WAB Ecal Calibration

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Strategy

- Use elastically scattered beam electrons to calibrate the energy scale of the calorimeter and the momentum scale of the SVT.

- Use bremsstrahlung events to extend the calibration to lower energies/momenta and to study the track-finding efficiency.

Calibration Data

- FEE triggers were taken throughout the run.
  - Maurik has written a nice evio file processor which can skim off events based on their trigger.
  - Can efficiently select events from any run.
- Dedicated FEE runs
  - 9371,9593,9898, 9899,9920, 9921,10716, 10717, 10718
- Sample partitions ending in 041 or 042 have been staged for all of the "decent" runs. These provide a snapshot of conditions throughout the summer.
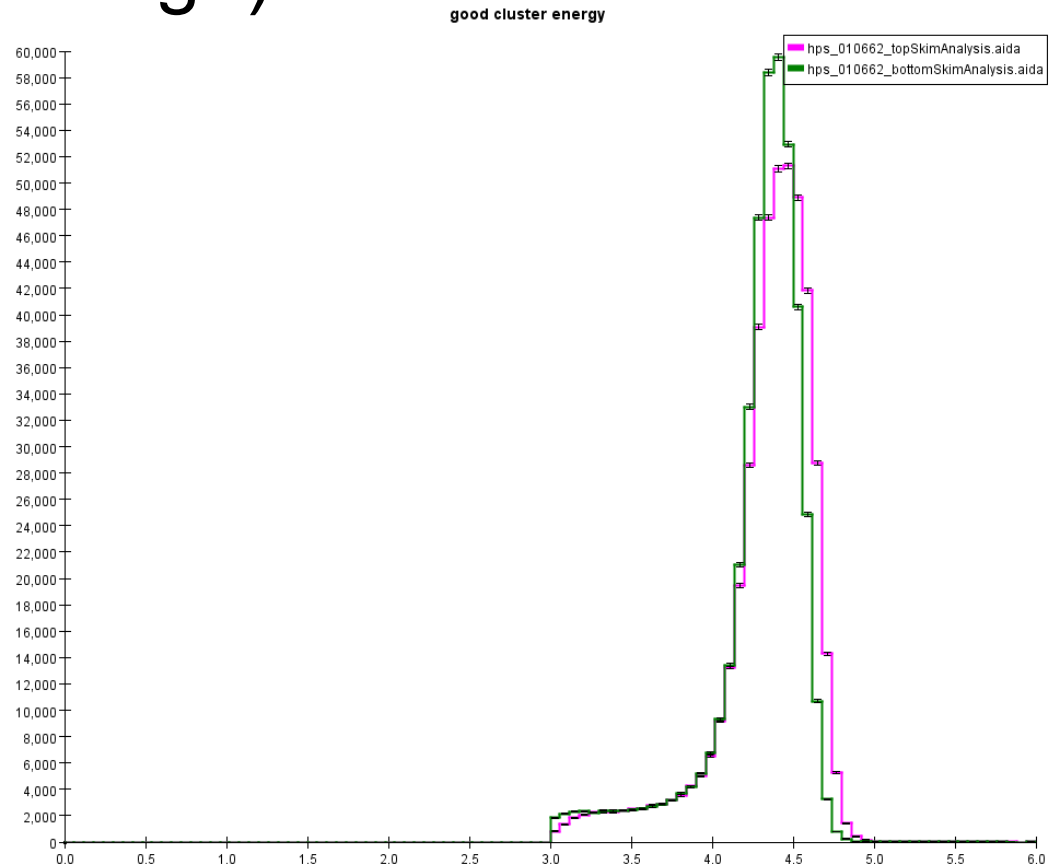
Ecal Energy Scale (Full Energy)

- ## Select events with one and only one cluster in the fiducial region of the calorimeter (viz. seed crystal is not on the edge).
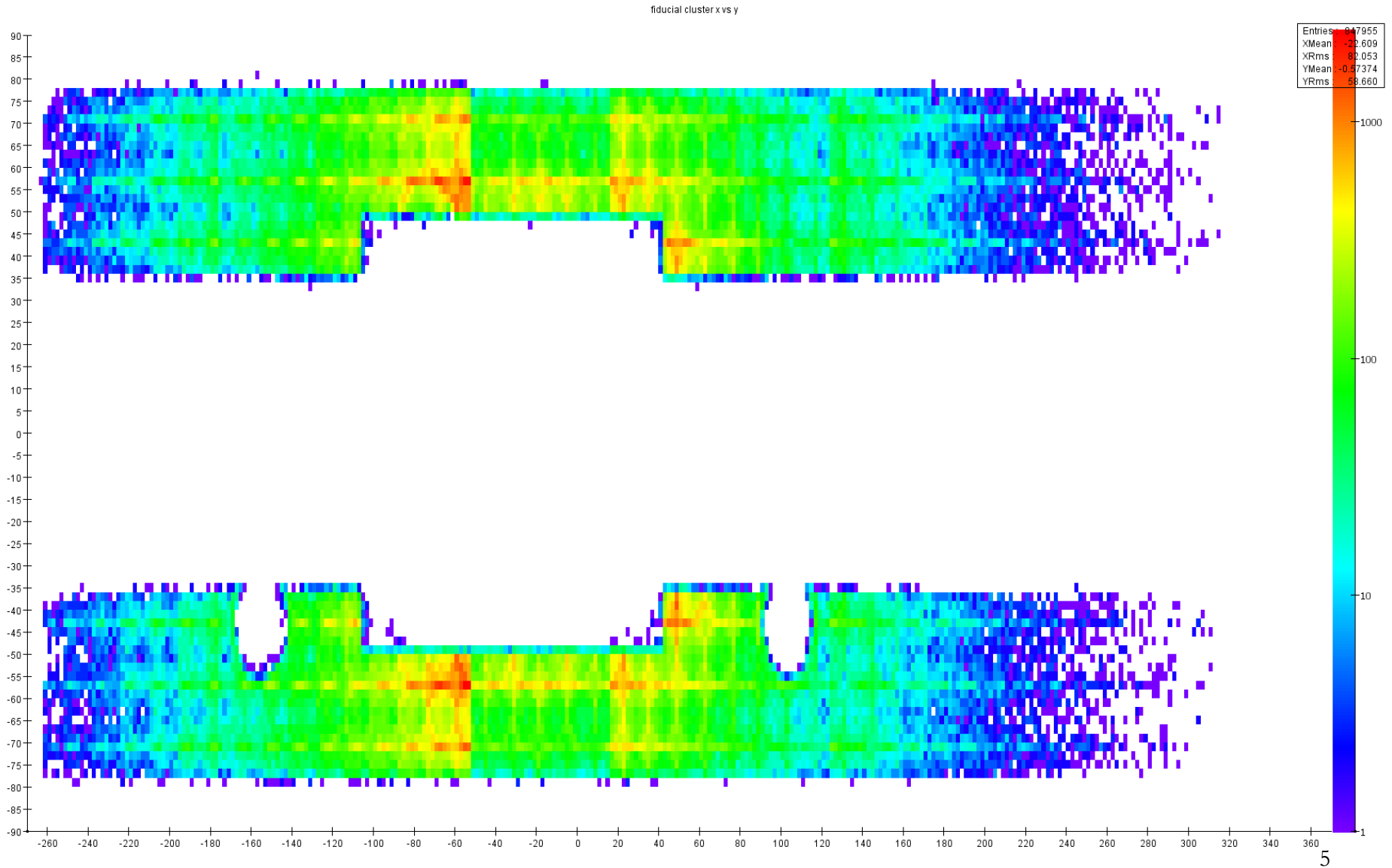
Looks pretty good right out of the box!
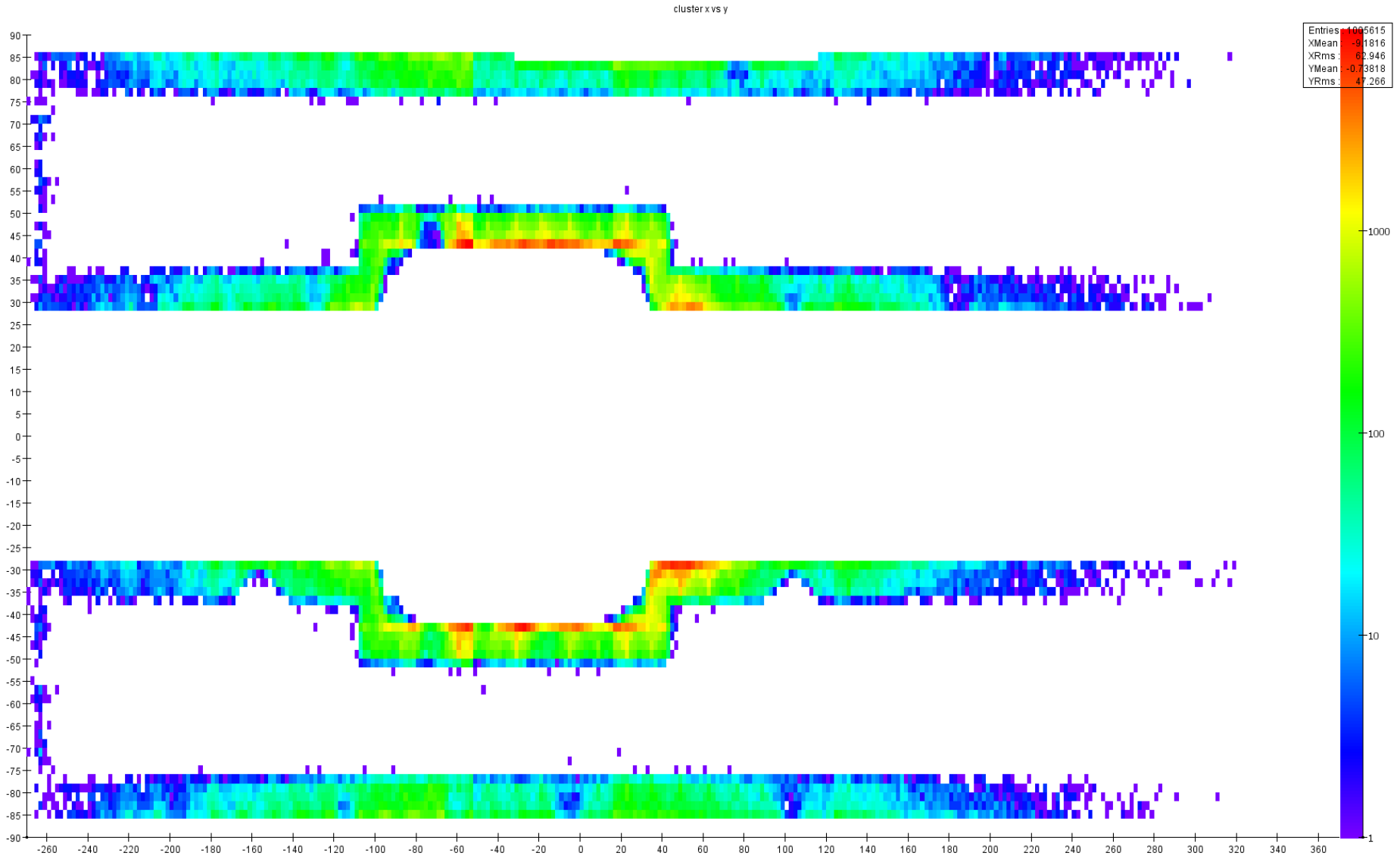Slight differences in absolute scale and resolution between top and bottom.

Crystal calibration being undertaken be Andrea.

good cluster energy

hps_010662_topSkimAnalysis.aida
hps_010662_bottomSkimAnalysis.aida

FEE Trigger coverage
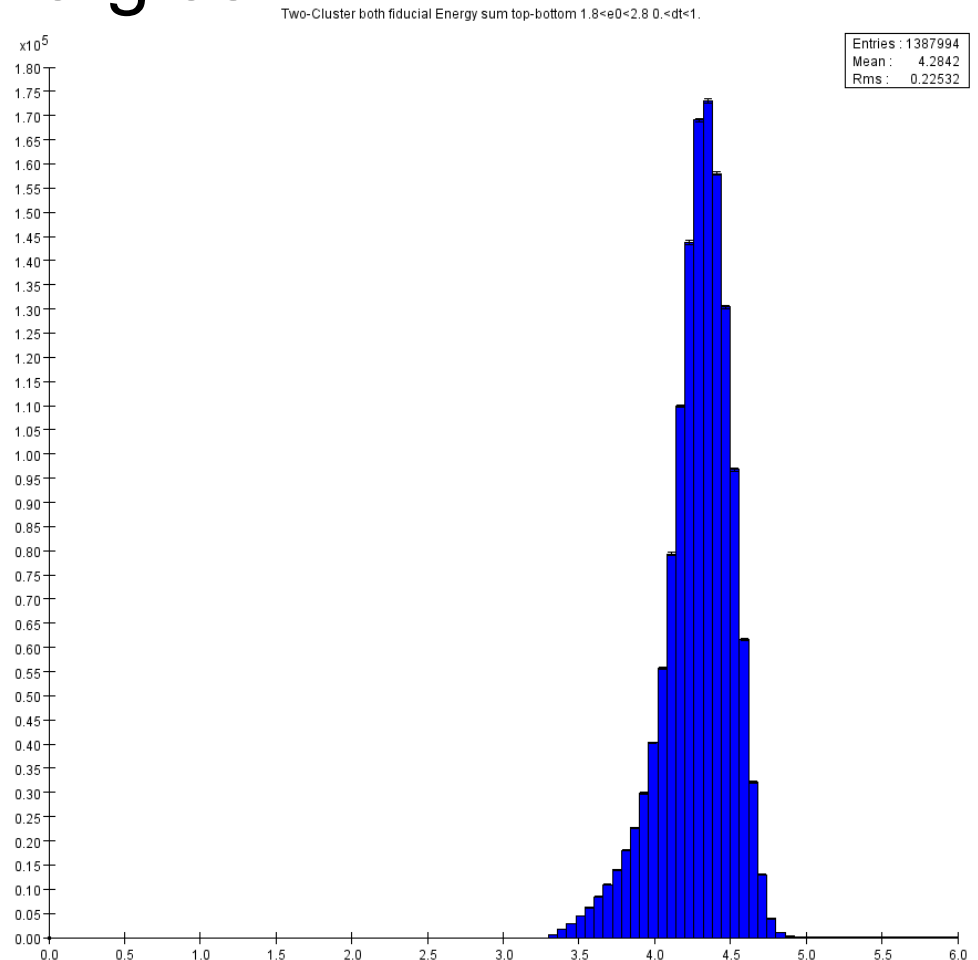

fiducial cluster x vs y

FEE Trigger coverage Non-Fiducial

Ecal Energy Scale (All Energies)

- Use bremsstrahlung events to transfer energy calibration to lower energies.

Select two and only two fiducial clusters in the event. Plot energy sum.
Should equal beam energy if we have an inelastic electron and the radiated photon.
Looks pretty good right out of the box!
Can select one fiducial cluster and correct edge clusters.

Two-Cluster both fiducial Energy sum top-bottom 1.8<e0<2.8 0.<dt<1.

Entries :	1387994
Mean :	4.2842
Rms :	0.22532

Sample Partitions

Select events passing the 2 gamma trigger:
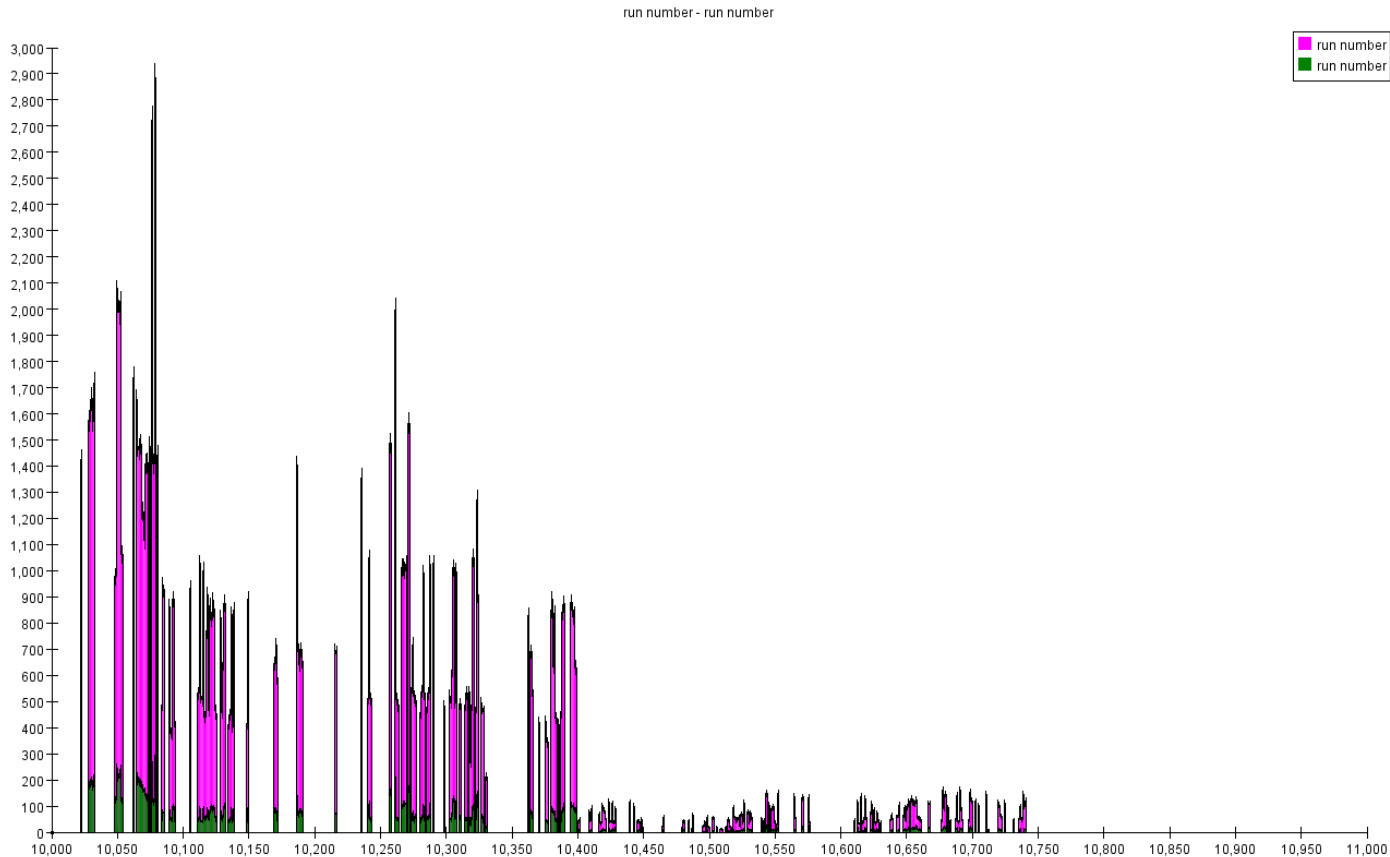

/home/holtrop/bin/HPS_Trigger_Filter

  -o hps_010050_2gamma.evio

  -T 2gamma

  -m 250000

/cache/mss/hallb/hps/physrun2019/data/hps_0100
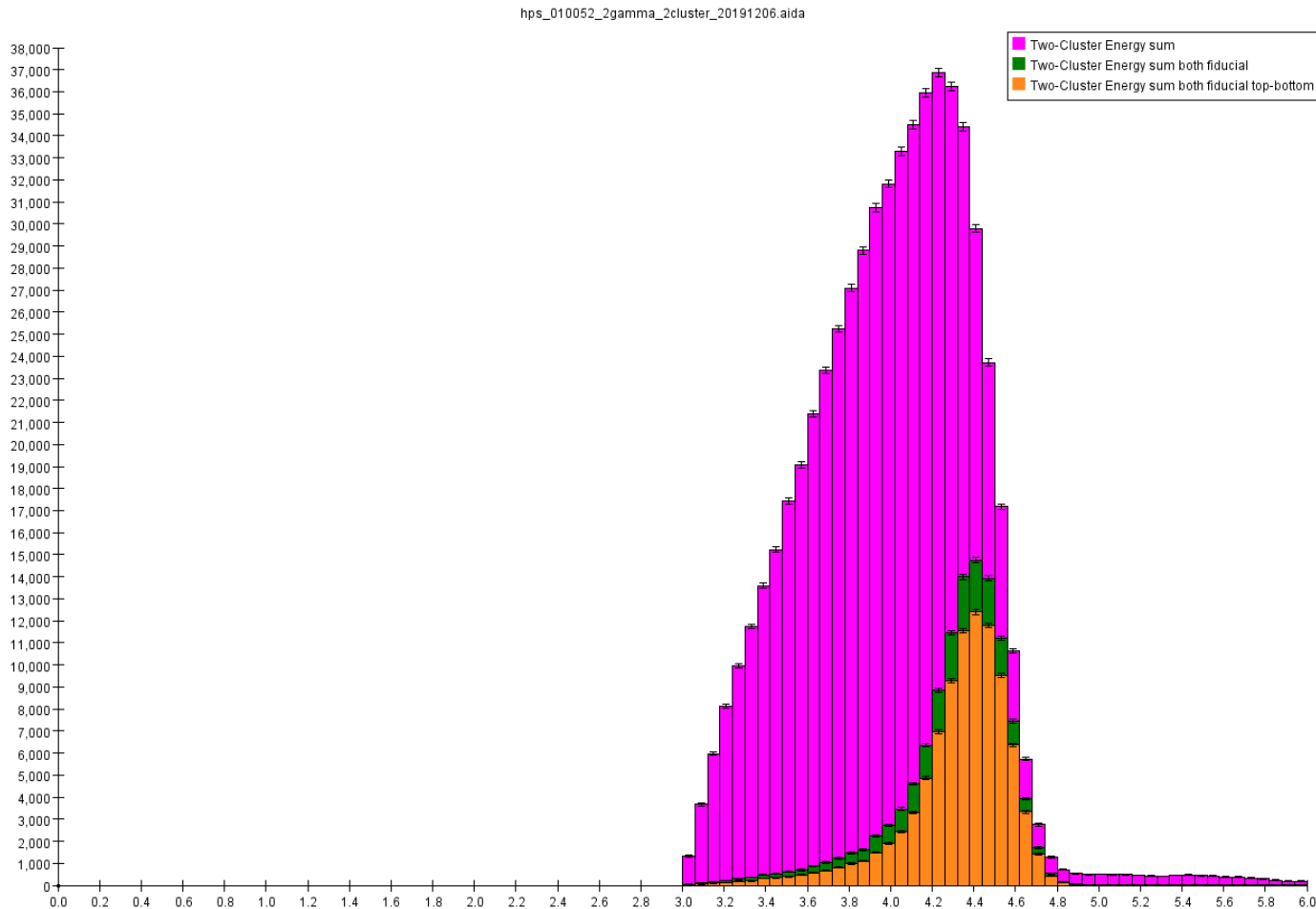50/hps_010050.evio.*

Sample Partitions

- Number of 2 cluster events per run.
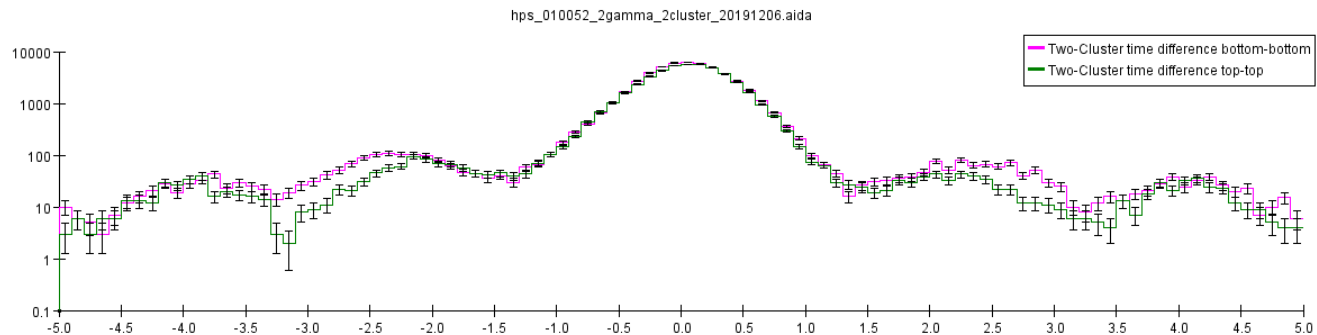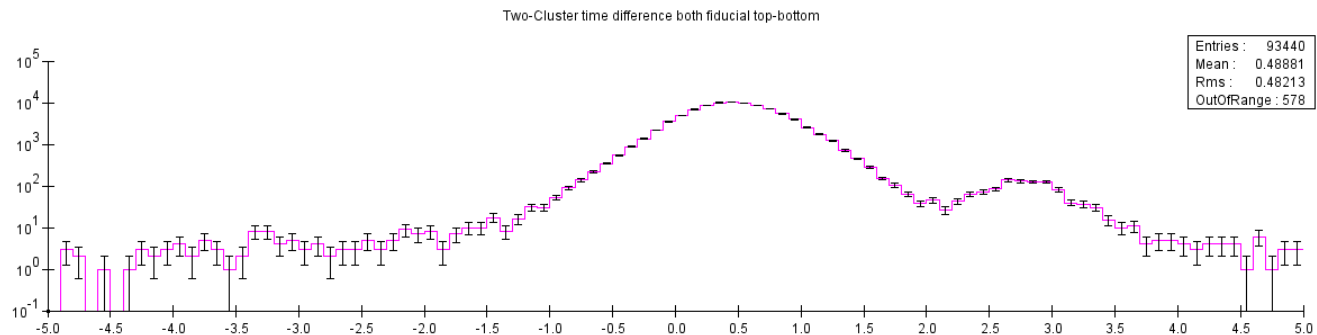- Trigger appears to have changed around 10400

2 gamma Data Sample

- Stage and skim events from runs 10050, 51 & 52
- Get roughly ½ million events per run.

hps_010052_2gamma_2cluster_20191206.aida

Legend:
- Two-Cluster Energy sum
- Two-Cluster Energy sum both fiducial
- Two-Cluster Energy sum both fiducial top-bottom

2 gamma Trigger Skim delta t

- Appears to be a .5ns time offset between top and bottom

Two-Cluster time difference both fiducial

Entries :	116762
Mean :	2.8898E-3
Rms :	0.67945
OutOfRange :	885

Two-Cluster time difference both fiducial top-bottom

Entries :	93440
Mean :	0.48881
Rms :	0.48213
OutOfRange :	578

hps_010052_2gamma_2cluster_20191206.aida

— Two-Cluster time difference bottom-bottom
— Two-Cluster time difference top-top
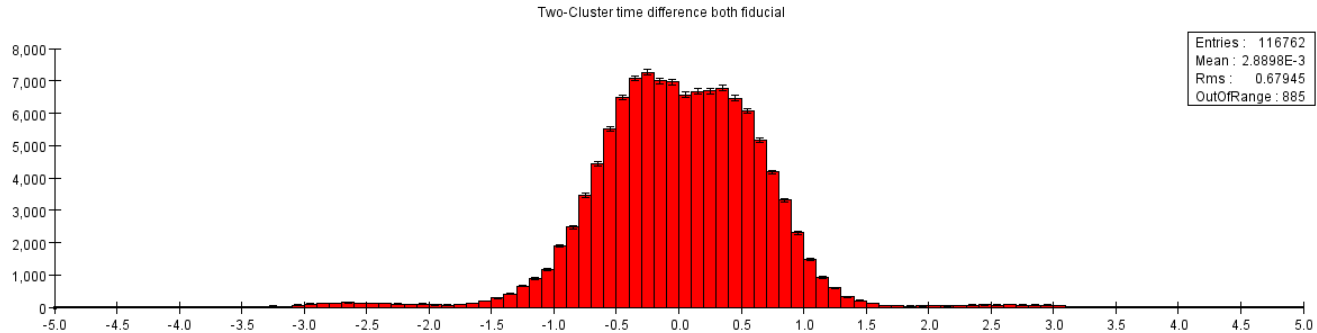
2 gamma Trigger Electron Coverage

- Clusters associated with a track
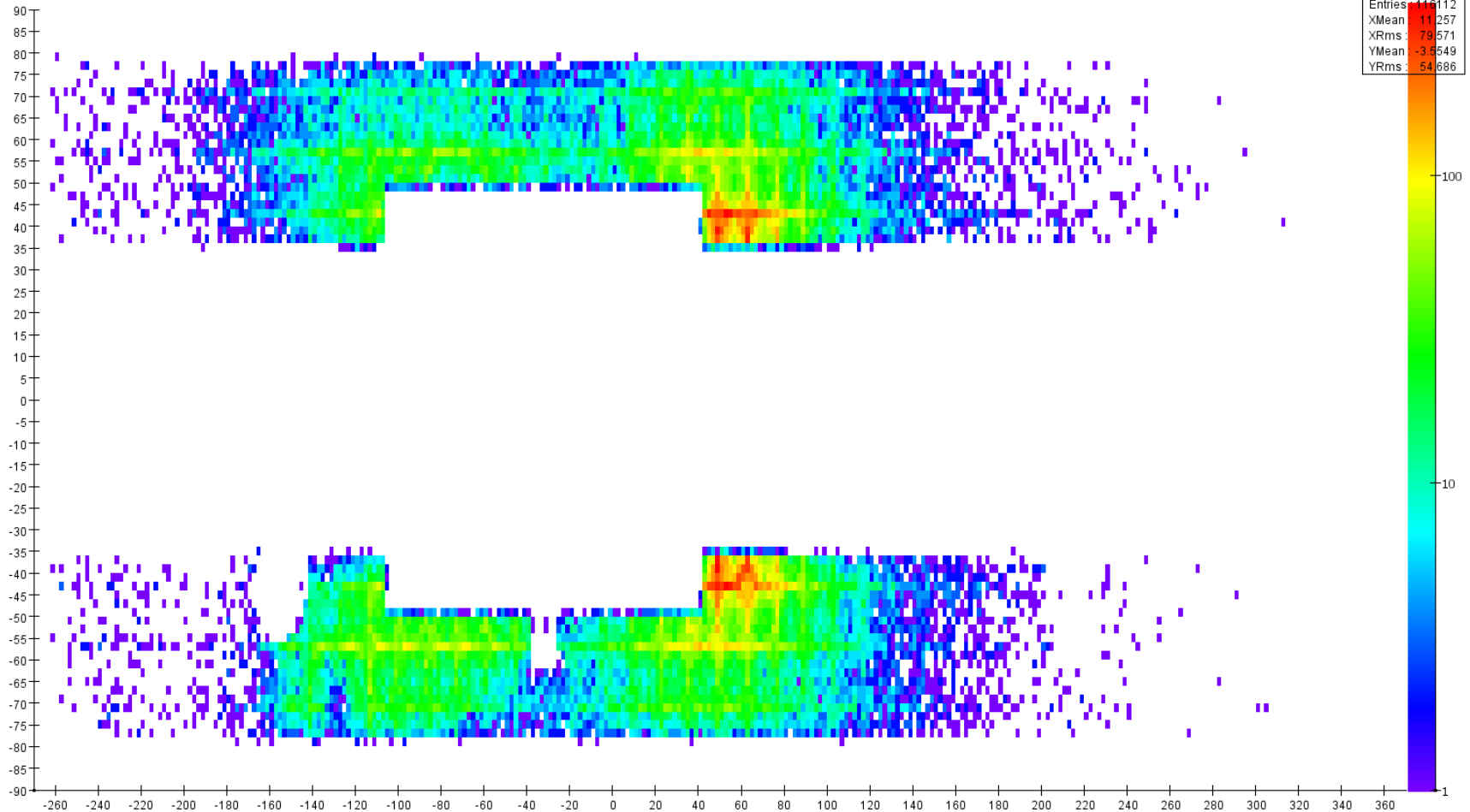

electron cluster x vs y
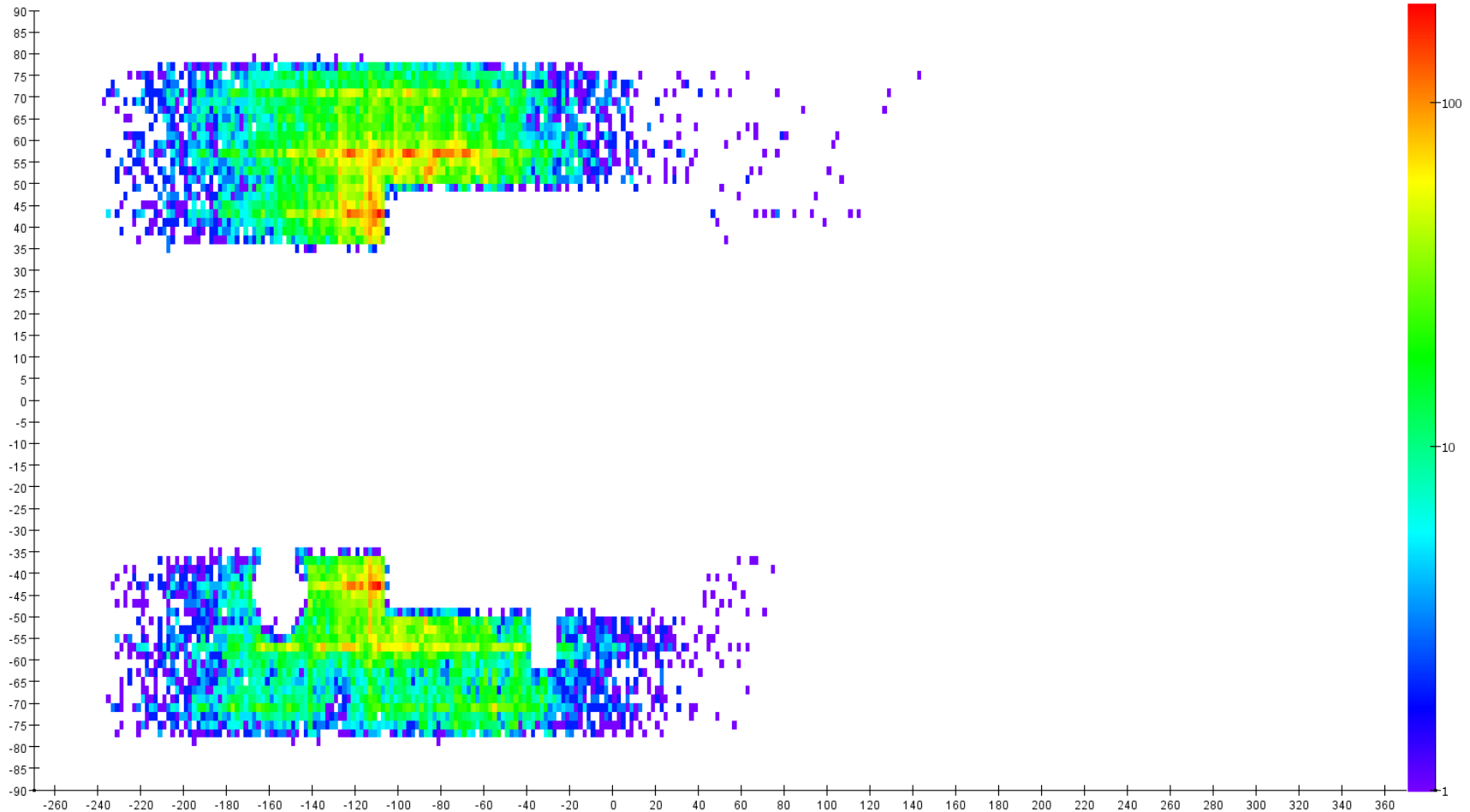
2 gamma Trigger Photon Coverage

■ Non-track clusters in electron events

Summary

- The wide angle bremsstrahlung photon events collected with the 2 gamma trigger provide a nice sample for extending/testing the Ecal & SVT calibration to lower energies and momenta.

- The events also provide a good sample to measure the tracking efficiency at lower momenta.

- First-pass reconstruction of these events are currently available at SLAC and Jlab.