

Simulation Progress on Crystal Based, Fast Timing ECAL Design

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Physics Requirement of Separation

Physics events:

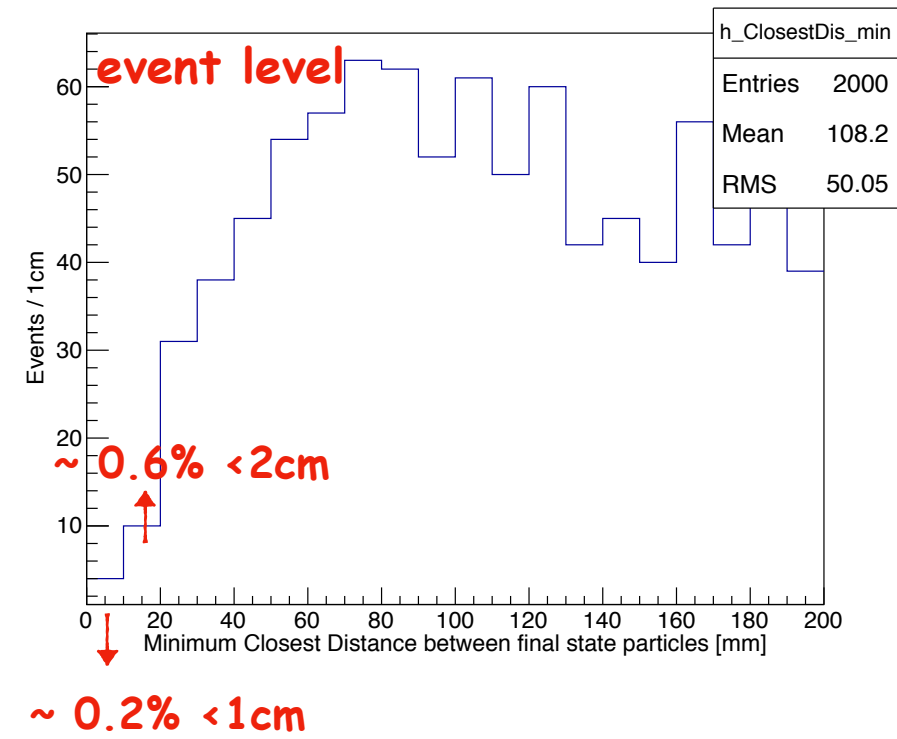
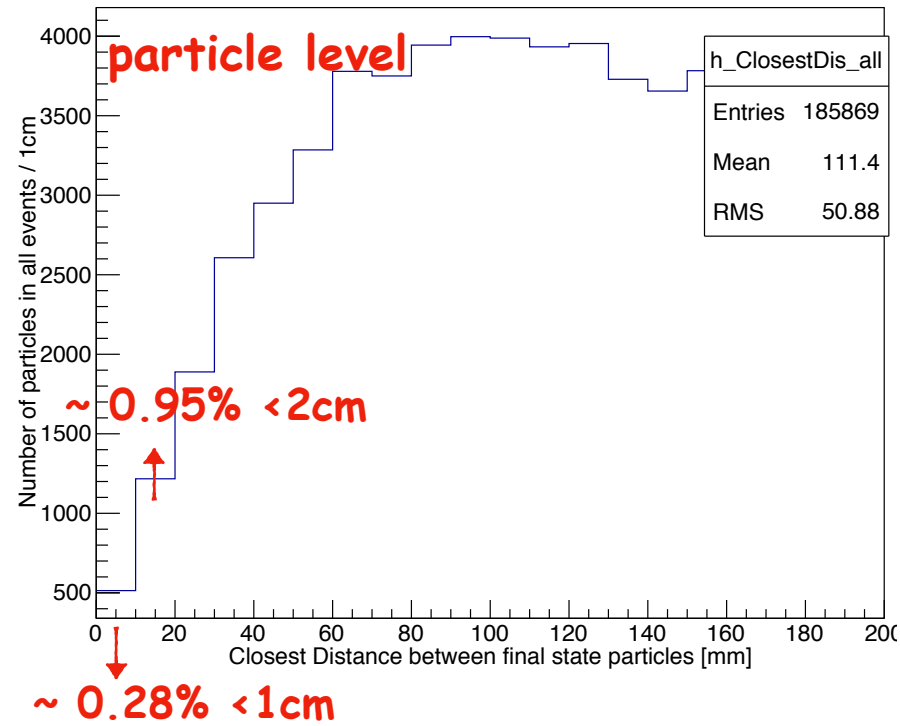
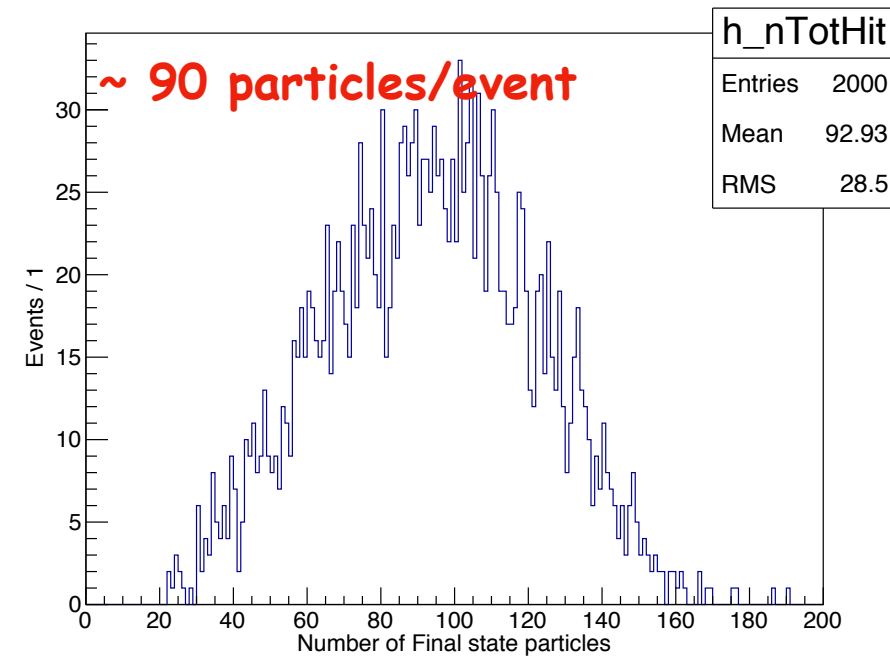
- $qqH \rightarrow qqZZ$ (has possibility to 6 jets)
- $qqH \rightarrow qqWW$ (has possibility to 6 jets)
- $bbH \rightarrow bbbb$ (4 jets)

Analysis level:

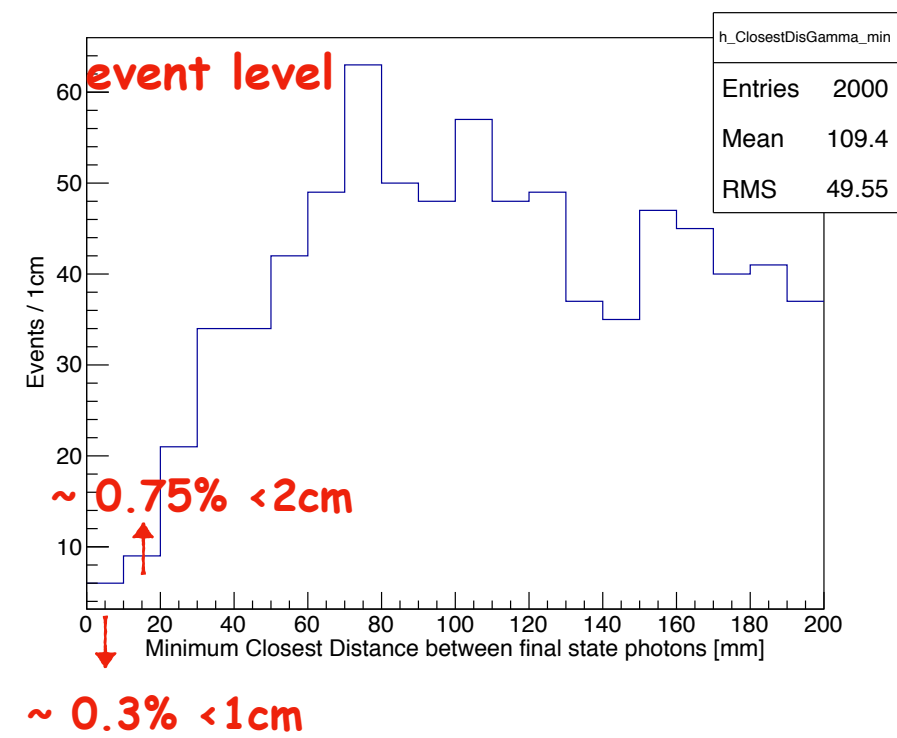
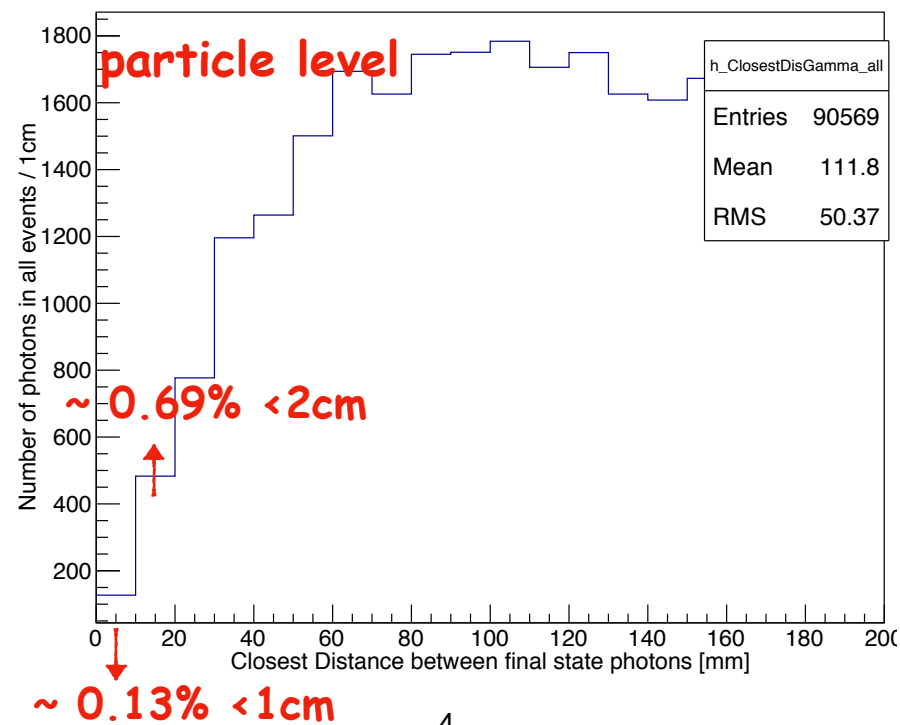
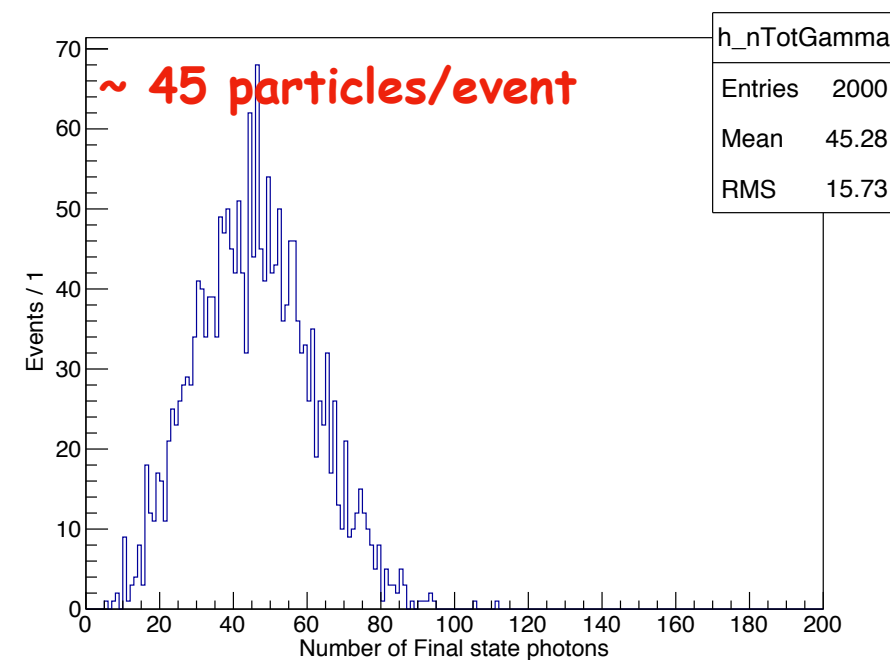
- Distribution of Closest Distance between all final state particles/photons
- Distribution of Number of cells with n particles/photon
 - at different cell size (1 strip crystal)
 - $40 \times 1 \text{ cm}^2$
 - $40 \times 2 \text{ cm}^2$
 - $60 \times 2 \text{ cm}^2$

qqH- > qqZZ (6 jets)

All final state particles

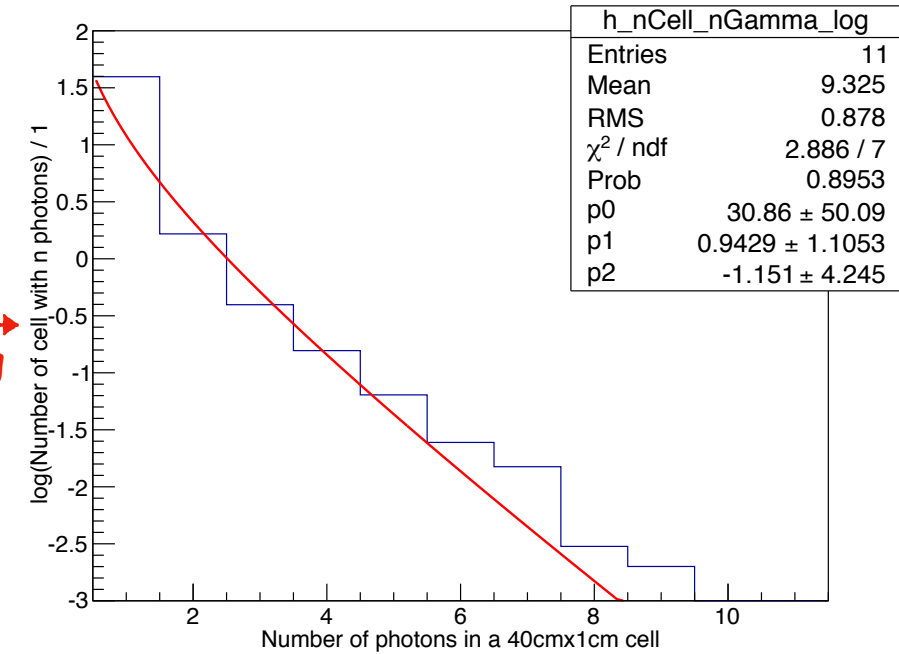
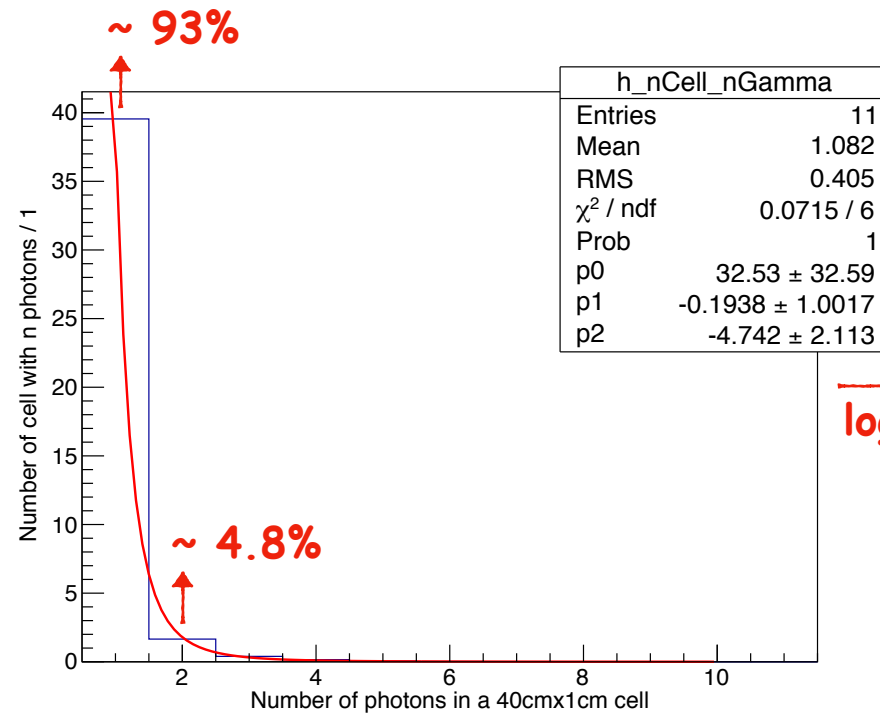
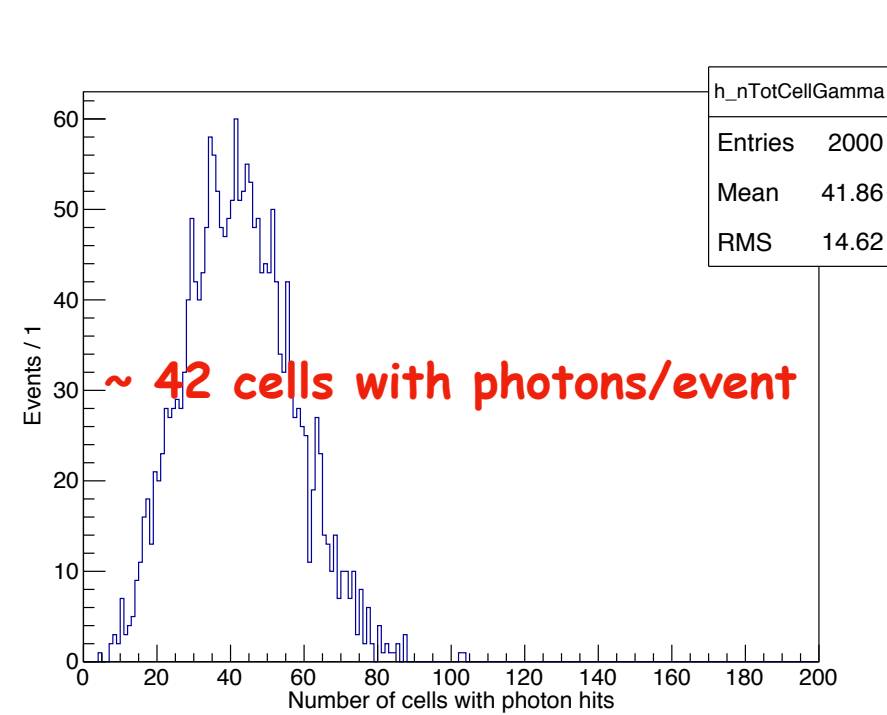
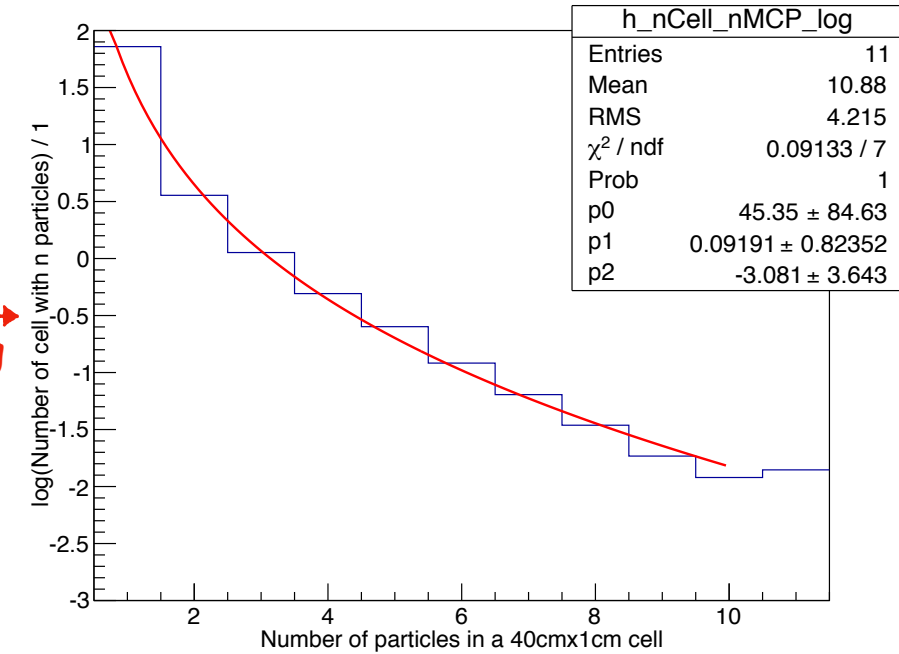
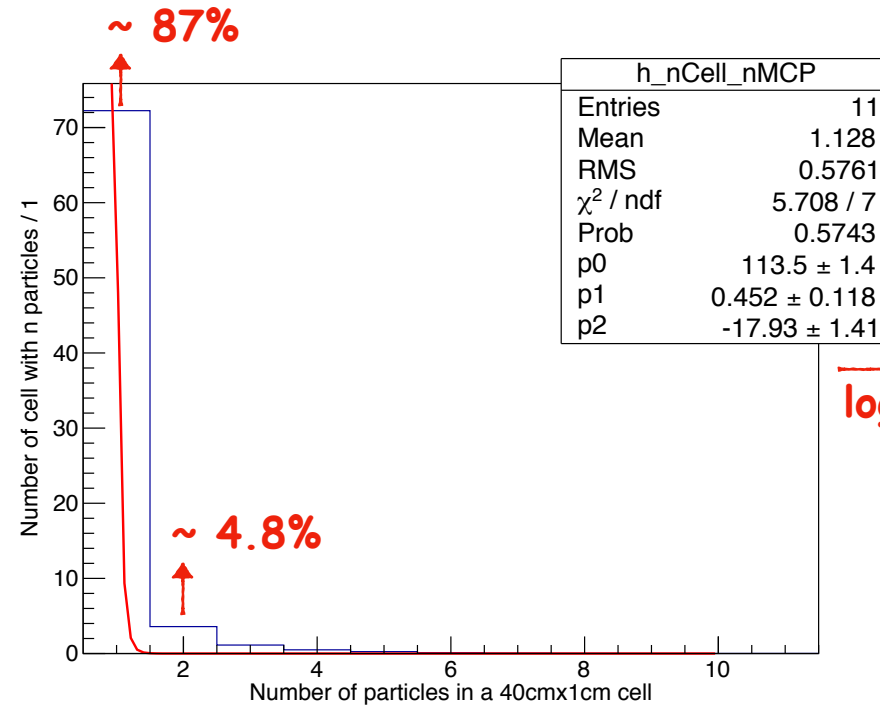
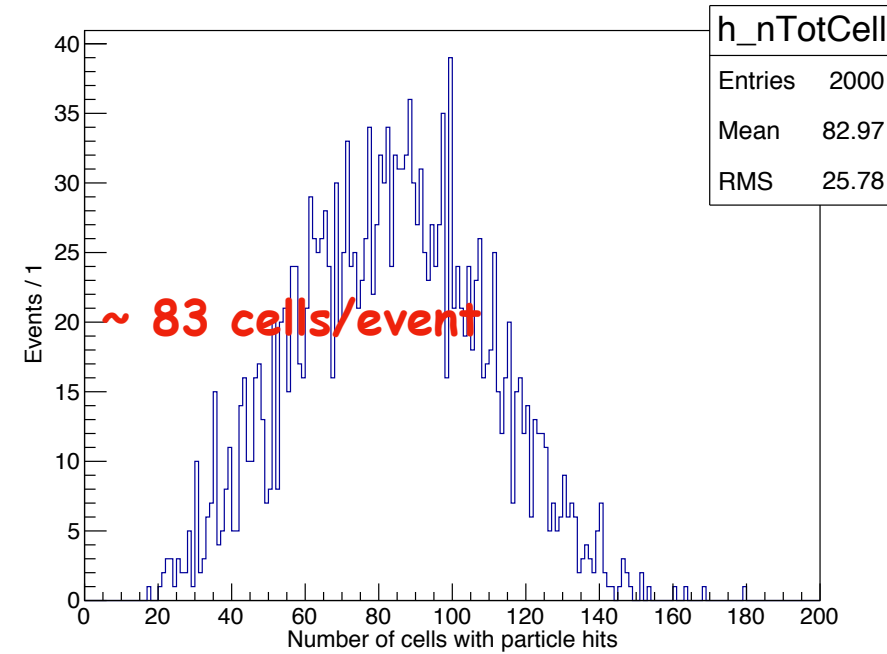


Only final state photons



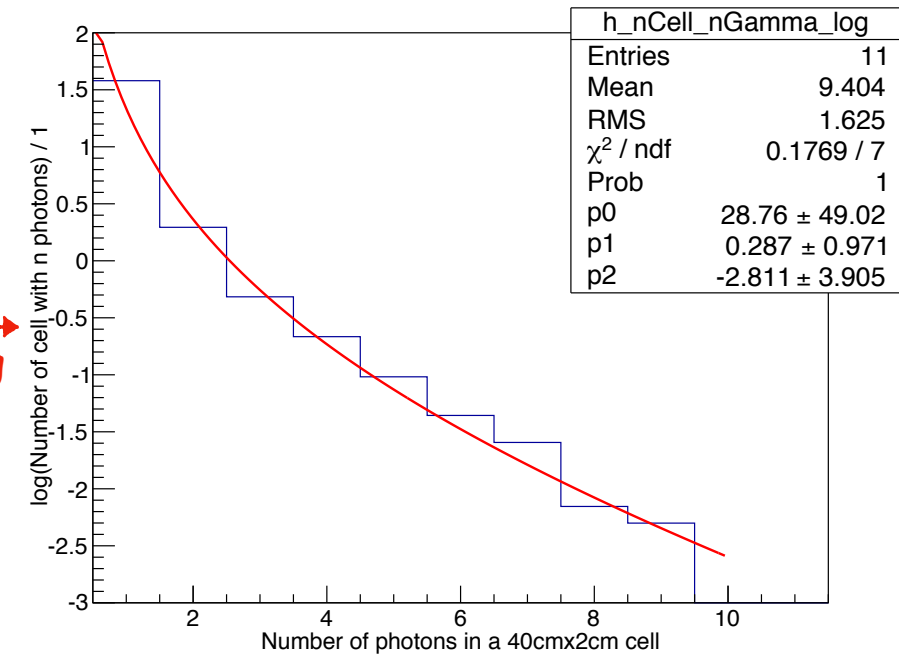
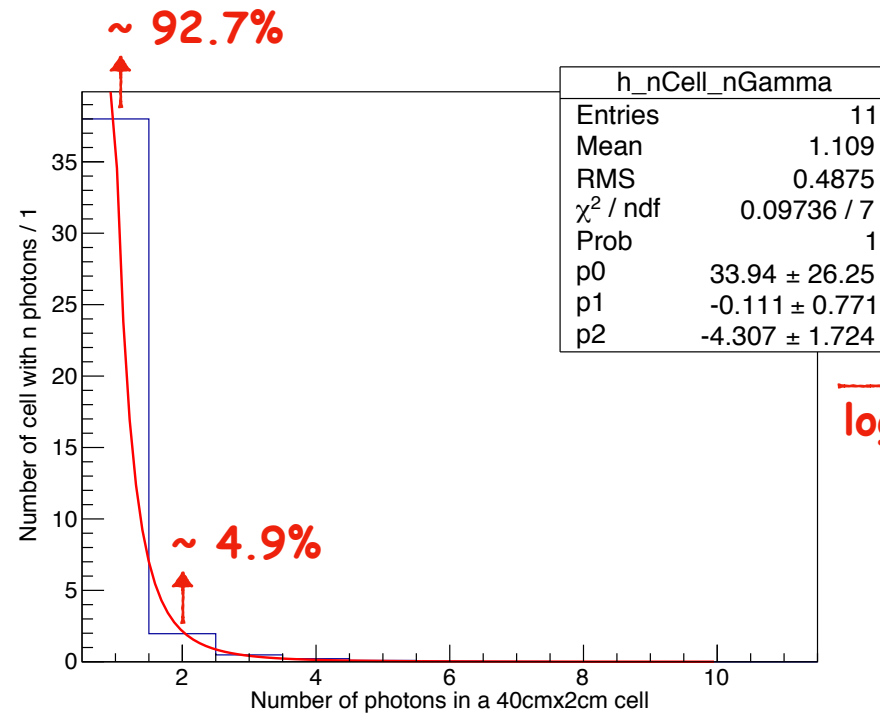
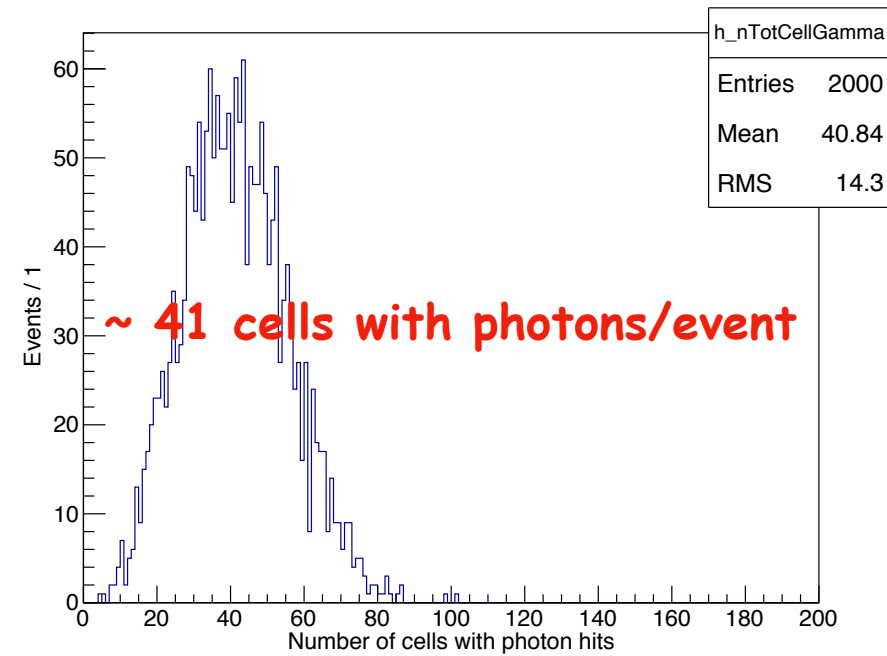
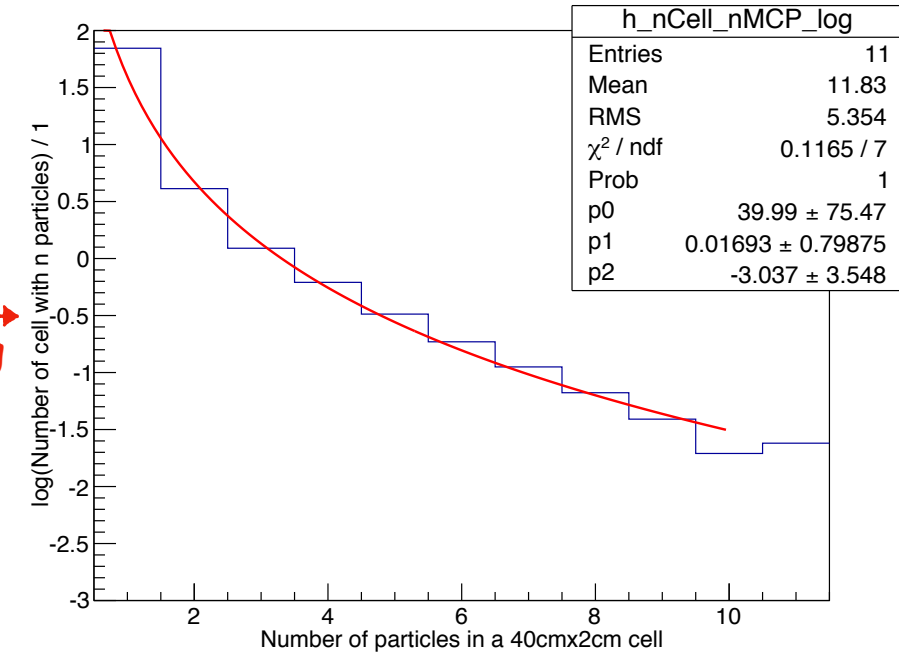
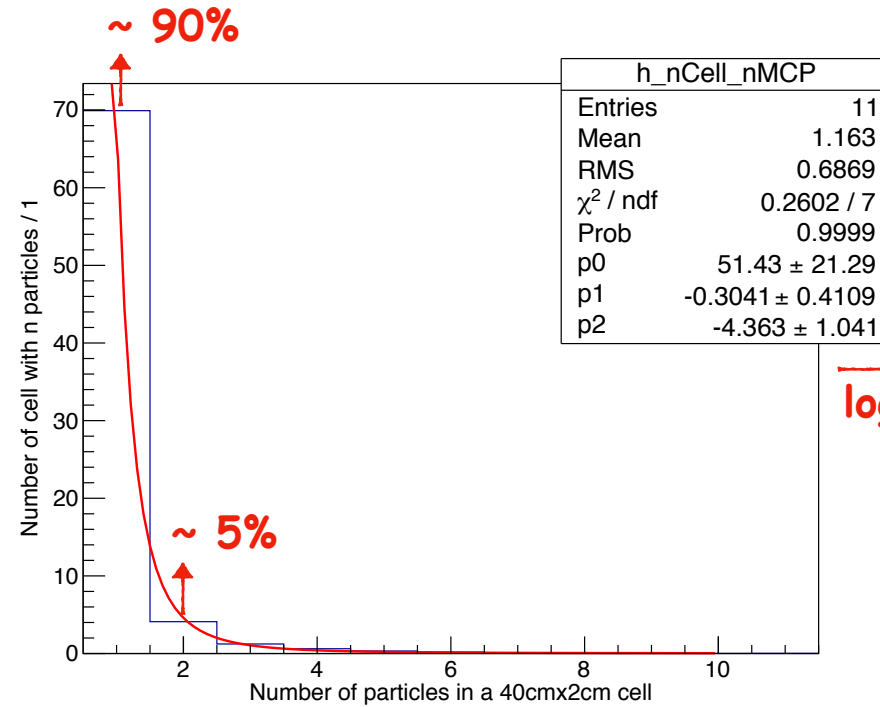
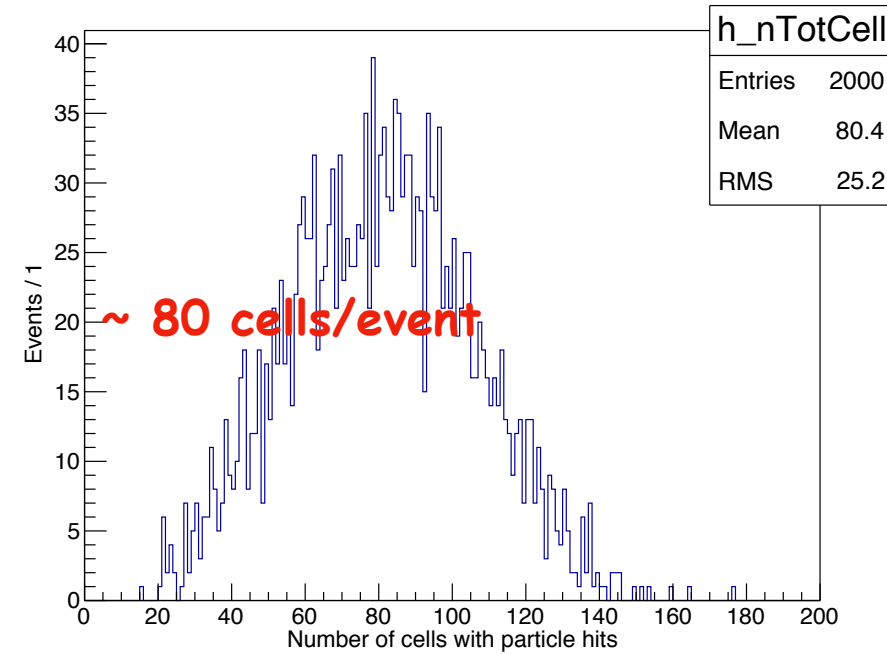
qqH- > qqZZ (6 jets)

Cell Size: 40x1cm²



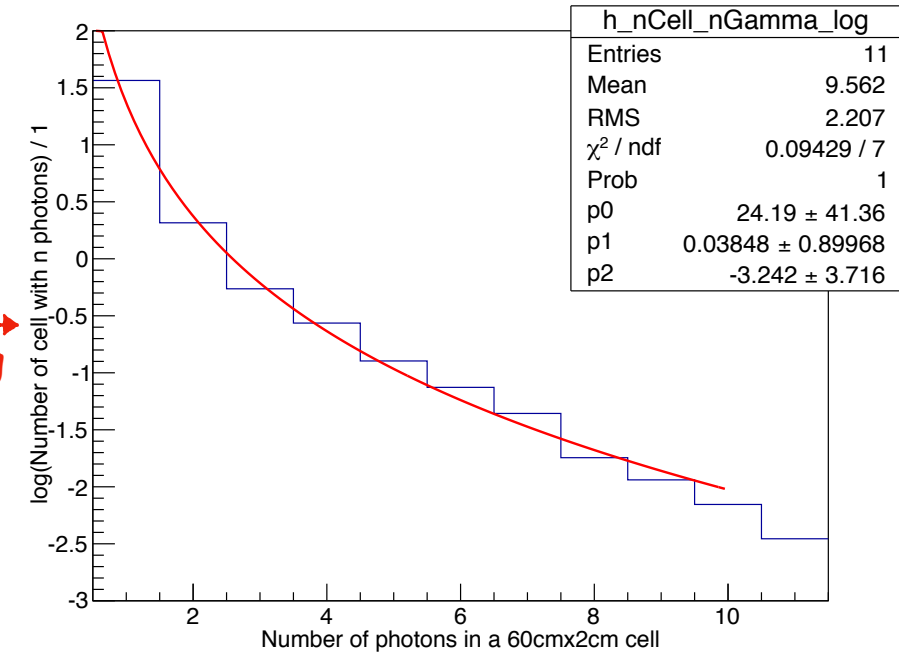
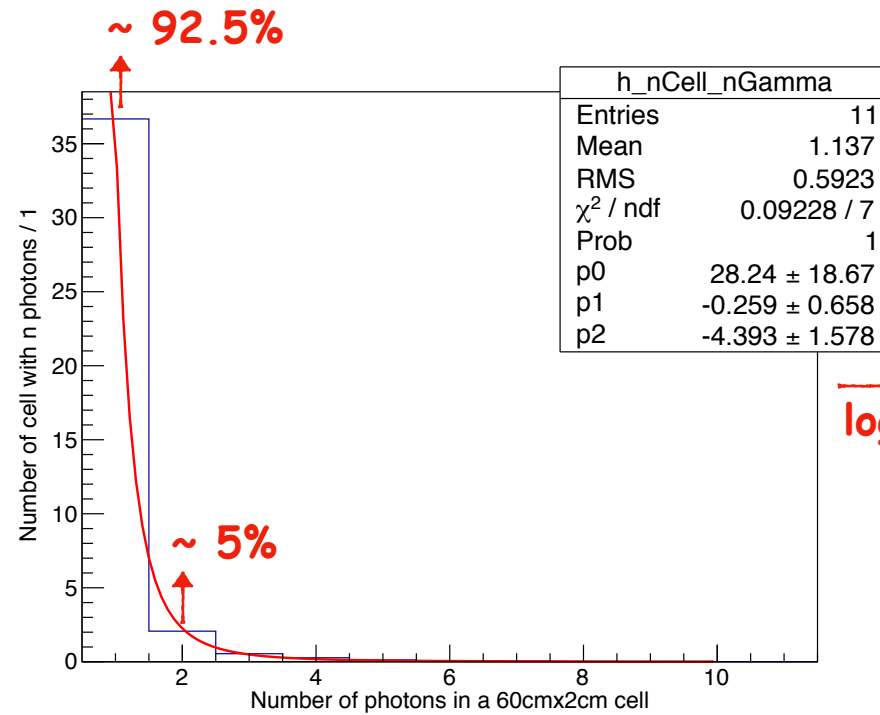
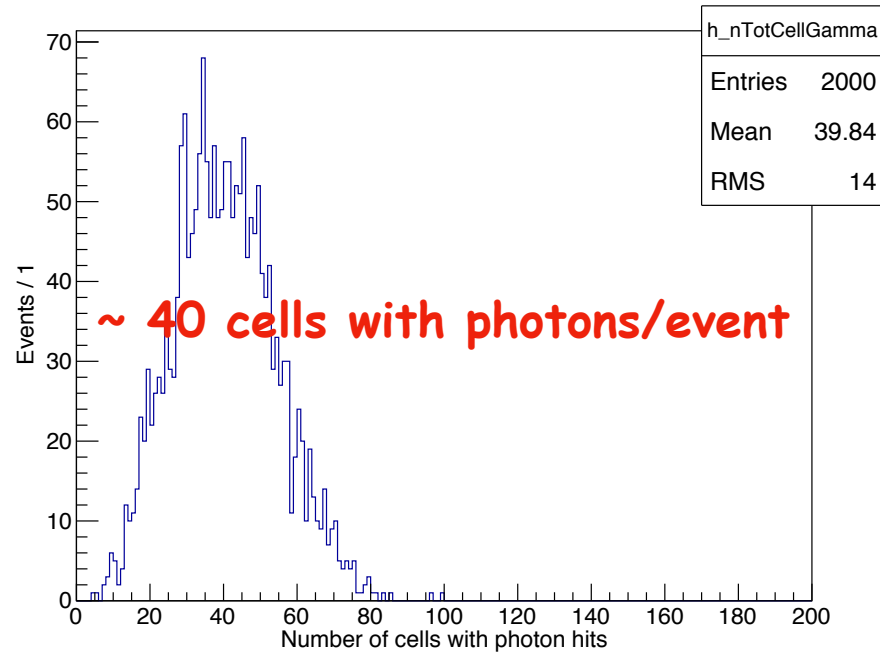
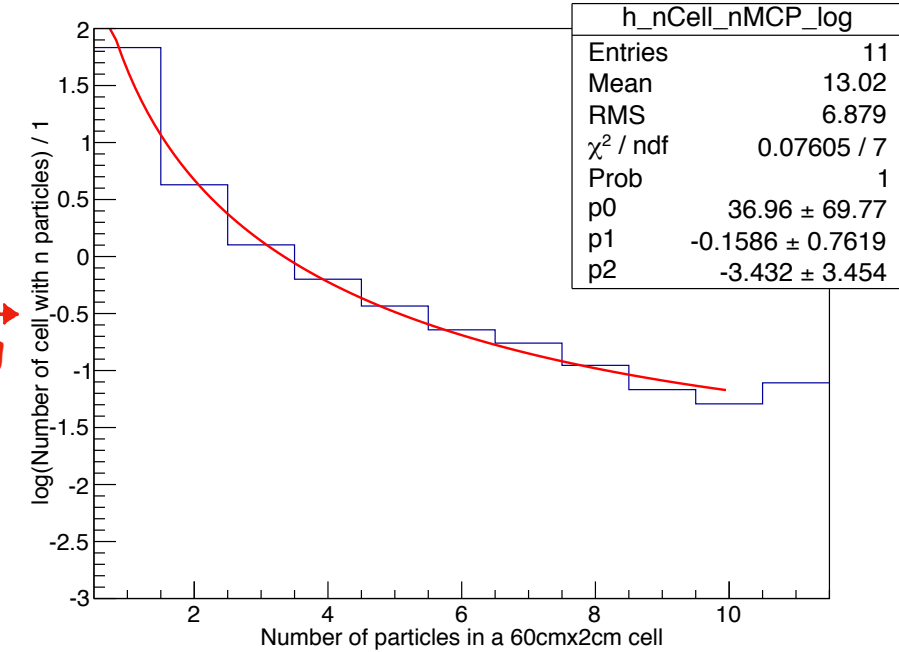
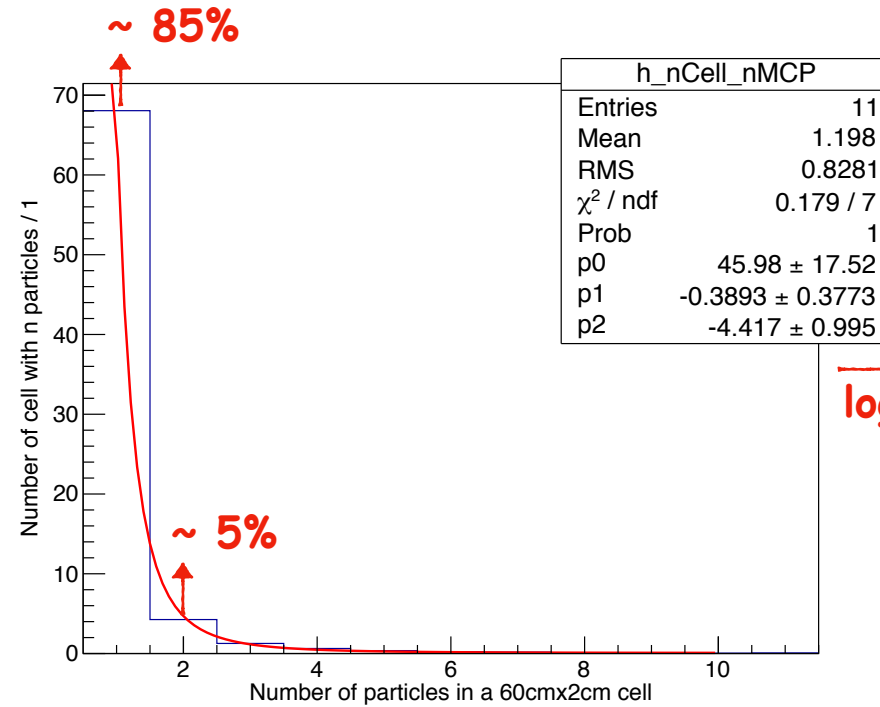
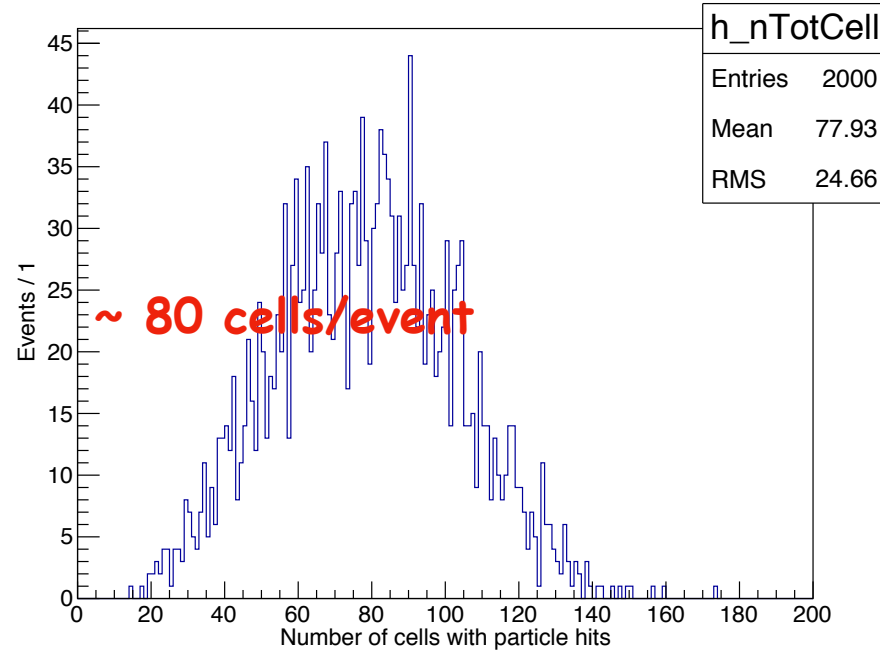
qqH- > qqZZ (6 jets)

Cell Size: 40x2cm²



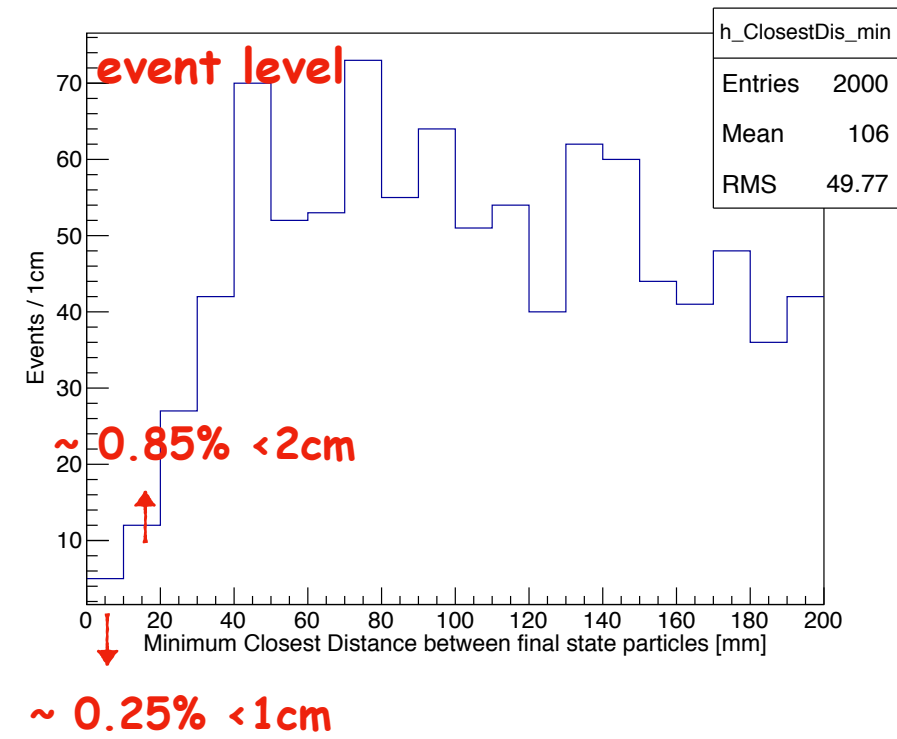
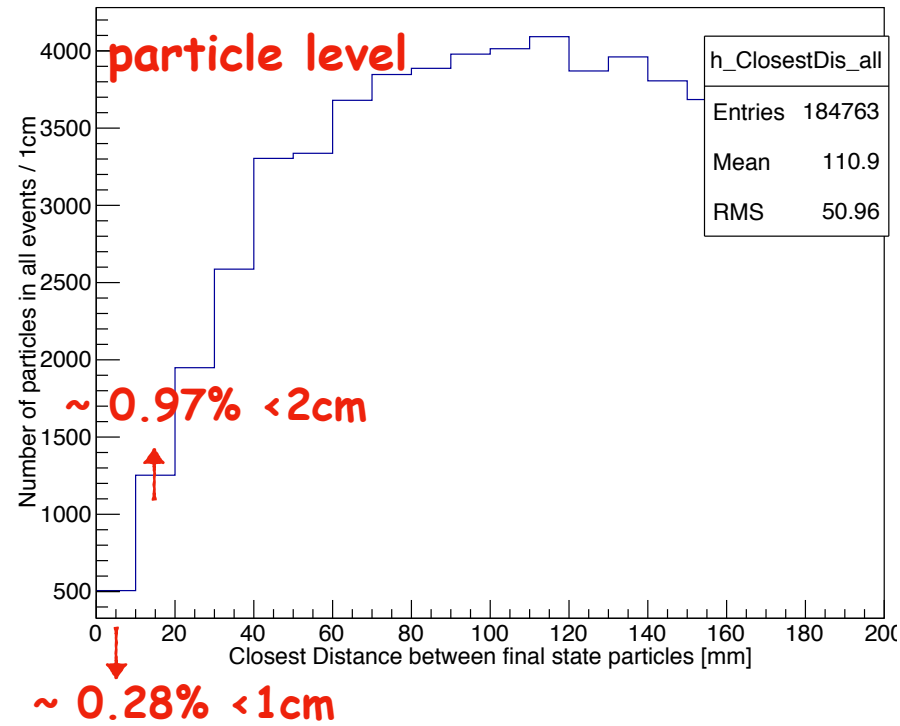
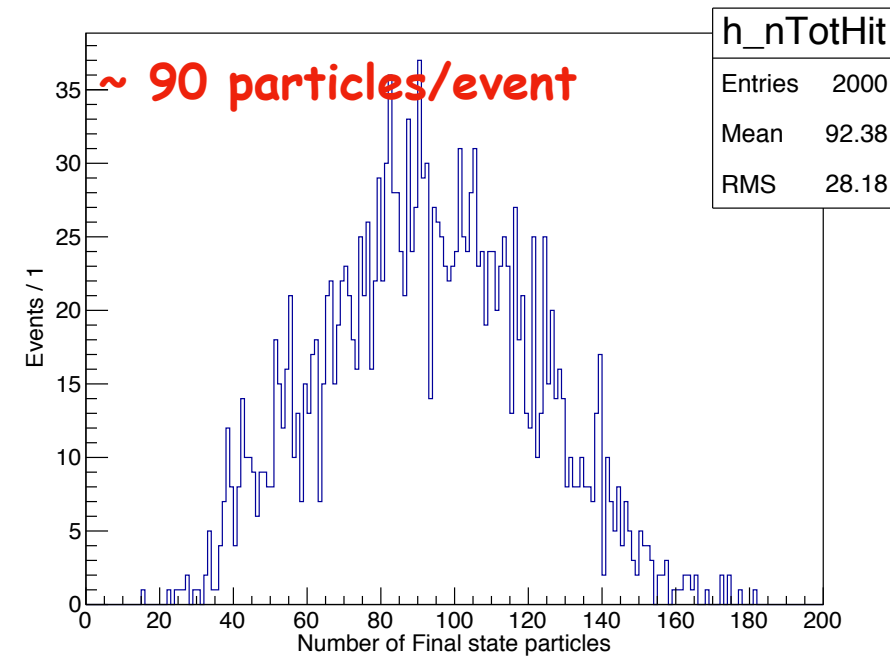
qqH- > qqZZ (6 jets)

Cell Size: 60x2cm²

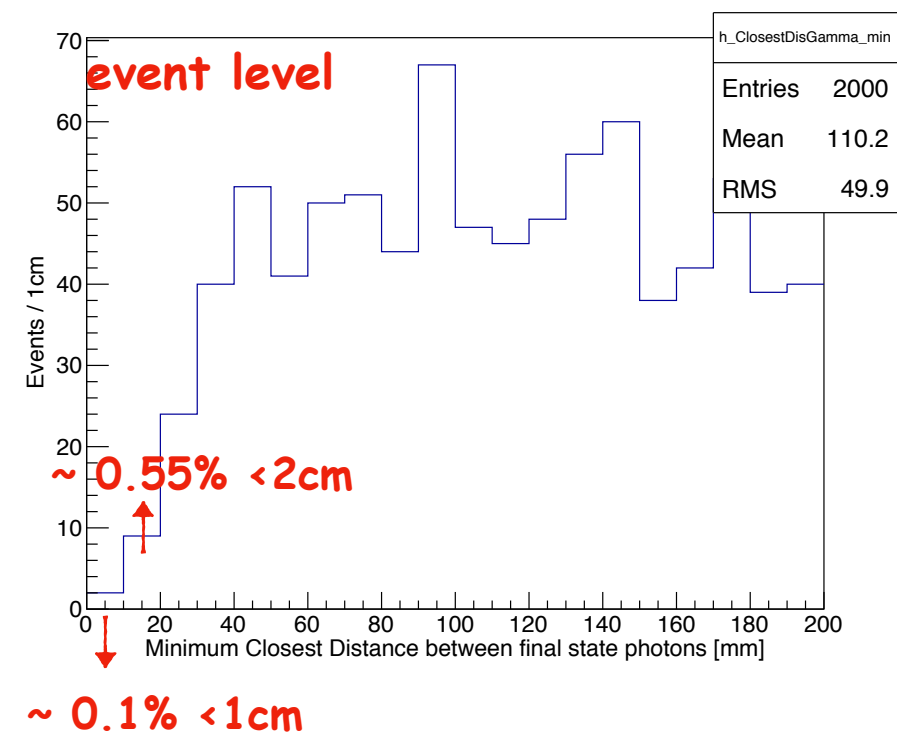
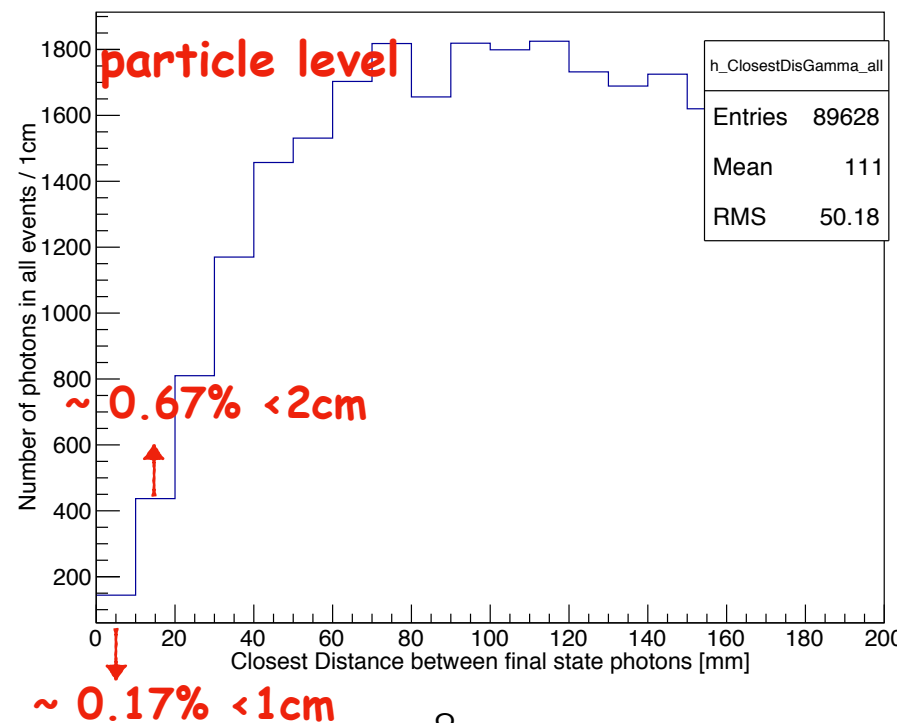
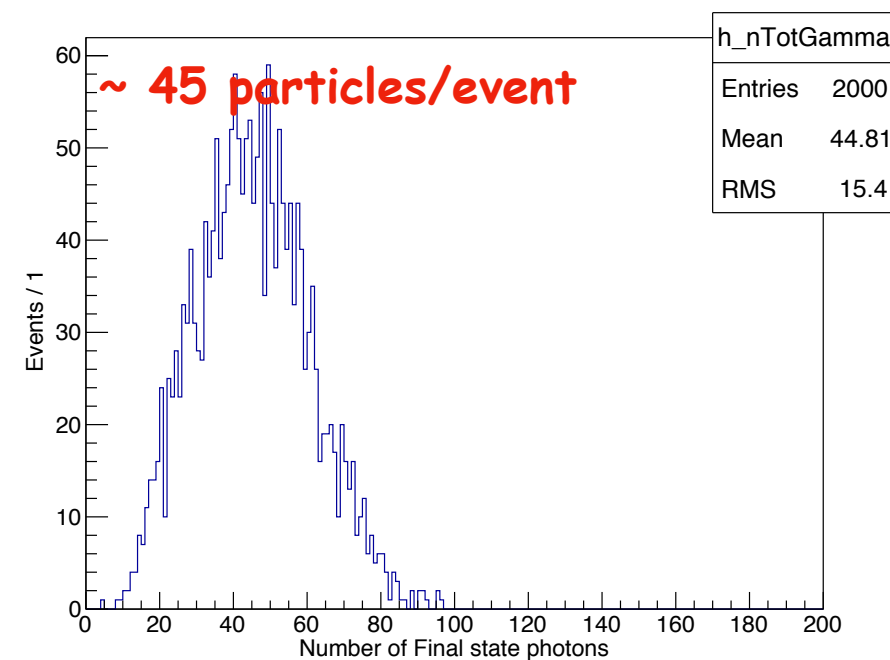


qqH- > qqWW (6 jets)

All final state particles

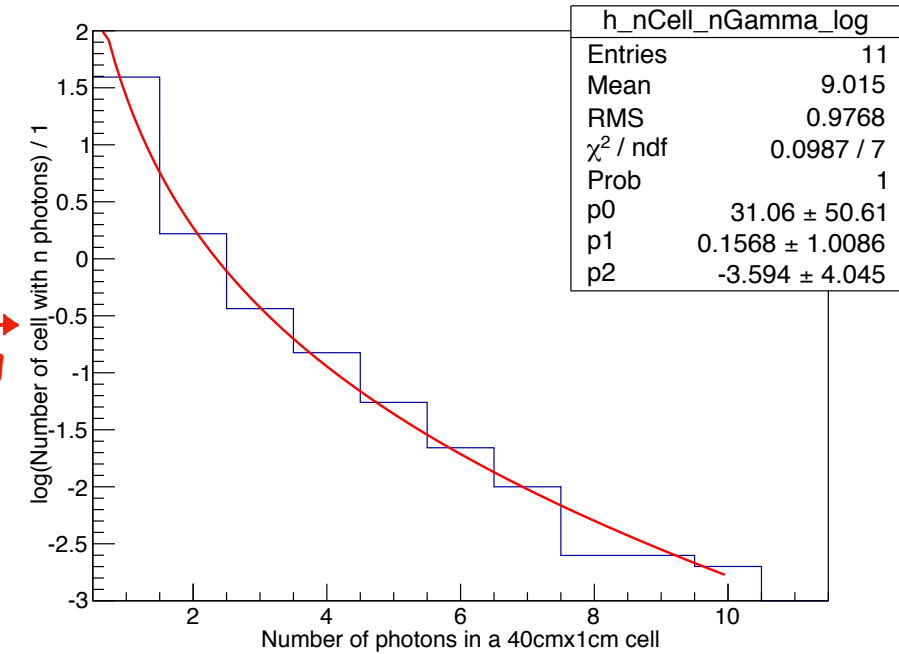
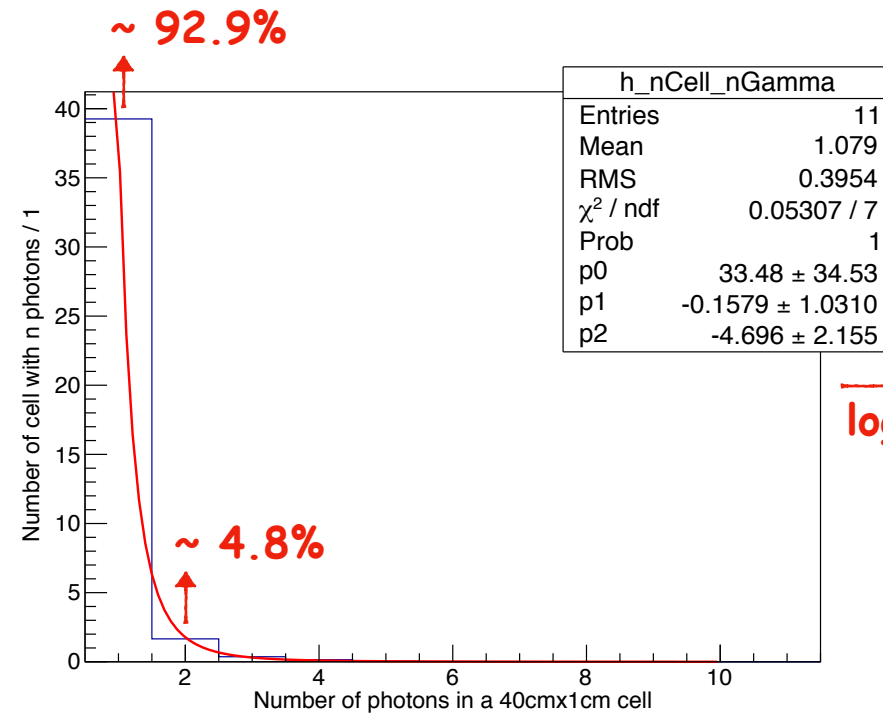
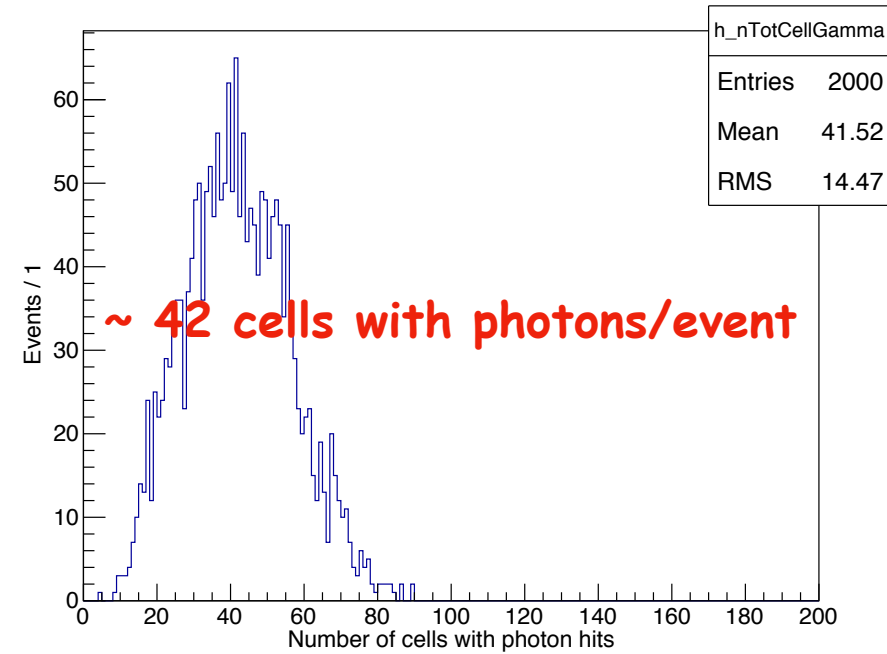
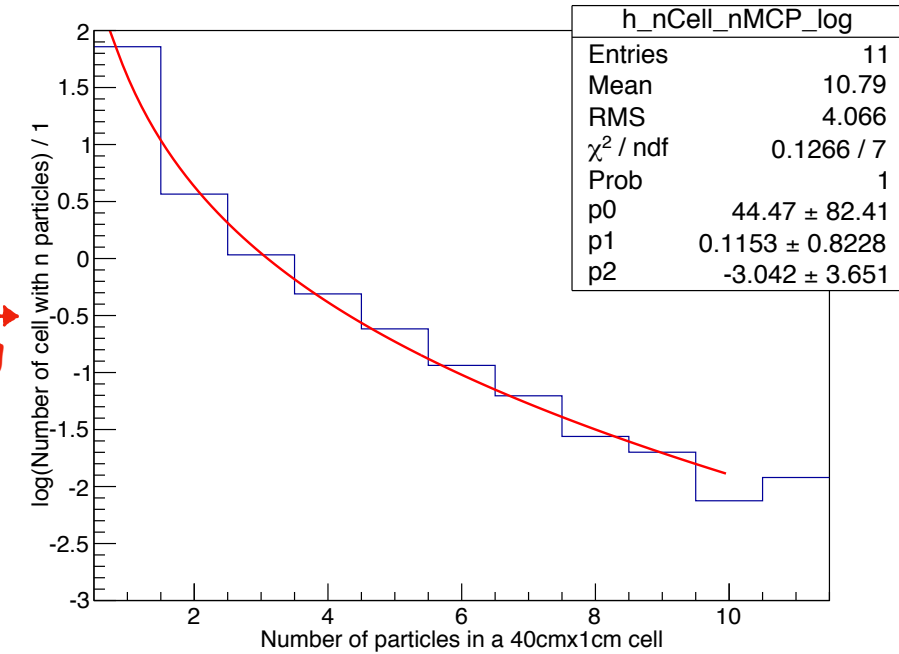
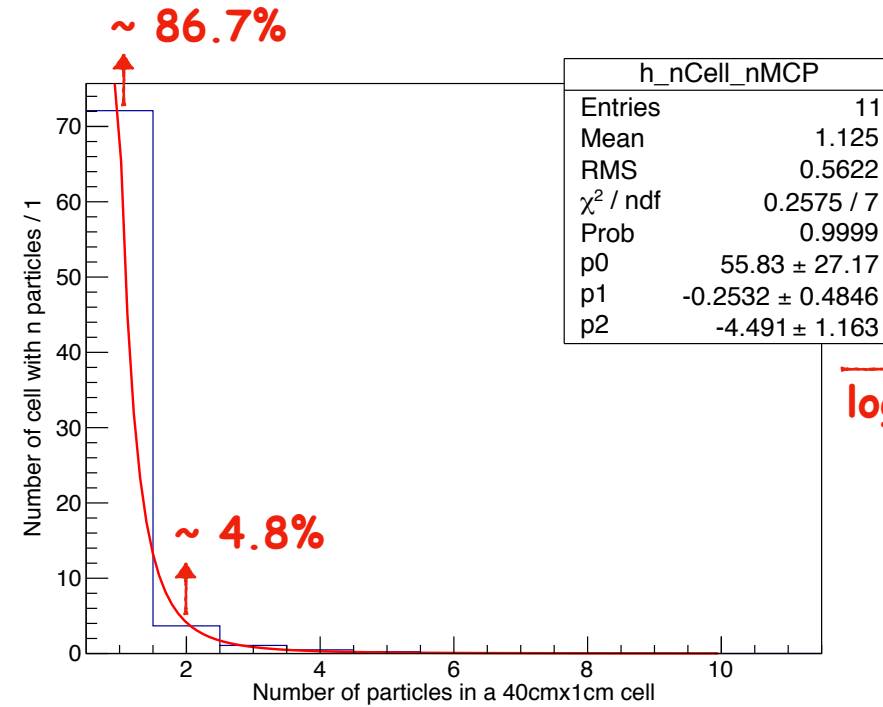
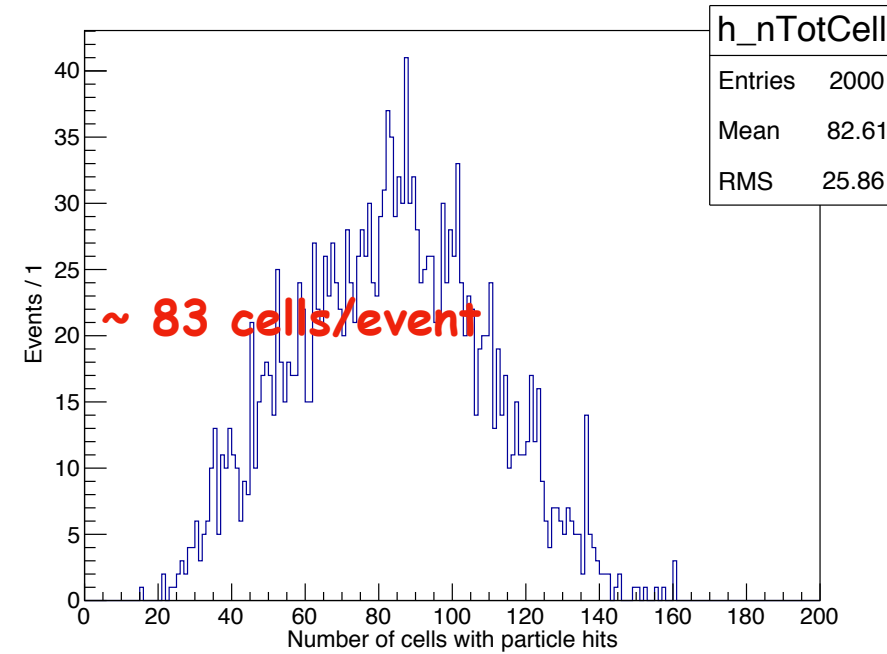


Only final state photons



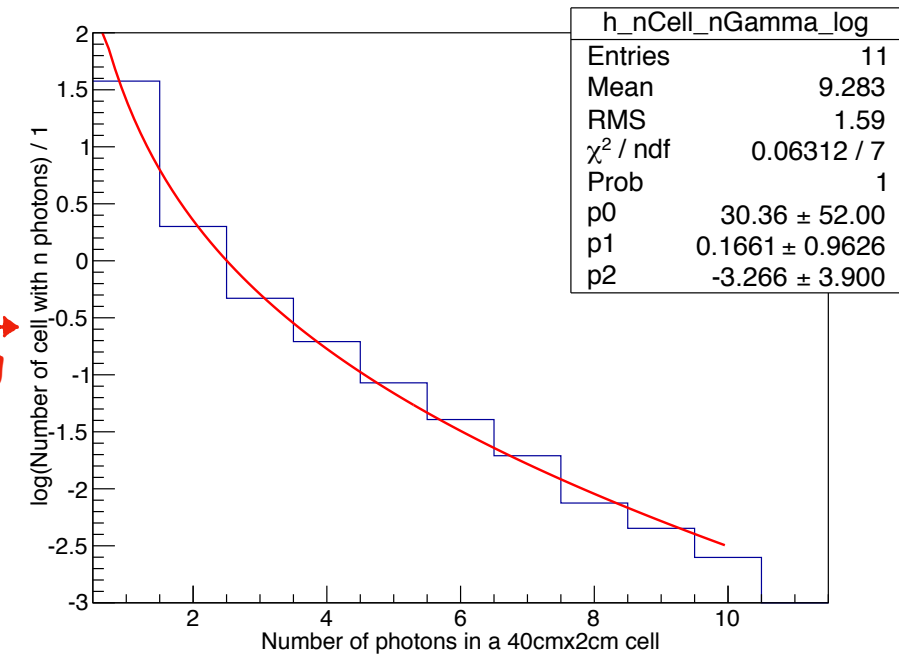
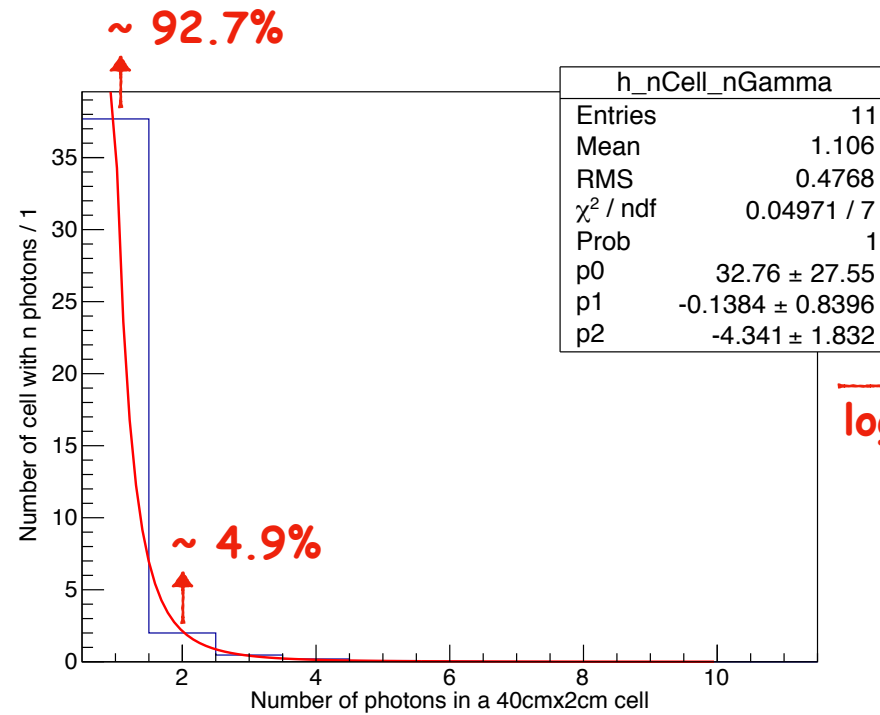
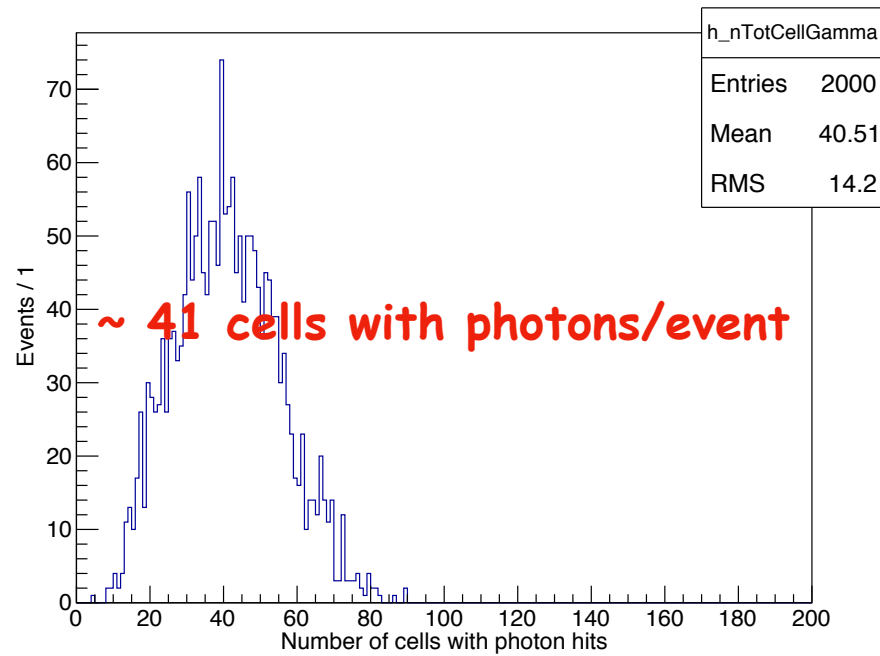
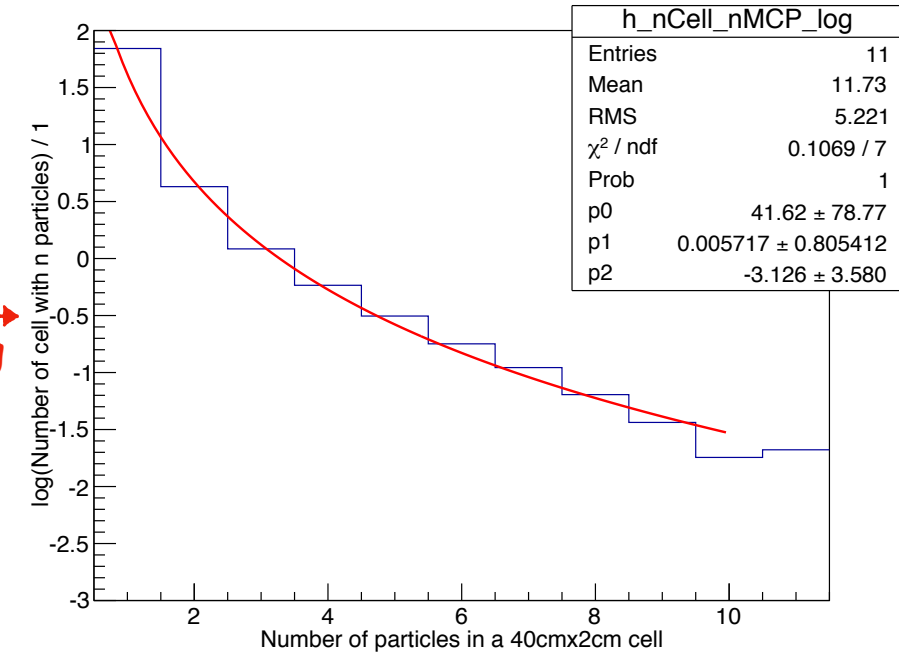
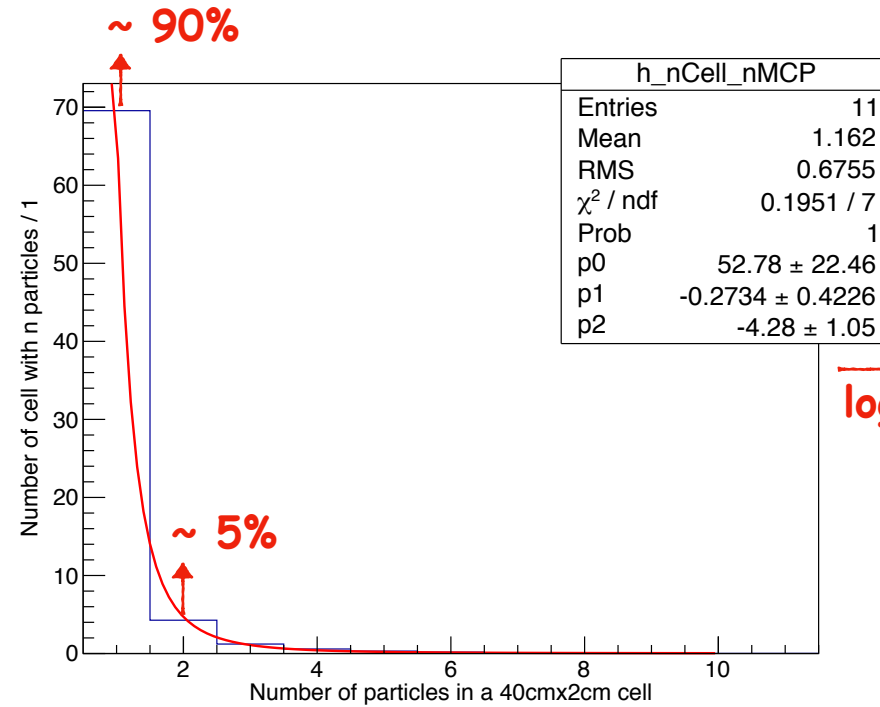
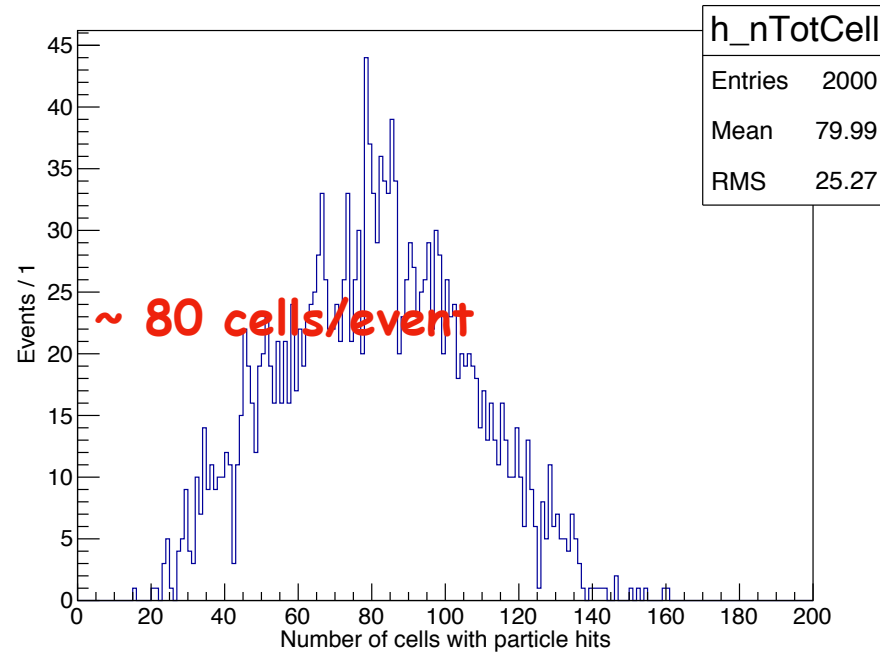
qqH- > qqWW (6 jets)

Cell Size: 40x1cm²



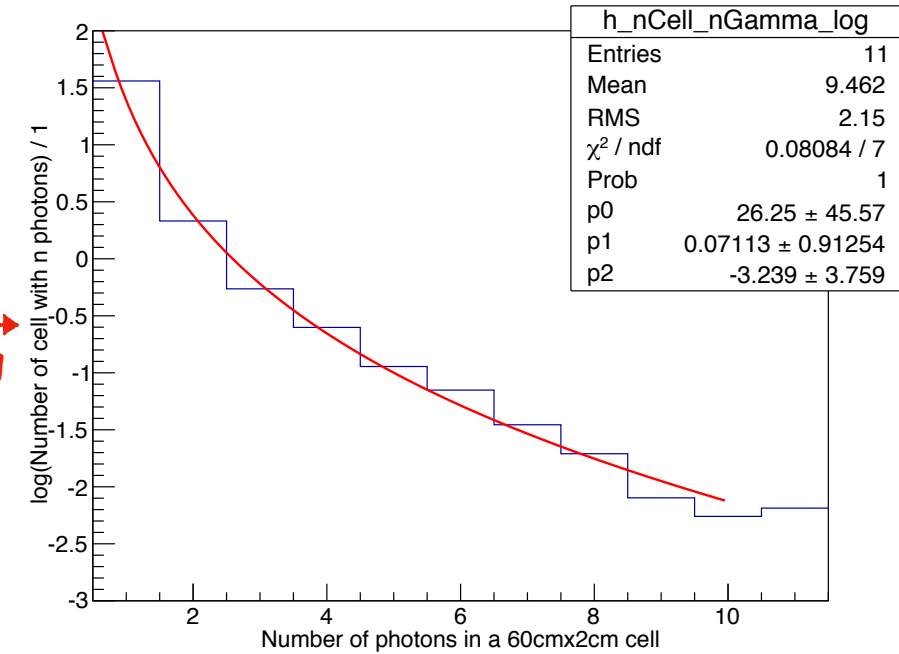
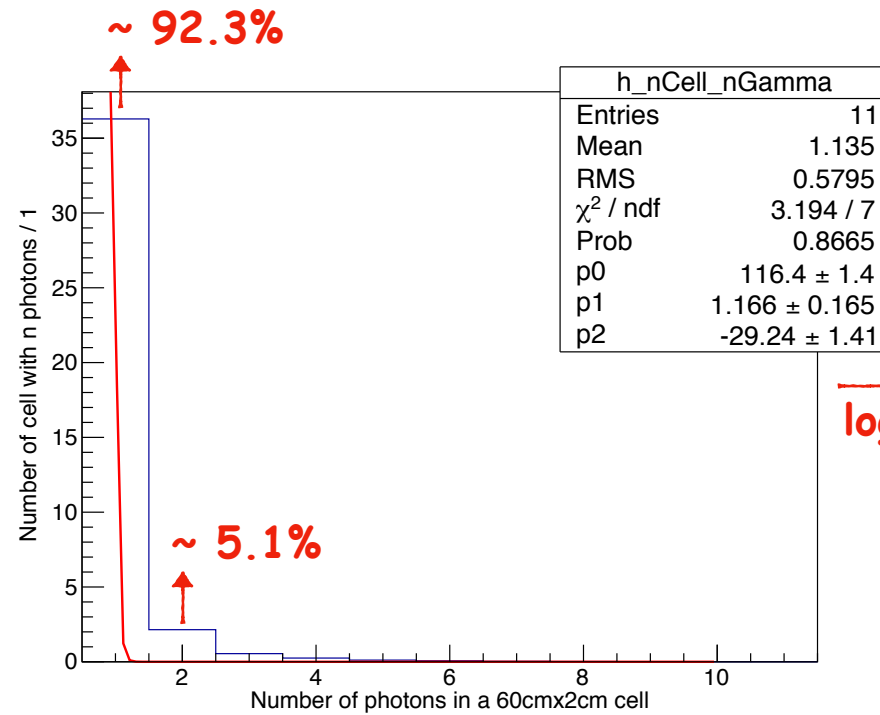
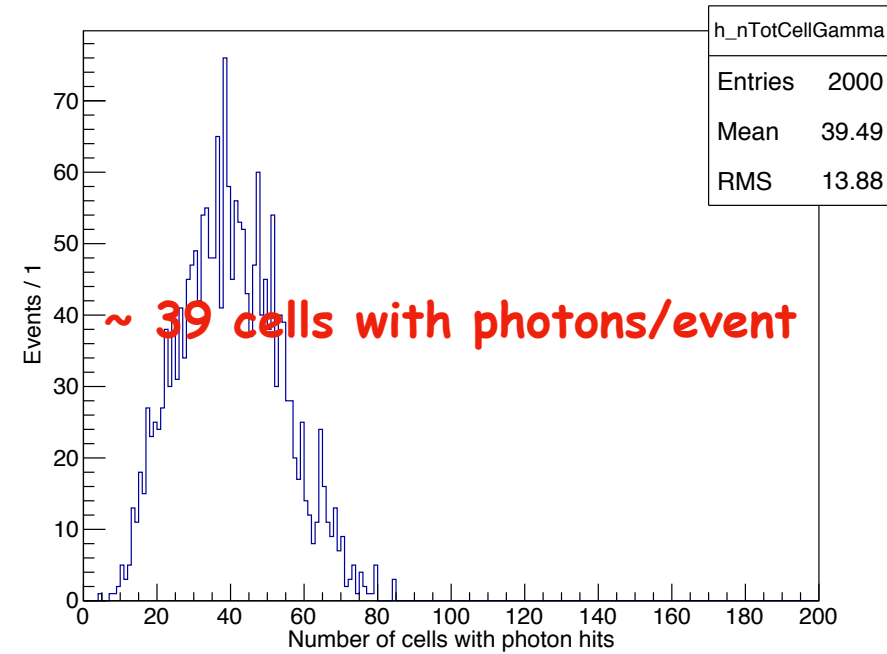
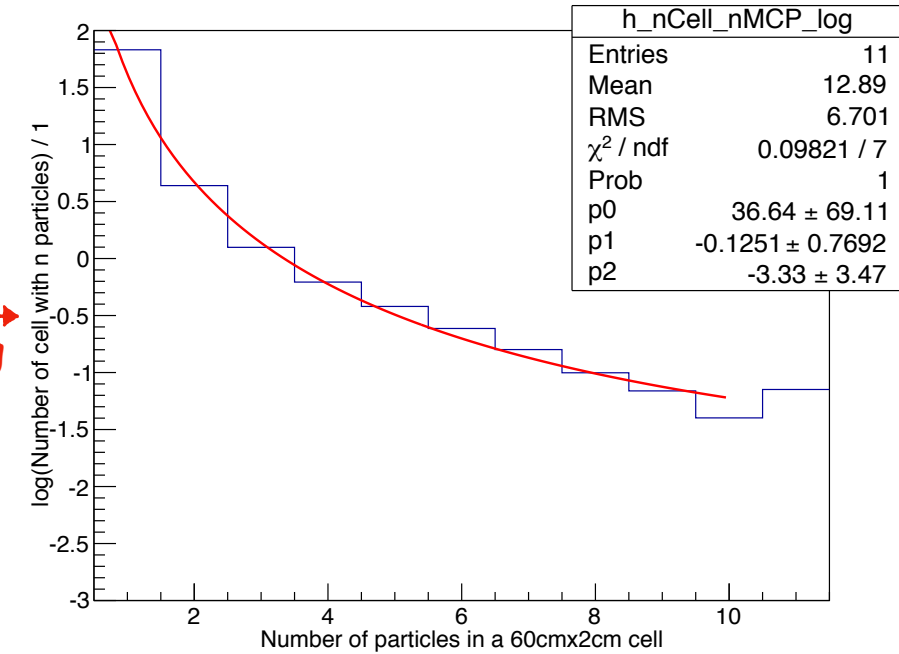
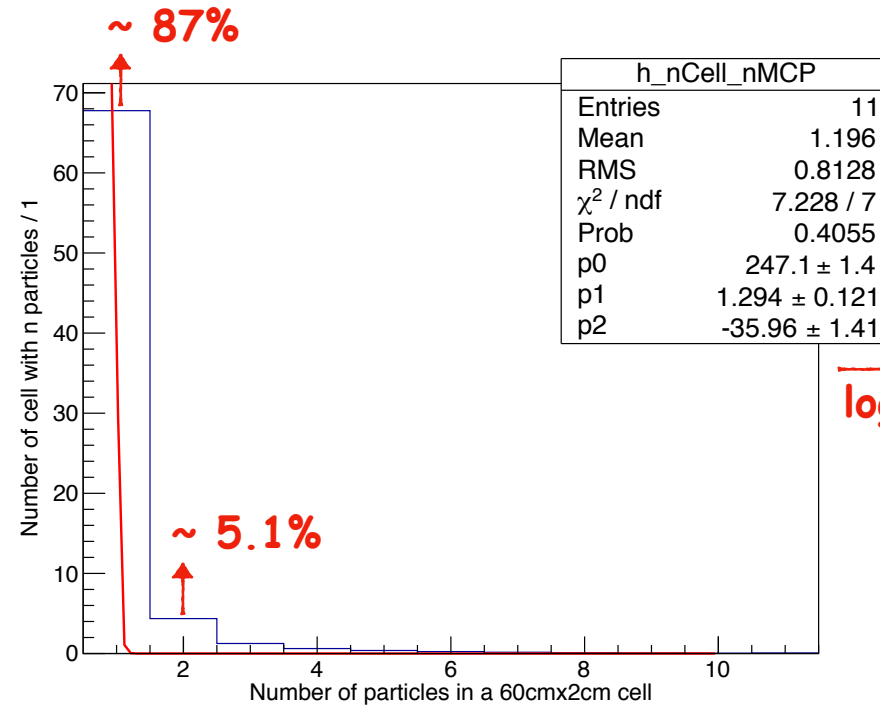
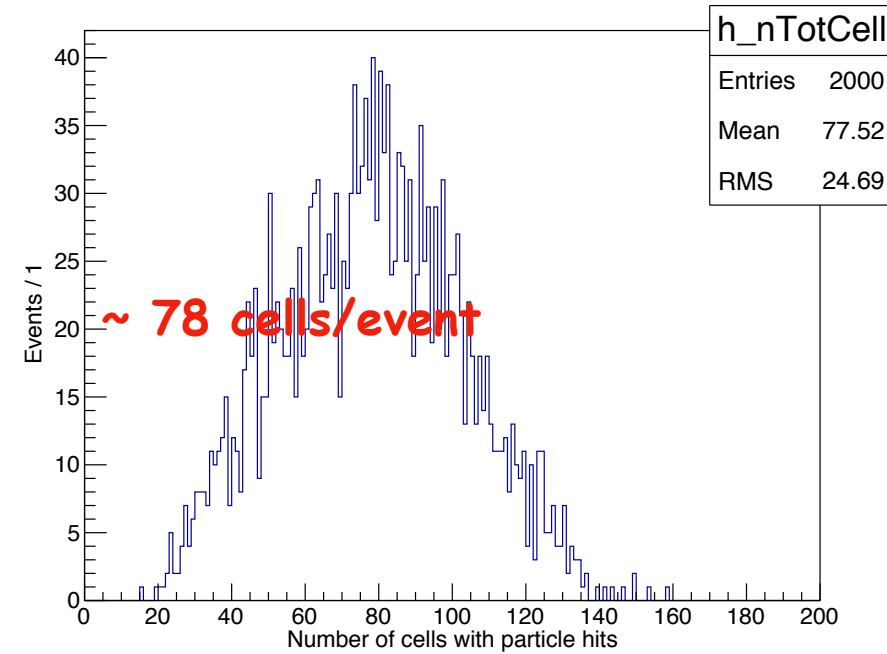
qqH- > qqWW (6 jets)

Cell Size: 40x2cm²



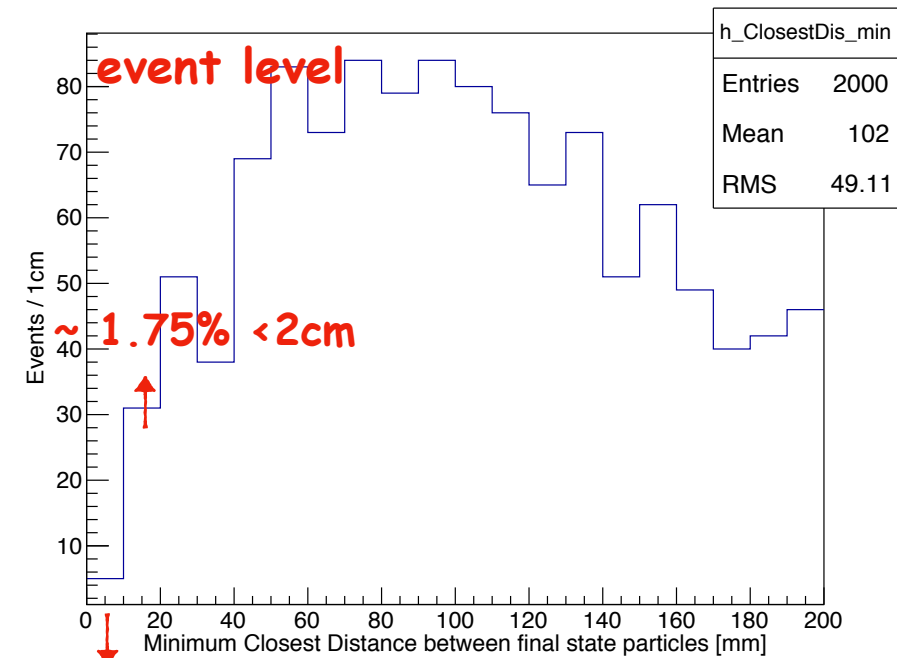
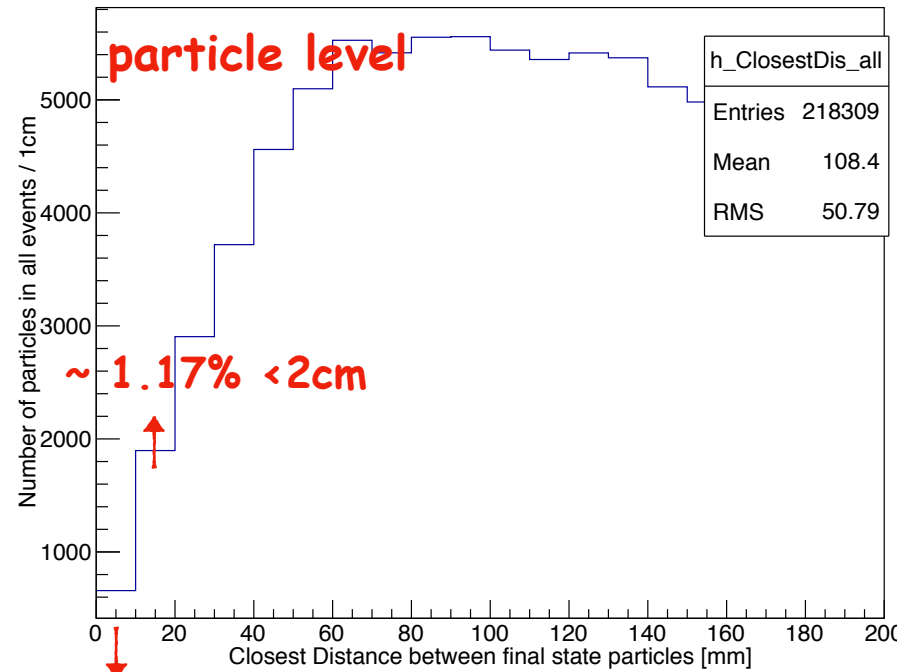
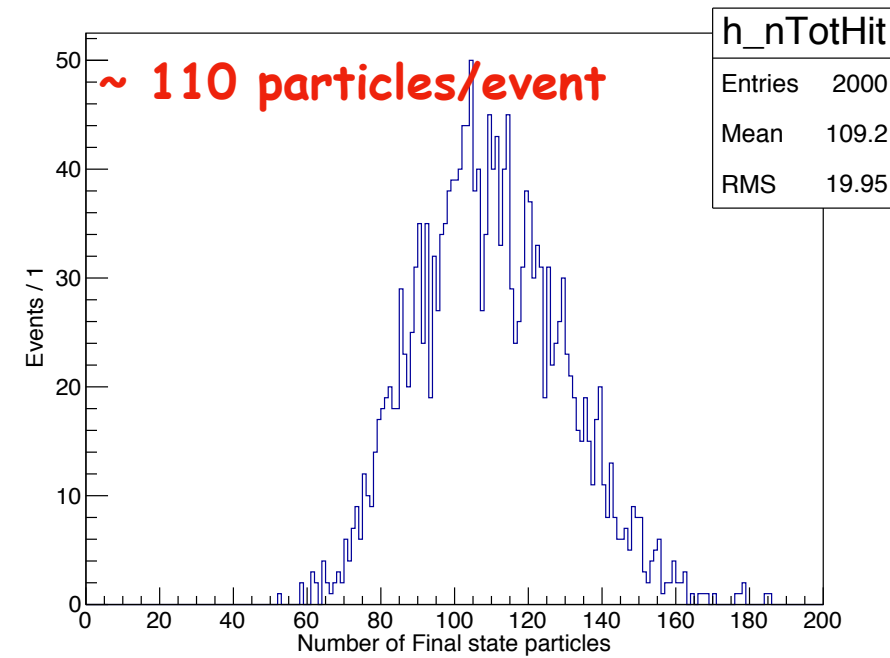
qqH- > qqWW (6 jets)

Cell Size: 60x2cm²



bbH->bbbb (4 jets)

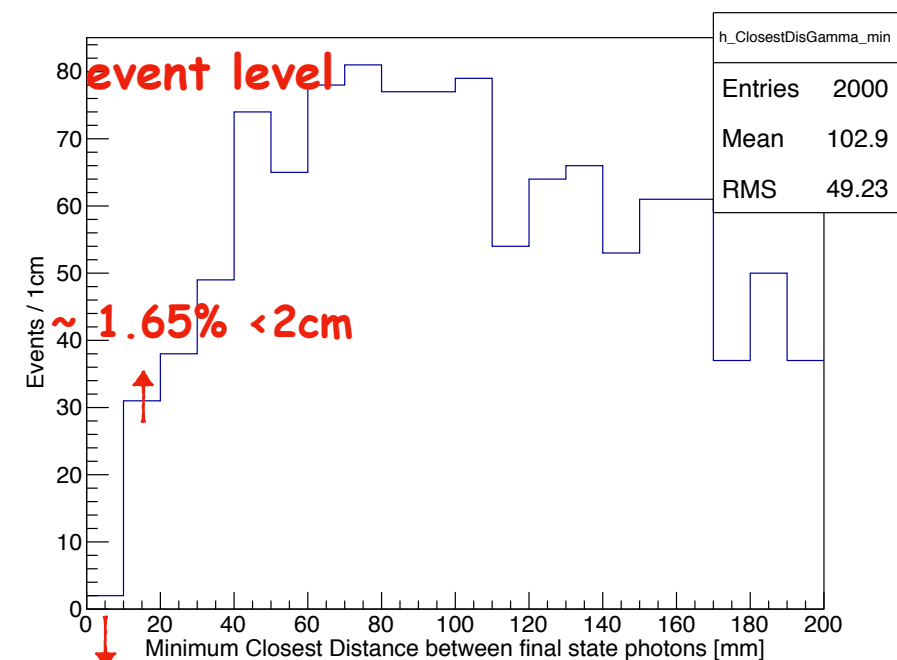
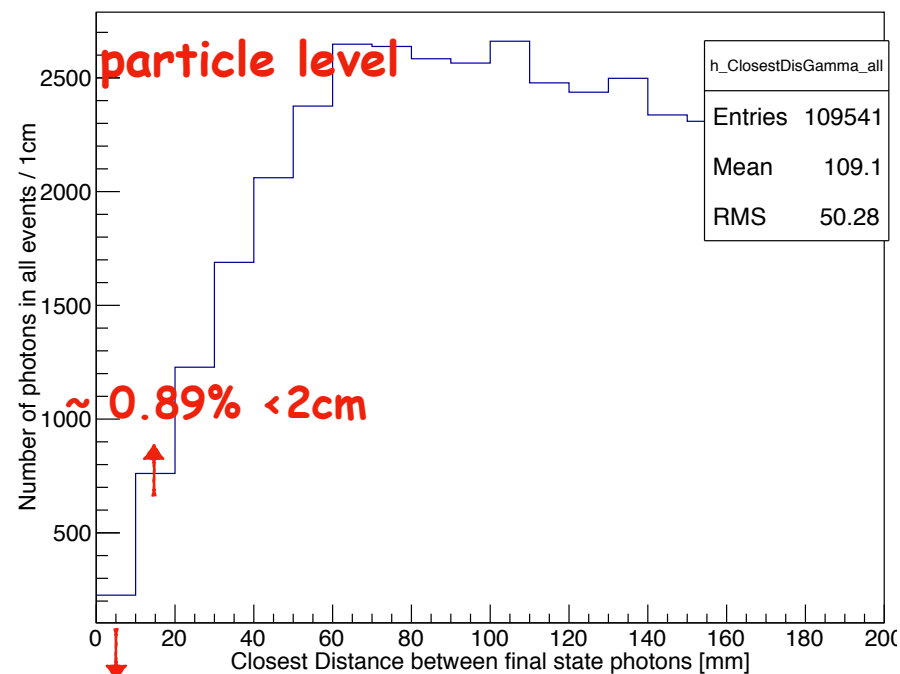
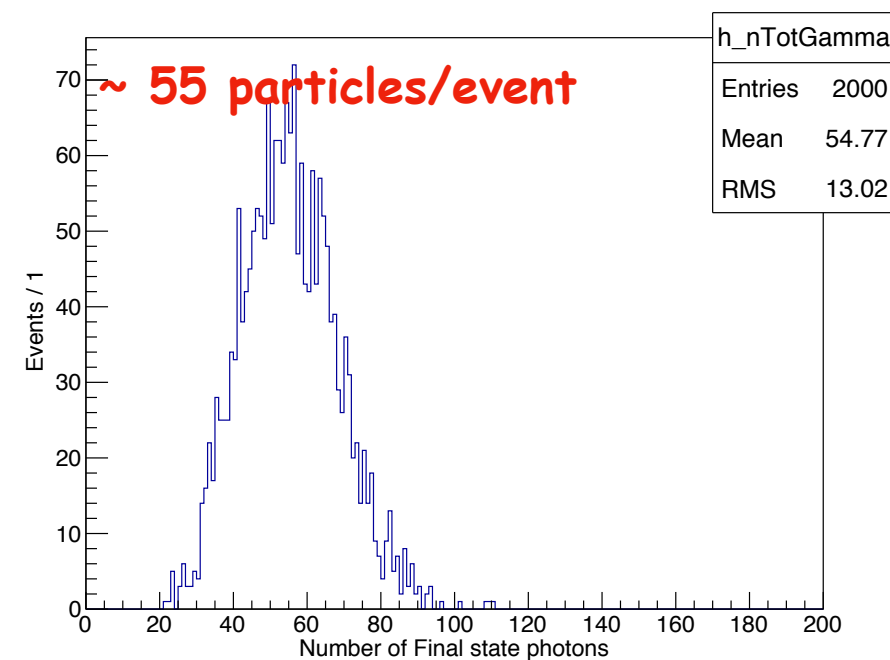
All final state particles



~ 0.3% < 1cm

~ 0.25% < 1cm

Only final state photons

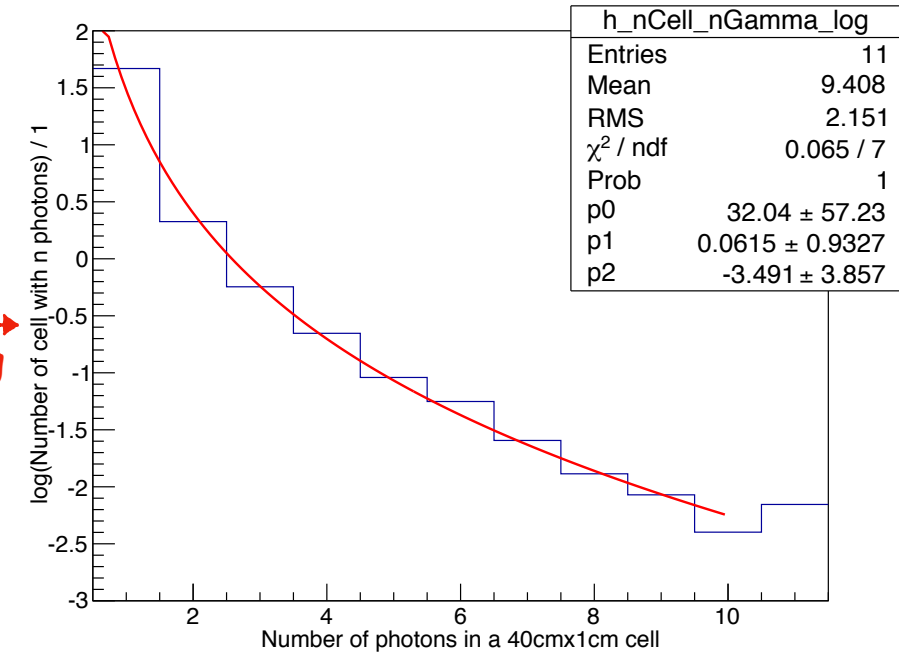
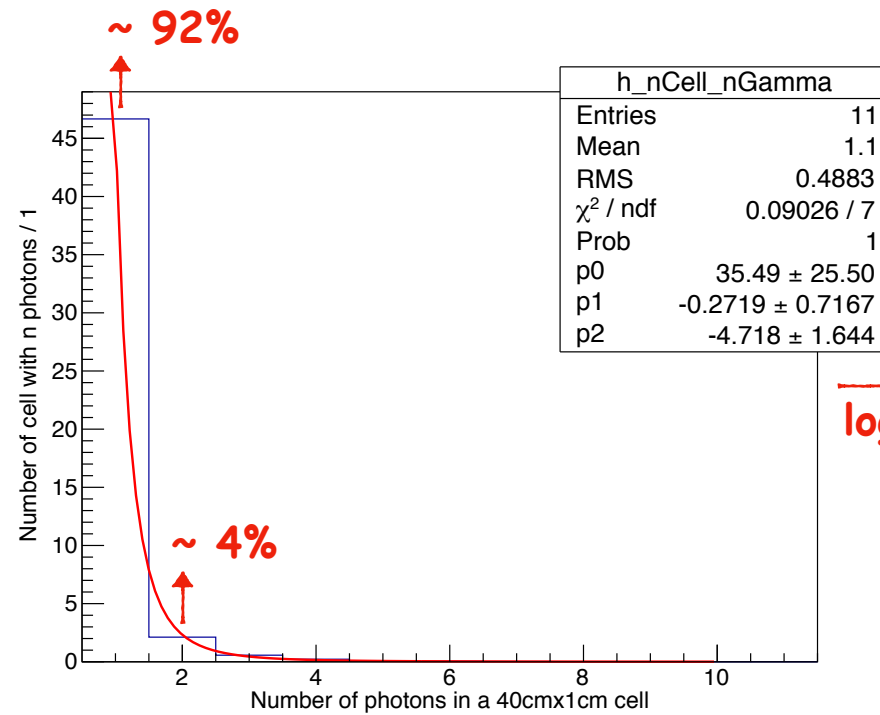
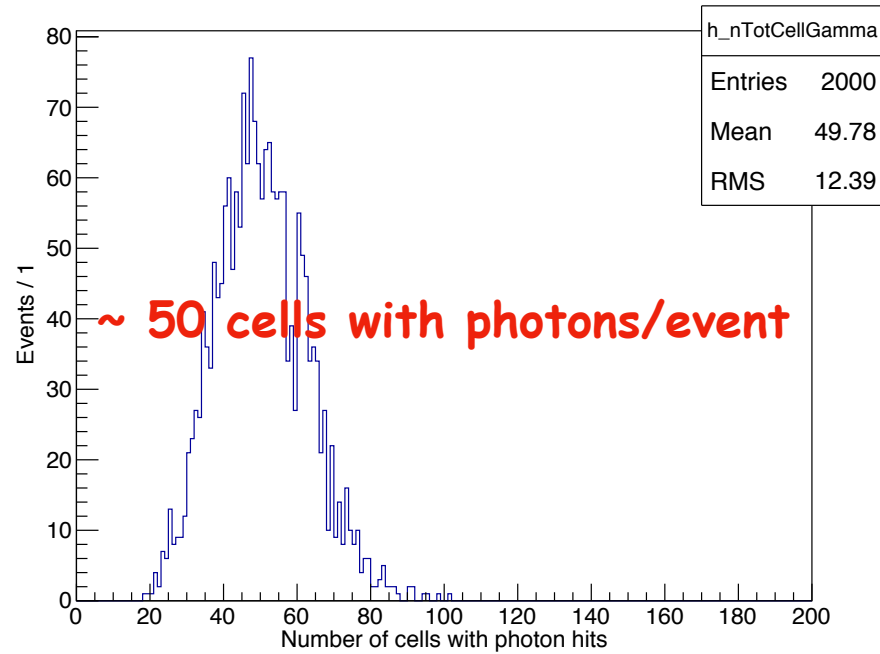
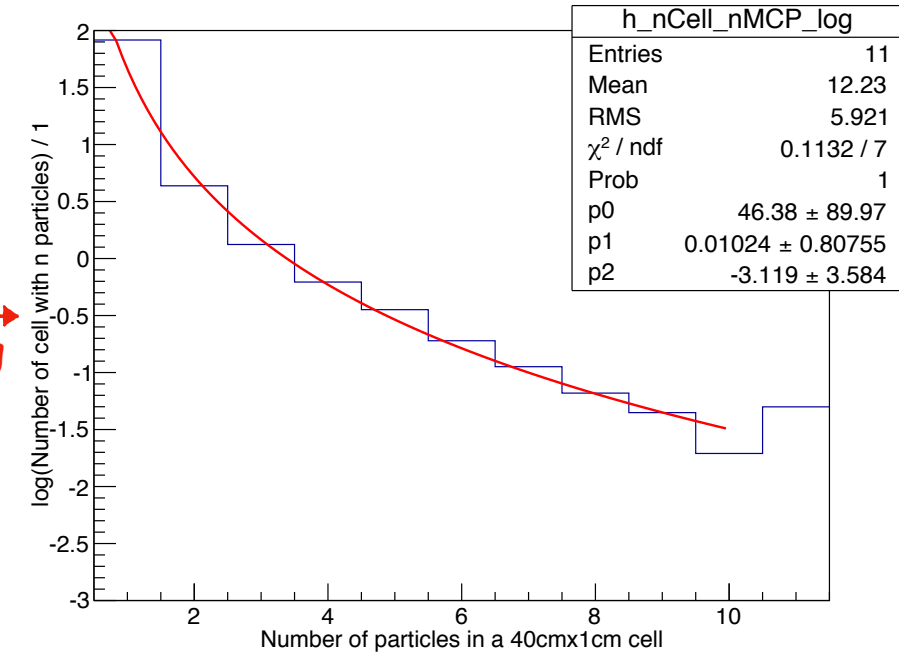
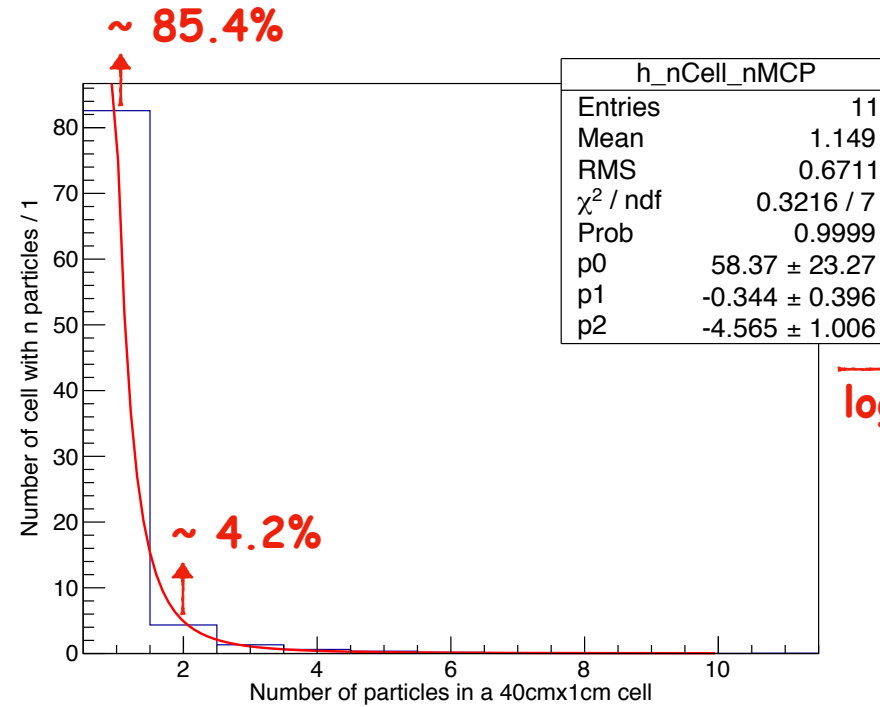
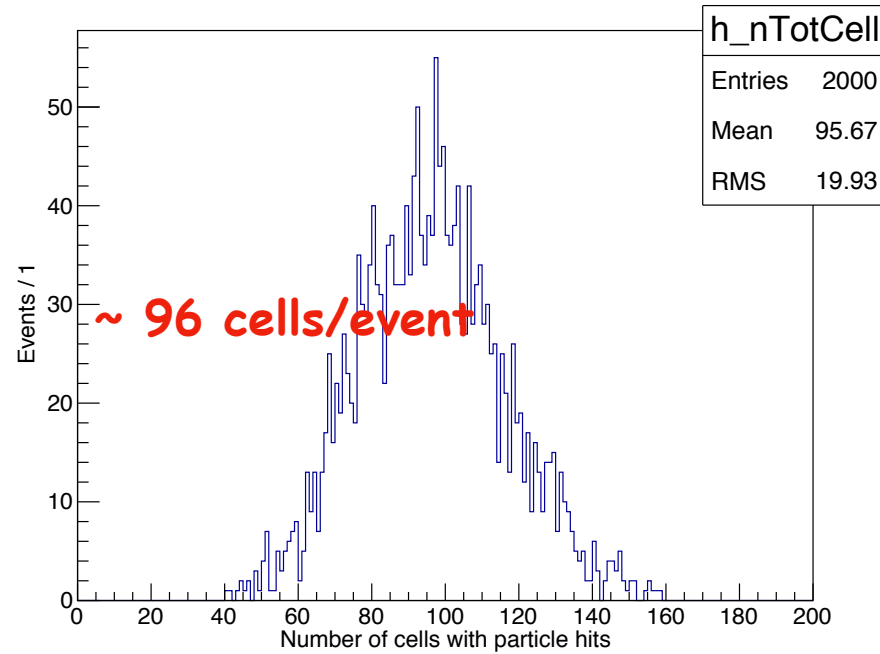


~ 0.2% < 1cm

~ 0.1% < 1cm

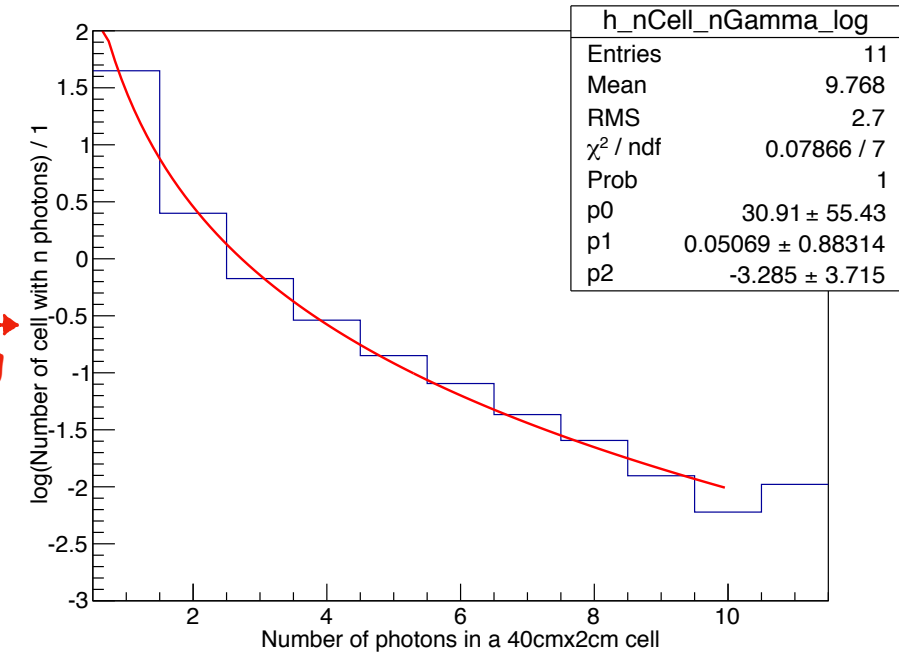
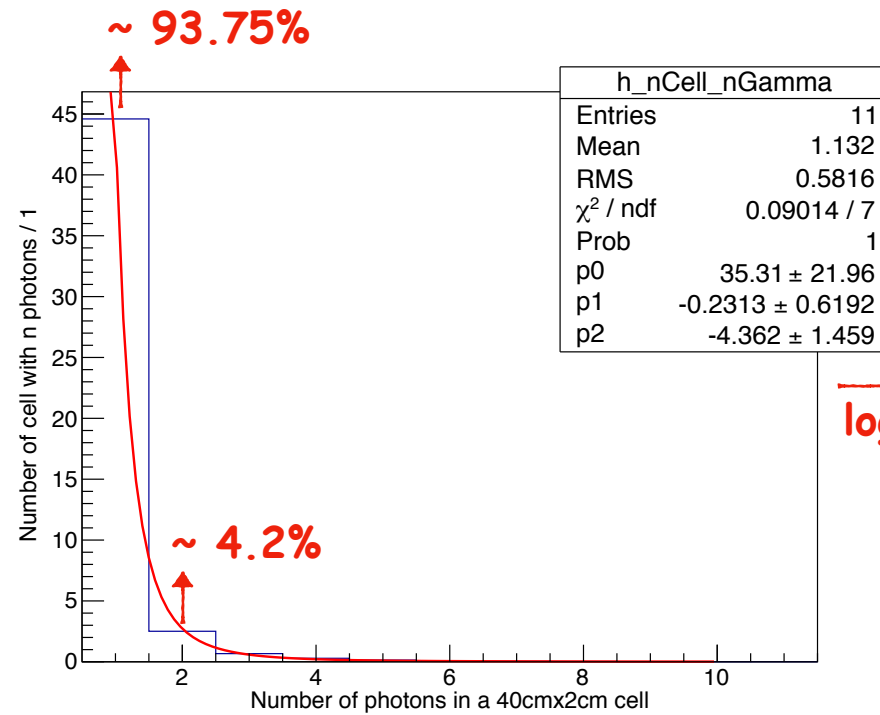
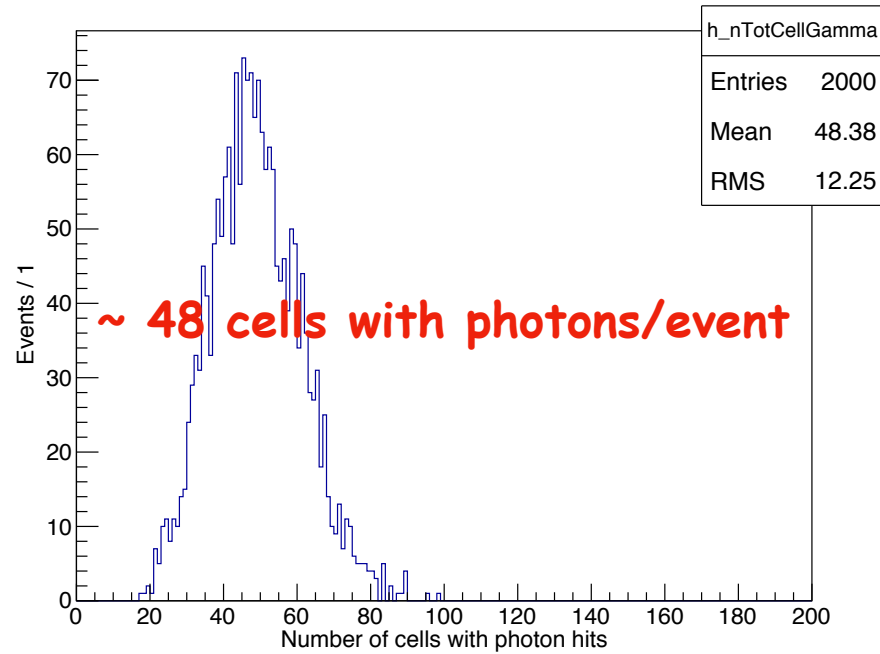
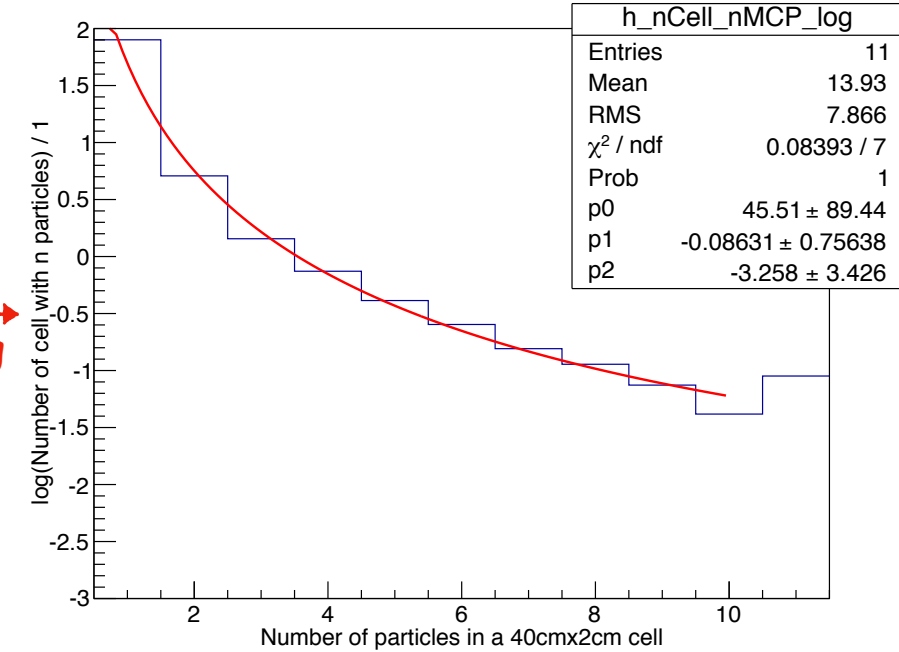
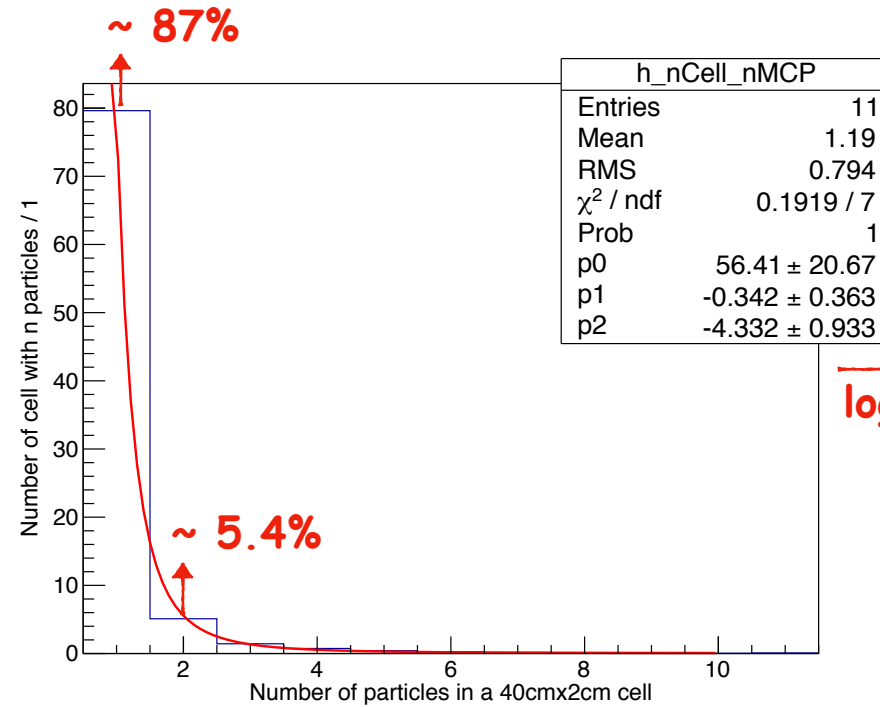
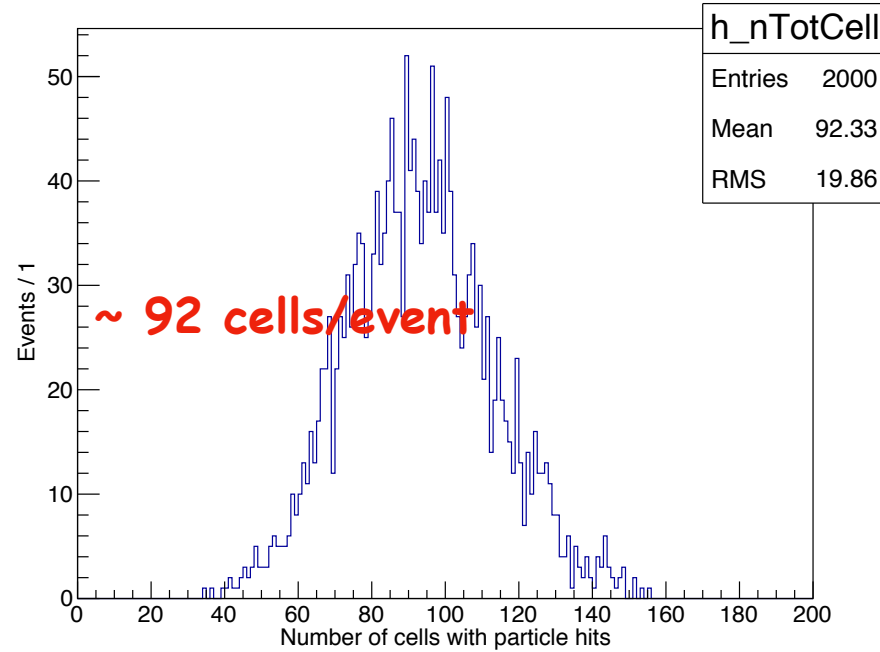
bbH->bbbb (4 jets)

Cell Size: 40x1cm²



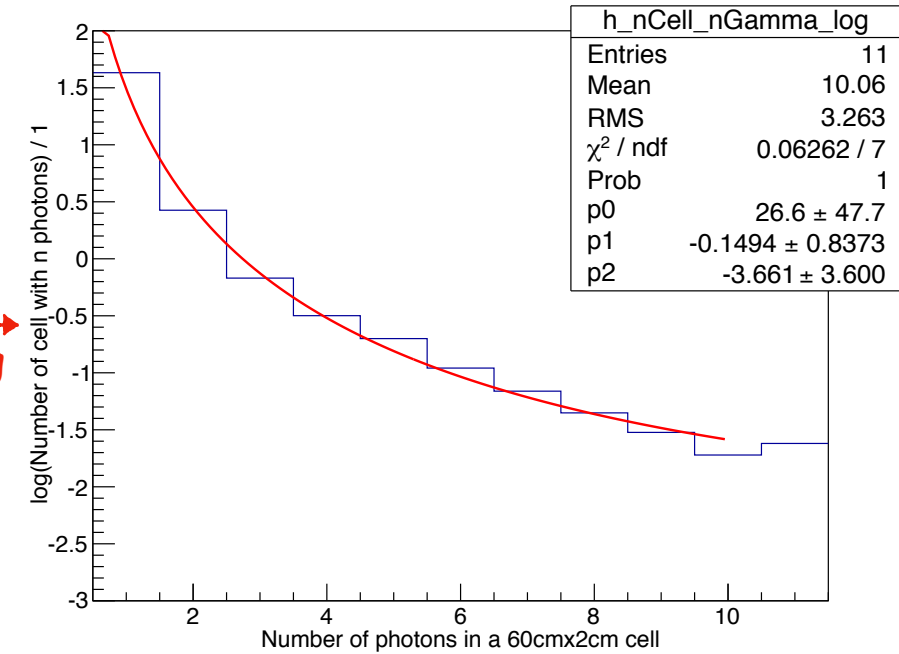
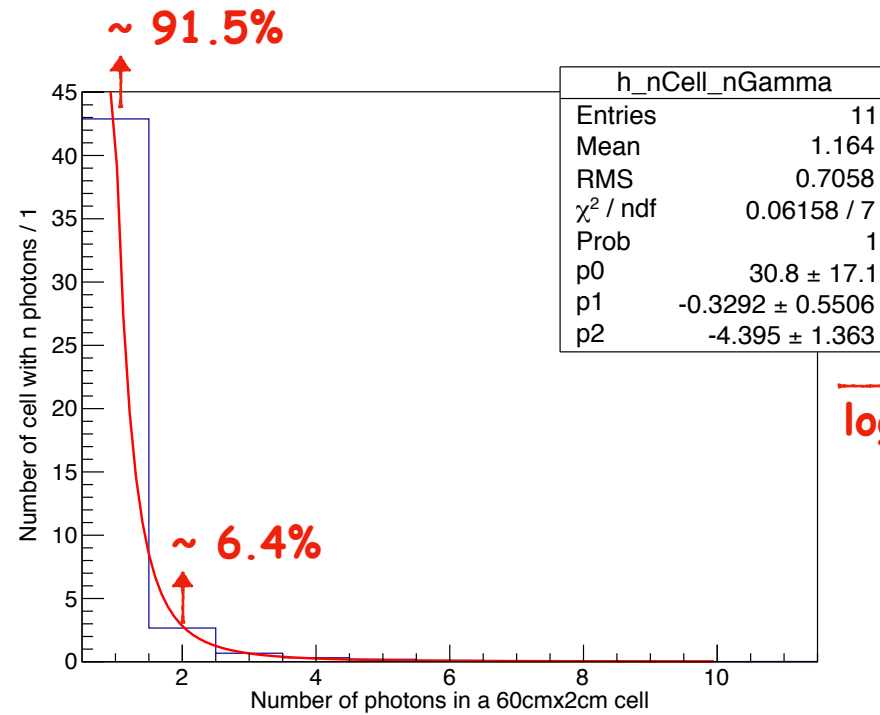
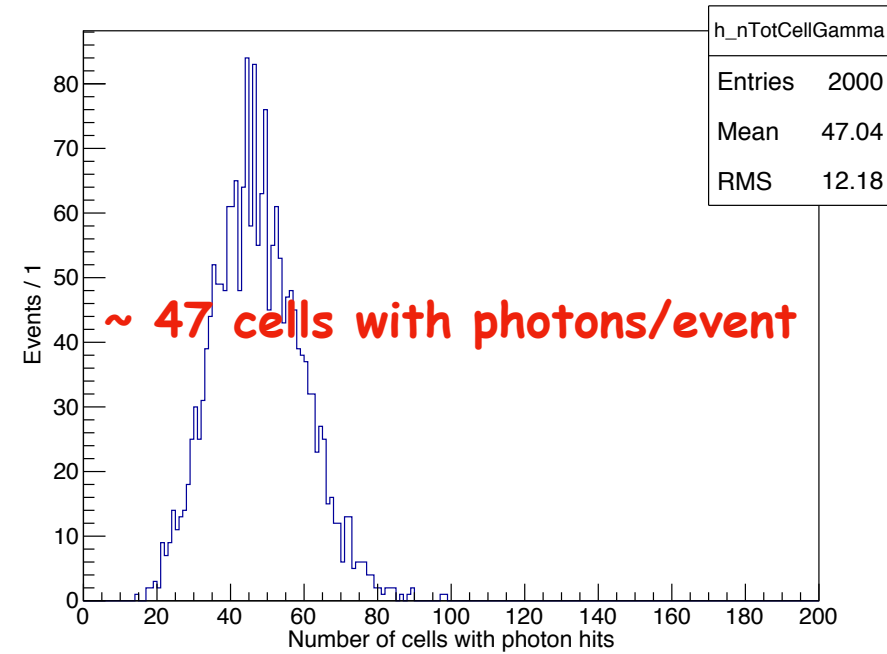
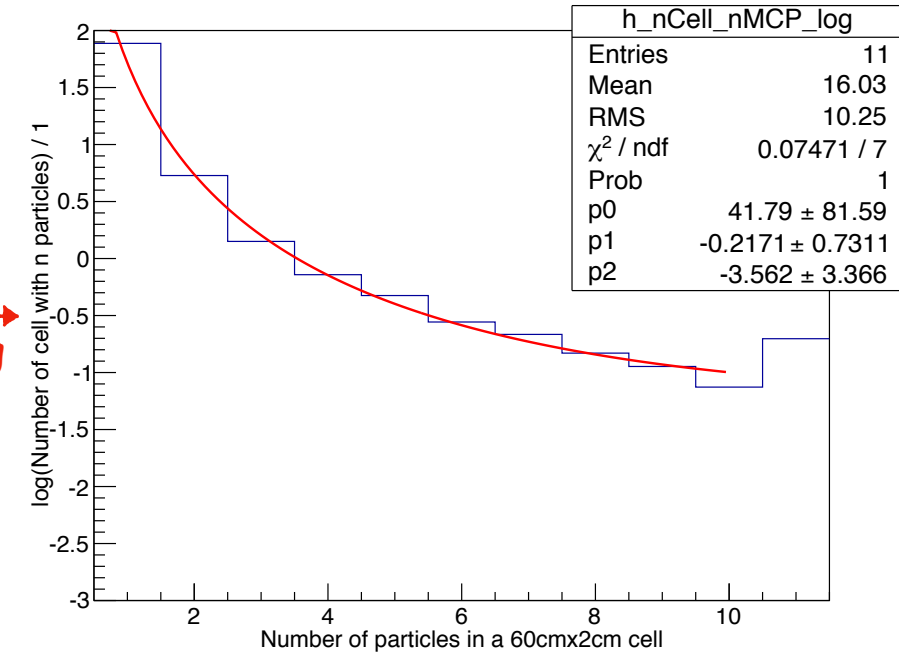
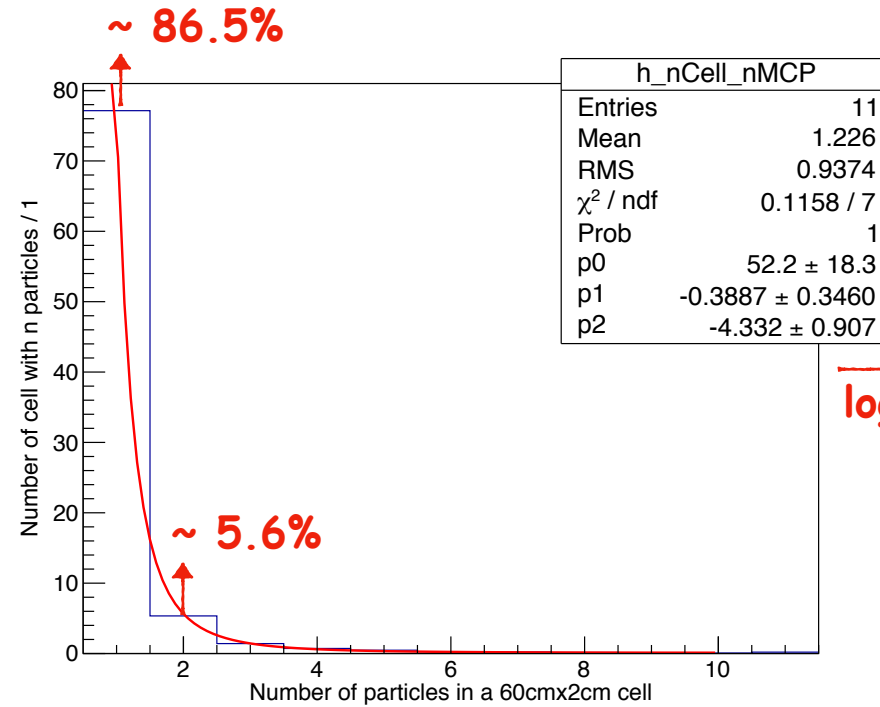
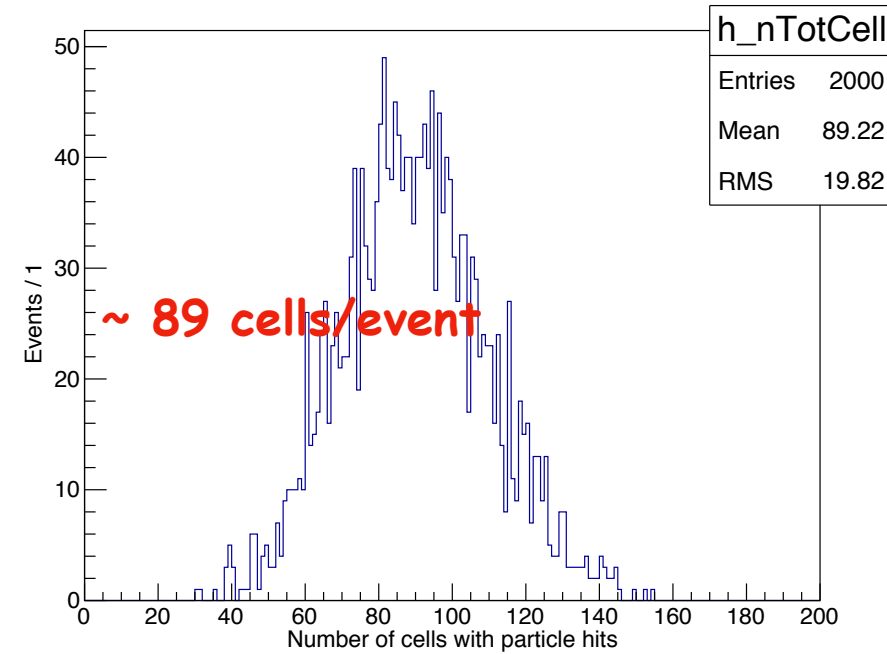
bbH->bbbb (4 jets)

Cell Size: 40x2cm²



bbH->bbbb (4 jets)

Cell Size: 60x2cm²



Energy Resolution and Position Resolution

as a function of Energy

Scan Setup

BGO:

1 strip: $2 \times 2 \times 60 \text{ cm}^3$

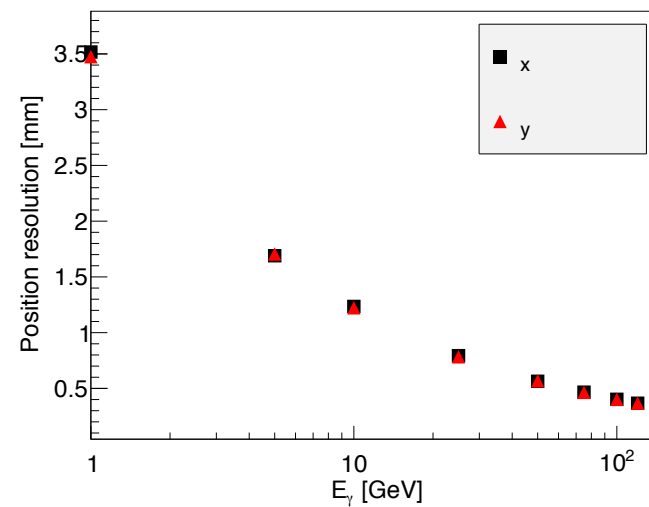
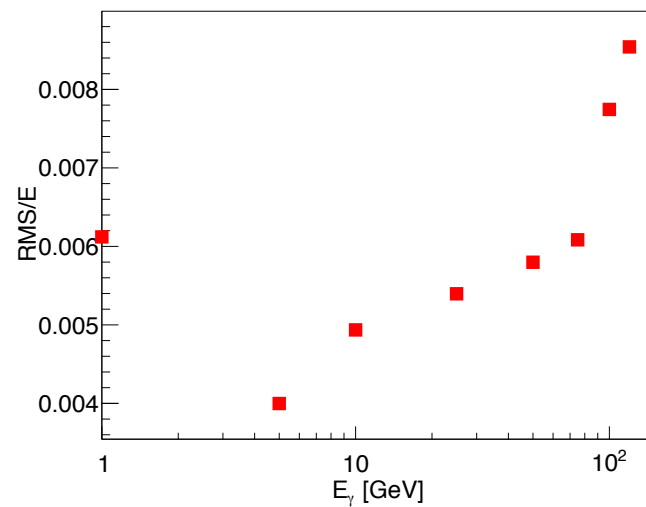
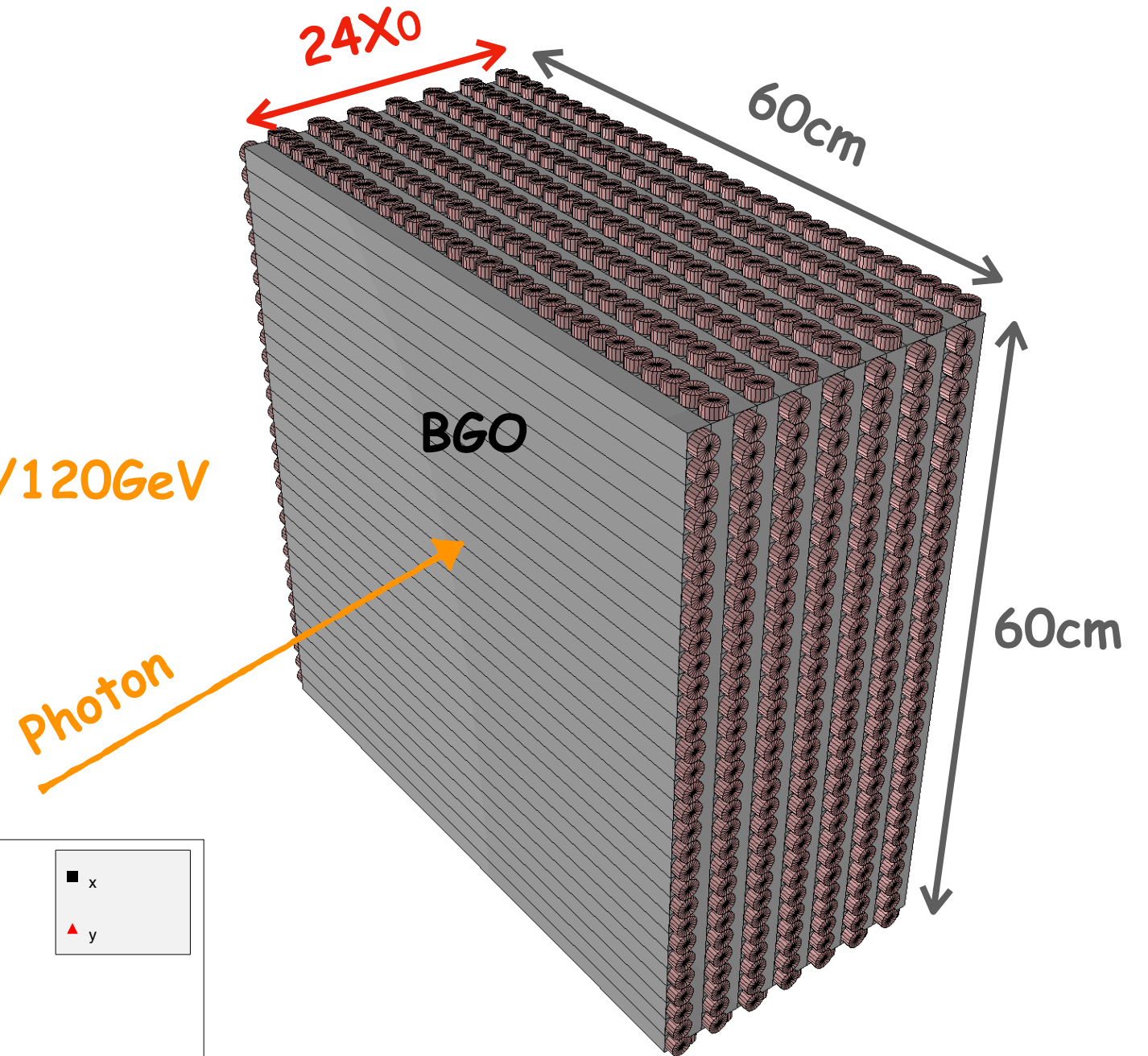
14 layers: 24×0

Photon:

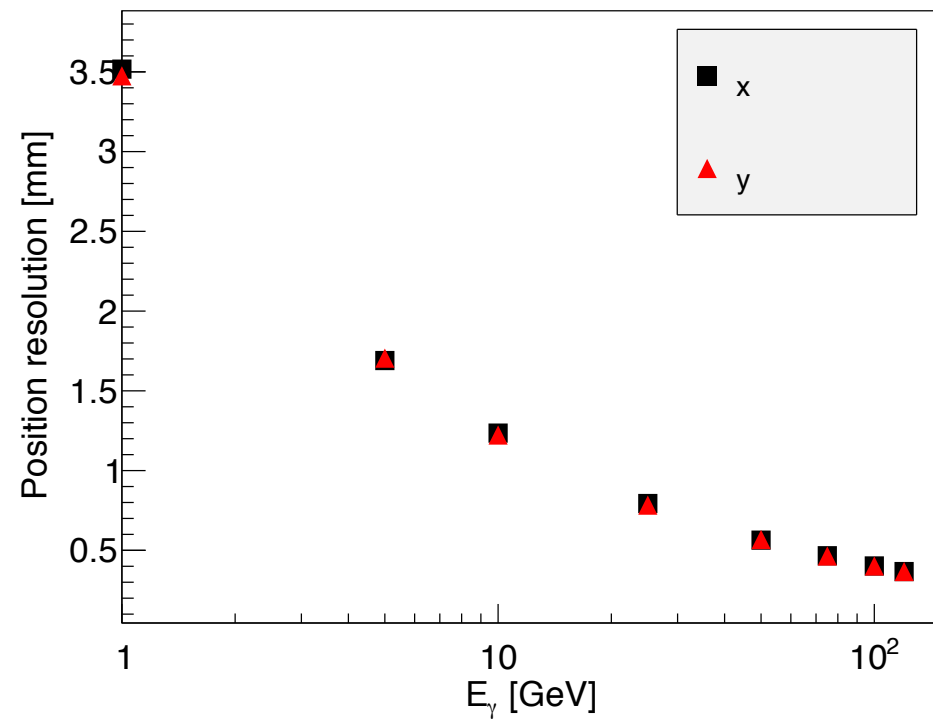
Position: $x=0, y=0$

Direction: $(0,0,1)$

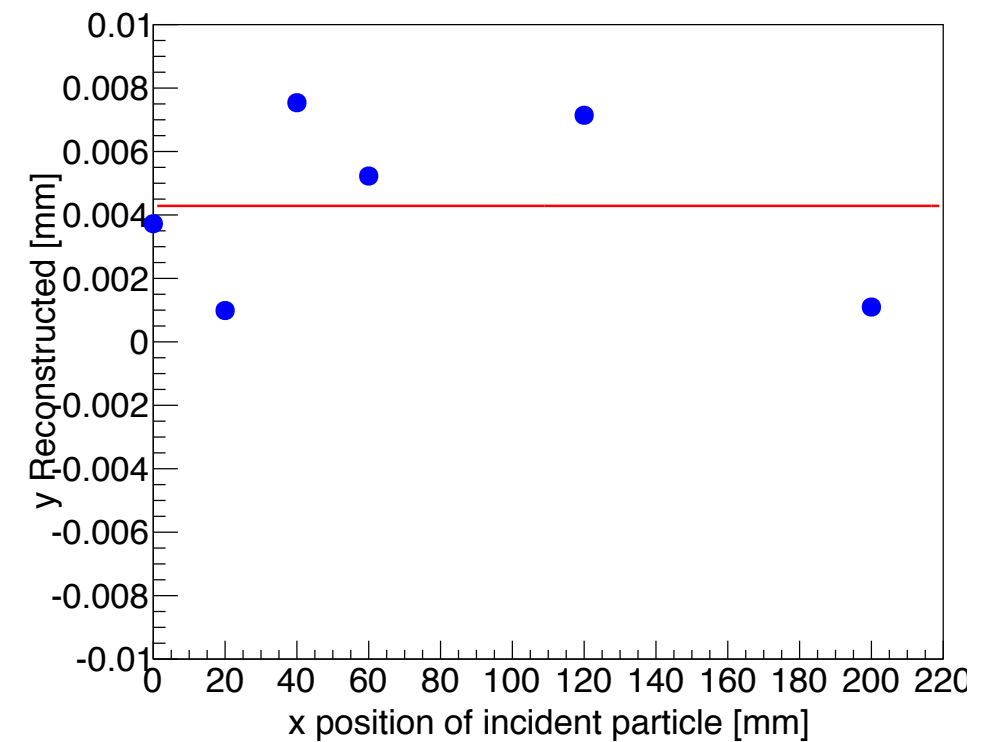
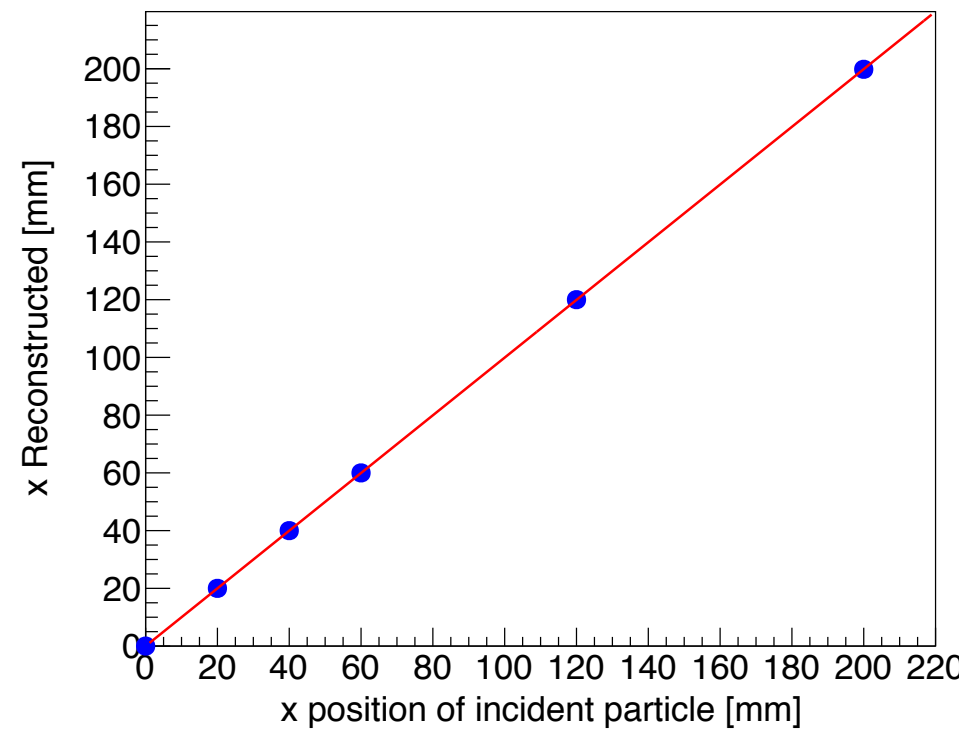
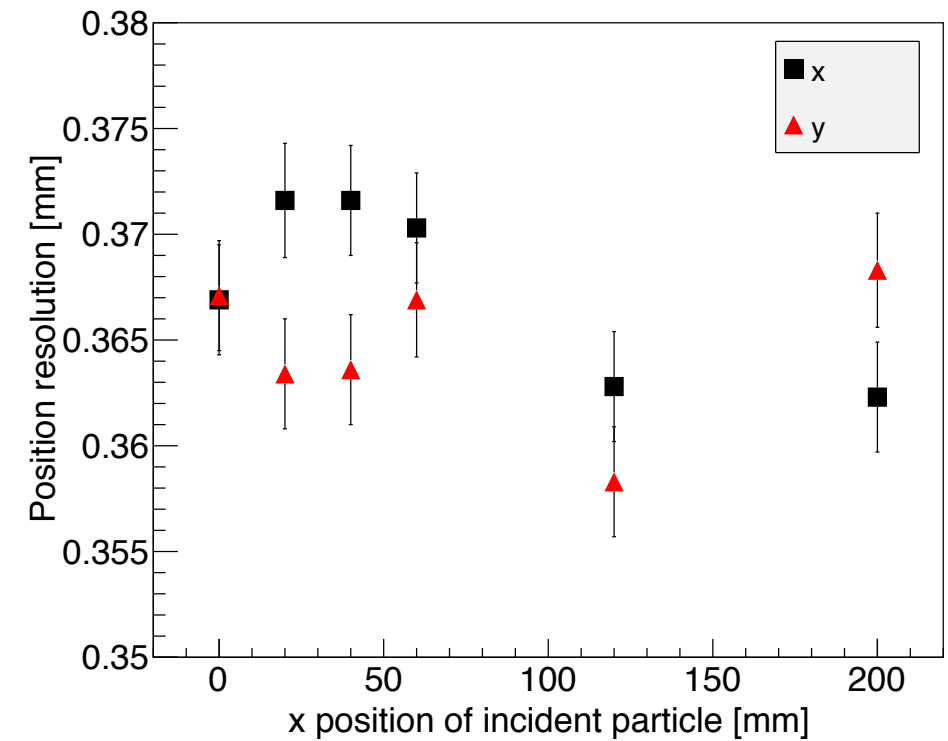
Energy: 1/5/10/25/50/75/100/120 GeV



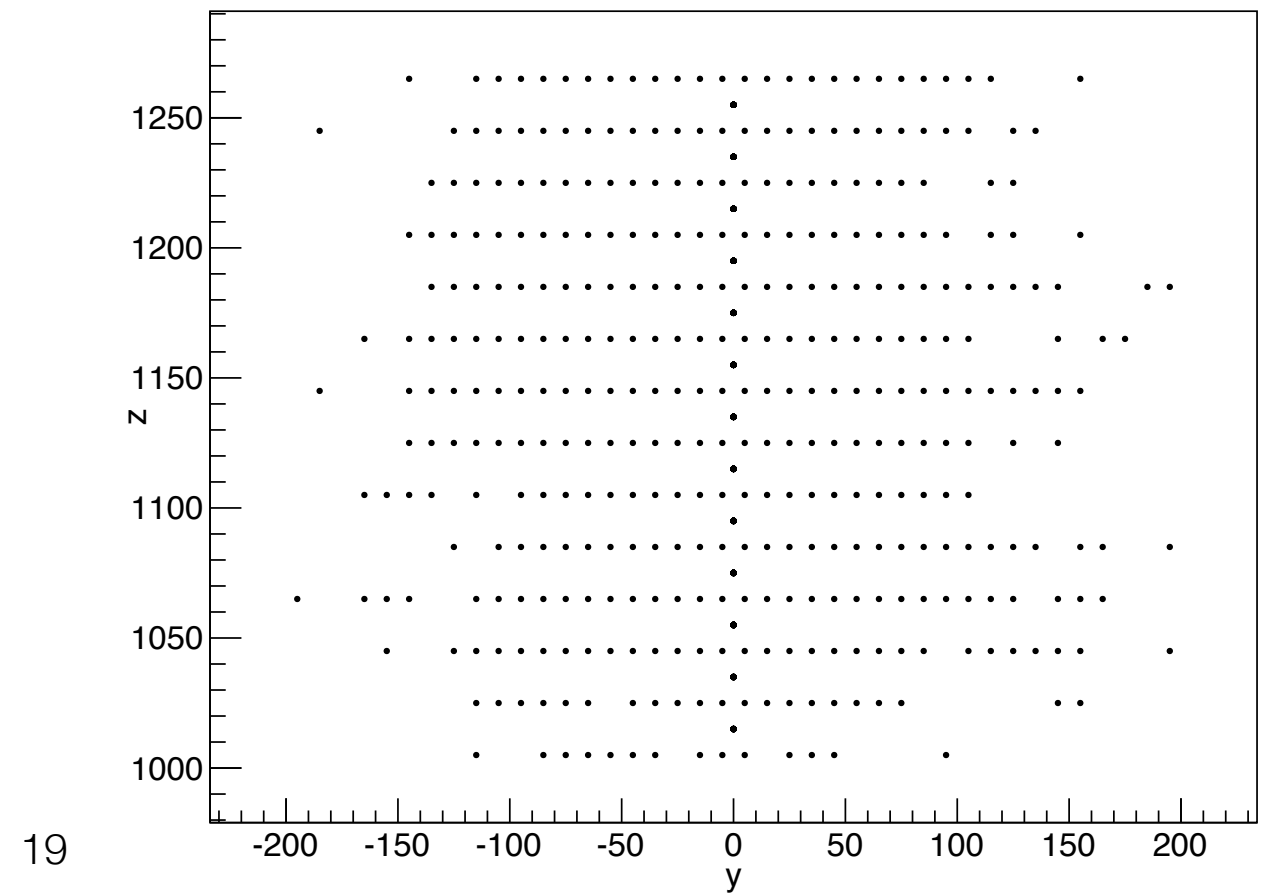
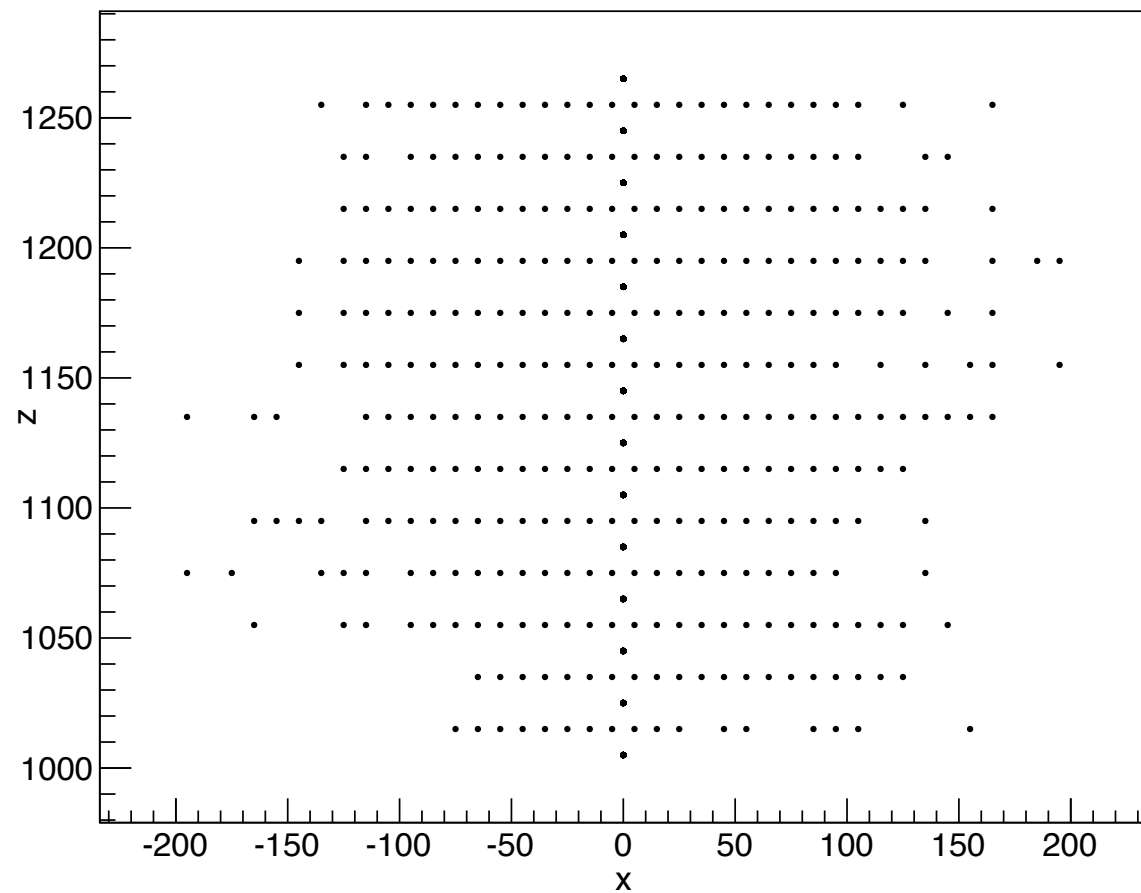
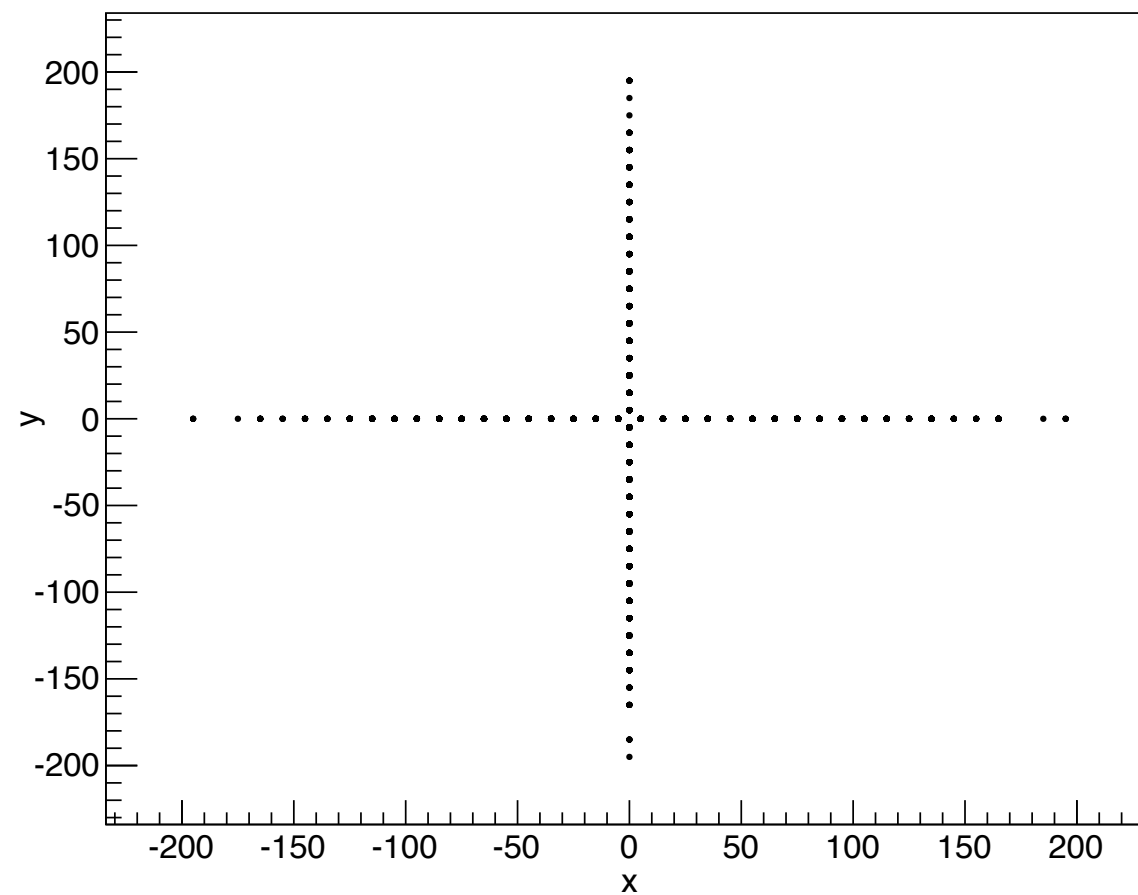
Photon Position Resolution



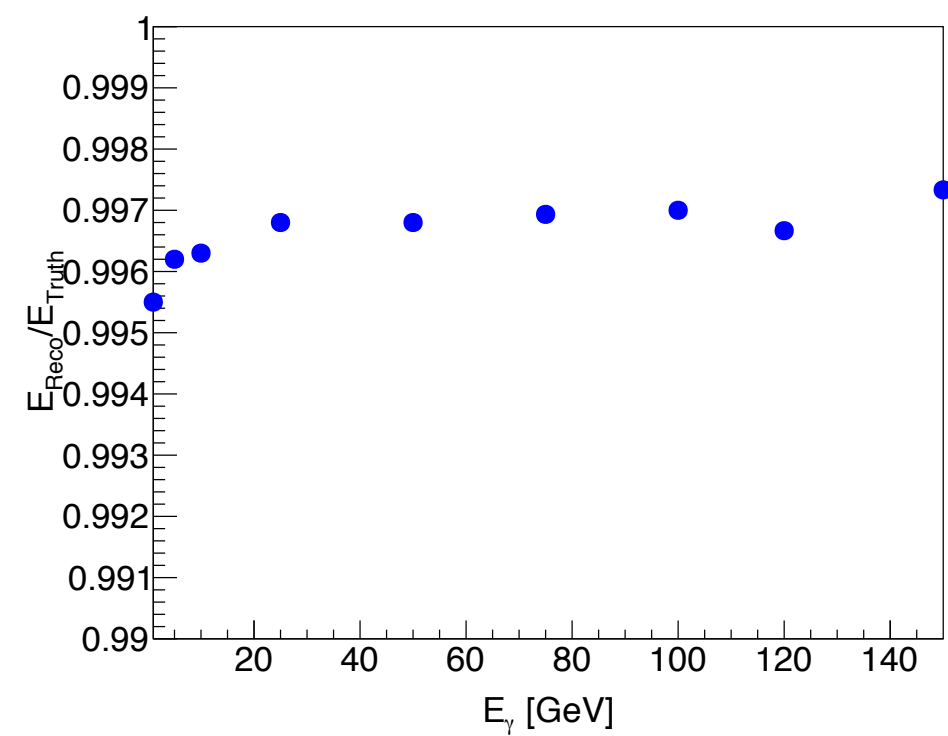
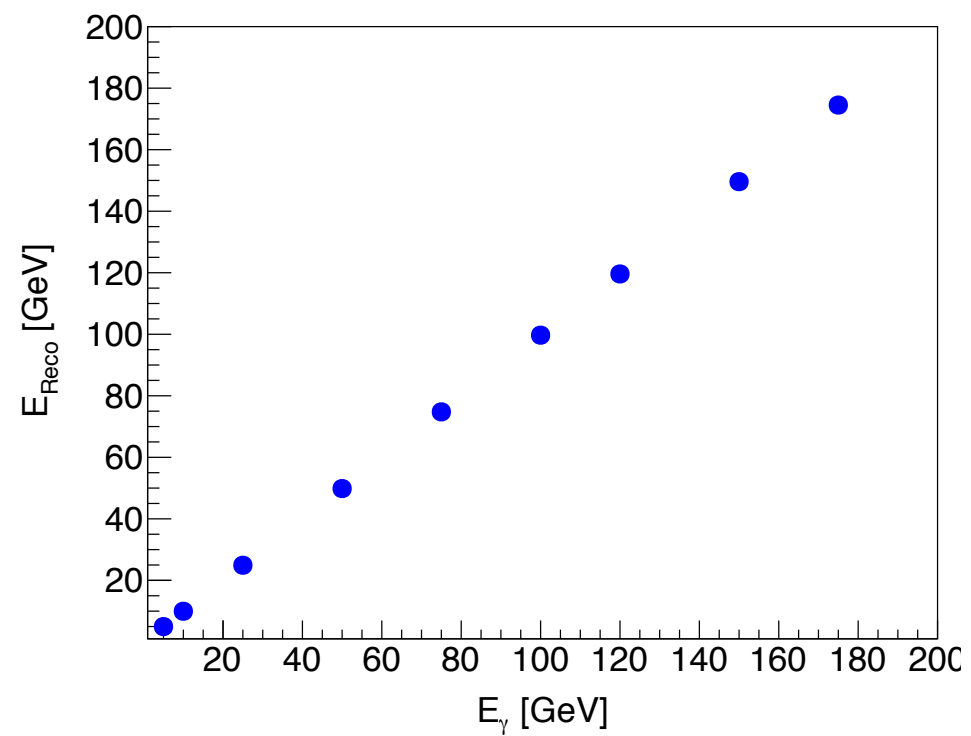
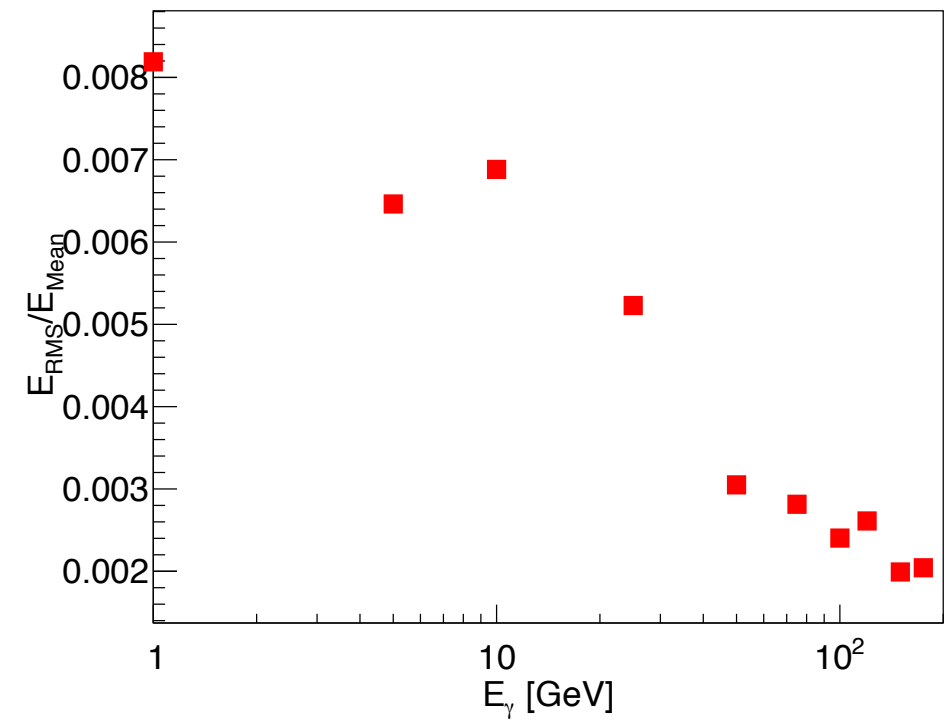
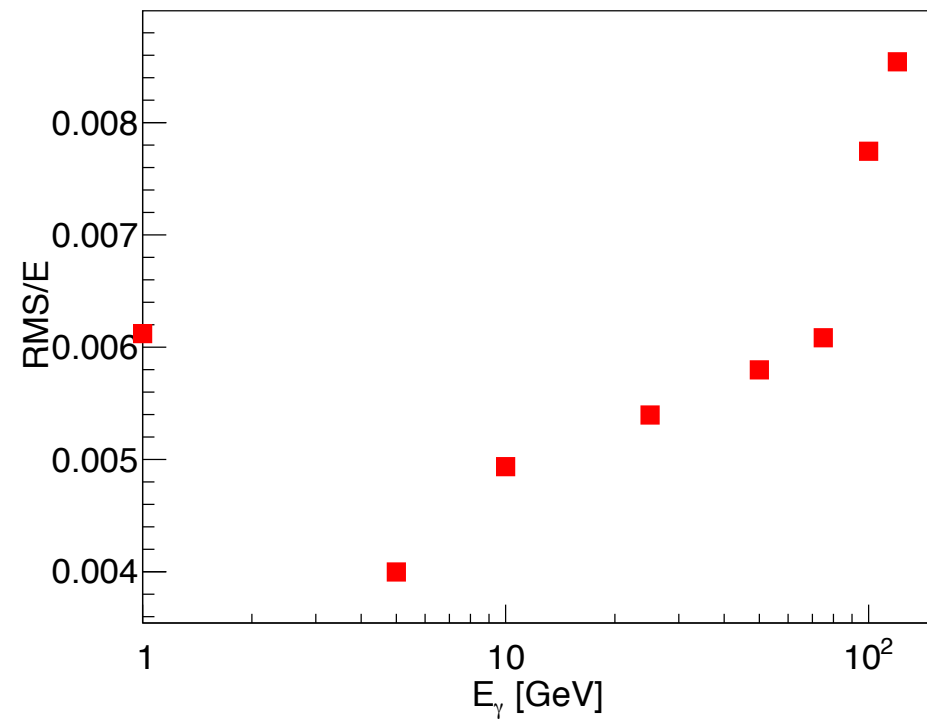
120GeV
→



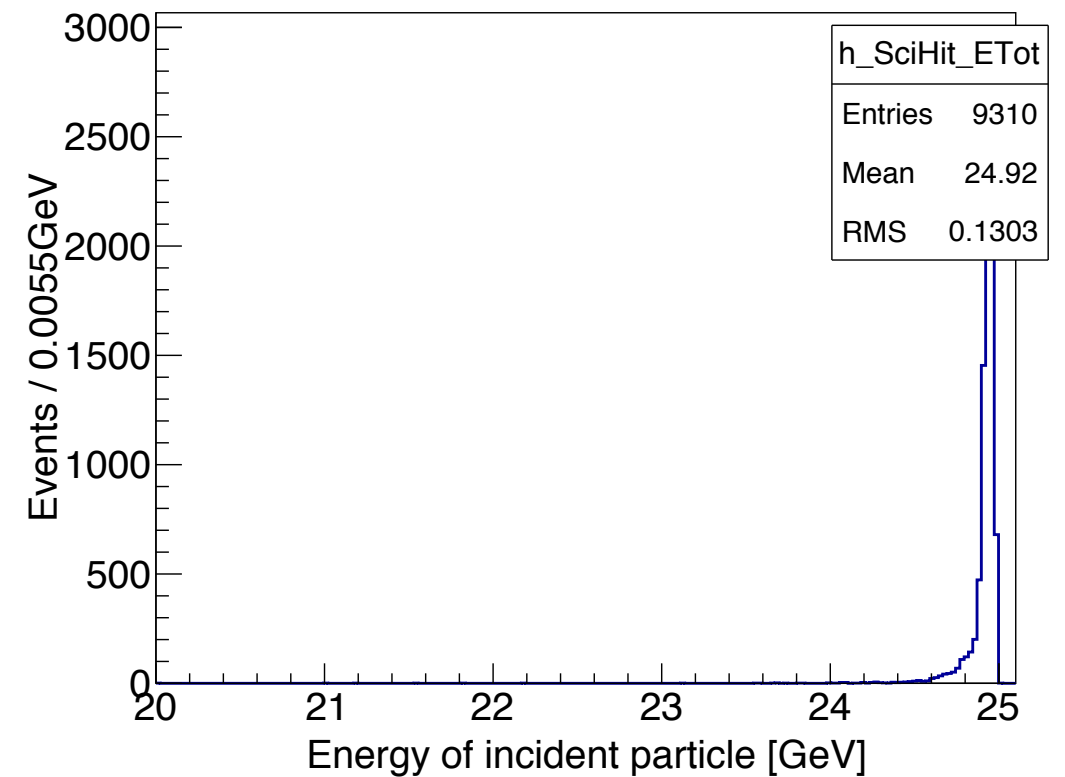
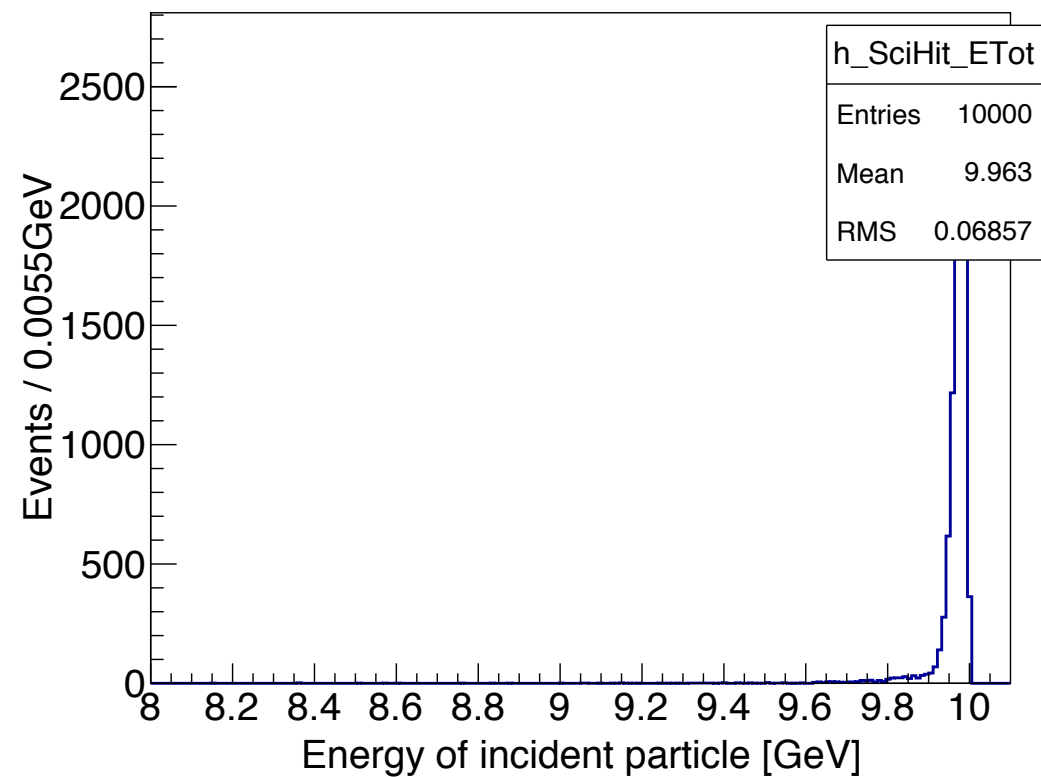
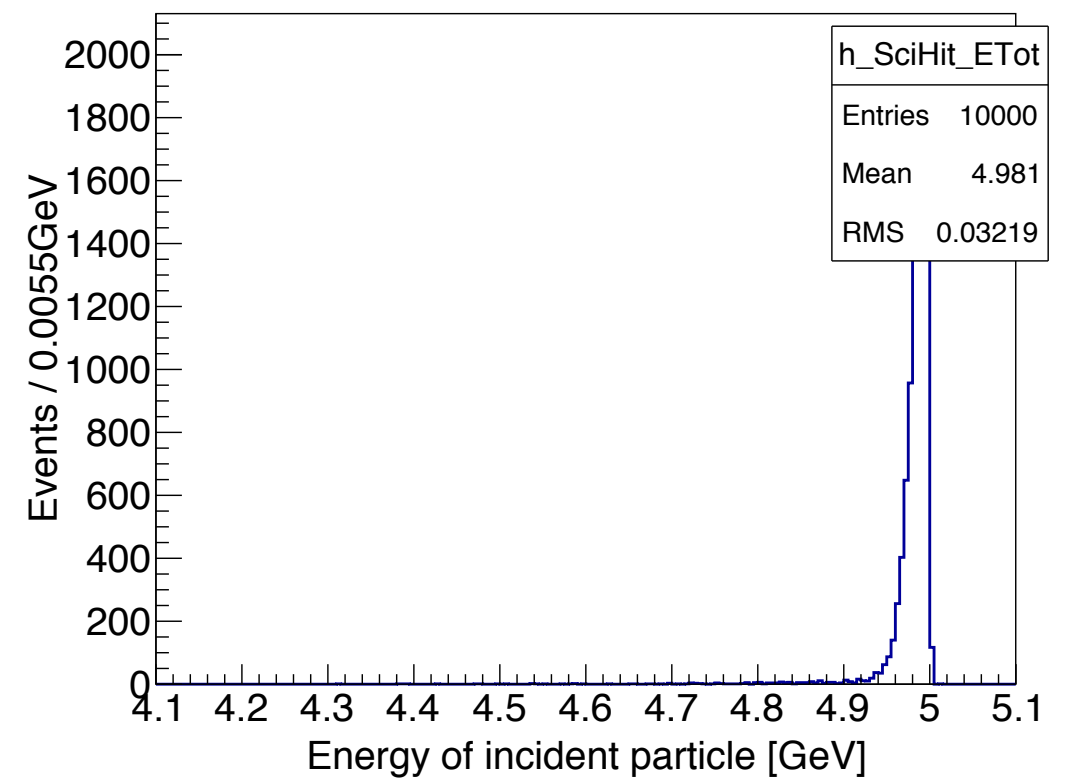
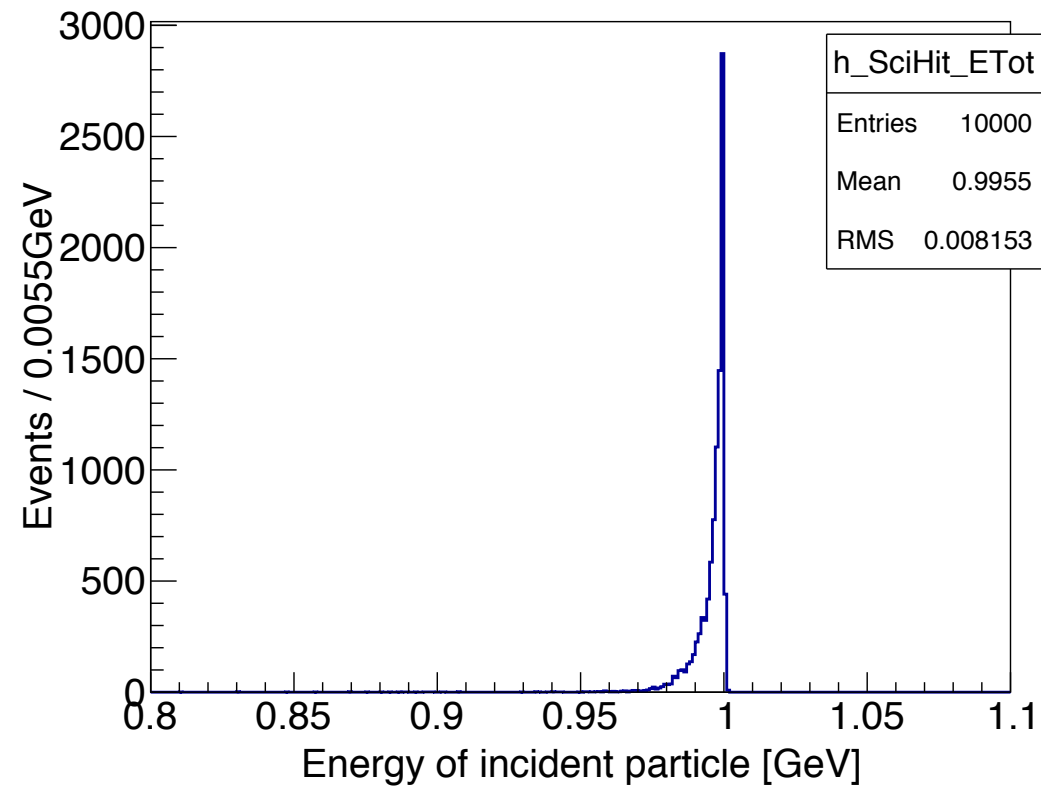
Edep position distribution



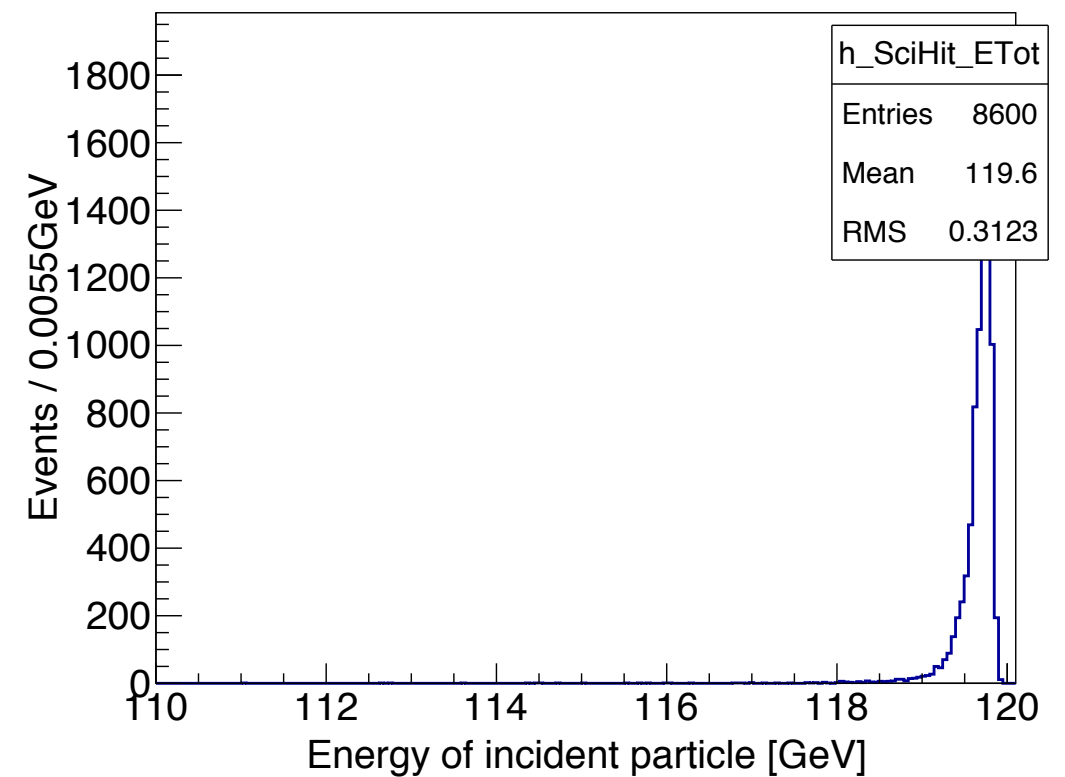
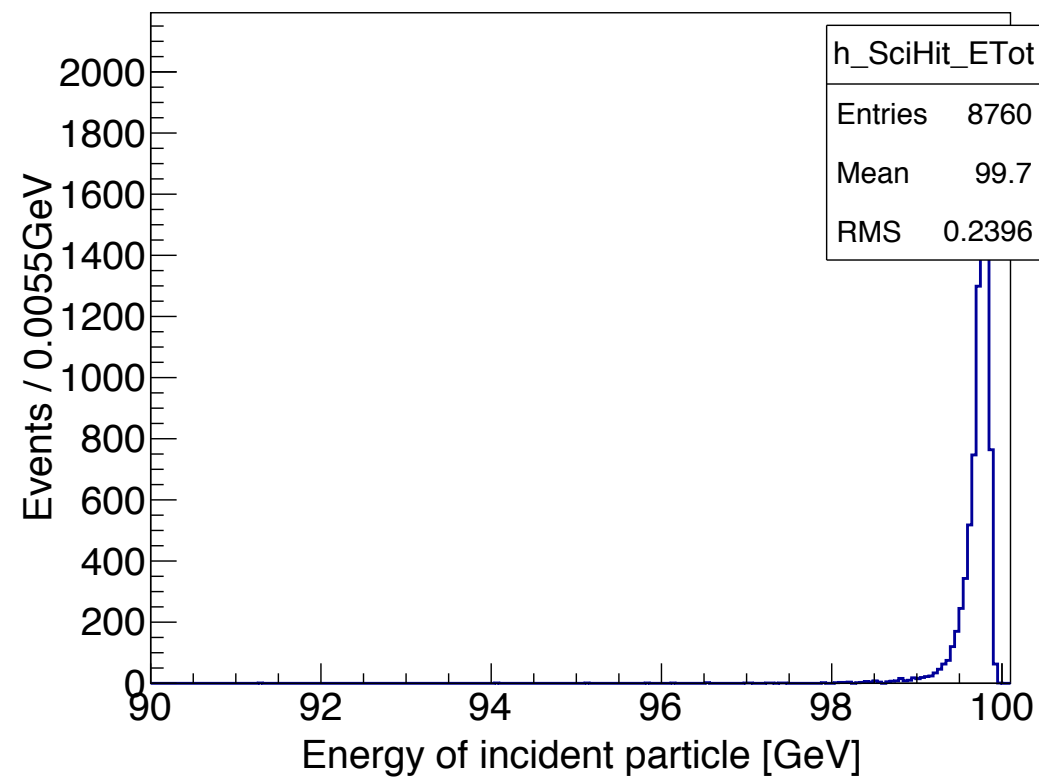
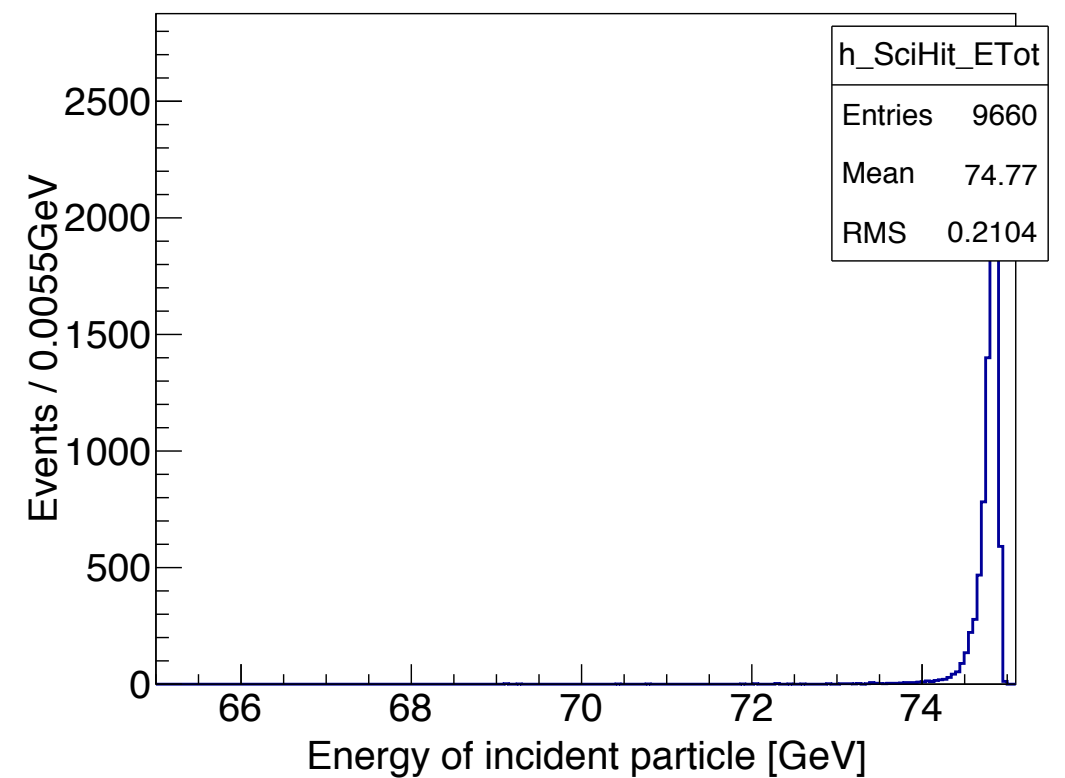
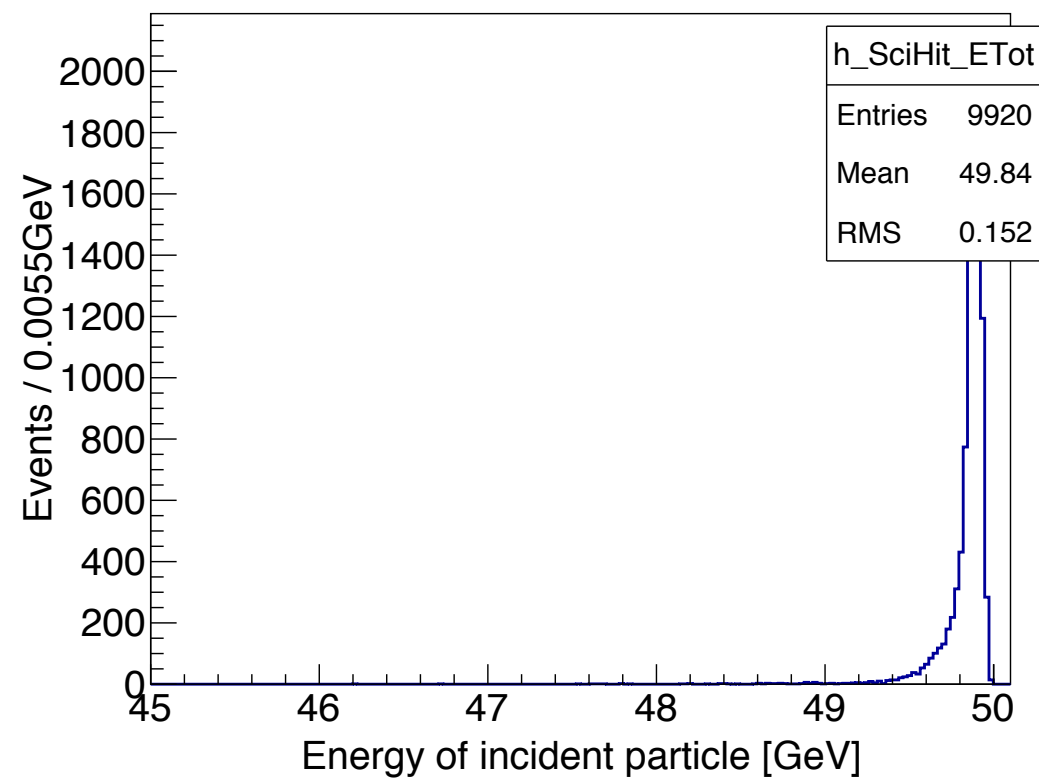
Photon Energy Resolution



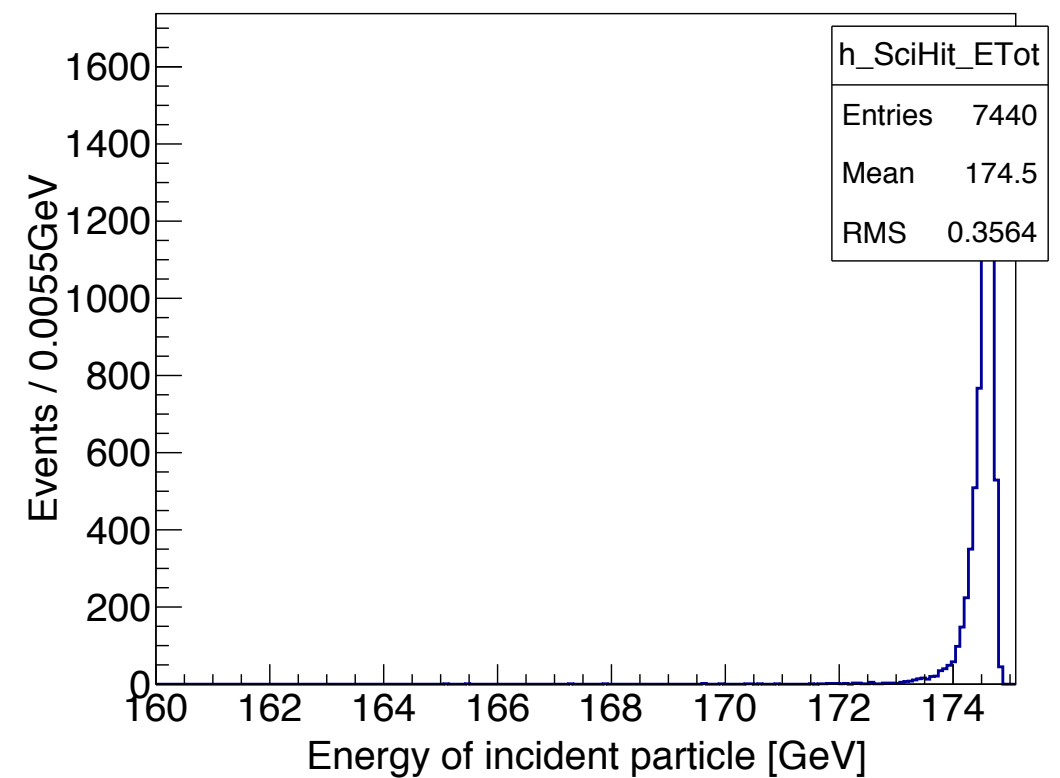
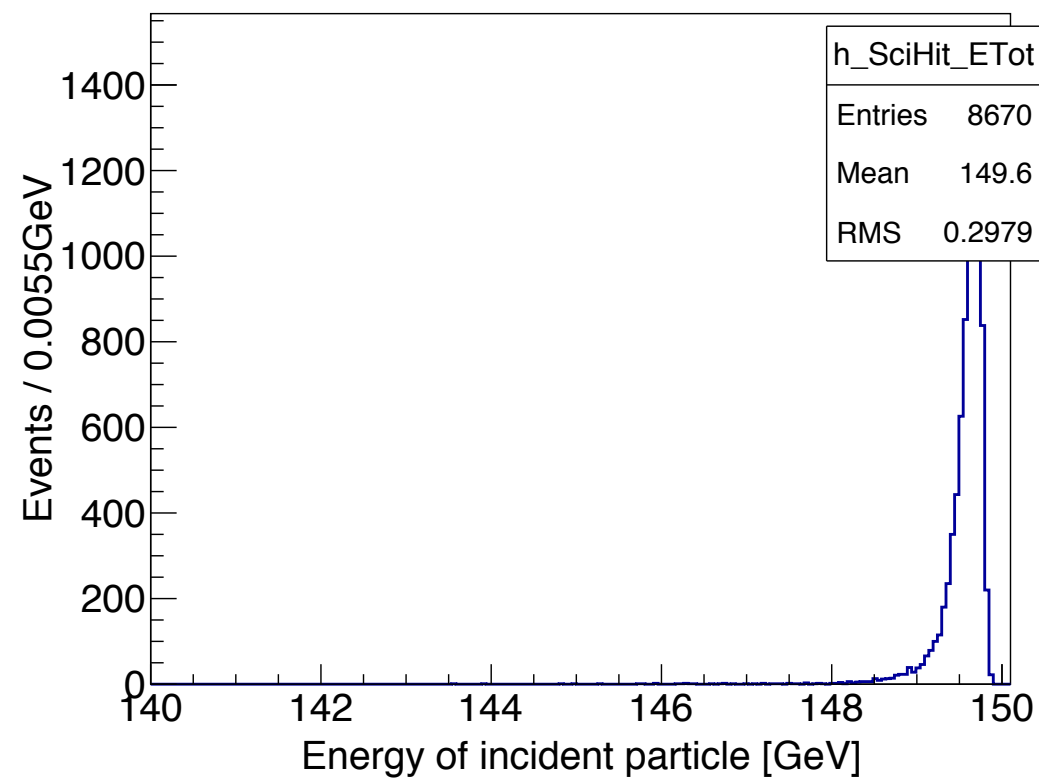
Photon Energy Spectrum



Photon Energy Spectrum



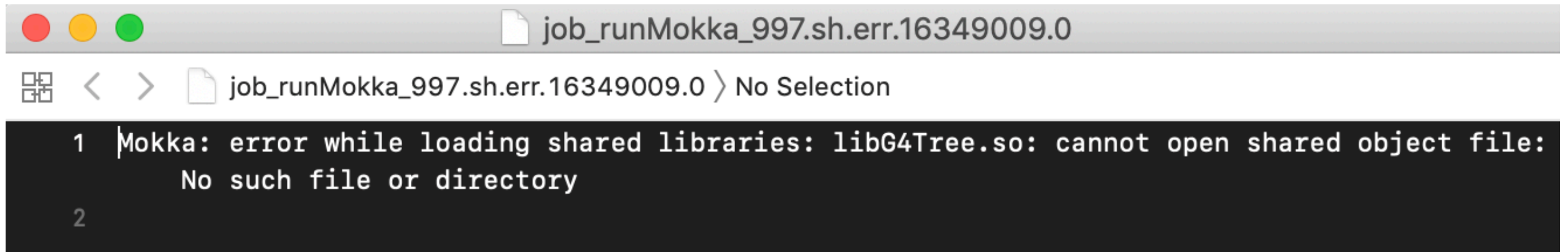
Photon Energy Spectrum



Simplified Digitization

```
90
91 nPhoton = gRandom->PoissonD( Edep_cell*SciPhotonYeild );
92 smear = gRandom->Gaus( nPhoton*SciPhotonColEff, resolution*nPhoton*SciPhotonColEff );
93
```


tech problem



A screenshot of a macOS-style terminal window. The title bar is light gray and contains three colored window control buttons (red, yellow, green) on the left and a document icon followed by the text 'job_runMokka_997.sh.err.16349009.0' on the right. Below the title bar is a dark gray bar with a grid icon, left and right arrow keys, a document icon, the text 'job_runMokka_997.sh.err.16349009.0', and 'No Selection'. The main area of the terminal is black with white text. It shows a line number '1' followed by the error message 'Mokka: error while loading shared libraries: libG4Tree.so: cannot open shared object file: No such file or directory'. A second line number '2' is visible on the next line, but no text follows it.

```
1 Mokka: error while loading shared libraries: libG4Tree.so: cannot open shared object file:  
  No such file or directory  
2
```