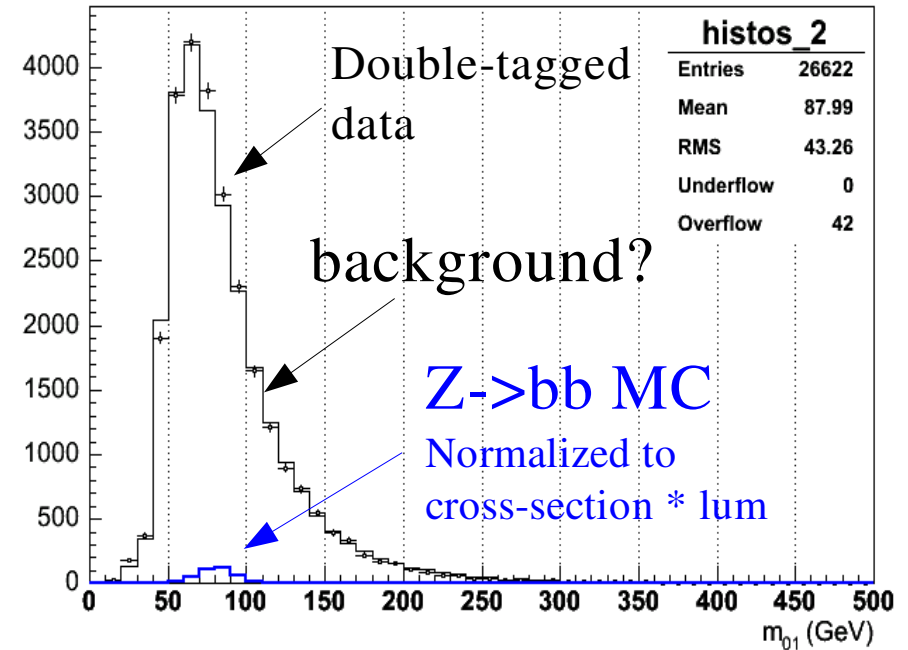


# Z->bb Studies / Overview

- *Objective:*  
*Find a good way of determining the background to Z->bb.*
  - *Must be determined from data!*
- *Two weeks ago I showed a new method, and tested it on:*
  - *A small Pass2 di-jet data set*
  - *The Pass1 multi-jet data set*
- *This week:*
  - *Full Pass2 di-jet data set...*
  - *Comparison of two  $d(\phi)$  cuts...*



*We're trying to pull a signal out of a HUGE background with low systematics... !!!*

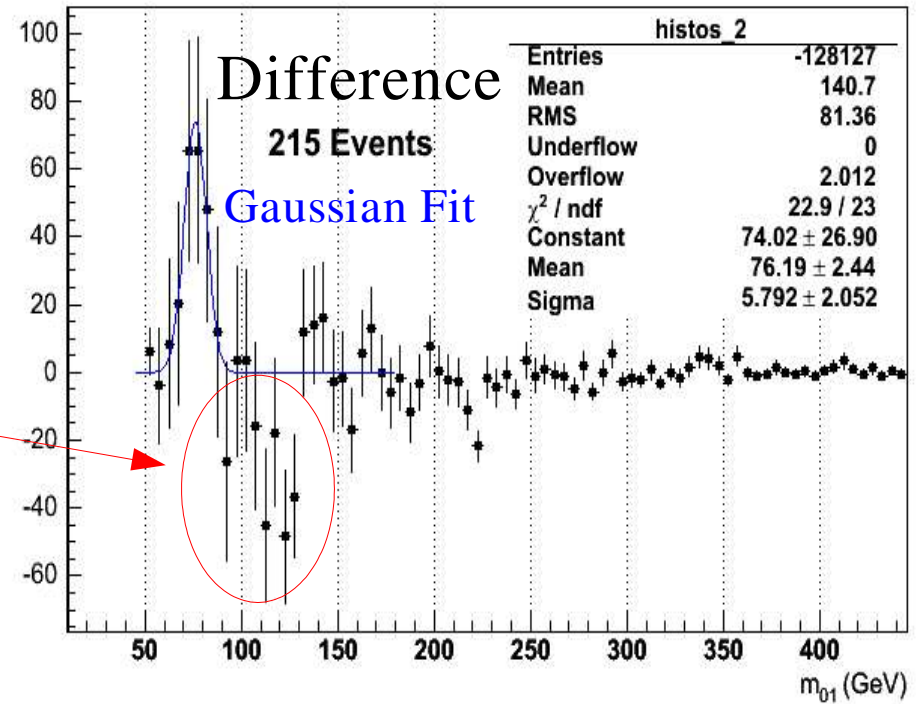
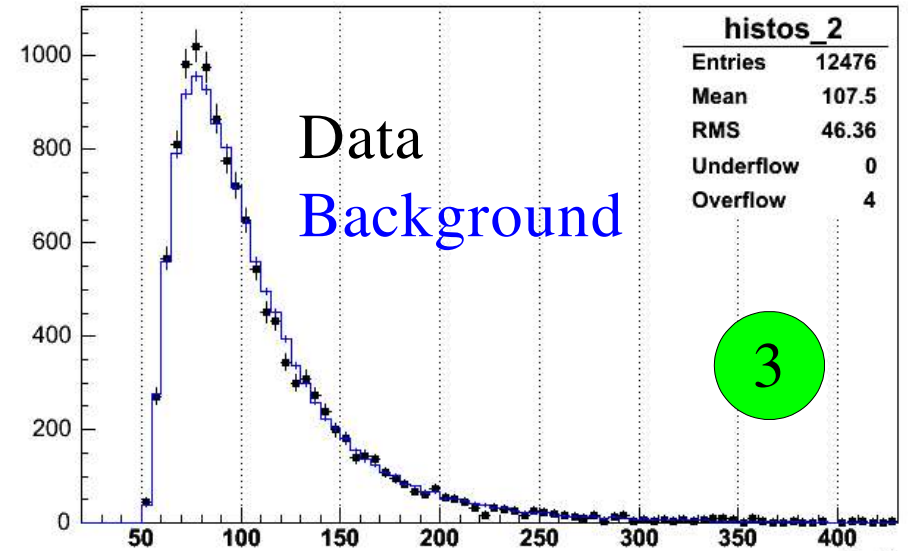
# A Heavy 2-jet Dataset

- I'm playing around with the following dataset:
  - “*BID*” skim – *PASS2*
    - Loose mu,  $p_T > 4 \text{ GeV}$
    - Matched to *JCCB* jet,  $d\mathcal{R} < .7$
  - *JES 5.3* (results shown include mu corrections)
  - 90M events -> *higgs\_multijet* rootuples
  - $\sim 350/\text{pb}$  ?
  - *Invariant mass spectrum looks pretty smooth*
    - *Many triggers are overlapped*
- *MC: Pass2 ->  $\sim 200k$   $Z \rightarrow b\bar{b}$ ,  $\sim 200k$   $b\bar{b}$*
- *I wasn't able to update all the plots in this talk with the full dataset in time...*
  - *Most plots here are for  $\sim 100/\text{pb}$  of data*



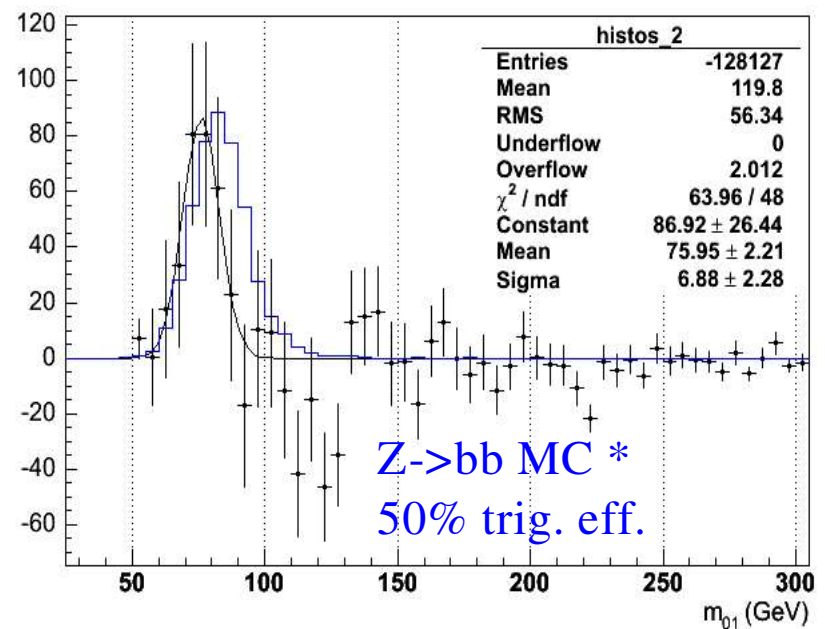
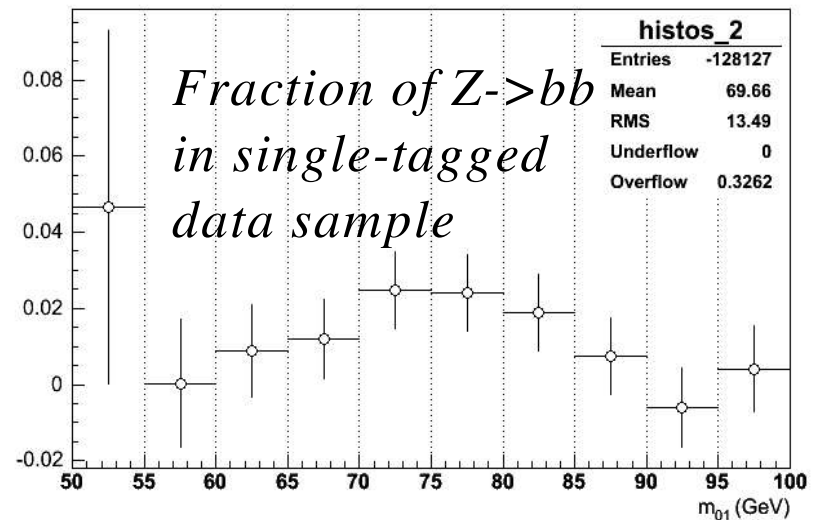
# TRF Method (cont.)

- What were the assumptions?
  - There's no  $Z \rightarrow b\bar{b}$  in the single-tag sample
    - Wrong, but we can correct for this !
- Inv. mass spectrum of the  $cc/b\bar{b}$  background is the same as that of the light QCD background
  - This depletion indicates a shift?
  - We can correct for this by comparing to the  $d(\phi) < 2.9$  data sample



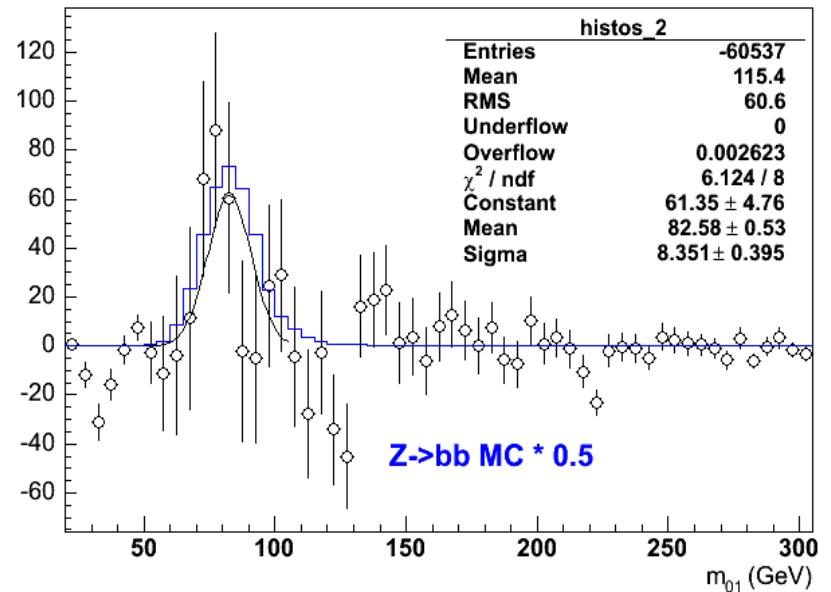
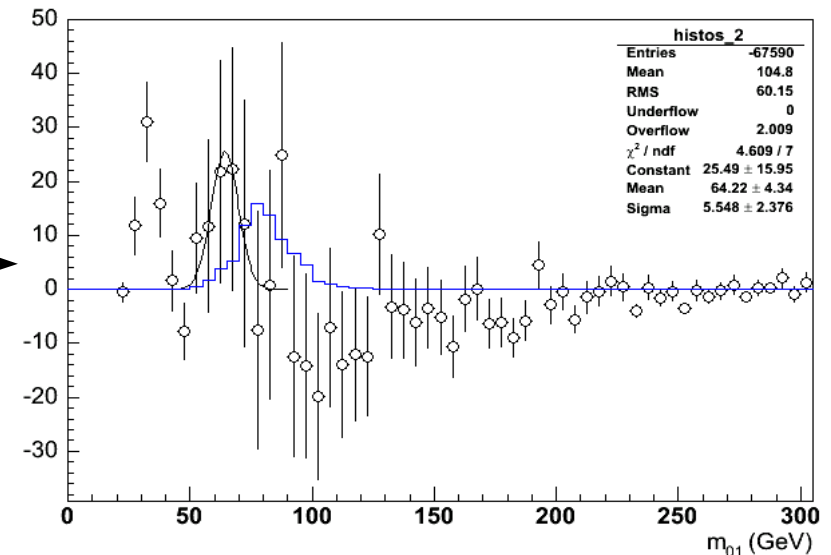
# Z TRF Correction

- Initial Z peak measured in data
- Get ratio of Z peak size in single/double-tag Z->bb MC (~6.5)
- Scale initial Z peak back to the amount of Z->bb expected in the single-tagged data
- Re-calculate the TRF after subtracting expected single-tagged Z peak from the single-tagged data
- Re-apply the new TRF to the single-tagged data



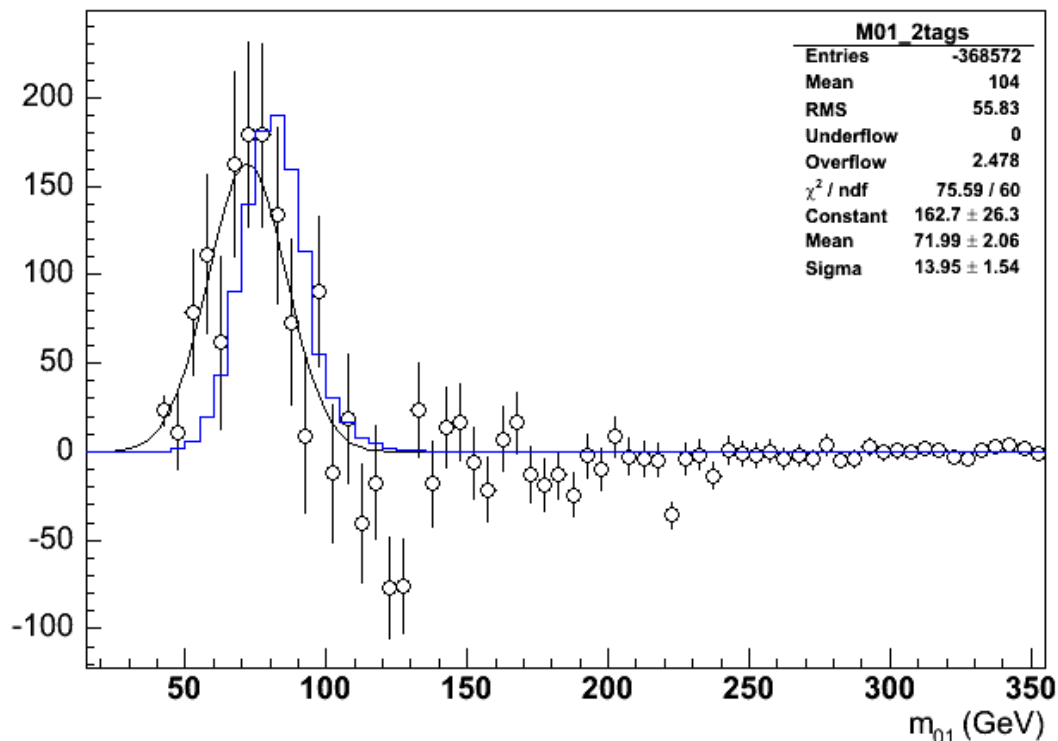
# Comparison to $d(\phi) < 2.9$ data

- There is less  $Z \rightarrow bb$  (lower  $S/B$ ) in  $d(\phi) < 2.9$  data
  - $Z \rightarrow bb$  peak should be smaller
  - Background effects, like from differences in the  $bb/cc$  vs. QCD  $inv.$  mass spectrum, should not be reduced (maybe even increased)
- We can use the difference in shape between the  $\pm d(\phi) = 2.9$  cut to correct for background biases...
  - This is the difference between the two  $d(\phi)$  cuts



# Full Pass2...

- *I have rootuples for all of Pass2 but the analysis is not completely done for them*
  - *Have to re-derive a TRF's, corrections, etc.*
  - *Needs to be more automated!*
- *Here's the result for  $d(\phi) > 2.9$* 
  - *I' also lowered the  $p_T$  cut from 25 to 20 GeV*
  - *I' not yet compared to  $d(\phi) < 2.9$  and made the necessary corrections!*



→ *Should be compared to step 4...*

# Summary

- *Full Pass2 data set has been analyzed*
  - *Z peak in  $d(\phi)>2.9$  is larger than in  $d(\phi)<2.9$*
- *It needs some more work...*
  - *What are the systematic errors involved?*
    - *How dependent are the results on the exact TRF method used?*
      - *Bin sizes, number of eta regions, etc. ???*
  - *What's the trig. eff. for Z->bb, averaged over all Pass2 data?*
    - *Can we use the Andre trick ? :*
      - *Take the amount of bb in inv. mass region of Z collected on a known trigger with known lum. and known Z->bb eff.*
      - *Find the amount of expected Z->bb collected on that trigger*
      - *Ratio of Z->bb to bb should stay the same for all triggers*
- *This method could be an important cross-check of results obtained with the CDF-method*