Problem about the angle of gamma with charged track

Hadronic event selection

π^0 production and hadronic event

① Select hadronic event ② π^0 reconstruction

- Remove Bhabha and (γ) γ γ events with EMC information
  - ✓ Two showers with 1st/2nd energy deposition
    $|\theta_1+\theta_2-180^\circ|<10^\circ$ and $E > 0.65*E_{beam}$
- Good track selection
  - ✓ $|Vr|< 1cm$, $|\cos\theta| < 0.93$ **(|Vz| cut ?)**
  - ✓ Momentum $<0.94*E_{beam}$
  - ✓ $(dE/dx_{mea}-dE/dx_{proton})/\sigma_{proton}<10$
  - ✓ Veto election with Momentum $> 0.65*E_{beam}$ && $e/p > 0.8$
  - ✓ Veto gamma conversion with $M(e,e) < 100MeV$ && Open angle$<15^\circ$
- good photon selection
  - ✓ $E_{barrel} > 25MeV$; $E_{endcap} > 50MeV$
  - ✓ $0<=$ TDC $<= 14(\times 50ns)$;
- Isolated photon selection
  - ✓ $E_{barrel} > 25MeV$; $E_{endcap} > 50MeV$
  - ✓ $0<=$ TDC $<= 14(\times 50ns)$;
  - ✓ Angle $> 20^\circ$ && $E_{deposited} > 100MeV$

Why not use the
Angle > 20 ° cut

Hadronic event selection

- Event level selection
  - ✓ Number of good track N_{good}>=2
  - ✓ Deposited energy @ EMC >= 0.40*E_{beam}

  1. Event with N_{good}=2
  - ✓ veto | $\theta_1+\theta_2-180^\circ$ |<15° && | $|\varphi_1-\varphi_2|-180^\circ$ |<10°
    number of Isolated photon N >= 2

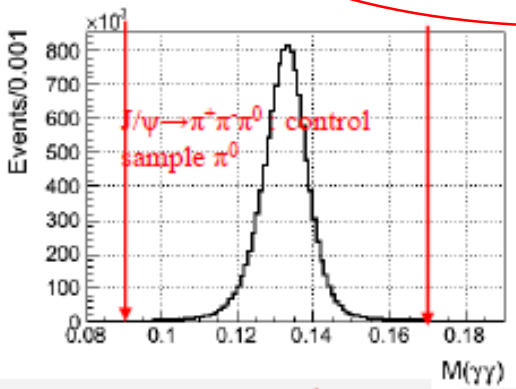
  2. Event with N_{good}=3
  - ✓ Veto, angle between 1st/2nd energy track
    | $\theta_1+\theta_2-180^\circ$ |<15° and | $|\varphi_1-\varphi_2|-180^\circ$ |<10°

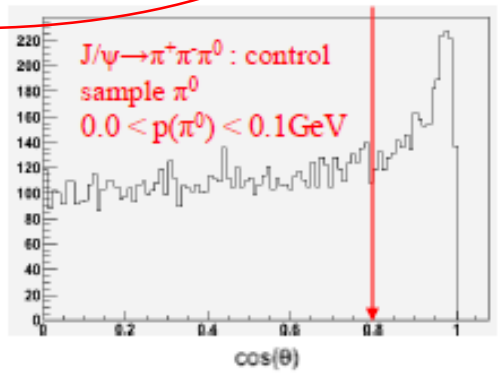
Because the total visible energy of MC have a shift comparing with experiment data. We weight the MC to the experiment data using good charged tracks and good photon tracks distribution.

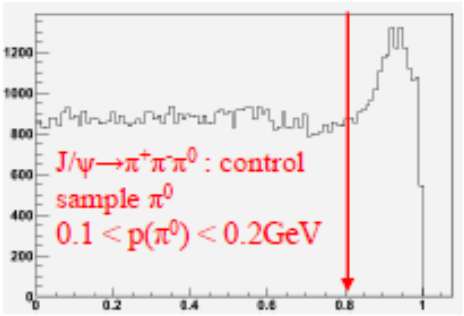
π^0 reconstruction

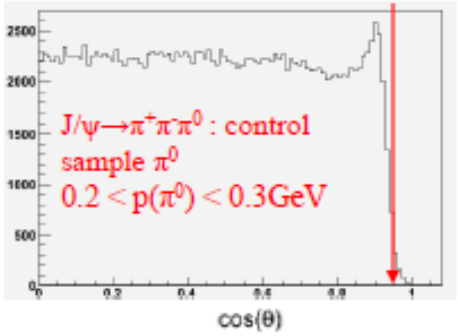
- π^0 selection: neutral track from hadronic selection
  - ✓ $0.09\text{GeV} < M(\gamma\gamma) < 0.17\text{GeV}$
  - ✓ $|\cos\theta_{\gamma\pi}| < 0.95$ (for $0.2 < p(\pi^0) < 1.4\text{GeV}$)
  - ✓ $|\cos\theta_{\gamma\pi}| < 0.8$ (for $0.0 < p(\pi^0) < 0.2\text{GeV}$)

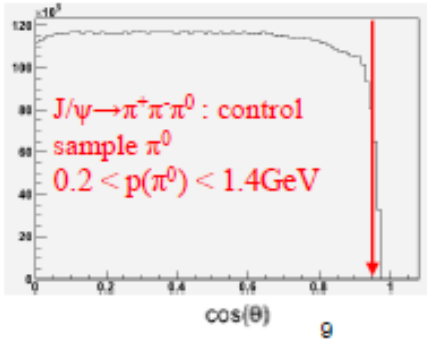
Why not use the Angle > 20 ° cut



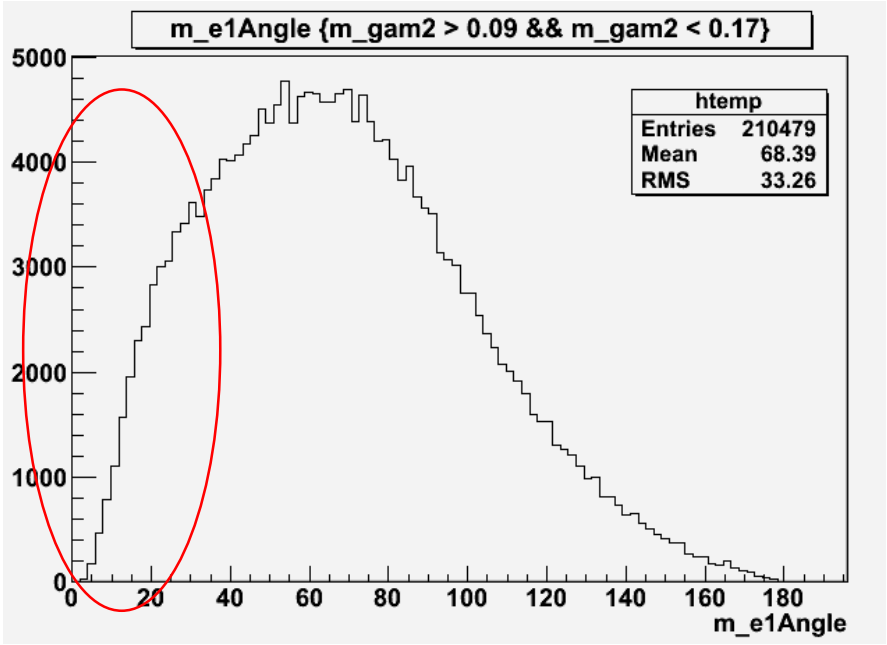


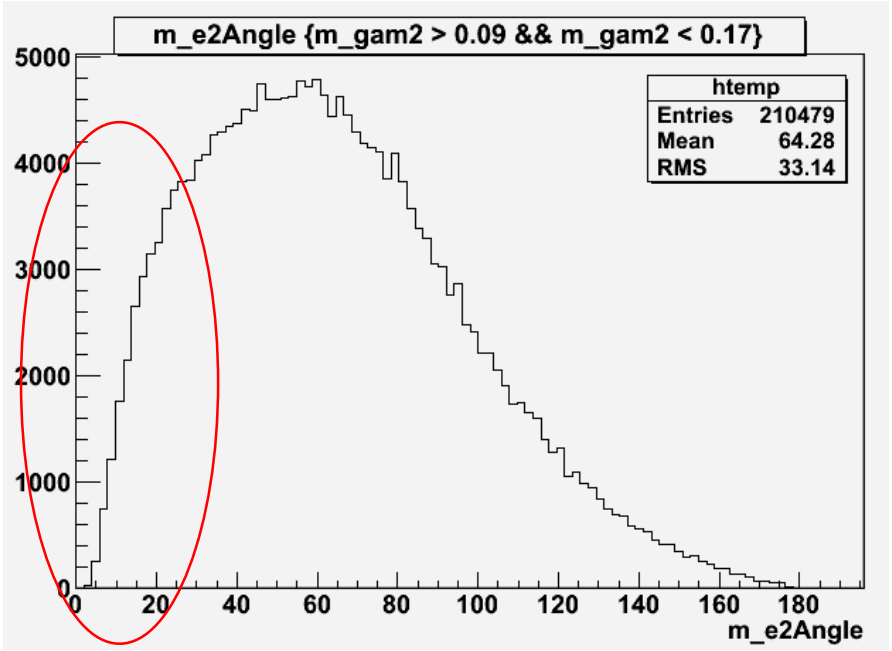






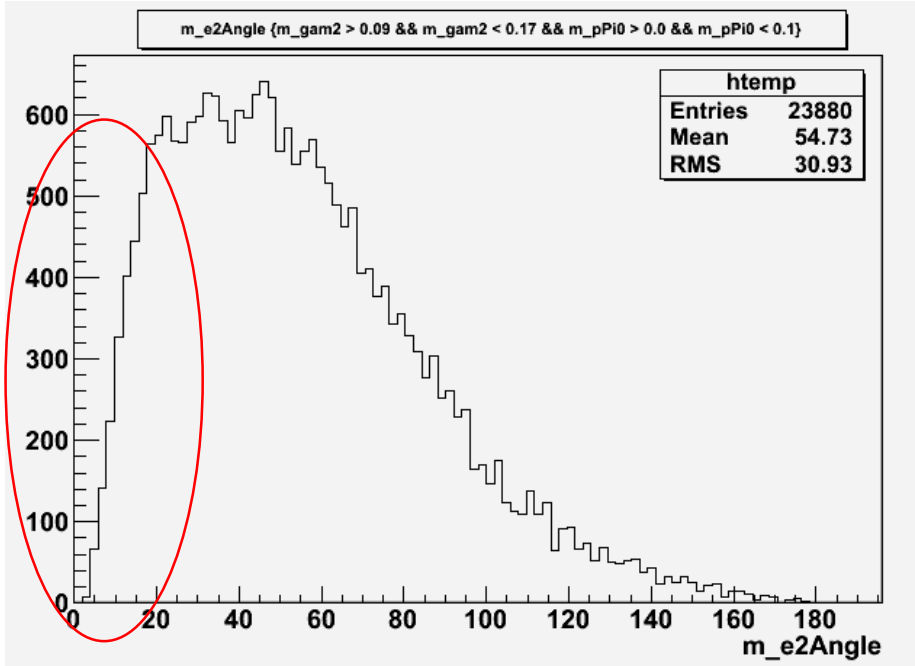
Angle of gamma with charged track

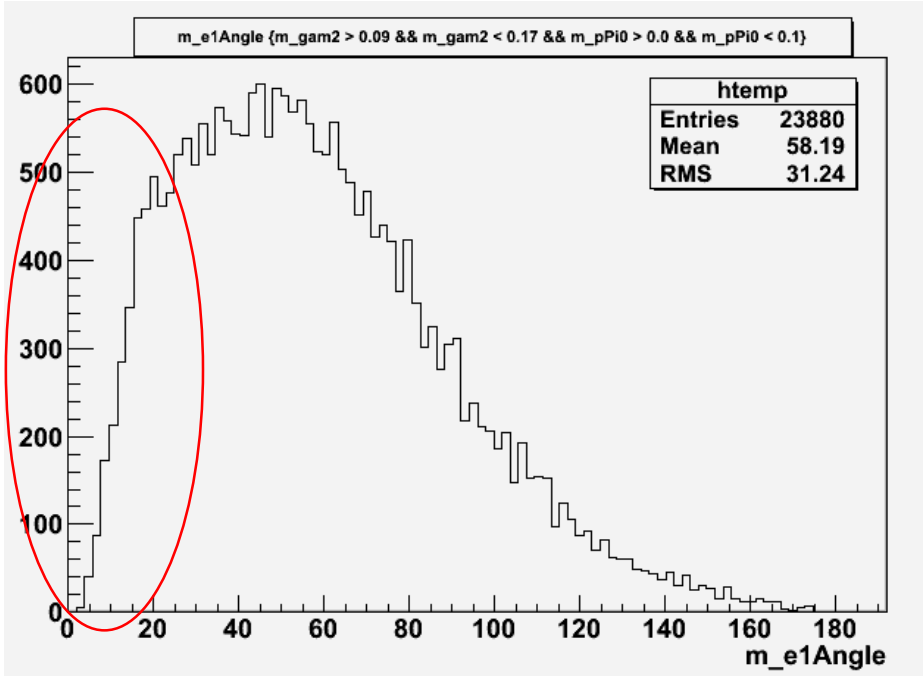




0.09GeV < M($\gamma\gamma$) < 0.17GeV

Angle of gamma with charged track

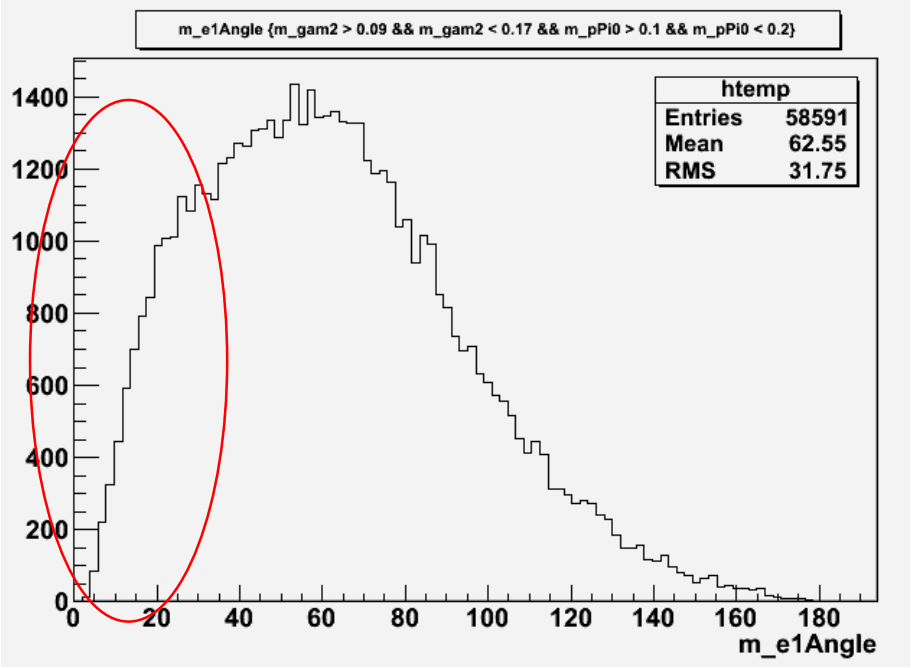


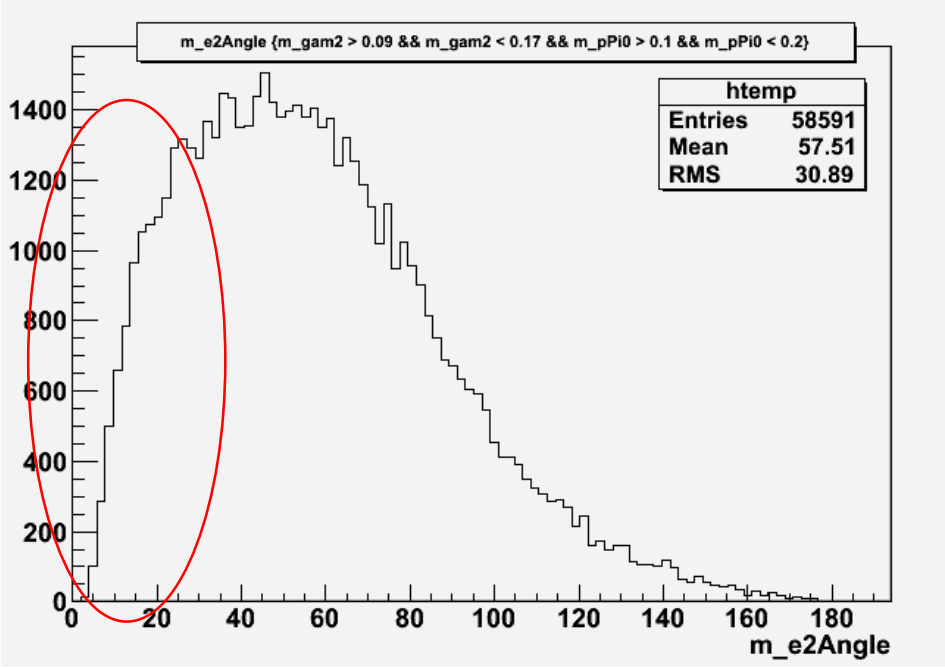


0.09GeV $< M(\gamma\gamma) <$ 0.17GeV

$0 < p(\pi^0) <$ 0.1 GeV

Angle of gamma with charged track

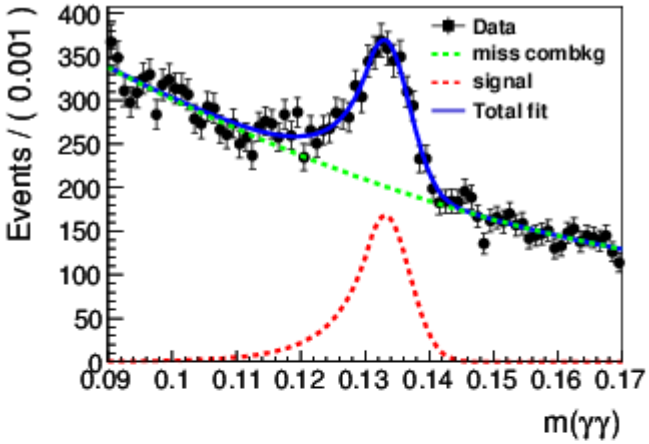


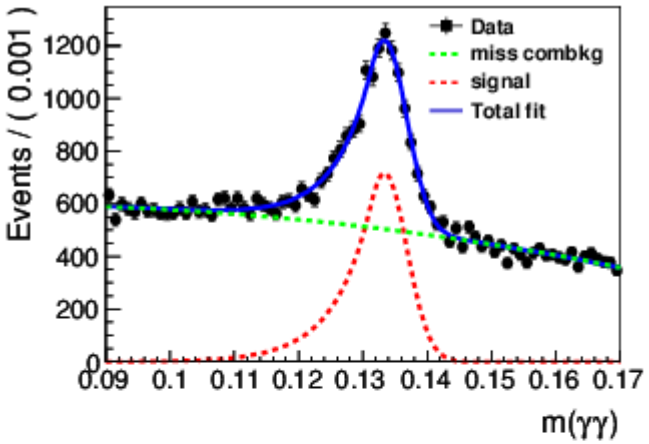


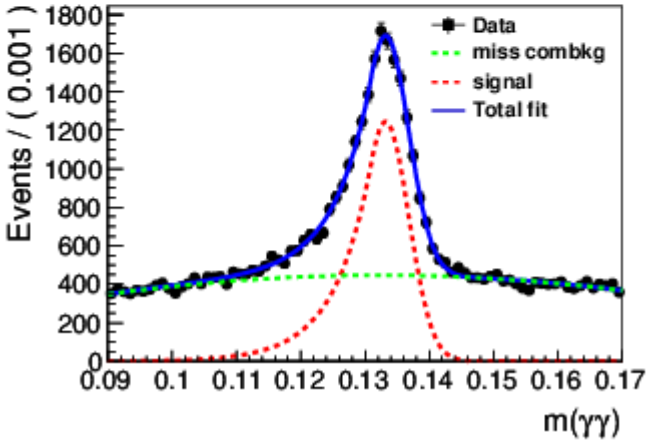
$0.09\text{GeV} < M(\gamma\gamma) < 0.17\text{GeV}$

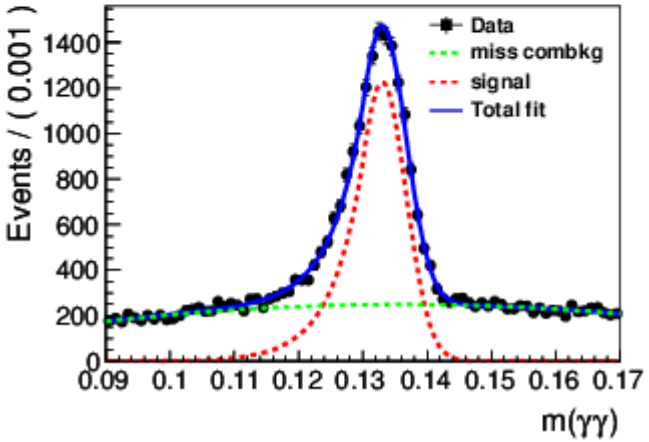
$0.1\ \text{GeV} < p(\pi^0) < 0.2\ \text{GeV}$

Fitting result without angle cut (Exp.Data)

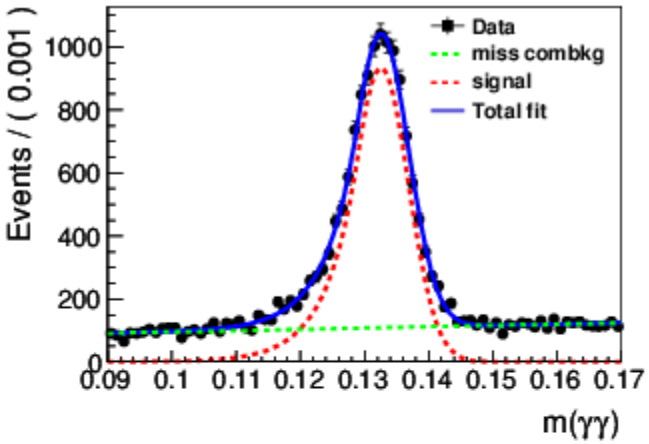


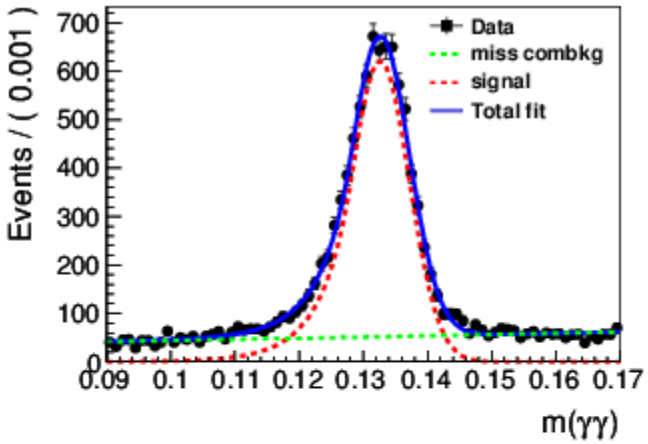


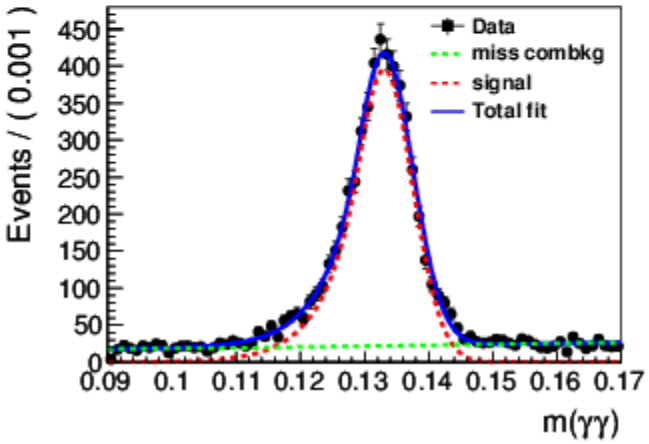


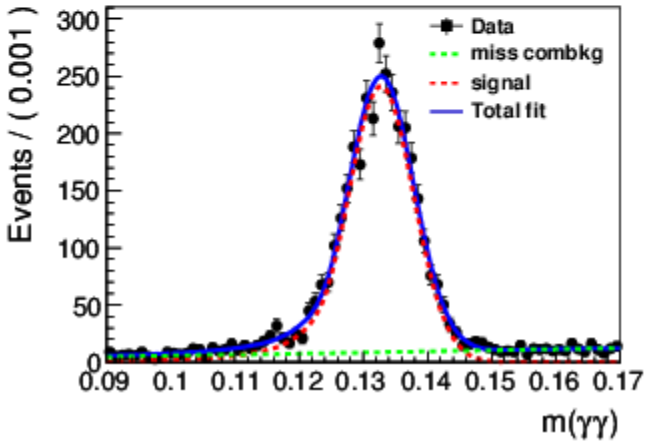


Fitting result without angle cut (Exp.Data)

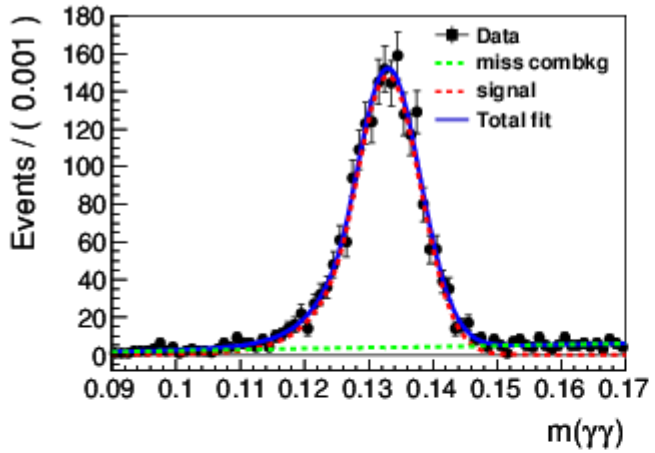


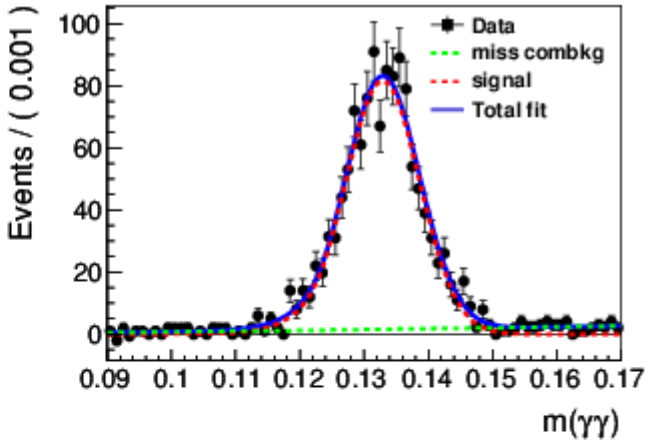


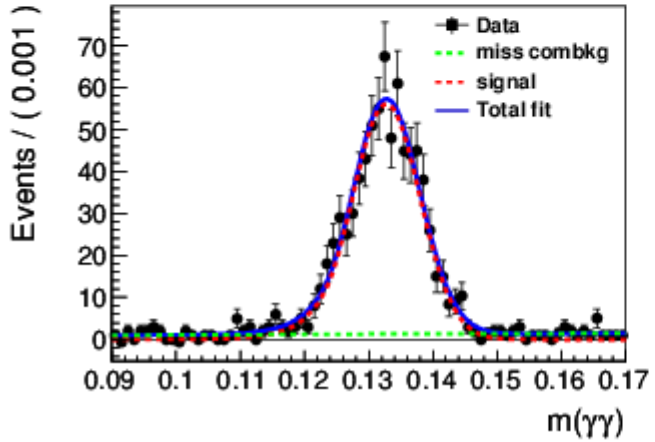


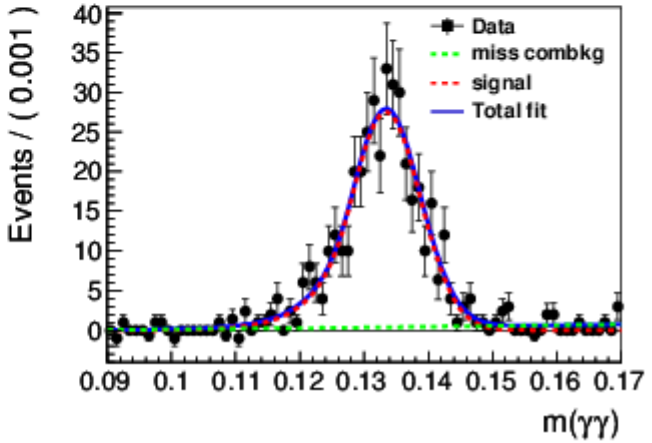


Fitting result without angle cut (Exp.Data)

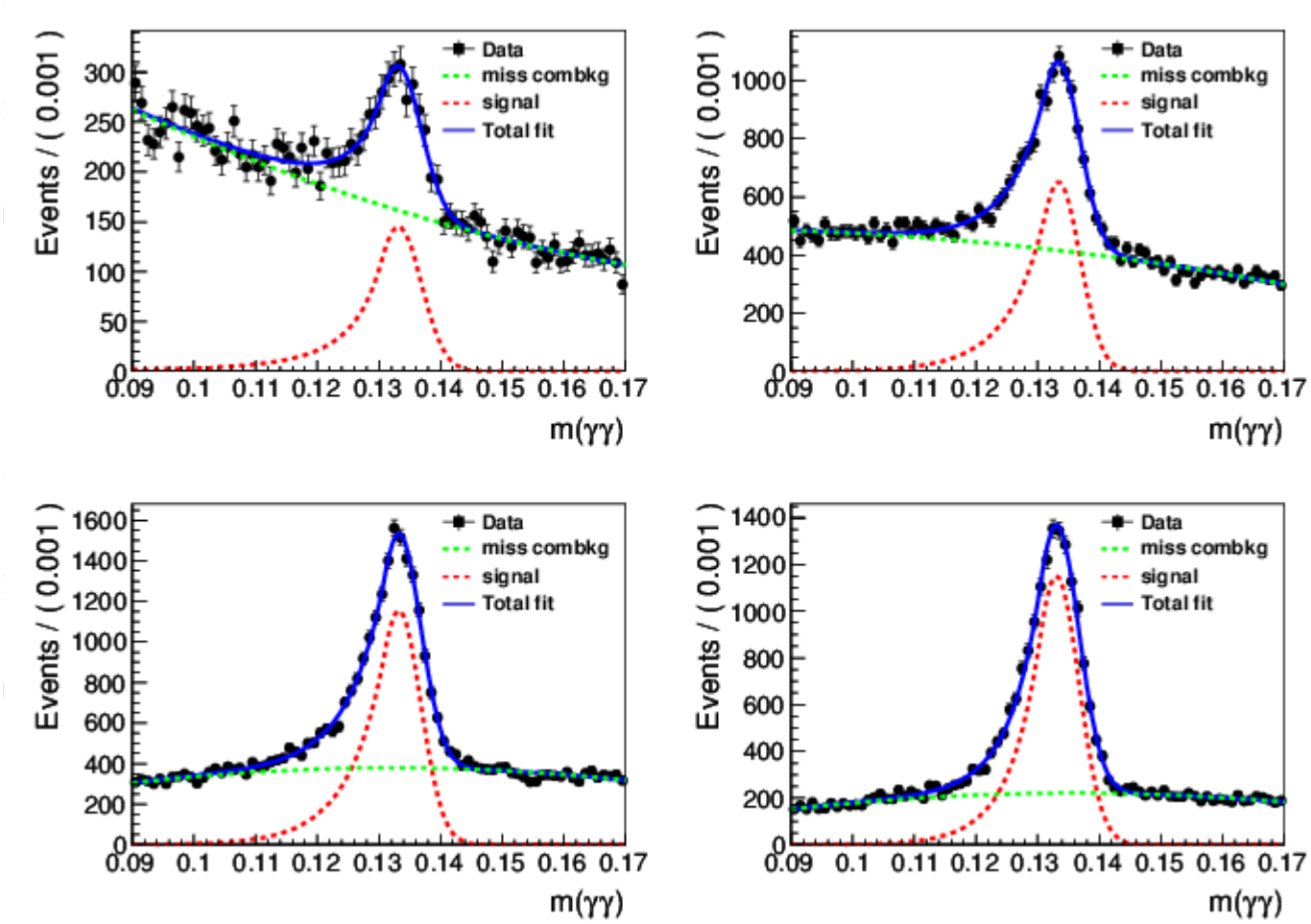




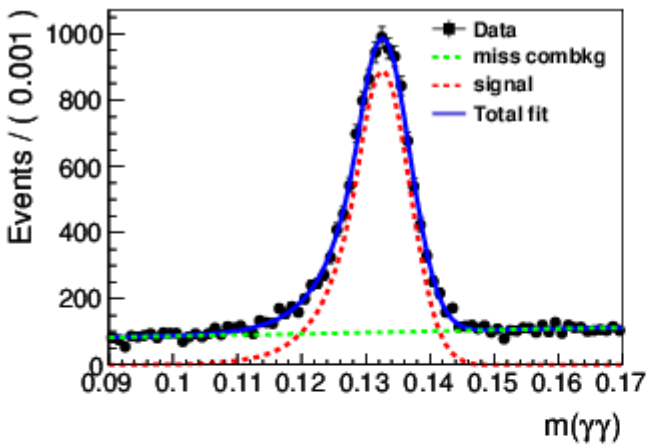


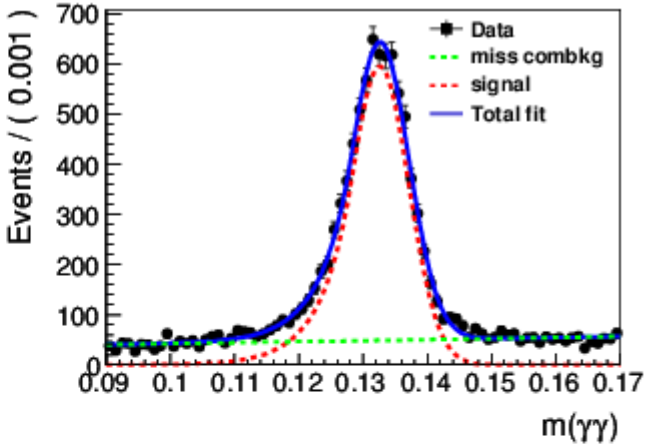


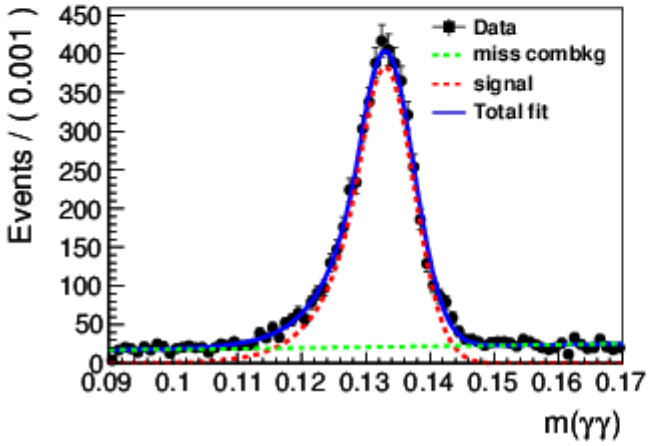
Fitting result with angle cut (Exp.Data)

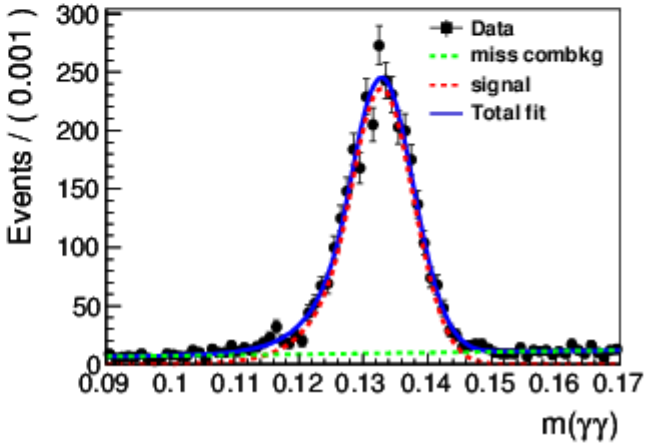


Fitting result with angle cut (Exp.Data)

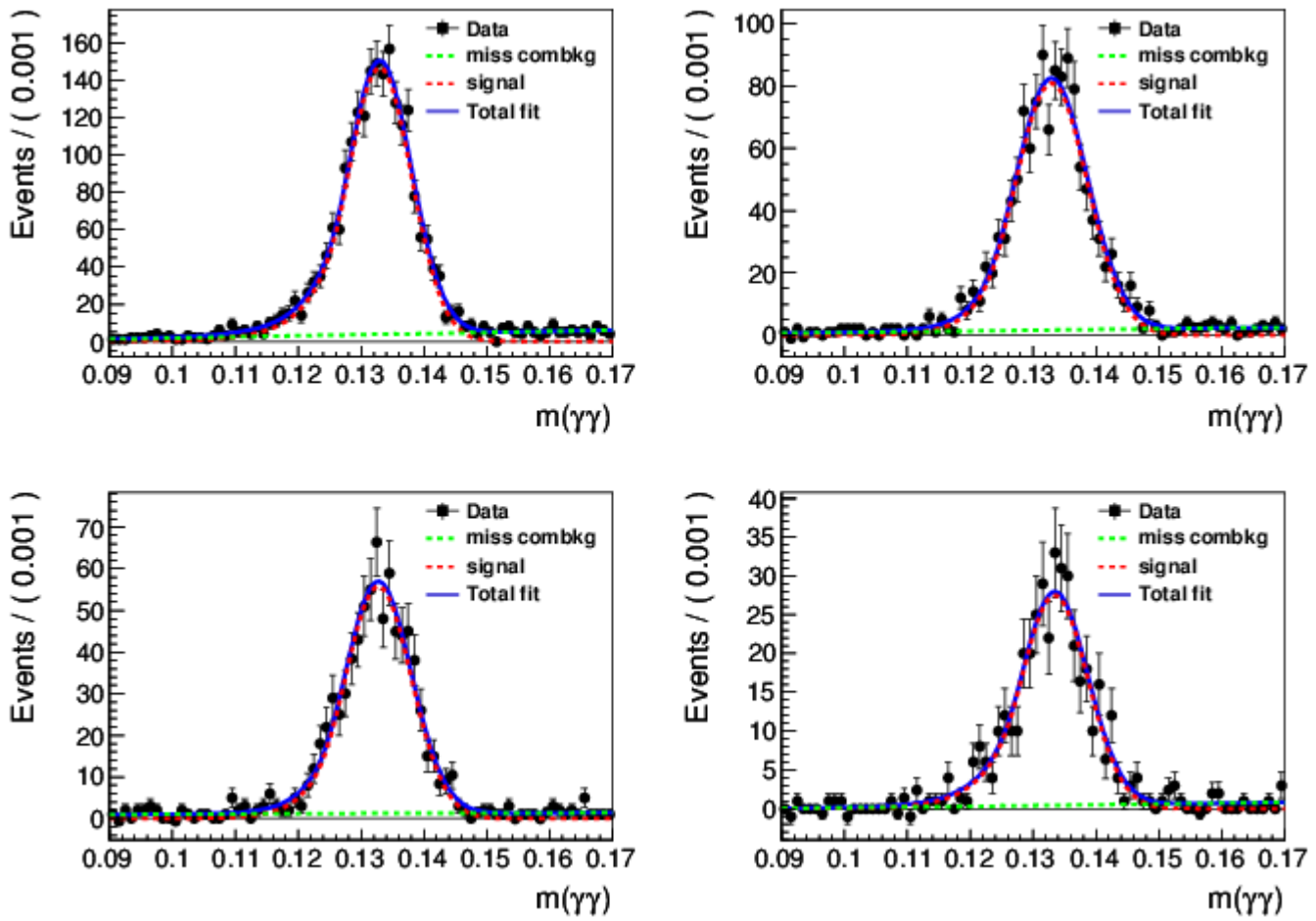








Fitting result with angle cut (Exp.Data)



Momentum (GeV)	Using angle cut (Sig)	Using angle cut (Bkg)	S/sqrt (S+B)	Without angle cut (signal)	Without angle cut (Bkg)	S/sqrt(S+B)
0.0-0.1	1764.5	13847.4	14.12	1983.49	17404.5	14.24
0.1-0.2	7389.58	32961.9	36.78	8023.8	40028.7	36.60
0.2-0.3	13201.7	28456.3	64.68	14175.5	33336.6	65.03
0.3-0.4	12440.1	16148.1	73.57	13272.5	18354.5	74.63
0.4-0.5	10633.6	7853.41	78.20	11256.2	8618.35	79.84
0.5-0.6	7373.83	3884.07	69.49	7759.11	4124.8	71.17
0.6-0.7	4810	1679.02	59.71	4980.79	1756.31	60.68
0.7-0.8	3123.78	739.315	50.25	3272.5	684.488	52.02
0.8-0.9	1984.01	290.088	41.60	2004.26	304.701	41.71
0.9-1.0	1178.32	126.927	32.61	1194.65	123.508	32.90
1.0-1.1	752.523	95.1268	25.84	757.839	98.124	25.90
1.1-1.2	386.23	32.9874	18.86	389.877	29.0183	19.04
1.2-1.3	299.774	6.11389	17.14	298.494	7.9718e-08	17.277