b-ID:

p17 certification:

Version 1.1 seems solid so far
- Maybe some failure of the pT/eta parameterization of TRFs for ALPGEN W/Z+bb/cc samples?

- Also certifying SVT tight for comparison with p14

Version 2.0: for p17 publications
- stalled…

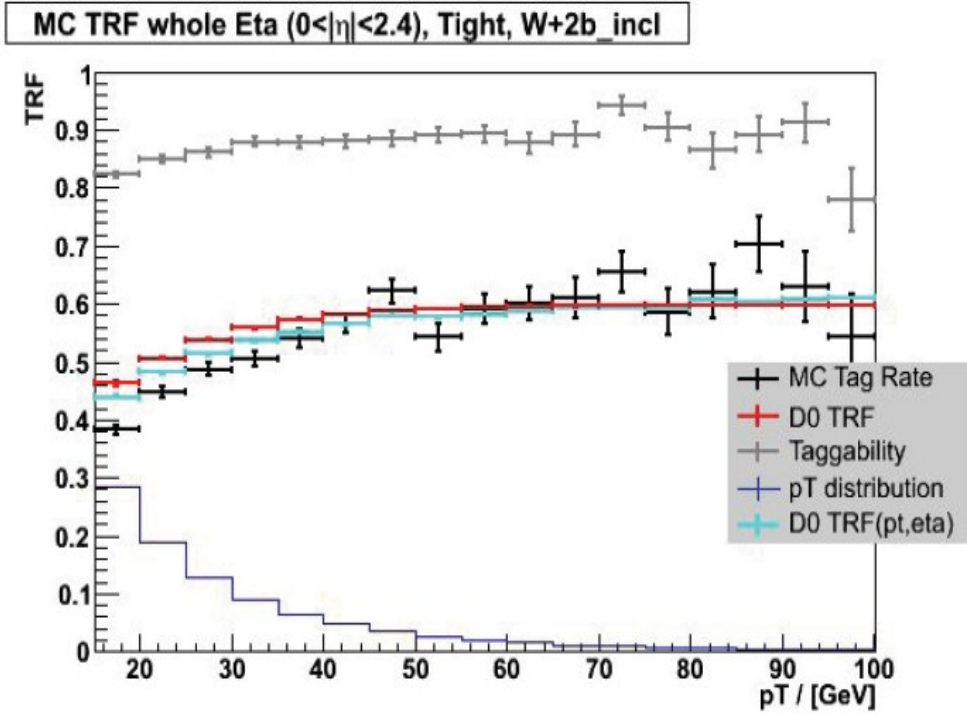
p20:

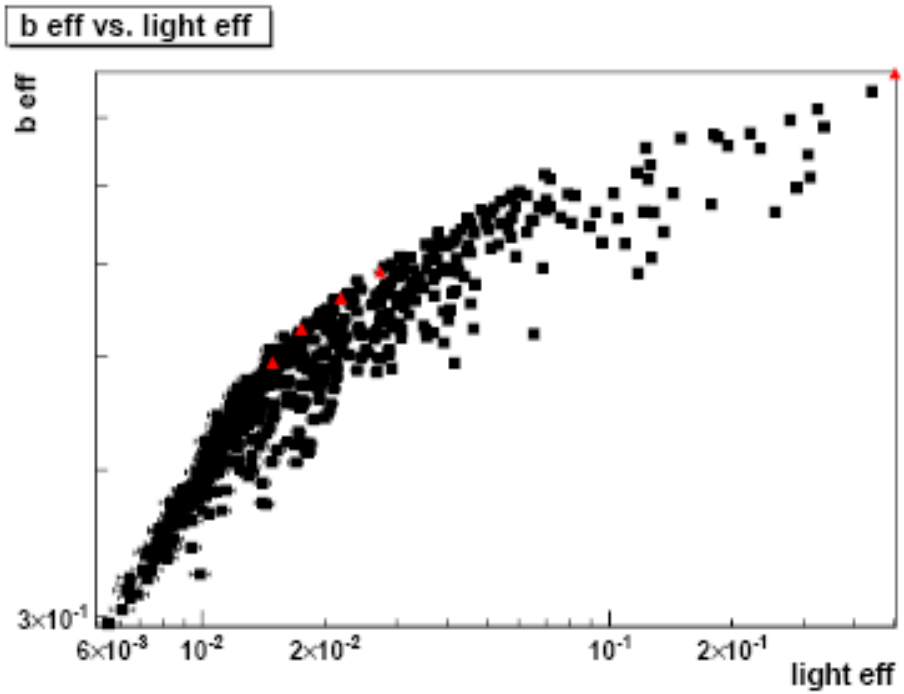
- Optimizing the SV reconstruction parameters (track pT, chi2, etc.)… -> random grid search in MC
- Have new help from a new Notre Dame grad student for NN !

CAFe interface:

- Processor for running over a data sample and deriving a taggability parameterization is available – I need to test it

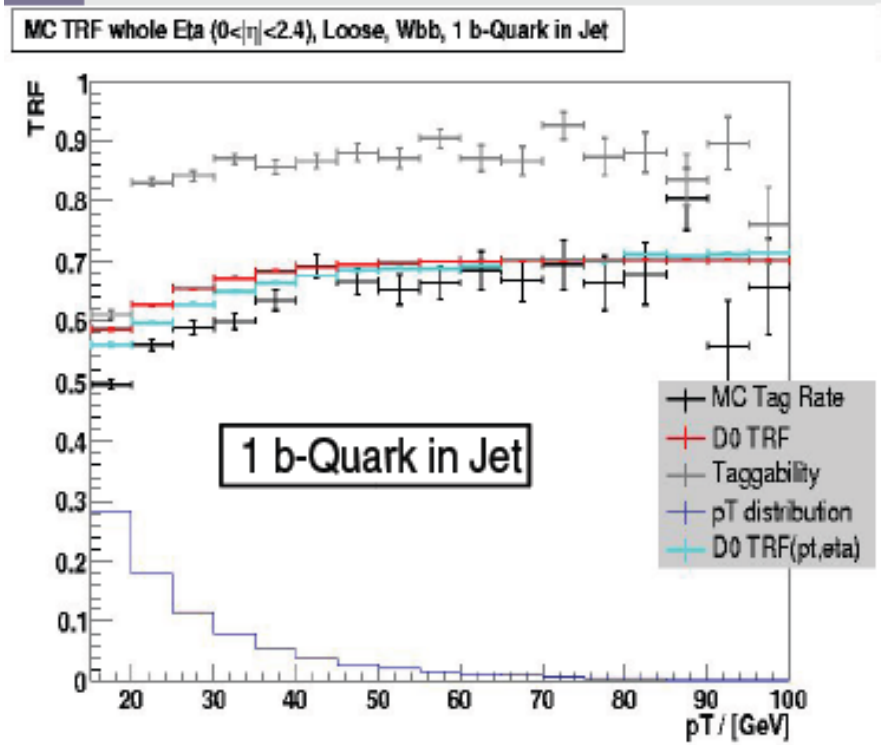
- Additional taggability studies, n_PV, sample/trigger, etc. have been done, systematics evaluated

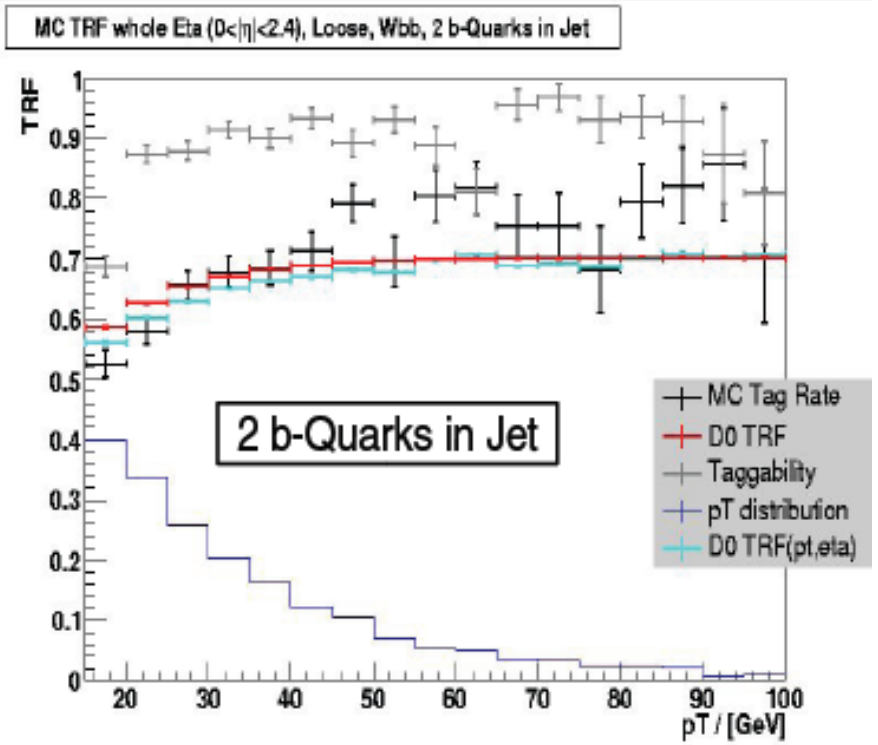




Tag Rate for 1 / 2 b-Quarks in Jet

- for jets with two quarks, tag rate is *not* lower *(except for very low pT)*
- *the same behaviour for* QCD with b-*sample (request id 32018)*
- possible reason: with more b-Quarks in a jet, there are: more displaced tracks; two possible secondary vertices -> the tag rate tends to be generally higher
- *possible reason for lower tag rate at low pT:* both b-Quarks contribute to the energy of the jet, so each has less energy





Stopped Gluinos:

Got comments from EB, responded, now waiting... but wheels are in motion for publication approval...

p17 Search for NLLP->bb

Stalled while pushing for ICHEP...

p14 Evidence of ppbar->Z->bb (4.4 sigma)

Used to be combined with Per's analysis

We decided to push just my part of the analysis for ICHEP

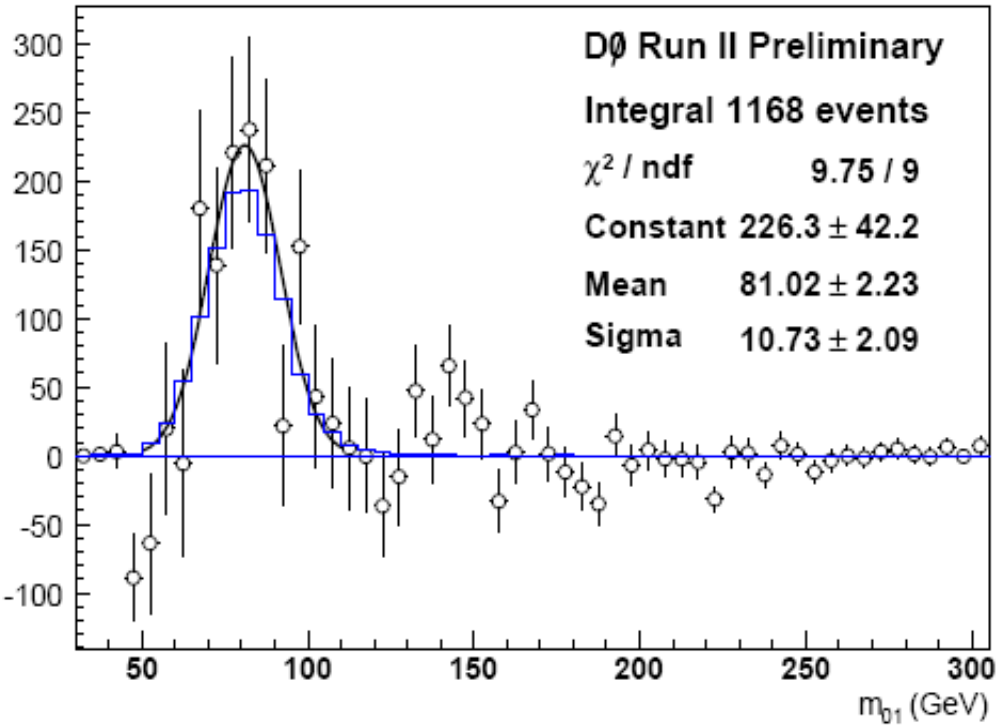
Systematic uncertainties were evaluated

Shown at ICHEP last Friday!

p17 ZH(->mumubb):

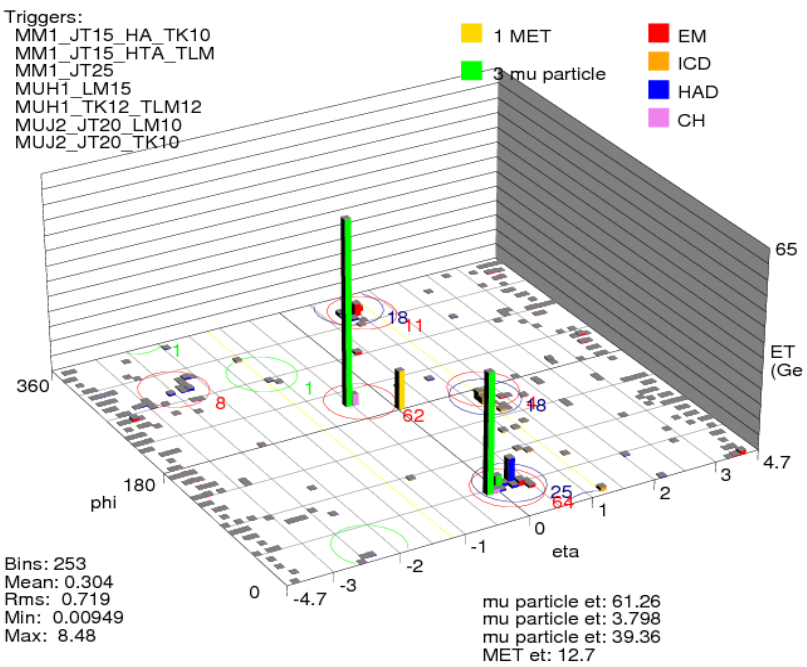
QCD background
- evaluated in 2 b-tagged channel
- tried several methods of muon isolation for optimal S/sqrt(B)

REU student has finished a NN for S/sqrt(B) separation, using variables like MET, M(mumu), jet angles (eta1, eta2, dphi, deta, dR), etc.



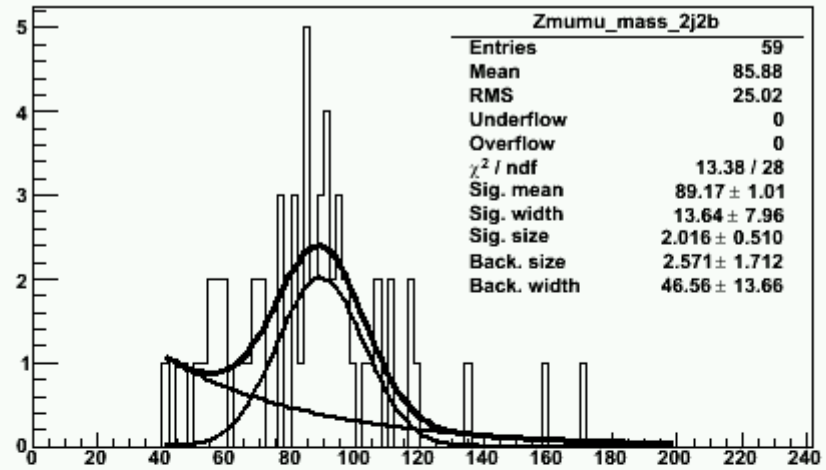
QCD Background

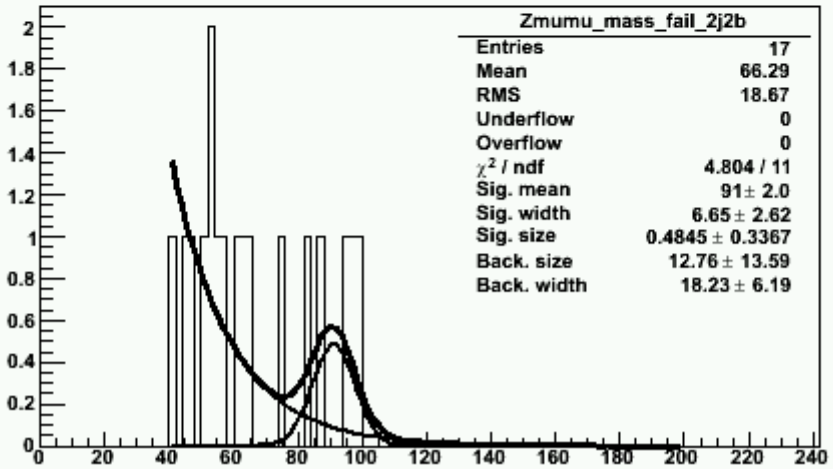
- Looking at double b-tagged events, I was disturbed to see many very non-isolated muons forming the Z
  - Comes from 2/4 isolation cuts
  - As long as one muon is very isolated, the other can be in a jet!
  - Enhanced in b-tagged events, due to muons in jets from b-jets
- Require that <u>both</u> muons are isolated (allow 0/4 isolation cuts to fail)
- New method: require that the <u>product</u> of the <u>scaled isolation</u> is <0.01
  - scaled isolation = (track + cal halo) / muon pT
  -
  - gives better signal efficiency, and less background fraction, even in 2b channel...



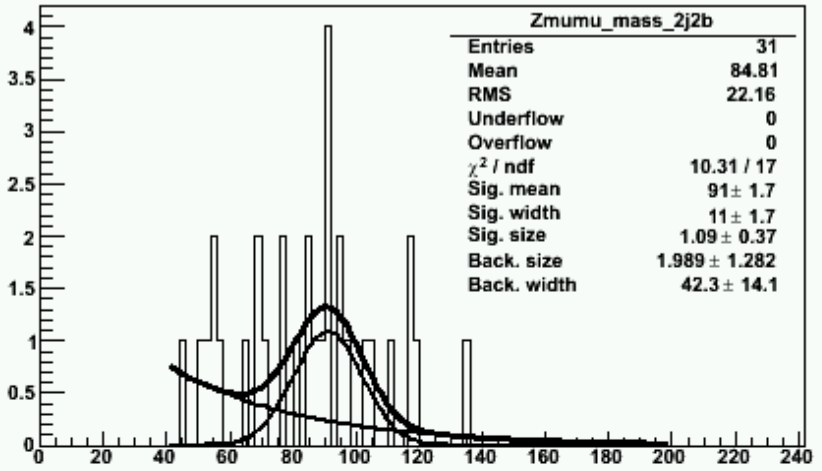
isolated
vs.
non-isolated

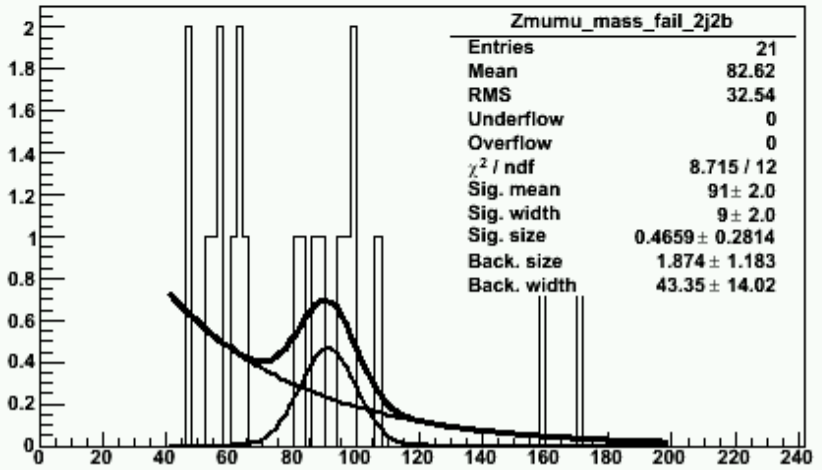
QCD Background with 2 b-tags





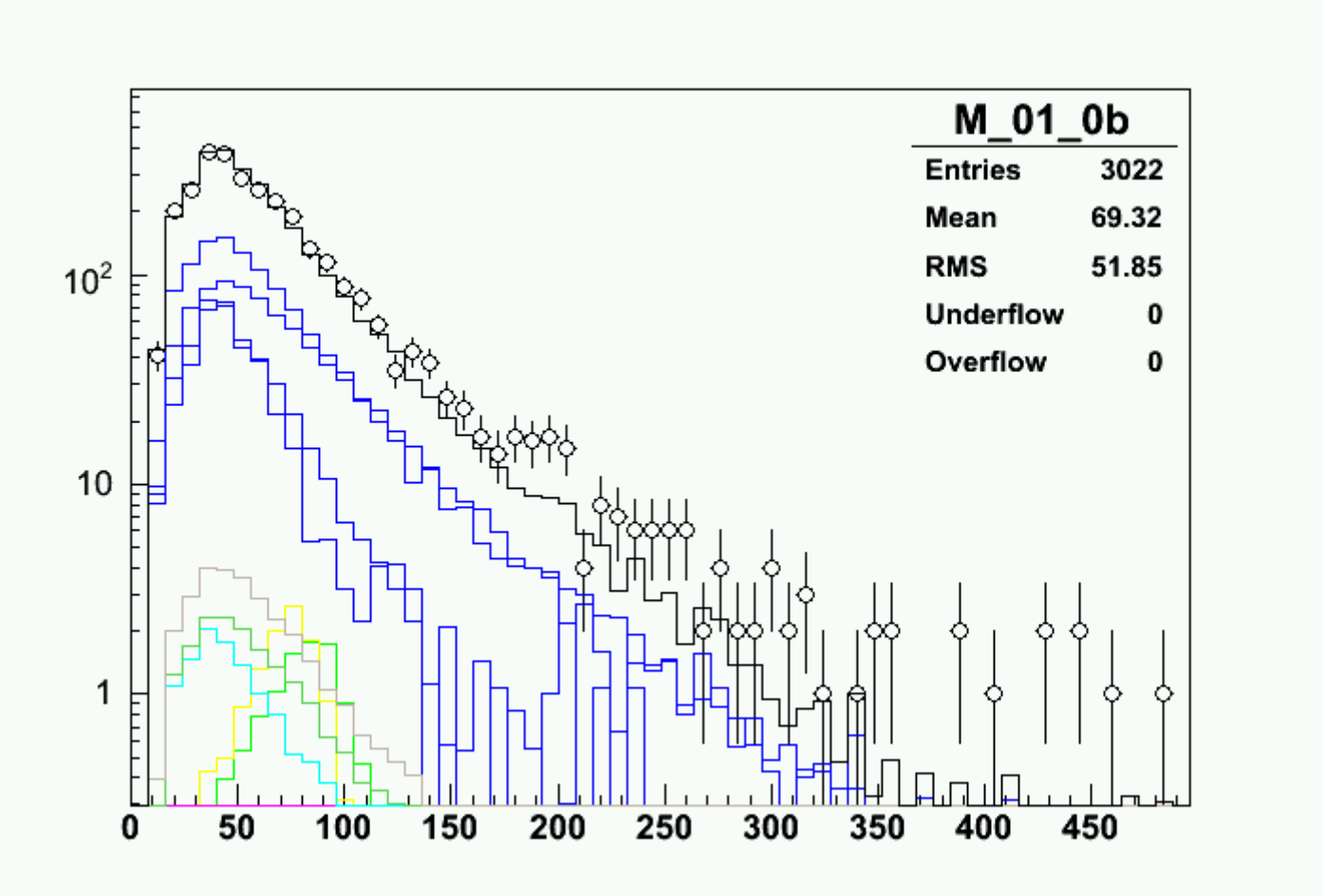
scaled isolation < 0.01



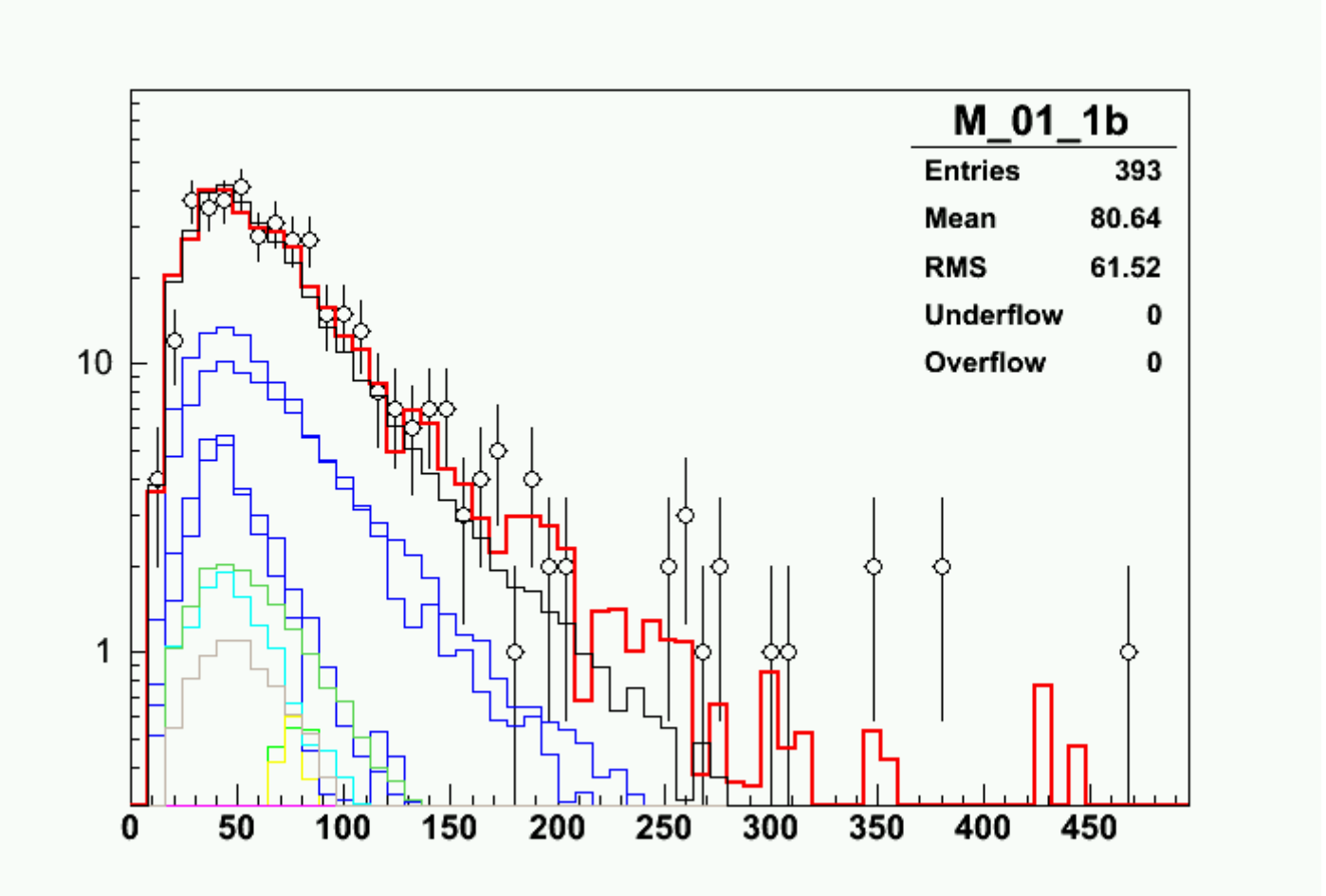


0/4 isolation

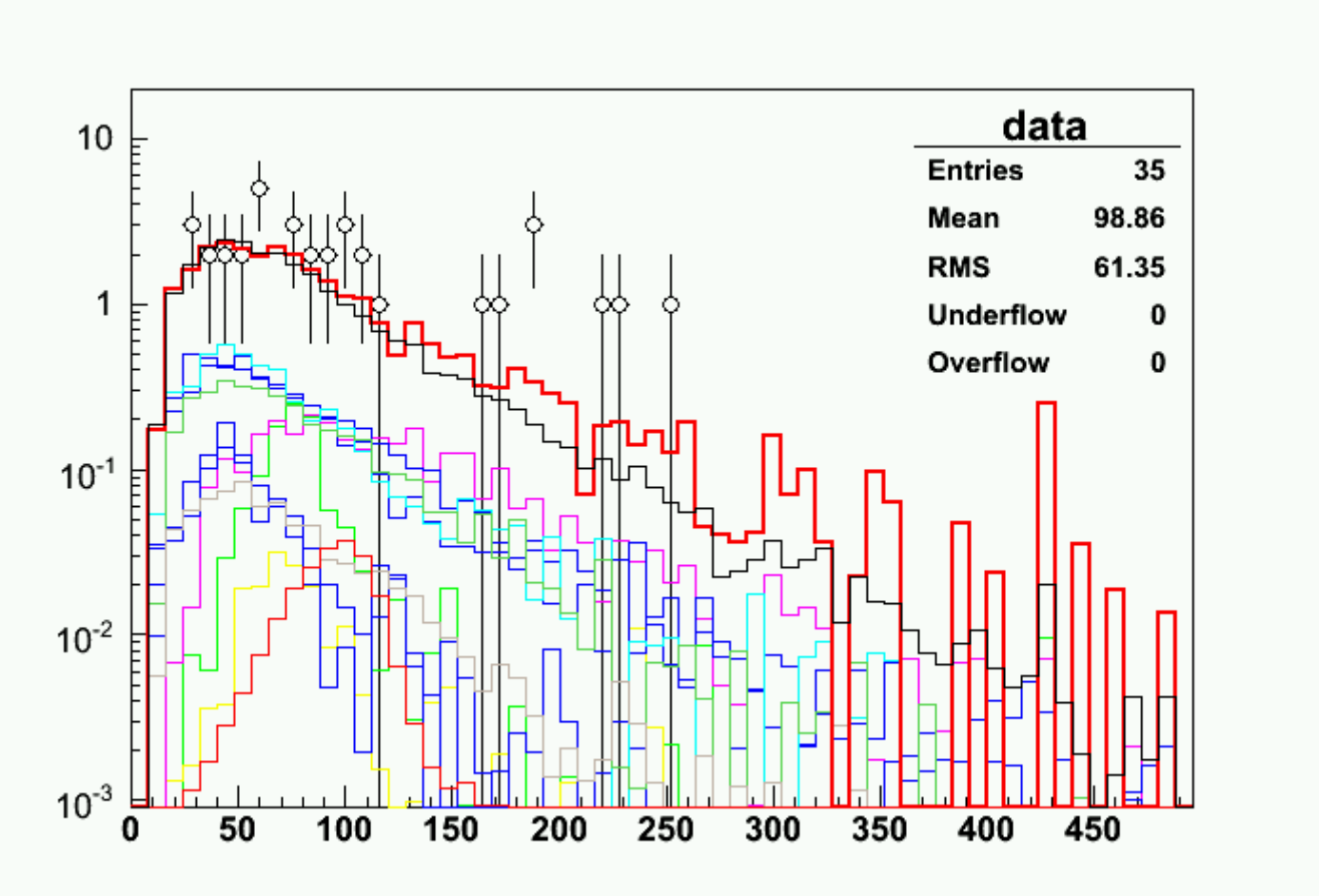
M(j0,j1) – 0 b-tags



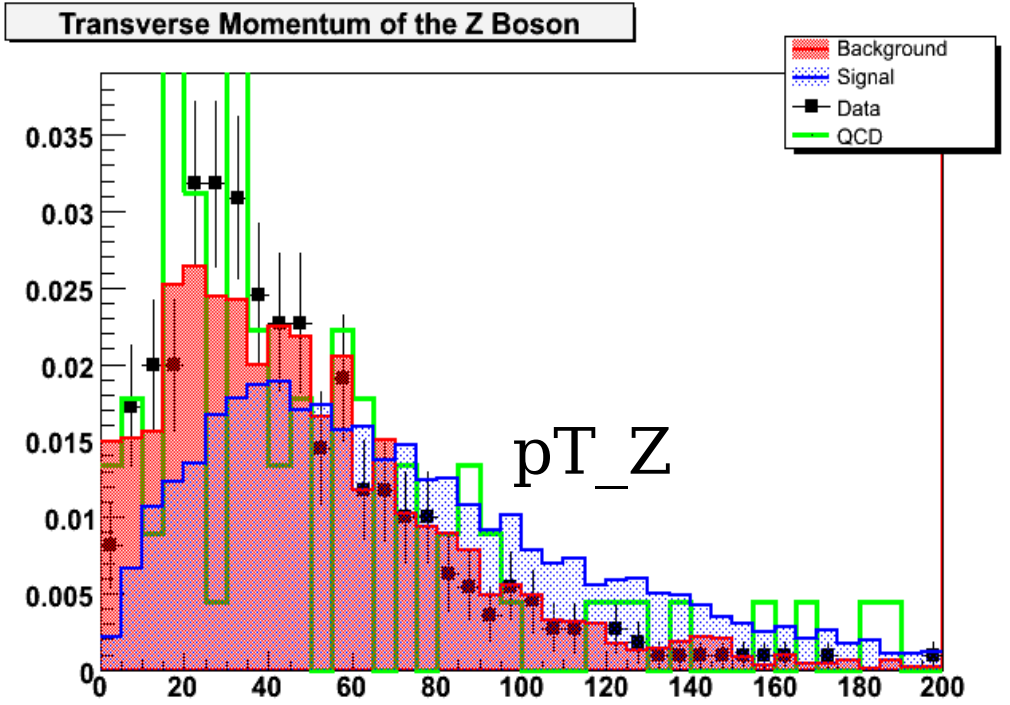
1 b-tag

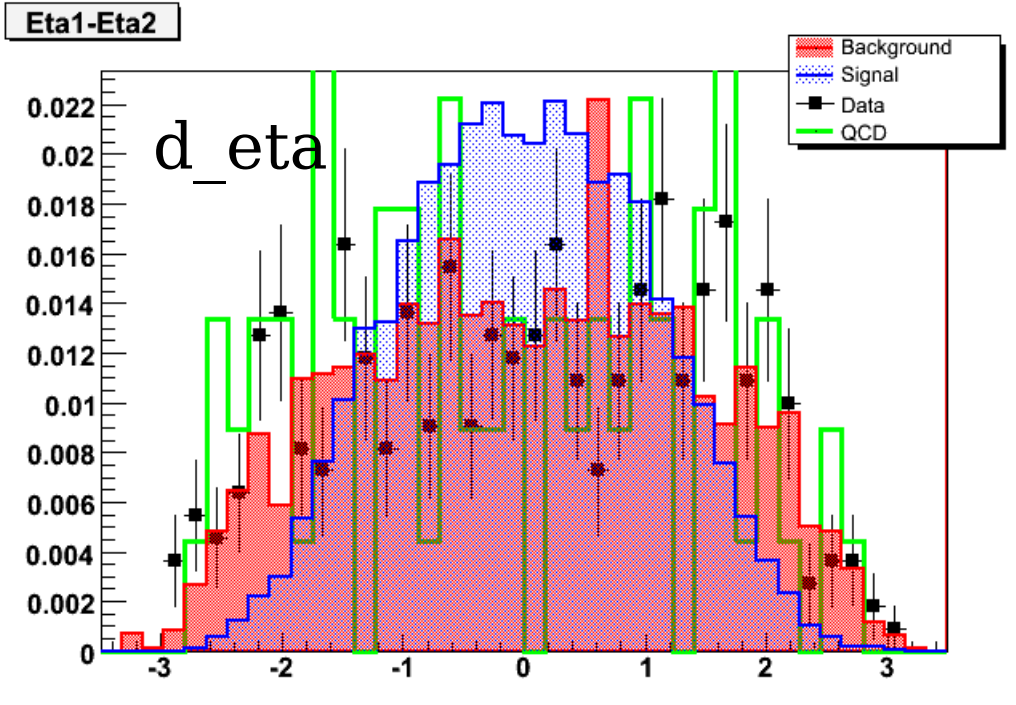

M_01_1b
Entries 393
Mean 80.64
RMS 61.52
Underflow 0
Overflow 0
10
1
0
50
100
150
200
250
300
350
400
450

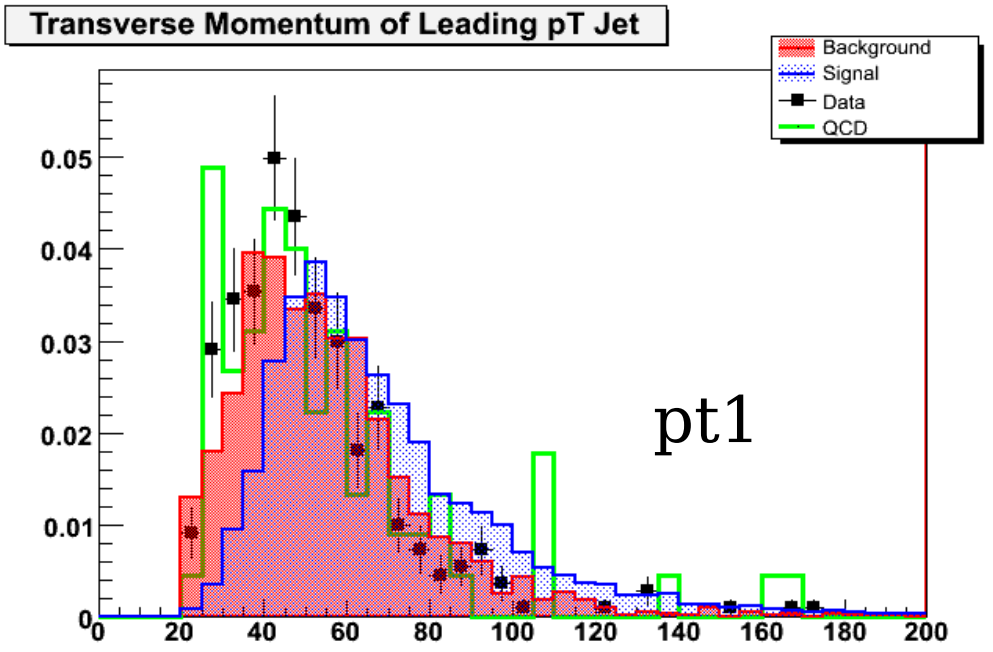
2 b-tags

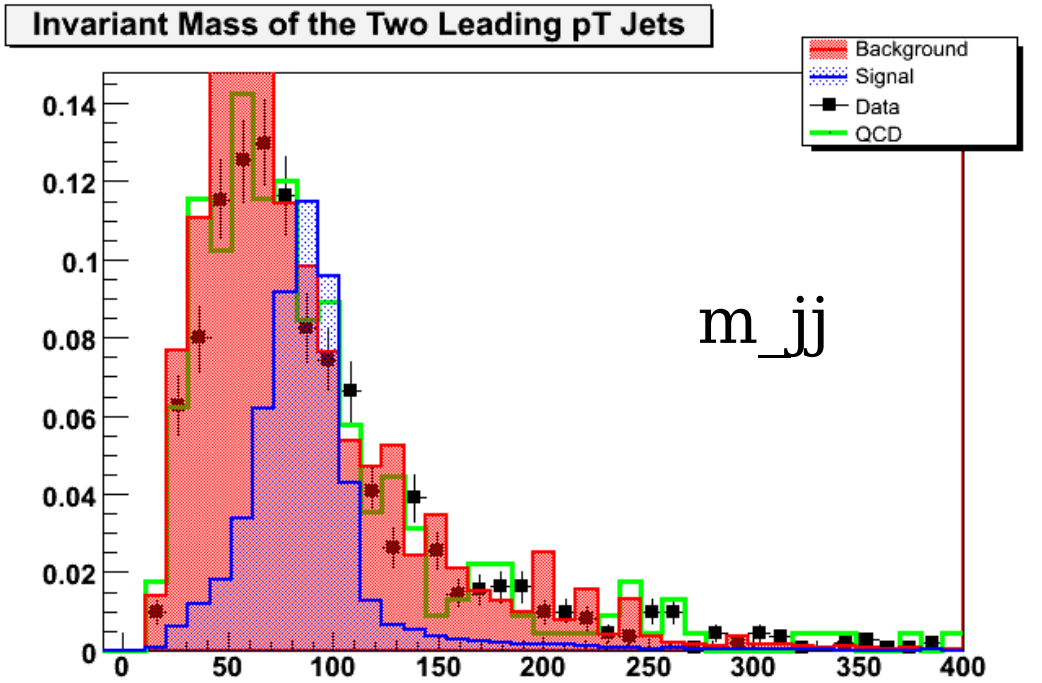


Good agreement after adding 25% QCD background...


Transverse Momentum of the Z Boson
Background
Signal
Data
QCD
pT_Z
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0
20
40
60
80
100
120
140
160
180
200


Eta1-Eta2
Background
Signal
Data
QCD
d_eta
0.022
0.02
0.018
0.016
0.014
0.012
0.01
0.008
0.006
0.004
0.002
0
-3
-2
-1
0
1
2
3


Transverse Momentum of Leading pT Jet
Background
Signal
Data
QCD
pt1
0.05
0.04
0.03
0.02
0.01
0
0
20
40
60
80
100
120
140
160
180
200


Invariant Mass of the Two Leading pT Jets
Background
Signal
Data
QCD
m_jj
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
50
100
150
200
250
300
350
400

NN

Including QCD background from data as a background sample (M(mumu) outside Z mass 70-110 window)
- *Can train the NN against QCD kinematics*

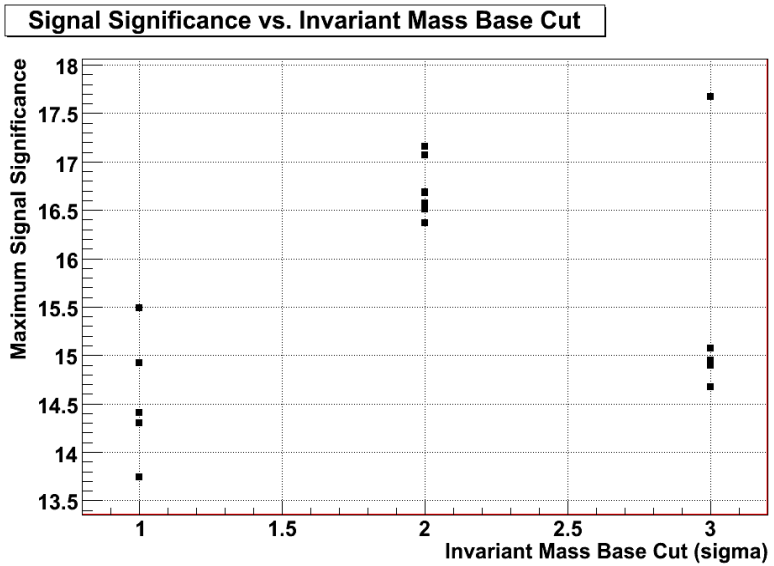
Optimized many parameters...
- # training epochs
- # hidden neurons
- training method
- NN weighting method of backgrounds
- Initial Mjj cut

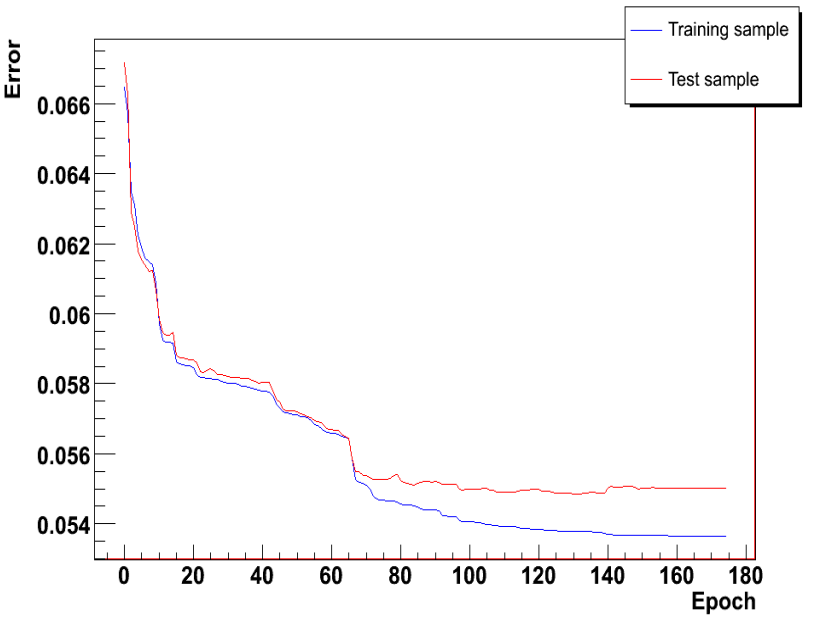
Separate NN for each m_H (105, 115, ... 155)

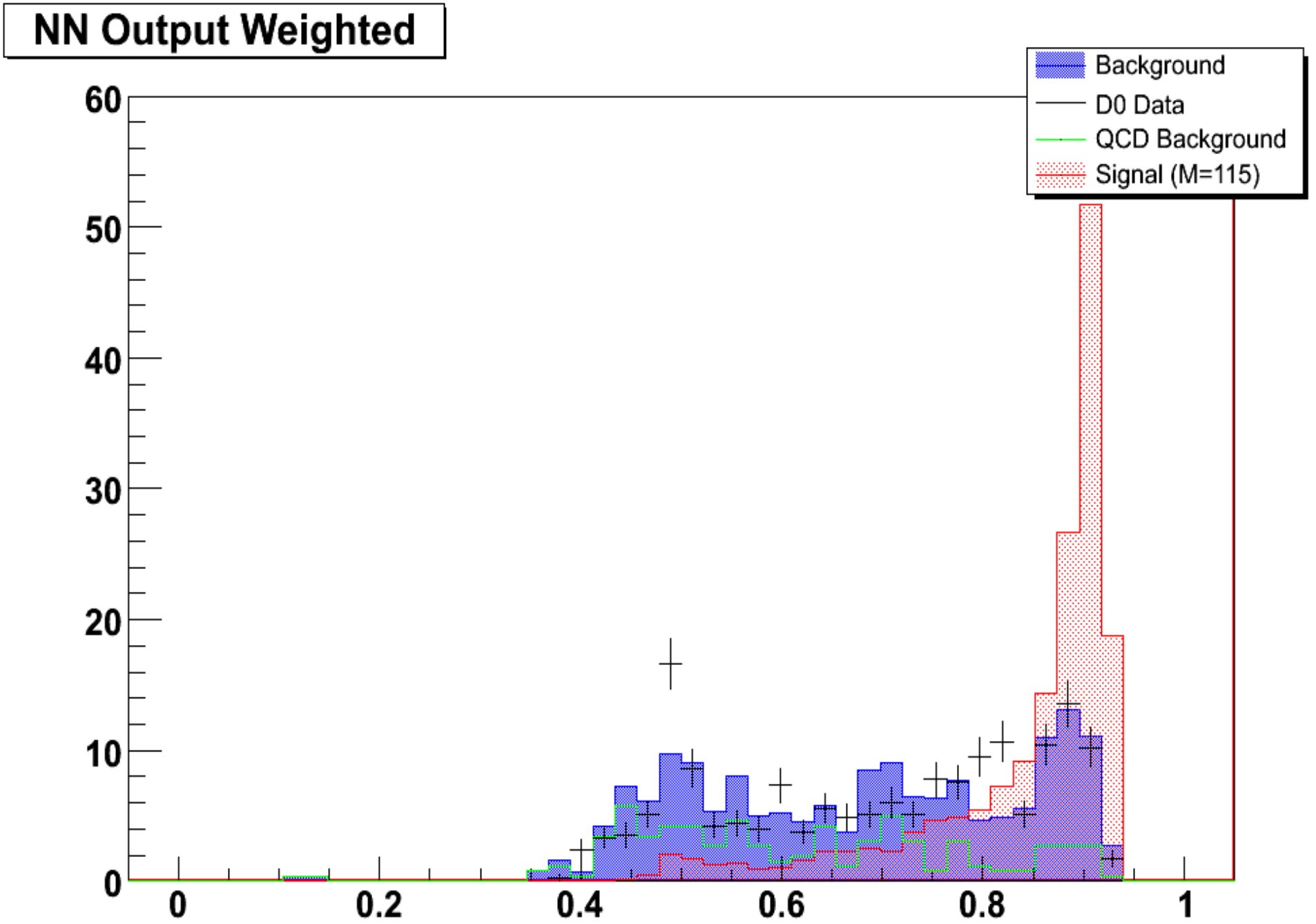
Find an optimal cut on the NN that maximizes S/sqrt(B)

Significance increases such that only 60 – 75 % of the integrated luminosity is needed for the same expected limits compared to just a simple window cut at +-2 sigma on the Mjj

Will be even better once CLs is used directly on the NN output for limit setting !






NN Output Weighted
Background
D0 Data
QCD Background
Signal (M=115)
60
50
40
30
20
10
0
0
0.2
0.4
0.6
0.8
1