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Semi-Digital Hadronic Calorimeter

Introduction

One of the innovative concept to be fully tested by the CALICE collaboration is the one of a semi-digital hadronic calorimetry where the deposits from the hadronic showers are recorded with a fine (1×1 cm² cells, 40-50 layers) granularity with only a coarse energy information (2 - 3 thresholds). Based on gaseous sensor (GRPC or MICROMEGAS chambers) the proposed detector also includes, for the first time memory capable and power pulsed embedded readout chips.

This page present the effort of the groups toward the construction and beam test of a full 1 m³ prototype, including most of the dependancies implied by the running at the ILC, totalling 400000 channels.

Detectors

MICROMEGAS

One possibility for a gaseous HCAL active medium is the Micro Mesh gaseous structure (MICROMEGAS), a detector based on the micro-pattern detector technology, today widely used by many experiments: COMPASS, CAST, NA48, n-TOF, T2K and the ILC TPC project. First prototypes consist of a commercially available fine mesh which separates the drift gap (3 mm) from the amplification gap (128 μm). This simple structure allows full efficiency for MIPs and thanks to thin pillars, provides a good uniformity over the whole surface. The rate obtained with Micromegas chamber is not constrained, as it is the case for the Glass RPC. Moreover the tiny size of the amplification avalanche, results in fast signals without physical cross talk and leads to low multiplicities. The chosen bulk technology based on industrial PCB processes, offers a robust detector with no working voltages higher than 500 V. MICROMEGAS are therefore a very appealing possibility to equip a DHCAL optimized for the PFA. Reference Paper : MICROMEGAS chambers for hadronic calorimetry at a future linear collider C Adloff et al 2009 JINST 4 P11023

GRPC

- Simple
- Drawings
- MultiLayers

Electronics

Very Front-end Electronics

The readout will be done with embedded HARDROC or DIRAC able to store the hits above 3 thresholds for 64 channels with very low consumption (using power pulsing techniques)

Digital Interface Electronics

- DIF: Digital InterFace board
- DCC: Digital Concentrated Card
- LDA: Link-Data aggregator

Data Acquisition

- ODR: Off-Detector Receiver

The presentation of the SdHCal can be found here;

The DIF Geometry file (May & August) : Slot1_39_Geom.txt

The Trivent Documetation : Trivent_user_manuel.pdf

Presentation in conference.

List of Run used for the CALICE note CAN-037.

Beam Energy (GeV)	Runs
7.5	715695
10	715692 , 715693
15	715699
20	714565 ,715675
25	715700 ,715703
30	714562, 715671 ,715747
40	714561, 715651 ,715748
50	715751, 715551, 715612, 715596, 715595, 715594, 715593 ,714556
60	715511, 715531 ,715753
70	714547, 715493 ,715754
80	14470, 715480, 715491 ,715756

low consumptionILC dependancies

- Zero suppression
- Differed readout
- Excellent geometric resolution, suitable for the PFA techniques adopted by the ILD and SiD concepts.

Implied Groups

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MailingList

HARDROC
: Hadronic RPC Detector ReadOut Chip, a very front-end readout chip

DIRAC
: DIRAC: DIgital Readout Asic for hadronic Calorimeter, a very front-end readOut chip

-- VincentBoudry - 12 Sep 2008

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