Digital HCAL slice test monitoring

Georgios Mavromanolakis

Cambridge University

and **FERMILAB**

Outline

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

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 (DHCAL slice test)

- **input**

  : .bin data files produced by daq

  + channel mapping file (readout id $\rightleftharpoons$ physical position)

  + calibration constants (?)

- **output**

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

  + (if needed) Dhcal specific `Monitor<run>.<file>.Dhcal...dat, ..dat`

Classes

► .

COMPONENTS-DETECTORS		BACKBONE
(DHCAL)	**(ECAL)**	DatMgr
	...	RunMgr
DhcalReader		Handler
DhcalEvt	**(ECALSCINT)**	ClosableMgr
	...	Closable
DhcalMap	**(HCAL)**	
DhcalReadoutPad	...	MonitorMgr
DhcalPhysPad		Monitor
	(TCMT)	SharedMonitor
	...	SocketClient
DhcalHandler		
DhcalRawHitExtractor	**(TDC)**	MyMainFrame
DhcalHits	...	MySpyMainFrame
DhcalEnergy		MessageHeader
DhcalMonitor	**(VETO)**	MessageObj
		MyEventDisplay

■ general analysis classes

■ gui related classes

Histograms

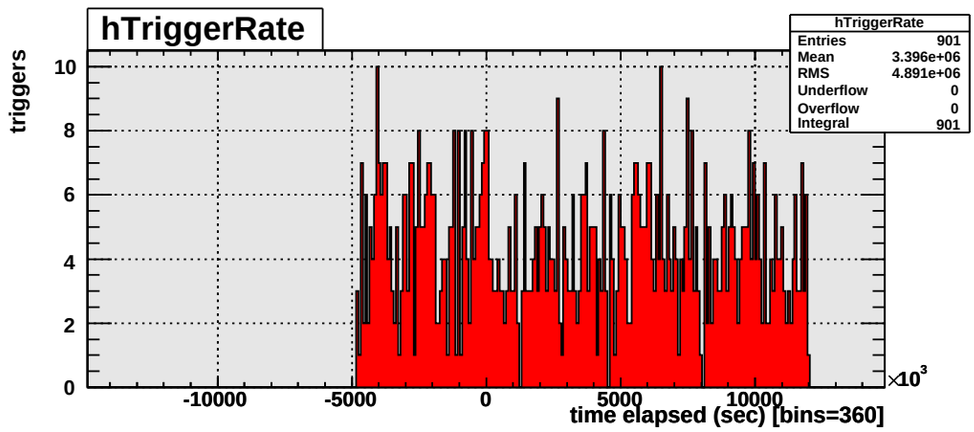
- **DHCAL slice test (50 histos)**

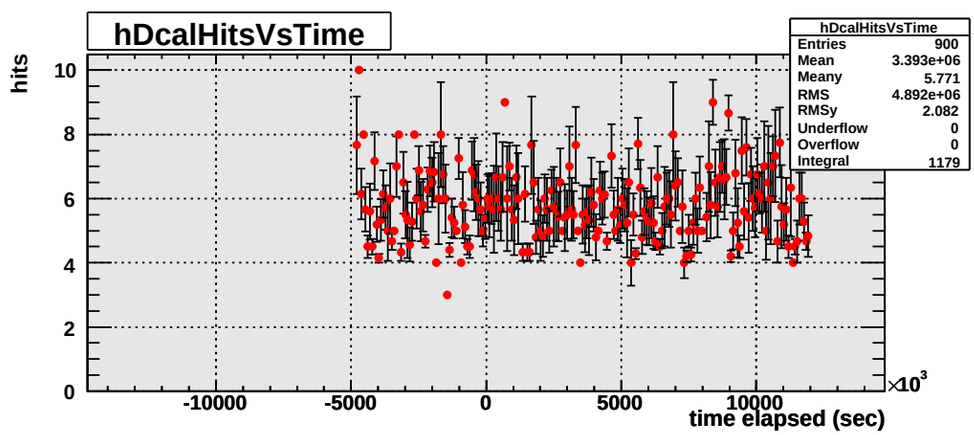
  (DHCAL)
  hDhcalTriggerEvents
  hDhalBadReadout
  hDhcalHits
  hDhcalHitsVsTime
  hDhcalHitsPerLayer
  hDhcalX
  hDhcalY
  hDhcalXY
  hDhcalXZ
  hDhcalYZ

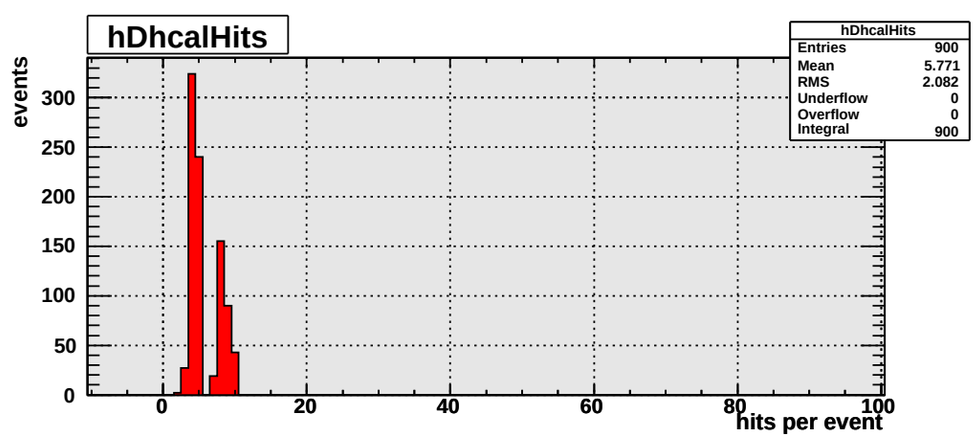
  hDhcalHitsLayer[10]
  hDhcalXYLayer[10]
  hDhcalXLayer[10]
  hDhcalYLayer[10]

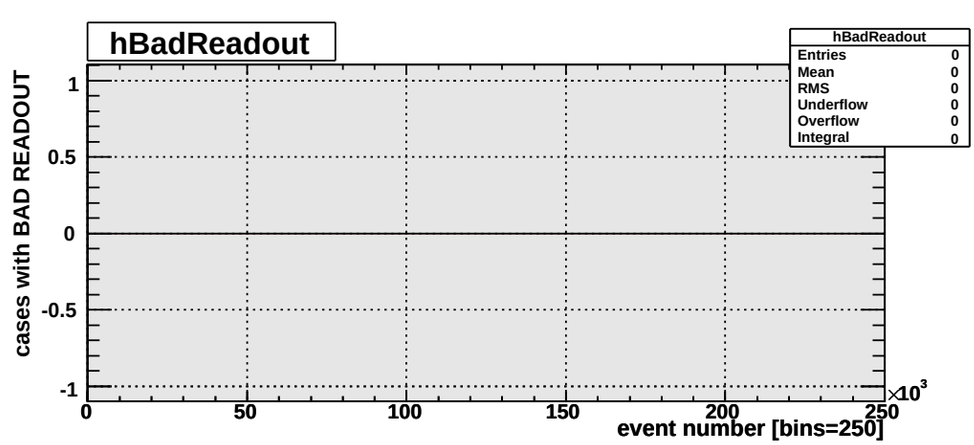
- arranged in 6 gui panels (=printout pages)

panel Main

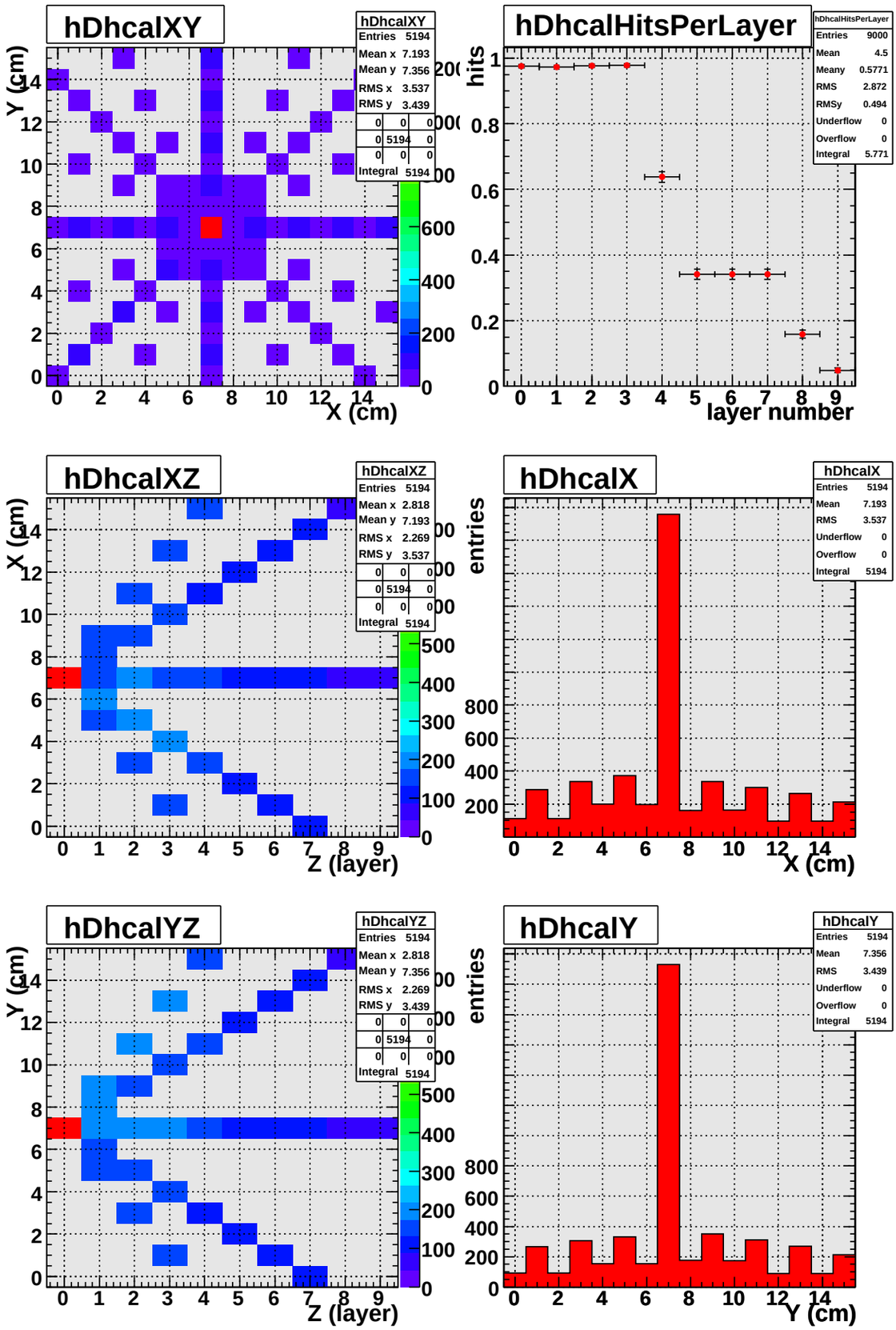

hTriggerRate
hTriggerRate
Entries 901
Mean 3.396e+06
RMS 4.891e+06
Underflow 0
Overflow 0
Integral 901
triggers
time elapsed (sec) [bins=360]
×10^3


hDcalHitsVsTime
hDcalHitsVsTime
Entries 900
Mean 3.393e+06
Meany 5.771
RMS 4.892e+06
RMSy 2.082
Underflow 0
Overflow 0
Integral 1179
hits
time elapsed (sec)
×10^3

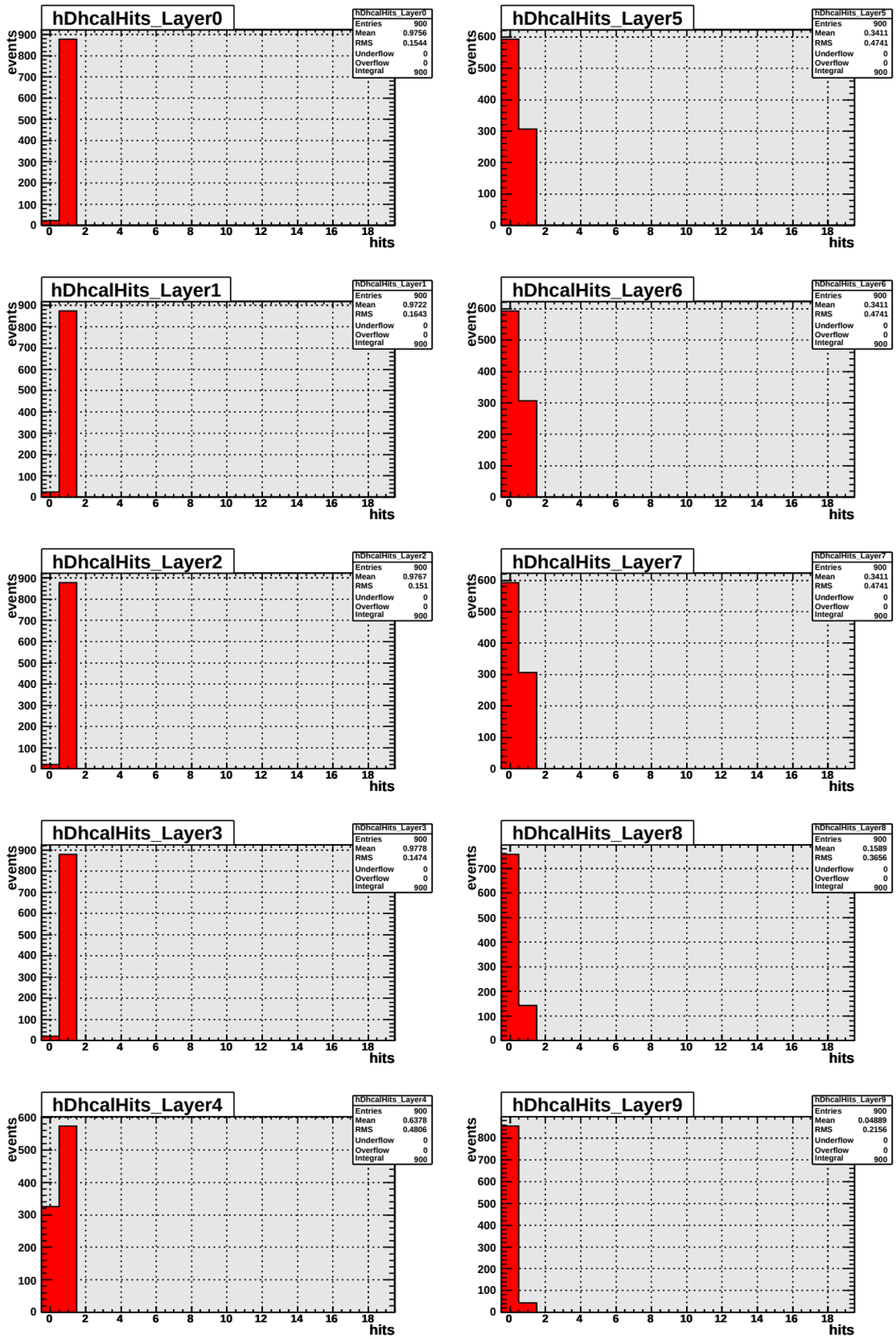

hDhcalHits
hDhcalHits
Entries 900
Mean 5.771
RMS 2.082
Underflow 0
Overflow 0
Integral 900
events
hits per event


hBadReadout
hBadReadout
Entries 0
Mean 0
RMS 0
Underflow 0
Overflow 0
Integral 0
cases with BAD READOUT
event number [bins=250]
×10^3

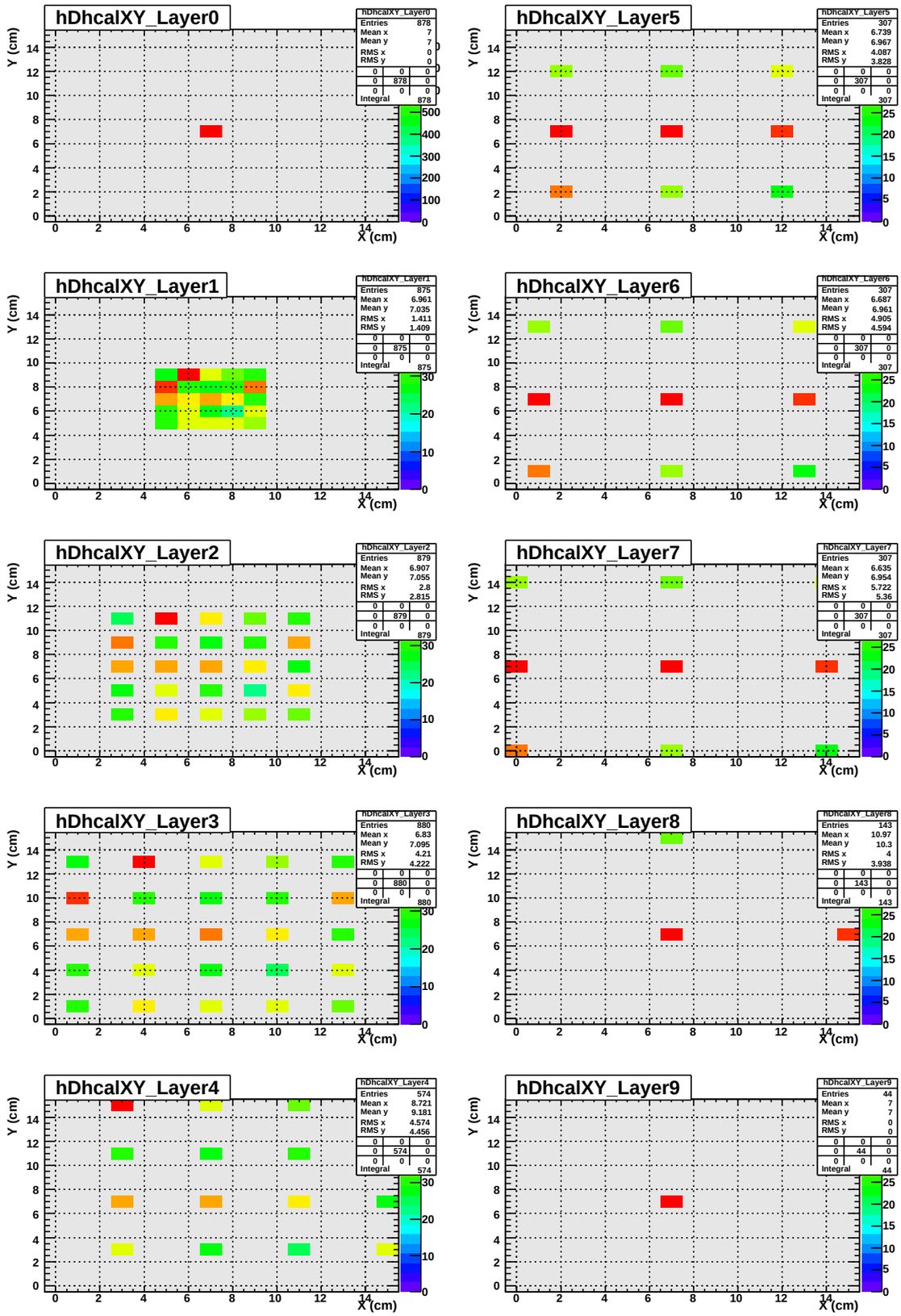
panel AllLayers



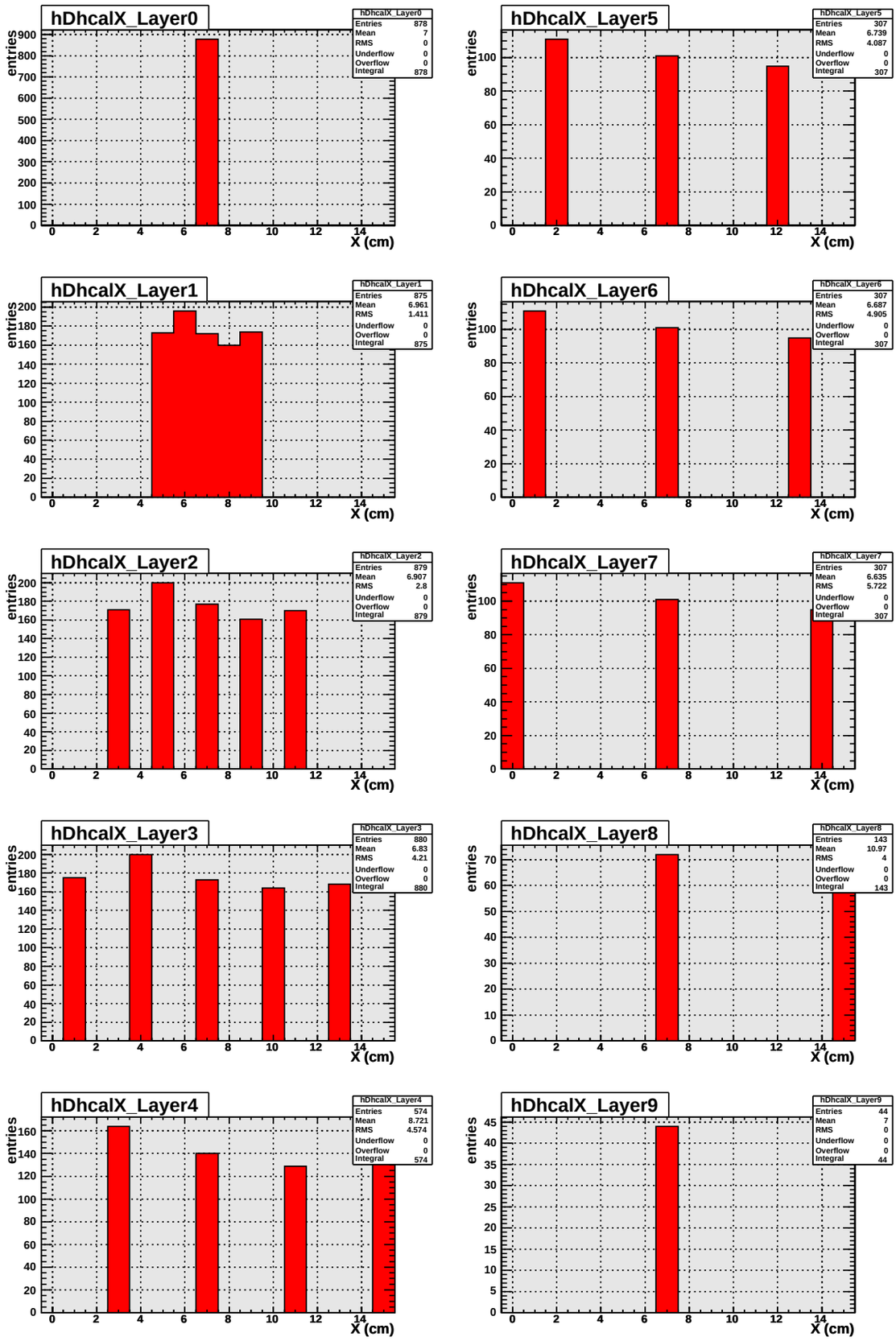
panel HitsPerLayer



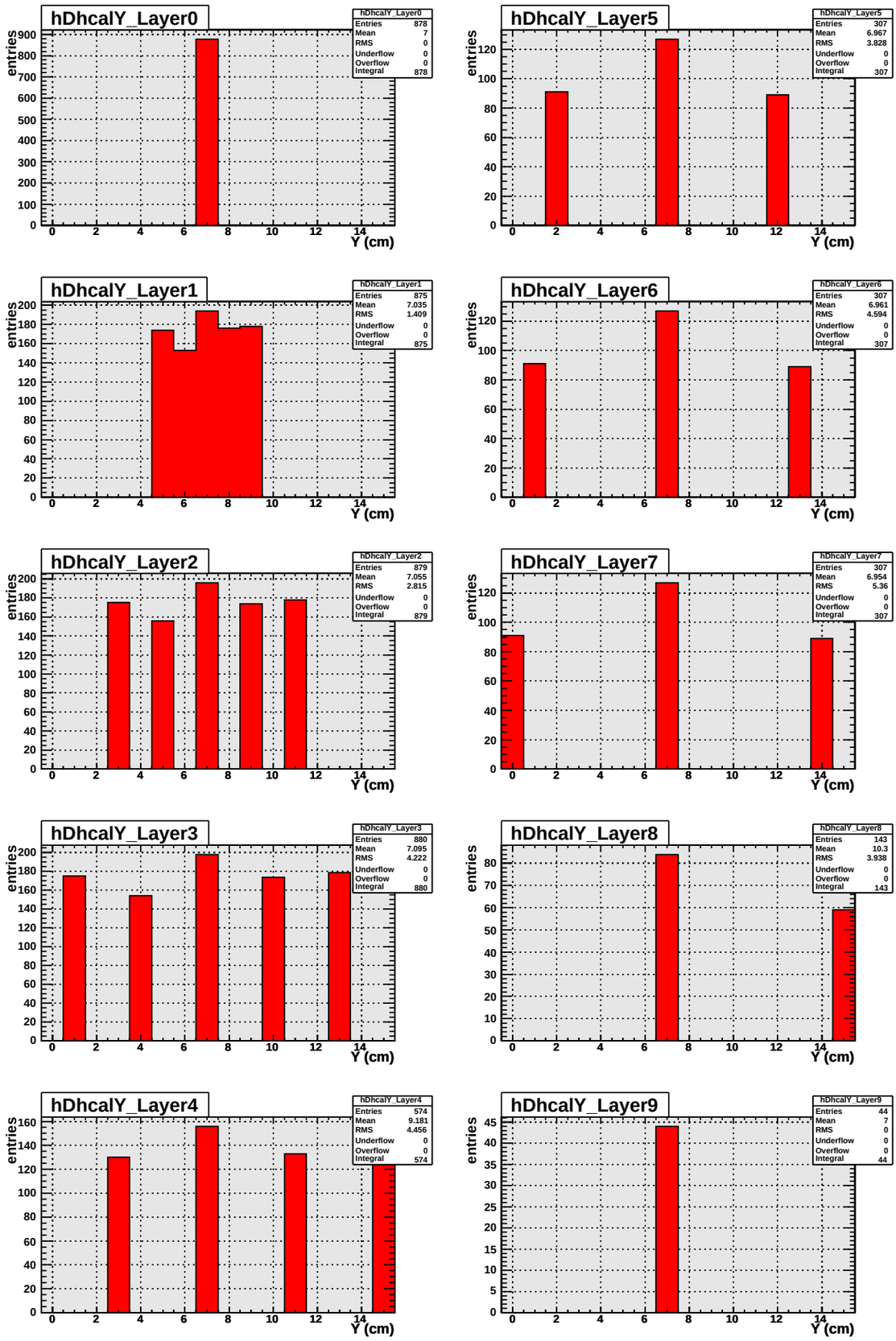
panel XYPerLayer



panel XPerLayer



panel YPerLayer

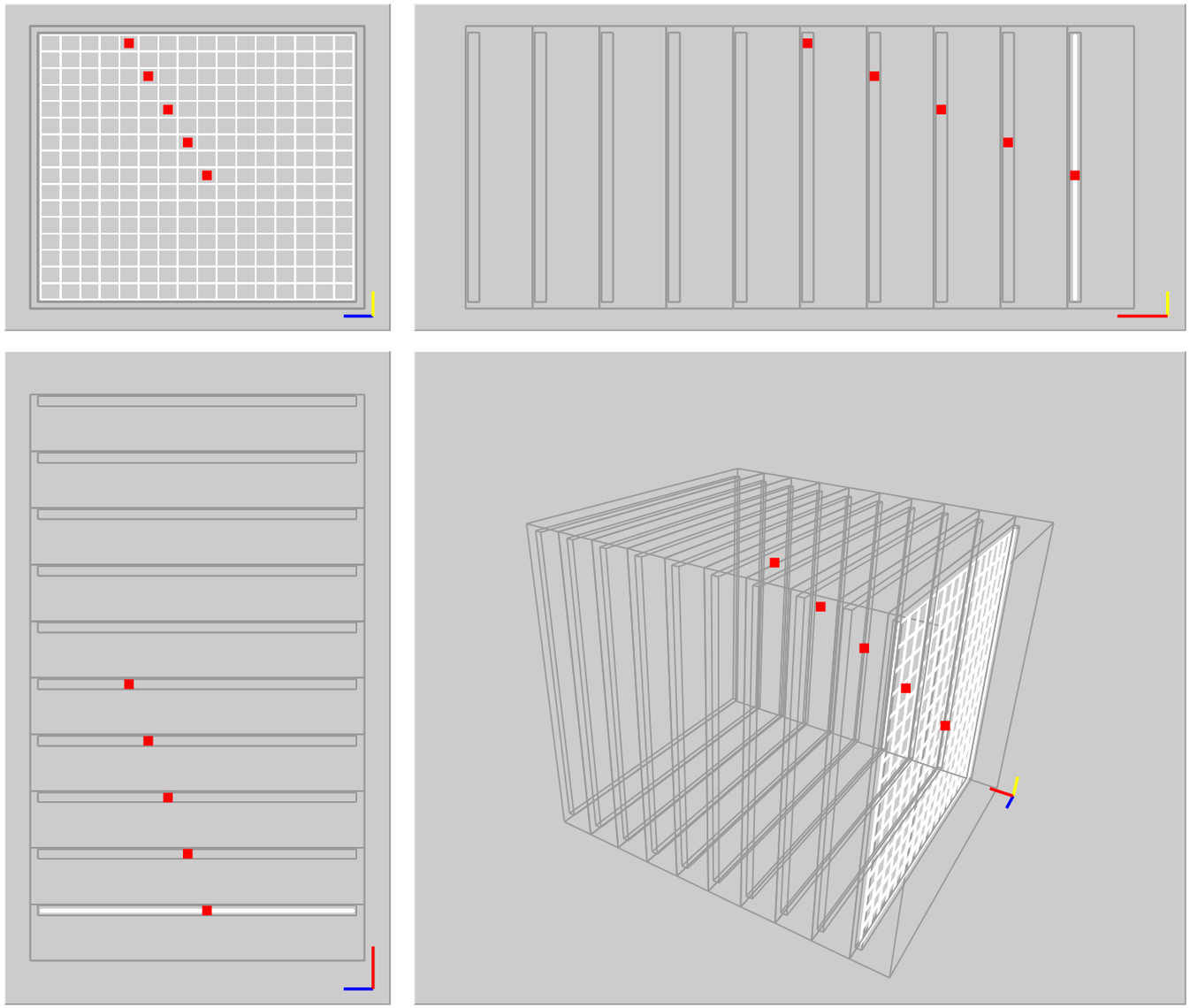


DHCAL(slice test) Display

Run 999999:0 Event 800

Time: Thu Apr 16 16:34:17 1970

Hits: 5 Energy: xxx mips



(slice test)
16 $\times$ 16 pads 1 cm^2,
10 layers
total: 2560 channels

Demonstration ...