Forward/Back Asymmetry in tt bar decay
## Full hadronic decay mode @ 500 GeV.

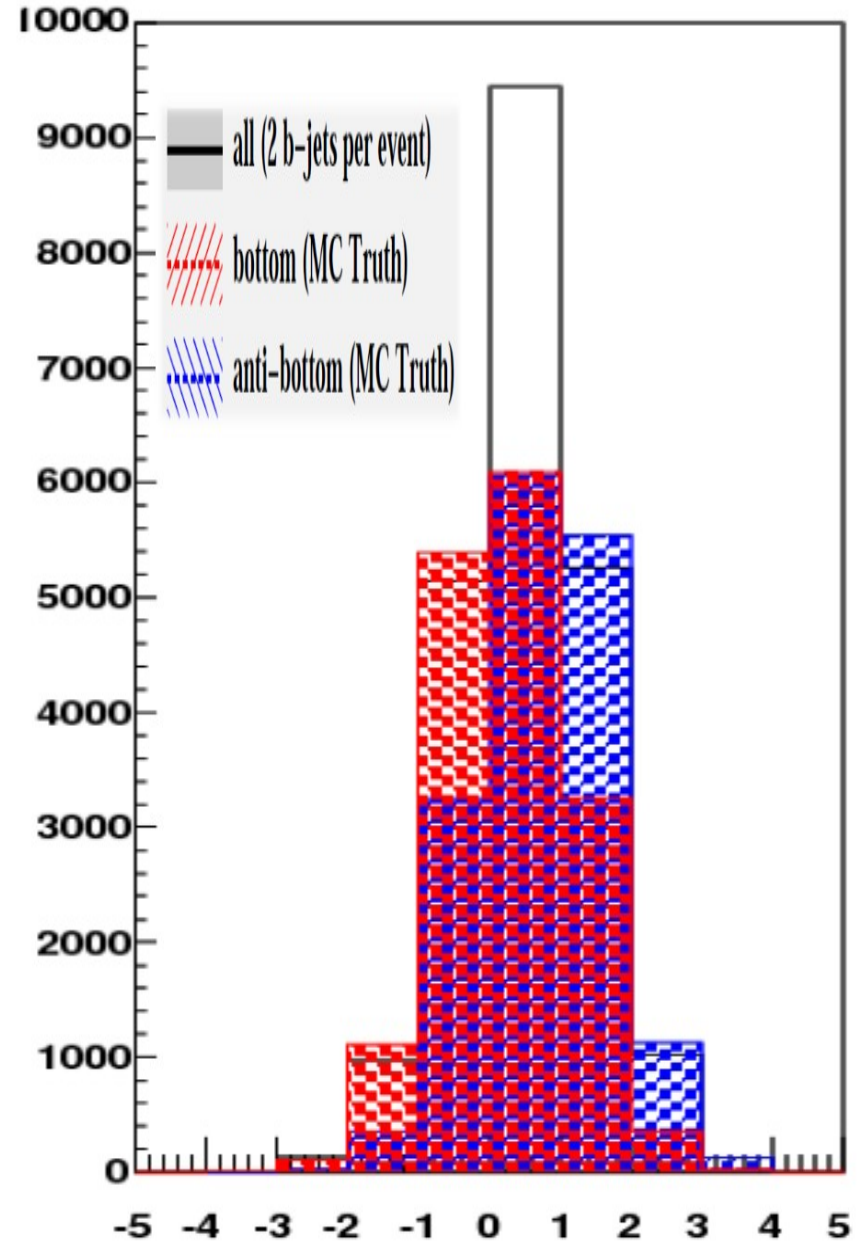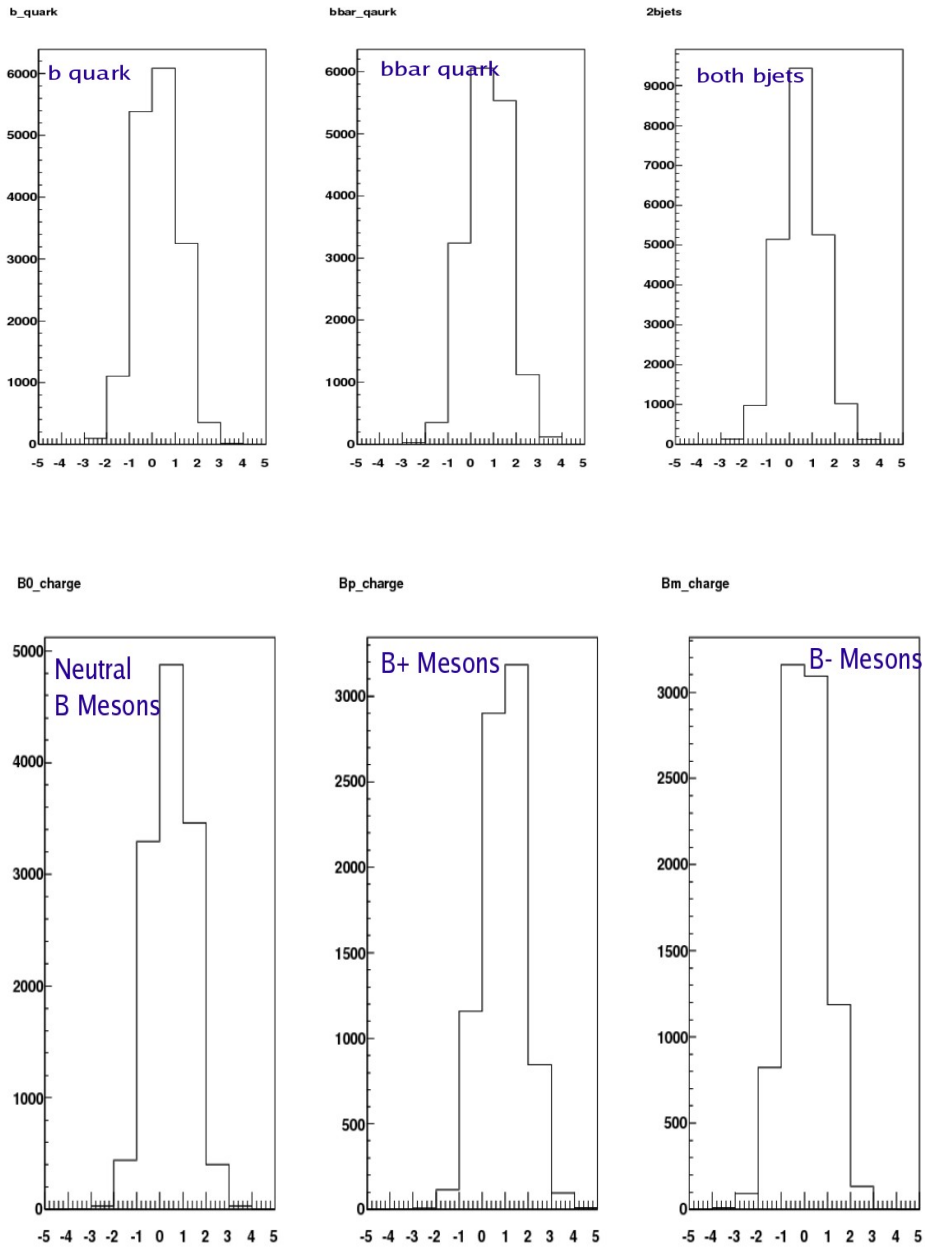# Muhammad Sohail AMJAD

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12/12/12

Background

- The aim of studies is to find 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). A total luminosity of 155.140 /fb is used with γγ overlay.

- Selecting only the signal events, using MCTruth.

  *(only bbcyyc samples so far).
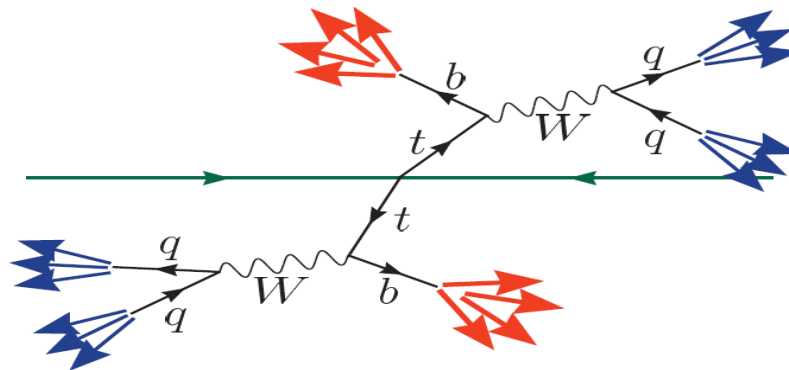
Vertex Charge

Method

b1 and b2 are two b-jets which make t1 and t2. c1 and c2 denote the charge of jets respectively.

The Sum C = c1-c2, is used to determine if top1 is top or topbar.

- ➢ C<0 : top1=top
- ➢ C>0 : top1=antitop
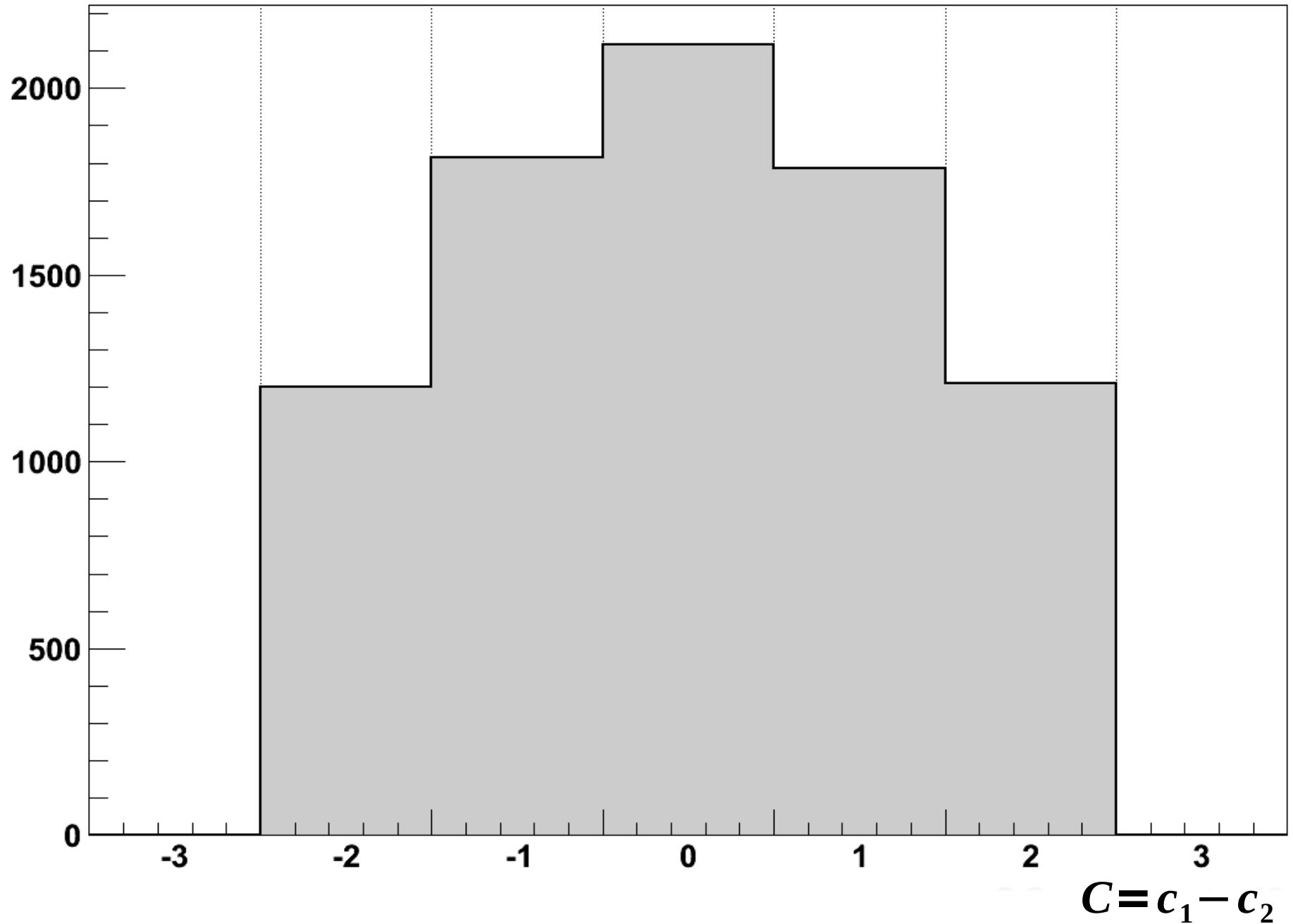- ➢ C=0 : Event discarded.

Cos(theta _top) = -1 * Cos(theta _antitop)
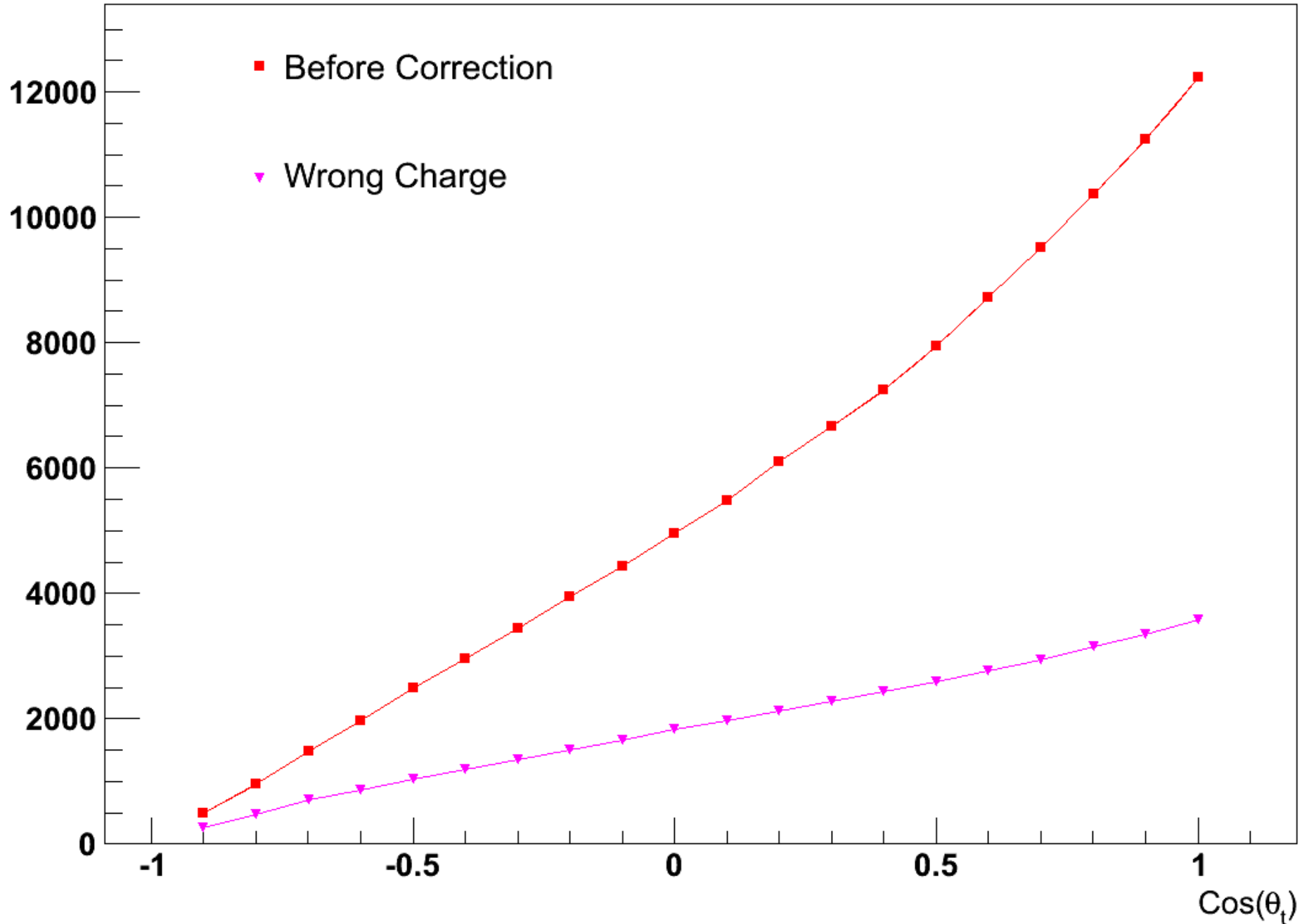
ref:(K.Ikematsu,A.Miyamoto & K.Fujii. arXiv:1005.4635v1 2010)

Cuts

- btag1 >0.9 , btag2>0.65
- For the correction of charge the proximity of reconstructed bjet to MC bjet is required as

  Cos(θ) >0.95
- Further discussion on these cuts in last table.

Event Charge Sum (C)

$$C = c_1 - c_2$$

Wrong Charge

Correction for wrong Charge

MC Comparison

Legend:
- Monte Carlo 0.3482
- Before Correction 0.1906
- After Correction 0.3032

$$A_{fb}^{top} = \frac{N_{\cos\theta > 0} - N_{\cos\theta < 0}}{N_{\cos\theta > 0} + N_{\cos\theta < 0}}$$
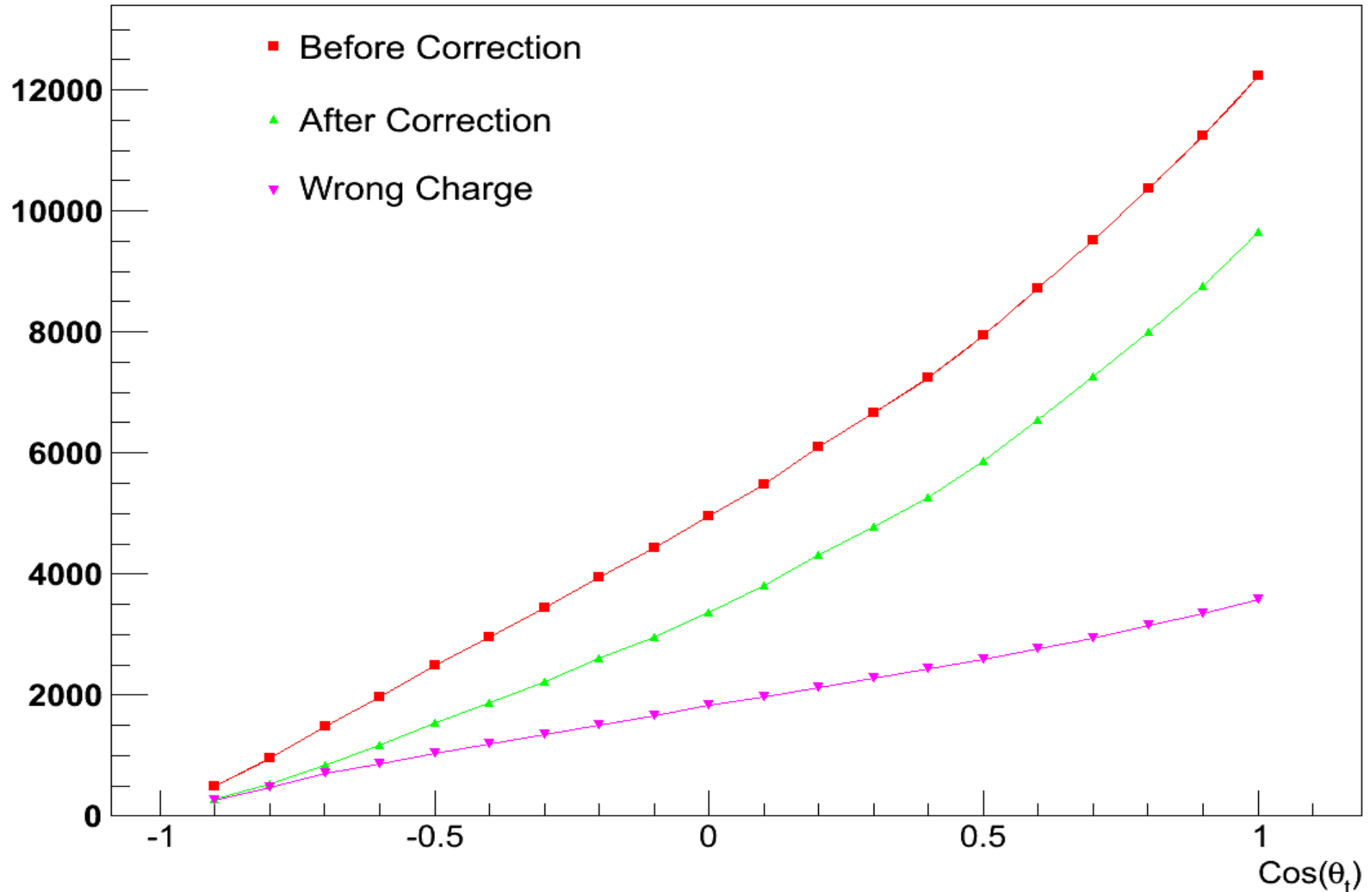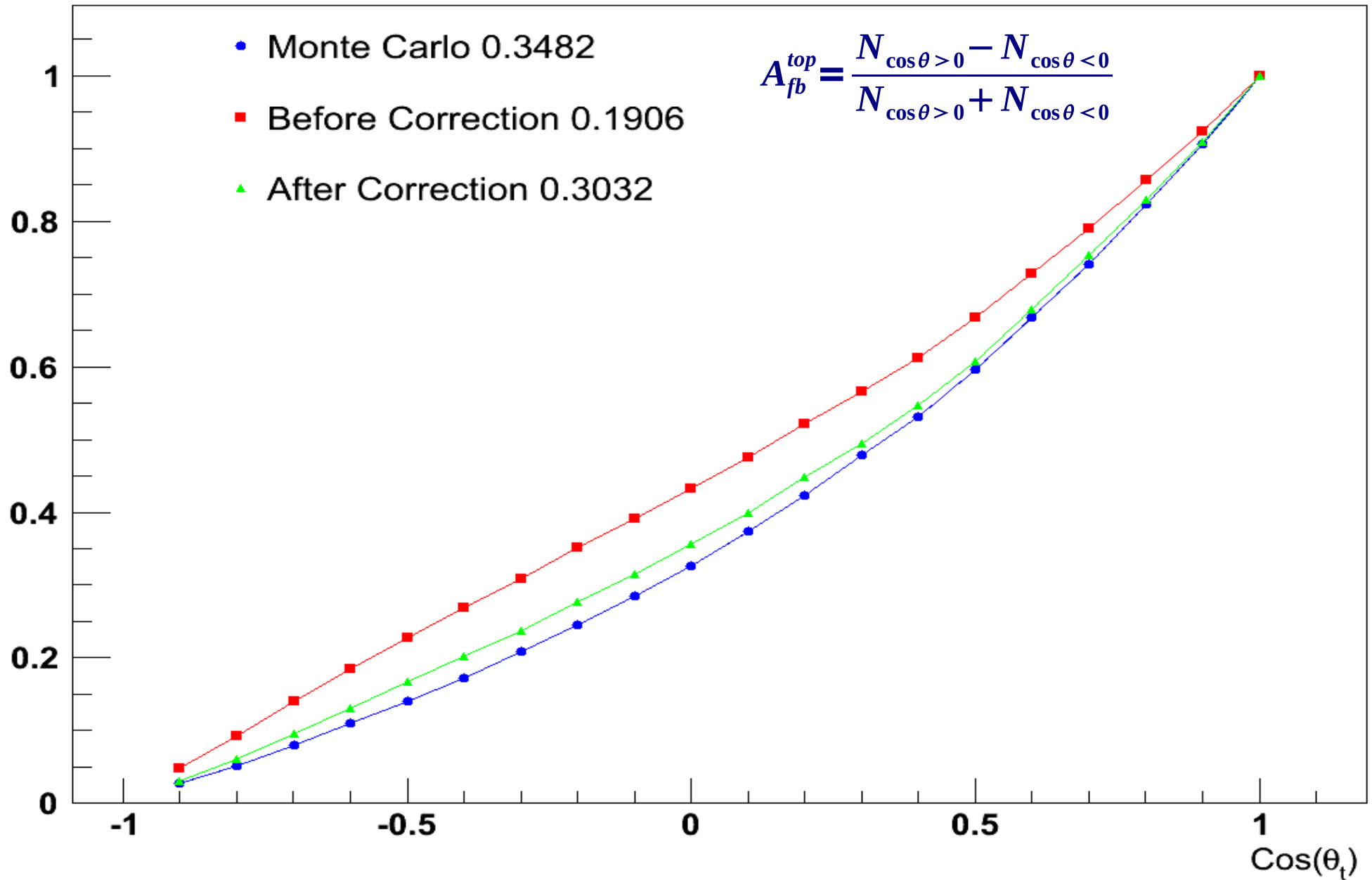
Cuts vs Afb

Afb	Eff	Ratio(A)	(btag1,btag2,Cosθ)
0.2896	0.3977	0.5521	(0.3,0.3,0.8)
0.2951	0.3356	0.6054	(0.5,0.5,0.8)
0.2998	0.3135	0.6333	(0.8,0.6,0.8)
0.3032	0.2925	0.6286	(0.9,0.65,0.95)

Afb = Asymmetry.

Eff = Efficiency.

Ratio(A) = Afb(Uncorrected) / Afb(Corrected).

Cosθ = Angle between reconstructed & MC bjet.

Conclusions

➢ The method of using vertex charge in order to identify the charge of top quark works fine. An asymmetry of 0.3032 ± 0.017 has been obtained with an efficiency 29% for eL.pR polarization, at 500 GeV, in fully hadronic decay mode.

➢ The work for looking into the other samples and ploarization(s) is in progress.

➢ So far the recipe in LOI has been followed to produce these results. Efforts to improve the analysis will be continued.