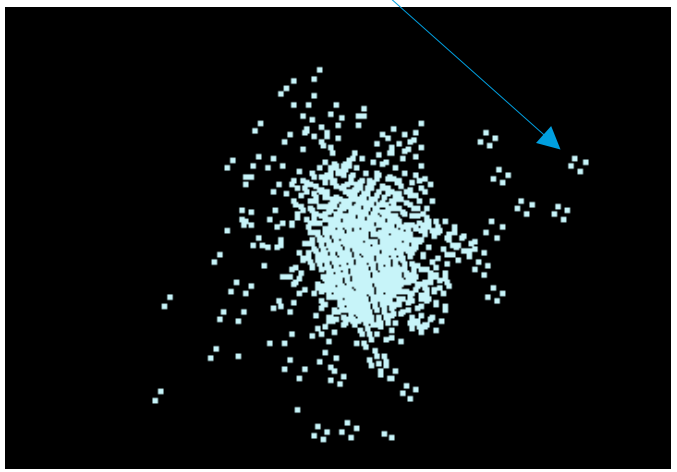
A first look at 6x6 grid splitting

23.11.2023

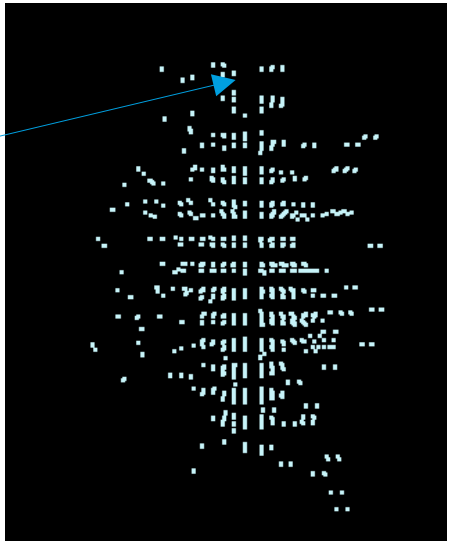
BIB-AE Output Splitting in DDML

- Now adjusted convert output for BIB-AE implementation to be able to split output into n sub-cells (evenly)
- First shot: use n = 6 for 36x higher granularity (a la CaloClouds)
- Two positions:
  - One with insensitive material at the edges of the shower
  - One with insensitive volume near the shower core
- Look at some single shower distributions...
- First notice clusters of 4 hits appearing

Clusters of 4 cells

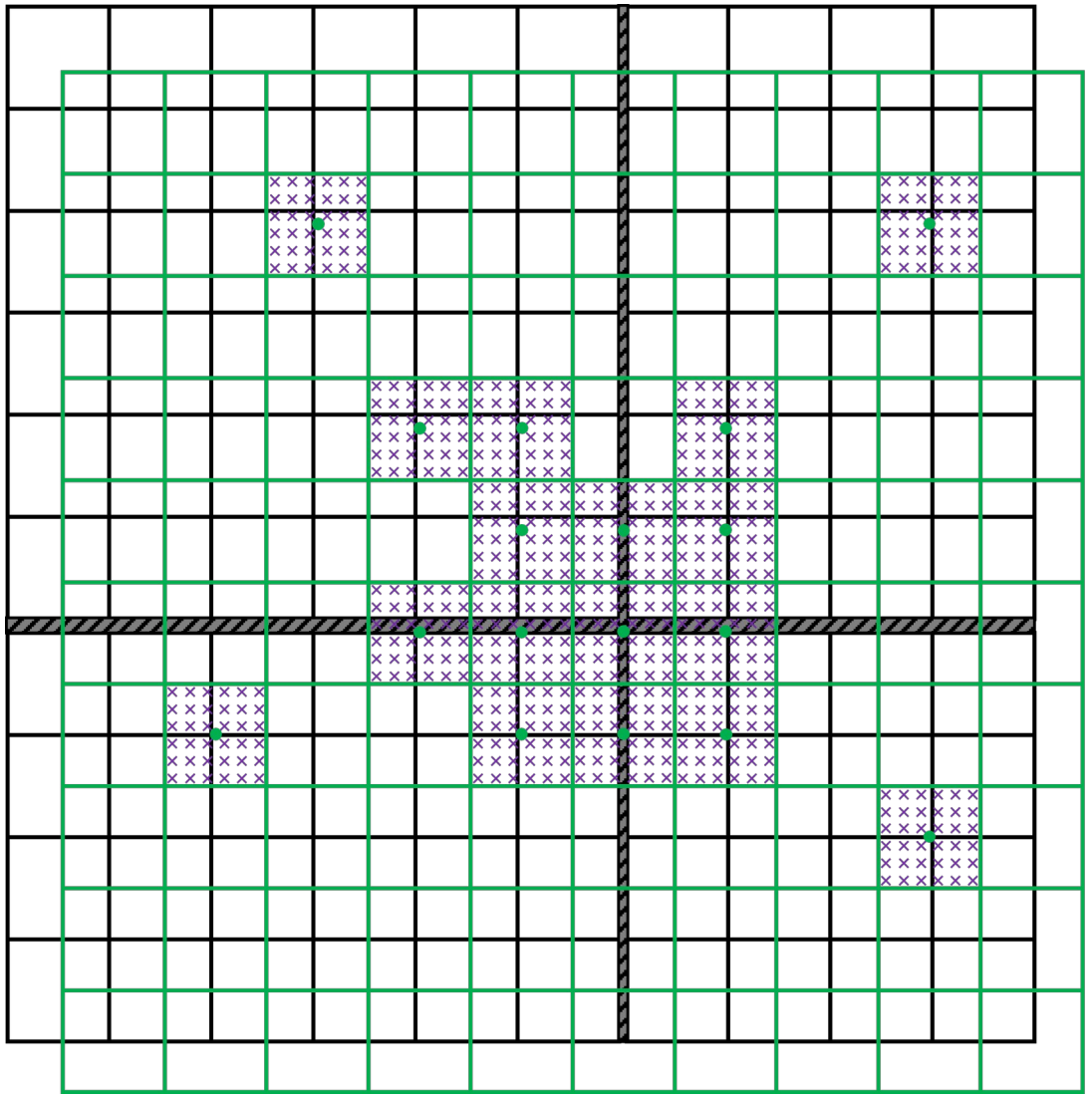


Insensitive volume near shower core



BIB-AE Output Splitting in DDML

Following discussion with Anatolii...



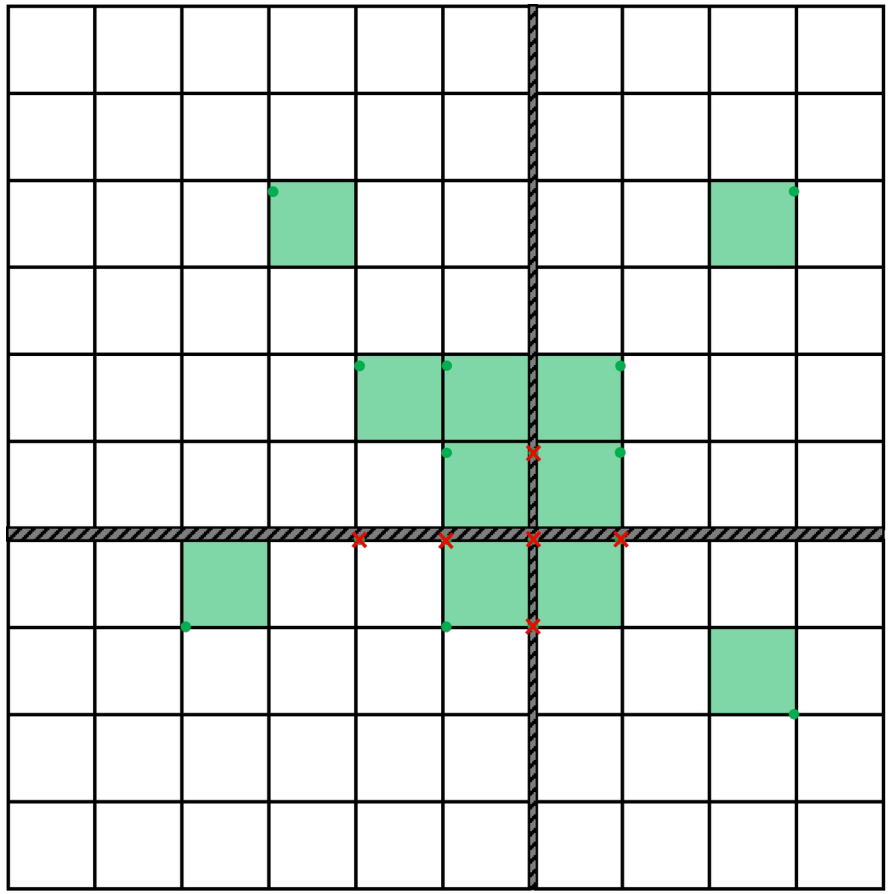
Physical geometry

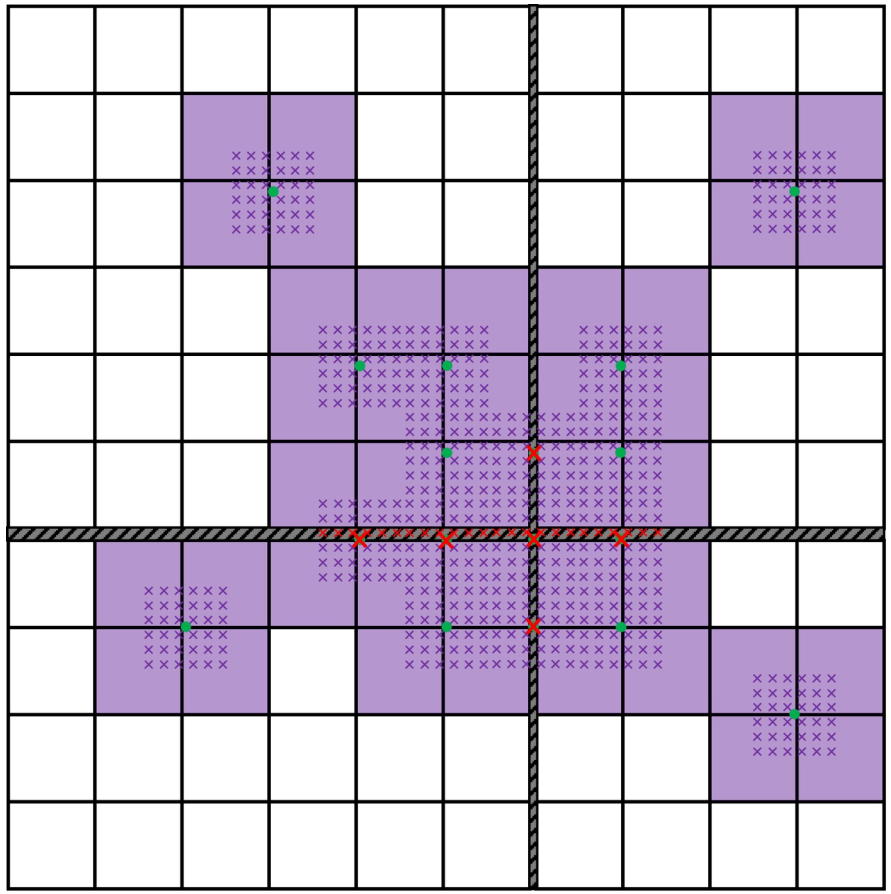
BIB-AE cell-level

BIB-AE 6x6 granularity

BIB-AE Output Splitting in DDML

Following discussion
with Anatolii...





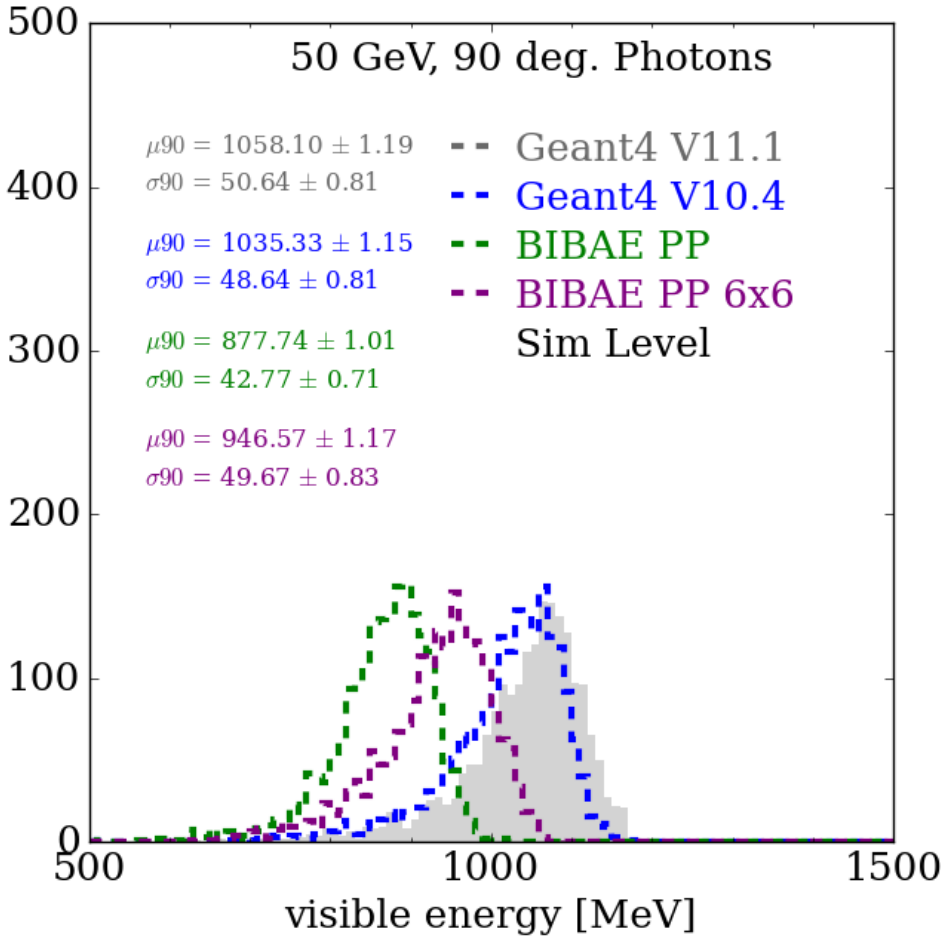
Physical geometry

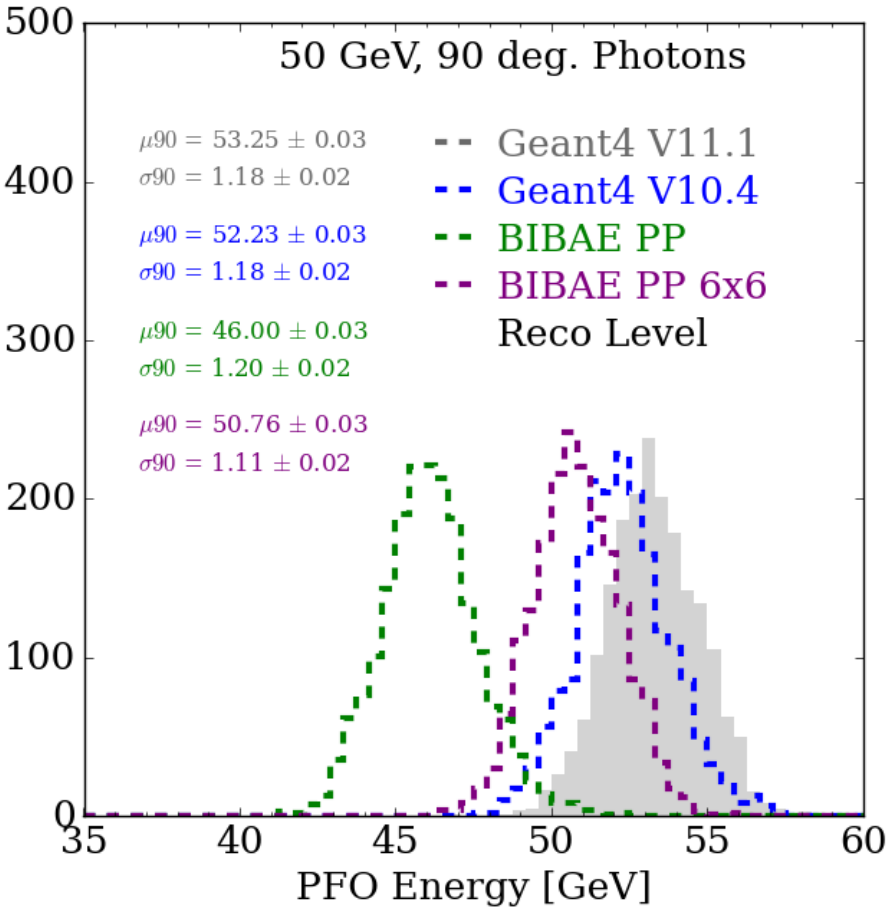
BIB-AE cell-level

BIB-AE 6x6 granularity

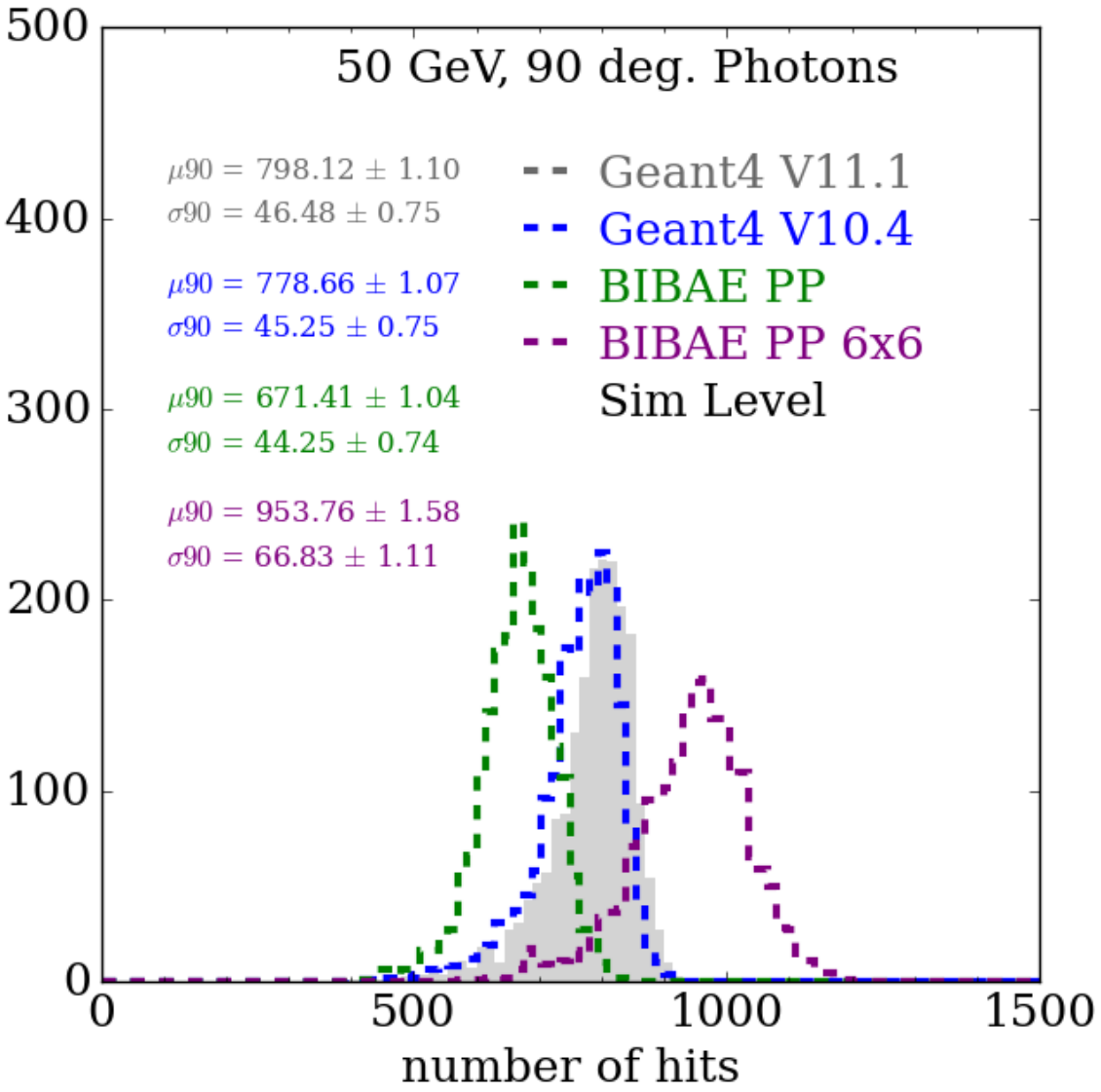
Energy Sum/ PFO energy

More distributions to follow

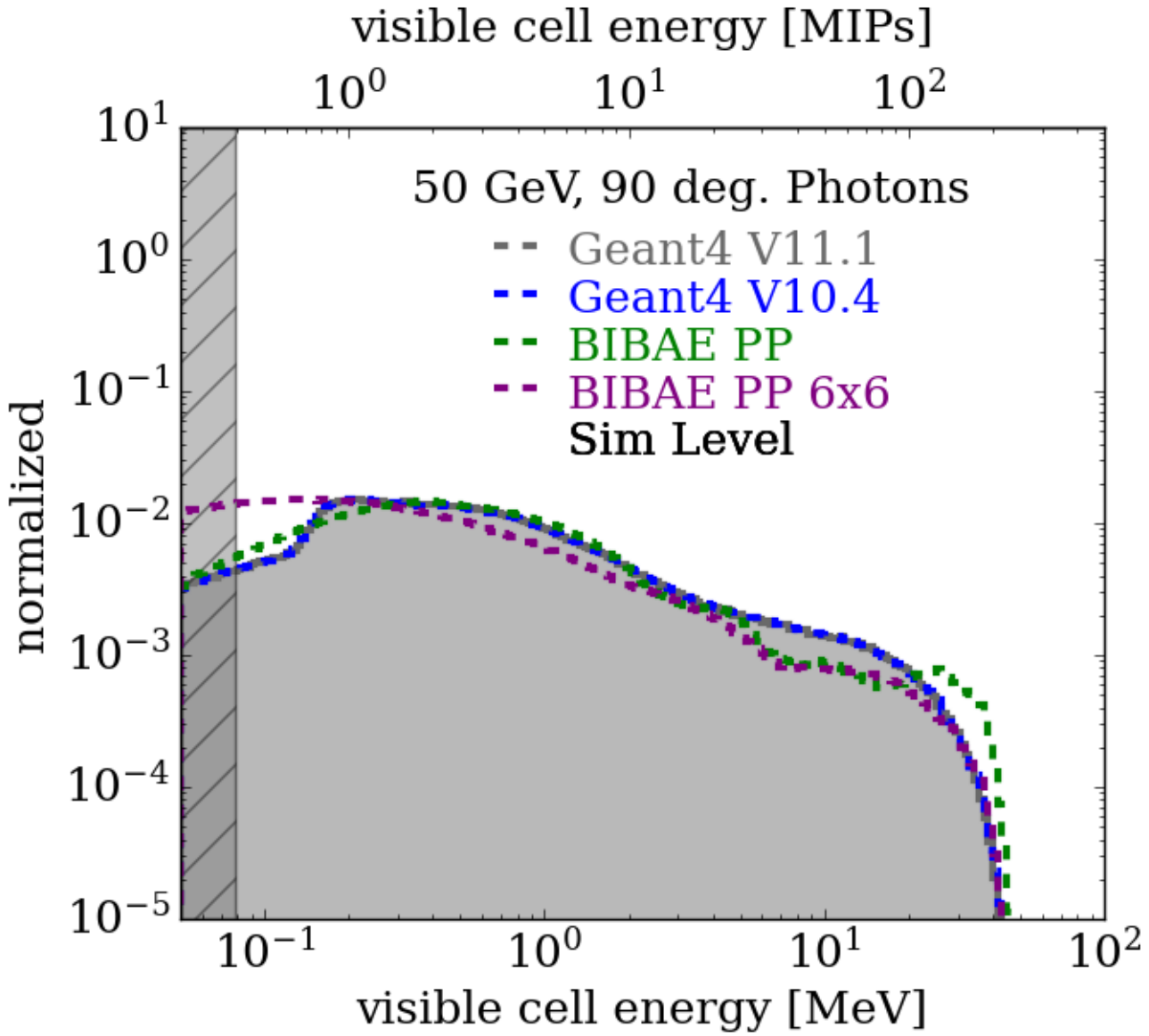




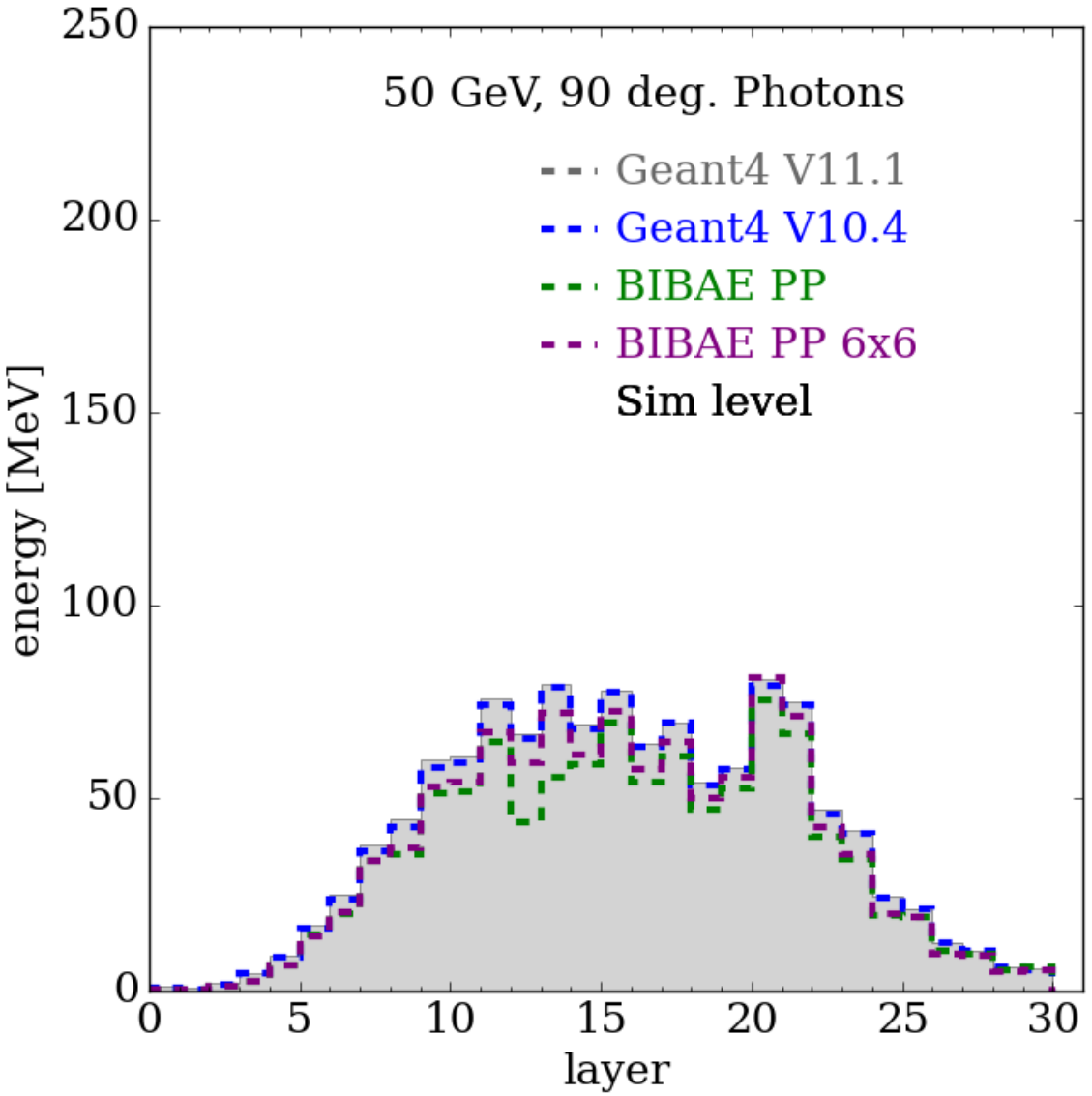
Nhits


50 GeV, 90 deg. Photons
μ90 = 798.12 ± 1.10
σ90 = 46.48 ± 0.75
μ90 = 778.66 ± 1.07
σ90 = 45.25 ± 0.75
μ90 = 671.41 ± 1.04
σ90 = 44.25 ± 0.74
μ90 = 953.76 ± 1.58
σ90 = 66.83 ± 1.11
Geant4 V11.1
Geant4 V10.4
BIBAE PP
BIBAE PP 6x6
Sim Level
500
400
300
200
100
0
0
500
1000
1500
number of hits

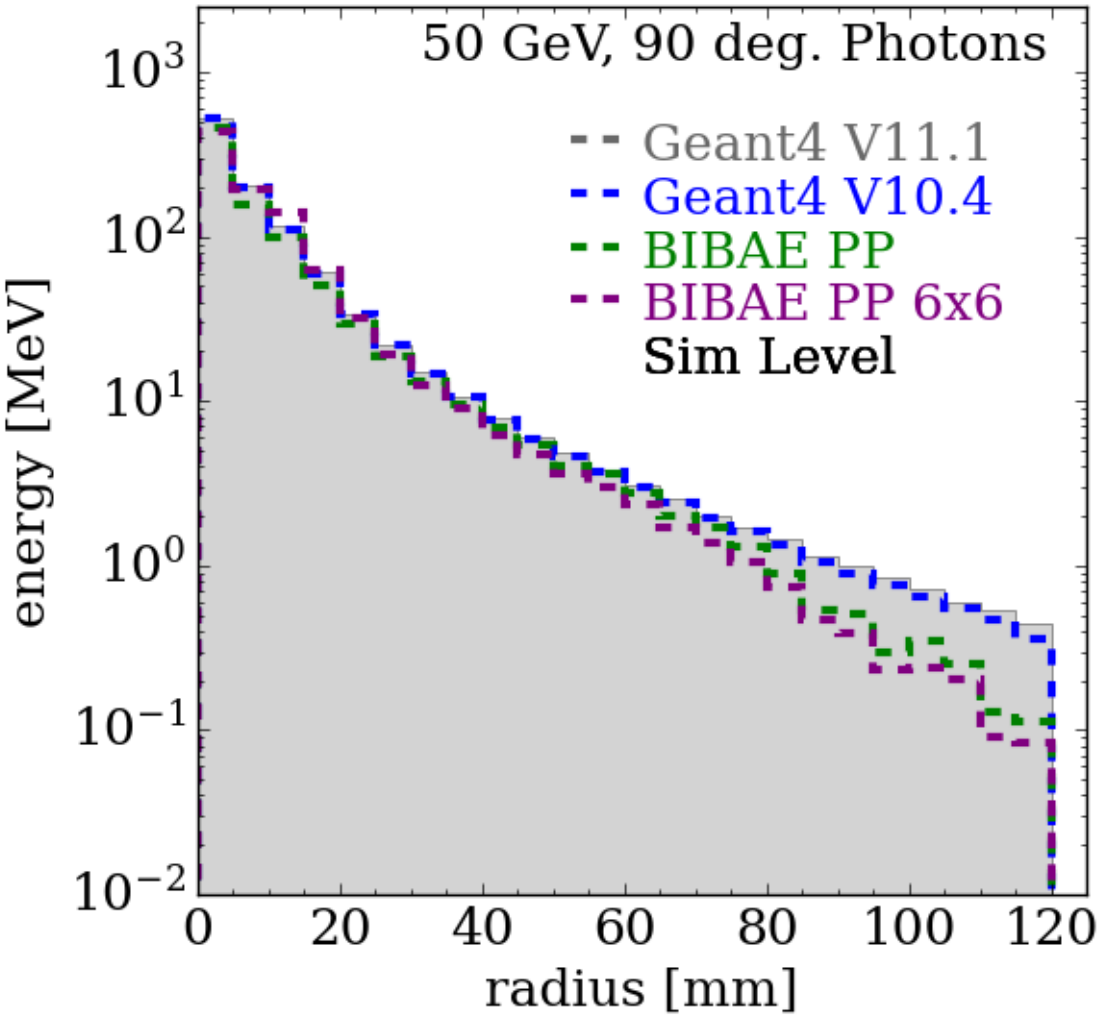
Cell E


visible cell energy [MIPs]
10^0
10^1
10^2
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
normalized
50 GeV, 90 deg. Photons
Geant4 V11.1
Geant4 V10.4
BIBAE PP
BIBAE PP 6x6
Sim Level
10^{-1}
10^0
10^1
10^2
visible cell energy [MeV]

Longitudinal

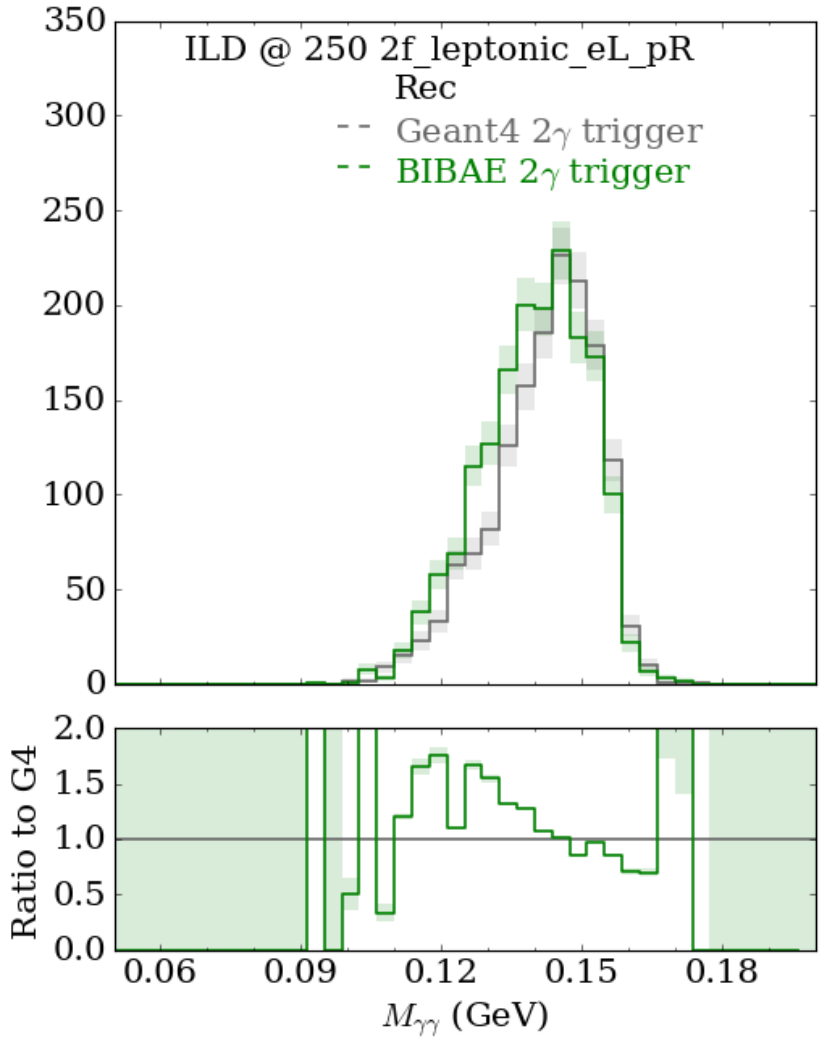


Radial

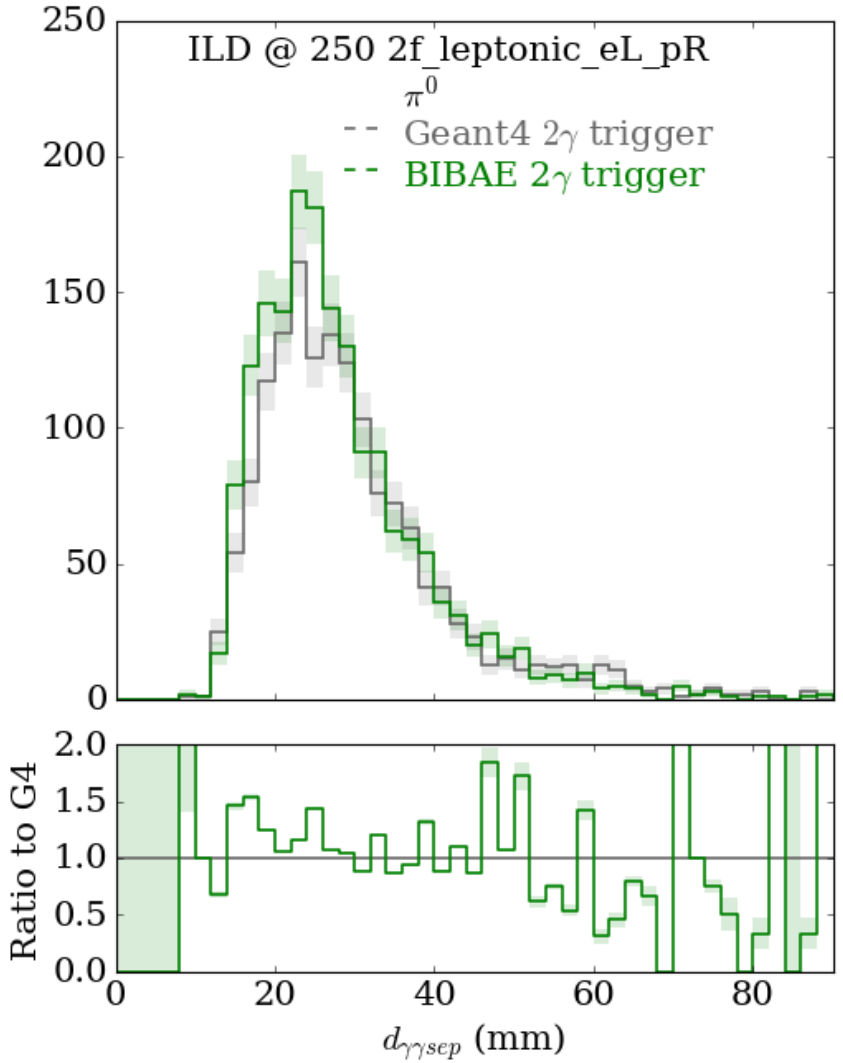

50 GeV, 90 deg. Photons
Geant4 V11.1
Geant4 V10.4
BIBAE PP
BIBAE PP 6x6
Sim Level
energy [MeV]
radius [mm]
10^3
10^2
10^1
10^0
10^{-1}
10^{-2}
0
20
40
60
80
100
120

Brief Aside on Tau plots:

Now added ratio with errors with correlation coefficient =1



Also re-running with different seed to get error estimation….



Next Steps

- Look at a slightly less extreme case (dead material at edge of shower)
- Idea from Katja: threshold on splitting energy- only split if energy above 1.something MIPs- prevent 4 cell creation in edges of shower
- Look at one other grid size for splitting (8x8)
- Also simulate Taus with whatever splitting is best and see how it affects distributions