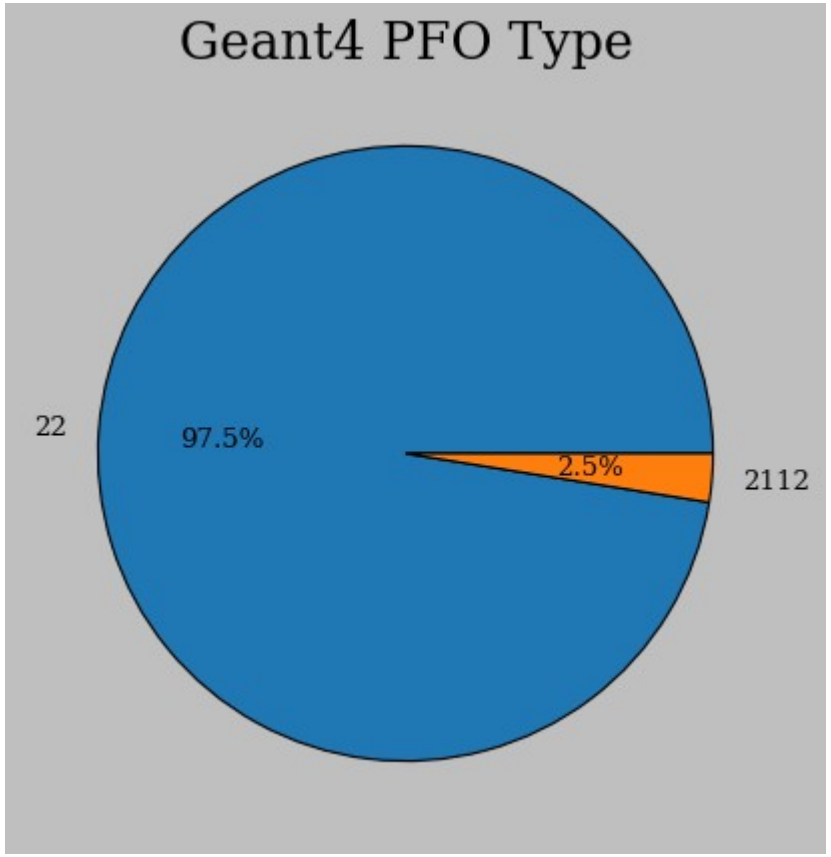
# A First Look At pi0 Photon Performance: BIB-AE vs Geant4 in DDML

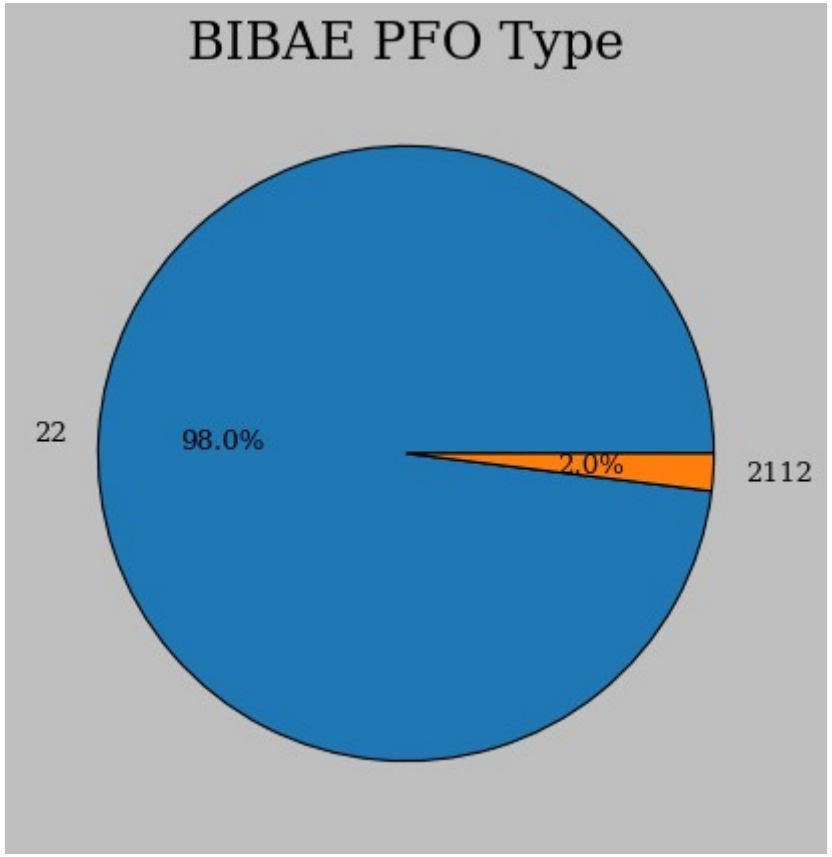
2.11.2023

# Pi0 photons: simulation to reconstruction

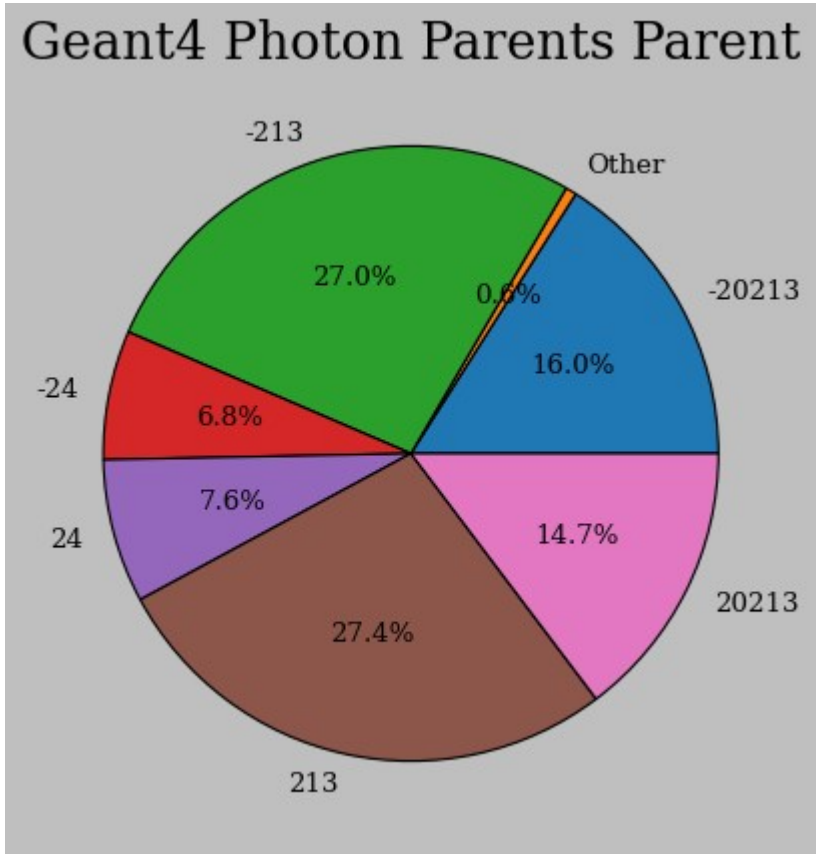
- Simulated 9,000 ee → ττ with the requirement that there was at least one pi0 in the final state
- All photons and e+/- with energy > 10 GeV (+ passing geometrical constraints from trigger) were simulated with BIB-AE in BIB-AE sample
- Apply full standard reconstruction to all samples
- For now, focused on photons from pi0s:
  - Reco-MCTruth link to get all pfos linked to mc photon
  - Require that parent of the photon is a pi0 and that the pi0 was produced by tau (through intermediate decay )
  - Also have restriction of mc photon energy > 10GeV, but no geometry constraints yet, so expect G4 contamination
- Total of 8348 BIBAE vs 8386 Geant4 photons reconstructed in this fashion

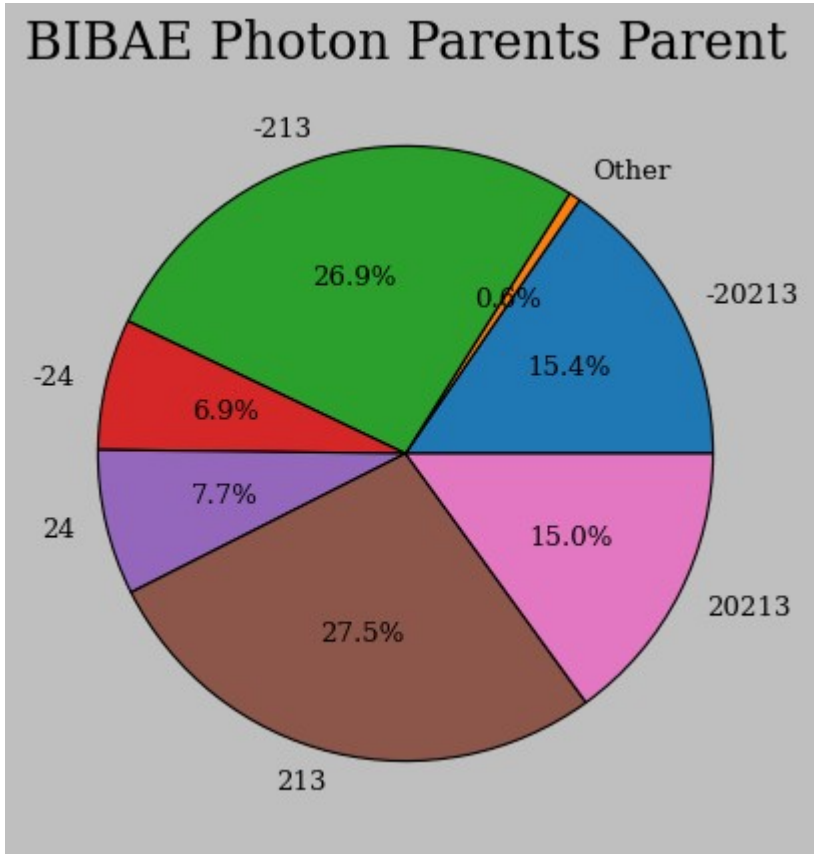
# PFO Type



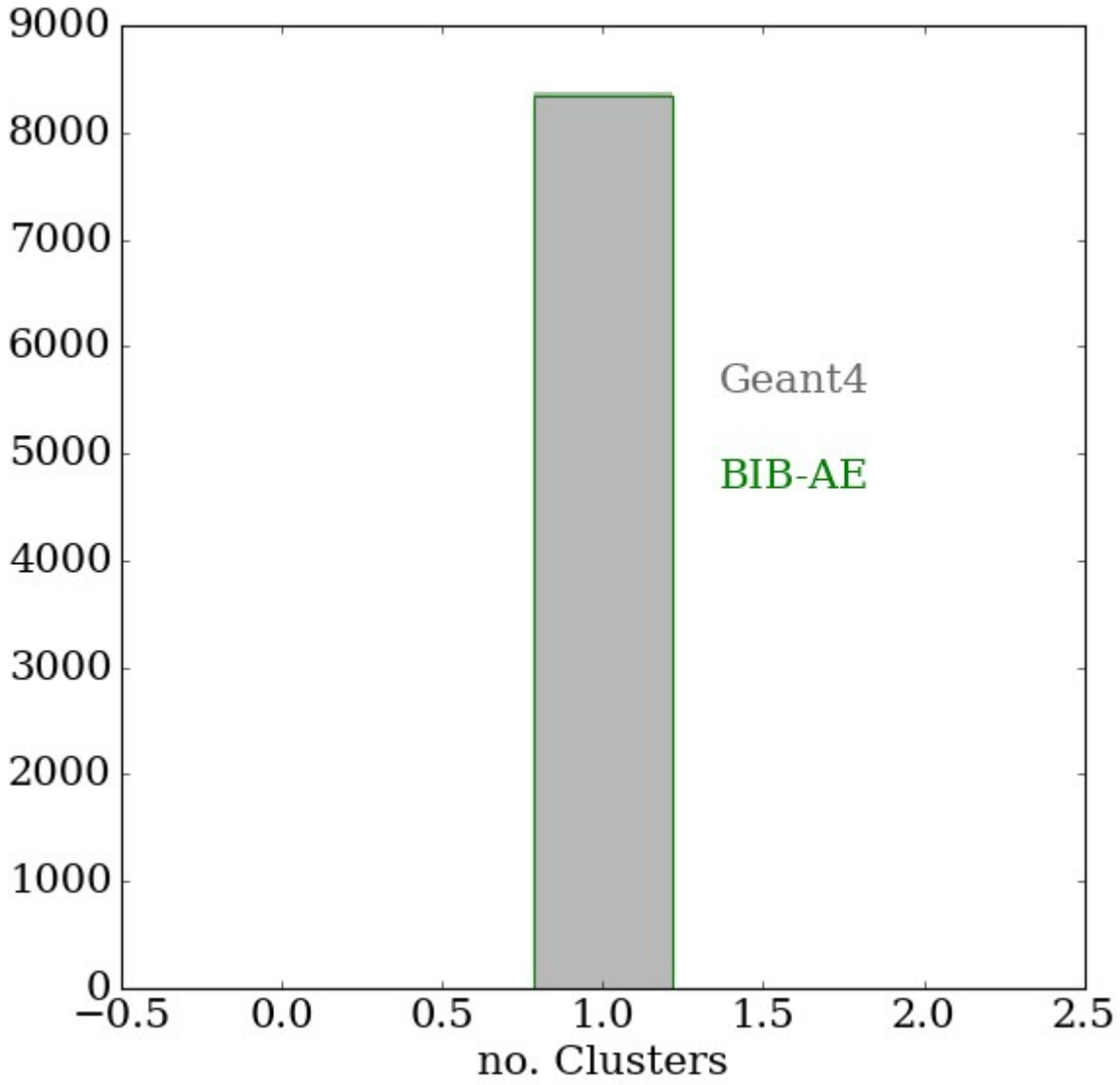



# Pi0 Parents

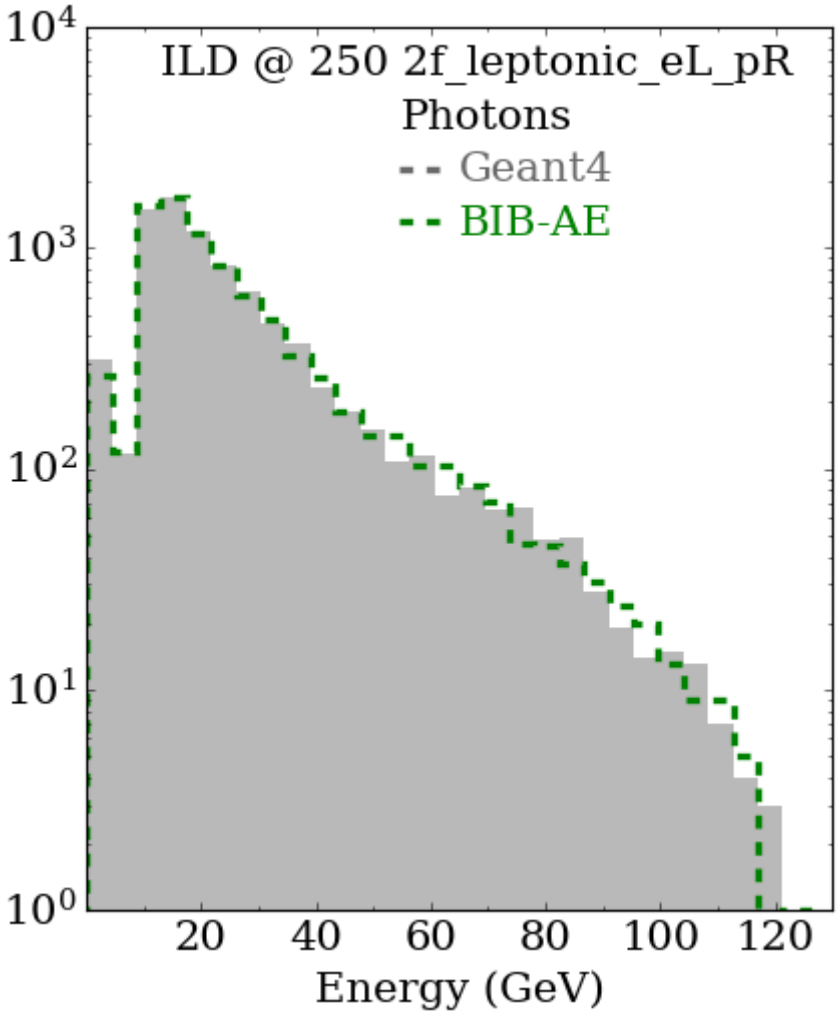

Geant4 Photon Parents Parent
-213
Other
-20213
-24
24
20213
213
27.0%
0.6%
16.0%
6.8%
7.6%
14.7%
27.4%

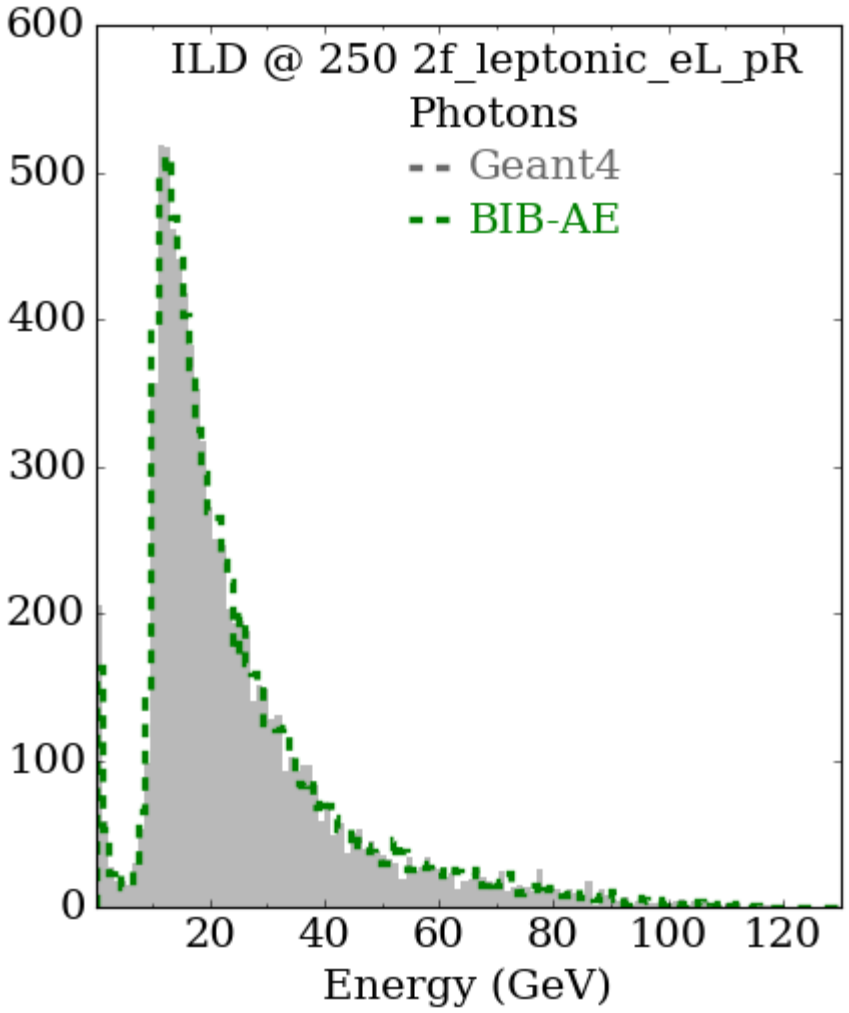

BIBAE Photon Parents Parent
-213
Other
-20213
-24
24
20213
213
26.9%
0.6%
15.4%
6.9%
7.7%
15.0%
27.5%

# No. Clusters in PFO



# Photon PFO energy



# Conclusions

- First look at photons from pi0s- looks reasonable?
- However: so far have ‘cheated’ using MCTruth link (although I think for our purposes we have to do this- need to know which particle passed cuts in the simulation)
- Also, haven’t looked at all yet at what this means for subsequent object reconstruction- e.g. of the pi0.