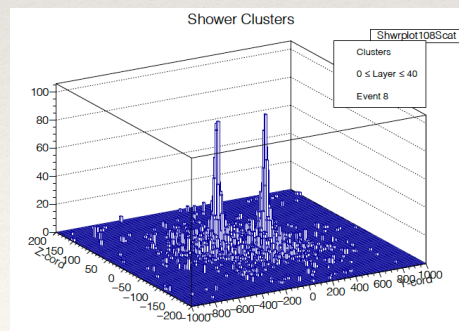




September 22, 2021

Higgs \rightarrow strange tagging with $K^0 \rightarrow \pi^0 \pi^0$ in the SiD MAPS Digital ECal

Jim Brau
University of Oregon

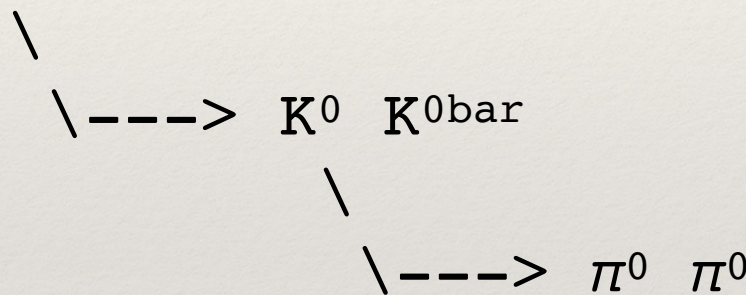




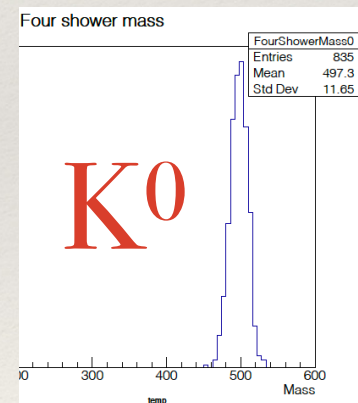
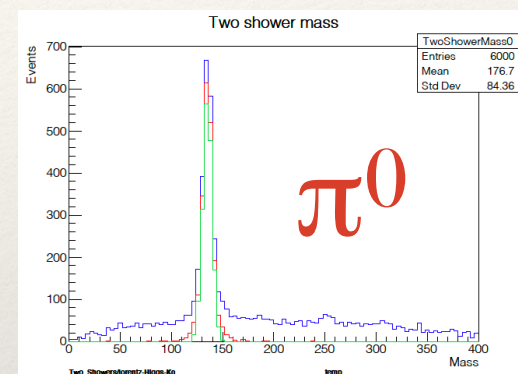
$$K^0 \rightarrow \pi^0 \pi^0$$

At last optimization meeting, I showed distributions for

$$e^+e^- \rightarrow Z^0 \text{ Higgs}$$

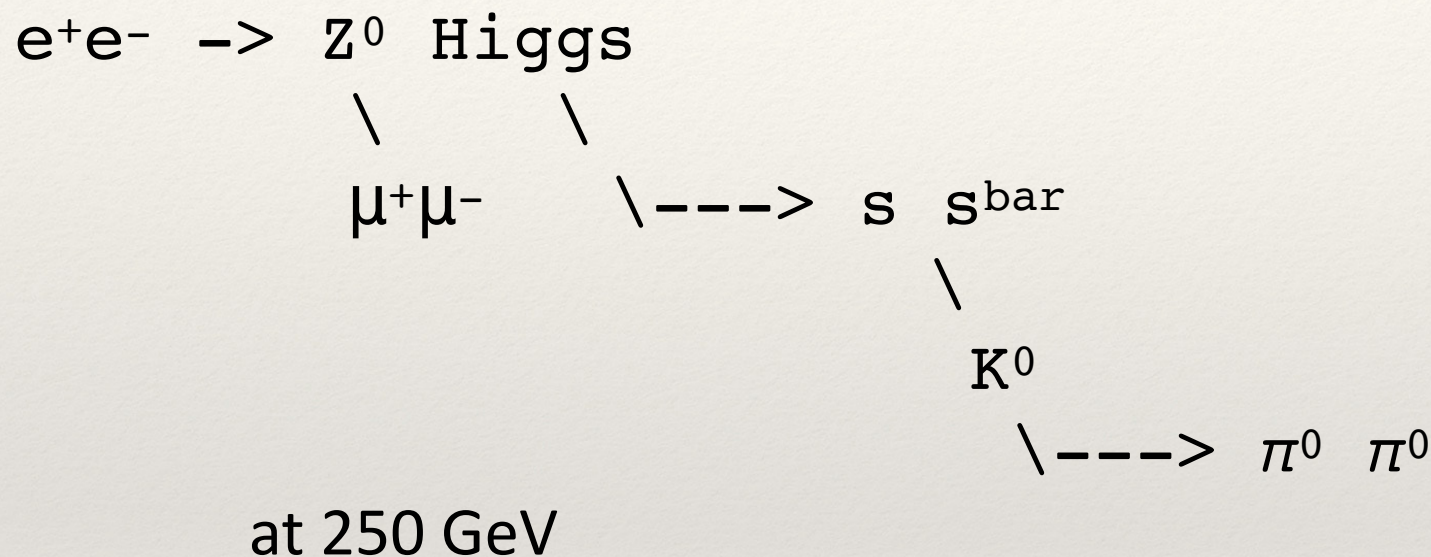


at 250 GeV



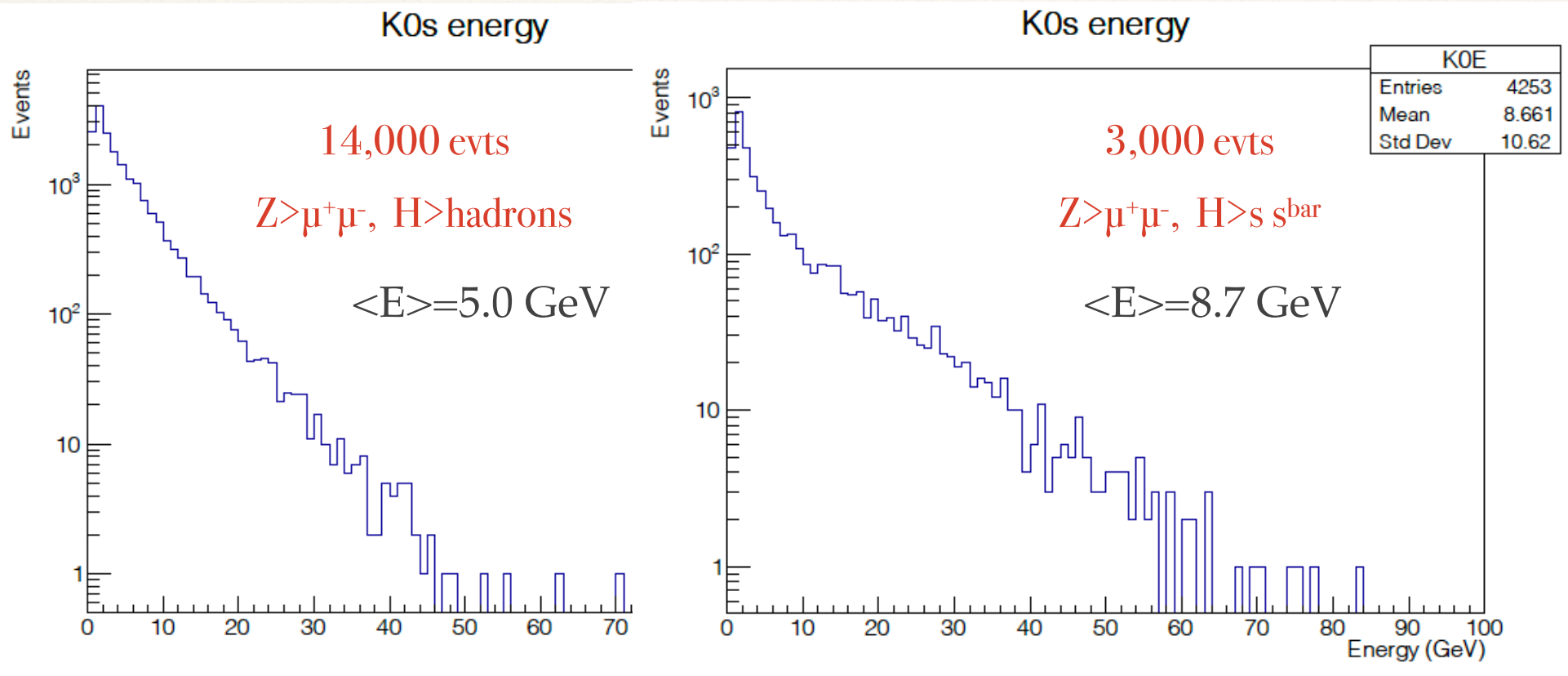
- ❖ This is a quite rare process, it sets a scale for where we would like to have sensitivity. But what about all Higgs > strange?

$K^0 \rightarrow \pi^0 \pi^0$ in Higgs $\rightarrow s \bar{s}$



How well can we tag inclusive Higgs $\rightarrow s \bar{s}$ with $K^0 \rightarrow \pi^0 \pi^0$?

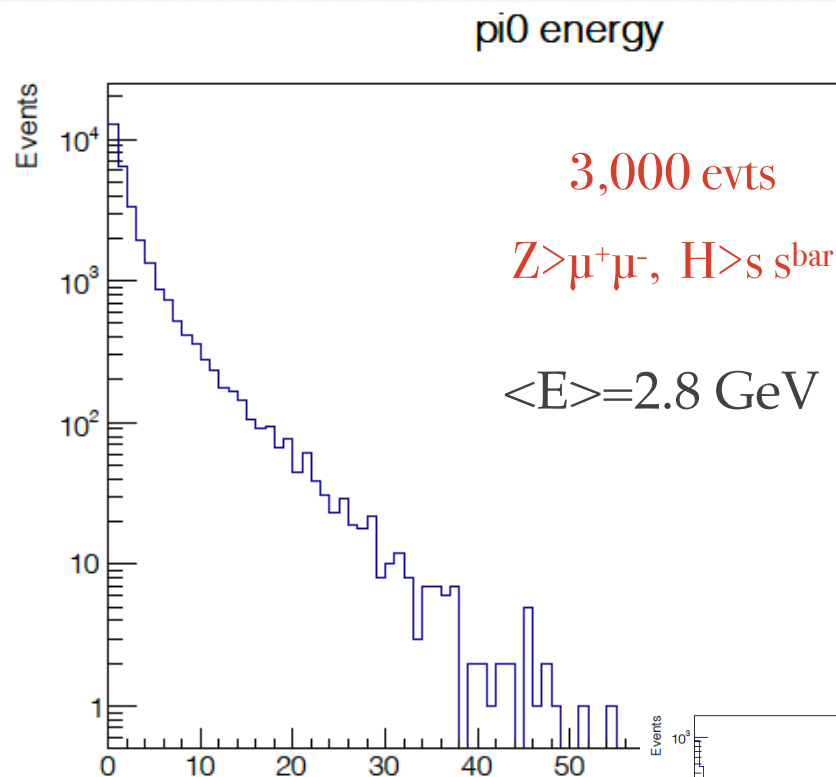
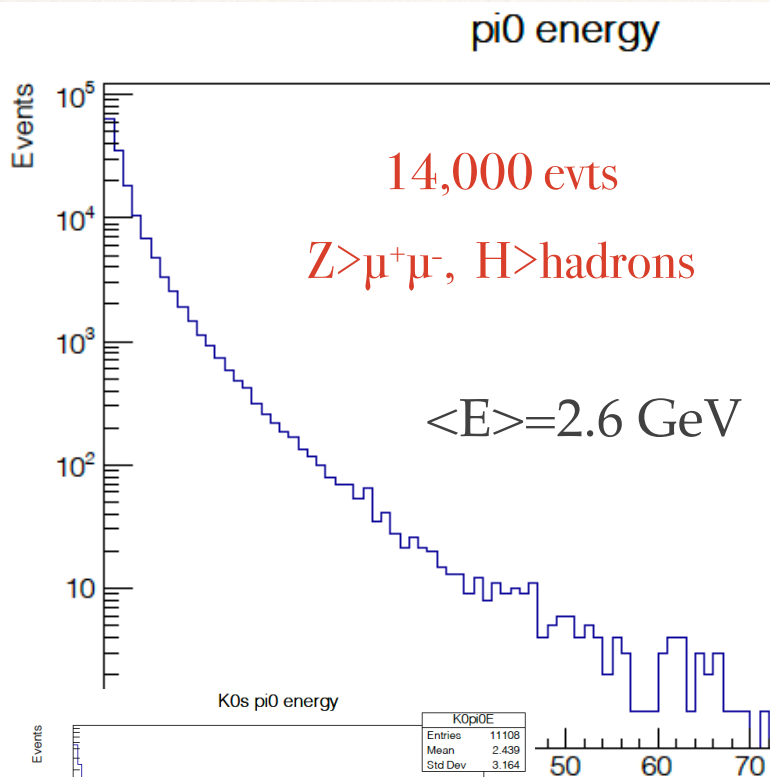
K^0_s @ 250 GeV



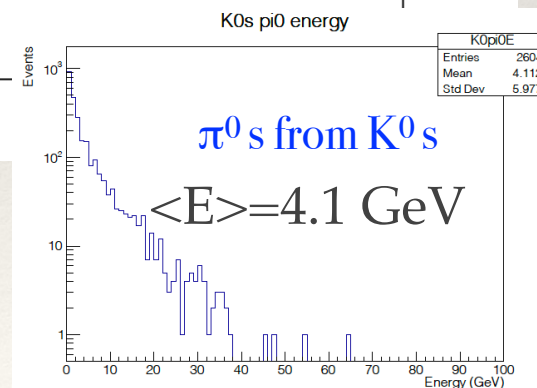
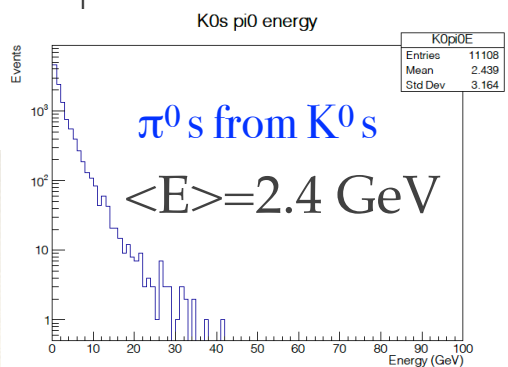
Event counts
not properly
normalized

Pythia 8.306

π^0 s @ 250 GeV



pi0E	
Entries	30578
Mean	2.834
Std Dev	4.256



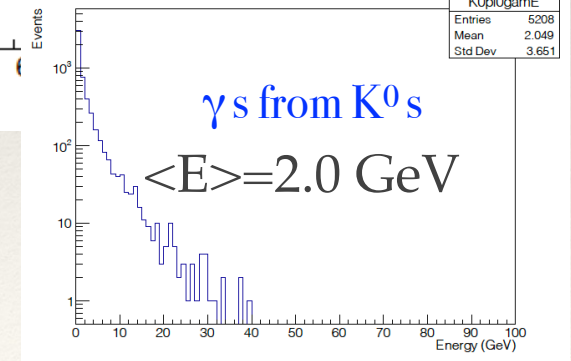
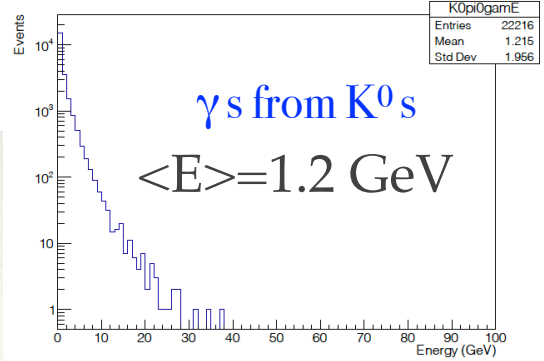
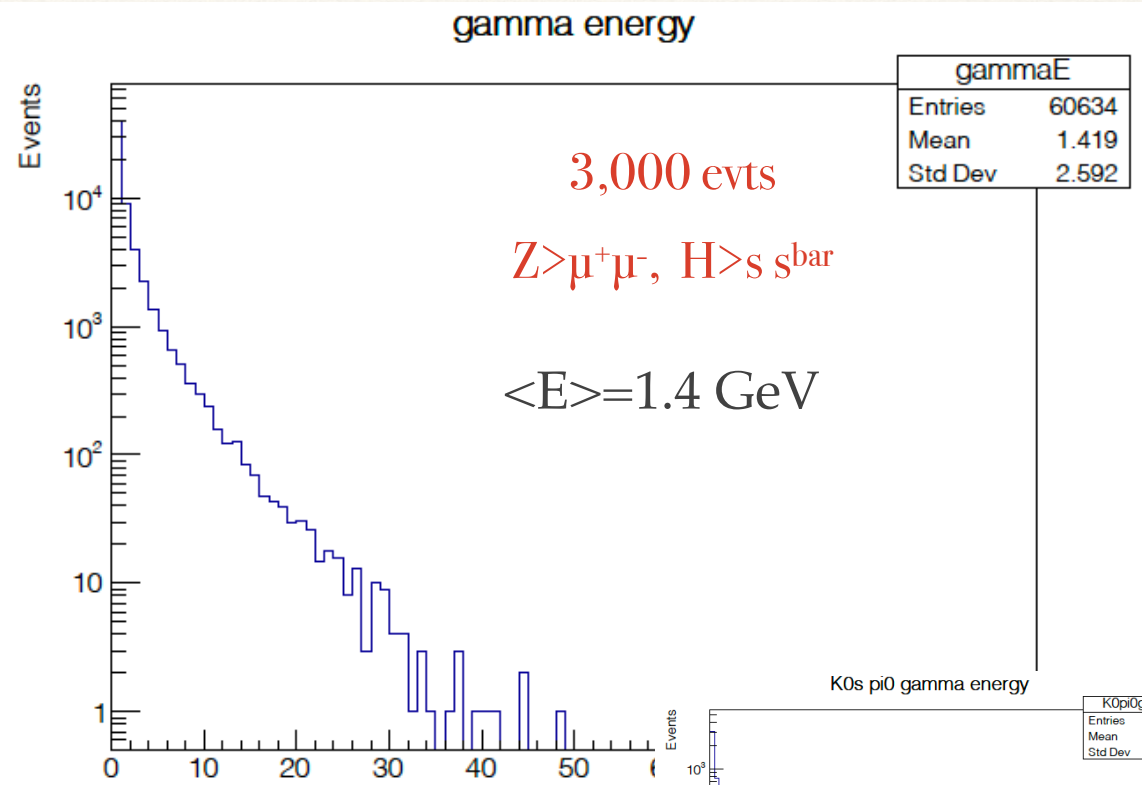
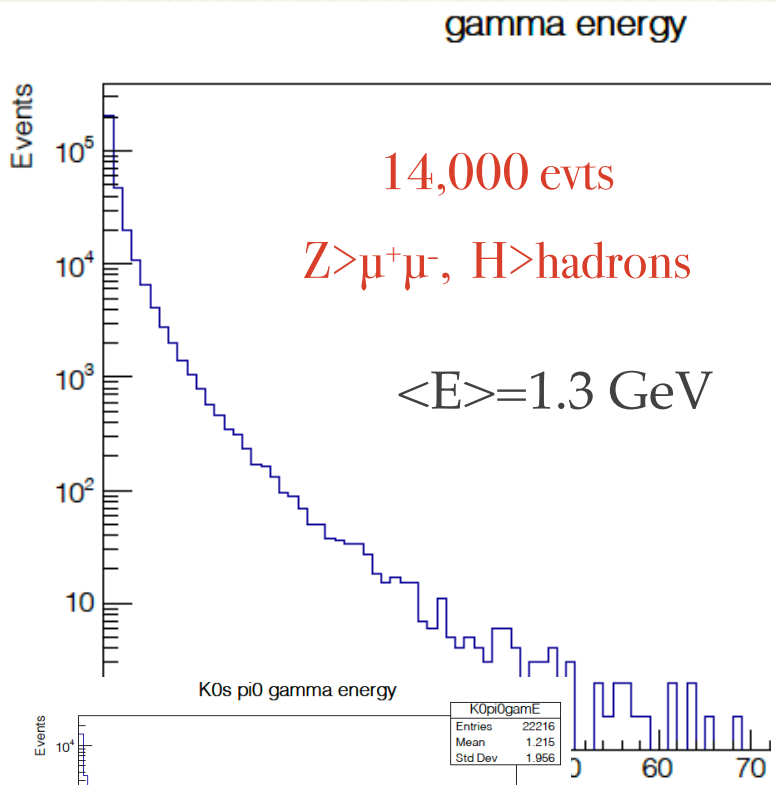
Pythia 8.306

Event counts
 not properly
 normalized

γ s @ 250 GeV



SiD MAPS Digital ECal J. Brau - 22 September 2021

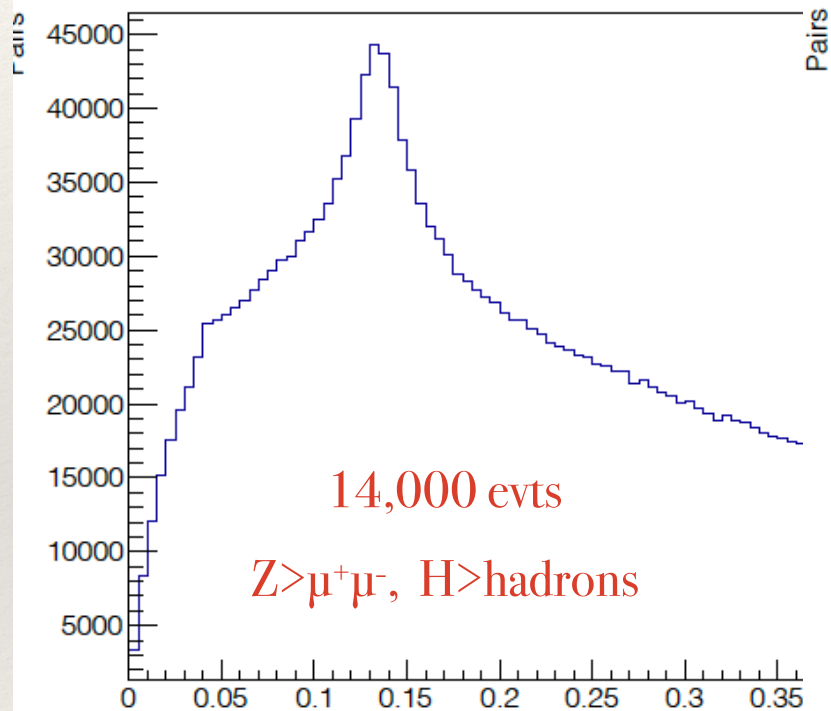


Pythia 8.306 Event counts not properly normalized

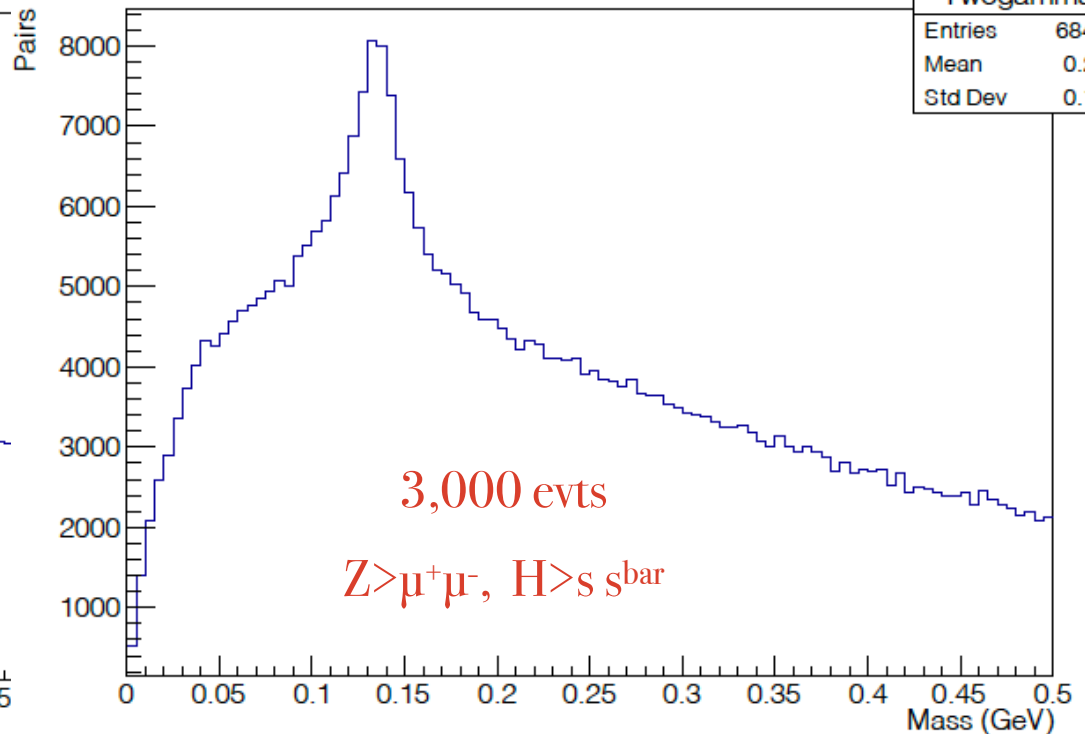
$\gamma\gamma$ mass @ 250 GeV



Two shower mass plot (mc)



Two shower mass plot (meas)



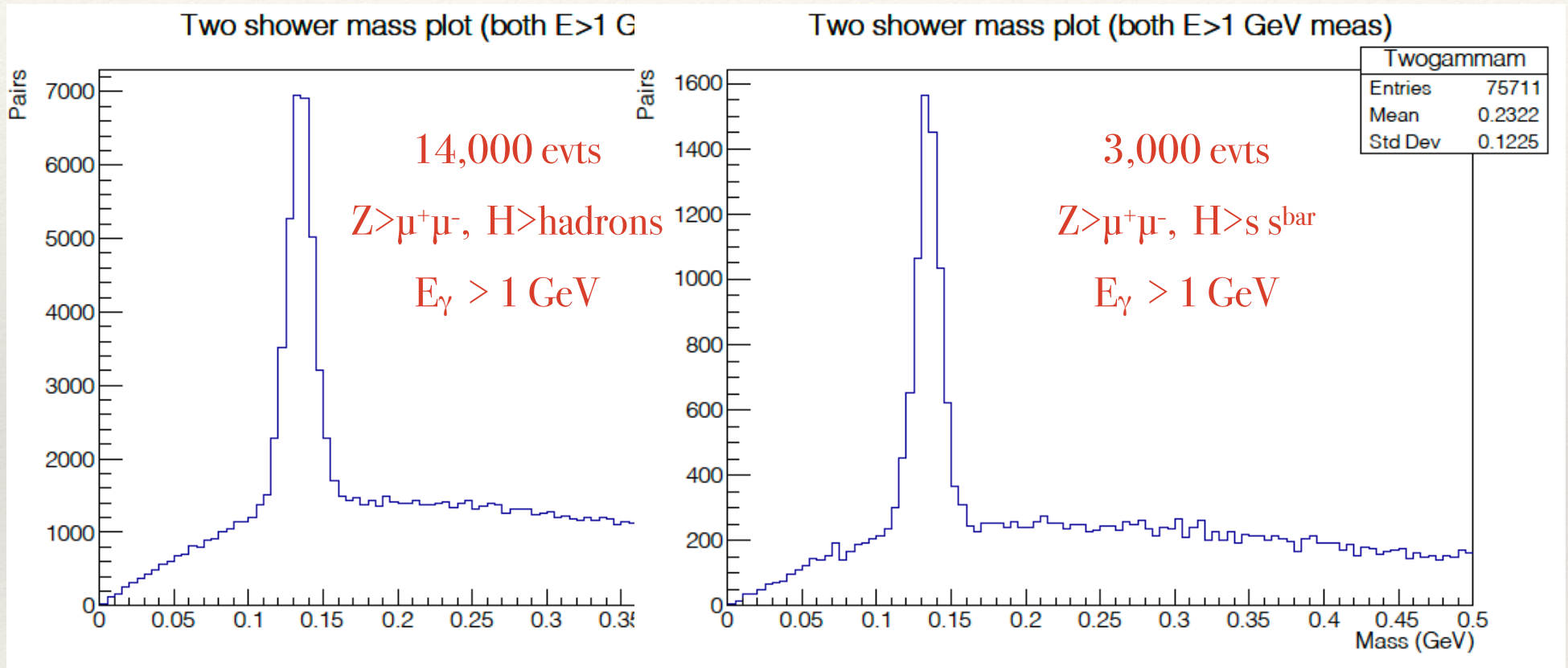
Pythia 8.306

γ energy smeared

$$\sigma_{E(\gamma)} = 0.15\sqrt{E(\gamma)}$$

Event counts
not properly
normalized

$\gamma\gamma$ mass @ 250 GeV



Pythia 8.306

γ energy smeared

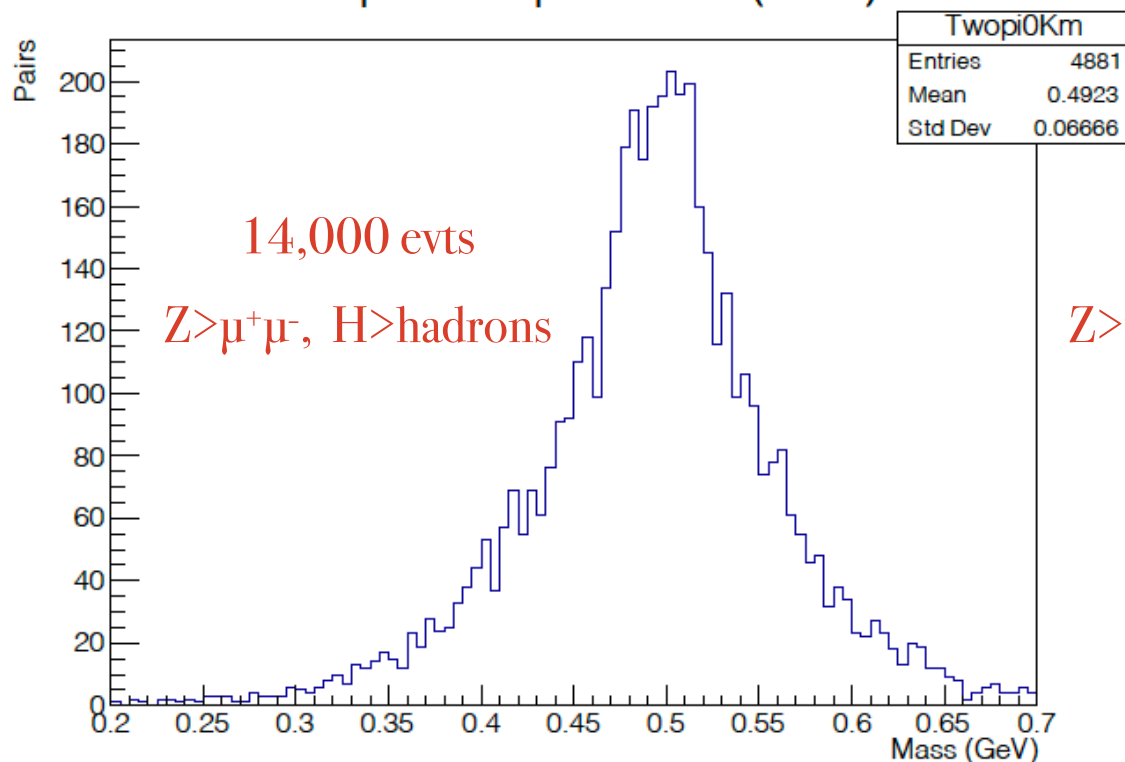
$$\sigma_{E(\gamma)} = 0.15\sqrt{E(\gamma)}$$

Event counts
not properly
normalized

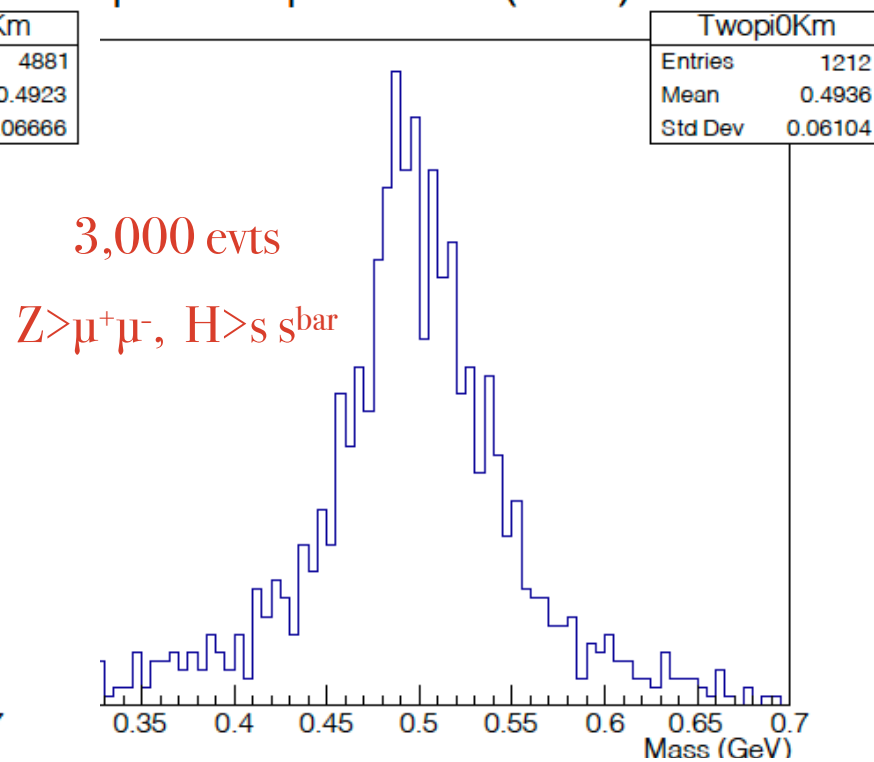
$K^0 > \pi^0\pi^0$ mass @ 250 GeV



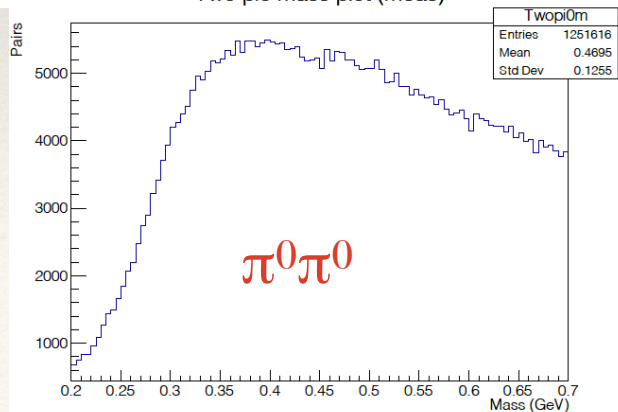
Two pi0 mass plot for K0s (meas)



pi0 mass plot for K0s (meas)



Two pi0 mass plot (meas)

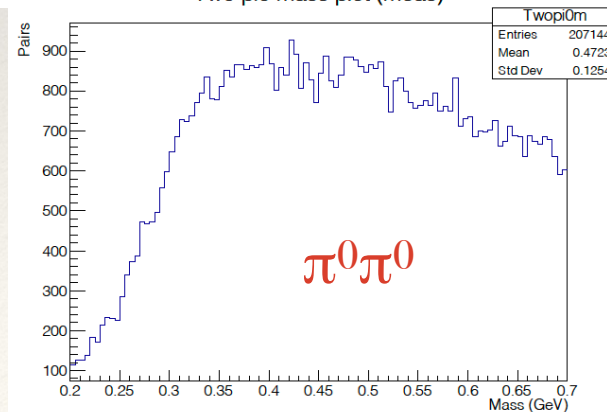


γ energy smeared

$$\sigma_{E(\gamma)} = 0.15\sqrt{E(\gamma)}$$

Event counts not properly normalized

Two pi0 mass plot (meas)

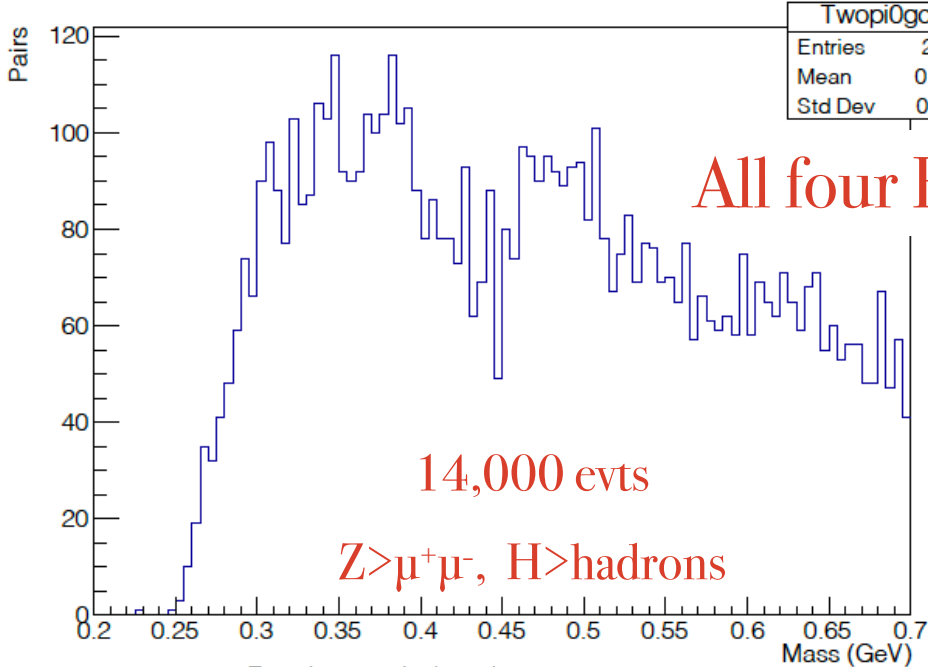


$\pi^0\pi^0$ mass @ 250 GeV

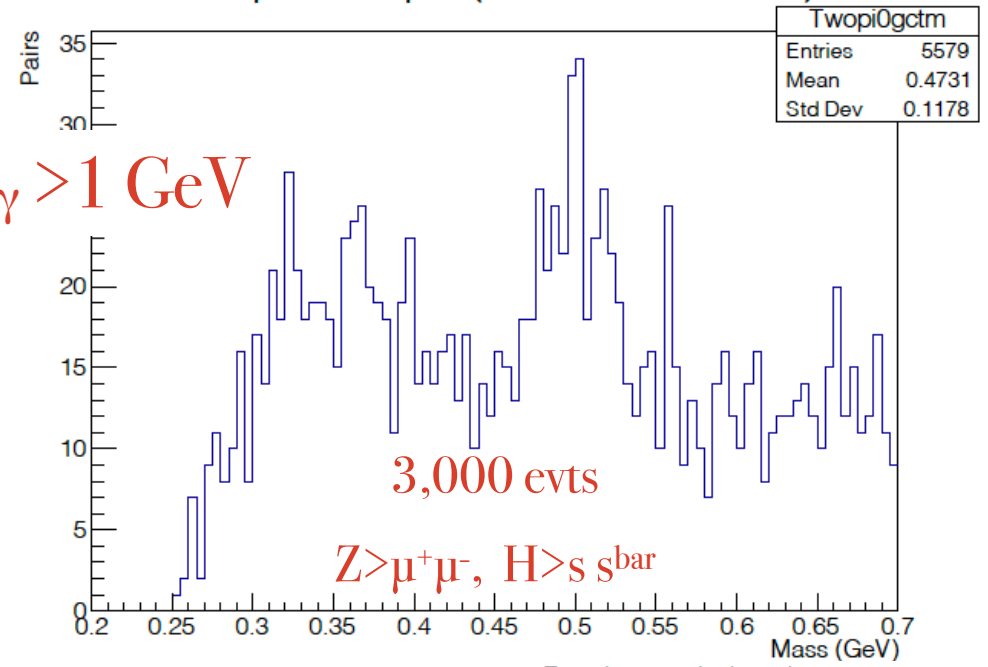


This is a first look - optimization still to come

Two pi0 mass plot (both E>1 GeV meas)

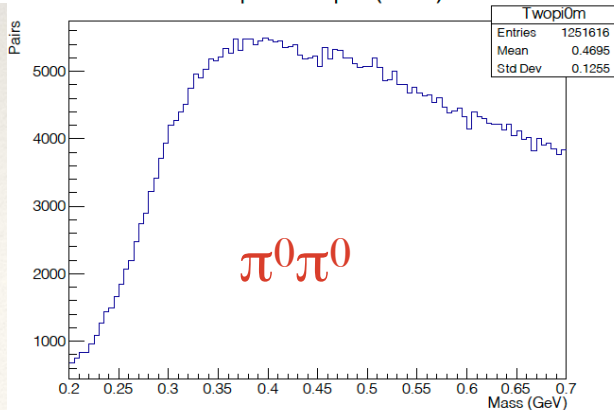


Two pi0 mass plot (both E>1 GeV meas)



All four $E_\gamma > 1$ GeV

Two pi0 mass plot (meas)

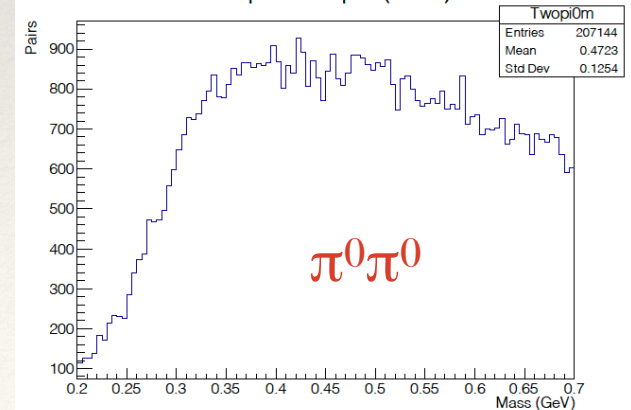


γ energy smeared

$$\sigma_{E(\gamma)} = 0.15\sqrt{E(\gamma)}$$

Event counts not properly normalized

Two pi0 mass plot (meas)



Summary



❖ Higgs > hadrons

❖ 14,000 events

❖ 18,400 K^0 short

❖ $\langle E \rangle = 5.0 \text{ GeV}$

❖ 5,500 $K^0 \rightarrow \pi^0 \pi^0$

❖ $\langle E_\gamma \rangle = 1.2 \text{ GeV}$

❖ Higgs > strange

❖ 3,000 events

❖ 4,250 K^0 short

❖ $\langle E \rangle = 8.7 \text{ GeV}$

❖ 1,300 $K^0 \rightarrow \pi^0 \pi^0$

❖ $\langle E_\gamma \rangle = 2.0 \text{ GeV}$

Event counts not properly normalized

Working on optimizing reconstruction

Still to do



- ❖ Now need to put these distributions into SiD MAPS Digital ECal to study reconstruction.

