

2019 Track-Finding Efficiency: WABs

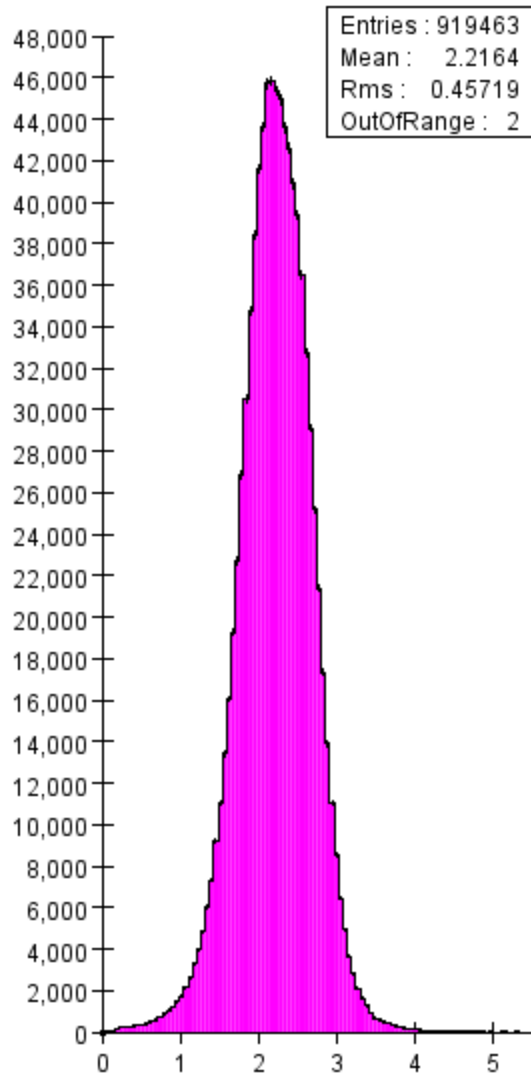
Norman Graf (SLAC)
Data Reconstruction Meeting
May 11, 2021

Track-Finding Efficiency with Data

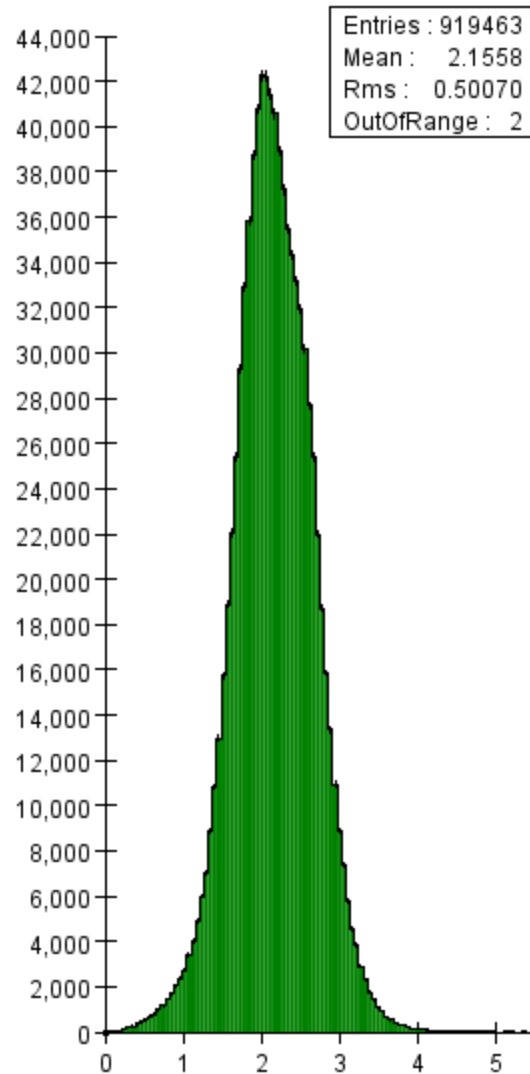
- Data Samples
 - Data run 105
- Reconstruction Version
 - hps-java 5.1 snapshot
- Detector
 - HPS_PhysicsRun2019-v2-FEE-Pass0
- Skim events containing two and only two clusters in the fiducial region of the calorimeter
- Clusters in diagonally opposite quadrants
- Cluster times within 2ns
- Cluster $E_{\text{sum}} > 3.5\text{GeV}$
- Provides 918954 WAB candidates

Cluster Energies

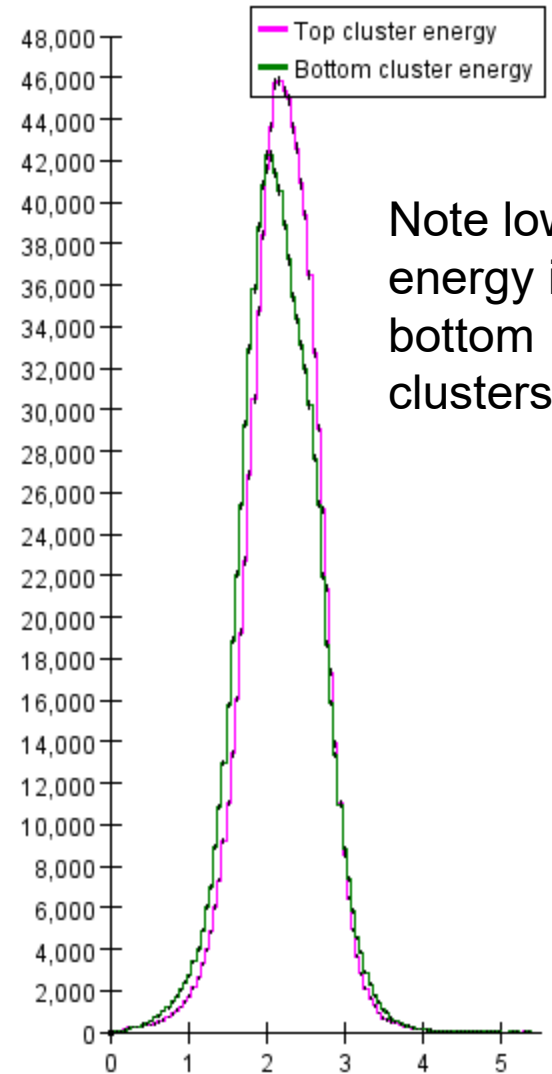
Top cluster energy



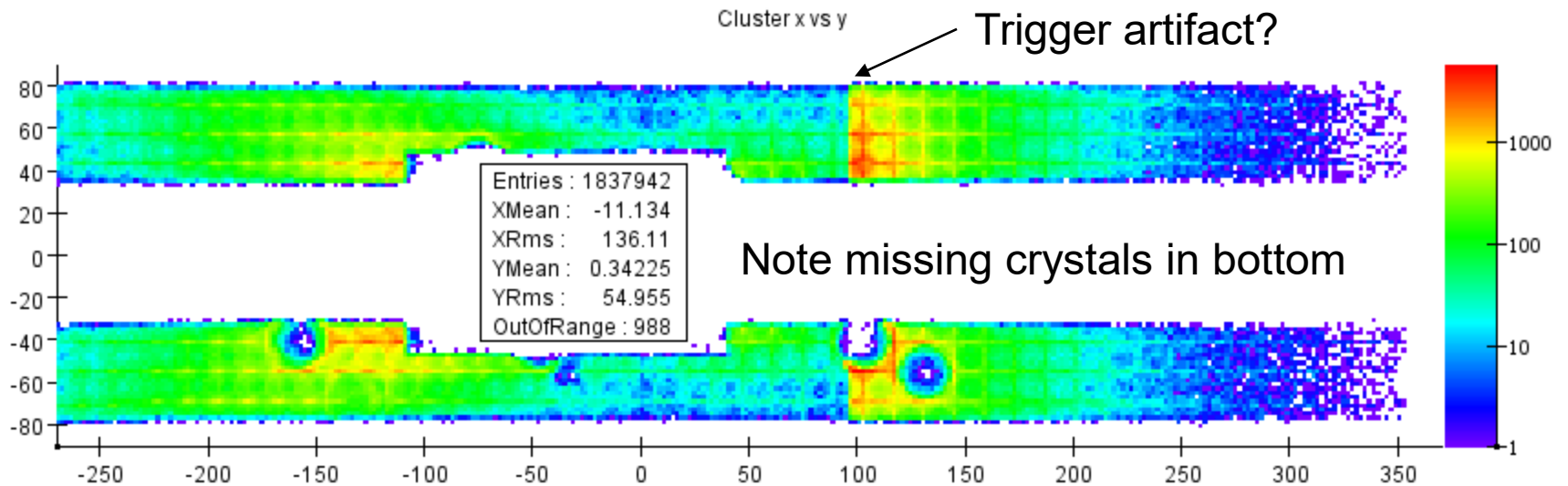
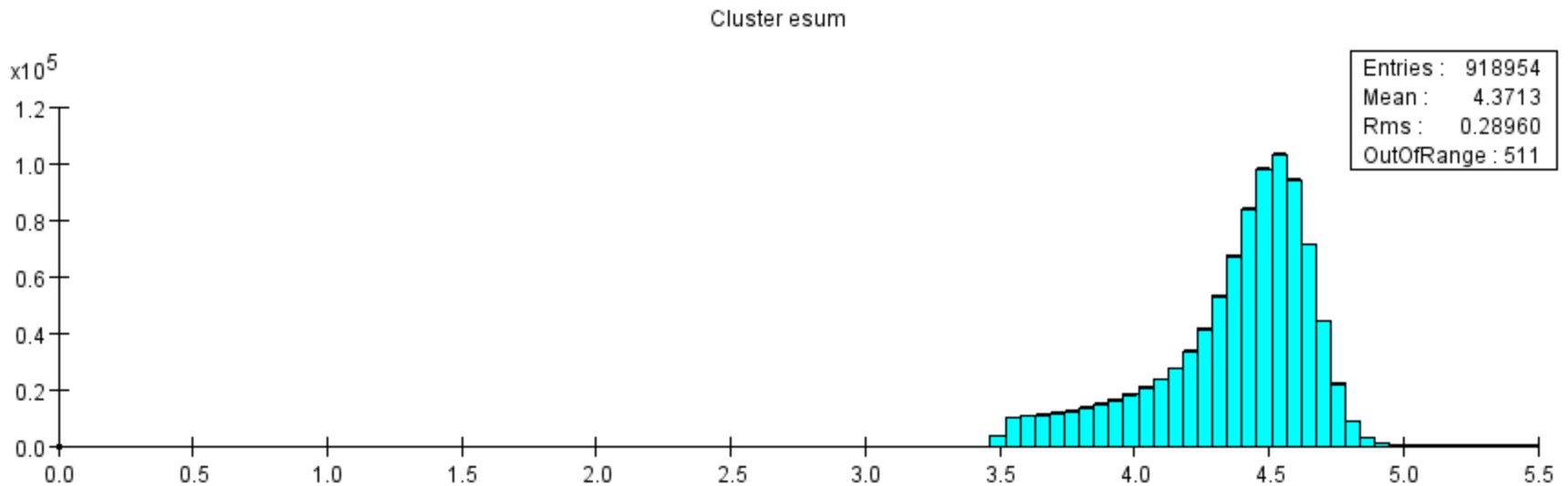
Bottom cluster energy



aida8172138980026543742.aida



Event Characteristics

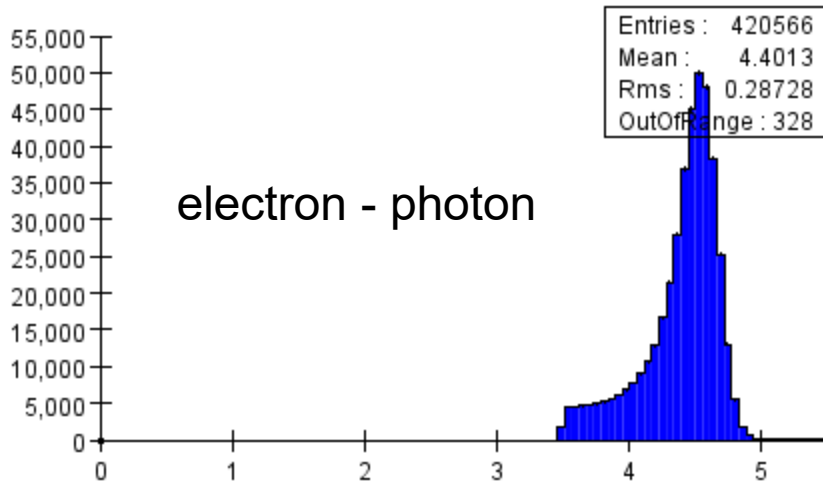


Event Classification

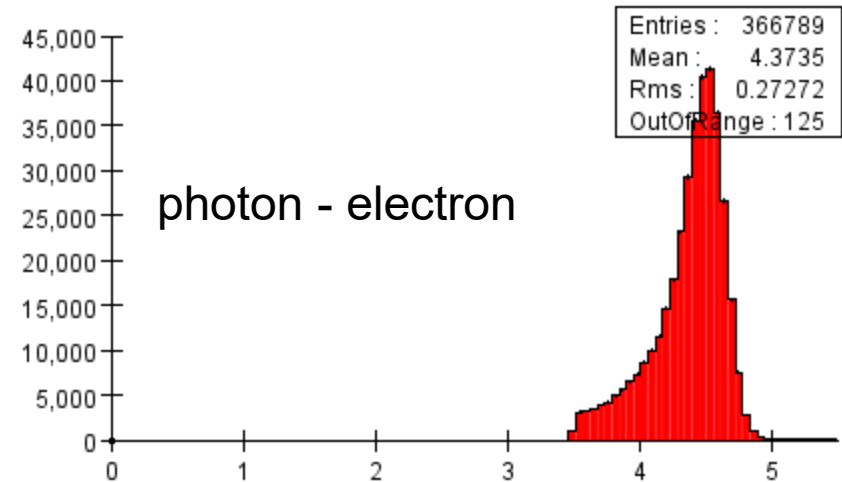
- Hypothesis is that these events are wide-angle bremsstrahlung (WAB) candidates where we have detected both the inelastically-scattered electron and the radiated photon.
- E_{sum} should equal beam energy
- One, or the other, of the clusters should have an associated track, the other should not.
- Discard events with a reconstructed positron, as these may be real trident events.
- Events reconstructed with two photons is a measure of the track inefficiency.

Event Cluster Types GBL

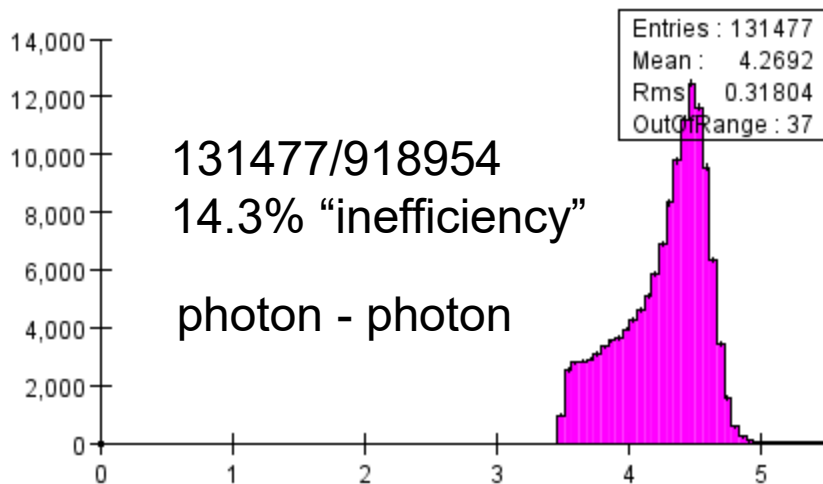
Cluster esum GBL eg



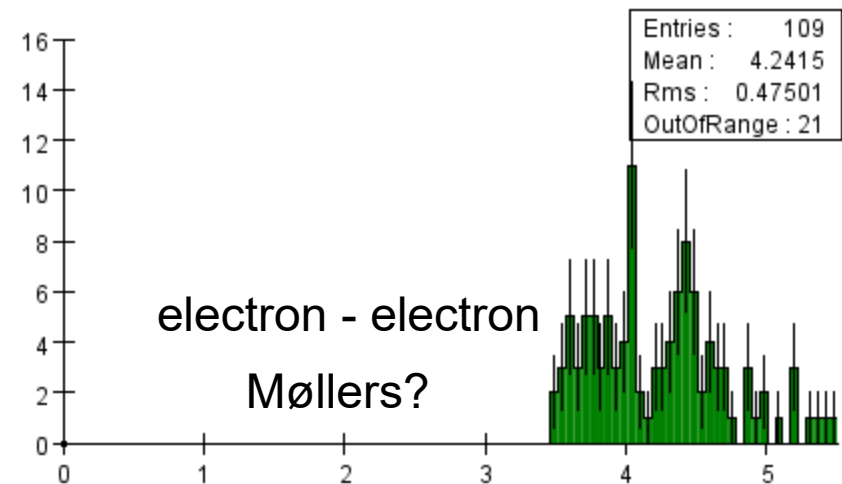
Cluster esum GBL ge



Cluster esum GBL gg

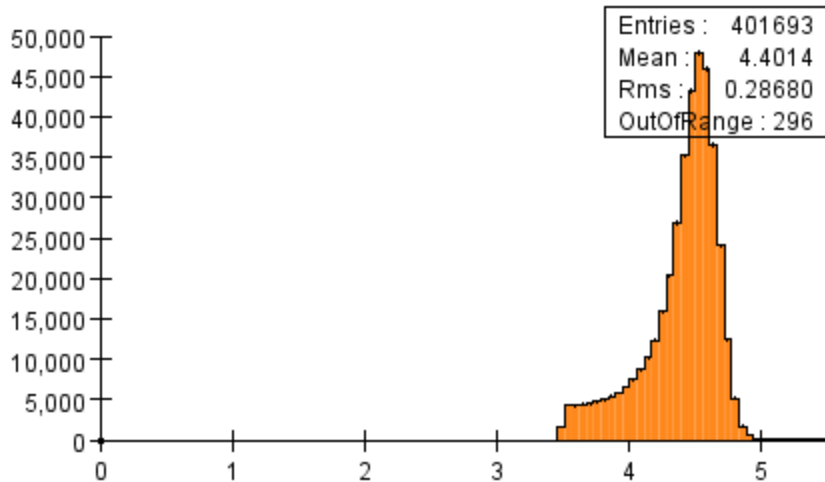


Cluster esum GBL ee

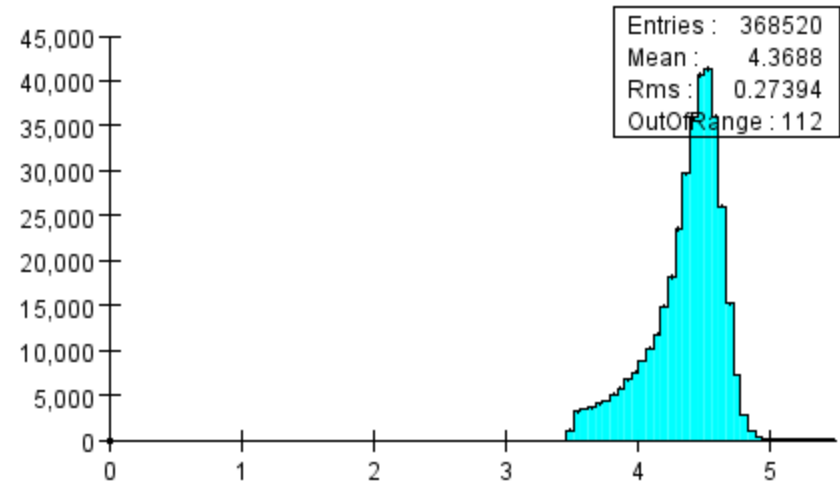


Event Cluster Types KF

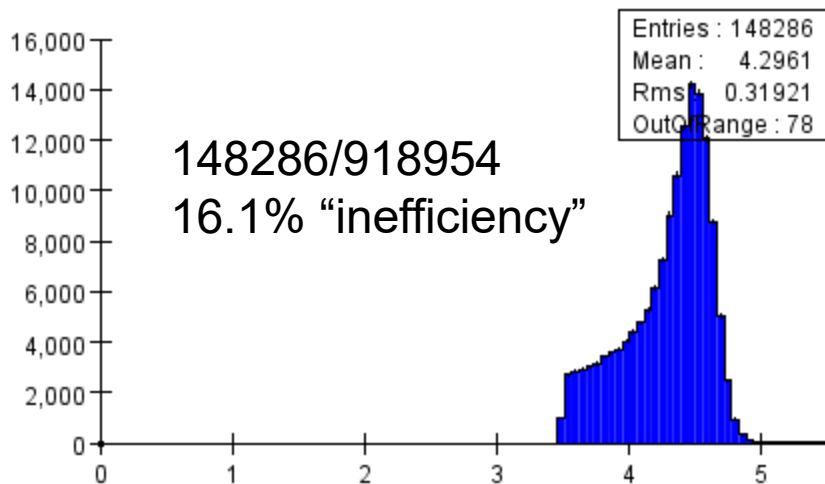
Cluster esum KF eg



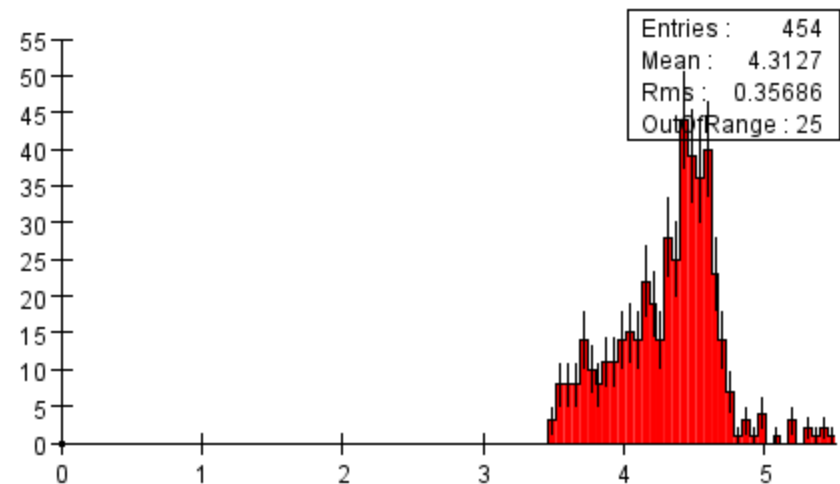
Cluster esum KF ge



Cluster esum KF gg

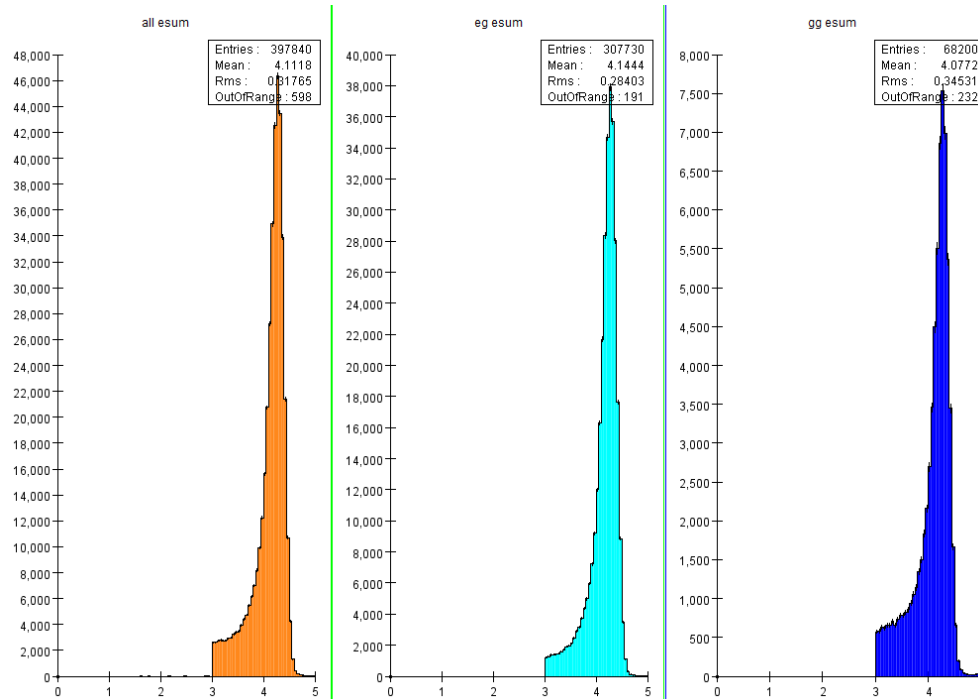


Cluster esum KF ee



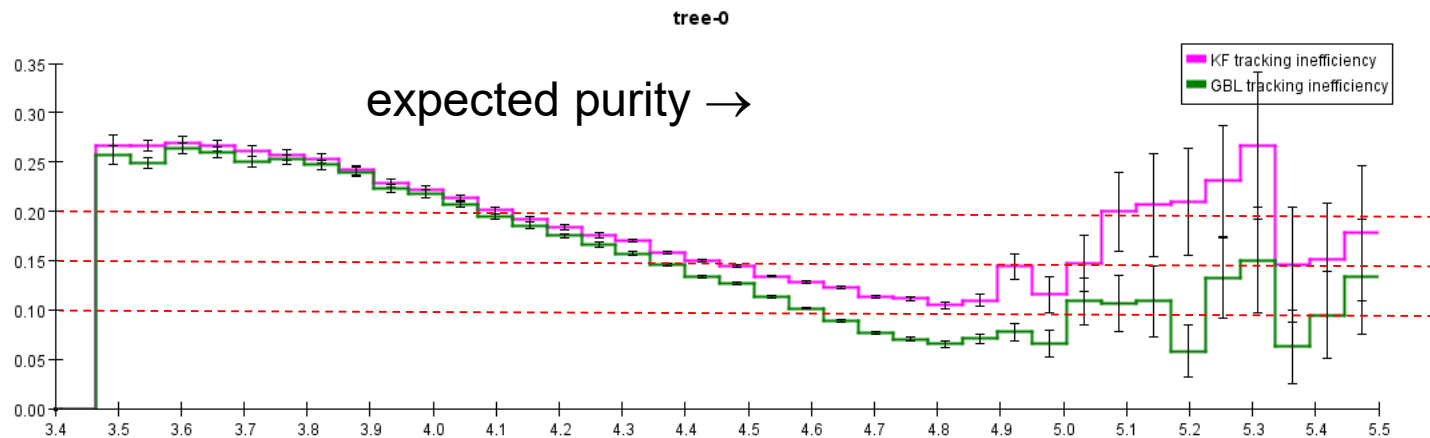
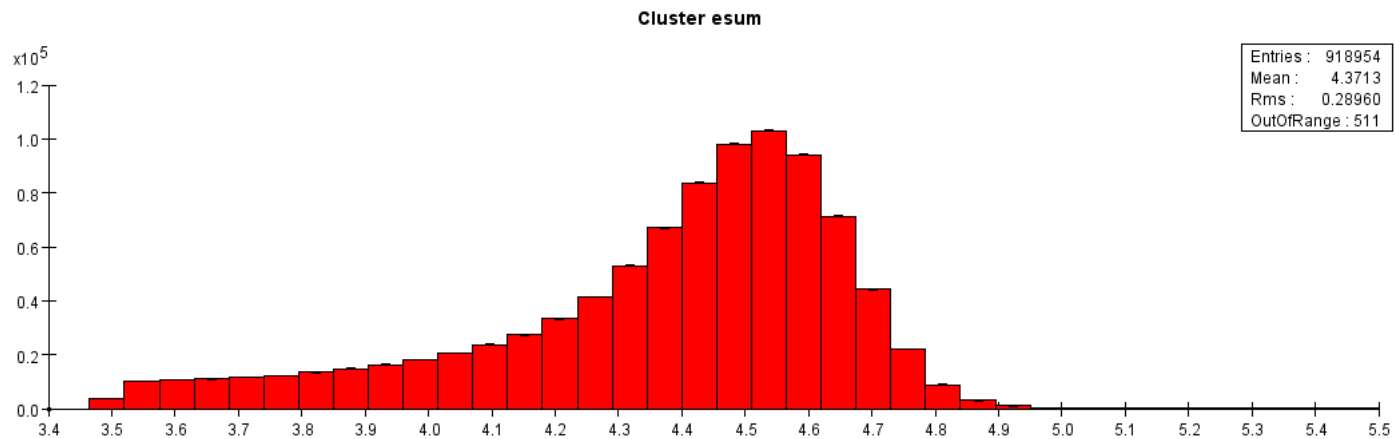
“Inefficiency”

- Measured “inefficiency” is affected by the purity of the parent sample.
- Note that the gg Esum distribution has more of a “porch” at low Esum than the eg (or ge) sample



“Inefficiency” vs Esum

- Expect purity of the parent sample to increase as Esum nears beam energy.



Track-Finding Efficiency Using Data

- Preliminary study of the track-finding efficiency using WABS indicates an inefficiency of finding tracks in the momentum range between 1 and 3.5 GeV of between ~10-15%
- Seed Tracker appears to have a slightly higher efficiency of finding tracks.
 - This study conducted before the latest round of KF strategies and code improvements.
- Will be repeated with the latest snapshot.
- Will study the track-finding efficiency in greater detail
 - top/bottom
 - slot/hole
 - as function of cluster energy (track momentum)
- Compare with FEE tracking efficiencies reported at last meeting.