

Comparison of Hbb prediction and shapes with different discriminators.

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INFN Padova

PD meeting,
PD, 1 March 2012



Intro

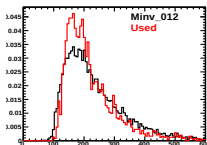
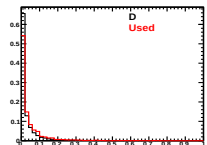
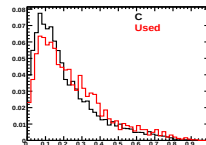
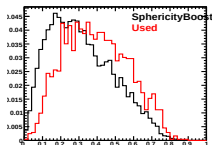
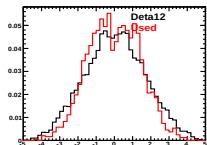
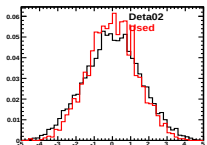
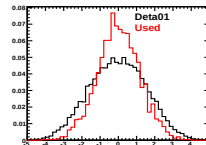
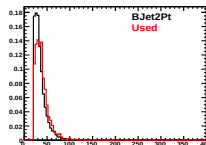
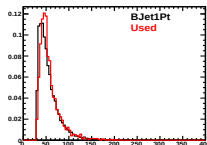
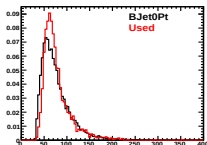


What is about

- Once prediction is more or less working, try to see if a change in the discriminator gives better or worse results
- in particular check the effect of inclusion of invariant mass in the discriminator.
- Higgs Mass 120 GeV, σ for $\tan\beta = 30$.
 - ▶ **Discriminator 0** baseline so far, not optimized
 - ▶ **Discriminator 1** optimized, w/ $M_{inv}(jj)$
 - ▶ **Discriminator 2** same as $_1$ but w/o $M_{inv}(jj)$

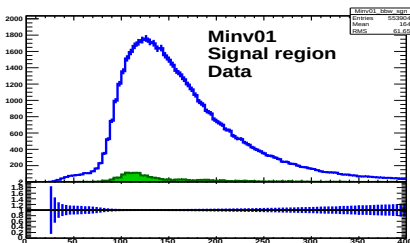
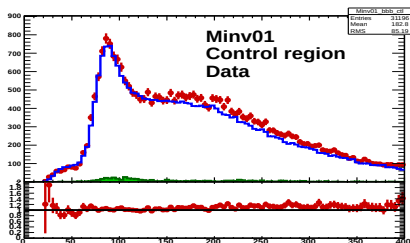
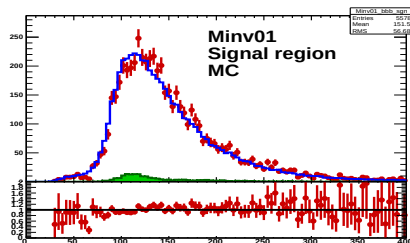
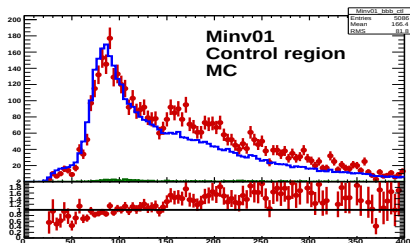


Variables used for discriminator



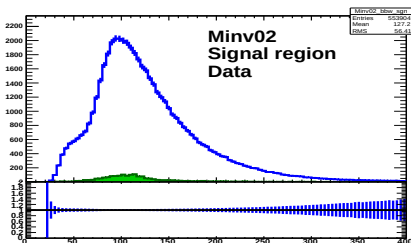
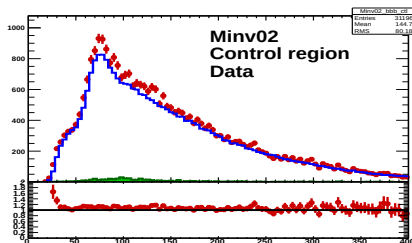
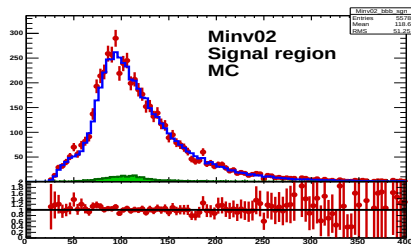
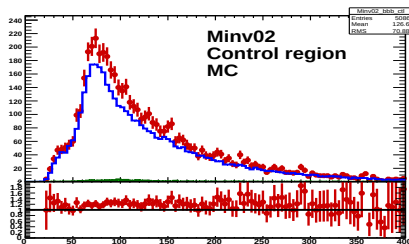


Invariant Mass Jet 1 and 2



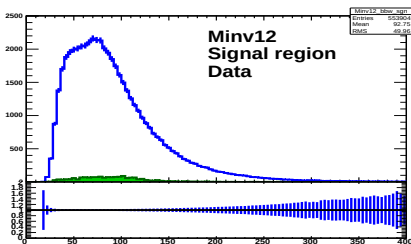
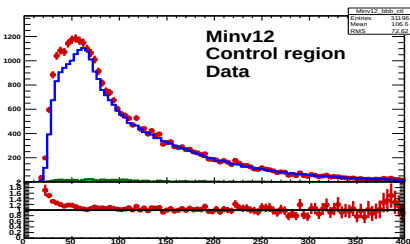
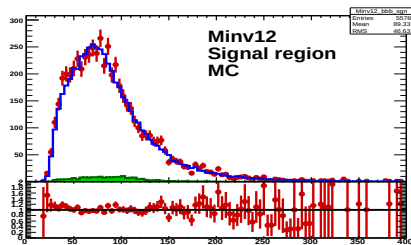
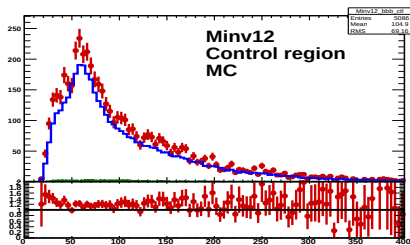


Invariant Mass Jet 1 and 3



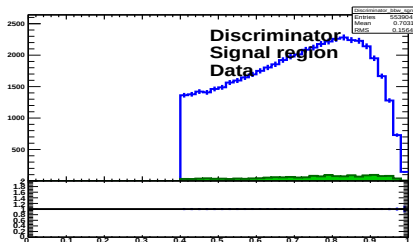
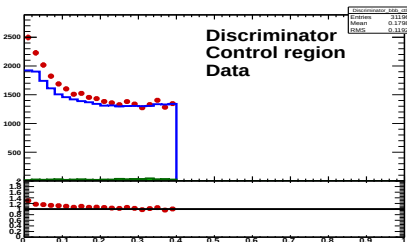
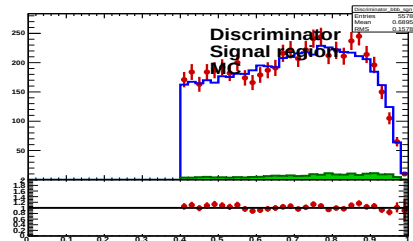
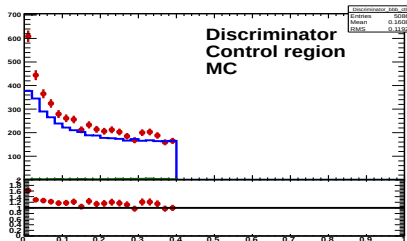


Invariant Mass Jet 2 and 3



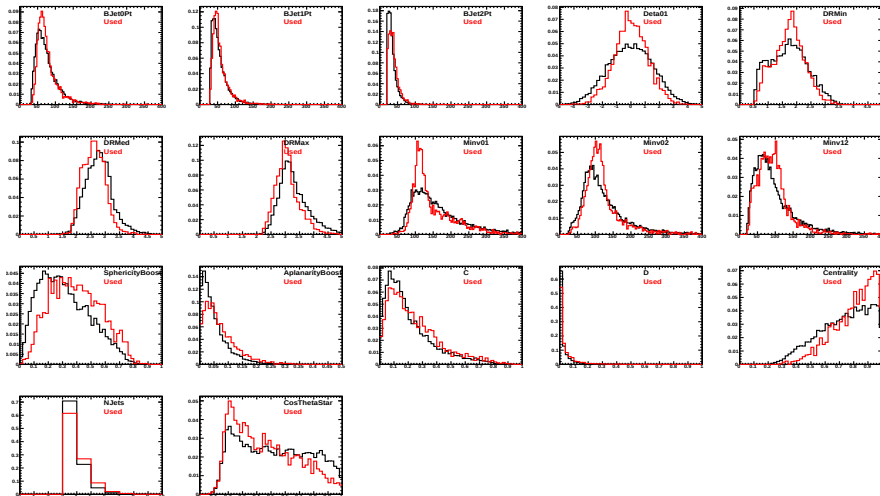


Discriminator



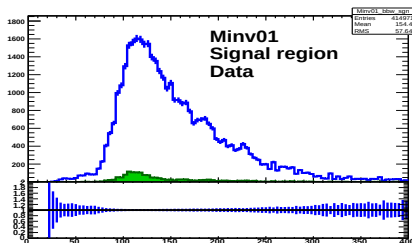
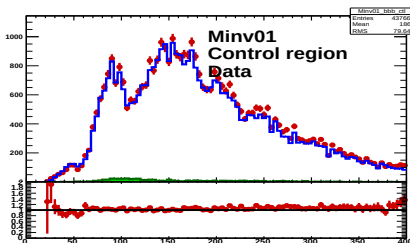
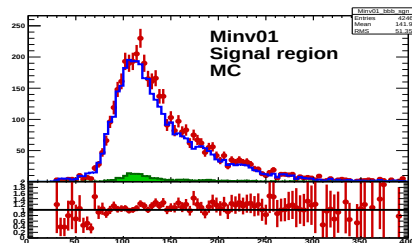
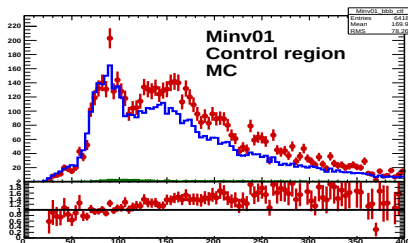


Variables used for discriminator



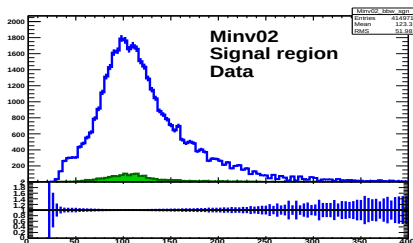
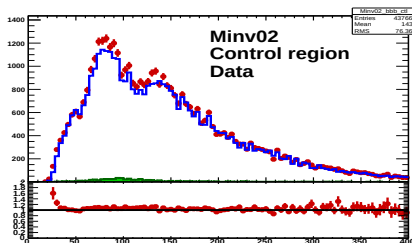
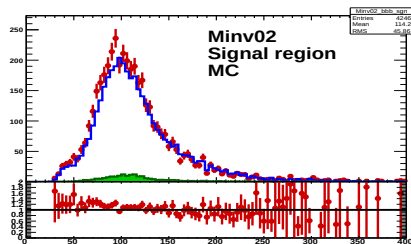
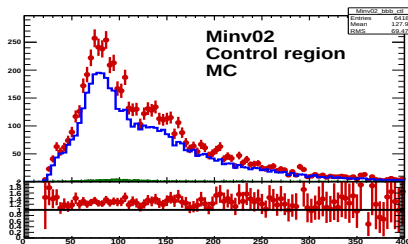


Invariant Mass Jet 1 and 2



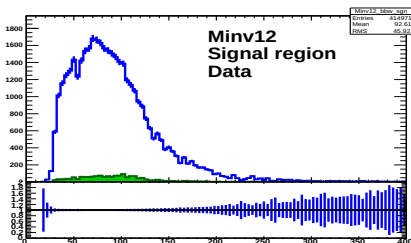
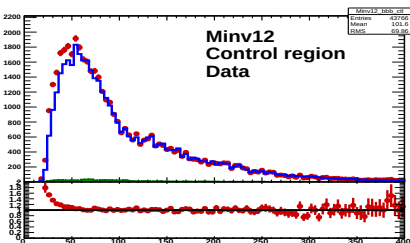
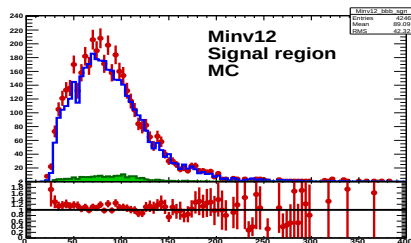
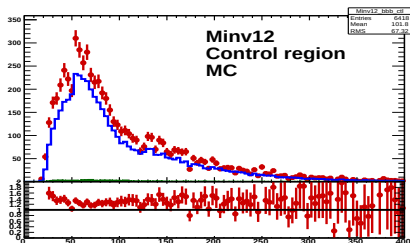


Invariant Mass Jet 1 and 3



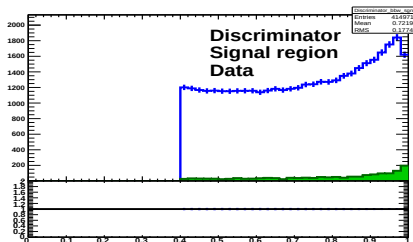
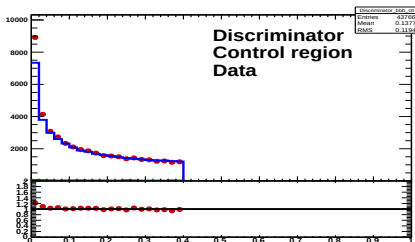
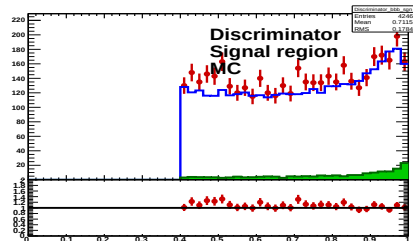
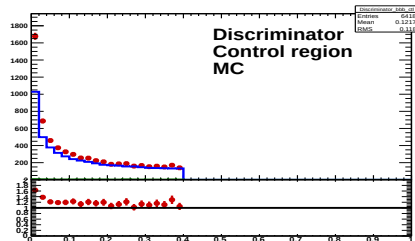


Invariant Mass Jet 2 and 3



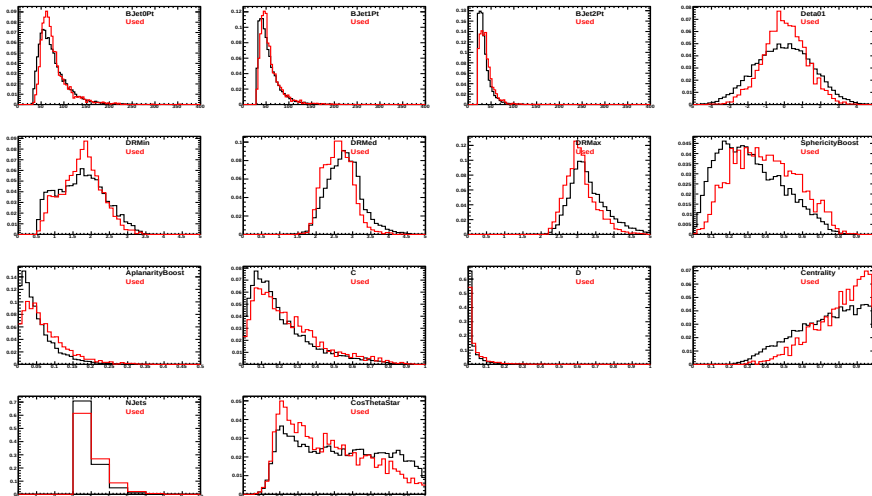


Discriminator



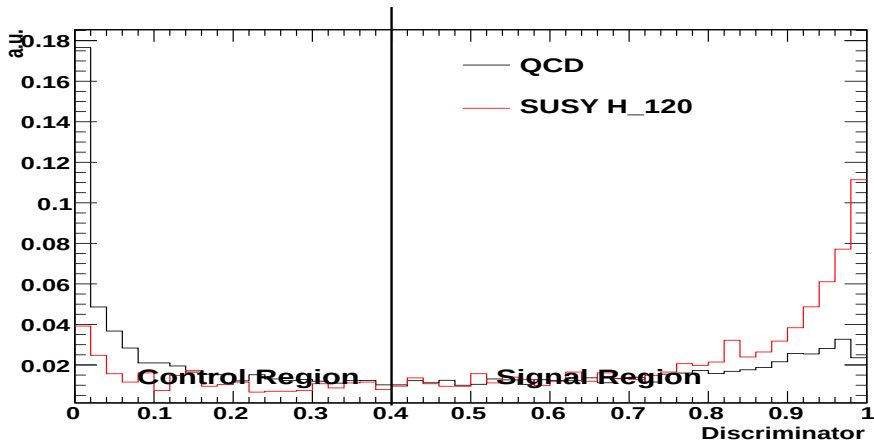


Variables used for discriminator



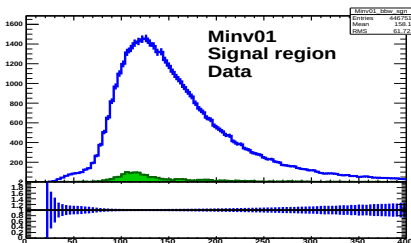
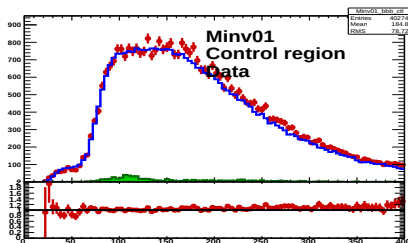
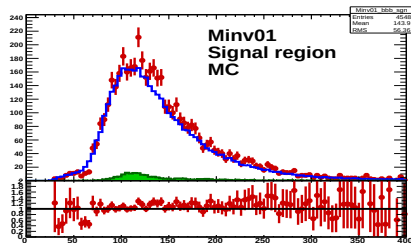
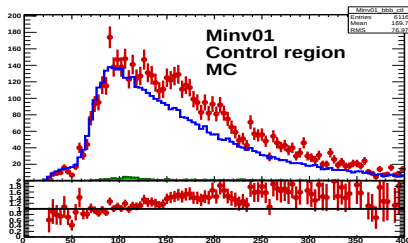


Discriminator



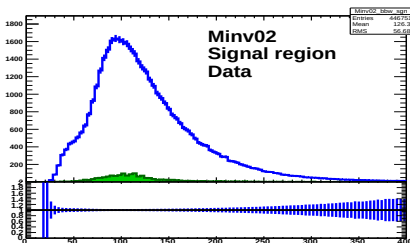
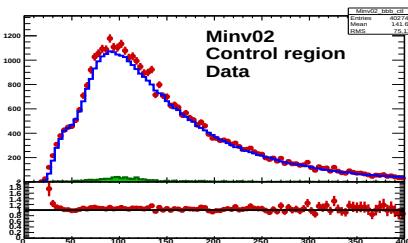
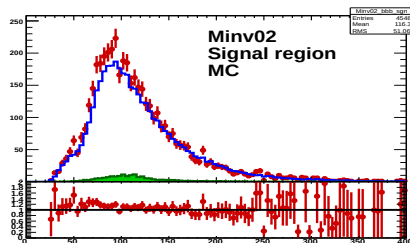
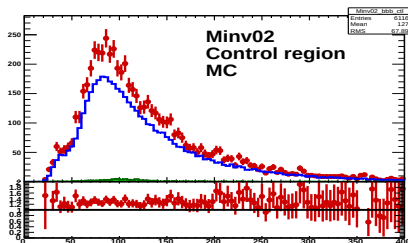


Invariant Mass Jet 1 and 2



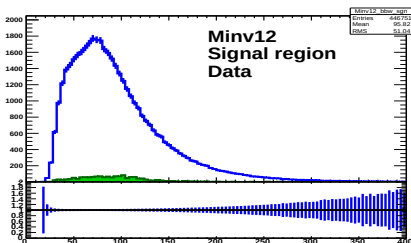
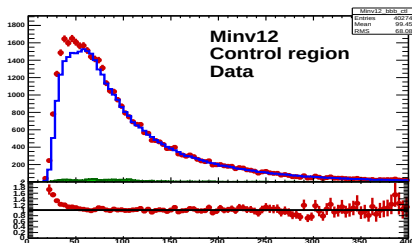
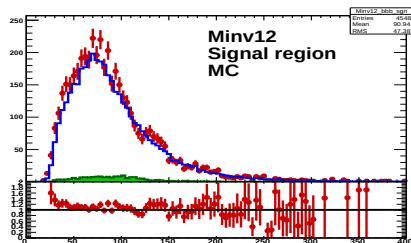
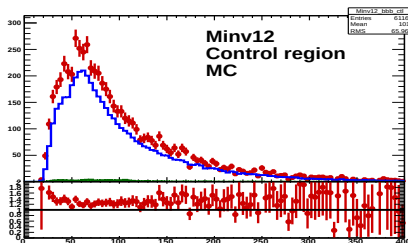


Invariant Mass Jet 1 and 3



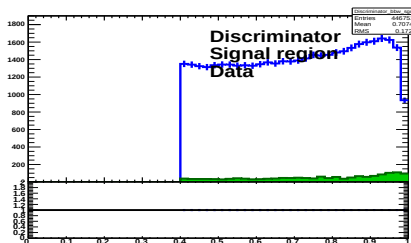
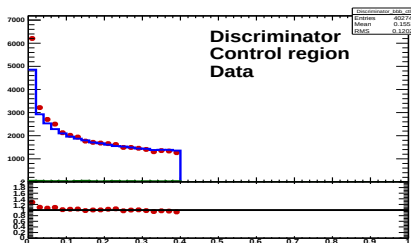
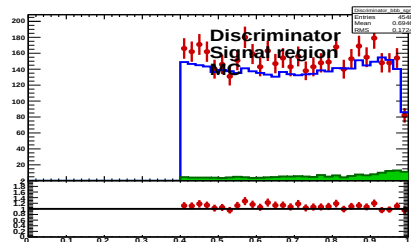
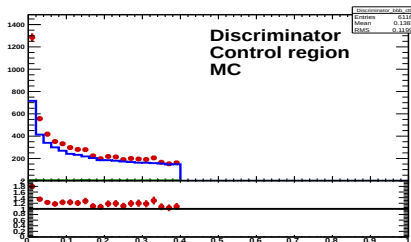


Invariant Mass Jet 2 and 3



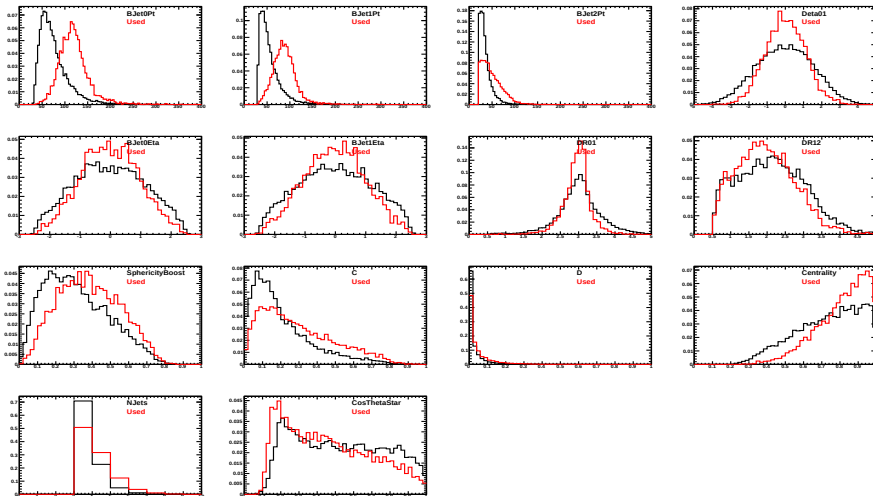


Discriminator



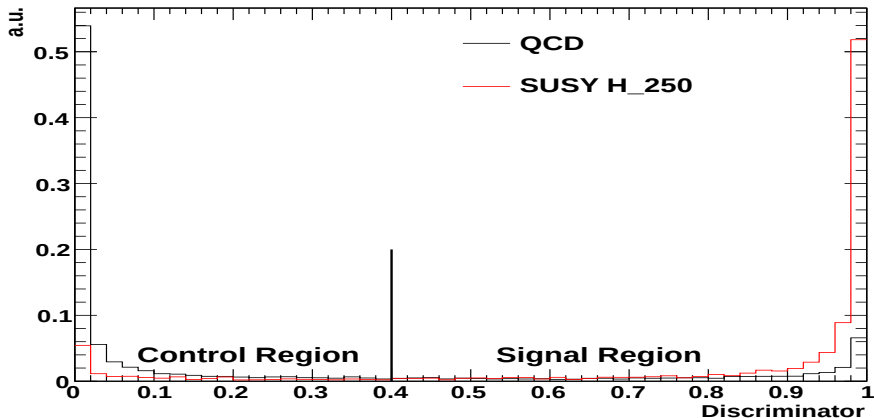


Variables used for discriminator





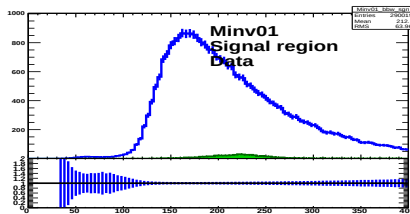
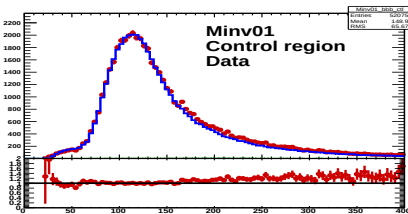
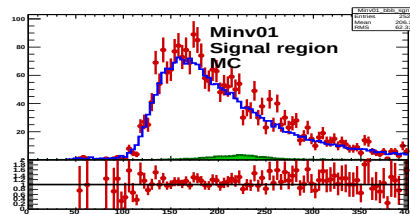
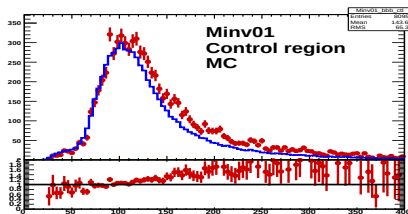
Discriminator



Why the background peak at 1??



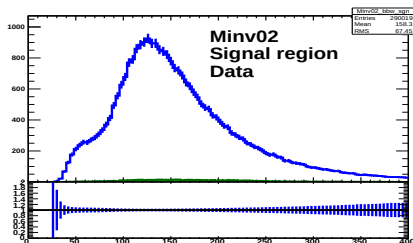
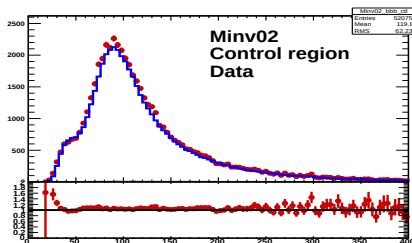
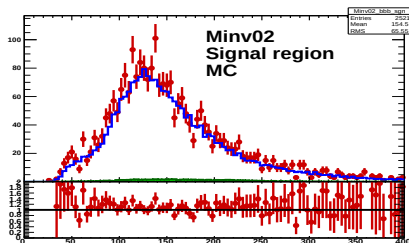
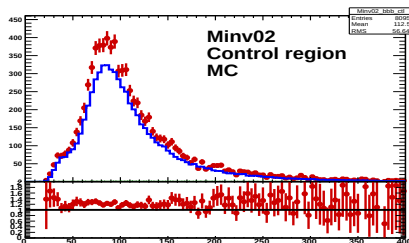
Invariant Mass Jet 1 and 2



$$\sigma \times BR = 14.57 \text{ pb} (\tan \beta = 30)$$

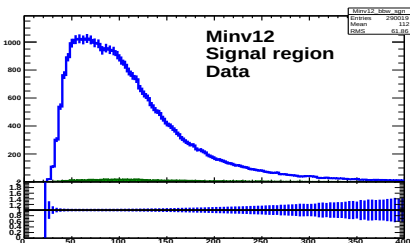
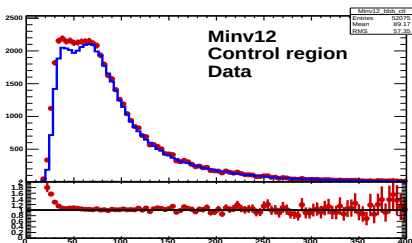
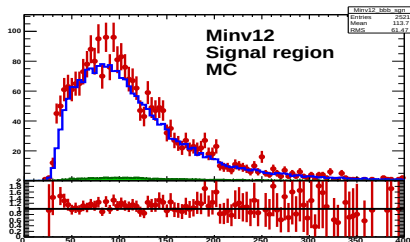
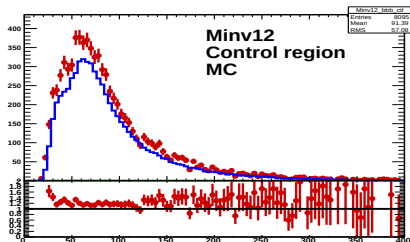


Invariant Mass Jet 1 and 3



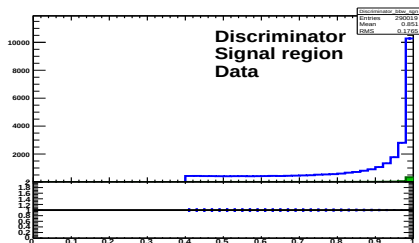
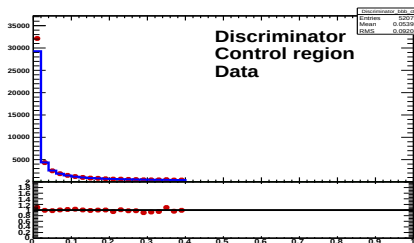
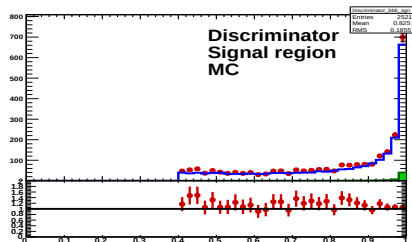
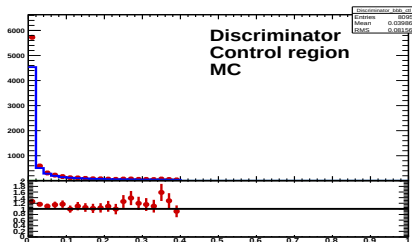


Invariant Mass Jet 2 and 3





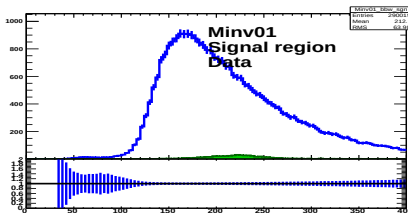
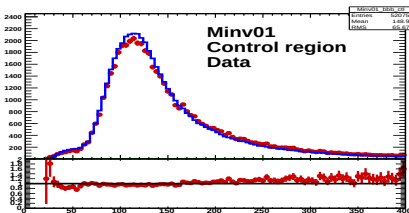
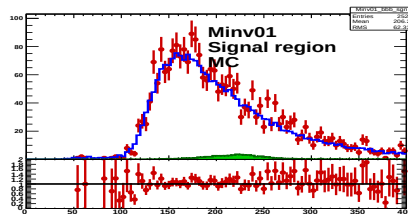
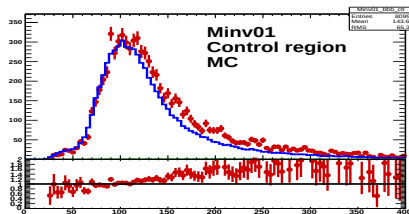
Discriminator





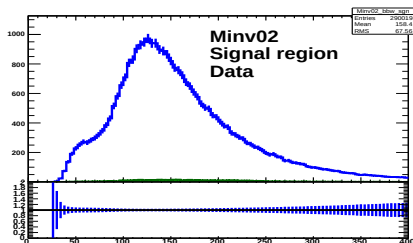
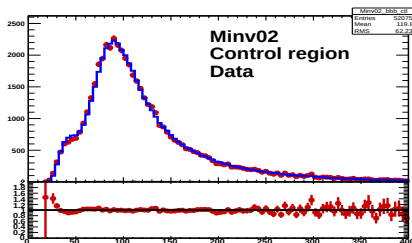
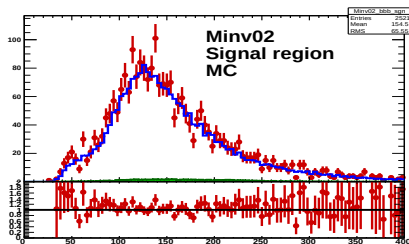
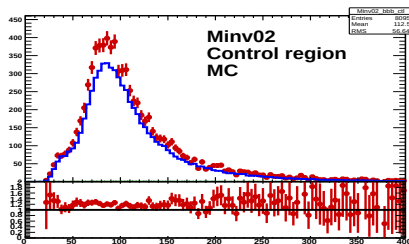
Invariant Mass Jet 1 and 2

Results with JetBProbability for FB/C fit



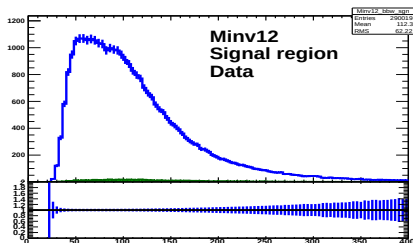
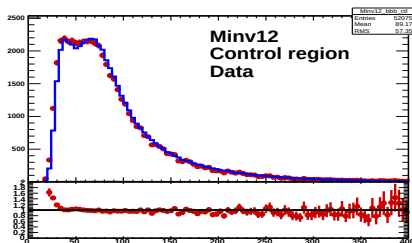
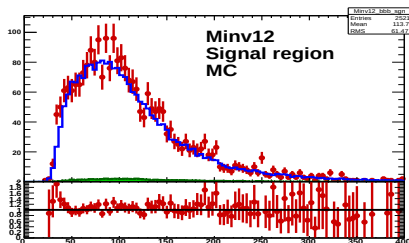
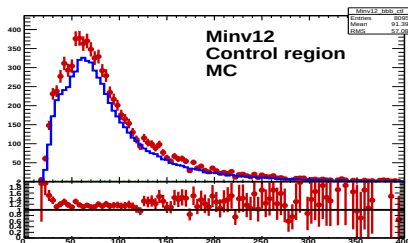


Invariant Mass Jet 1 and 3



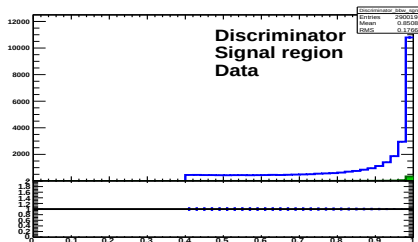
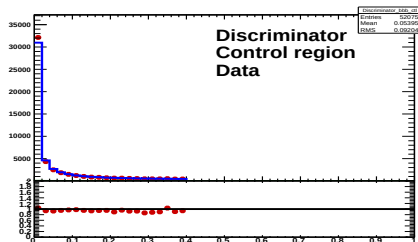
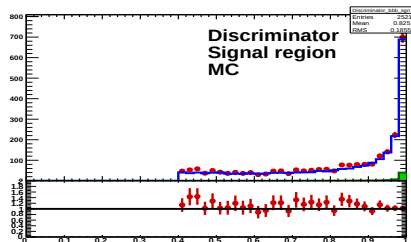
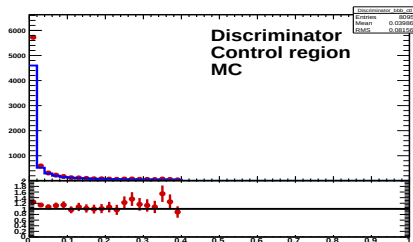


Invariant Mass Jet 2 and 3





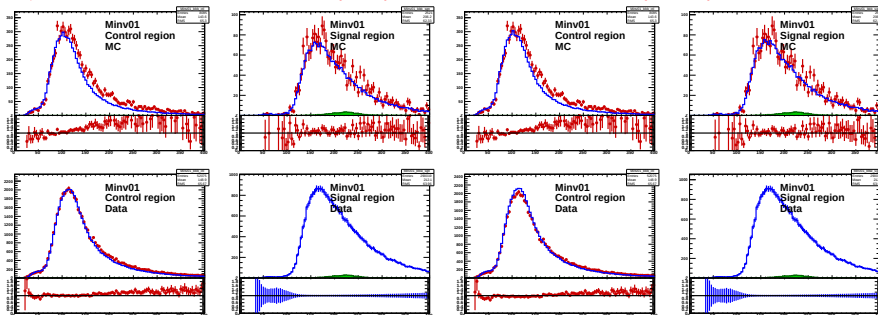
Discriminator





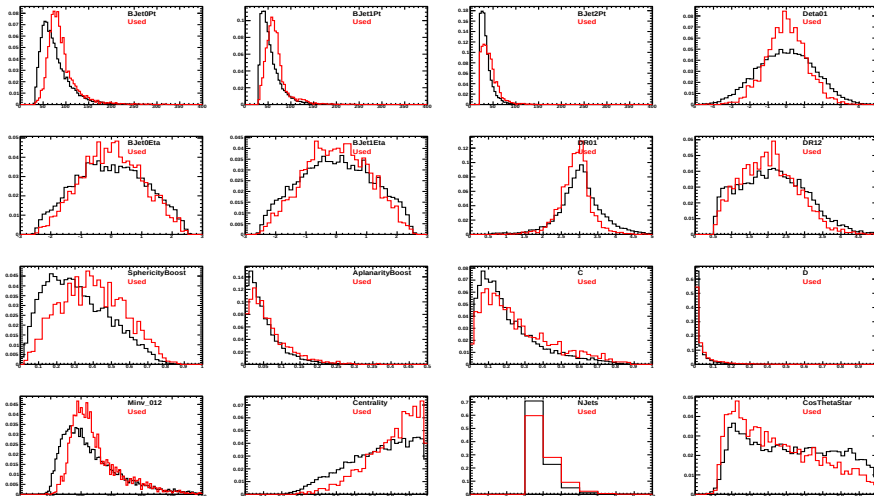
JetProbability vs Jet**B**Probability (MH=250)

FB/C fitting JetProbability (left) vs Jet**B**Probability (right)



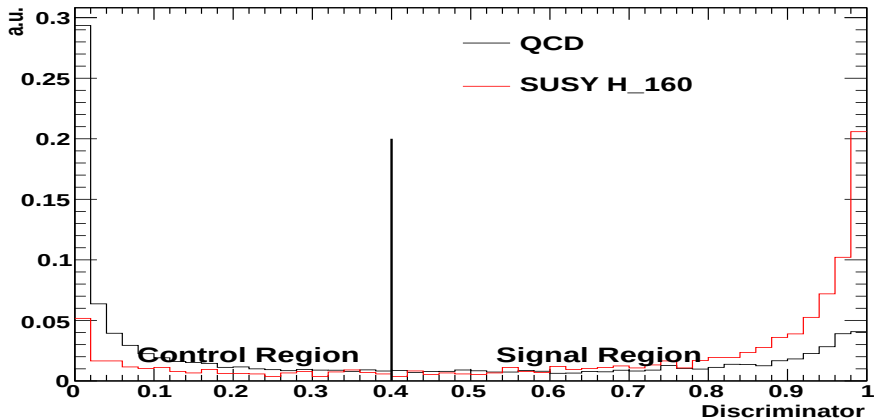


Variables used for discriminator





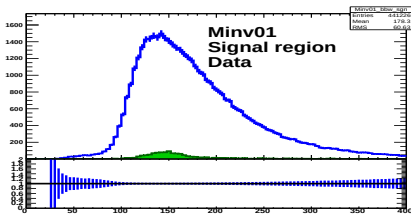
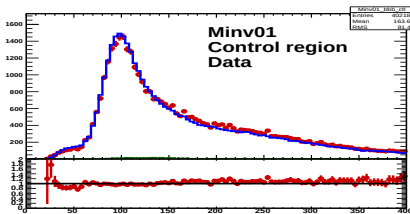
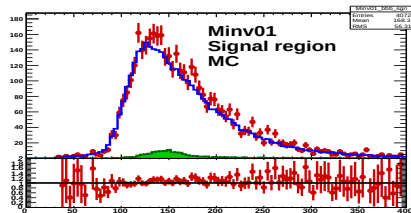
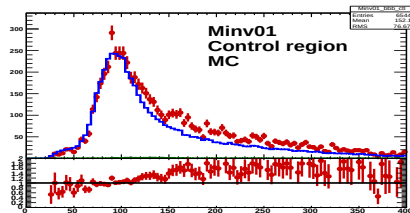
Discriminator





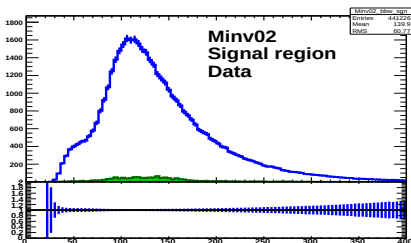
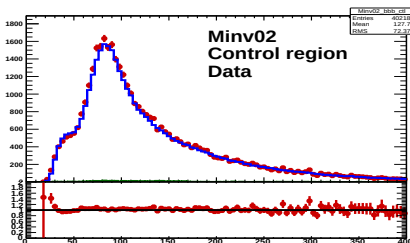
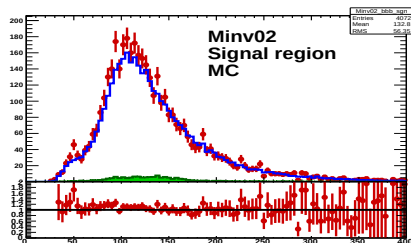
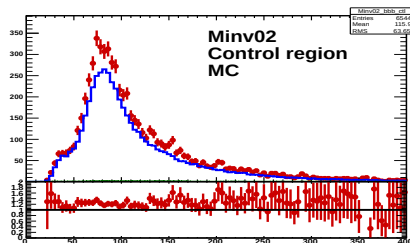
Invariant Mass Jet 1 and 2

Results with JetBProbability for FB/C fit



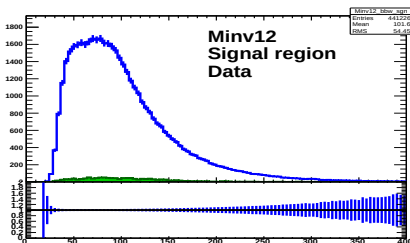
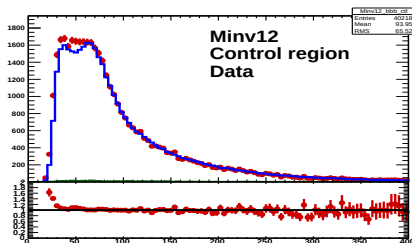
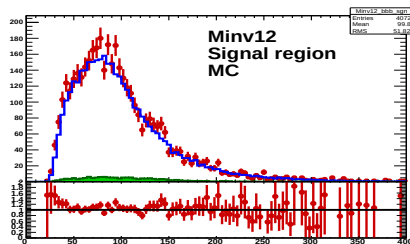
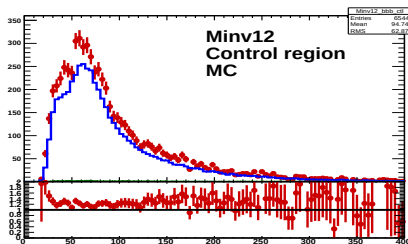


Invariant Mass Jet 1 and 3



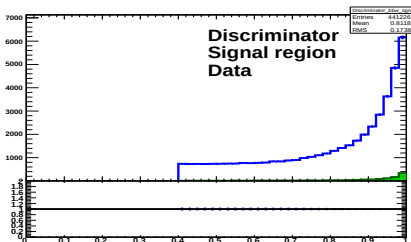
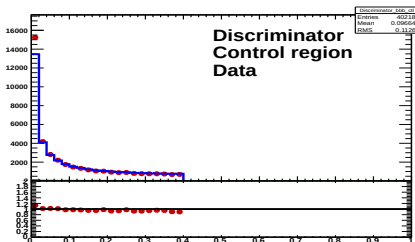
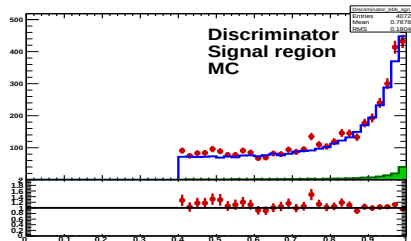
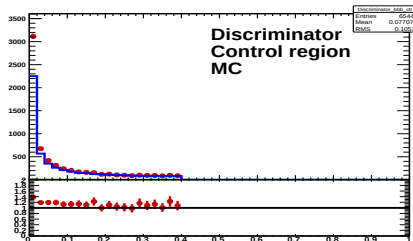


Invariant Mass Jet 2 and 3



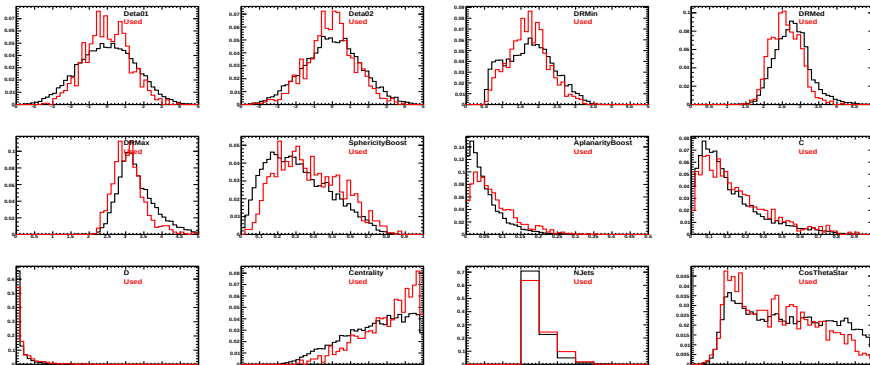


Discriminator



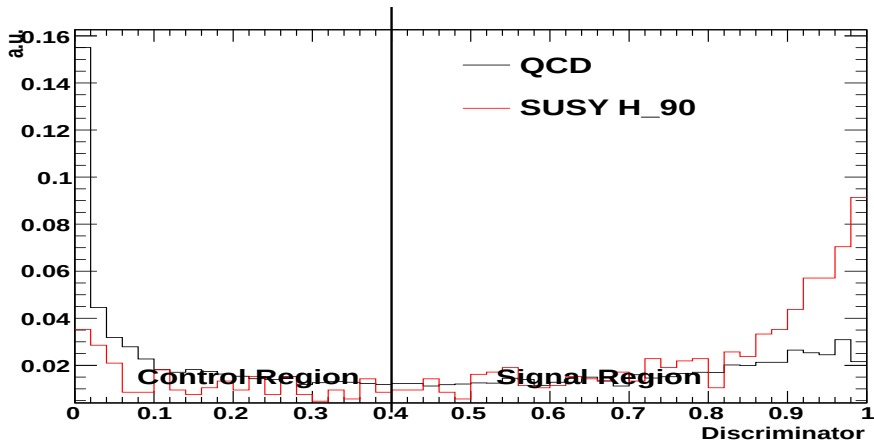


Variables used for discriminator





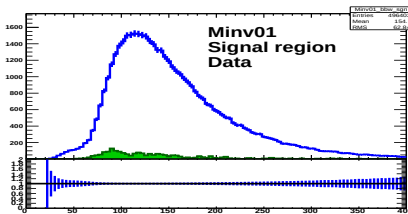
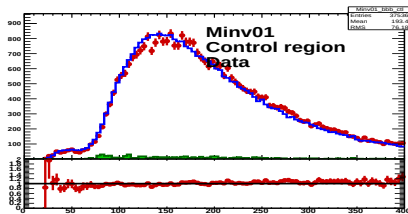
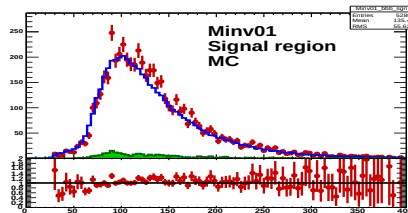
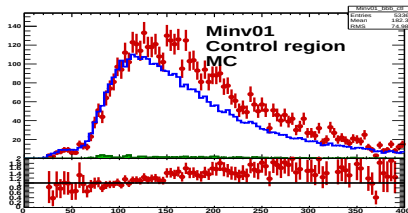
Discriminator





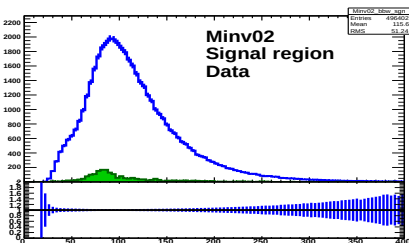
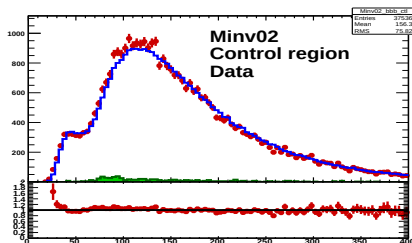
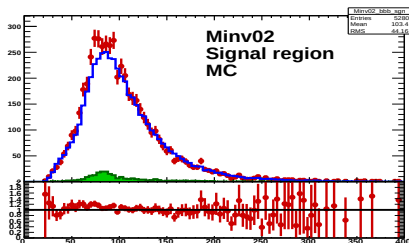
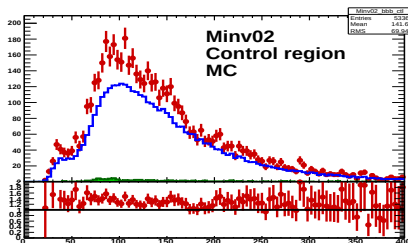
Invariant Mass Jet 1 and 2

Results with JetBProbability for FB/C fit



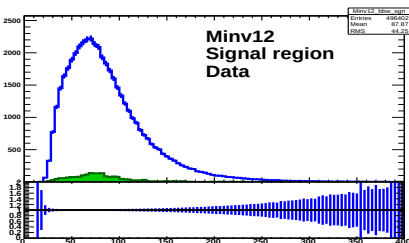
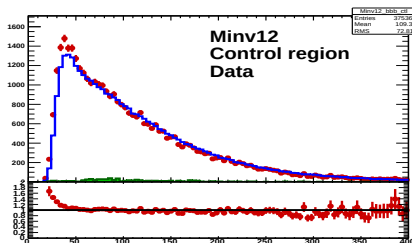
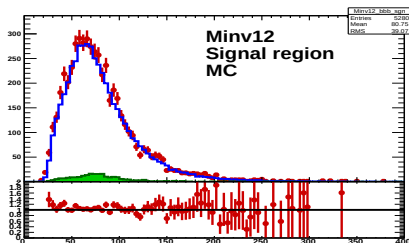
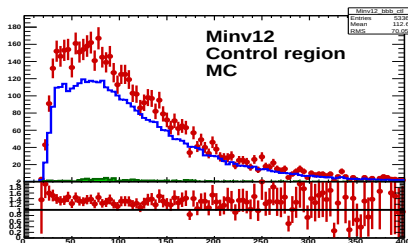


Invariant Mass Jet 1 and 3



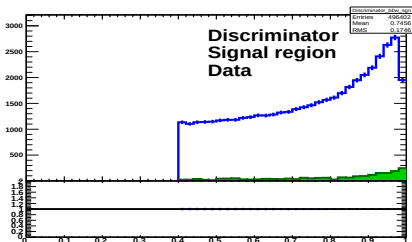
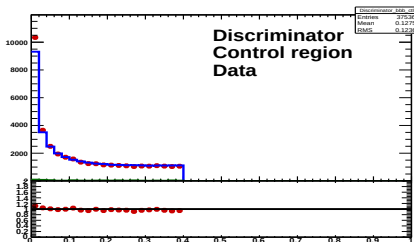
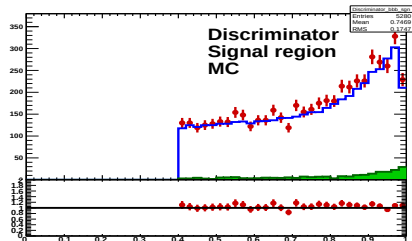
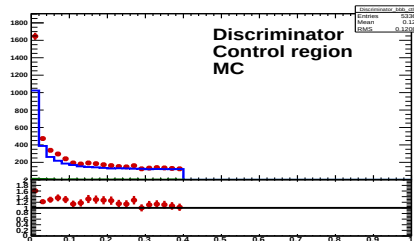


Invariant Mass Jet 2 and 3





Discriminator





Conclusion



- Inclusion of M_{inv} in the discriminator produces a better discriminator
- it also gives funny shape of $M_{inv}(1,2)$ in the control region
- however, the prediction seems better than with discriminator#0 (the old one, used so far)
- the same discriminator w/o the use of invariant mass gives still good results, w/o funny shapes. The discriminator is a bit less discriminating, but still good.
- Shown also results for high Higgs mass (250). Discriminator very powerful (shape to the checked, strange peak at $\Delta \sim 1$ for QCD)
- very low signal yield.