b-ID:

p17 certification

Version 1.0
Had a bug! CSIP input was not being calculated correctly in nn_cert framework -> closure tests failed in CAFe (but worked in nn_cert).

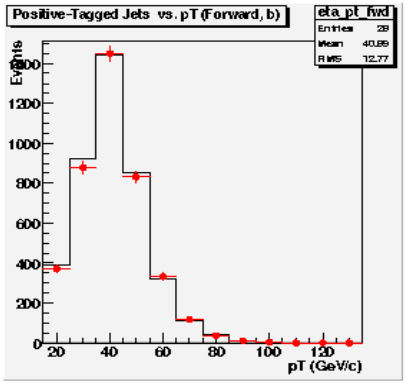
Version 1.1
Retrained NN and derived TRFs with fixed CSIP variable.
We've triple checked that there's no mismatch between nn_cert and CAFe anymore. Closure tests now pass in both nn_cert and CAFe.
While we were at it....
Added more operating points. There's now 13... from L6 (fake rate = 8%) to MegaTight (fake rate = 0.05%).
Updated “alpha” systematic using QCD MC.

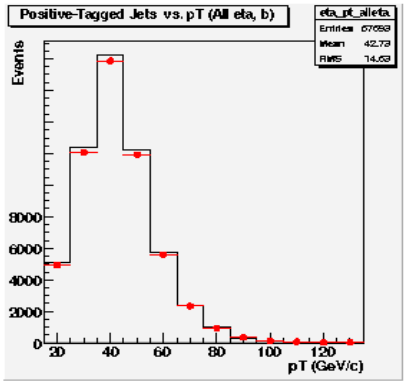
Version 2.0: for p17 publications
Move to interpolated rather than functional parameterizations?
Measure “beta” systematic using QCD d0mess b->mu MC.
Need to work on data/MC b->mu/b->incl SF.
Need to work on PV_Z parameterization.

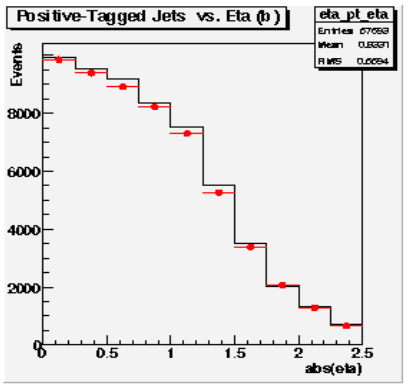
CAFe interface:

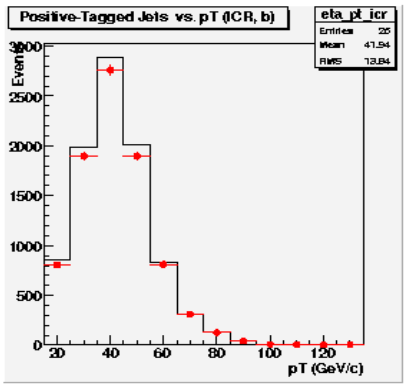
Processor for updating an existing NN b-tag branch output with a new NN output... based on inputs stored in the branch. Much faster since it doesn't have to recalculate the inputs (do vertexing).

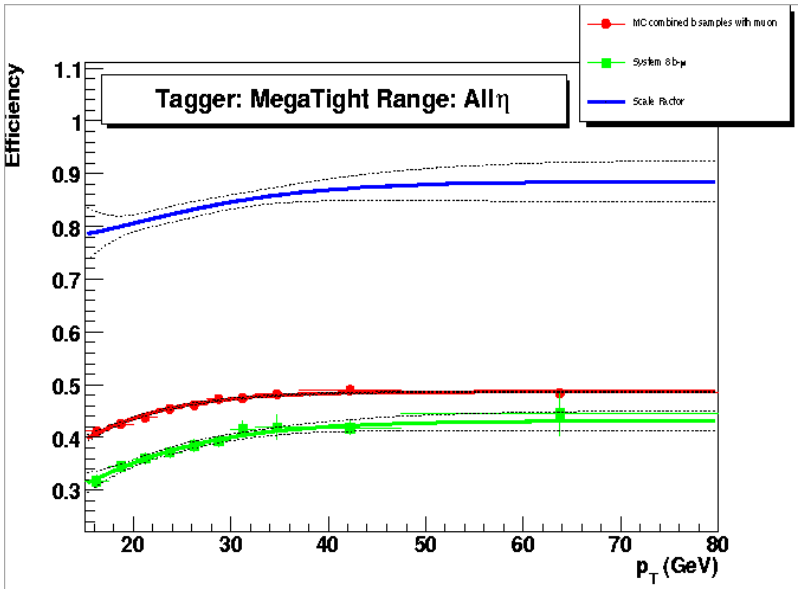
Putting a lot of effort into taggability support:
Processor for running over a data sample and deriving a taggability parameterization (Timour).
Processor for applying a taggability parameterization to MC (Gordon).
Additional taggability studies, n_PV, sample/trigger ... (Me, Ioana).











Stopped Gluinos:

Still waiting to hear from EB.... it's been ~6 weeks since NP group approval for publication...

p17 ZH(->mumubb):

Properly combining ALPGEN samples with weighted normalizations from xs scaled to Z-peak.

Upgraded to version 1.1 b-ID.

Applied jet SSR corrections and recomputed MET.

Applied taggability from the Top group parameterization

Measured Higgs mass peak windows

Did Bayesian limit setting

Used systematics from p14 analysis
Still haven't estimated QCD background (should be ~2 events, based on p14)

Writing the analysis note
Deadline: June 21 -> note to Higgs group!

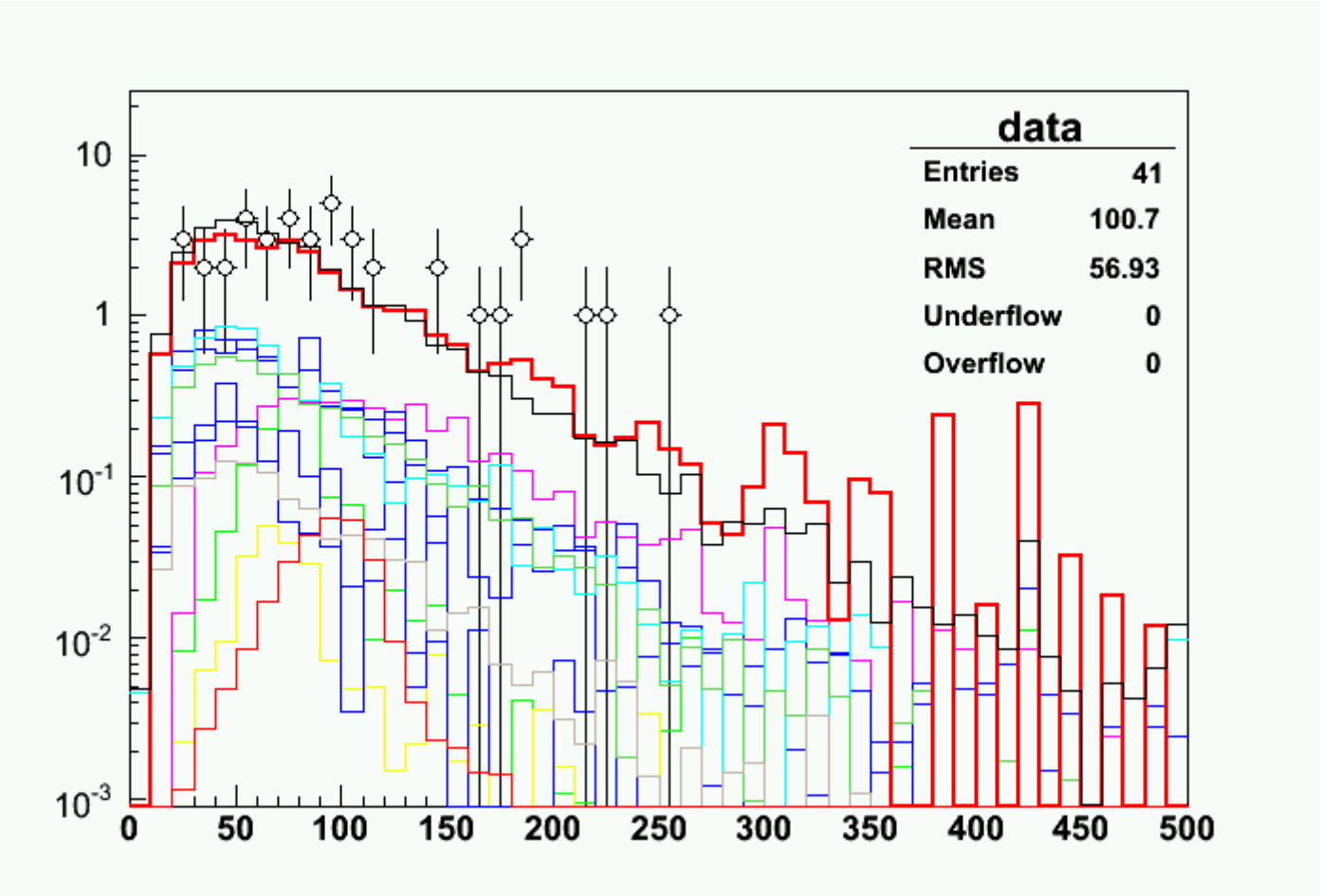
REU student is working on a NN for S/B separation, using variables like MET, M(mumu), jet angles (eta1, eta2, dphi, deta, dR), etc.

Di-jet Mass (2 b-tags)

Data

Total background
Corrected background

Z->mumu+Xlp
Z->mumu+2b+Xlp
Z->mumu+2c+Xlp
ttbar->2l+bb
ZZ
WZ
ZH->mumubb



Windows and limits

m_H (GeV)	Mass Range (GeV)	Data	Bgnd.	Sig.	Eff.	Exp. (pb)	Obs. (pb)
105	68.2-120.0	21	13.41	0.28	0.07	0.15	0.30
115	74.1-131.2	17	10.92	0.21	0.08	0.12	0.24
125	80.2-142.3	18	11.82	0.15	0.08	0.12	0.23
135	86.6-154.2	14	9.44	0.09	0.09	0.11	0.18
145	92.8-165.9	15	10.03	0.05	0.09	0.10	0.18
155	98.9-177.2	12	7.55	0.02	0.10	0.08	0.15

p17

Need to multiple by
1/(Z->mumu BR)=~30
to compare p17/p14

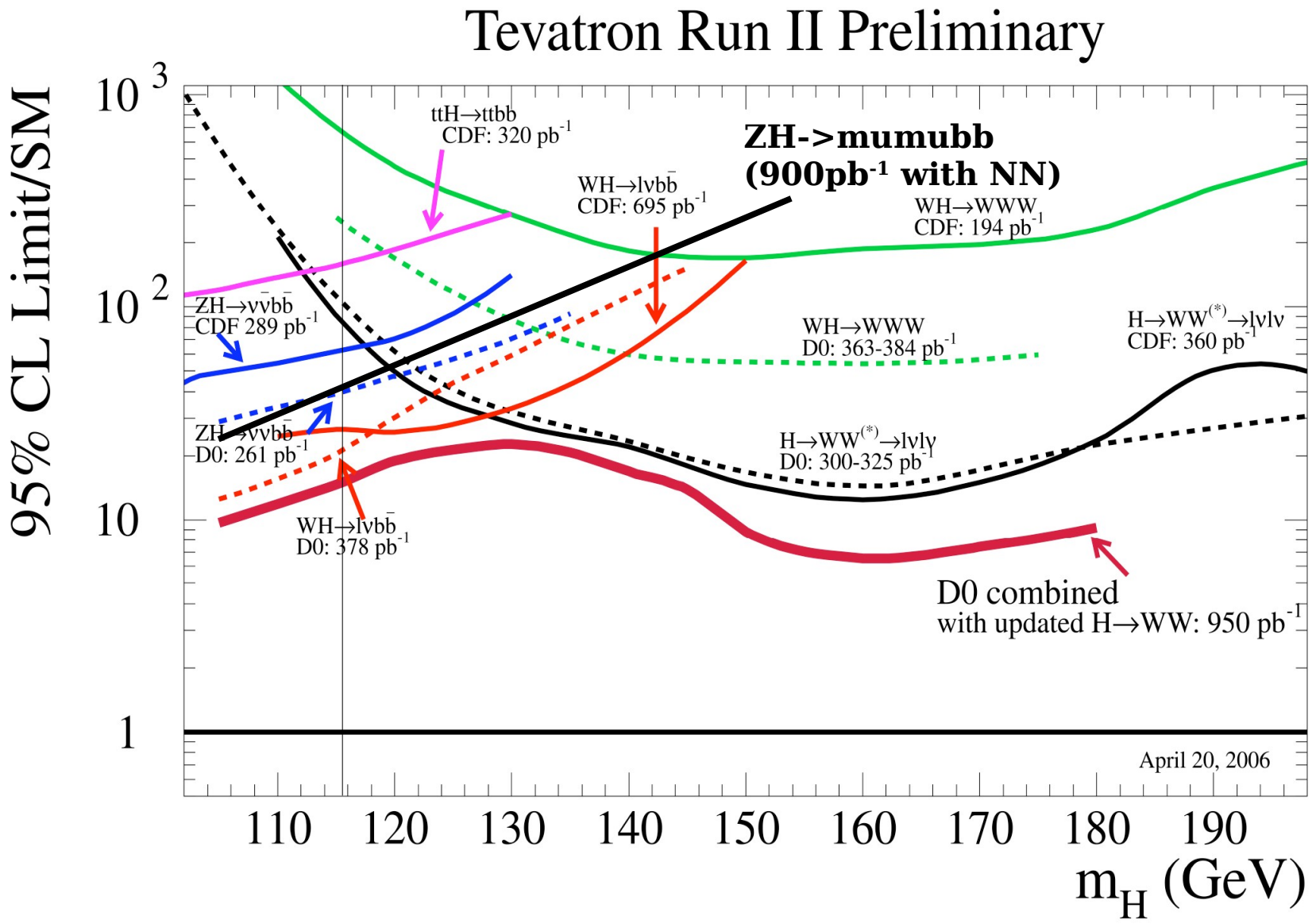
Results are consistent with:
2x efficiency (tagging? jet pT>15?)
3x integrated luminosity

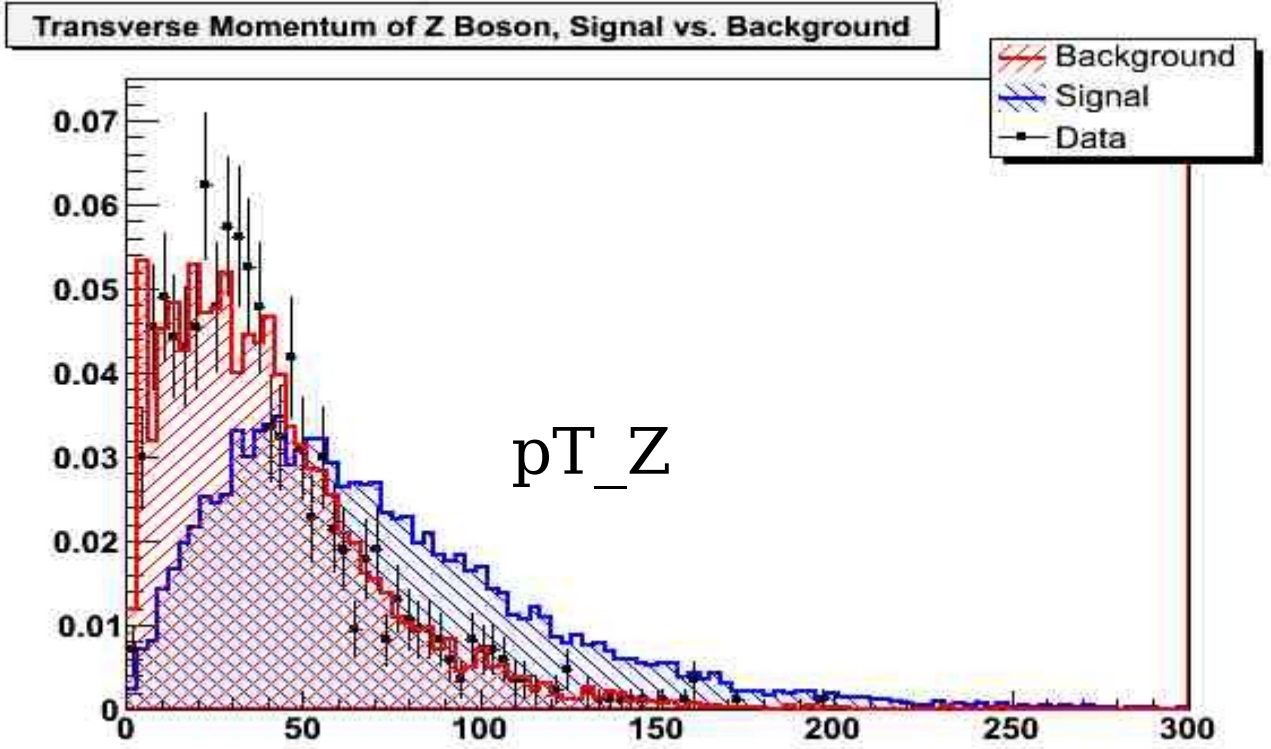
Exp. limits have improved by factor of ~2.3 ~ sqrt(6) ... -> consistent!

p17 analysis is unoptimized still.

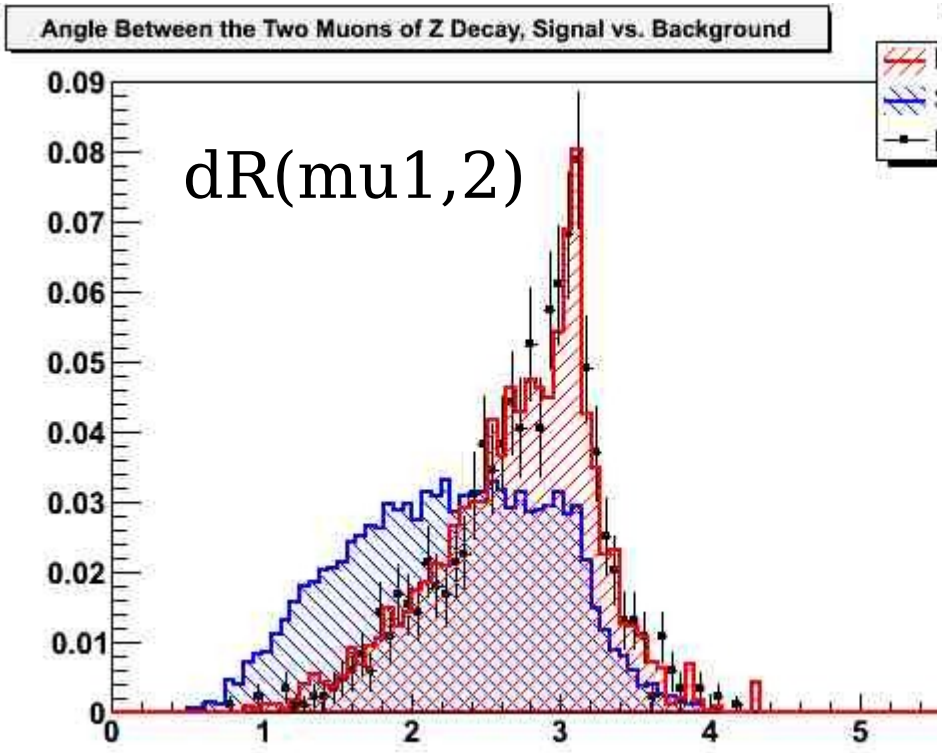
m_H (GeV)	105	115	125	135	145
Expected ZH	0.0583	0.0463	0.0318	0.0214	0.0100
Acceptance	0.045	0.051	0.054	0.060	0.063
$t\bar{t}$	0.657	0.679	0.626	0.692	0.679
ZZ	0.257	0.244	0.193	0.154	0.077
$Zb\bar{b}$	0.623	0.600	0.546	0.498	0.454
$Zc\bar{c}$	0.295	0.283	0.237	0.204	0.199
Zjj	0.942	0.845	0.727	0.786	0.727
QCD	0.042	0.042	0.028	0.028	0.042
Total BKGD	2.82	2.69	2.36	2.36	2.17
Total BKGD Syst. Err.	0.61	0.57	0.50	0.49	0.47
Total BKGD Stat. Err.	0.18	0.16	0.14	0.15	0.14
Total BKGD Err.	0.64	0.59	0.52	0.51	0.49
Events in Data	3	3	4	5	6
95% Limit (pb)	0.29	0.30	0.37	0.43	0.51

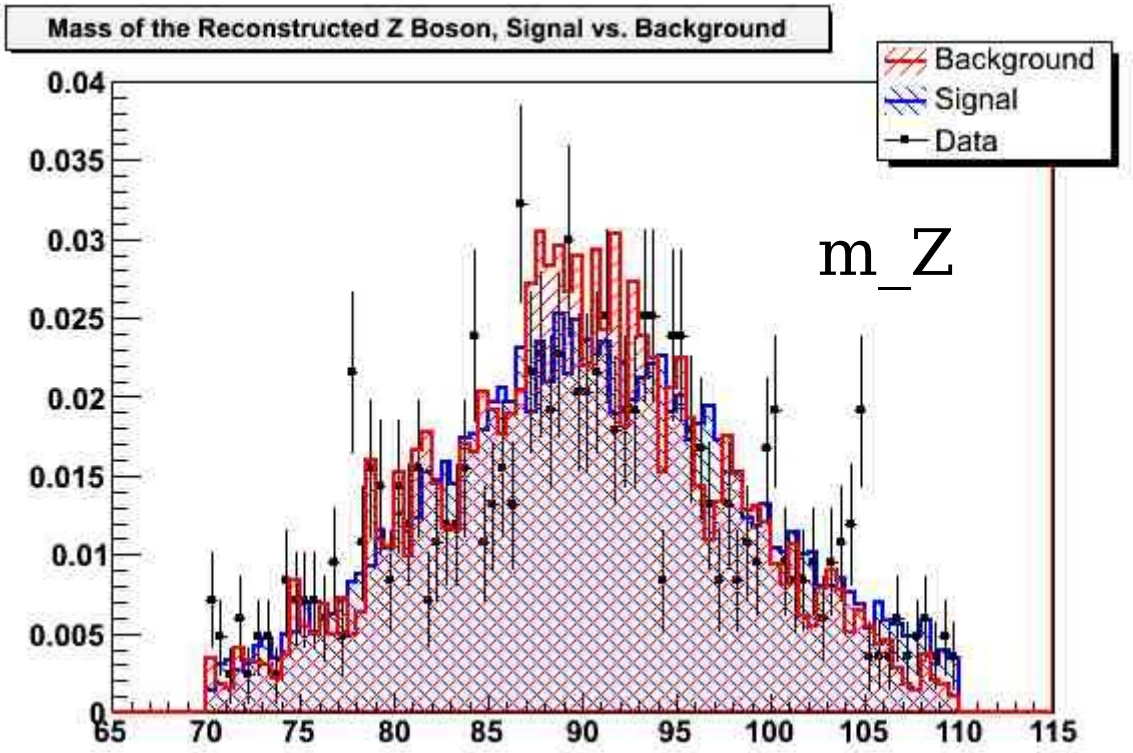
p14

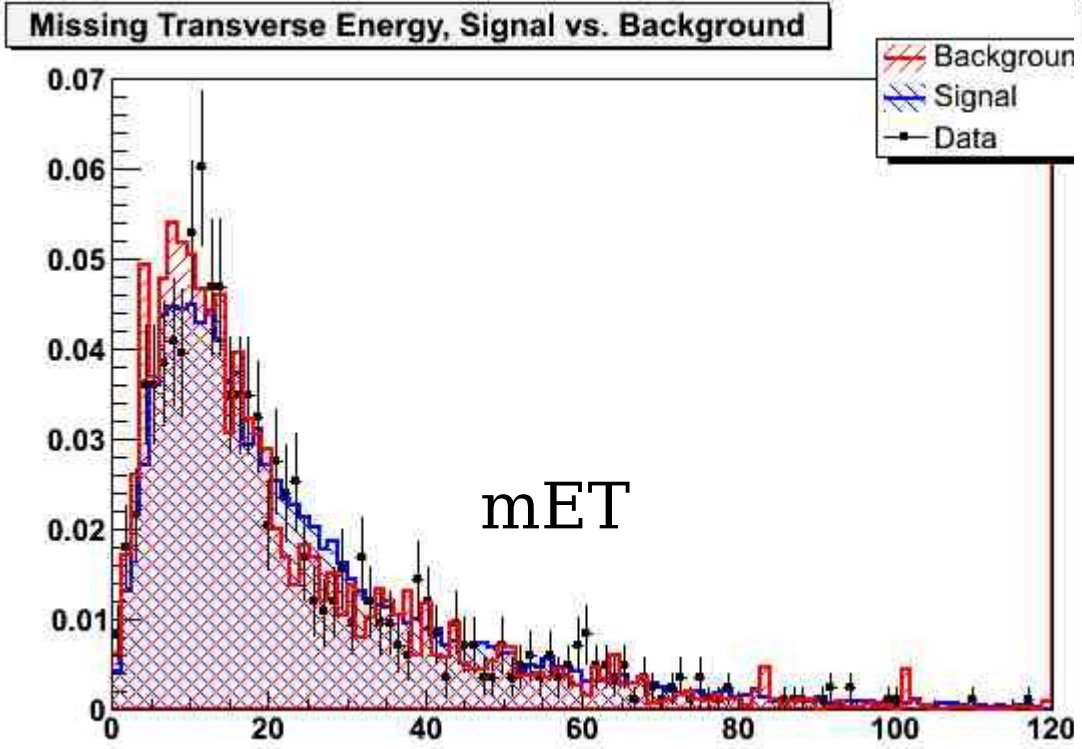

Tevatron Run II Preliminary
95% CL Limit/SM
10 3
10 2
10
1
ttH→ttbb
CDF: 320 pb-1
ZH->mumubb
(900pb-1 with NN)
WH→lνbb̄
CDF: 695 pb-1
WH→WWW
CDF: 194 pb-1
ZH→νν̄bb̄
CDF 289 pb-1
WH→WWW
D0: 363-384 pb-1
H→WW(*)→lνlν
CDF: 360 pb-1
ZH→νν̄bb̄
D0: 261 pb-1
H→WW(*)→lνlν
D0: 300-325 pb-1
WH→lνbb̄
D0: 378 pb-1
D0 combined
with updated H→WW: 950 pb-1
April 20, 2006
110
120
130
140
150
160
170
180
190
mH (GeV)

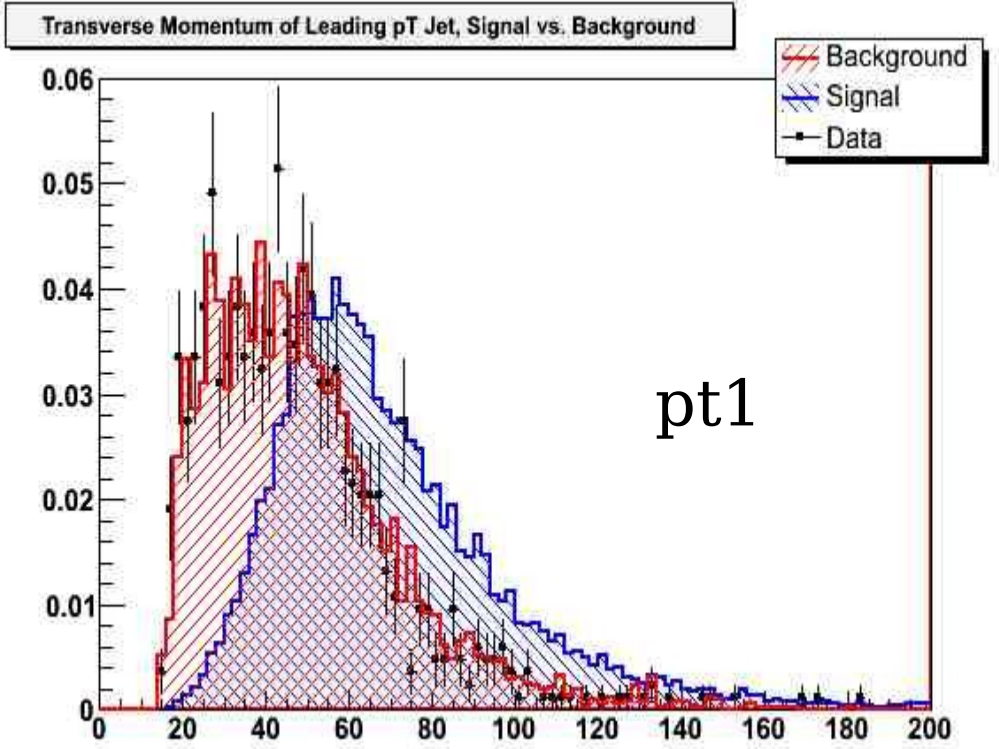


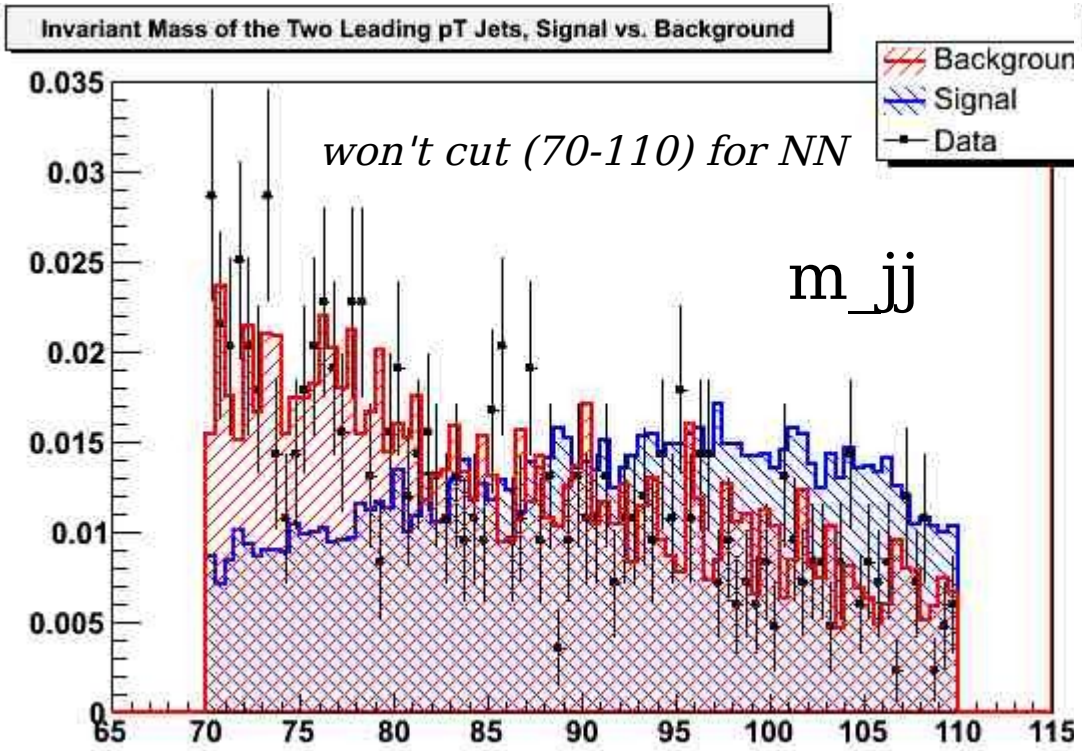
NN selection variables

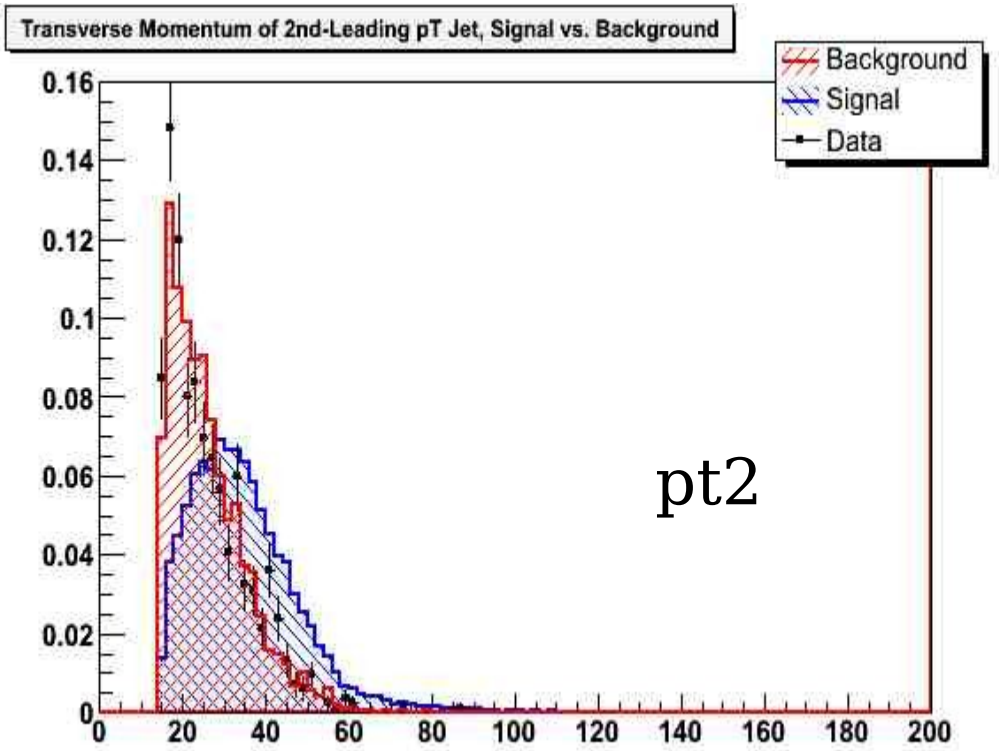


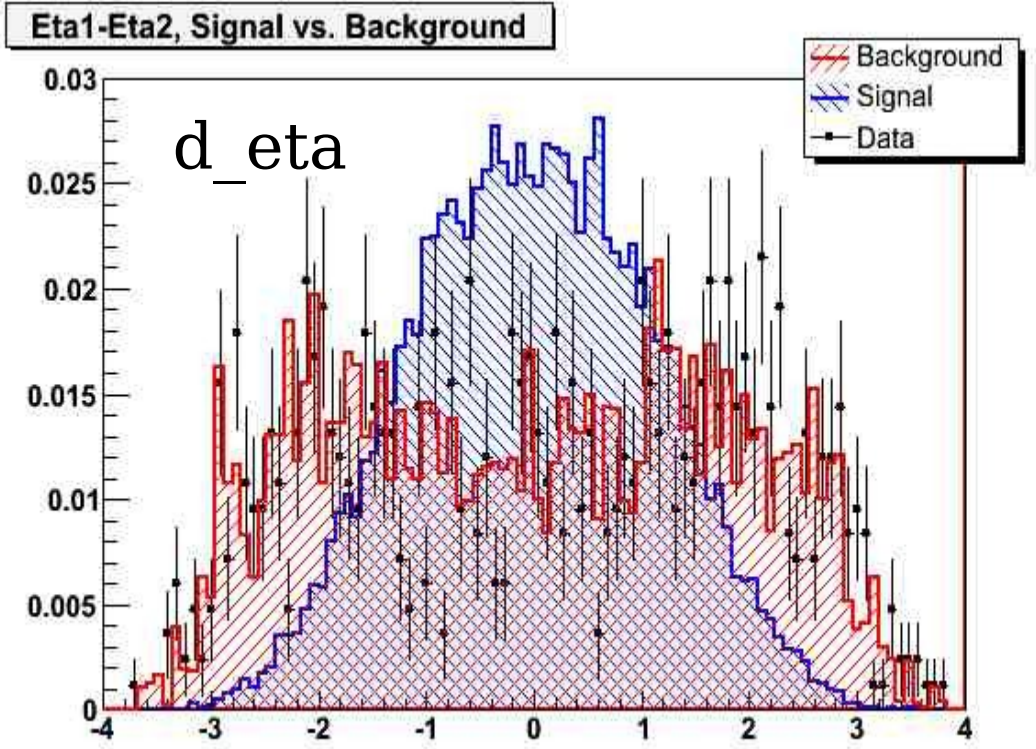


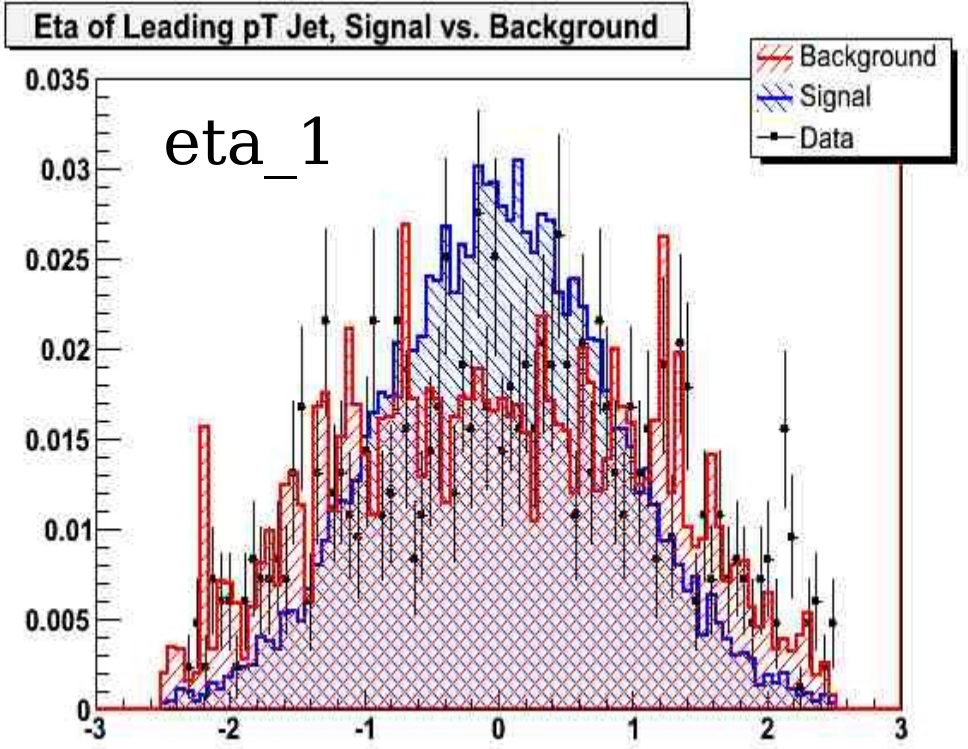

Missing Transverse Energy, Signal vs. Background
Background
Signal
Data
mET

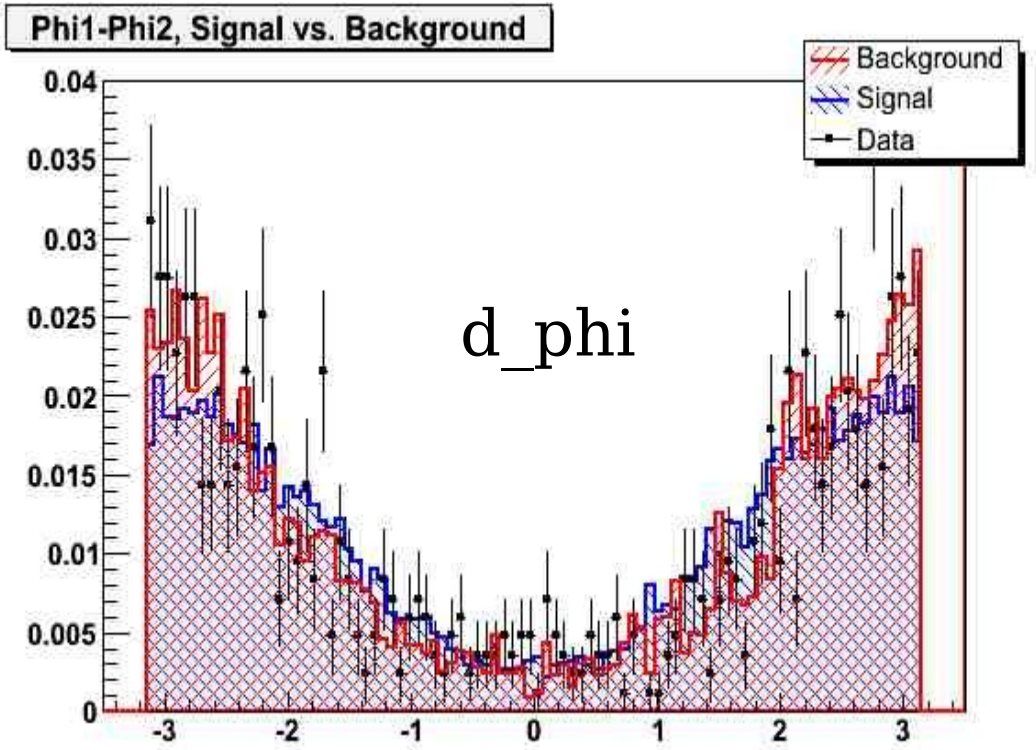

Transverse Momentum of Leading pT Jet, Signal vs. Background
Background
Signal
Data
pt1

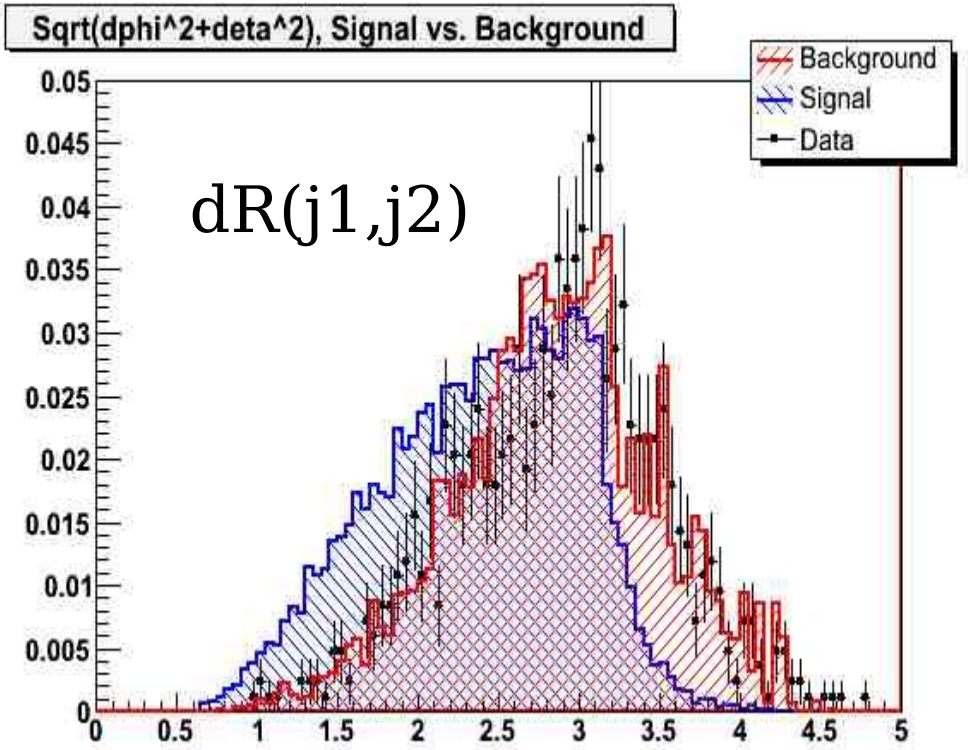

Invariant Mass of the Two Leading pT Jets, Signal vs. Background
Background
Signal
Data
won't cut (70-110) for NN
m_jj

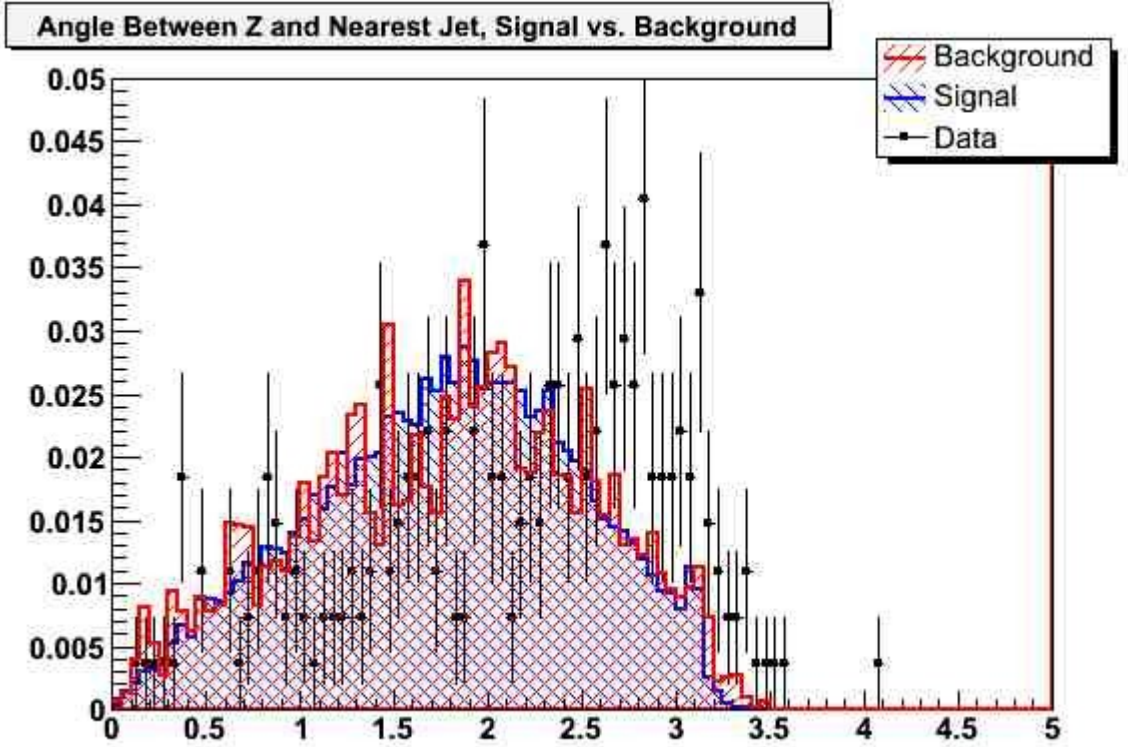

Transverse Momentum of 2nd-Leading pT Jet, Signal vs. Background
Background
Signal
Data
pt2

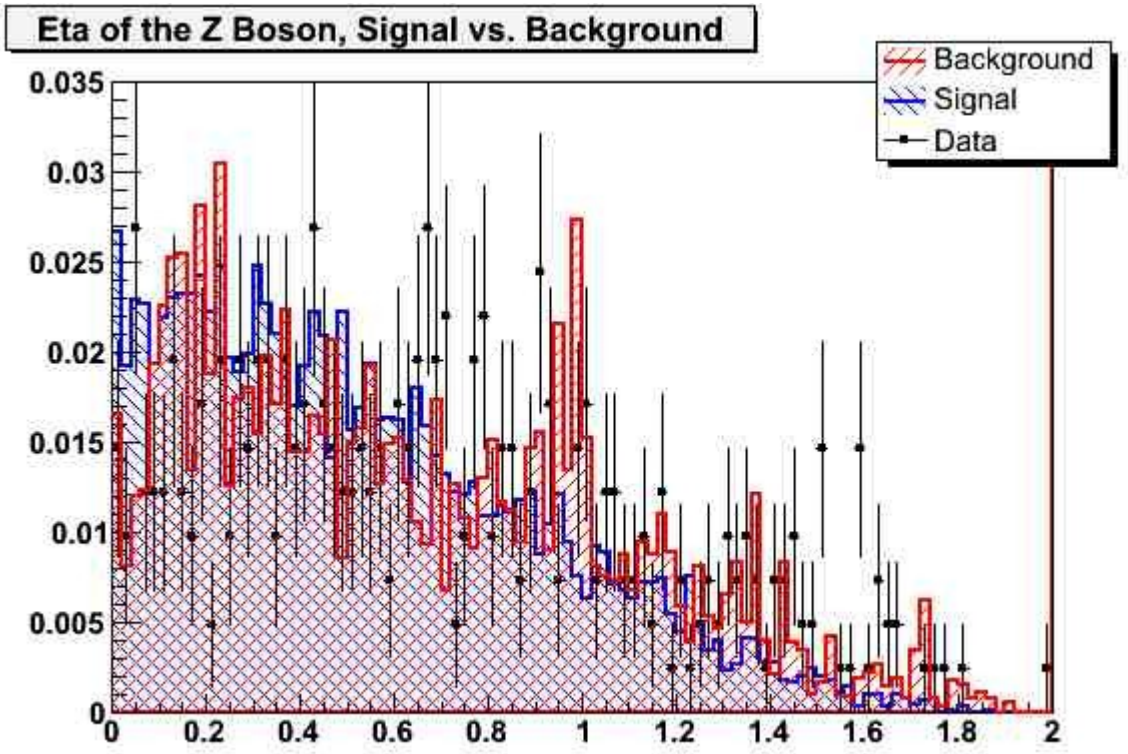

Eta1-Eta2, Signal vs. Background
Background
Signal
Data
d_eta

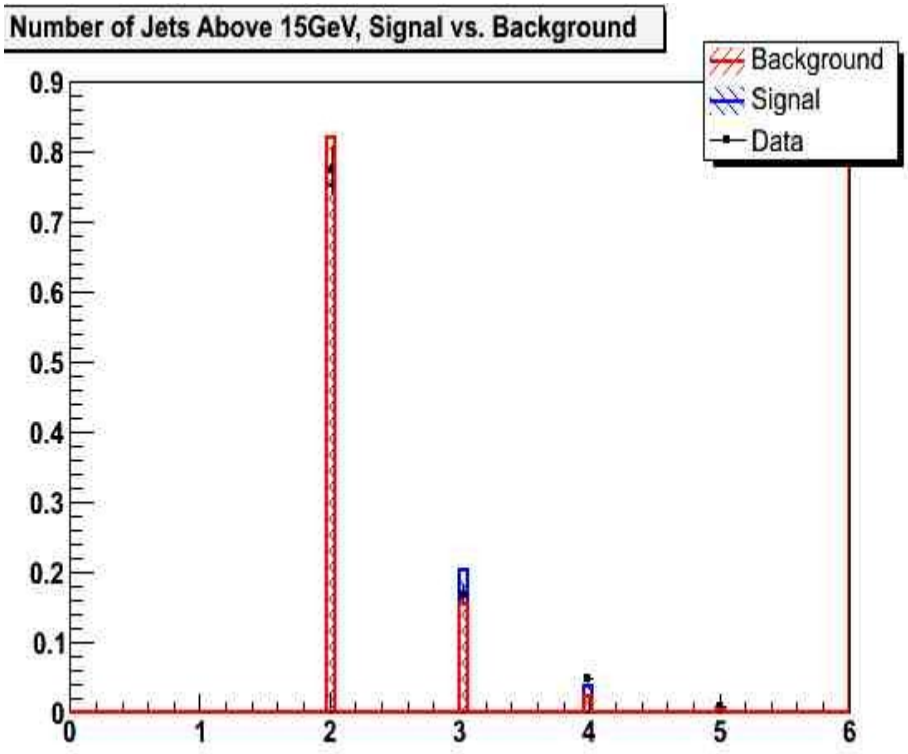

Eta of Leading pT Jet, Signal vs. Background
Background
Signal
Data
eta_1


Phi1-Phi2, Signal vs. Background
Background
Signal
Data
d_phi


Sqrt(dphi^2+deta^2), Signal vs. Background
Background
Signal
Data
dR(j1,j2)

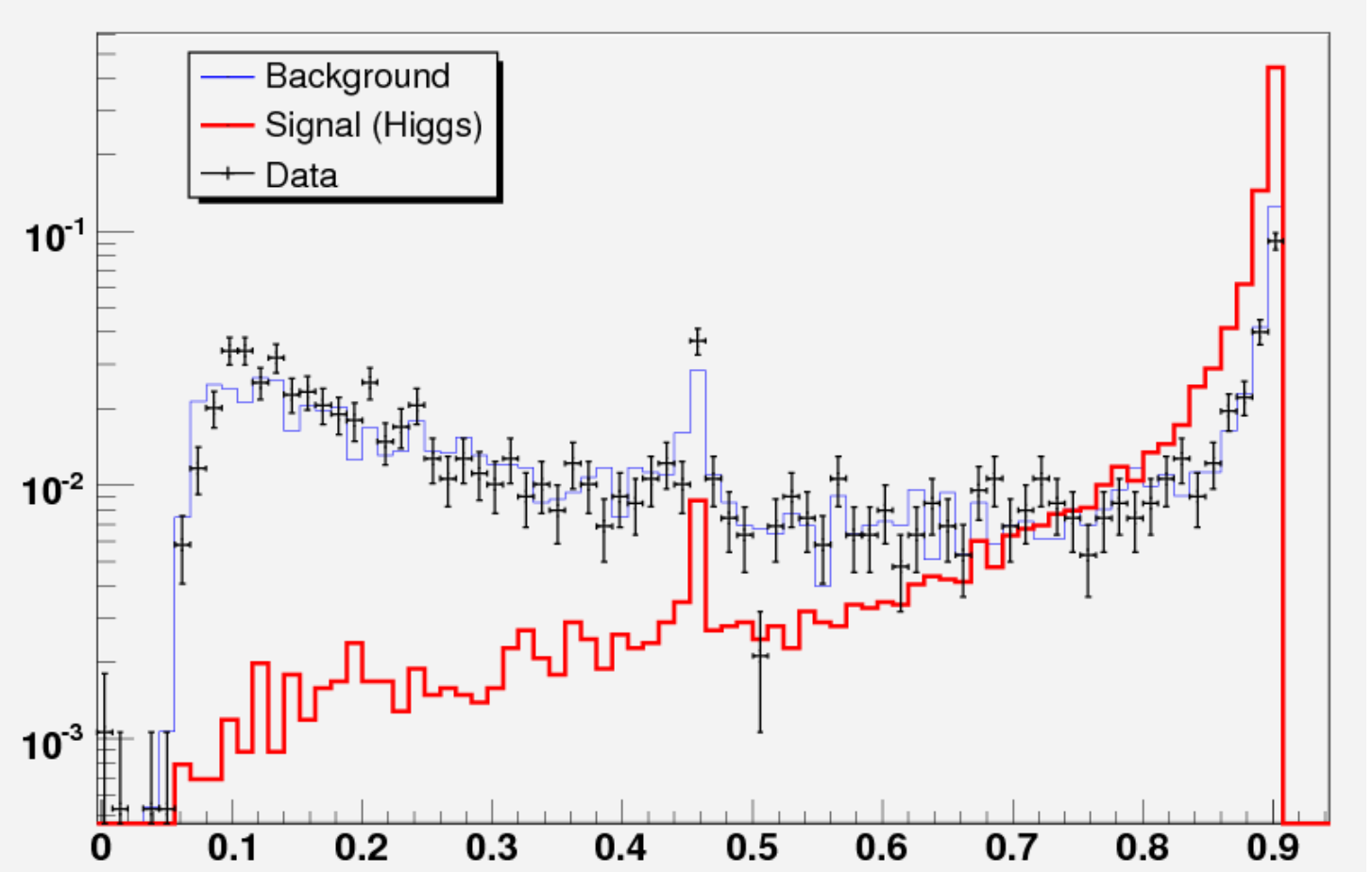

Angle Between Z and Nearest Jet, Signal vs. Background
Background
Signal
Data
0.05
0.045
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5


Eta of the Z Boson, Signal vs. Background
Background
Signal
Data
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2


Number of Jets Above 15GeV, Signal vs. Background
Background
Signal
Data
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
1
2
3
4
5
6

NN output

Simple 5 variable network (pt1,pt2,ZdR,met,mjj)



Significance improves by factor ~1.25
with optimal cut of 0.85

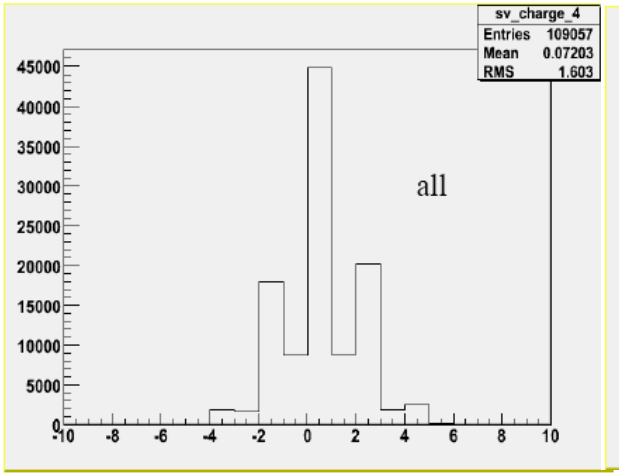
p17 Search for NLLP->bb

Had to fix a memory leak in my rootuple maker such that I could finish processing the PASS3 data.
  Used “valgrind” on my D0ChunkAnalyze executable.
  Turned out my leak was from making a new JES object each event, and the JES constructor leaks about 1k. Switched to just resetting a single JES object (also much faster!).

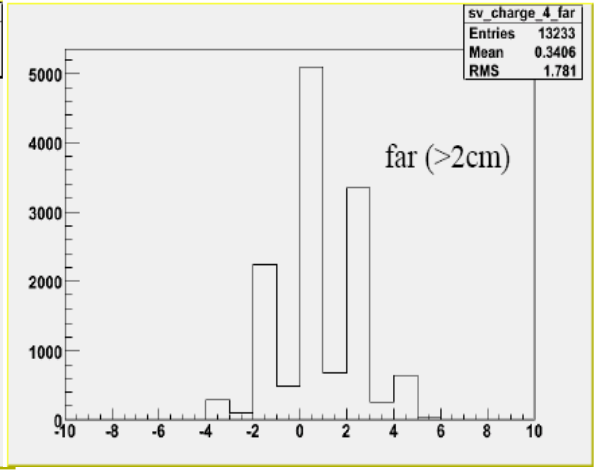
Working on code to identify/cluster nearby vertices.

Optimizing the matching of muons to vertices.
  More fakes matches past |eta|>1.
  Lots of fake matches at low pT too... (require pT > 3 GeV?)

Looking at the charge of vertices.
  b-decays have no charge asymmetry.
  Material interactions do!



Mean=0.07



Mean=0.34