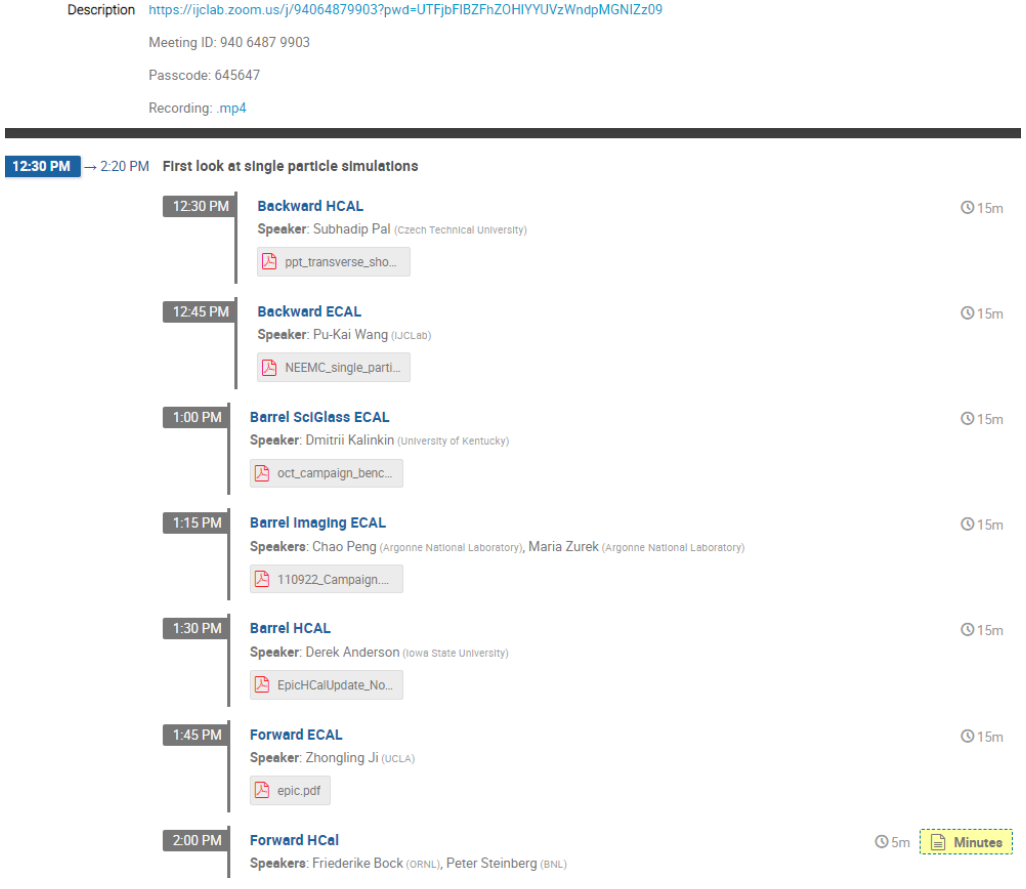
Simulation, Production, and QA Weekly Meeting
Nov 10, 2022

Calorimetry report:

Summary of EPIC calorimetry meeting on Nov 9: https://indico.bnl.gov/event/17705/

First look at single particle outputs from Simulation WG



C. Munoz, for the EPIC calorimetry WG

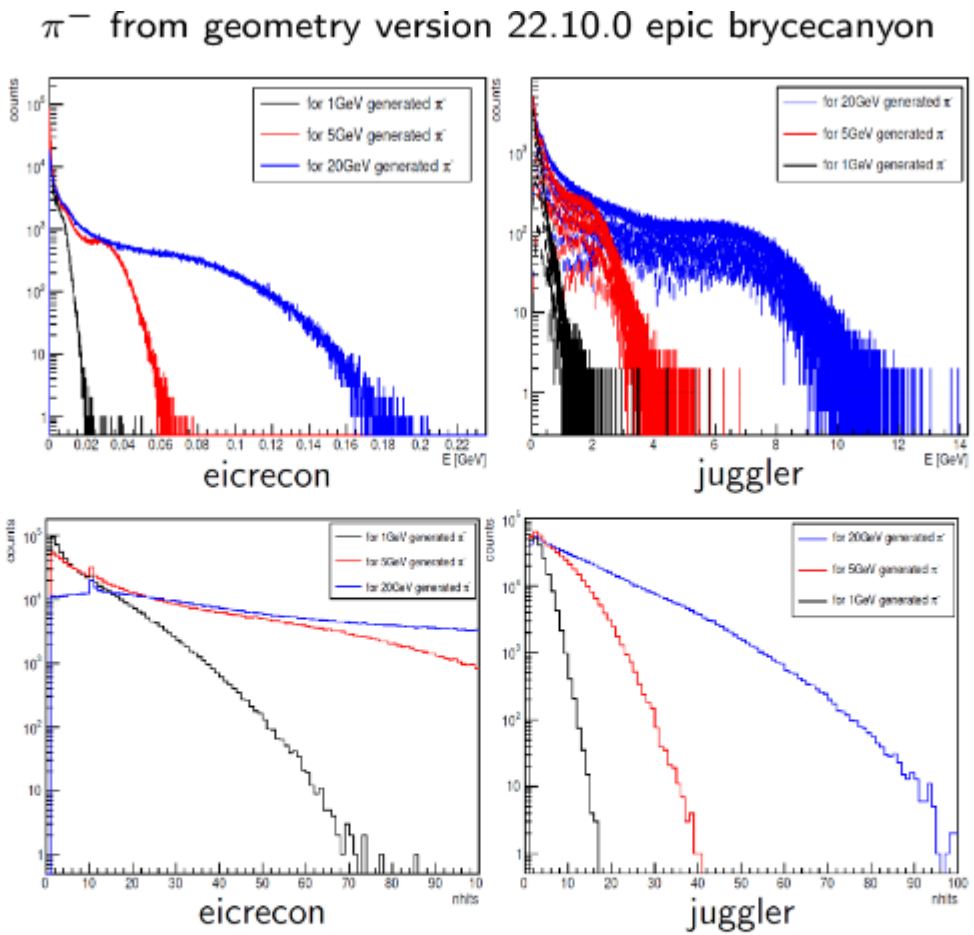
October campaign

- Particle species are e^- and π^-
- $p_{\text{thrown}} = 100$ MeV, 200 MeV, 500 MeV, 1 GeV, 2 GeV, 5 GeV, 10 GeV, 20 GeV
- Three polar angle ranges: $3 - 50°$, $45 - 135°$ and $130 - 177°$
- Reconstruction with Gaudi+Juggler (Athena) and with JANA2+EICrecon (ePIC)
- Two ePIC detector configurations "Arches" and "Bruce Canyon" with geometry tag 22.10.0
- Certain combinations of energies and angles are currently missing
  Reported on Mattermost

  Re-run with 22.11.0 in progress

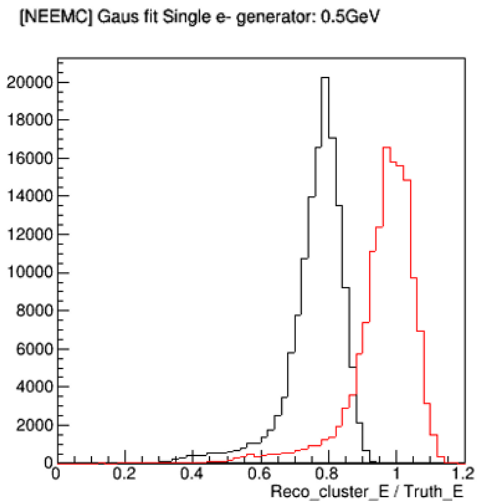
University of Kentucky

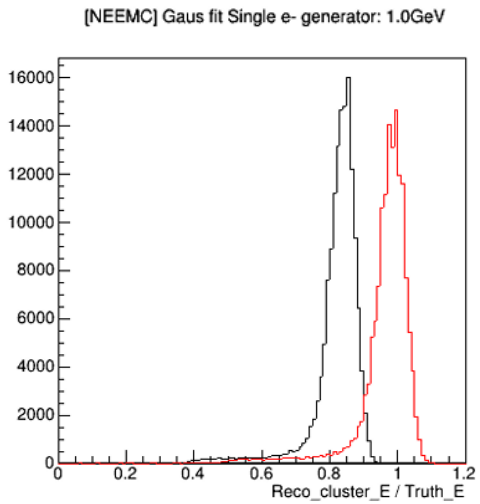
Backward HCal

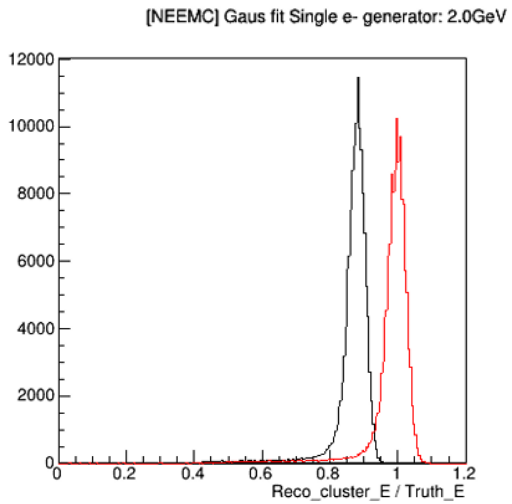


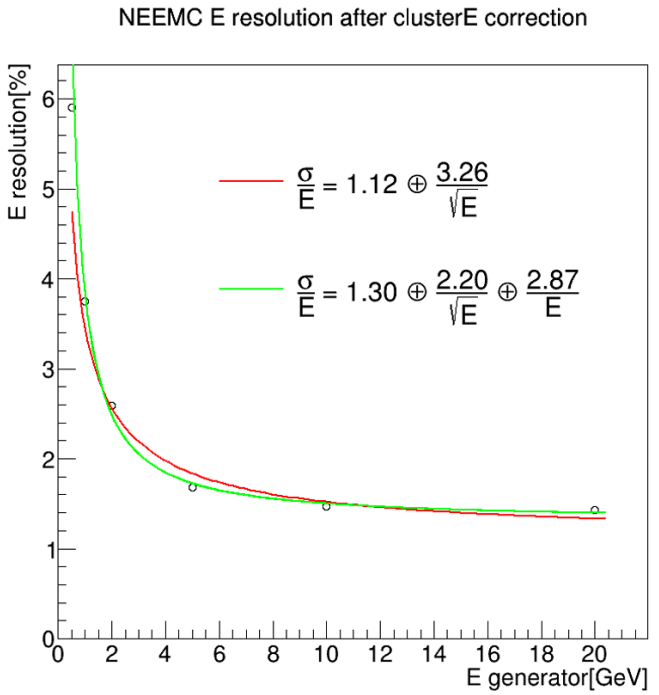
- Low reconstructed cluster energy with EICrecon compared to Juggler
- Much more hits per cluster with EICrecon than Juggler
- Some clusters are located in the middle hole for the beampipe - too large clusters?
- All of it suggest that clustering parameters need to be adjusted

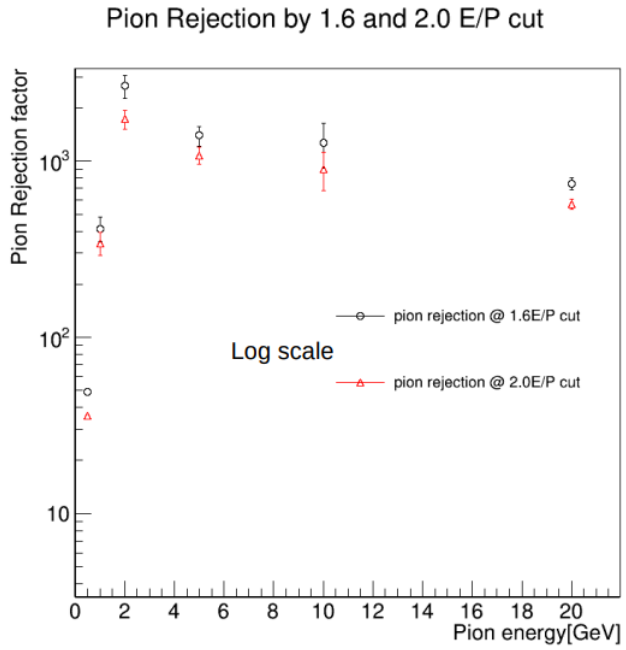
Backward ECal





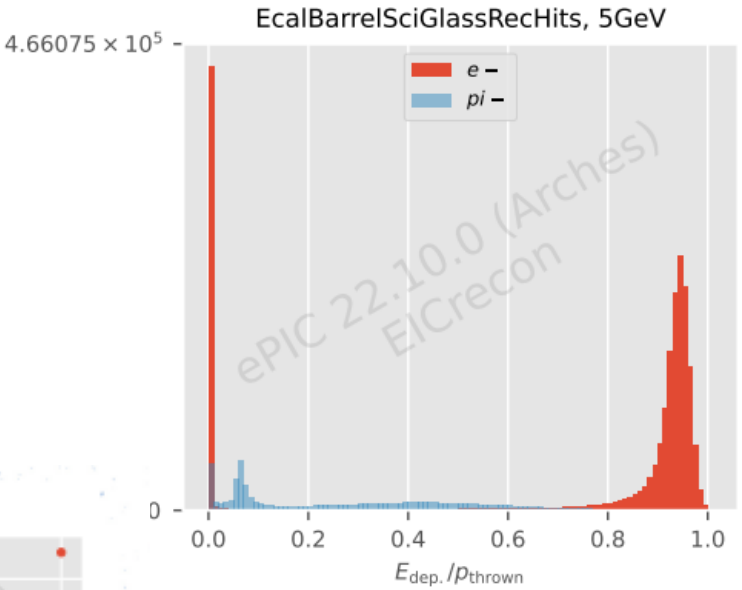


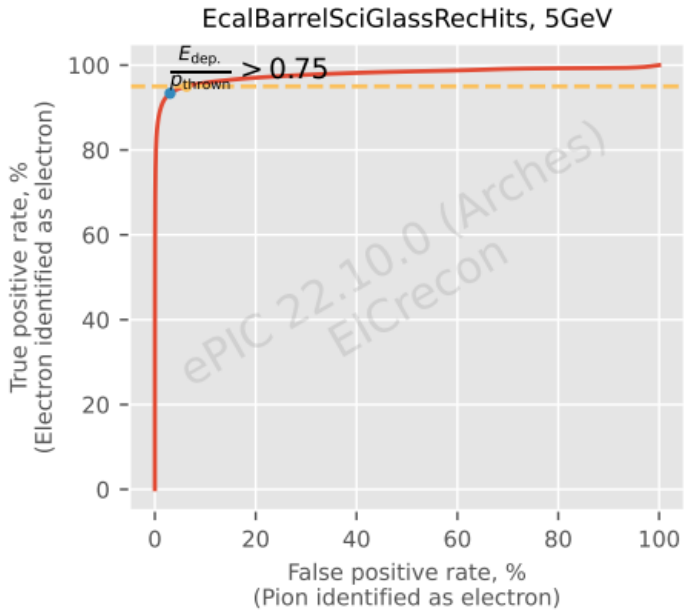


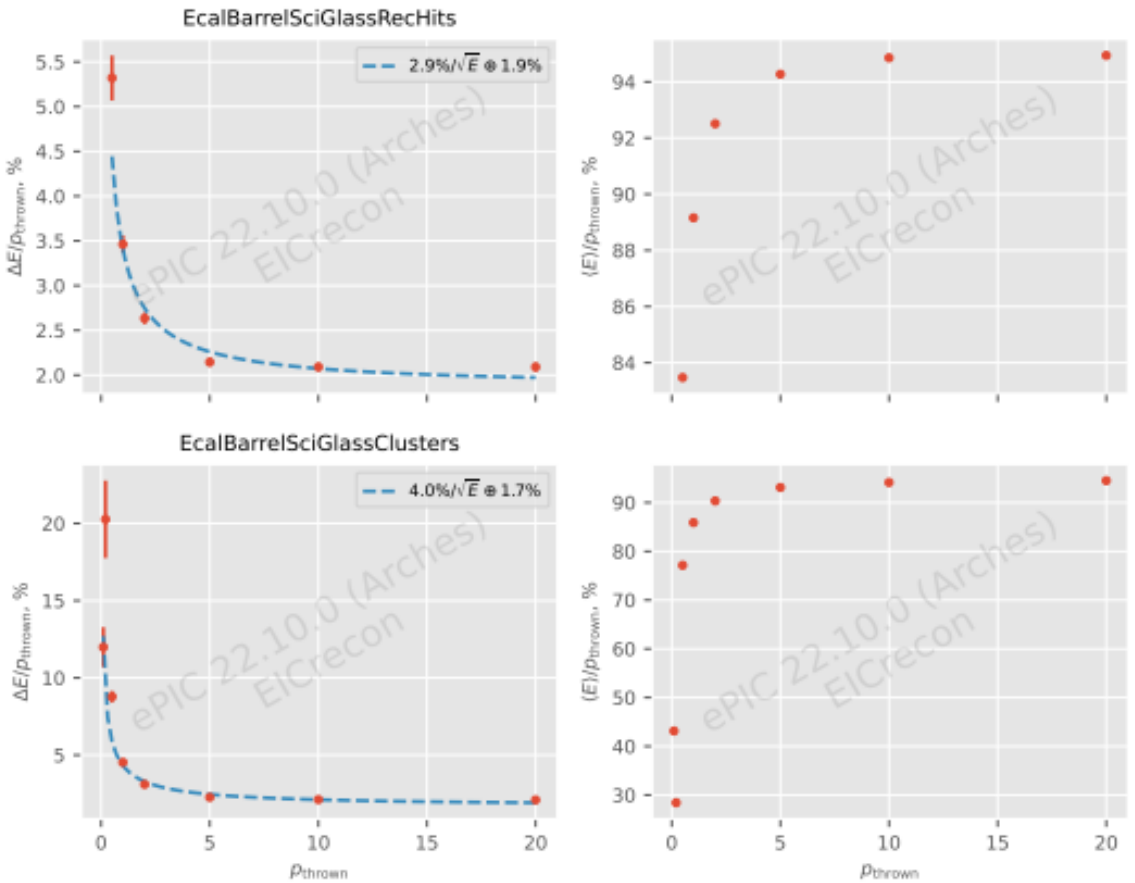


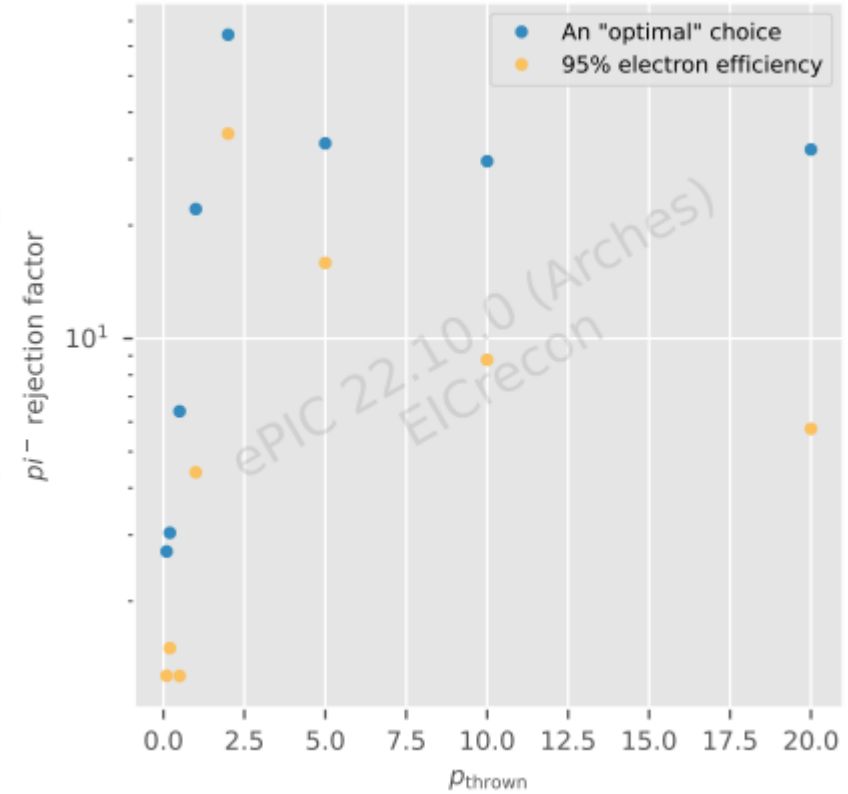
- First look at single particle simulations
- Energy resolution and pion rejection values as expected
- No issue identified so far

Barrel Ecal SciGlass



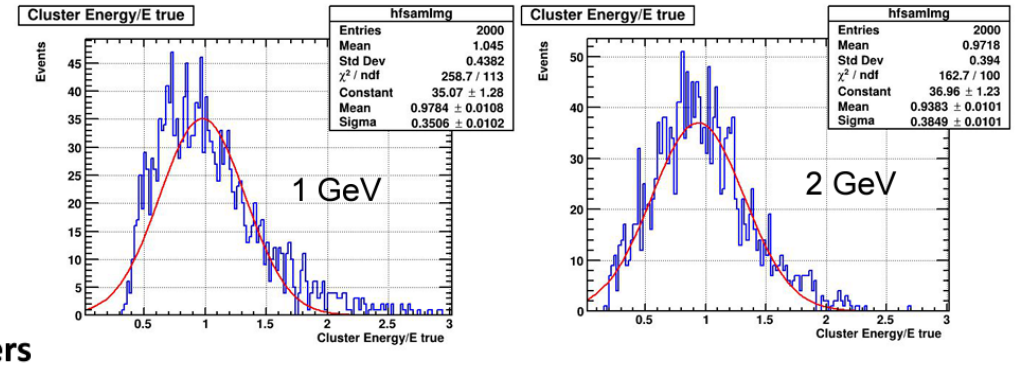






Barrel Ecal Imaging

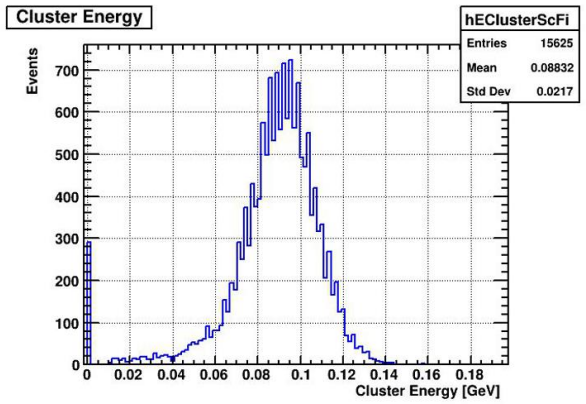
Single particle simulations
eictest/EPIC/RECO/22.11.0/epic_brycecanyon/SINGLE/



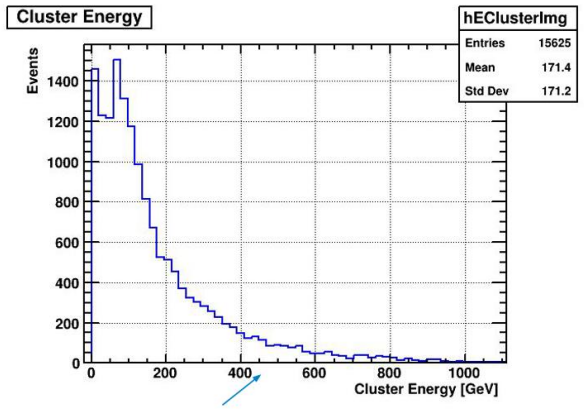
Immediate observation:
Raw and Reco hits and clusters available for SciFi layers
Raw and Reco hits available for Imaging layers, there is **no clusters reconstructed for imaging layers**
There are no truth clusters neither for SciFi nor for Imaging layers

- Plots are corrected with flat 0.45% sampling fraction only.
- This sampling fraction is for 5 GeV photons (too low for lower energies, because of the leakage).
- Low energies show (much) larger reco energies than thrown, but also weird shape.

Energy of SciFi Clusters

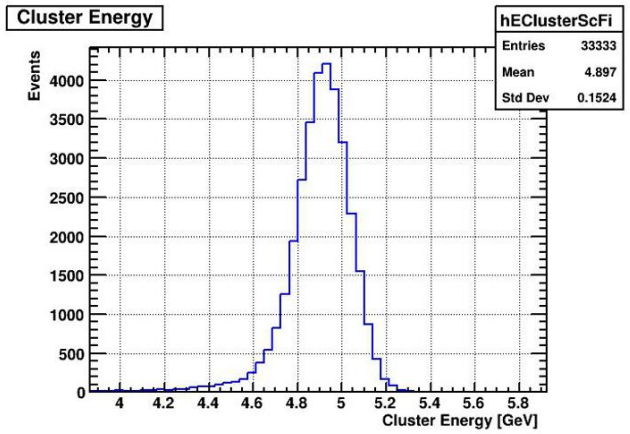


Energy of All Reco Imaging hits

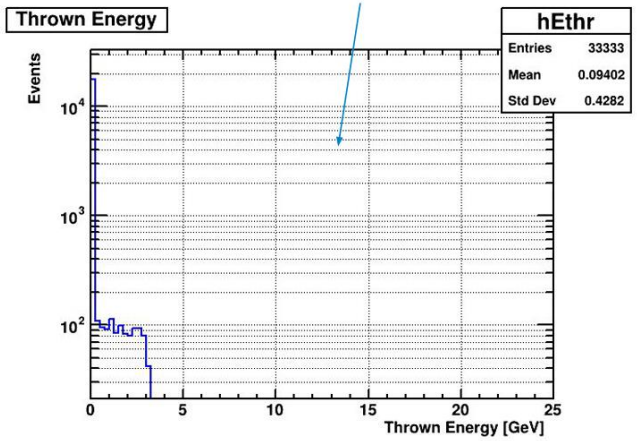


Something is completely wrong with fsam correction?

Energy of SciFi Clusters

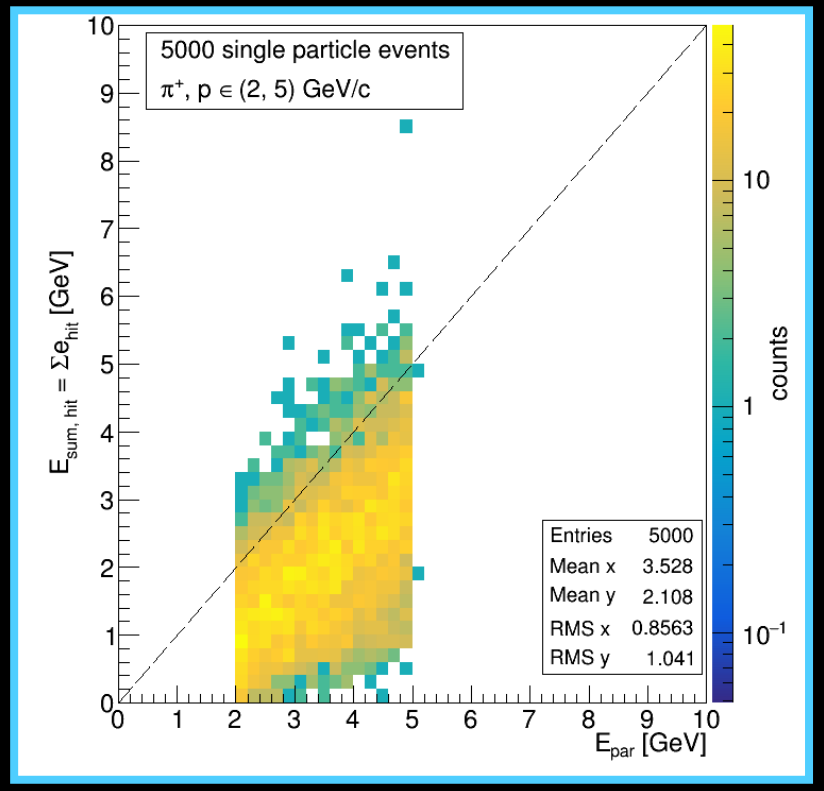


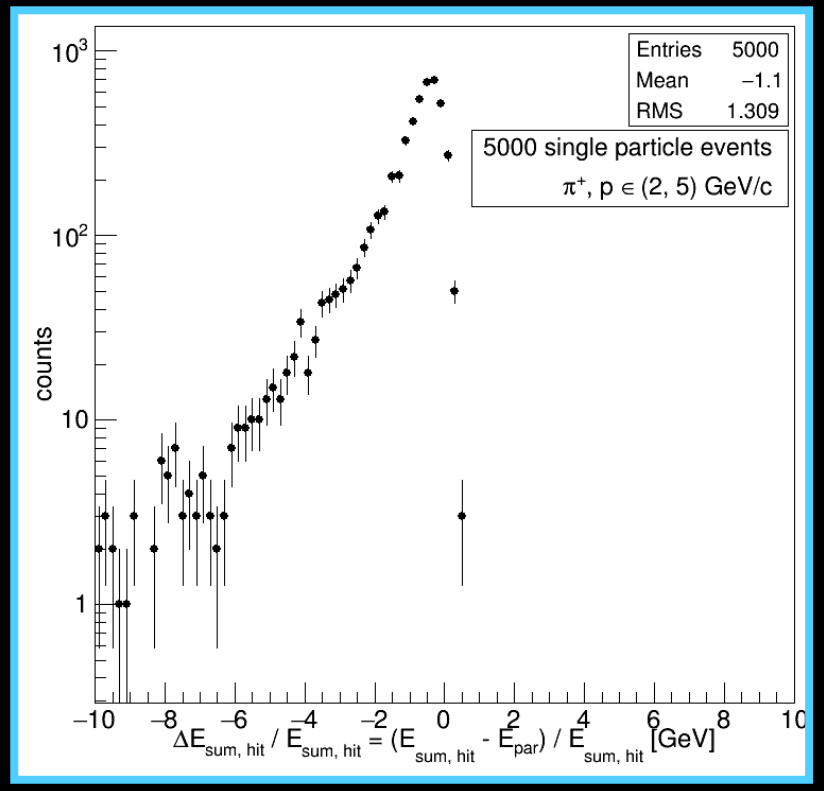
Thrown energy???



Energy of All Reco Imaging hits, also completely out of range

Barrel HCal



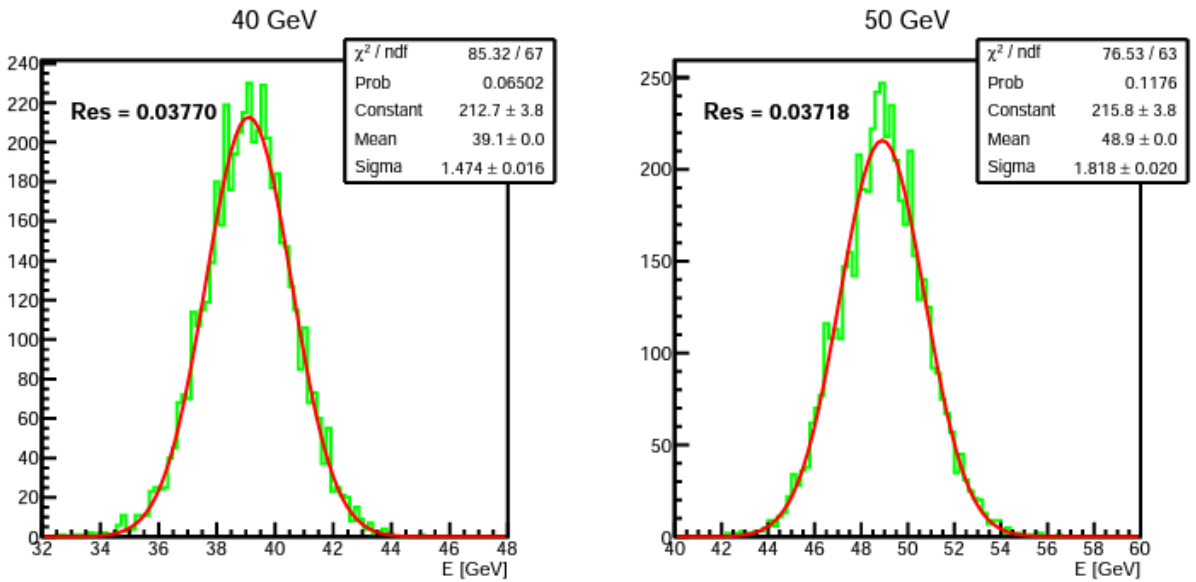


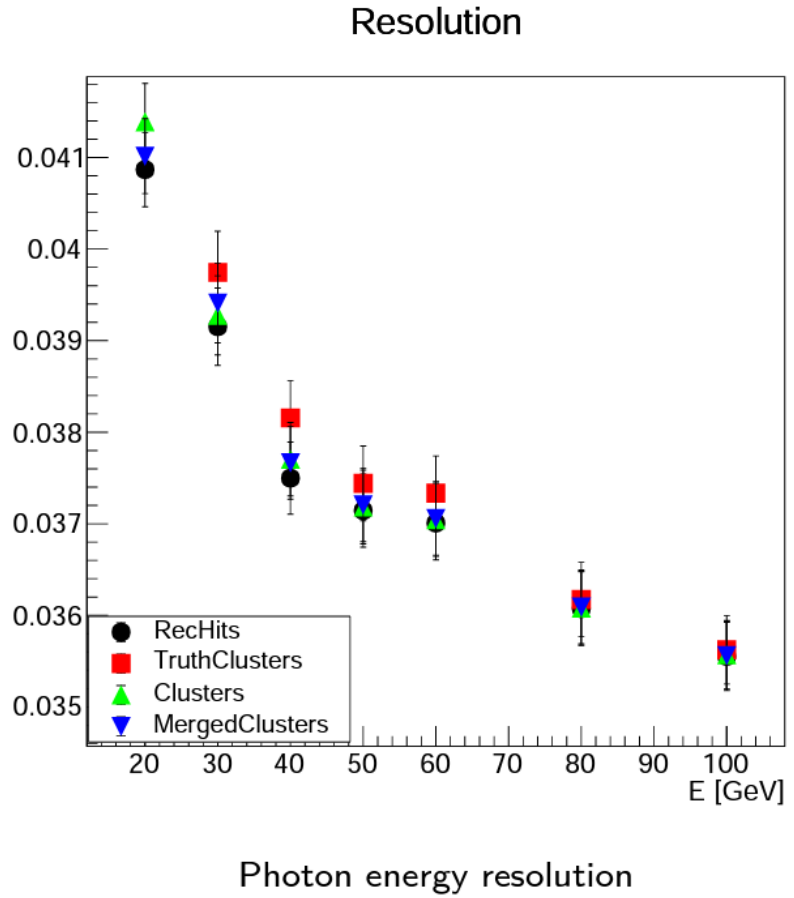
- Checked current implementation of sPHENIX Barrel Hcal with standalone single particle simulation
  - 2D distribution of particle vs. summed hit energy **(left)**
  - Difference b/n sum hit energy and particle **(right)**

- **Take-aways:**
  - Hits look reasonable
  - Summed hit energies get close to particle energy
  - ⇒ Current implementation will work for this simulation campaign

Forward Ecal

Caveat: single particle files produced (by Zhogling Ji) with the official version, but not the output files from Simulation WG





Photon energy resolution

- The energy responses look reasonable except 3% energy loss, which comes from DD4hep and may be due to the finite detector length.
- The energy resolutions are consistent with previous Geant4 simulations.
- Truth, island, and merged clustering algorithms work as expected for single particle input.

Forward HCal

- LFHCal hits currently not included in simulation output
- David Lawrence debugging together with Peter Steinberg, partial fixes in place
  - https://github.com/eic/EICrecon/pull/297
  - https://github.com/eic/EICrecon/commit/12cda3cfe5d08bda618d338610e2f4d4e87fda91

Forward calorimeter insert

No report yesterday