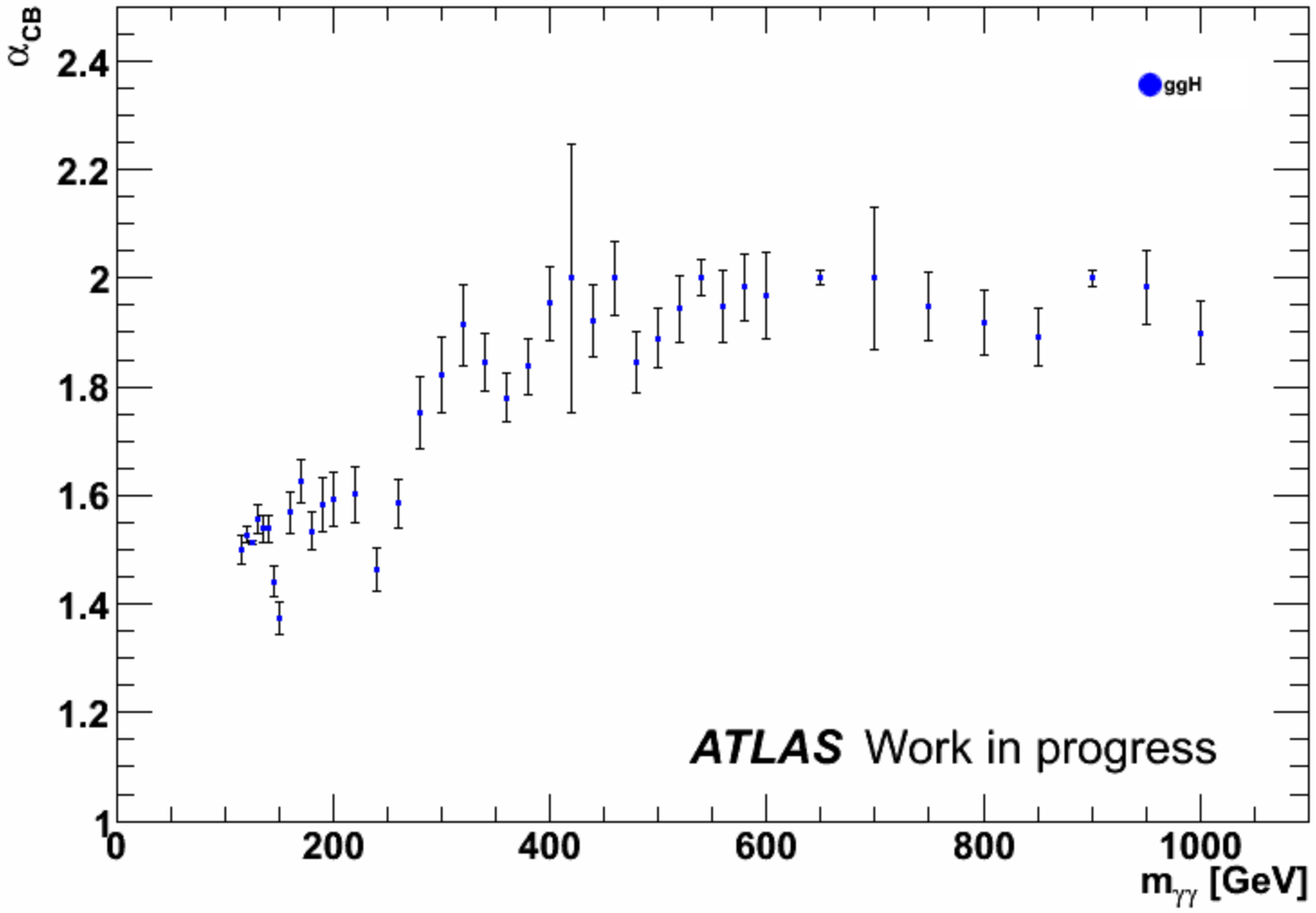
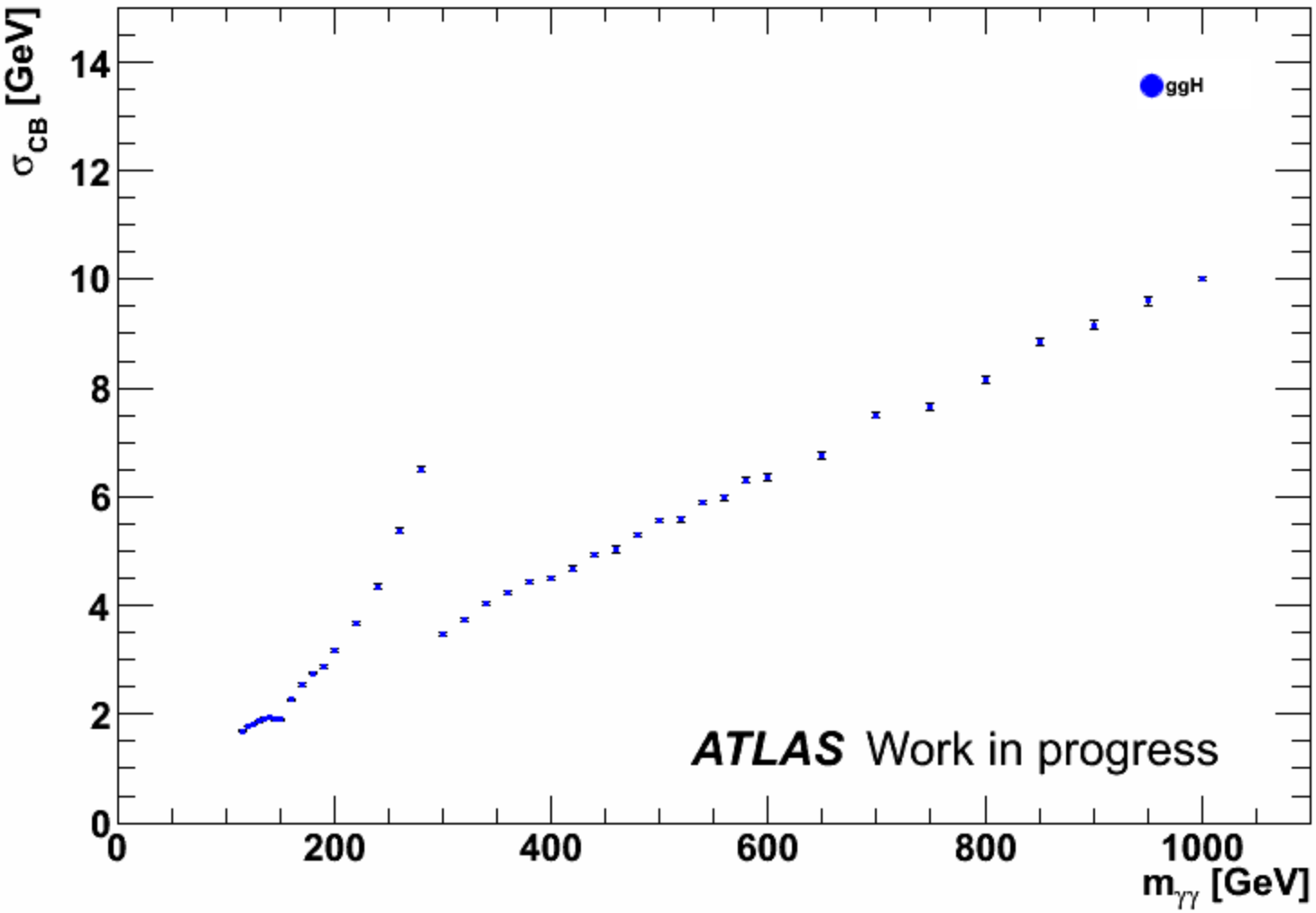
ggH 115 GeV – 1 TeV signal fits of the new MC samples

Zuzana Barnovska, LAPP, ATLAS

CBα

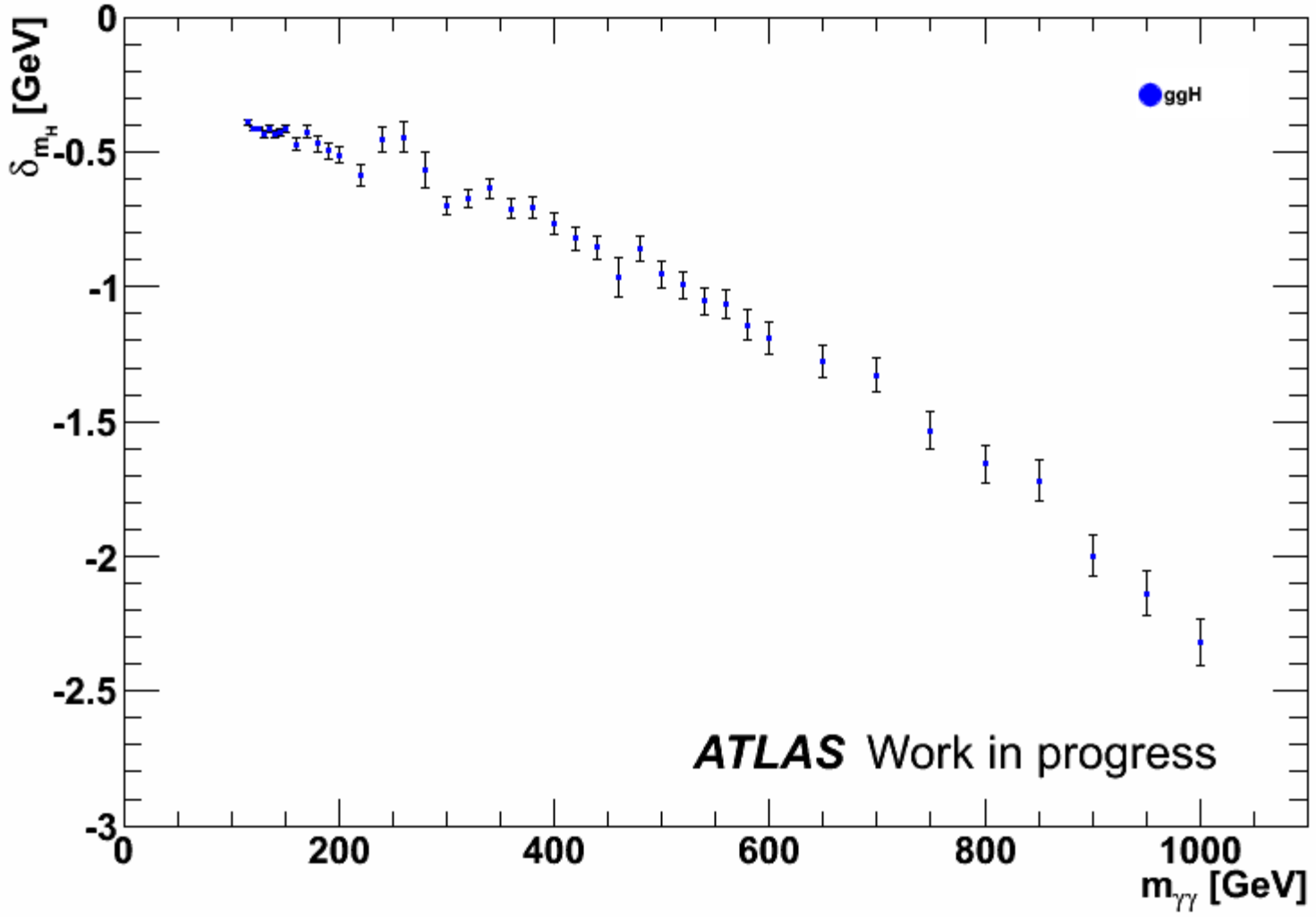

α_{CB}
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0
200
400
600
800
1000
$m_{\gamma\gamma}$ [GeV]
ggH
ATLAS Work in progress

CBσ

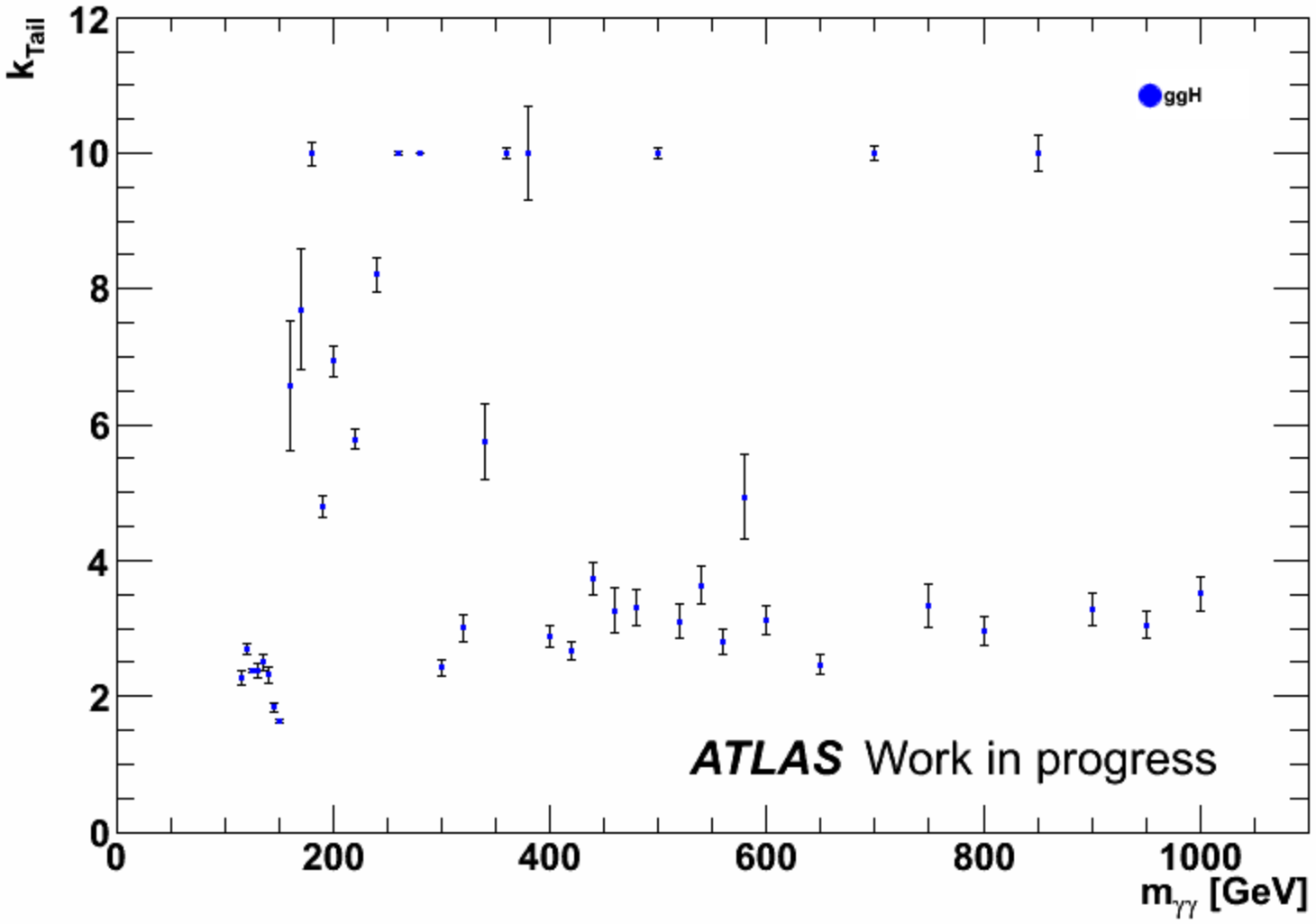


Something weird is happening around 200-300 GeV – no narrow width approximation

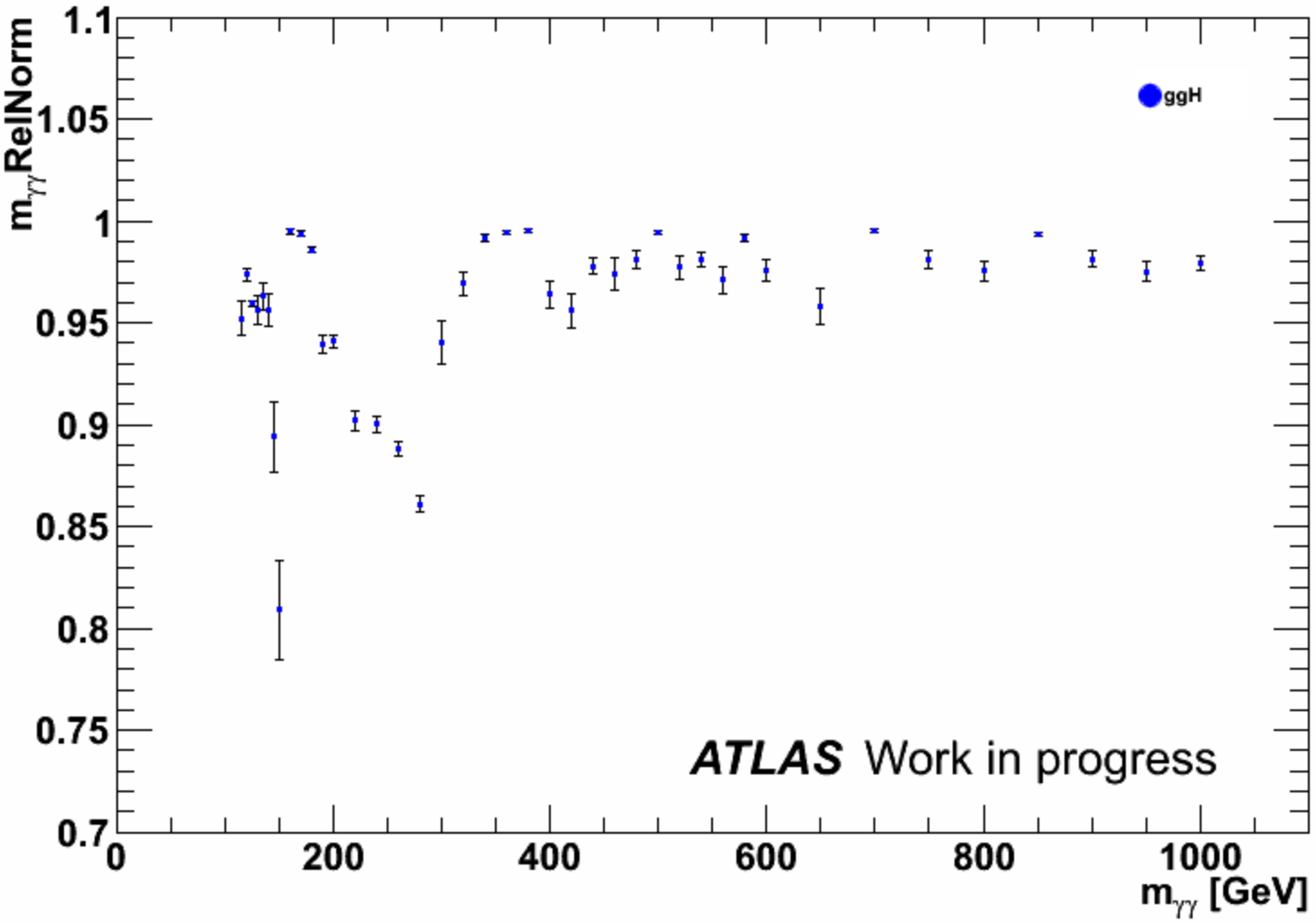
dm Higgs


δ_{m_H} [GeV]
0
-0.5
-1
-1.5
-2
-2.5
-3
0
200
400
600
800
1000
$m_{\gamma\gamma}$ [GeV]
ggH
ATLAS Work in progress

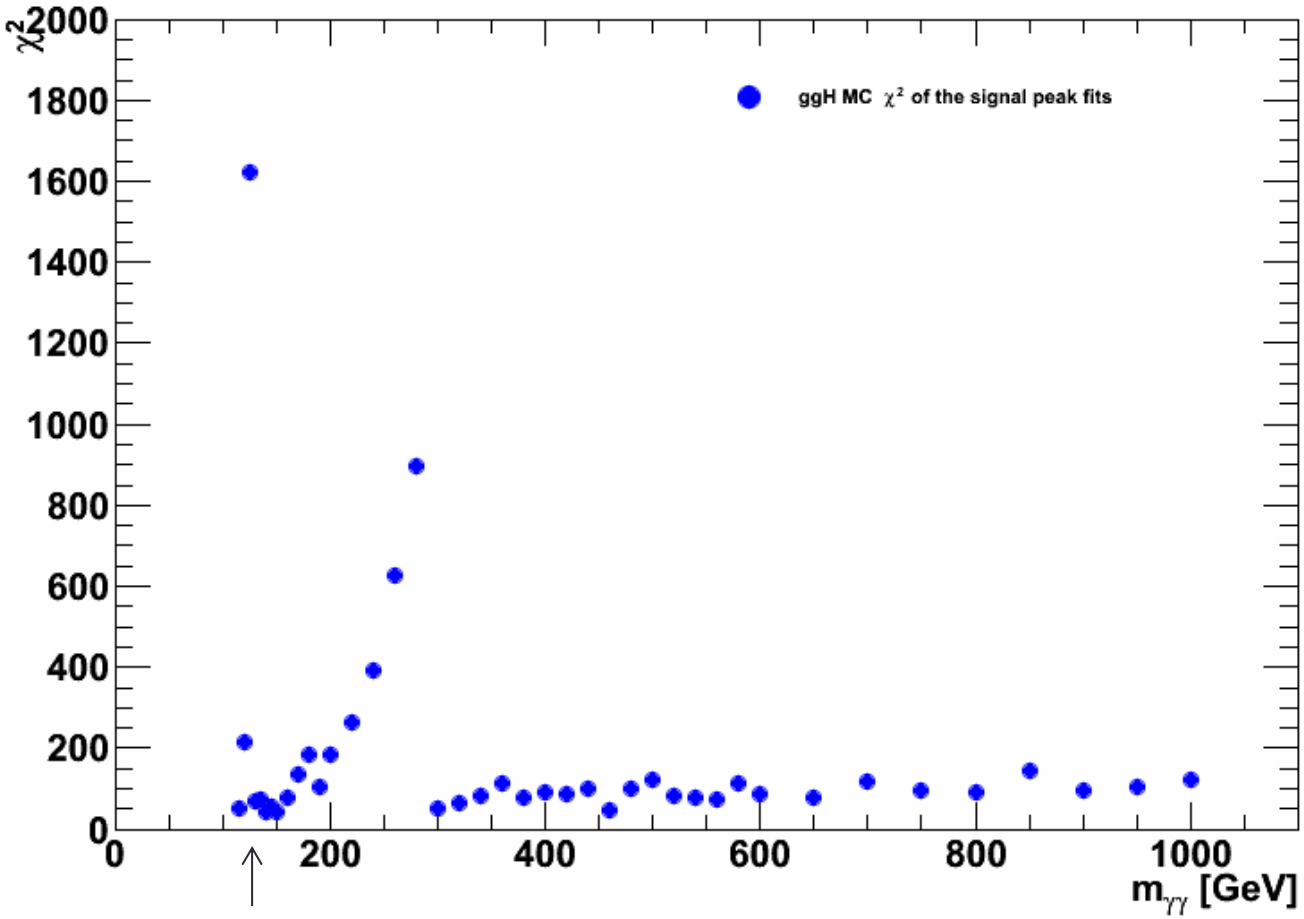
kTail


k_{Tail}
12
10
8
6
4
2
0
0
200
400
600
800
1000
$m_{\gamma\gamma}$ [GeV]
ggH
ATLAS Work in progress

mgg Rel Norm


$m_{\gamma\gamma}$RelNorm
1.1
1.05
1
0.95
0.9
0.85
0.8
0.75
0.7
0
200
400
600
800
1000
$m_{\gamma\gamma}$ [GeV]
ggH
ATLAS Work in progress

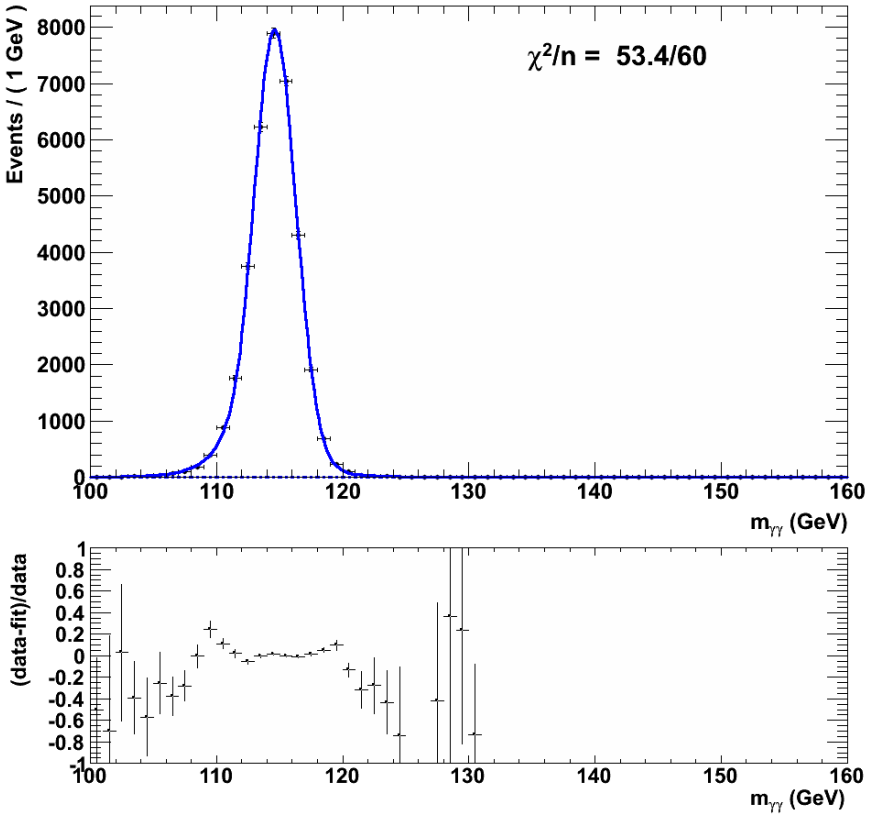
Chi2 of all the fits

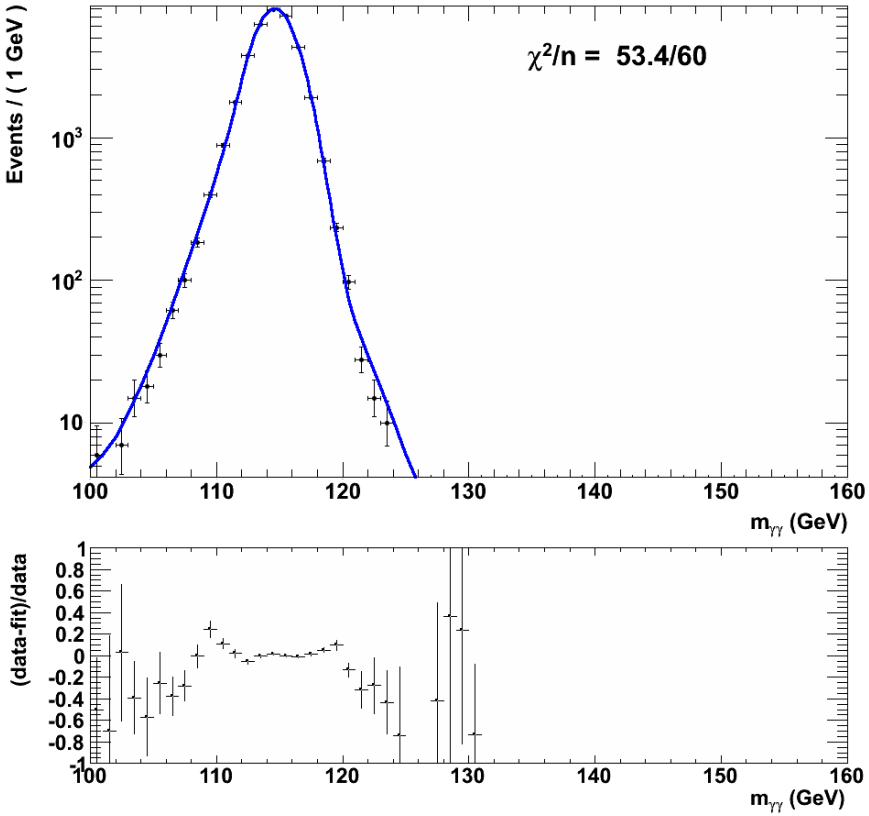


These are from the first fits I made a week ago – but they are essentially the same, except for ggH125 – that one I can not bring below 5k

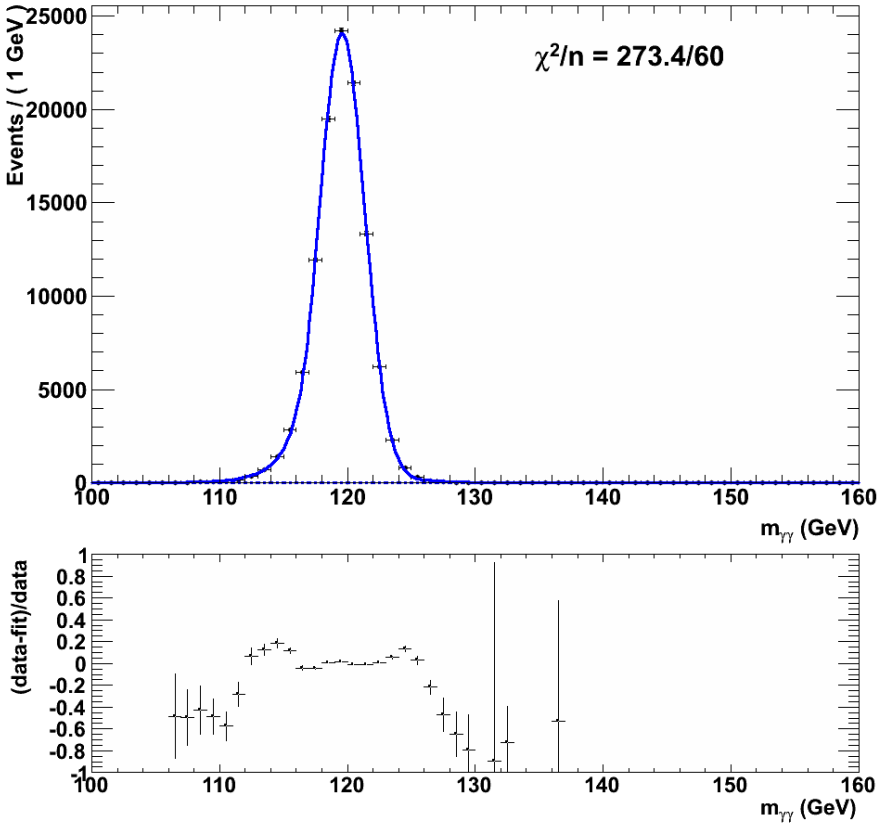
The fits, also in log scale

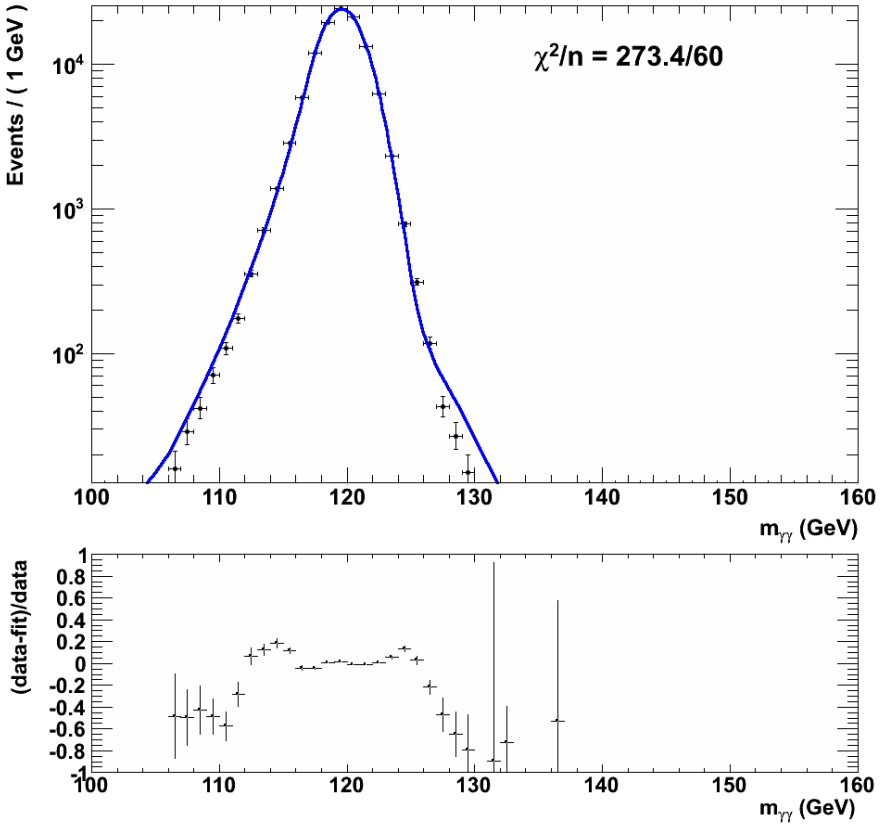
ggH 115 GeV


Events / (1 GeV)
χ^2/n = 53.4/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

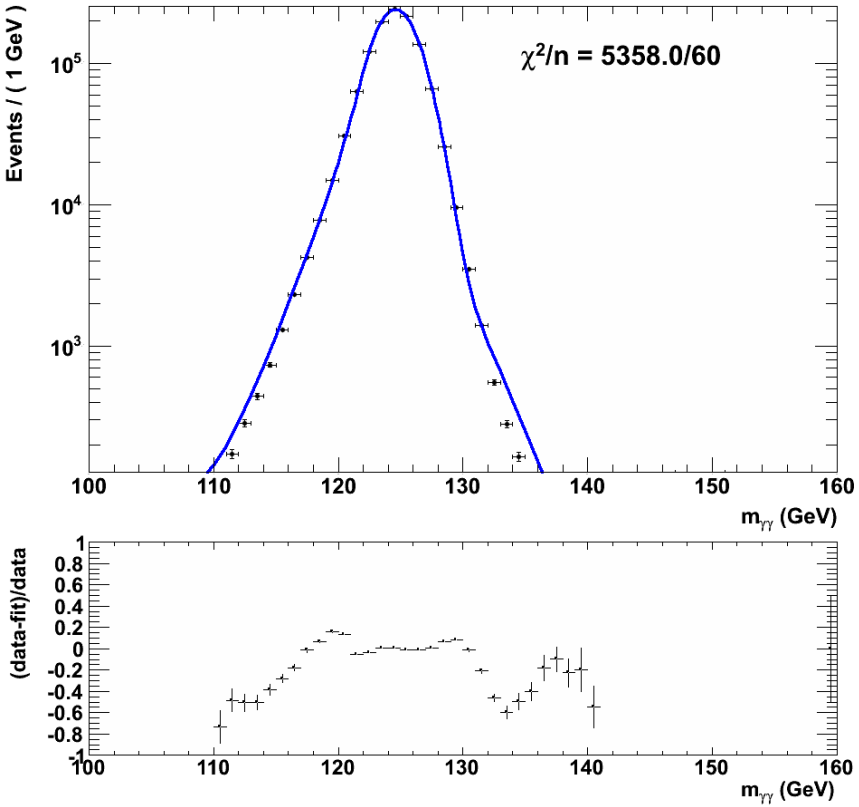

Events / (1 GeV)
χ^2/n = 53.4/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

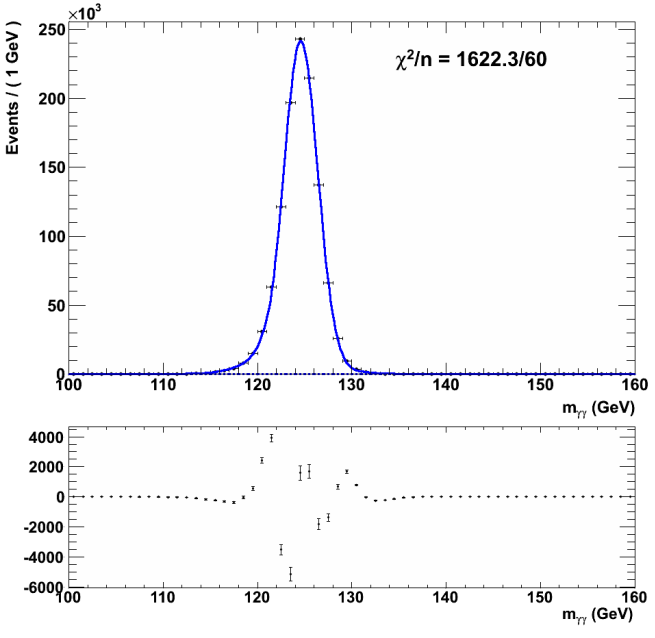
ggH 120 GeV

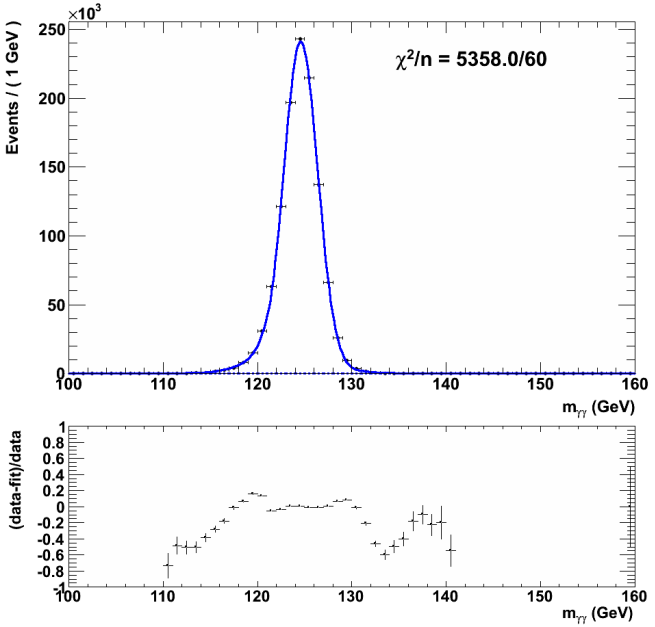

Events / (1 GeV)
χ^2/n = 273.4/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)


Events / (1 GeV)
χ^2/n = 273.4/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

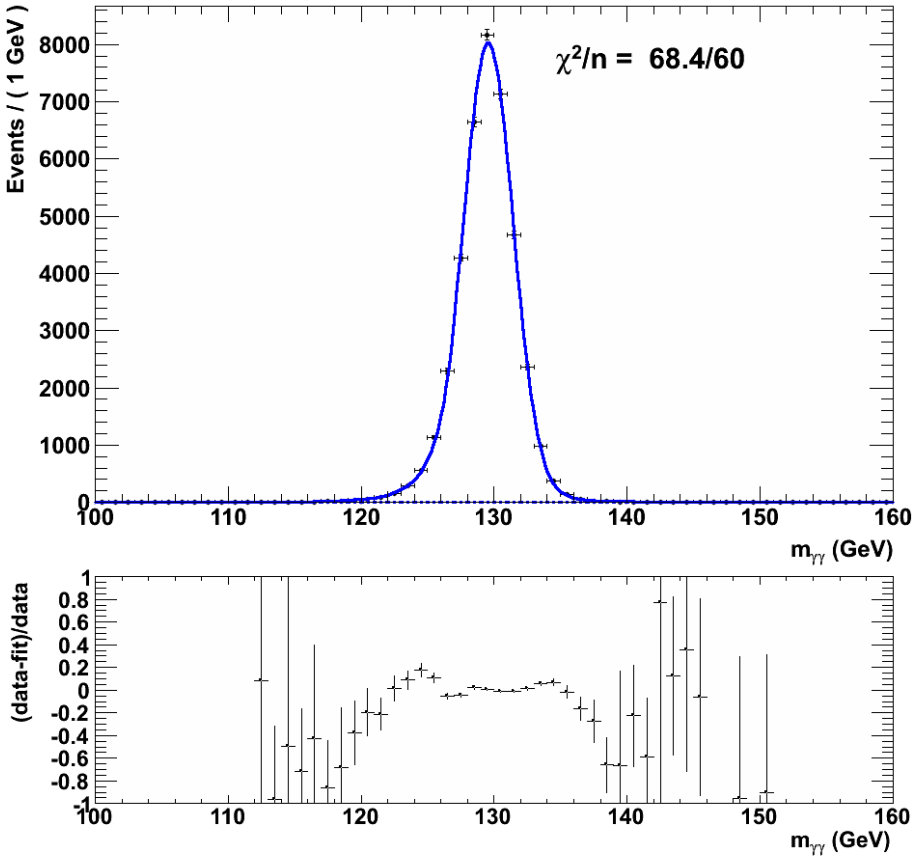
ggH 125 GeV

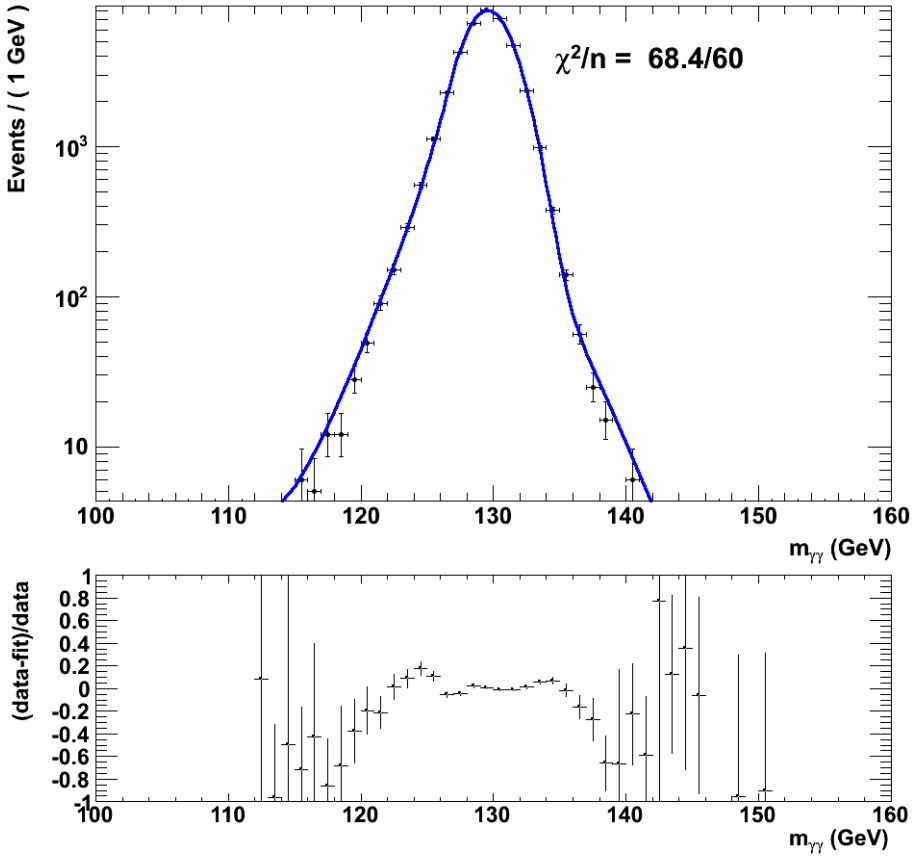

Events / (1 GeV)
χ^2/n = 5358.0/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)


×10³
Events / (1 GeV)
χ^2/n = 1622.3/60
$m_{\gamma\gamma}$ (GeV)
$m_{\gamma\gamma}$ (GeV)

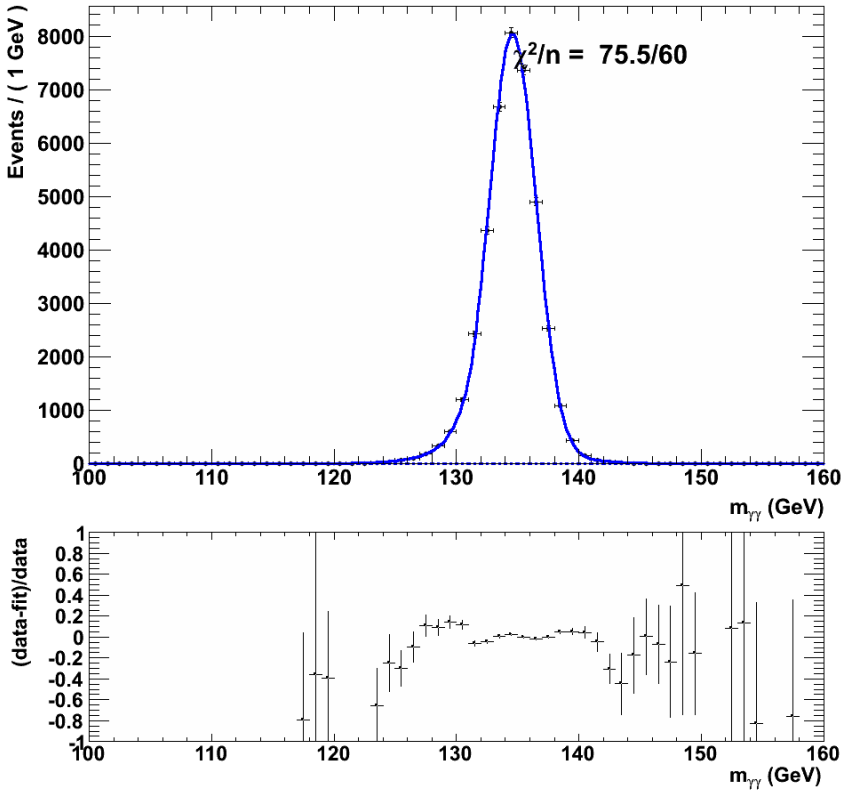

×10³
Events / (1 GeV)
χ^2/n = 5358.0/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

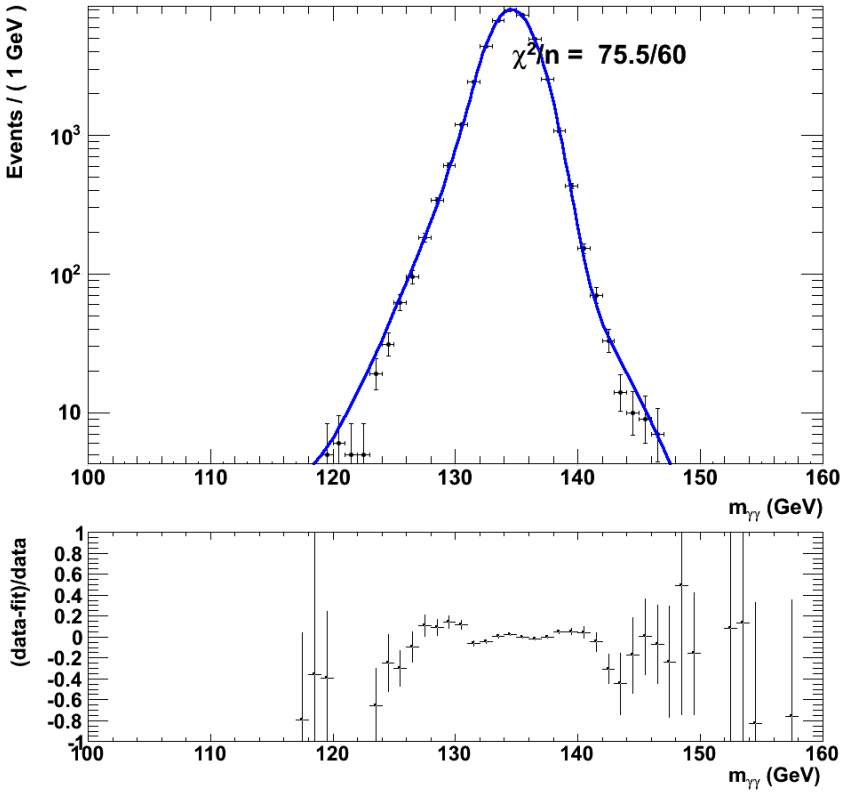
ggH 130 GeV


Events / (1 GeV)
χ^2/n = 68.4/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

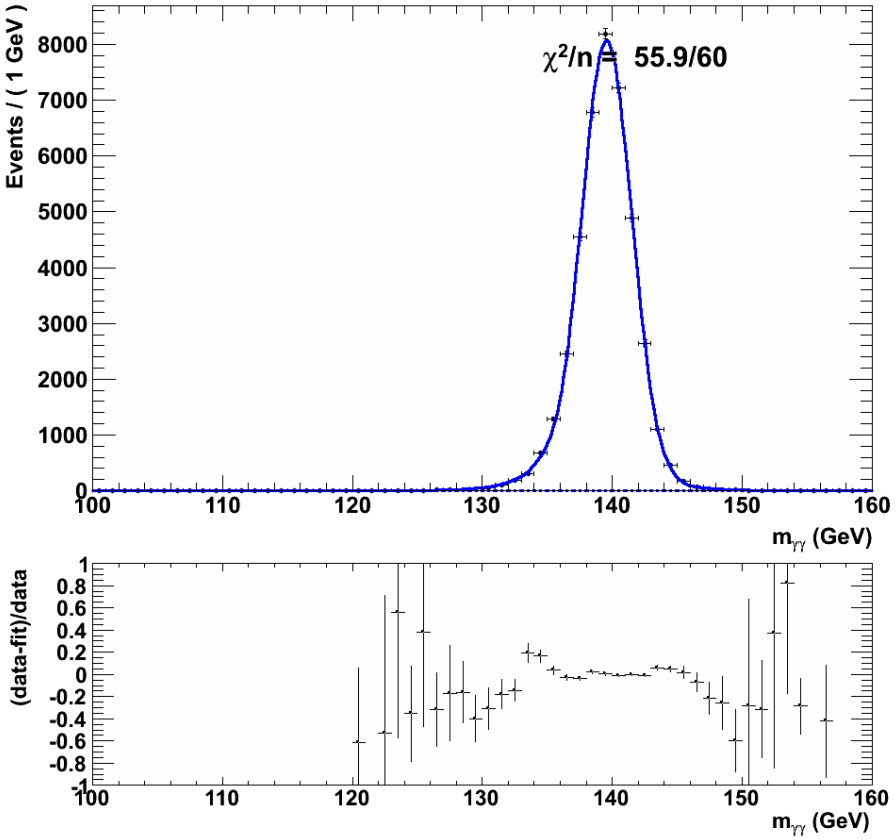

Events / (1 GeV)
χ^2/n = 68.4/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

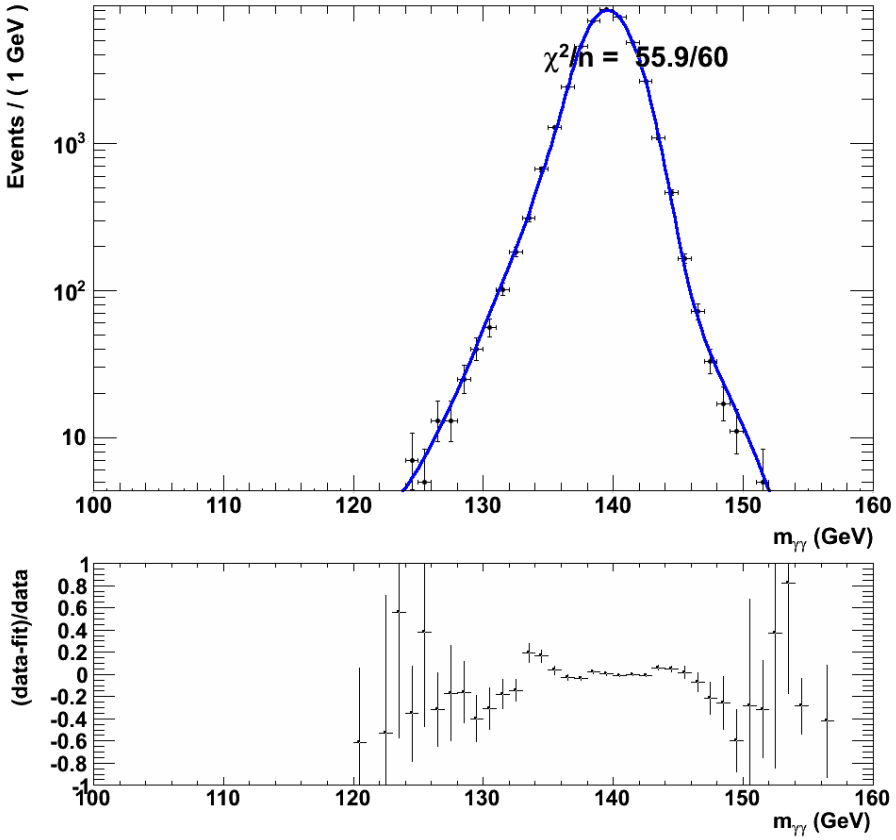
ggH 135 GeV


Events / (1 GeV)
χ^2/n = 75.5/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

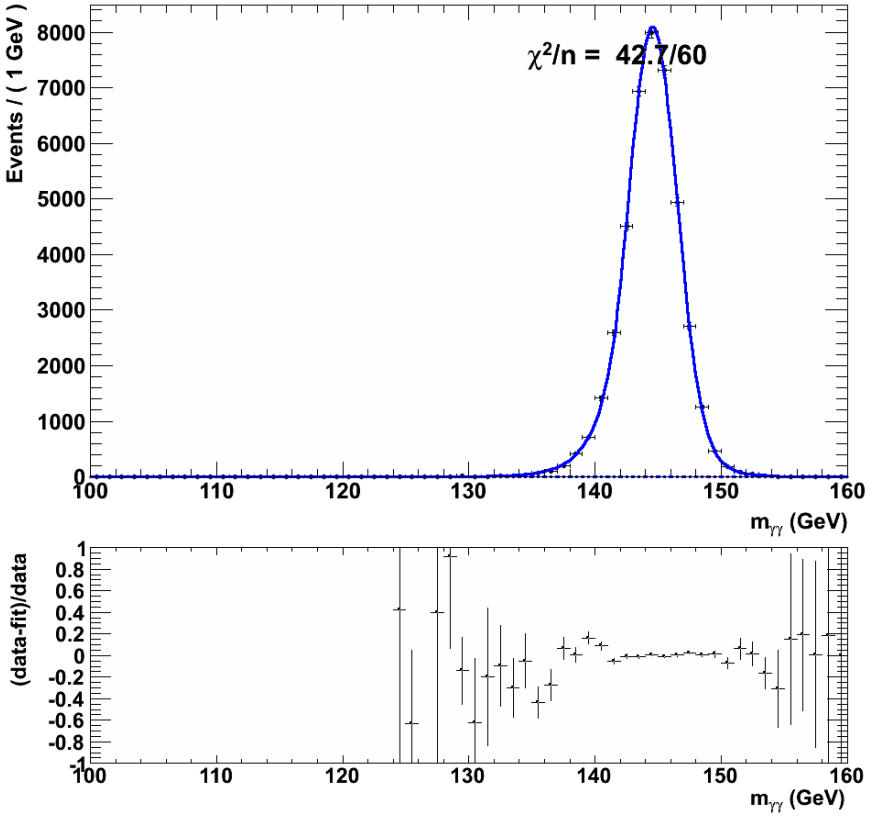

Events / (1 GeV)
χ^2/n = 75.5/60
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

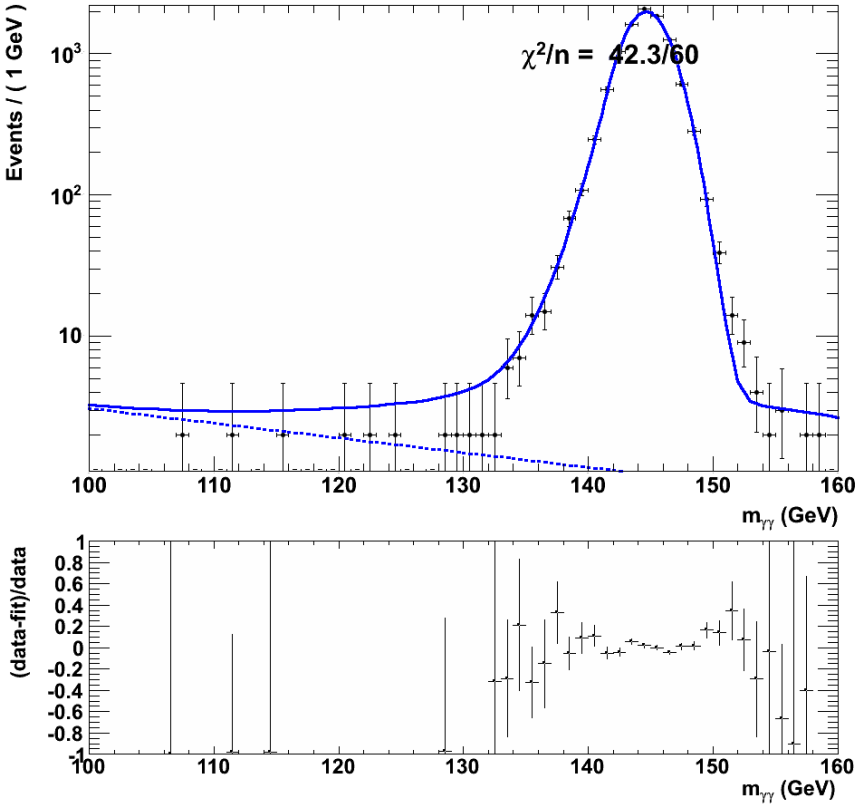
ggH 140 GeV


Events / (1 GeV)
χ²/n = 55.9/60
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

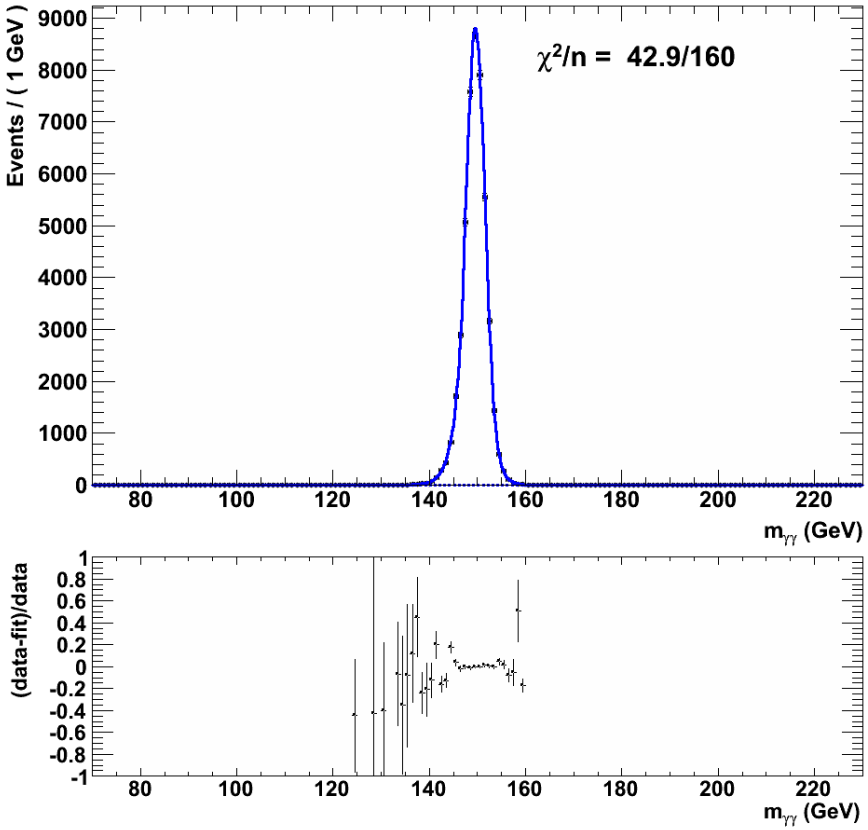

Events / (1 GeV)
χ²/n = 55.9/60
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

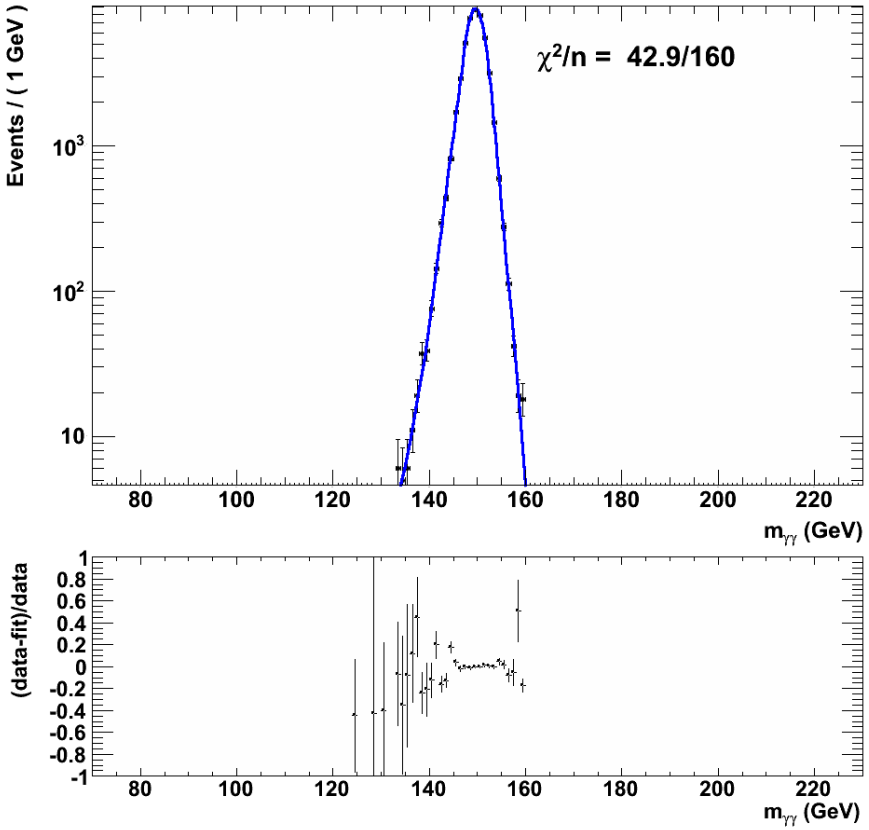
ggH 145 GeV


Events / (1 GeV)
χ²/n = 42.7/60
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)


Events / (1 GeV)
χ²/n = 42.3/60
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

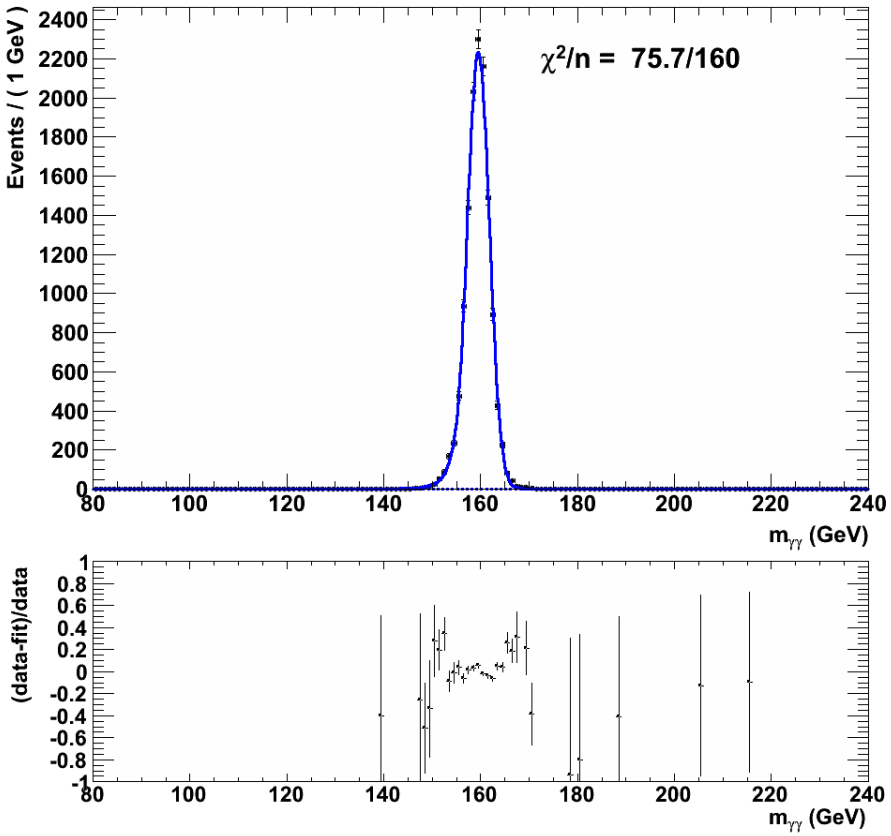
ggH 150 GeV

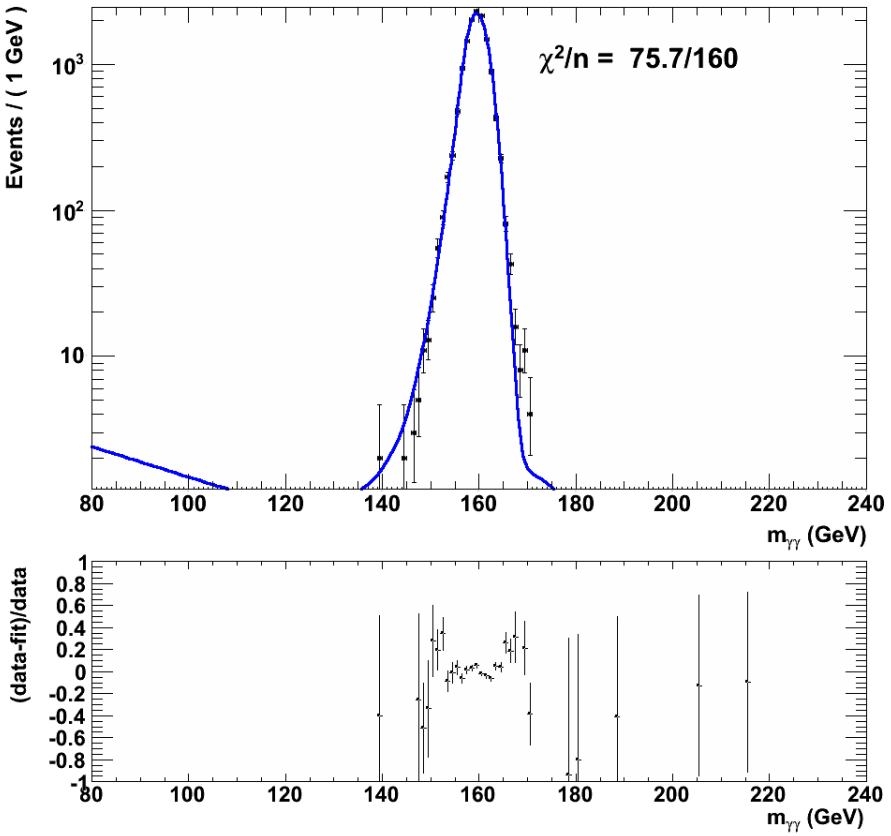




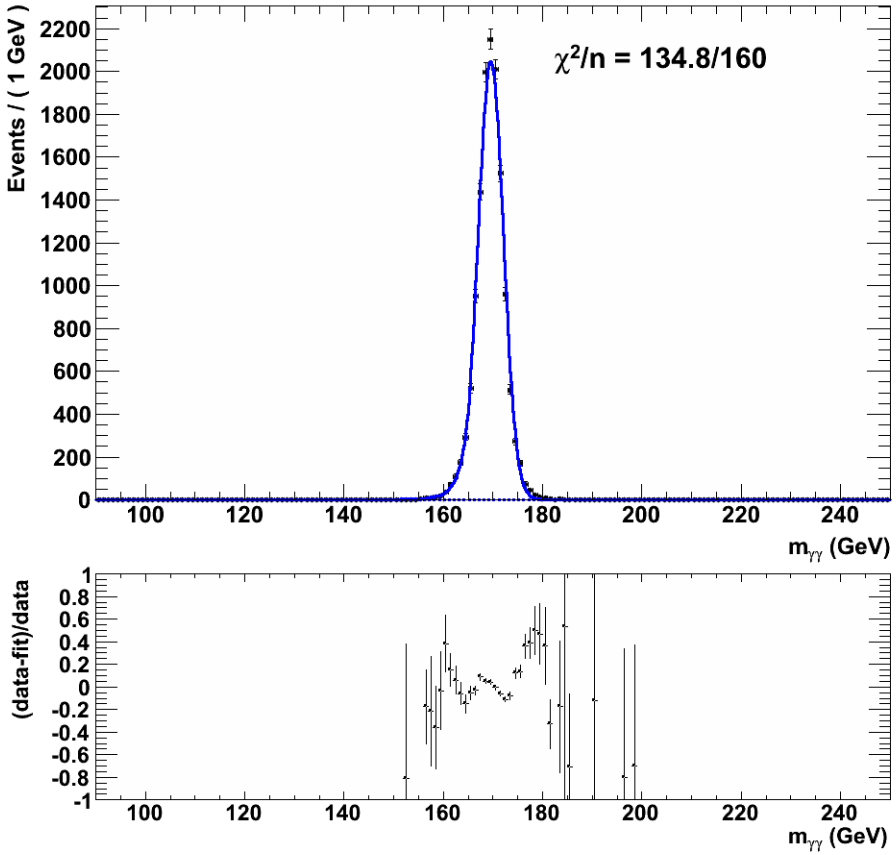
Why is it cut off at 160?

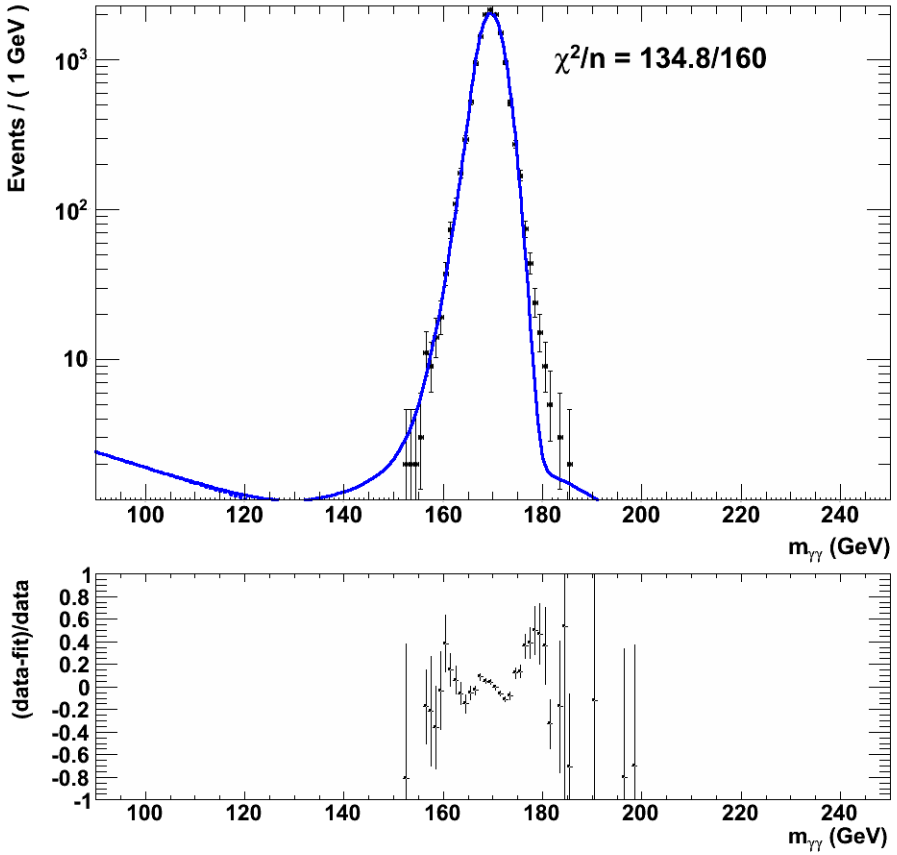
ggH 160 GeV


Events / (1 GeV)
χ^2/n = 75.7/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

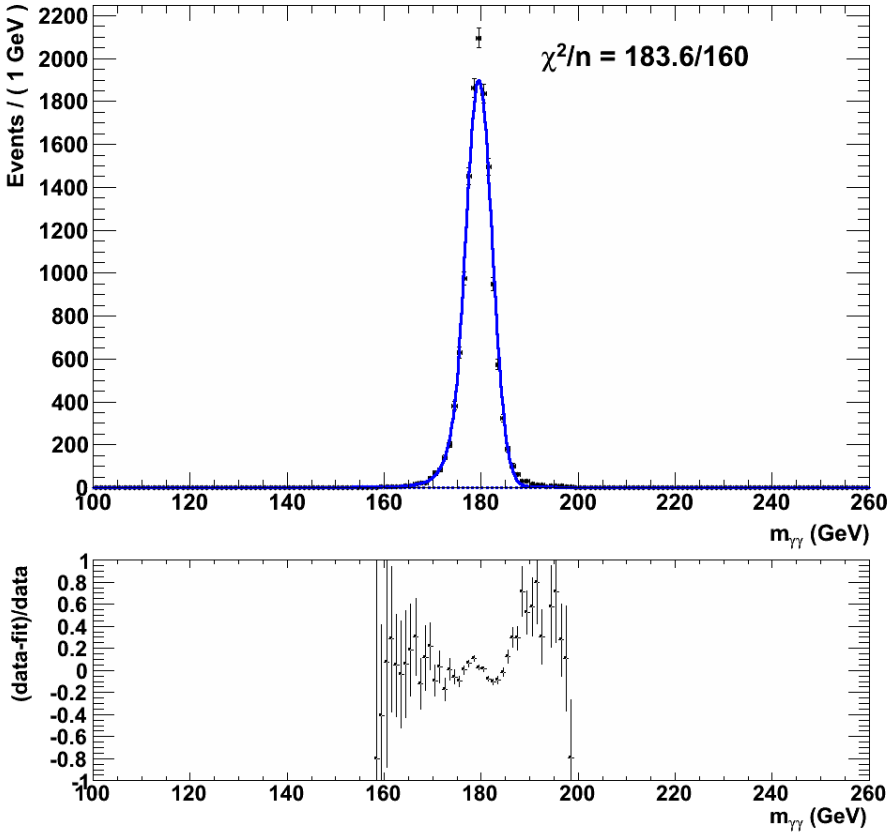

Events / (1 GeV)
χ^2/n = 75.7/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

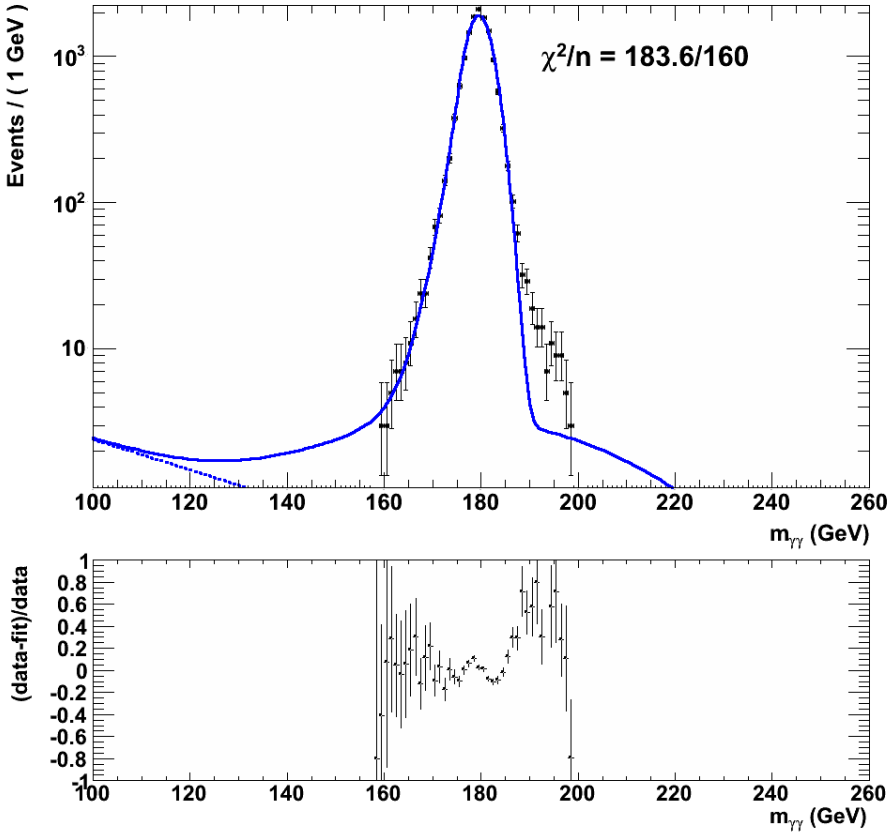
ggH 170 GeV


Events / (1 GeV)
χ^2/n = 134.8/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

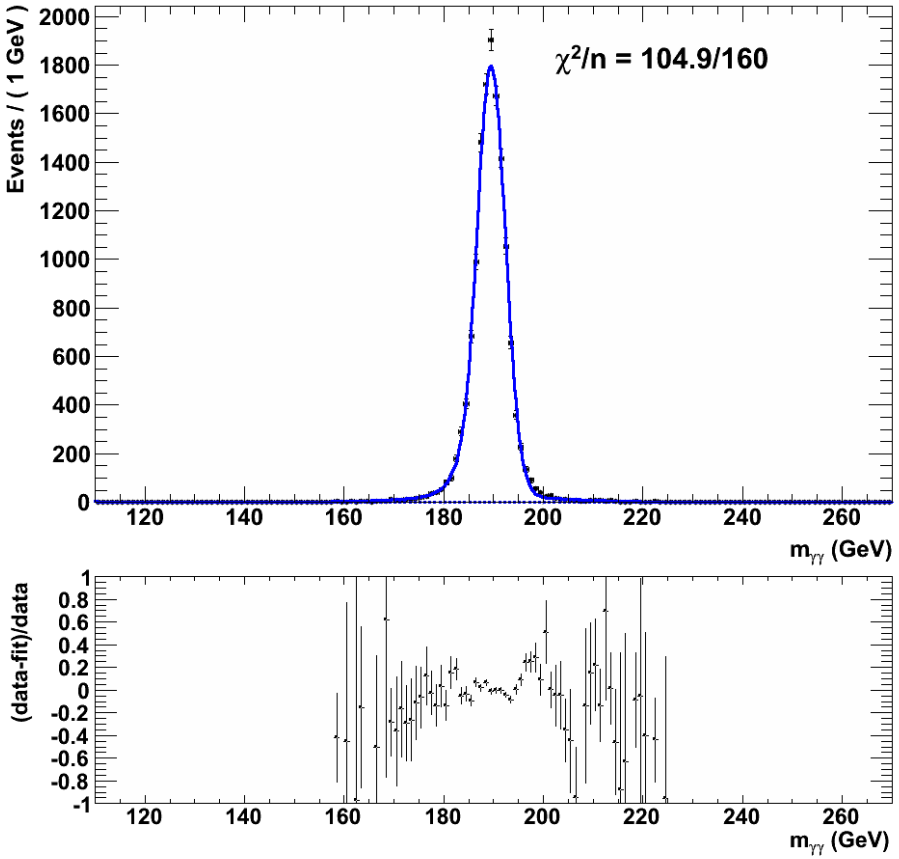

Events / (1 GeV)
χ^2/n = 134.8/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

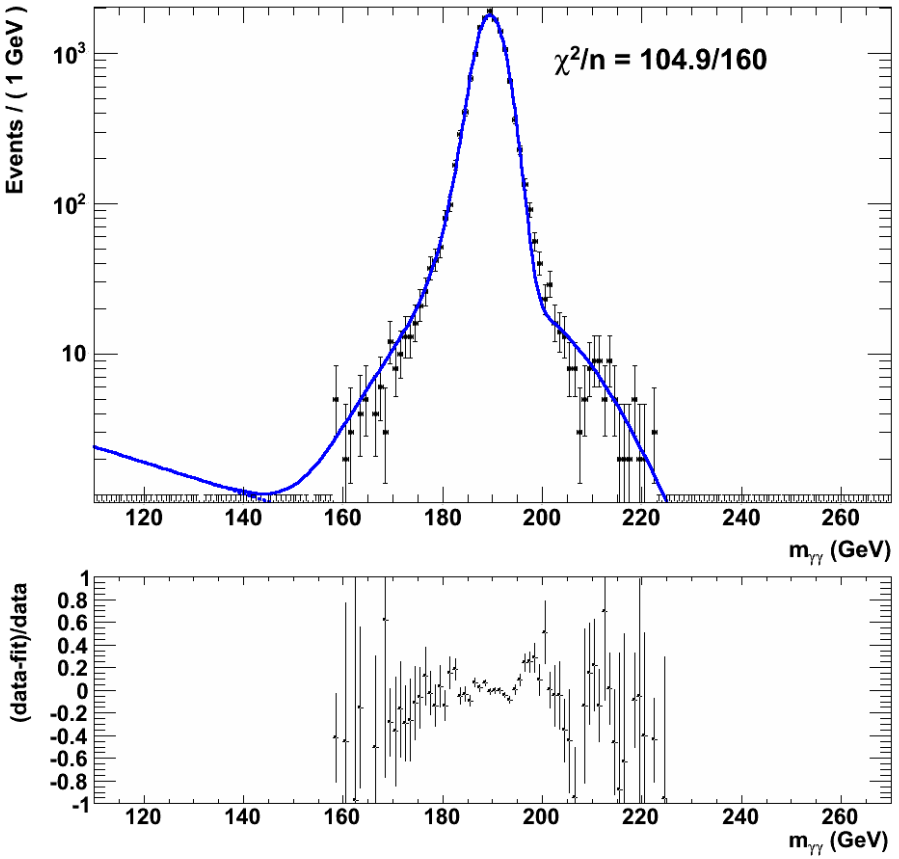
ggH 180 GeV


Events / (1 GeV)
χ^2/n = 183.6/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

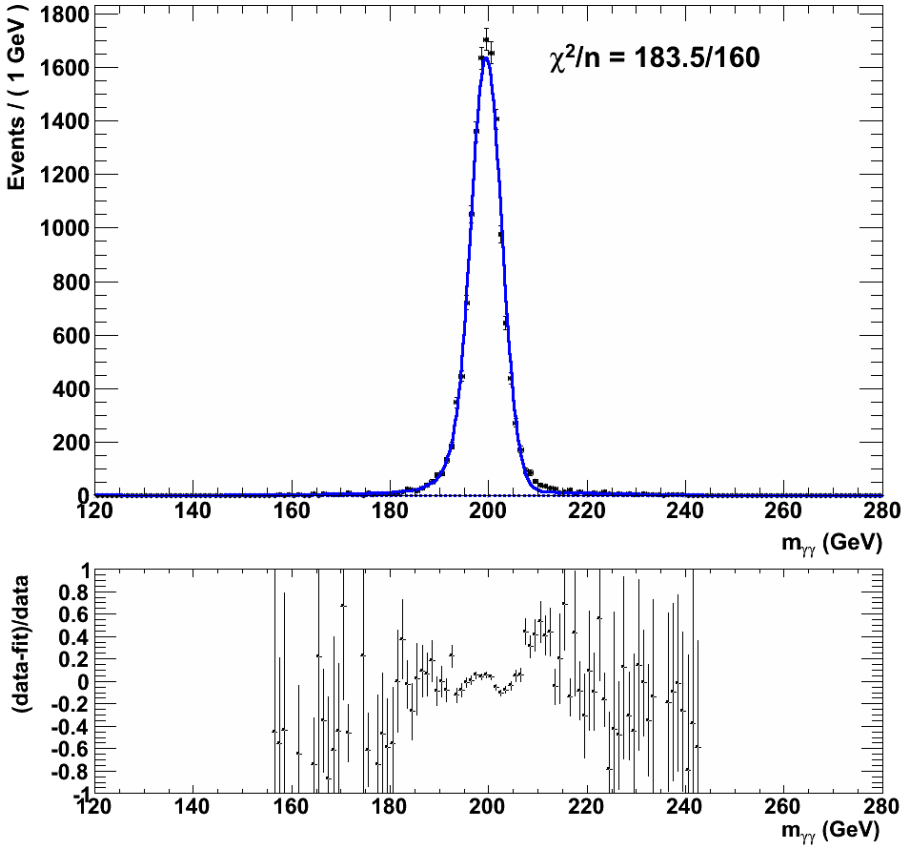

Events / (1 GeV)
χ^2/n = 183.6/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

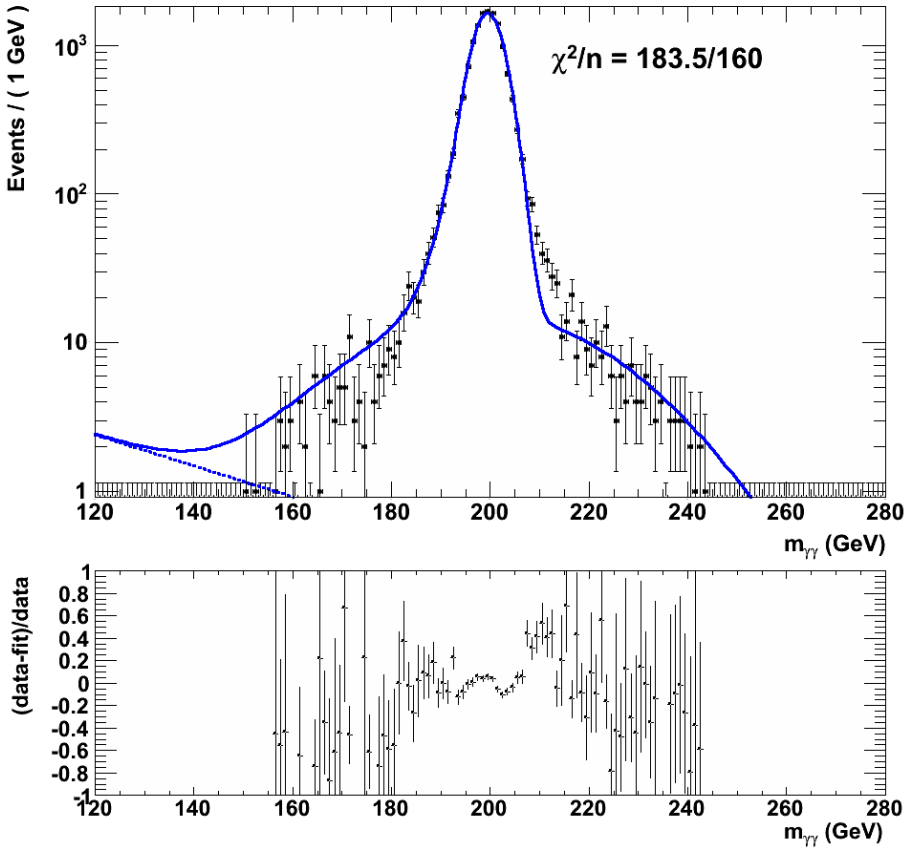
ggH 190 GeV


Events / (1 GeV)
χ^2/n = 104.9/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)


Events / (1 GeV)
χ^2/n = 104.9/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

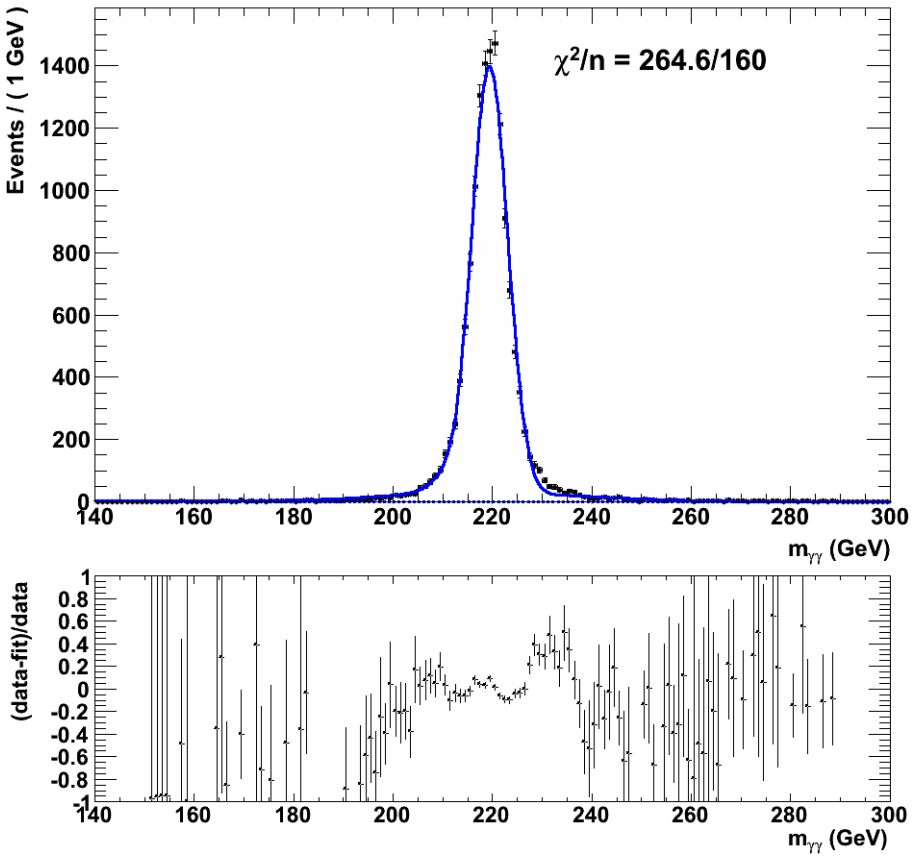
ggH 200 GeV

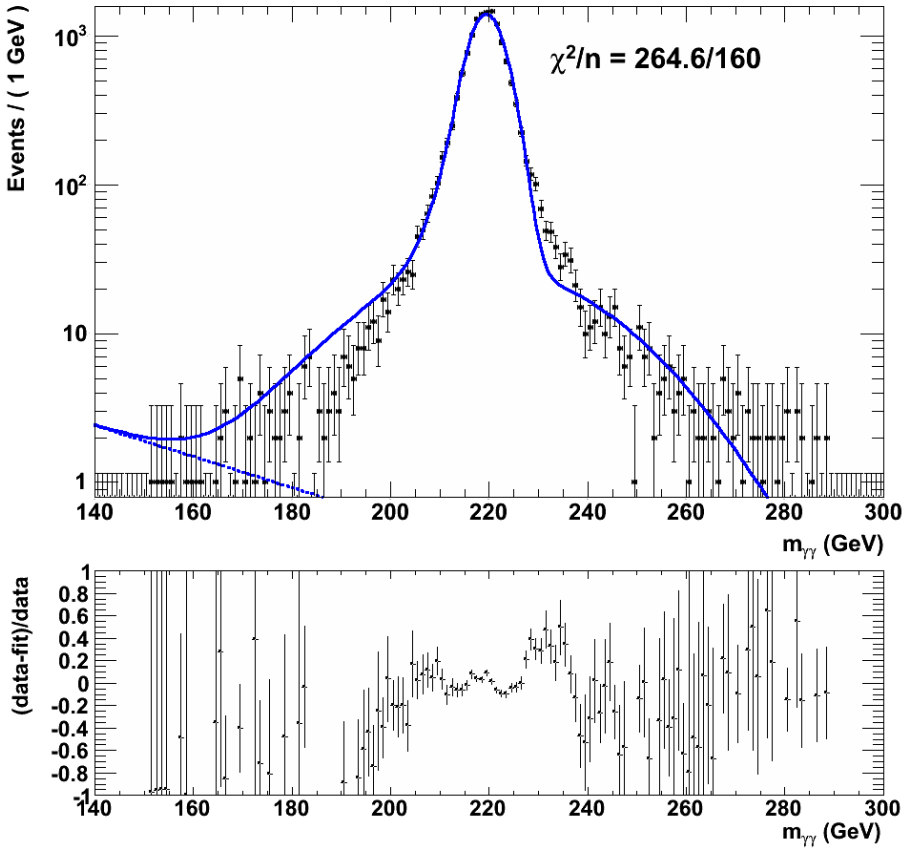




The signal peak widens

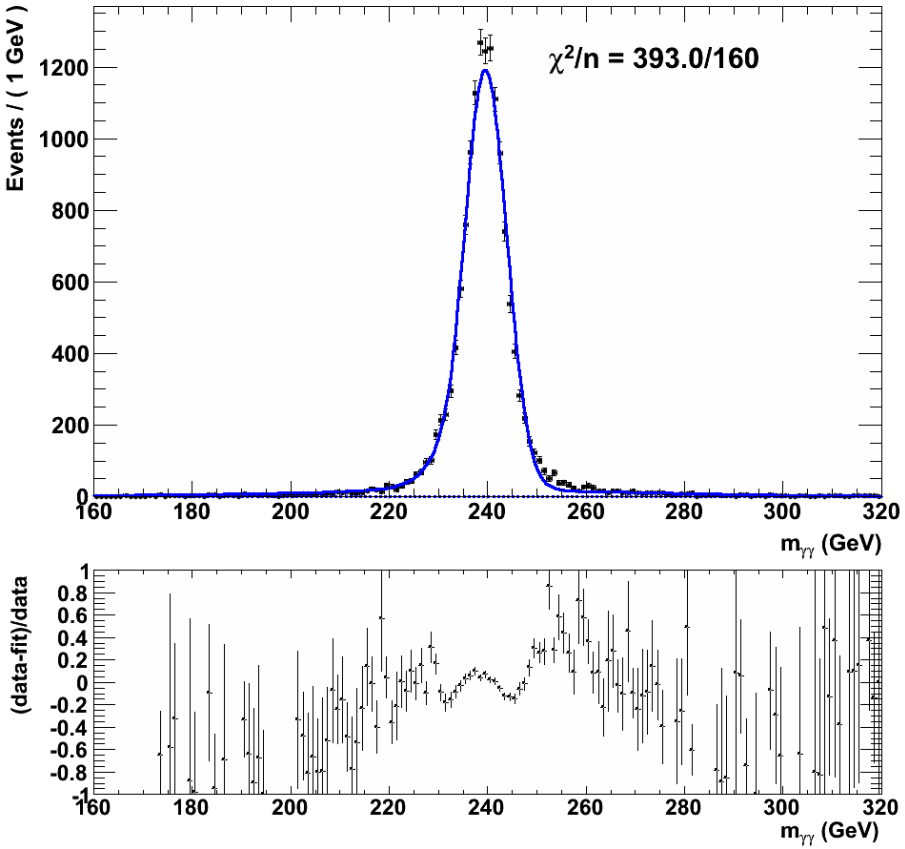
ggH 220 GeV

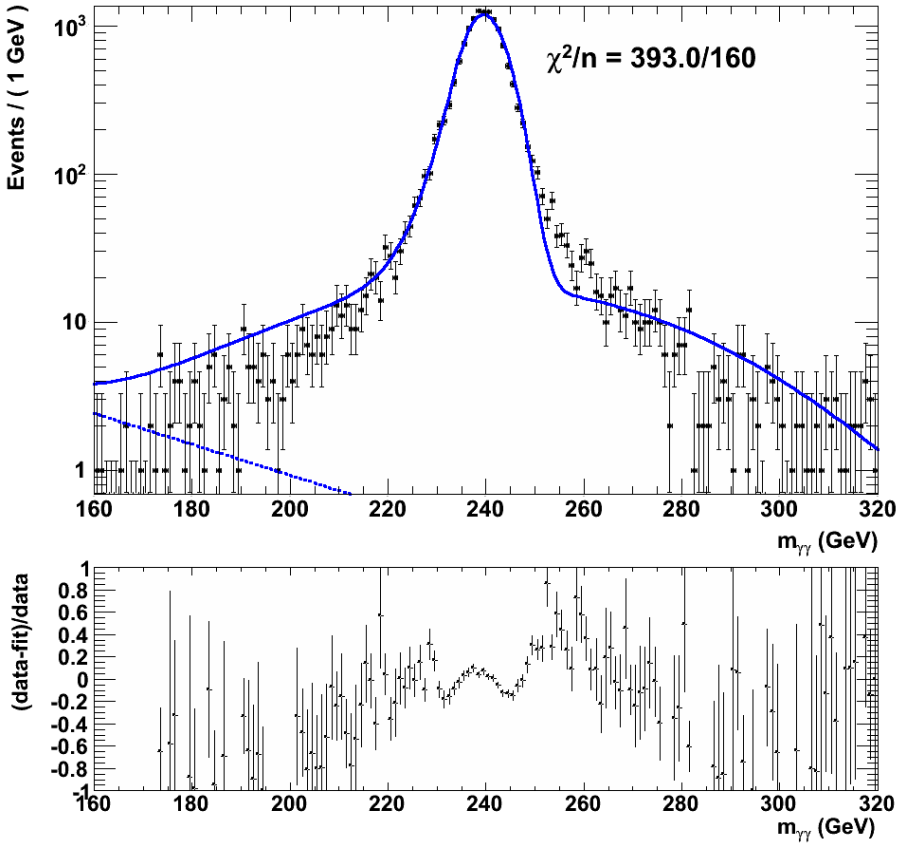




The signal peak widens

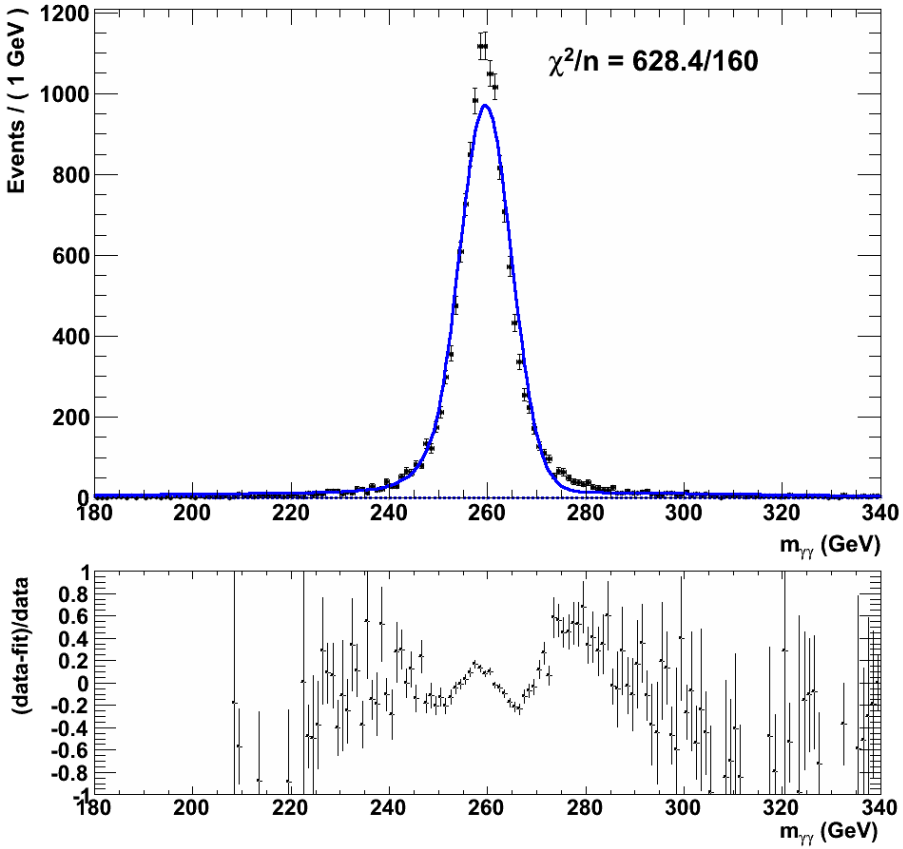
ggH 240 GeV

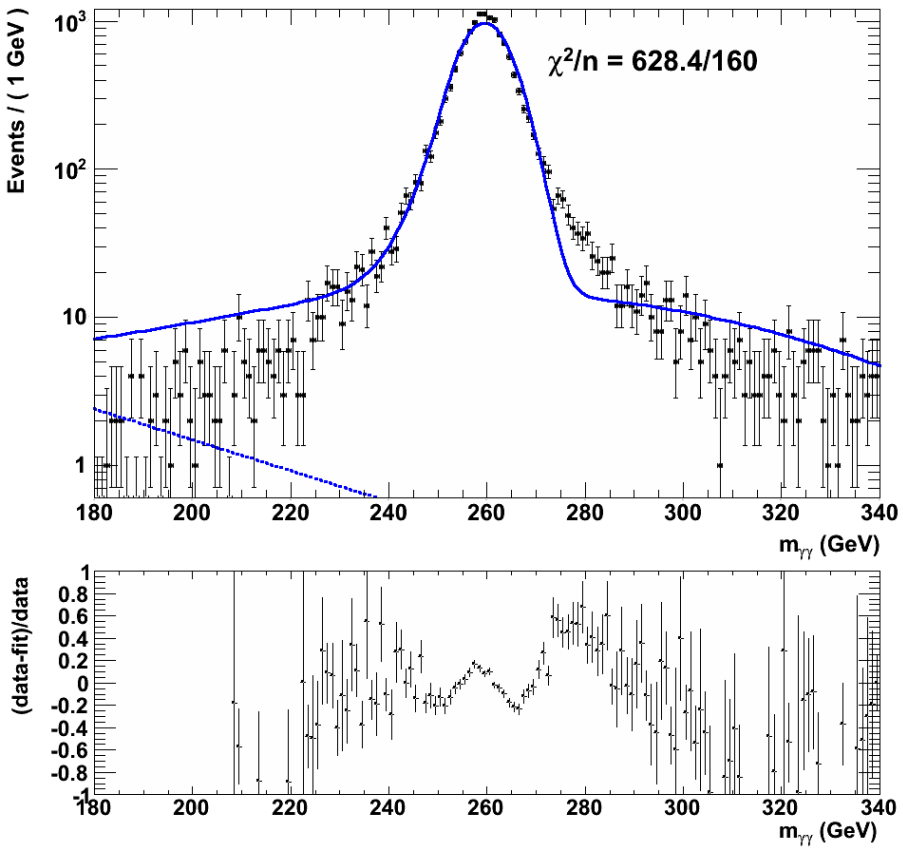




The signal peak widens

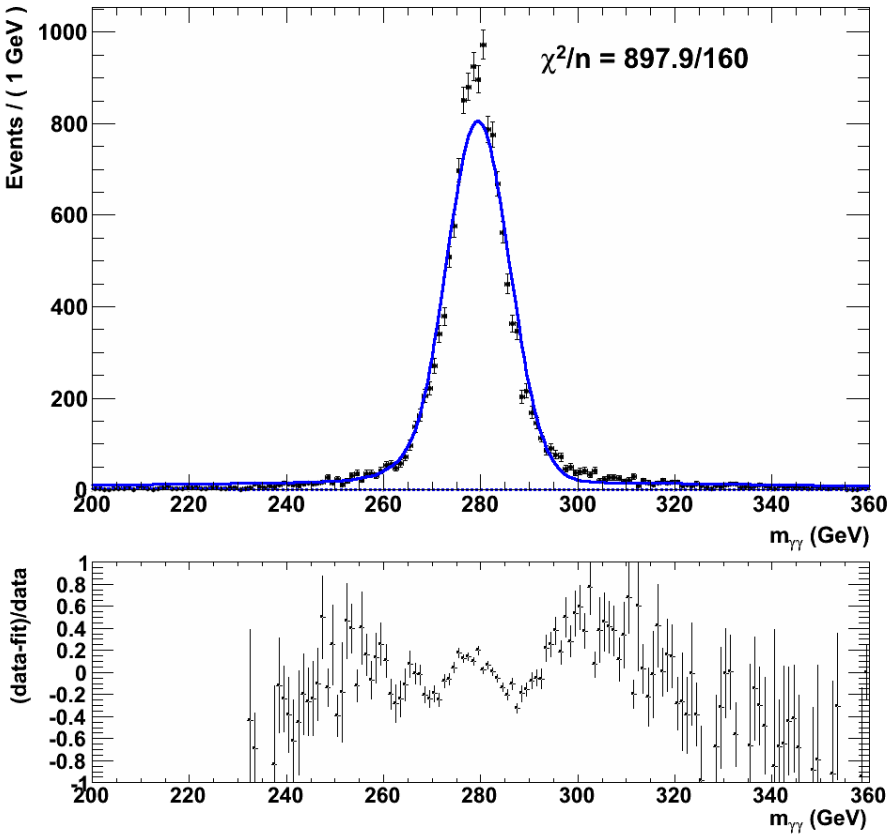
ggH 260 GeV

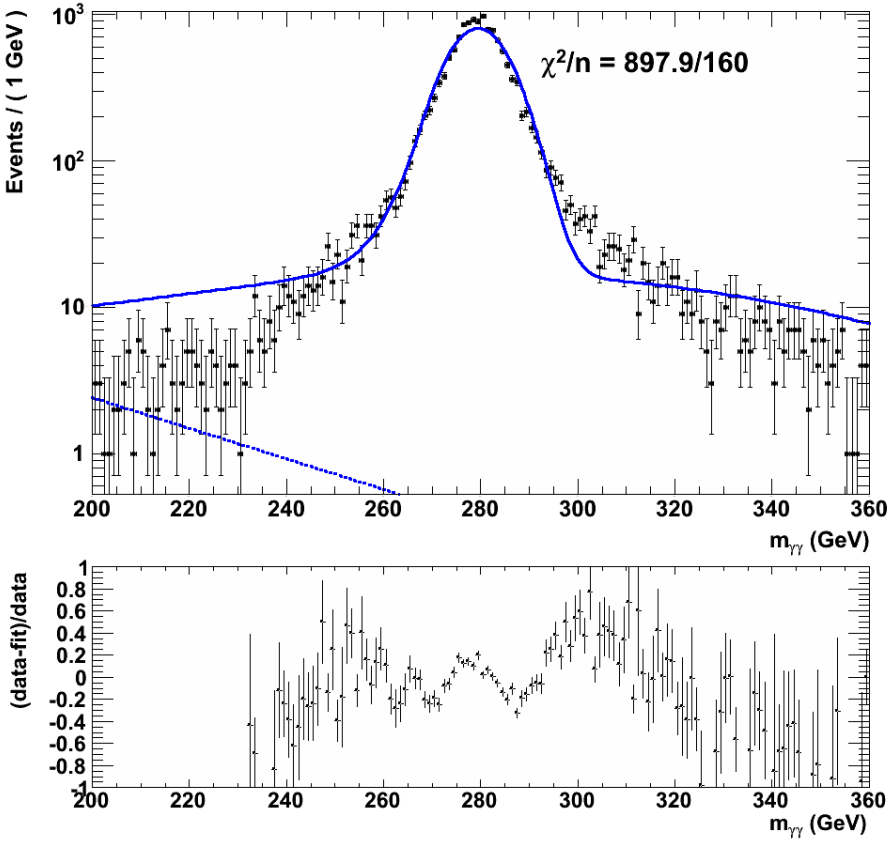




The signal peak widens

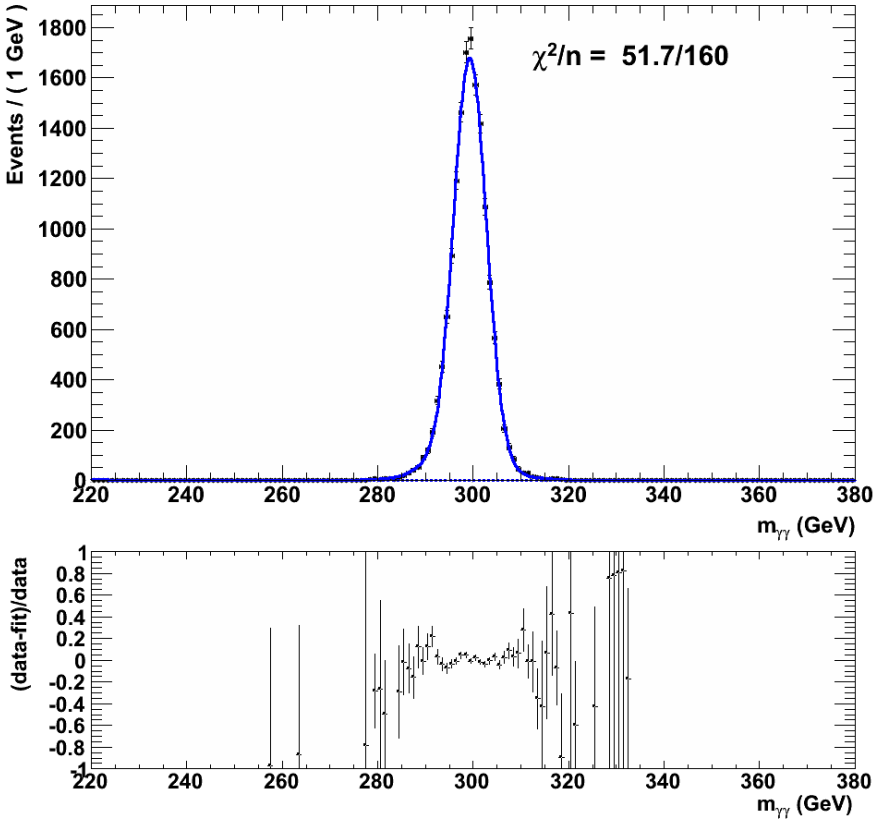
ggH 280 GeV

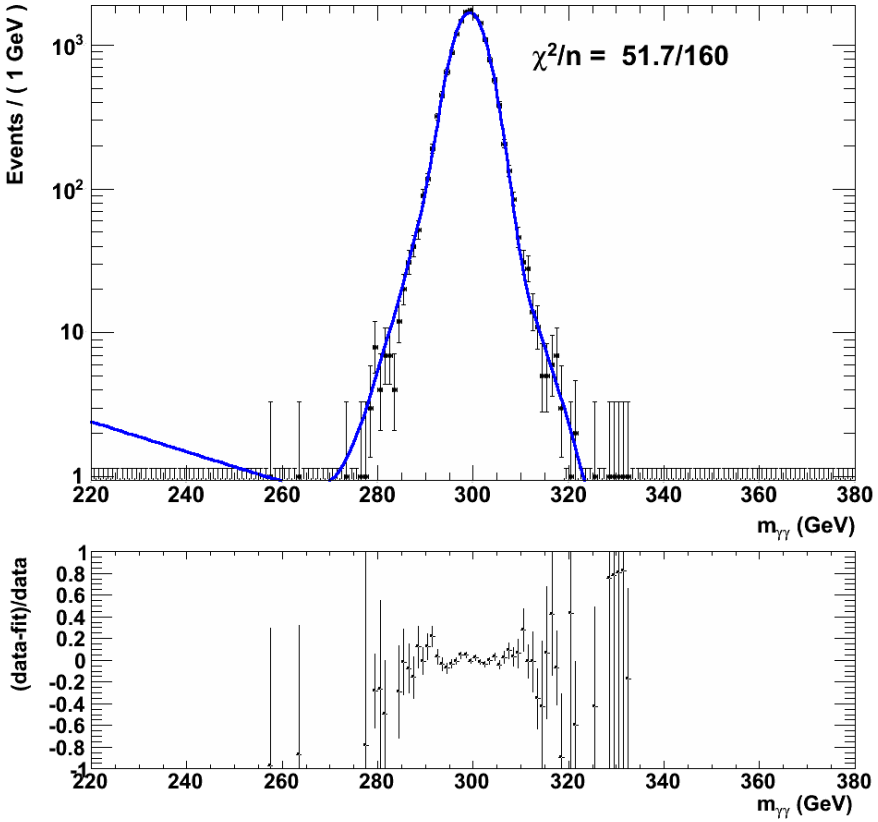




The signal peak widens

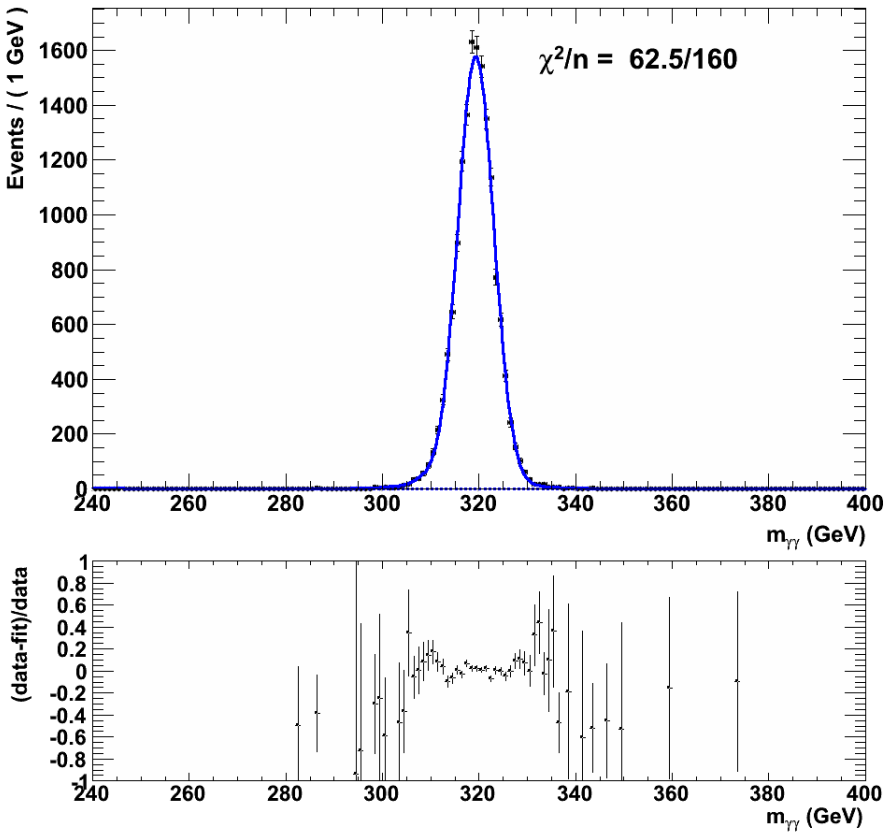
ggH 300 GeV

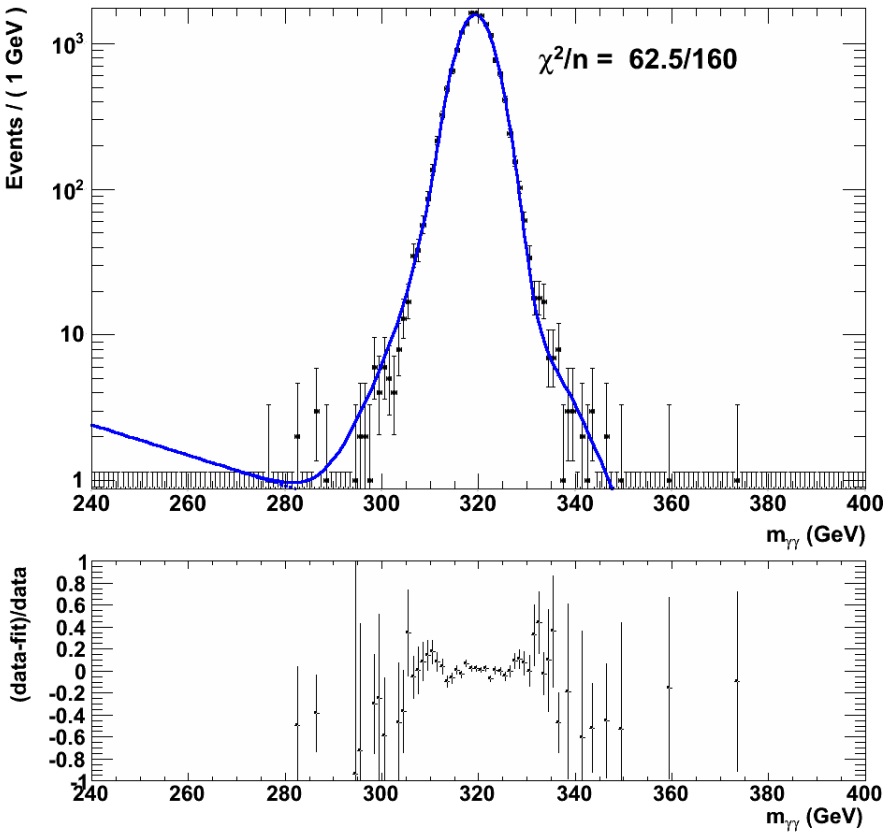




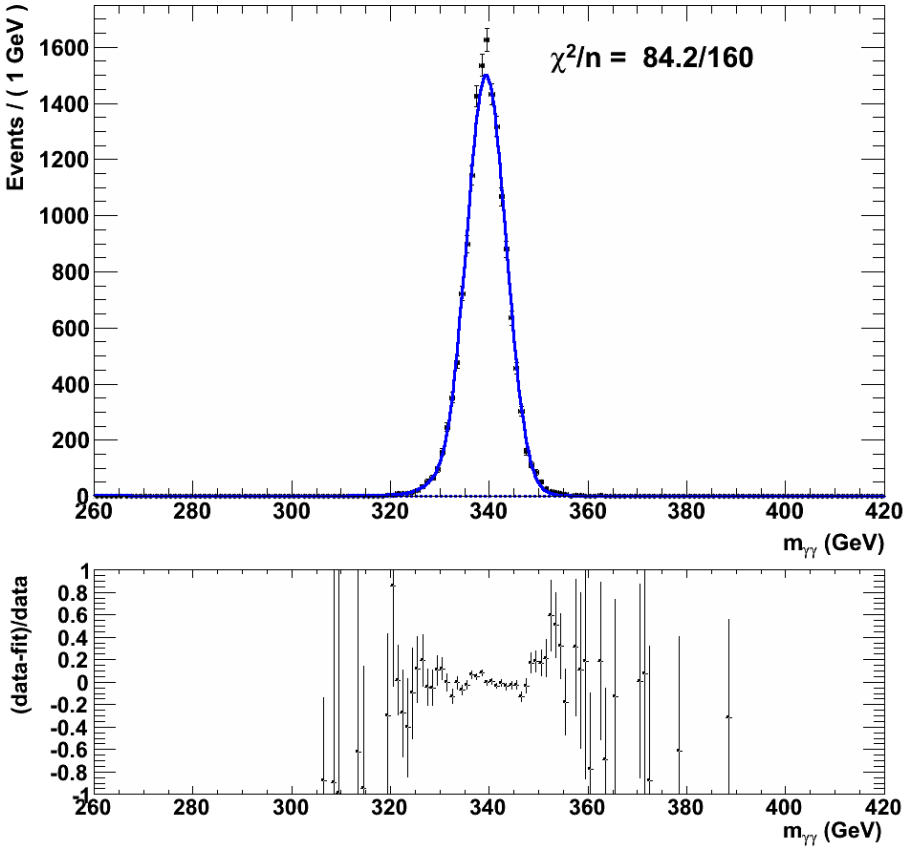
Now it gets back to normal (corresponding to the ?expected? growth of CBsigma)

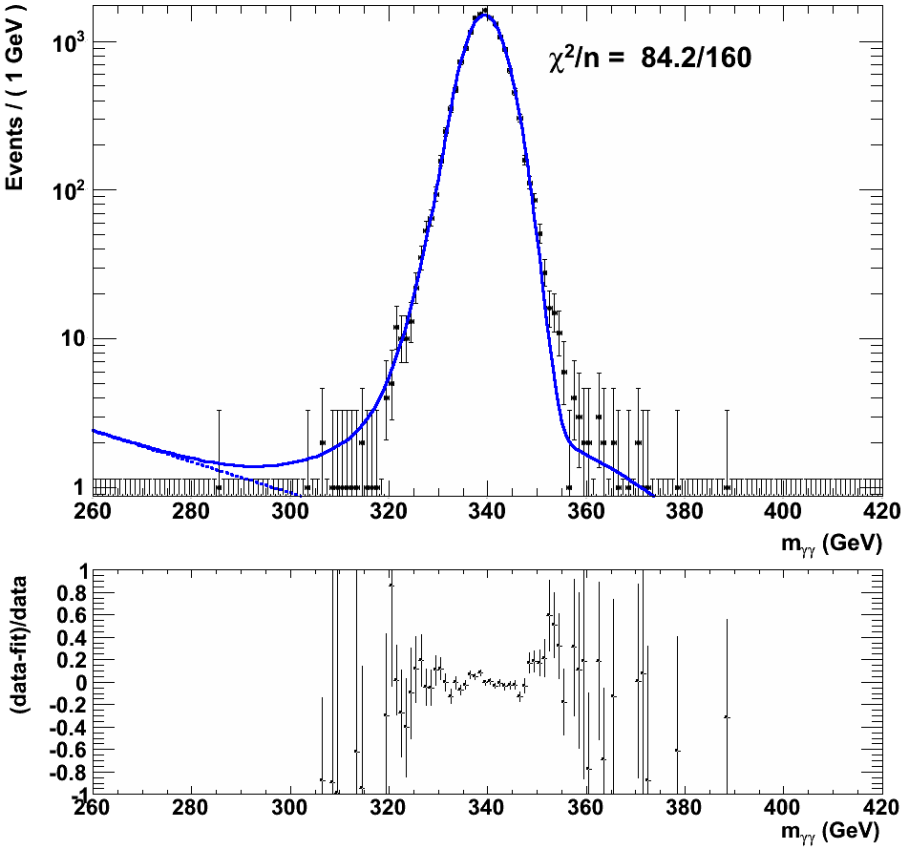
ggH 320 GeV


Events / (1 GeV)
χ^2/n = 62.5/160
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

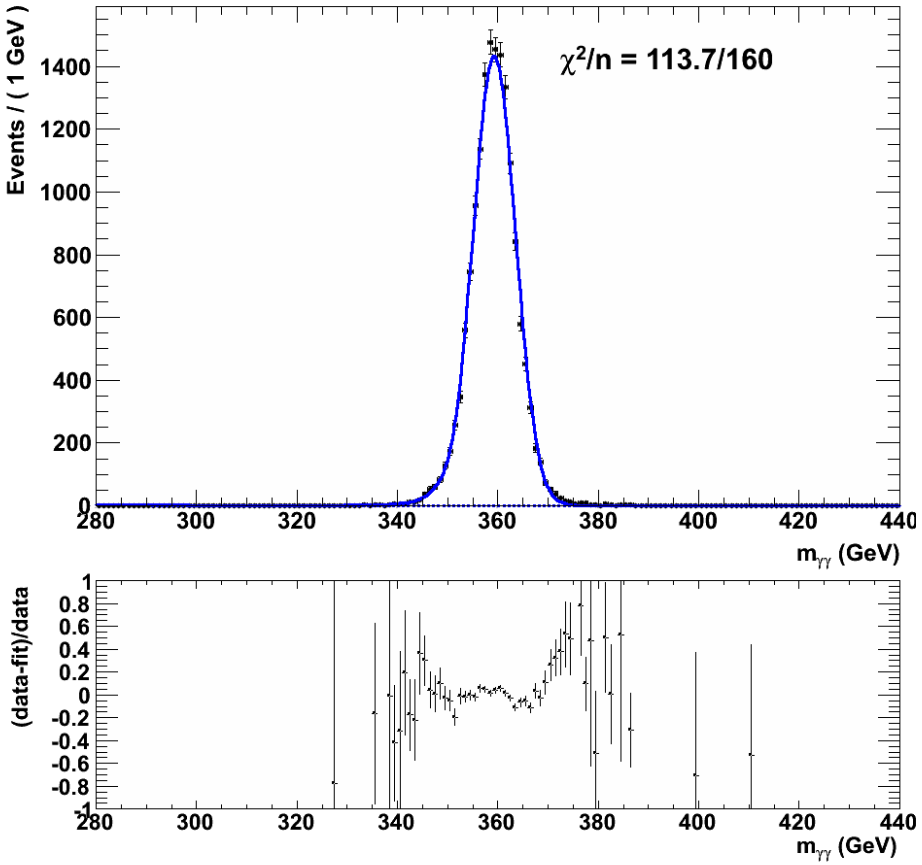

Events / (1 GeV)
χ^2/n = 62.5/160
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

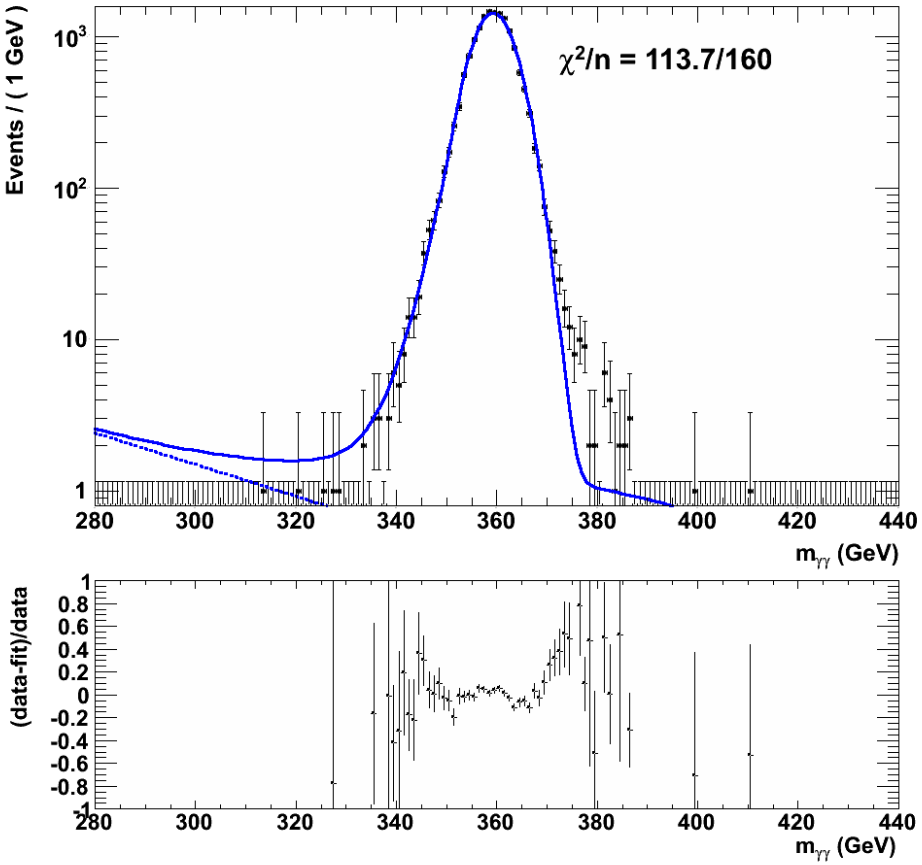
ggH 340 GeV


Events / (1 GeV)
χ^2/n = 84.2/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

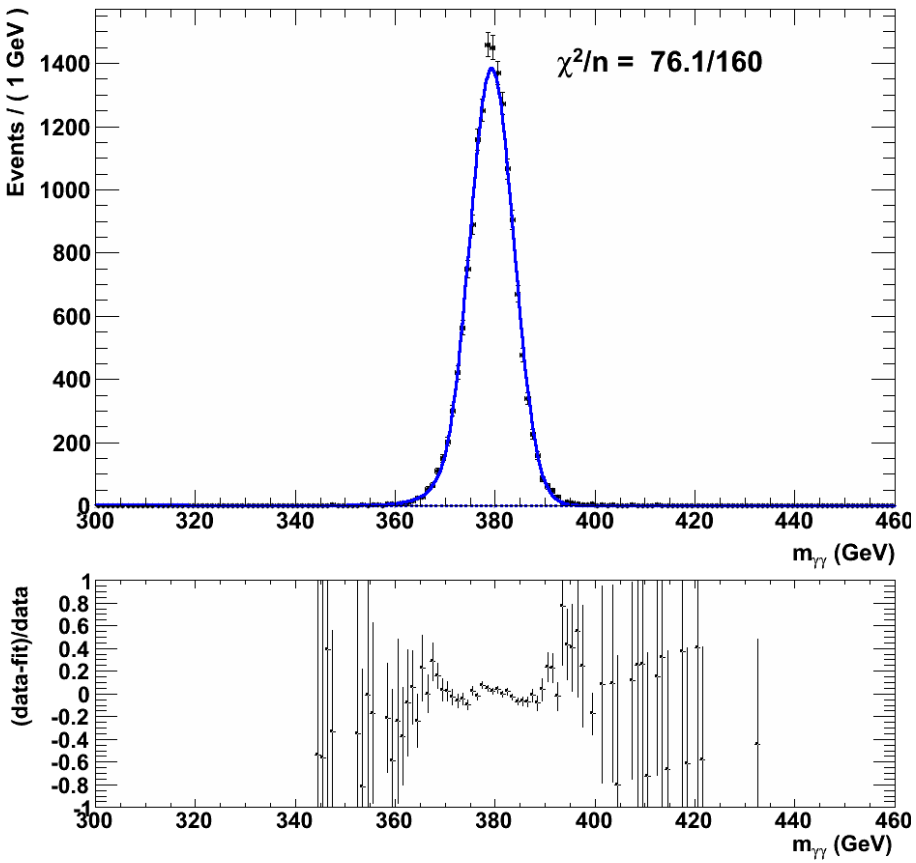

Events / (1 GeV)
χ^2/n = 84.2/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

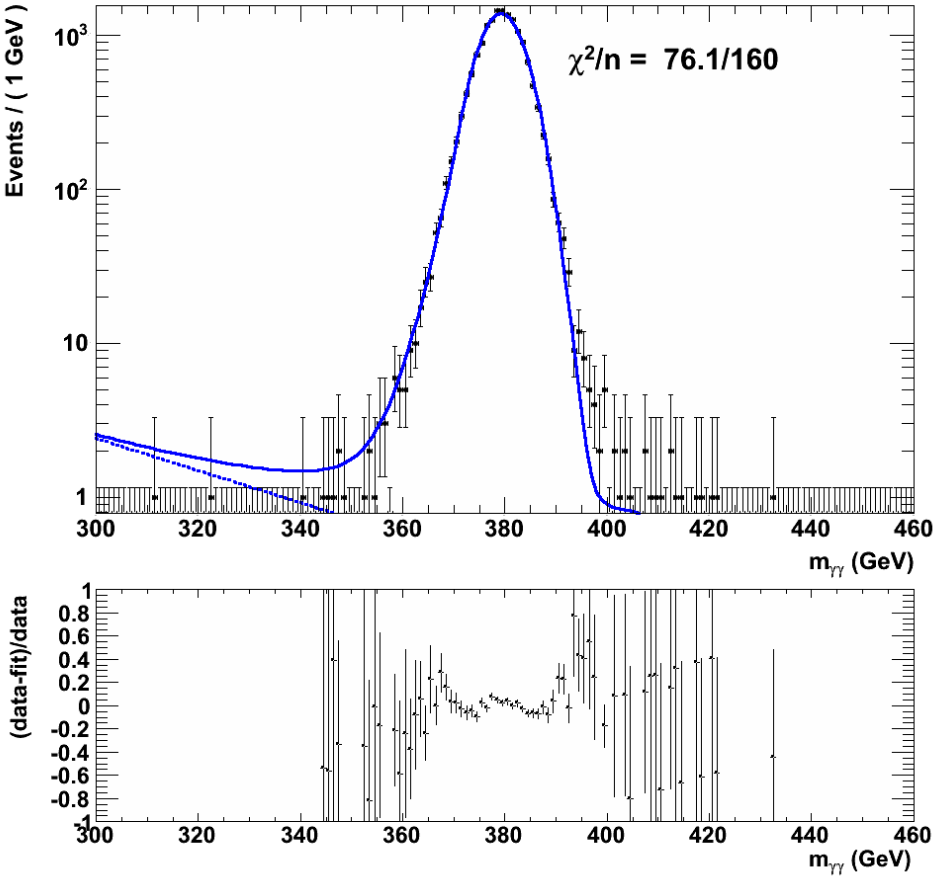
ggH 360 GeV


Events / (1 GeV)
χ^2/n = 113.7/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

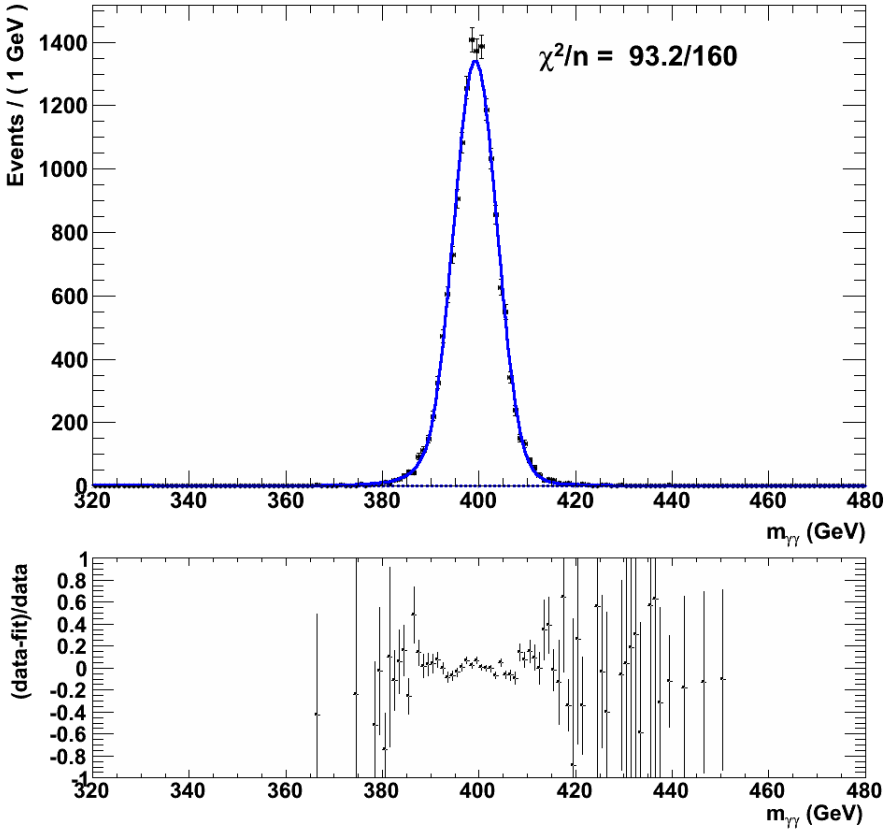

Events / (1 GeV)
χ^2/n = 113.7/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

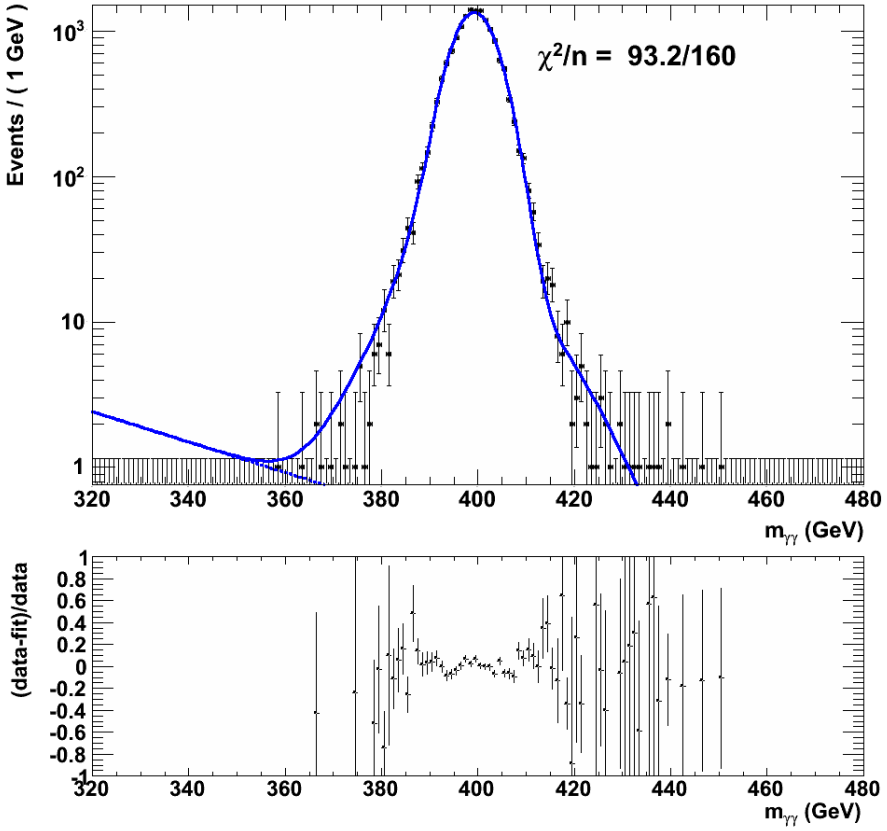
ggH 380 GeV


Events / (1 GeV)
χ^2/n = 76.1/160
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

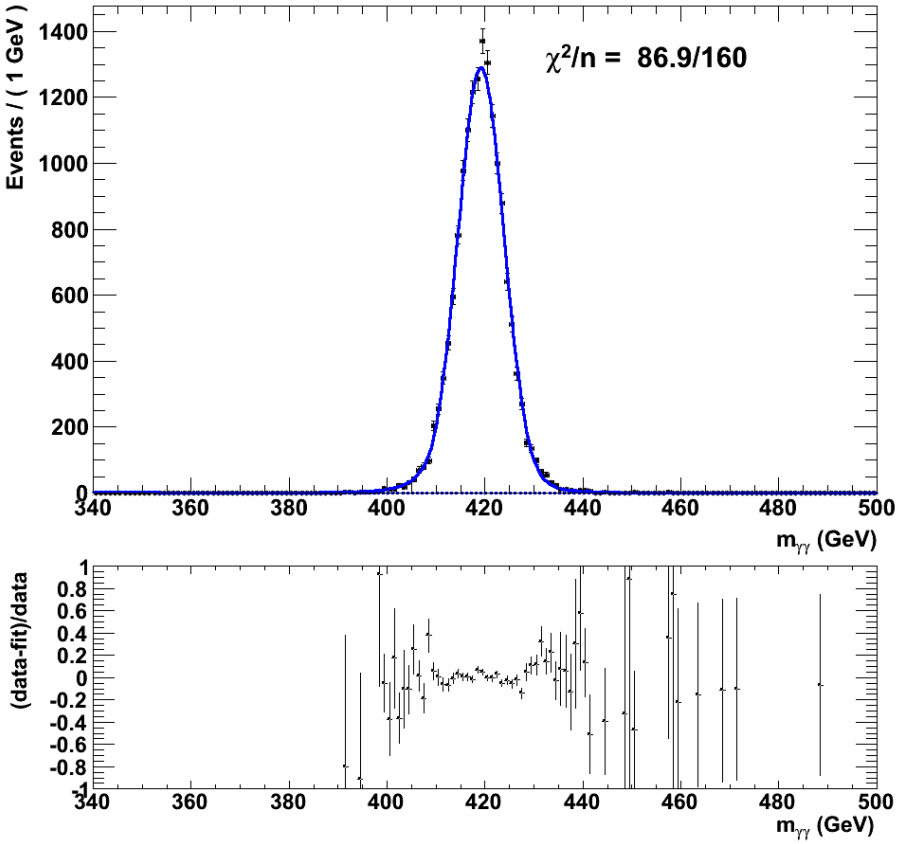

Events / (1 GeV)
χ^2/n = 76.1/160
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

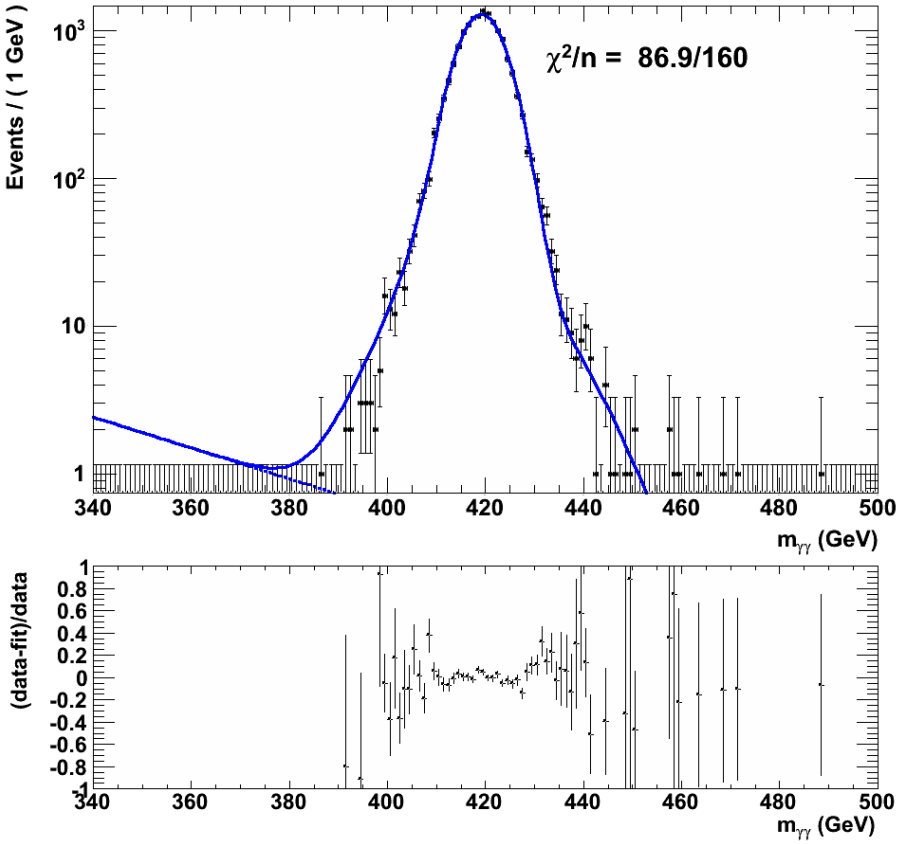
ggH 400 GeV


Events / (1 GeV)
χ²/n = 93.2/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

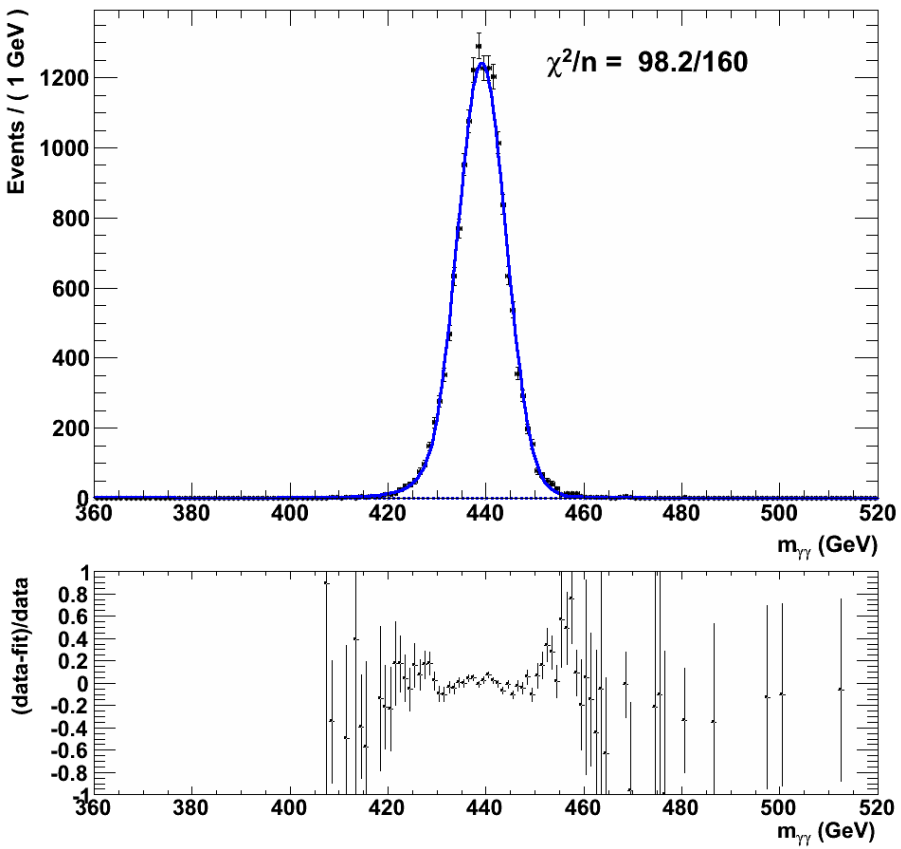

Events / (1 GeV)
χ²/n = 93.2/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

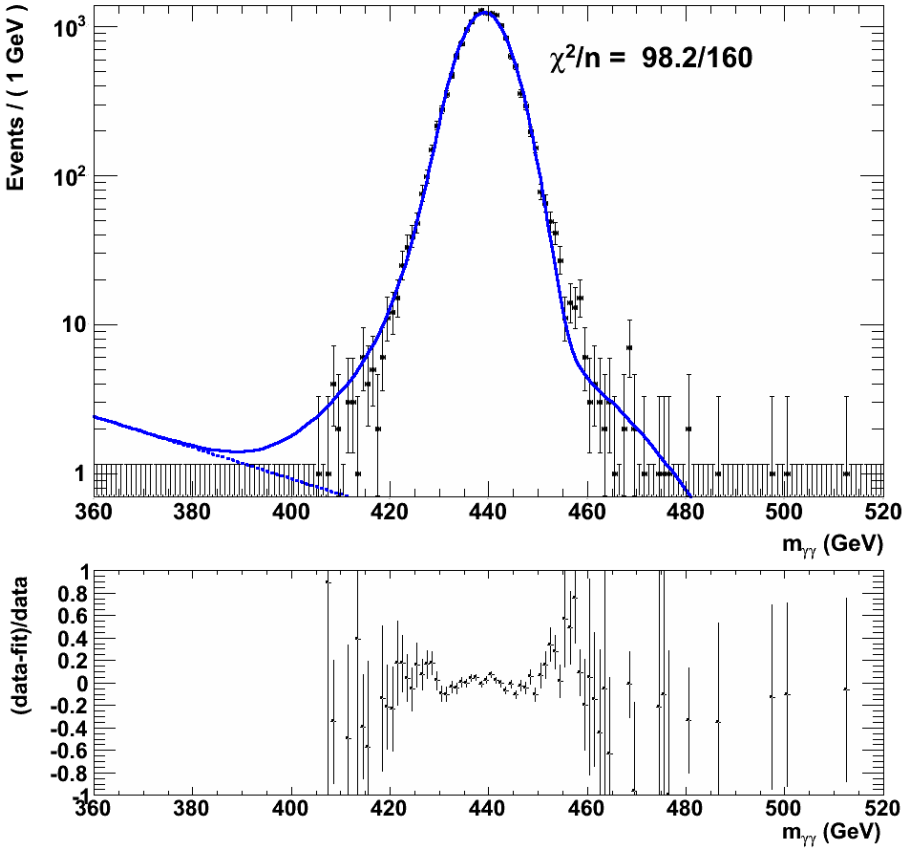
ggH 420 GeV


Events / (1 GeV)
χ^2/n = 86.9/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

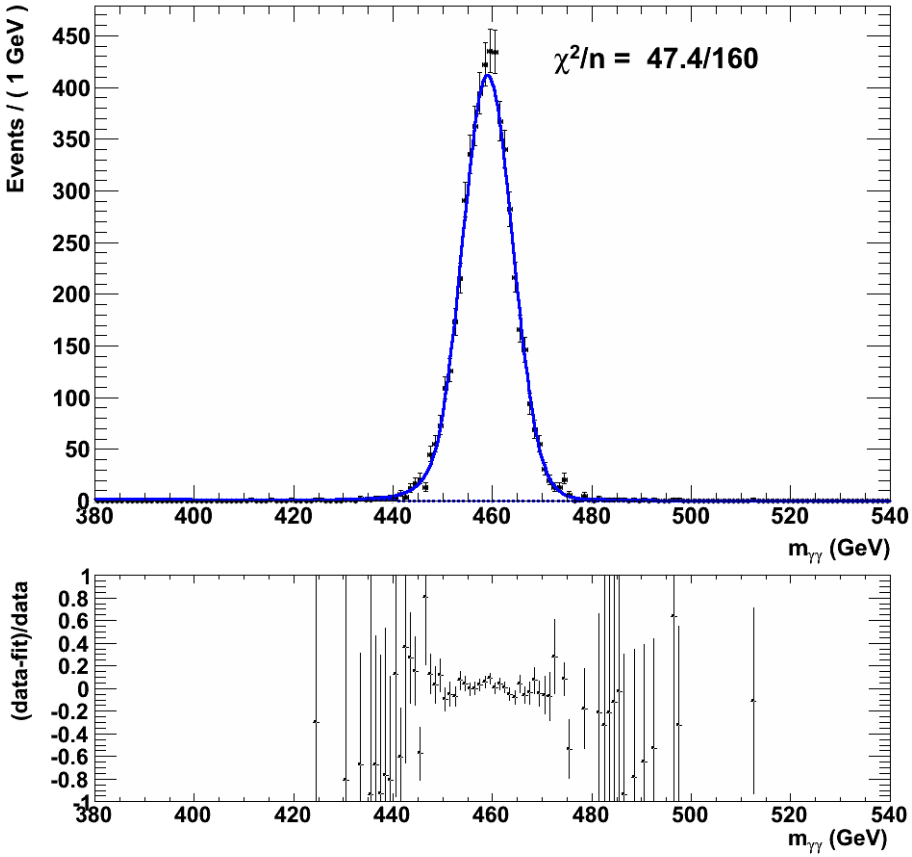

Events / (1 GeV)
χ^2/n = 86.9/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

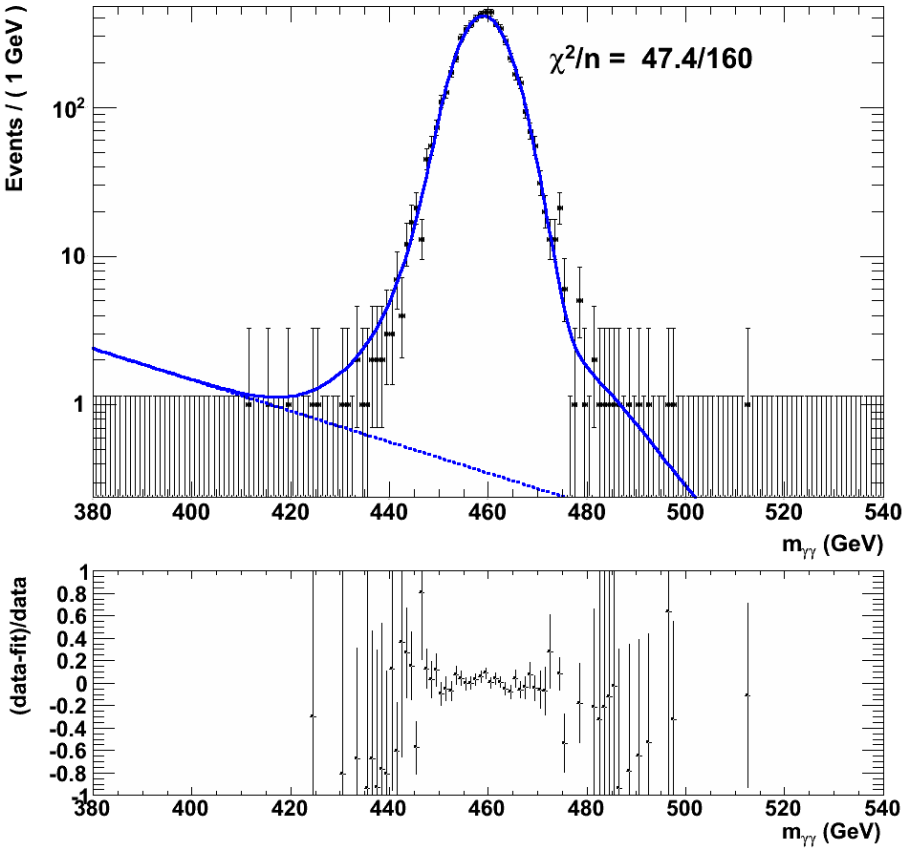
ggH 440 GeV


Events / (1 GeV)
χ^2/n = 98.2/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

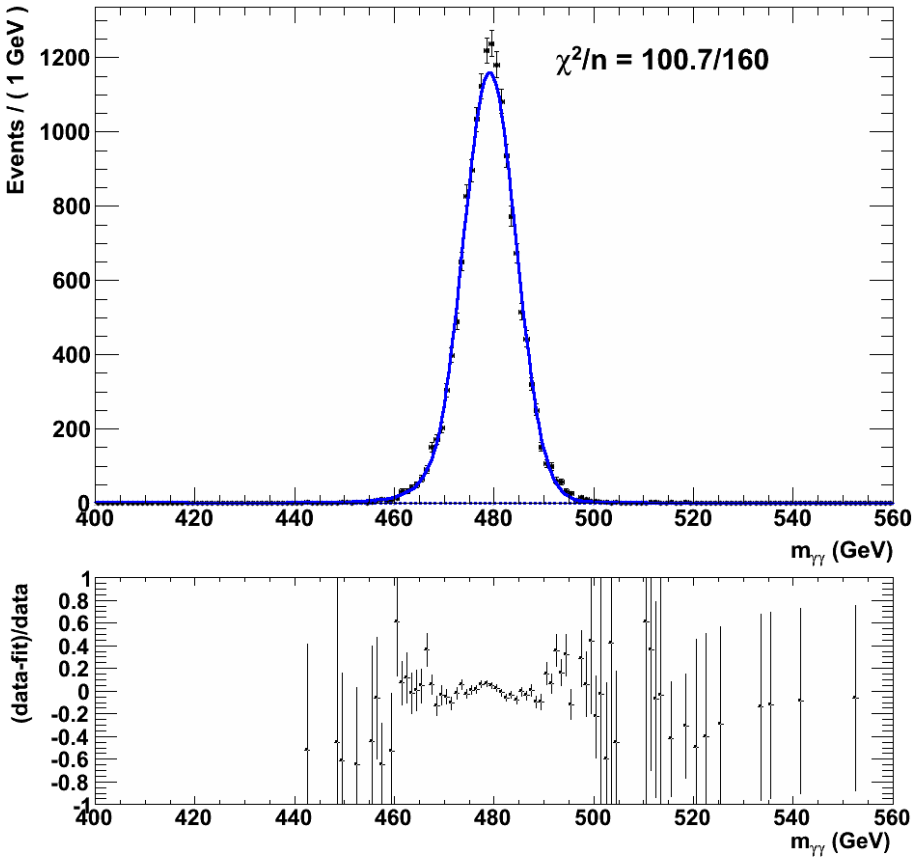

Events / (1 GeV)
χ^2/n = 98.2/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

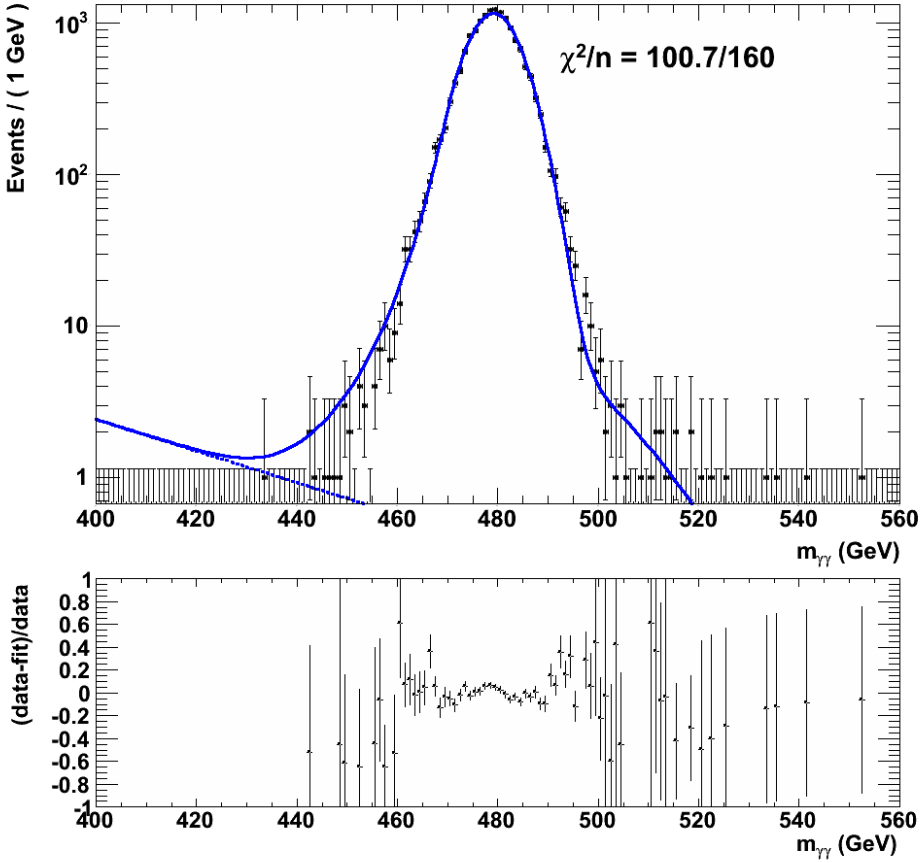
ggH 460 GeV


Events / (1 GeV)
χ^2/n = 47.4/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

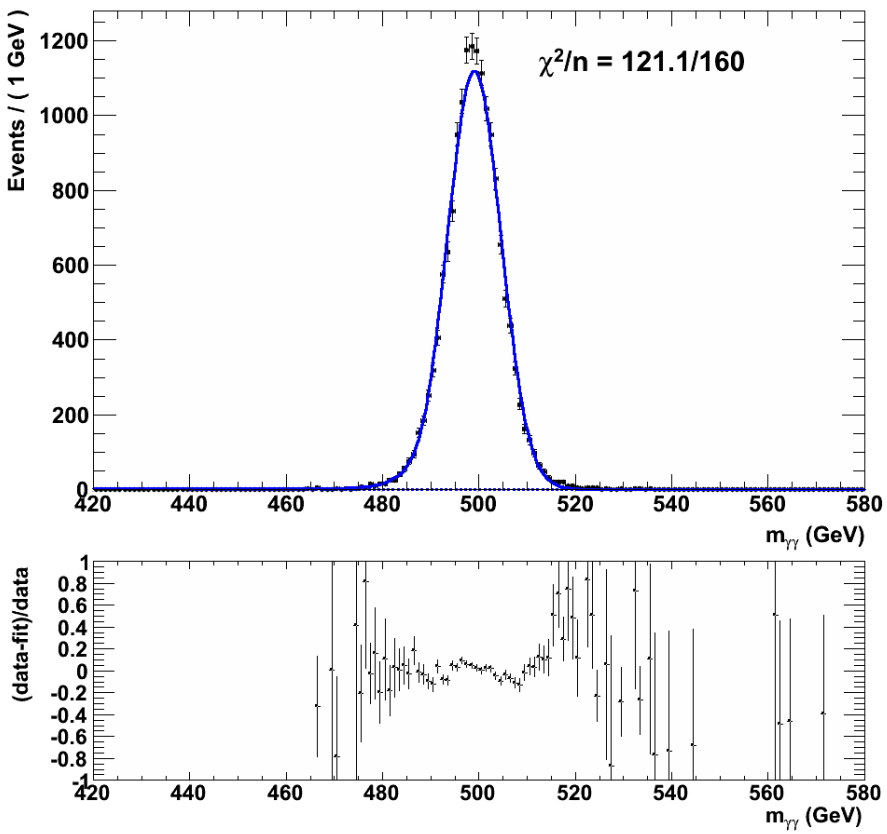

Events / (1 GeV)
χ^2/n = 47.4/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

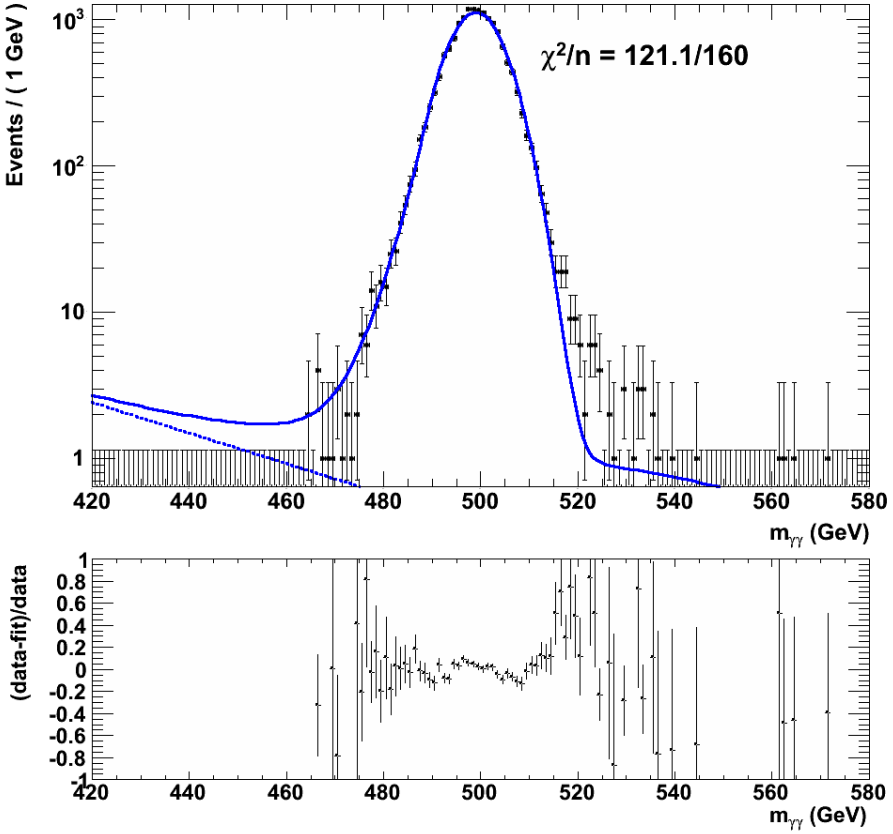
ggH 480 GeV


Events / (1 GeV)
χ²/n = 100.7/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

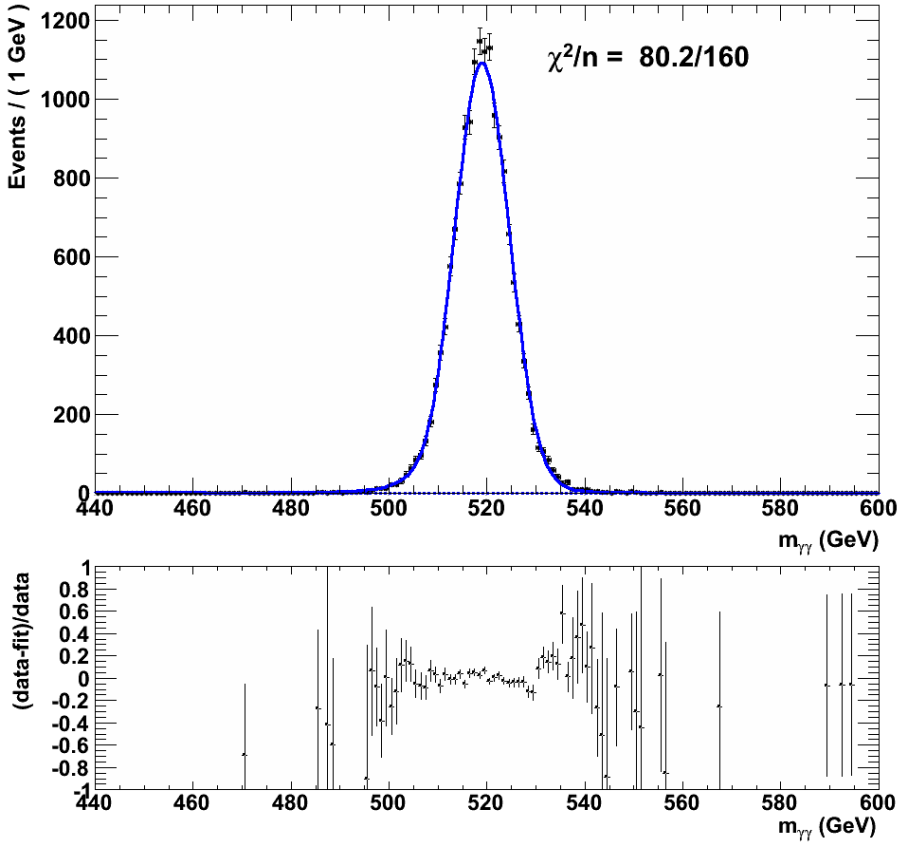

Events / (1 GeV)
χ²/n = 100.7/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

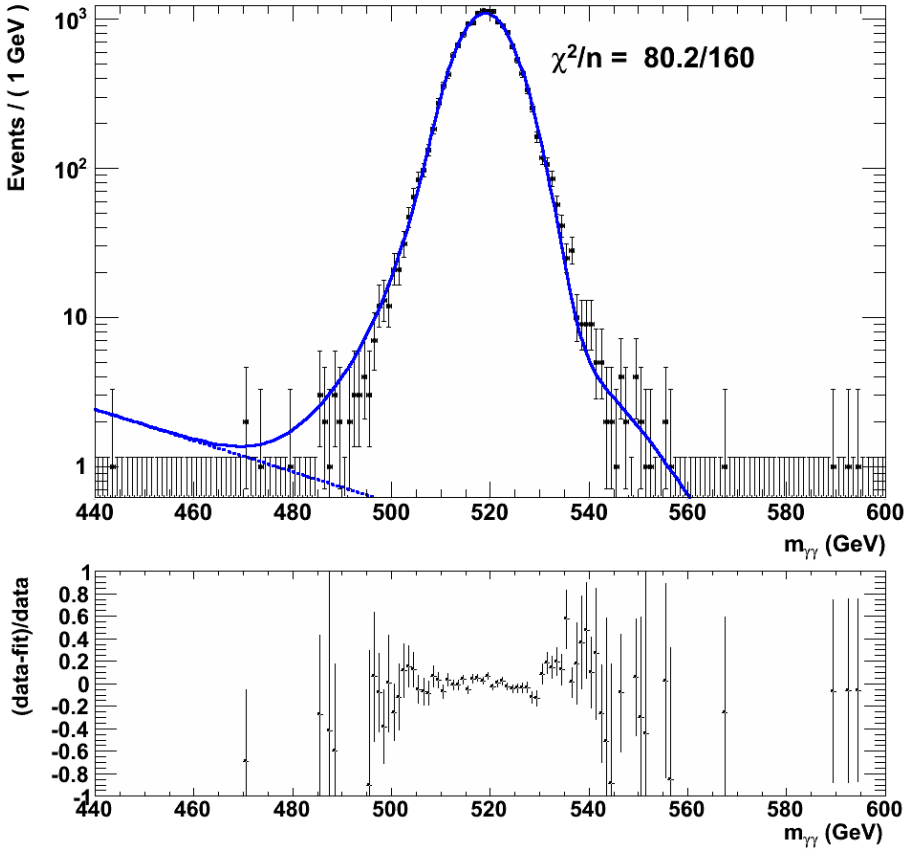
ggH 500 GeV


Events / (1 GeV)
χ^2/n = 121.1/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

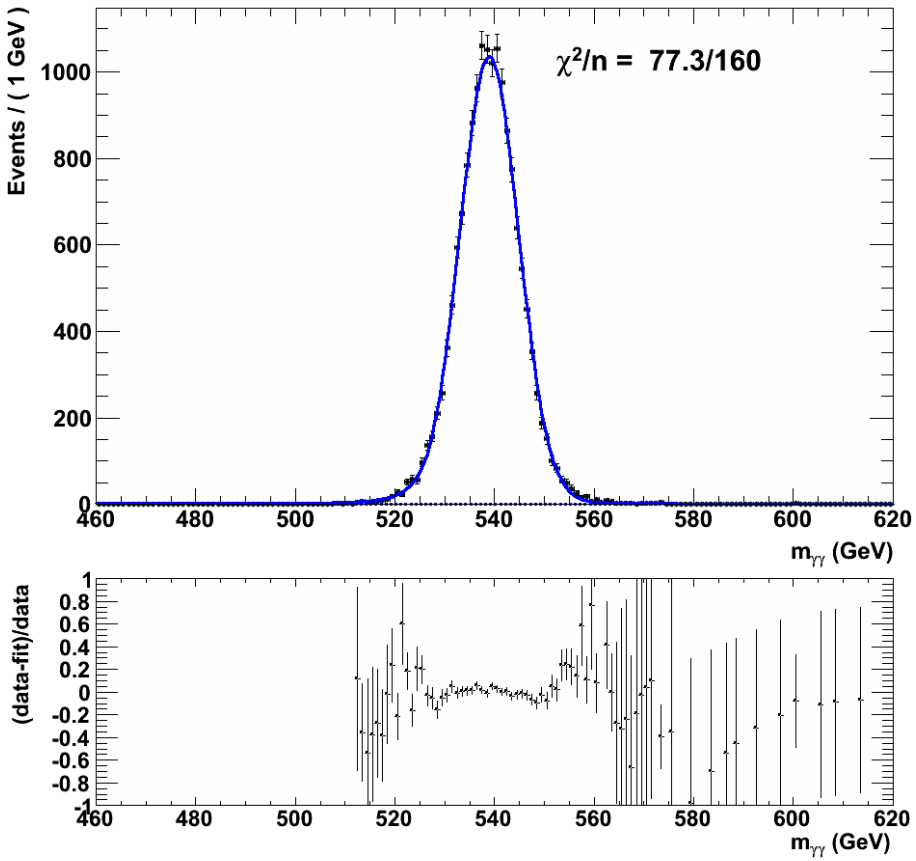

Events / (1 GeV)
χ^2/n = 121.1/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

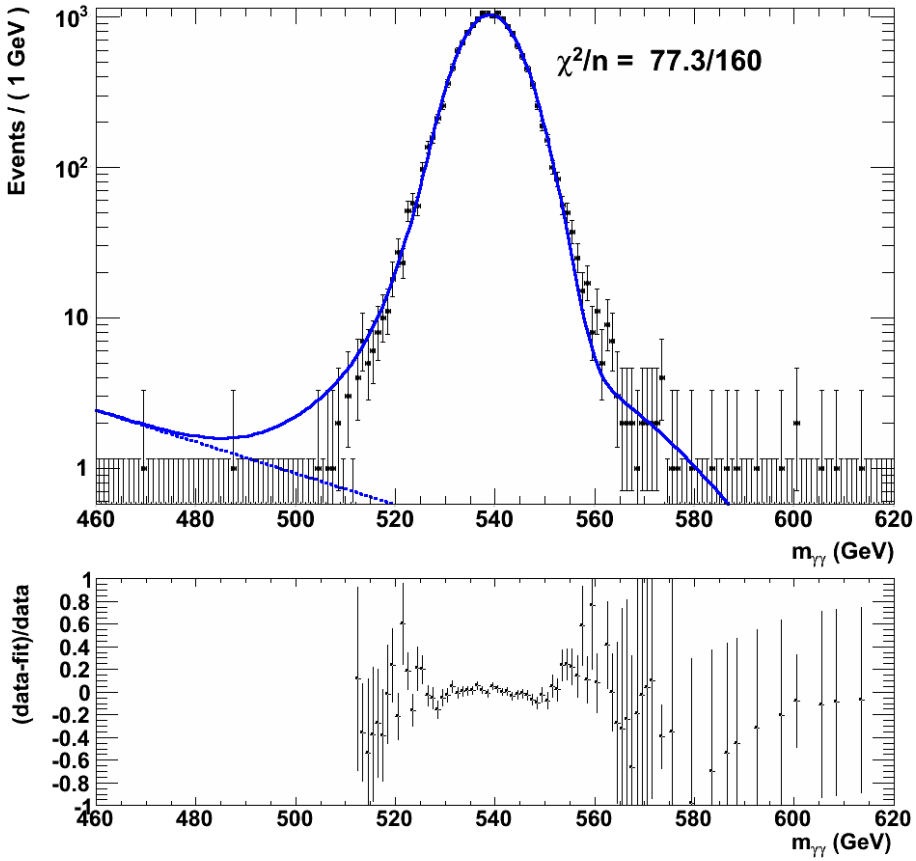
ggH 520 GeV


Events / (1 GeV)
χ²/n = 80.2/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

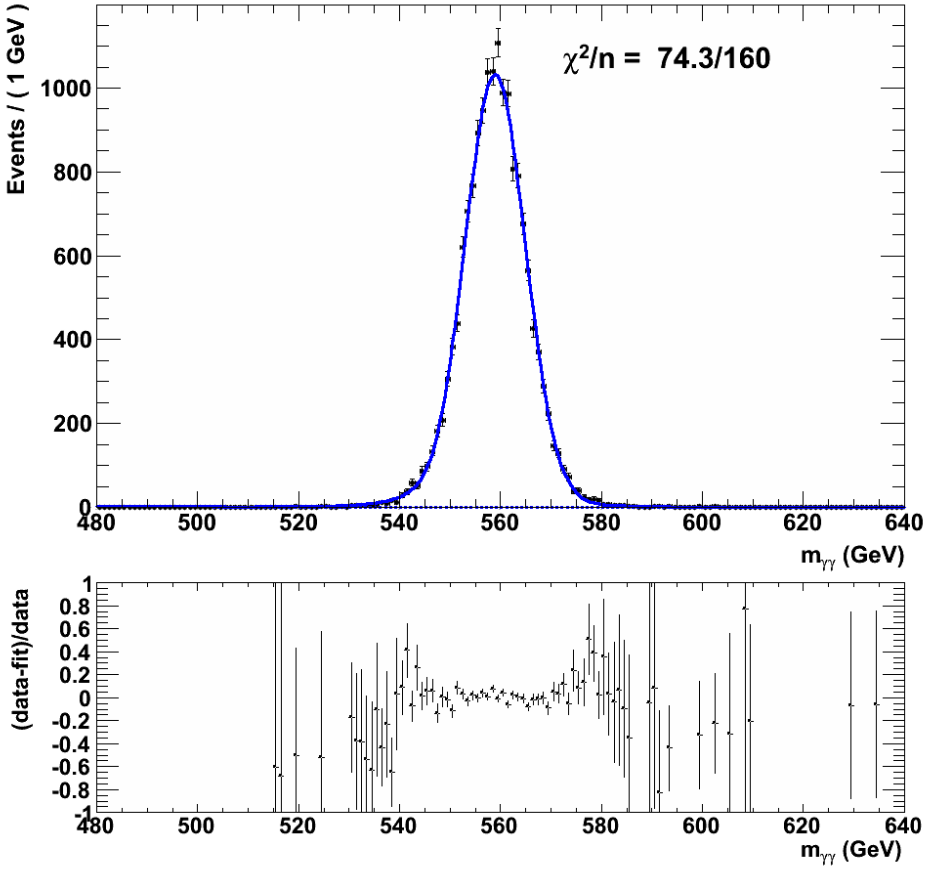

Events / (1 GeV)
χ²/n = 80.2/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

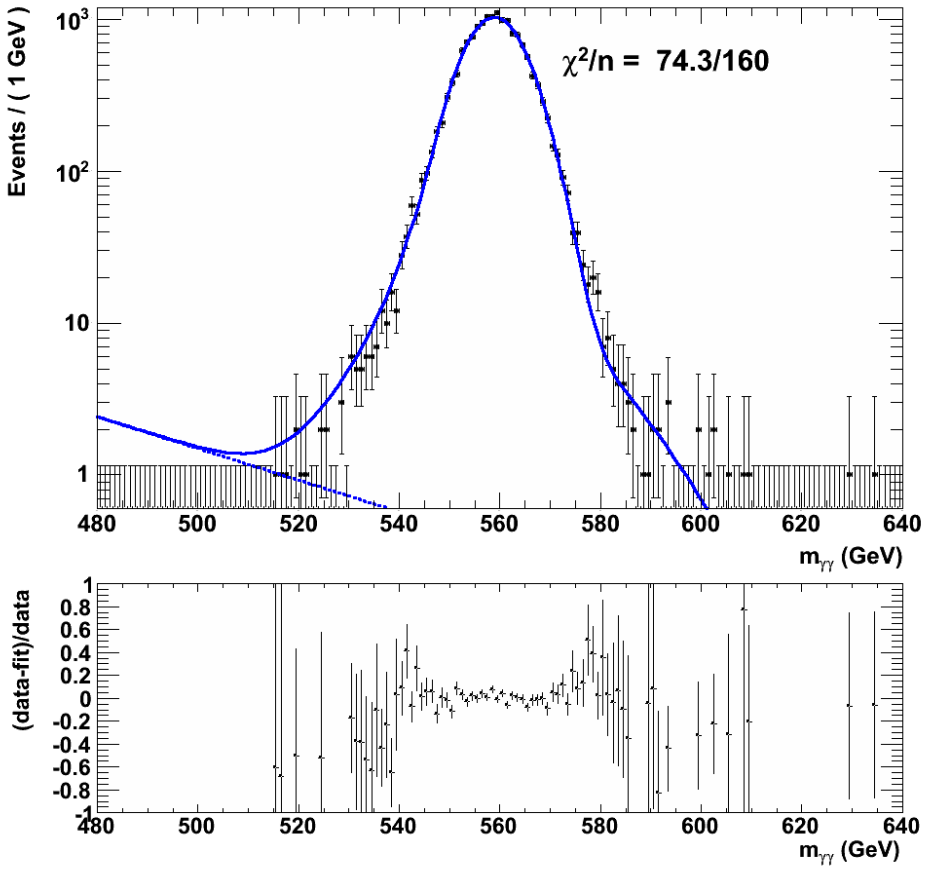
ggH 540 GeV


Events / (1 GeV)
χ²/n = 77.3/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

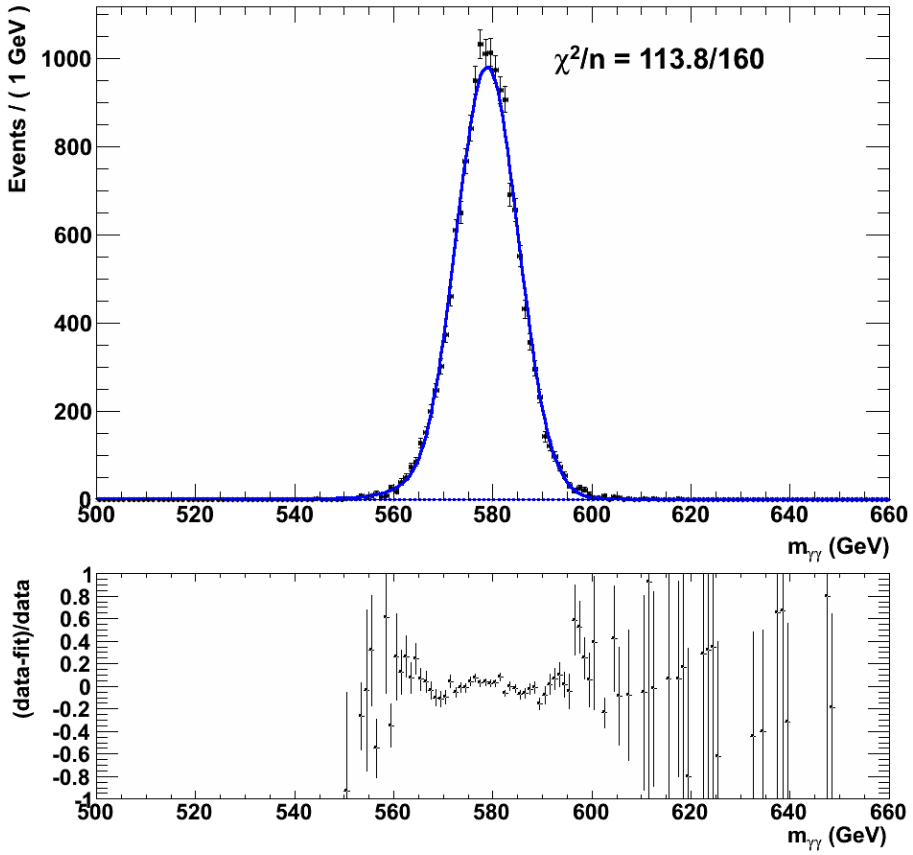

Events / (1 GeV)
χ²/n = 77.3/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

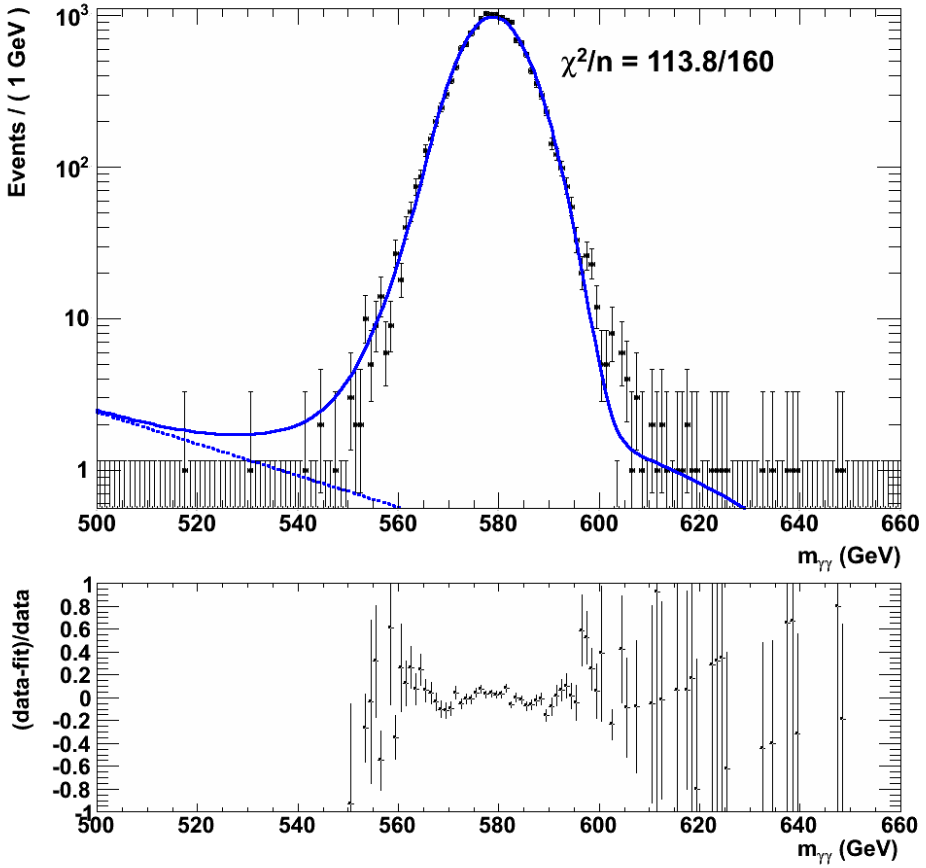
ggH 560 GeV


Events / (1 GeV)
χ²/n = 74.3/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

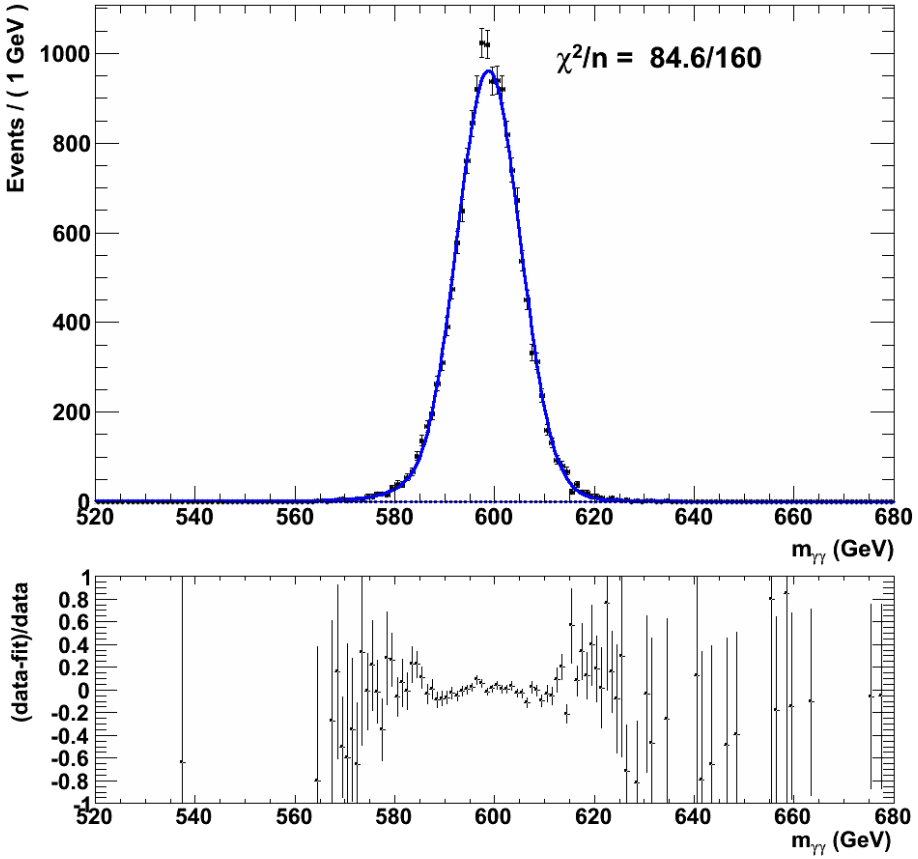

Events / (1 GeV)
χ²/n = 74.3/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

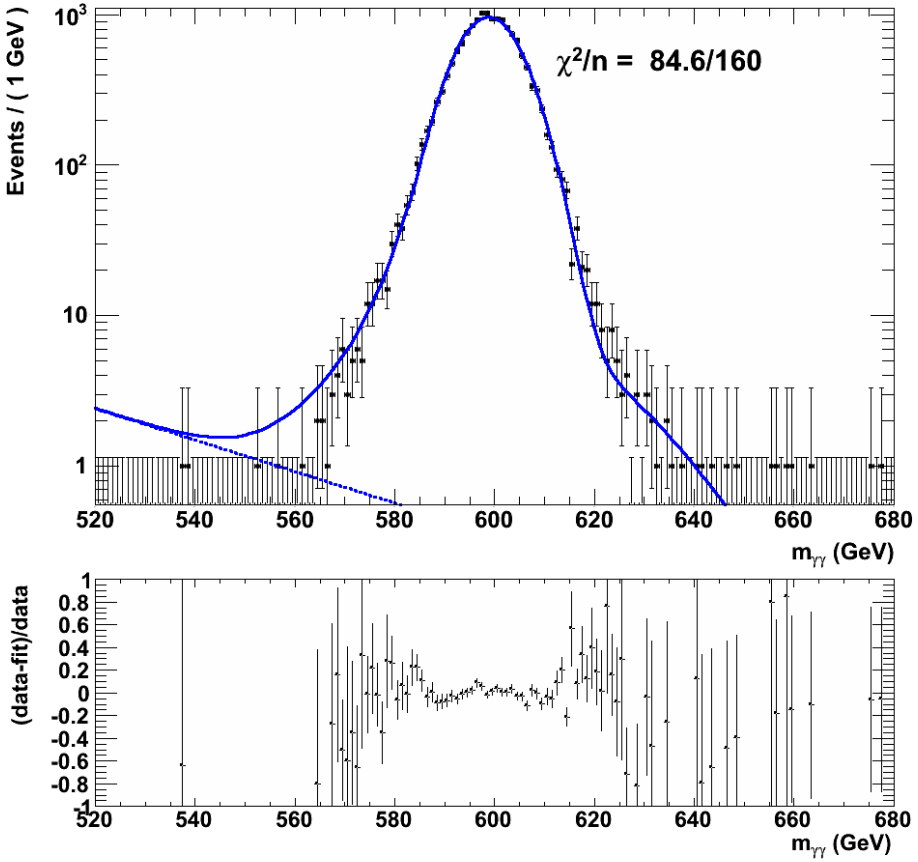
ggH 580 GeV


Events / (1 GeV)
χ^2/n = 113.8/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

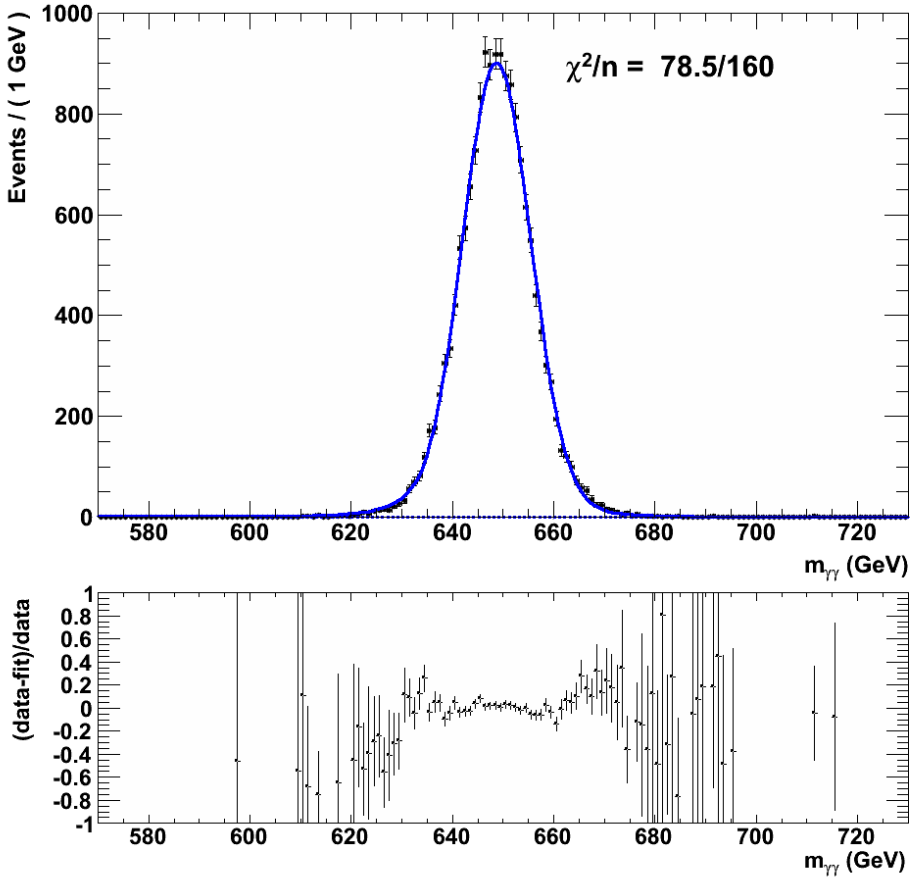

Events / (1 GeV)
χ^2/n = 113.8/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

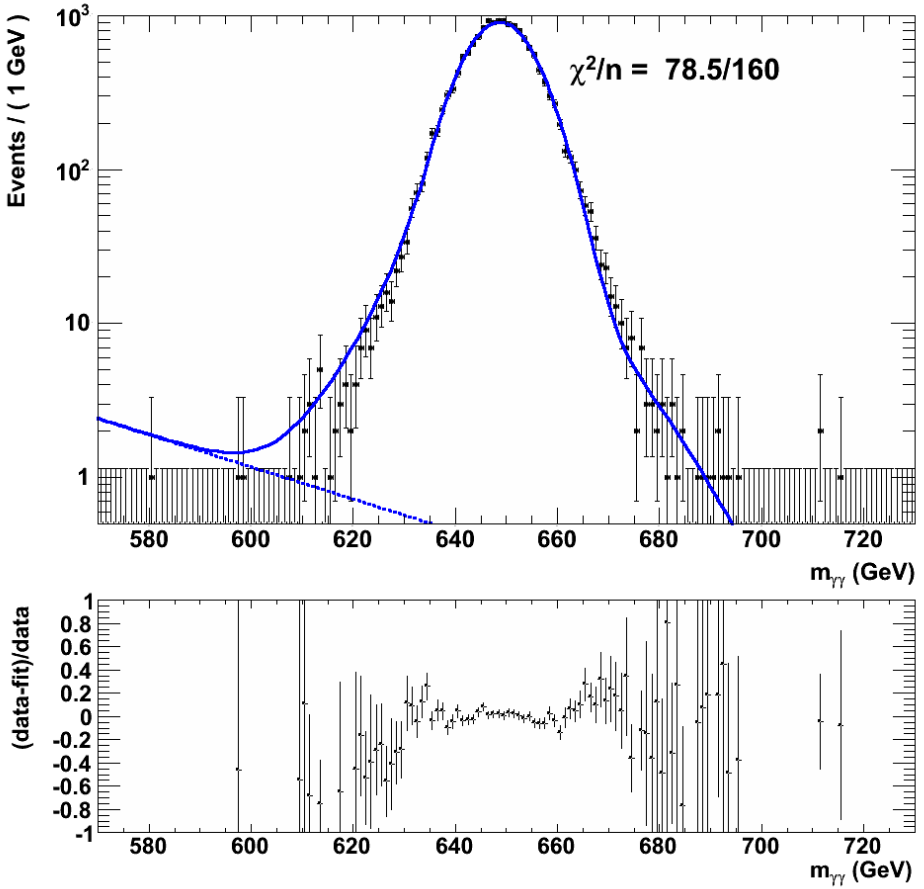
ggH 600 GeV


Events / (1 GeV)
χ^2/n = 84.6/160
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

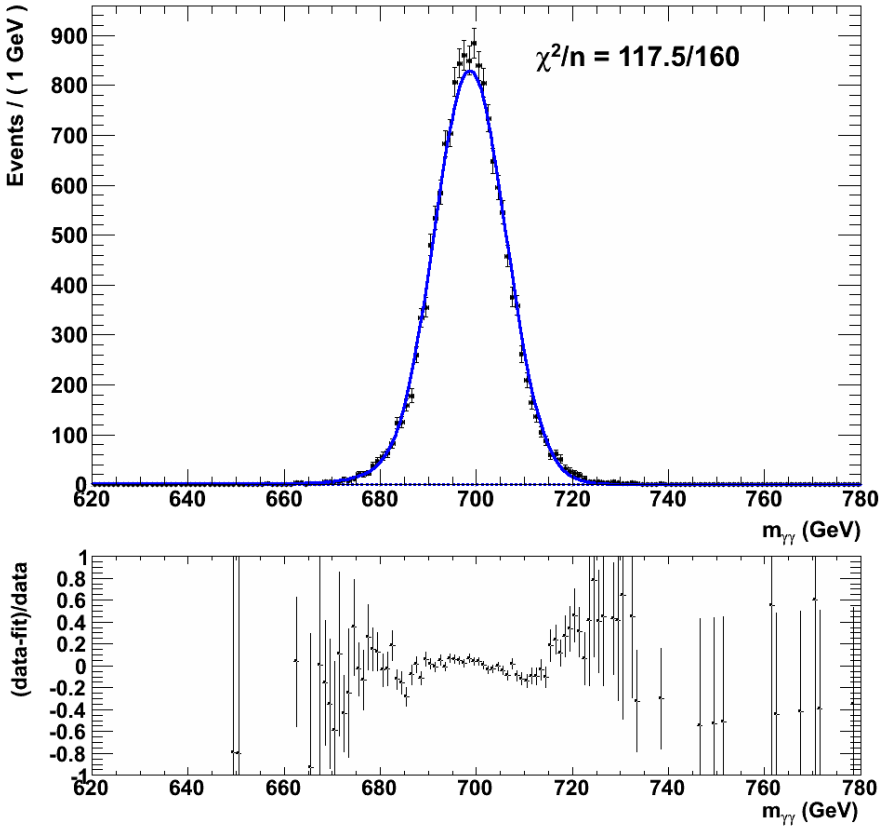

Events / (1 GeV)
χ^2/n = 84.6/160
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

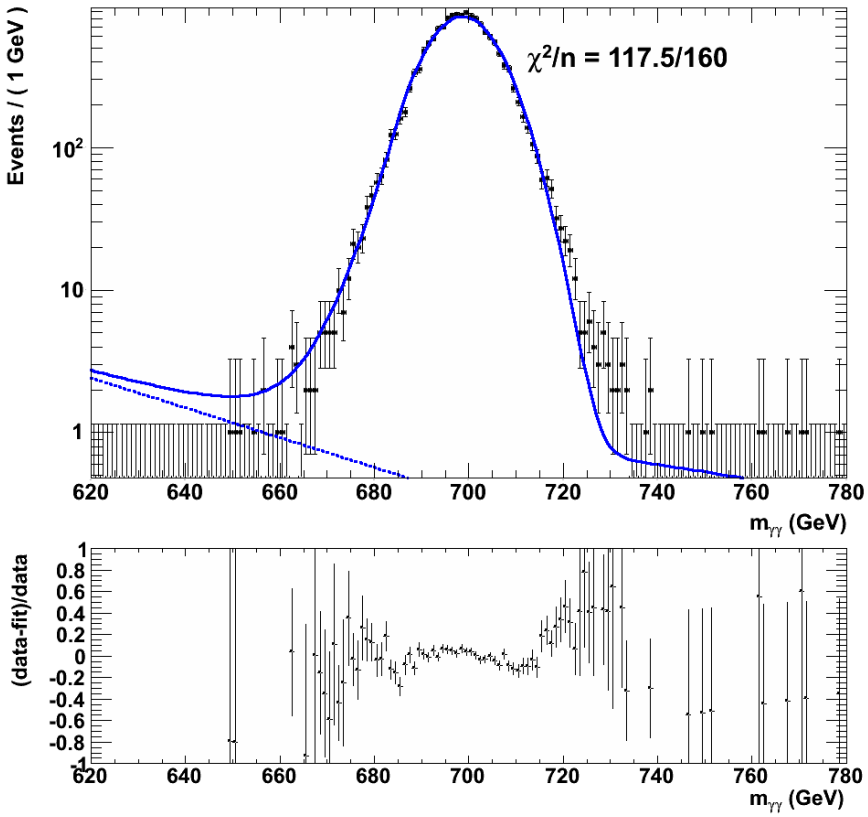
ggH 650 GeV


Events / (1 GeV)
χ^2/n = 78.5/160
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

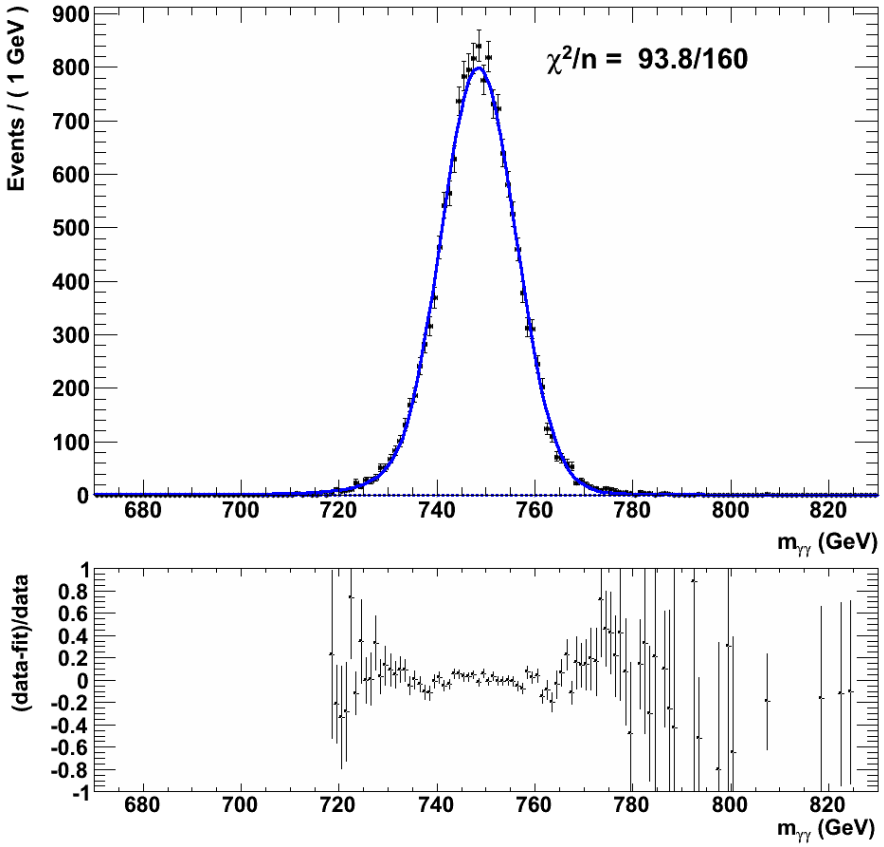

Events / (1 GeV)
χ^2/n = 78.5/160
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

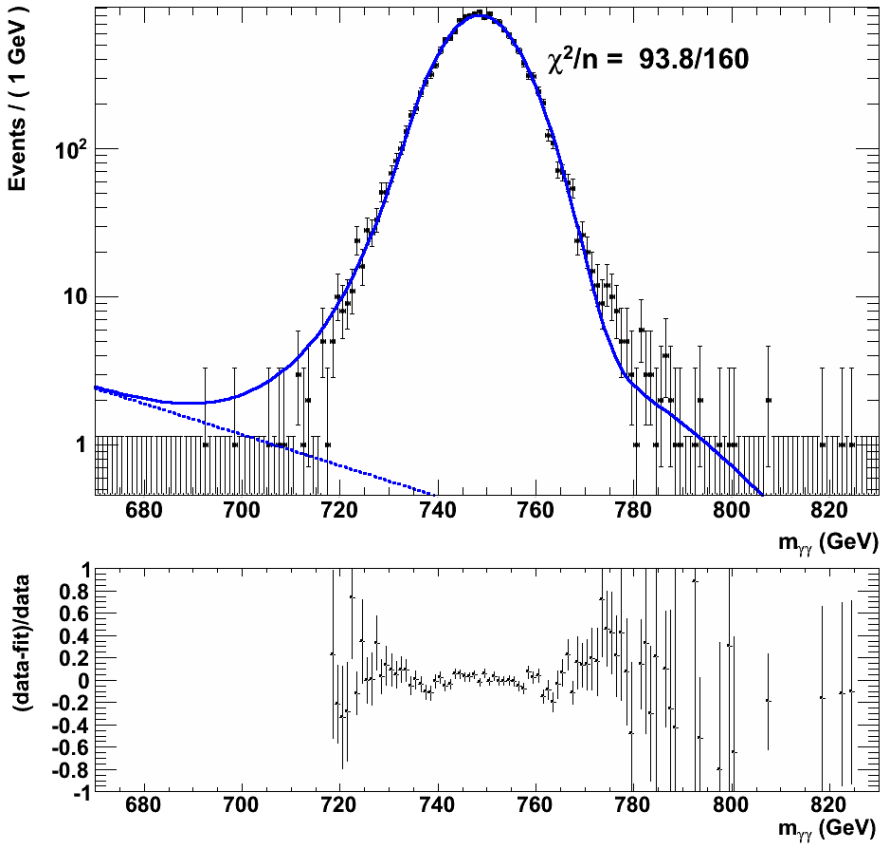
ggH 700 GeV


Events / (1 GeV)
χ^2/n = 117.5/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

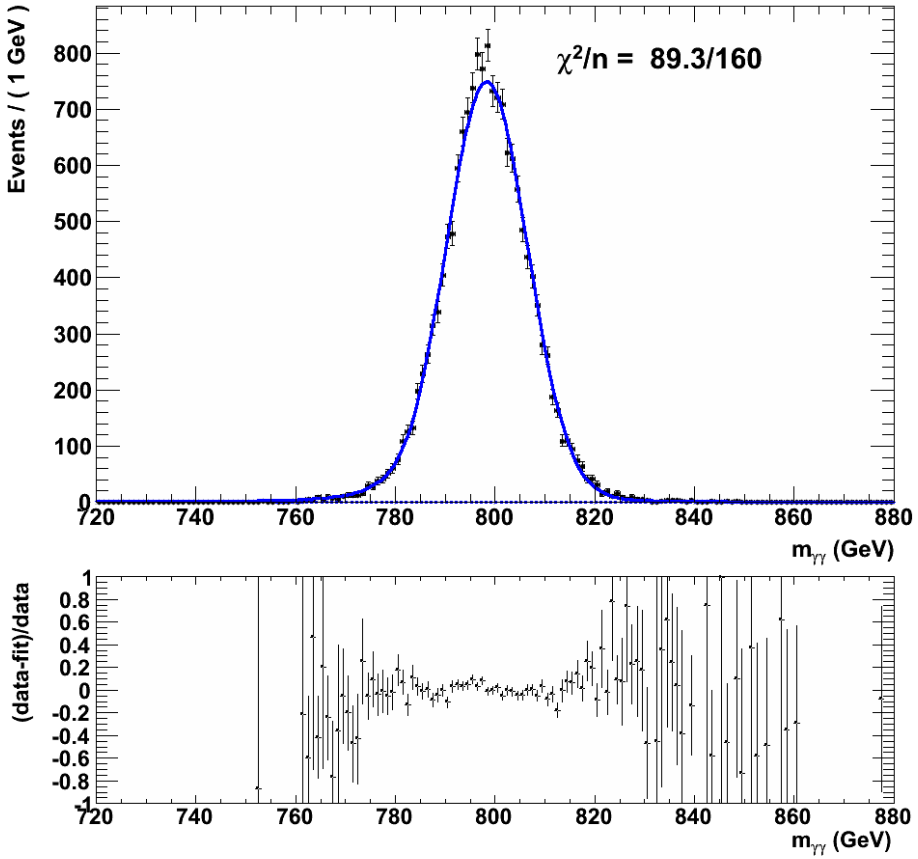

Events / (1 GeV)
χ^2/n = 117.5/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

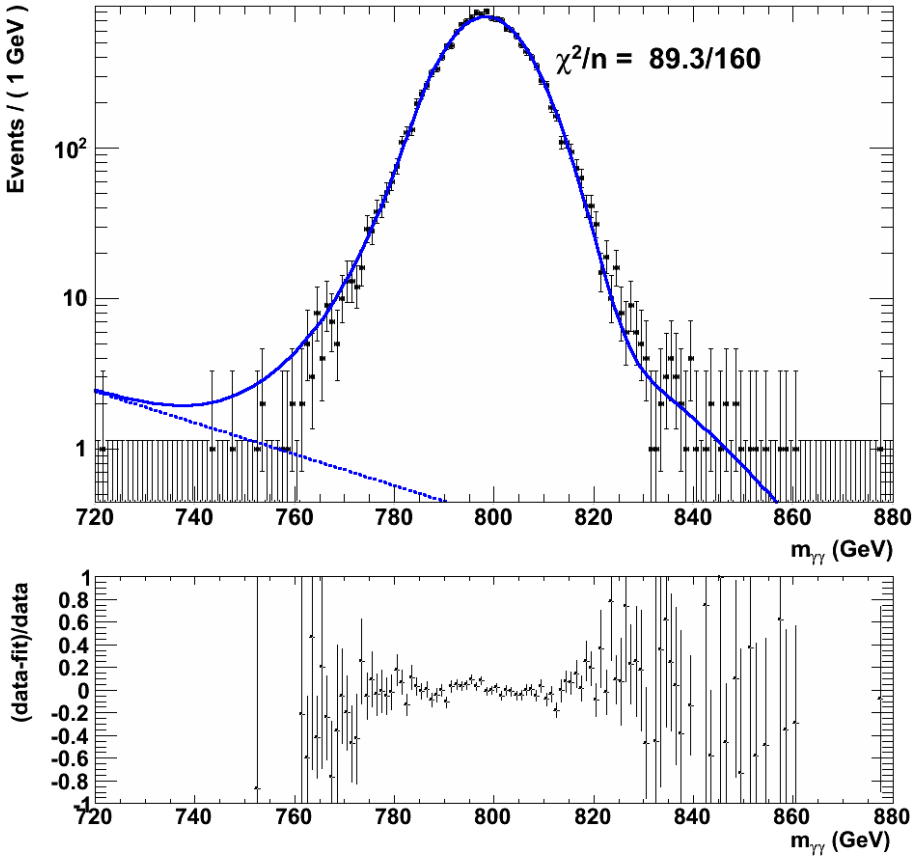
ggH 750 GeV


Events / (1 GeV)
χ^2/n = 93.8/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

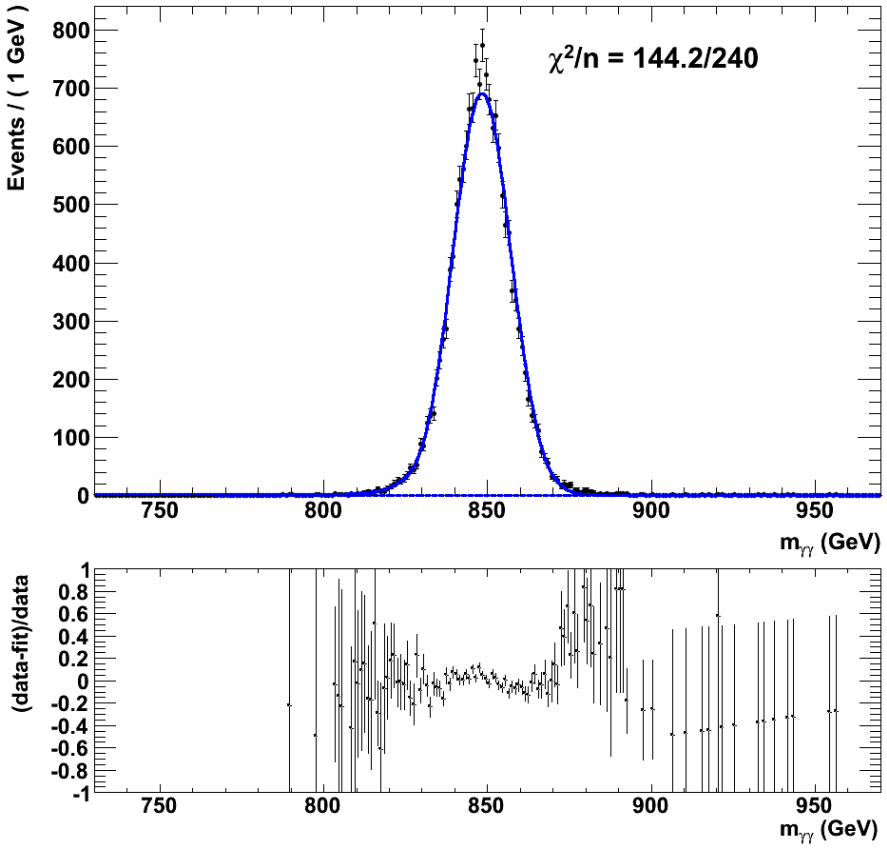

Events / (1 GeV)
χ^2/n = 93.8/160
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

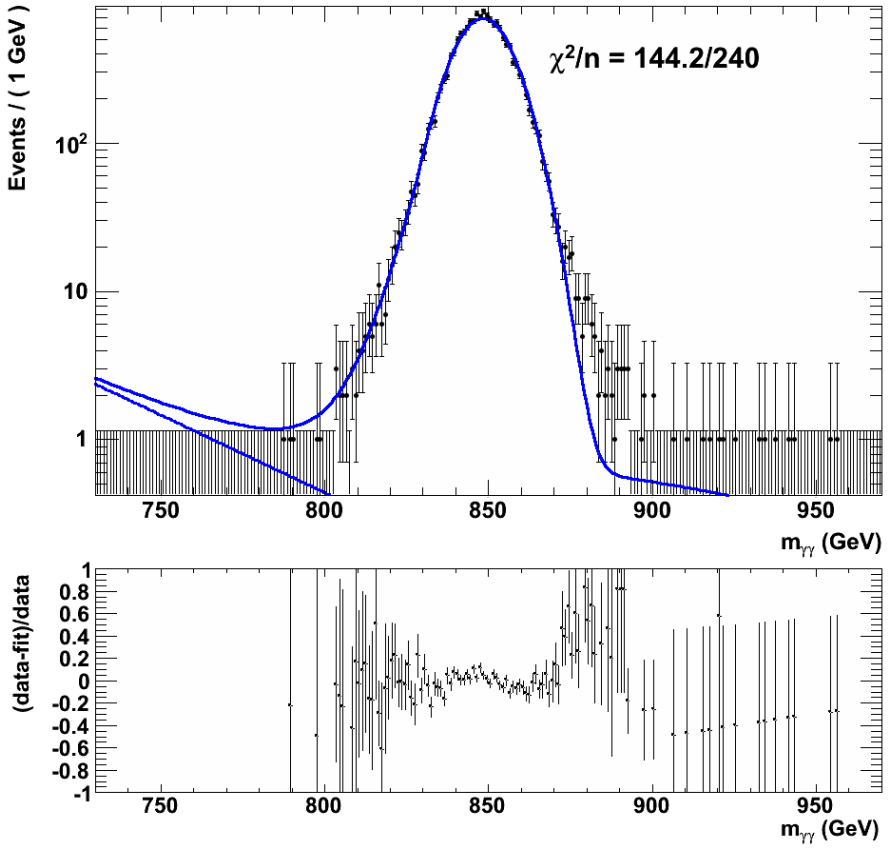
ggH 800 GeV


Events / (1 GeV)
χ²/n = 89.3/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)


Events / (1 GeV)
χ²/n = 89.3/160
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

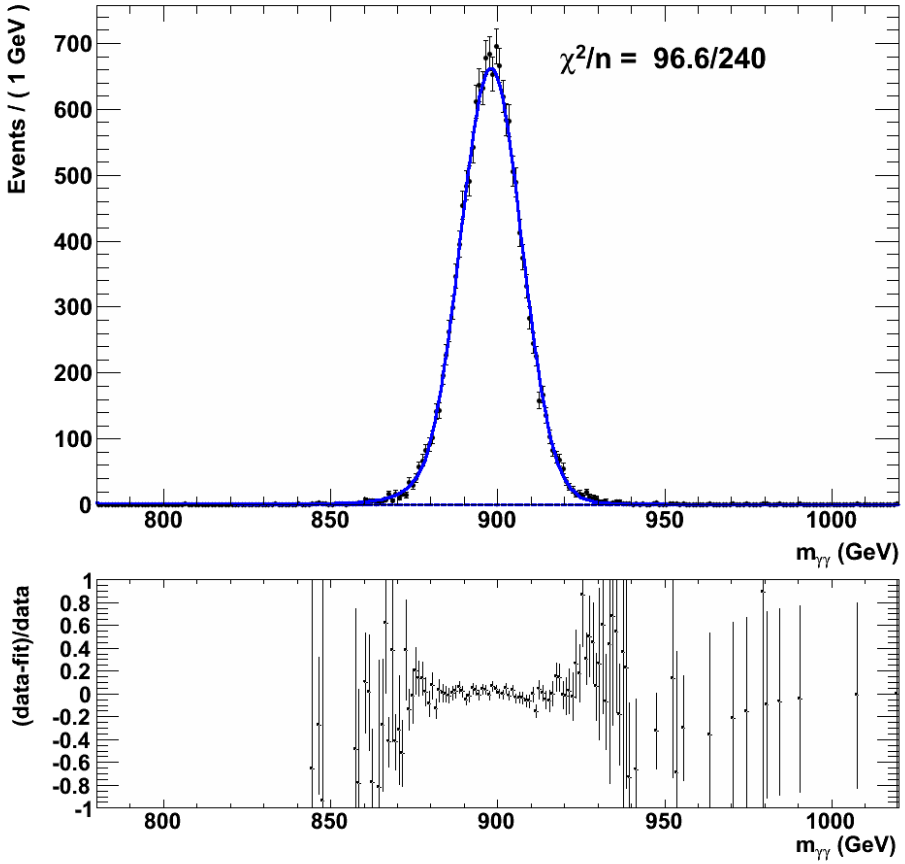
ggH 850 GeV

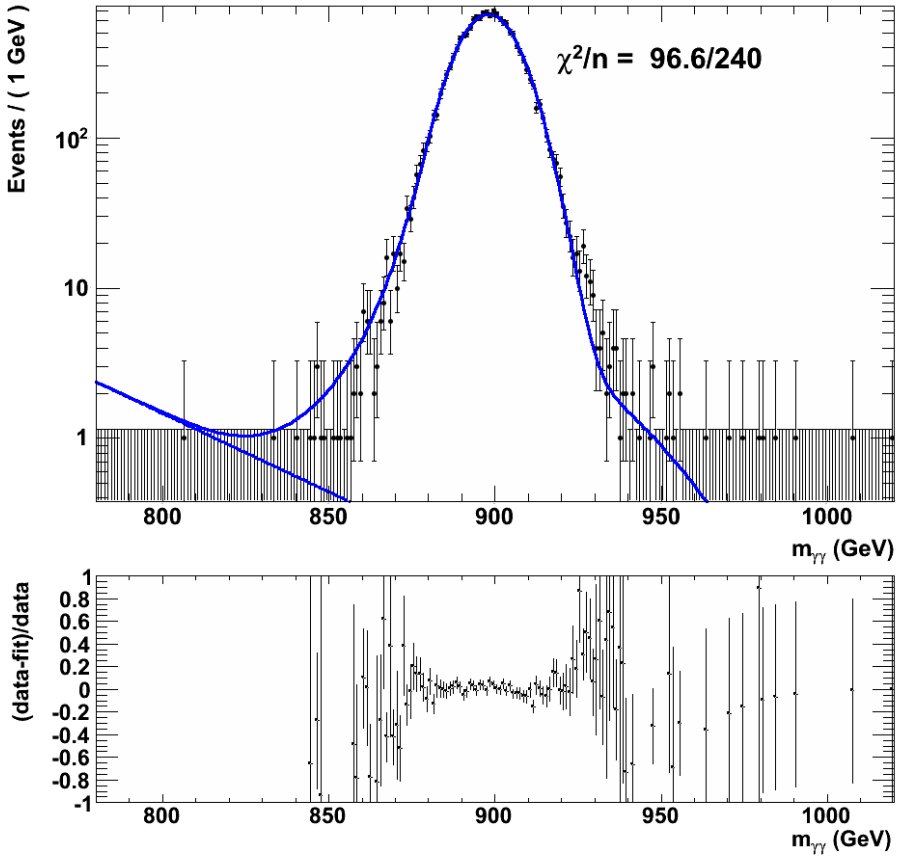




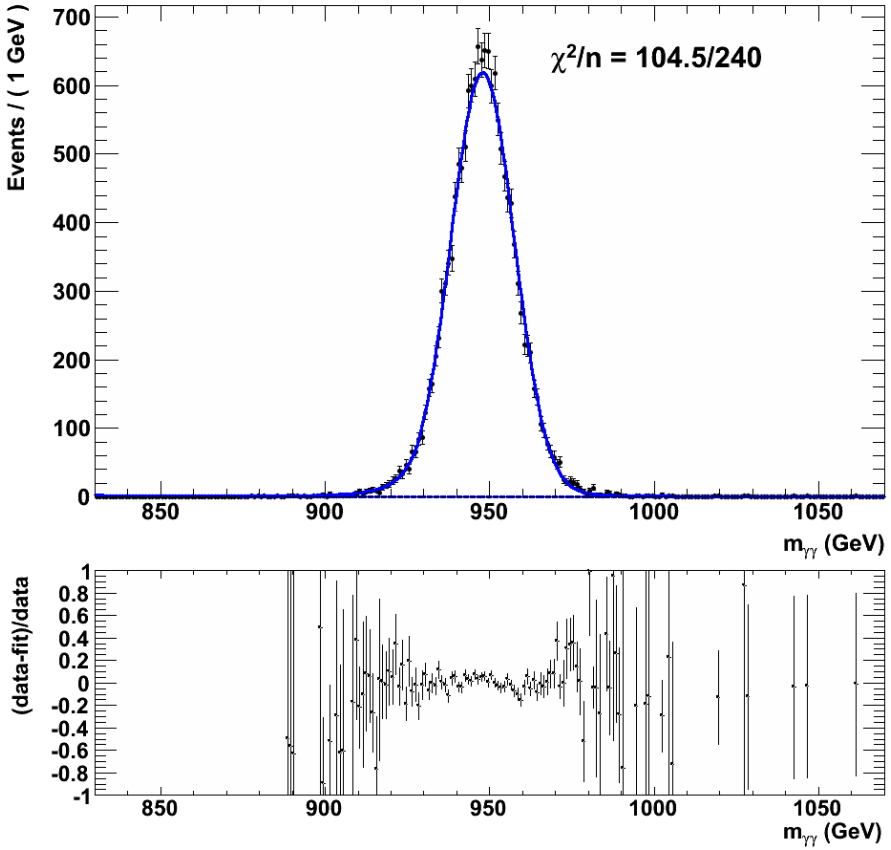
Beware: From here, the range of the x axis changes to +- 120 GeV around the peak (before it was 80), maybe it is not the smartest move (for comparisons)

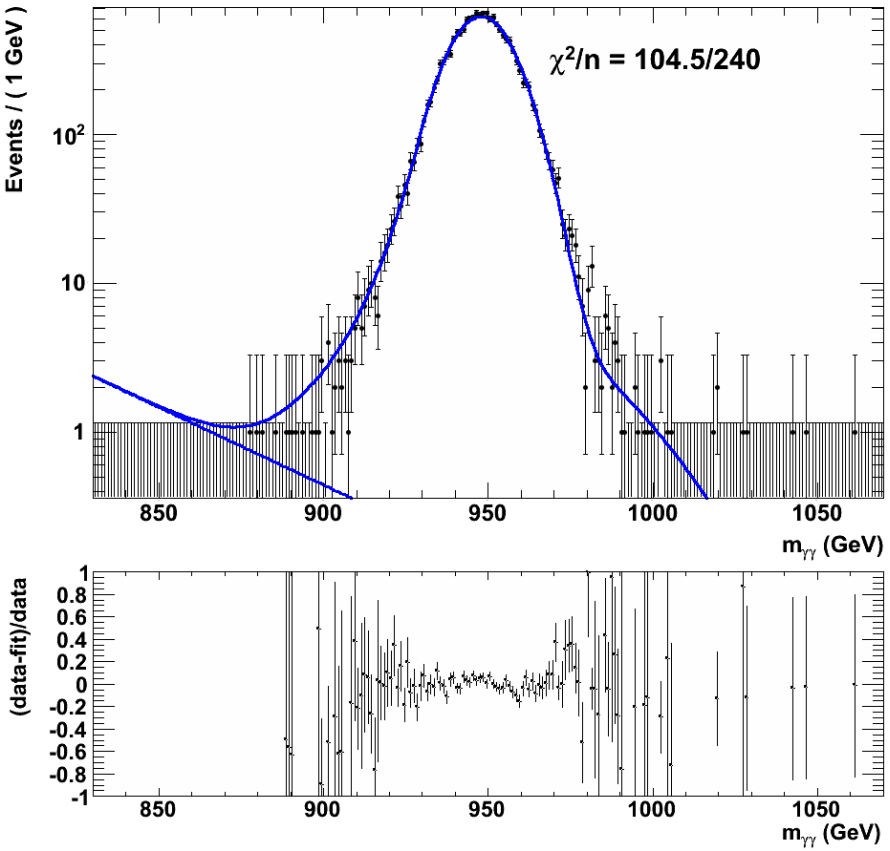
ggH 900 GeV


Events / (1 GeV)
χ^2/n = 96.6/240
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

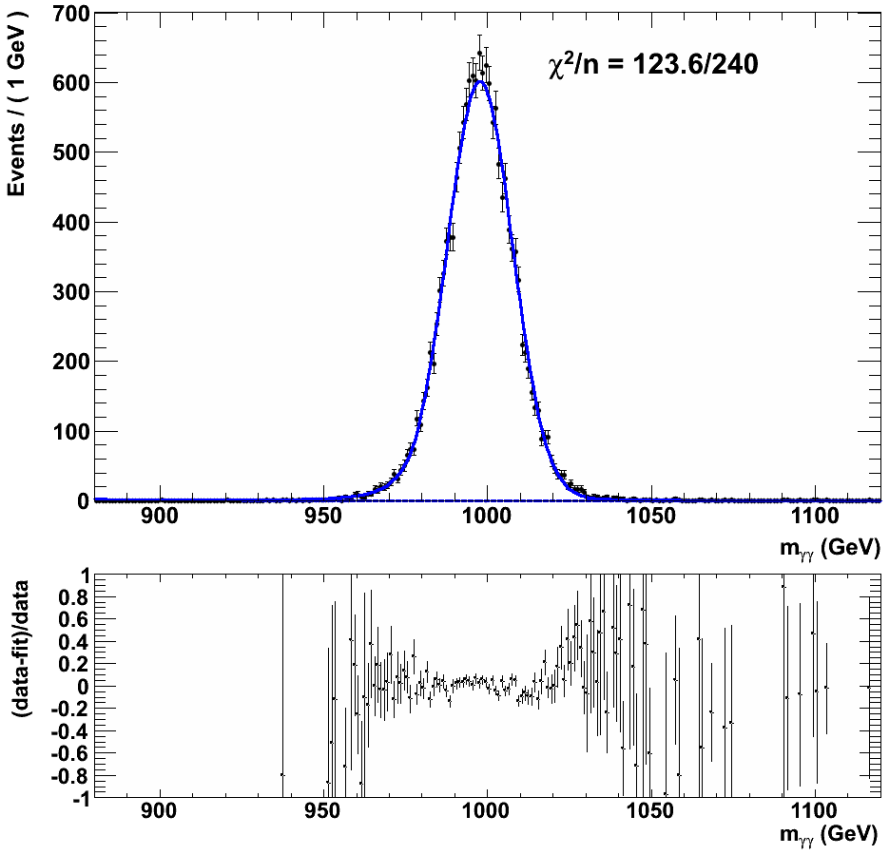

Events / (1 GeV)
χ^2/n = 96.6/240
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

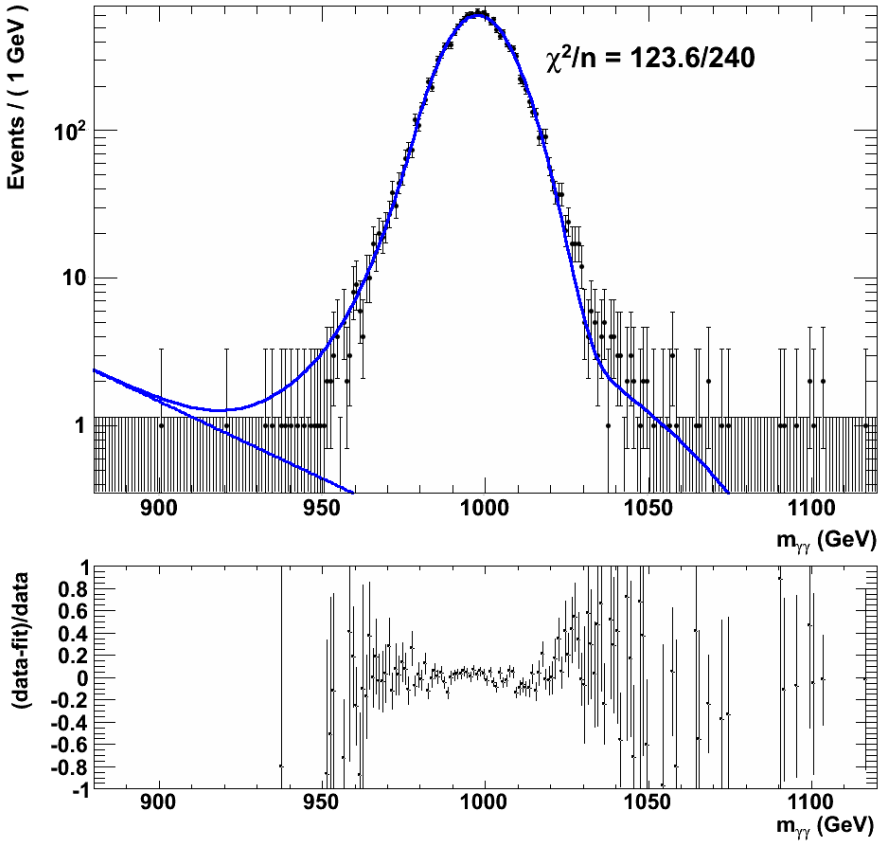
ggH 950 GeV


Events / (1 GeV)
χ²/n = 104.5/240
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)


Events / (1 GeV)
χ²/n = 104.5/240
m_γγ (GeV)
(data-fit)/data
m_γγ (GeV)

ggH 1000 GeV


Events / (1 GeV)
χ^2/n = 123.6/240
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)


Events / (1 GeV)
χ^2/n = 123.6/240
$m_{\gamma\gamma}$ (GeV)
(data-fit)/data
$m_{\gamma\gamma}$ (GeV)

Conclusion

- What about the samples 160 – 280 GeV?
- any suggestions are welcome