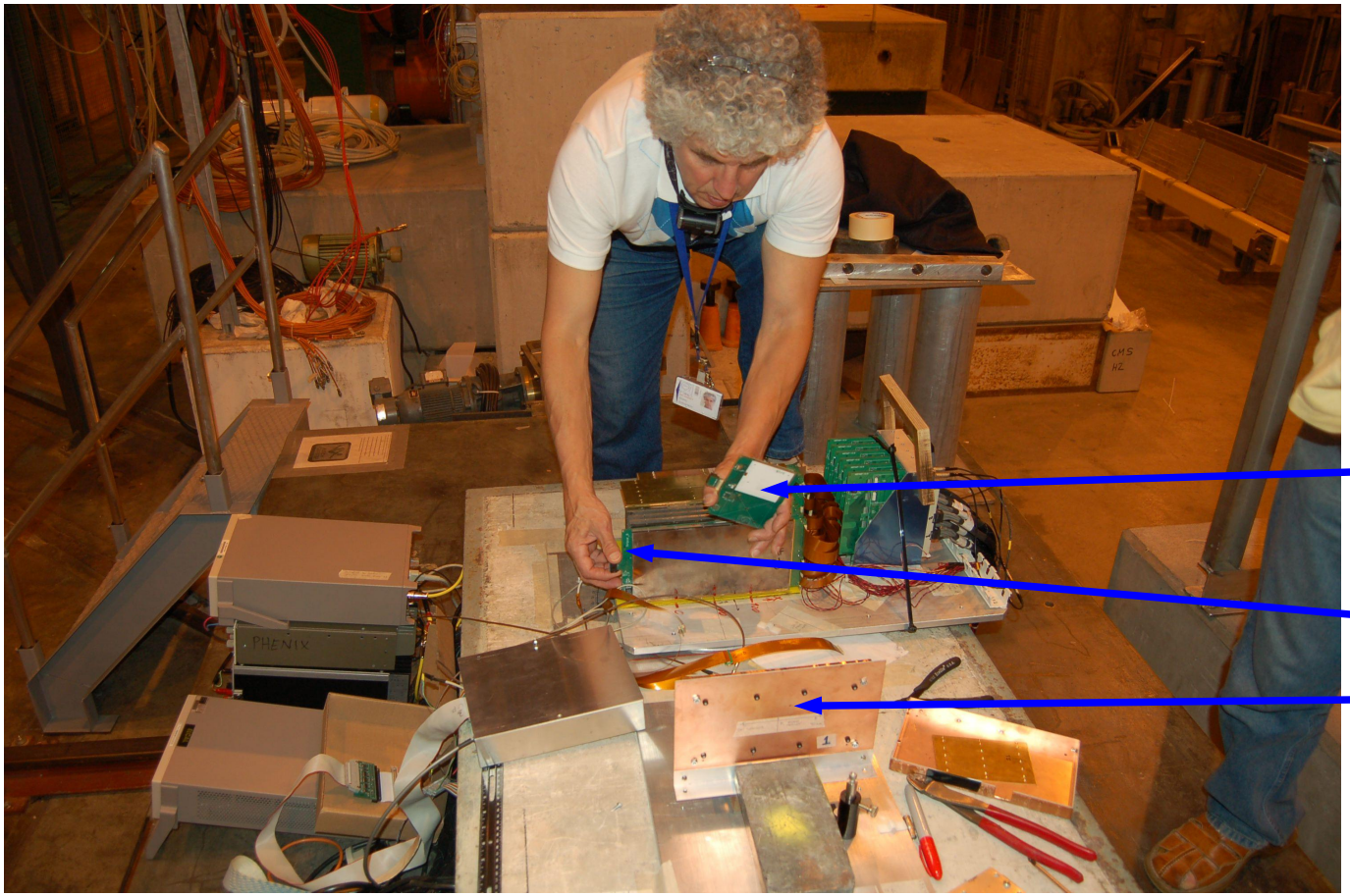
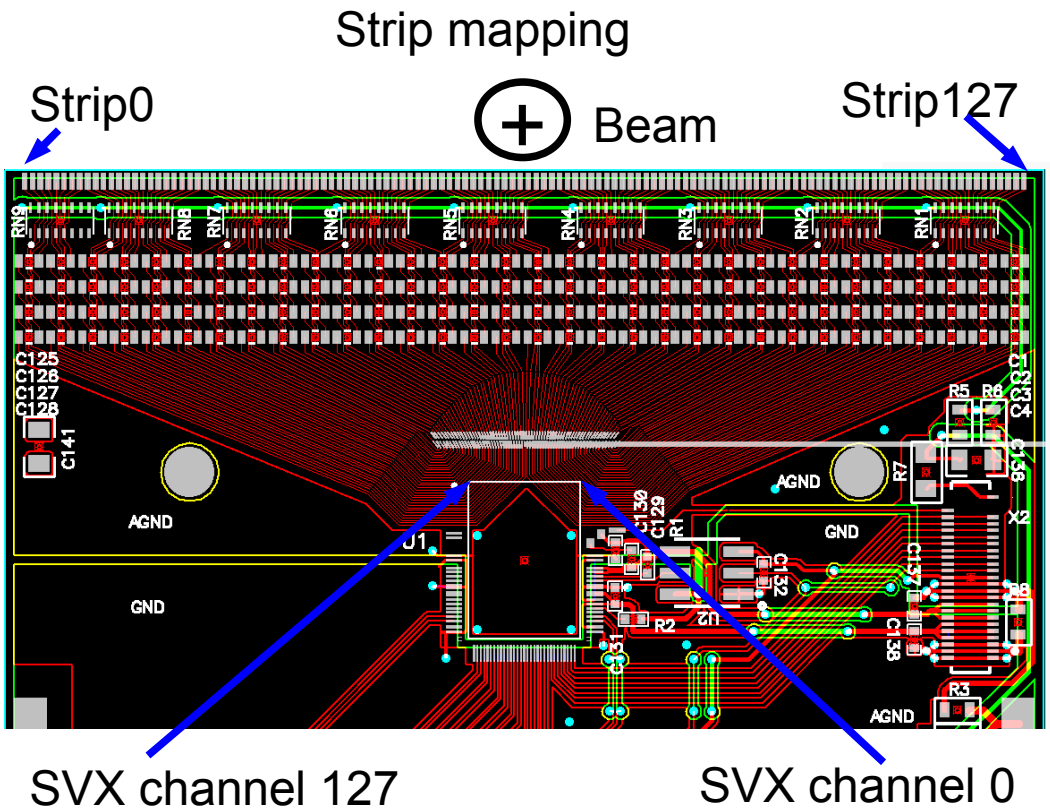
Setup



Most runs were taken with 2 StripCar1 modules.

Electronics and Mapping

PCB drawings are on the WIKI:
https://www.phenix.bnl.gov/WWW/offline/wikioffline/index.php/Beam_Test_Electronics



Software

offline/packages/ncc/strips

Main class is Tn3c

Raw ingredients:

```
ftree->Branch("adc",fadc,"fadc[512]/S"); // adc array sorted in ascending strip numbers
ftree->Branch("chn",fchn,"fchn[512]/s"); // strip number, basically 0,1,2,3...
```

Hit stuff:

```
ftree->Branch("hitsInPlane",(UChar_t*)fhitsInPlane,"fhitsInPlane[4]/b");
ftree->Branch("hitPos0",(UChar_t*)&fhitPos[0],"fhitPos0[10]/b");
```

Sum of amplitudes of 3 strips in plane2 associated with a hit in plane0:

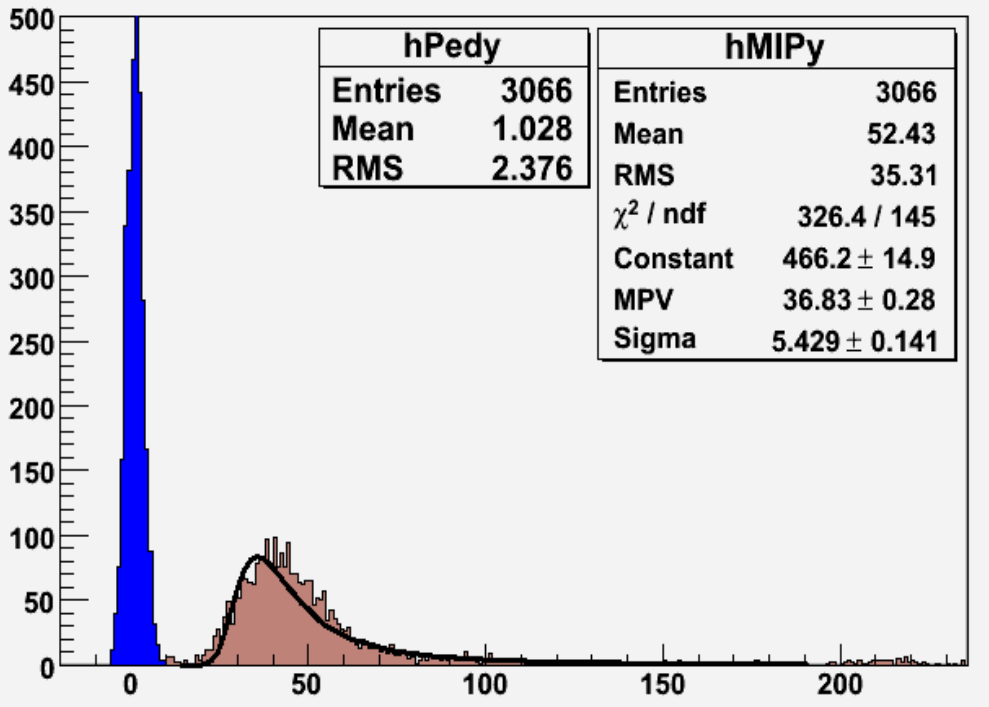
```
ftree->Branch("sumROI0",(UChar_t*)&fsumROI[0],"fsumROI0[10]/b");
```

Important globals:

```
Int_t    Tn3c::gHitThreshold = 20; // set to 0 to disable hit processing
// chip orientation bitmask, bit[0]: X/Y, bit[1]: right/left
UChar_t Tn3c::gChipOrientation[MAXCHIPS]={2,3,2,1};
Int_t Tn3c::gROIHalfWidth = 1;
// Position of the beam image in the plane. The most important is difference in each
// coordinates. It can be retrieved using
//Tree->Draw("hitPos3-hitPos1","3<=clkphase&&clkphase<=4")
// for run 090629060741 the differences are 16 and 49
Int_t Tn3c::gBeamOffset[MAXCHIPS] = {61,61,77,110};
```

Commands

.x init.C
.x go.C("../data/090629060741.dq0")



To get sum of amplitudes in ROI (3 strips around projected hit) in plane0 associated with a hit in plane3:

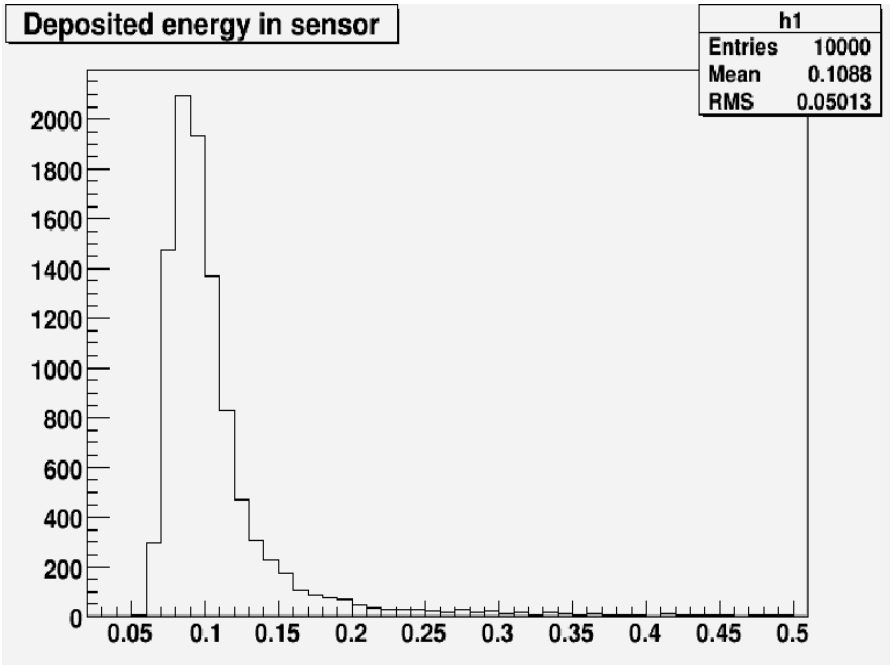
```
TH1D *hMIPy = new TH1D("hMIPy","hMIPy",256,-20,236)
gTree->Draw("sumROI3>>hMIPy","3<=clkphase&&clkphase<=4&&hitsInPlane[3]==1&&
hitsInPlane[1]==1&&sumROI3>0")
```

To get amplitudes in strip 40 in plane1 (40=168-128):

```
gTree->Draw("adc[168]>>hPedy",...,"same")
```

Signal To Noise Ratio

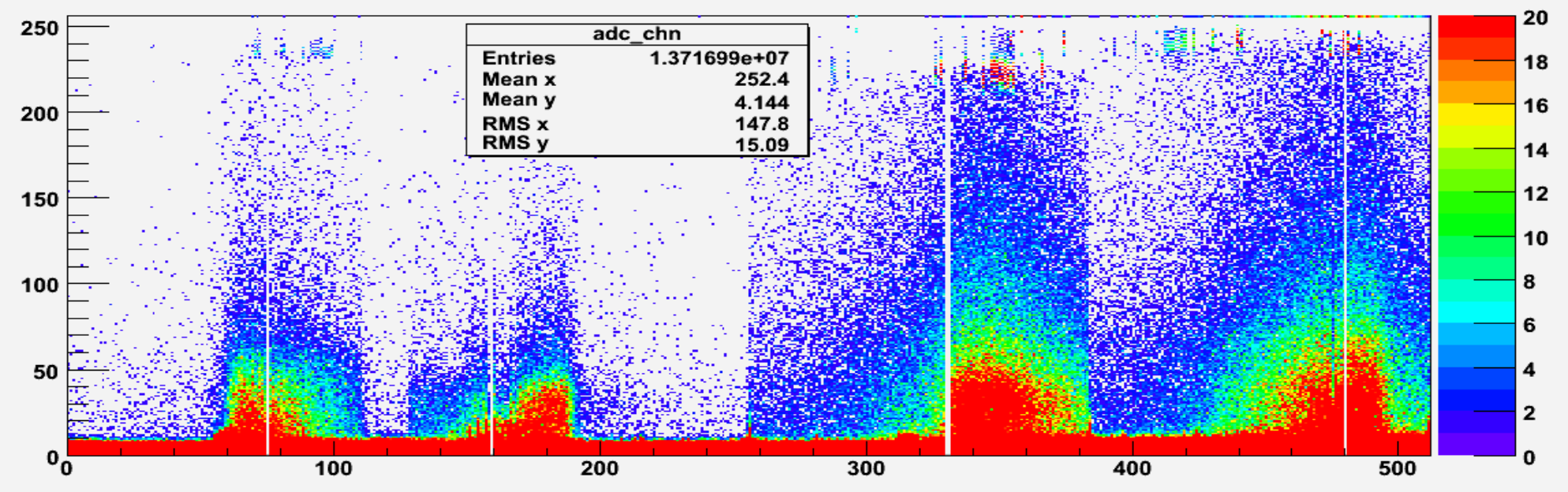
Noise performance.
The RMS noise is equal to the RMS of the pedestals.
What we need is to convert ADC counts into the:
•deposited energy [KeV]
•Number of electrons [3.6 eV to ionize one electron]
•Equivalent charge [fC]



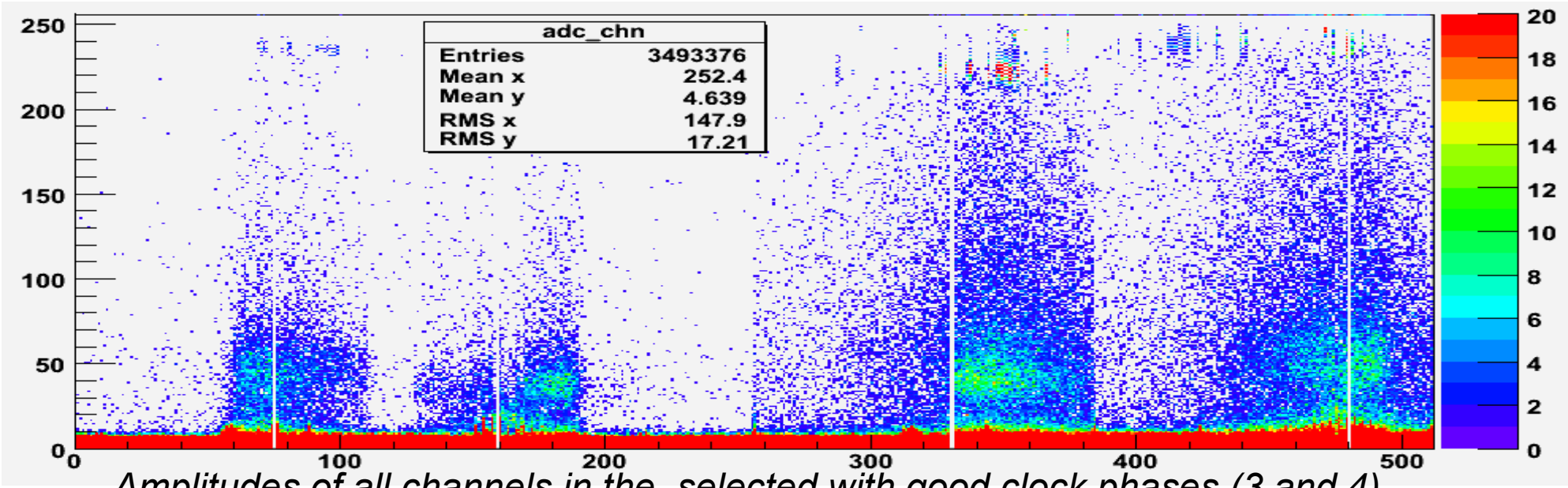
The natural calibration – using MIP particle – any particle with energy more than $5*mc^2$

Geant4 simulation of energy deposition of 1 GeV electron in 0.3mm of Silicon, Bremsstrahlung inactivated. The most probable value is 82 KeV. It is in agreement with the experimental values of 80 KeV.

Current Status: Amplitudes



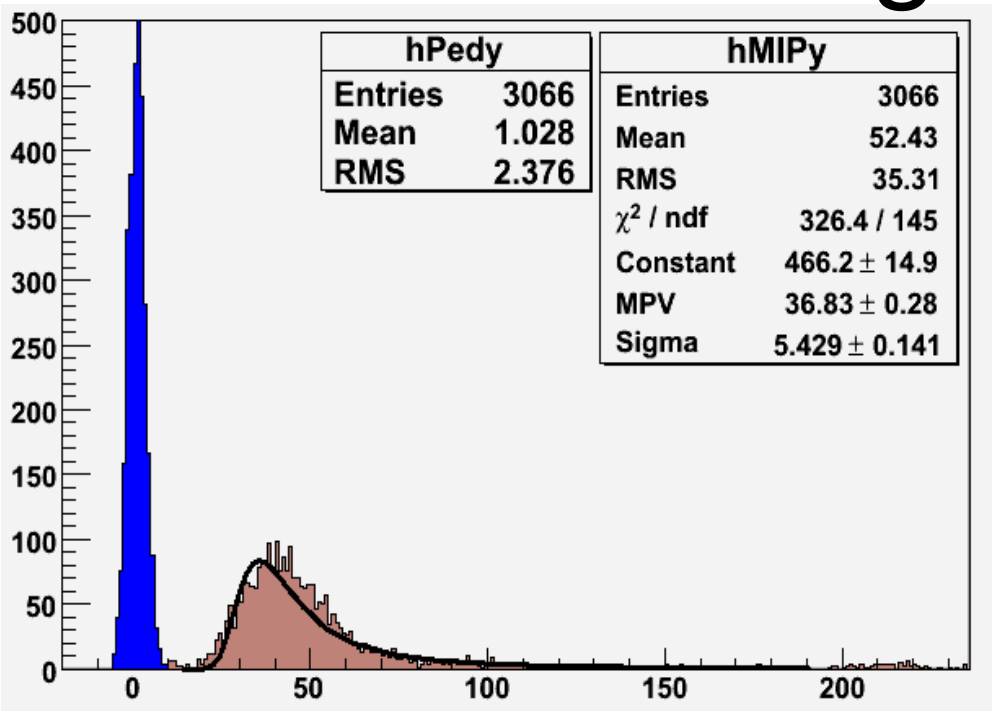
gTree->Draw("adc:chn>>adc_chn","","colz")



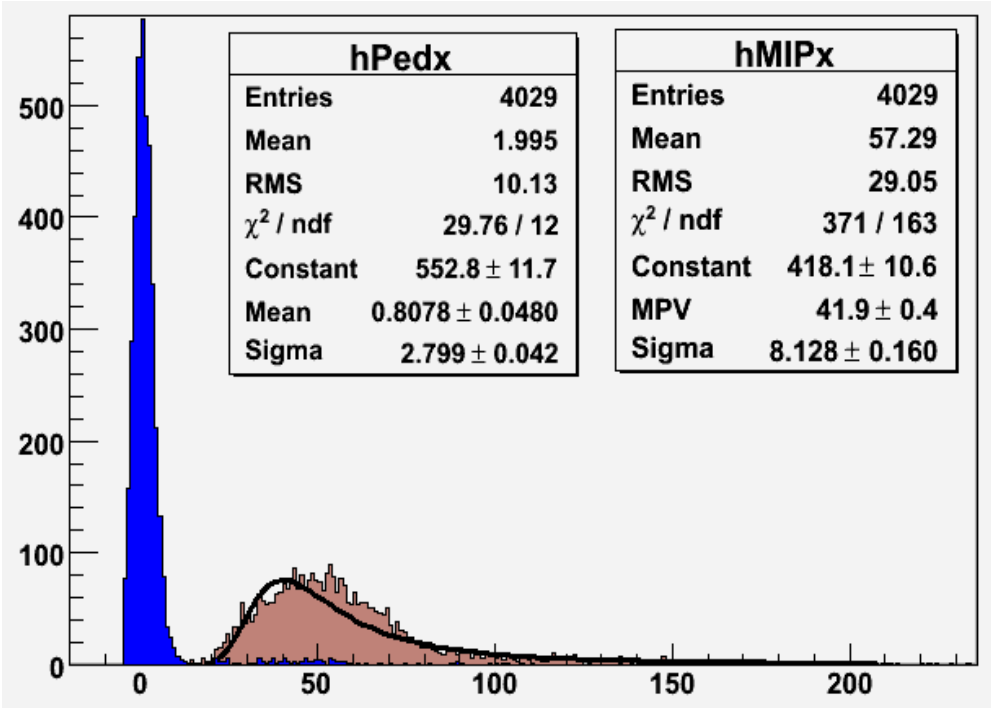
Amplitudes of all channels in the selected with good clock phases (3 and 4).

gTree->Draw("adc:chn>>adc_chn","3<=clkphase&&clkphase<=4","colz")

Status: Signal And Noise

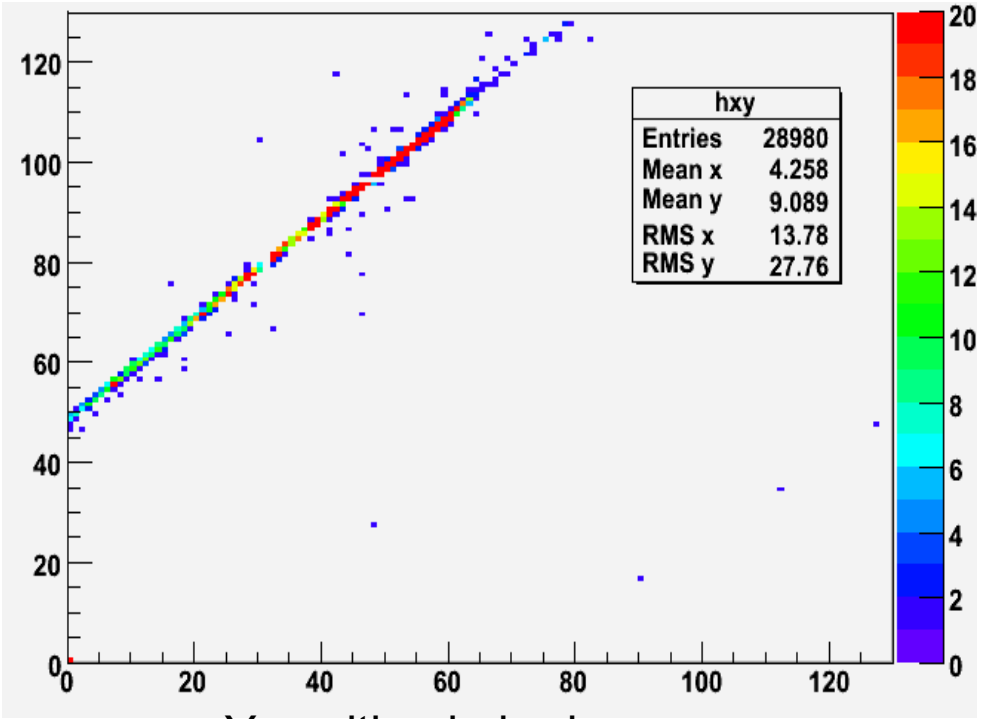


MIP peak and the pedestal peak (strip no. 40) in Y strip plane in the hodoscope module. For this channel the energy resolution is 5.3 KeV. The S/Nrms = 15.5

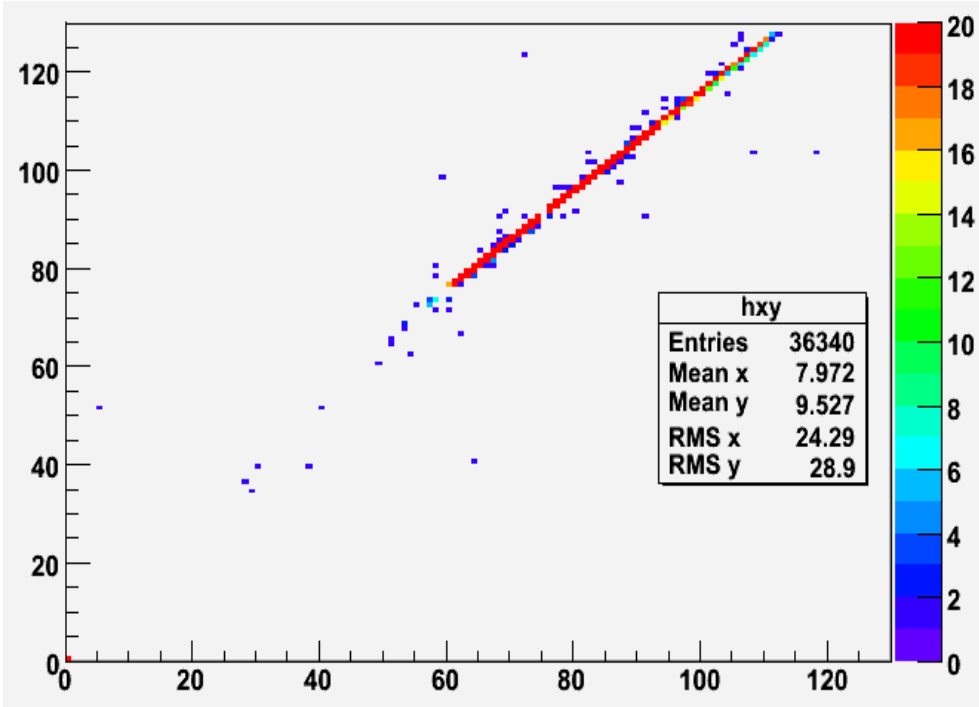


MIP peak and the pedestal peak (strip no. 64) in X strip plane in the hodoscope module. For this channel the energy resolution is 5.5 KeV. The S/Nrms = 15.

Current Status: Hit Position Correlation



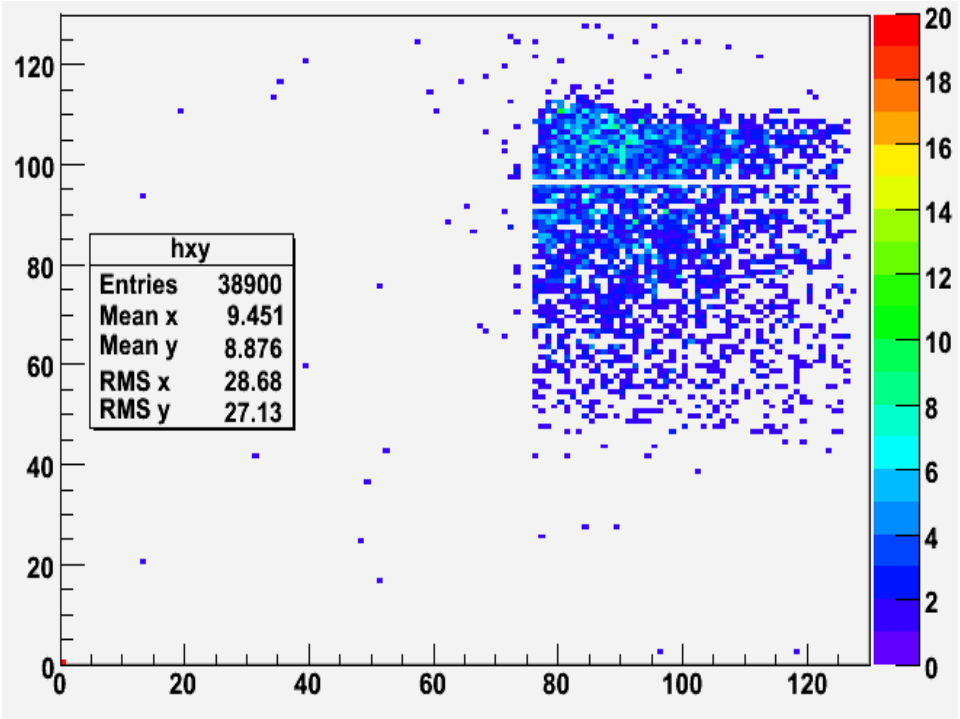
Y position in hodoscope



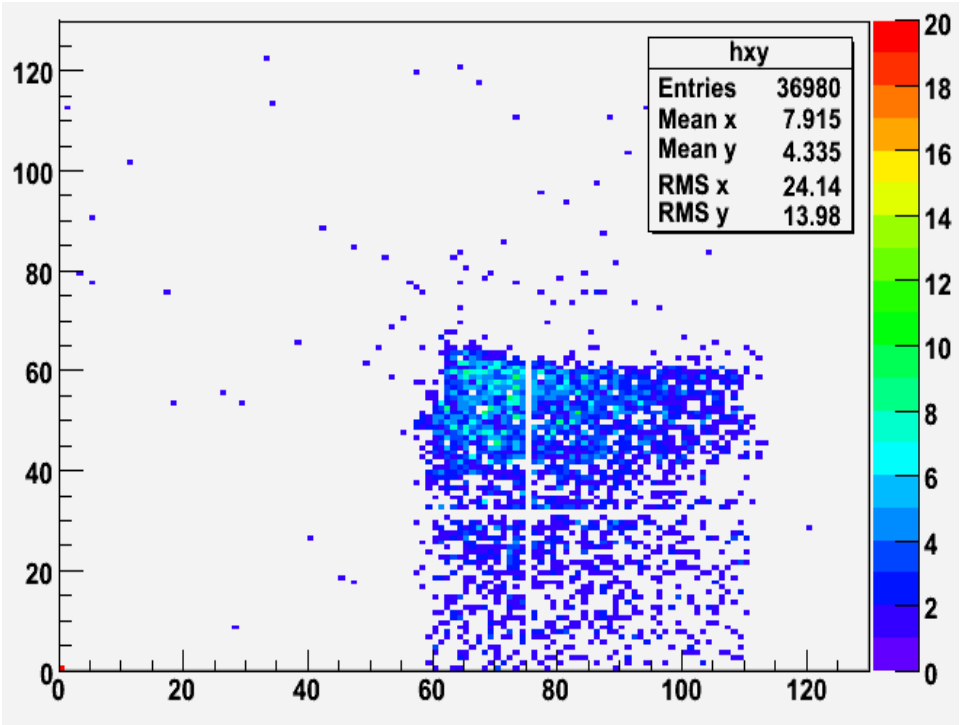
X position in hodoscope

Correlation between hit positions in strip planes in the calorimeter (Y-axis) versus the same in the hodoscope (X-axis)

Current Status: Beam Image



Beam image in hodoscope strip plane.



Beam image in strip plane inside the calorimeter

ToDo

•Signal-to-noise is quite undersood S/N=12:15.
The deposited energy resolution is 6.0 KeV, ENQ = 0.25fC, 1600 electrons.
•MIP peak is not perfect. Halo particles?
•Effect and the magnitude of the cross talk.
•Efficiency
•Any effect on noise due to the different signal routing on the readout card?

<u>Investigate hit distribution inside the calorimeter</u>.
We have 4 positions of the strip plane inside the calorimeter

•Work from the the hodoscope side,
•predict hit in the calorimeter
•select punch through or shower conditions
•Hit distribution in XY
•Energy distribution in XY in strip plane.