Status of tt bar full hadronic decay studies @ 500 GeV

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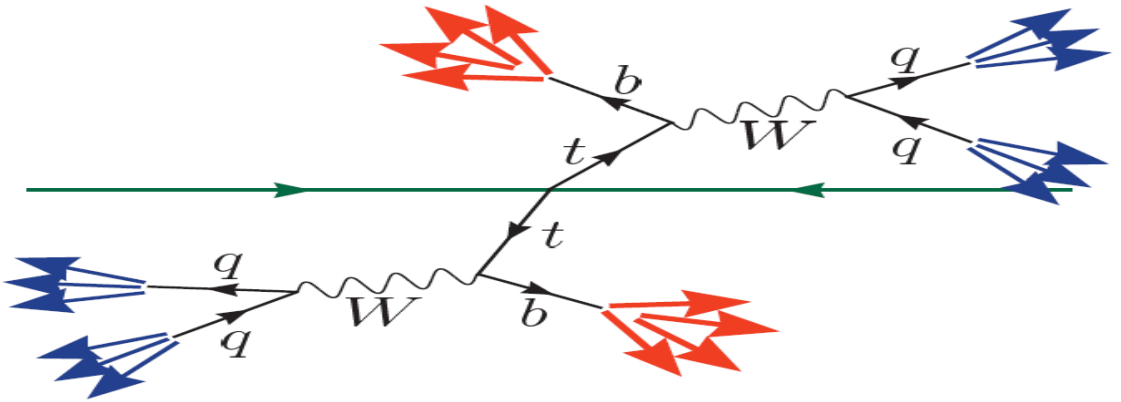
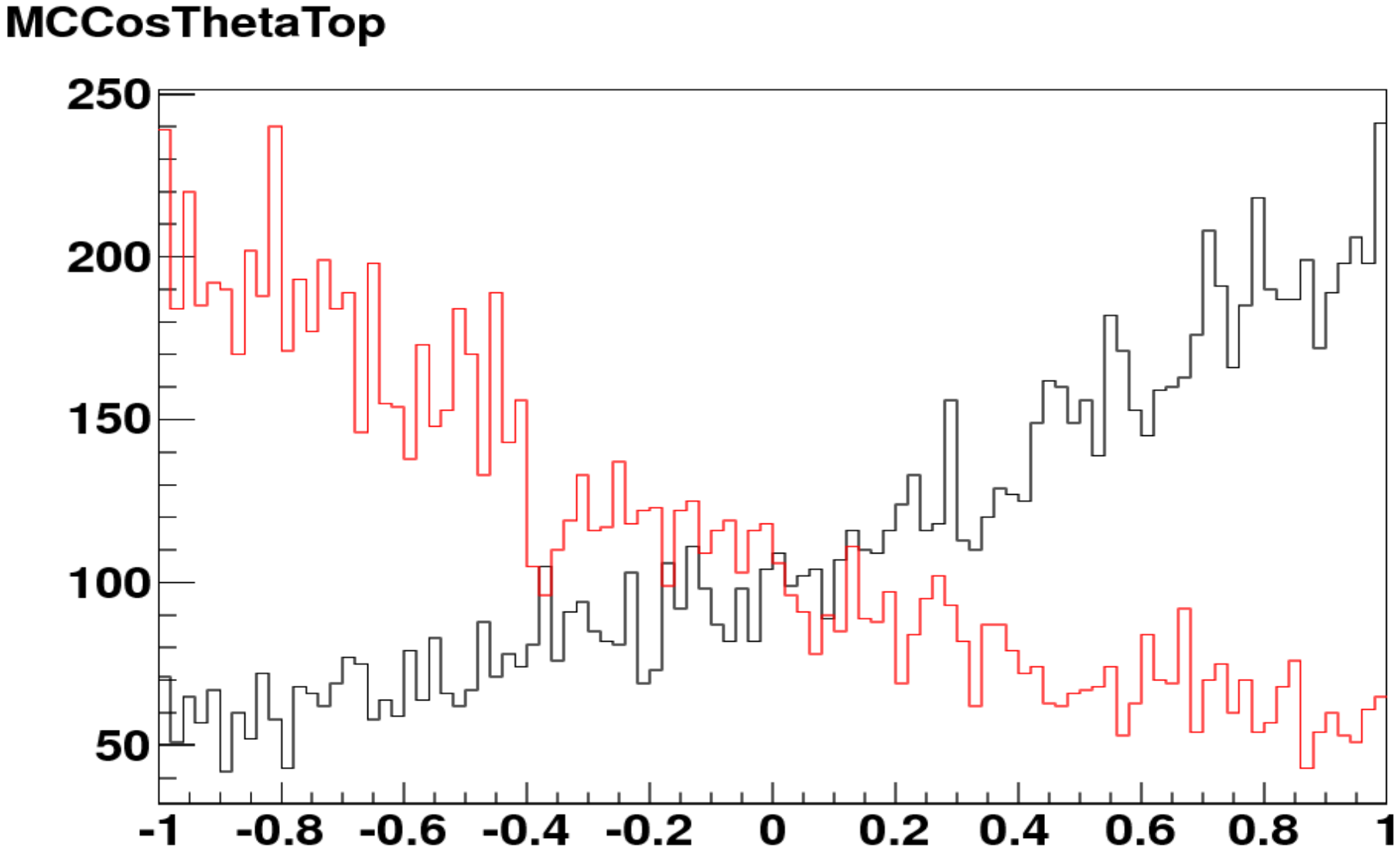
Background

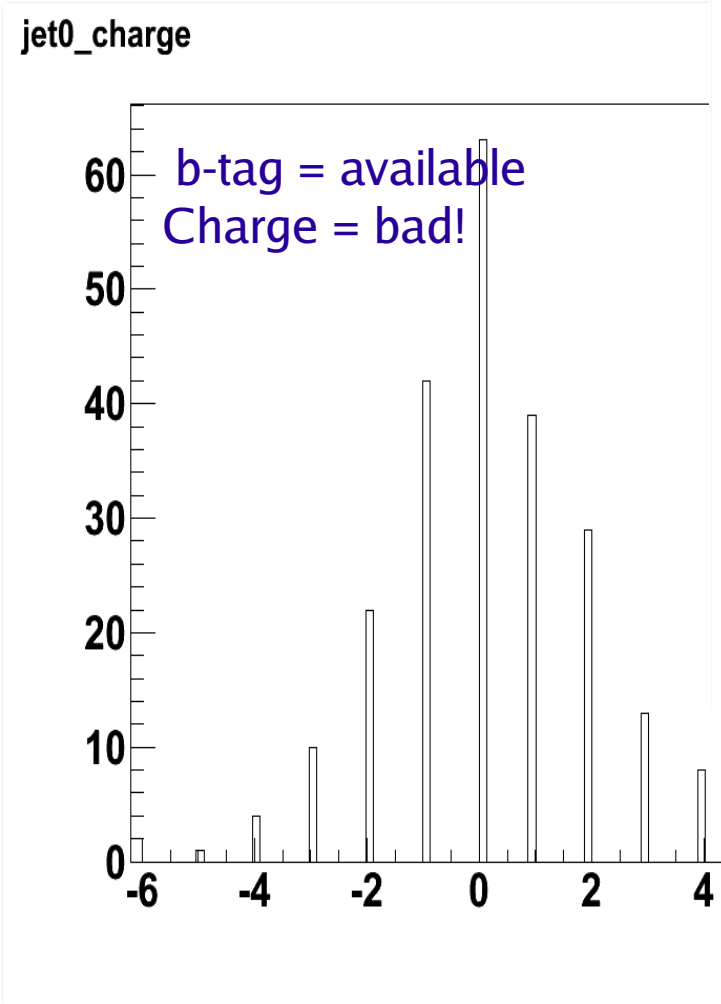
- The aim of studies is to study the Forward/Back Asymmetry in the fully hadronic channel.
- I use DBD samples at 500 Gev with ILCSoft(v01-16) and LCFIPlus (v00-05-02).
- Selecting only the signal events, using MCTruth.

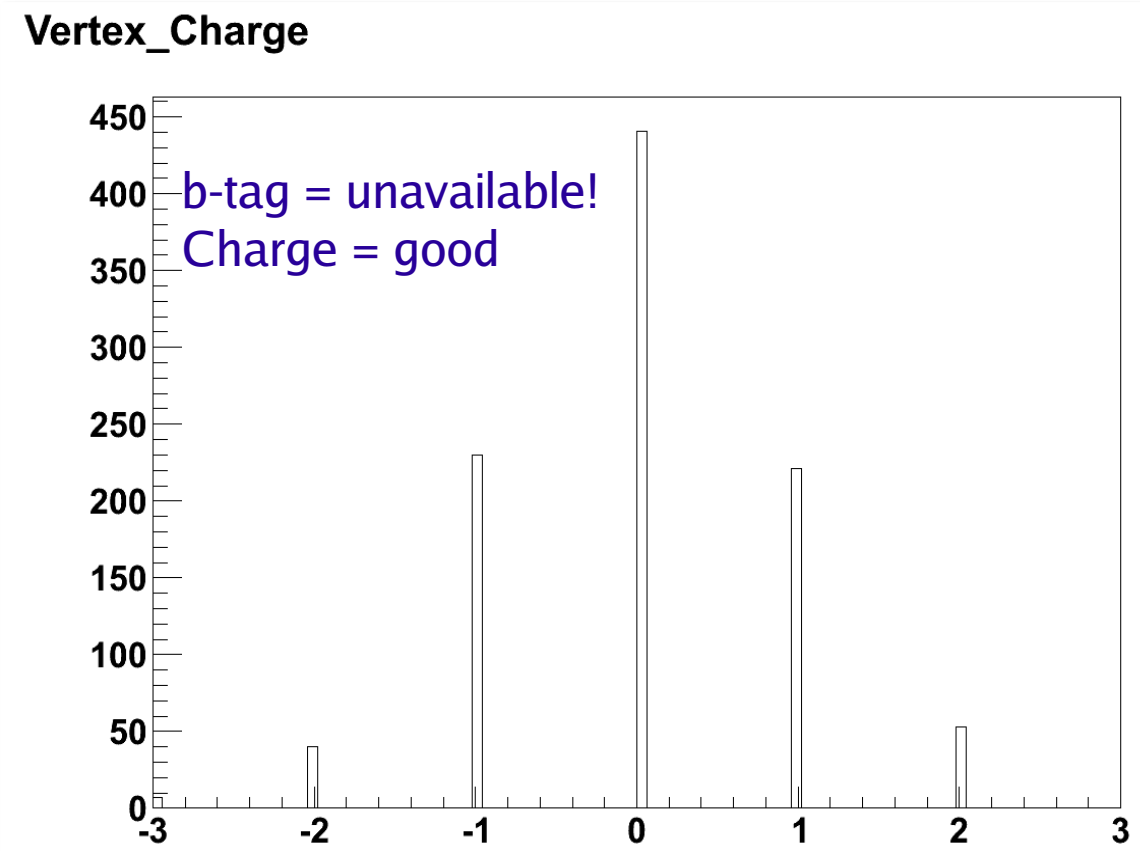


Forward/Back Asymmetry



Jet Charge & Vertex Charge

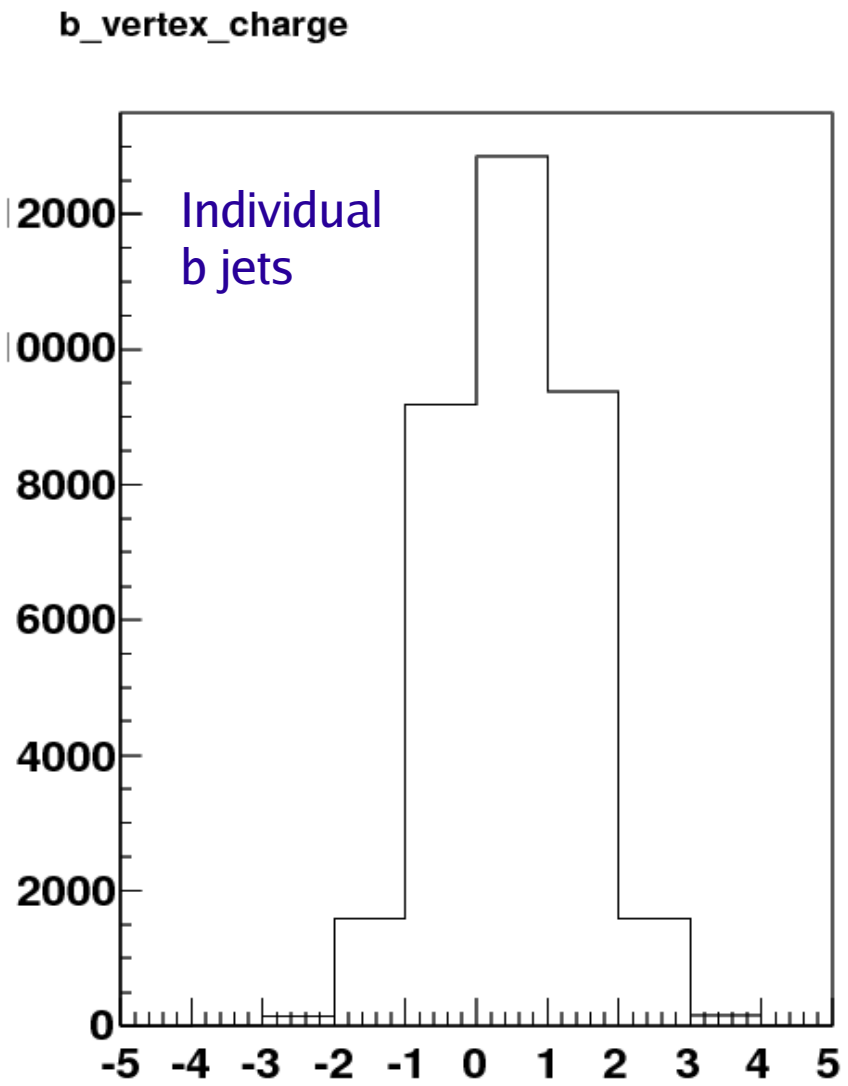


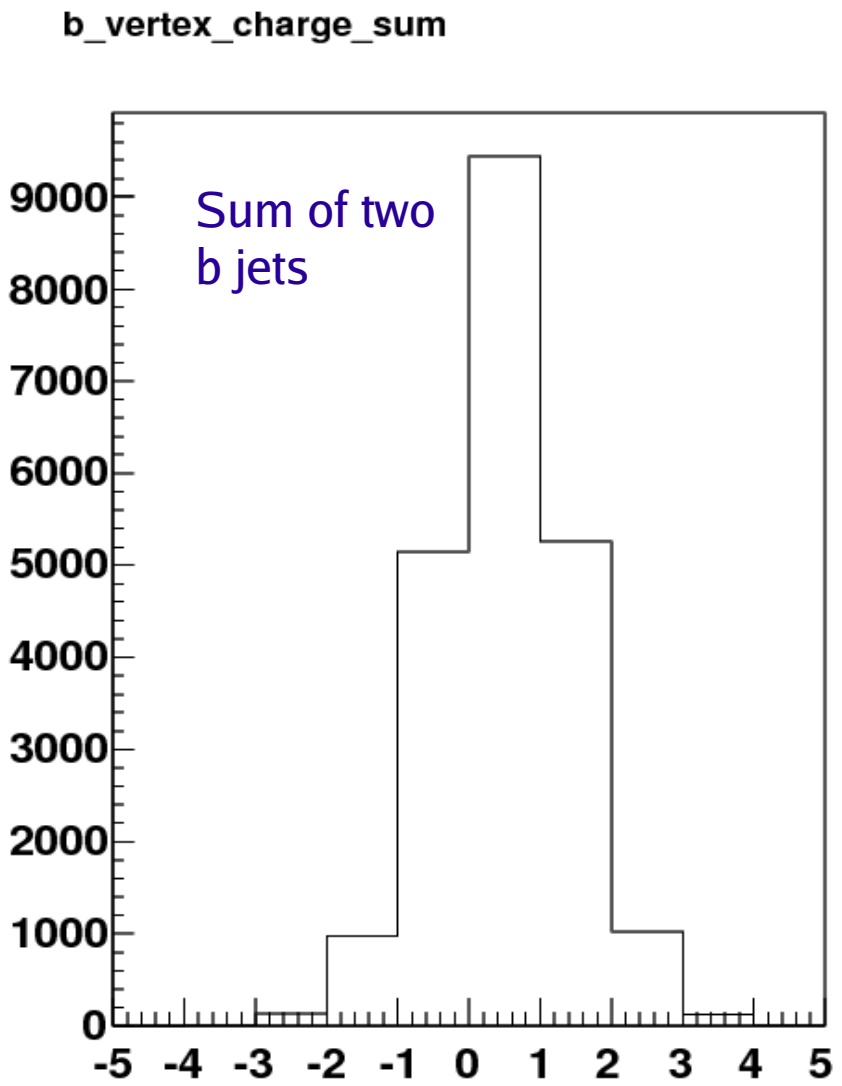


Way out !!!

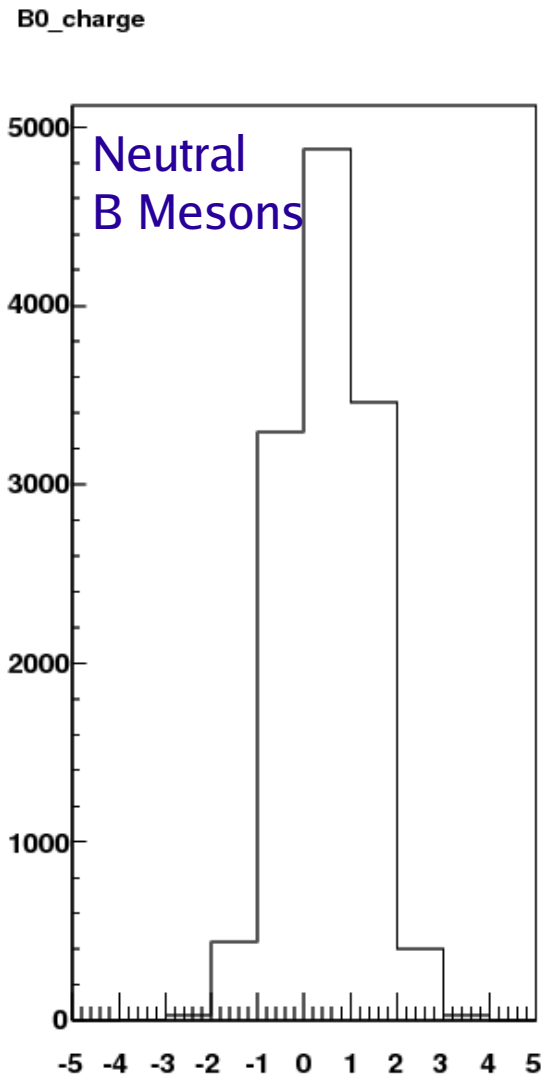
- Information on b-tag contained in RefinedJets.
- 'Reliable' information on charge is at Vertex.
- PIDHandler doesn't work at Vertex.
- Use LCRelation to make a connection between b-tag and Charge of jets.
- Use MC Information to verify the sign of charge.

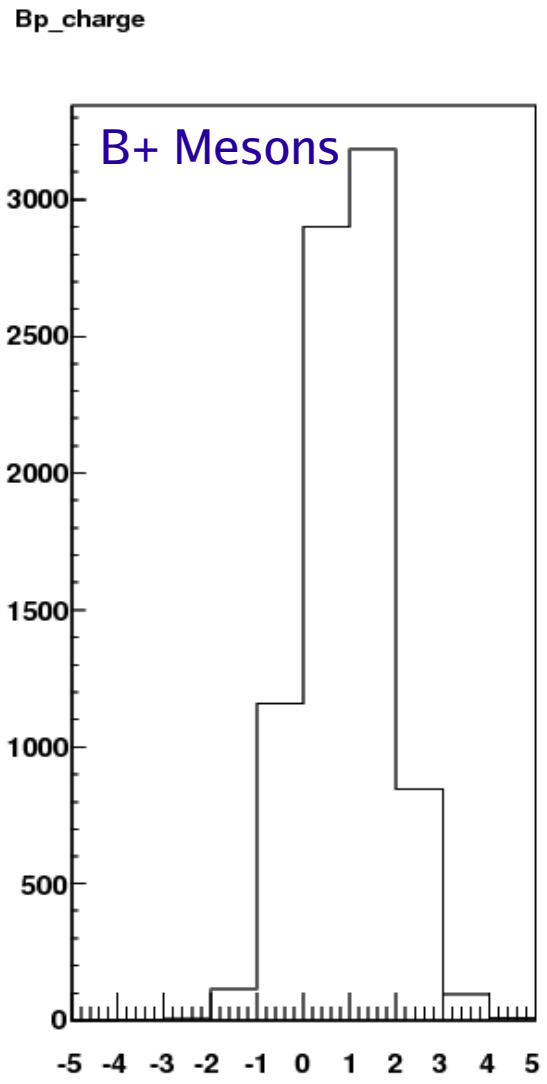
Vertex Charge & Sum at Vertex

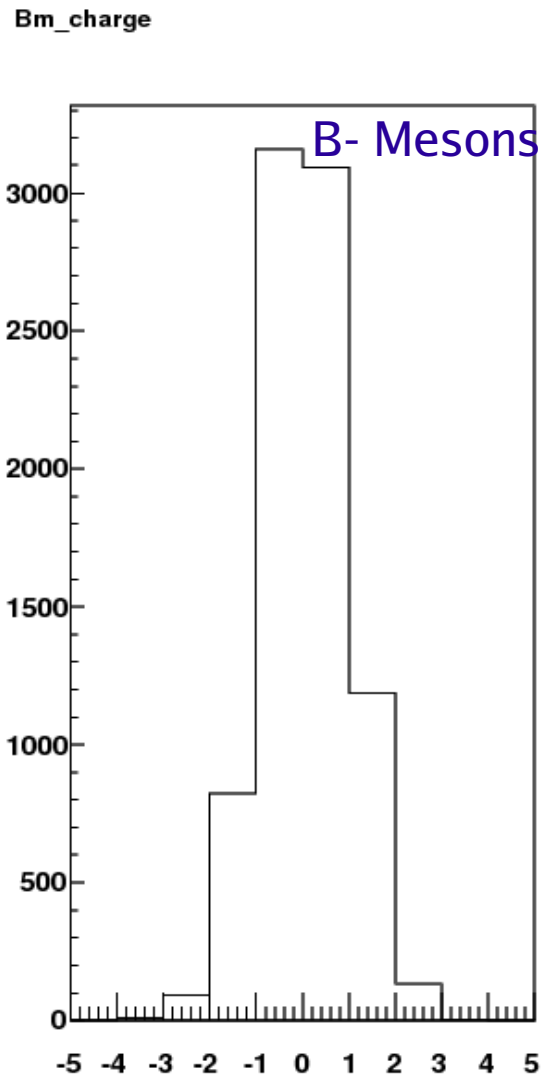




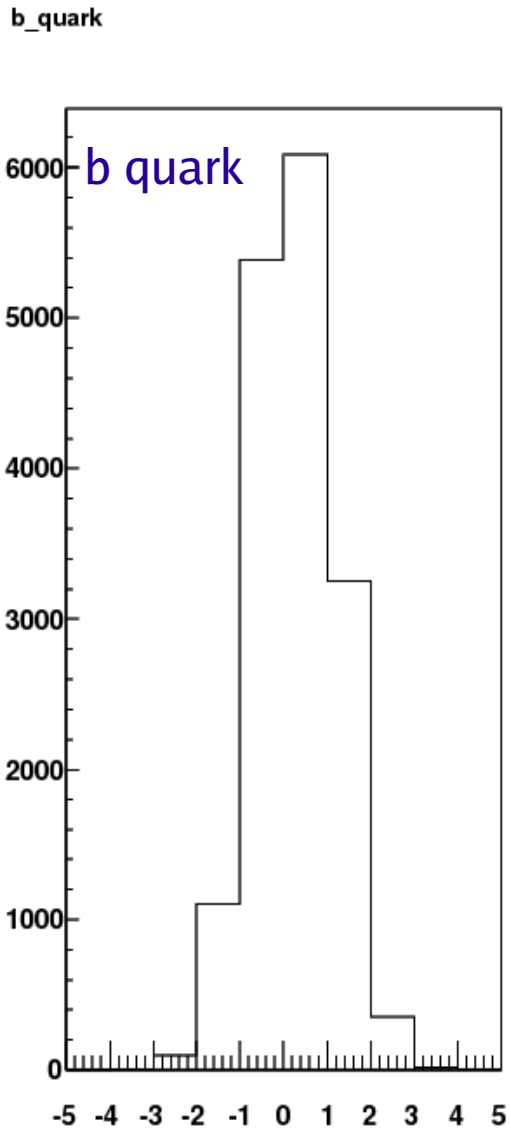
Using MCTruth (B Mesons)

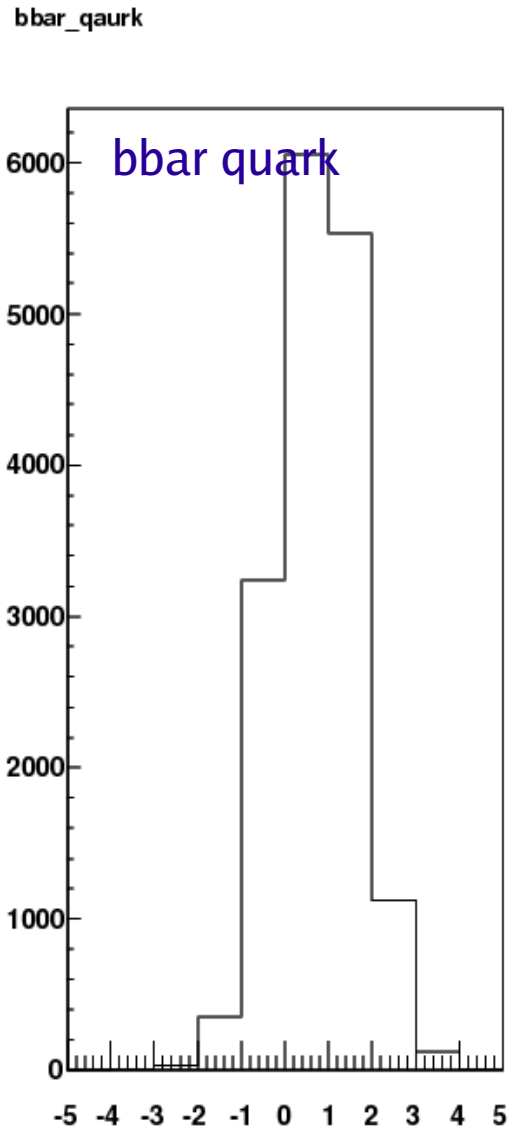


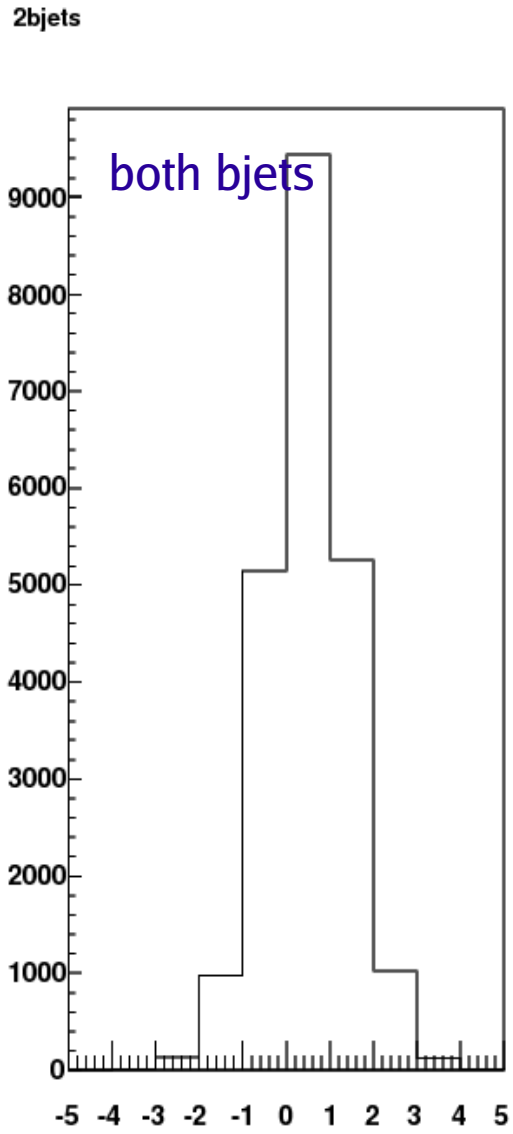




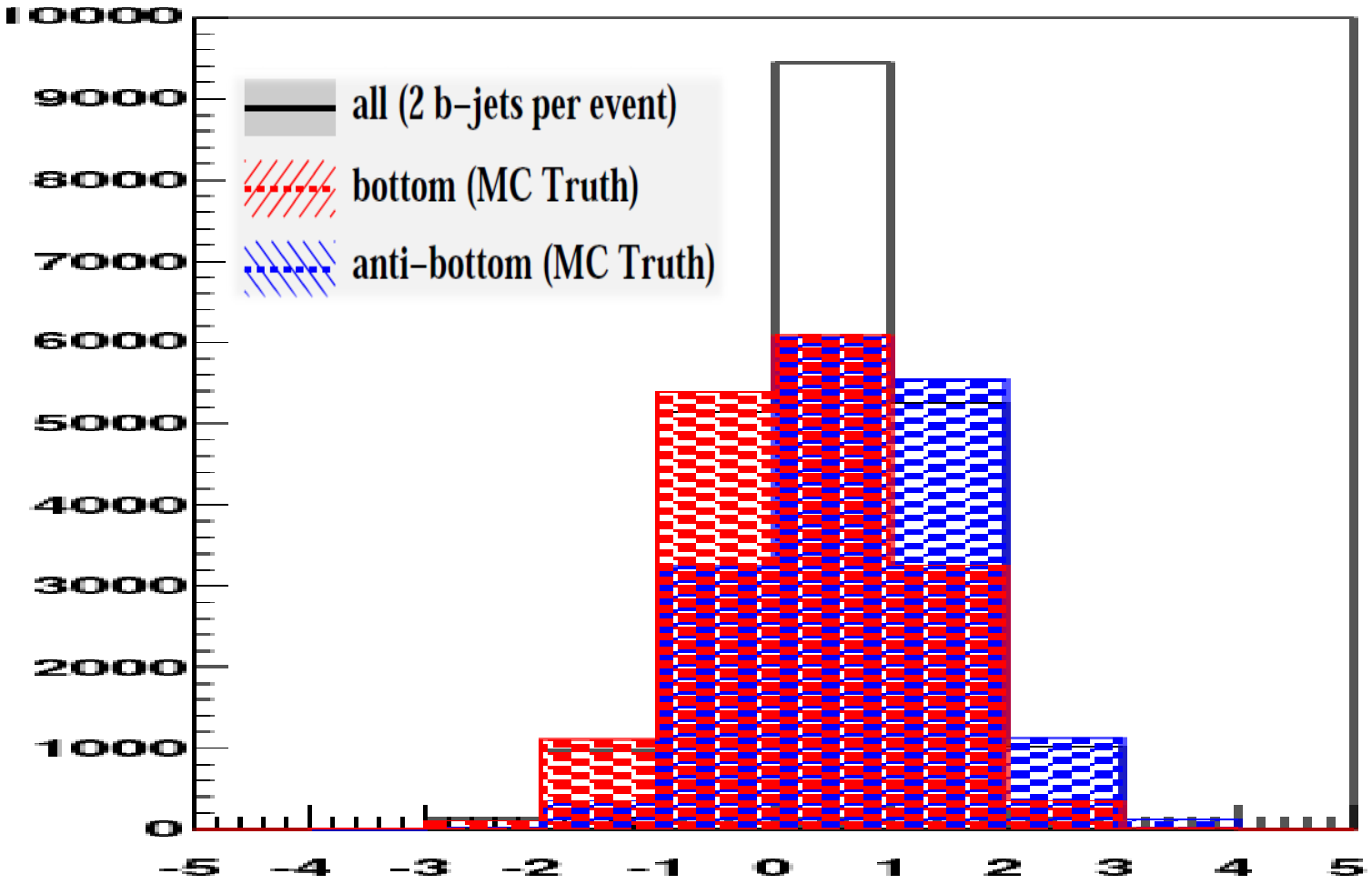
Using MCTruth (b quarks)



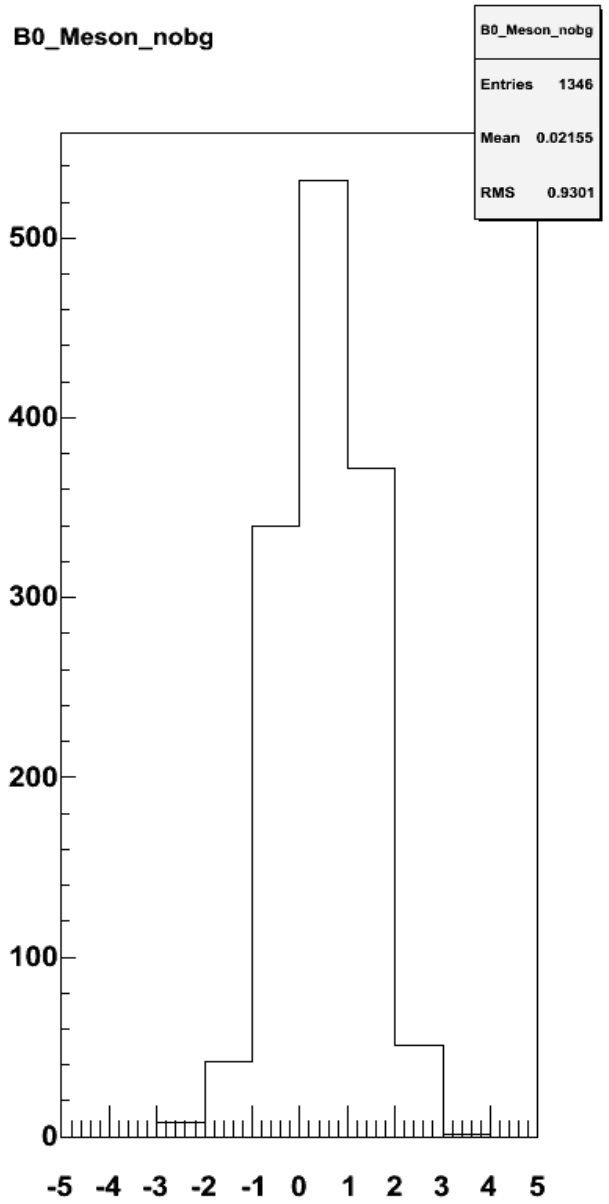


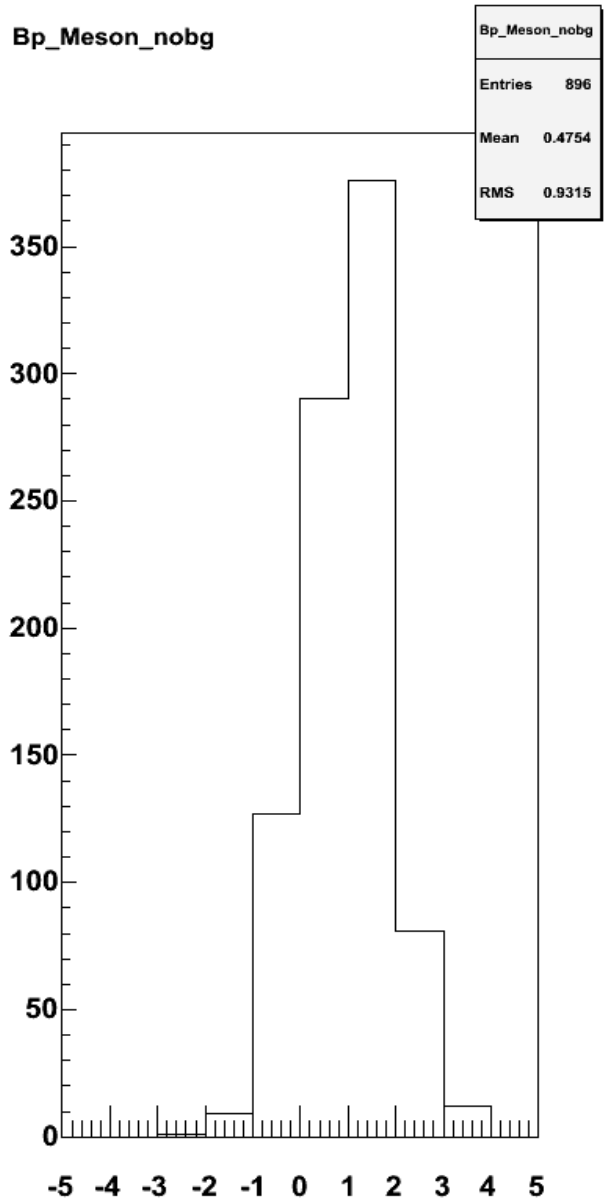


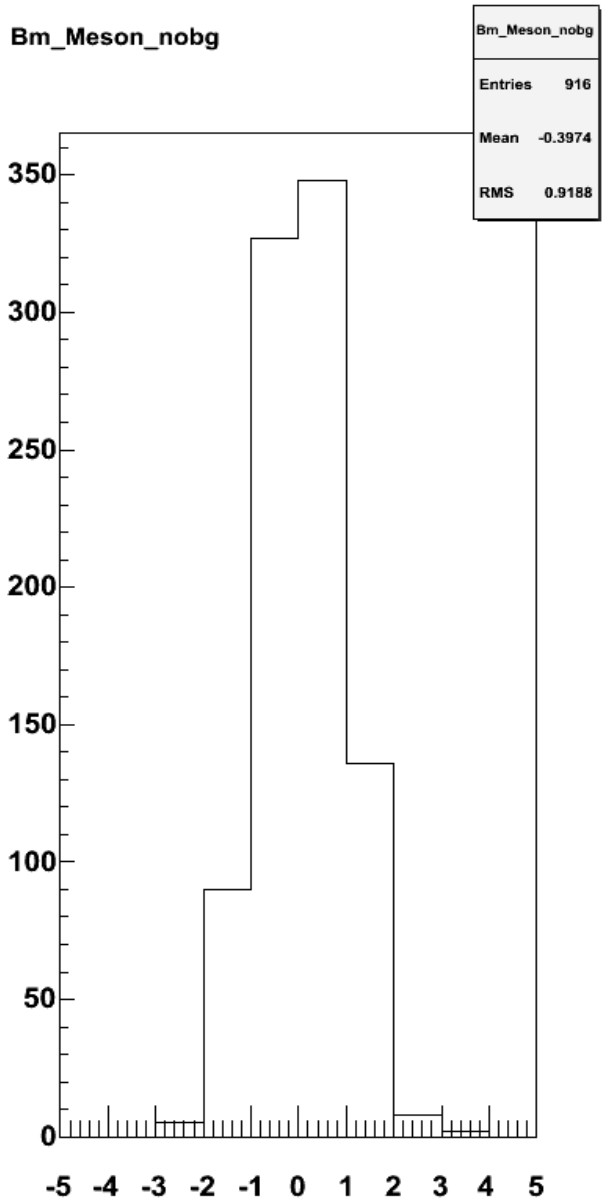
Comparison


all (2 b–jets per event)
bottom (MC Truth)
anti–bottom (MC Truth)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
-5
-4
-3
-2
-1
0
1
2
3
4
5

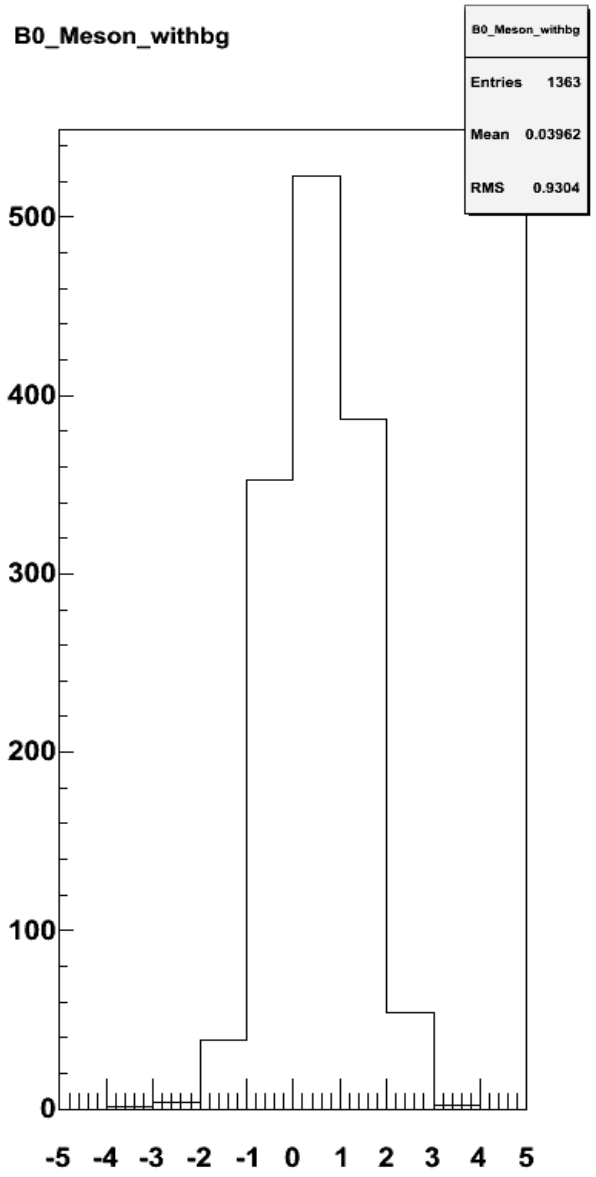
Without Background

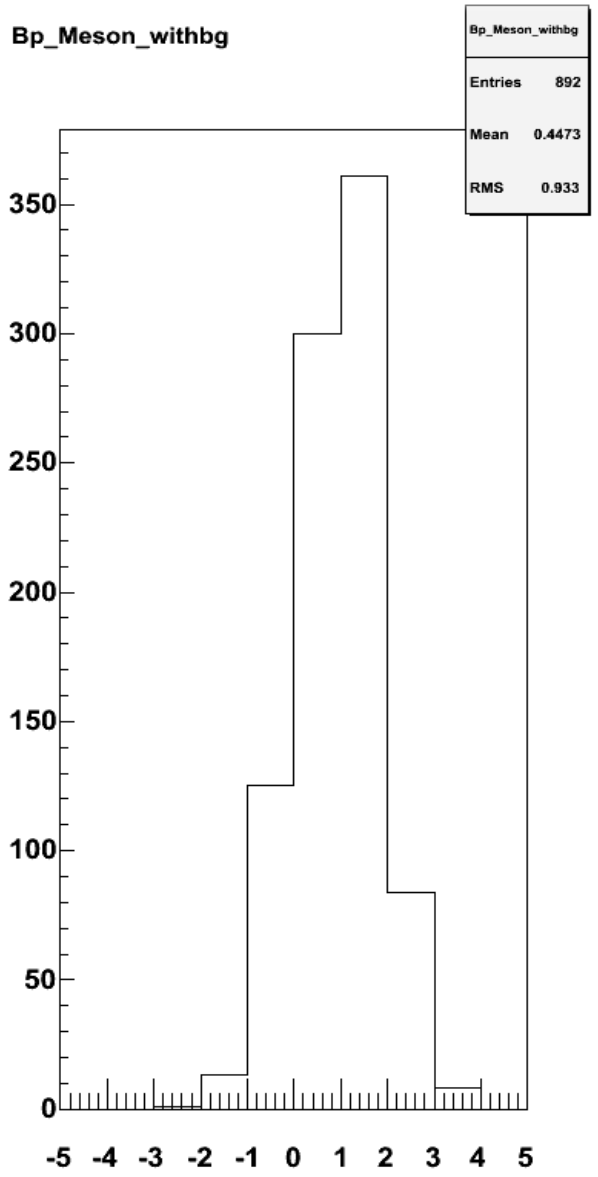


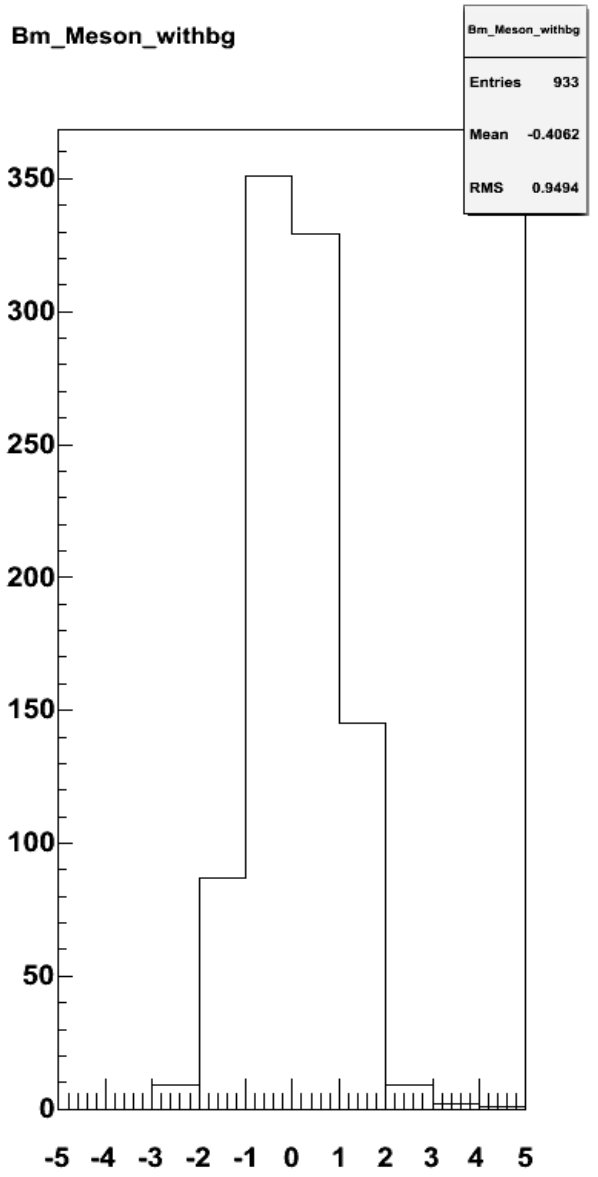




With Background



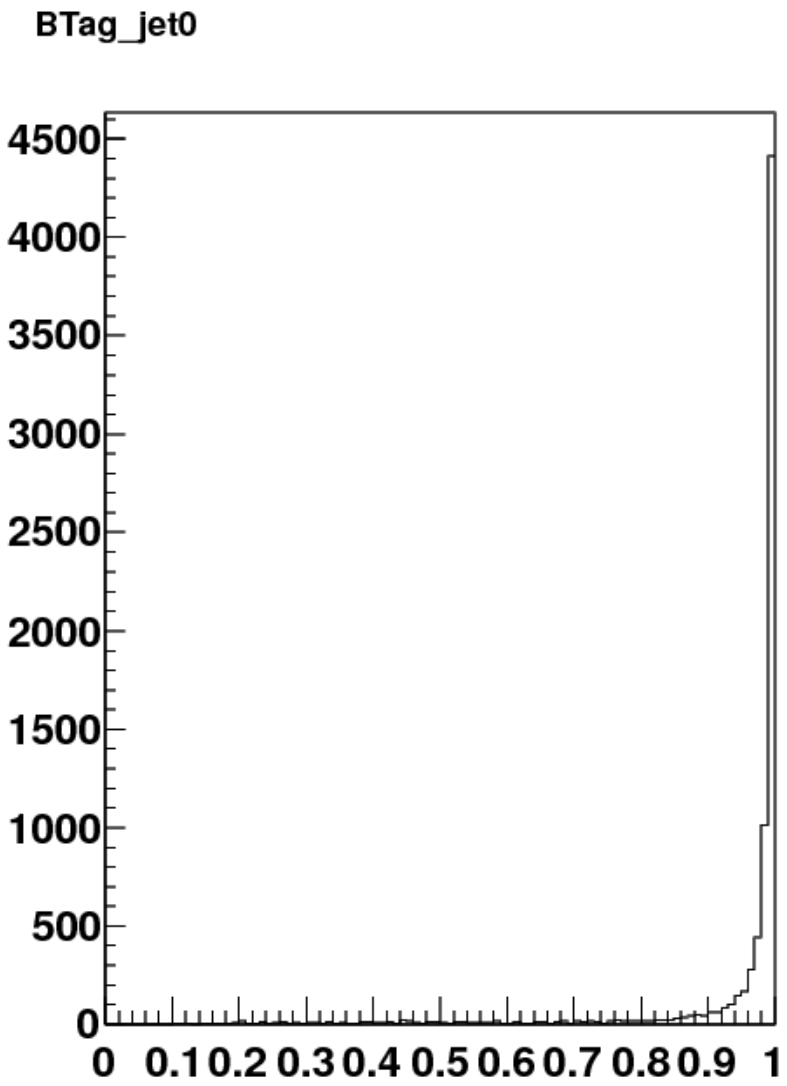


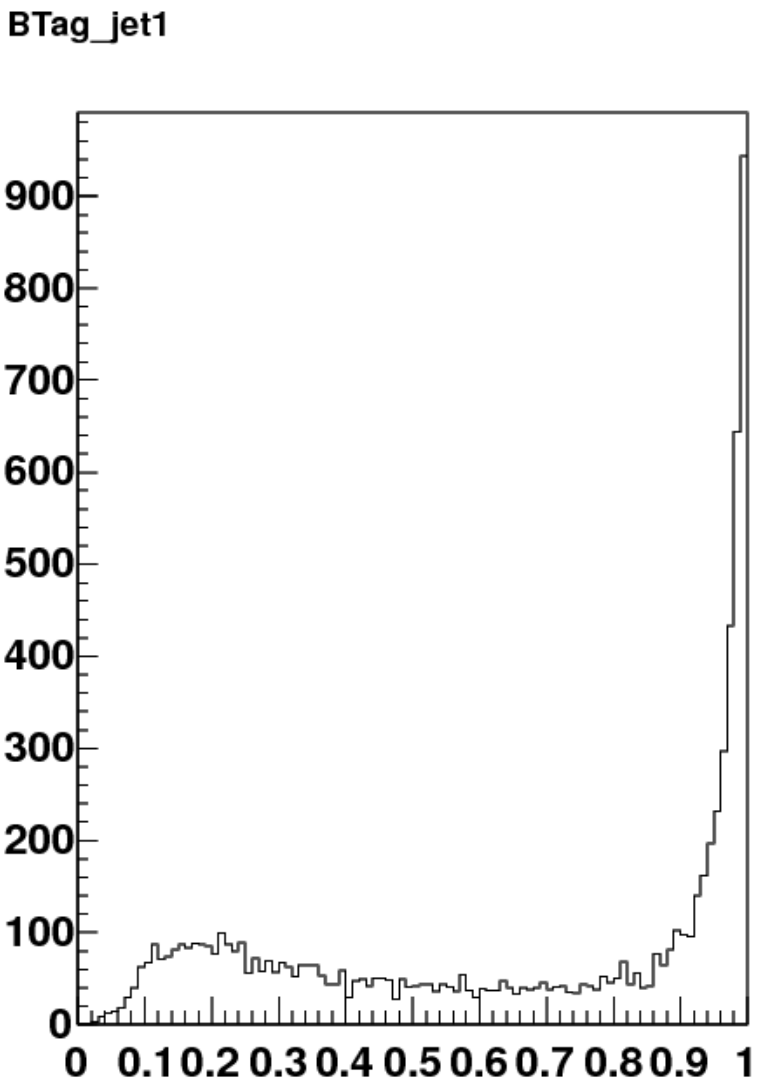


The analysis seems to give good results for differentiating between b and bbar. There is an agreement between the current and previous results (obtained without LCFIPlus).

To do forward/backward asymmetry by using b-jet Charge for identifying top and topbar at 500 GeV.

B-tagging


BTag_jet0
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1


BTag_jet1
900
800
700
600
500
400
300
200
100
0
0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

Reconstruction

- After having tagged the b-jets, out of the rest of foud jets, I choose the best combination of jets, making 2 Ws, by minimizing the variable

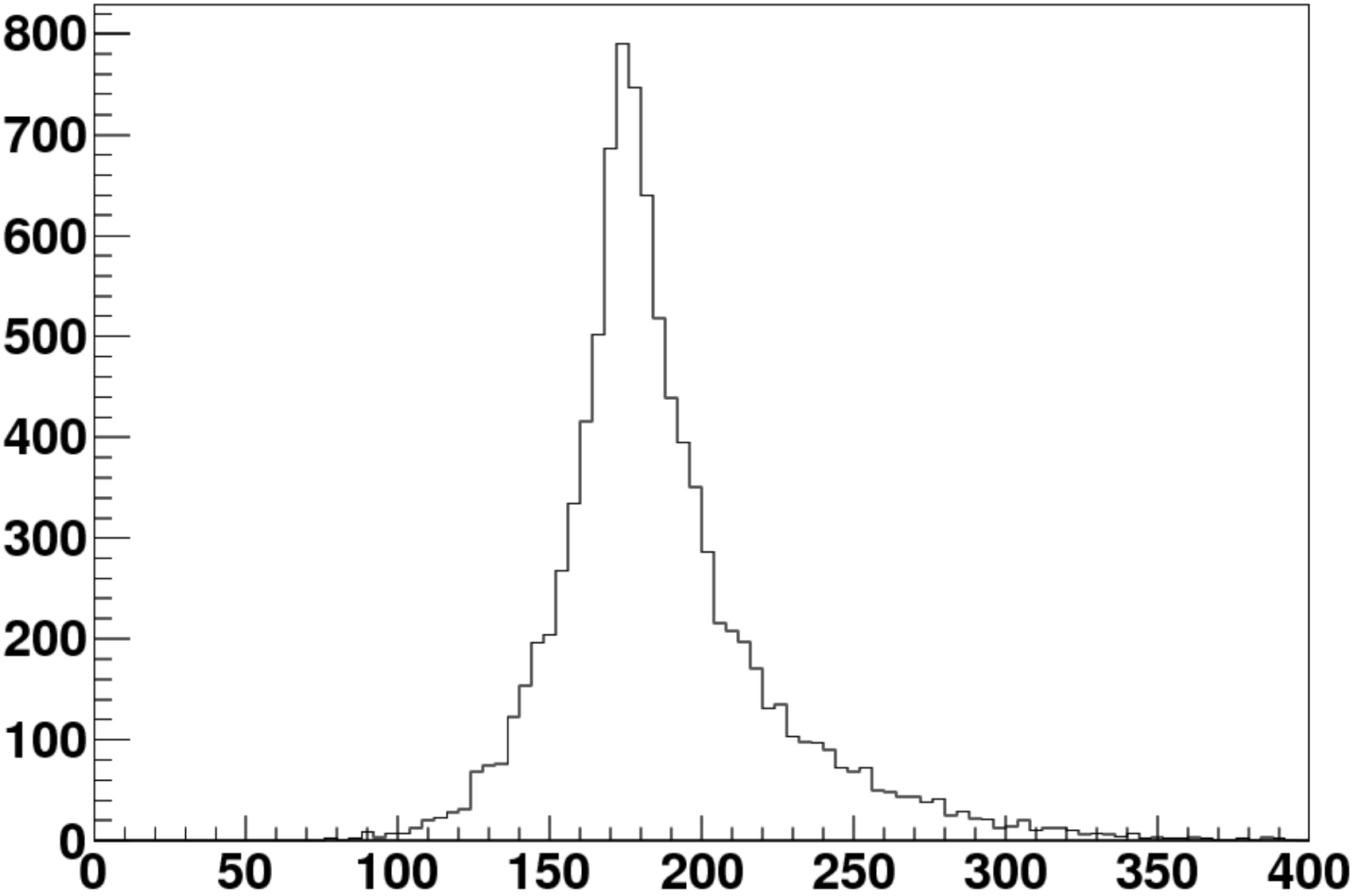
$$\mu = |m_{ij} - m_w| + |m_{kl} - m_w|$$

Where i,j,k,l are four different jets.

The Similar Approach is then followed for choosing a combination of two top quarks, along with minization of Chi2.

$$\chi^2 = \frac{(m_t - 174)^2}{(\sigma_{m_t})^2} + \frac{(E_t - 250)^2}{(\sigma_{E_t})^2} + \frac{(p_b^s - 69)^2}{(\sigma_{p_b^s})^2}$$

Top Quark Mass



Top Mass With some cuts