



the CALICE test beam set-up and running experience

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The CALICE test beam effort



CALICE test beams:

tasks of the prototypes tests:

- Establish the technology of each calorimeter
- operate combined system
- Collect hadronic showers data with unprecedented granularity to
 - tune reconstruction algorithms
 - validate existing MC models

test beam requirements:

- e beam 1 50 GeV
- π^{\pm} , p, \overline{p} beam 1 100 GeV
- μ beam for calibration
- tracker with ~ 100 μ m resolution
- DESY 2006 Si-W ECAL CERN 2006 Si-W ECAL + AHCAL + TCMT DESY 2007 Sci.-W ECAL



IECA

DESY electron test beam

→ Energy and angle scan completed GOAL angles 0 deg 10 deg 20 deg 30 deg 45 deg per (k Evt.) (k Evt.) (k Evt.) (k Evt.) angle total : (GeV)





DESY electron test beam





The CERN installation









July - Nov. 2006 CALICE detectors installed in the H6b experimental hall at the CERN SPS

successful commissioning

Hadron (electron) beam 6 - 100 (50) GeV





Steps towards a clean physics data sample:

- 1) Optimize beam → tune magnets, collimators, secondary trg, abs
- 2) Separate $e/\pi \rightarrow$ Cherenkov detector (for $E_{beam} < 40 \text{ GeV}$)
- 3) Identify beam impact point on ECAL \rightarrow 3 x/y pairs of MWPC with double readout
- 4) Tag multi-particle events → amplitude r/o of 1cm thick scint. counter (veto)
- 5) trigger physics with high efficiency \rightarrow trigger system

→ Store event by event info from 2) 3) 4) 5) in the common DAQ



muon calibration runs



parasitic muon calibration:

- before and after main data taking periods
- high intensity (DAQ @ max rate, 130Hz)
- wide distribution (1x1 m² covered uniformly)
- high statistics (> 50 M events)
- AHCAL and TCMT calibrated at various operation voltages





electron runs



Tertiary e- 6-45 GeV, from 50 GeV beam

ECAL em program

- ECAL rotation: 0,10,20,30 deg

AHCAL em program

- remove ECAL
- establish calibration chain on understood phys. process





pion runs

combined system needed to study hadronic showers



data collected at 0° incident angle only

from 50 GeV secondary beam:

E [GeV]	Pion	E [GeV]	Electron
80	~1.2M	45	~600 k
60	~1.2M	40	~600 k
50	~1.2M	30	~600 k
40	~1.2M	20	~600 k
30	~1.2M	10	~600 k

from 10 GeV secondary beam:

E [GeV]	Pion	E [GeV]	Electron	
20	~120k	20	~50k	
15	~300k	15	~200k	
10	~100k	10	~120k	
6	~250k	6	~50k	

E. Garutti



The tools for data taking

the online monitor





The tools for data taking

the slow control

HV Main HV T - 20 HV 21 - 40 monitoring Voltage [V] Current [uA] 1 39,90 79 2 39,70 171 3 69,20 37 4 41,10 155 5 71,30 40 6 42,90 71 7 42,70 182	Switch On / Off Set [V] Initial [V] I 33.90 I 10.00 I 39.70 I 10.00 I 41.10 I 10.00 I 41.10 I 10.00 I 71.30 I 10.00 I 42.90 I 10.00 I 42.70 I 10.00	comments IN I mod 4a r cd I mod 4b,3a r cd I mod 5b,18b r cd I mod 5b,18b r cd I mod 6a r cd I mod 6b r cd I mod 8b r cd	V ON, HV NIT	V RAMP up/down LV OFF, CMB	HV OFF OFF 200 -150 -100	-control SiPM voltages and LED monitoring system -r/o relevant monitor par. -collect beam parameters -send all to the DAQ
8 42,80 78 9 41,90 136 10 42,20 158 11 39,90 149 12 45,10 104 13 40,60 129 14 40,10 132 15 40,70 123 16 41,51 164 17 74,30 66 18 40,80 176 19 43,60 80 20 77,70 62	I 42.80 I 10.00 W Ramp OFF I 41.90 I 10.00 W Ramp OFF I 42.20 I 10.00 W Ramp OFF I 33.90 I 10.00 W Ramp OFF I 45.10 I 10.00 W Ramp OFF I 40.60 I 10.00 W Ramp OFF I 40.70 I 10.00 W Ramp OFF I 40.70 I 10.00 W Ramp OFF I 41.50 I 10.00 W Ramp OFF I 43.60 I 10.00 W Ramp OFF I 77.70 I 10.00 W Ramp OFF	I mod 8b I of a,14a I mod 9b,19a I of a,14a I mod 9b,19a I of a,17b I mod 11a,17b I of a,17b I mod 11b I of a,17b I mod 12a,15a HEI I mod 13a,13b Feeta I mod 14b,7a I mod 18a,21a I mod 19b rec	hill hill hill hill 22:20	23:20 23:50 6 05,10,2006 05,10,2006 From file edit fi: 2NLY HV OFF ONLY LV HV Crate ON HV Crate HV 1 detail HV 4 de HV 2 detail HV 5 de U 3 detail LV det dump ALL values (posit	50 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	PREL to eLog CLOSE v 3.1.6 22 23 24 Image:
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Impressive data collection



36 days of data taking granted by CERN beam duty cycle ~ 60% detector up-time > 95%

(including ECAL + AHCAL + TCMT + DAQ) 70 M events on tape including calibrations

160 140 number of shifts covered 120 100 80 60 40 20 0 Russia tores Germany Norway en Rep. Natocco 56 people in shift !!! from 9 countries and as much of engineers on board for the more specific technical aspect

Shift sharing in the collaboration



Conclusion





Outlook / Plan for next run

Next installation at CERN with:

- fully commissioned detectors
 - all 38 layers for AHCAL
 - all 30 complete layers for ECAL

movable stage for ECAL+AHCAL →
hadronic showers from 0° to 30°

Also wanted: -Pion / proton separation -Low energy hadrons (< 6 GeV)

 \rightarrow The analysis of the data taken is ongoing

✓ Yery good connection established with the CERN team
✓ 6 weeks test beam time granted in Jul.-Aug. 2007 @ CERN
November 2007 the whole CERN system moves to FermiLab

