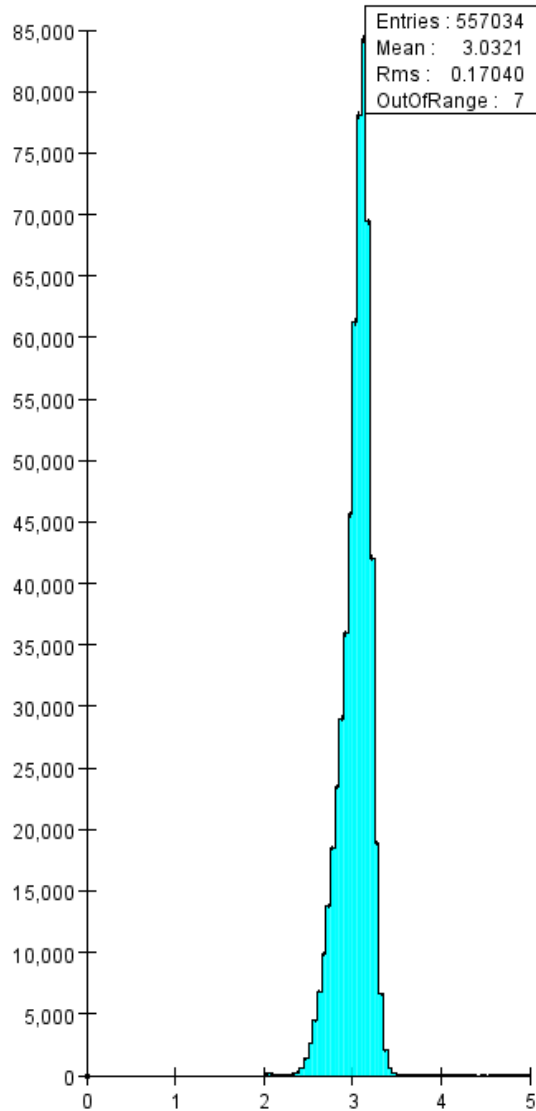# 2021 Data First Look

Norman Graf (SLAC)

Software Calibration meeting

September 14, 2021

My First Look at the 2021 Data
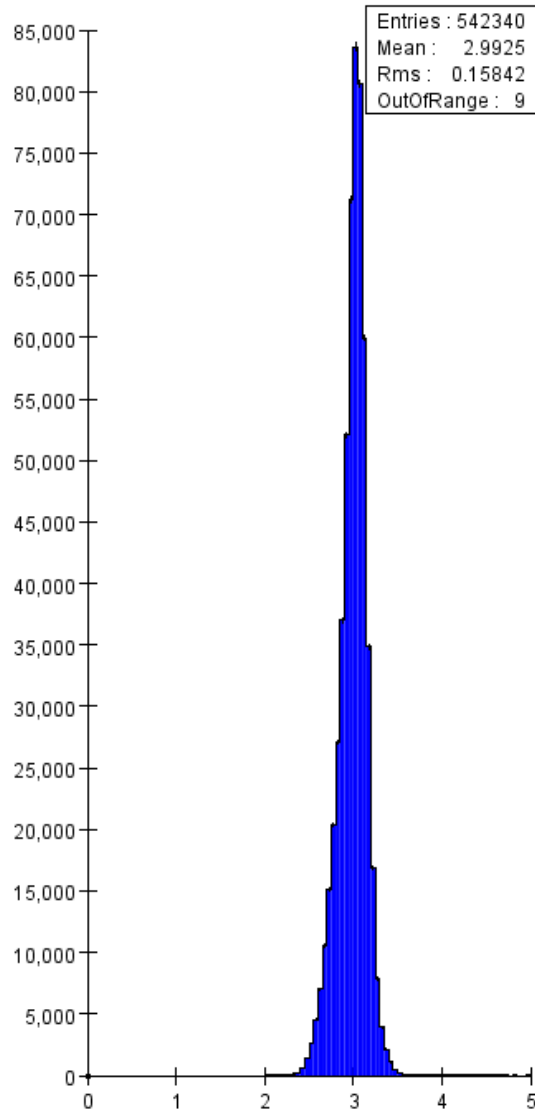
- **Data Samples**
  - Run 14168, 97 partitions, FEE trigger
- **Reconstruction Version**
  - hps-java 5.1, master and Run2021 branch
- **Detector**
  - HPS-v2019-3pt7GeV
- **Steering File**
  - PhysicsRun2021_pass0_recon_evio.lcsim
- **FEEs**
  - One and only one fiducial cluster
  - Seed energy > 1.9GeV
  - Plot uncorrected cluster energies for top and bottom
- **WABs**
  - Skim events containing two and only two clusters in the fiducial region of the calorimeter
  - Clusters in diagonally opposite quadrants
  - Cluster times within 2ns
  - Cluster Esum > 2.GeV
  - Plot uncorrected energy sum of two clusters
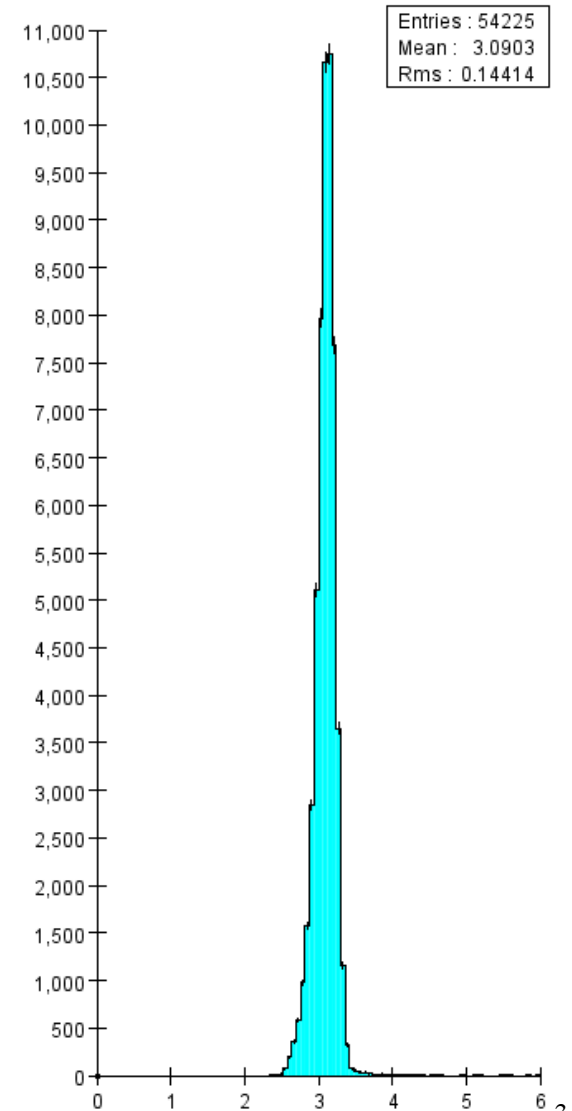
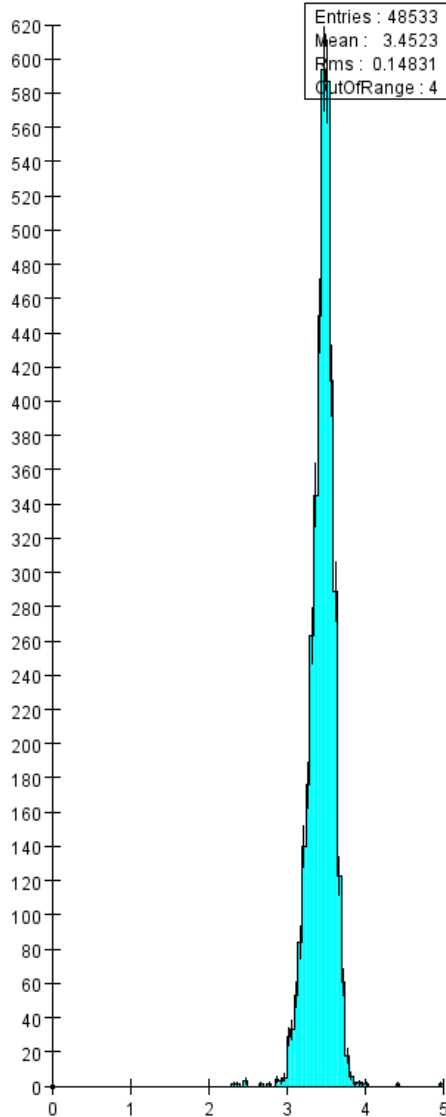# Uncorrected Calorimeter Energies

Top Cluster Energy

Entries :	557034
Mean :	3.0321
Rms :	0.17040
OutOfRange :	7

Bottom Cluster Energy

Entries :	542340
Mean :	2.9925
Rms :	0.15842
OutOfRange :	9

Two-Cluster both fiducial Energy sum top-bottom 1.8<e0...

Entries :	54225
Mean :	3.0903
Rms :	0.14414

"Corrected" Calorimeter Energies

Top Cluster Energy seed energy > 2.1

Entries : 48533
Mean : 3.4523
Rms : 0.14831
OutOfRange : 4

Bottom Cluster Energy seed energy > 2.1

Entries : 44618
Mean : 3.4256
Rms : 0.14339
OutOfRange : 2

Two-Cluster both fiducial Energy sum top-bottom 1.8...

Entries : 9752
Mean : 3.5076
Rms : 0.15298
OutOfRange : 2
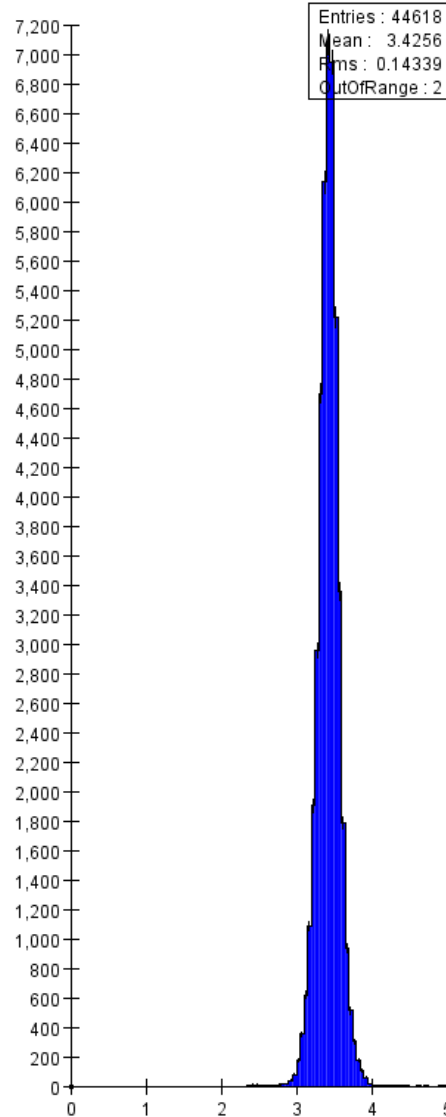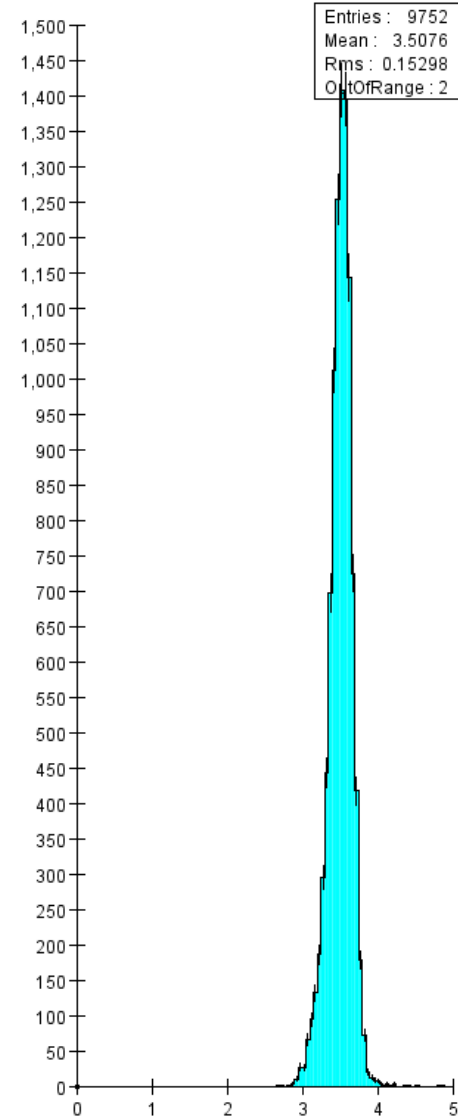
WAB E1 vs E2

Two-Cluster both fiducial top-bottom E0 vs E1
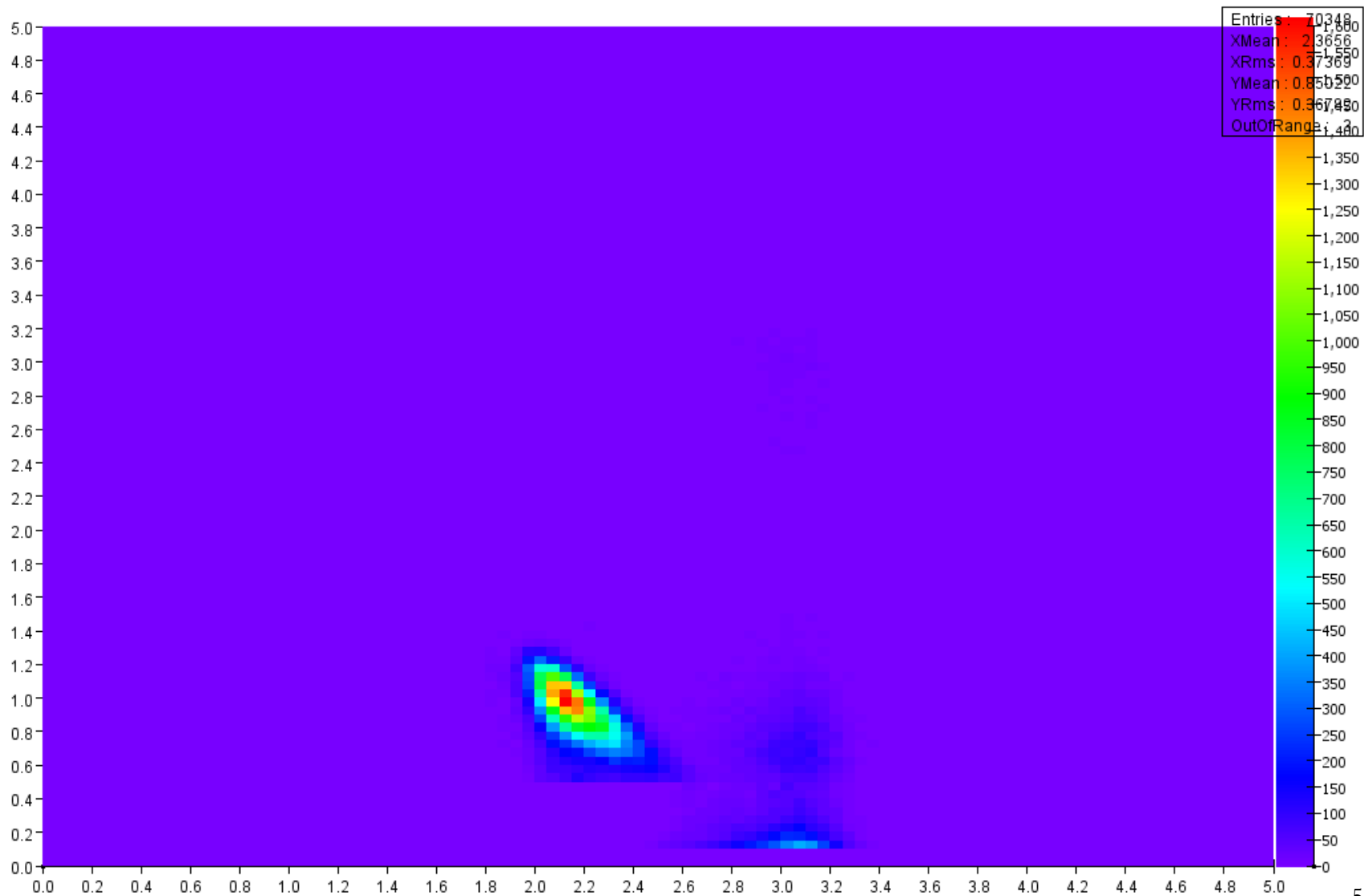
Calorimeter IX vs IY 14168
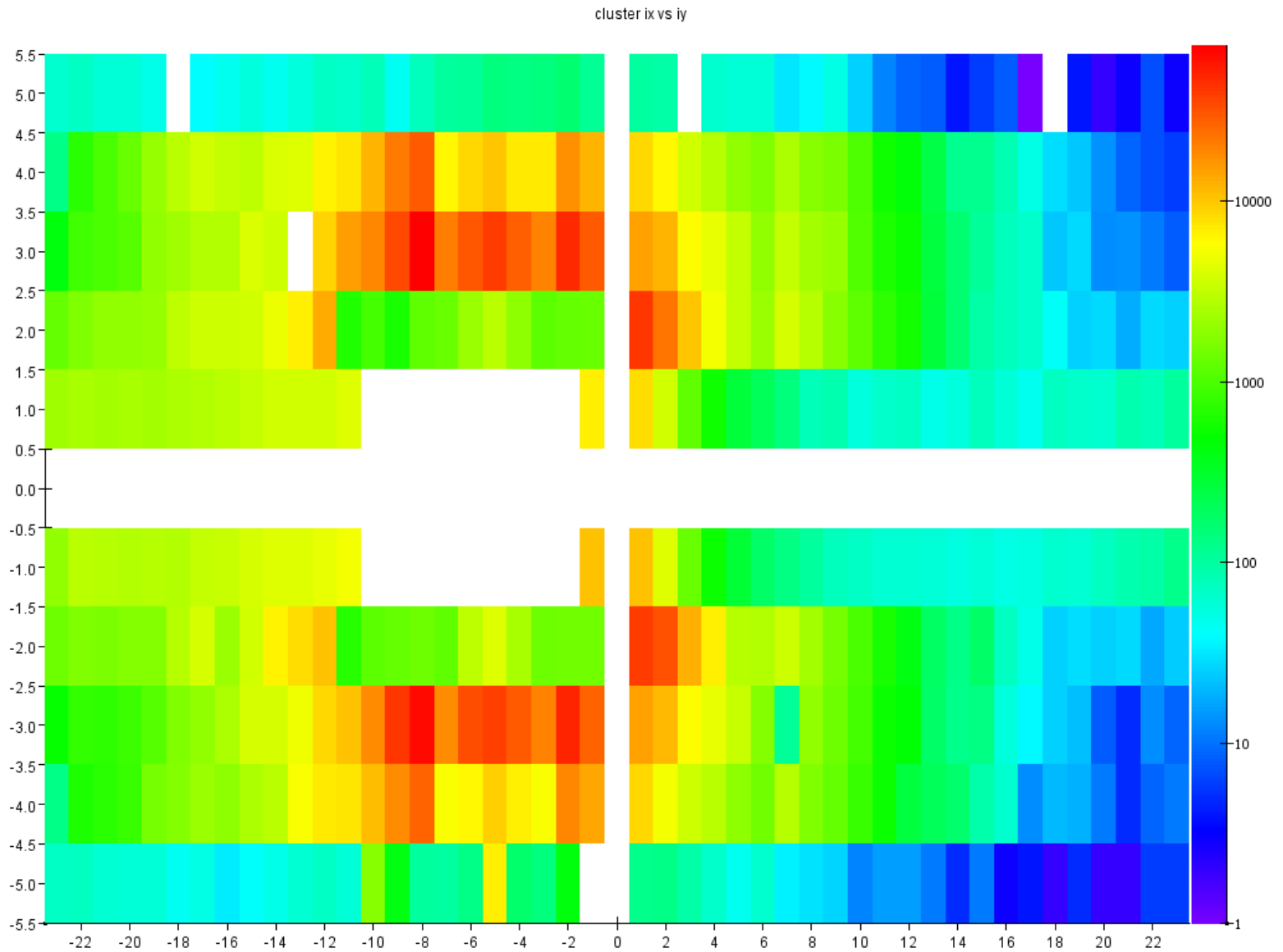
cluster ix vs iy

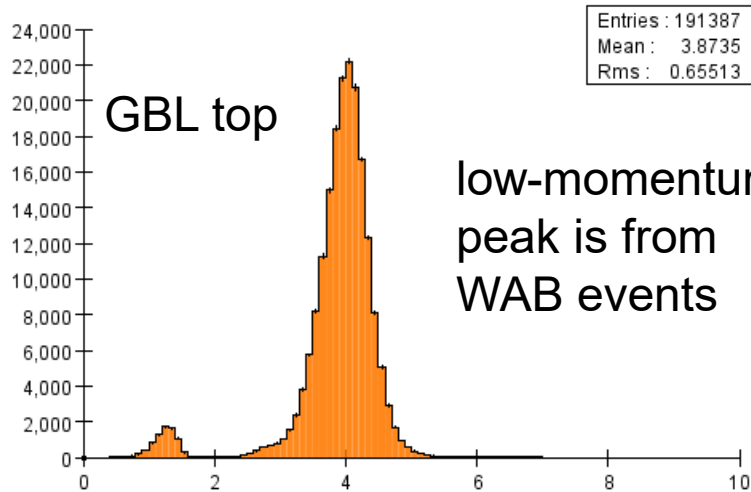# Calorimeter IX vs IY 14211
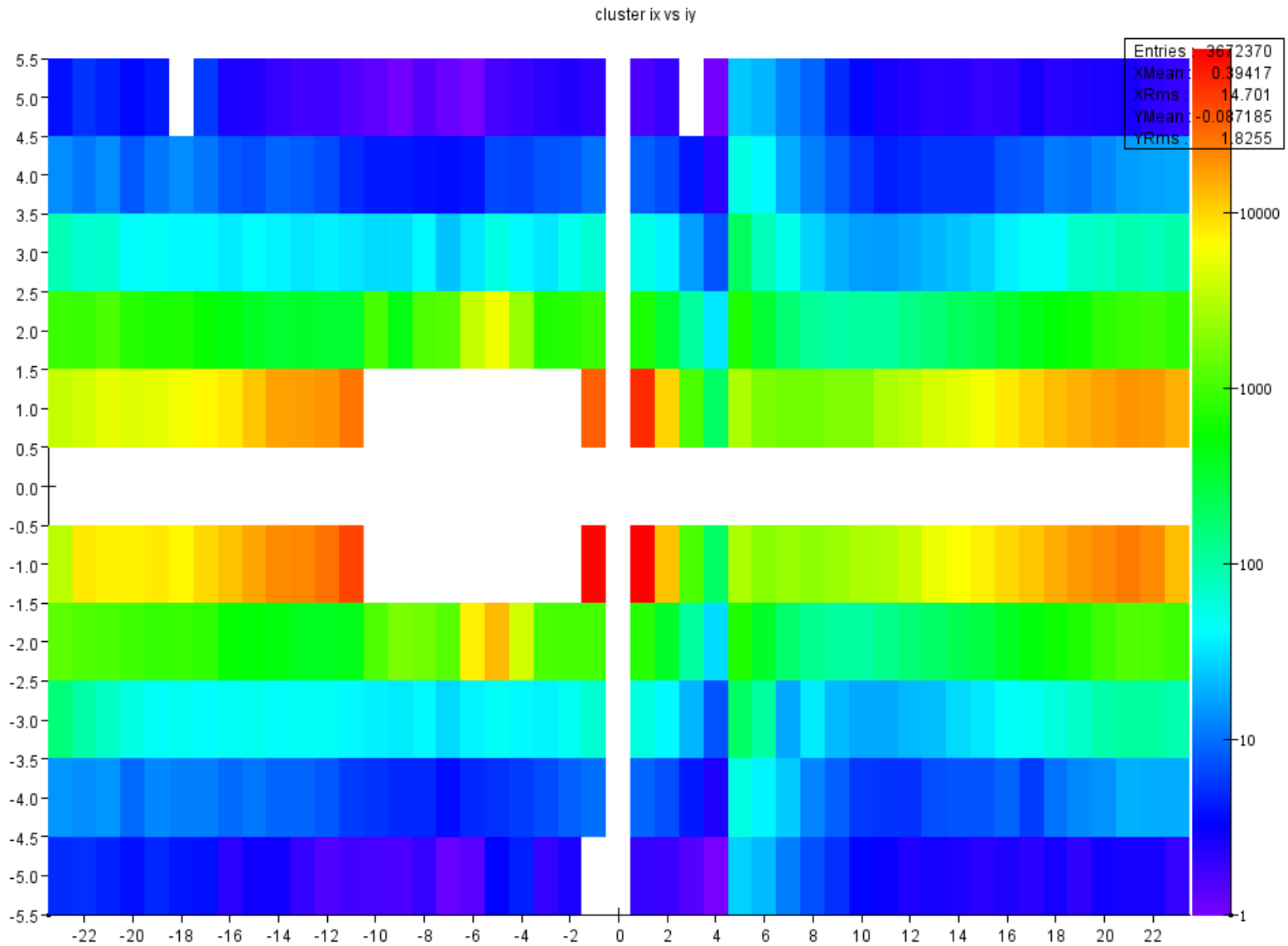
Ecal performance

- The consistency between top and bottom FEE cluster energies and between single-cluster energies and the two-cluster energy sum is strong evidence that the calorimeter is performing well.

- Cluster corrections derived for the 2019 run provide energies ~95% of nominal.

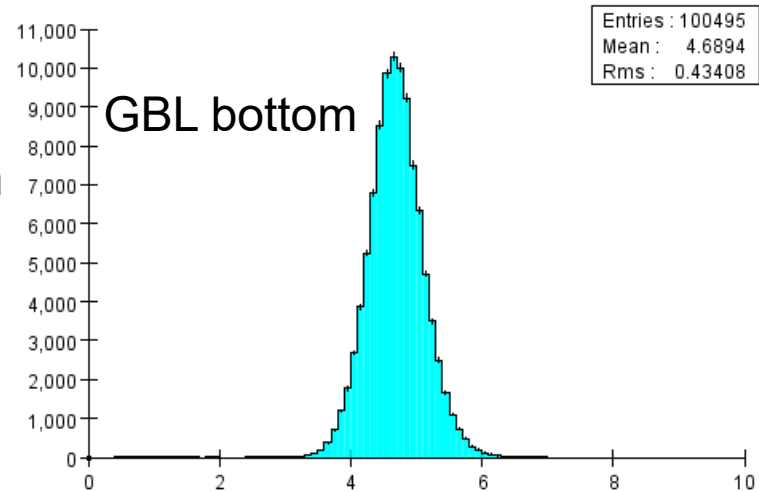- A few crystals ((-18,5), (3,5), (-1,-5) appear to be dead and one (7,-3) is at a lower efficiency.

SVT

- Using the FEE events to align/calibrate the SVT.

- Select FEE events with tracks having hits in all layers (7 for GBL, 14 for KF).

- Break tracks associated with FEE clusters into two parts: front four sensors & back three sensors

- Fit each segment separately and extrapolate to the z of the SVT hinge.

- Compare slopes and intercepts to measure "opening angle" and offsets.
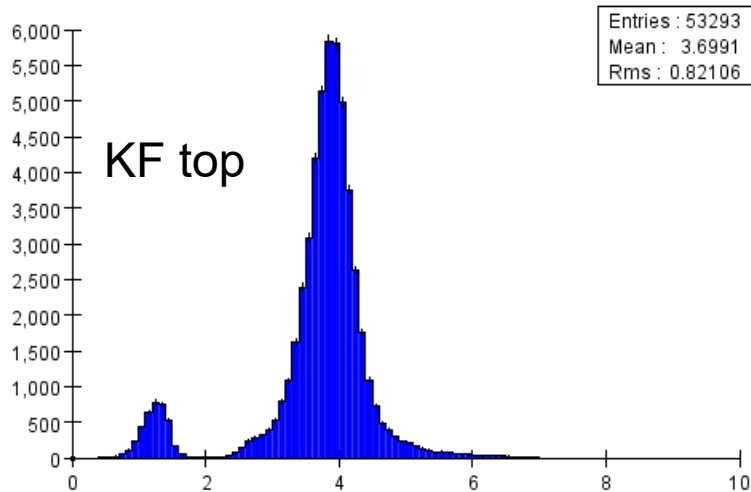
FEE track momenta
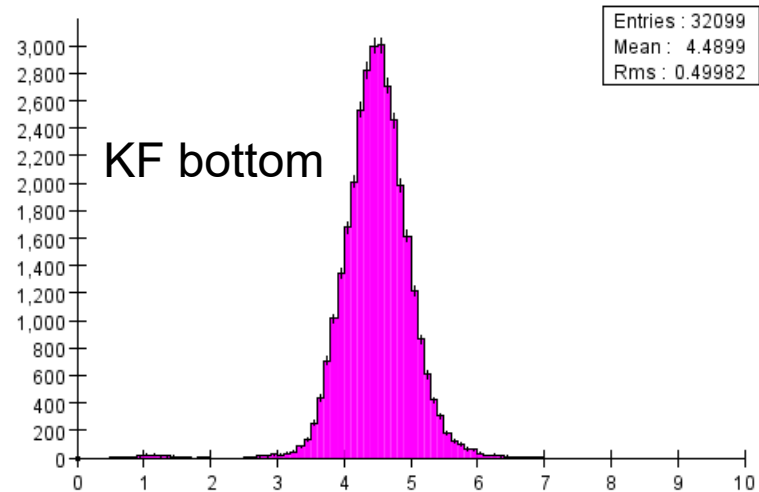

GBL top electron track momentum with fiducial cluster 7 hits

GBL top

low-momentum
peak is from
WAB events

Entries : 191387
Mean :   3.8735
Rms :   0.65513

GBL bottom electron track momentum with fiducial cluster 7 hits
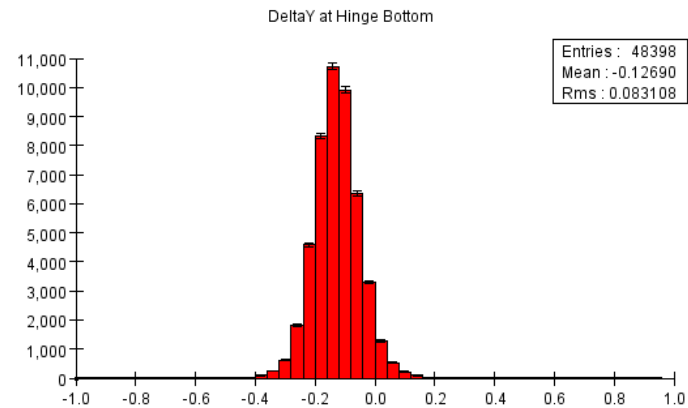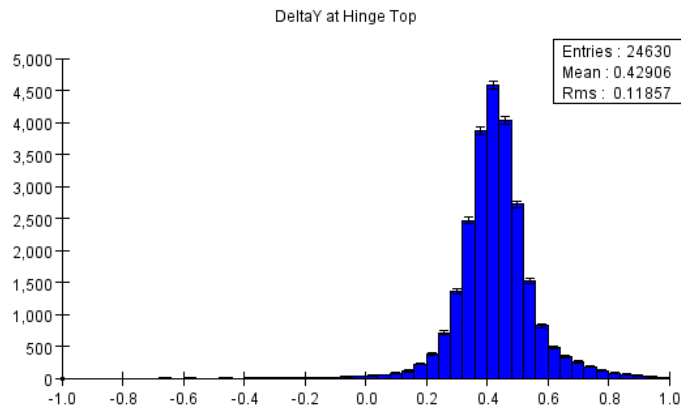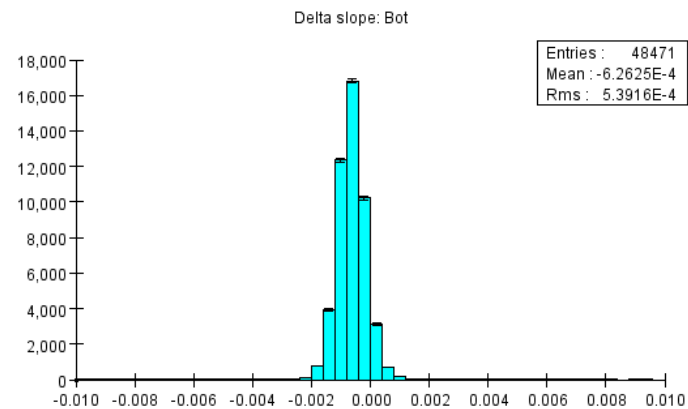
GBL bottom

Entries : 100495
Mean :   4.6894
Rms :   0.43408
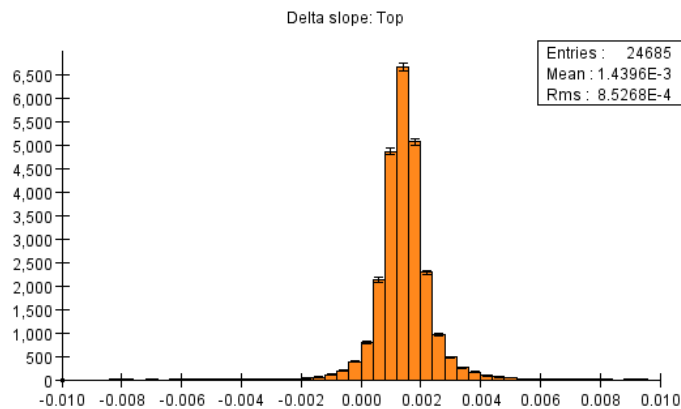
Kalman top electron track momentum with fiducial cluster 14 hits

KF top

Entries : 53293
Mean :   3.6991
Rms : 0.82106

Kalman bottom electron track momentum with fiducial cluster 14 hits

KF bottom

Entries : 32099
Mean :   4.4899
Rms : 0.49982

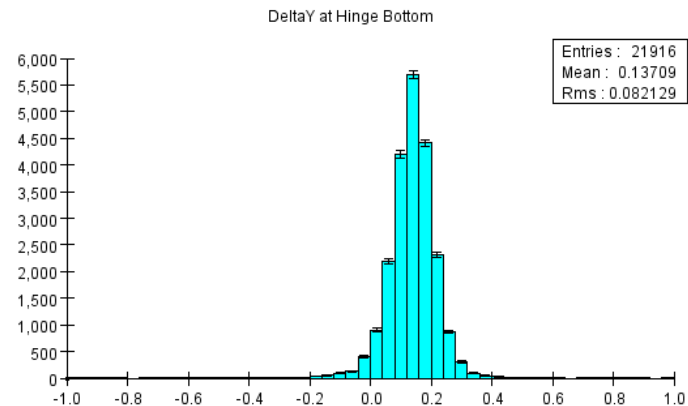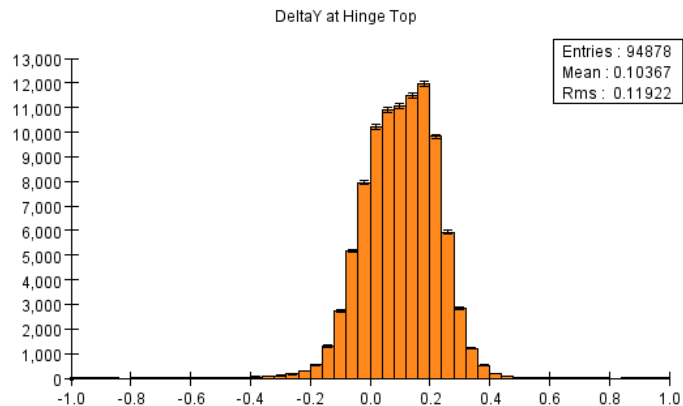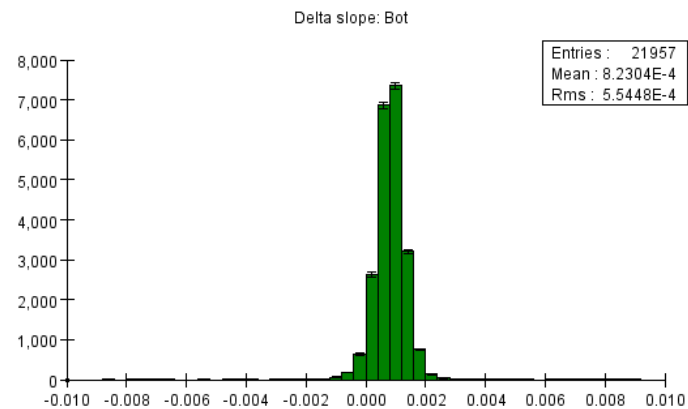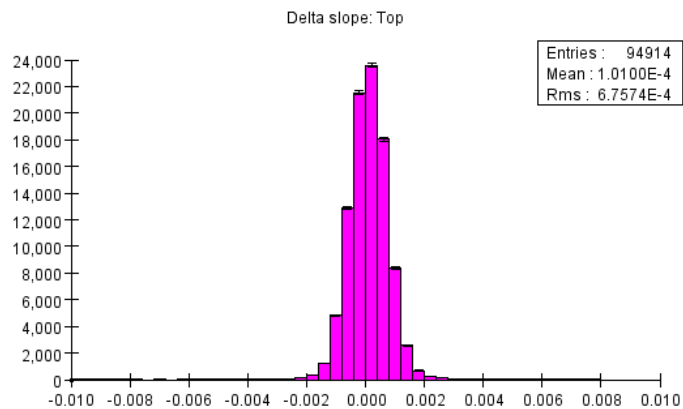# "Old" detector

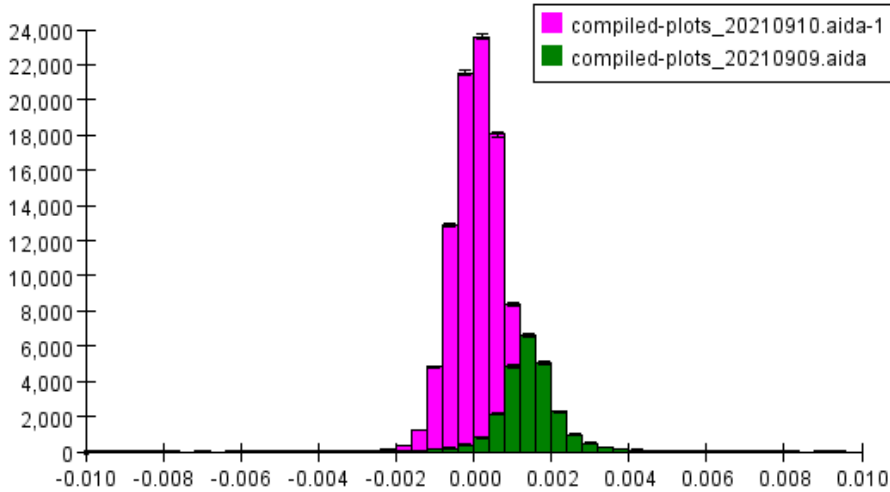- Detector on master branch has 2019 survey constants hard-coded.

"New" detector

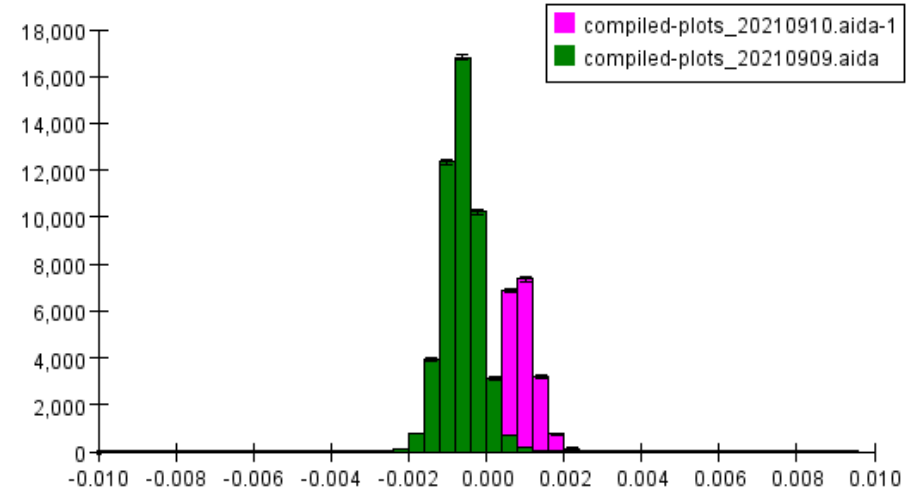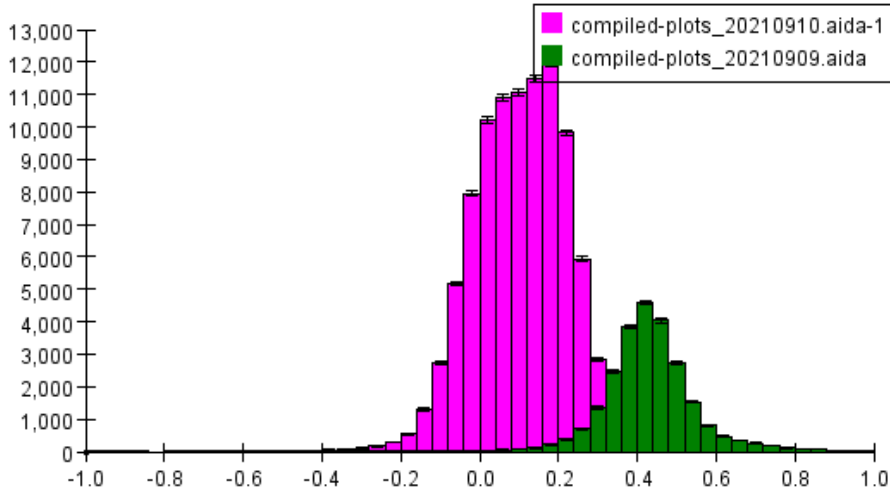- Detector on Run2021 branch has removed the 2019 survey constants.

Comparison
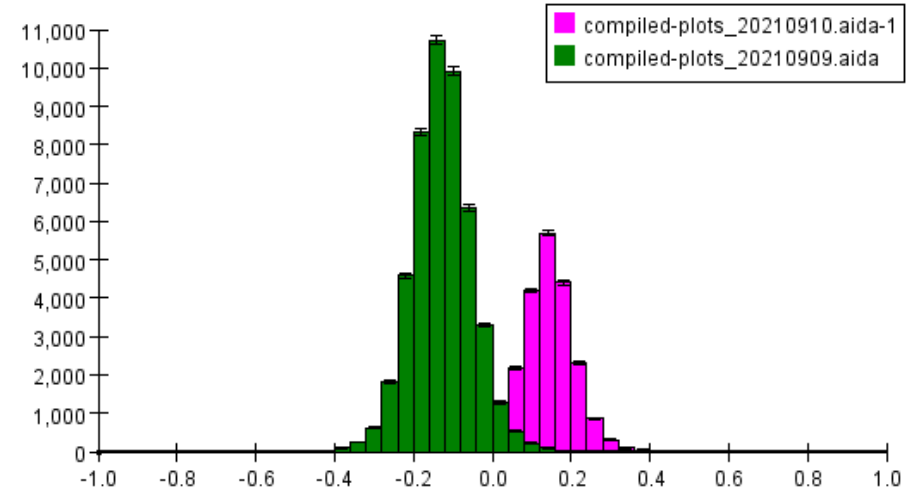
Status

- See PF's presentation for latest efforts to understand SVT geometry and to calibrate SVT.

- Yield of fully-reconstructed three-prong tridents is fairly low and mass peak is broad.

- Møllers will have to wait as the current momentum scale and resolution is not yet good enough to resolve.