

SLTNN and $ZH \rightarrow \nu\bar{\nu}b\bar{b}$

04/01/2009

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INTRODUCTION

- SLTNN results in the $ZH \rightarrow \nu\nu b\bar{b}$ analysis :
used “hznunubb” package version from July 2008

PBLM : we saw too many QCD

→ update the package to the Moriond 2009 version

Steps shown today: Moriond 2009 analysis with
runIIb DATA only, JESMU correction, vertex confirmed jets
to exercise the analysis framework before to update it with SLTNN

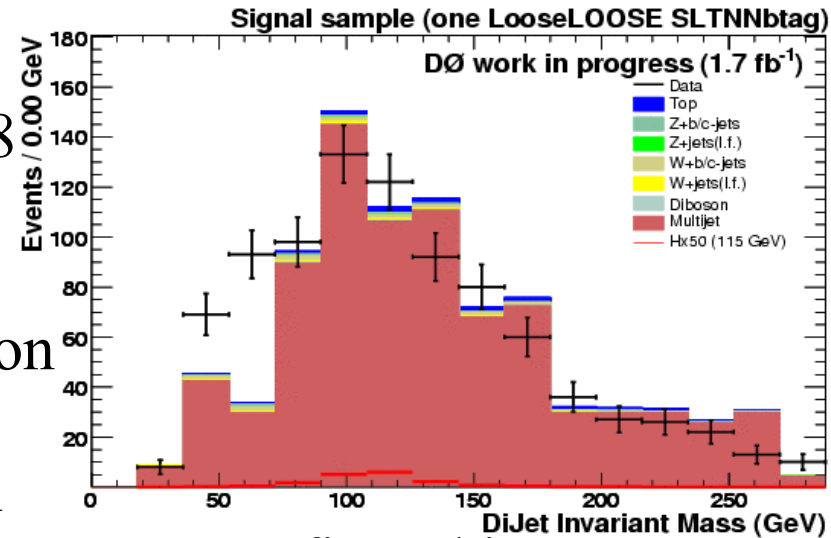
→ control samples

→ QCD enriched samples

→ selection + bTagging : NN b-tag: one Tight and two Asymmetric

- Worked on 3 fb^{-1} samples so far (runIIb Moriond 2009)

- Scale Factors, TRFs, fake rates, systematics, etc.. are available
for p20 but a complete update is on going to work with vertex
confirmed jets and switch to direct SLTNN tagging instead of TRF
→ after : need to adapt the “hznunubb package” to use SLTNN

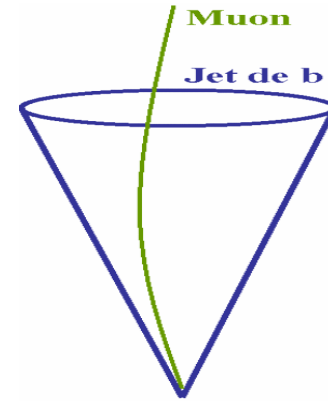


SLTNN METHOD

Around 20% of the b-jets contain muon $\left\{ \begin{array}{l} b \rightarrow \mu + X \sim 10 \% \\ b \rightarrow c \rightarrow \mu + X \sim 10 \% \end{array} \right.$

\Rightarrow 40% of our hznunubb signal events have at least one muon in jet
 \rightarrow goal is a $\sim 5\%$ per tagging efficiency increase

- “Muon Tagging”: muon $p_T > 4 \text{ GeV}$
muon $|\eta| < 2$
 $\Delta R(\text{muon}, \text{Jet}) < 0.5$



3 types of muon quality are studied in parallel :

Loose, Medium, Medium3 (Medium with nseg = 3)

- Neural Network : 5 Muon variables and 6 SVT variables

muon p_T
muon p_{Trel}
muon ΔR
muon χ^2/dof
muon IP sig

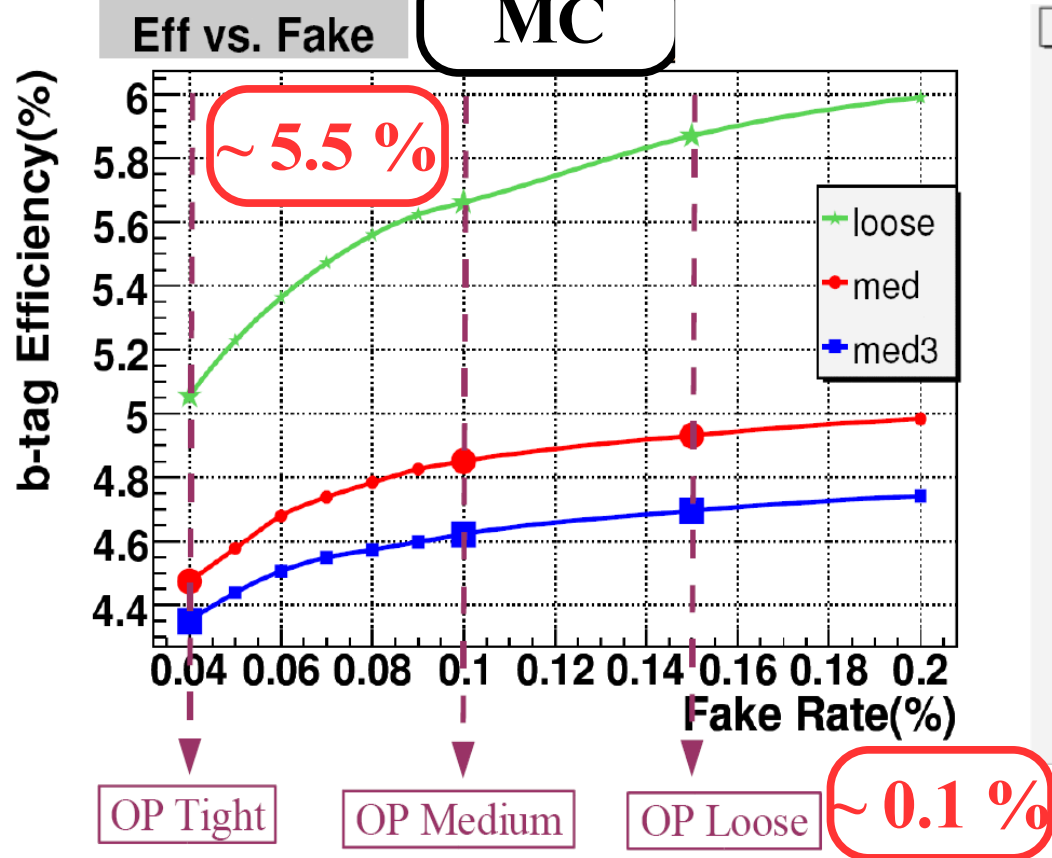
SV DLS
SV Mass
SV χ^2/dof
SV Ntracks
SV Nvtx
CSIPcomb

SLTNN RESULTS

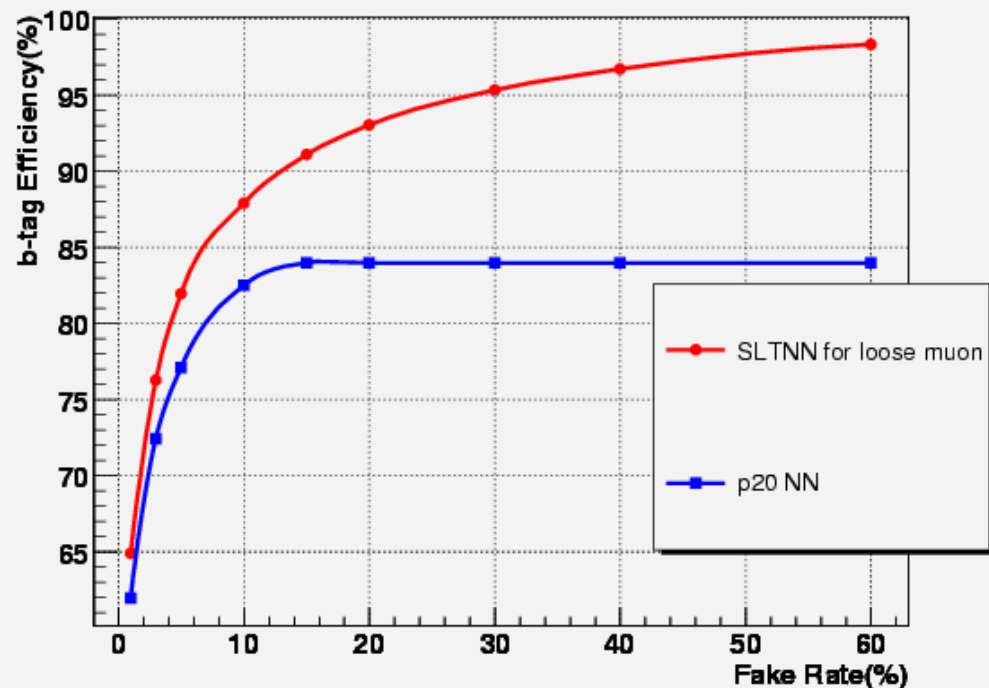
updating

for a sample
with a muon in jet

MC



Eff vs. Fake



We provide Scale Factors, TRFs, Fake Rates

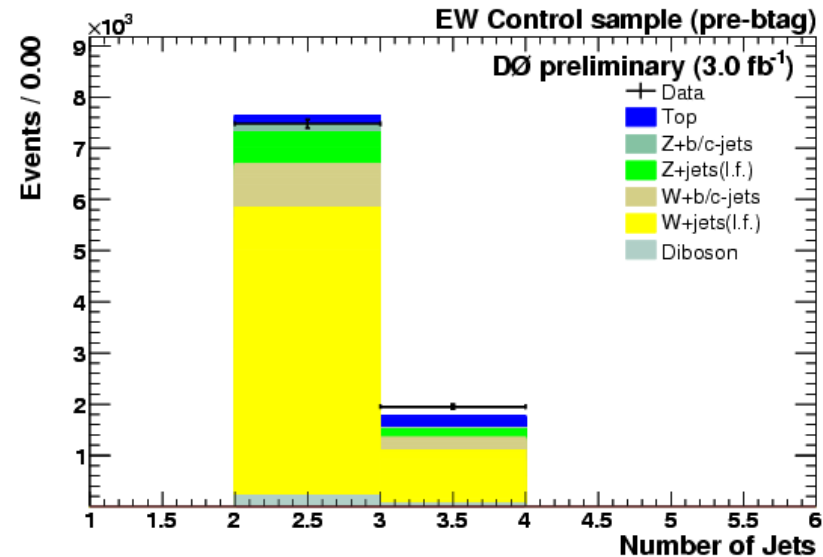
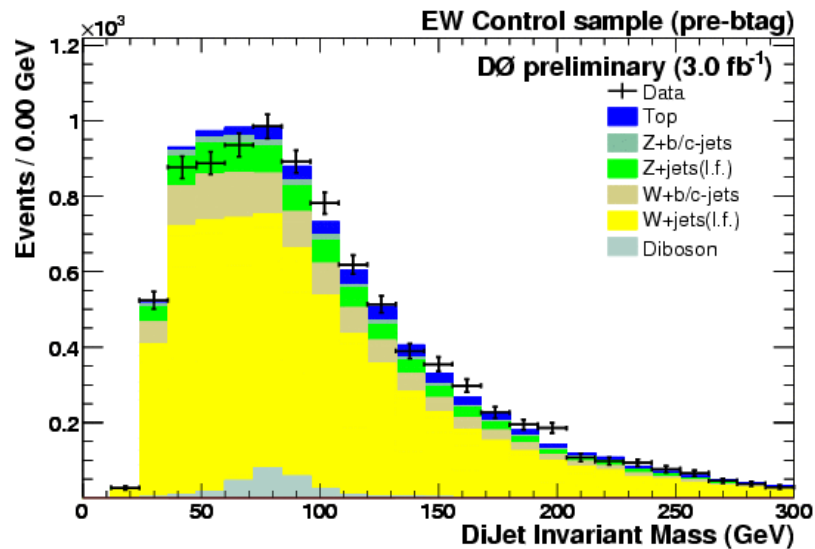
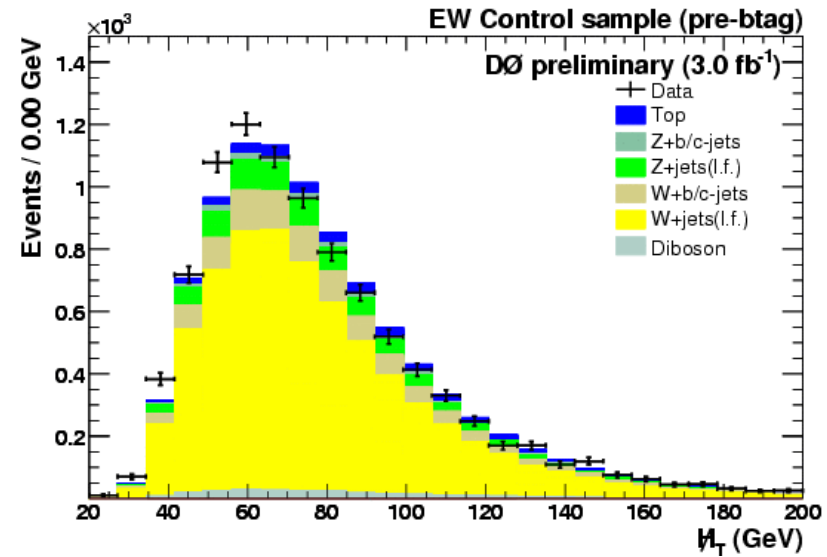
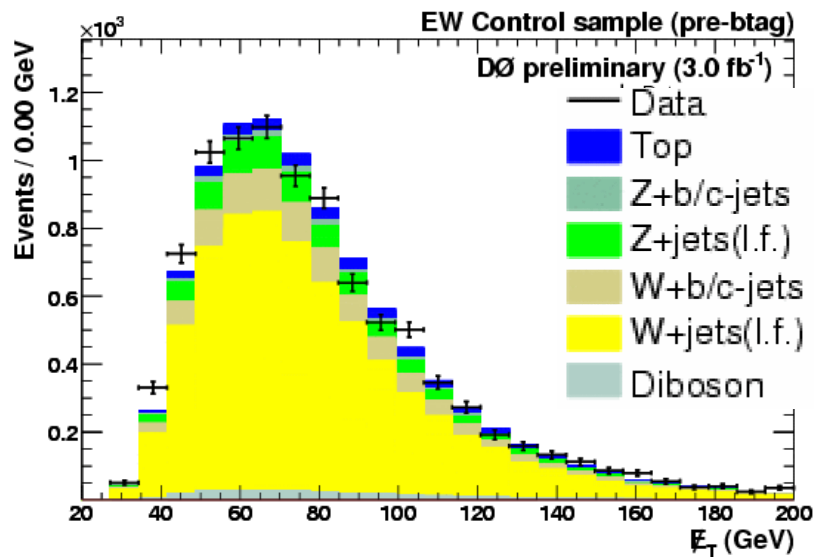
**Reproduce the $ZH \rightarrow \nu \nu b b$
Moriond 2009 Analysis**

W($\mu\nu$) + jets

CONTROL PLOTS

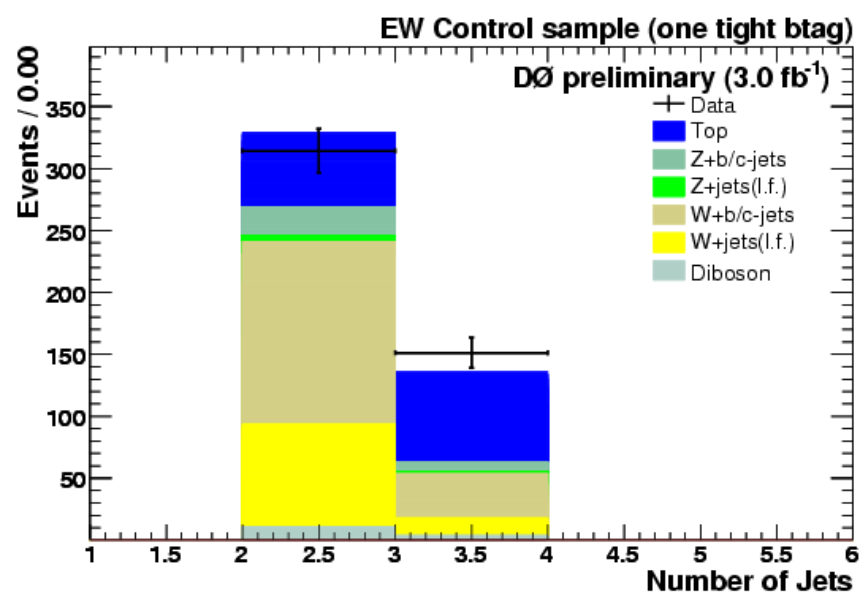
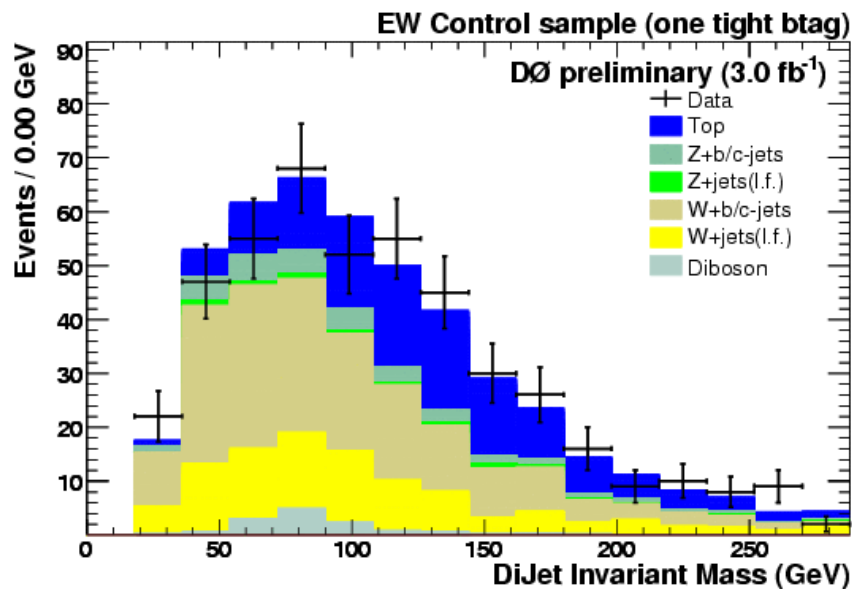
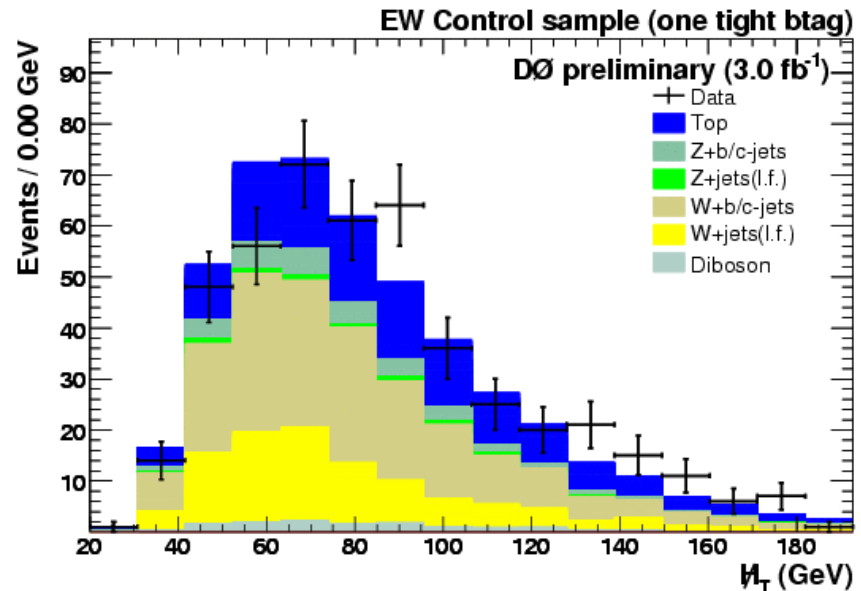
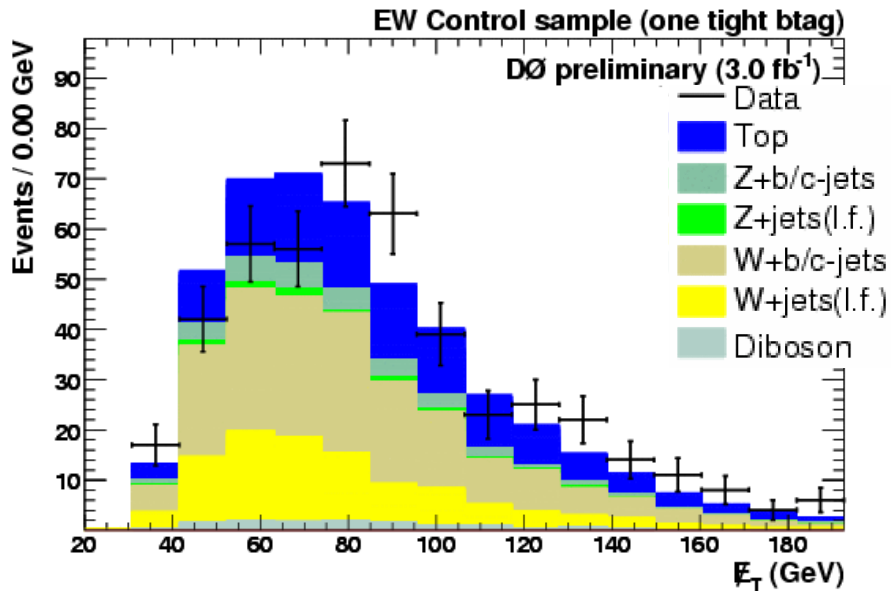
(pre- NN bTag)

We select W($\mu\nu$) + jets events to check EW bkg and Scale Factor



CONTROL PLOTS (one Tight NN bTag only)

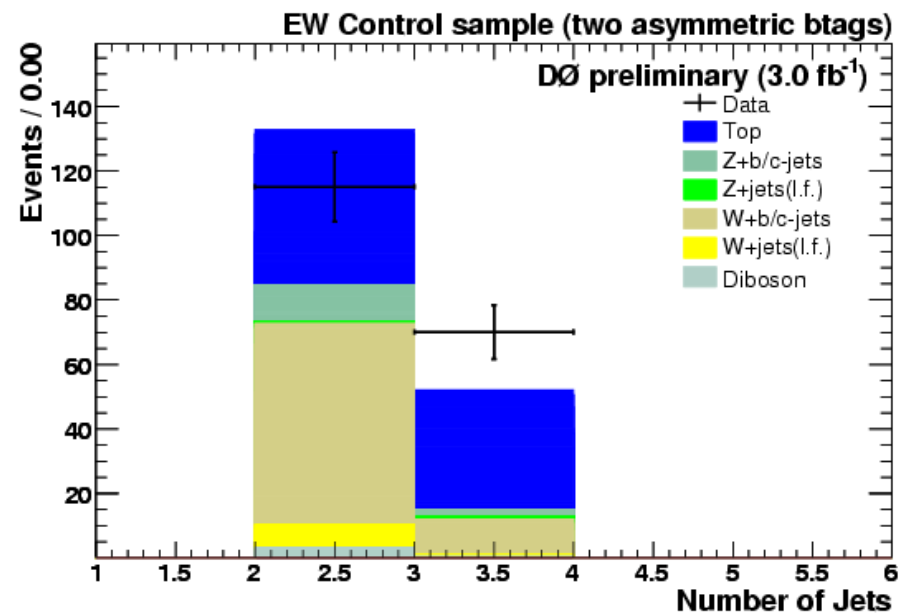
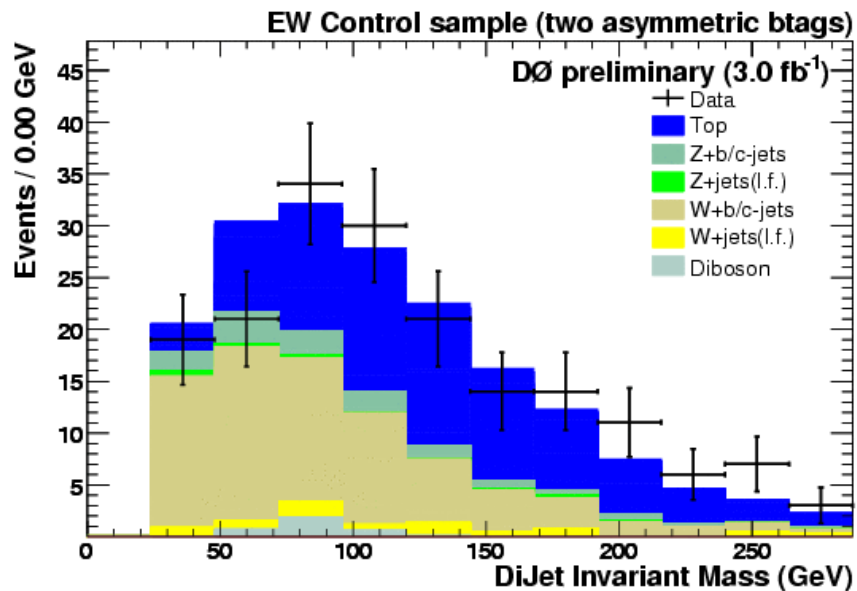
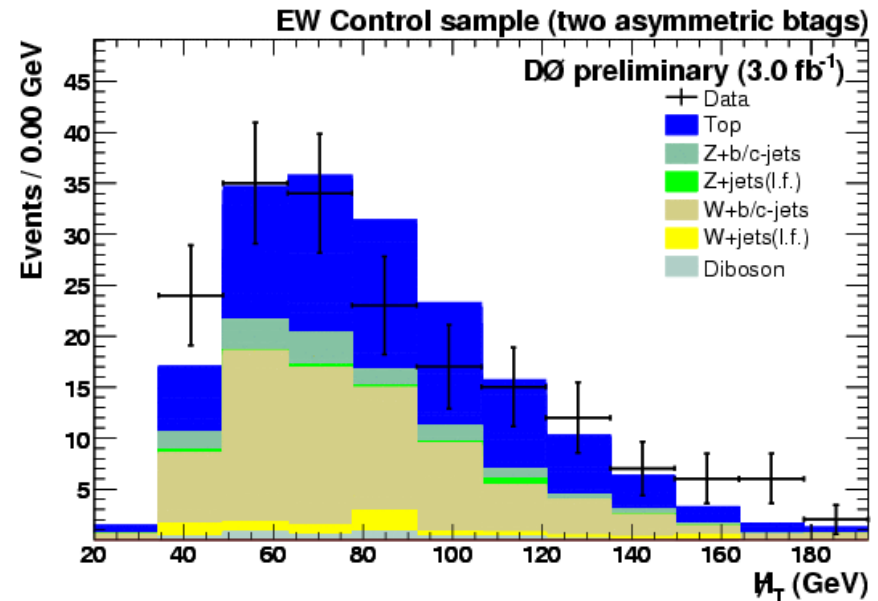
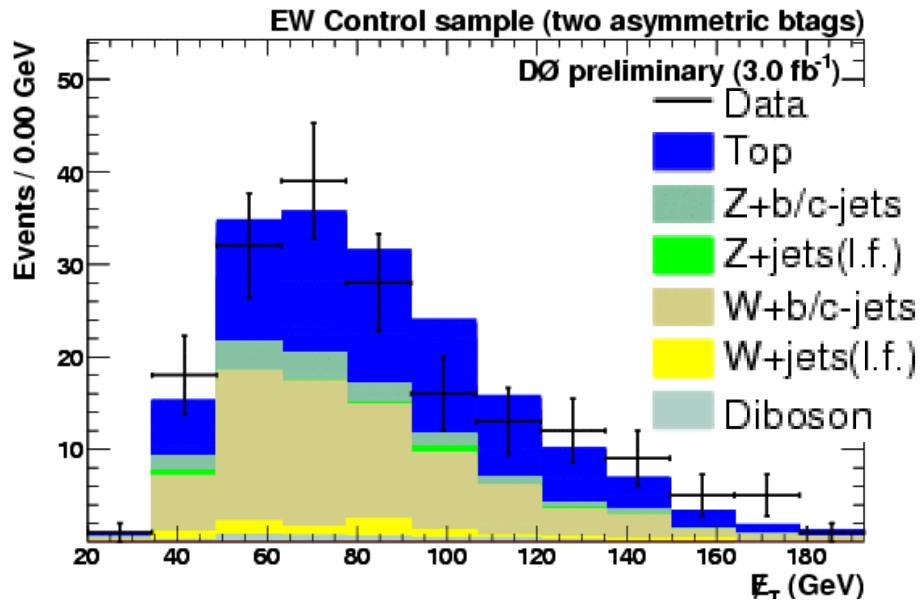
W($\mu\nu$) + jets



CONTROL PLOTS

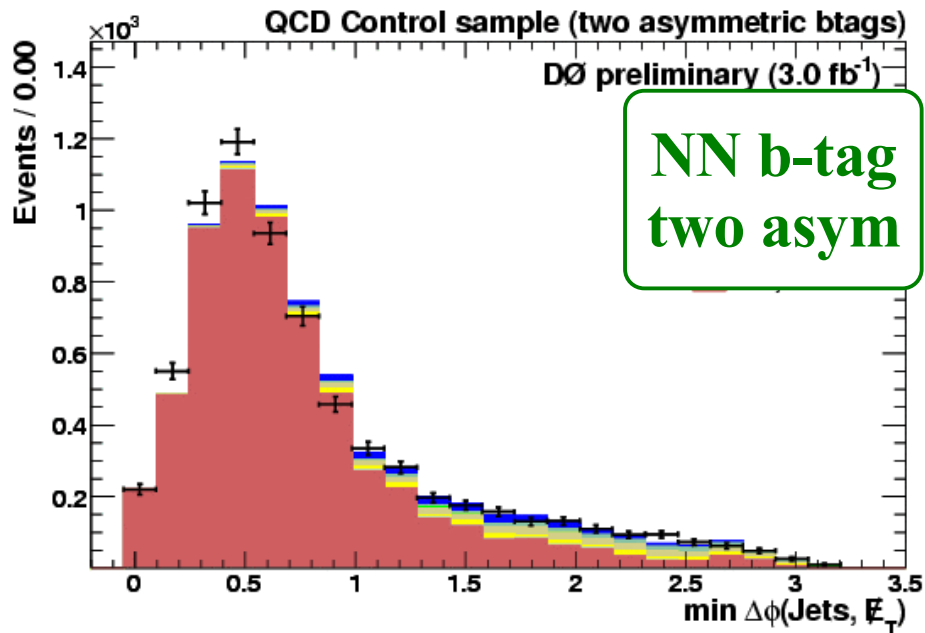
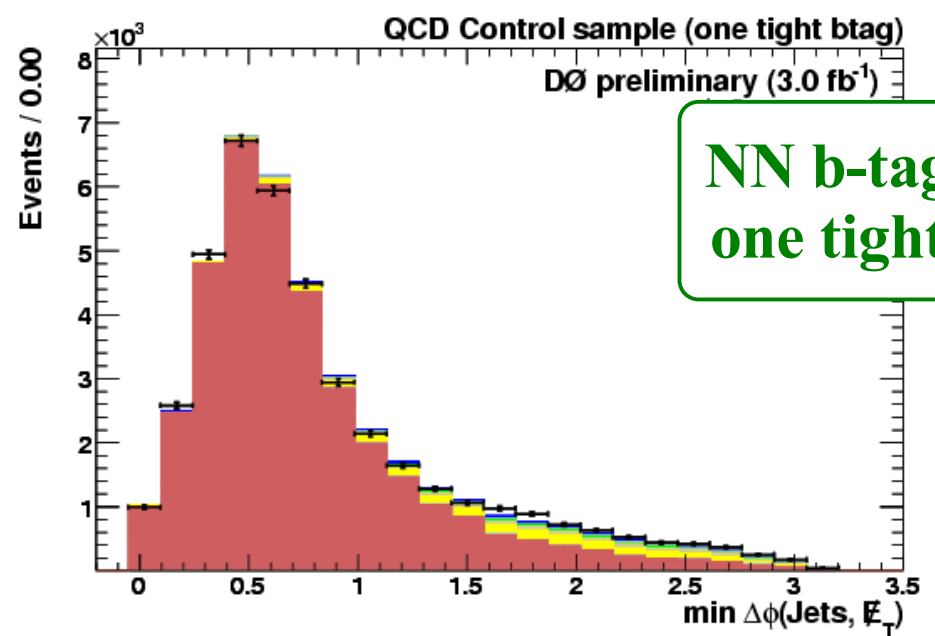
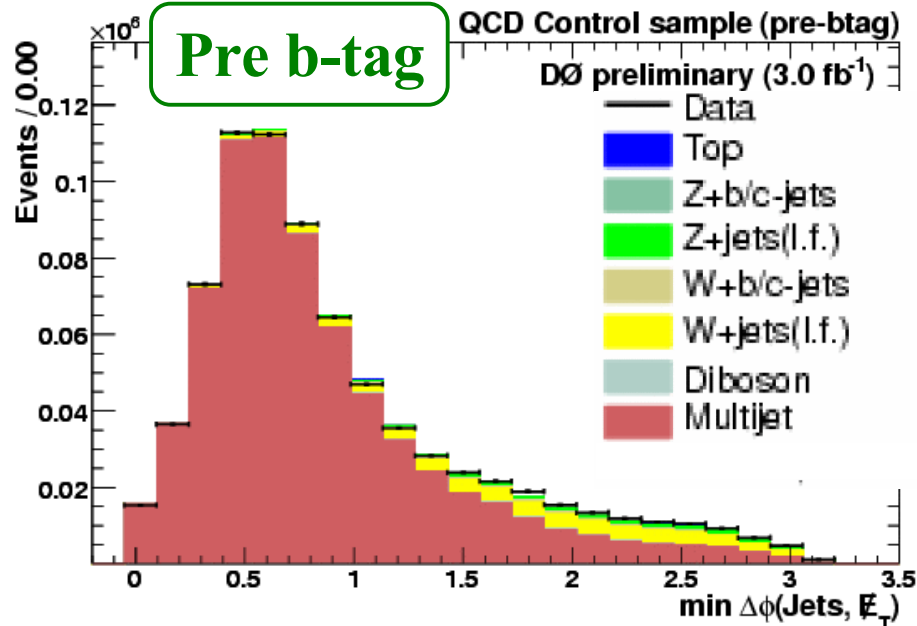
$W(\mu\nu) + \text{jets}$

(two Asymmetric NN bTag only)



QCD Enriched PLOTS MET > 30 GeV

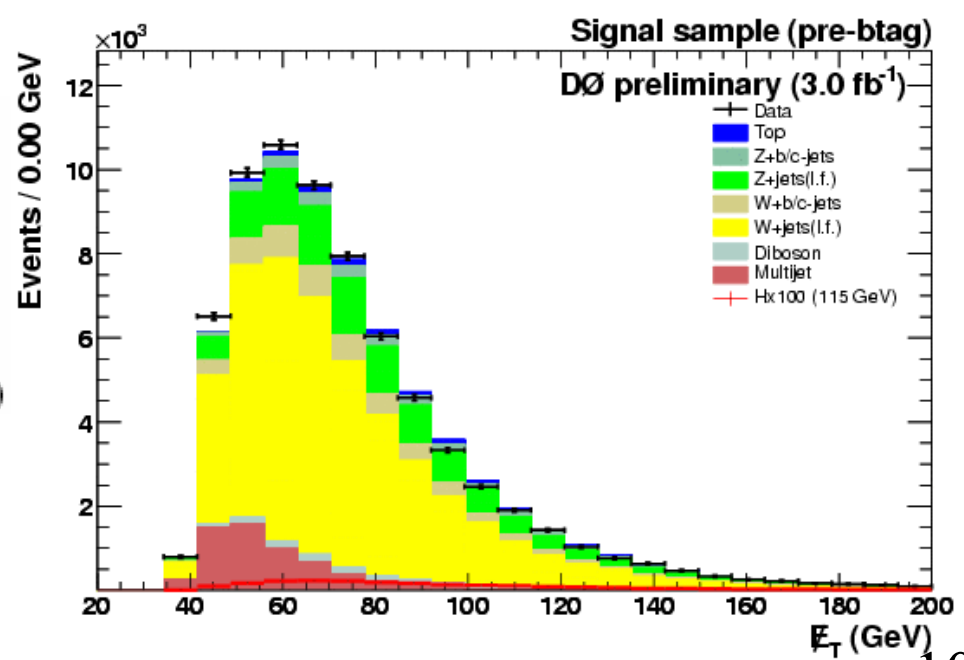
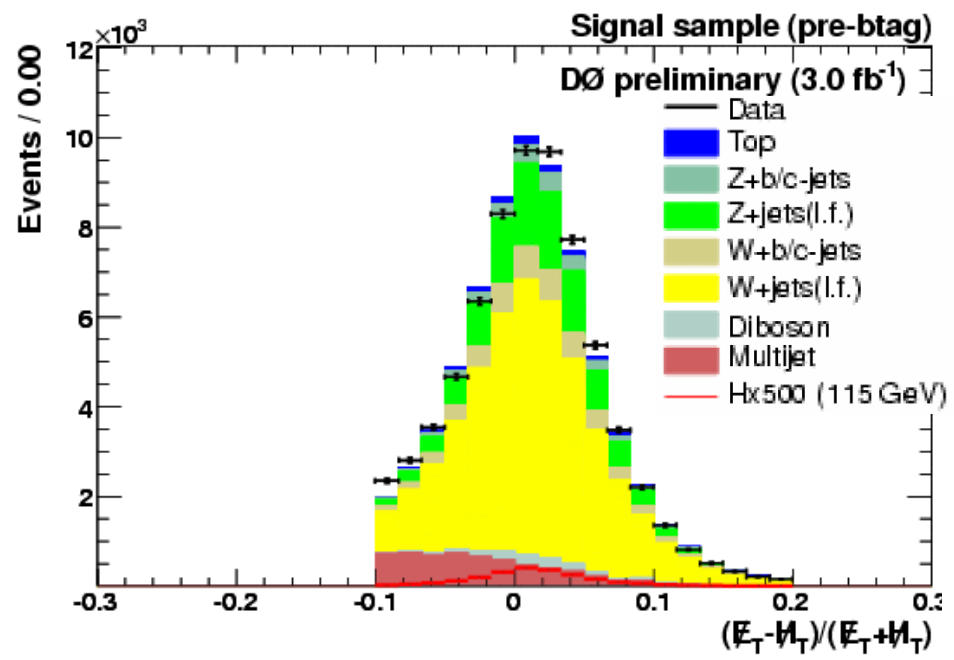
Now check if QCD is under control



now the analysis

SELECTION

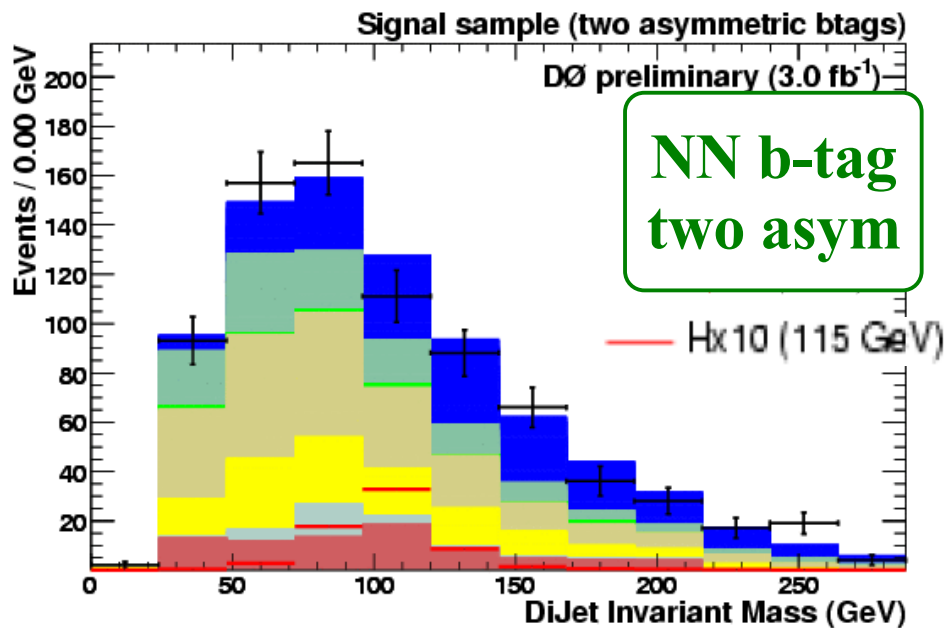
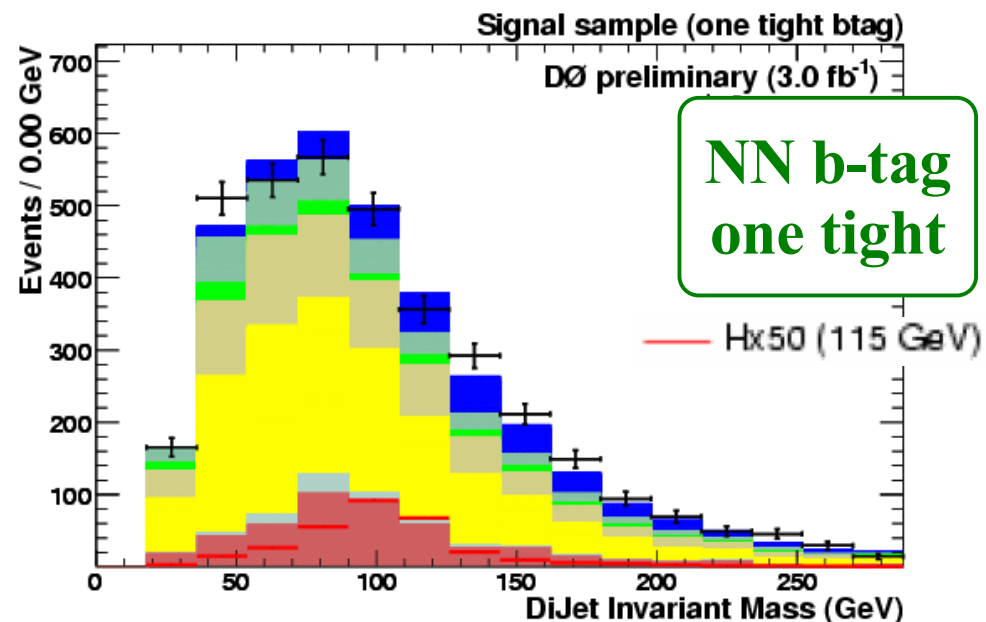
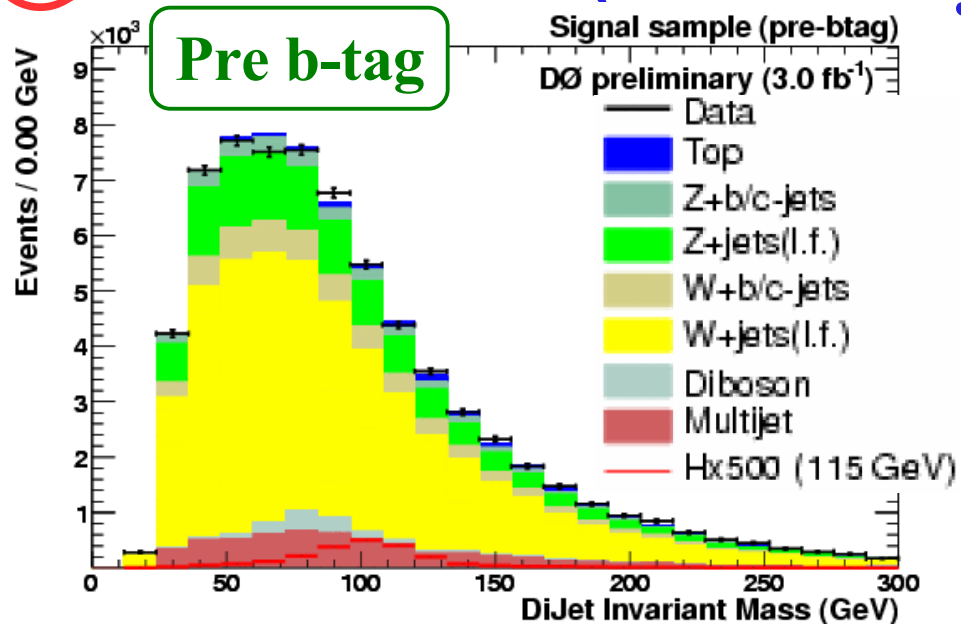
- METsignificance > 5
- MET > 40 GeV
- “Triangle” cut : $MET \geq -40 * \min\Delta\Phi + 80$
- Asymmetry cut:
 $-0.1 < MA < 0.2$ ($MA = [MET - MHT] / [MET + MHT]$)



NN

ANALYSIS PLOTS

(after asymmetric cut)



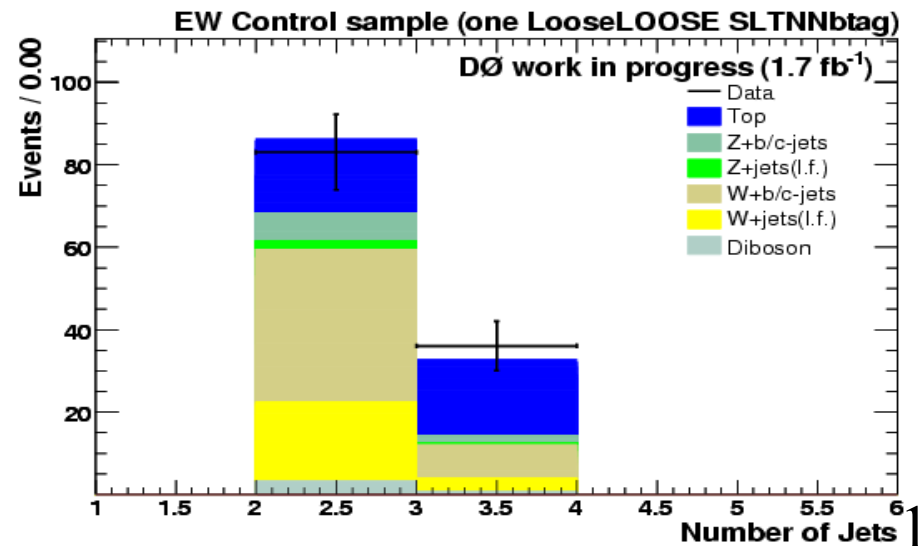
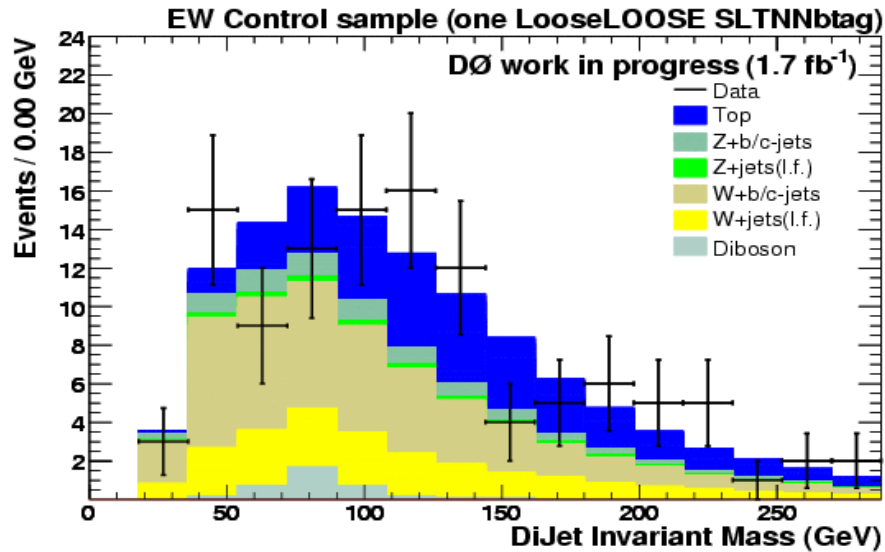
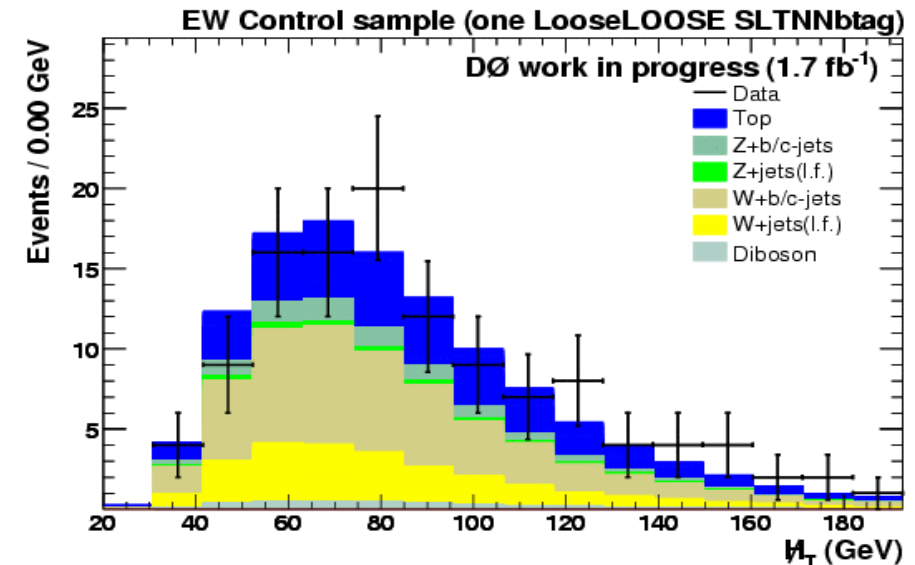
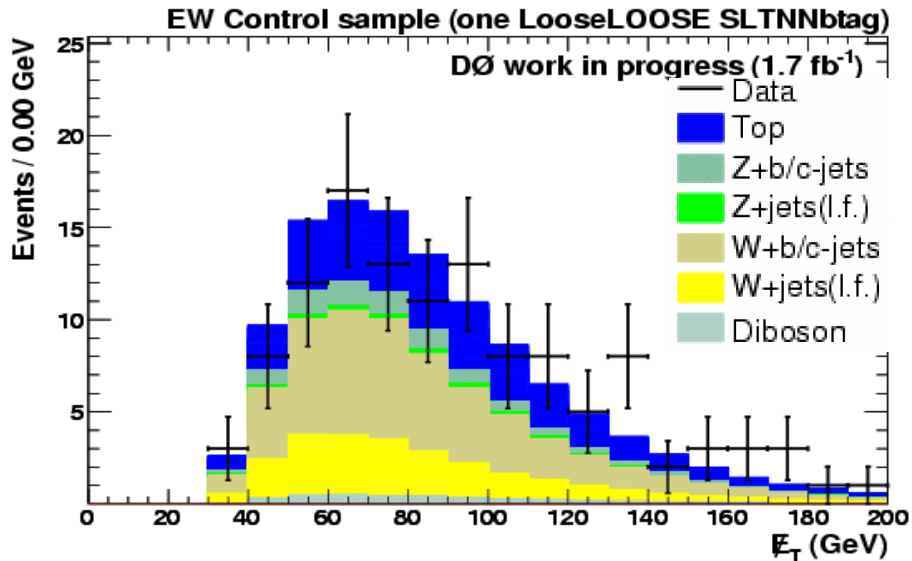
SLTNN

CONTROL PLOTS

$W(\mu\nu) + \text{jets}$

(one Loose μ LOOSE OP SLTNN bTag only)

SLTNN results in July 2008 package (1.7 fb^{-1})
used with TRFs and without vertex confirmed jets



CONCLUSION :

**ZH→ vbb moriond 2009 package
was successfully updated with JESMU correction
and gives similar results to the one shown at Moriond 2009 using JES**

**JES Analysis SF : 0.93 (EW) / 1.30442 (QCD enriched) / 1.14 (QCD)
JESMU Analysis SF : 0.96 (EW) / 1.30371 (QCD enriched) / 1.13 (QCD)**

ON GOING :

- **Update and developed to Run IIb the SLTNN tagger:
Scale Factors, TRFs, fake rates, systematics, etc..
with vertex confirmed jets, direct taggability and direct tagging**
- **Adapte the “hznunubb package” to compare NN and SLTNN
performances on the analysis subsamples with muon in jets**
- **Derive Collie plots**
- **But how to combine NN and SLTNN ?**