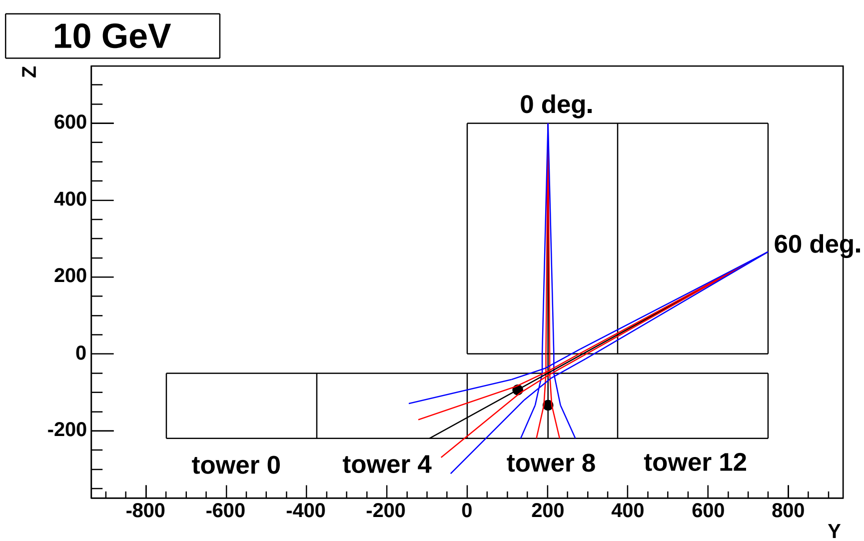
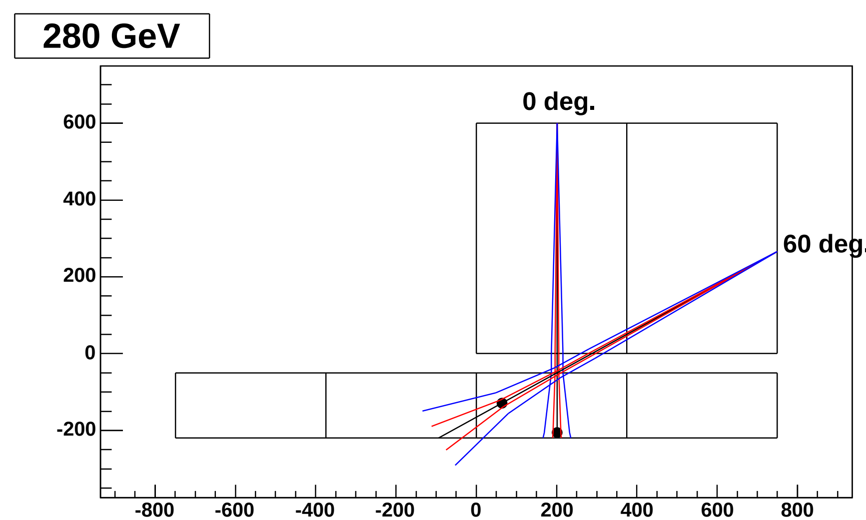
SPS beam tests preparation

- my first attempt to look at what should/could be done at SPS
- simulation of electrons in the Calibration Unit (2 full towers + 2 calorimeters)
- with v7r2 (DC2-like code)

Simulation of electrons

- 10, 50, 100 and 280 GeV pencil beams (radius = 1 cm)
- impact point definition : Z = top of cal
  and (X,Y) : in cell pitch unit, 0 = center of tower 8
- angle scan : 0, 30, 45 and 60 deg.
- Y scan : 0.5, 5.5 (= center of last log before tower boundary), 5.8 and 5.9





What do we want to do ?

General feeling :

- check the simulation of showers in GLAST
  $\Rightarrow$ check mainly "raw" individual quantities (energy distribution in one log, etc...)
- assess the SRD quantities
  $\Rightarrow$ check "compound" quantities (analysis cuts efficiency, energy resolution, PSF, etc...)
- throughout a large phase space

How can we do it ?

General feeling (after having scanned a lot of plots) :

- checking very accurately individual quantities needs large statistics
- and one should check correlations as well...
- but I think what is MORE IMPORTANT is to check (even not very accurately) that everything is under control throughout the whole phase space
  $\Rightarrow$ "quick" scans (angle, impact position, energy) rather than few configurations with large statistics

How to compare simulation to data ?

- mean and rms of individual quantities can teach us a lot
- checking compound quantities (centroid position, reconstructed direction, reconstructed energy) is a way to check the details of individual quantities and their correlations

Towards a beam test program strategy ?

- determining the minimum statistics that we need for one configuration
- determining the steps of the scans :
  - impact position : loss in cracks, effect of log segmentation on position reconstruction,...
  - angle : leakage, loss in cracks,...
- that gives t_E = the time needed for one energy
- the number of energies = t_{total}/t_E
- choose the energies to have equal steps in T = position of the shower maximum in X_0 between :
  - 10 GeV $\rightarrow T \sim 5.6\ X_0$
  - 280 GeV $\rightarrow T \sim 9.2\ X_0$

First guesstimate

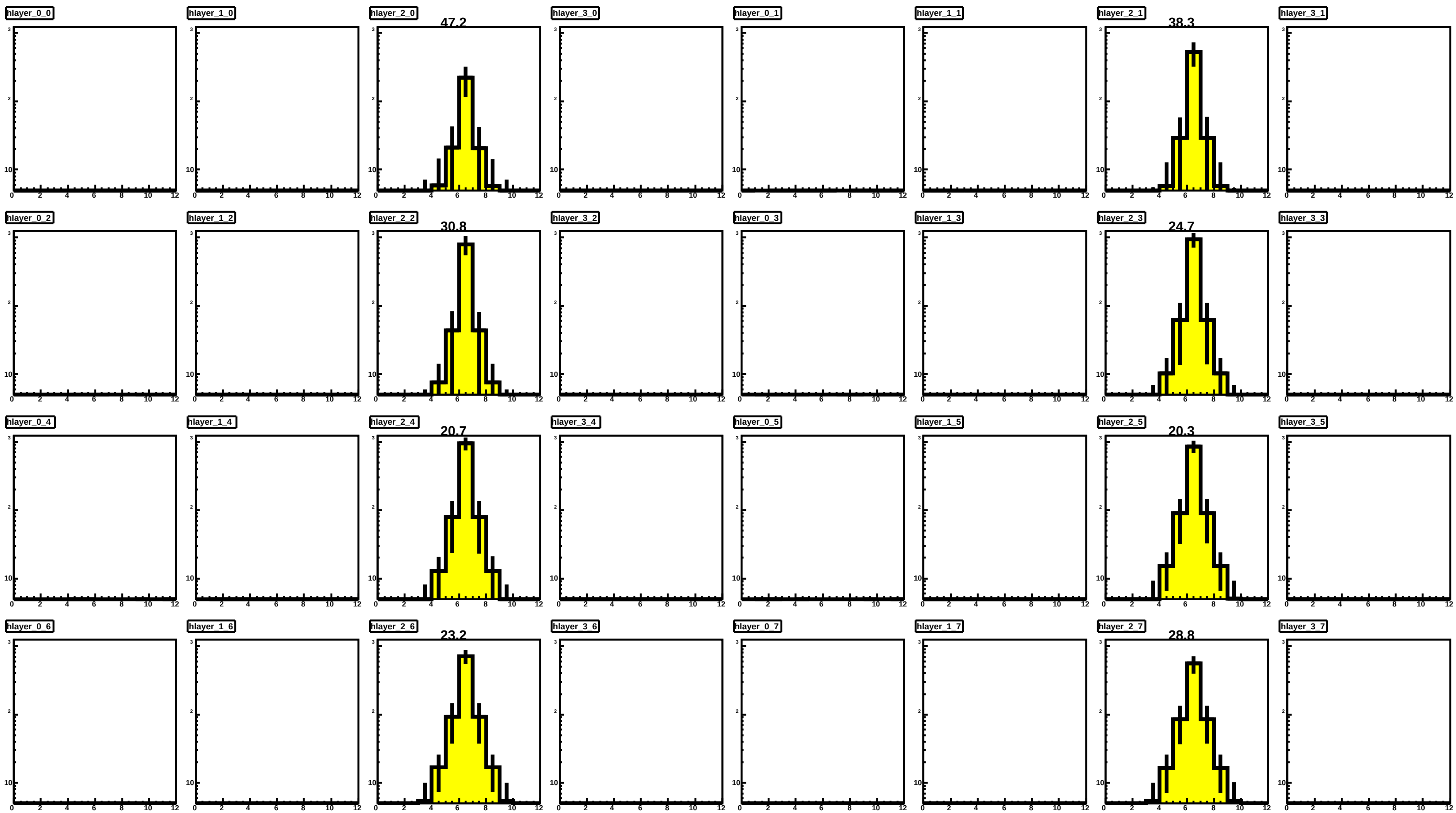
- from Benoît : 200000 evts = 1 hour
- 100000 evts = 1/2 hour (already large statistics)
- Y scan : 1/2 tower = 6 logs : step = 1/4 log $\Rightarrow$ 24 steps
- angle : every 10 deg. from 0 to 90 $\Rightarrow$ 10 steps
- t_E = (24 + 10) $\times$ 1/2 hour = 17 hours $\Rightarrow$ 1 day
- more scans (X,Y$\times$angle) $\Rightarrow$ t_E = 2 days
- one week = 6 days with beam $\Rightarrow$ n_E = 3
- two weeks (n_E = 6) is good
- but three weeks (n_E = 9) is better

And now the plots

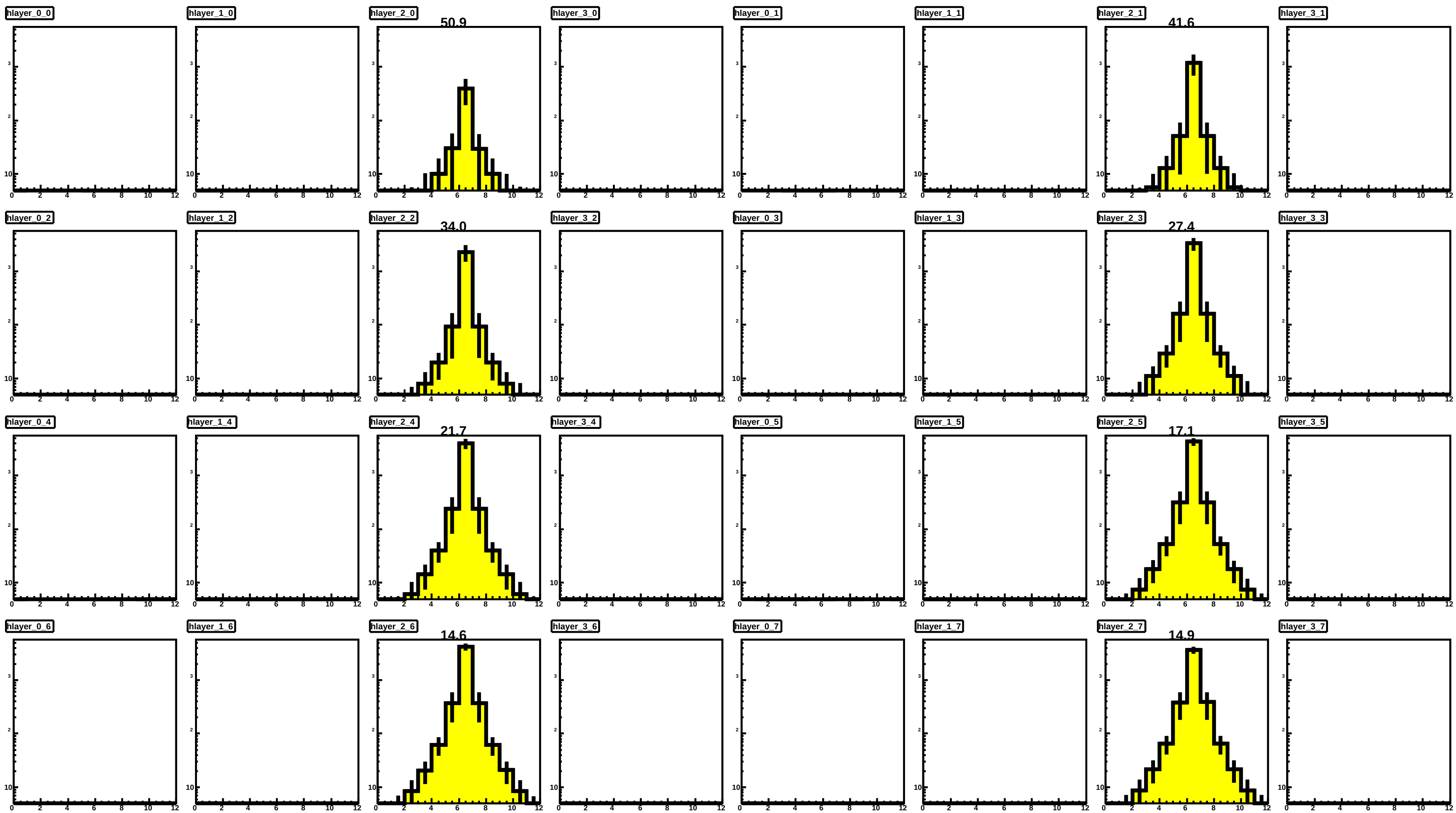
two series of plots :

- mean and rms of energy in the logs
  - 4 left columns : Y orientated logs (1 column = 1 tower, 1 row = 1 layer)
  - right : X orientated logs
- distributions of several reconstructed quantities

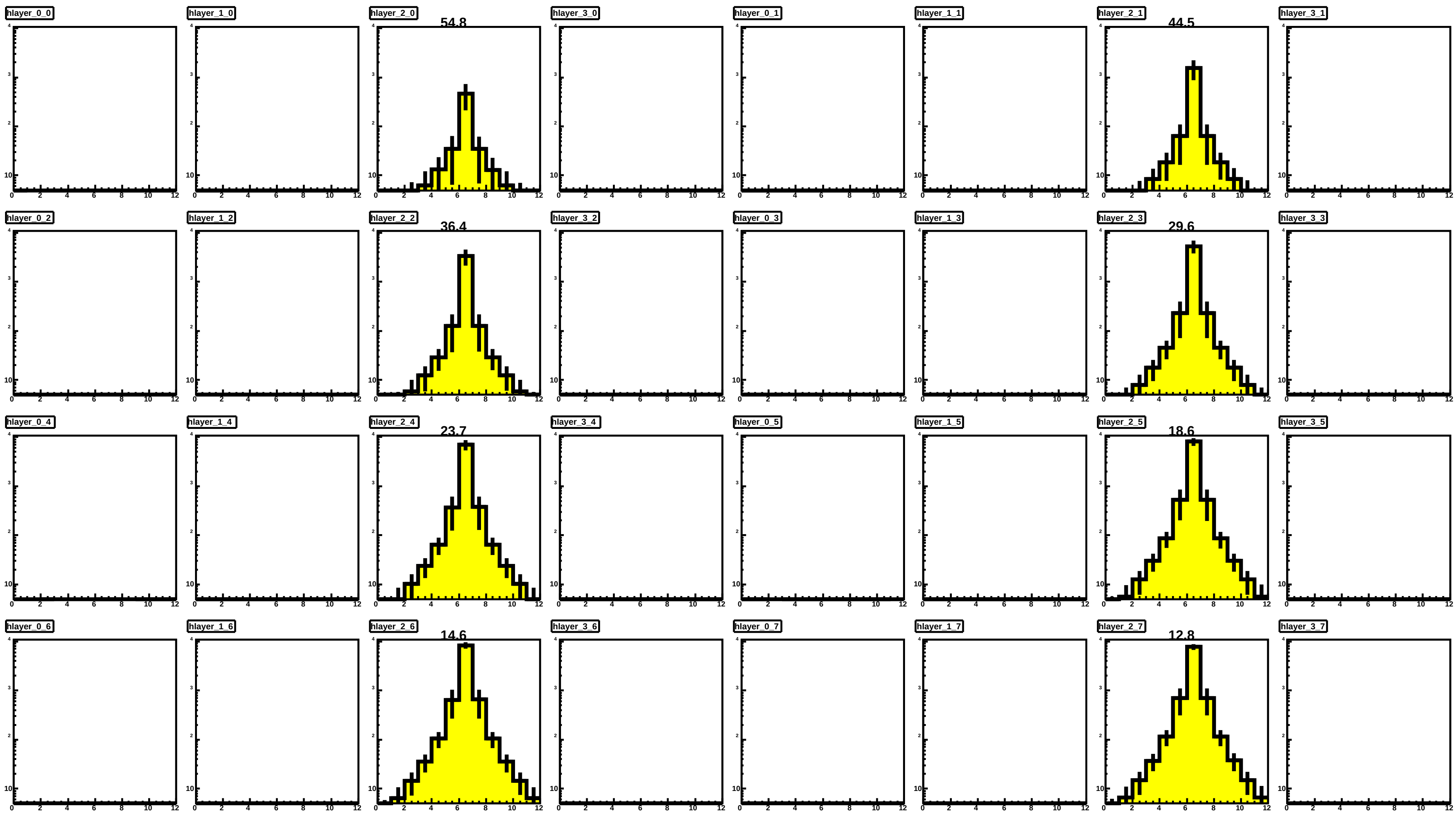
10 GeV (X = 0.5,Y = 0.5) 0 deg.



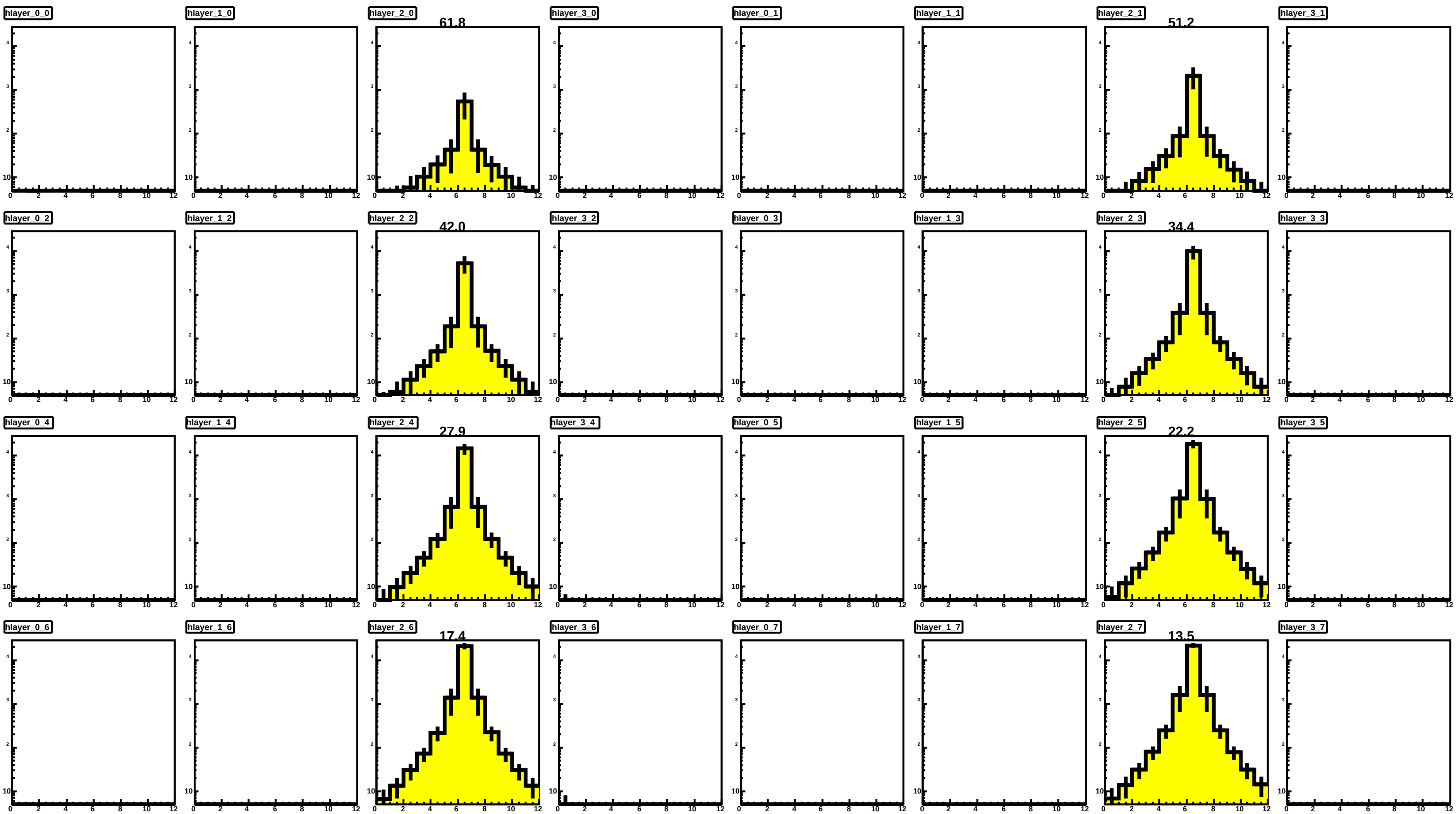
50 GeV (0.5,0.5) 0 deg.



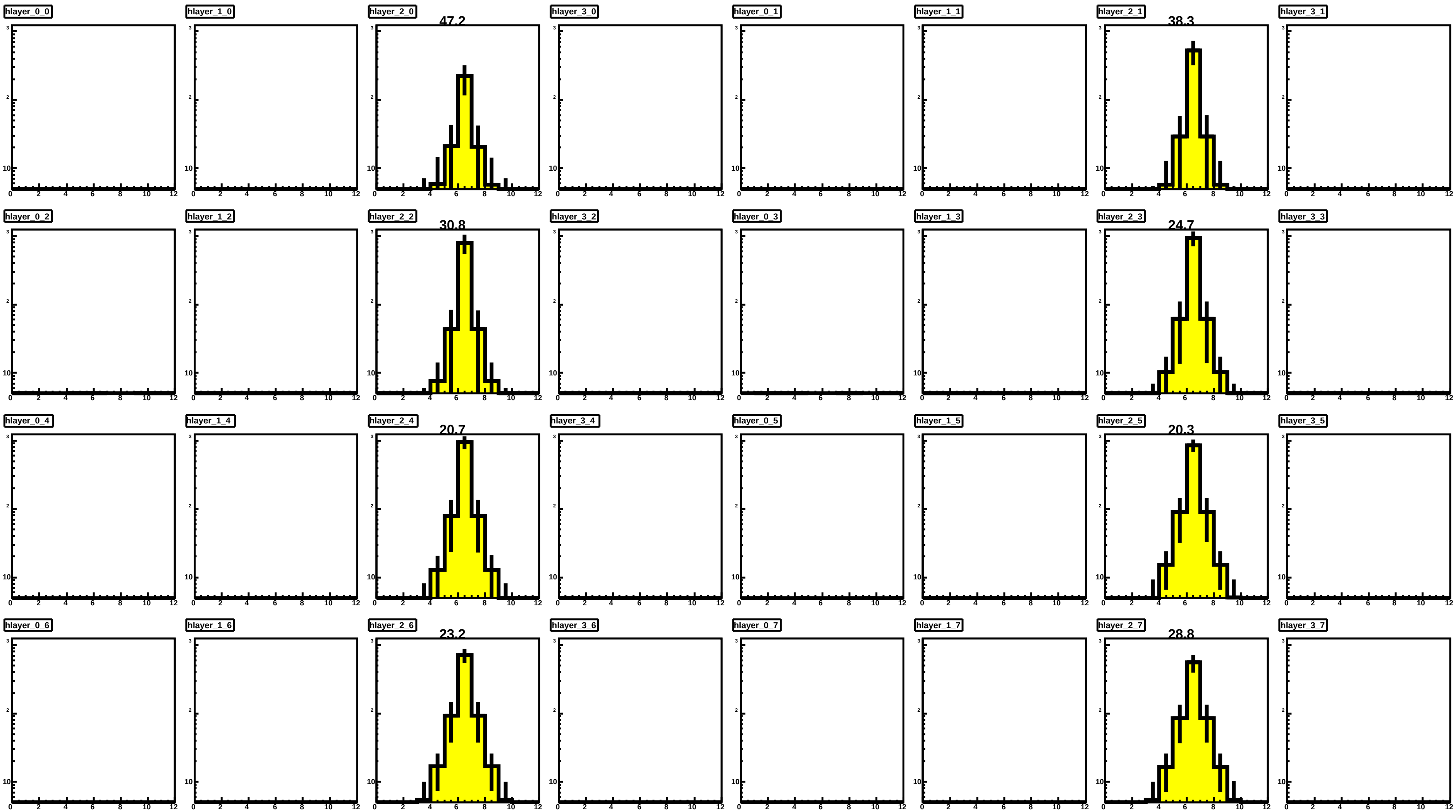
100 GeV (0.5,0.5) 0 deg.



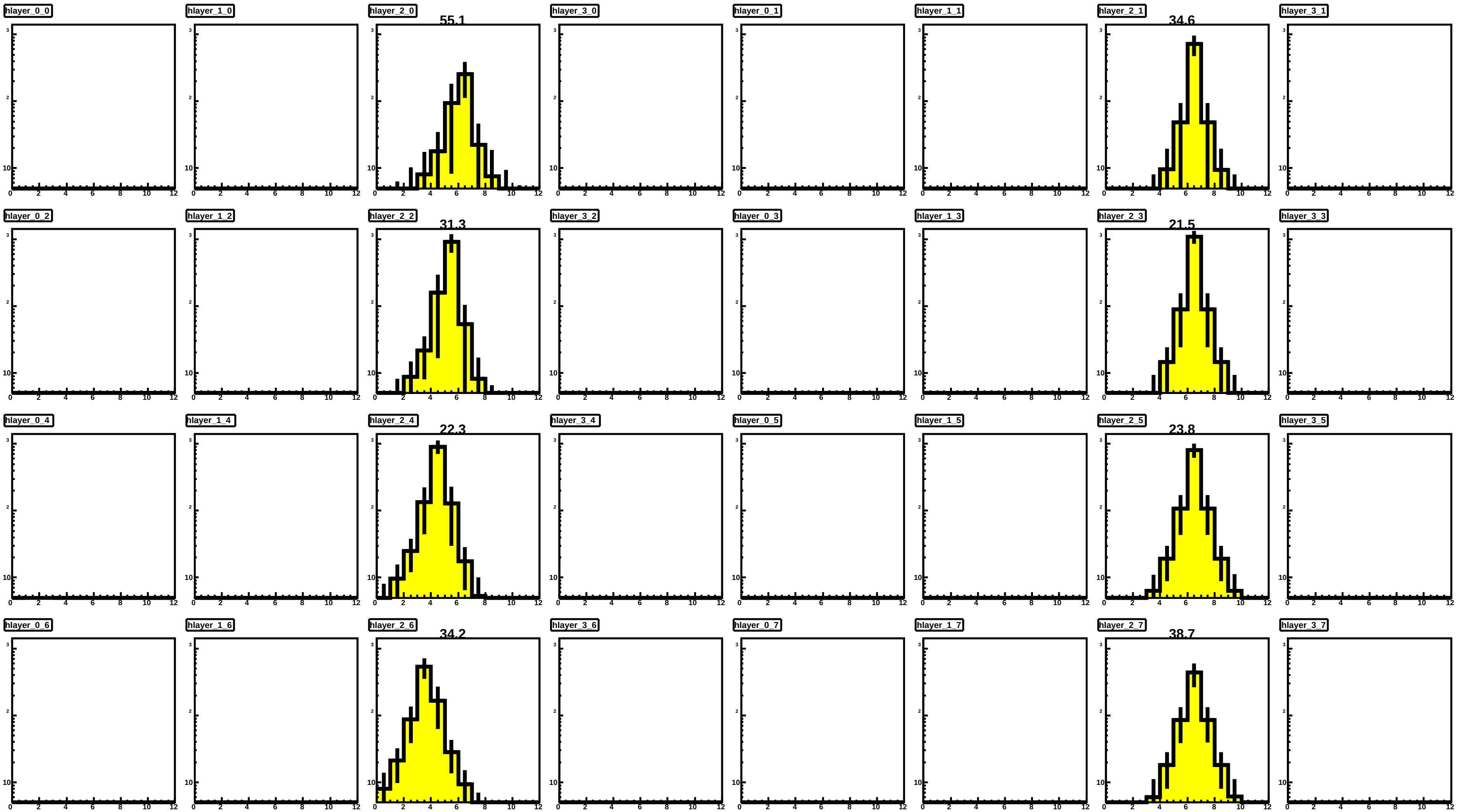
280 GeV (0.5,0.5) 0 deg.



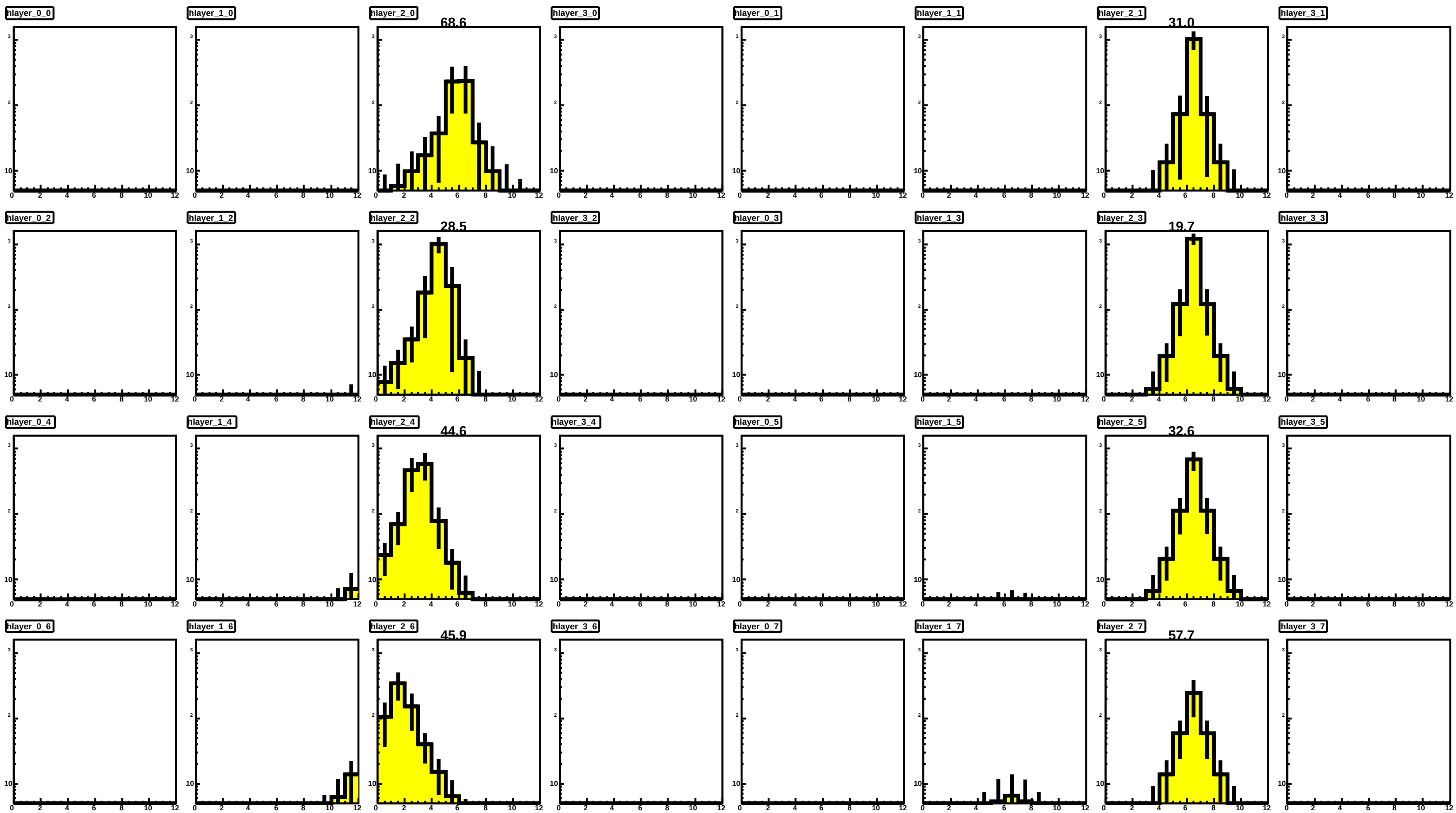
10 GeV (0.5,0.5) 0 deg.



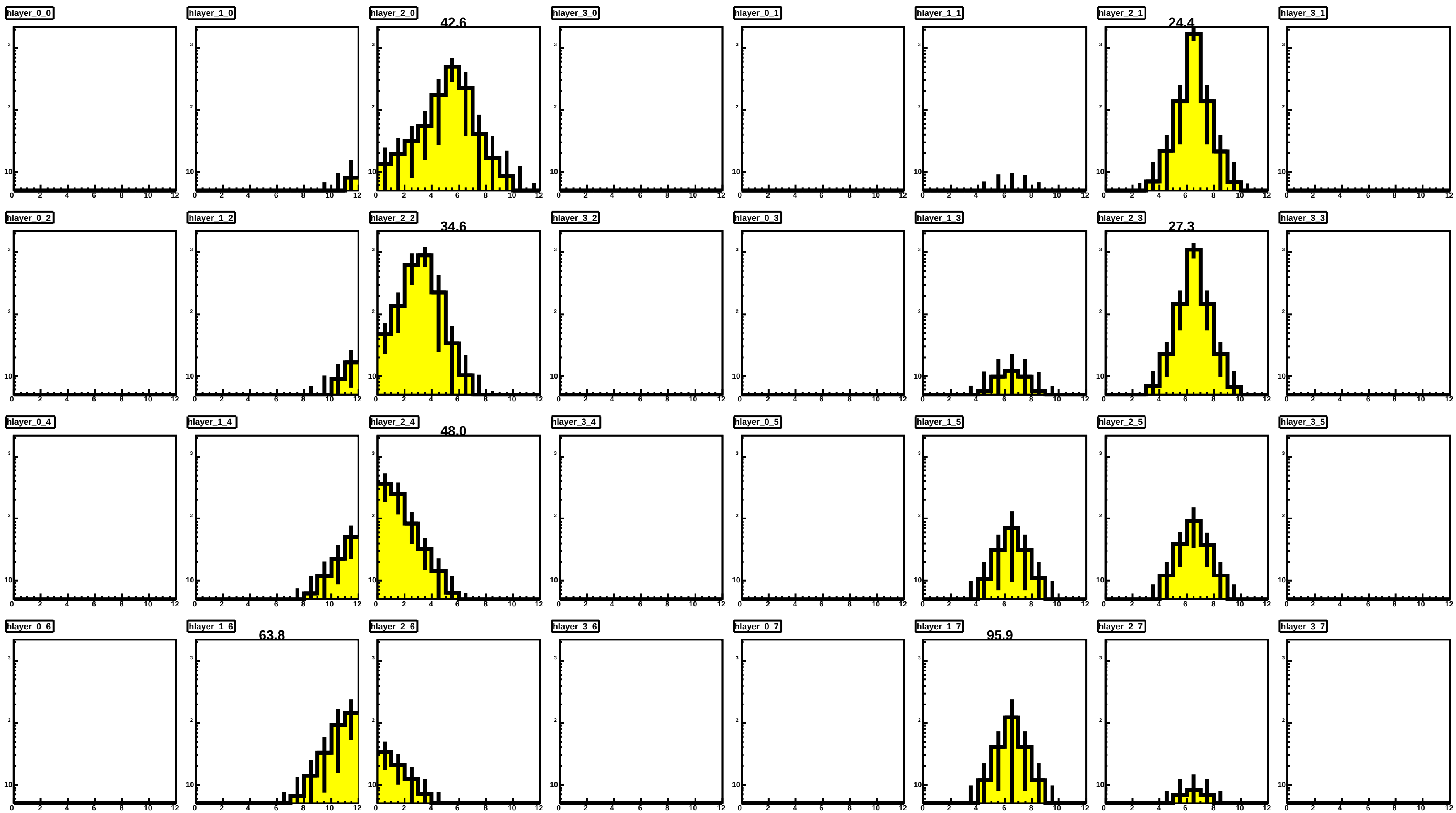
10 GeV (0.5,0.5) 30 deg.



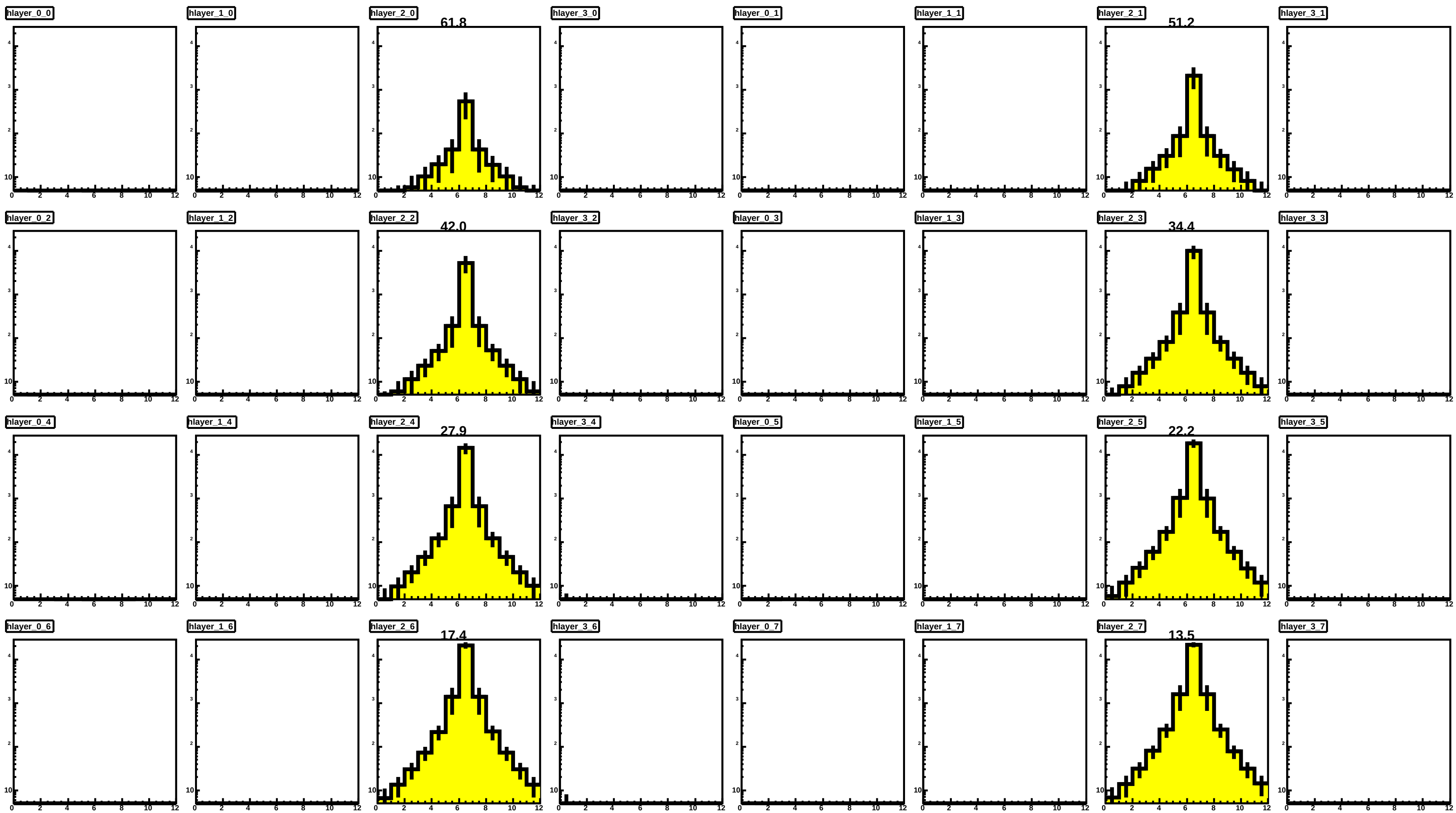
10 GeV (0.5,0.5) 45 deg.



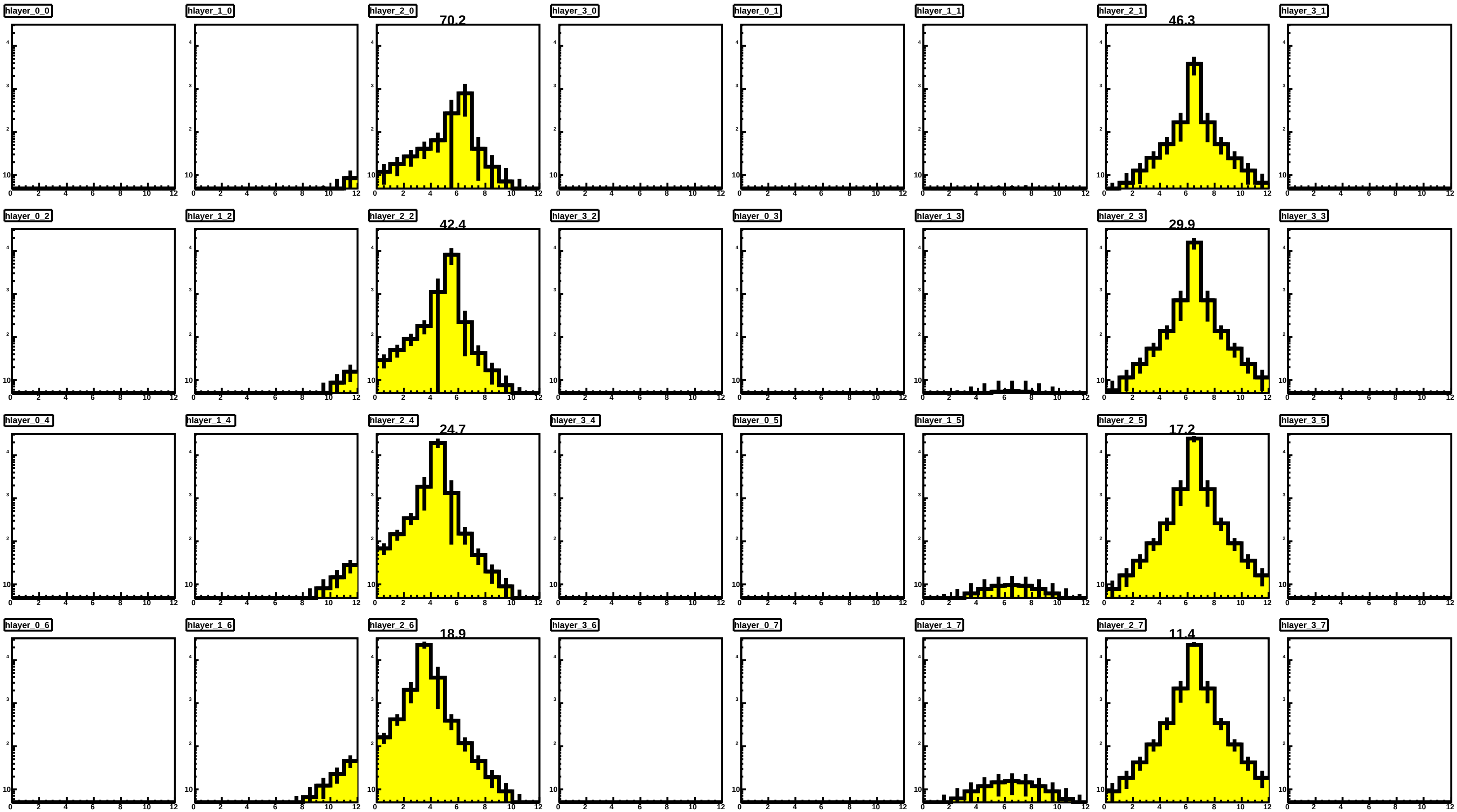
10 GeV (0.5,0.5) 60 deg.



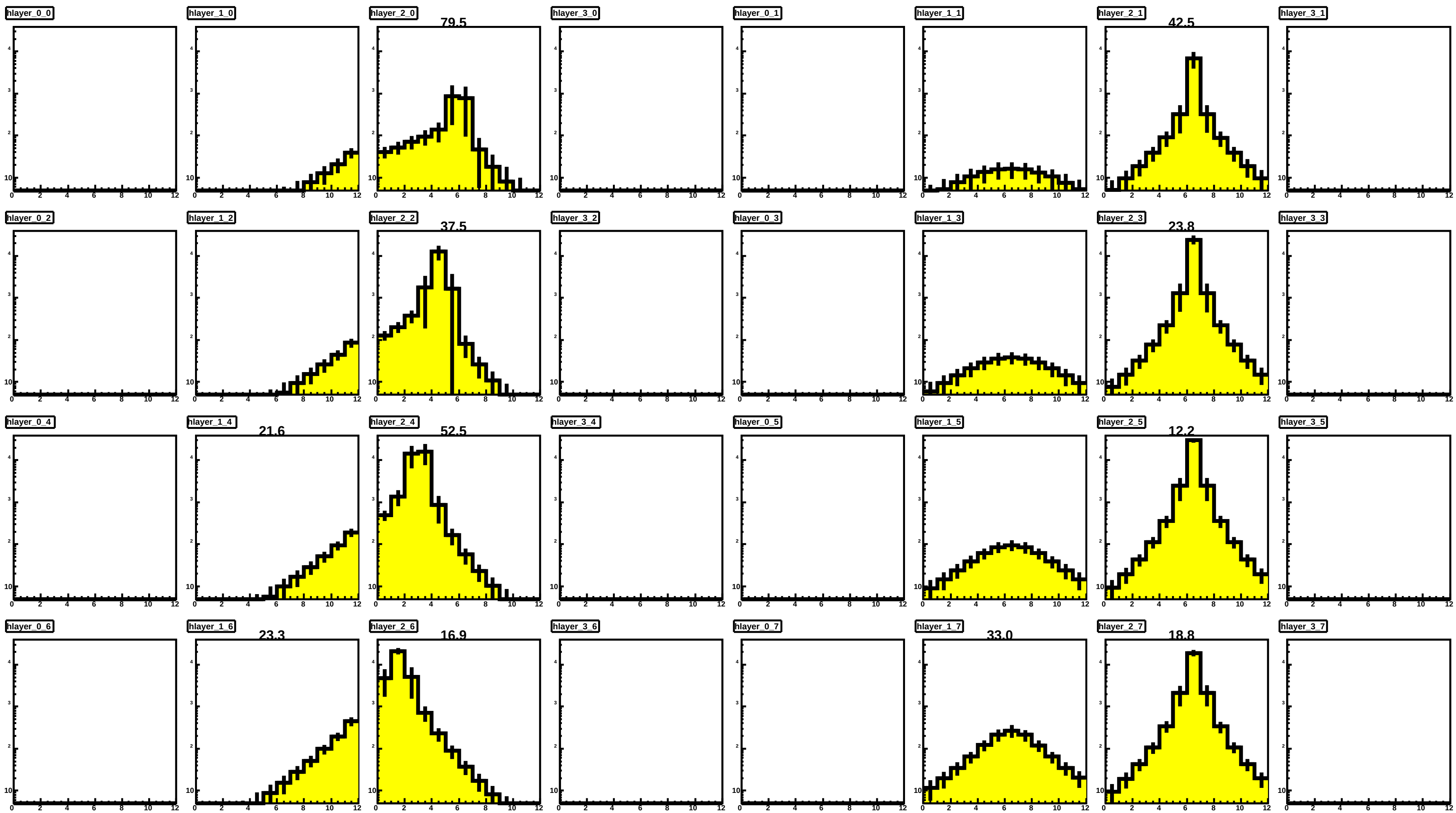
280 GeV (0.5,0.5) 0 deg.



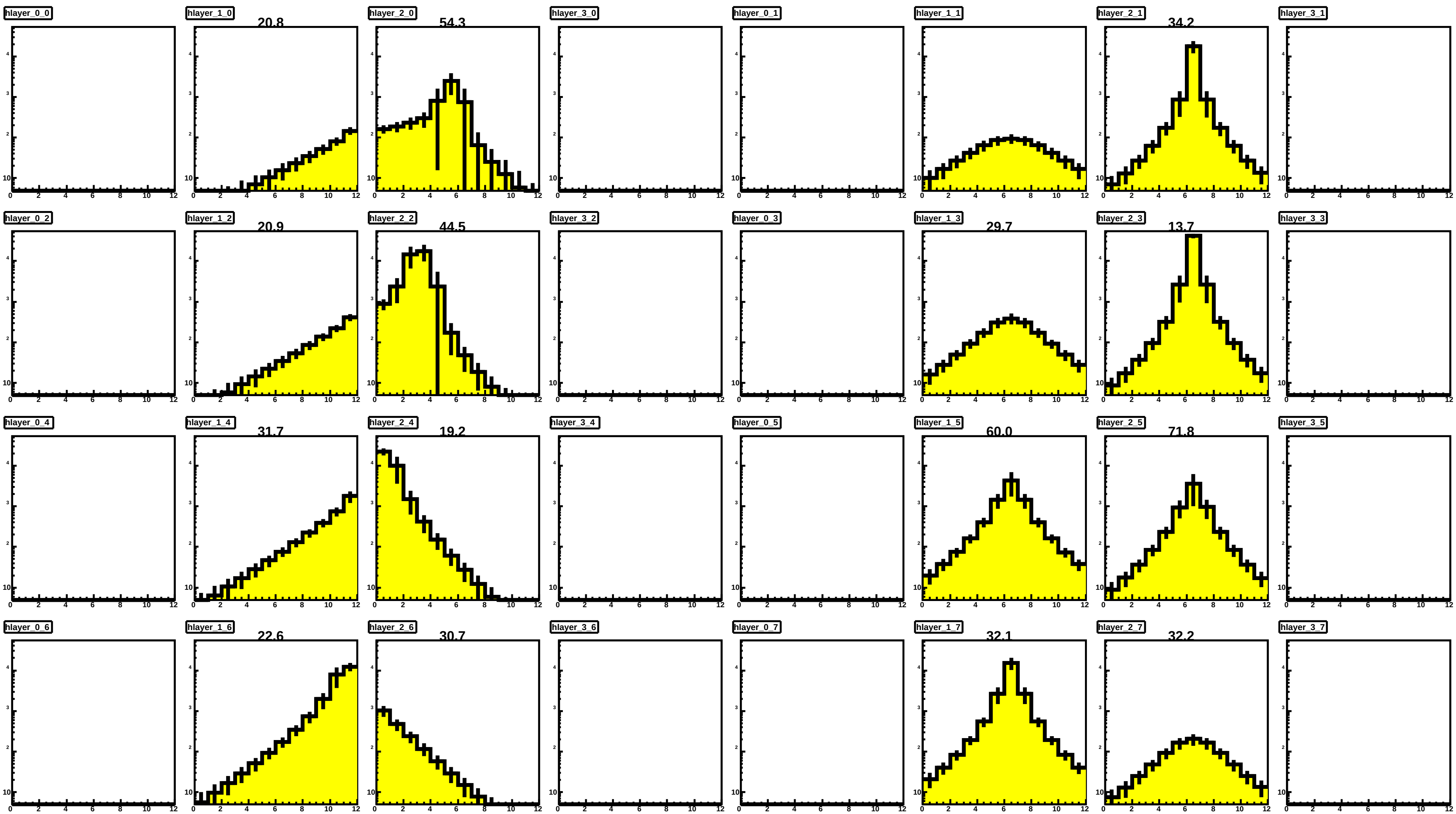
280 GeV (0.5,0.5) 30 deg.



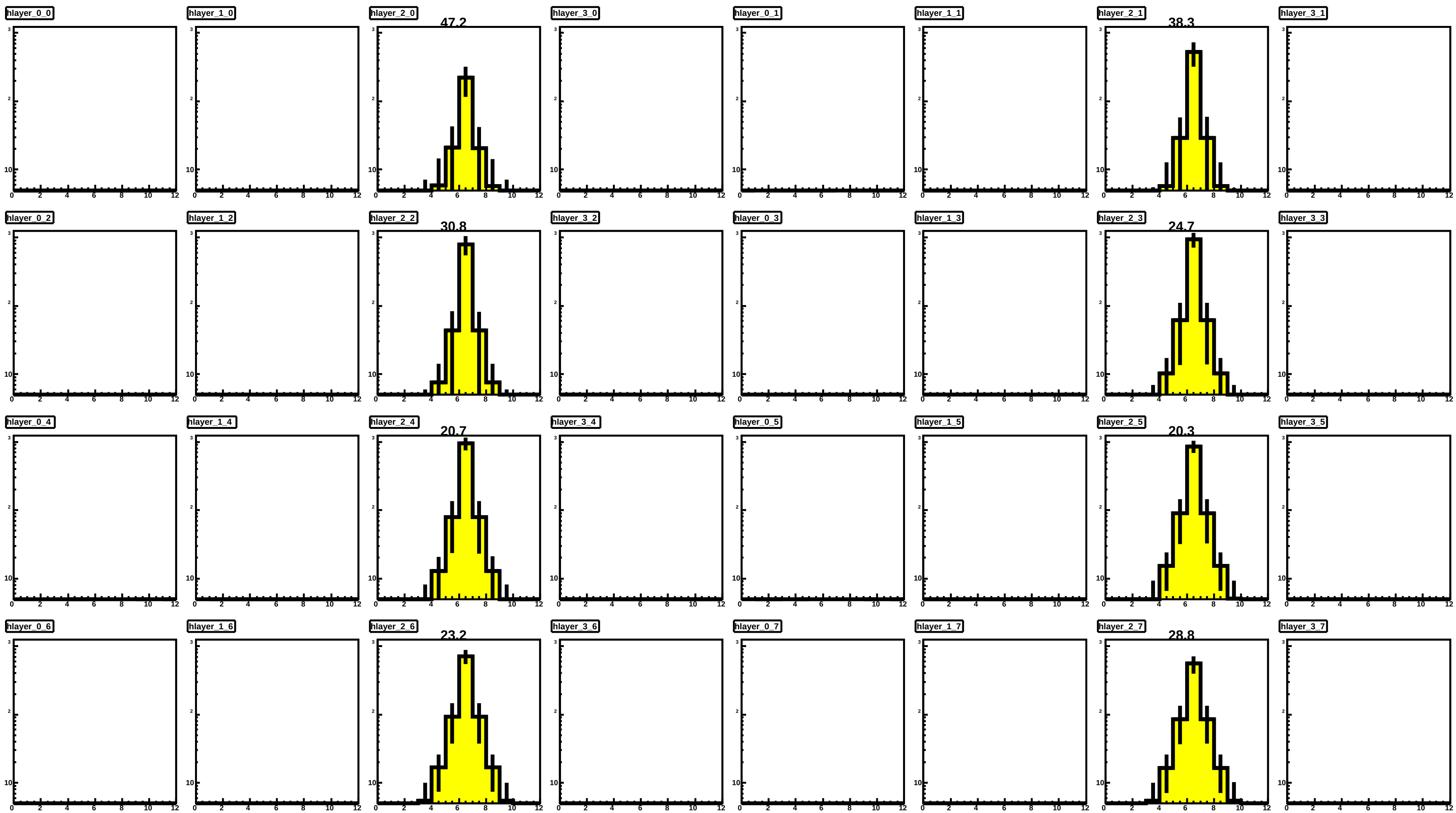
280 GeV (0.5,0.5) 45 deg.



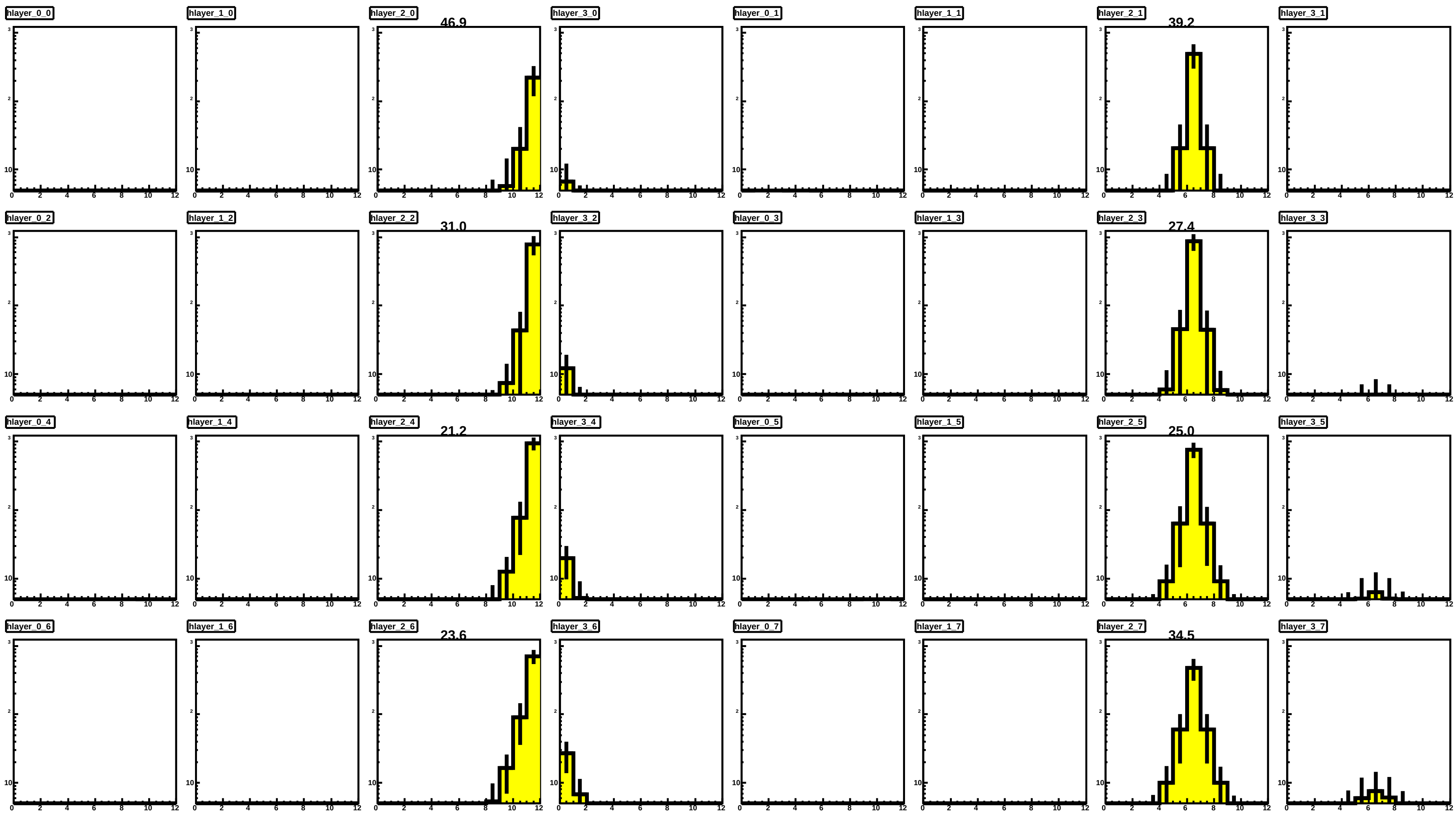
280 GeV (0.5,0.5) 60 deg.



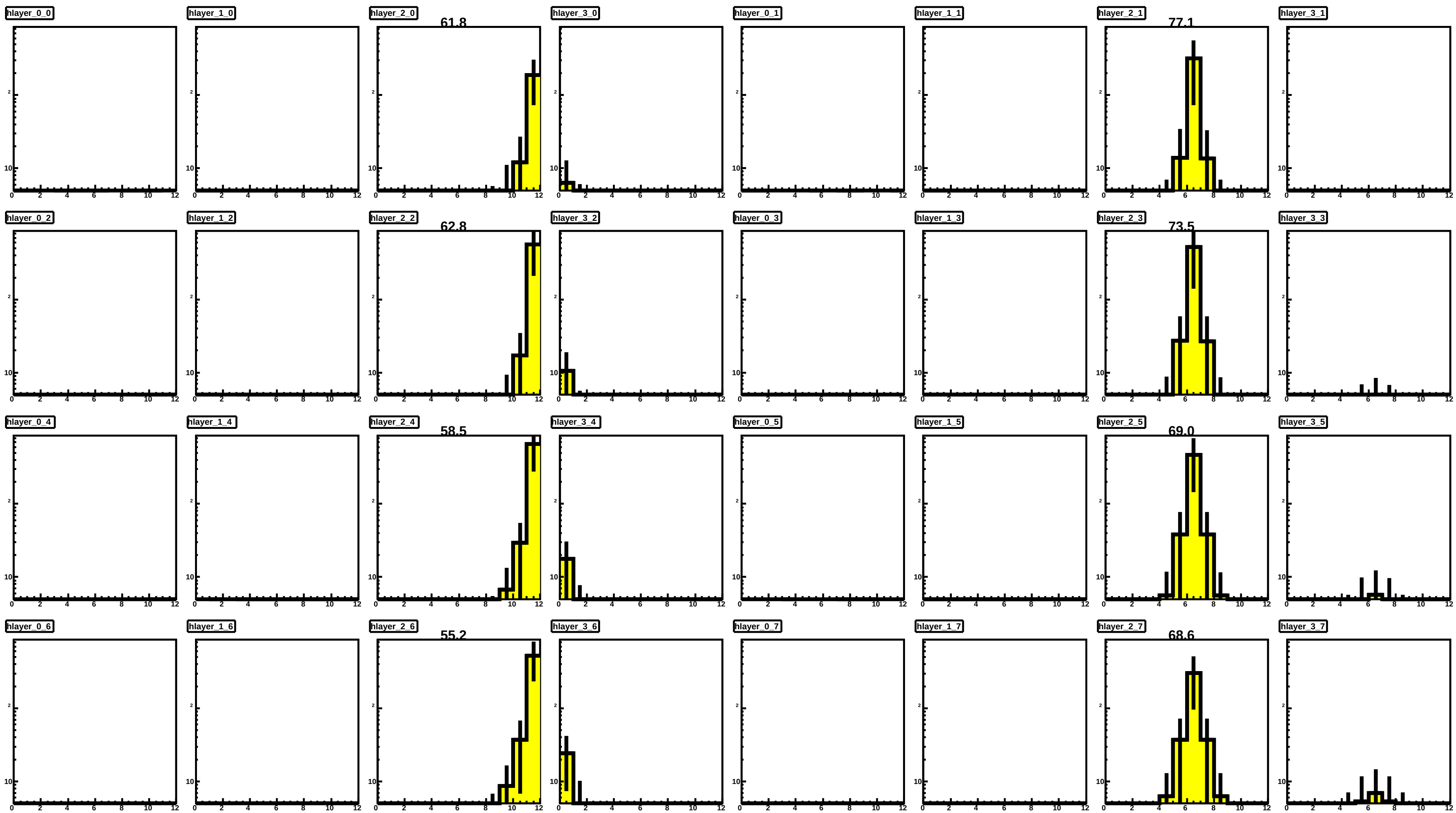
10 GeV (0.5,0.5) 0 deg.



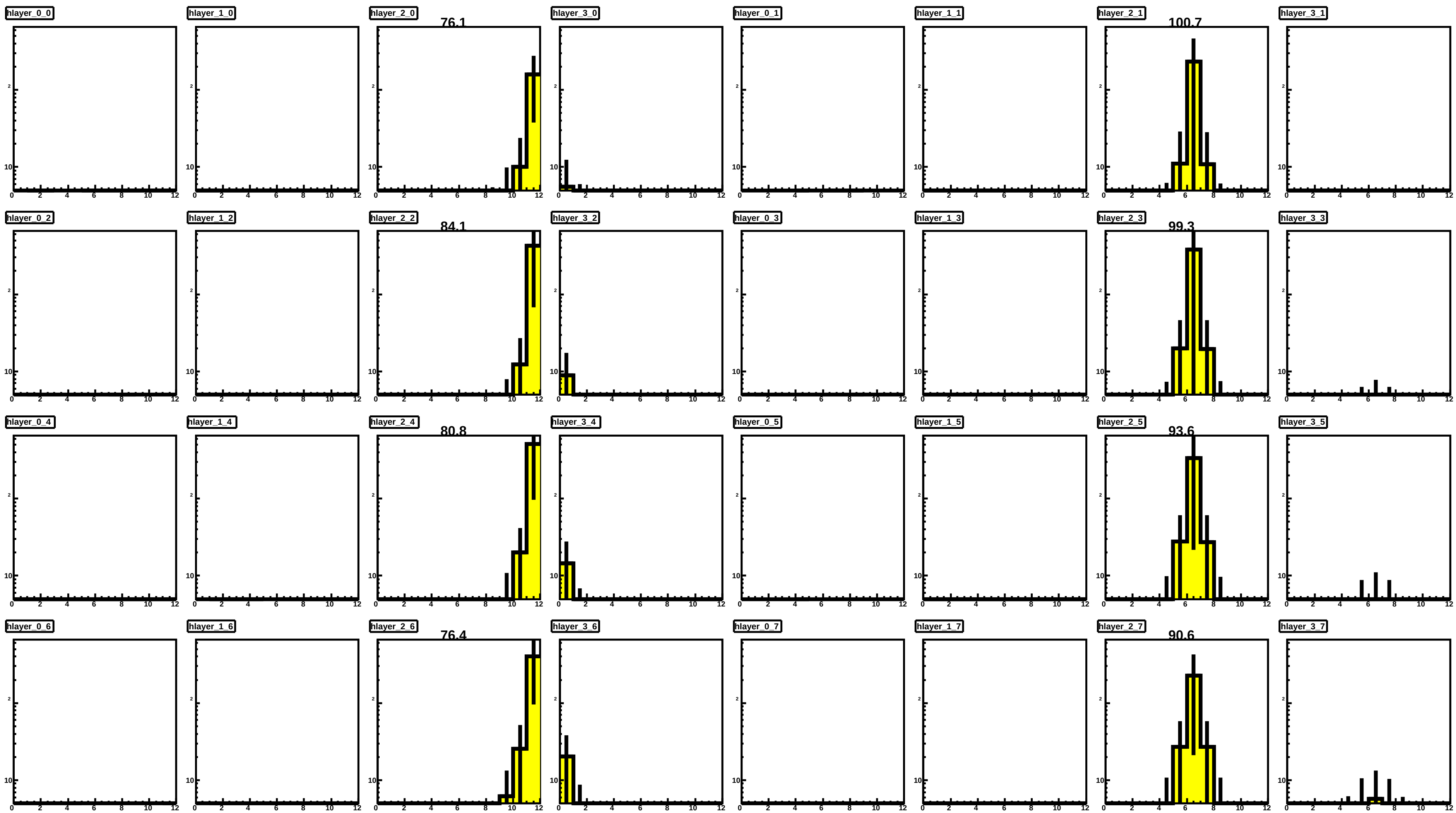
10 GeV (0.5,5.5) 0 deg.



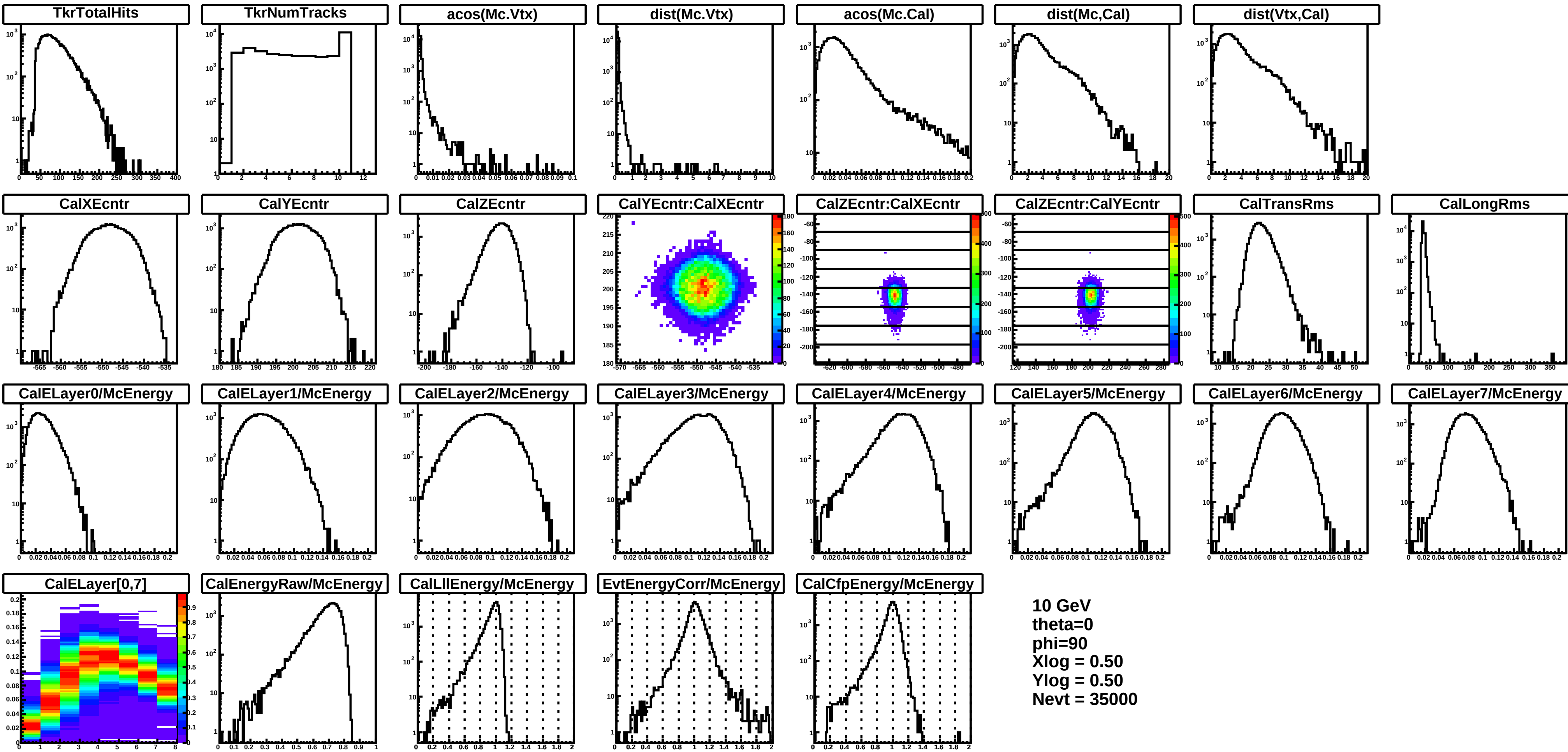
10 GeV (0.5,5.8) 0 deg.



10 GeV (0.5,5.9) 0 deg.

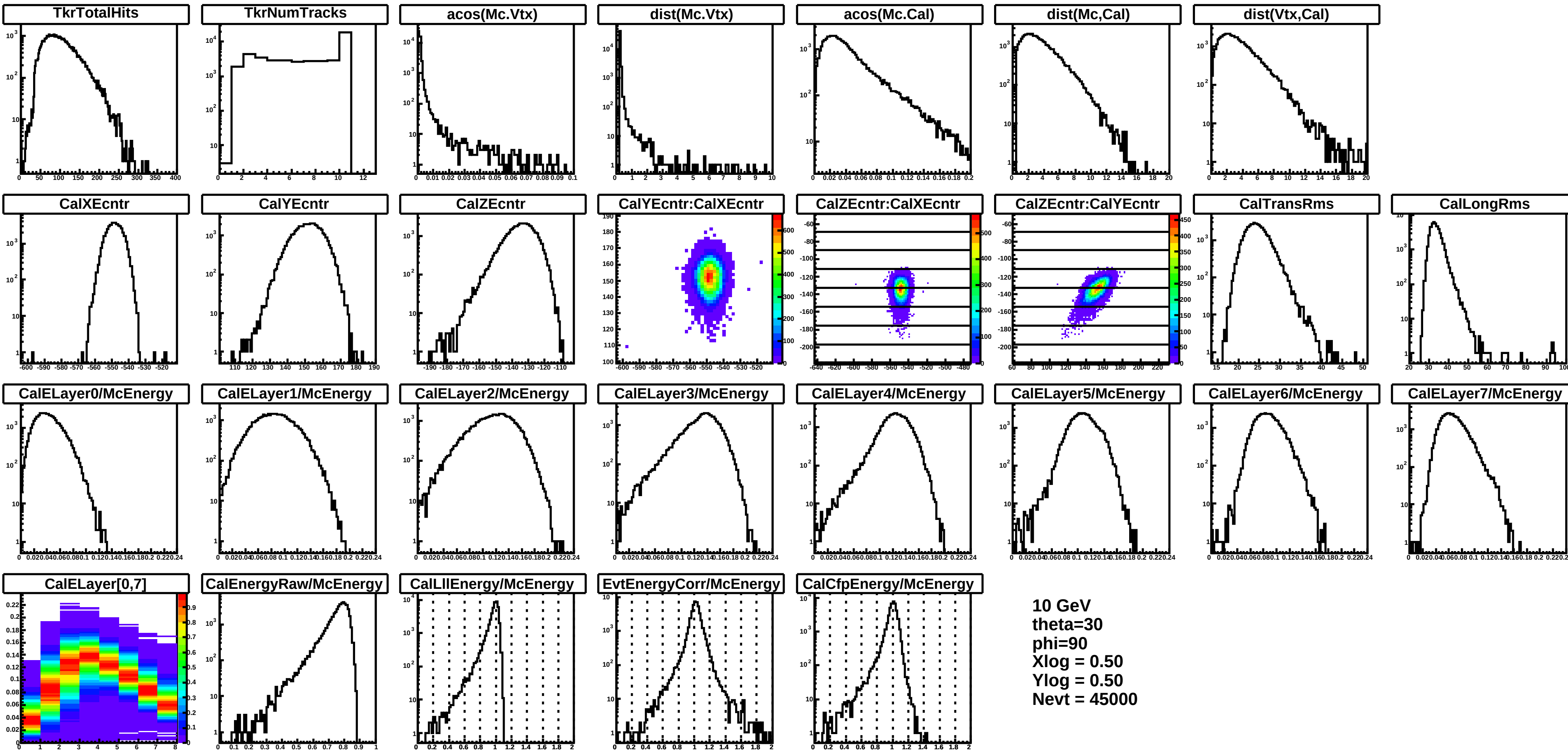


10 GeV (0.5,0.5) 0 deg.



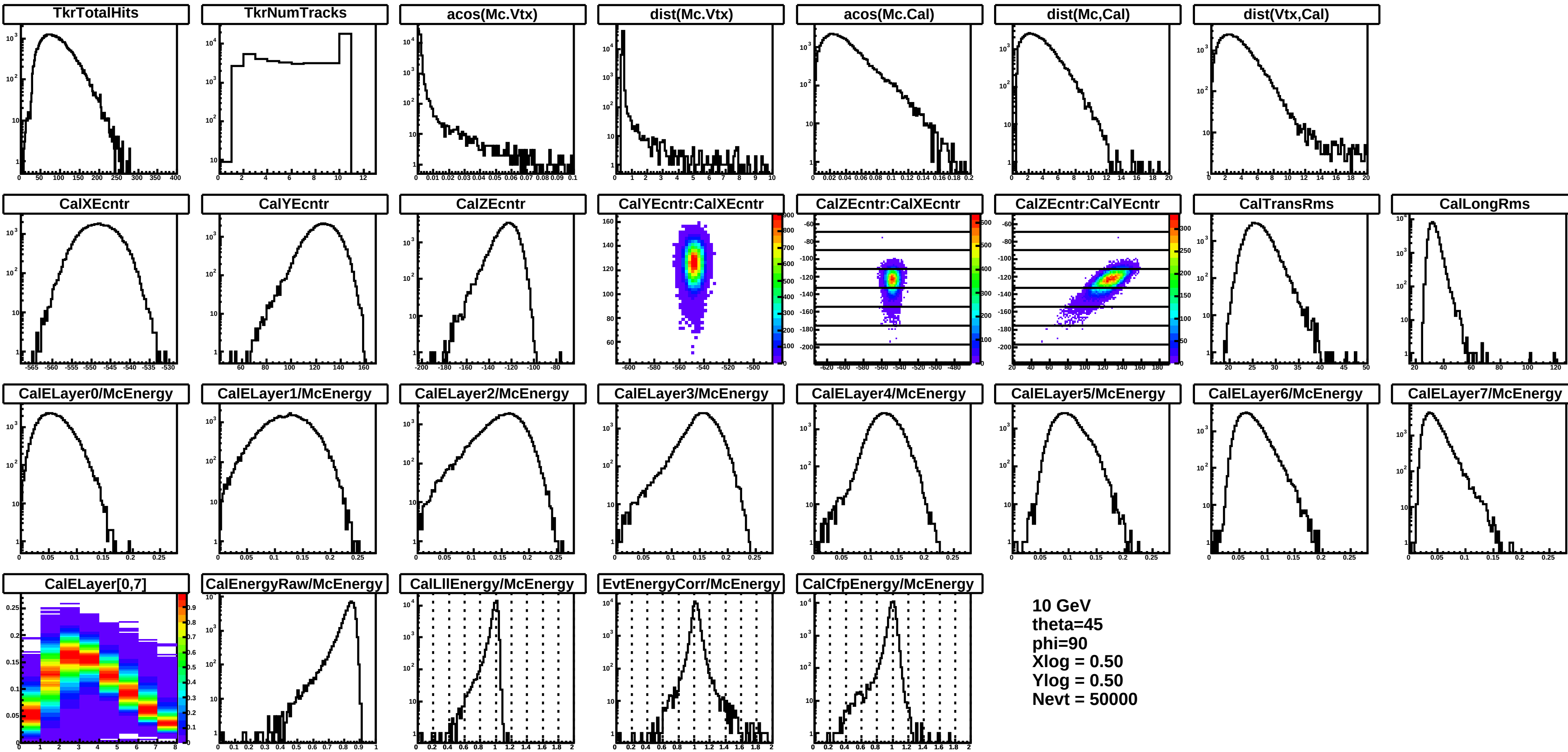
10 GeV
theta=0
phi=90
Xlog = 0.50
Ylog = 0.50
Nevt = 35000

10 GeV (0.5,0.5) 30 deg.

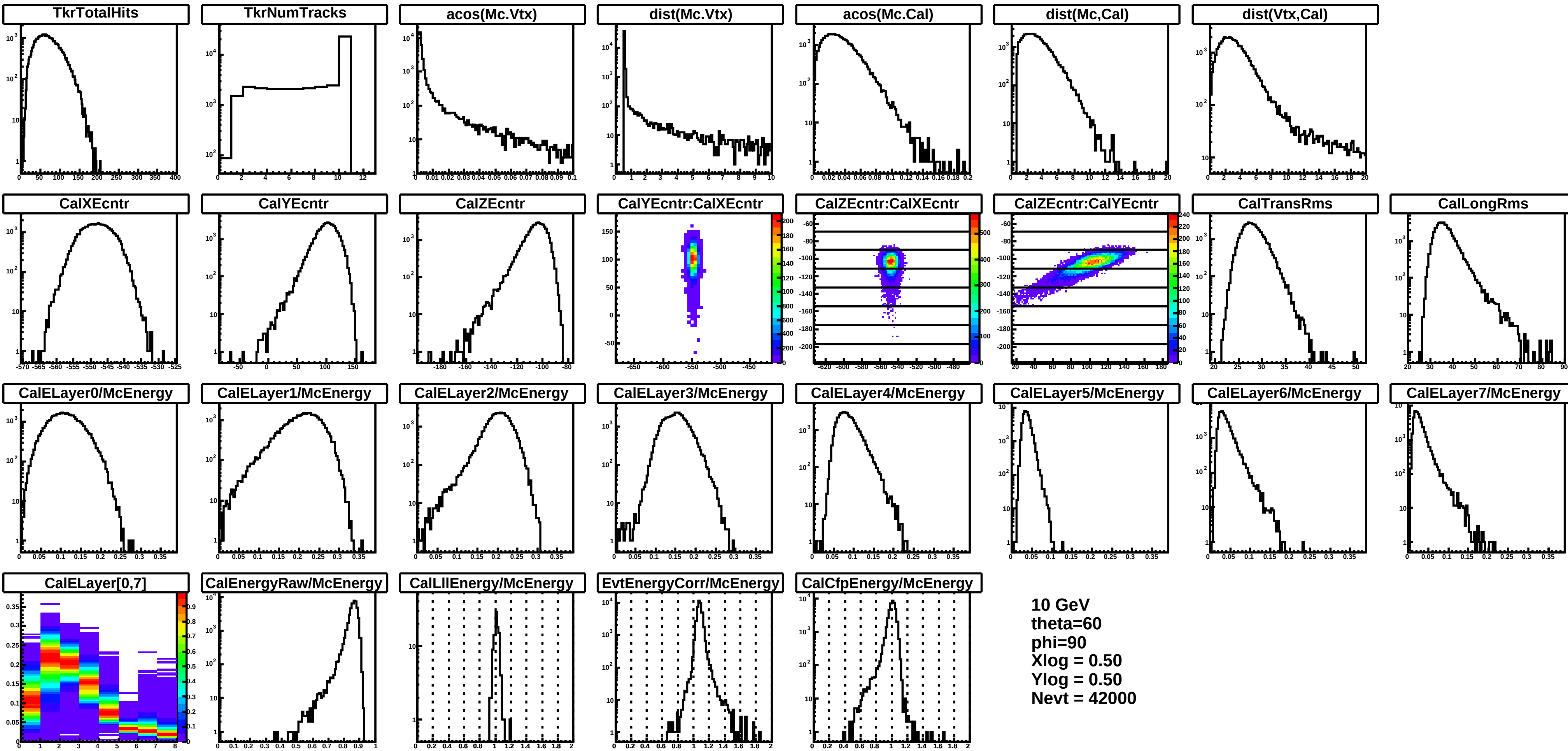


10 GeV
theta=30
phi=90
Xlog = 0.50
Ylog = 0.50
Nevt = 45000

10 GeV (0.5,0.5) 45 deg.

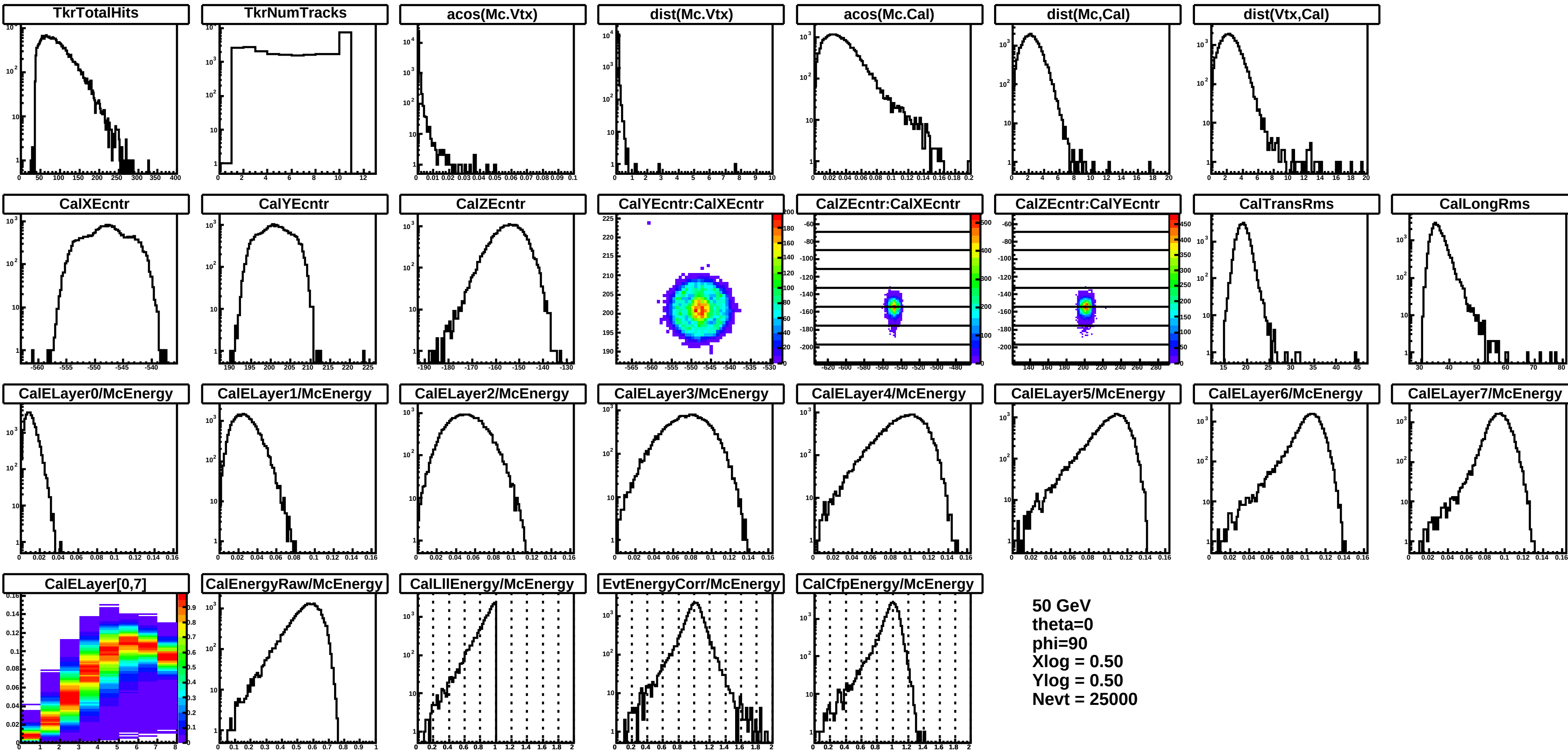


10 GeV (0.5,0.5) 60 deg.



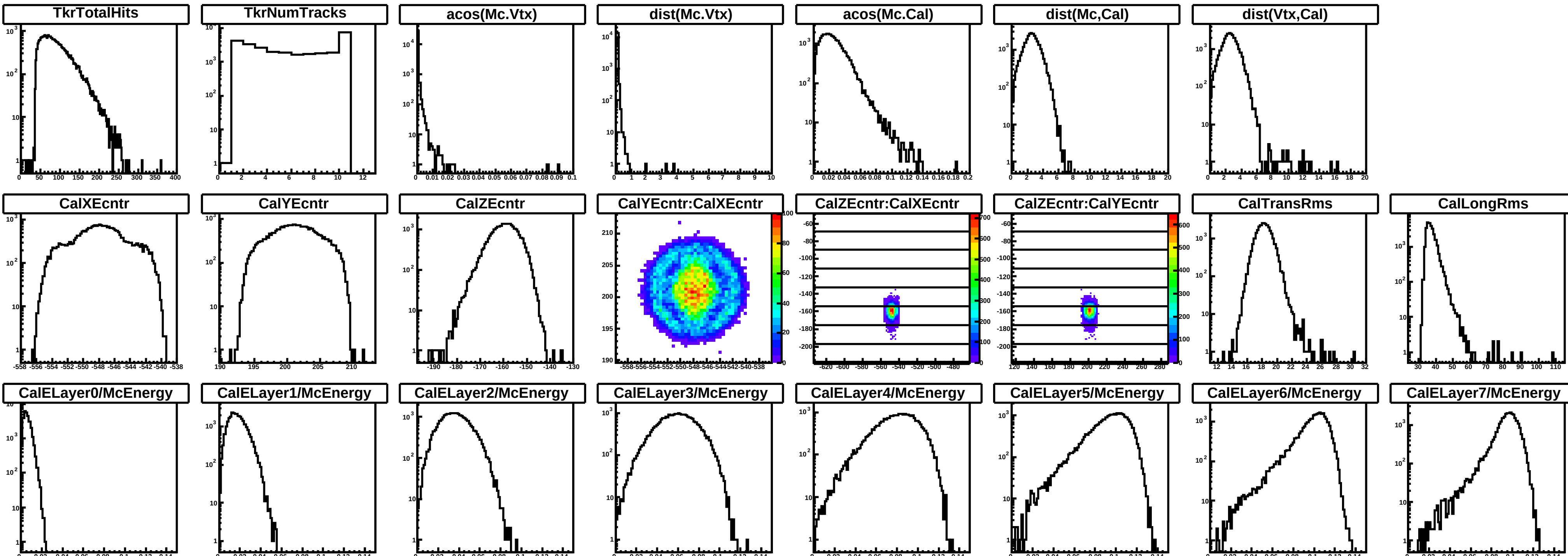
10 GeV
theta=60
phi=90
Xlog = 0.50
Ylog = 0.50
Nevt = 42000

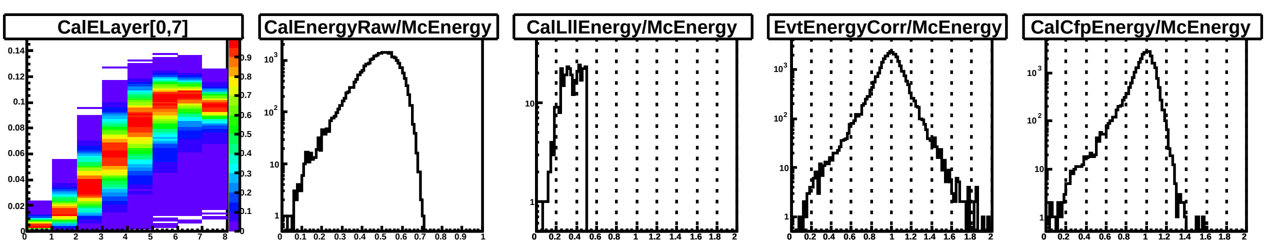
50 GeV (0.5,0.5) 0 deg.



50 GeV
theta=0
phi=90
Xlog = 0.50
Ylog = 0.50
Nevt = 25000

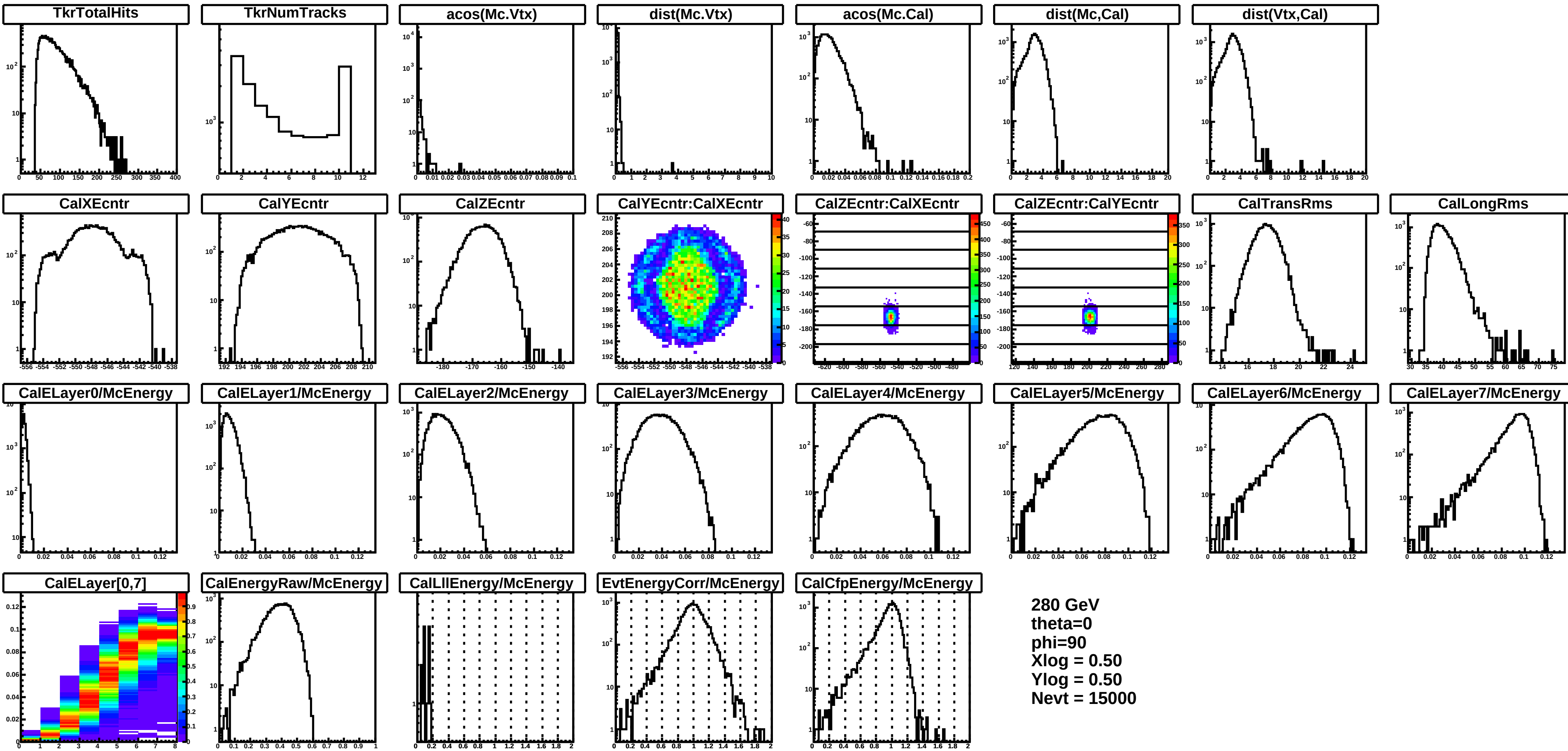
100 GeV (0.5,0.5) 0 deg.





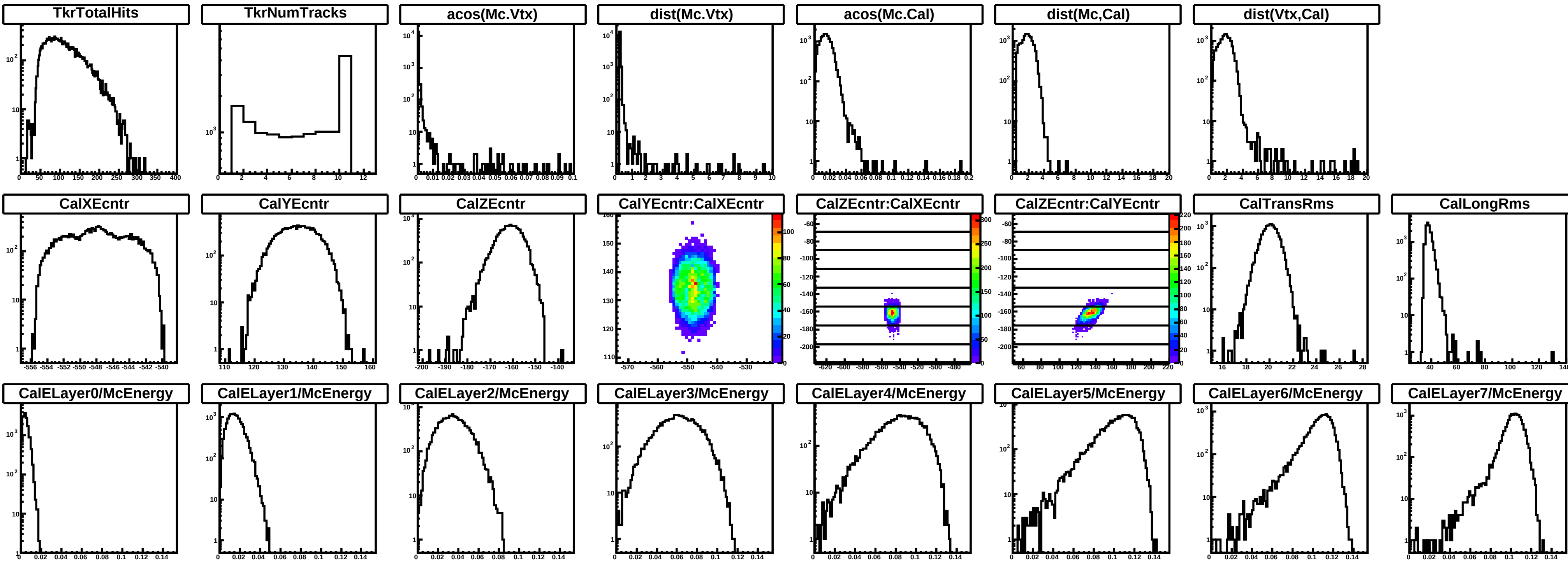
100 GeV
theta=0
phi=90
Xlog = 0.50
Ylog = 0.50
Nevt = 28500

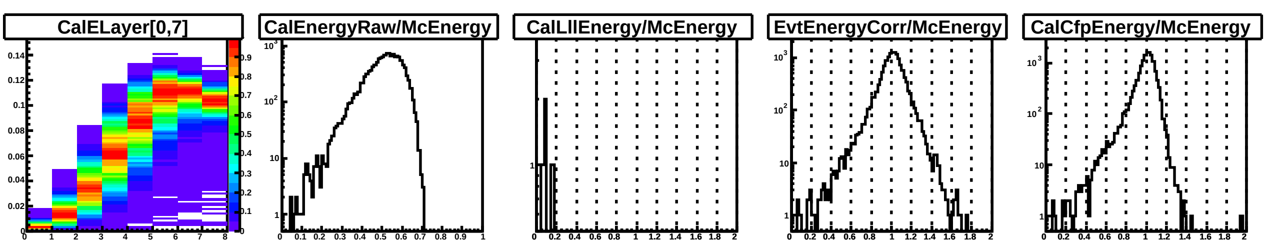
280 GeV (0.5,0.5) 0 deg.



280 GeV
theta=0
phi=90
Xlog = 0.50
Ylog = 0.50
Nevt = 15000

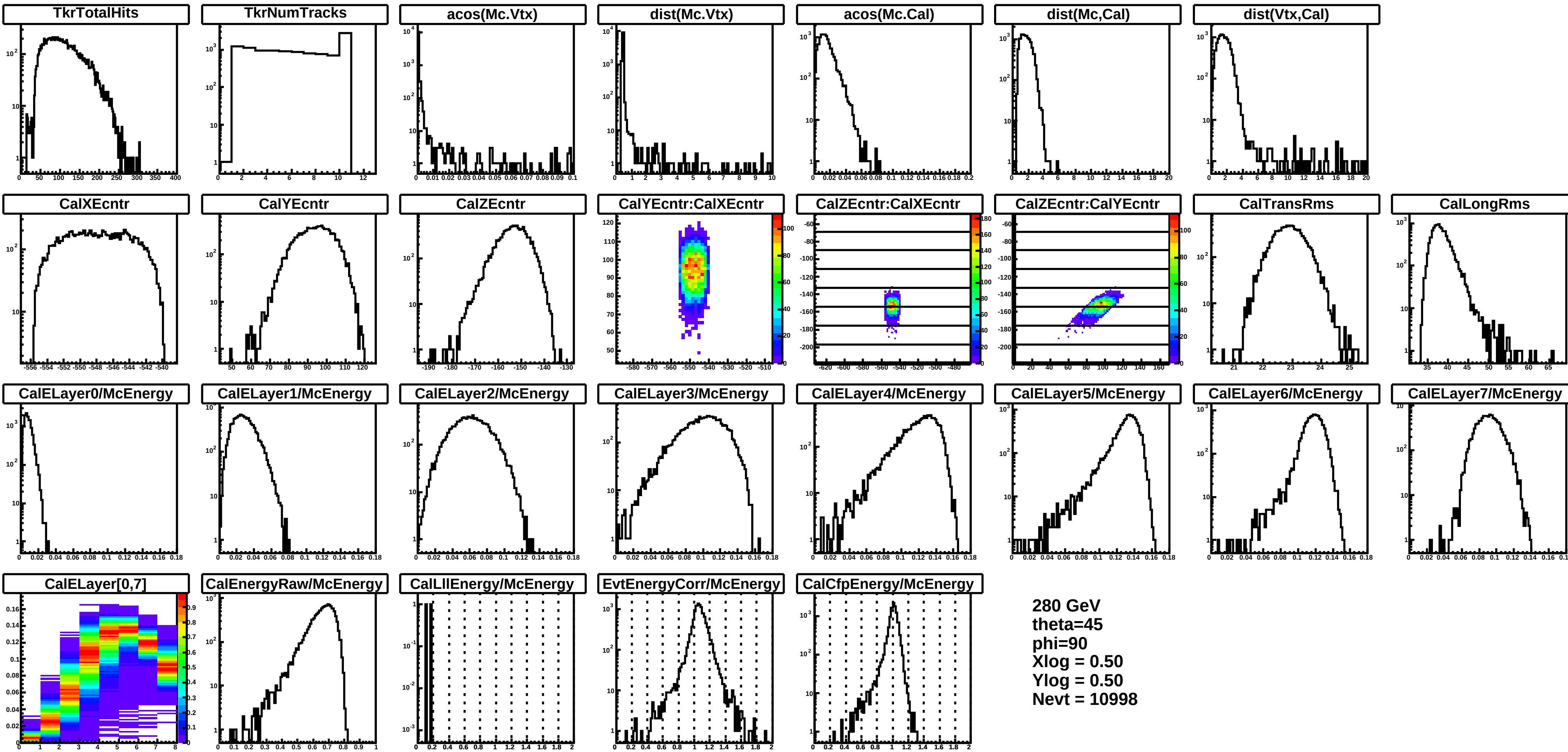
280 GeV (0.5,0.5) 30 deg.





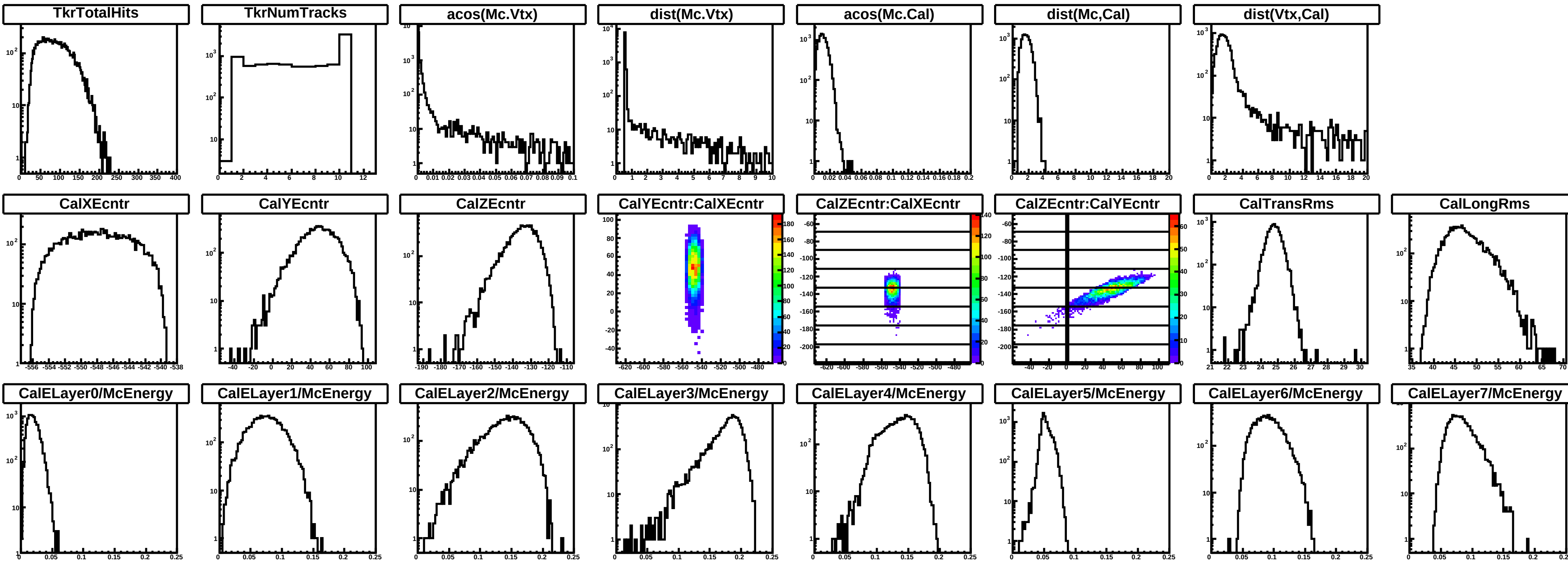
280 GeV
theta=30
phi=90
Xlog = 0.50
Ylog = 0.50
Nevt = 13990

280 GeV (0.5,0.5) 45 deg.



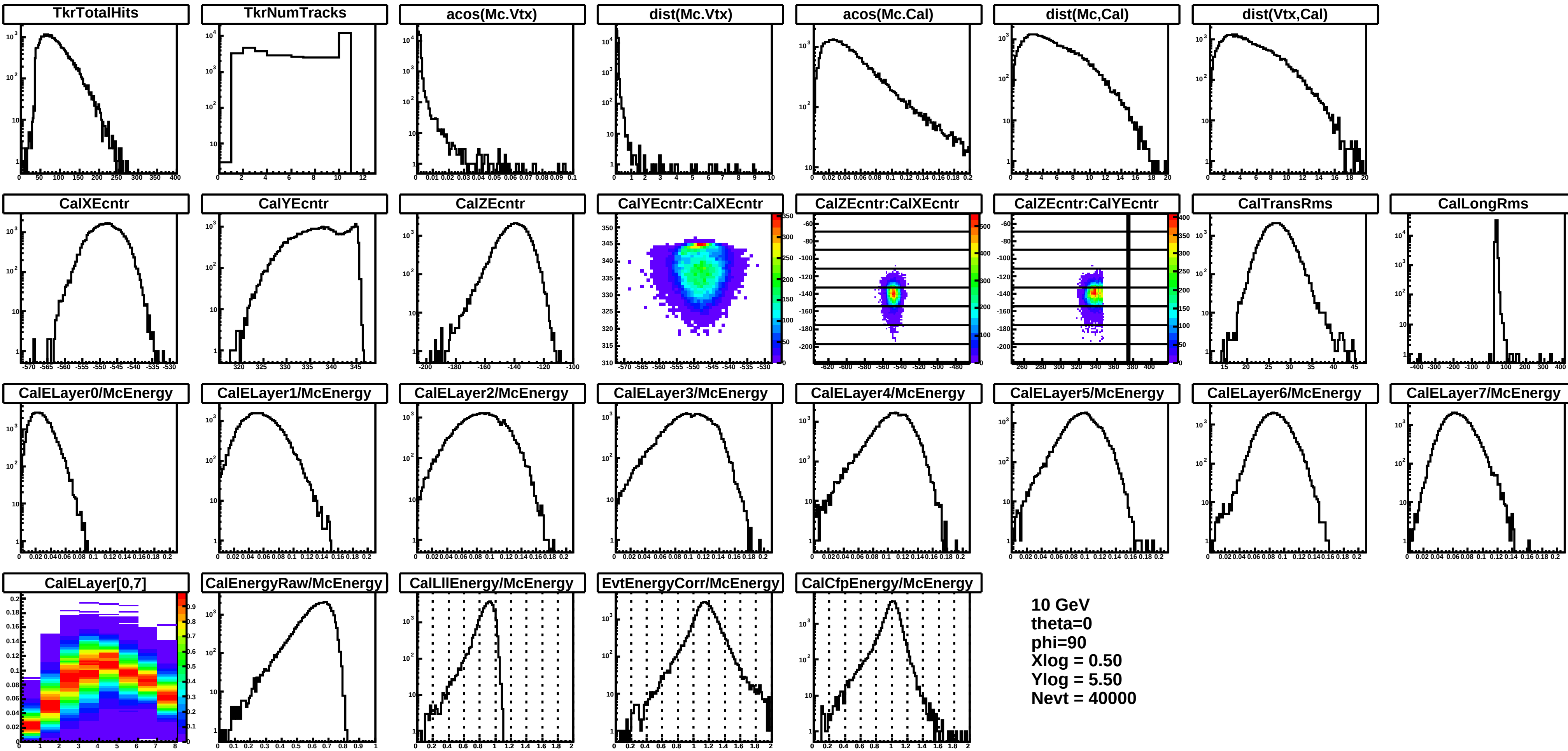
280 GeV
theta=45
phi=90
Xlog = 0.50
Ylog = 0.50
Nevt = 10998

280 GeV (0.5,0.5) 60 deg.



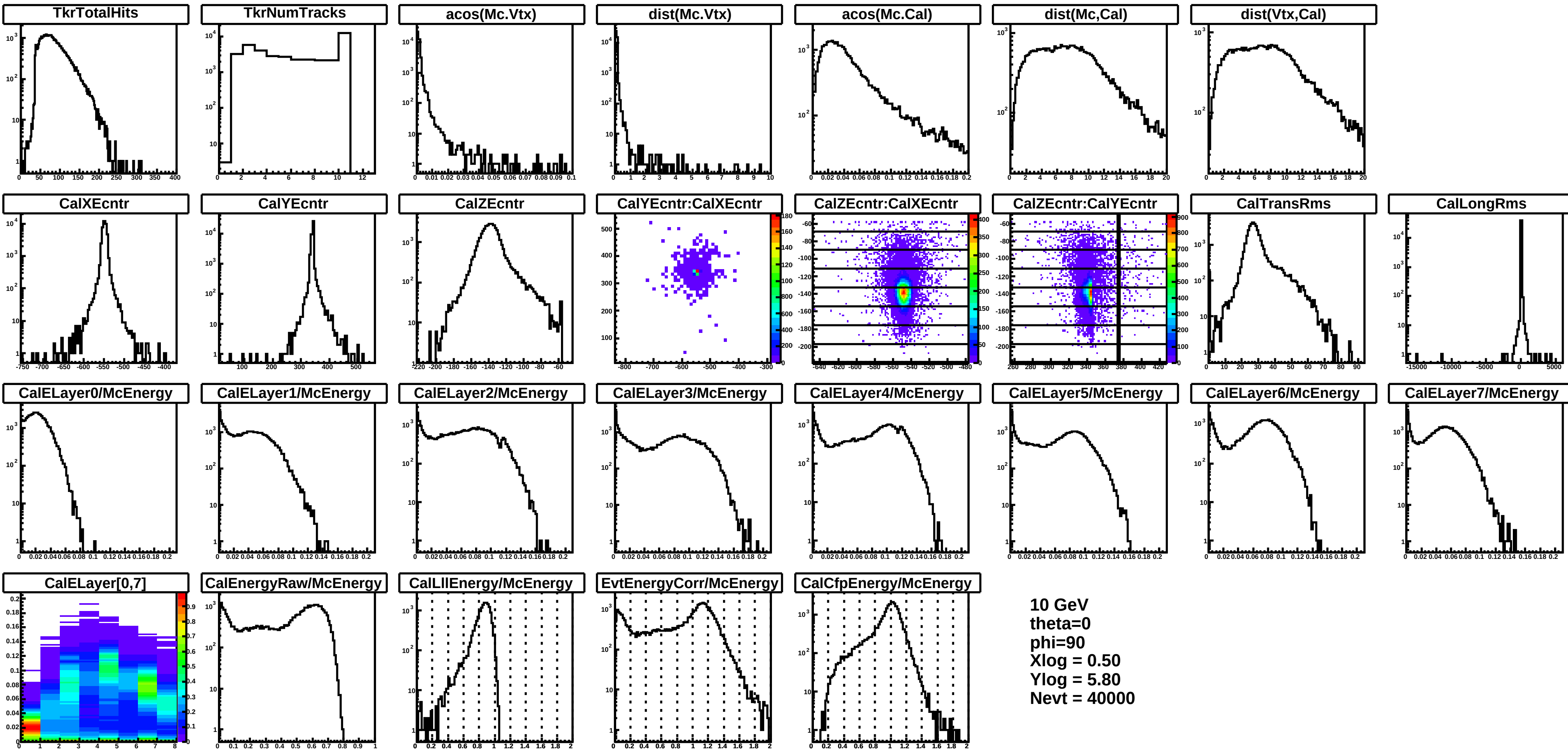
280 GeV
theta=60
phi=90
Xlog = 0.50
Ylog = 0.50
Nevt = 9100

10 GeV (0.5,5.5) 0 deg.



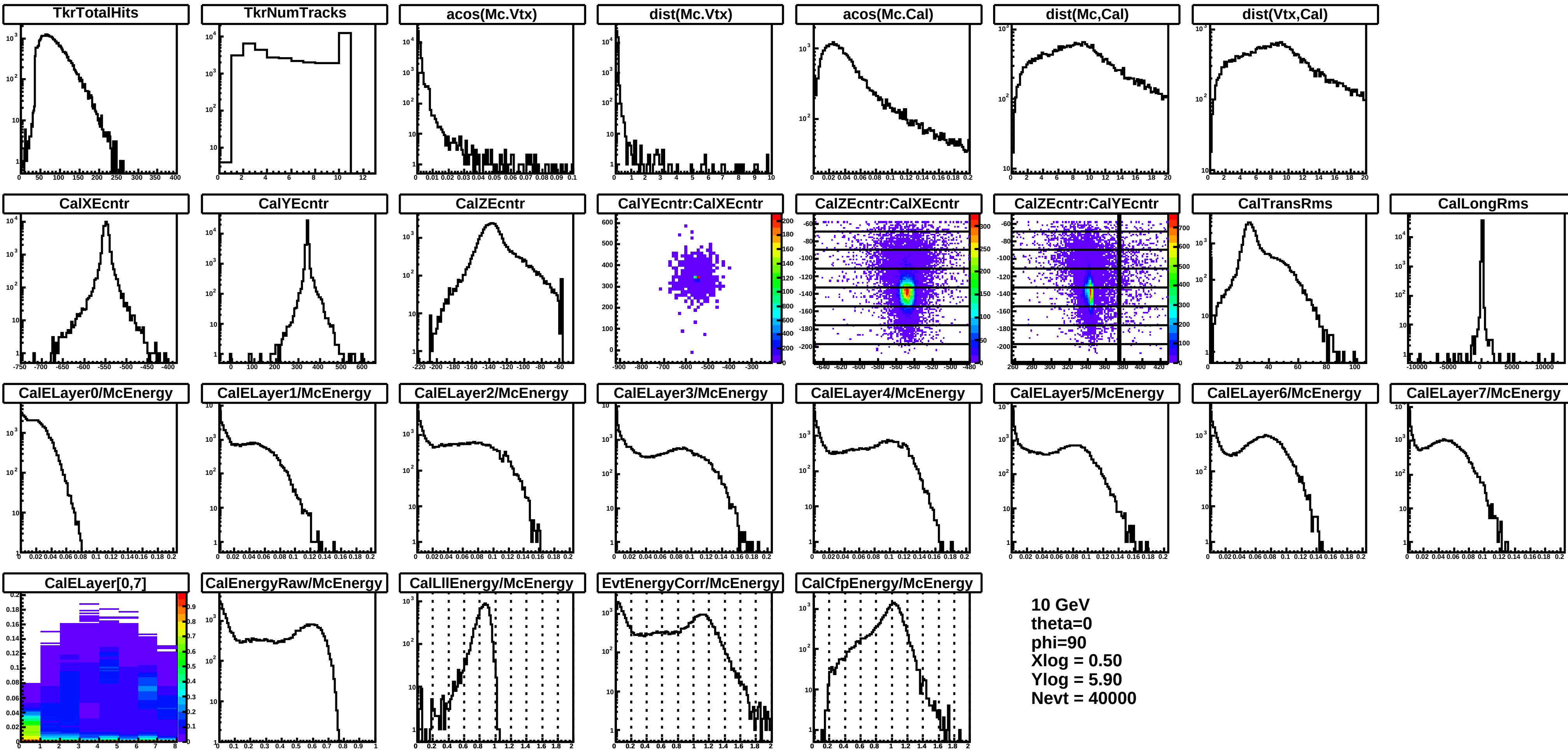
10 GeV
theta=0
phi=90
Xlog = 0.50
Ylog = 5.50
Nevt = 40000

10 GeV (0.5,5.8) 0 deg.



10 GeV
theta=0
phi=90
Xlog = 0.50
Ylog = 5.80
Nevt = 40000

10 GeV (0.5,5.9) 0 deg.



10 GeV
theta=0
phi=90
Xlog = 0.50
Ylog = 5.90
Nevt = 40000