Kin Fit Study

Discussion:

- After completing the study on secondary photons for MC, bggen, and data, it was found that the best cuts were:
 - P Vs Theta cut + 2 Photon cut.
- Another idea we have decided to look into is the effect a KinFit cut will have on secondaries. Since many of these photons are junk, a KinFit cut should throw most of them away and may do a better job.
- We will now take the same samples (MC, bggen, and data) to see what effect these cuts have in conjunction with a kinematic fit cut.

P Vs Theta; All Photons



Accepted Monte Carlo





P Vs Theta; Thrown Photons

Entries 75310 Mean x 23.2 ± 0.069 Mean y 1.554 ± 0.004502 50 Std Dev x 18.93 ± 0.04879 Std Dev y 1.236 ± 0.003184 40 30 20 10 20 40 60 80 100 120 140 Theta

Accepted Monte Carlo





bggen

P Vs Theta; Secondary Photons

Accepted Monte Carlo



bggen





Phi Vs Theta; All Photons

Accepted Monte Carlo

bggen







Phi Vs Theta; Thrown Photons

Accepted Monte Carlo

bggen







Phi Vs Theta; Secondary Photons

Accepted Monte Carlo

bggen







g1g2 Mass Vs Number of Photons in Event; All Photons Accepted Monte Carlo

Entries 58709 Mean x 3.47 ± 0.004923 0.9 Mean v 0.4206 ± 0.0007002 Std Dev x 1.192 ± 0.003481 0.1696 ± 0.0004951 0.8 Std Dev y 0.7 10^{2} 0.6 0.5 0.4 10 0.3 0.2 0.1 0, 10 5 7 9 3 4 6 Num Photons





g1g2 Mass Vs Number of Photons in Event; Thrown Photons







g1g2 Mass Vs Number of Photons in Event; Secondary Photons







g1g2 Mass with 2 Photons in Event; Thrown Photons







g1g2 Mass with more than 2 Photons in Event; Thrown Photons Accepted Monte Carlo ProjectionY of binx=[4,10] [x=3.0..10.0] ProjectionY of binx=[4,10] [x=3.0..10.0]







g1g2 Mass Vs Confidence Level; All Photons

0.9 Entries 59751 0.9 γγ Invariant Mass (GeV/c²) 59959 γγ Invariant Mass (GeV/c²) Entries Mean x 0.3163 ± 0.001652 Mean x 0.03858 ± 0.0007386 Mean y 0.4912 ± 0.0005689 Mean y 0.1565 ± 0.0009985 Std Dev x 0.3471 ± 0.001168 60 Std Dev x 0.1389 ± 0.0005223 Std Dev y 0.1195 ± 0.0004023 Std Dev 0.1878 ± 0.000706 50 0.7 10^{2} 0.6E 40 0.5 0.4 0.3 0.2 0.1 0.530 0.4 FIT HILE 10 0.3 20 0.210 0.1 10^{-37} 10^{-27} 10^{-42} 10⁻⁴⁷ 10^{-42} 10^{-32} 10^{-22} 10^{-47} 10^{-32} 10^{-27} 10^{-22} Kinematic Fit Confidence Level $10^{-17}_{\text{Kinematic Fit Confidence Level}}$ 10^{-37} 10^{-1} Data



Perform Confidence Level Cut of 10^-6 on All Photons





P Vs Theta Distributions With Cut, All Photons

Accepted Monte Carlo

bggen







P Vs Theta Distributions With Cut, Thrown Photons

Accepted Monte Carlo

bggen







P Vs Theta Distributions With Cut, Secondary Photons





Phi Vs Theta Distributions With Cut, All Photons

Accepted Monte Carlo

bggen



24262 Entries 18 Mean x 27.56 ± 0.1798 150 Mean v 1.733 ± 0.6693 Std Dev x 28.01 ± 0.1272 16 Std Dev 104.3 ± 0.4733 100 14 50 12 10 -50-100-1500 20 4060 80 100 120 140 Theta

Phi Vs Theta Distributions With Cut, Thrown Photons

Accepted Monte Carlo

bggen







Phi Vs Theta Distributions With Cut, Secondary Photons





g1g2 Mass Vs Number of Photons in Event; All Photons





g1g2 Mass Vs Number of Photons in Event; Thrown Photons





g1g2 Mass Vs Number of Photons in Event; Secondary Photons





g1g2 Mass with 2 Photons in Event; Thrown Photons







g1g2 Mass with more than 2 Photons in Event; Thrown Photons Accepted Monte Carlo ProjectionY of binx=[4,10] [x=3.0..10.0] ProjectionY of binx=[4,10] [x=3.0..10.0]







Look at plots when we do a CL Cut of 10^-6 and a P Vs Theta Cut to Eliminate more secondary Photons

g1g2 Mass with more than 2 Photons in Event; All Photons





g1g2 Mass with more than 2 Photons in Event; Thrown Photons





g1g2 Mass with more than 2 Photons in Event; Secondary Dhatanc bggen

Accepted Monte Carlo





g1g2 Mass with 2 Photons in Event; Thrown Photons







g1g2 Mass with more tha 2 Photons in Event; Thrown Photons Accepted Monte Carlo Projection Y of binx=[4,10] [x=3.0..10.0]



Table of Old Results:

	2 Gamma Cut	P Vs Theta Cut + 2 Gamma Cut
Accepted MC LOST	8,000/30,315 = 26 %	1383/30,315 = 5%
bggen	+1,243	+1,676
Data	+3,143	+3,489

Table of New Results:

	Kin Fit Cut + 2 Gamma Cut	Kin Fit Cut + P Vs Theta Cut + 2 Gamma Cut
Accepted MC LOST	2,526/30,315 = 8 %	2,034/30,315 = 7%
bggen	+545	+529
Data	+1,291	+1,319