Data Quality Studies

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Introduction

Large amount of data on tape & coming which
 we want to analyse!!

    ======> Check the quality of our devices e.g HCAL

Define a Run Status: Good, Medium, Bad
    - *all Information had to be stored in a DB*

Data Quality Tools

- RootTreeWriter:

    - Modular Root-Ntuple where Engines can be switch on/off.
    - Starting point: LCIO files

  Engines: Trigger, Ecal ,Hcal, Tcmt & Drift Chamber

  Root-Ntuples: only each 10th event is stored
                    ----> 35M size for 25Kevts

Data Quality Ntuple Production

- Production:
  Input:
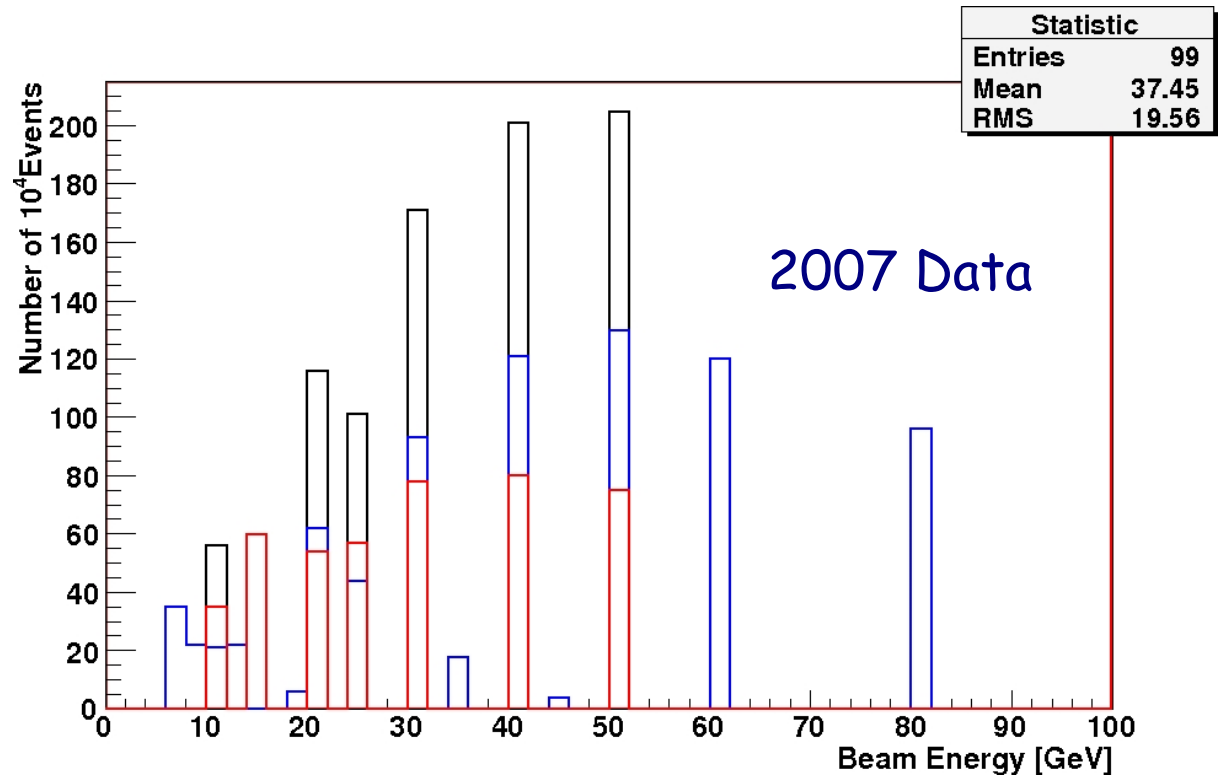   RunNumber
  Output:
    Root Ntuple,
    Log-file,
    DQ Summary List

~100 Runs processed: having different test beam configurations

Data Quality Information

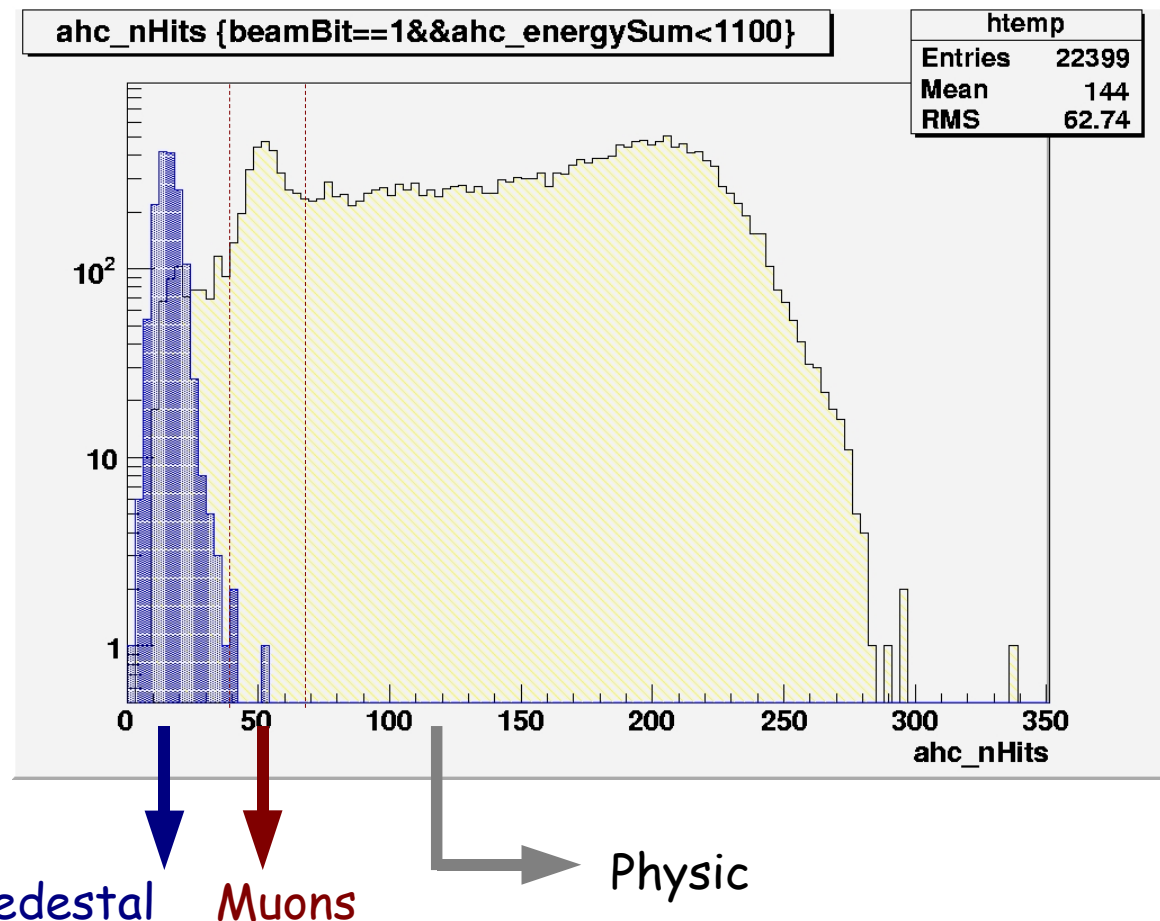| From: Elog	From: DQ Root-Ntuple
Run Number	# of total Events
Number of Events	# of Beam-events
x,y, Θ	# of Pedestal, muon-like & Physic events
	# of π, contained π & e
	Pedestal mean (mip)
	Mip-like mean (mip)
	reconstructed Energy (GeV)
	DC x,y, x-rms,y-rns
	x-cog, y-cog of Ecal

Event Classification

Number of events in a Run:

- Pedestal tagged by random trigger
- Muons tagged by beam trigger
- Physics events tagged by beam trigger
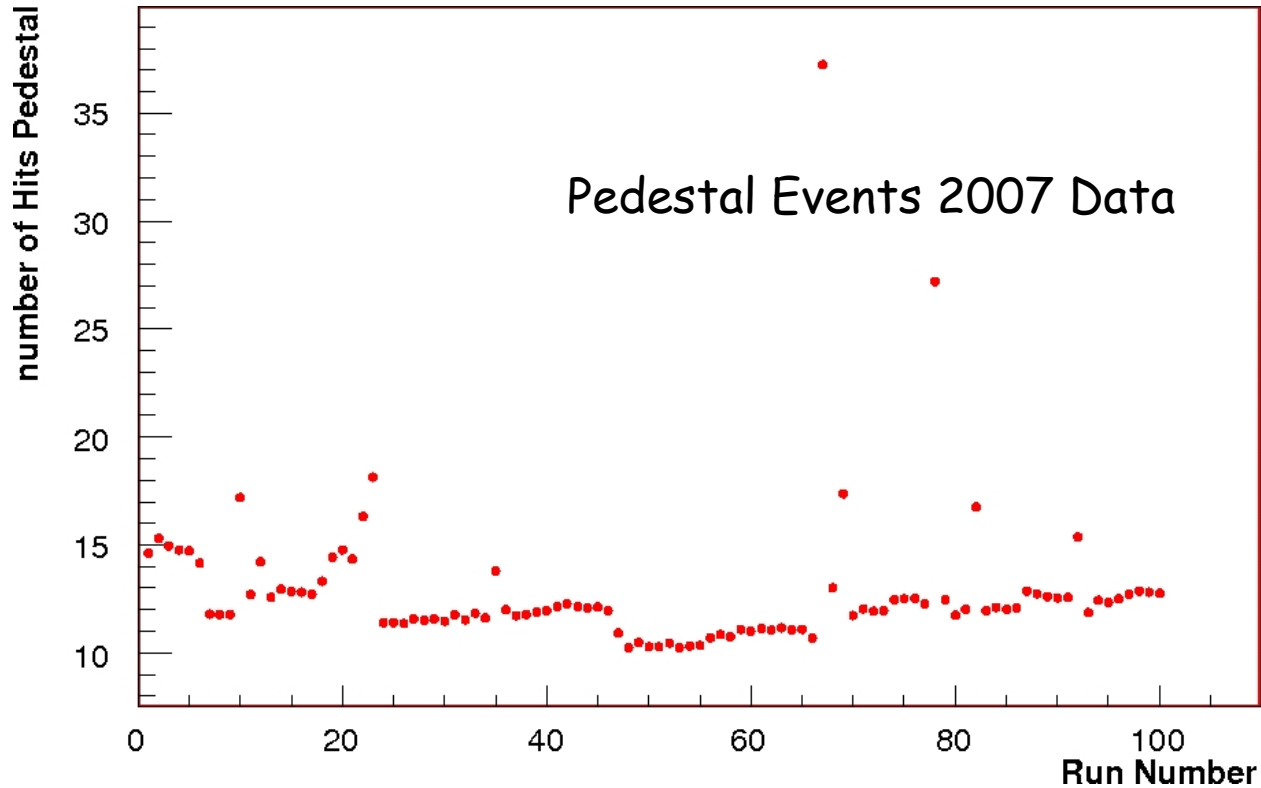
a) Stability of the detector

    - # of hits of Pedestal & muons events

b) How many events do we have for physic analysis?

ahc_nHits {beamBit==1&&ahc_energySum<1100}

htemp	
Entries	22399
Mean	144
RMS	62.74

Pedestal   Muons   Physic

Number of Hits of Pedestal events

Pedestal Events 2007 Data

- Average noise level ~ 11-12 hits/event expected
- List of noisy runs to be better investigated

Mean Energy of Pedestal Events

Pedestal Events 2007 Data

- sensitive to change in the calibration (temp. dependence of SiPM response)
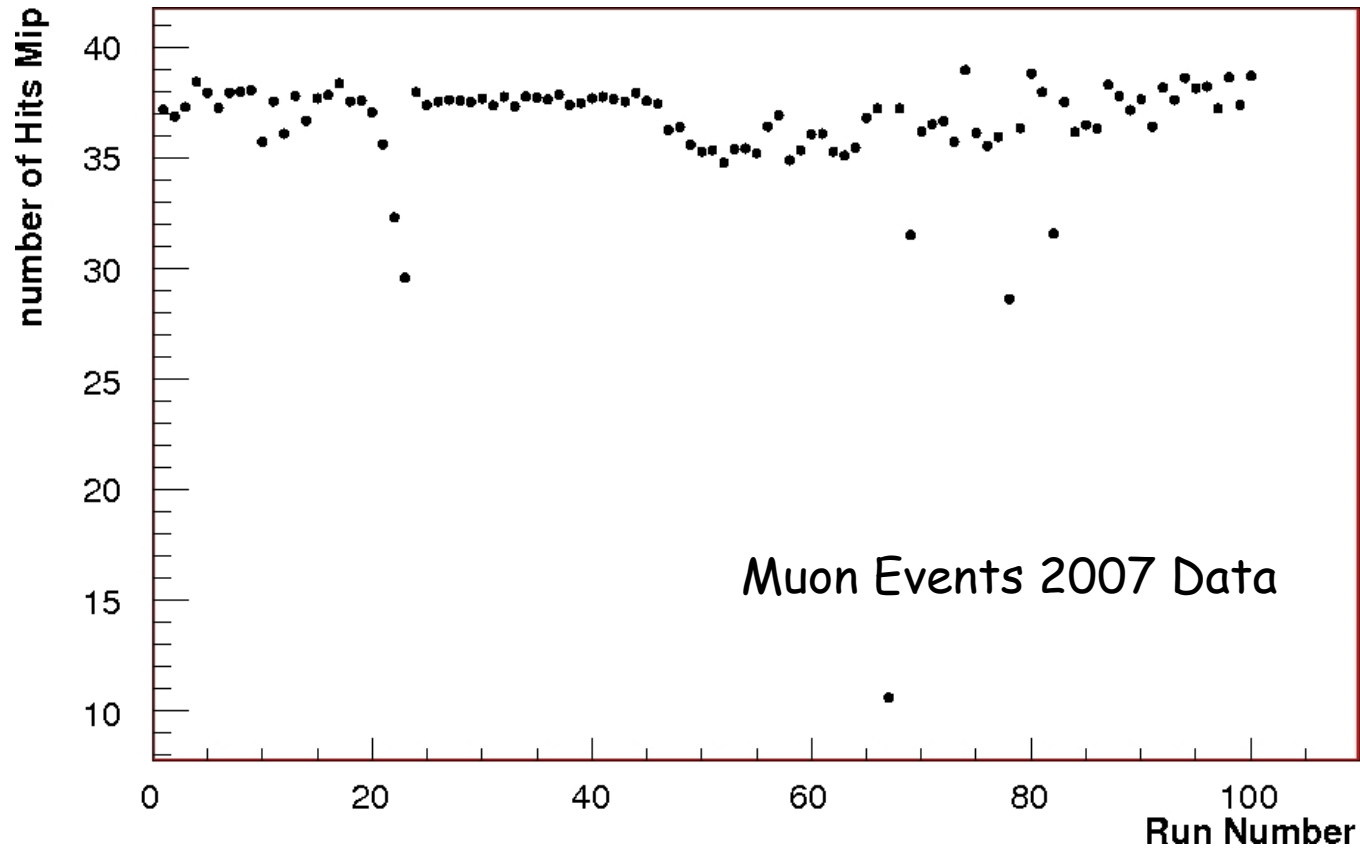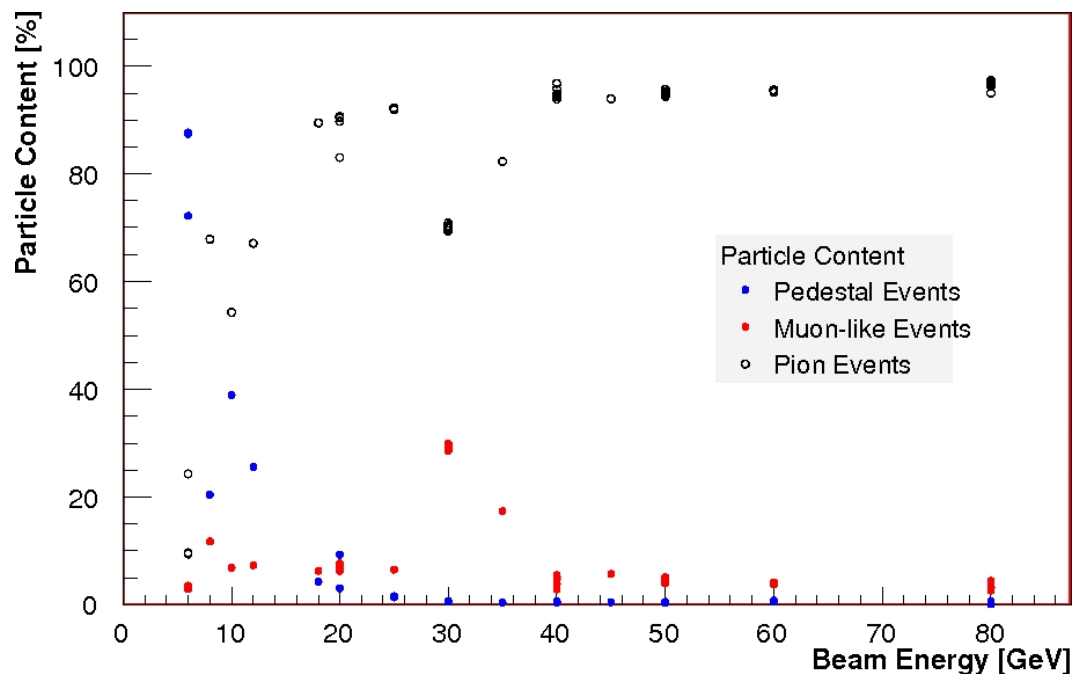- average amplitude of a noise hit = 0.7 mip, consistent

Number of Hits of Muon events

expected 38*detection efficiency (0.93-0.95) ~36 Hits
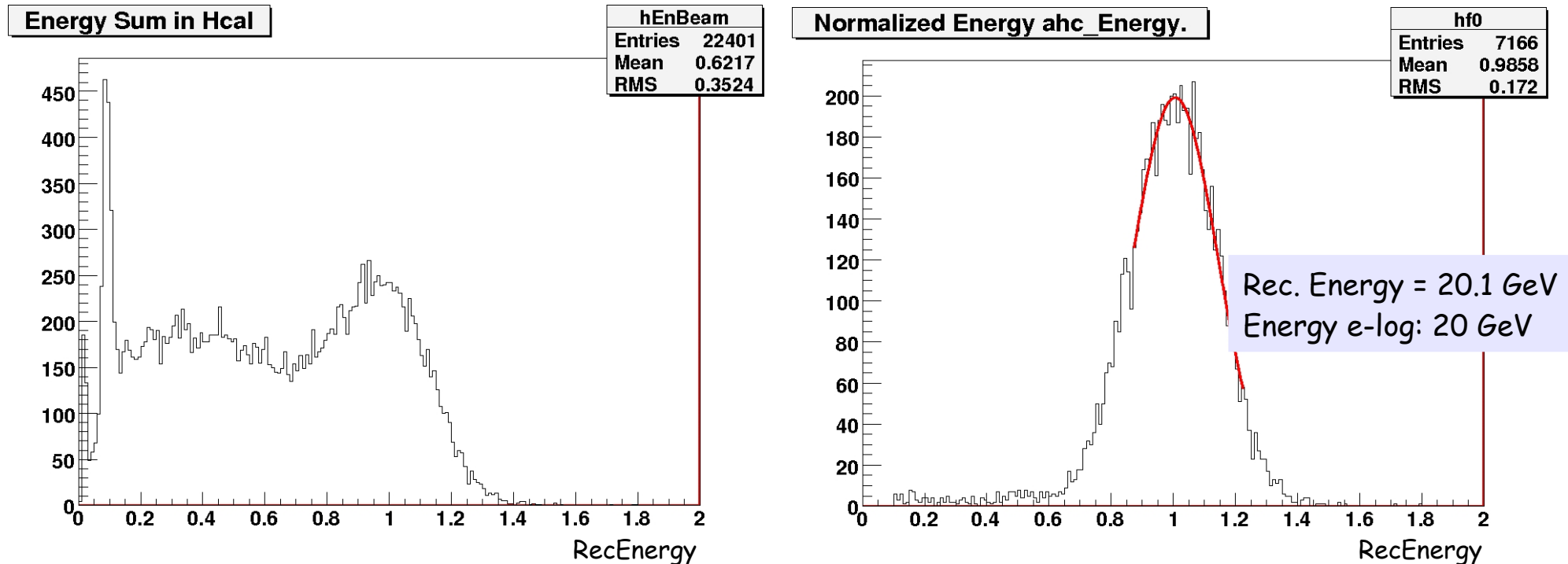
Event Clasification

~50% of physics events in a 10 GeV run (down to ~20% at 6 GeV)

About 10% muons present at every energy

Increased number of pedestal at low energy due to low beam trigger rate
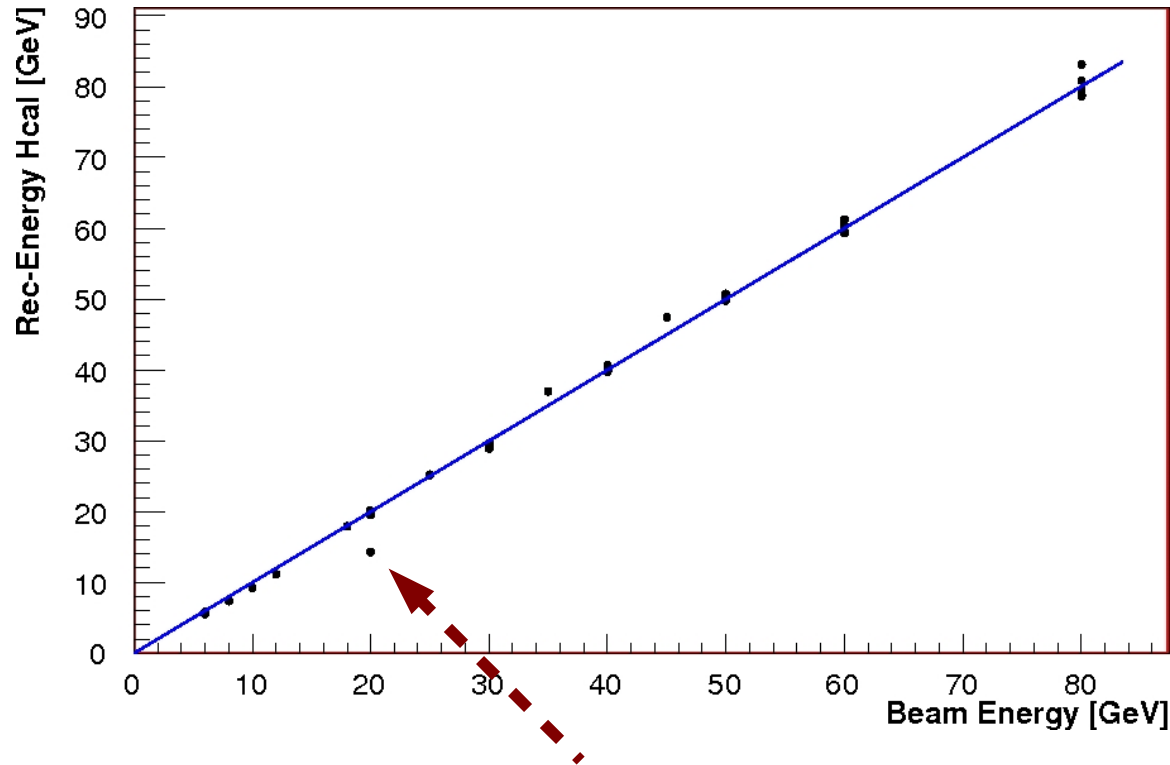
Reconstructed Energy: Pion Runs

Selection:

- low energy deposition on Ecal & Tail Catcher:
  shower mainly begin in HCAL --> events with shower start in HCAL
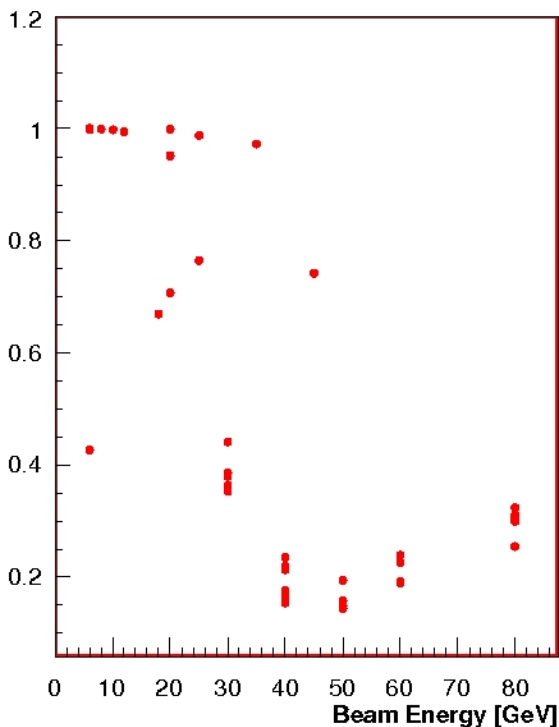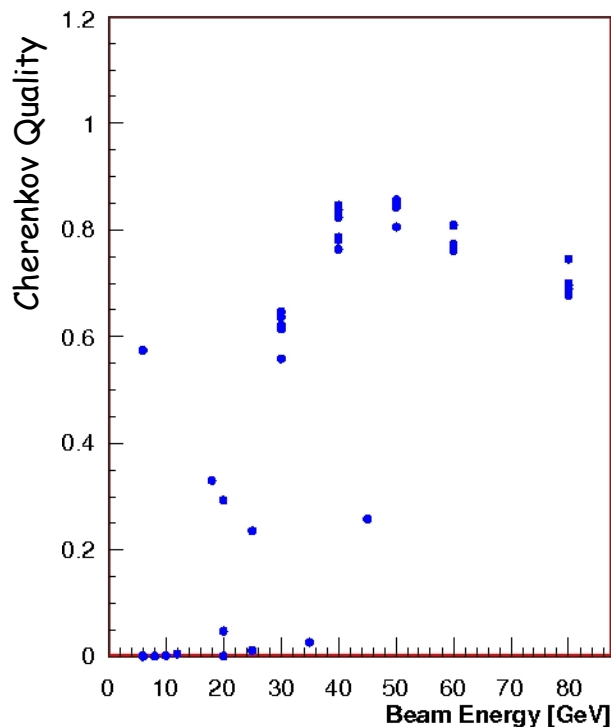
Reconstructed vs Beam Energy

Aim: find runs where the reconstructed energy deviates significantly from the beam energy

Reconstructed vs Beam Energy

Low energy runs (<20GeV) to be further investigated for systematic shift

compare same energy obtained with different beam optics settings

Quality of Cherenkov

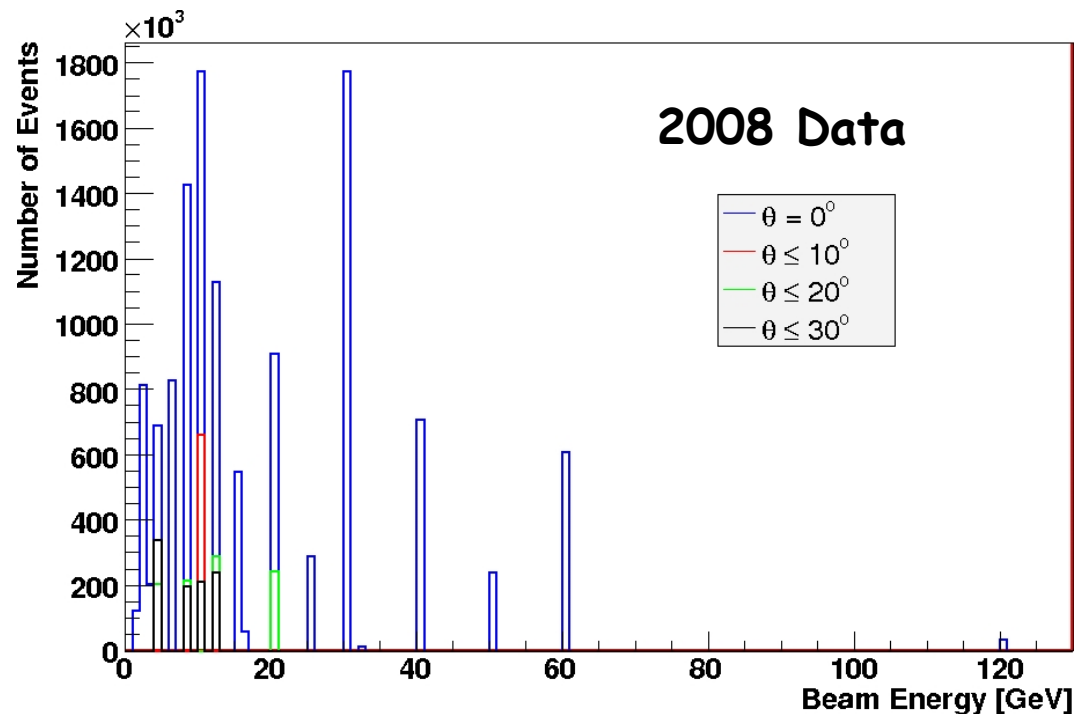Use <u>contained pions</u> in HCAL to check the quality of the Cherenkov:

- E>30 GeV Cherenkov cannot be used to tag pions
- E<30 GeV expected 100% correlation with tagged pion sample in HCAL

identified some run with bad Ch-tag ===> to check bad pressure settings

Data Quality Analysis 2008

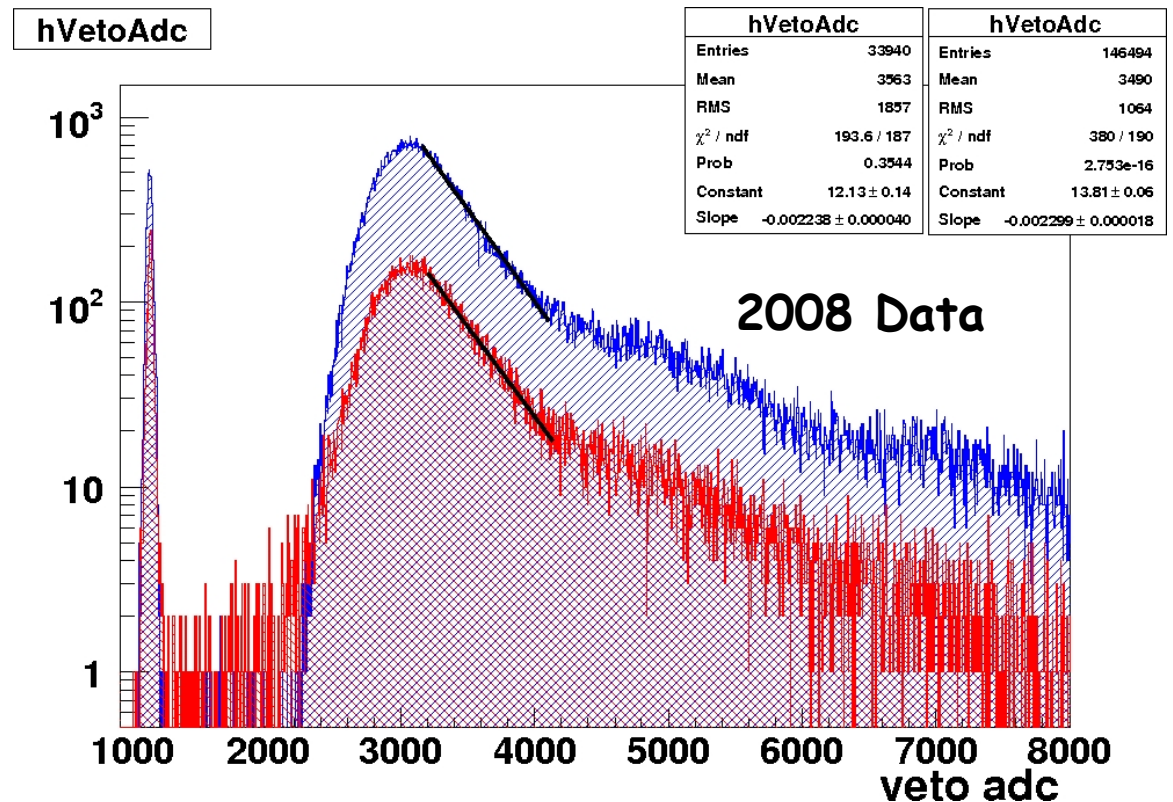First Analysis performed with <u>Online Monitoring Histograms</u>

- Overall statistics at various energies and angles

- Lower statistic than at CERN

- Fraction of physics events in the sample to be studied by DQ

Event Classification

Number of Pedestal, Muon and Physic events defined as before
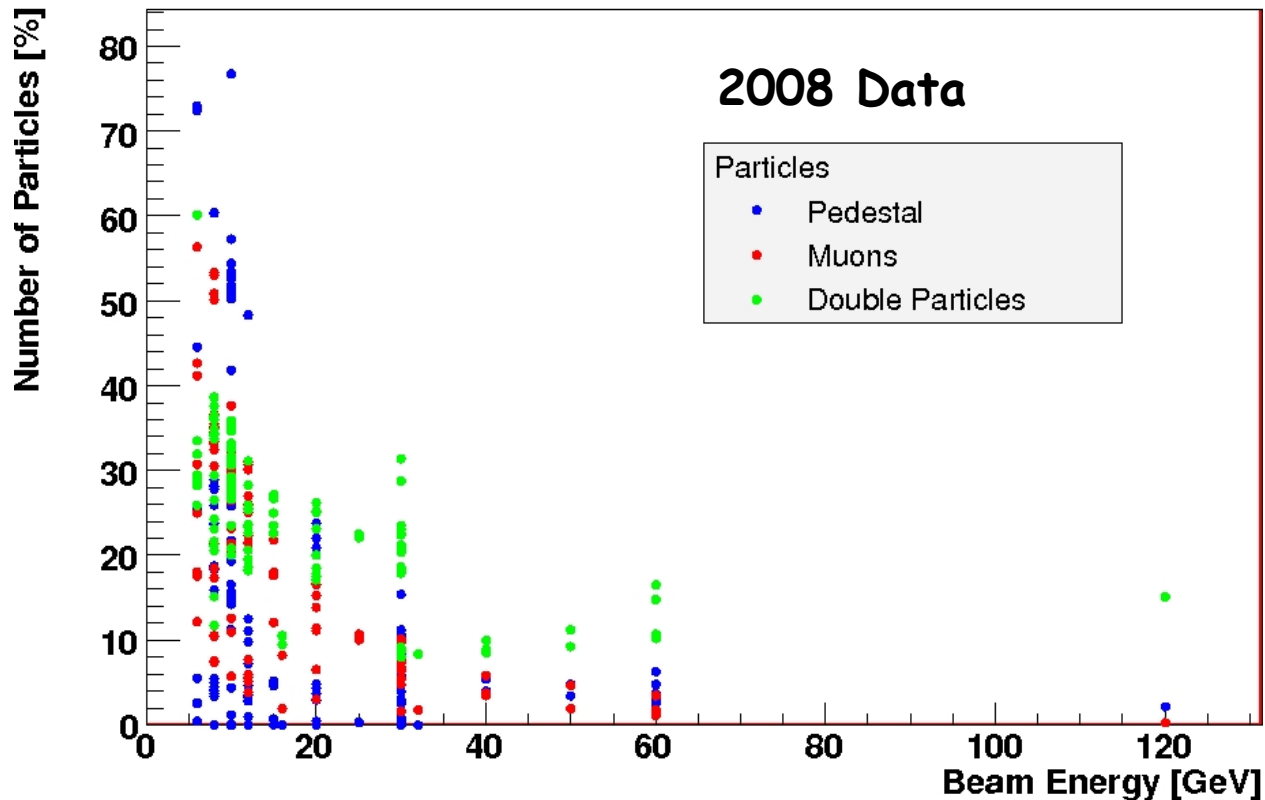
Estimation on double particles:

1) Use the multiplicity counter to cut on double tracks [20x20 cm² area]

2) Use digital information in veto counter to reject beam halo and preshowers in the 1x1 m² area outside the 20x20 cm² multiplicity.

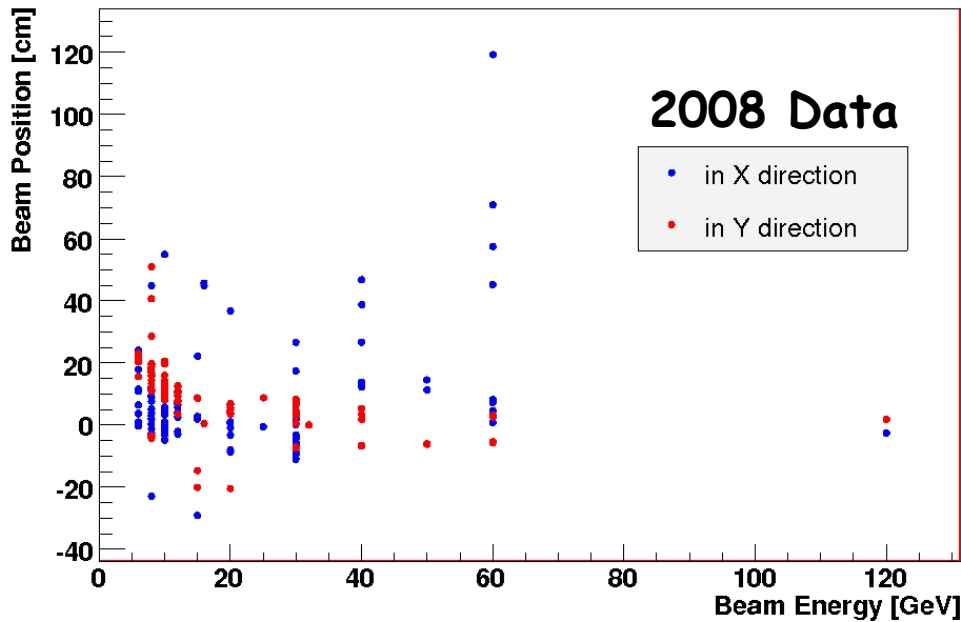| hVetoAdc	
Entries	33940
Mean	3563
RMS	1857
χ^2 / ndf	193.6 / 187
Prob	0.3544
Constant	12.13 ± 0.14
Slope	-0.002238 ± 0.000040

hVetoAdc	
Entries	146494
Mean	3490
RMS	1064
χ^2 / ndf	380 / 190
Prob	2.753e-16
Constant	13.81 ± 0.06
Slope	-0.002299 ± 0.000018

2008 Data

Event Classification

Low energy suffering of background events ==> low statistics in physics events

Beam Properties
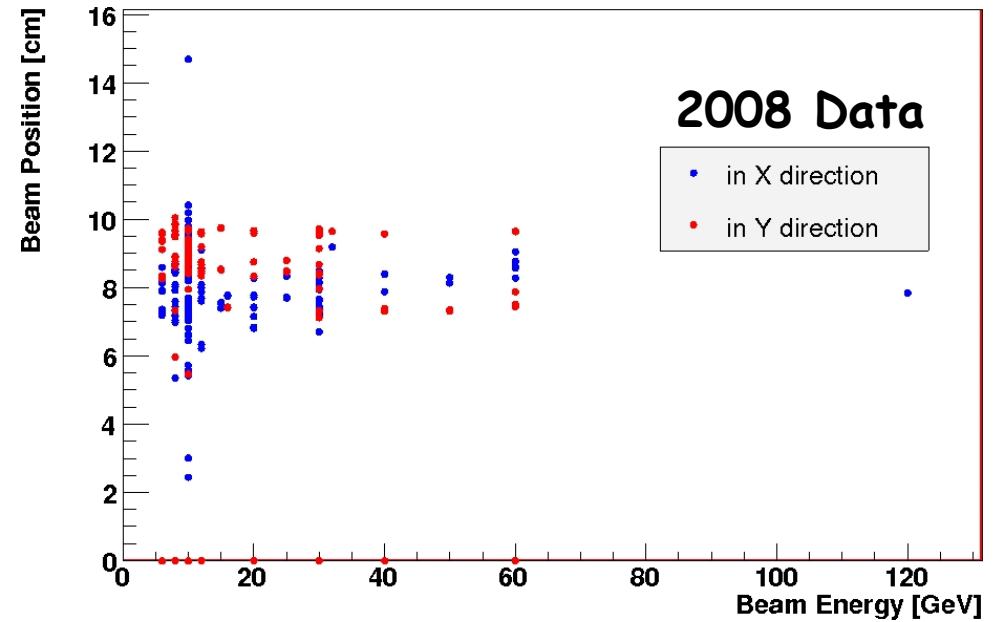
Relative off set ===> alignment between Ecal & Drift Chamber

Summary & Outlook

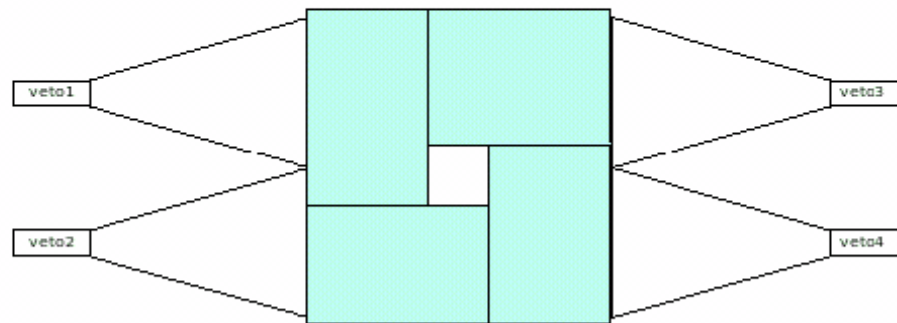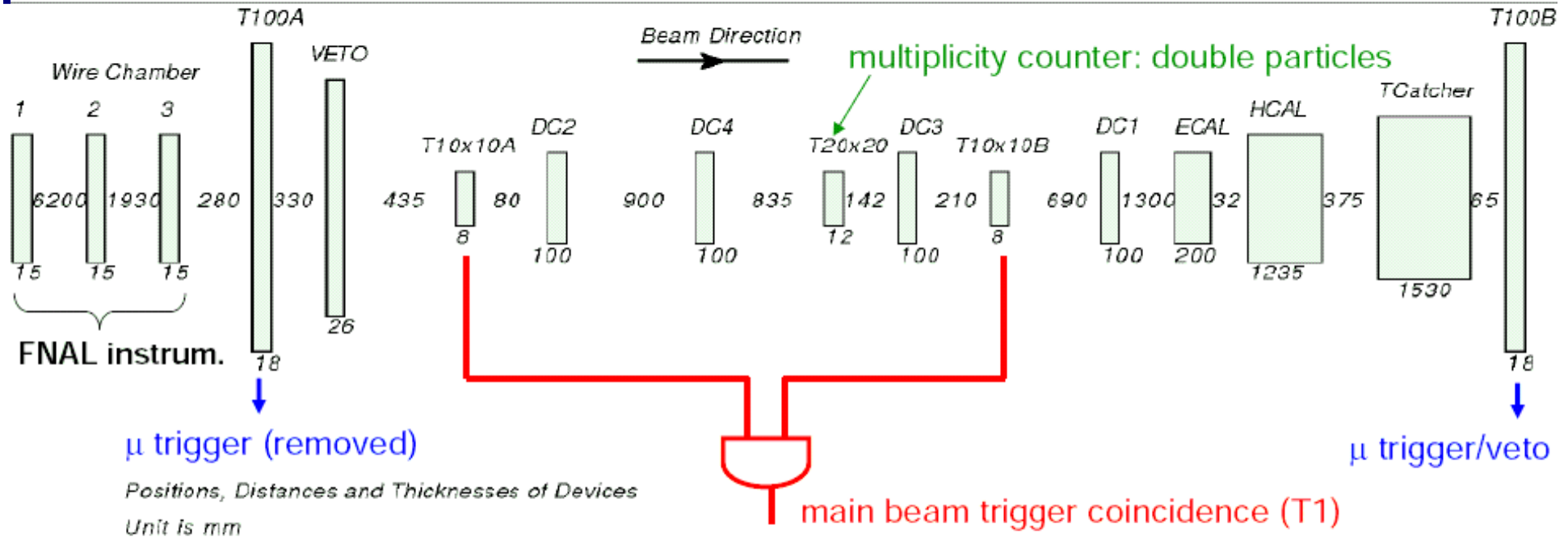Data Quality Analysis tool was developed

- 2007 Data
  - stability of the detector was studied with the DQ tool
  - more information has to be added to the Ntuple
    - ---> suggestions are appreciated!

- 2008 Data
  - Monitoring histograms used to estimate number of events collected
  - ---> Next step is to use Root-Ntuples to analyze further the data

CALICE testbeam 2008 FNAL

multiplicity counter: double particles

main beam trigger coincidence (T1)

μ trigger (removed)

μ trigger/veto

Positions, Distances and Thicknesses of Devices

Unit is mm

veto counter:
100x100 cm, 20x20 cm hole on the beam line,
4 PMT readout ➔ make a .or. in coincidence
with T1

beam points into image plane

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Available Information

	2007	2008
Trigger	ok	ok
Ecal	ok	?
Hcal	ok	ok
Tcmt	ok	ok
Drift Chamber	ok	-
Number of Runs	~200	~80