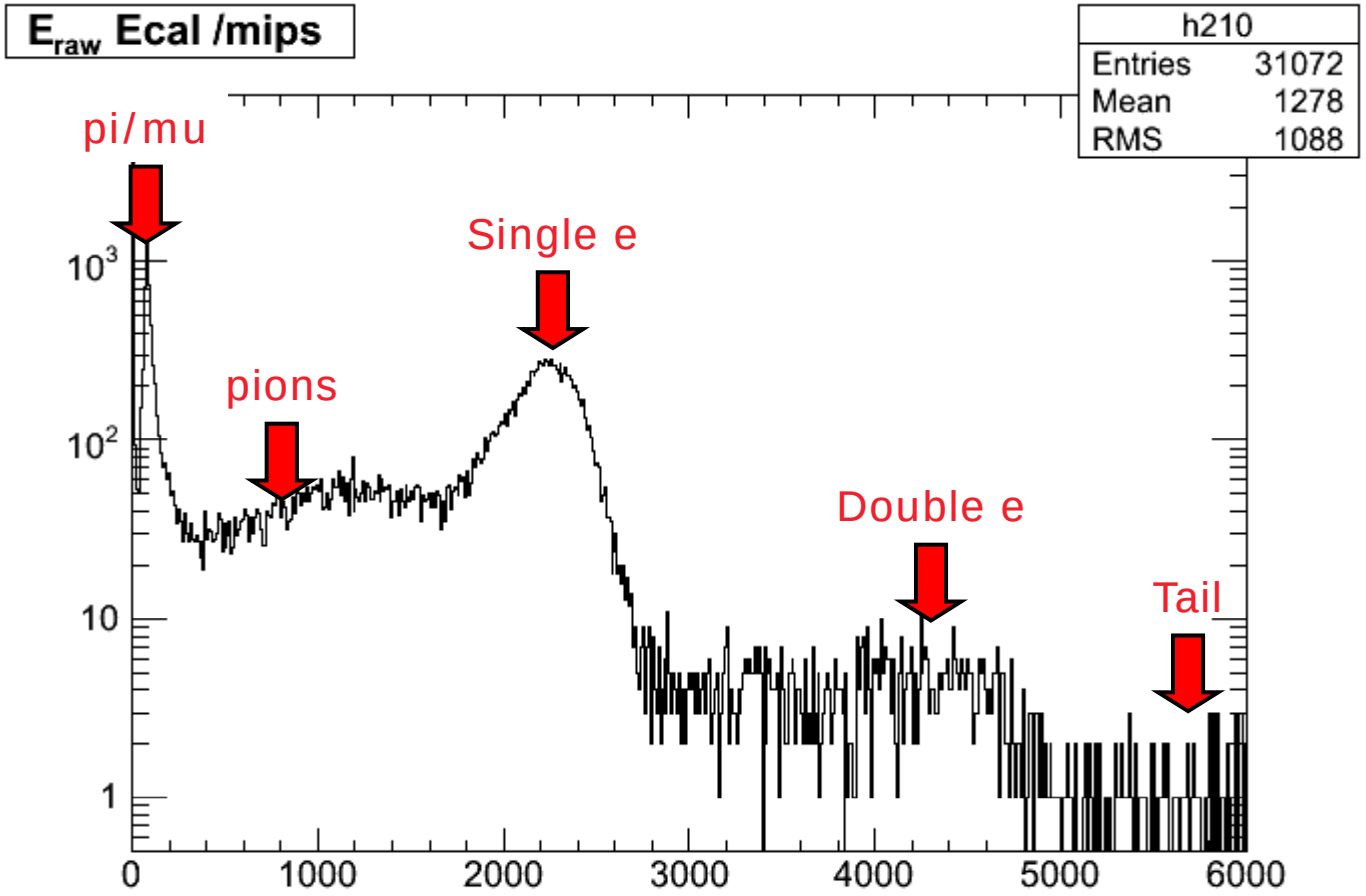
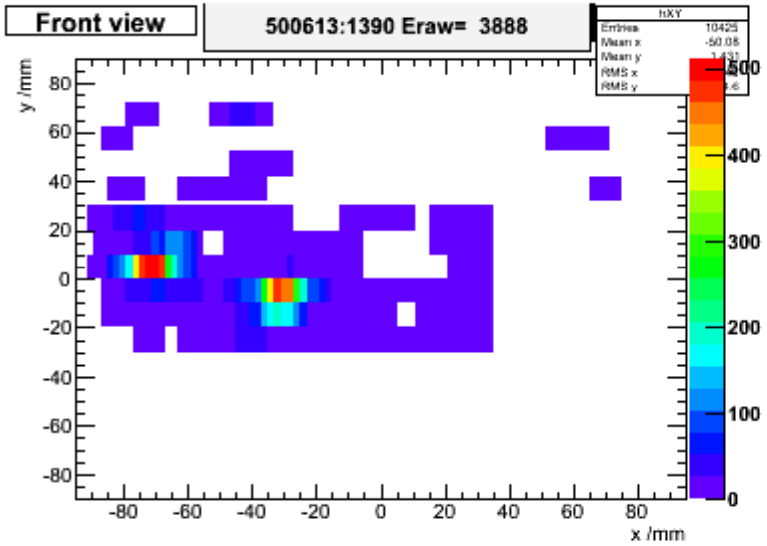
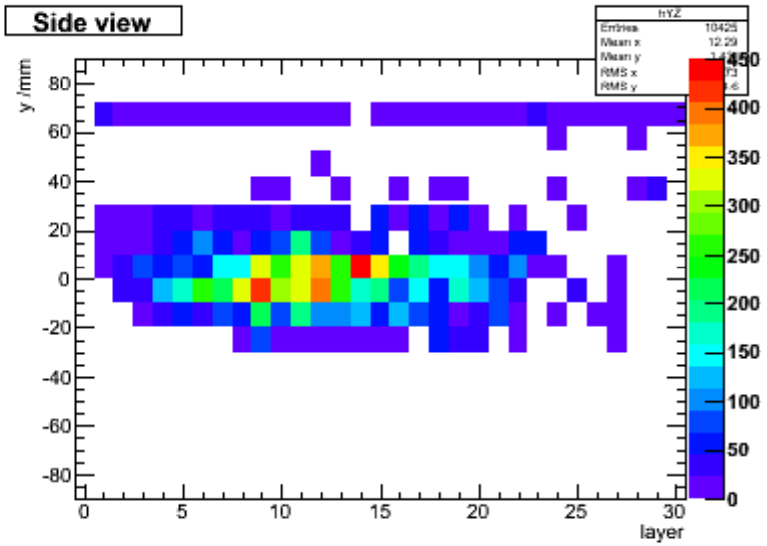
Quick look at 2008 e^- data; low energy hits in 2006

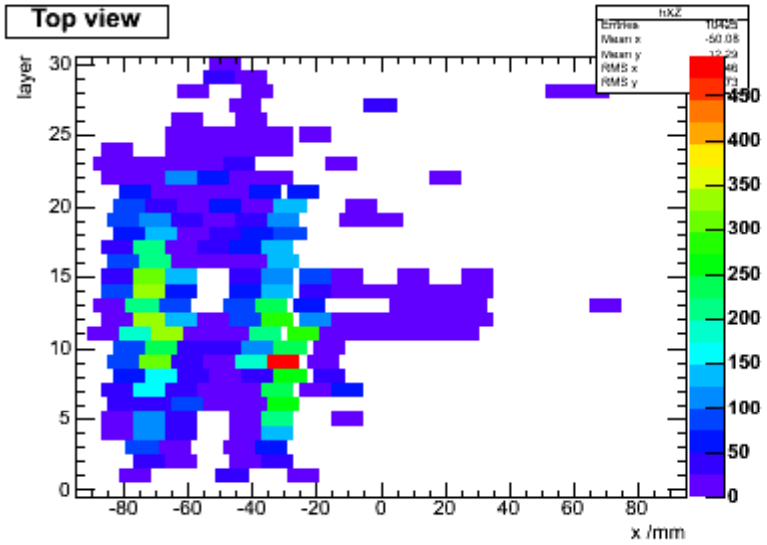
- 2008 e^- data from Fermilab; July'08
  - Looked at several runs processed by Hengne Li.
  - Today focus on a typical run (500613) at 10 GeV; compare with 2006 and 2007 data.
- Also a few further thoughts about the 2006 data.

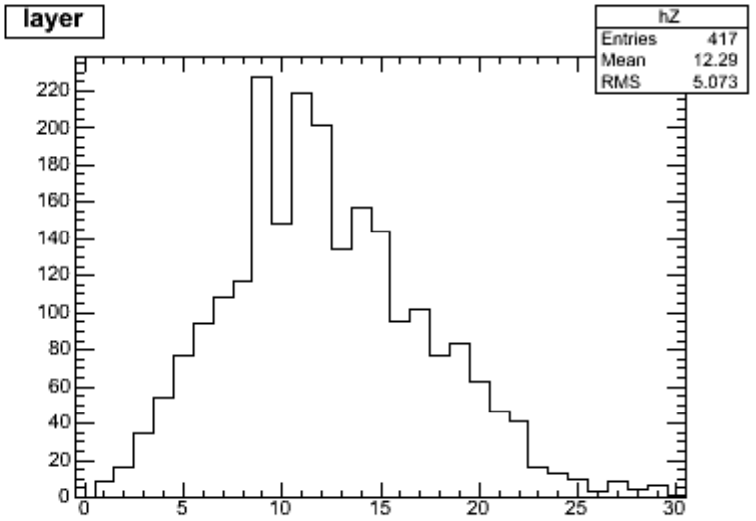
Eraw – all events

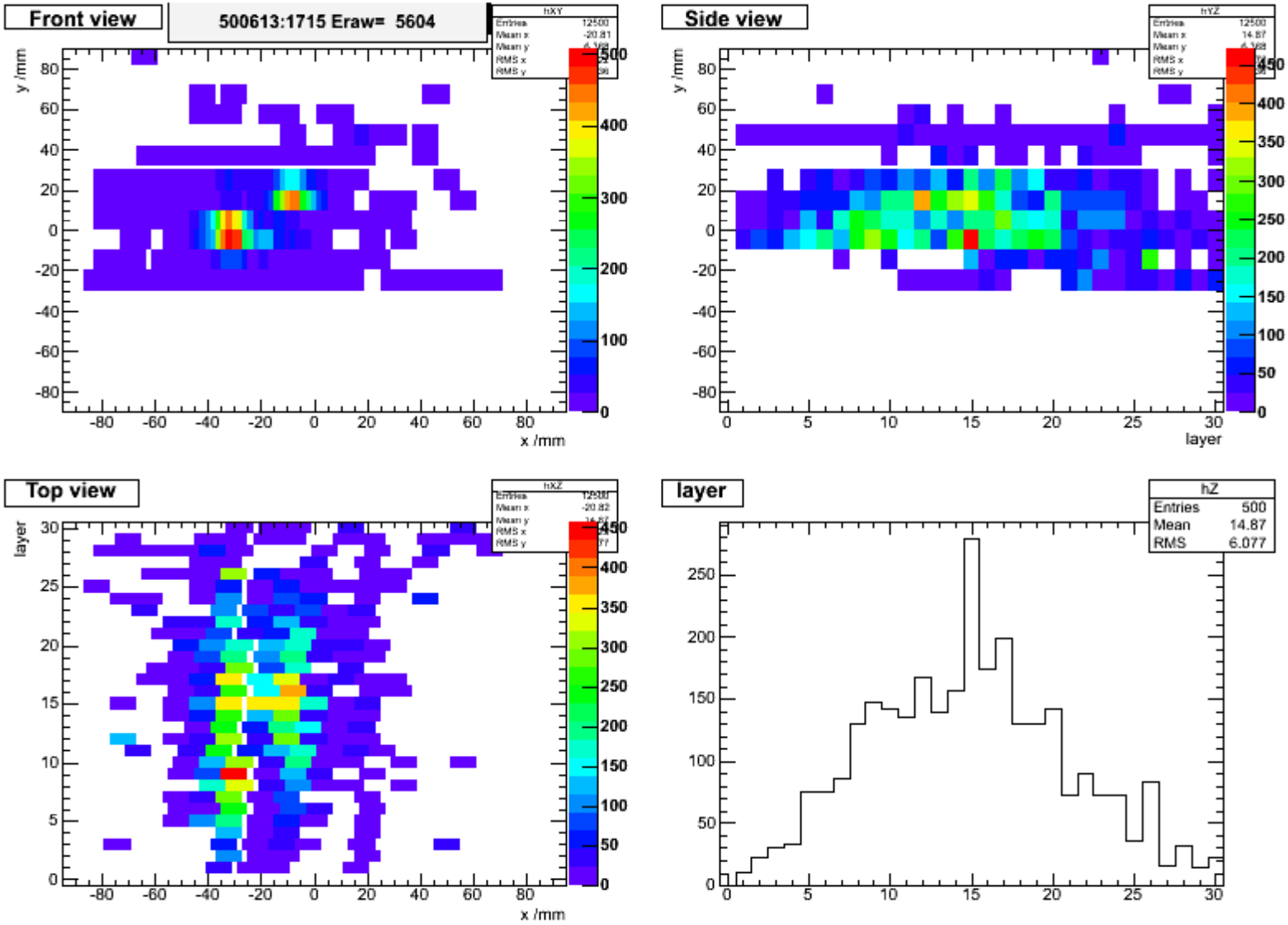


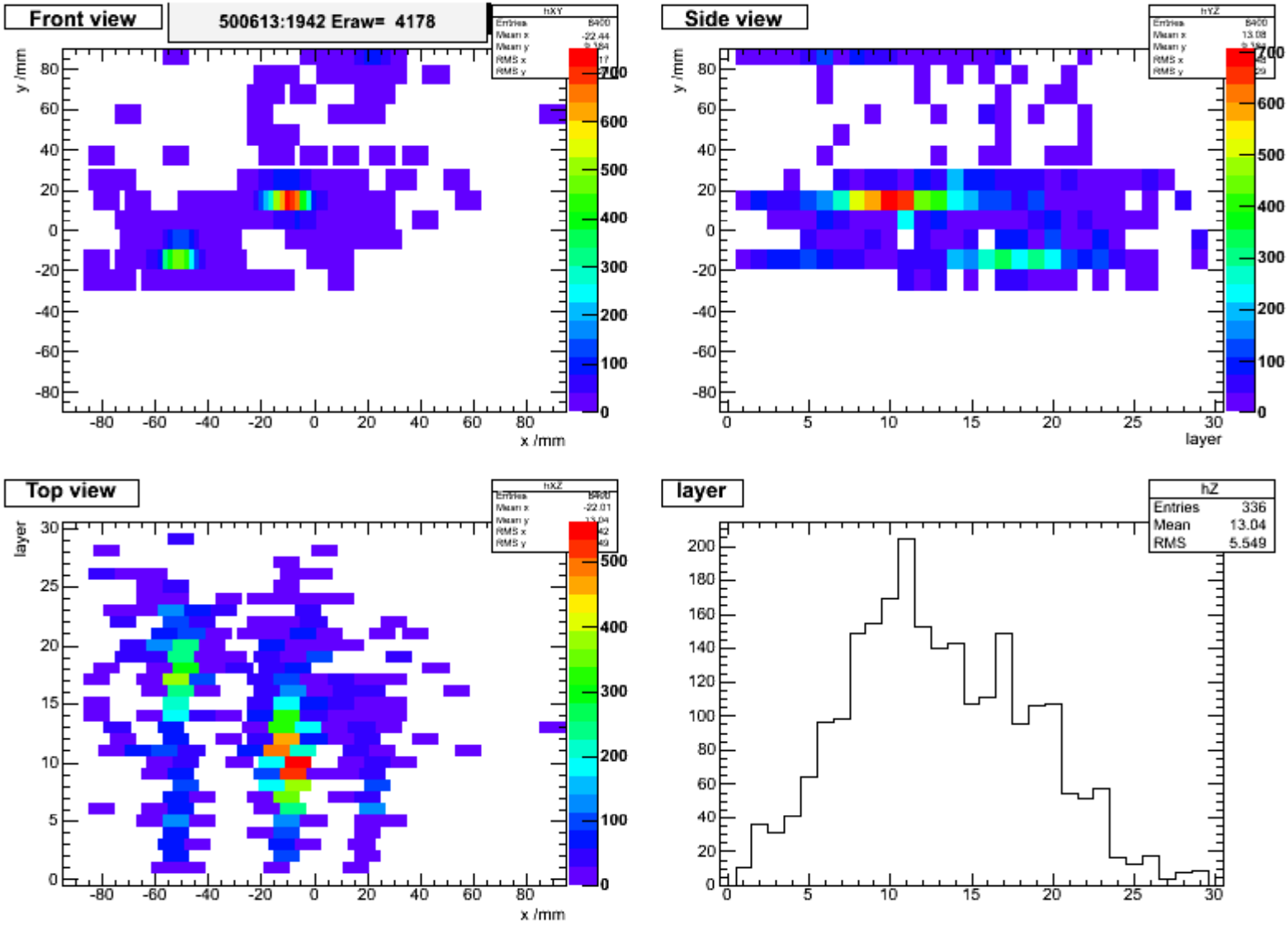

Front view
500613:1390 Eraw= 3888
y /mm
x /mm


Side view
y /mm
layer


Top view
layer
x /mm

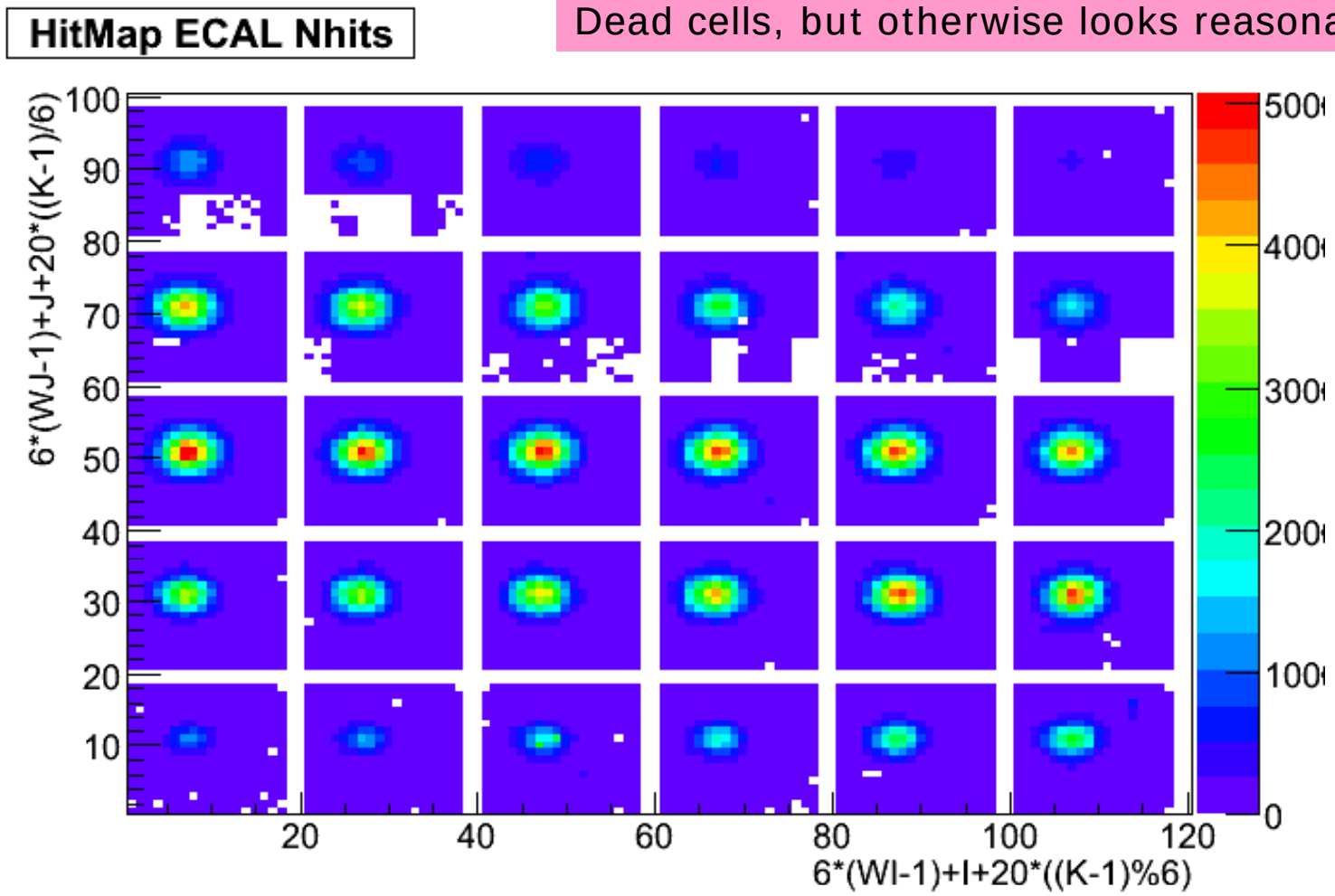

layer
Entries 417
Mean 12.29
RMS 5.073


Front view
500613:1715 Eraw= 5604
hXY
Entries 12500
Mean x -20.81
Mean y
RMS x
RMS y
y /mm
x /mm
Side view
hYZ
Entries 12500
Mean x 14.87
Mean y
RMS x
RMS y
y /mm
layer
Top view
hXZ
Entries 12500
Mean x -20.82
Mean y
RMS x
RMS y
layer
x /mm
layer
hZ
Entries 500
Mean 14.87
RMS 6.077

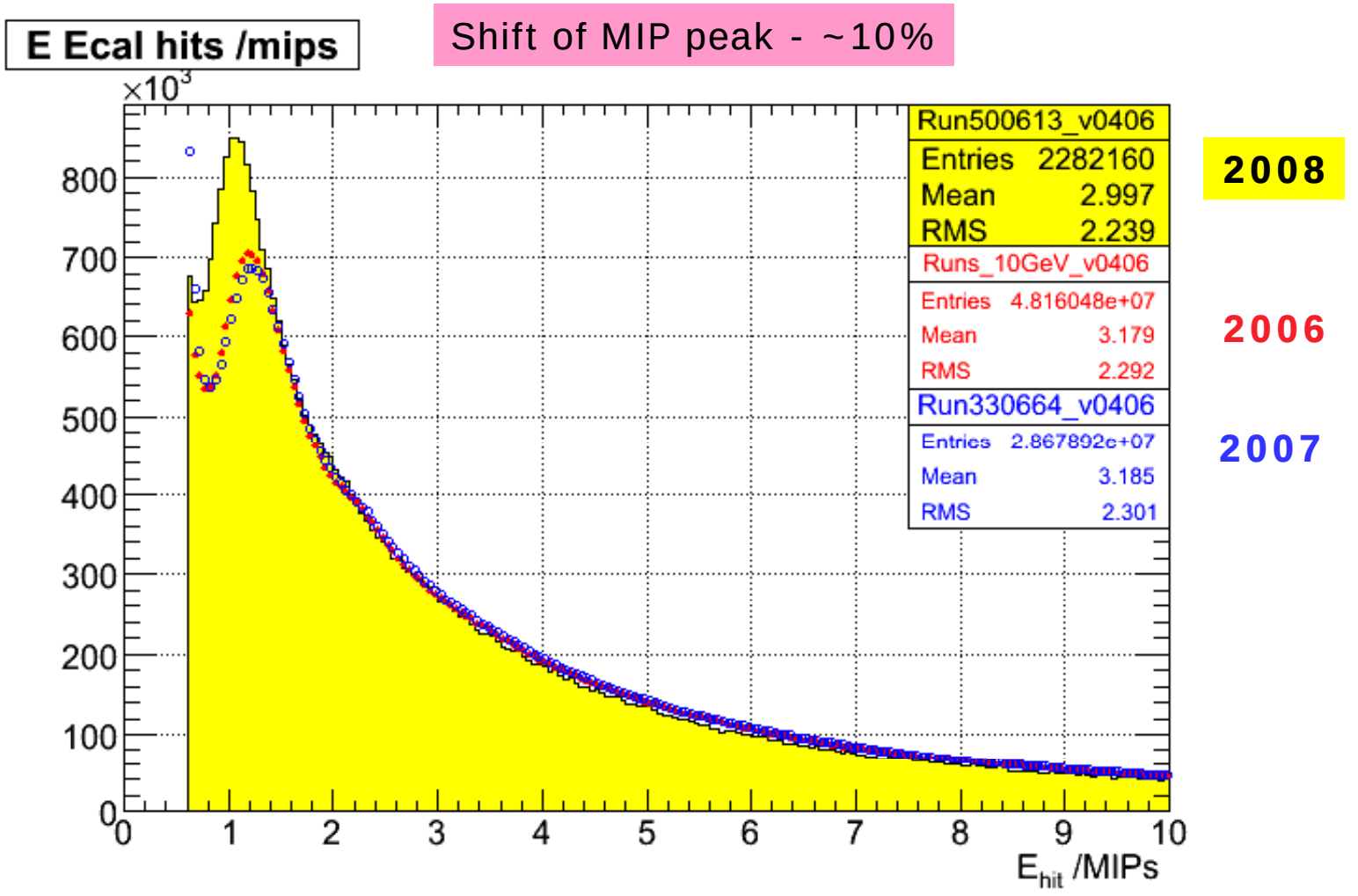

Front view
500613:1942 Eraw= 4178
hXY
Entries 8400
Mean x -22.44
Mean y 9.384
RMS x 17
RMS y 17
y /mm
x /mm
Side view
hYZ
Entries 8400
Mean x 13.08
Mean y 9.384
RMS x 7.549
RMS y 7.29
y /mm
layer
Top view
hXZ
Entries 8400
Mean x -22.01
Mean y 13.04
RMS x 17
RMS y 7.549
layer
x /mm
layer
hZ
Entries 336
Mean 13.04
RMS 5.549

Hit Map

Dead cells, but otherwise looks reasonable

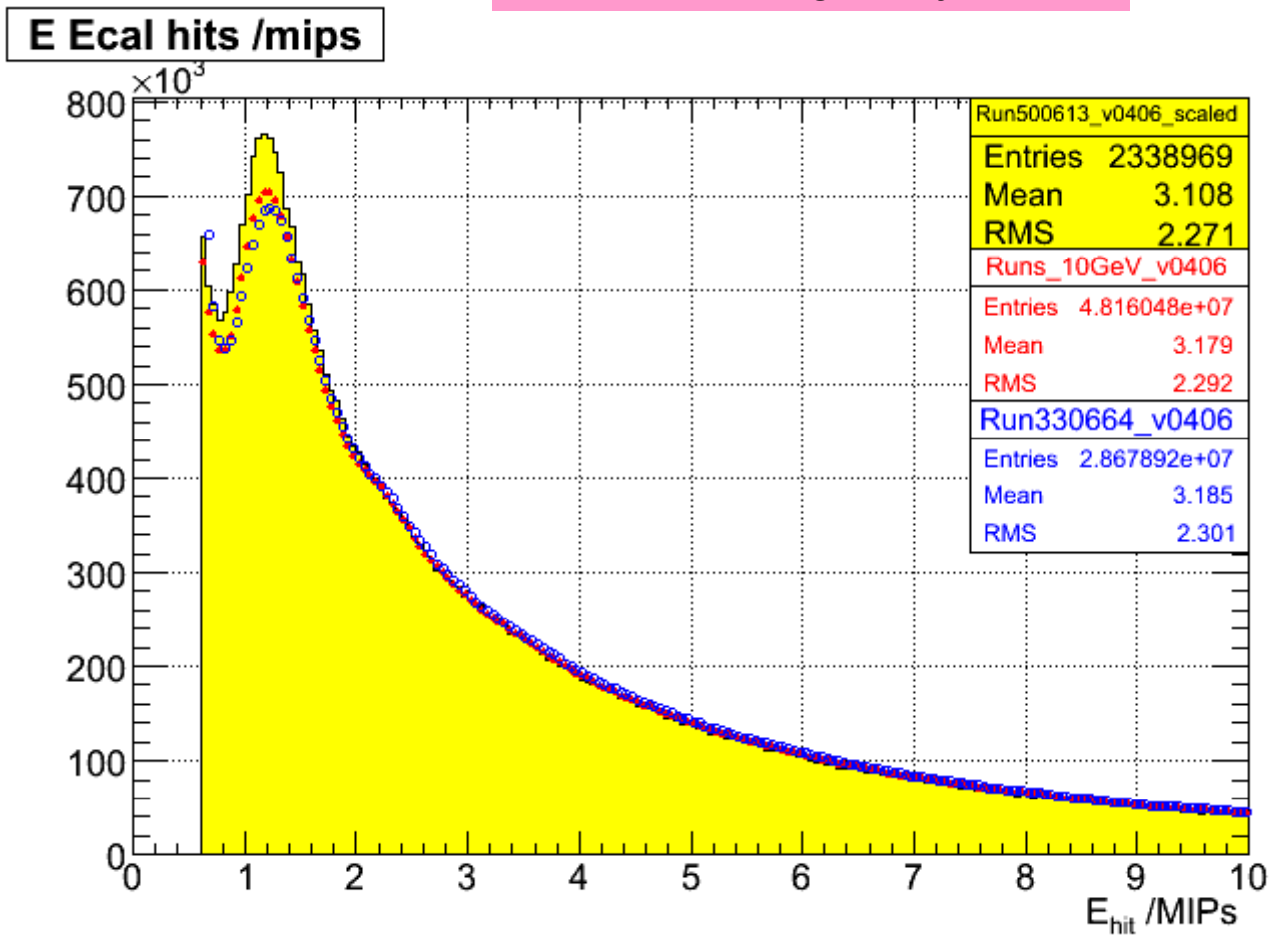


Hit energies



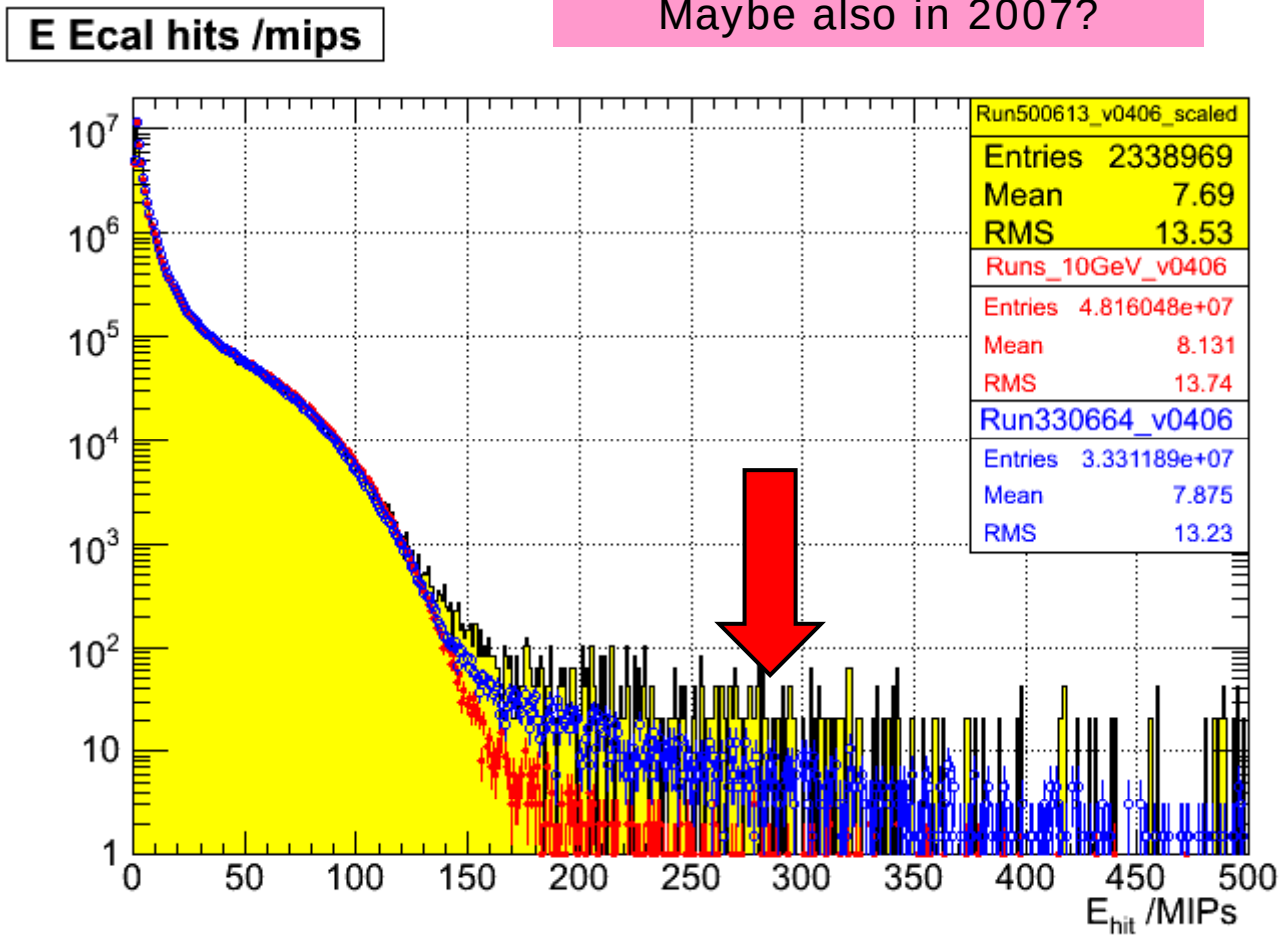
MIP peak (scaled)

Scale hit energies by ~10%

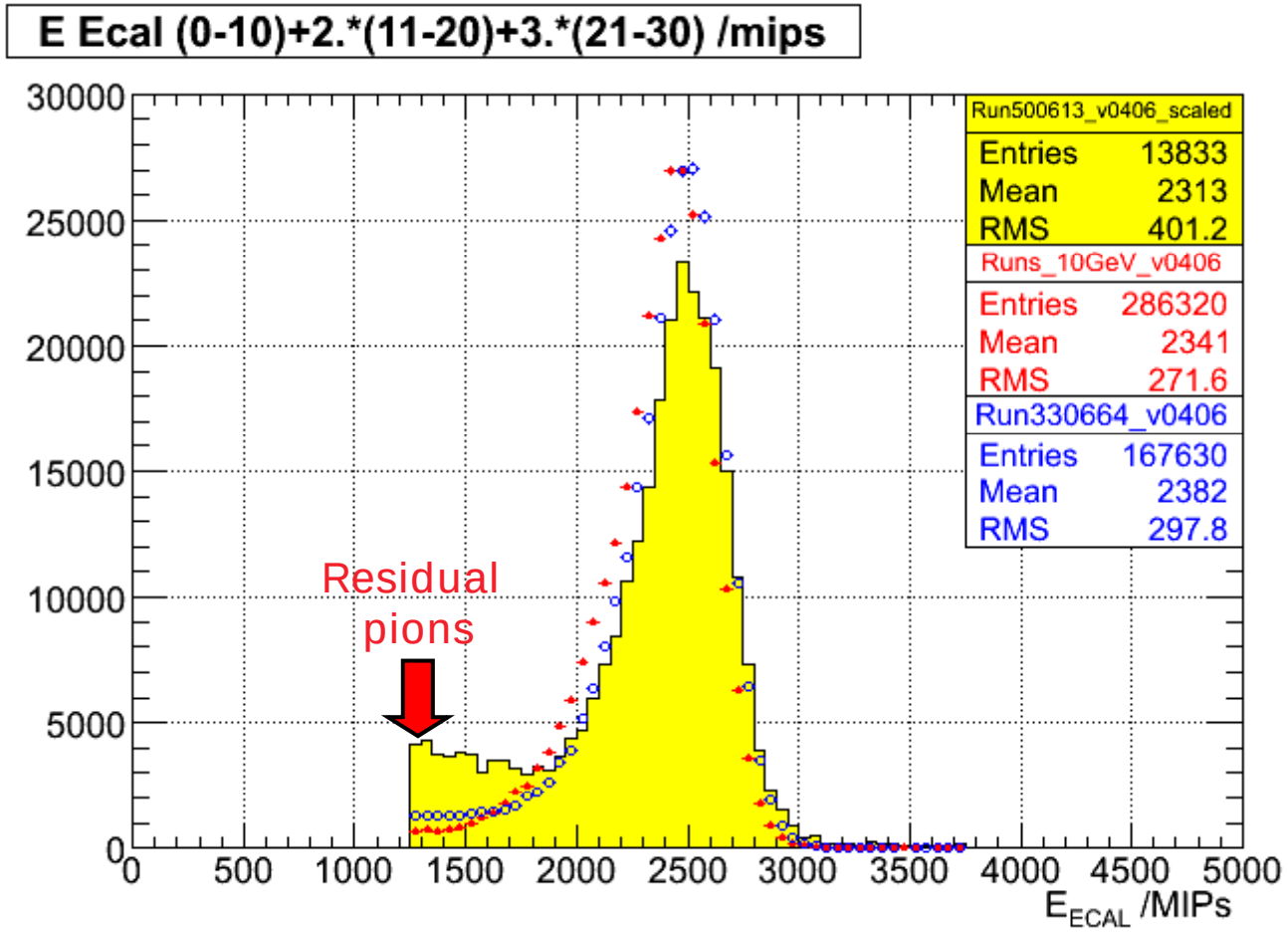


Ehit tail

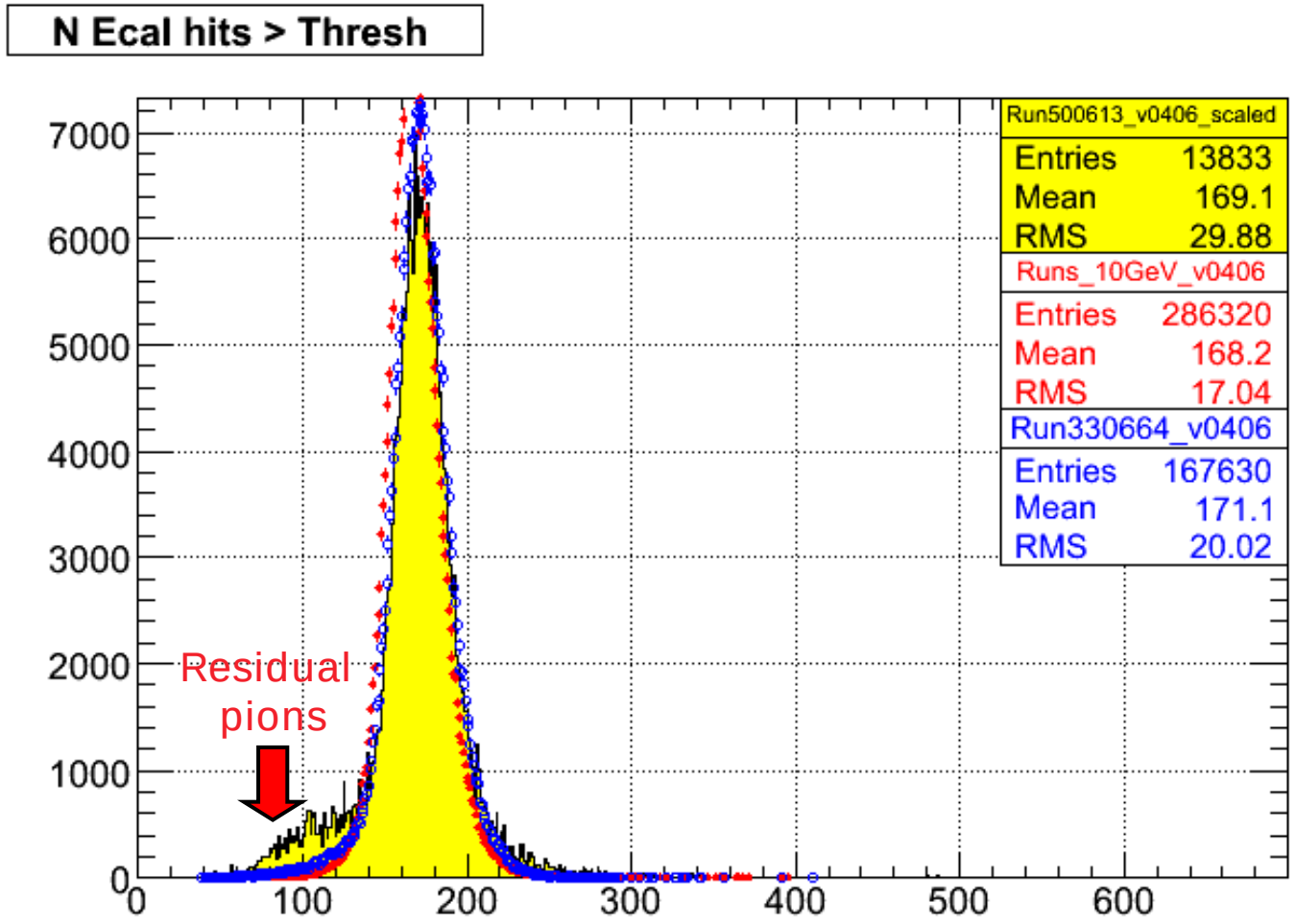
Slightly greater tail in 2008?
Maybe also in 2007?



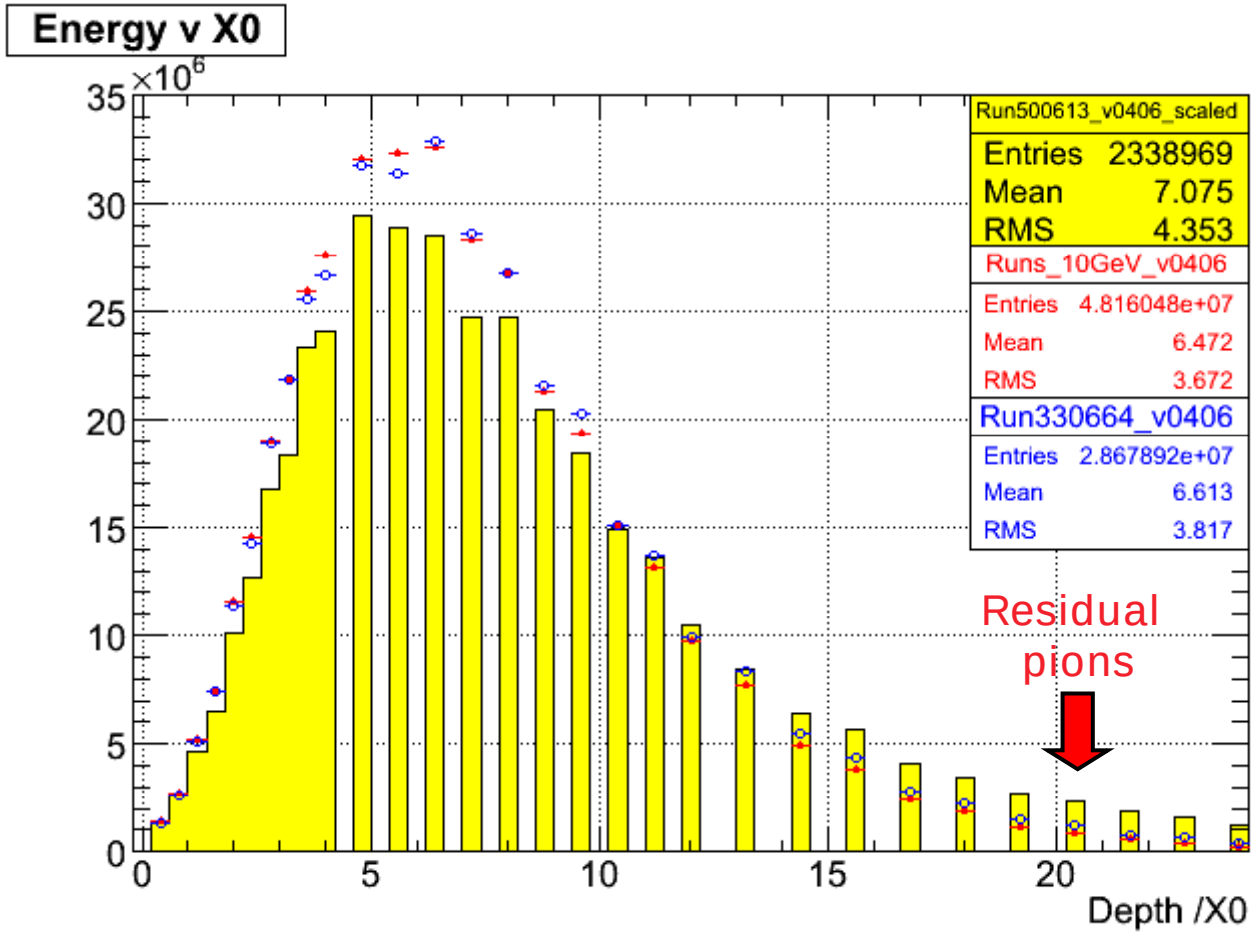
Total energy



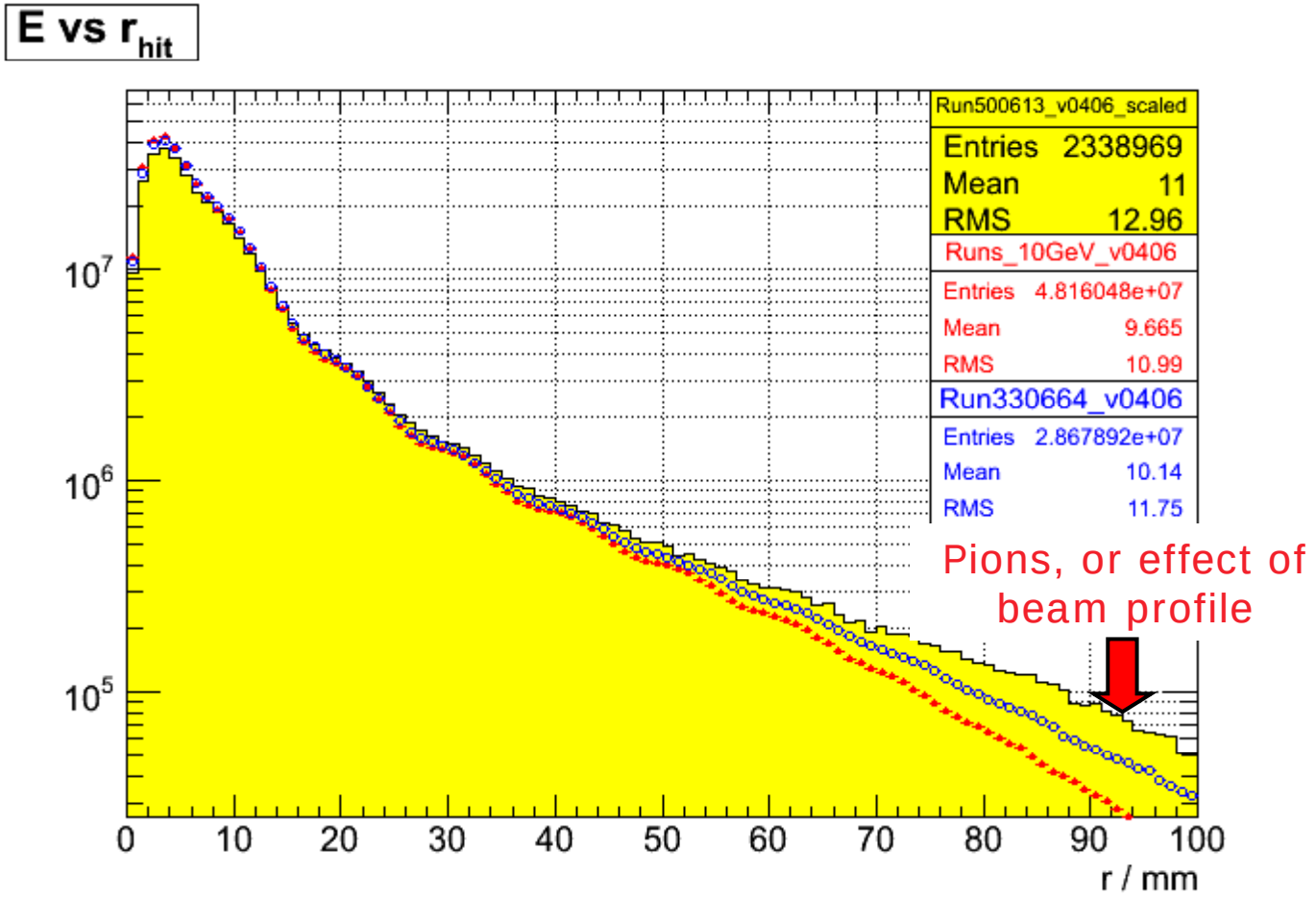
Number of hits



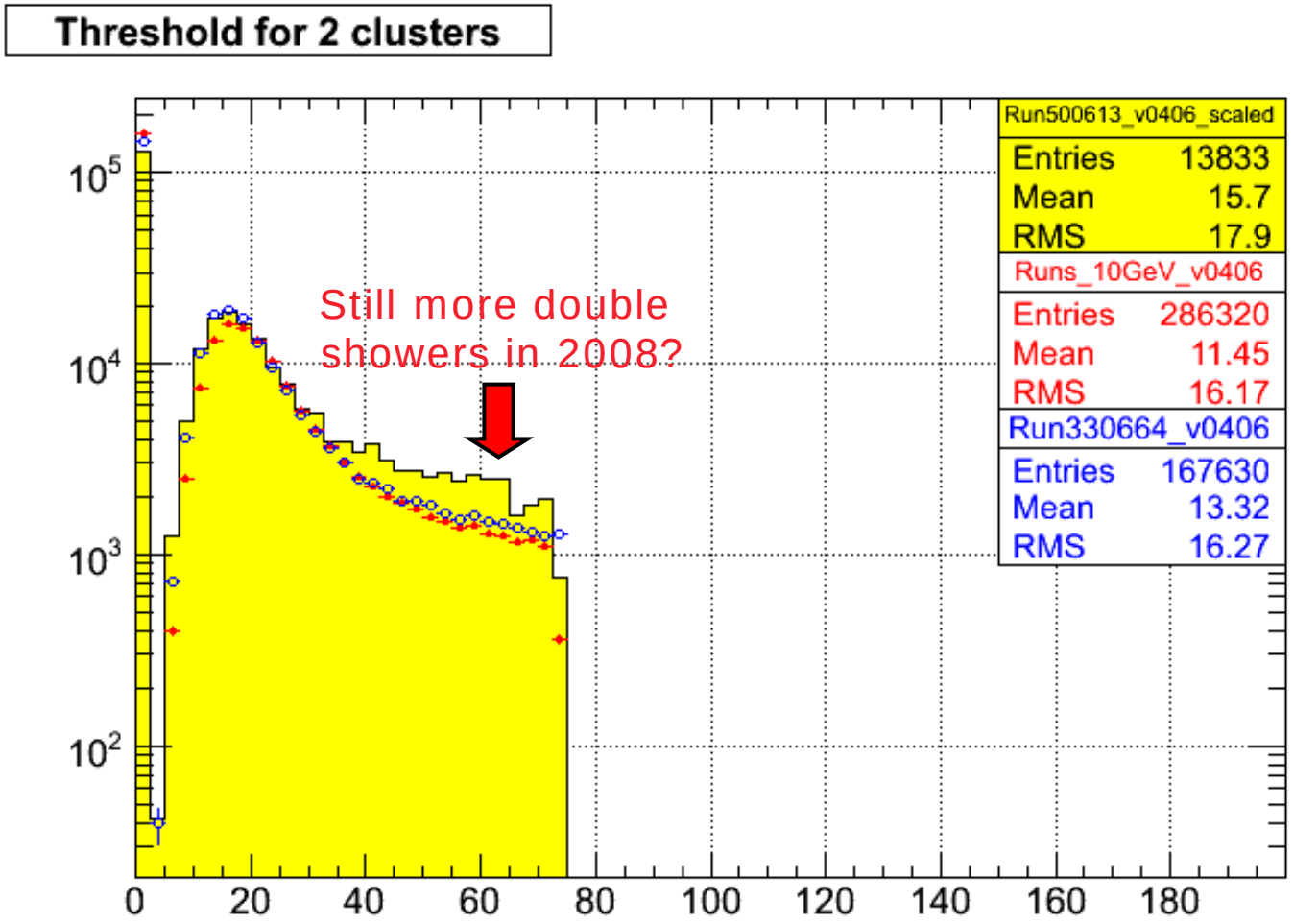
Longitudinal profile



Radial distribution



Two cluster cut



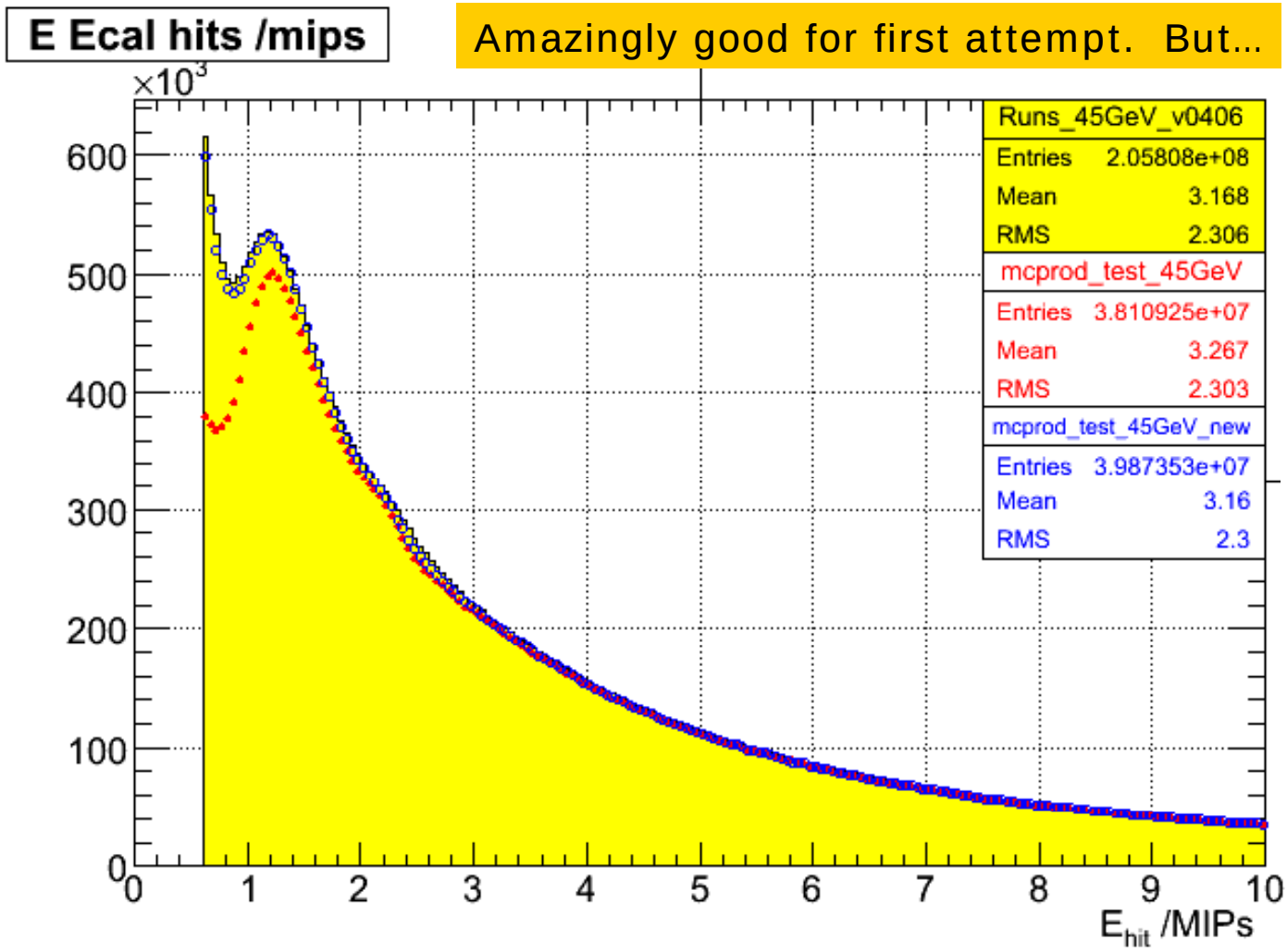
Summary

- ECAL data processed by Hengne basically look OK.
- Seems to be a calibration shift – energies ~10% lower than in most recent 2006/7 processing ("v0406").
- Impression is that then beam is a little dirtier than CERN (pi/mu content; double particles) $\Rightarrow$ a little extra care needed to devise suitable cleanup cuts. But should be OK.
- Possible excess of high energy hits (>200MIPs)? Certainly compared to 2006. Needs investigation.

Low energy hits in 2006

- Still worrying about the excess of low energy hits seen in data compared to MC.
  - Statement in the ECAL technical paper that in square events “about 1% of the guard ring energy is propagated into each border pixel (double in corner cells)”
  - Does this provide a means to simulate the effect?
- Tried a very naïve implementation:
  - Sum (three) guard ring hit energies for each wafer
  - Allocate 1% of this energy to each peripheral cell; 2% in the case of corner cells.
- Test at 45 GeV, where square event rates are greatest.

Hit energies

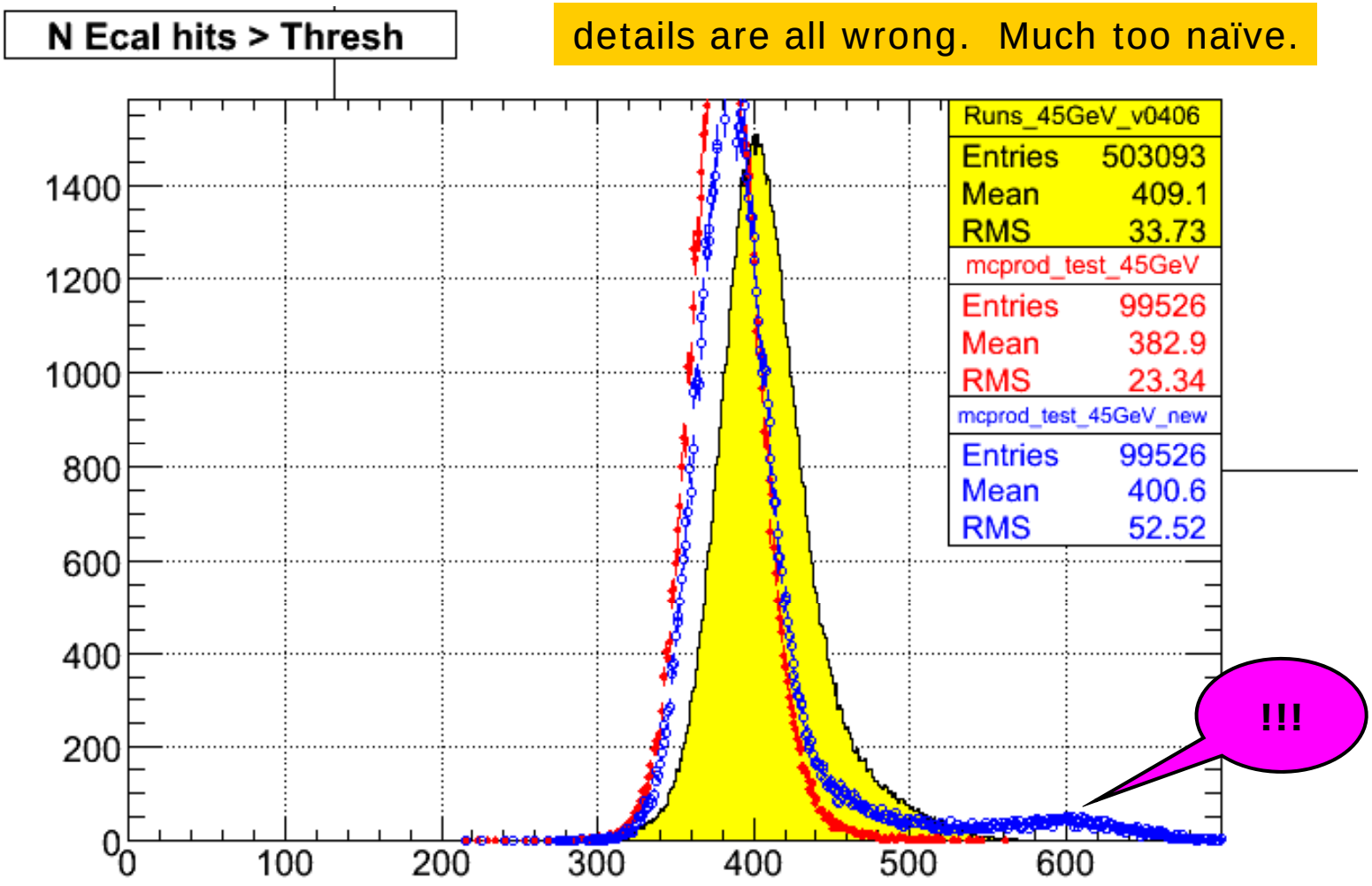


Data

Standard MC

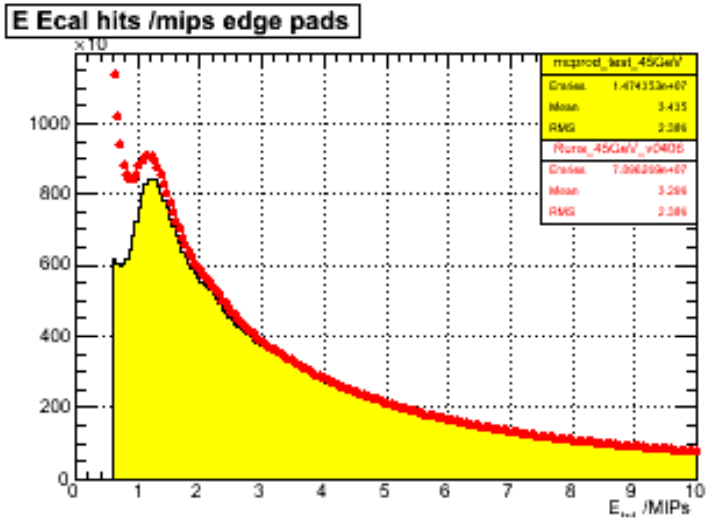
+ guard ring crosstalk

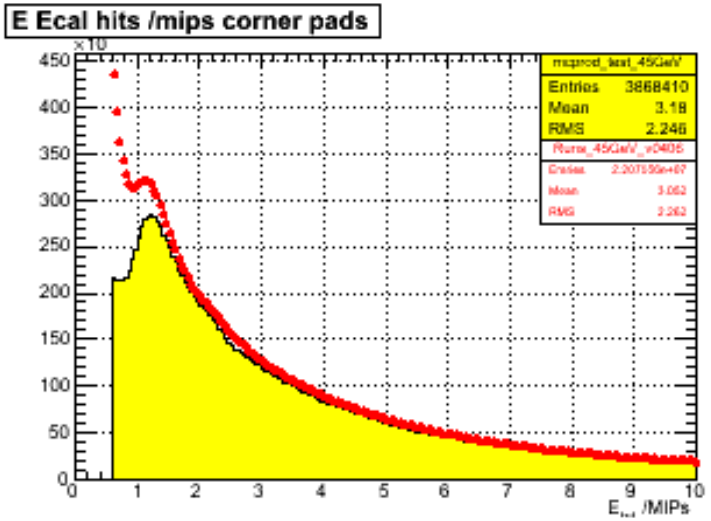
Number of hits

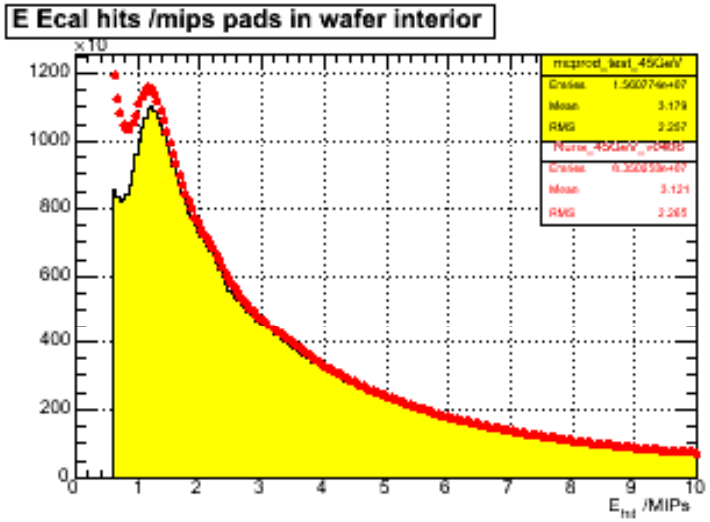


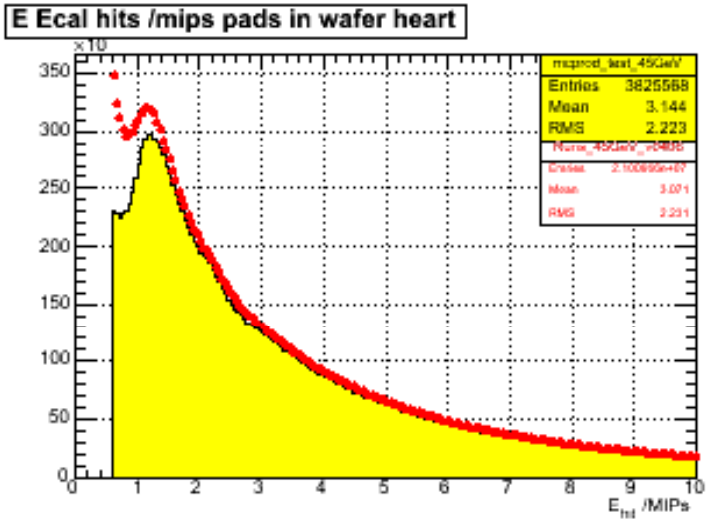
details are all wrong. Much too naïve.

Different pad types





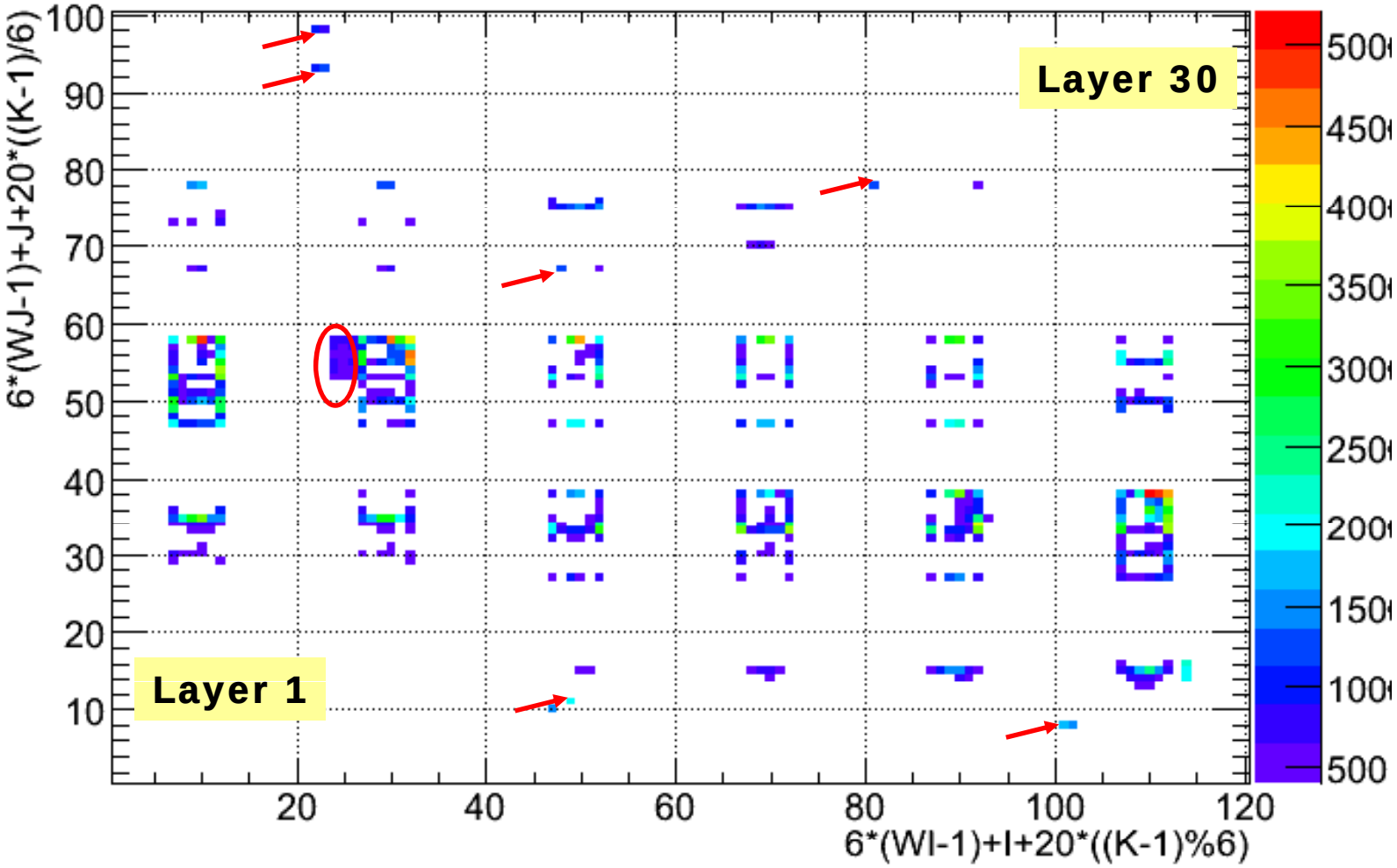




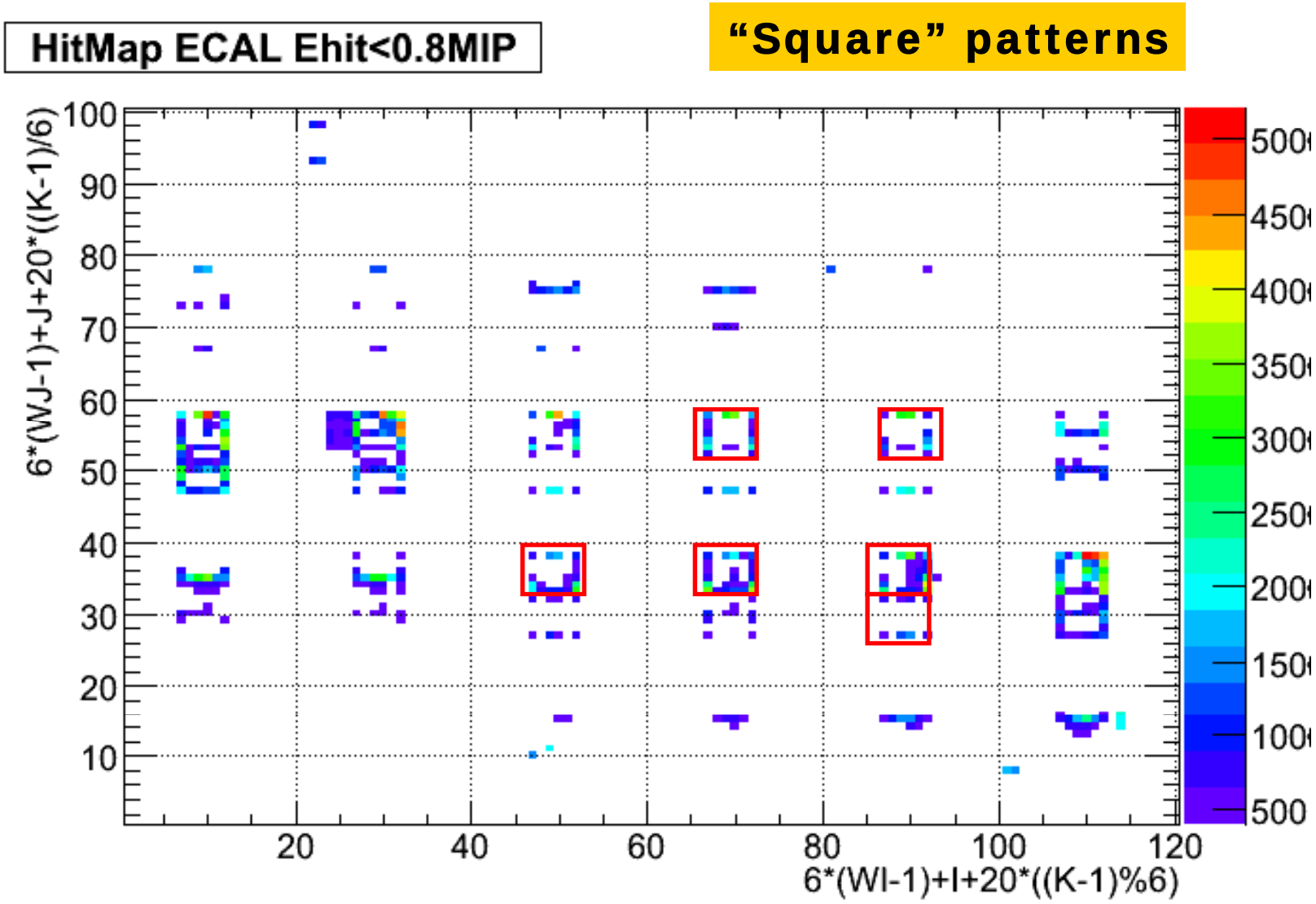
Data-MC Hitmap; 45 GeV; Ehit<0.8MIP

HitMap ECAL Ehit<0.8MIP

Noise. Simulated by Anne-Marie's code



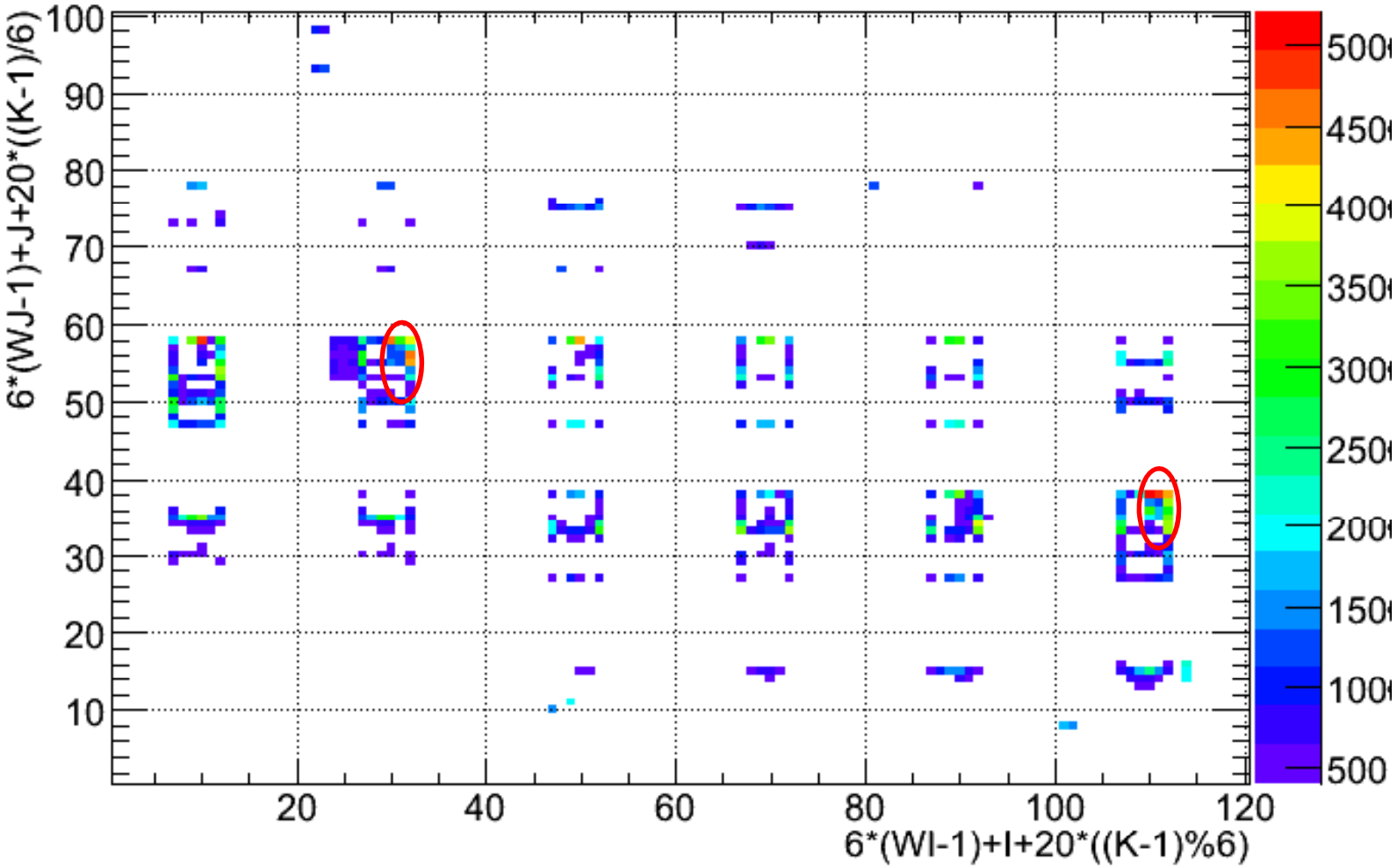
Data-MC Hitmap; 45 GeV; Ehit<0.8MIP



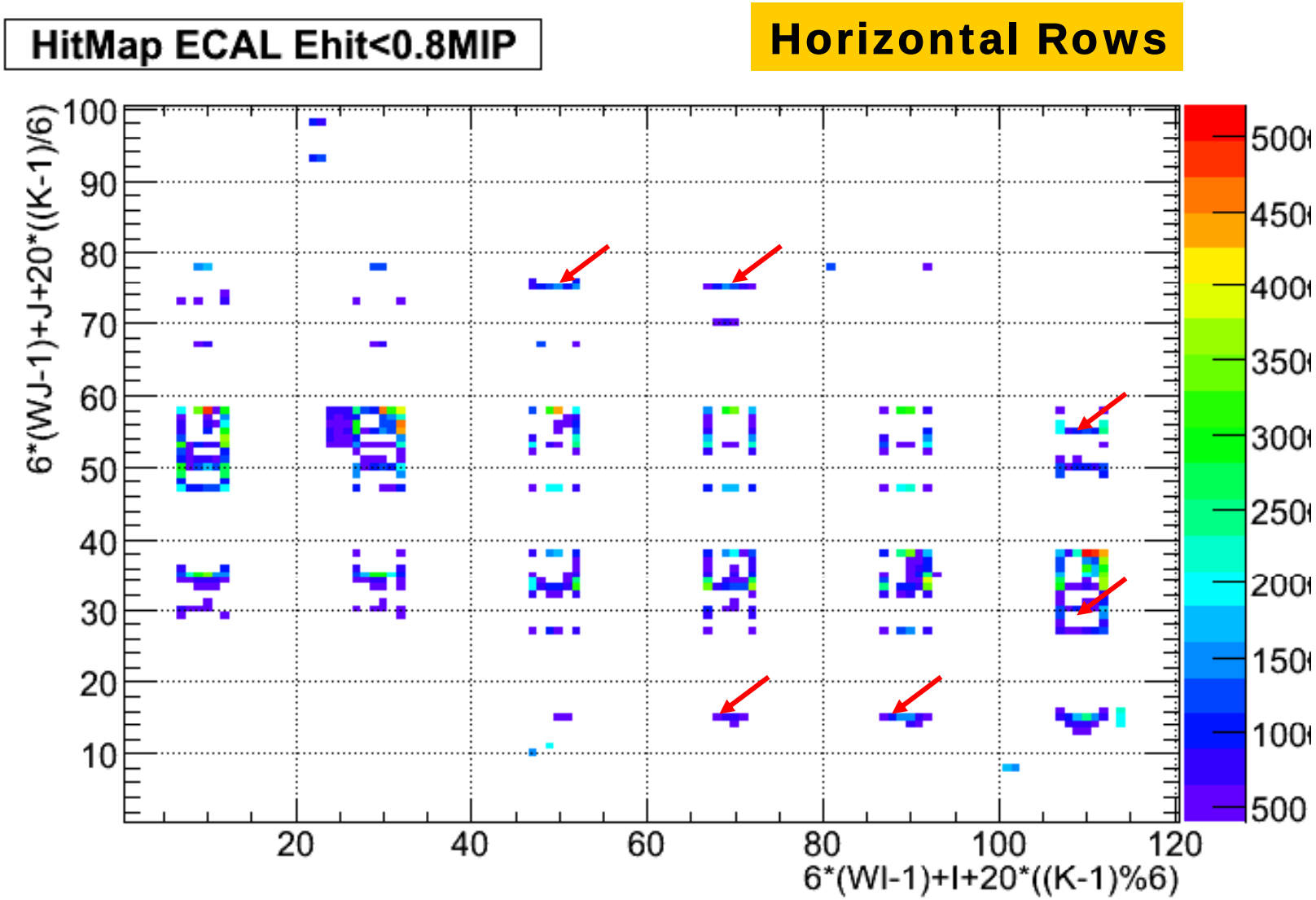
Data-MC Hitmap; 45 GeV; Ehit<0.8MIP

HitMap ECAL Ehit<0.8MIP

A couple of noisy quadrants of wafers

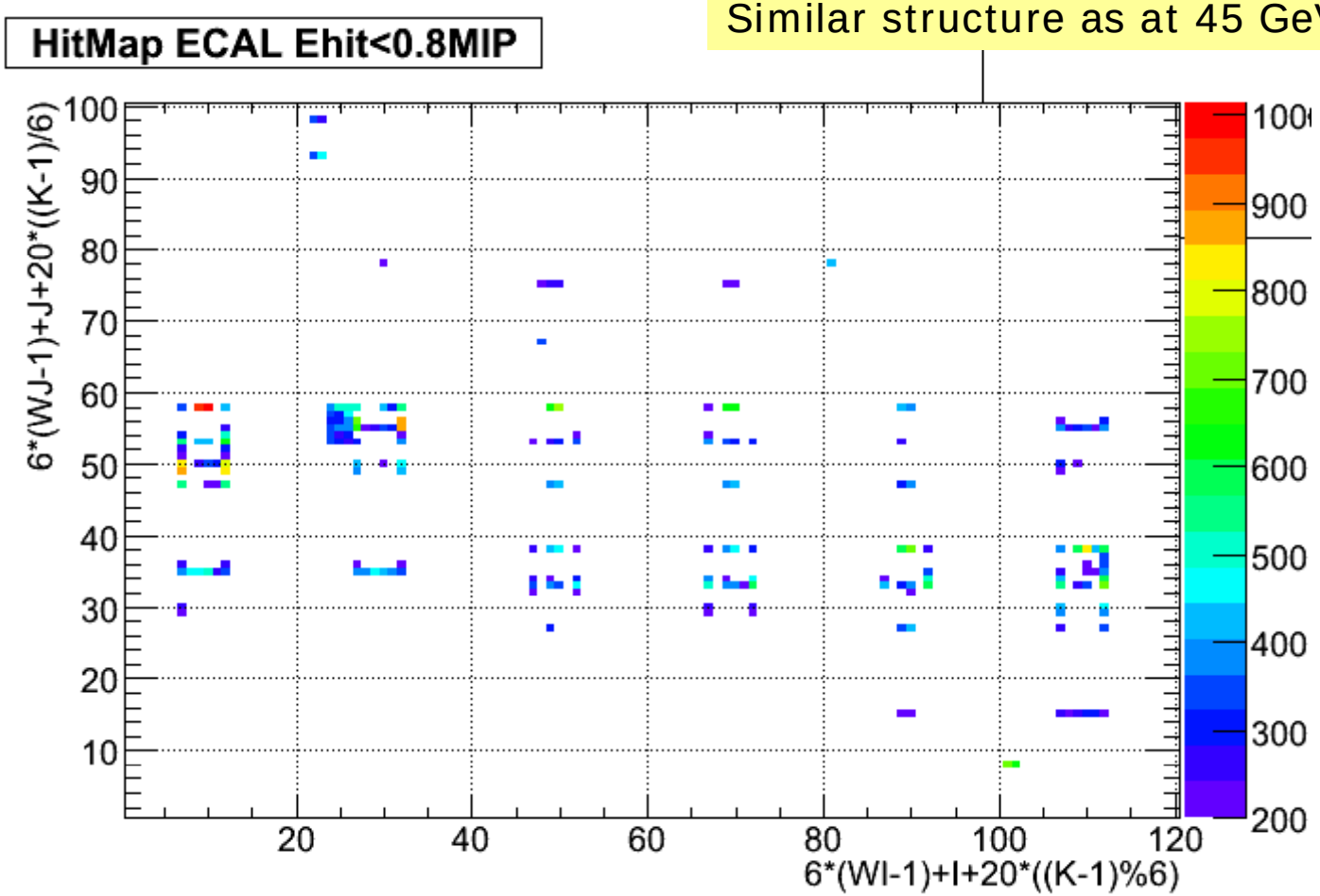


Data-MC Hitmap; 45 GeV; Ehit<0.8MIP



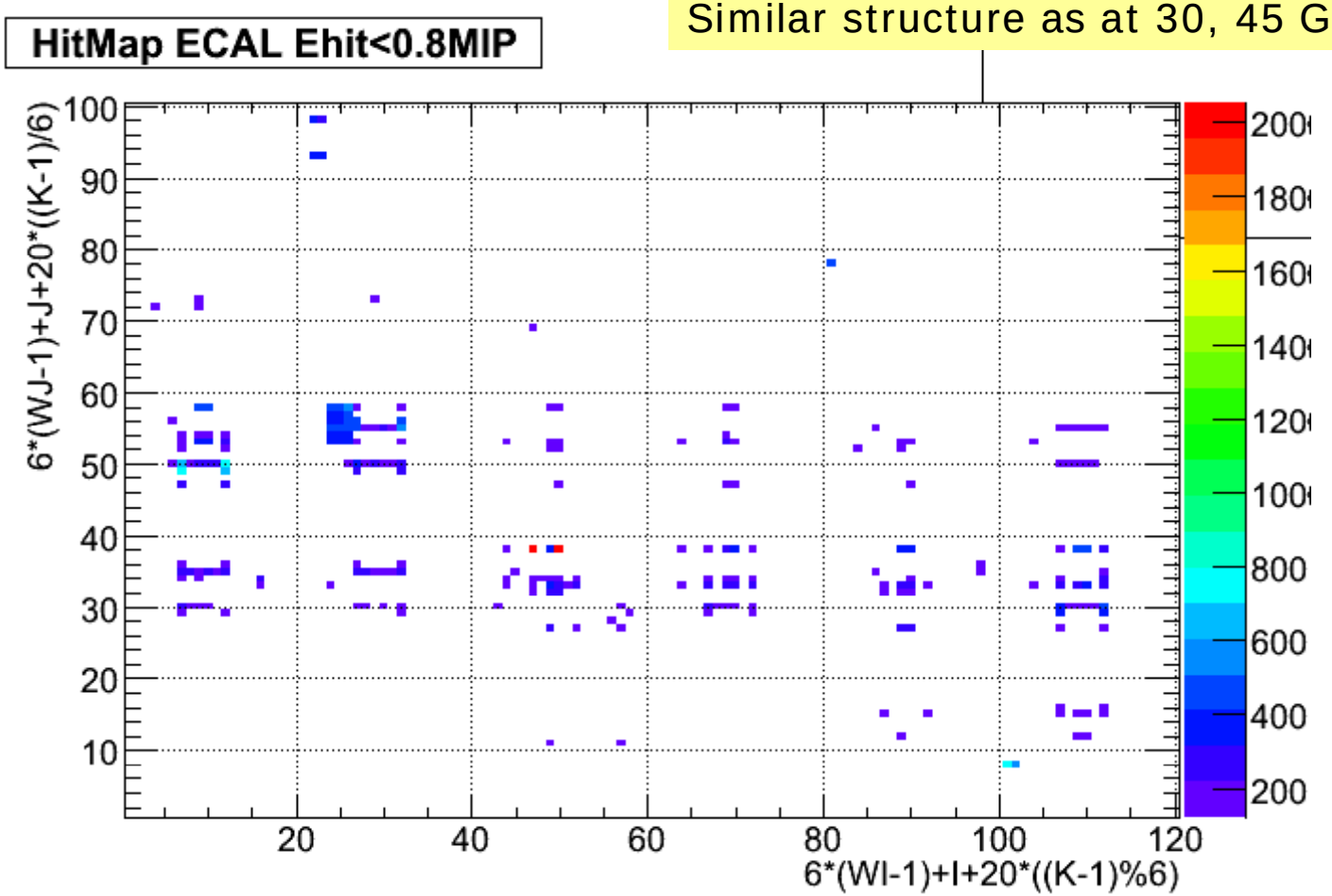
Data-MC Hitmap; 30 GeV; Ehit<0.8MIP

Similar structure as at 45 GeV



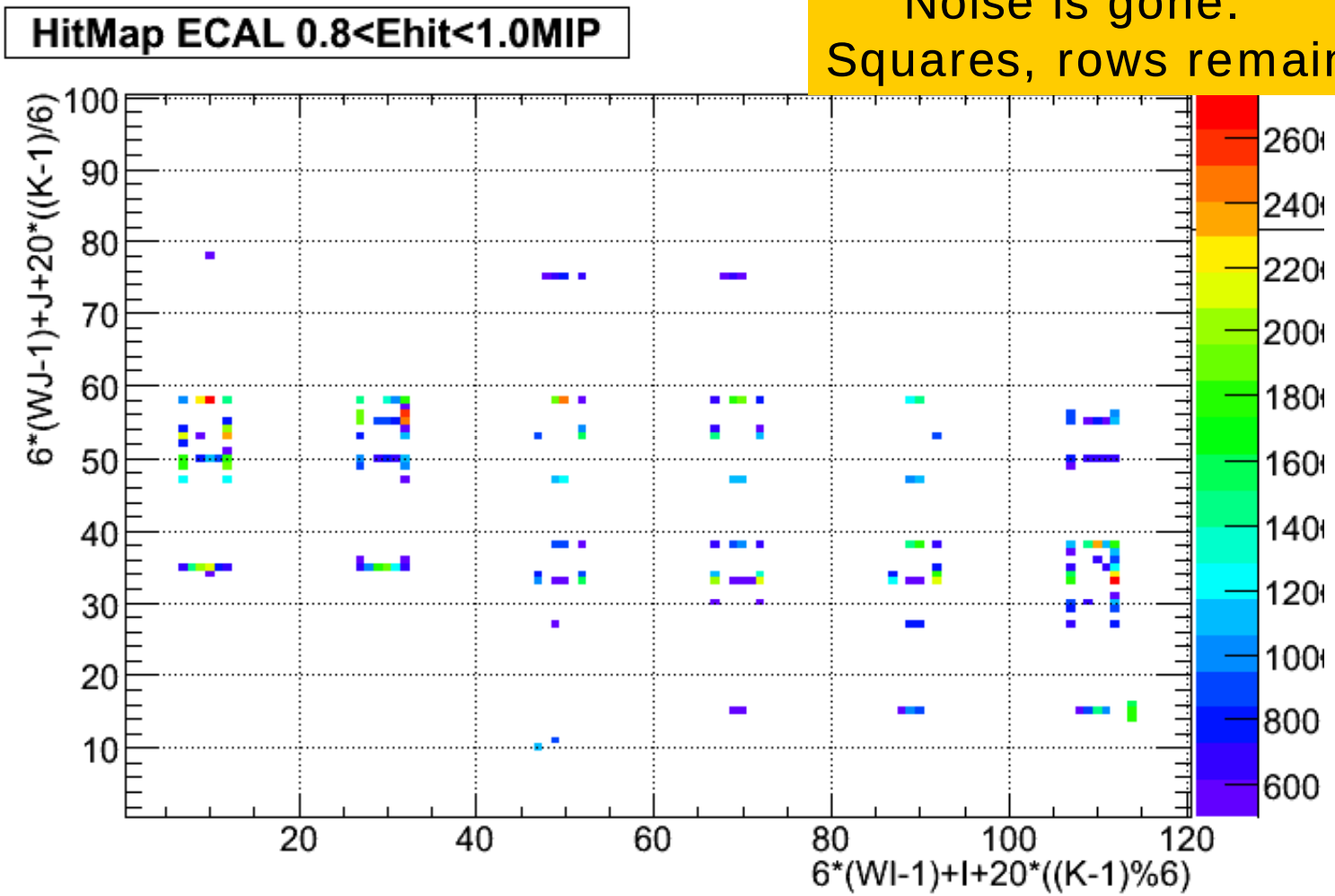
Data-MC Hitmap; 20 GeV; Ehit<0.8MIP

Similar structure as at 30, 45 GeV

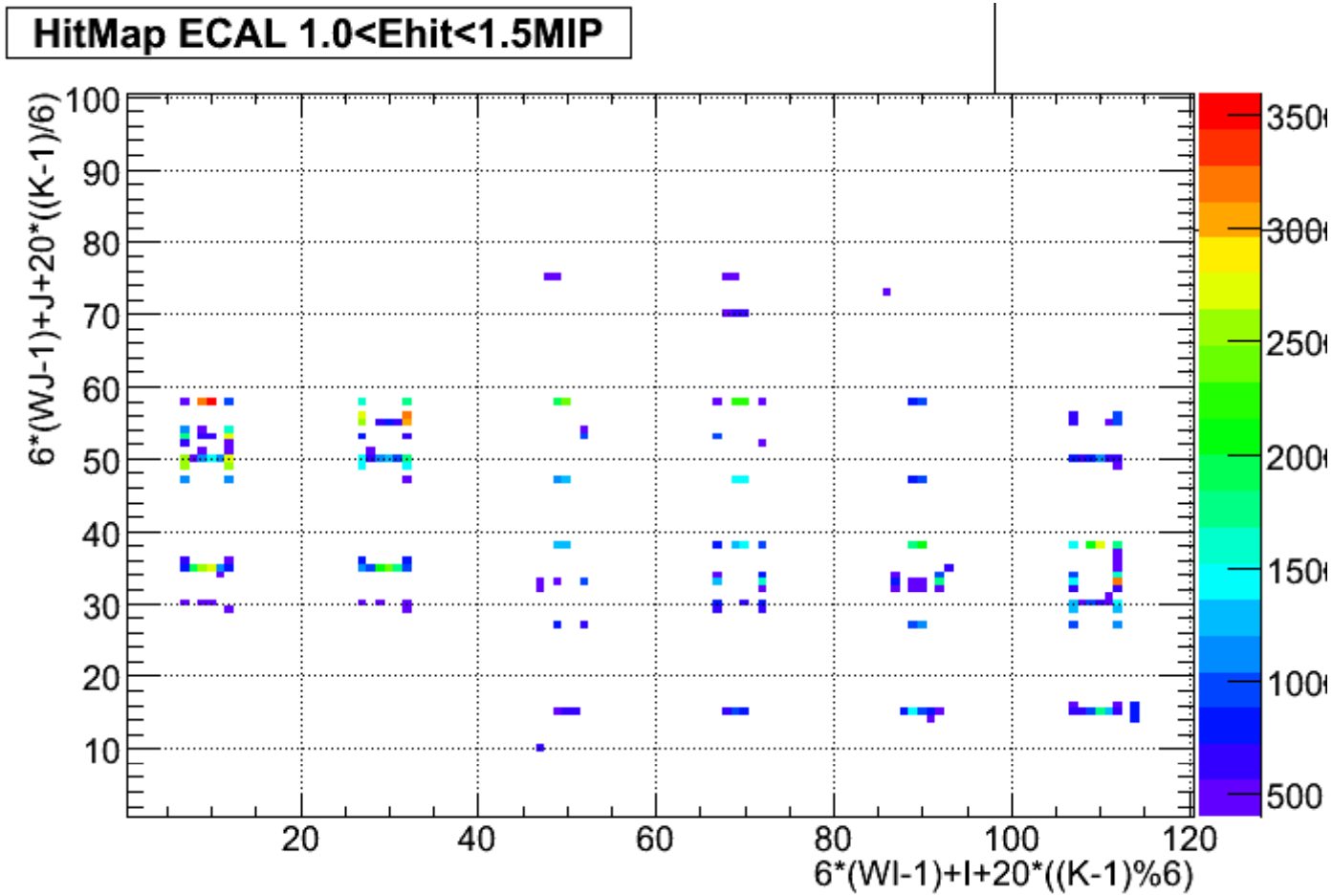


Data-MC Hitmap; 45 GeV; 0.8<Ehit<1.0MIP

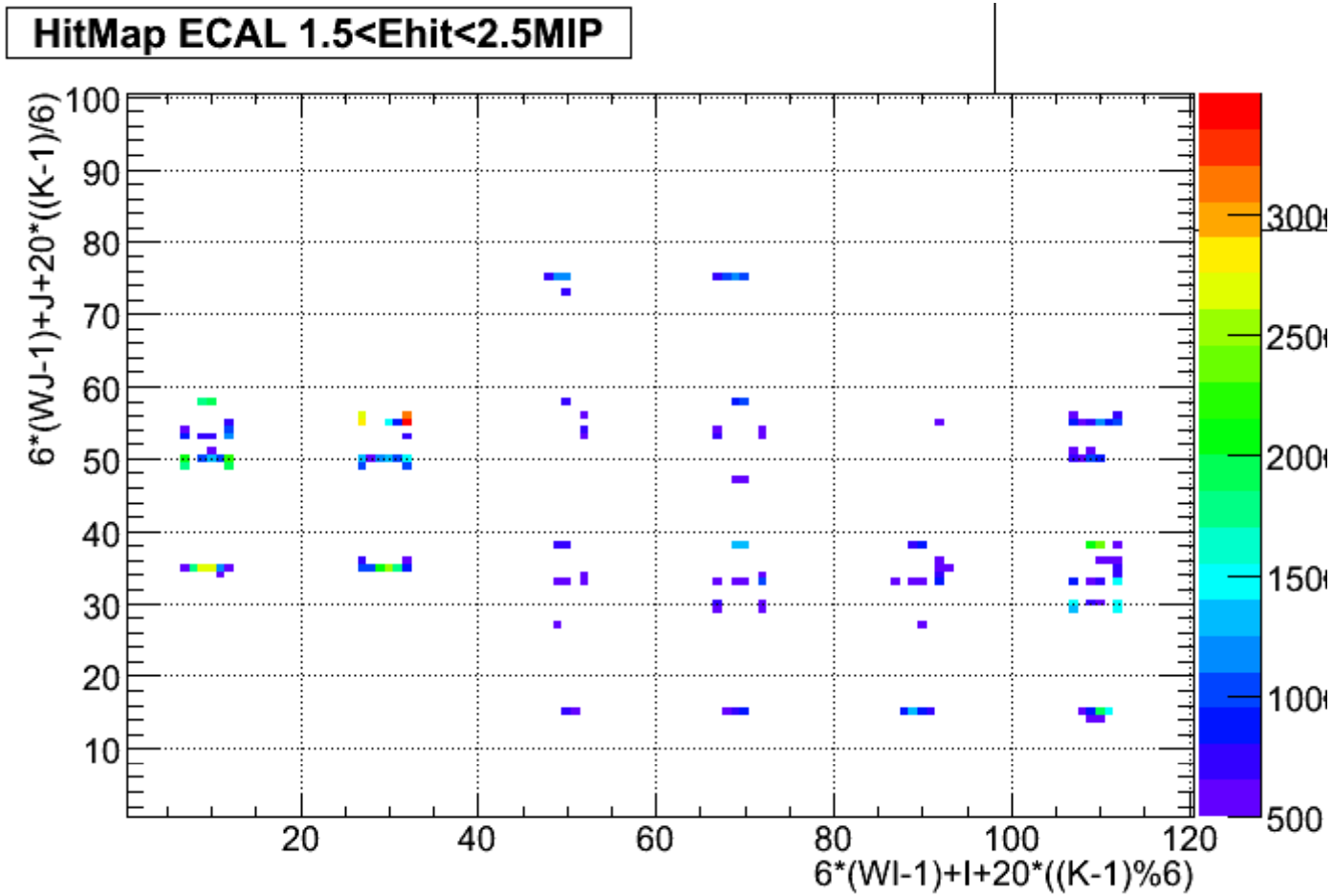
Noise is gone.
Squares, rows remain



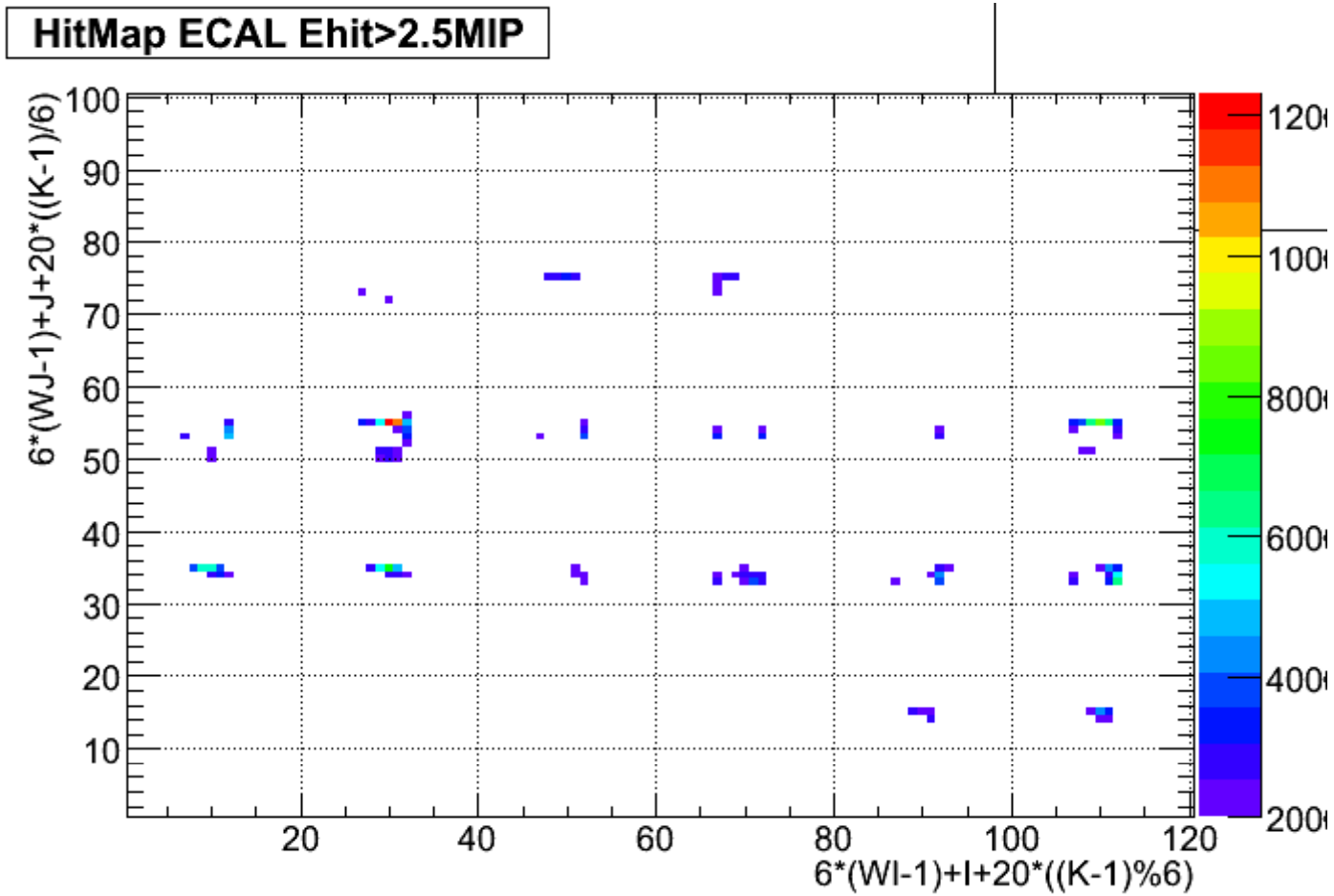
Data-MC Hitmap; 45 GeV; 1.0<Ehit<1.5MIP



Data-MC Hitmap; 45 GeV; 1.5<Ehit<2.5MIP

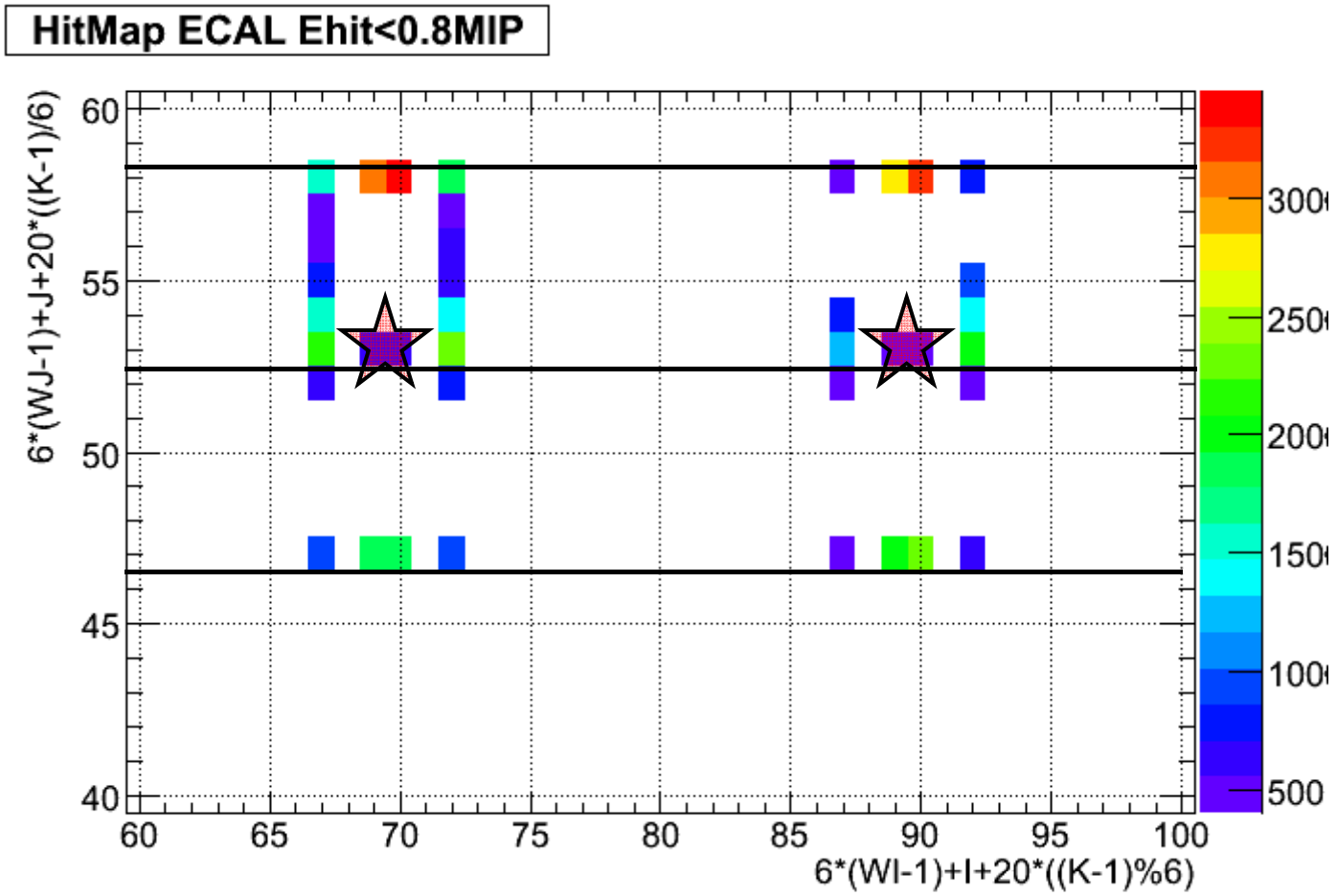


Data-MC Hitmap; 45 GeV; Ehit>2.5MIP



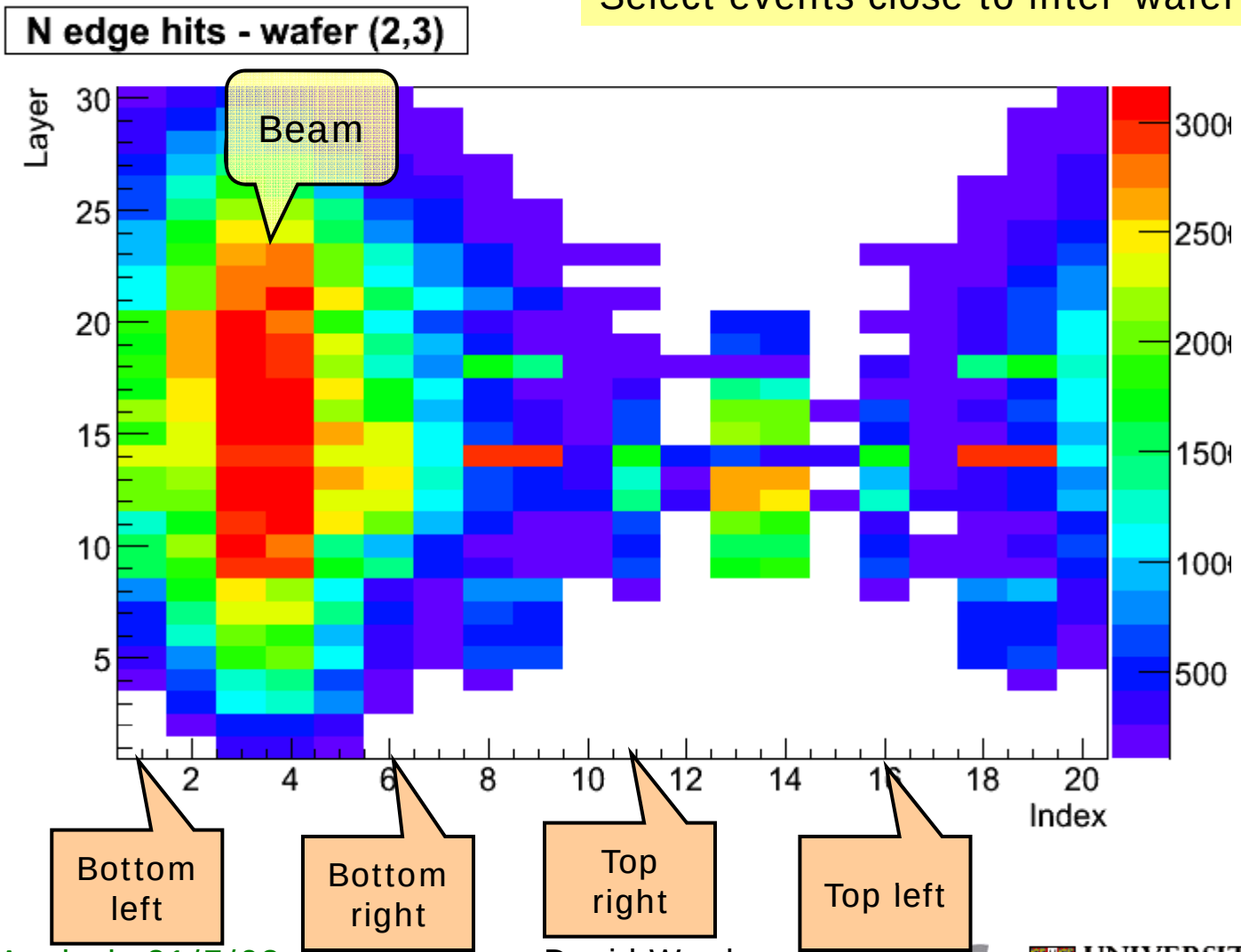
Zoom of two layers

Excess hits not uniformly distributed around the edge. (Known from François Morriseau's work).



Hit rate around the edge pads, per layer

Select events close to inter-wafer gap.



Low energy hits summary

- At least four contributions:
- Noisy cells (seen in pedestal events, muons, etc). These are more or less simulated by Anne-Marie's code.
- Correlated noise in edge cells (square events; cross-talk with guard rings).
  - Some possibility to make progress with simulating these. But the pattern of crosstalk is complicated.
- Rows in wafer interior exhibiting noise.
  - Seems reproducible run to run, but not sure how to characterise it, or what it depends on. Open question.
- A couple of noisy quarter pads.