High Granularity Semi-Digital Hadronic Calorimeter Using GRPCs

A Semi-Digital Hadronic Calorimeter using Glass Resistive Plate Chambers (GRPCs) is one of the calorimeters candidates proposed for particle physics experiments at the future electrons collider. It is a high granular calorimeter which is required for application of the particle flow algorithm in order to improve the jet energy resolution as one of the main goals.

**The Glass Resistive Plate Chamber**

- Resistor material coatings: Graphite / Licron / Statguard
- Glass plate: Borosilicate. (Cathode 1.1 mm / Anode 0.7 mm)
- Gas mixture: TFE 93.5 %, CO2 5 %, SF6 2 %
- Gas distribution: Capillary tubes drives channeled inlets.
- Spacers: 1.2 mm ceramic balls + a few 8mm diam. disk.

**The SDHCAL Prototype - Mechanical Structure**

Construction of the SDHCAL prototype 460800 electronics channels And self-supporting mechanical structure 50 units (>5 $\lambda$) working with power-pulsing

**Geant4 Simulation and Energy Reconstruction**

Reconstructed Energy: $E_{reco} = (a \times N_{12} + b \times N_{12} + c \times N_{83})$

**Electronic For GRPCs SDHCAL**

ASiCs: HARDROC2
- One ASIC manage 8x8 (64 channels)
- 1cm² sensitive PADs.
- Triggerless mode
- Memory depth: 127 events
- Semi-digital ASiCs: 3 thresholds
- Range: 10 fC - 30pC
- Power-pulsed-$\phi$-consumption< 10µW/ch

**Large Electronics**

DIF: FPGA-based DAQ talking through USB with Xdaq

**TestBeam Cern SPS May 2012**

Test Beam Data 50 GeV Pion

**Shower Profile Comparison with Monte Carlo simulation 50 GeV Pion**

Yield 93%