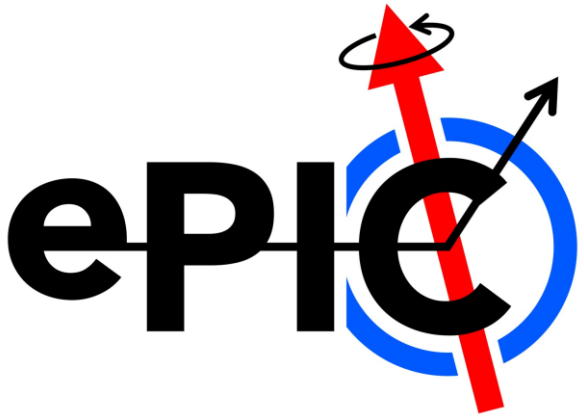


ePIC BHCal
Simulation Status

Derek Anderson

11.01.2024

Digi/Reco Parameters | Summary

- **Digitization parameters [HGCROC]**
  - ADC cap = 65536 (16 bit ADC)
  - ADC dynamic range = 1 GeV
  - ADC mean pedestal = 300
  - ADC pedestal sigma = 2
  - TDC resolution = 1 ps
  - Time cap = 100 ns (4 HGCROC samples)
- **Tile (“hit”) energy reconstruction**
  - ADC threshold = 33 (pedSigmaADC + threshold = half of a MIP = 333 ADC)
  - Sampling fraction = 0.033 (from sPHENIX simulations
- **Clustering parameters**
  - Minimum energy = 5 MeV
  - Minimum seed energy = 30 MeV
  - Log weight base = 6.2
  - Adjacency matrix = (see right)

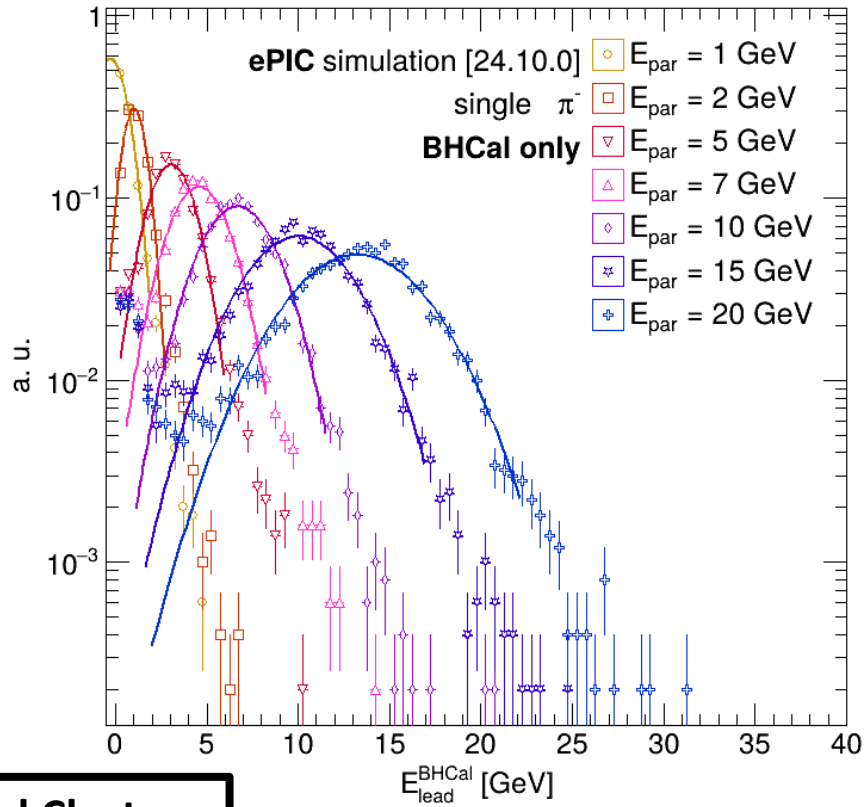
- **Merging parameters (based on single pion studies)**
  - Average E/p = 50%
  - E/p sigma = 0.25
  - Delta-R merge = 0.40 sr

☞ **Reminder:** can always check all parameters here

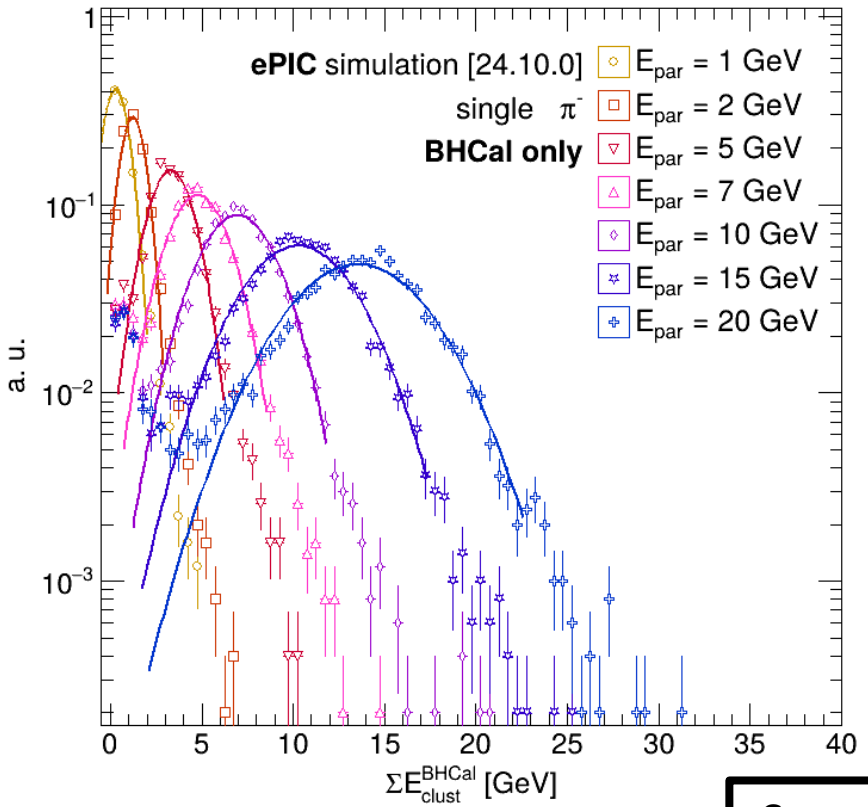
Adjacency Matrix

```
“(“
 // check for vertically adjacent tiles
 "  ( (abs(eta_1 - eta_2) == 1) && (abs(phi_1 - phi_2) == 0) ) ||"
 // check for horizontally adjacent tiles
 "  ( (abs(eta_1 - eta_2) == 0) && (abs(phi_1 - phi_2) == 1) ) ||“
 // check for horizontally adjacent tiles at wraparound
 "  ( (abs(eta_1 - eta_2) == 0) && (abs(phi_1 - phi_2) == (320 - 1)) )“
") == 1"
```

BHCal-Only Check | Energy Spectra



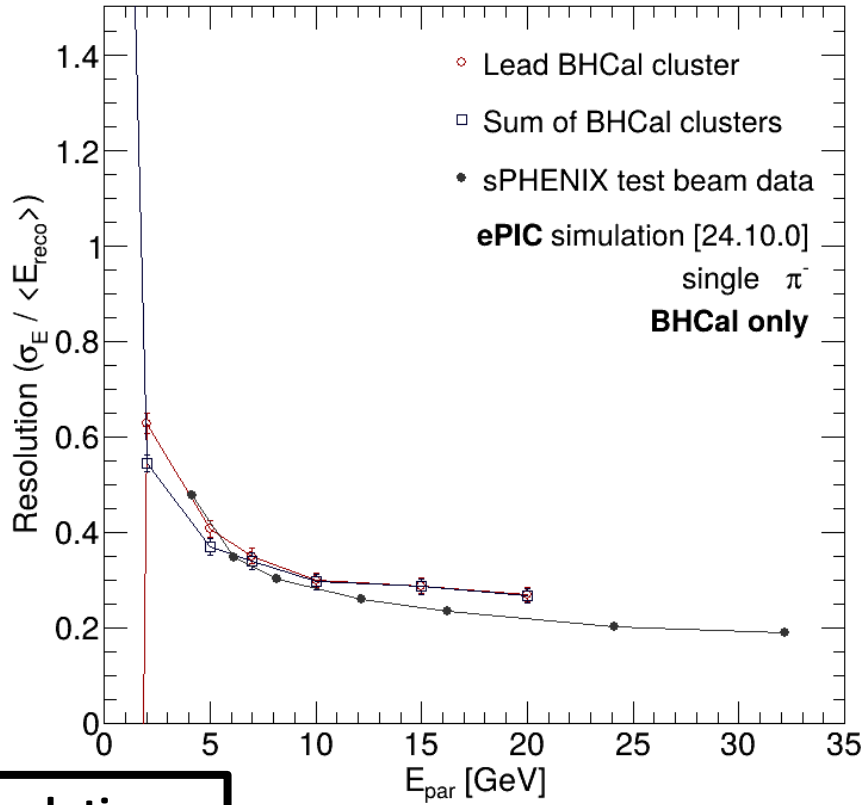
Lead Cluster



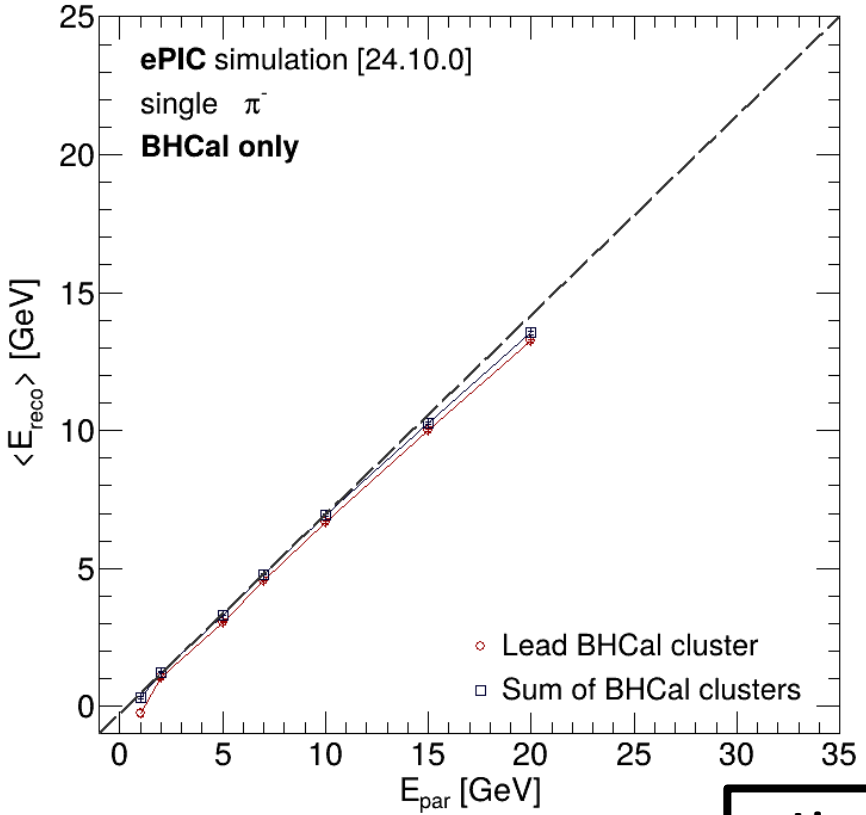
Sum of Clusters

- Simulated single π^- **w/ E = 1 - 20 GeV** in just the BHCal
  - Using 24.10.0 geometry, generated vertex = (0, 0, 0)

BHCal-Only Check | Resolution vs. Linearity



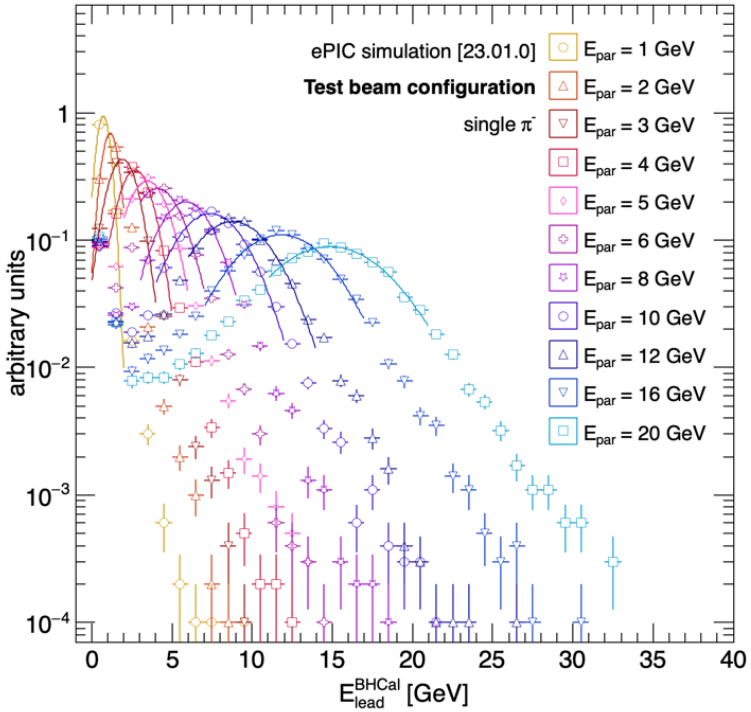
Resolution

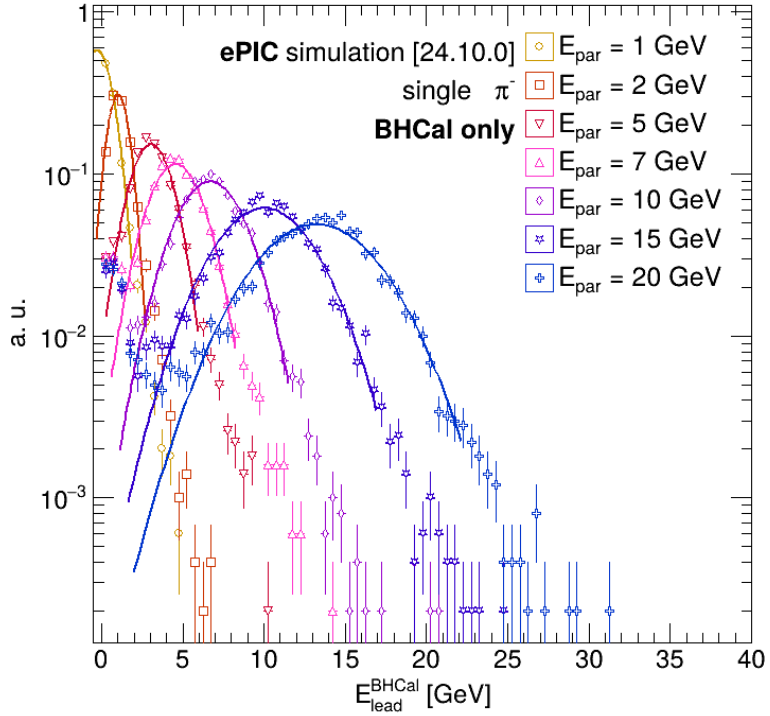


Linearity

- Simulated single π^- **w/ E = 1 - 20 GeV** in just the BHCal
  - Using 24.10.0 geometry, generated vertex = (0, 0, 0)
  - **Red = lead clusters**, **Blue = sum of clusters**

BHCal-Only Check | Tower vs. Tile Energies



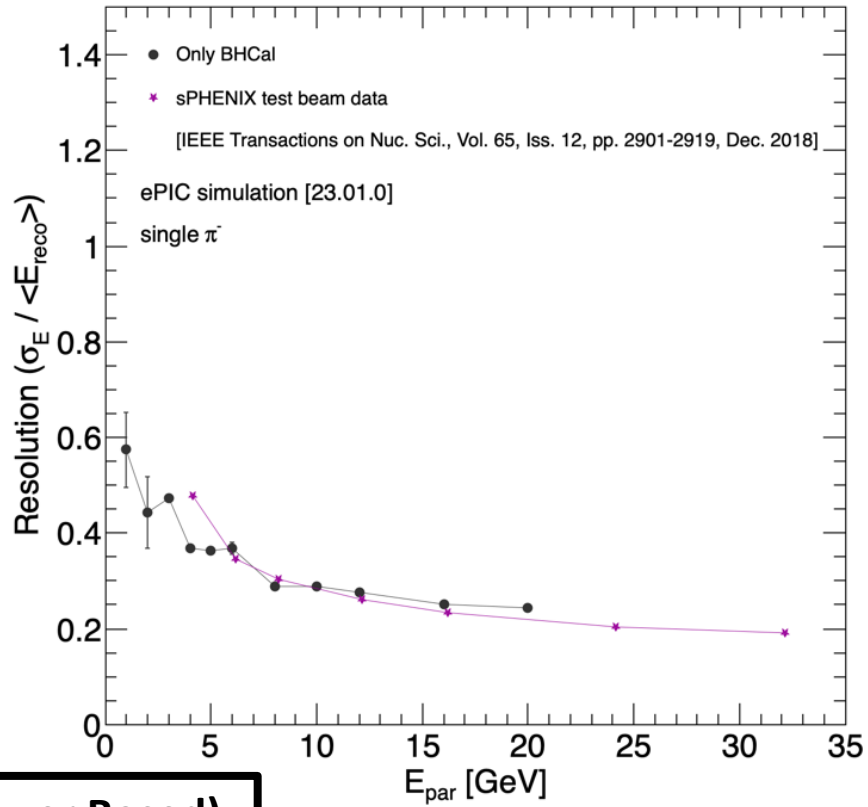


Old (Tower Based)

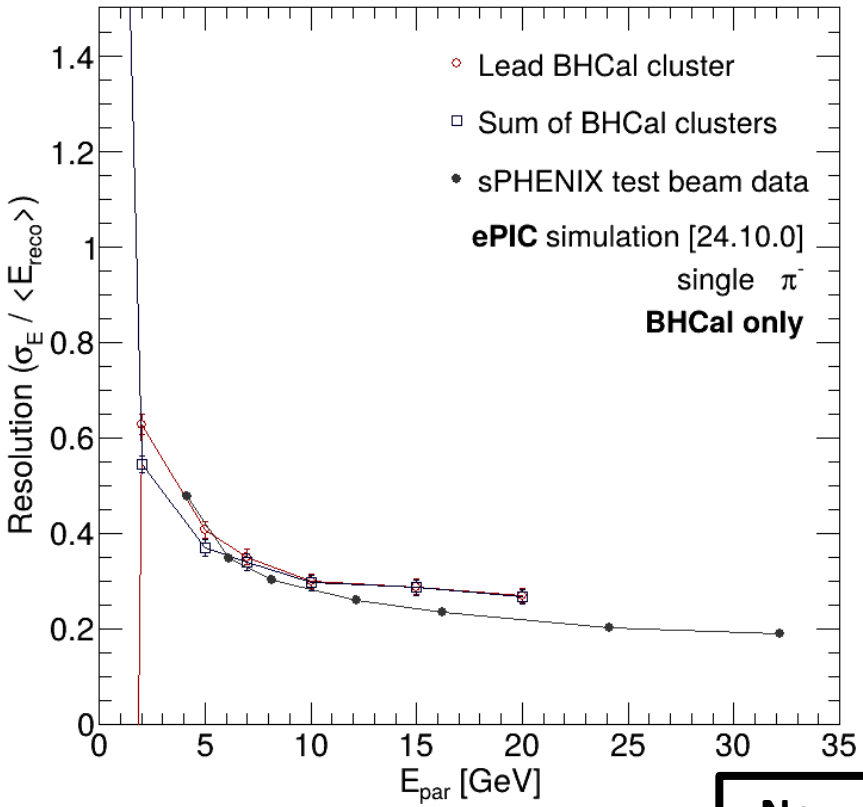
New (Tile Based)

- Simulated single π^- w/ E = 1 - 20 GeV in just the BHCal
  - New using 24.10.0 geometry, tile readout
  - Old using 23.01.0 geometry, tower readout
  - Both using generated vertex = (0, 0, 0)

BHCal-Only Check | Tower vs. Tile Resolution



Old (Tower Based)



New (Tile Based)

- Simulated single π^- **w/ E = 1 - 20 GeV** in just the BHCal
  - Using 24.10.0 geometry, generated vertex = (0, 0, 0)
  - **Red/black = lead clusters**, **Blue = sum of clusters**