EMCal Calibration Update

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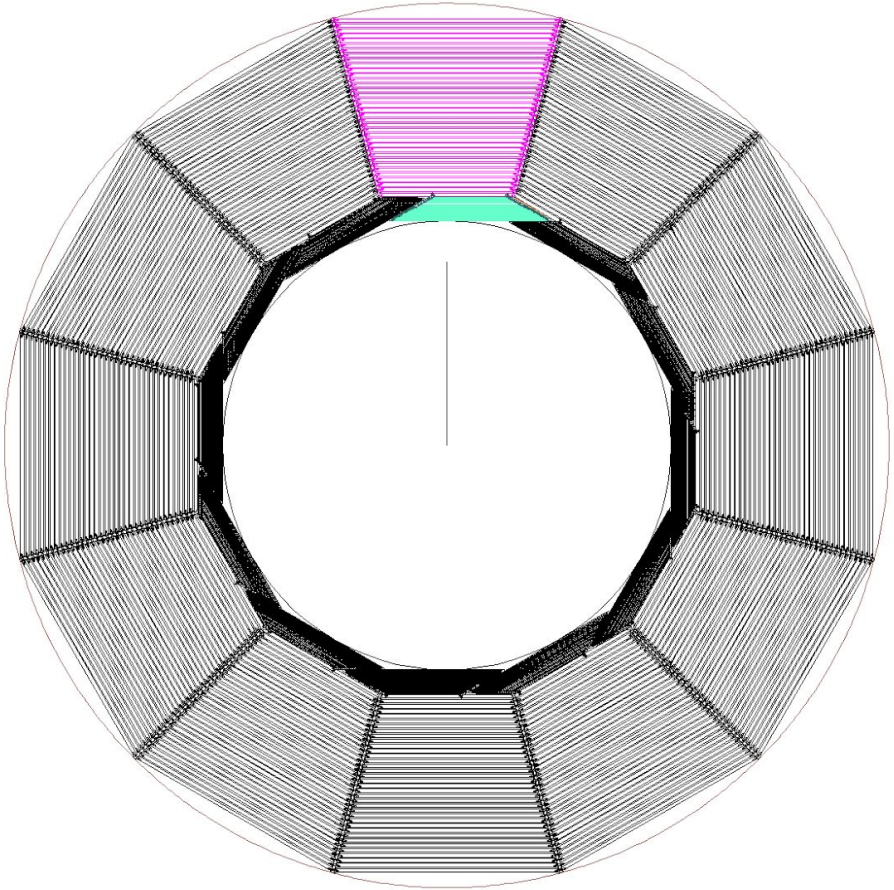
EMCal Geometry

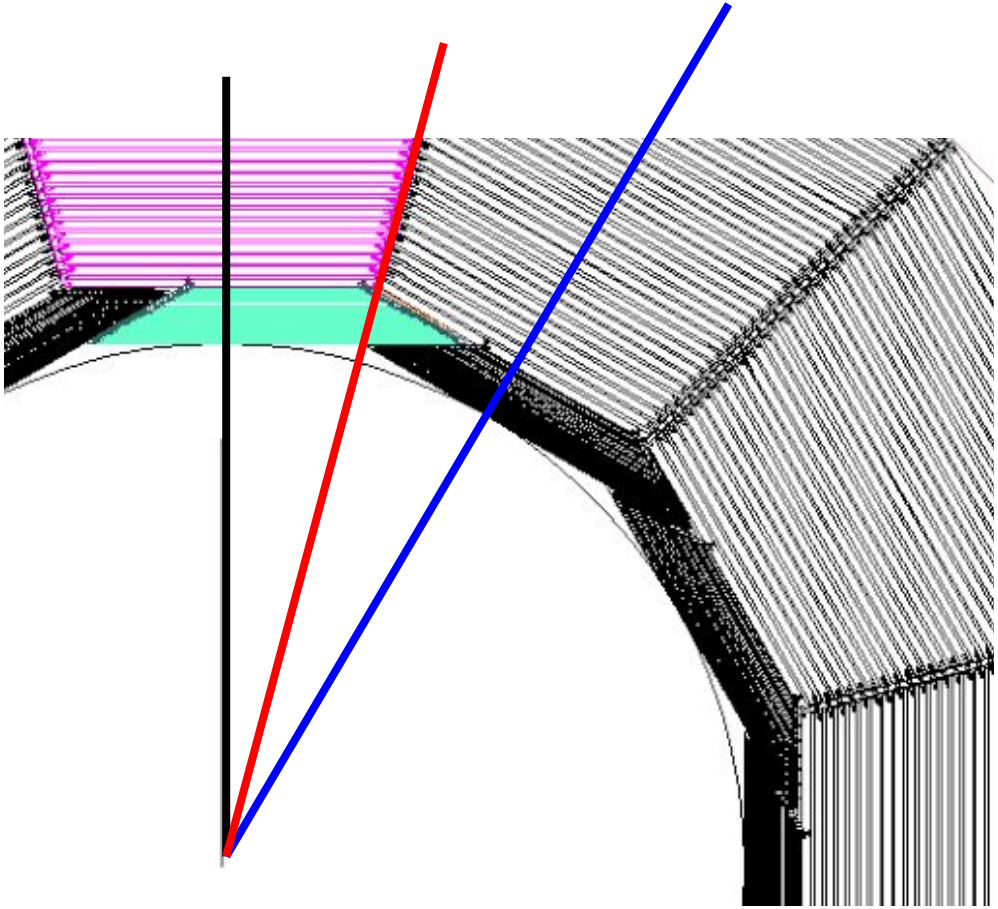
- 12 trapezoidal modules
- 20 thin W layers -> 10 thick W layers
  - Twice as thick
- Areas in phi where modules overlap
  - No thick layers



EMCal Geometry

- 12 trapezoidal modules
- 20 thin W layers -> 10 thick W layers
  - Twice as thick
- Areas in phi where modules overlap
  - No thick layers

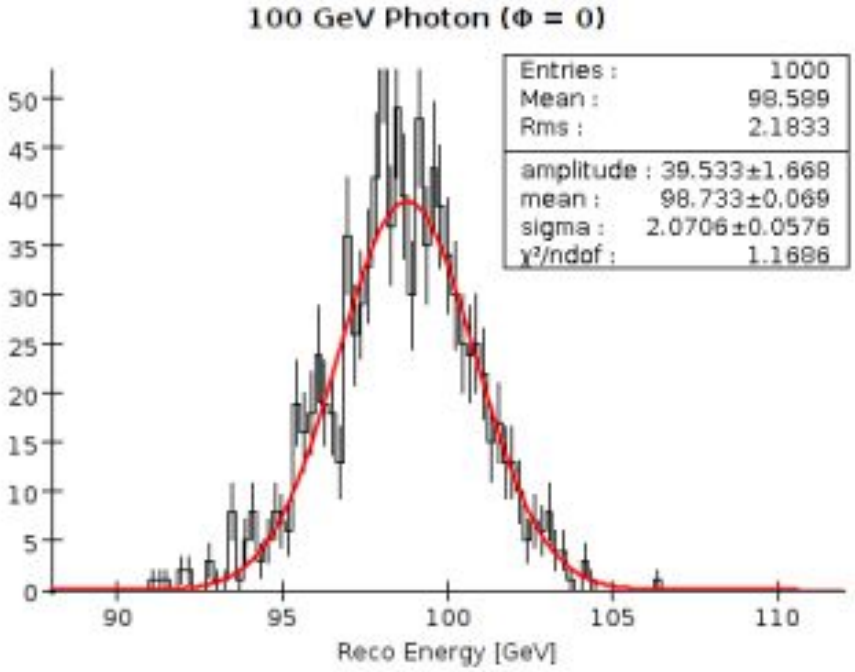
ϕ=0 deg
ϕ=15 deg
ϕ=30 deg

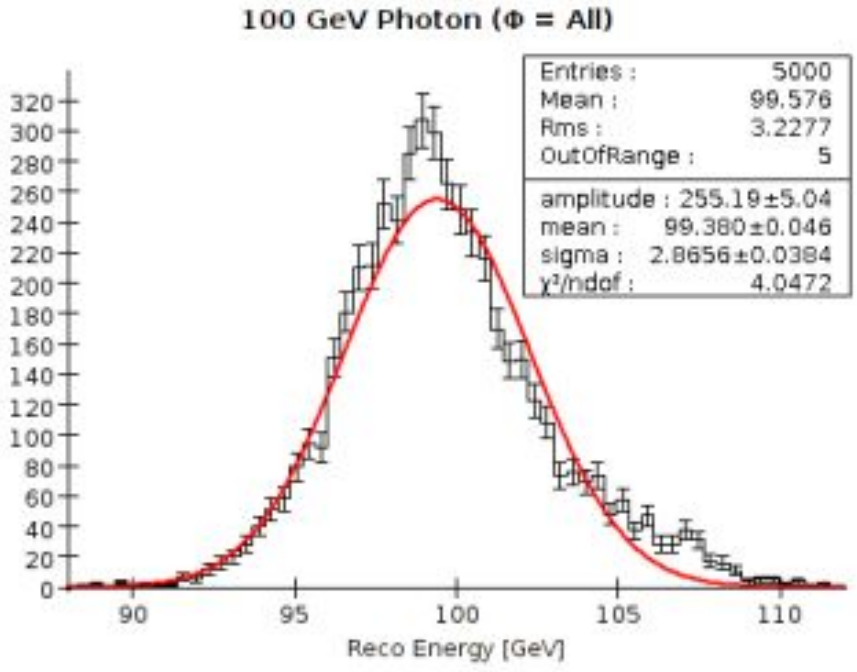


Past Work - Summer Student with Marty/Norman

Detector version = sidloi3
Θ=90 deg

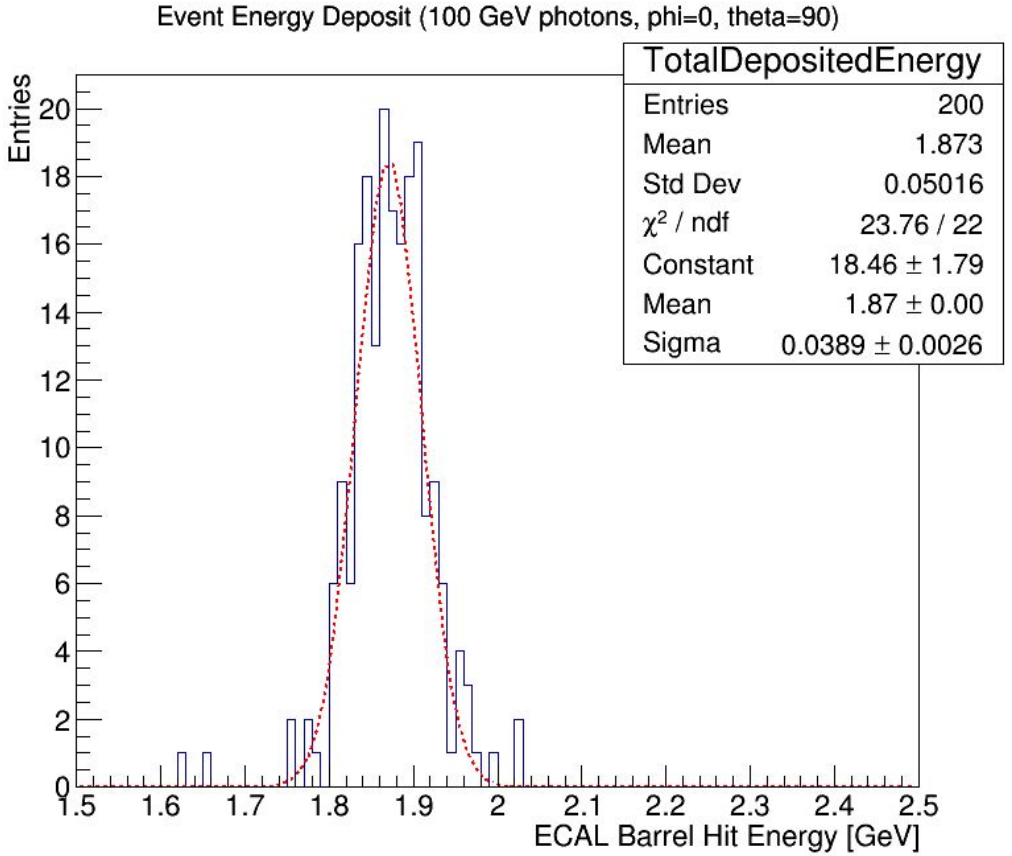
High energy excess due to enforcing layer structure (doubling deposits of last 10 layers)



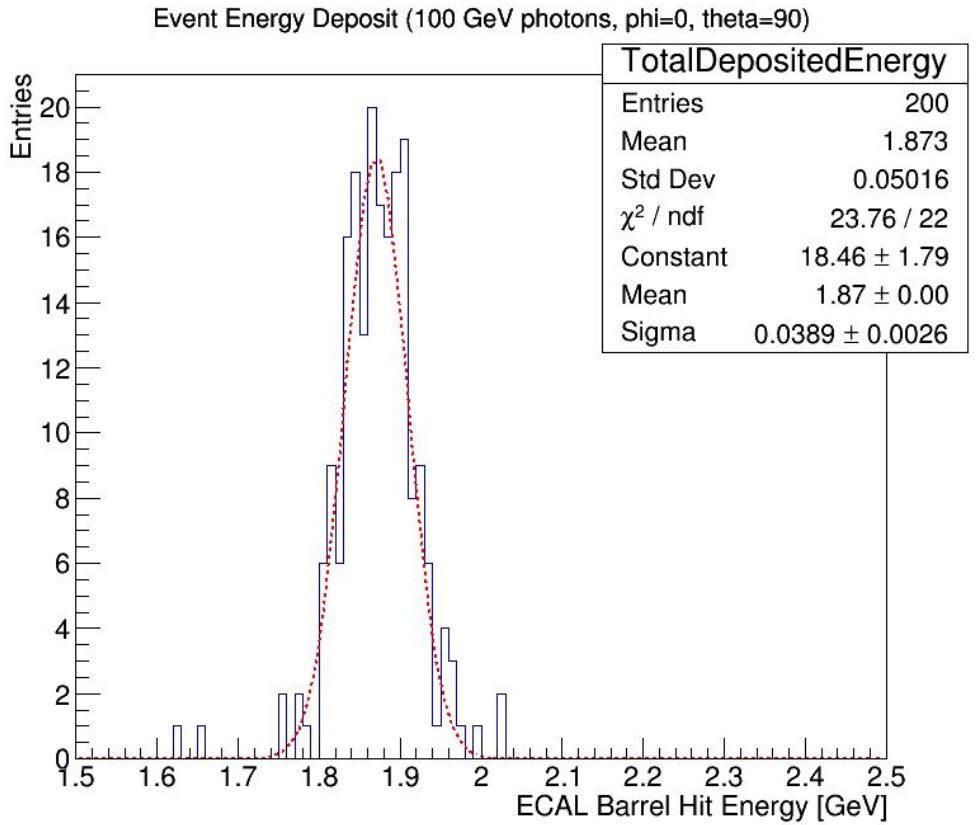


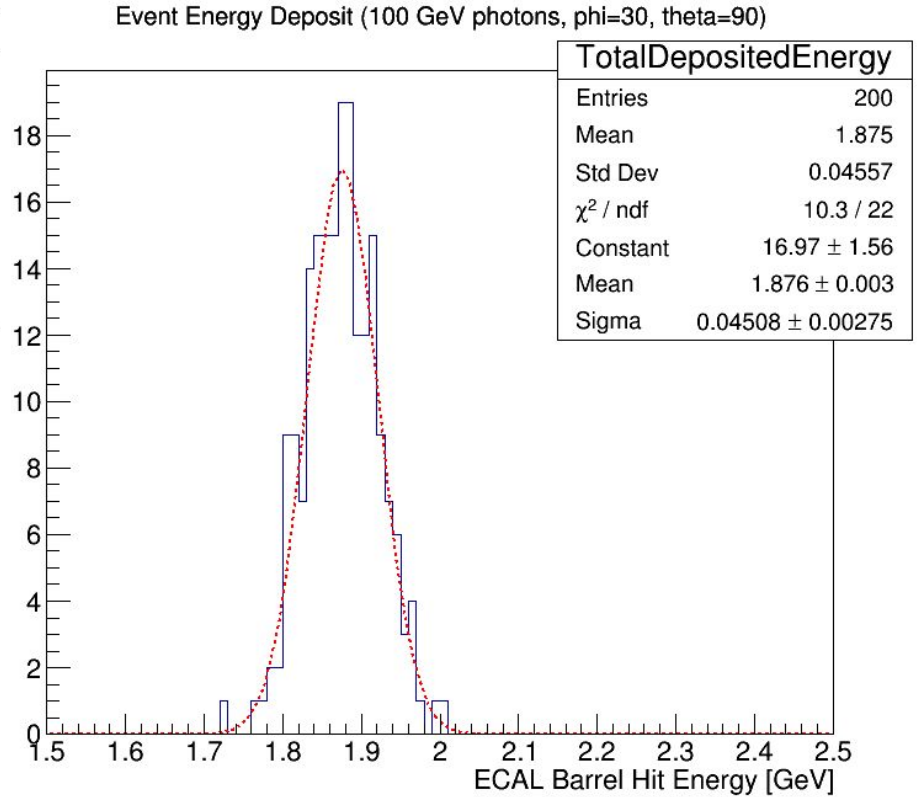
Preliminary Results

- Detector version = SiD_o1_v03 (from tutorial)
- Θ=90 deg
- Doubling deposit value for hits with layer>19
- ~2% of total energy deposited in EMCal
  - Consistent with test beam studies (~0.5% in 9 layers)
- Width consistent with previous study



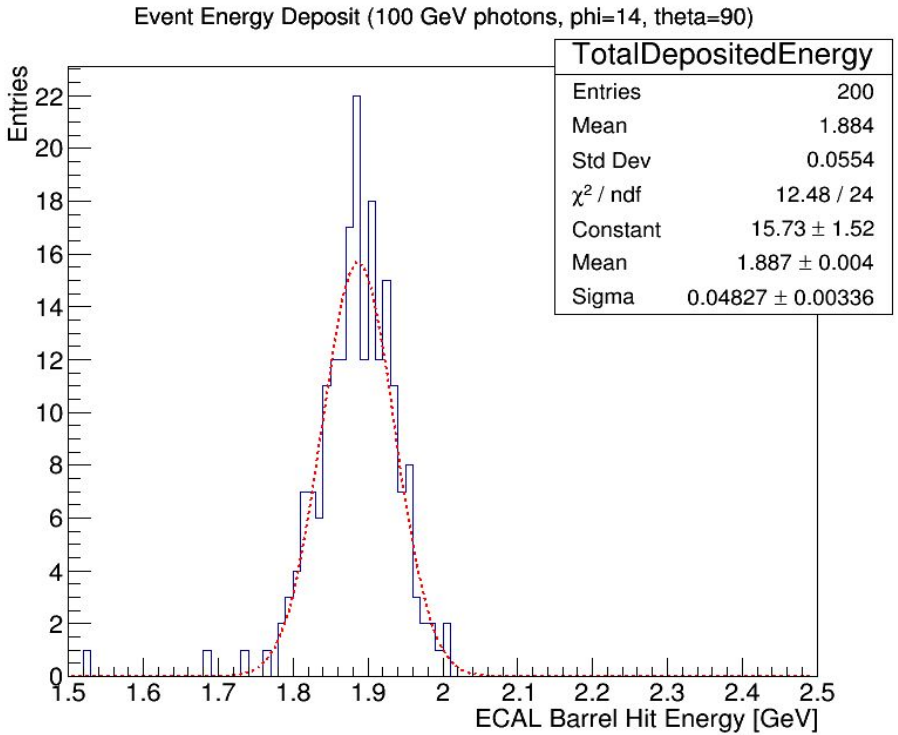
Periodicity of Detector

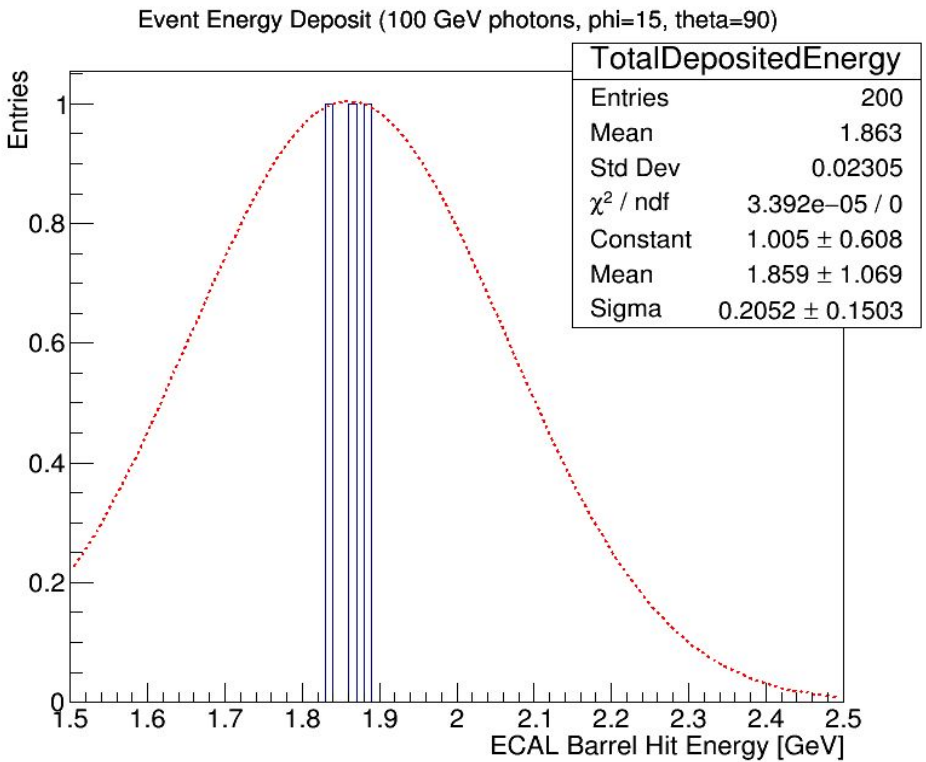




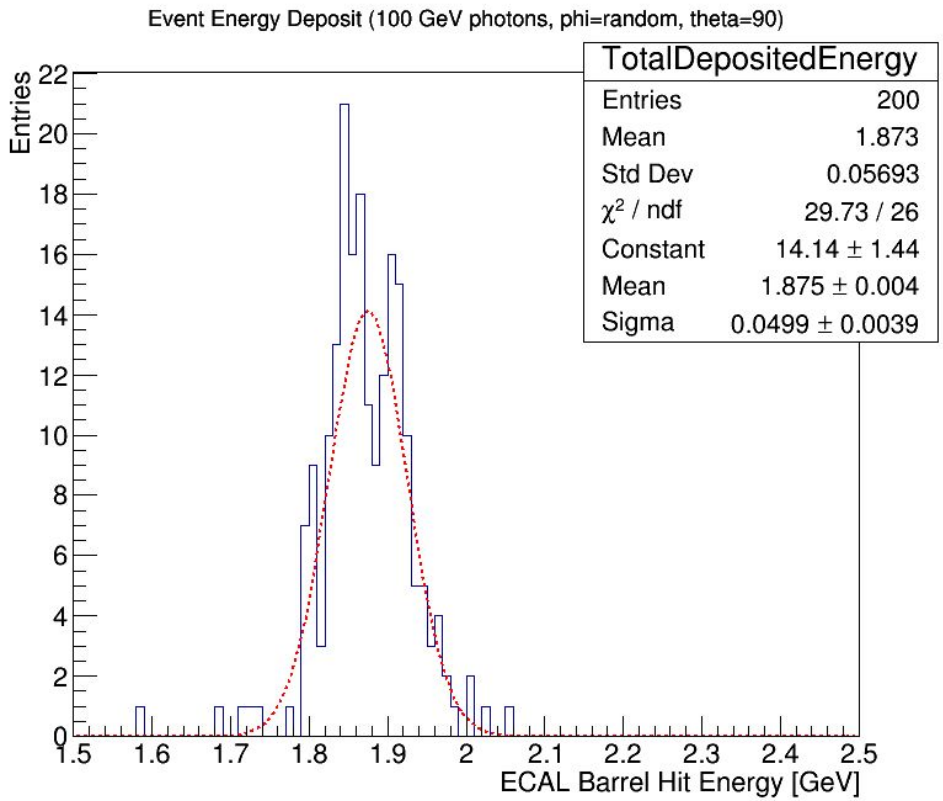
Expect High Energy Excess at phi=15 deg

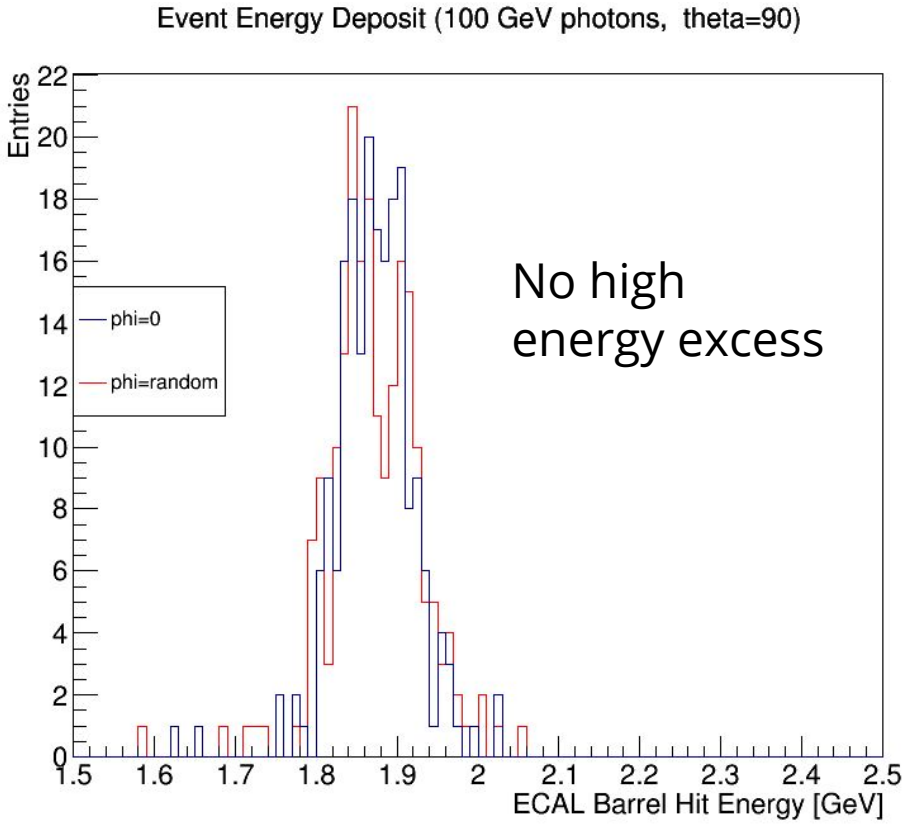
All other events in zero bin (identically zero)





Comparison to Previous Work



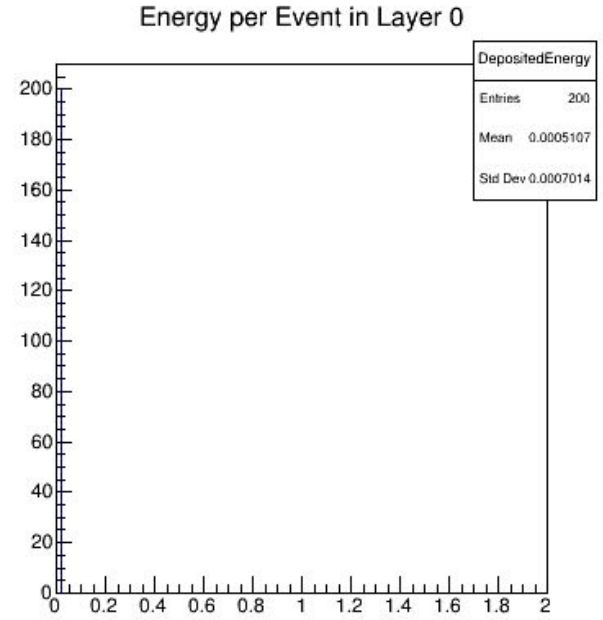


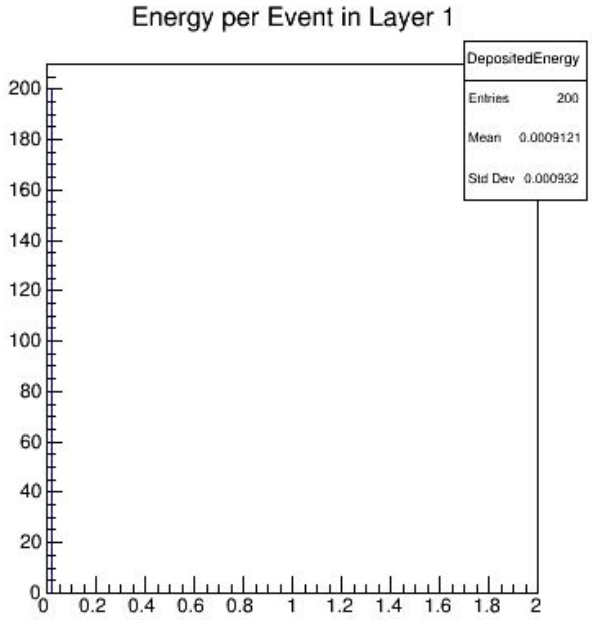
No high energy excess

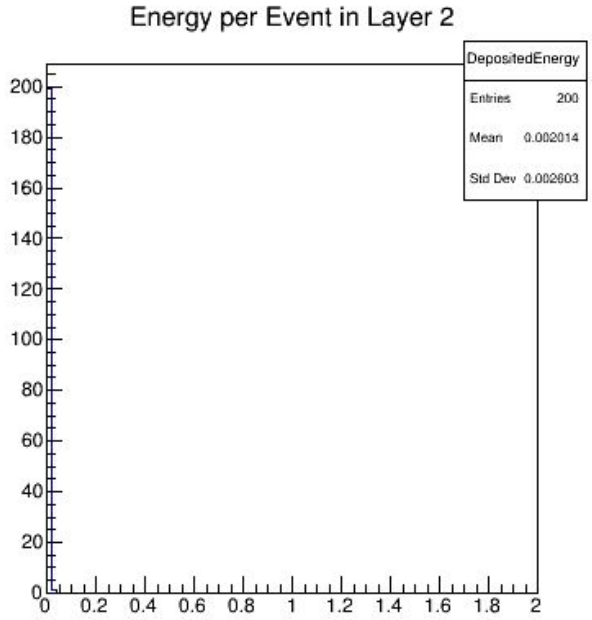
Geometry Explanation?

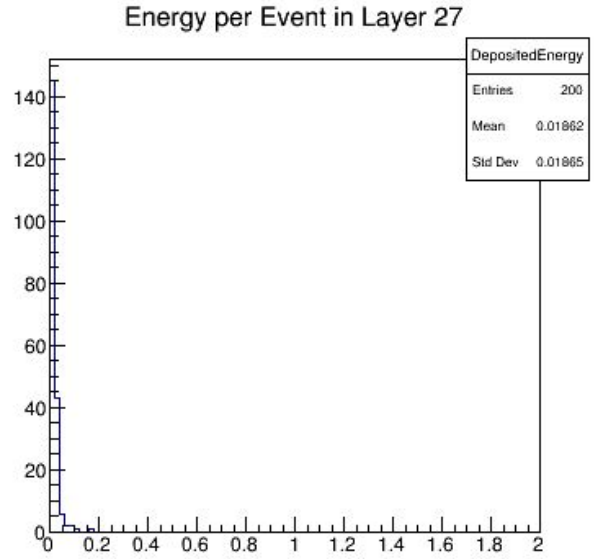
- No excess if layers are labeled individually by module
  - No layers would be accidentally overcounted
  - Multiple “layer 0”’s would be in beamline, would have no high layer hits
    - Both unseen
- Tutorial from Dan on drivers
  - https://twiki.ppe.gla.ac.uk/bin/view/LinearCollider/TweakingDrivers
  - Thank you!!

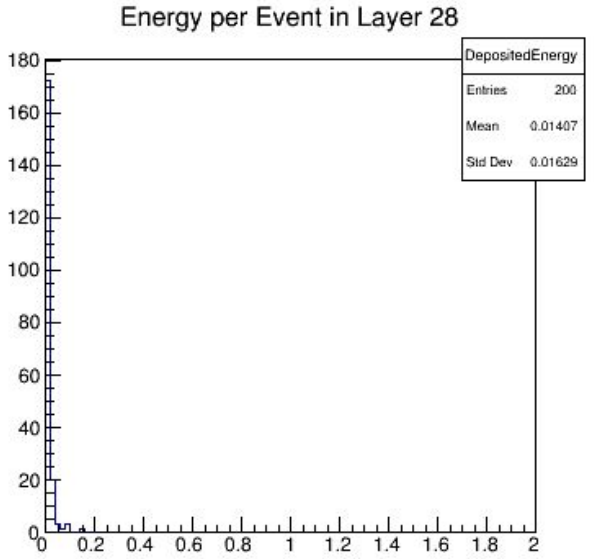
ϕ=14

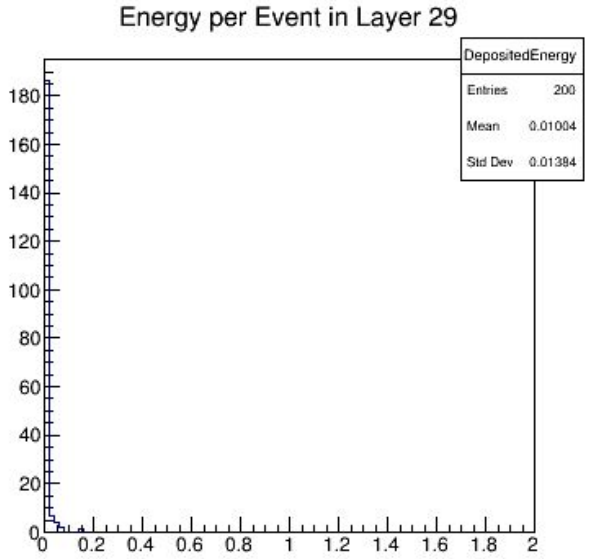

Energy per Event in Layer 0
DepositedEnergy
Entries 200
Mean 0.0005107
Std Dev 0.0007014
200
180
160
140
120
100
80
60
40
20
0
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2


Energy per Event in Layer 1
DepositedEnergy
Entries 200
Mean 0.0009121
Std Dev 0.000932
200
180
160
140
120
100
80
60
40
20
0
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2


Energy per Event in Layer 2
DepositedEnergy
Entries 200
Mean 0.002014
Std Dev 0.002603
200
180
160
140
120
100
80
60
40
20
0
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2


Energy per Event in Layer 27
DepositedEnergy
Entries 200
Mean 0.01862
Std Dev 0.01865
0 20 40 60 80 100 120 140
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2


Energy per Event in Layer 28
DepositedEnergy
Entries 200
Mean 0.01407
Std Dev 0.01629
0 20 40 60 80 100 120 140 160 180
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2


Energy per Event in Layer 29
DepositedEnergy
Entries 200
Mean 0.01004
Std Dev 0.01384
0 20 40 60 80 100 120 140 160 180
0 0.2 0.4 0.6 0.8 1 1.2 1.4 1.6 1.8 2

Next Steps

- Figure out funny business at ϕ=15 (region of interest)
- Make plots of total reconstructed energy (not only EMCal barrel)
- Look at “random” distribution hits as function of phi to potentially identify problematic regions
- Aim of calibration = ensure reconstruction works in overlap regions
    - Geometry itself may provide this