ECal. Digitization

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Digitization

- We observed inconsistencies between the energy scales of simulated and digitized hits.
- Digitized hits have a much greater energy scale, but both are supposed to be in GeV.
- This is the result of an energy scaling factor between simulation and digitization, established in steering files.
    - In these samples, the scaling factor is about 35.

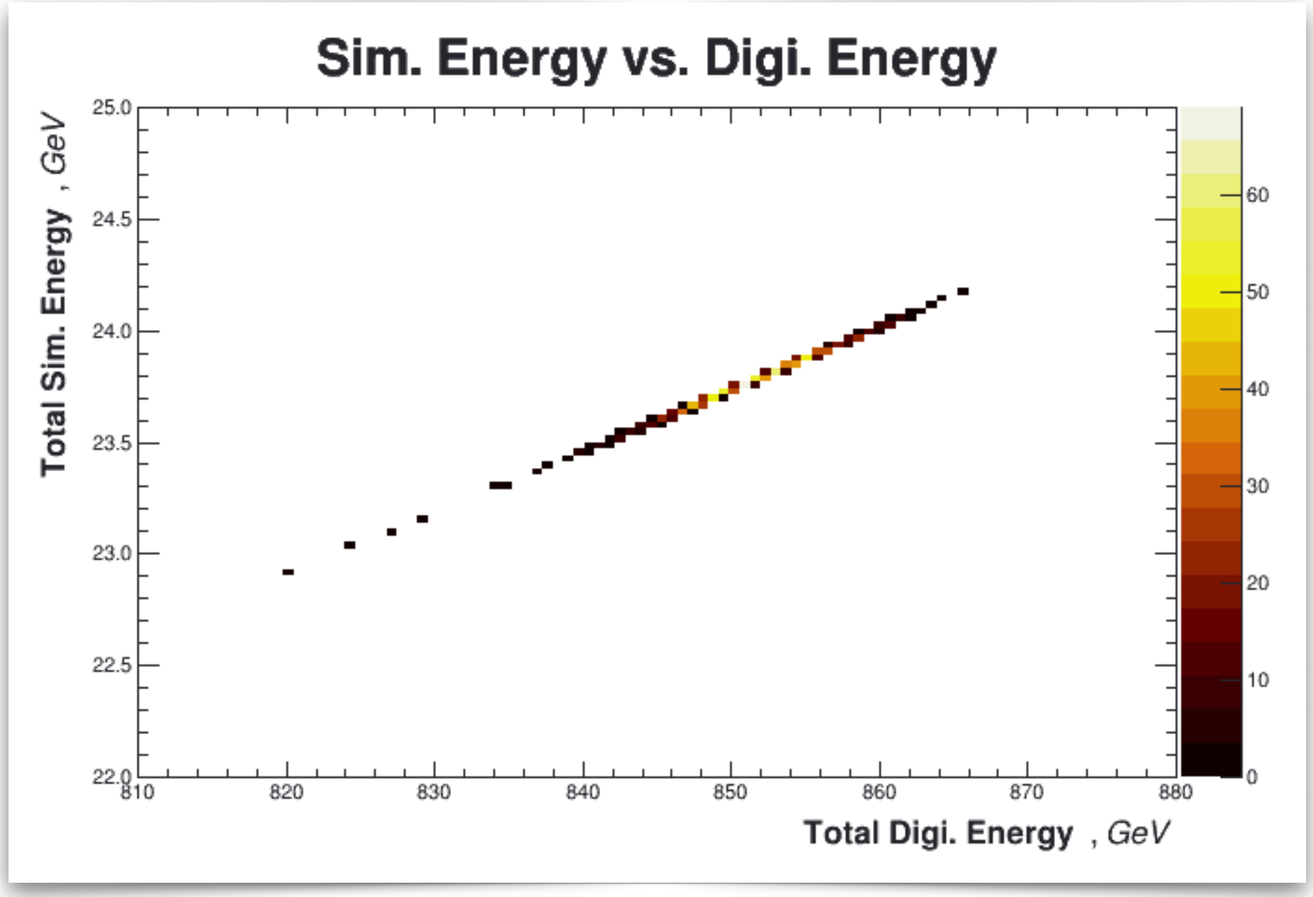


Fig. 1. Simulated subhit energies for one-thousand photon events at 1000GeV (no BIB), plotted against digitized energies.

Threshold Scaling

The minimum energy threshold is scaled during digitization.

How it works:

1. Sum simhits into cells, apply timing.

2. Apply smearing, dead pixels.

3. Apply threshold.

4. Calibrate using scaling factor.

The scaling factor of **~35x** should cause the **50 keV threshold** to be scaled to **~0.175 MeV,** which is what we see.

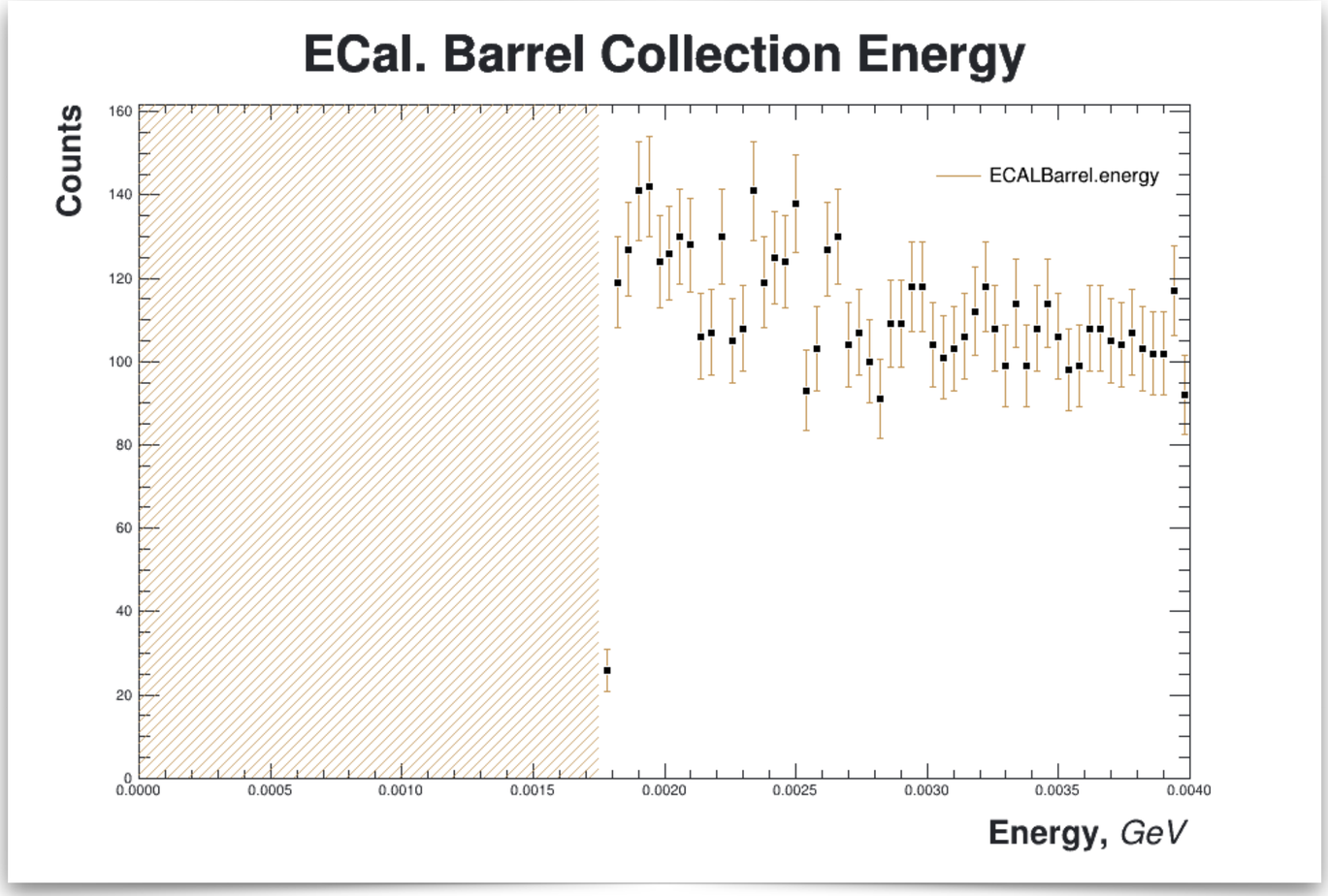
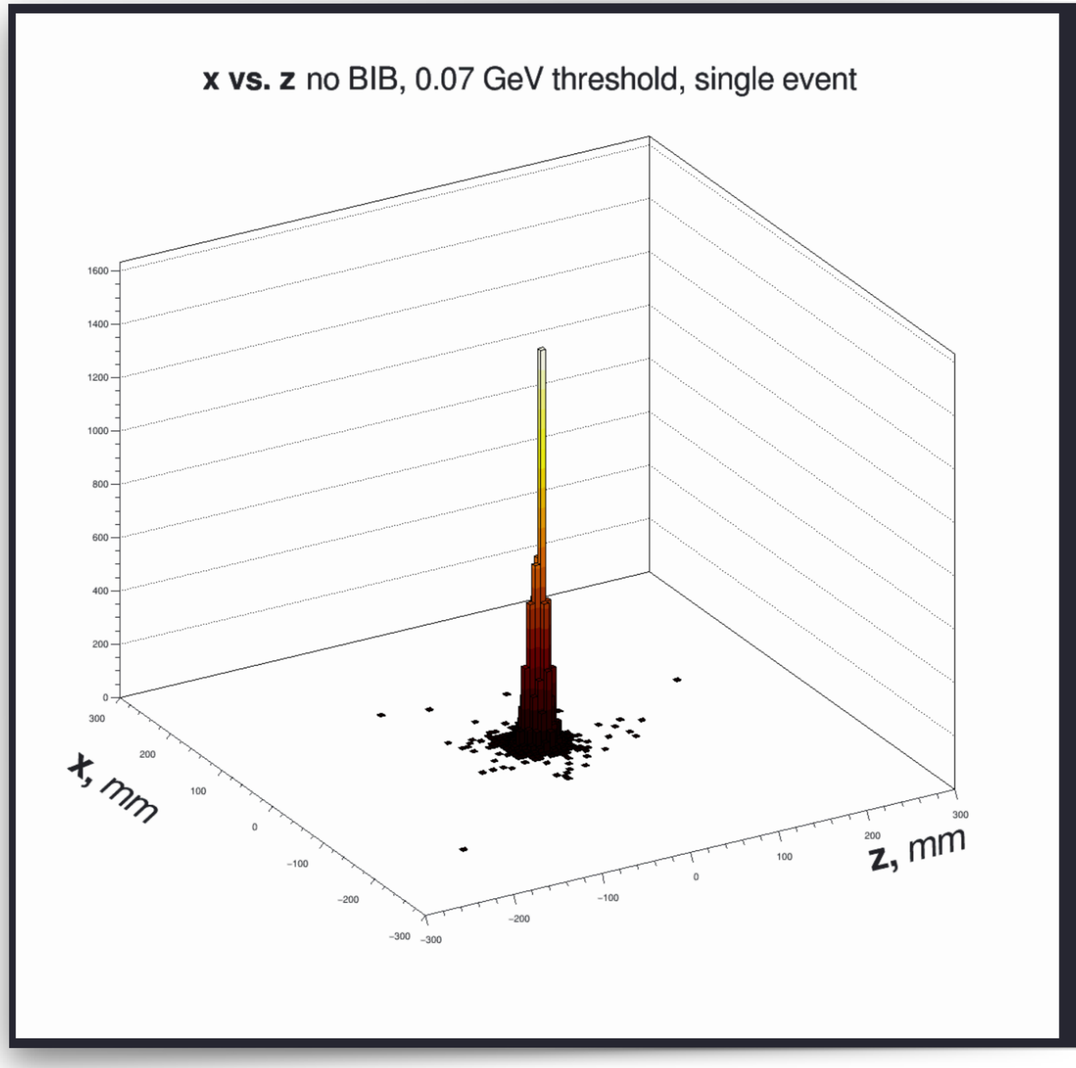


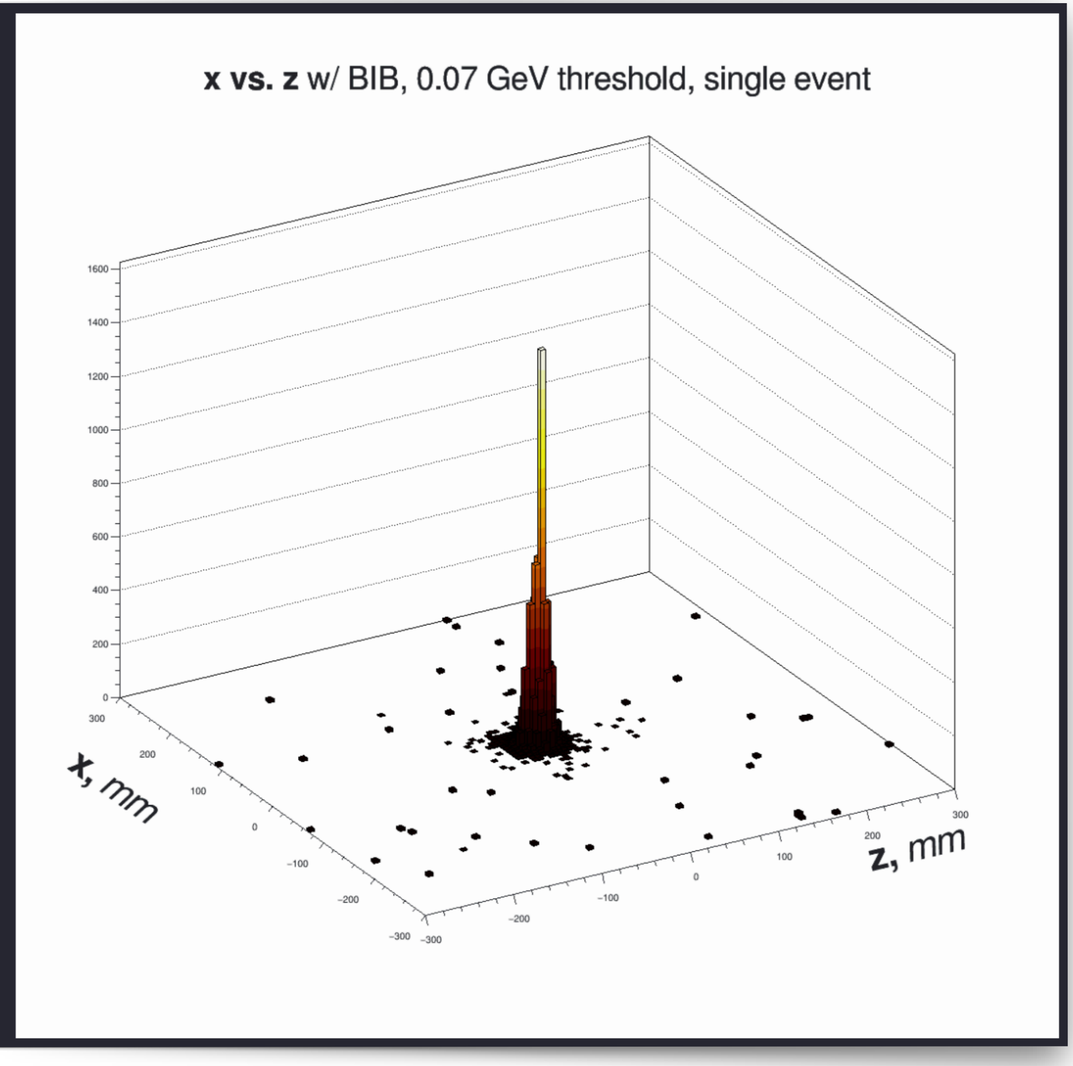
Fig. 2. Energy spectrum for ten **post-digi.** 1000GeV ECal. photon events **without BIB.** Shaded part represents the cut region.

Data in /collab/project/snowmass21/data/muonc/fmeloni/DataMuC_MuColl10_v0A/photonGun_1000/reco_k4.

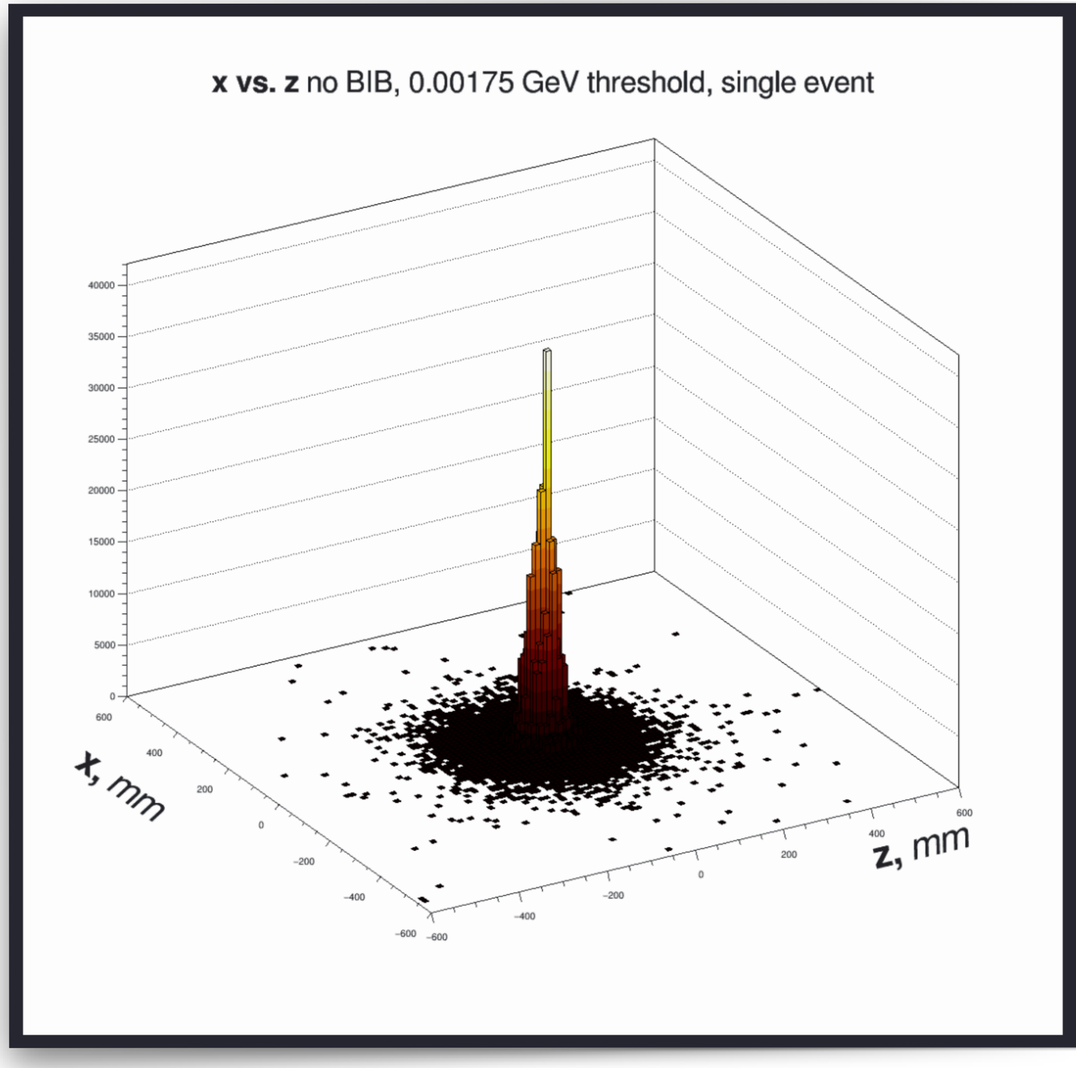
https://github.com/MuonColliderSoft/DDMarlinPandora/blob/2f5f3bac02d6b0b6ced65aface5d78dbadc60ea6/src/DDCaloDigi.cc#L782C1-L797C92

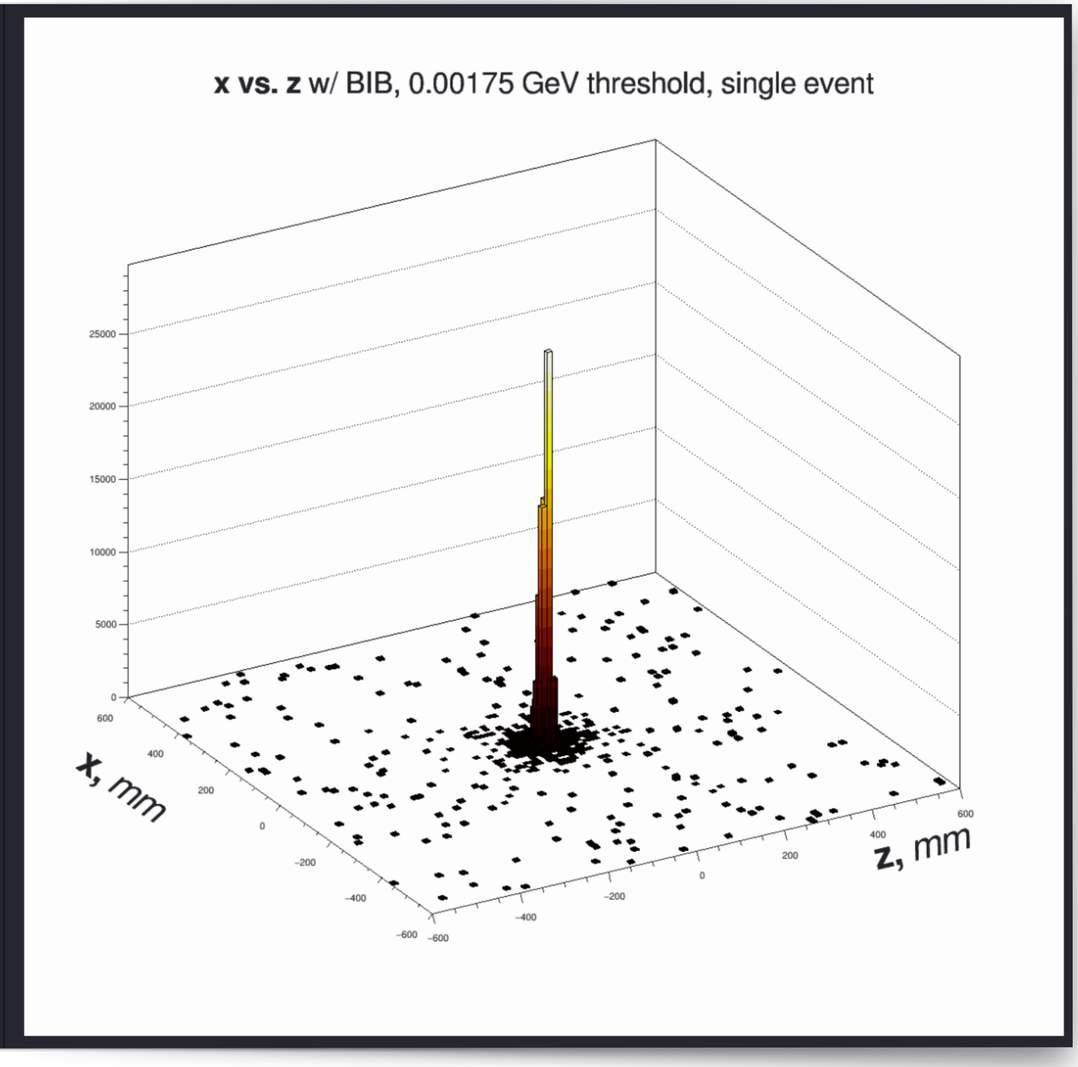
Some New Plots





Low Threshold Plots





Next Steps

- Characterize average cell energy contributions from BIB.
- Define a new energy threshold with this as a basis.
- Characterize the impact on photon reconstruction or energy distribution.
  - To what extent is the energy resolution impacted for more aggressive cuts?