

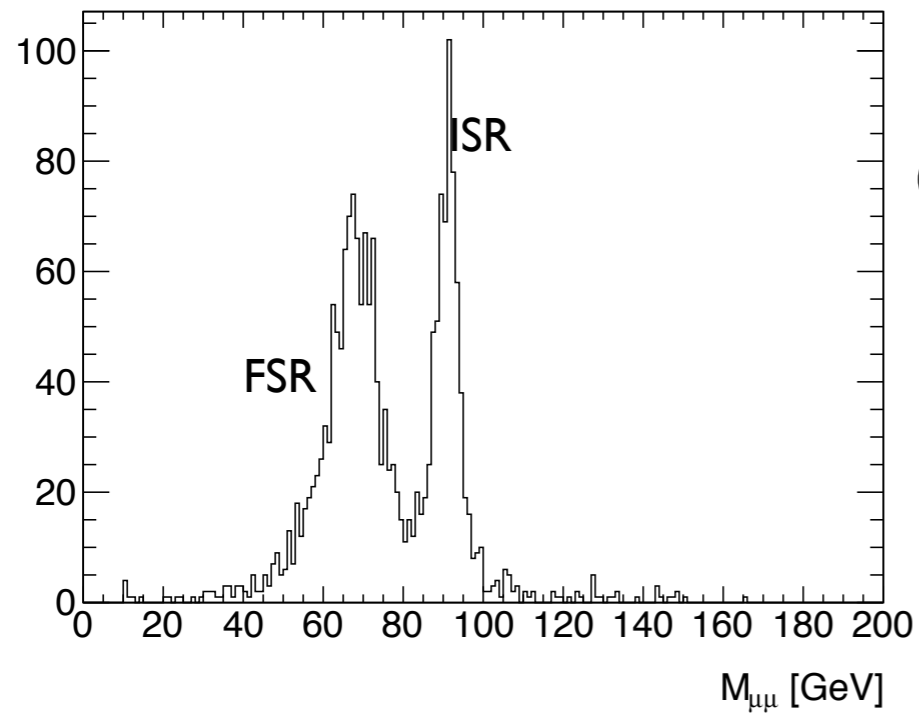
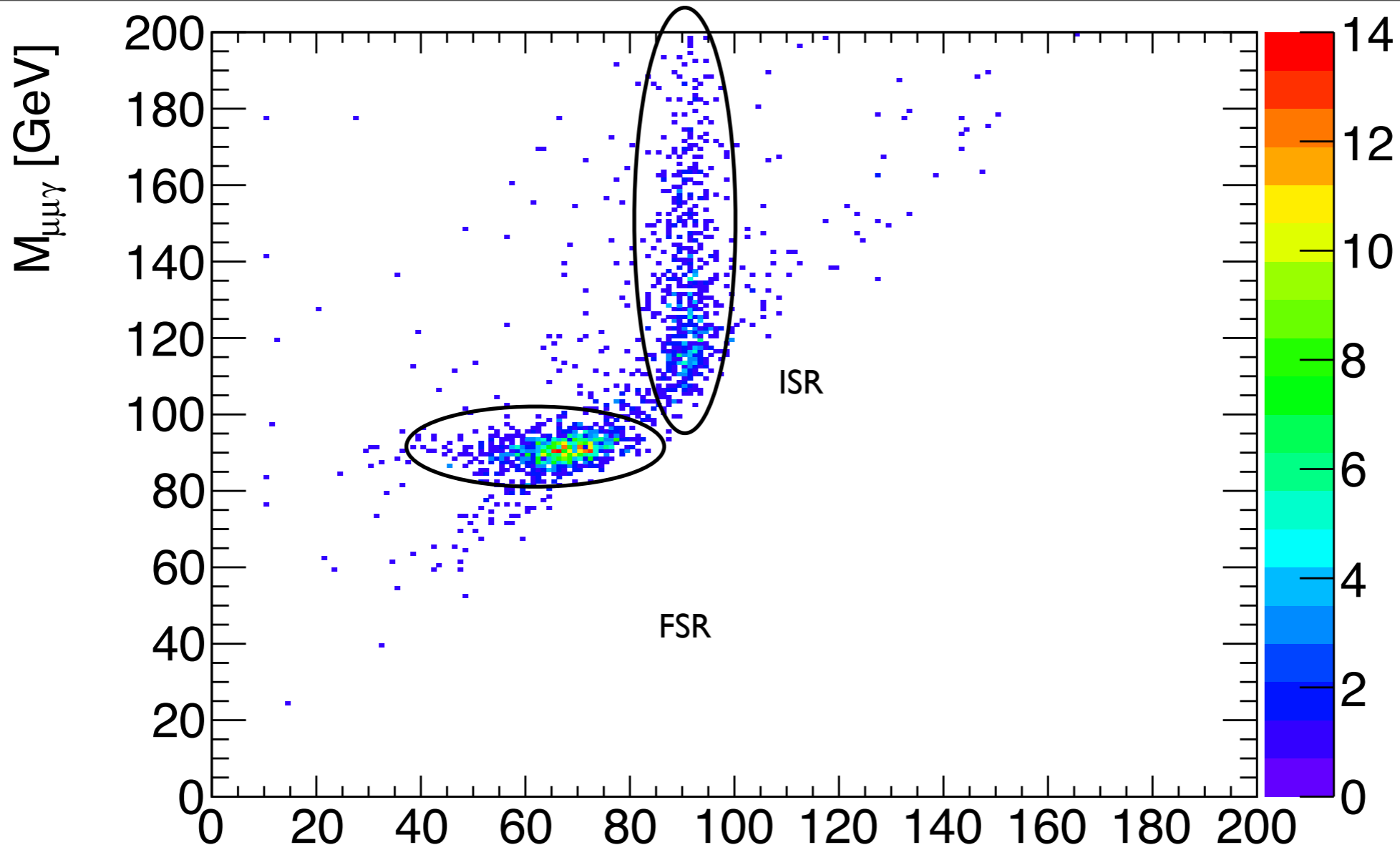
First look at 2012 $Z \rightarrow \mu\mu\gamma$ data

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LPNHE

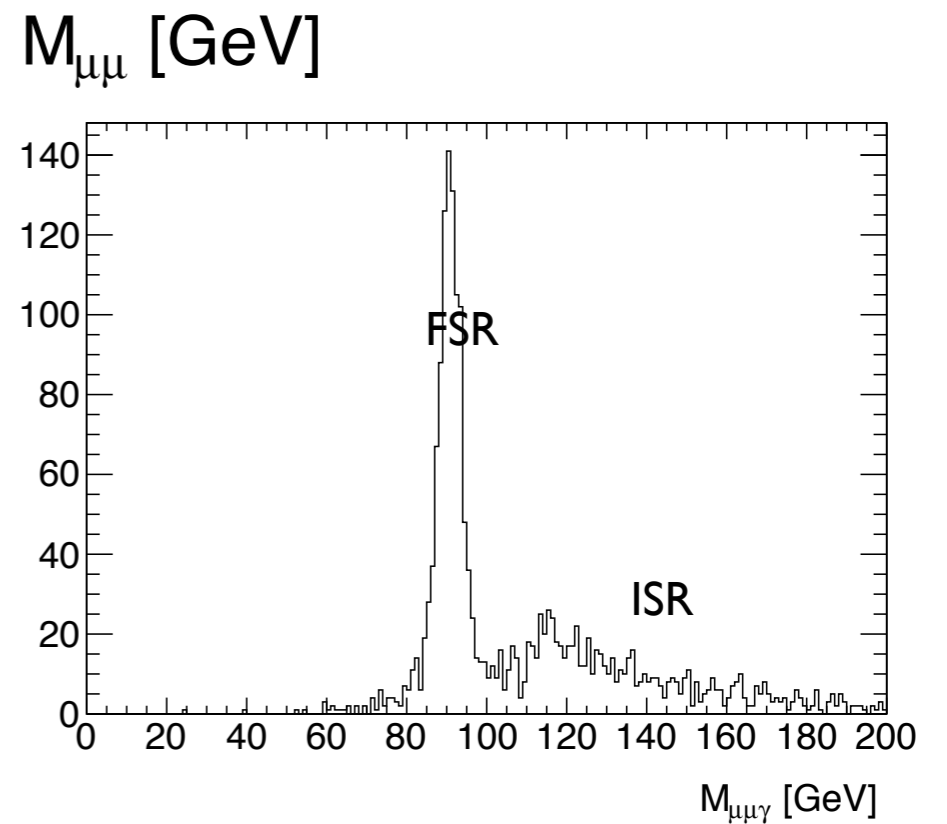
Selection

- 2012 Data from Zmumugamma stream created by Kun and Leonardo (~660 pb⁻¹)
 - **Photon Cuts:**
 - Isolated photons (calo isolation < 5GeV) with $E_t > 15$ GeV
 - photon GRL and good $|\eta^2|$ regions
 - **Muon Cuts:**
 - Trigger: EF_mu18_MG || EF_mu40_MOnly_barrel_medium
 - Combined staco muons with $|Z_{pv}| < 10$ mm
 - Tight muons with $P_t > 20$ GeV and $|\eta| < 2.4$
 - Inner detector track criteria
 - **Other cuts for Z to mumugamma**
 - ΔR cut btw photon and closest muon ($\Delta R > 0.3$)
 - Cut in Di-Muon Mass (ISR cut $45 \text{ GeV} < M_{\mu\mu} < 85 \text{ GeV}$)
- Photon energy in data corrected with EnergyRescaler

PART I :
Data 2011/2012
Comparison



1908 events
(no Mass or ΔR cut)



$Z\mu\mu\gamma$ after selection

In 2011 data (4.7 fb-1):

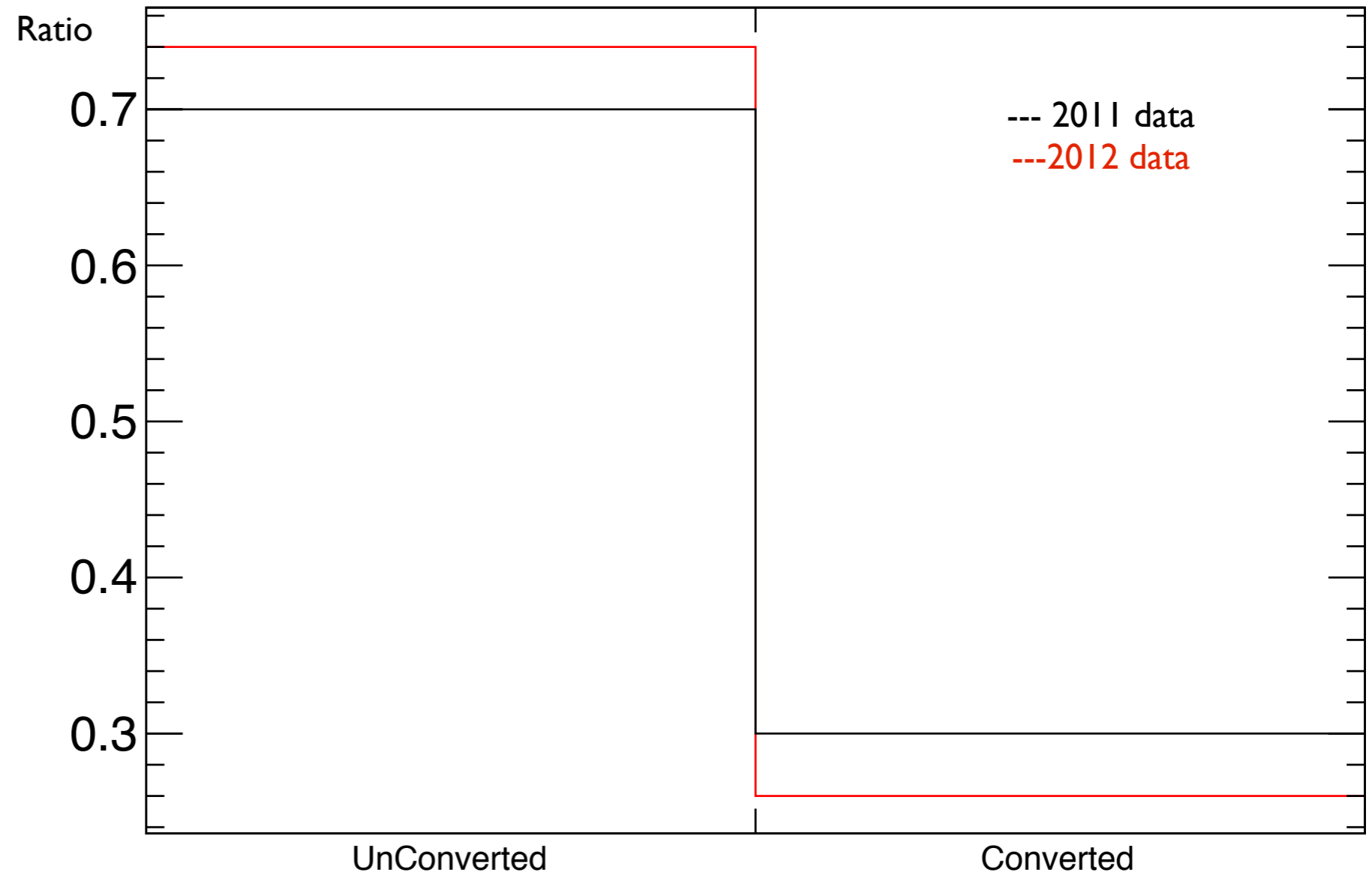
5041 events in total: 3516 with unconverted photons and 1525 (30.25 \pm 0.65)% converted.

1.07 events/pb-1

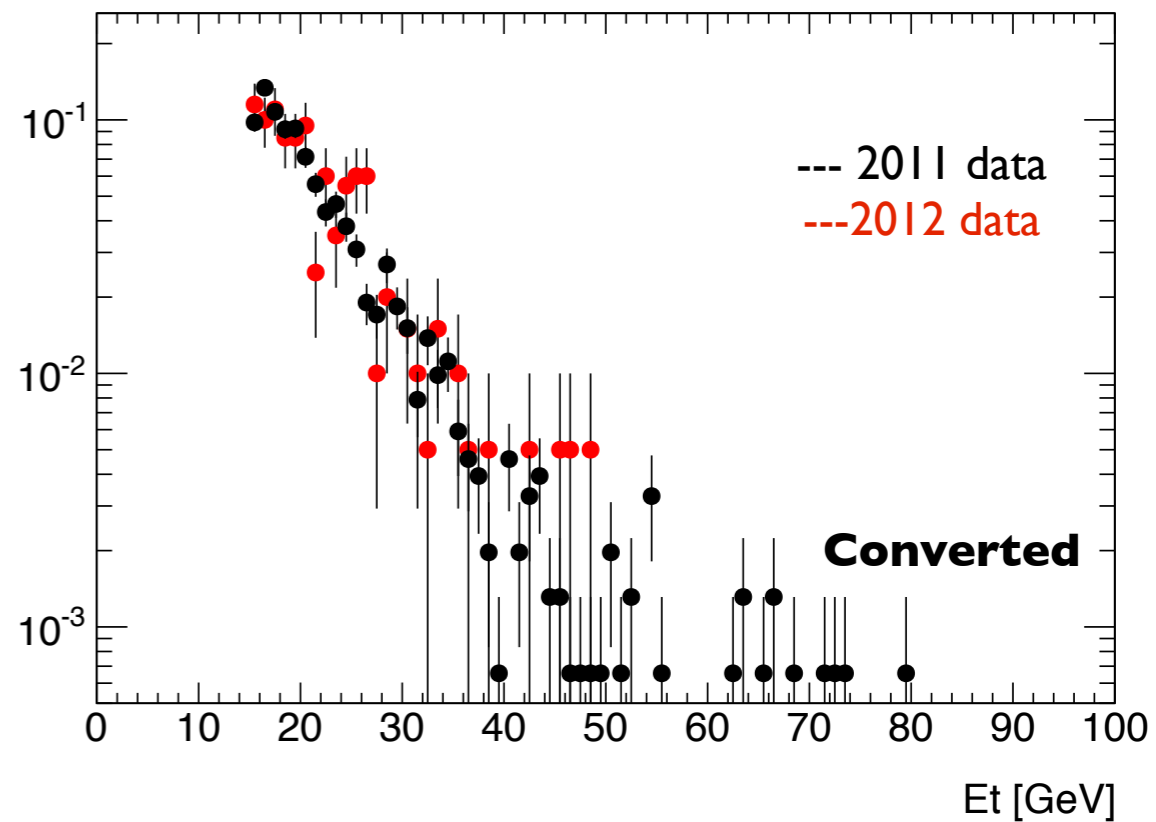
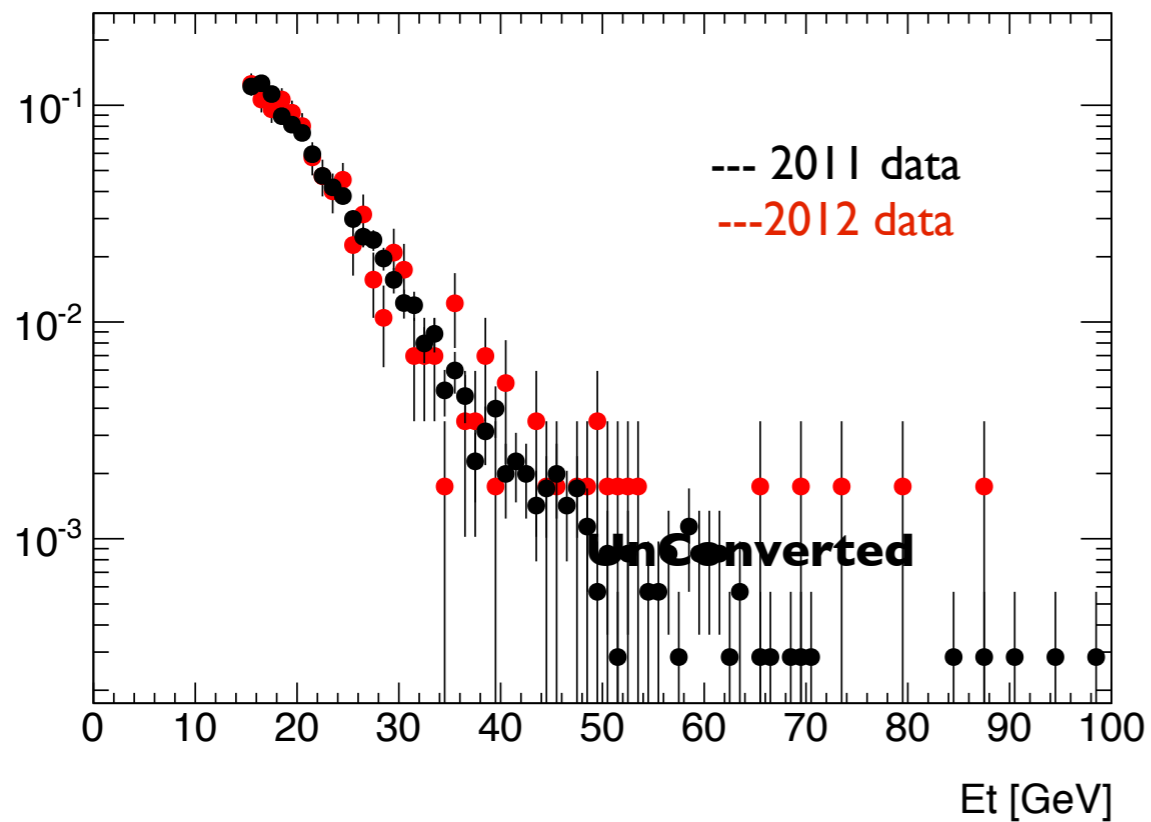
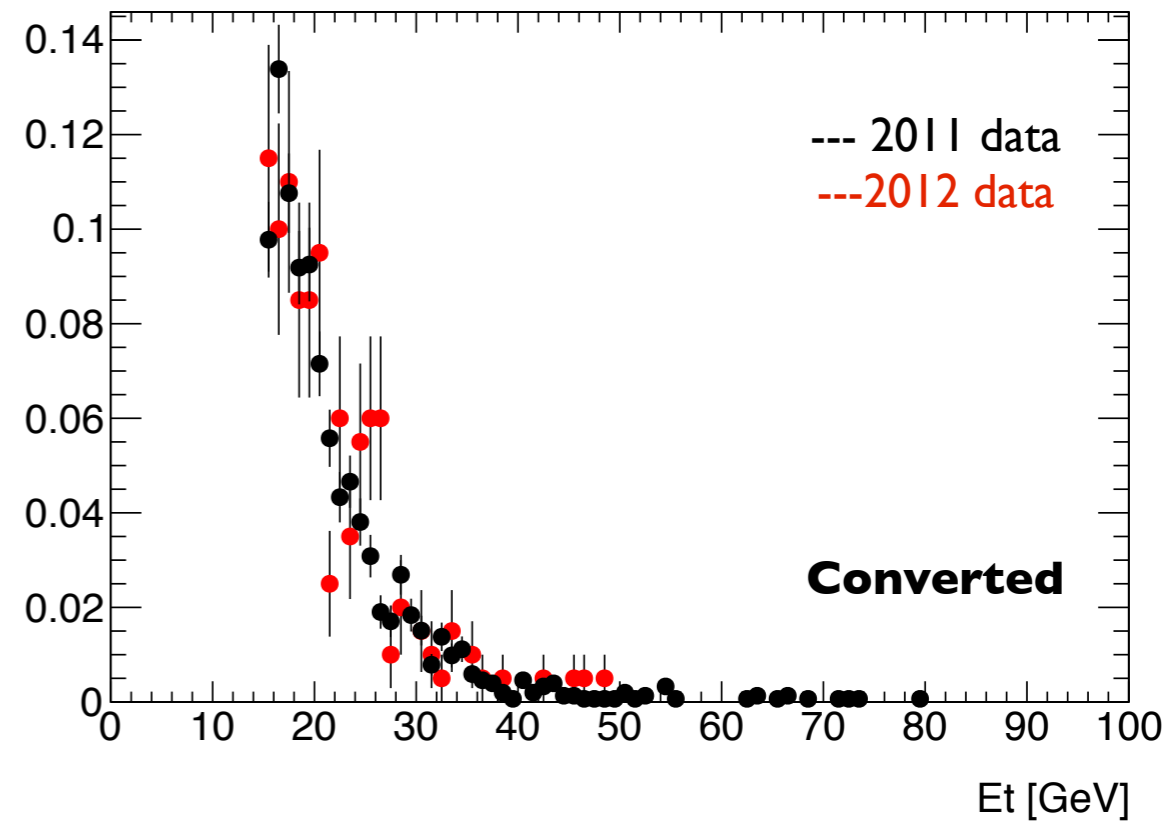
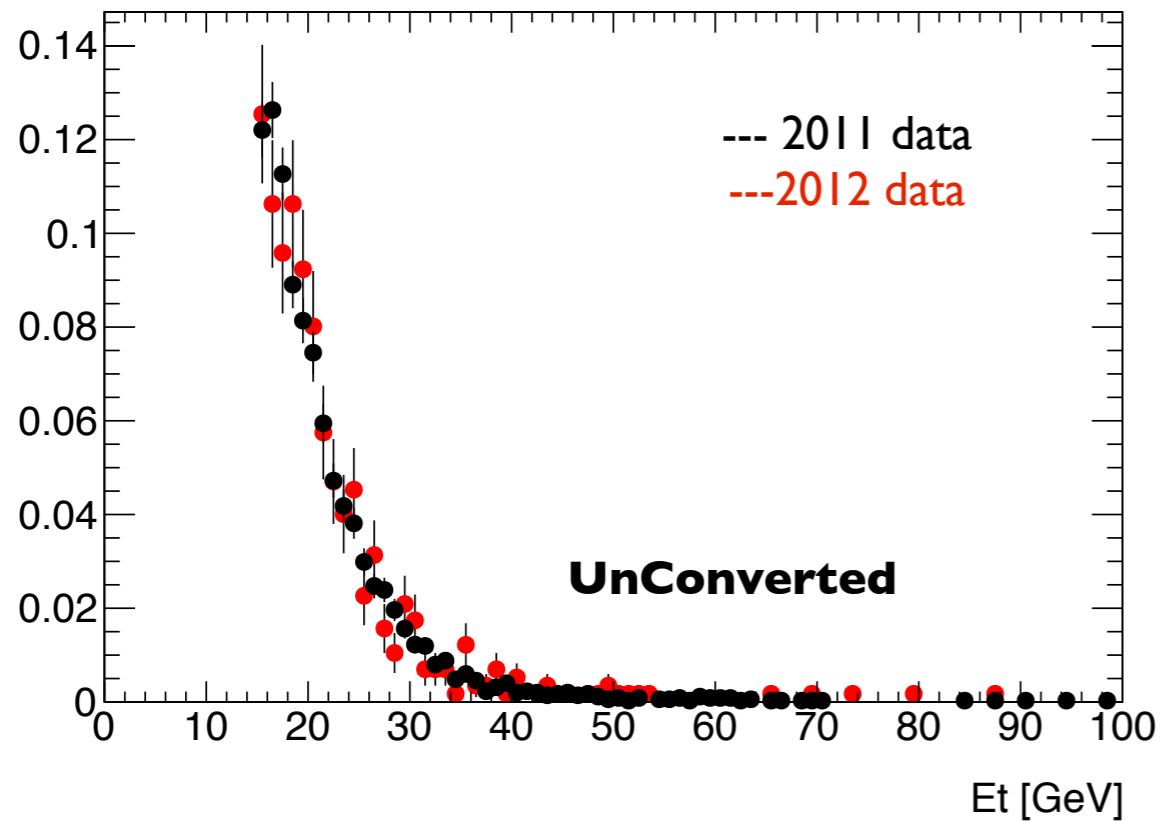
2012 data (~660 pb-1):

774 events in total: 574 unconverted photons and 200 (25.8 \pm 1.6)% converted.

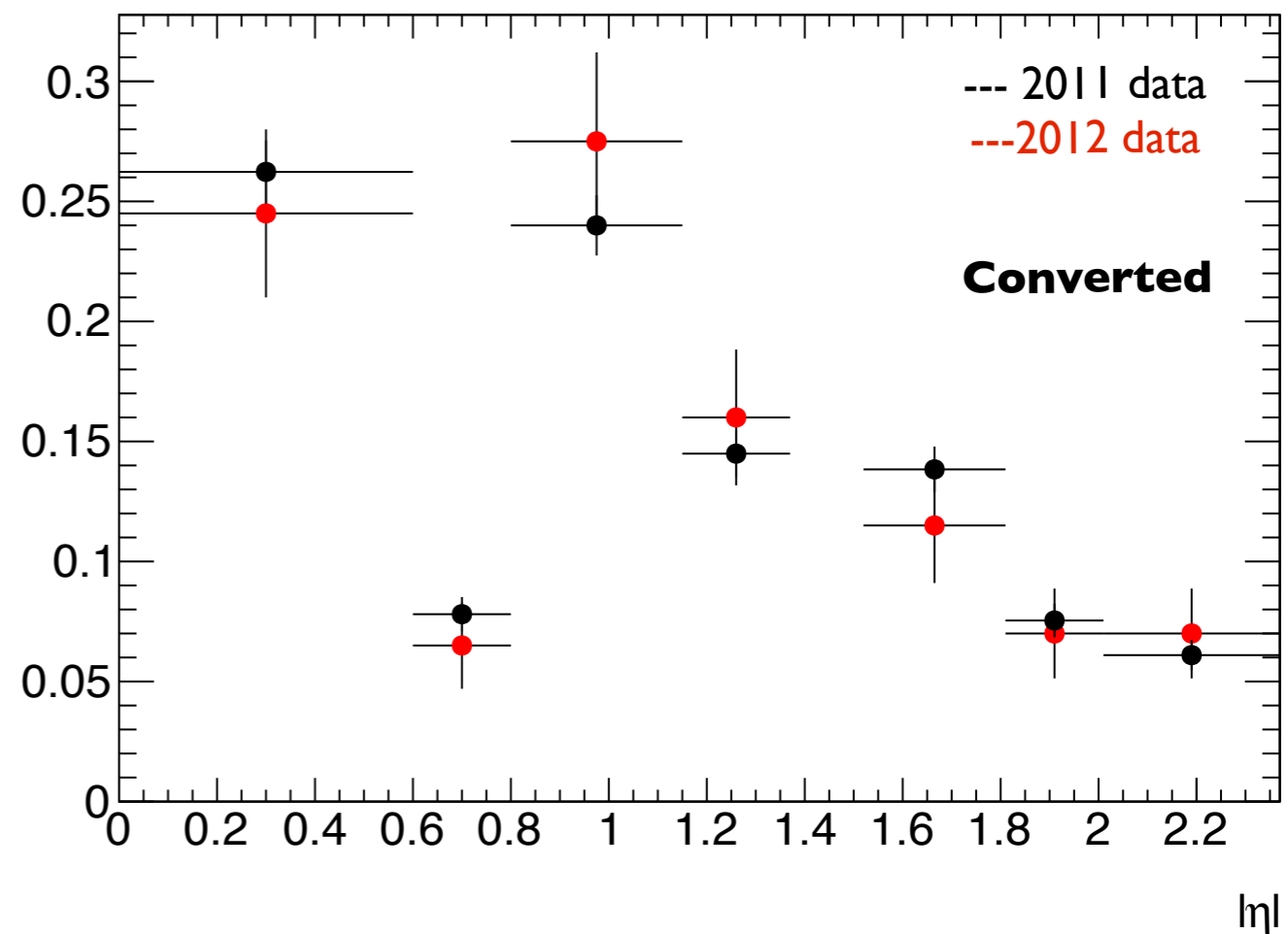
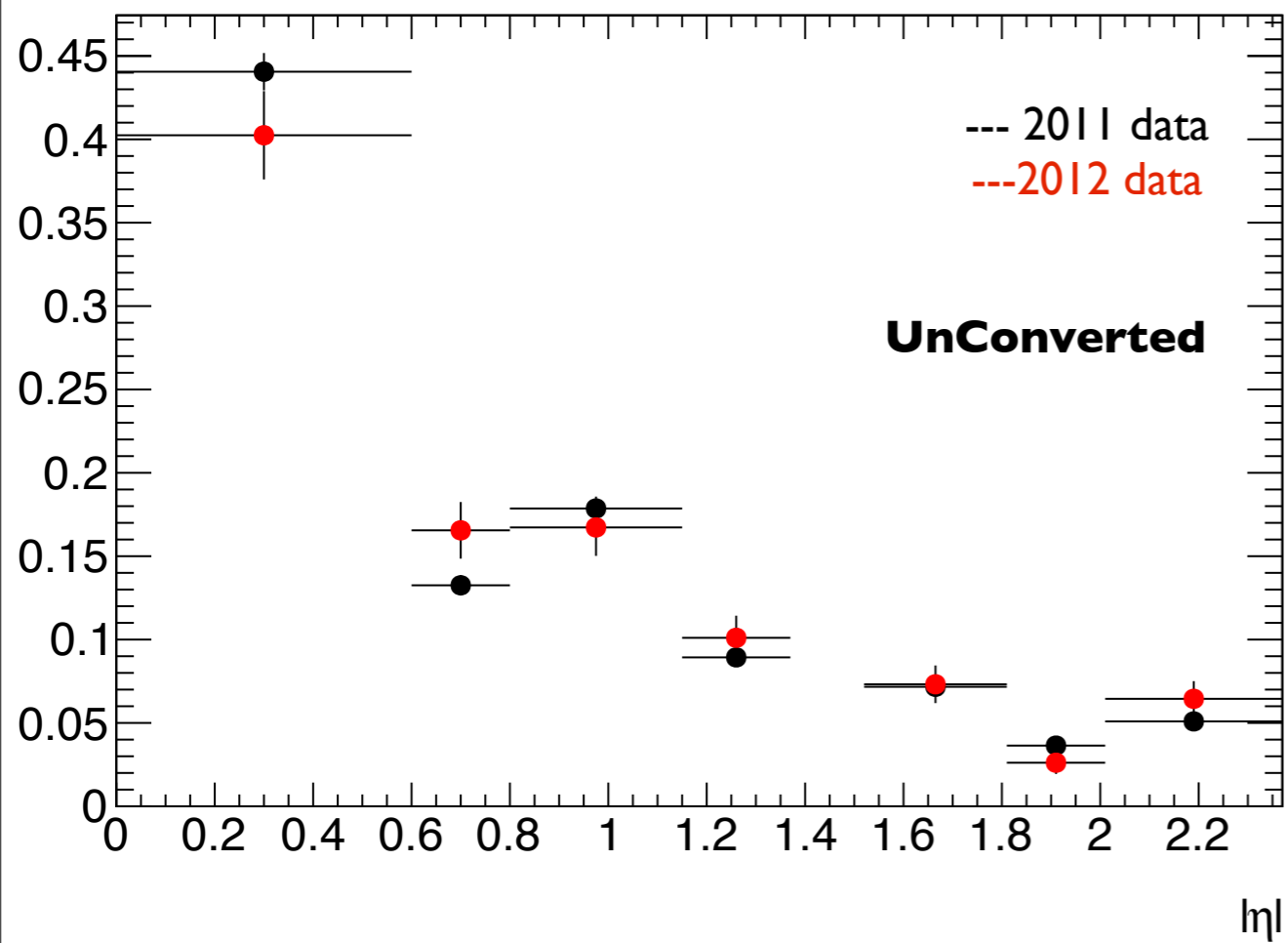
1.17 events/pb-1



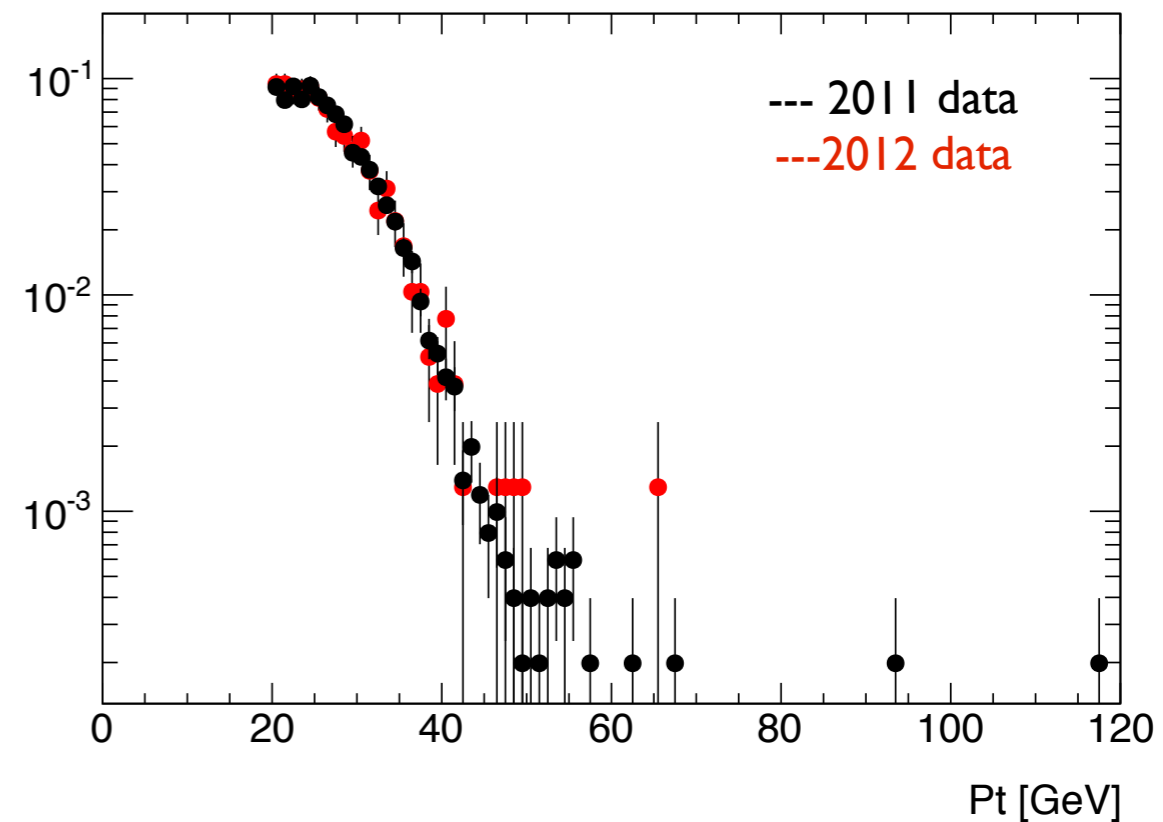
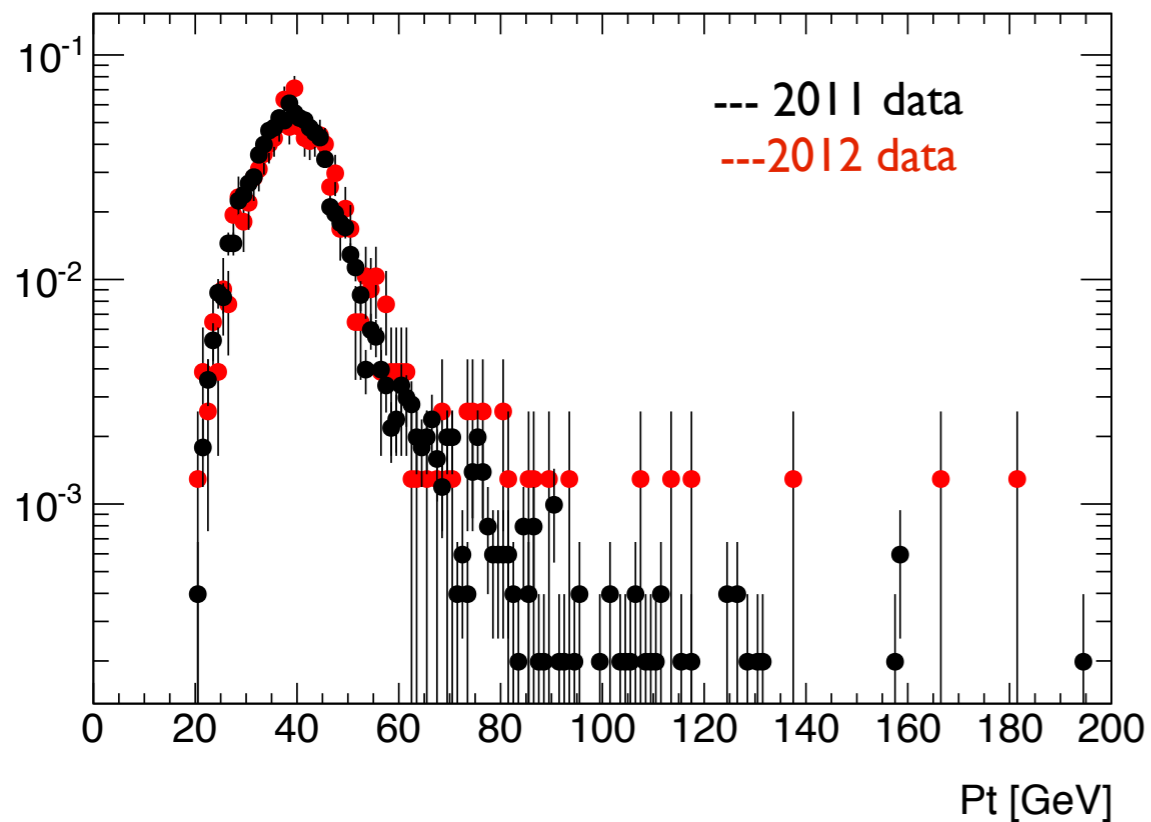
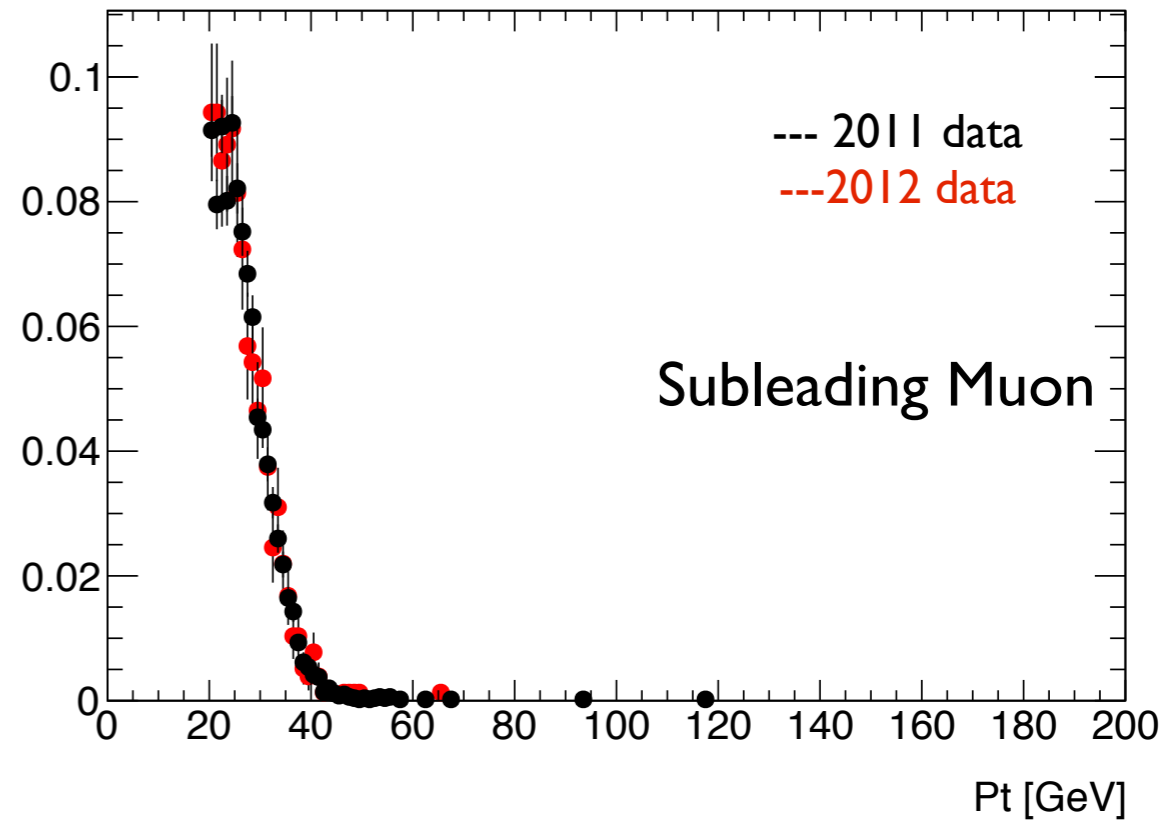
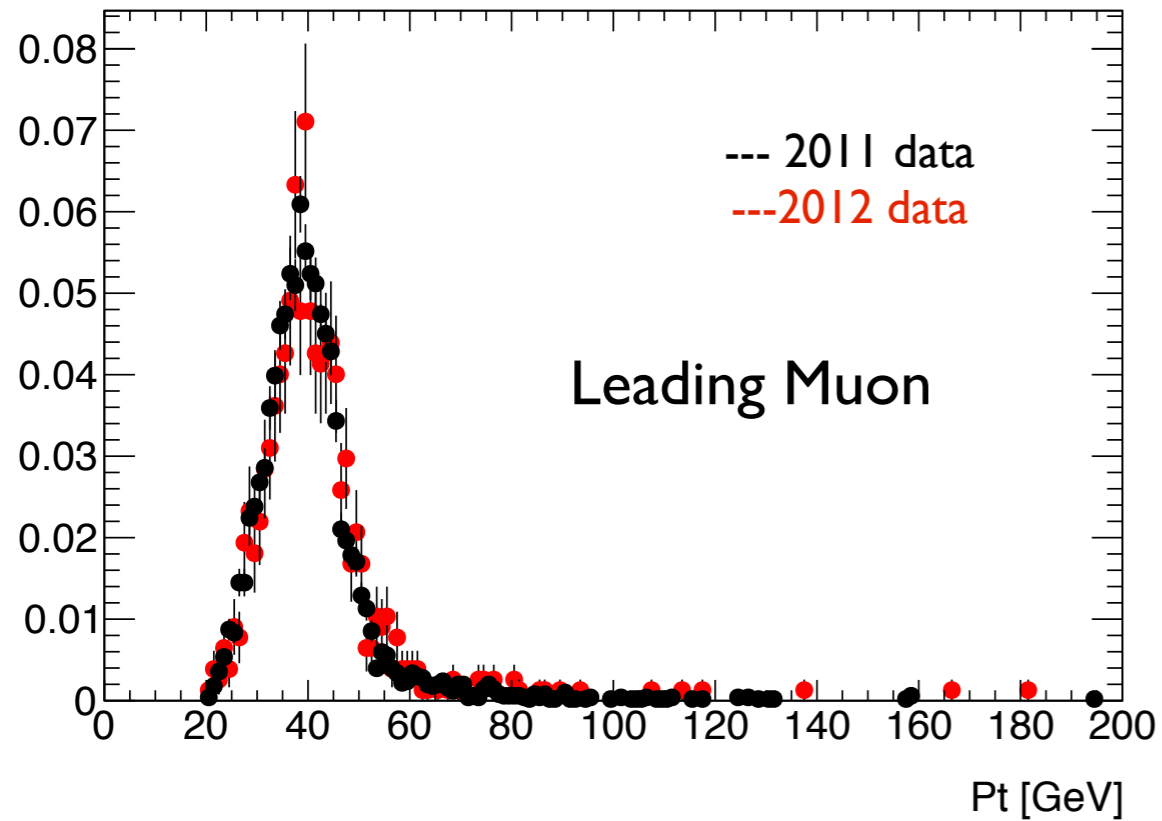
$Z\mu\mu\gamma$ photon's E_t



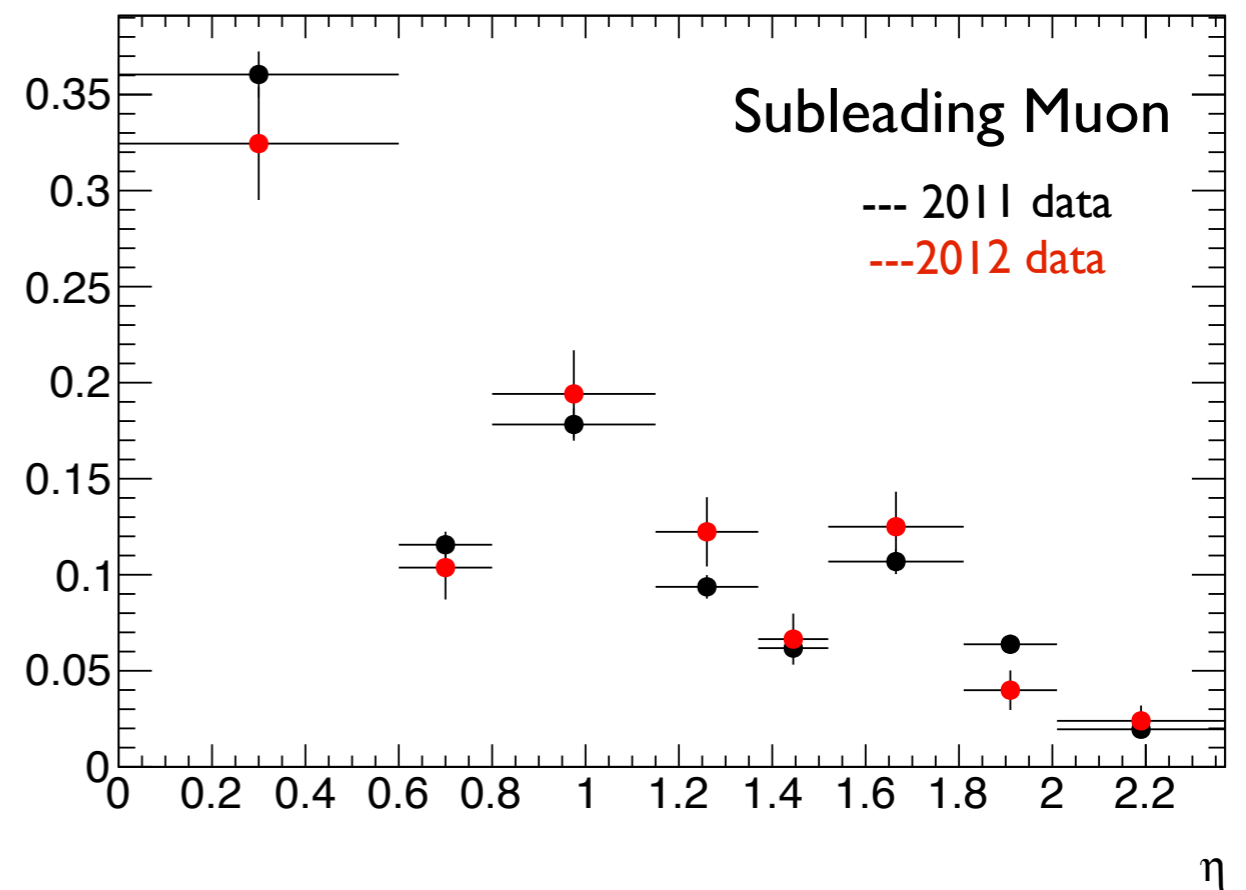
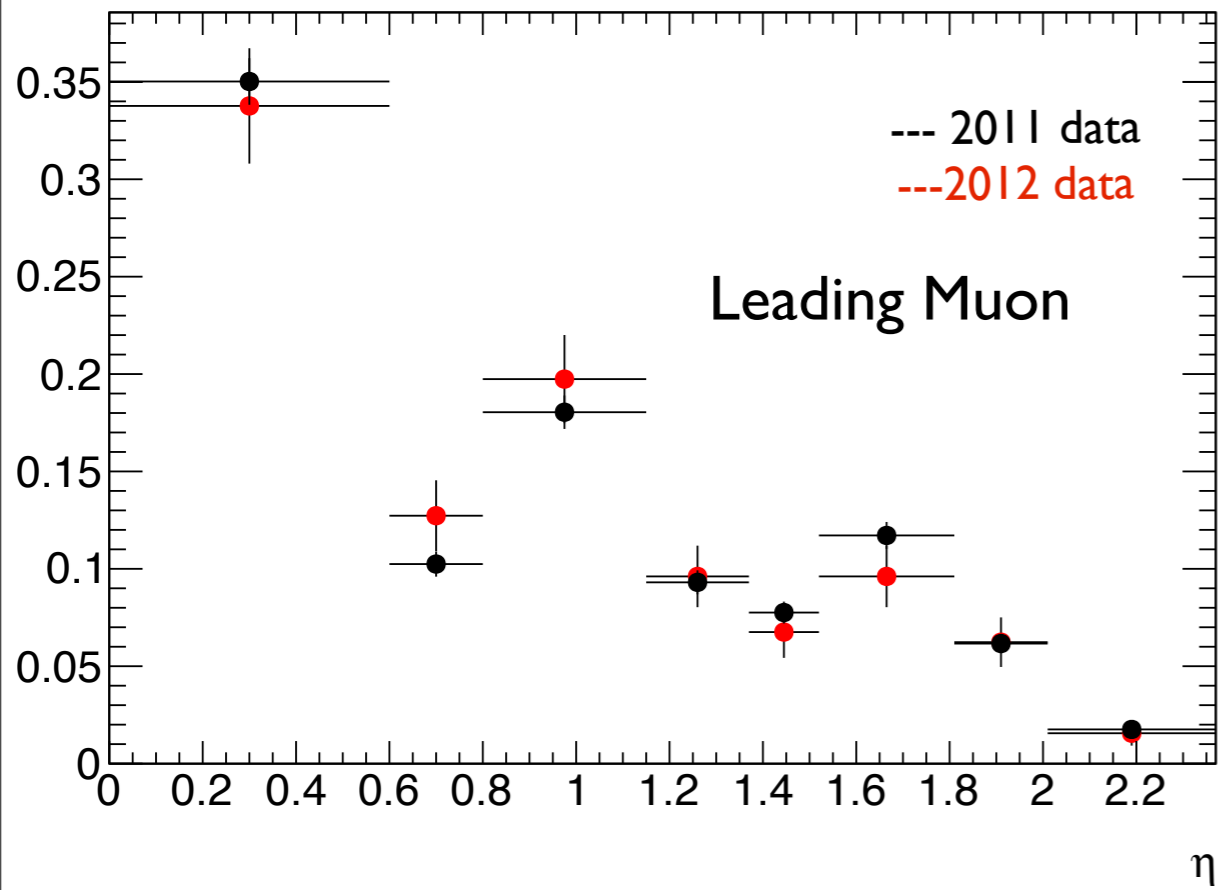
Z $\mu\mu\gamma$ photon η



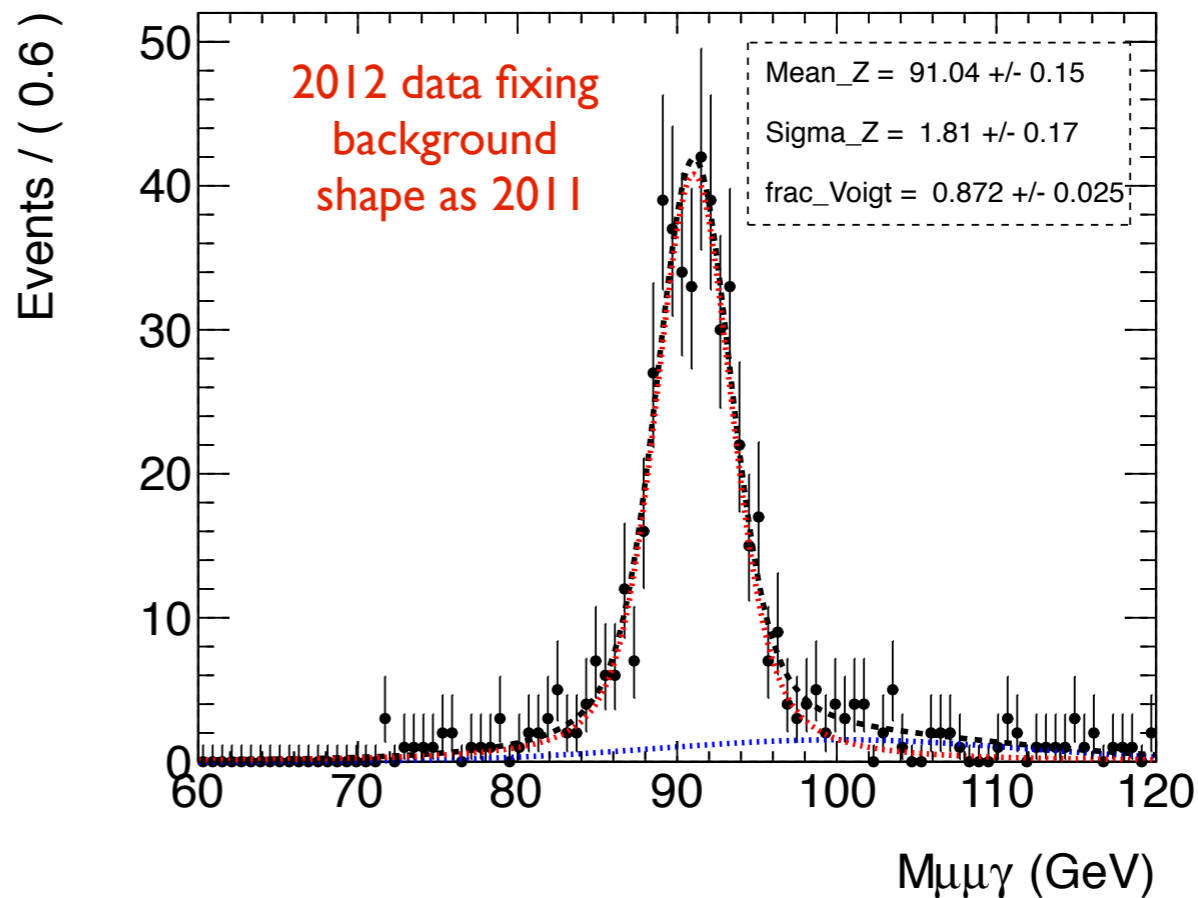
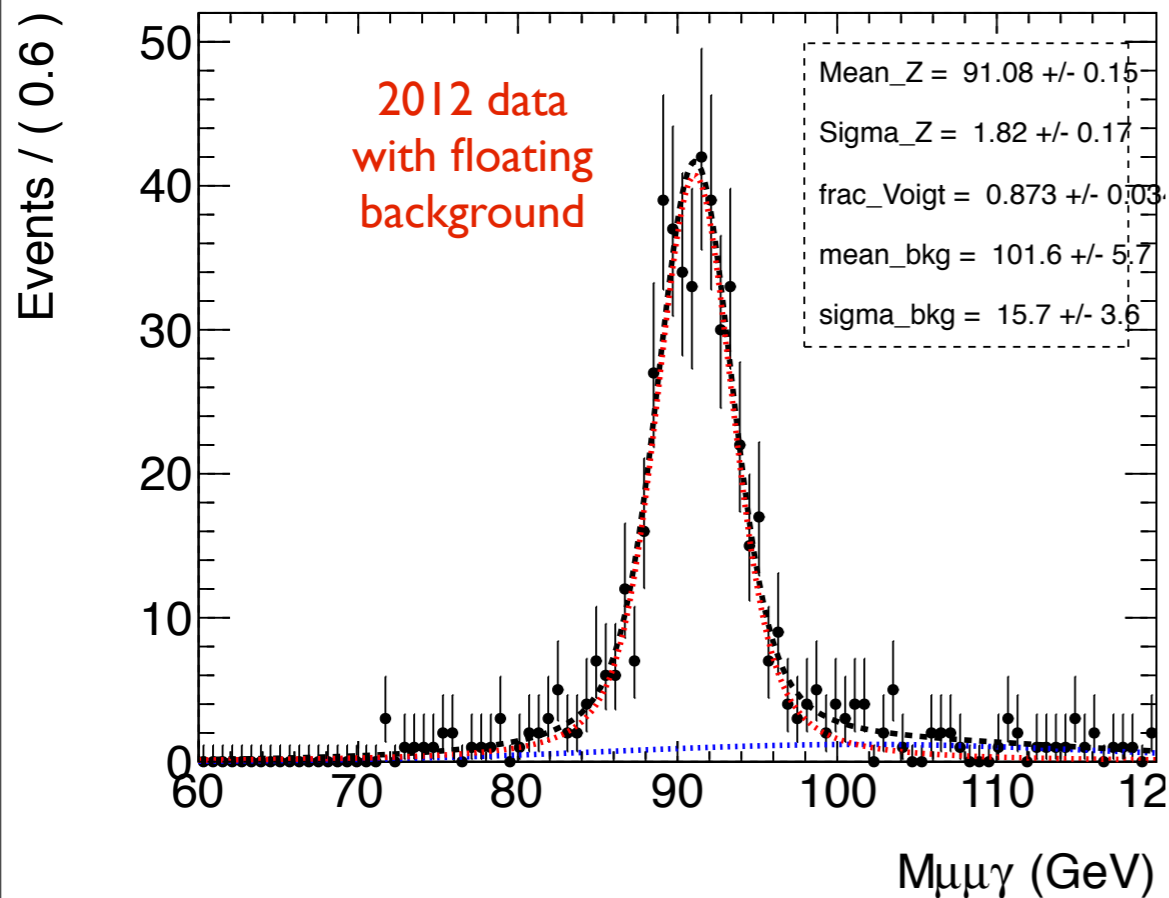
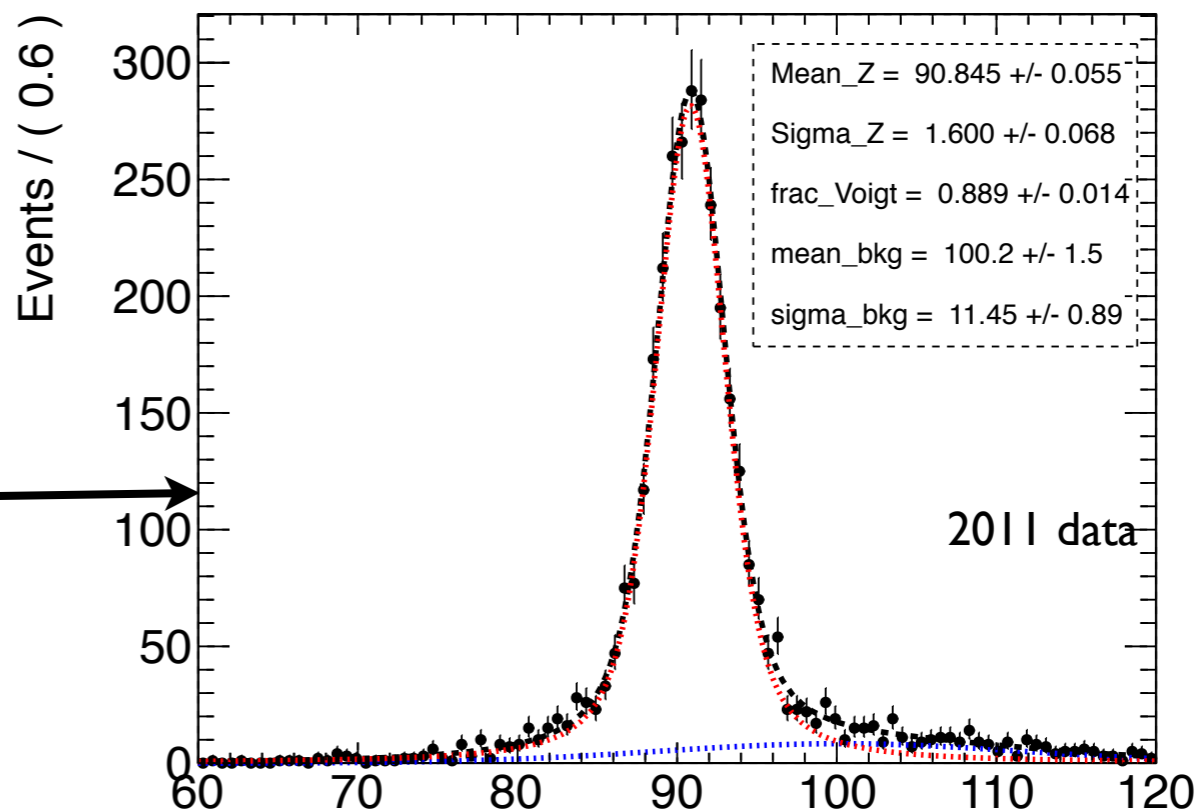
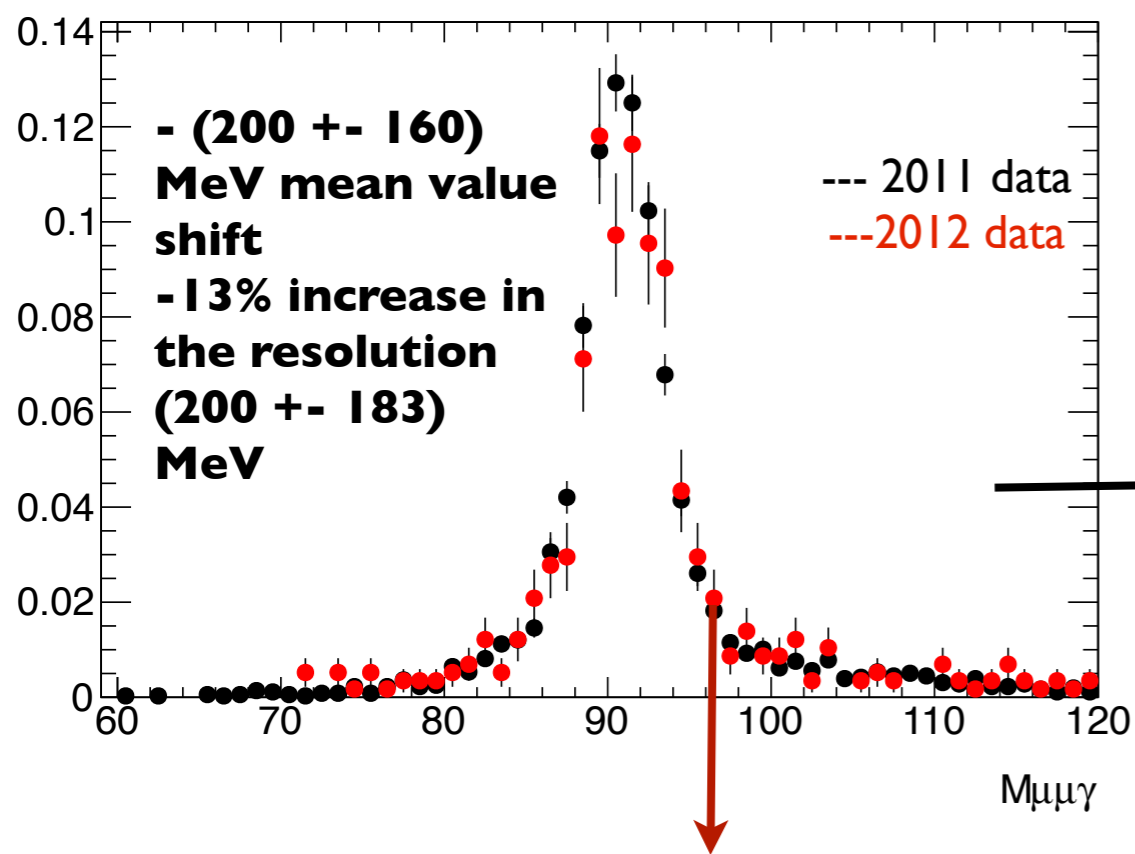
$Z\mu\mu\gamma$ muons Pt



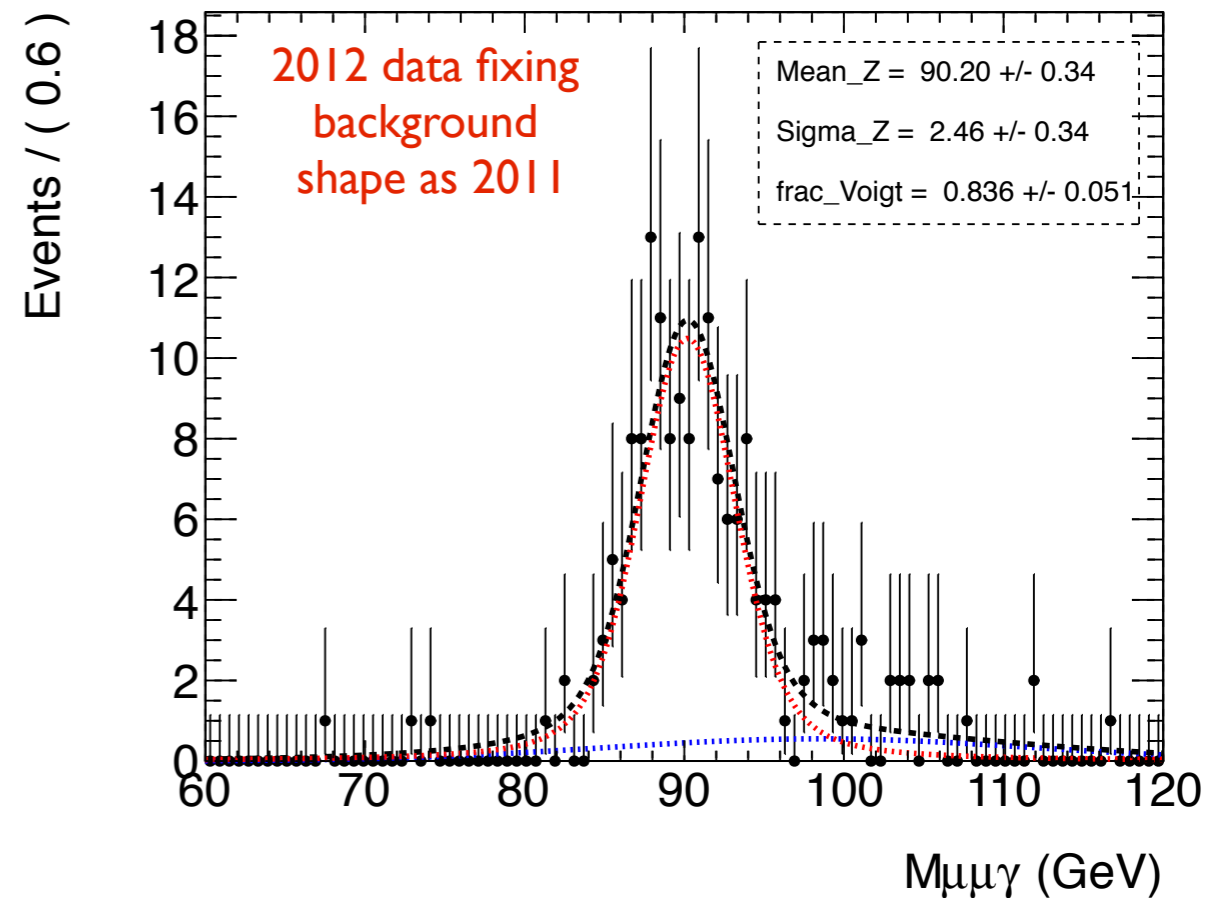
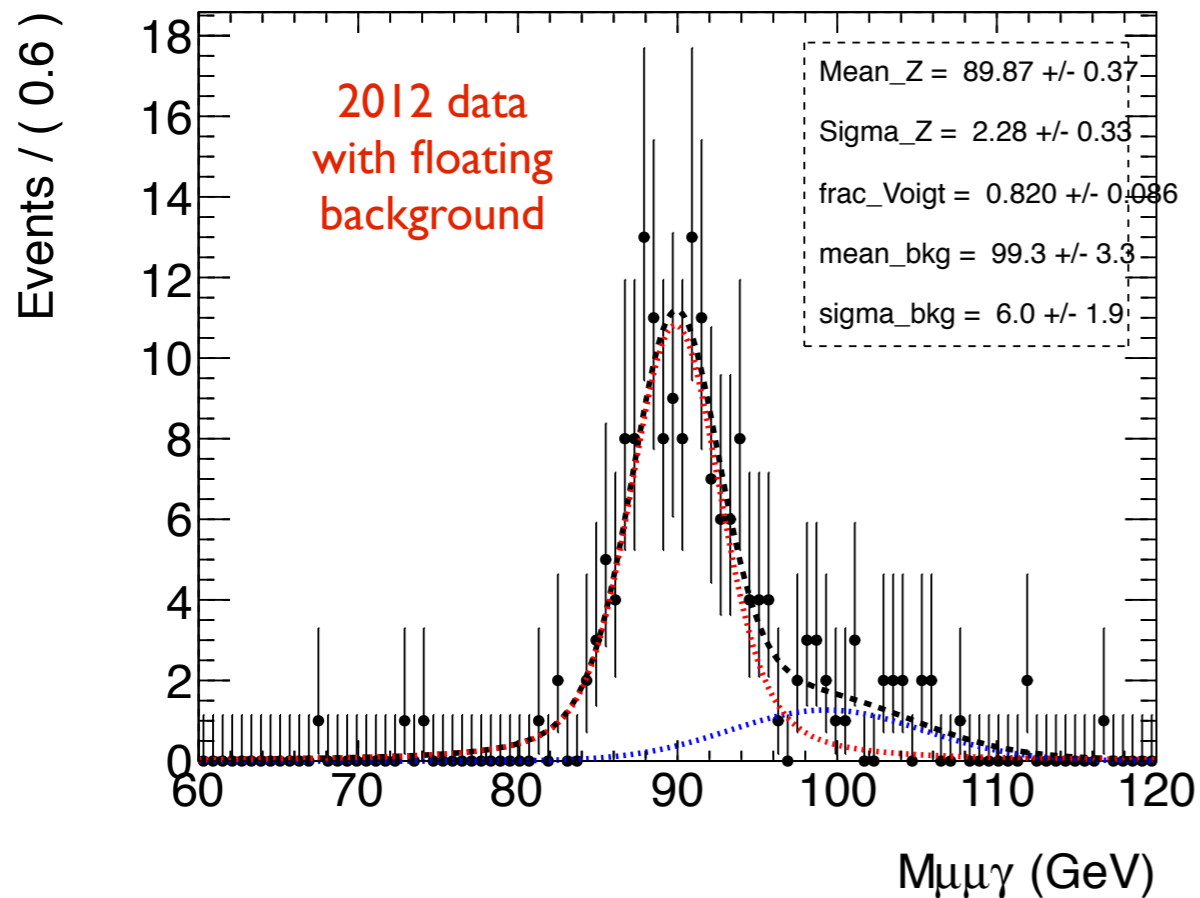
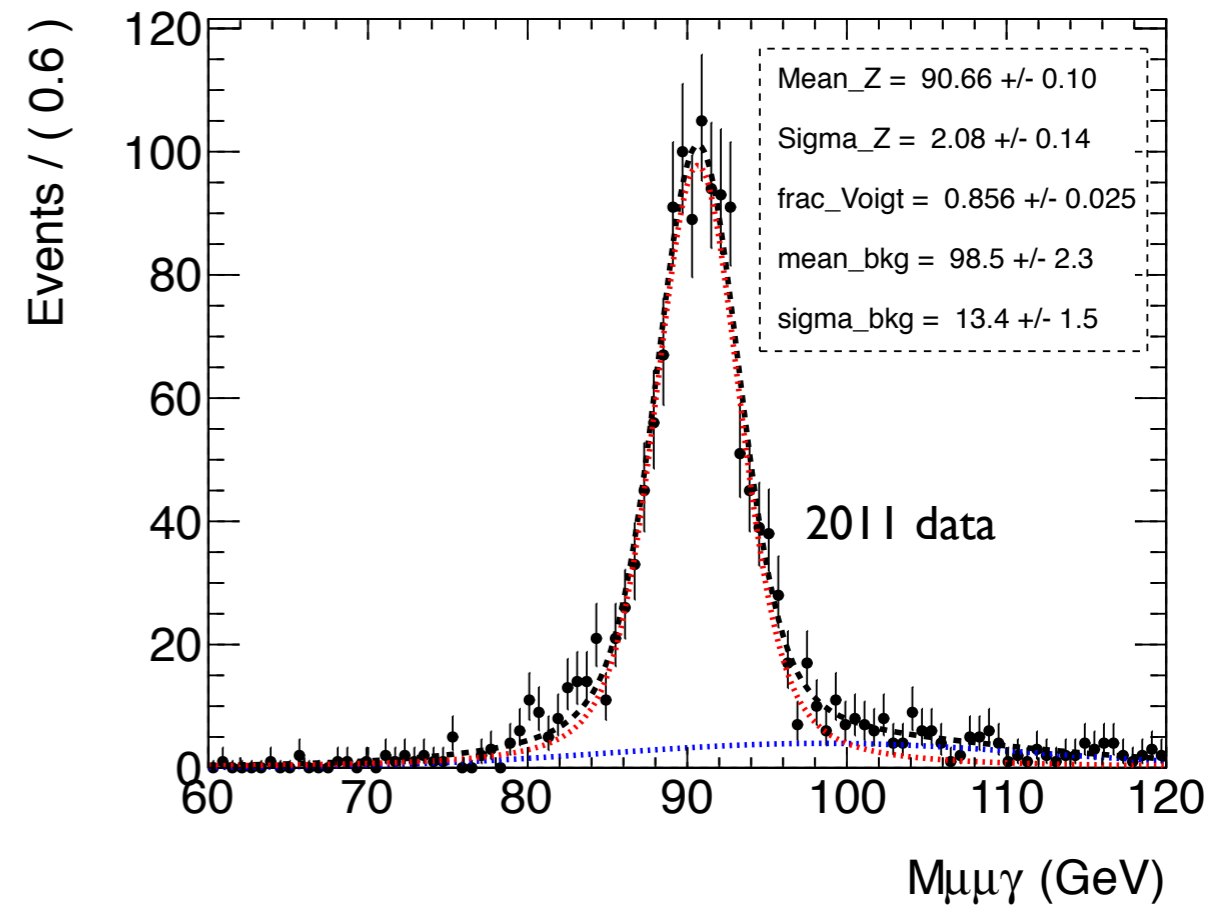
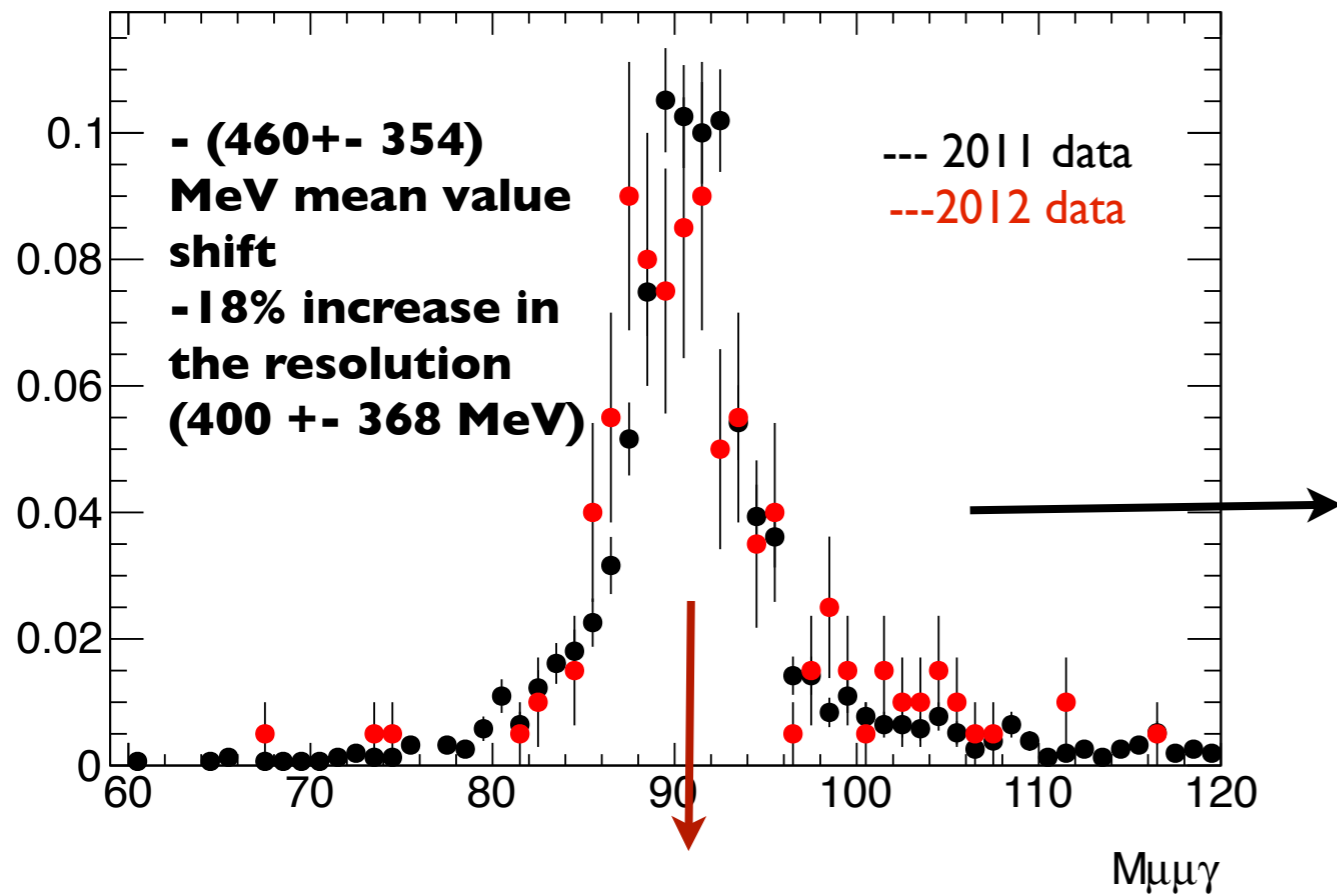
$Z\mu\mu\gamma$ muon η



$Z\mu\mu\gamma$ with unconverted photons



$Z\mu\mu\gamma$ with converted photons

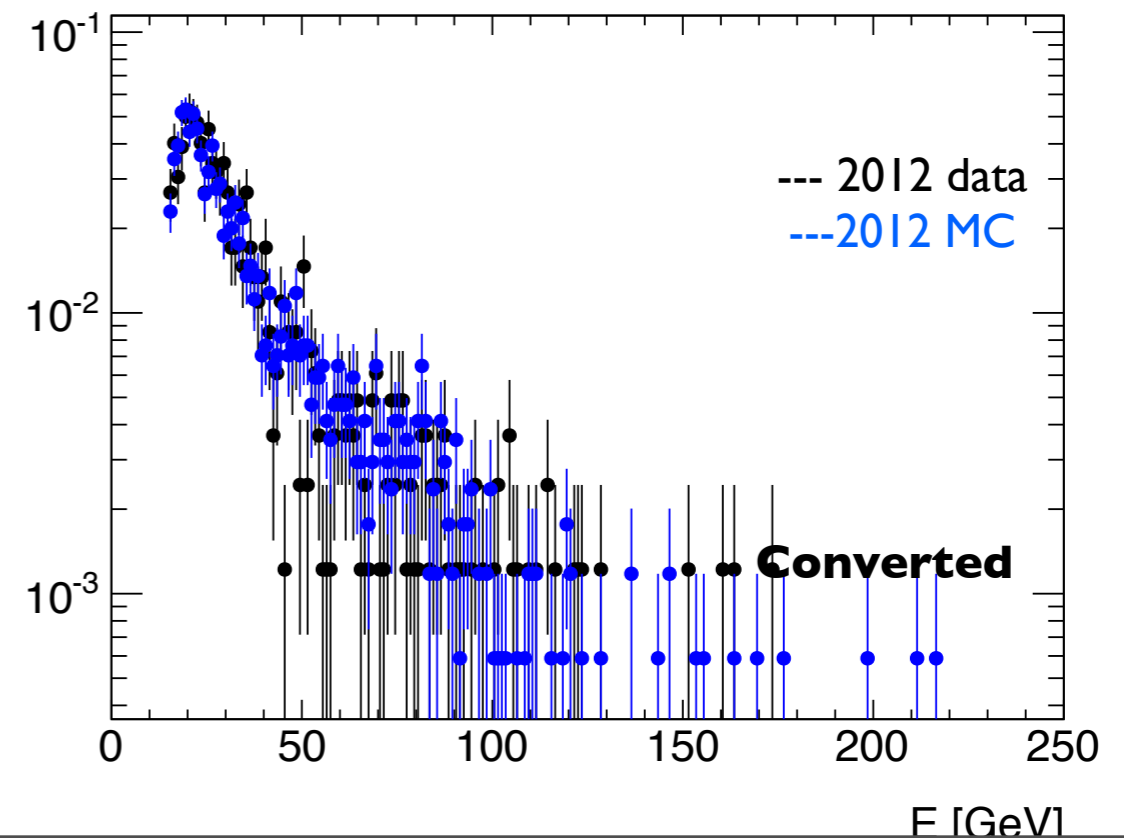
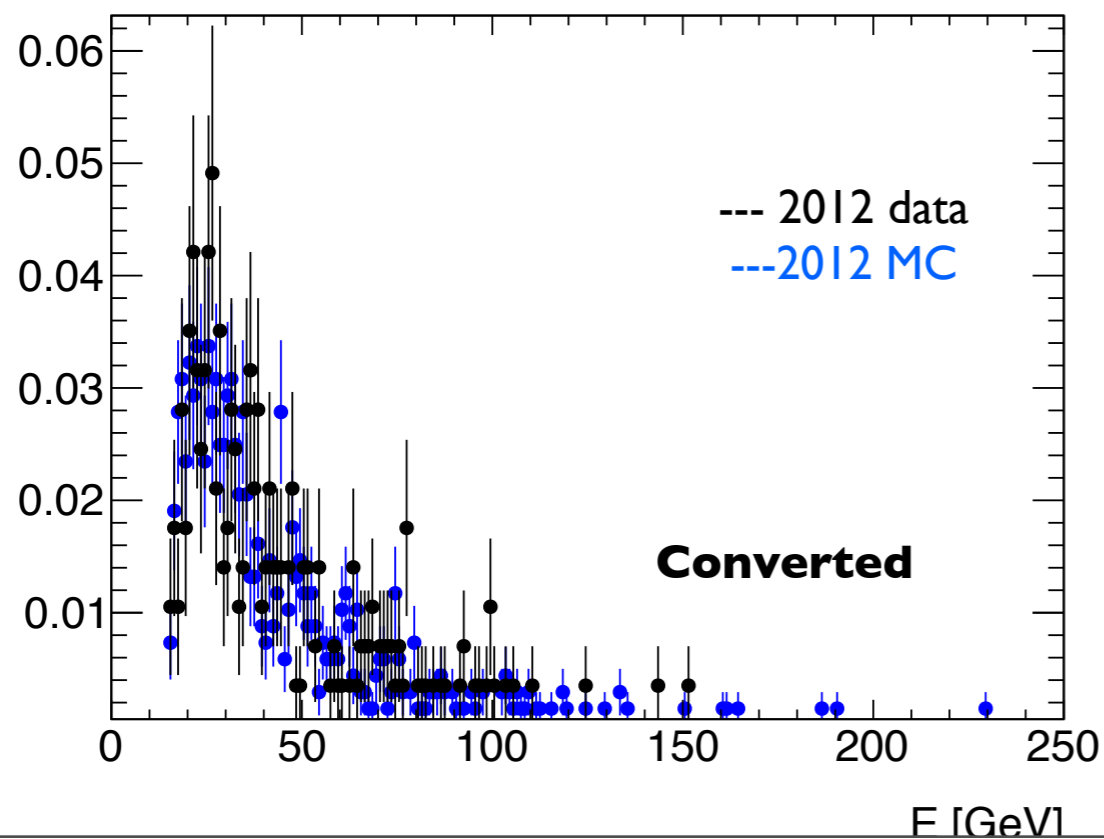
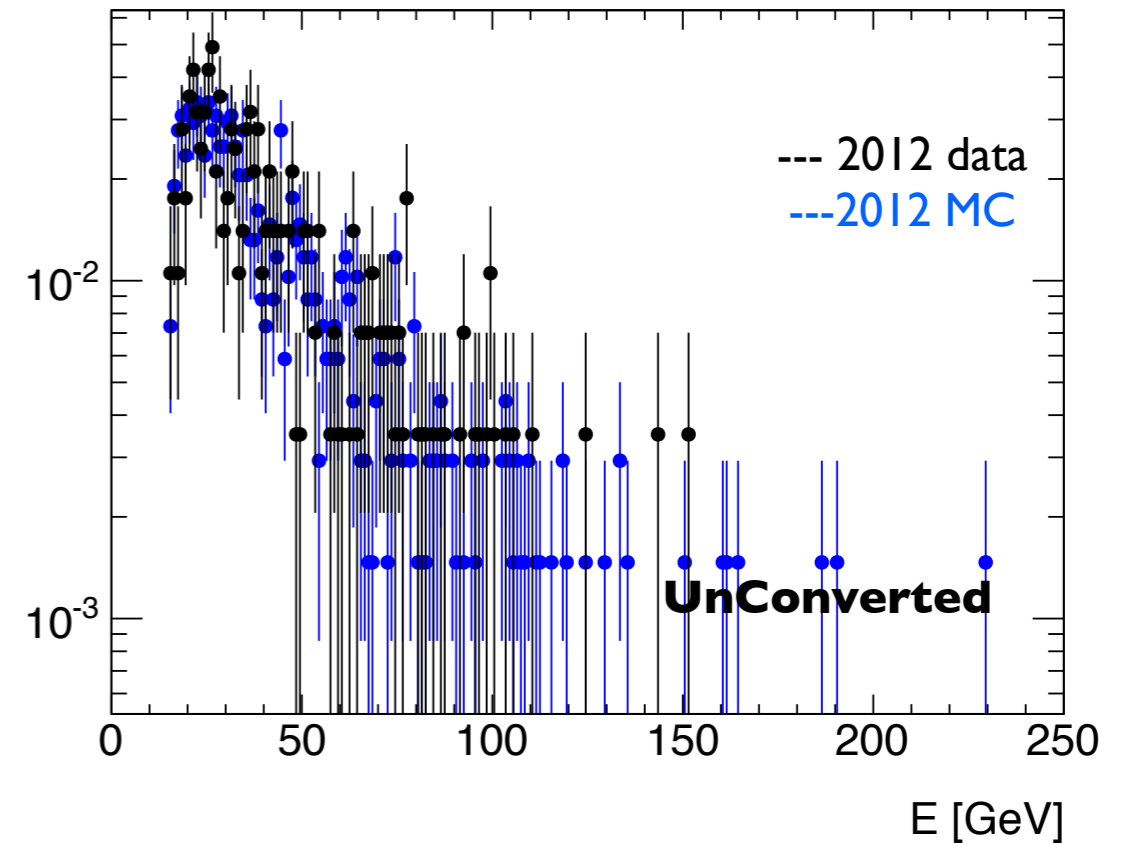
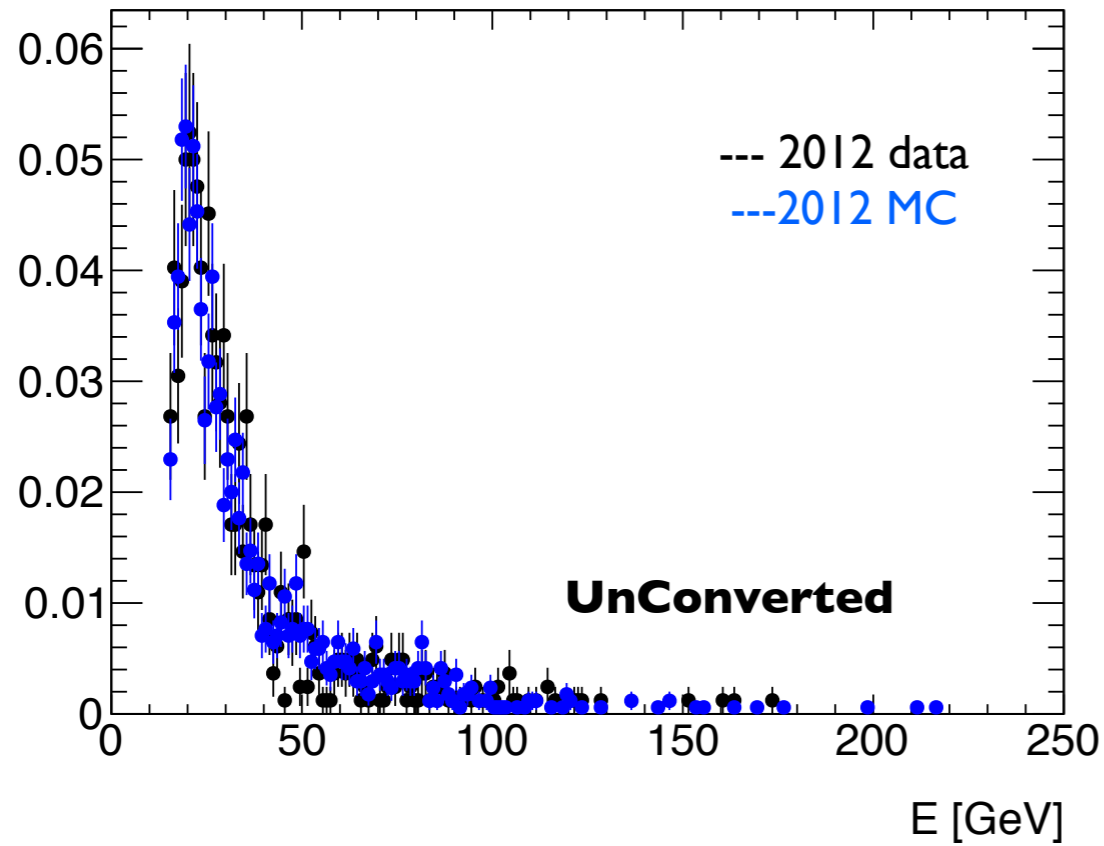


PART I: Conclusions

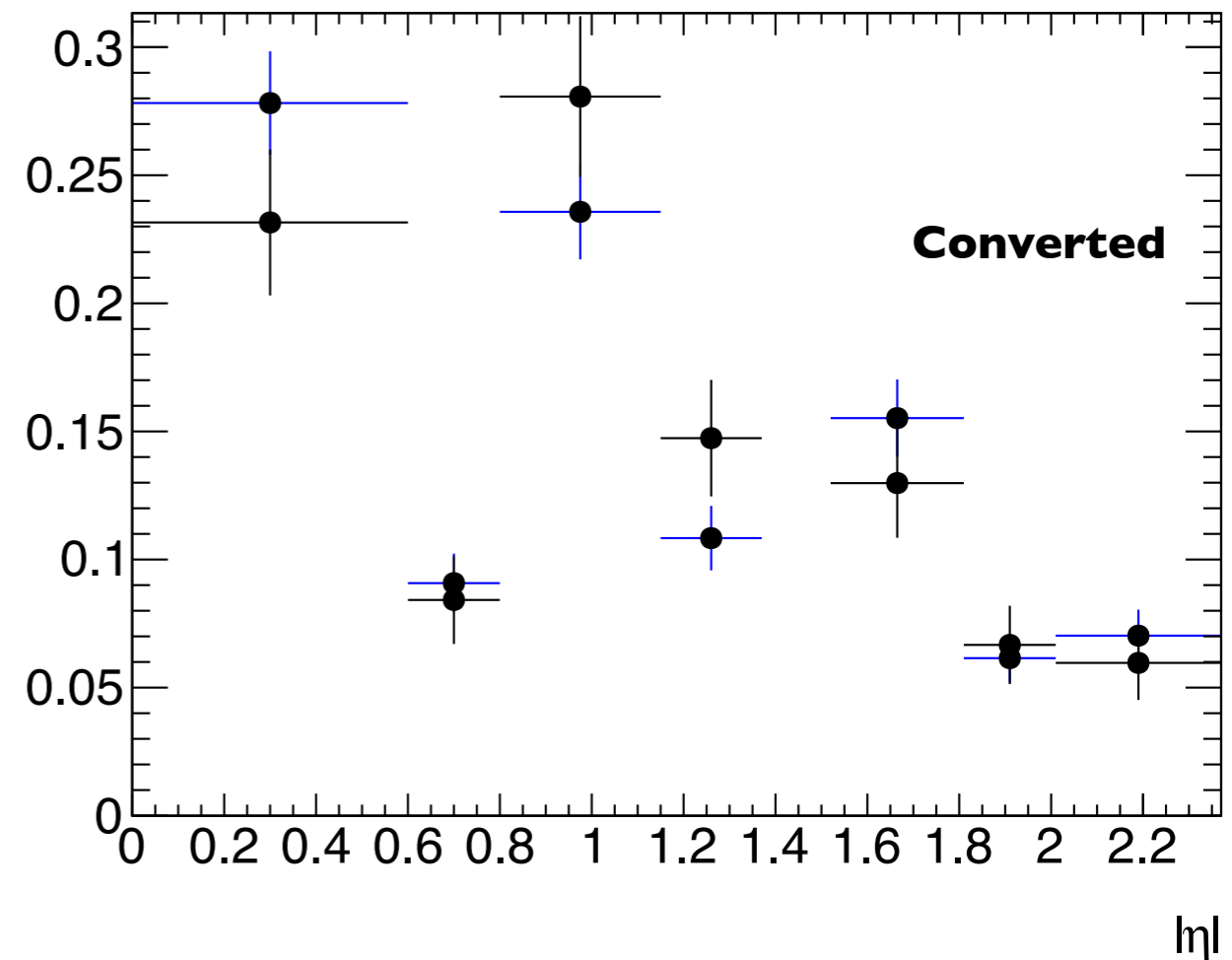
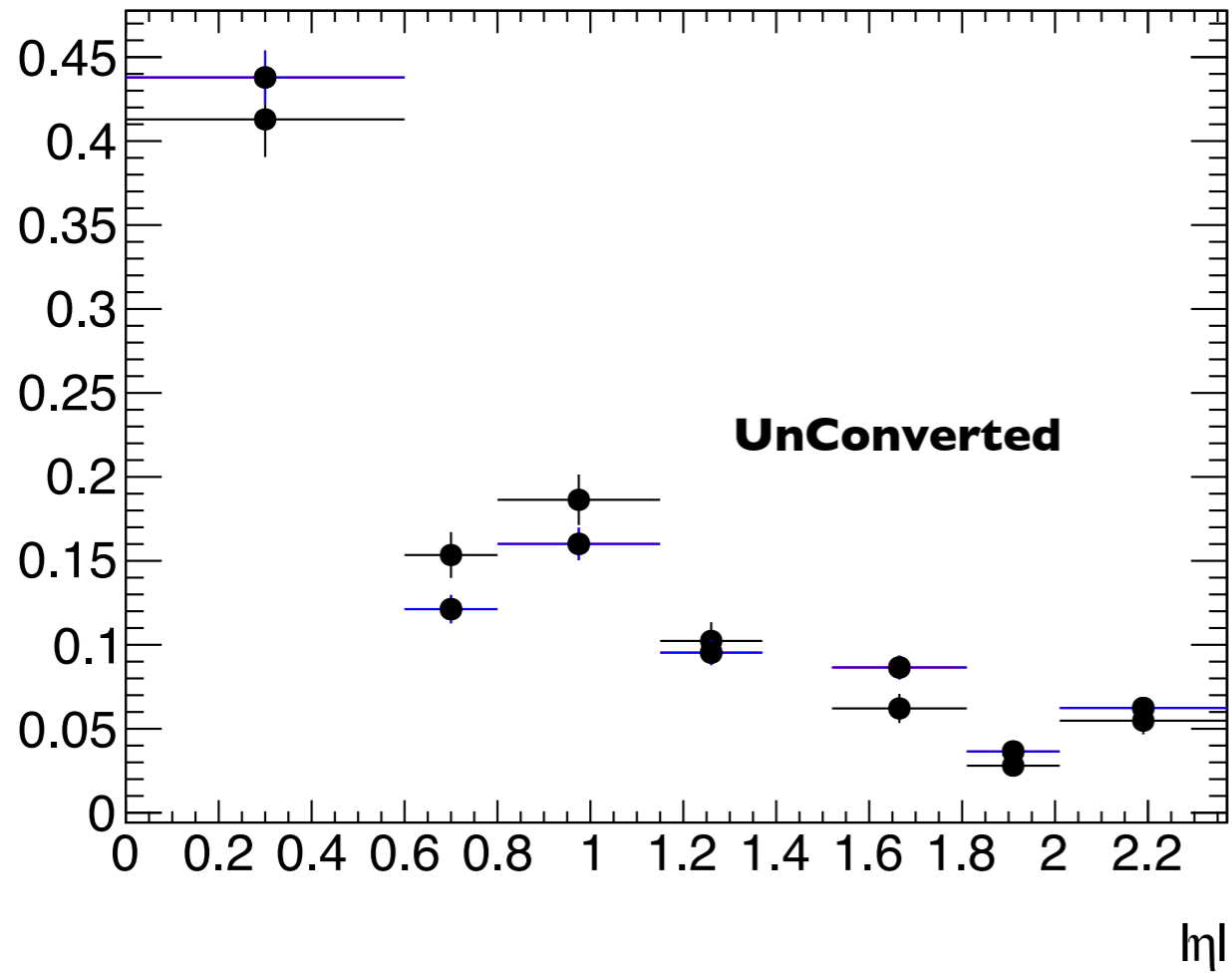
- First check at the Z to muon+gamma sample with 2012 data ($\sim 660 \text{ pb}^{-1}$)
- We observe a change in the fraction of unconverted photon ($6 \pm 1.7\%$) increase, (due to new 2012 reconstruction ??)
- With the current statistics it is difficult to see differences in the spectrum or eta distribution.
- Z peak was compared between 2011 and 2012, a shift is observed in the mean value, but within the statistical errors of the fit. The fitting technique could be revisited in the future.
- The resolution in 2012 peak seems bigger than 2011, but within the statistical errors.
- In 2011 the unconverted/converted mean value difference is of $(185 \pm 114) \text{ MeV}$, in 2012 is of $(840 \pm 371) \text{ MeV}$
- Still low statistics, and a lot of stuff needs to be understood. Work ongoing!

PART II
Quick Data/MC
comparison with ~ 1 fb $^{-1}$

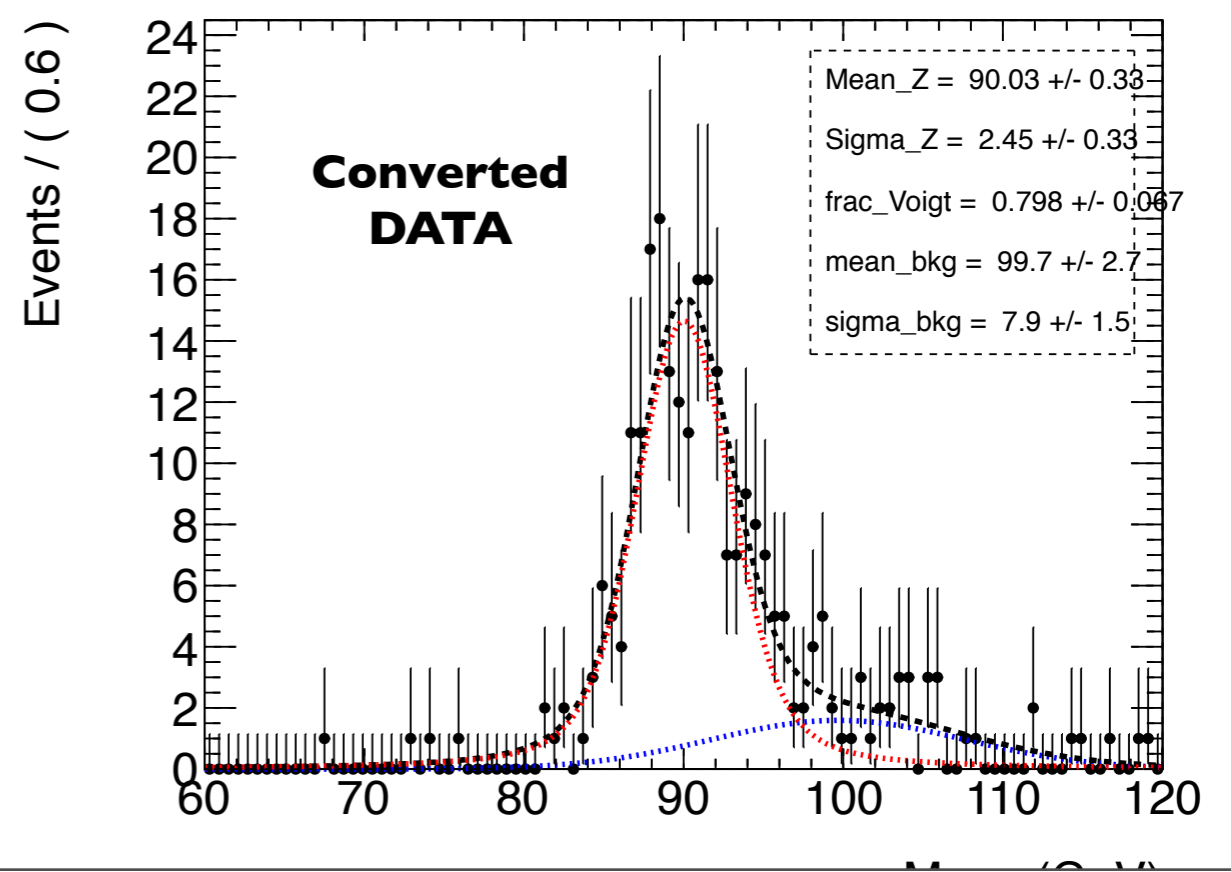
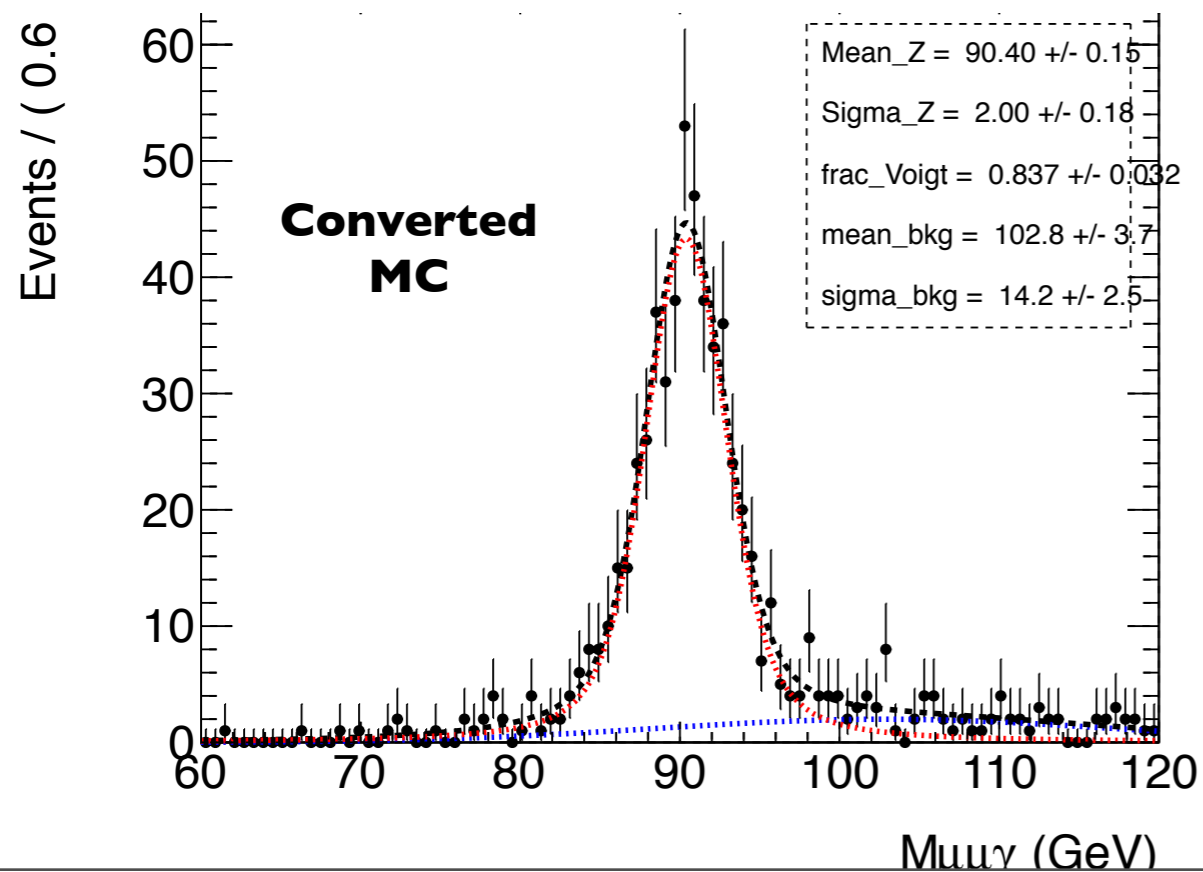
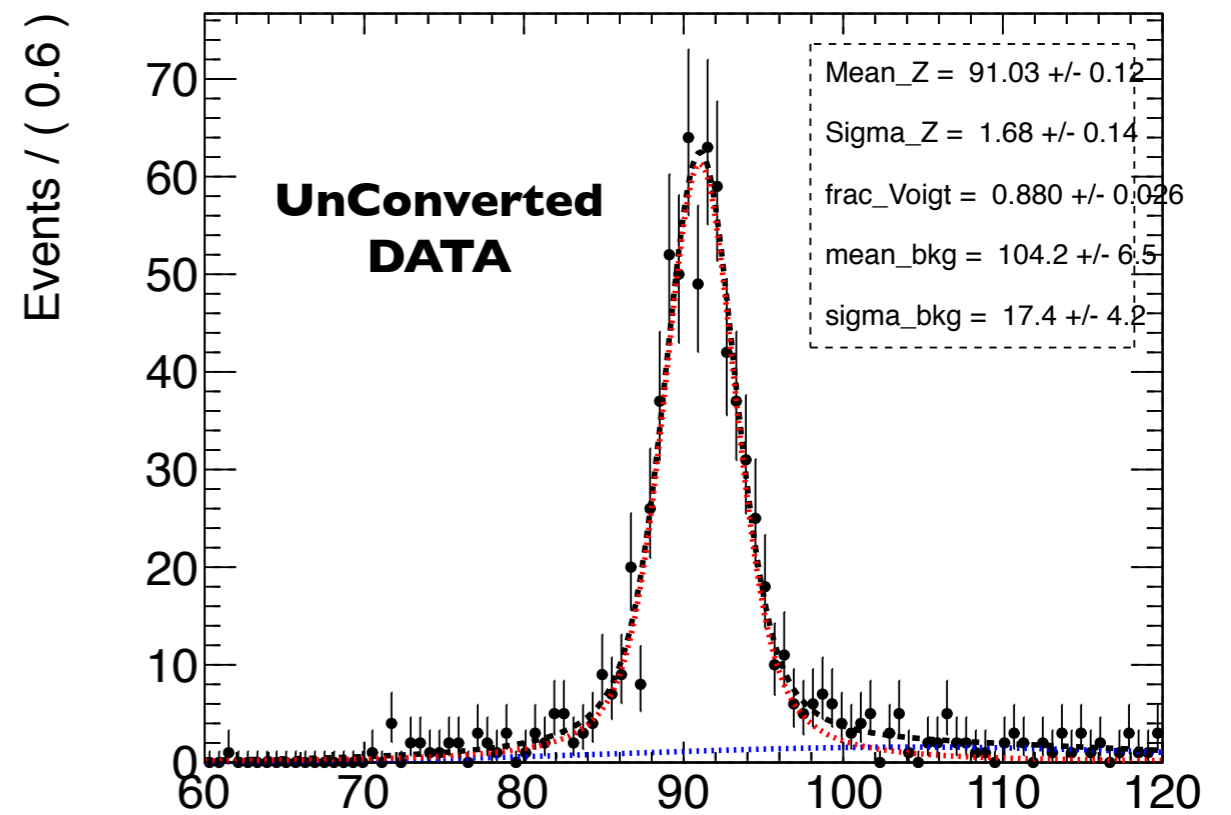
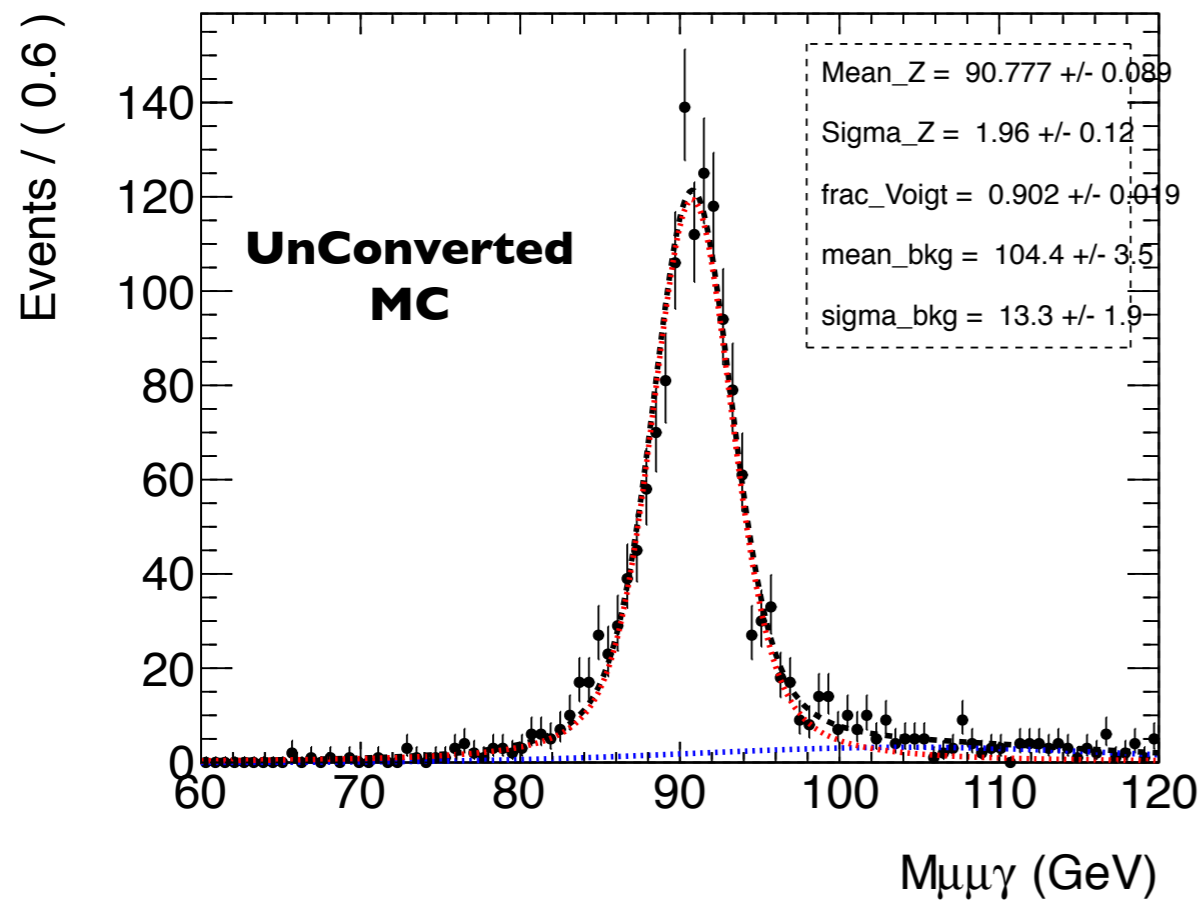
Photon Energy Comparison



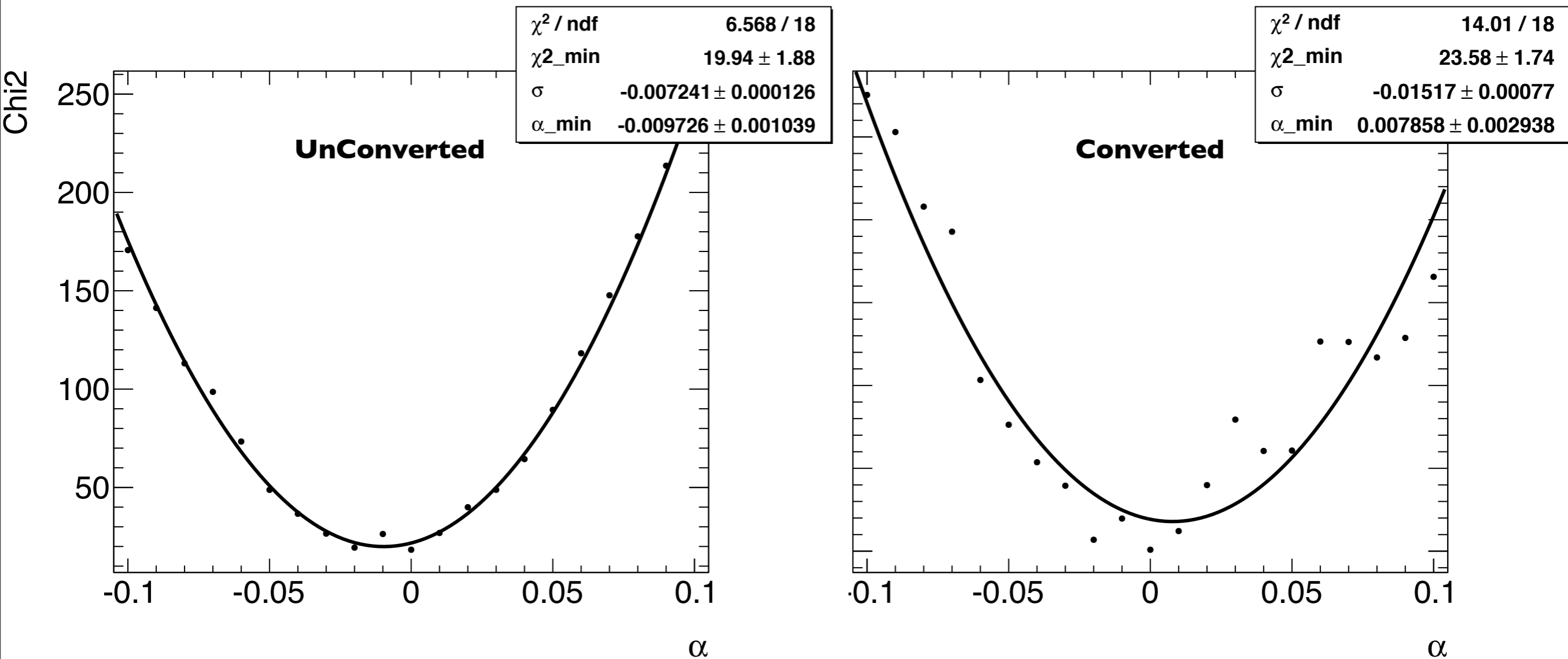
Photon Eta Comparison



Z $\mu\mu\gamma$ distribution



First α (photon scale) estimation



2011 results \rightarrow

$$\alpha_{\chi^2} = \begin{cases} 0.002 \pm 0.003 \text{ (stat.)} \pm 0.007 \text{ (sys.)} & \text{(unconverted)} \\ -0.011 \pm 0.006 \text{ (stat.)} \pm 0.007 \text{ (sys.)} & \text{(converted)} \end{cases}$$