

Curvature resolution smearing

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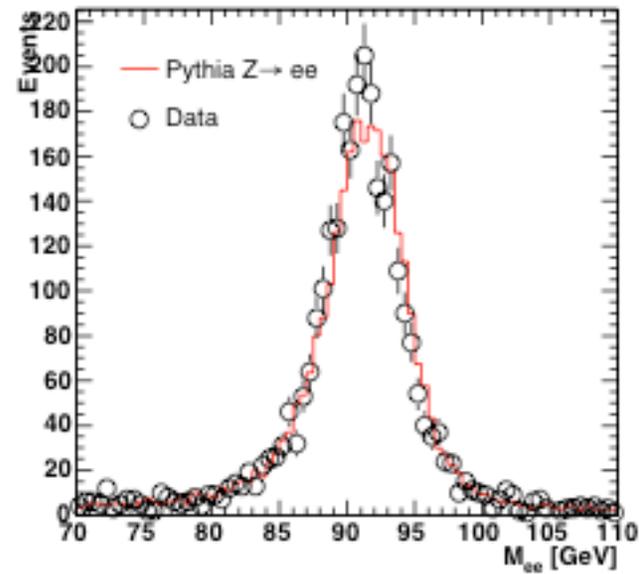
Samples & Selections

- Data: (throught Sept 2003)
 - topnt_Z-tight_gen5val_bhel0d [from Sal]
 - topnt_Z-tight_gen5val_bhmu0d [from Sal]
- MC:
 - topnt_tight_NewMC_531_Zee [Pythia] [from Eva]
 - topnt_tight_NewMC_531_Zmumu [Pythia] [from Mitch]
- Electrons:
 - pt > 20 GeV, Tight [CollType==1]
- Muons:
 - pt > 20 GeV, Tight [ViewType==1]

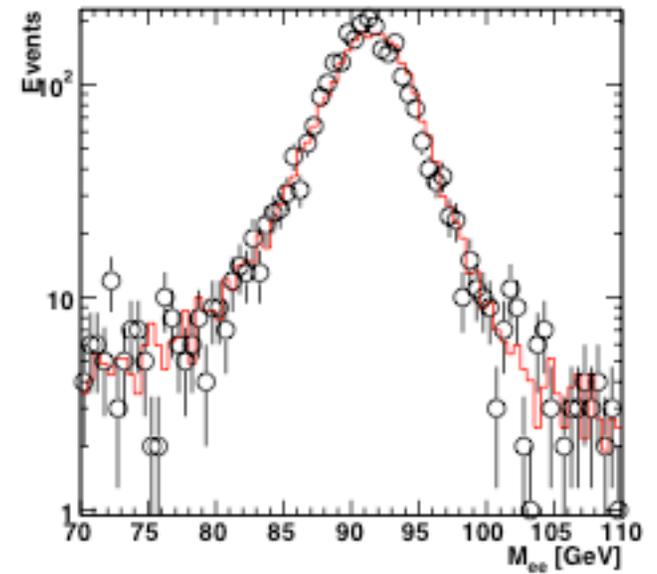
Leptons

Electrons

Central-Central Electrons

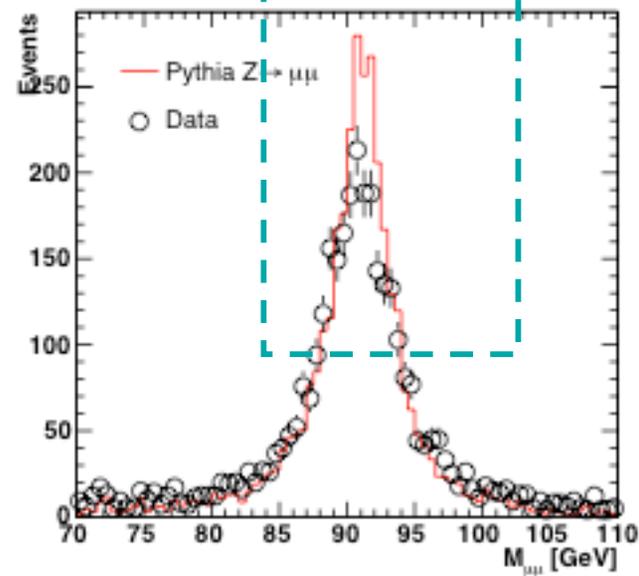


Central-Central Electrons

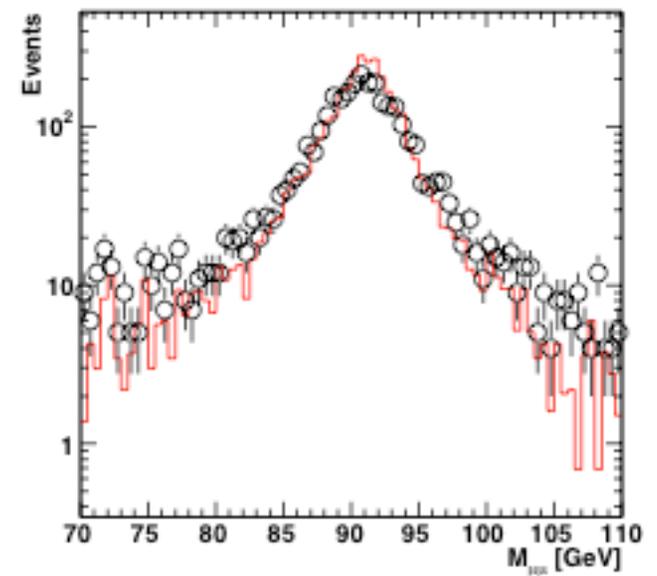


Normalization is relative

All Muons



All Muons



Muons

COT curvature correction for 5.3.1 applied

What is the cause?

- Muon momentum measured as P_T of track
- Misalignment causes shift in hit positions
- Smear hit positions to make data and MC agree
 - Make hit resolution $>\sim$ misalignment
 - Not ideal solution... “alignment will improve” -C.Hays
- Gen 4 MC
 - Misalignment larger (~ 200 microns)
 - Smearing done automatically
- Gen 5 MC
 - Misalignment smaller (~ 100 microns)
 - ***Smearing is left to user***

Smearing

Larger hit resolution would smear $1/P_T$

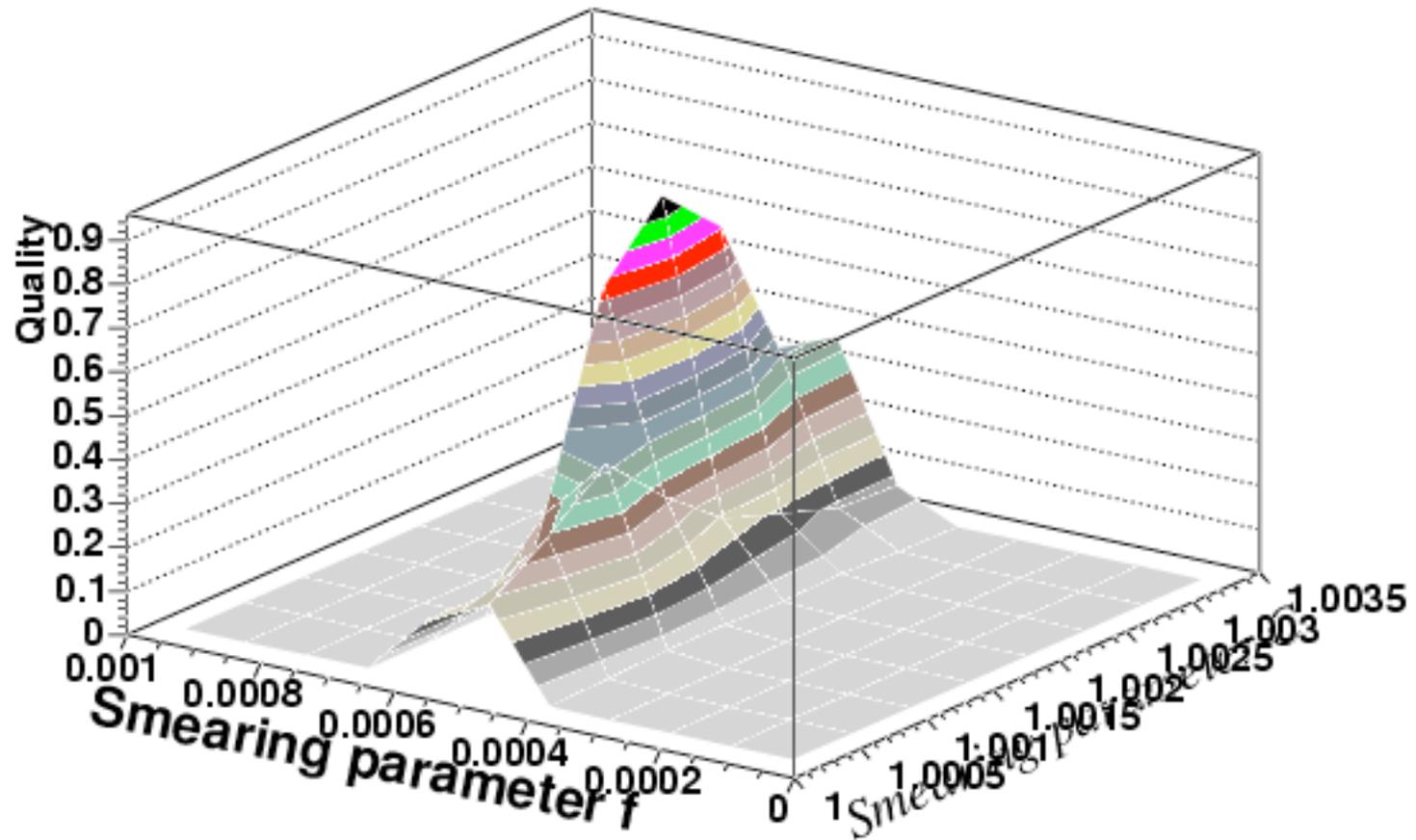
$$\frac{1}{p_T} \rightarrow \frac{C}{p_T} + f$$

C is a constant to describe a shift

F is drawn from a Gaussian of width f

How much smearing?

Effect of two parameters may be correlated, so study in 2D

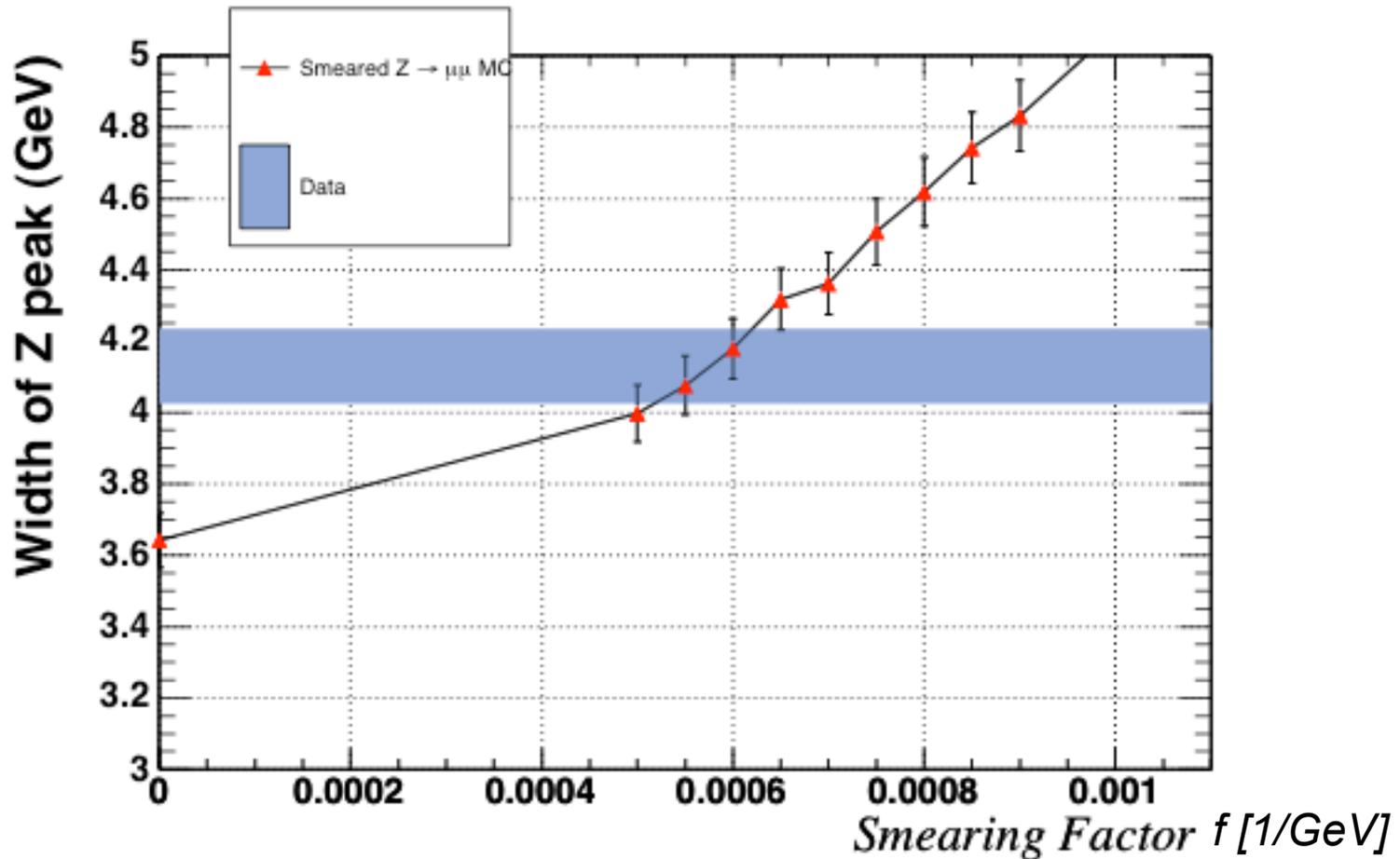


Quality is a chi-sq metric which compares Z mass and width in data and mc:

$$Q = e^{-\left(\frac{m_Z^{\text{data}} - m_Z^{\text{MC}}}{m_Z^{\text{data}}}\right)^2} e^{-\left(\frac{\Gamma_Z^{\text{data}} - \Gamma_Z^{\text{MC}}}{\Gamma_Z^{\text{data}}}\right)^2}$$

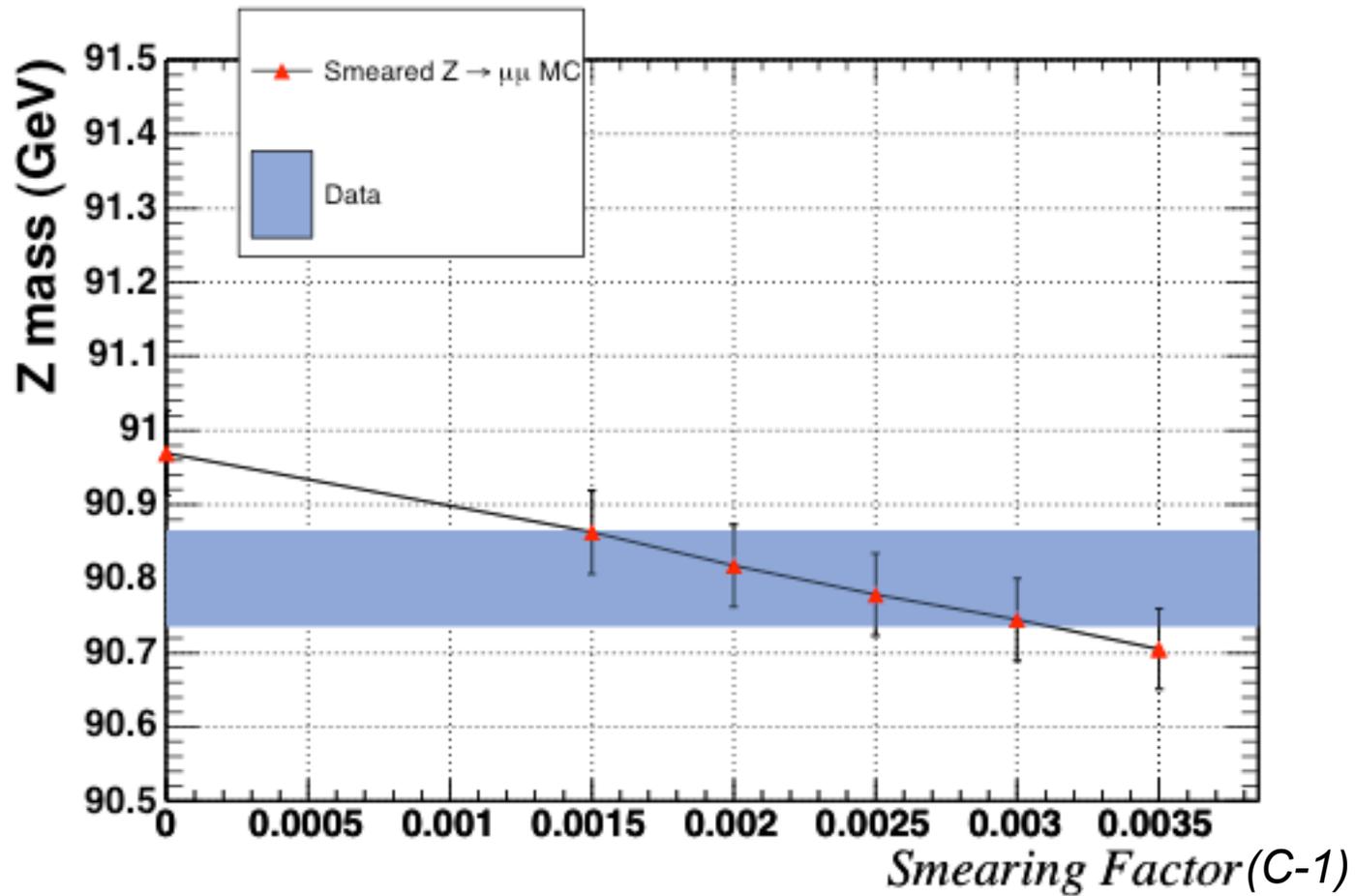
How much smearing?

$$f \sim 0.0006^{+0.000025}_{-0.0001} / \text{GeV}$$



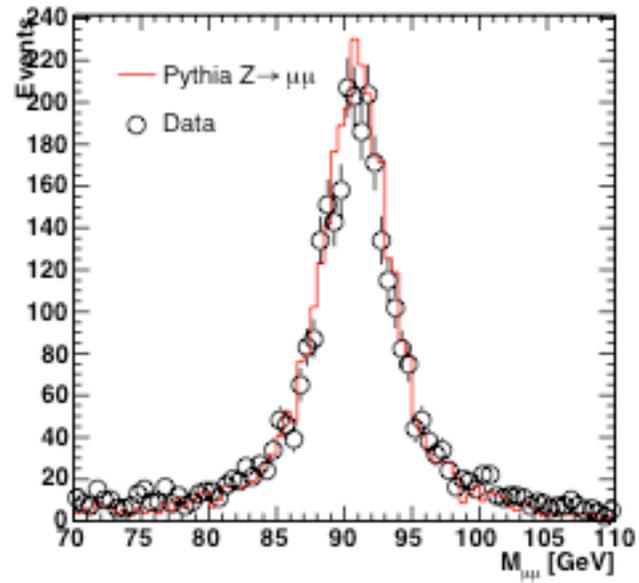
How much smearing?

$$C \sim 1.002^{+0.001}_{-0.0005}$$

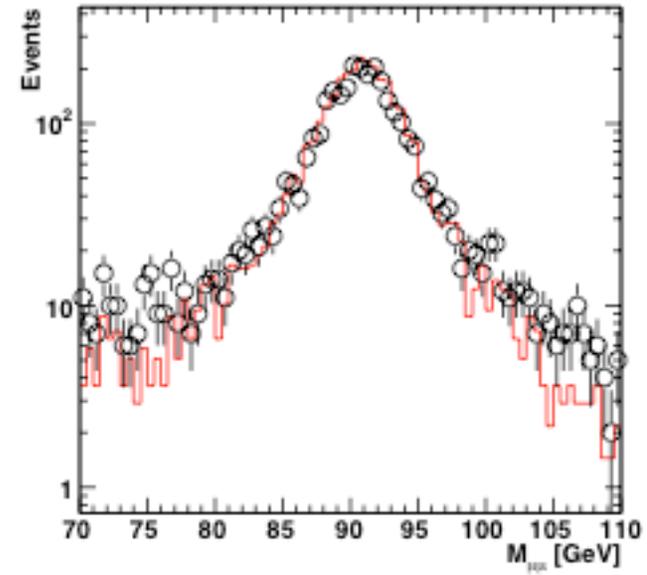


Smearred muons

All Muons



All Muons

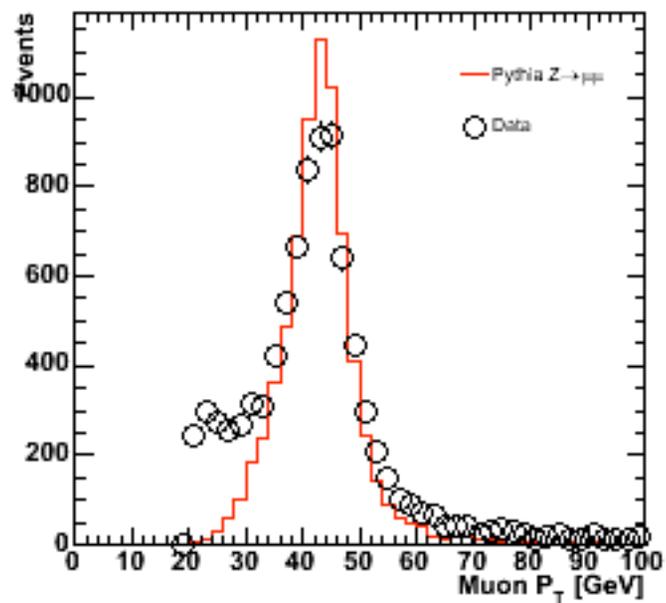


Data and MC with smearred muons in MC

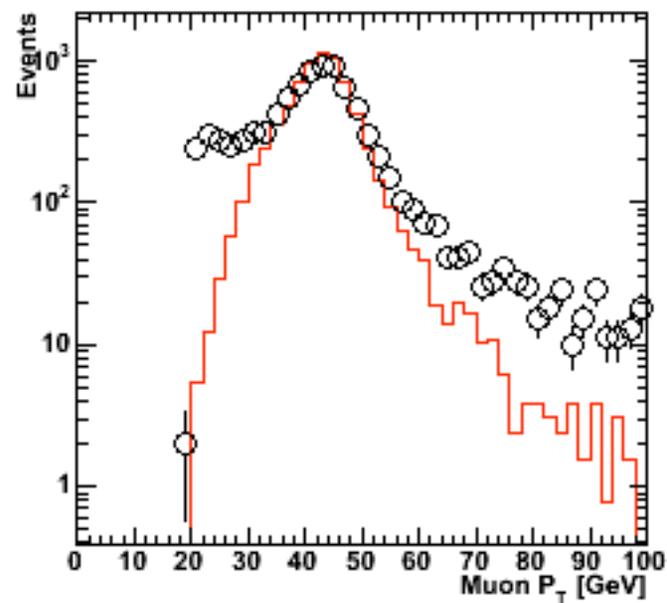
Pt spectrum

But does this solve the problem?

All Muons



All Muons



Muon pt spectrum has

-low shoulder (background?)

-high tail (alignment?)

Muon p_T range

Compare the Z mass for

Low p_T pairs

(both muons < 40 GeV)

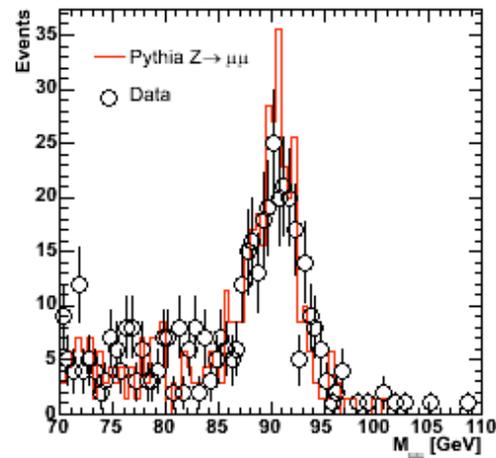
and

High p_T pairs

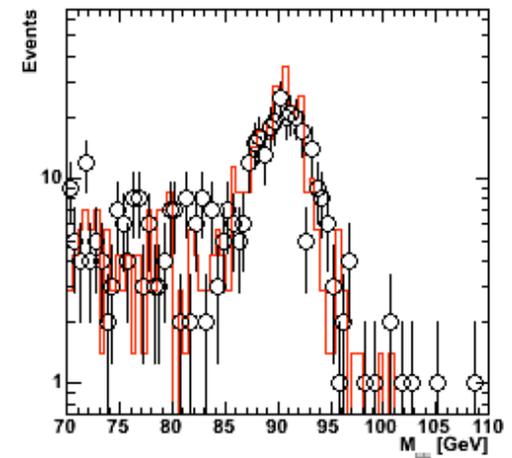
(both muons > 40 GeV)

And they look good.

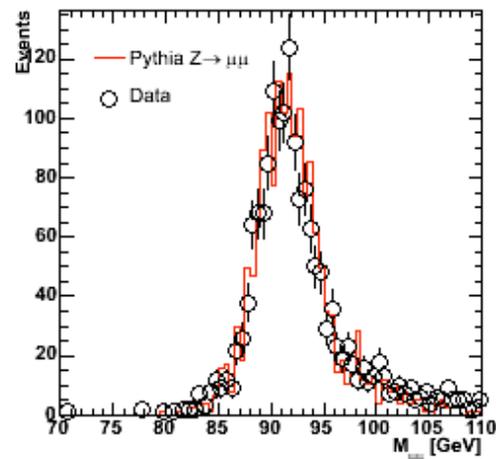
Muons $p_T < 40$ GeV



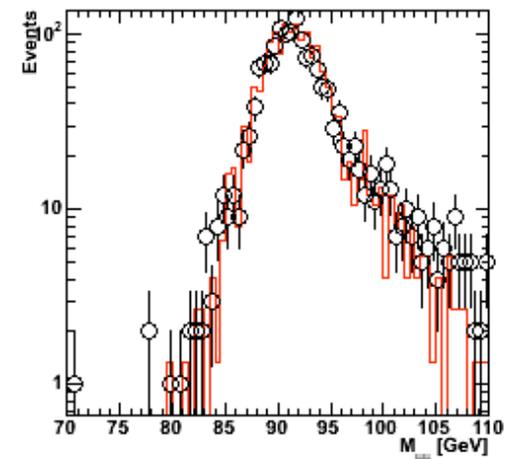
Muons $p_T < 40$ GeV



Muons $p_T > 40$ GeV



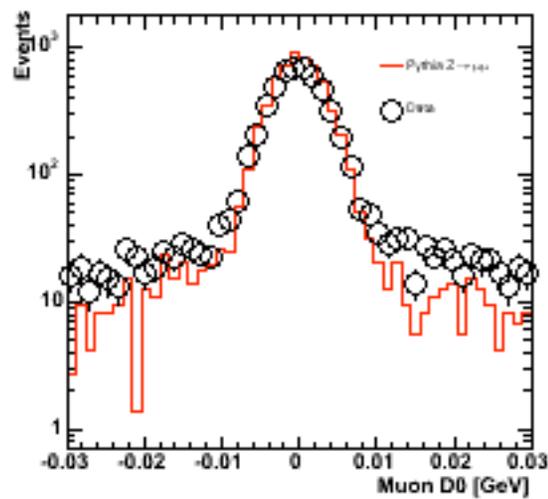
Muons $p_T > 40$ GeV



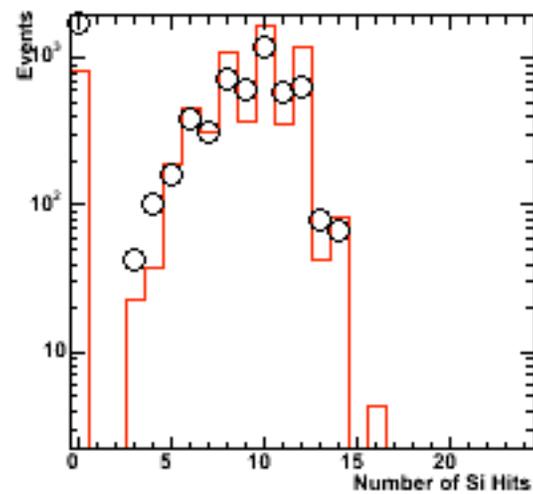
Track information

Comparison of track information

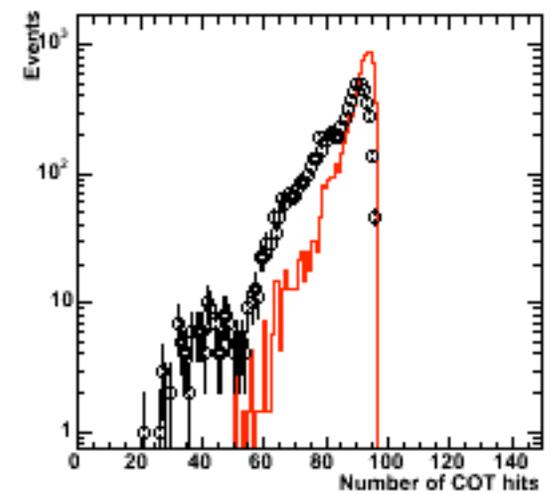
All Muons



All Muons



All Muons



Fewer hits in data than in MC.

Summary

- Track curvature is unrealistically good
- Smearing curvature directly makes Z width and peak agree nicely
- Is this a robust approach?