Testbeam monitoring

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* (also with **FERMILAB**)

Outline

- ► **General/Features**
- ► **Input/Output**
- ► **Code structure/Classes**
- ► **Info displayed**
- ► **Remarks**

General

- **application for testbeam monitoring**

  : code arranged in client-server parts (**GUI** and **SENDER**)

  : the different parts communicate through a socket
  i.e. can live and run at the same pc or at different pc's

- **tasks**

  : **GUI**'s task

  ▷ to provide a basic functionality through
  entry fields and action buttons

  ▷ to display the info that the sender sends

  : **SENDER**'s task

  ▷ to process the data and send plots and numeric info to gui

  ▷ to create persistent output (.root, .printout.ps, .log.txt, etc)

General features

► .

: requires ROOT 4.02/04 or higher and LCIO 01-04 or higher

: communication through secure connection using ssh is possible
i.e. gui and sender running in pc's that are behind different firewalls

: multiple types of transmission can occur,
currently one light and very frequent (say every 10events) and
one heavy and less frequent (say every 1000s events or some minutes)

: modular arrangement of components/detectors
easy to add/handle new ones

: gui's display pads invoke ROOT interactively

: it is a light application, easy to install/run

General features

- **info transmitted and displayed**
  - numerical
    - : event labels
    - : counters per detector
  - graphical
    - : 3d event display
    - : daq rate, badreadout, time series ...
    - : tdc time signal, track coordinates
    - : Ecal hits, energy, pedestals/noise ...
      Hcal hits, energy, pedestals/noise, leds ...
      Tcmt hits, energy, pedestals/noise, leds ...
    - : particle id plots, veto signal
    - : cross check plots, Tracker vs Ecal vs Hcal ...

Input/Output

- **input**

  : .bin data files produced by daq

  + mapping files for Tdc, Ecal, Hcal, Tcmt

  + calibration constants for Ecal, Hcal, Tcmt

- **output**

  : `Monitor<run>.<file>.root`
  `Monitor<run>.<file>.printout.ps`
  `Monitor<run>.<figure>.log.txt`

  + for Hcal `Monitor<run>.<file>.HcalLed.dat, ..Ped.dat`

Classes

- **v00.09 (60+ classes)**

EcalPcbPad
EcalReadoutPad
EcalPhysicalPad
EcalMap
EcalAdc
EcalEnergy
EcalCalibration
EcalRawAdcExtractor
EcalPedestalCalculator
EcalEnergyCalculator
EcalHandler
EcalMonitor

HcalProdTile
HcalReadoutTile
HcalPhysTile
HcalMap
HcalAdc
HcalEnergy
HcalCalibration
HcalRawAdcExtractor
HcalPedestalCalculator
HcalEnergyCalculator
HcalHandler
HcalMonitor

TcmtReadoutStrip
TcmtPhysStrip
TcmtMap
TcmtAdc
TcmtEnergy
TcmtCalibration
TcmtRawAdcExtractor
TcmtPedestalCalculator
TcmtEnergyCalculator
TcmtHandler
TcmtMonitor

TriggerExtractor

VetoRawAdcExtractor
VetoMap
VetoHandler
VetoMonitor

Tdc
TdcChannel
Chamber
ChamberChannel
TdcMap
TdcExtractor
Track
TdcHandler
TdcMonitor

DatMgr
RunMgr
Handler

MonitorMgr
Monitor
SharedMonitor
SocketClient

MyMainFrame
MySpyMainFrame
MessageHeader
MessageObj
MyEventDisplay

■ general analysis classes
■ gui related classes

Histograms

- **v00.09 (100+ histos)**

ECAL
hEcalTriggerEvents
hEcalBadReadout
hEcalHits
hEcalEnergy
hEcalEnergyPerLayer
hEcalHitsPerLayer
hEcalEnergyVsTime
hEcalPedChipAverage.slot7
hEcalPedRMSChipAverage.slot7
hEcalPedChipAverage.slot15
hEcalPedRMSChipAverage.slot15
hEcalPedChipAverage.slot17
hEcalPedRMSChipAverage.slot17
hEcalPedChipAverage.slot19
hEcalPedRMSChipAverage.slot19
. . .

HCAL
hHcalTriggerEvents
hHcalBadReadout
hHcalHits
hHcalEnergy
hHcalEnergyPerLayer
hHcalHitsPerLayer
hHcalEnergyVsTime
hHcalHitEnergy
hHcalHitAdc
hHcalLedPerLayer
hHcalPedPerLayer
hHcalPedRMSPerLayer
hHcalPedChipAverage.slot9
hHcalPedRMSChipAverage.slot9
hHcalPedPerChannel.slot9
hHcalPedRMSPerChannel.slot9
. . .

TCMT
hTcmtTriggerEvents
hTcmtBadReadout
hTcmtHits
hTcmtEnergy
hTcmtEnergyPerLayer
hTcmtHitsPerLayer
hTcmtEnergyVsTime
hTcmtHitEnergy
hTcmtHitAdc
hTcmtLedPerLayer
hTcmtPedPerLayer
hTcmtPedRMSPerLayer
hTcmtPedChipAverage.slot12
hTcmtPedRMSChipAverage.slot12
hTcmtPedPerChannel.slot12
hTcmtPedRMSPerChannel.slot12
. . .

Tracker
hTimeX0
hTimeY0
hTimeX1
hTimeY1
hTimeX2
hTimeY2
hTimeX3
hTimeY3
hTrackX0
hTrackY0
hTrackX1
hTrackY1
hTrackX2
hTrackY2
hTrackX3
hTrackY3
. . .

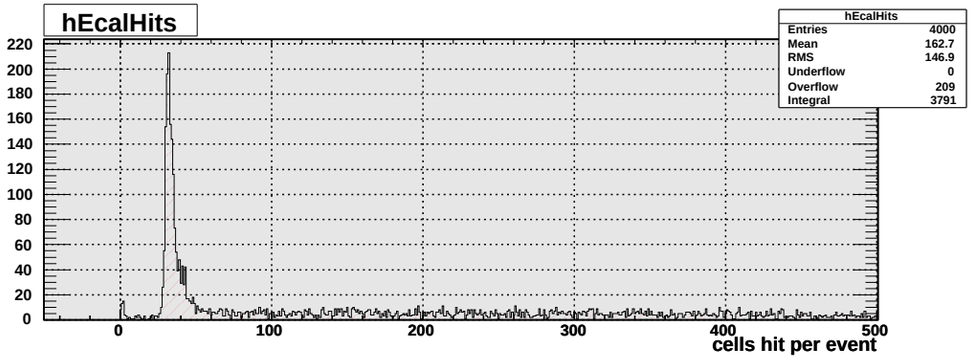
hTriggerRate
hBadReadout

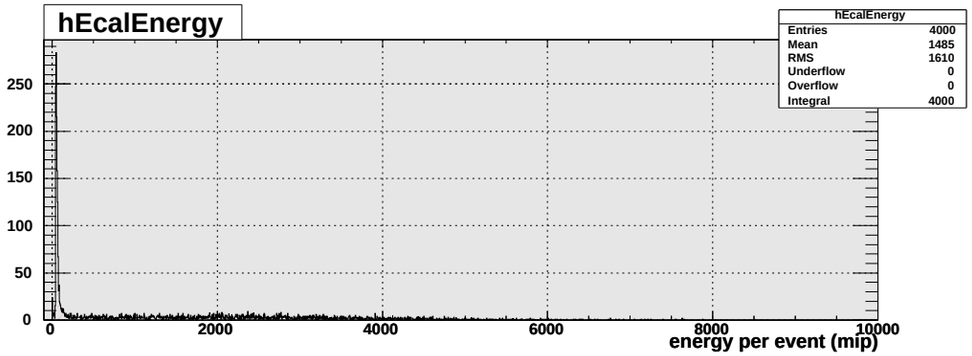
ParticleID
hEcalEnergyCherON/OFF
hEcalEnergyPerLayerCherON/OFF
hHcalEnergyCherON/OFF
hHcalEnergyPerLayerCherON/OFF

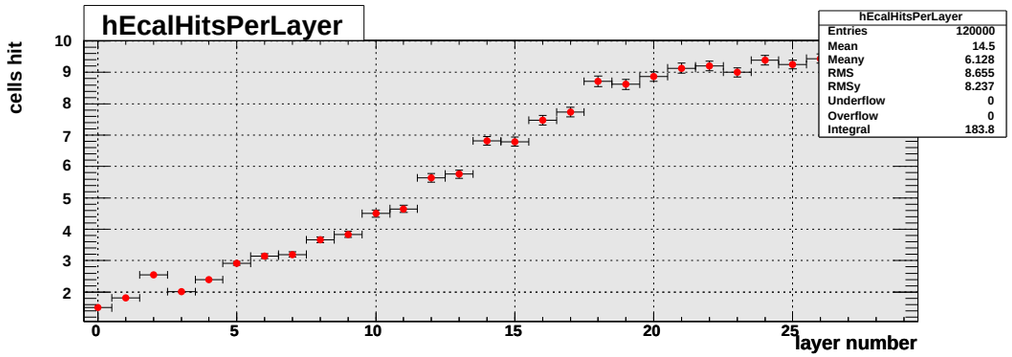
CrossChecks
hTrackBackX.vs.EcalFrontX
hTrackBackY.vs.EcalFrontY
hTrackBackX.vs.HcalFrontX
hTrackBackY.vs.HcalFrontY
hHcalFrontX.vs.EcalBackX
hHcalFrontY.vs.EcalBackY
hHcalEnergy.vs.EcalEnergy
hHcalHits.vs.EcalHits
. . .

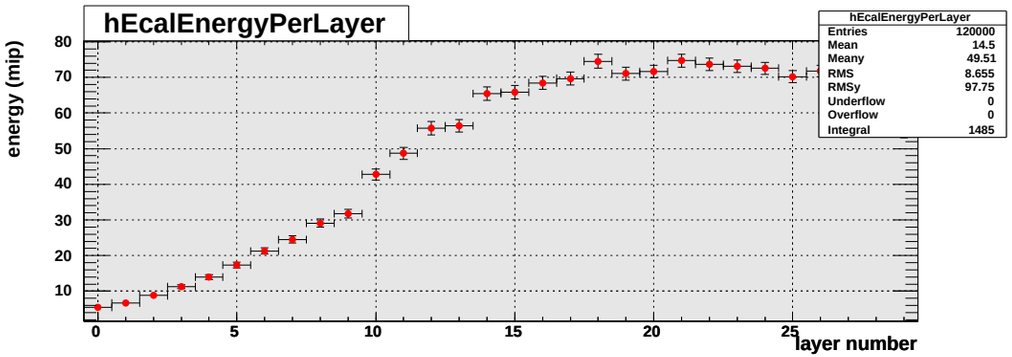
- arranged in 20 gui panels (=printout pages)

ECAL Response

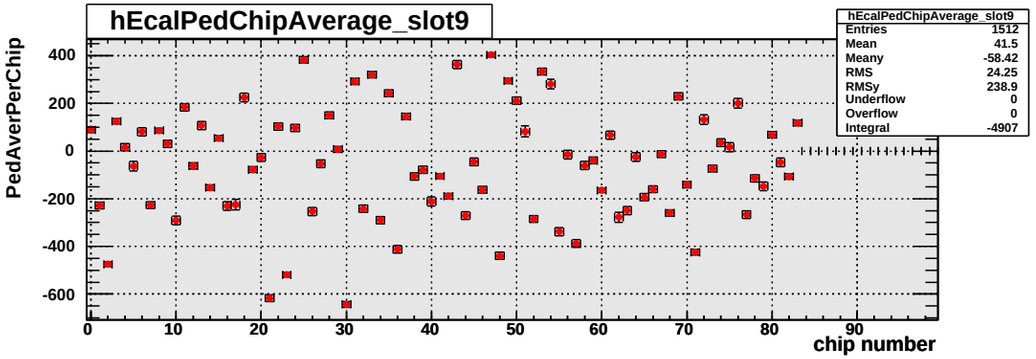


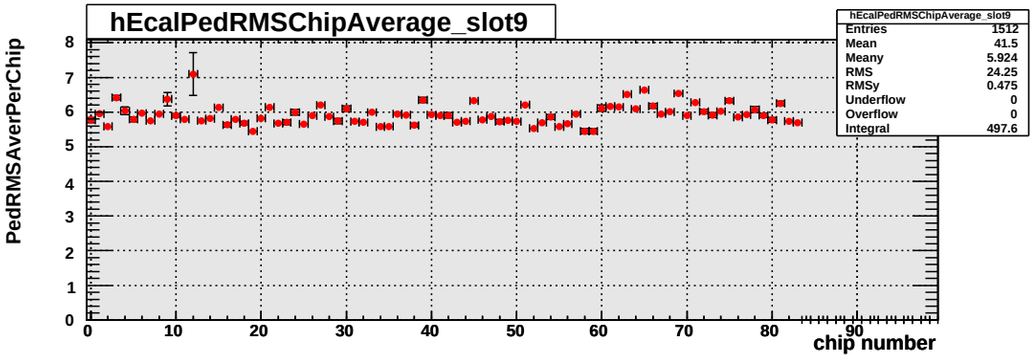


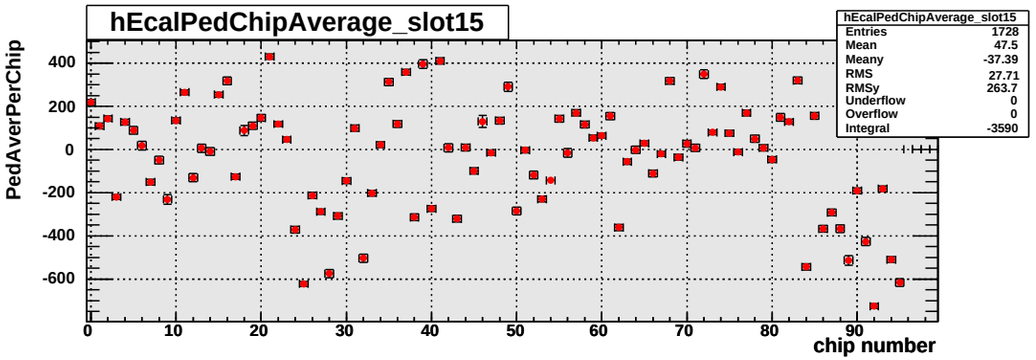


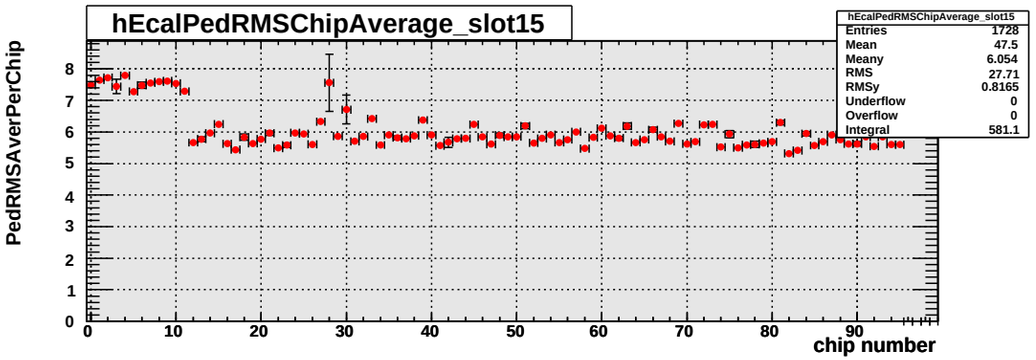


ECAL Pedestals/Noise

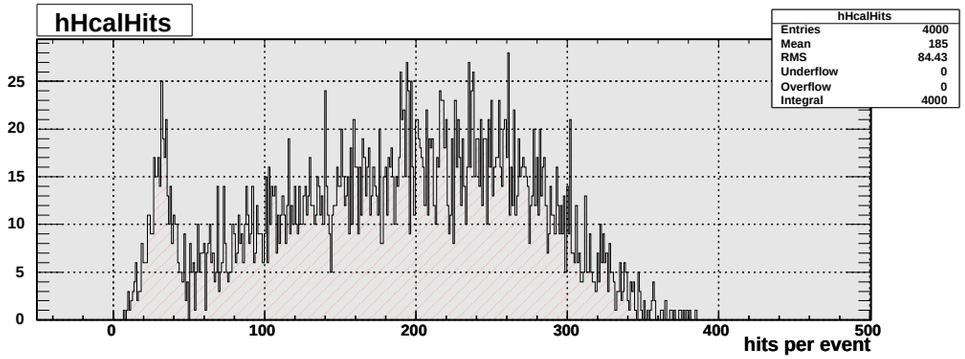


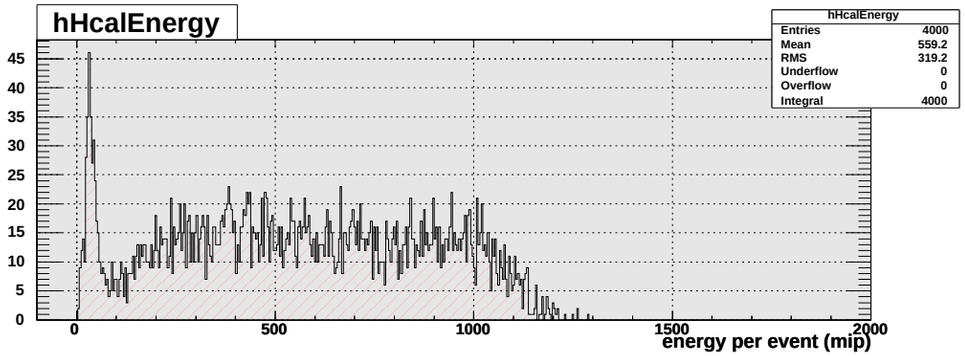


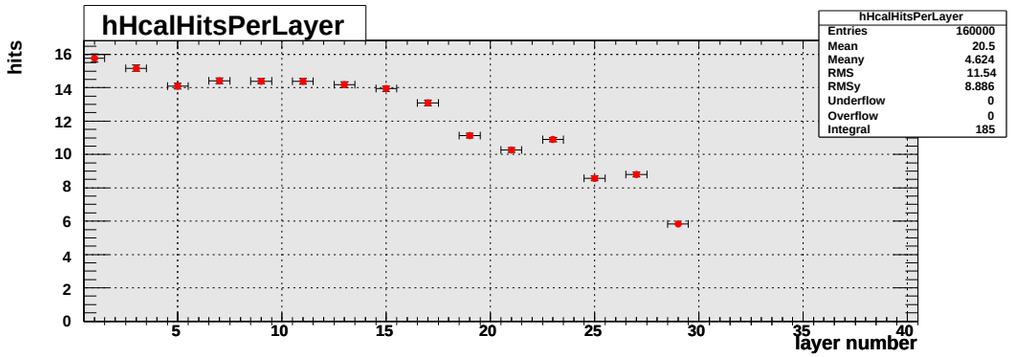


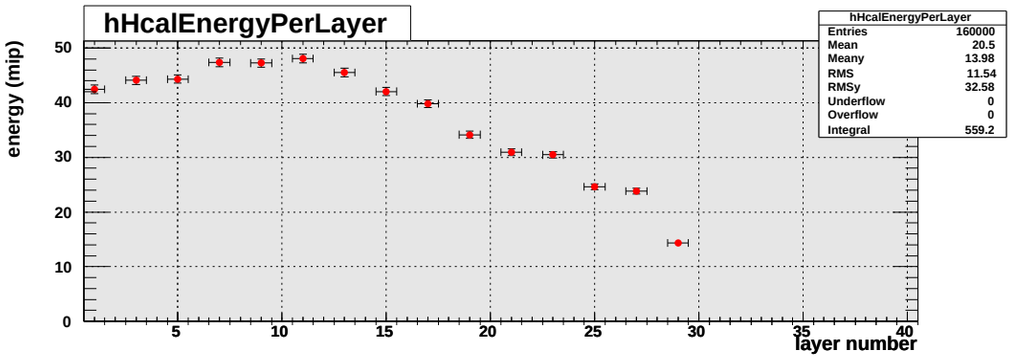


HCAL Response

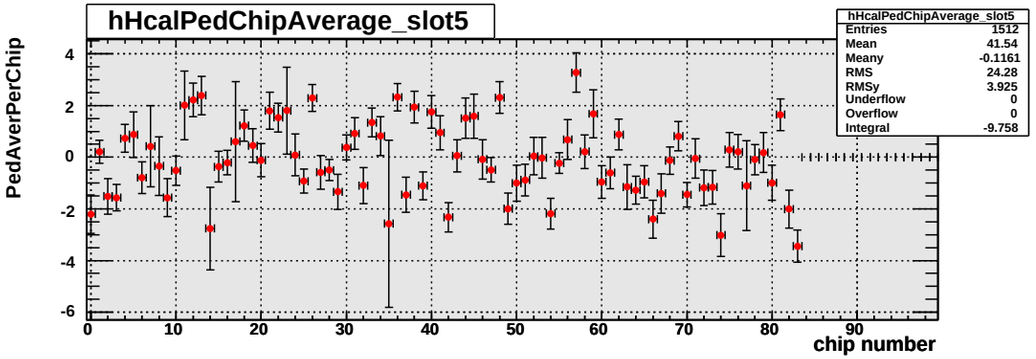


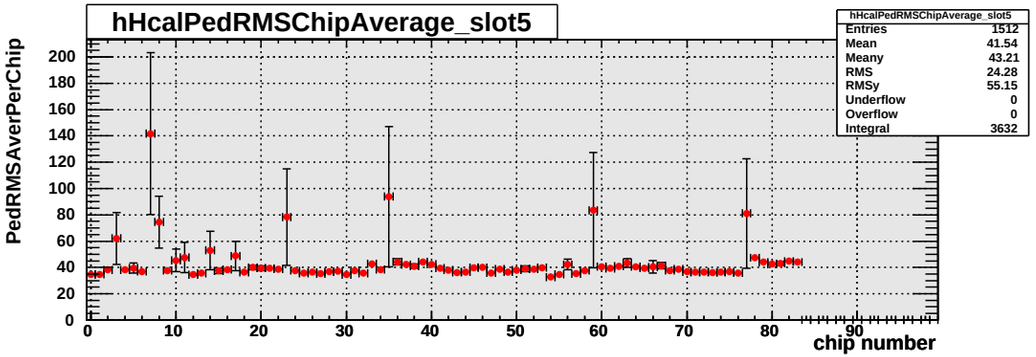


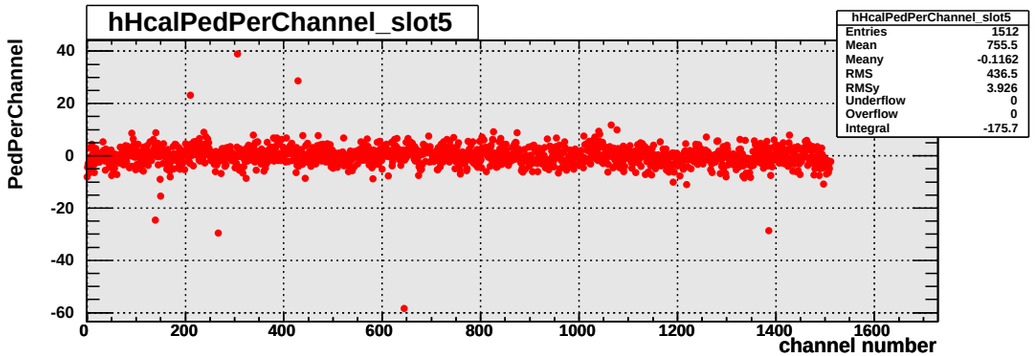


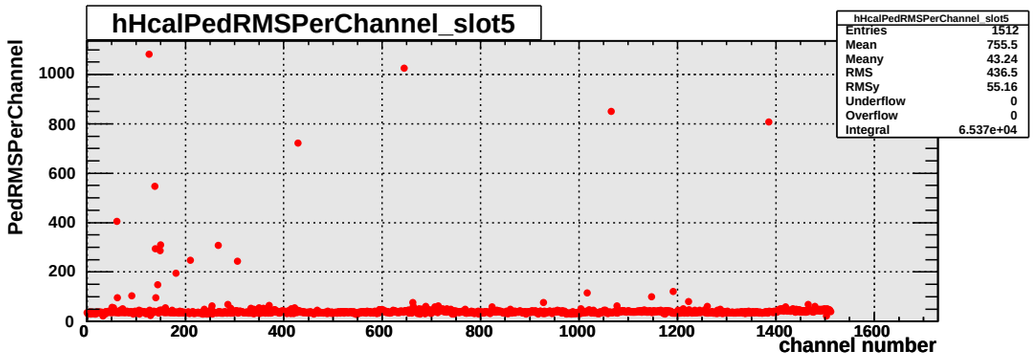


HCAL Pedestals/Noise

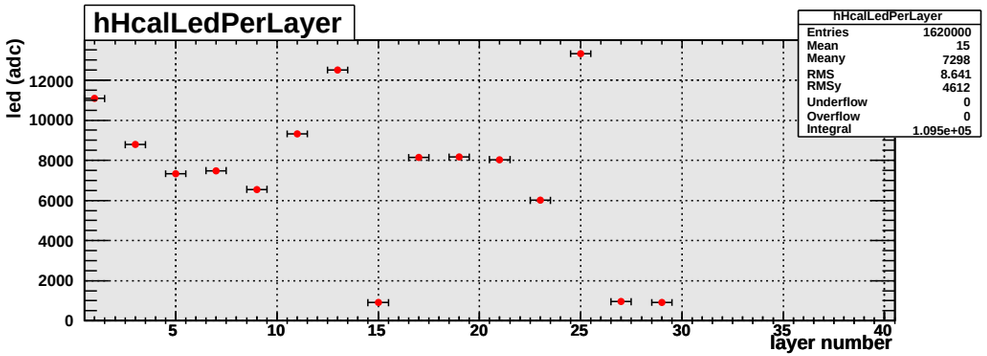


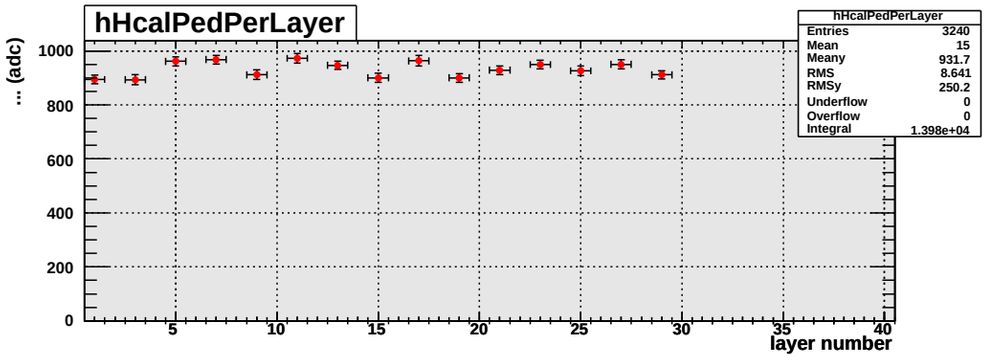


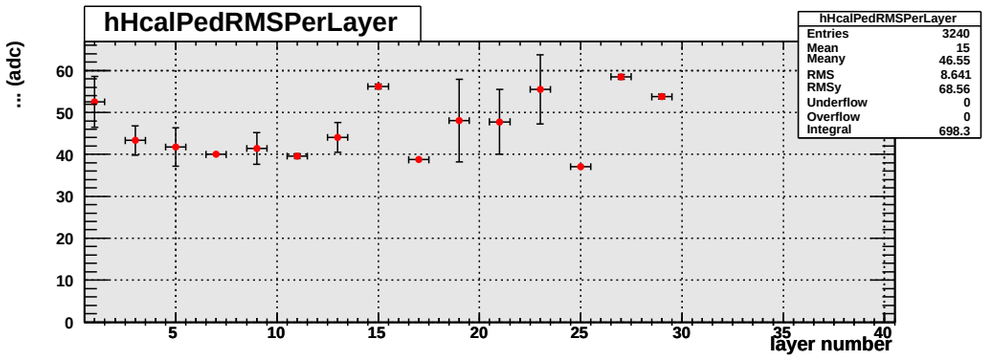




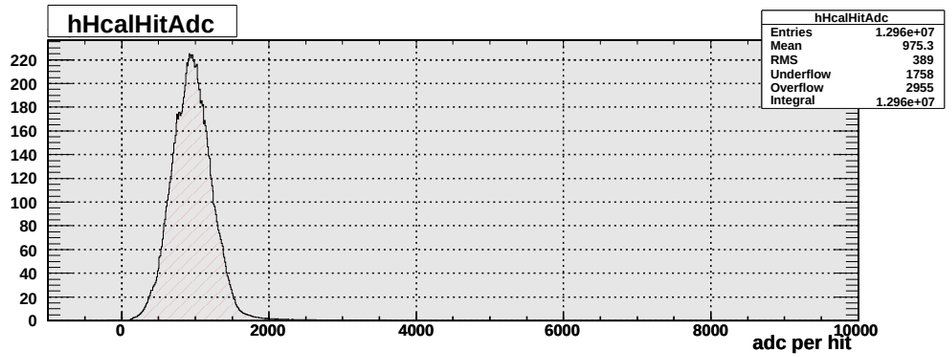
HCAL Leds

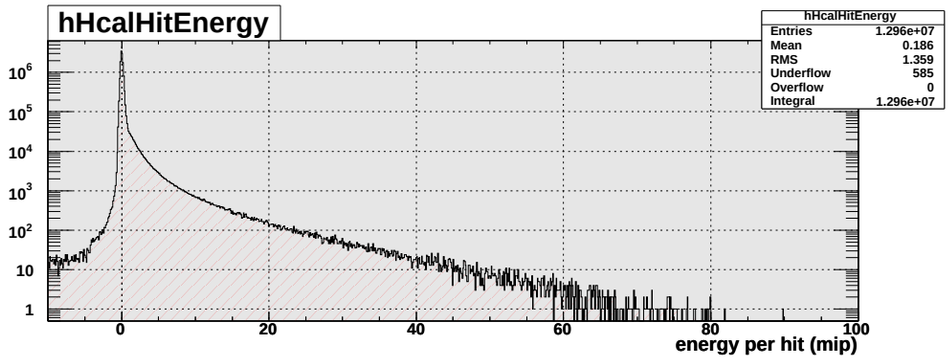


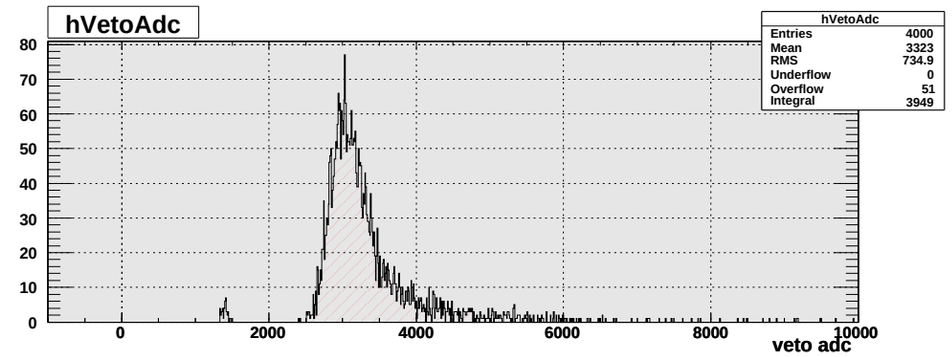




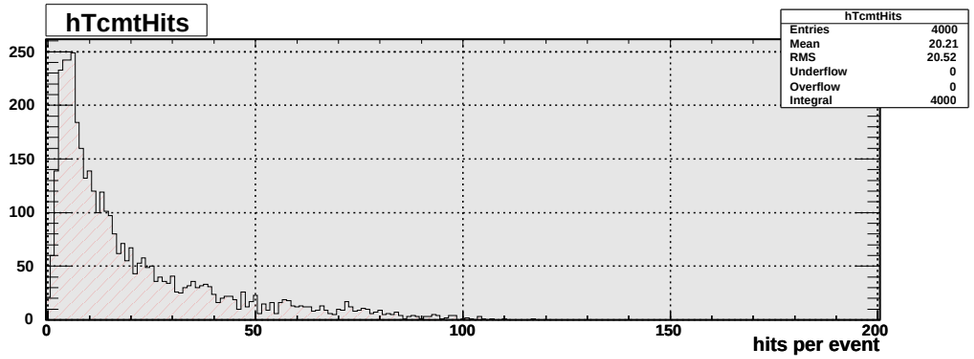
HCAL Misc

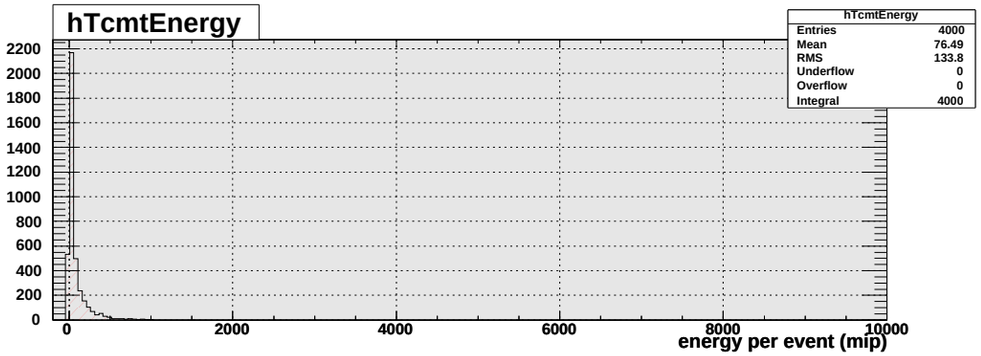


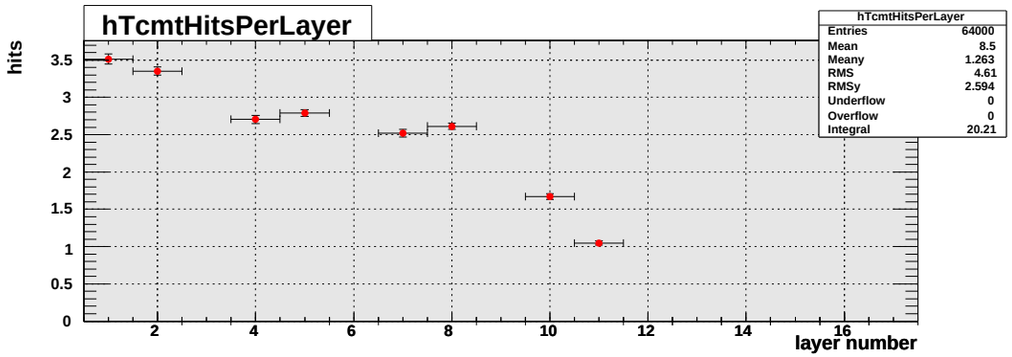


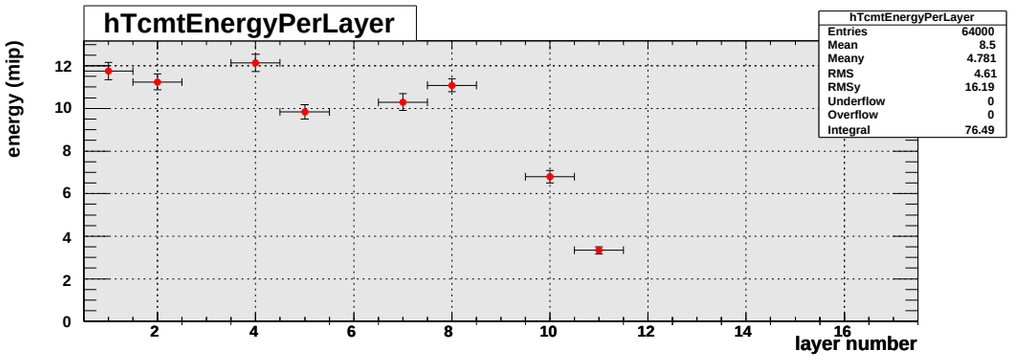


TCMT Response

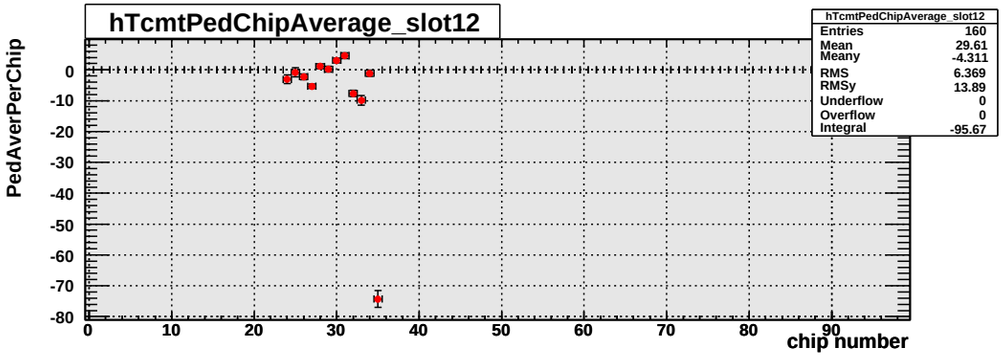


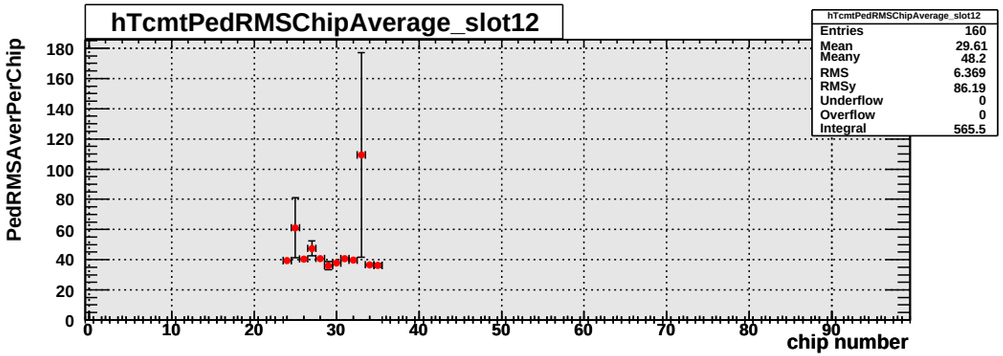


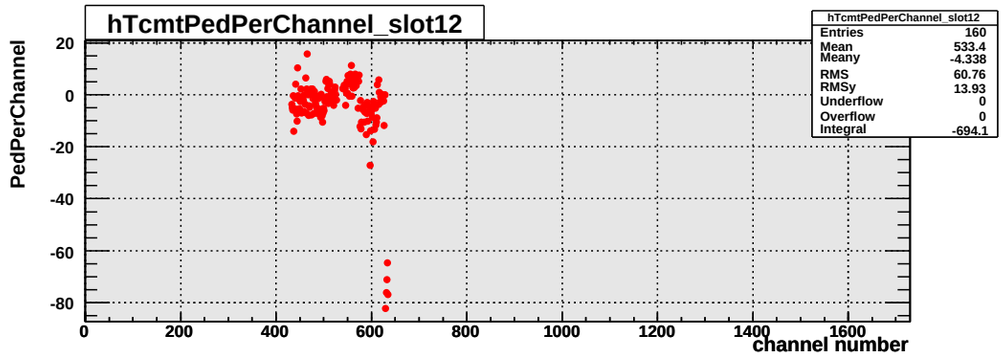


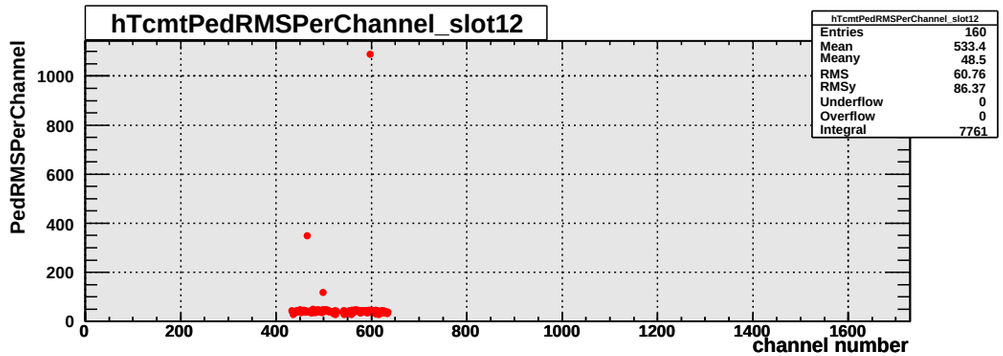


TCMT Pedestals/Noise

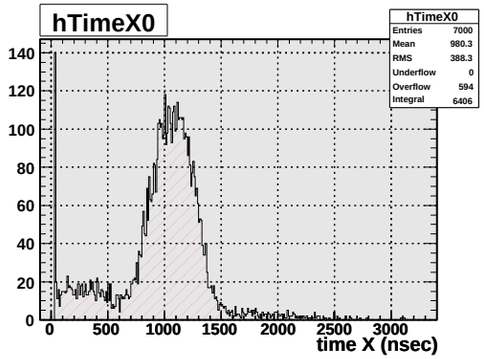


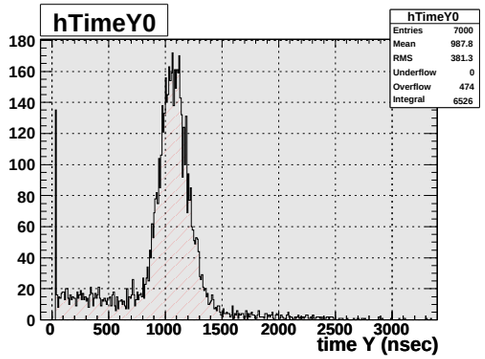


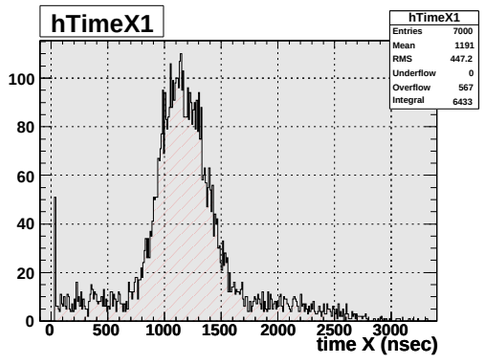


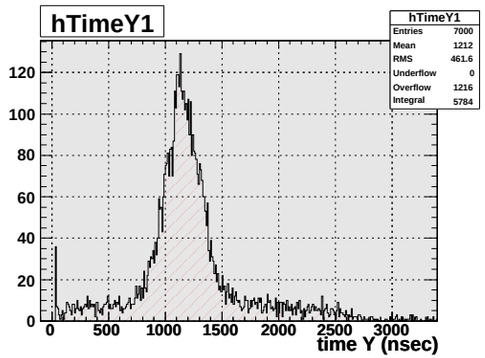


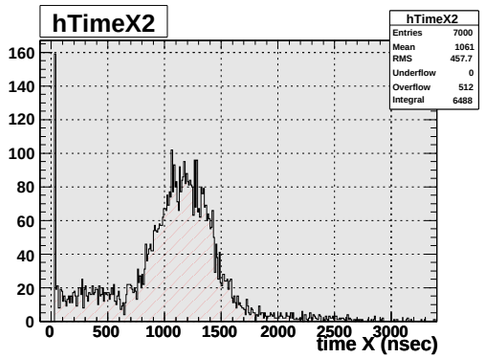
Tracker XY (time)

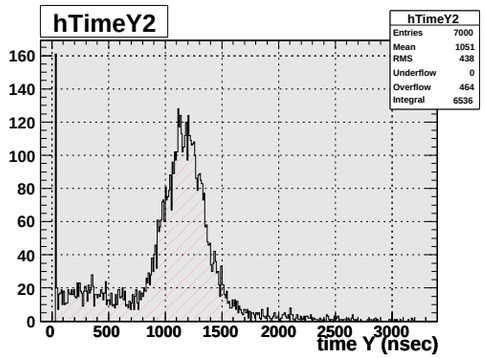


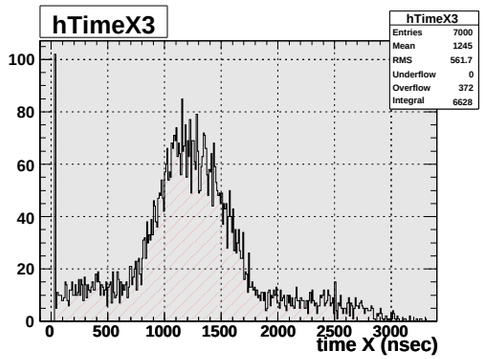


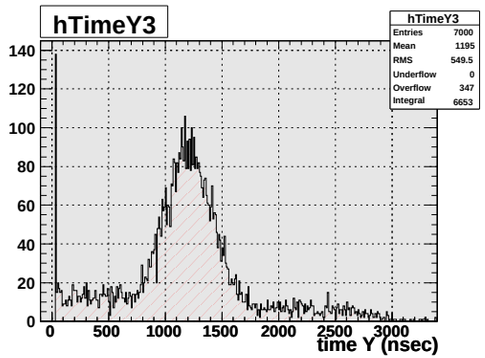




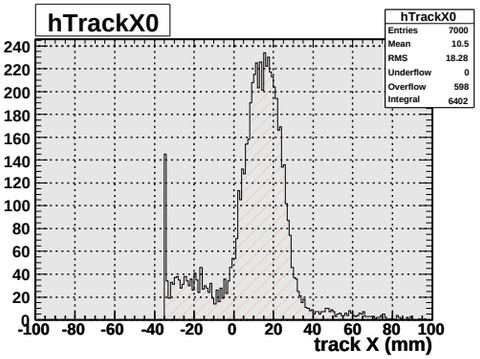


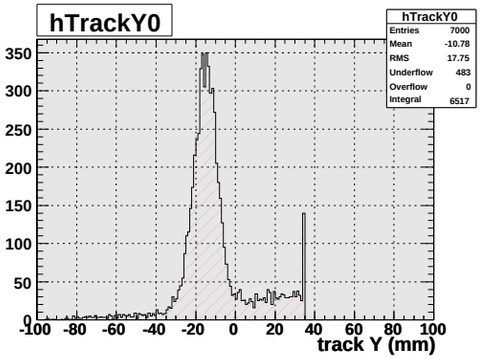


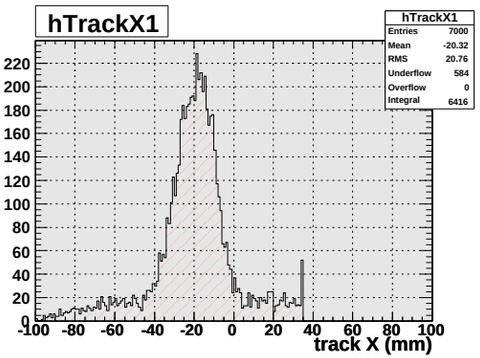


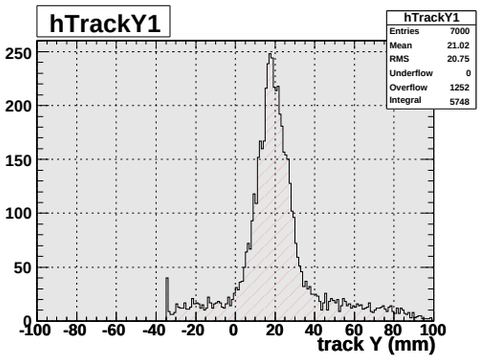


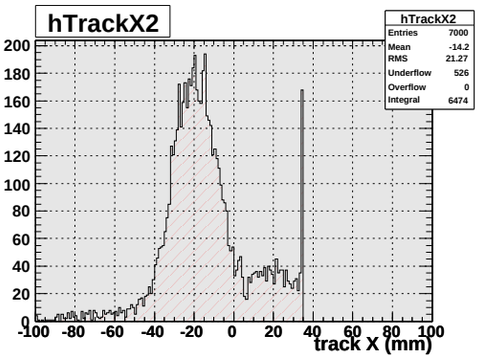
Tracker XY (space)

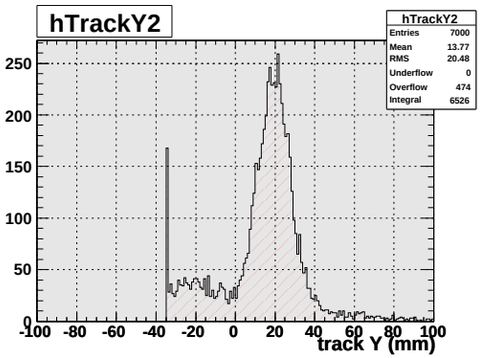


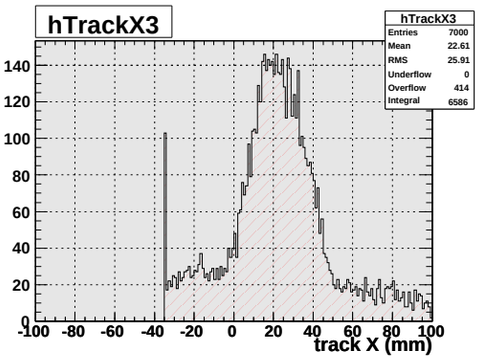


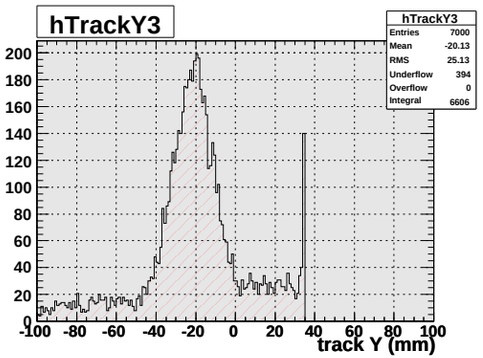






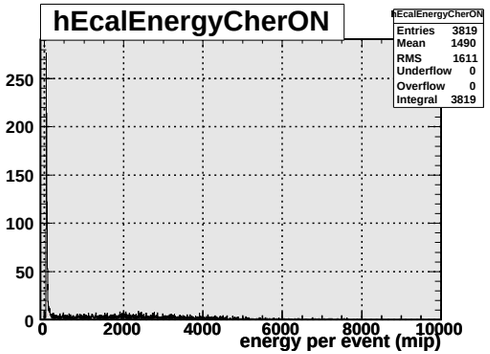


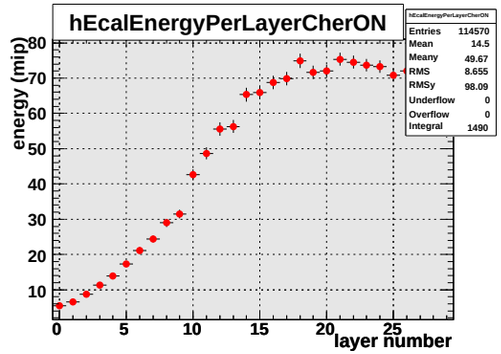


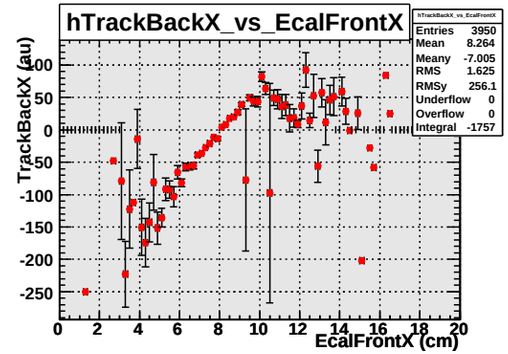


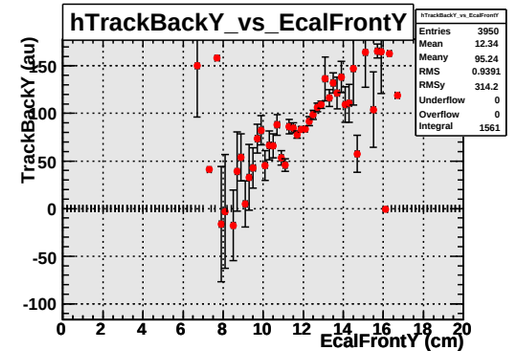
ParticleID

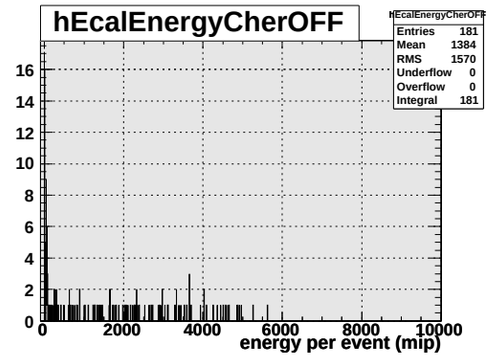
Cross checks

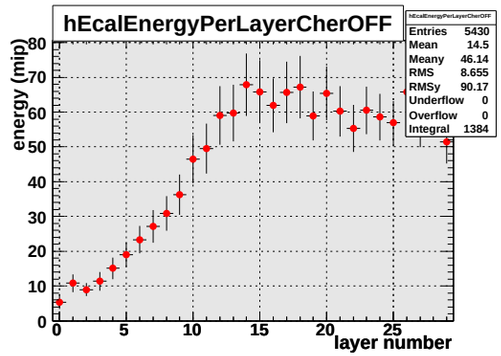


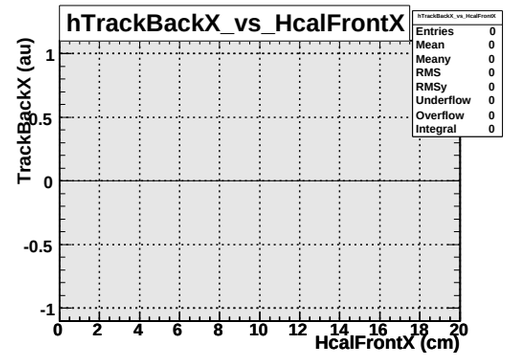


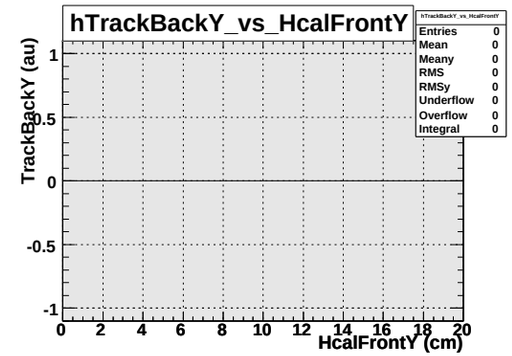


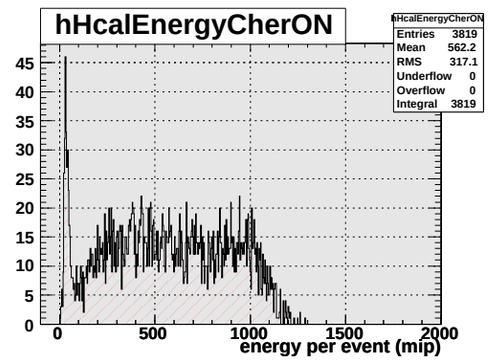


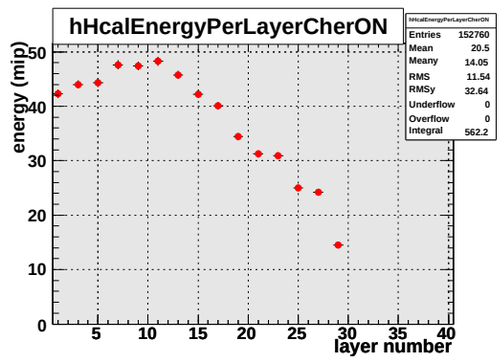


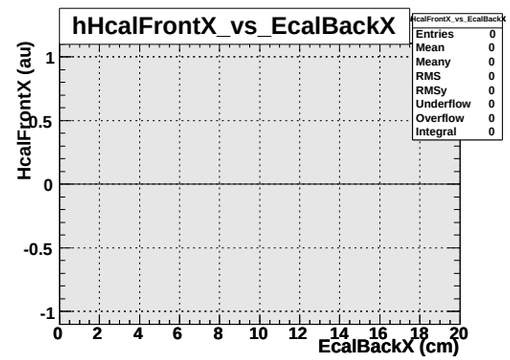


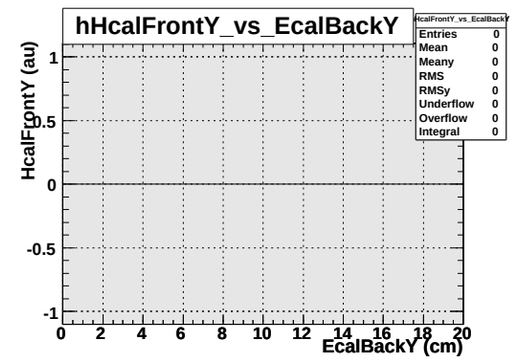


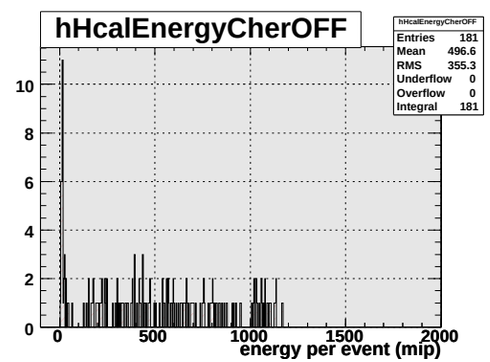


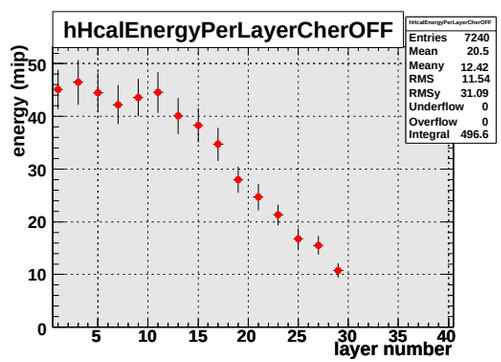


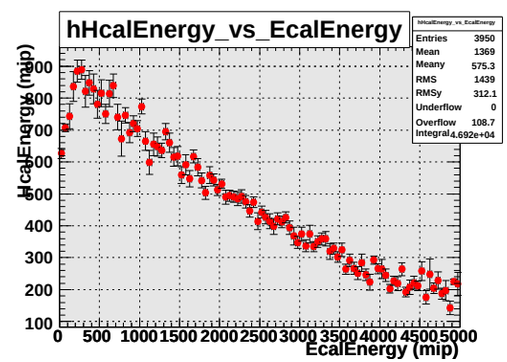


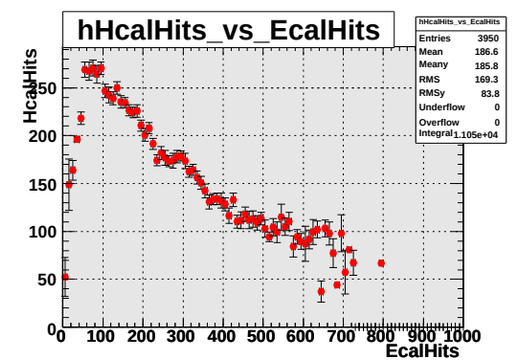




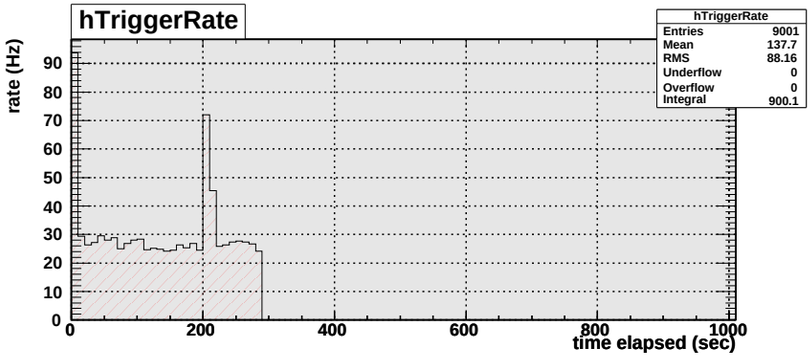


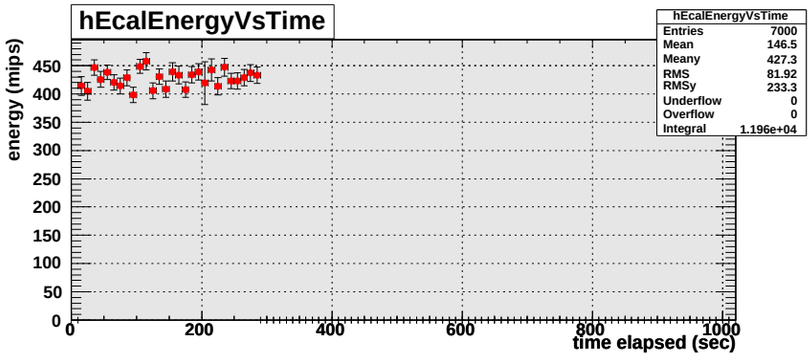


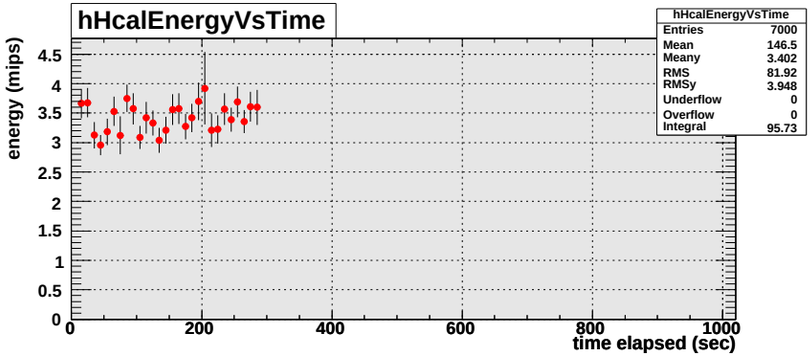


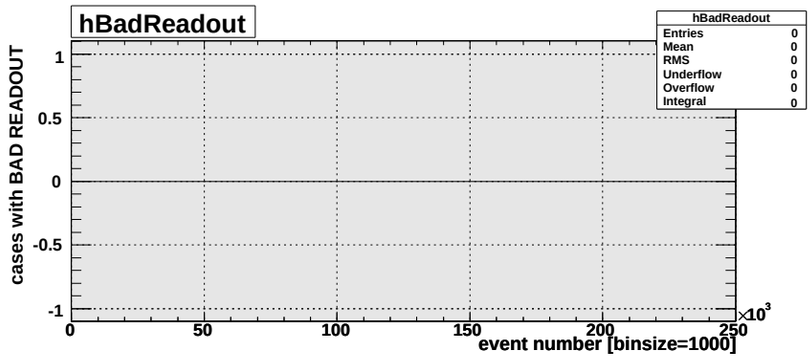


Main panel

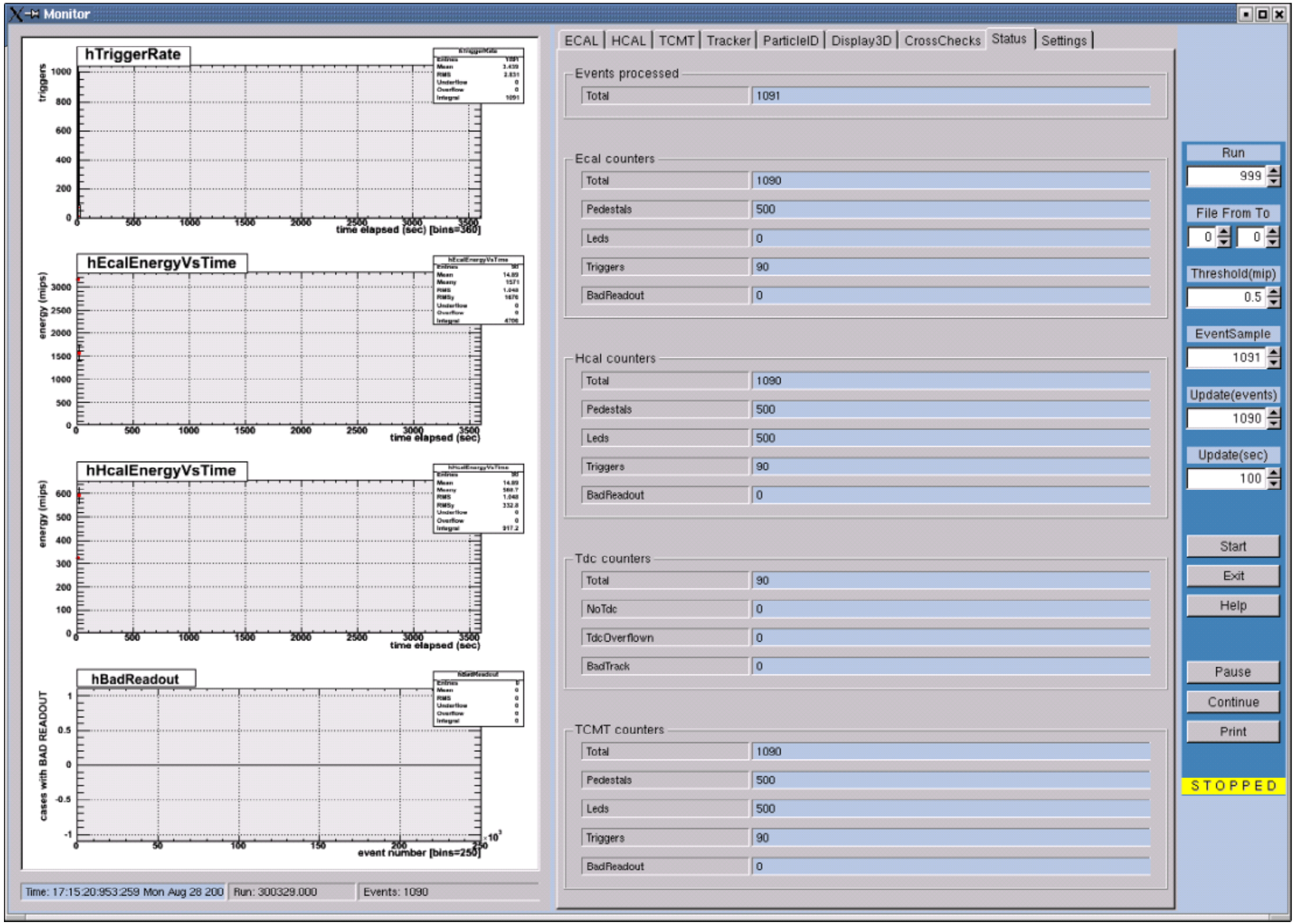

hTriggerRate
hTriggerRate
Entries 9001
Mean 137.7
RMS 88.16
Underflow 0
Overflow 0
Integral 900.1
rate (Hz)
time elapsed (sec)


hEcalEnergyVsTime
hEcalEnergyVsTime
Entries 7000
Mean 146.5
Meany 427.3
RMS 81.92
RMSy 233.3
Underflow 0
Overflow 0
Integral 1.196e+04
energy (mips)
time elapsed (sec)


hHcalEnergyVsTime
hHcalEnergyVsTime
Entries 7000
Mean 146.5
Meany 3.402
RMS 81.92
RMSy 3.948
Underflow 0
Overflow 0
Integral 95.73
energy (mips)
time elapsed (sec)


hBadReadout
hBadReadout
Entries 0
Mean 0
RMS 0
Underflow 0
Overflow 0
Integral 0
cases with BAD READOUT
event number [binsize=1000]
×10³

Status table

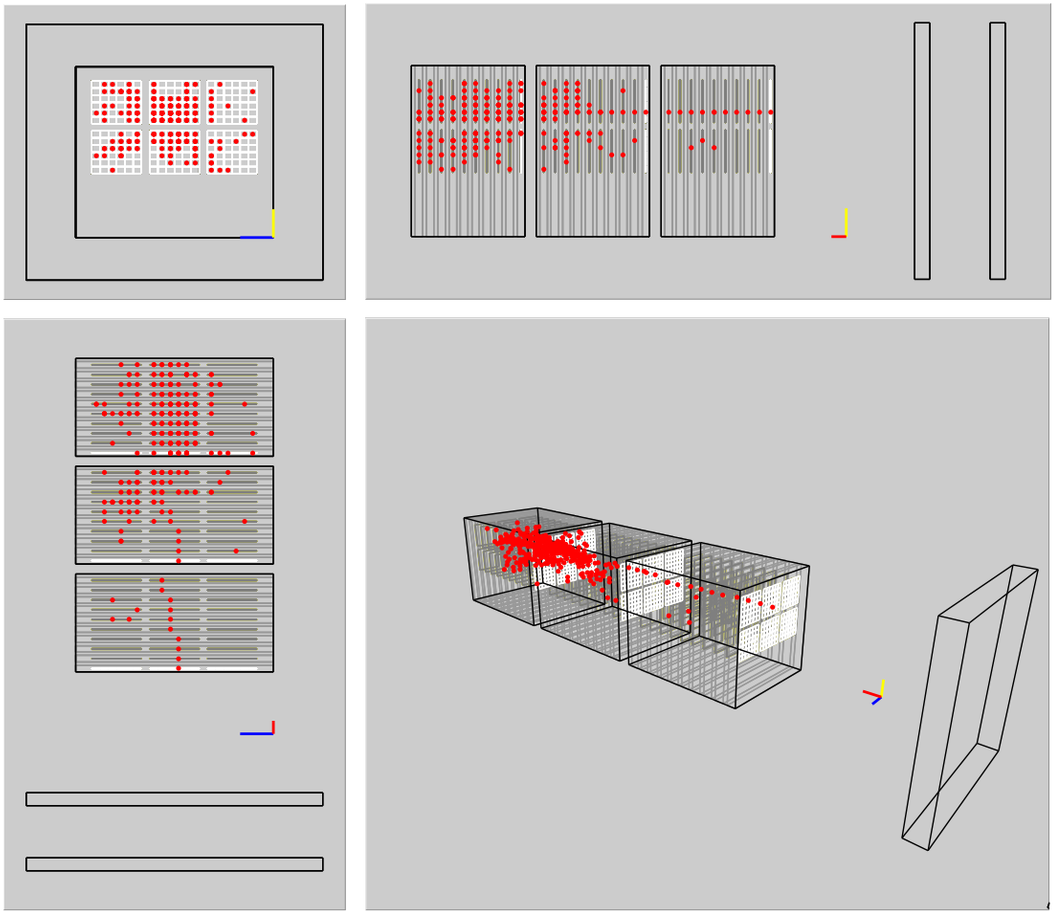


ECAL Display

Run 300329:0 Event 1090

Time: 17:15:20:953:259 Mon Aug 28 2006

Hits: 311 Energy: 1930.61 mips

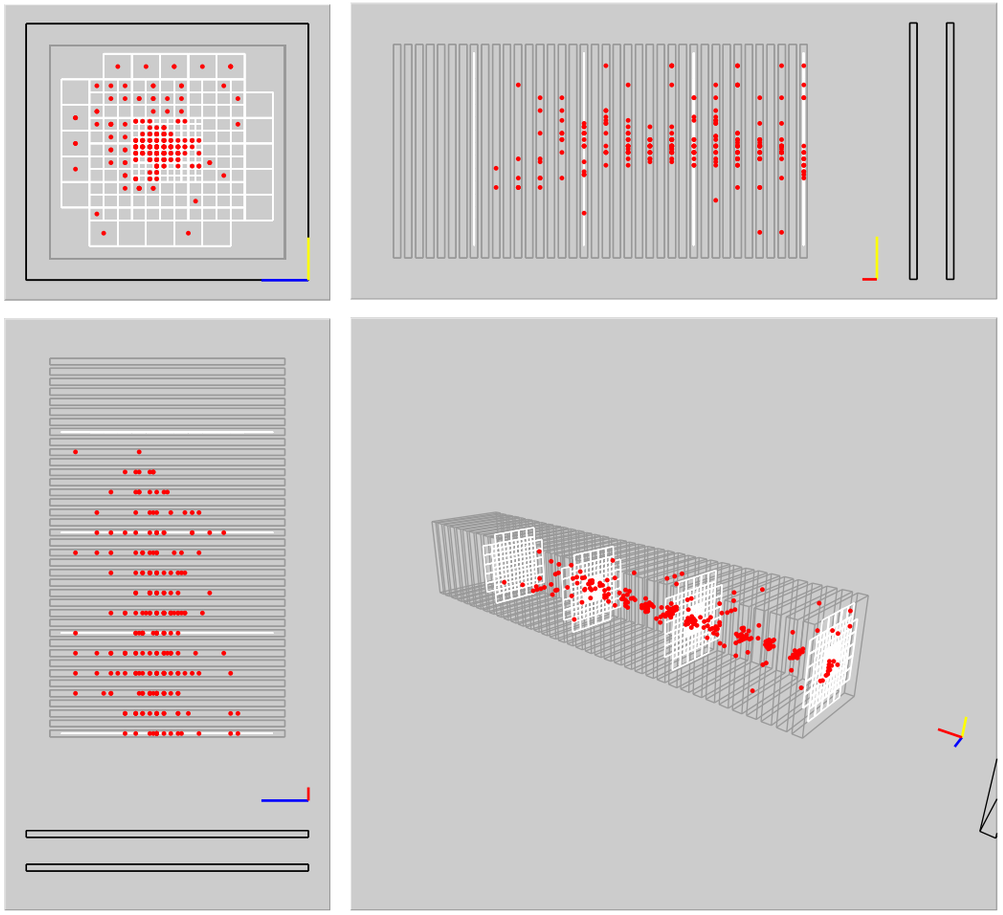


HCAL Display

Run 300329:0 Event 1090

Time: 17:15:20:953:259 Mon Aug 28 2006

Hits: 230 Energy: 566.372 mips

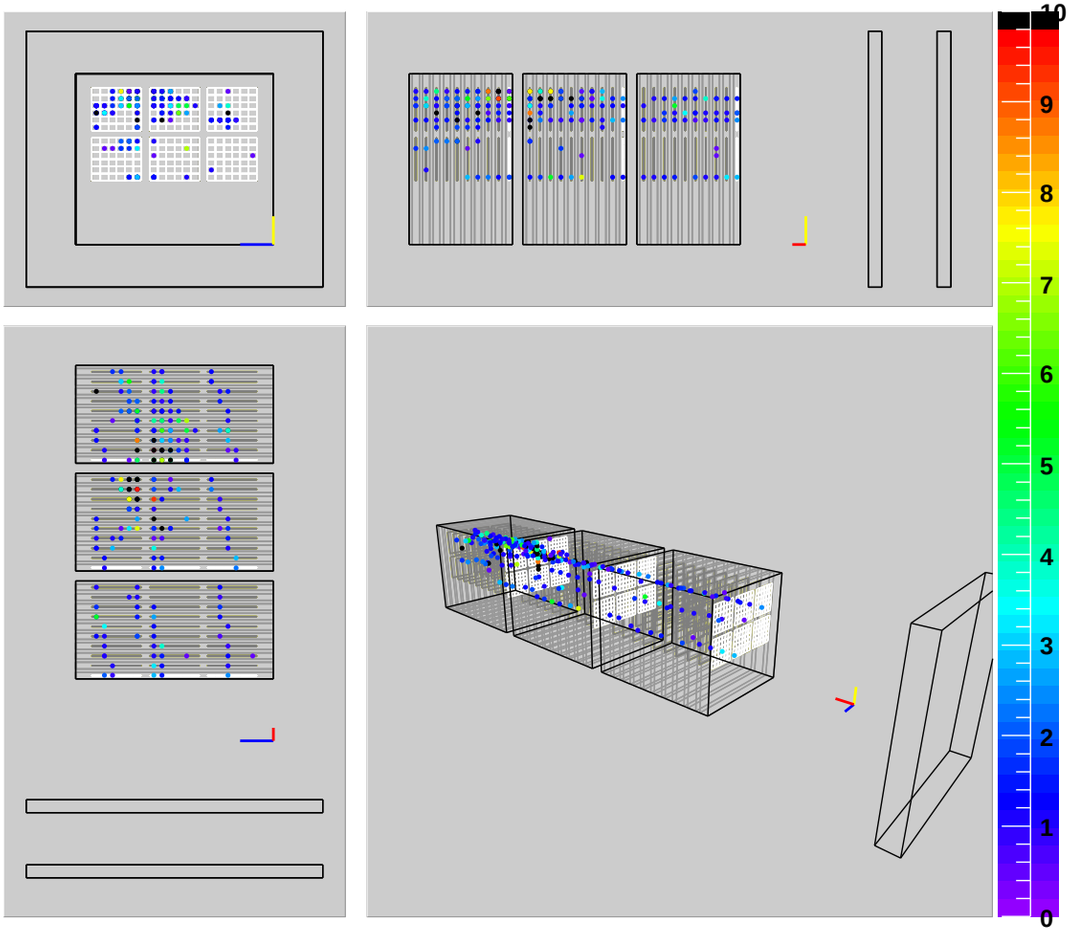


ECAL Display

Run 300329:0 Event 1240

Time: 17:15:21:676:663 Mon Aug 28 2006

Hits: 252 Energy: 1123.32 mips

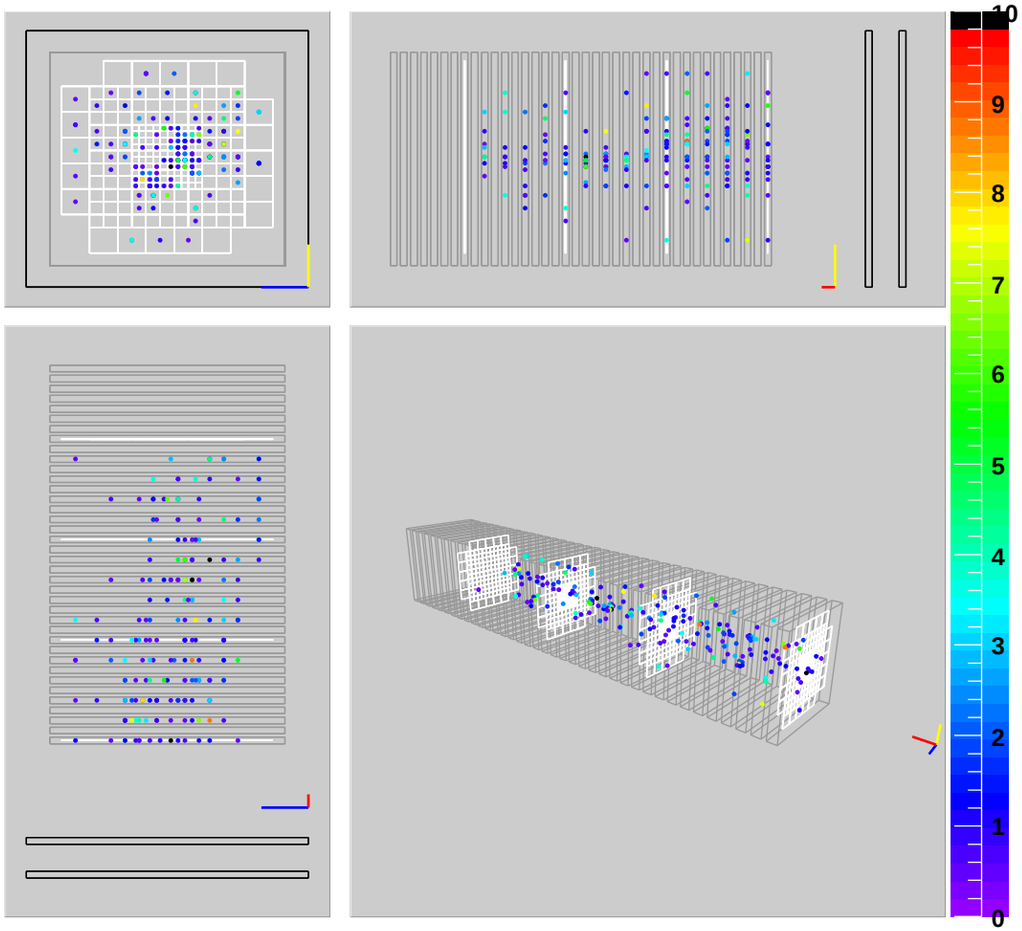


HCAL Display

Run 300329:0 Event 1240

Time: 17:15:21:676:663 Mon Aug 28 2006

Hits: 197 Energy: 431.805 mips

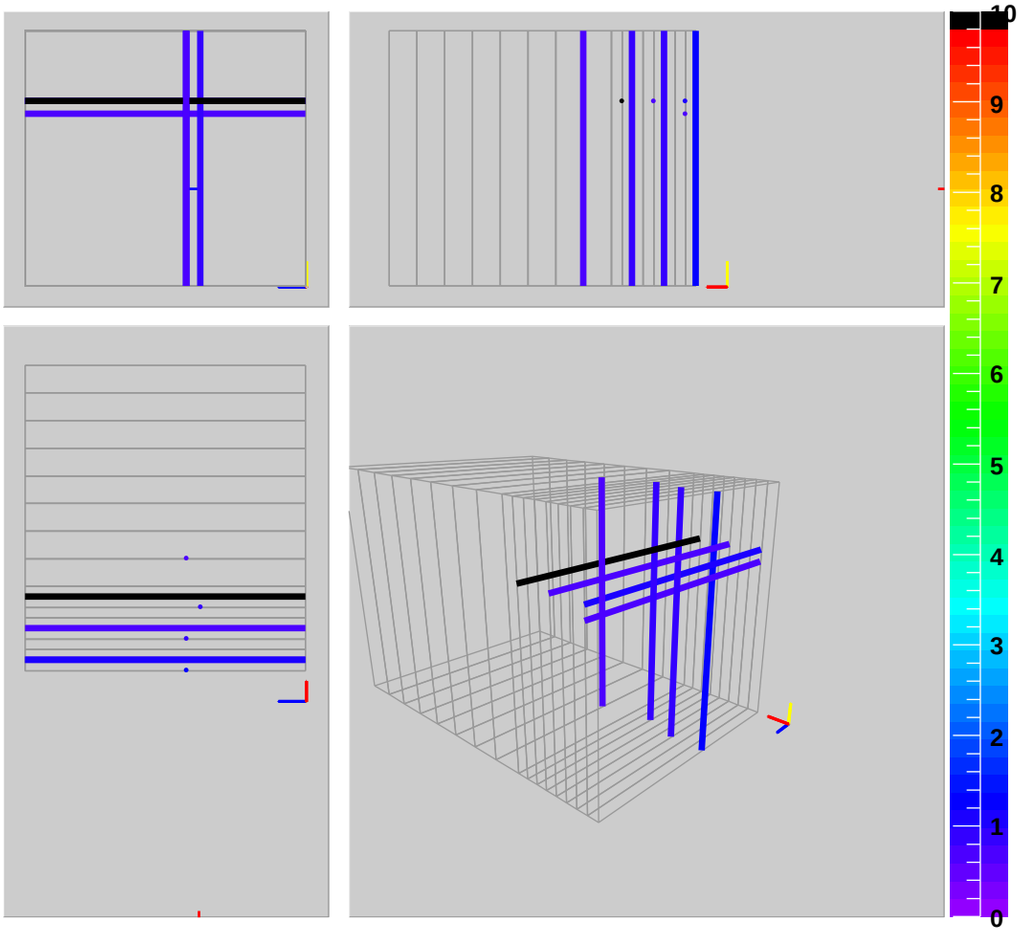


TCMT Display

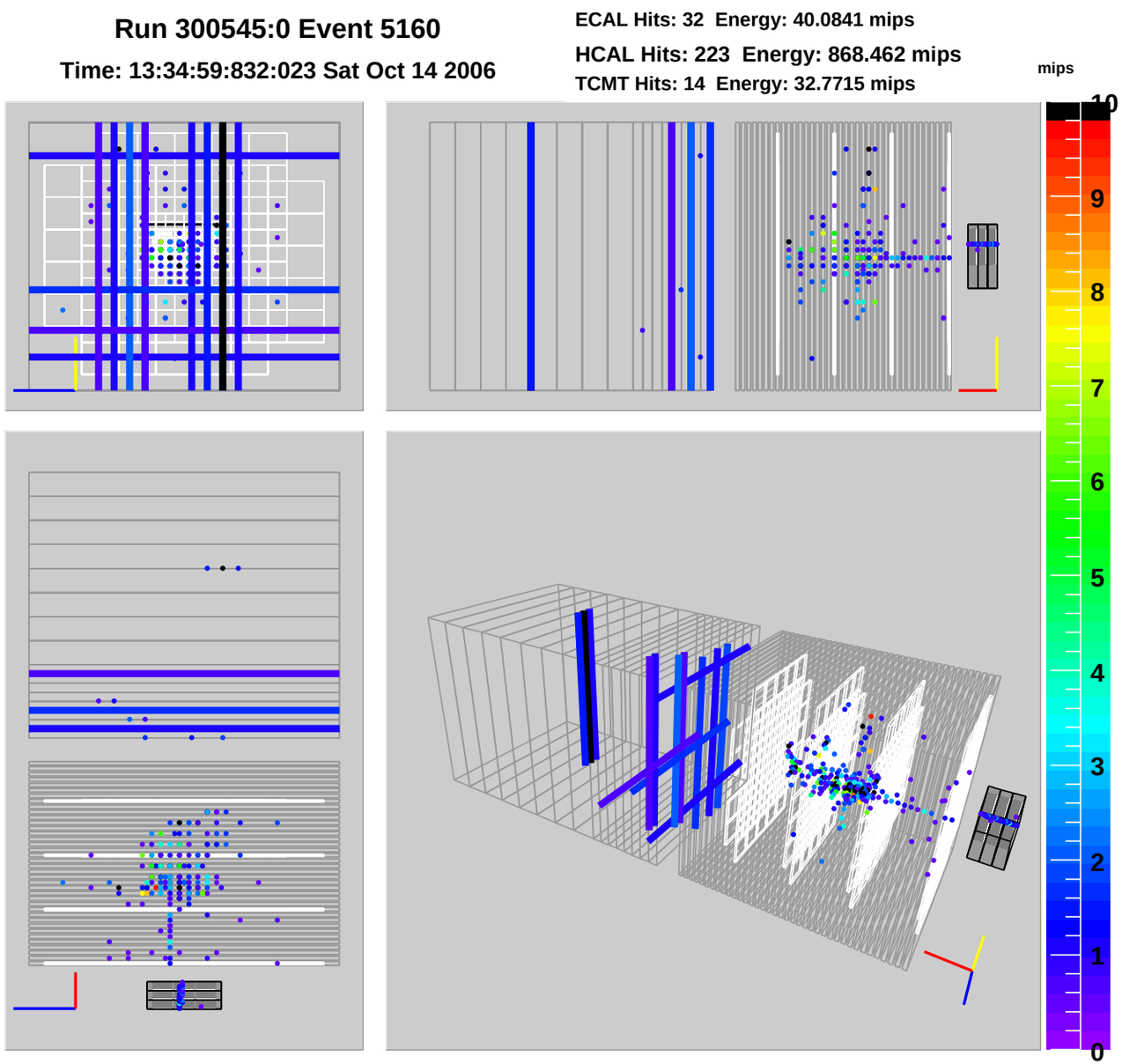
Run 300329:0 Event 1240

Time: 17:15:21:676:663 Mon Aug 28 2006

Hits: 8 Energy: 20.9211 mips



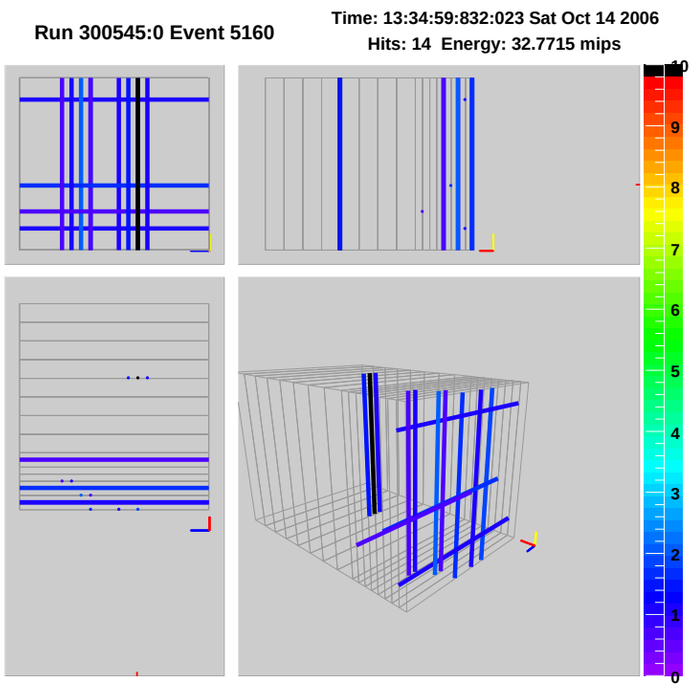
CALICE testbeam at CERN



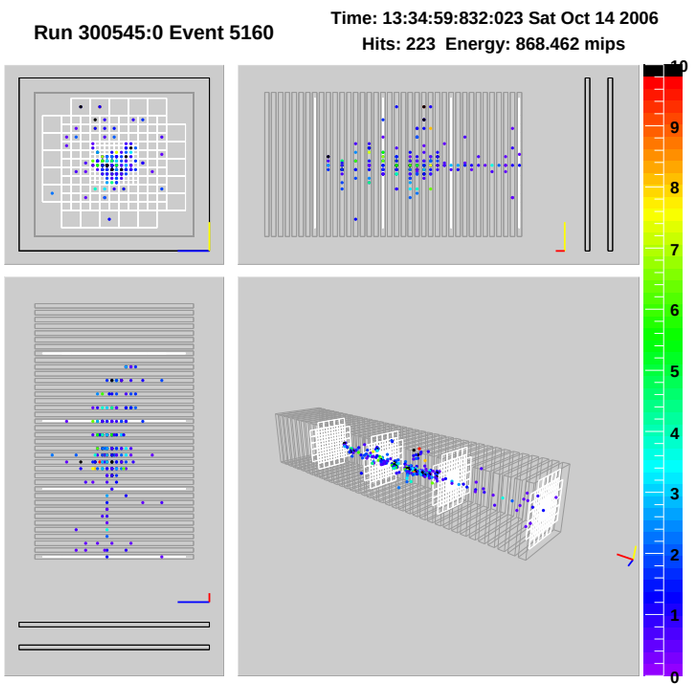
π^- 30 GeV

ECAL threshold = 0.5 mip
HCAL threshold = 0.5 mip
TCMT threshold = 0.7 mip

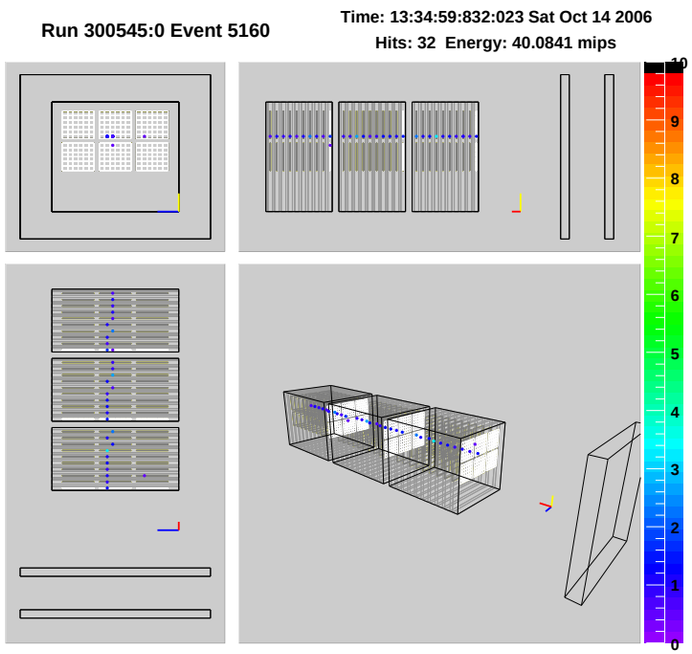
CALICE testbeam at CERN



TCMT



HCAL



ECAL

CALICE Testbeam Program (last 12 months)

(full monitor support provided)

- **DESY, 22 May - 31 May 2006**
  - : **ECAL(W/Si)** testbeam with electrons at 1-6 GeV
- **CERN, 24 Aug - 3 Sep 2006**
  - : **ECAL(W/Si)** testbeam with electrons at higher energy
  - : **AHCAL, TCMT** commissioning
  - : **AHCAL** technical run with electrons/pions
- **CERN, 12 Oct - 24 Oct 2006**
  - : combined **(ECAL+AHCAL+TCMT)** physics run with electrons/pions
- **DESY, 2 Mar - 26 Mar 2007**
  - : **ECAL(W/scint.strip)** testbeam with electrons at 1-6 GeV

Remarks/Todo

- **documentation**

  : basic technical documentation exists, needs substantial improvement

- **MonitorSpy**

  : a first solution implemented but not developed further,
  requires the monitor pc to be directly accessible through ssh

DHCAL "slice test"

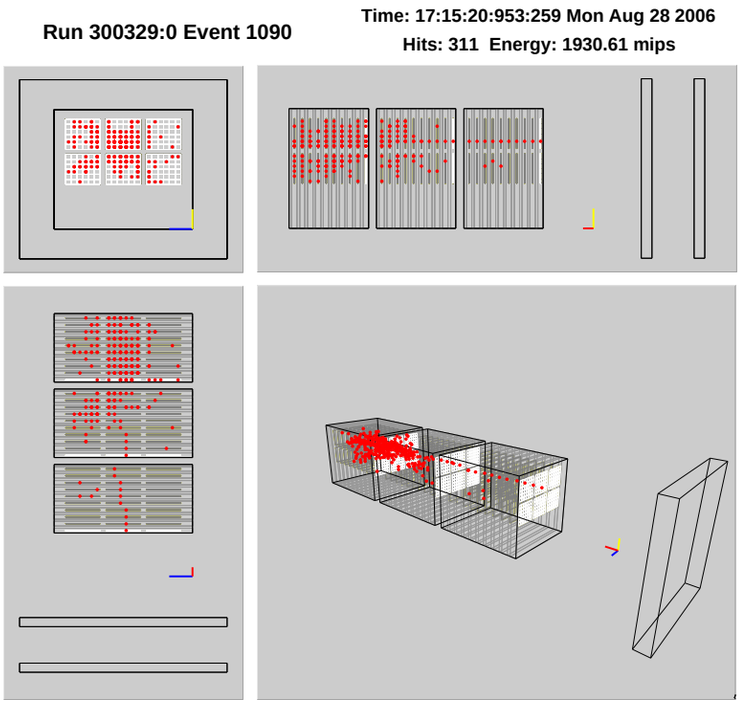
- .

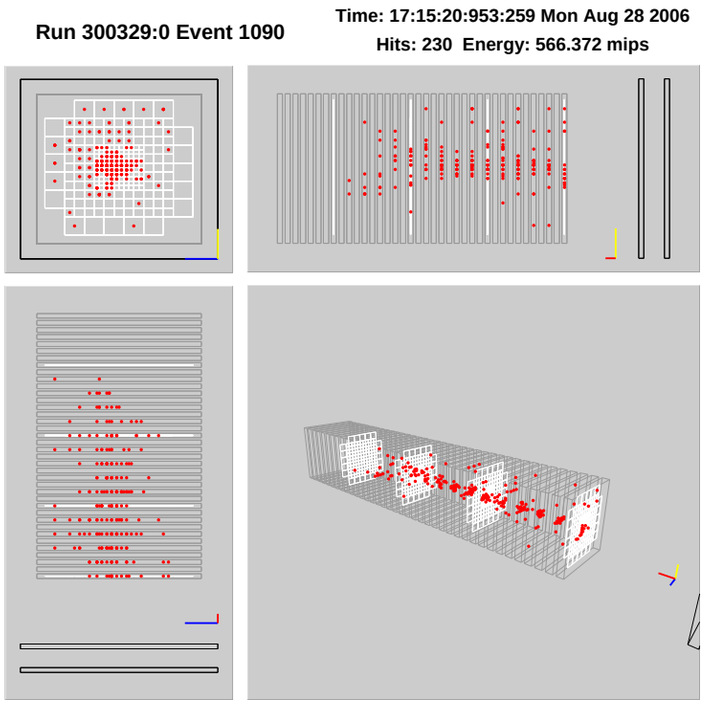
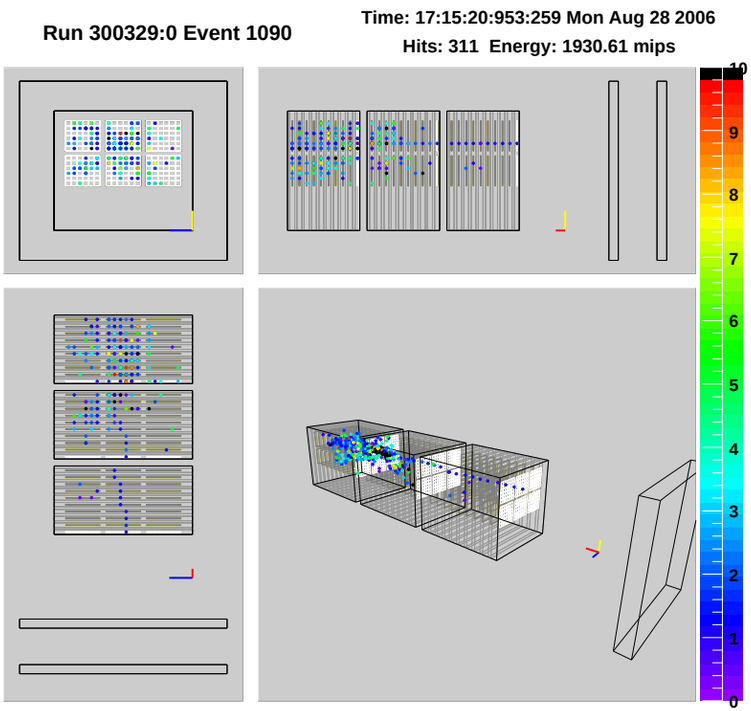
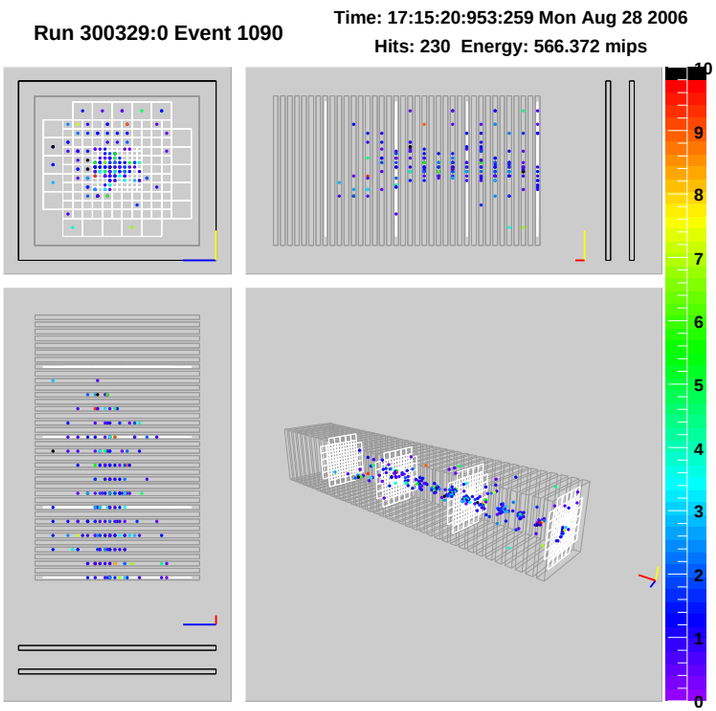
  : monitoring and support will be provided

ECAL Display

HCAL Display

digital





analogue