

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

Description <https://ijclab.zoom.us/j/94064879903?pwd=UTFjbFIBZFhZOHlYUUVzWmdpMGNIZz09>

Meeting ID: 940 6487 9903

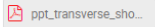
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Recording: [.mp4](#)

12:30 PM
→ 2:20 PM

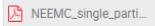
First look at single particle simulations

12:30 PM

Backward HCAL
Speaker: Subhadip Pal (Czech Technical University)


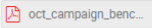
🕒 15m

12:45 PM

Backward ECAL
Speaker: Pu-Kai Wang (UCLab)


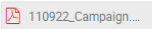
🕒 15m

1:00 PM

Barrel SciGlass ECAL
Speaker: Dmitrii Kalinkin (University of Kentucky)


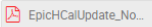
🕒 15m

1:15 PM

Barrel Imaging ECAL
Speakers: Chao Peng (Argonne National Laboratory), Maria Zurek (Argonne National Laboratory)



🕒 15m

1:30 PM

Barrel HCAL
Speaker: Derek Anderson (Iowa State University)


🕒 15m

1:45 PM


Forward ECAL
Speaker: Zhongling Ji (UCLA)


🕒 15m

2:00 PM

Forward HCal
Speakers: Friederike Bock (ORNL), Peter Steinberg (BNL)

🕒 5m

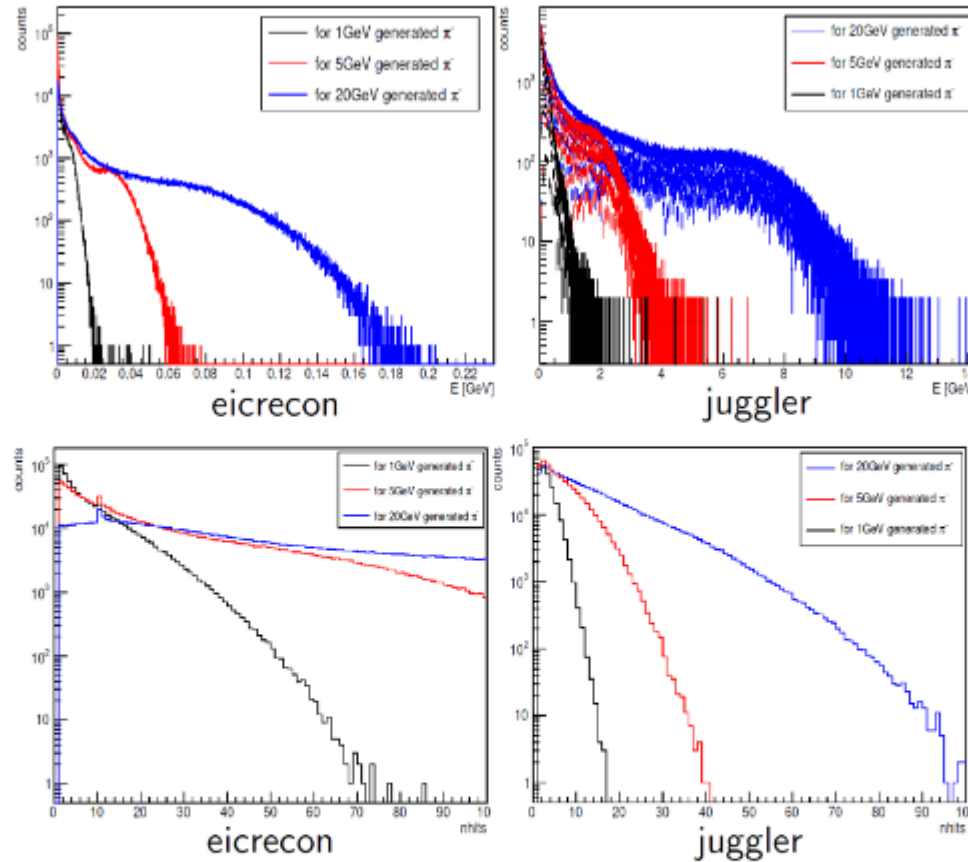


October campaign

- » Particle species are e^- and π^-
- » $p_{\text{thrown}} = 100 \text{ MeV}, 200 \text{ MeV}, 500 \text{ MeV}, 1 \text{ GeV}, 2 \text{ GeV}, 5 \text{ GeV}, 10 \text{ GeV}, 20 \text{ GeV}$
- » Three polar angle ranges: $3 - 50^\circ$, $45 - 135^\circ$ and $130 - 177^\circ$
- » Reconstruction with Gaudi+Juggler (Athena) and with JANA2+ElCrecon (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

Backward HCal

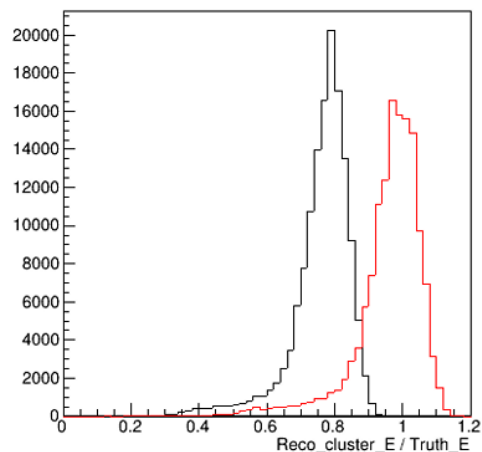
π^- from geometry version 22.10.0 epic brycecanyon



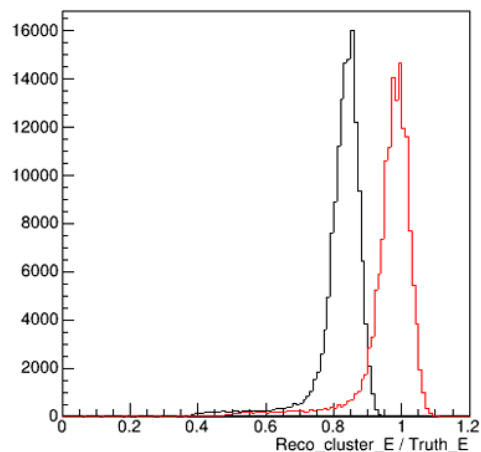
- Low reconstructed cluster energy with EICrecon compared to Juggler
- Much more hits per cluster with EICrecon than Juggler
- Some clusters are located in the middle hole for the beampipe - too large clusters?
- All of it suggest that clustering parameters need to be adjusted

Backward ECal

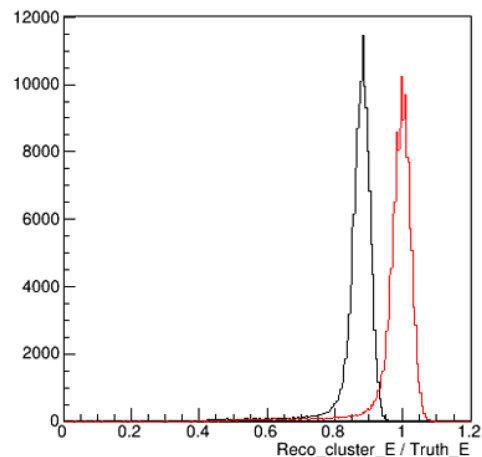
[NEEMC] Gaus fit Single e- generator: 0.5GeV



[NEEMC] Gaus fit Single e- generator: 1.0GeV

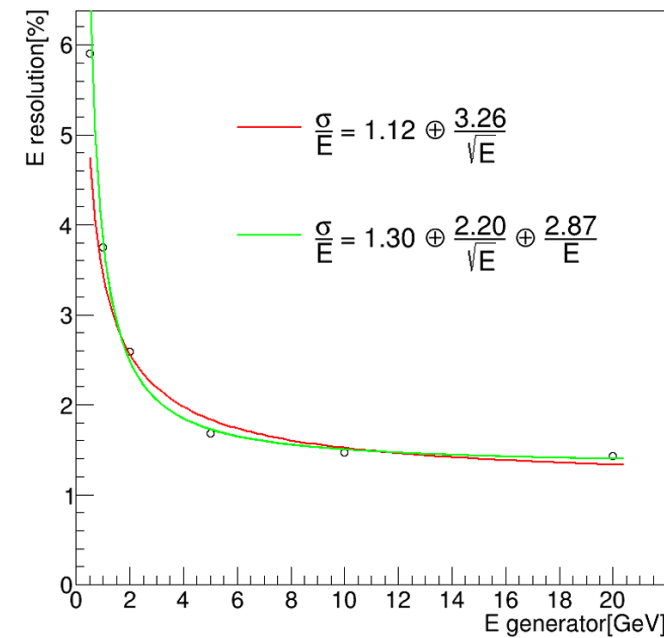


[NEEMC] Gaus fit Single e- generator: 2.0GeV

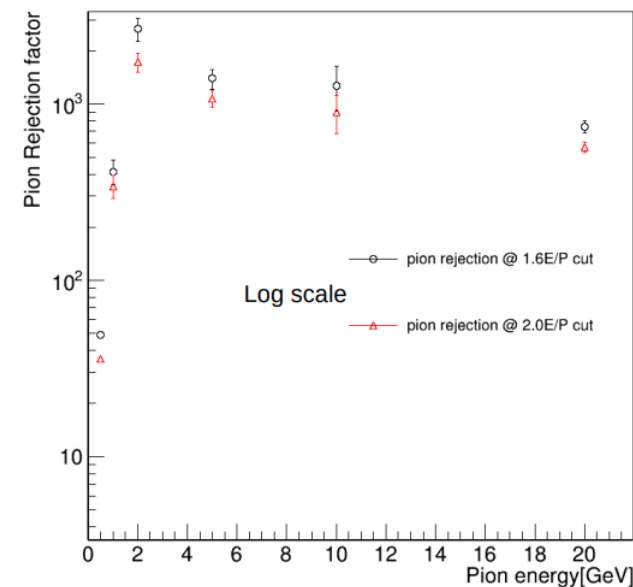


- First look at single particle simulations
- Energy resolution and pion rejection values as expected
- No issue identified so far

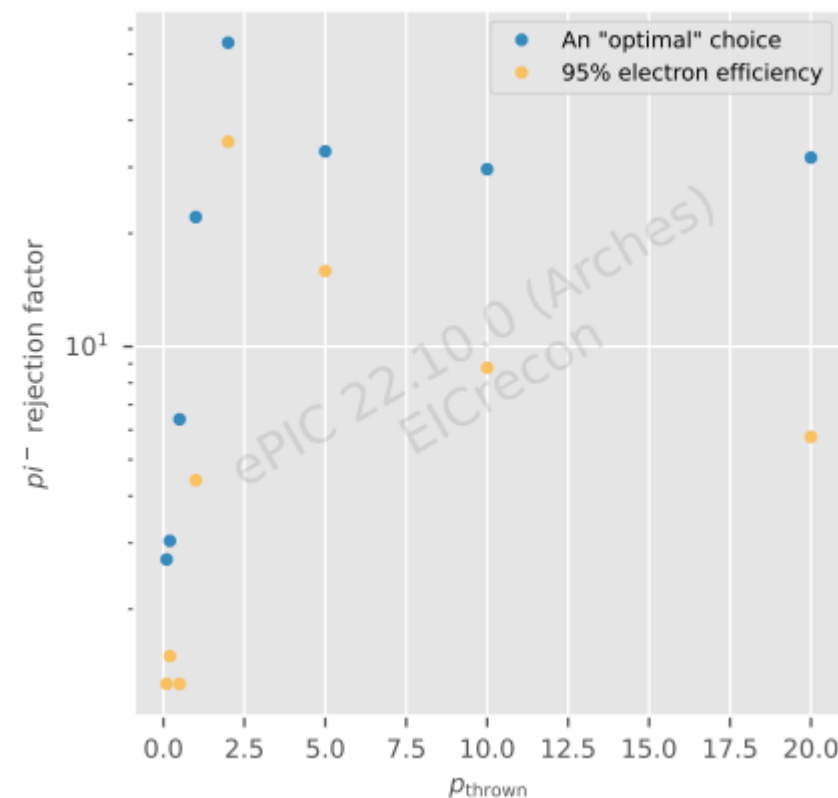
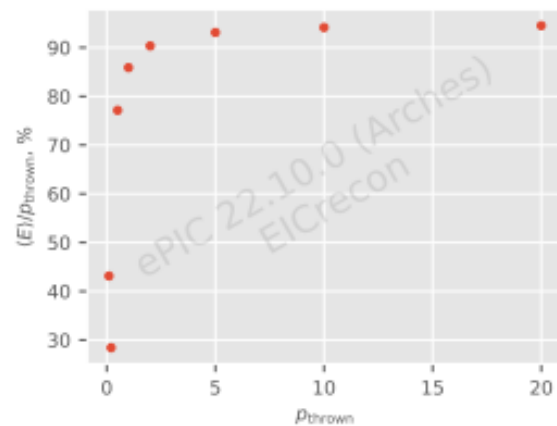
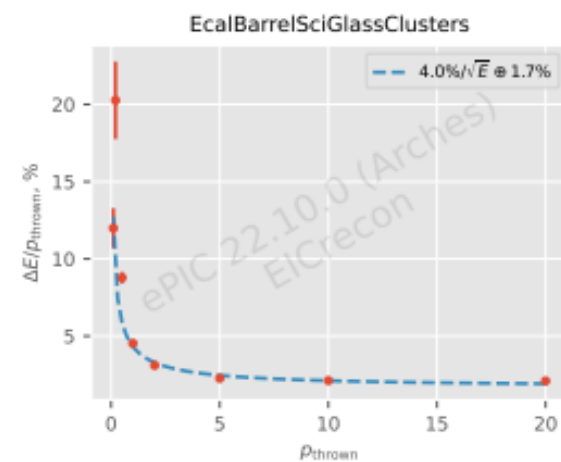
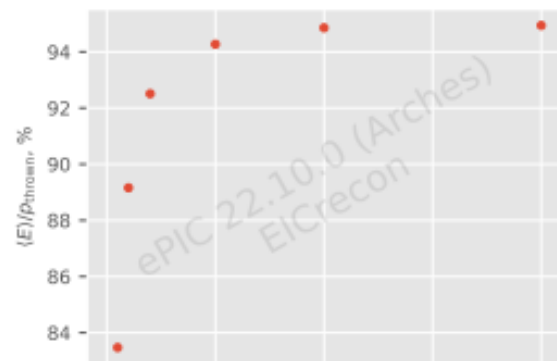
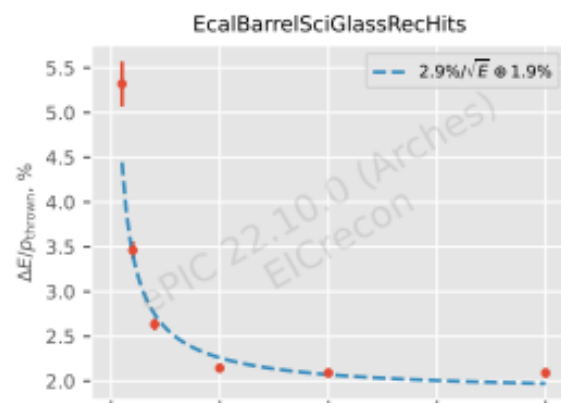
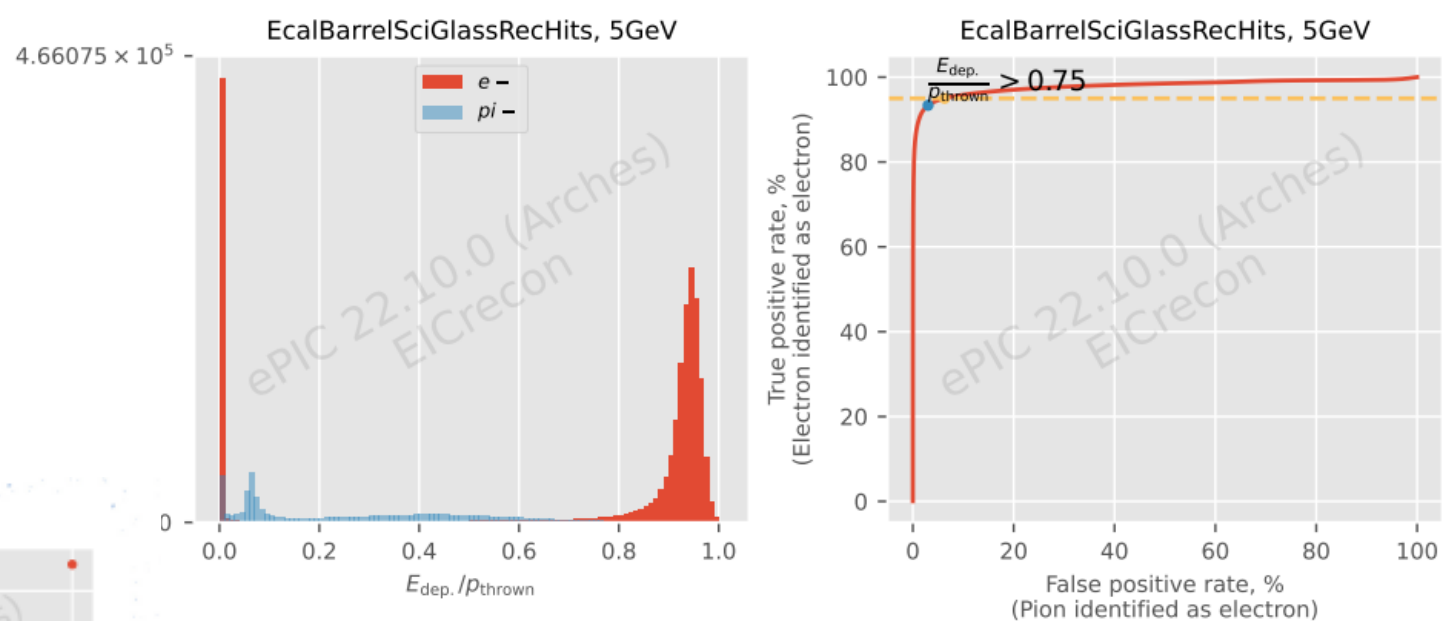
NEEMC E resolution after clusterE correction



Pion Rejection by 1.6 and 2.0 E/P cut



Barrel Ecal SciGlass



Barrel Ecal Imaging

Single particle simulations

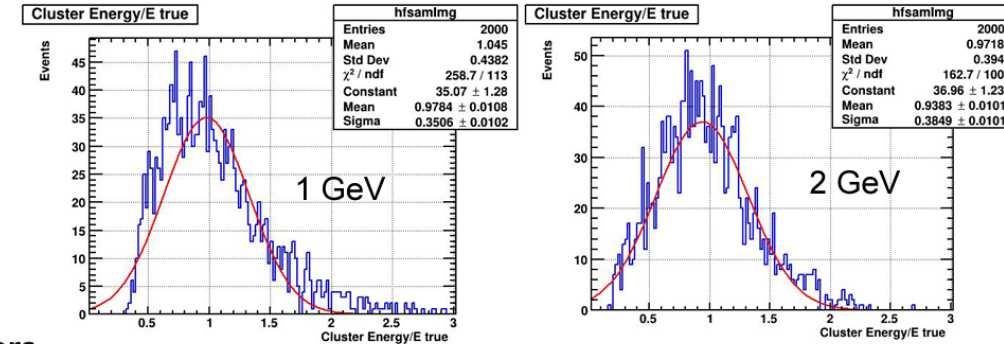
ectest/EPIC/RECO/22.11.0/epic_brycecanyon/SINGLE/

Immediate observation:

Raw and Reco hits and clusters available for SciFi layers

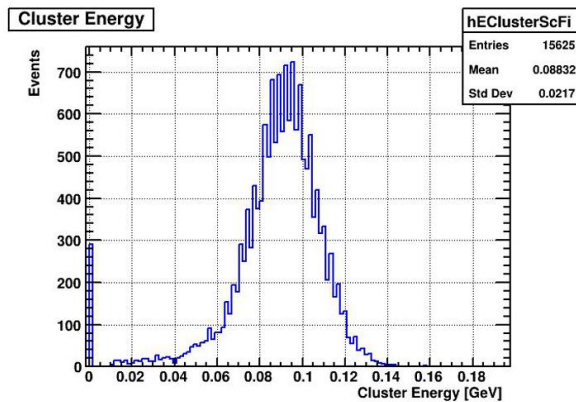
Raw and Reco hits available for Imaging layers, there is **no clusters reconstructed for imaging layers**

There are no truth clusters neither for SciFi nor for Imaging layers

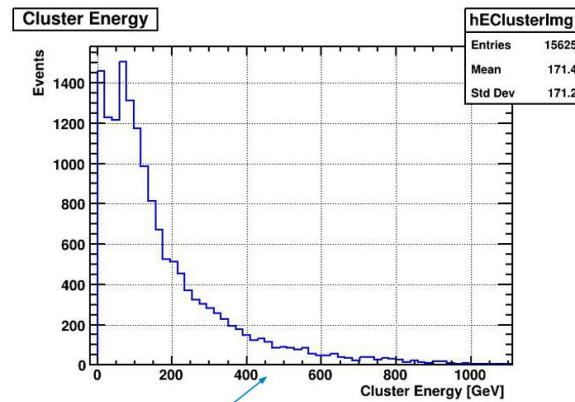


- Plots are corrected with flat 0.45% sampling fraction only.
- This sampling fraction is for 5 GeV photons (too low for lower energies, because of the leakage).
- Low energies show (much) larger reco energies than thrown, but also weird shape.

Energy of SciFi Clusters

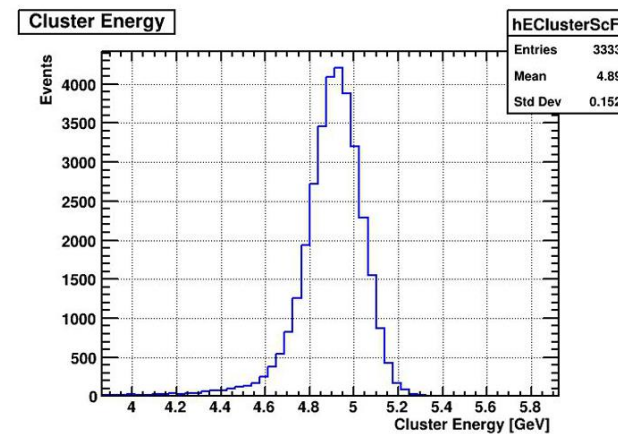


Energy of All Reco Imaging hits



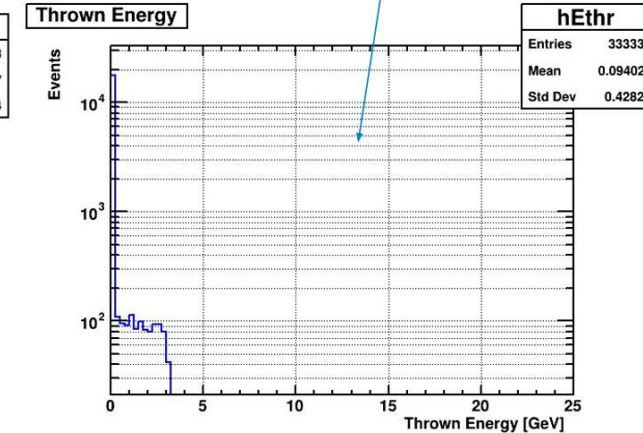
Something is completely wrong with fsam correction?

Energy of SciFi Clusters

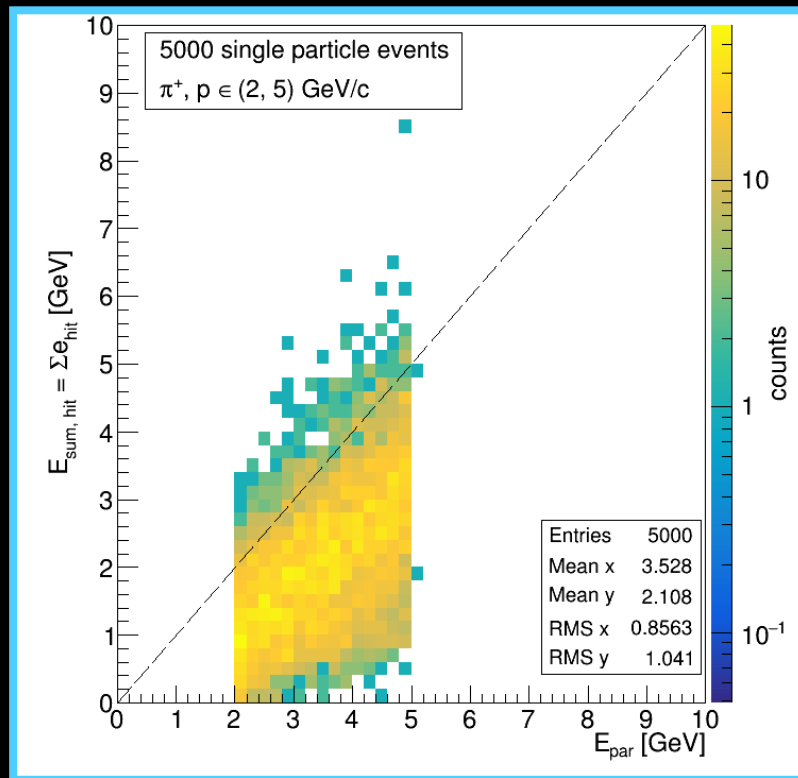


Energy of All Reco Imaging hits, also completely out of range

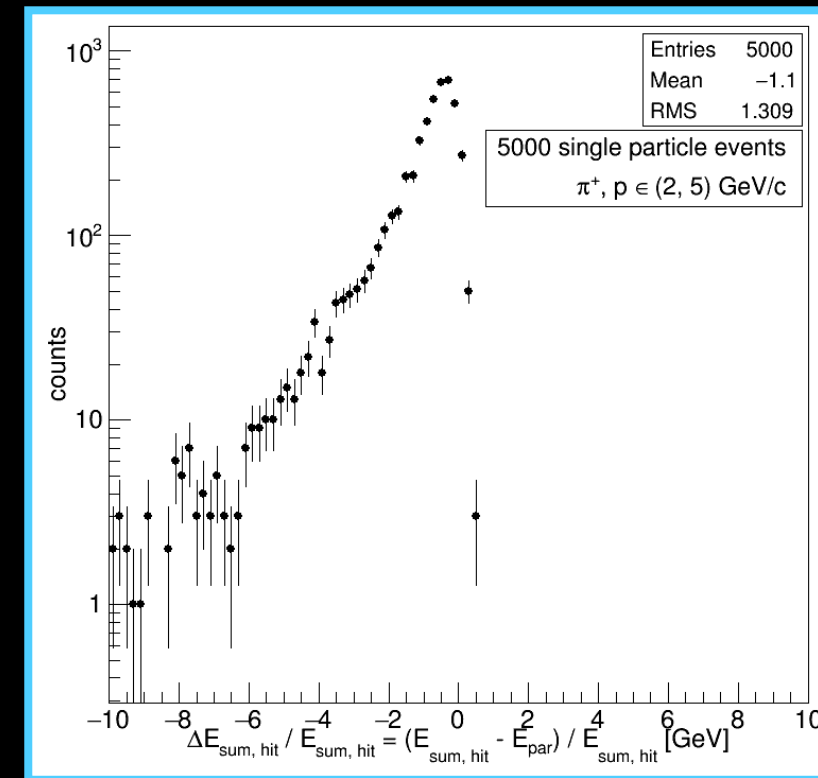
Thrown energy???



Barrel HCal



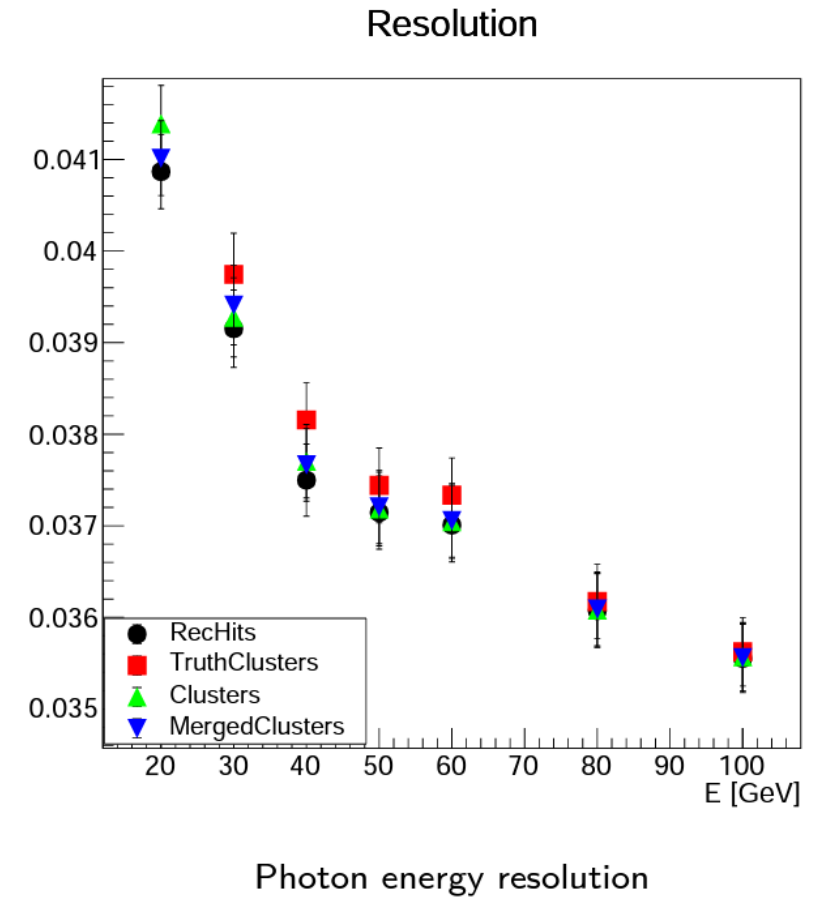
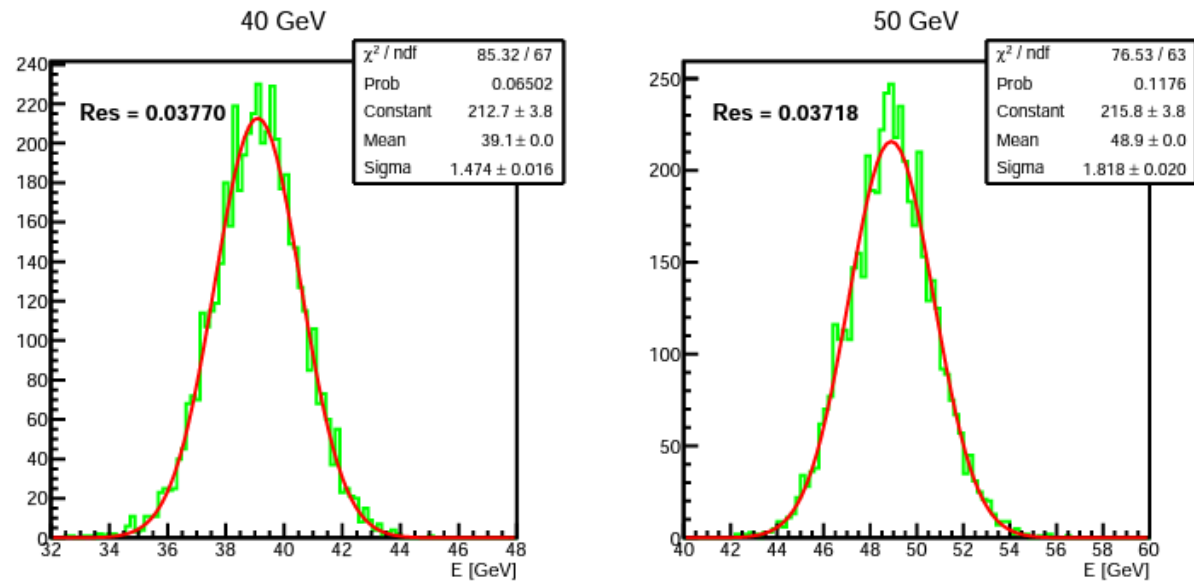
- Checked current implementation of sPHENIX Barrel Hcal with standalone single particle simulation
 - 2D distribution of particle vs. summed hit energy **(left)**
 - Difference b/n sum hit energy and particle **(right)**



- **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



- 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/ElCrecon/pull/297>
 - <https://github.com/eic/ElCrecon/commit/12cda3cfe5d08bda618d338610e2f4d4e87fda91>

Forward calorimeter insert

No report yesterday