

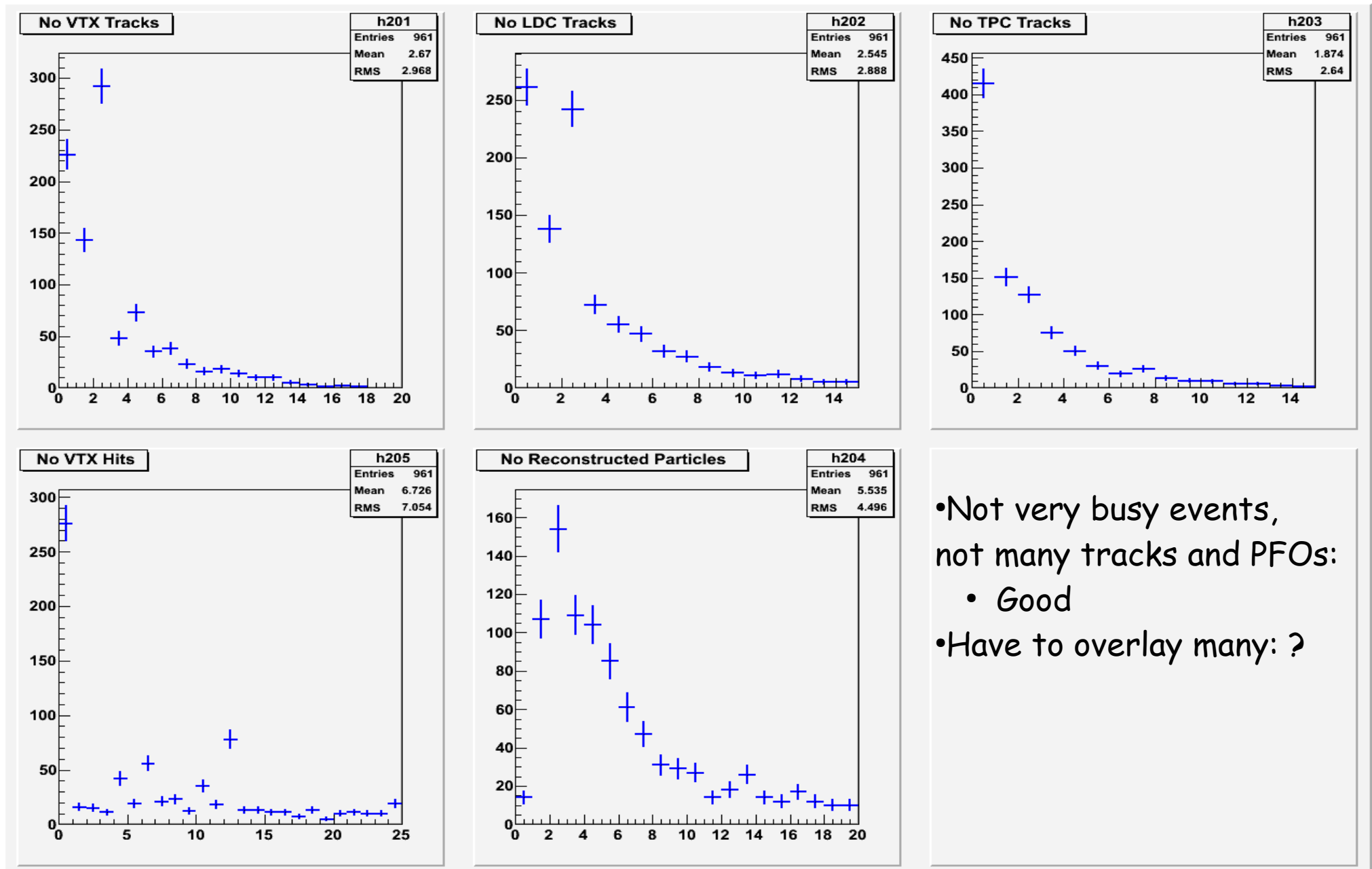
# $\gamma\gamma \rightarrow$ hadrons Background Studies

- $gg \rightarrow$  hadrons background simulated in SLAC (Pythia)
  - $CME = 500 \text{ GeV}$
  - Cross section =  $4.61E08 \text{ fb}$
  - $\sim 95000$  events (a big pool to use)
- Assuming ILC luminosity/BX of  $1.5E30 \text{ 1/(cm}^2\text{s)}$  and above  $\sigma$ :
  - Rate =  $0.7 \text{ } \gamma\gamma \text{ events/BX}$
- A lot!...
- These are real events, real tracks - not like pair background!
- Need to simulate  $gg$  events, study them, overlay, reconstruct etc...

# Simulation & Reconstructed

- Simulated with Mokka 2000 events and reconstructed 1000 events each for:
  - ILD00\_fw
  - ILD00\_fwp01
  - Problems with the new software versions (digitizers?), not solved yet, reconstructed with old version (LoI)
- 500 top events overlayed with 0.7evt/BX of  $\gamma\gamma$  events and reconstructed with newest software version (here it works!)

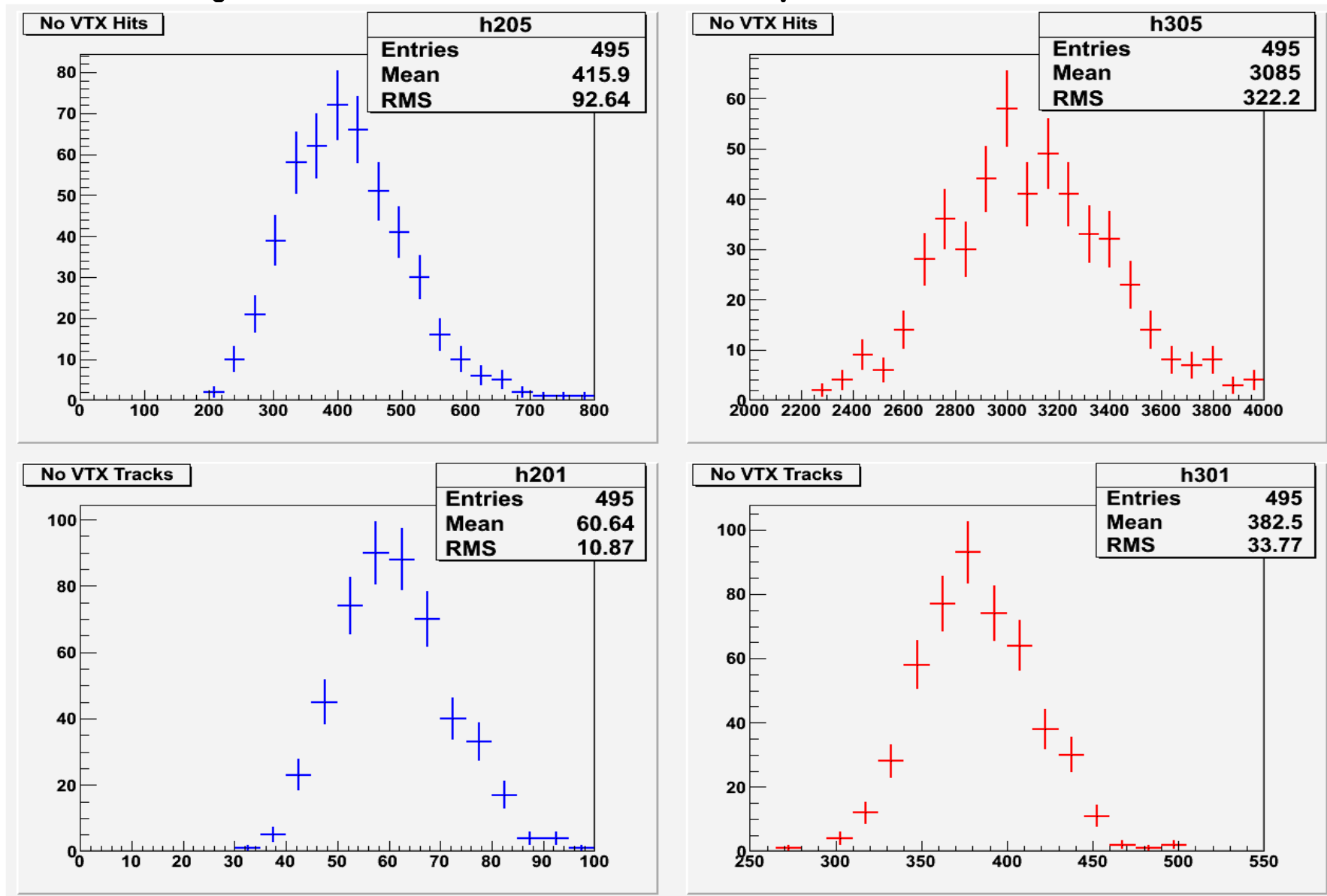
# Reconstructed $\gamma\gamma$ Events



- Not very busy events, not many tracks and PFOs:
  - Good
- Have to overlay many: ?

# Top Overlaid with $\gamma\gamma$ Events

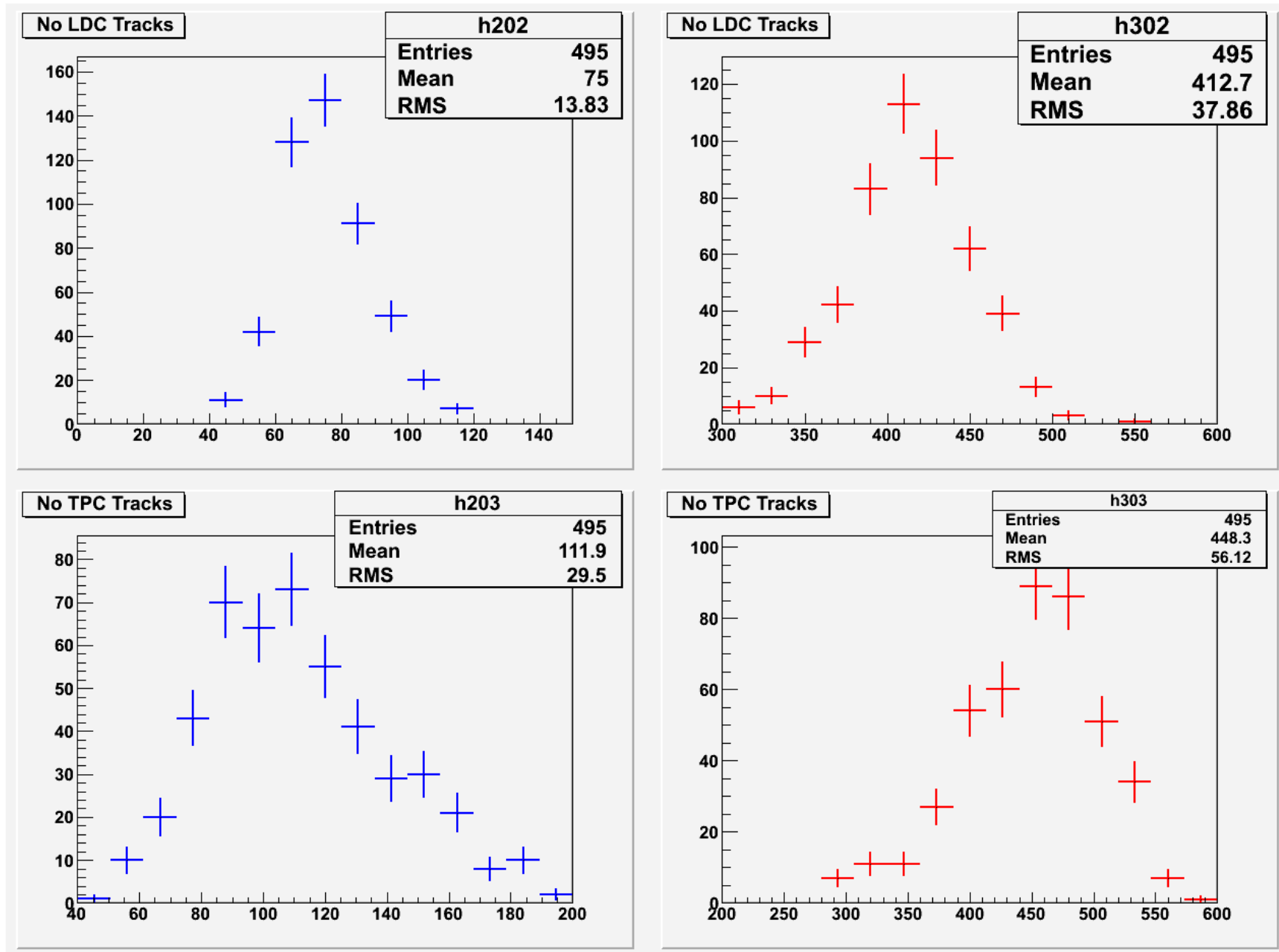
- $t\bar{t}$   $\rightarrow$  6 jets, 500 events, overlaid with  $\gamma\gamma$ , 0.7 eVt/BX



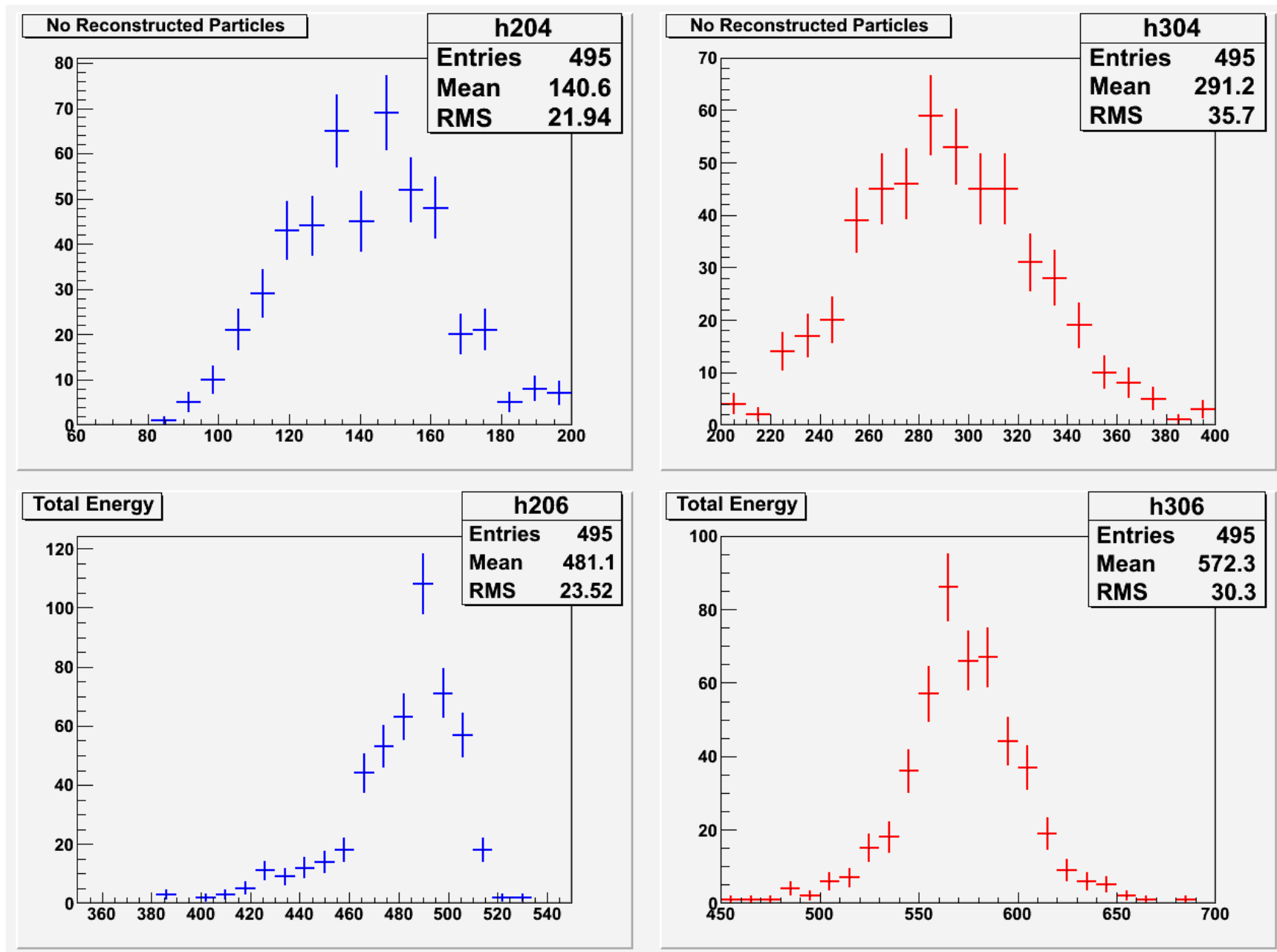
13.10.2010

$\gamma\gamma \rightarrow$  hadrons background

# Top Overlaid with $\gamma\gamma$ Events



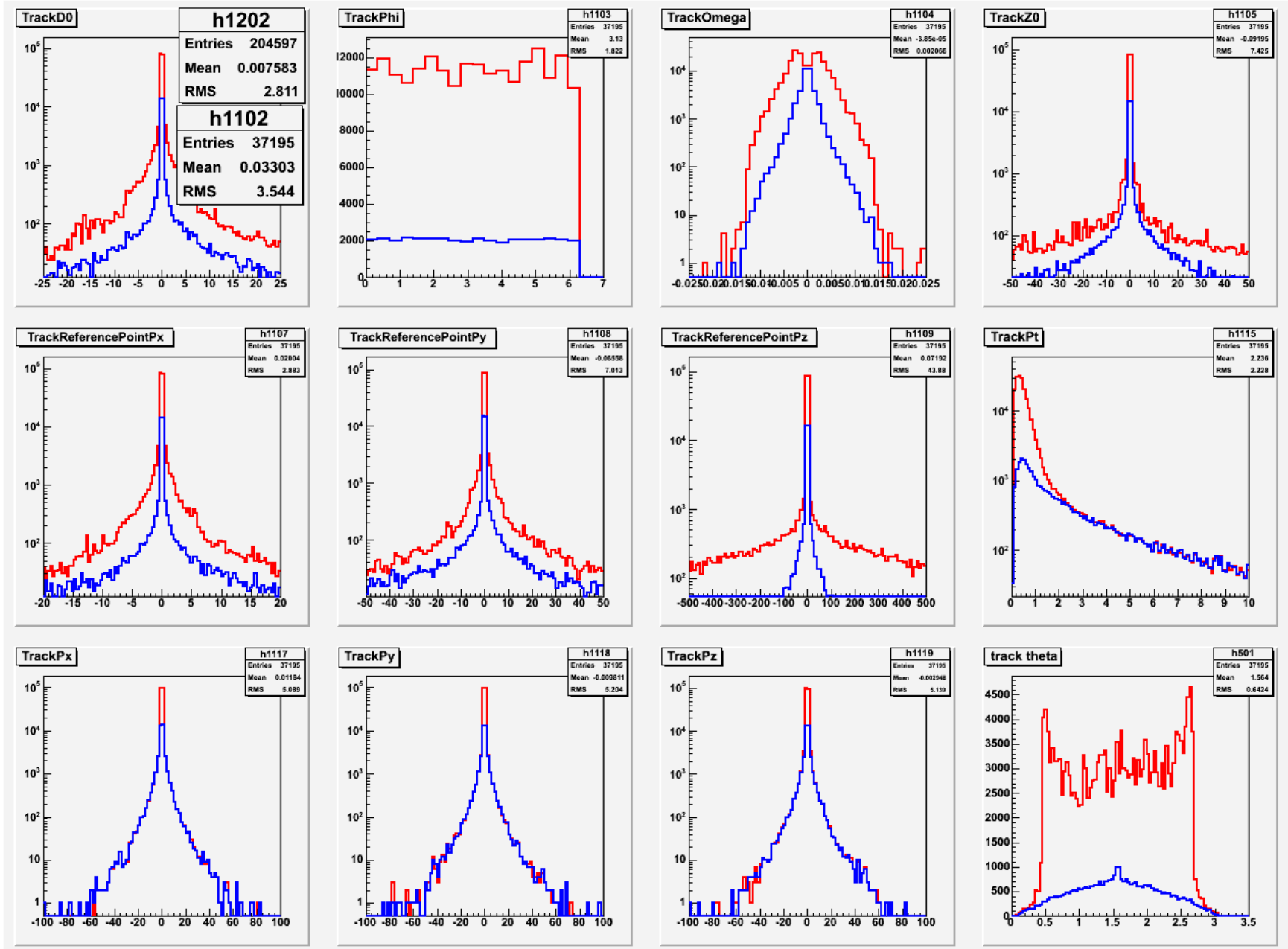
# Top Overlaid with $\gamma\gamma$ Events



# Tracks

Top

top+ $\gamma\gamma$

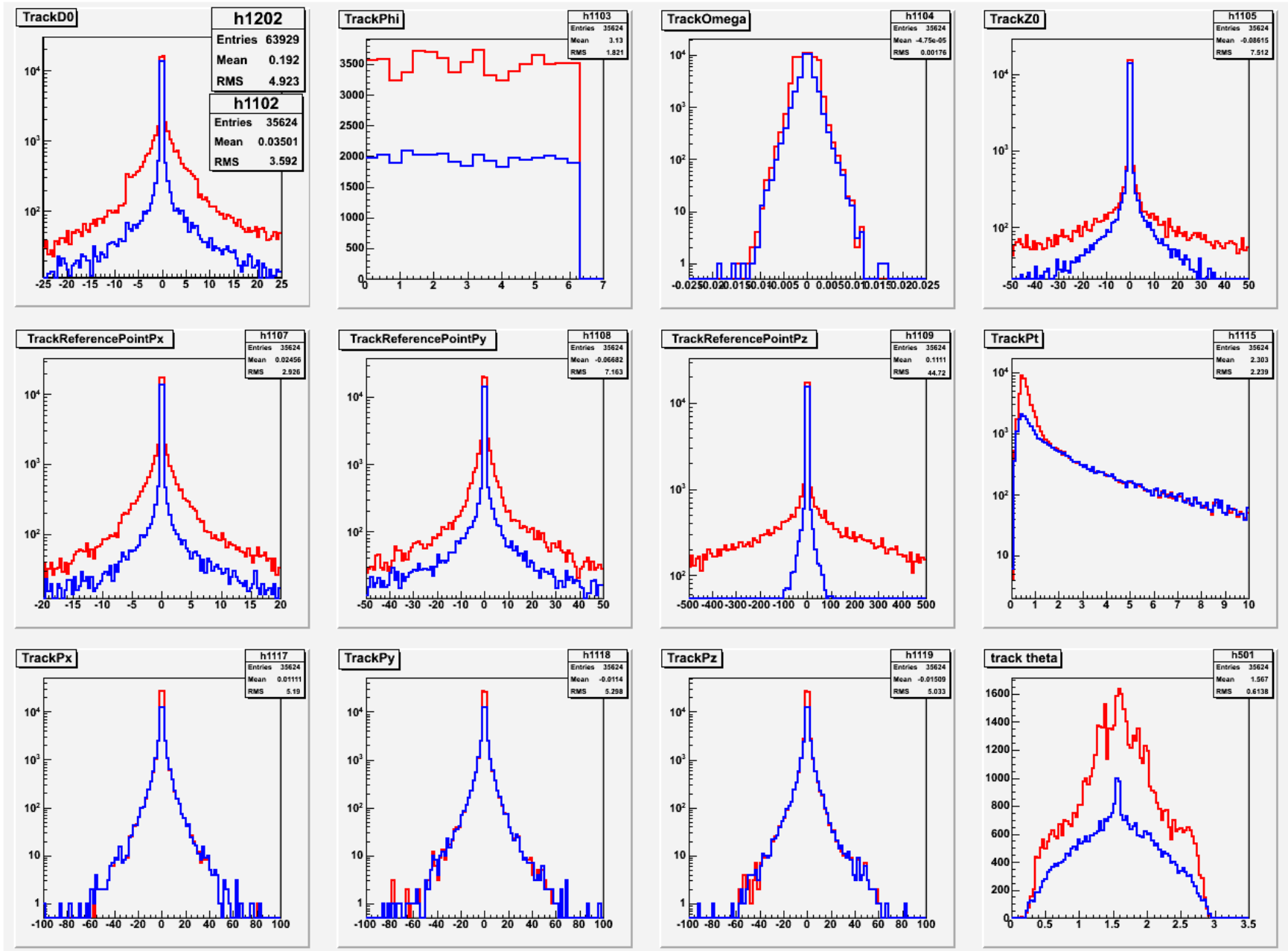


Top top+ $\gamma\gamma$

LoI cuts:  $SIT > 1 \ || \ TPC > 10$

- BG reduction  $\sim 70\%$

- signal reduction 4% (ALL tracks)



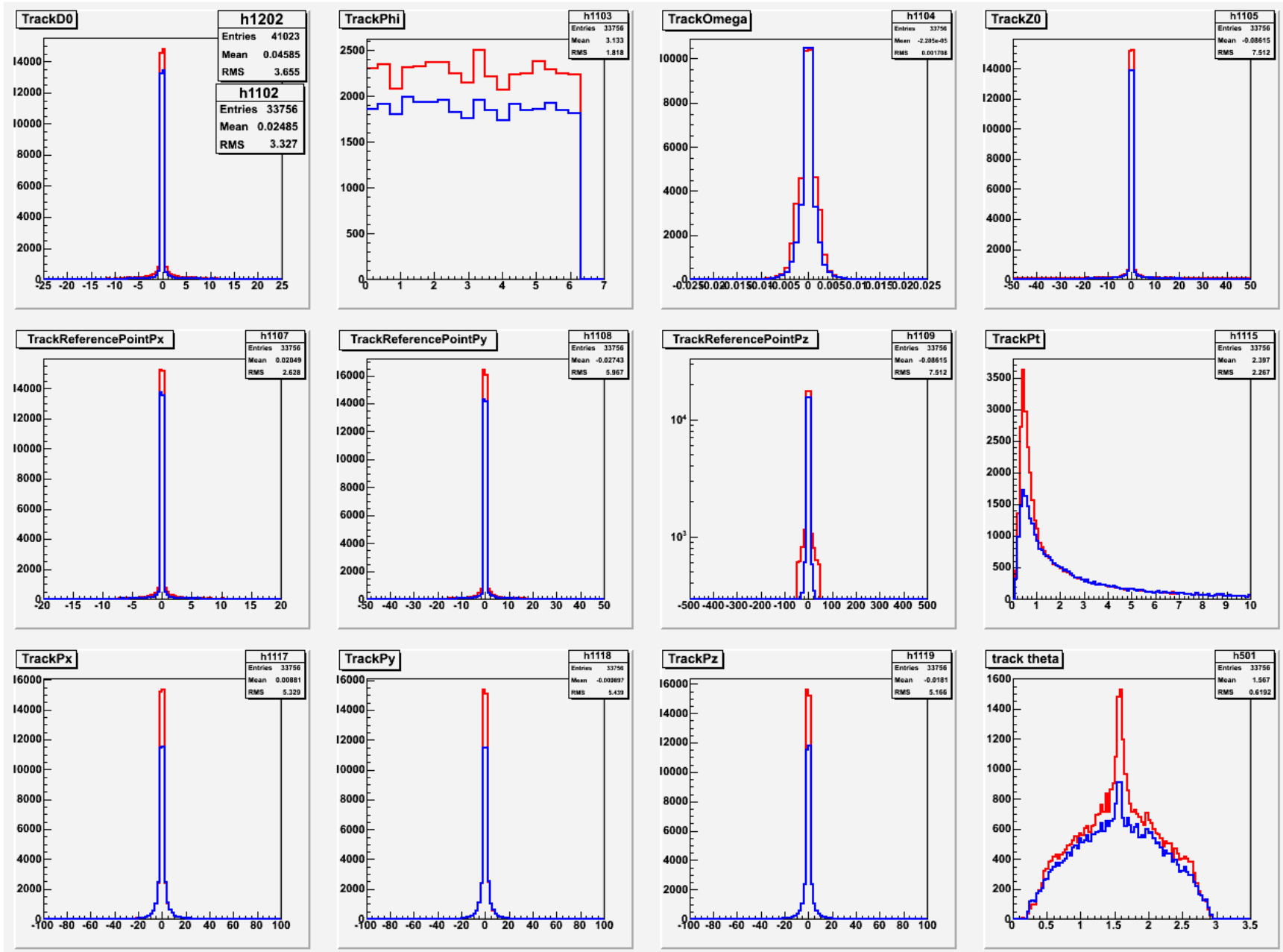


Top top+γγ

LoI cuts + |RefZ| < 50

- BG reduction ~80%

- signal reduction 8% (ALL tracks)



# Summary

- Studies of  $gg \rightarrow$ hadron background started and ongoing
- Samples generated, simulated & reconstructed
- We should expect about 0.7evt/BX from  $gg$
- We can overlay and reconstruct these events
- $gg \rightarrow$ hadrons events not very busy but many to overlay and these are real events with real tracks
- LoI “pair cuts” work OK but not enough - need to investigate further, next step - looking at vertex
- Tried to do “double overlay”: both pair and  $gg$  background
  - Technically works, reconstruction OK with small sample
  - Studies ongoing