamination.
Results of particle separation obtained with the Artificial Neural Network will be shown and compared to classical event selection methods.

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Session Classification: Track 2 Session

Track Classification: Track2: Offline software