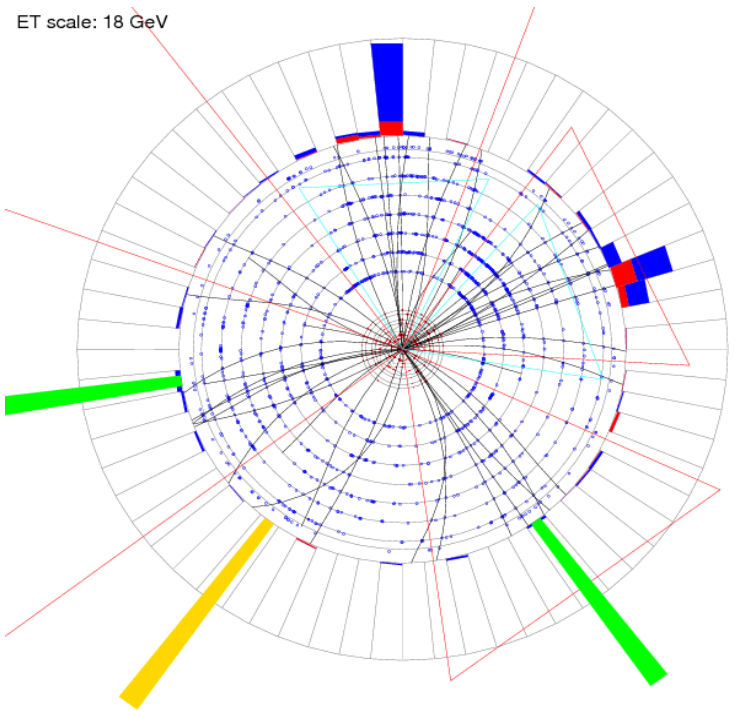


p17 ZH -> mumu bb Analysis w/ Neural Net Event Selection Update

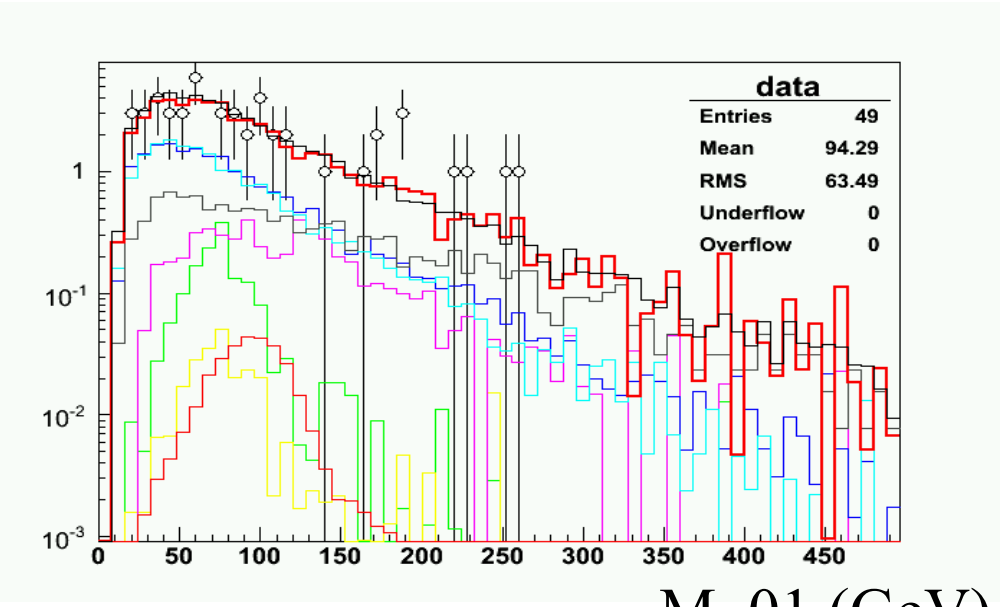
Andy Haas
Columbia University

V+jets Higgs Working Group Meeting
March 15, 2007

Analysis Updates

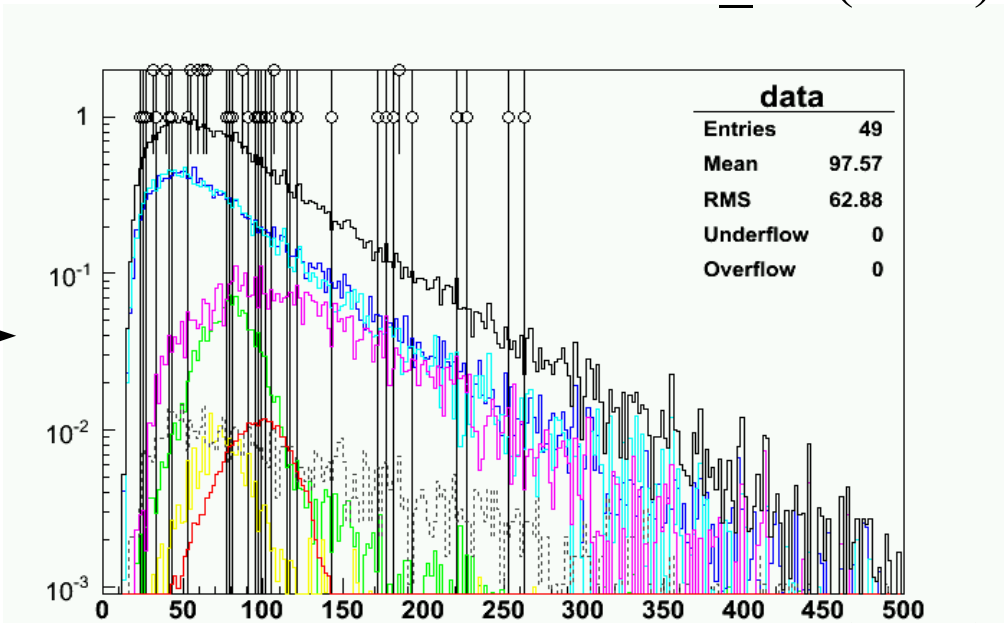
int N_zmumu_1560_0lp = 650250;
int N_zmumu_130250_0lp = 108000;
int N_zmumu_gt250_0lp = 106250;
int N_zmumu_0lp = **1469750**;
int N_zmumu_1560_1lp = 512500;
int N_zmumu_130250_1lp = 100250;
int N_zmumu_gt250_1lp = 105750;
int N_zmumu_1lp = **874116**;
int N_zmumu_1560_2lp = 205000;
int N_zmumu_130250_2lp = 100750;
int N_zmumu_gt250_2lp = 102250;
int N_zmumu_2lp = **413500**;
int N_zmumu_1560_3lp = 100500;
int N_zmumu_130250_3lp = 99750;
int N_zmumu_gt250_3lp = 105750;
int N_zmumu_3lp = **317000**;
int N_tt_incl = **1615030**;
int N_wz_incl = **724250**;
int N_zz_incl = **711000**;
int N_zmumu_2b0lp = **342000**;
int N_zmumu_2b1lp = 52750;
int N_zmumu_2b2lp = 25000;
int N_zh_mumubb_m105 = 50000;
int N_zh_mumubb_m115 = 50000;
int N_zh_mumubb_m125 = 50000;
int N_zh_mumubb_m135 = 52250;
int N_zh_mumubb_m145 = 49750;
int N_zh_mumubb_m155 = 50500;

before →



M_01 (GeV)

after →



M_01 (GeV)

Old QCD Fit

Used to assume QCD shape was exponential
 – same as DY

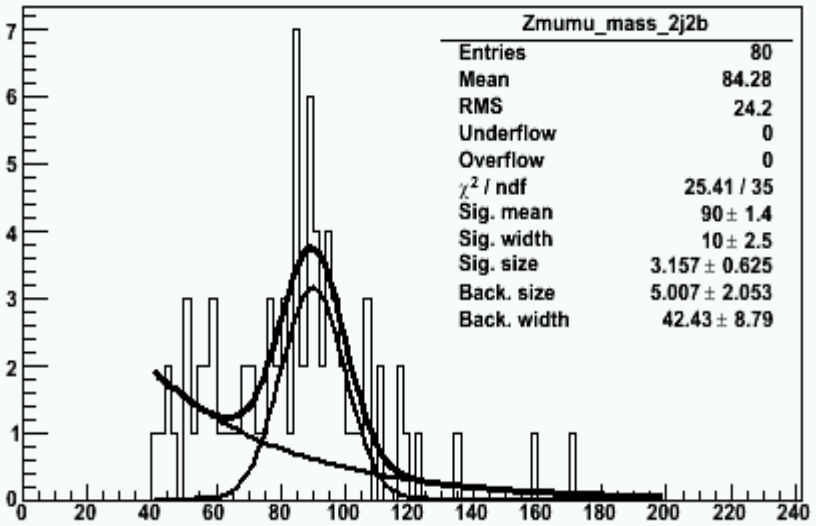
Fit data to sum of Z (gaus) and
 QCD/DY (exp) shapes

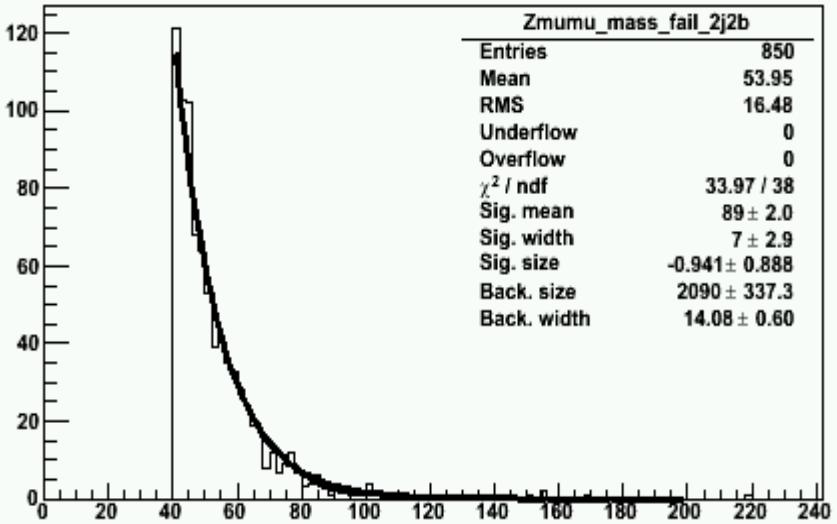
Got 32% QCD+DY from fit
 -> 27% after subtracting
 DY fraction (5%) from MC

WRONG!

Measure QCD shape in non-isolated data:
 -> QCD shape is exponential, but falls off
 faster than DY!

There is another background besides QCD/DY:
 -> tt is significant in 2b channel!





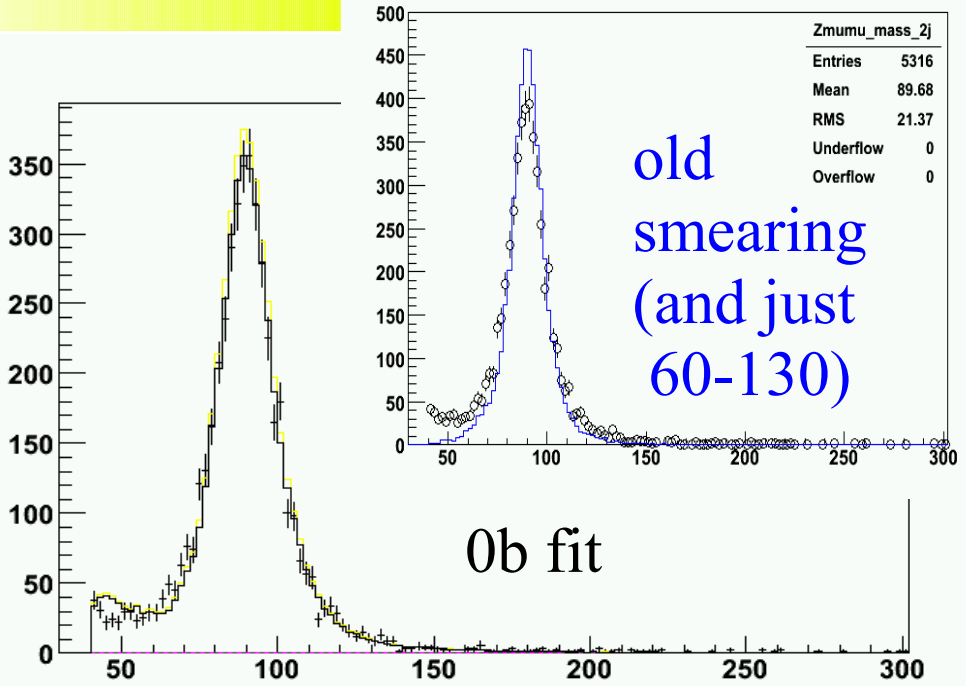
New QCD Fit

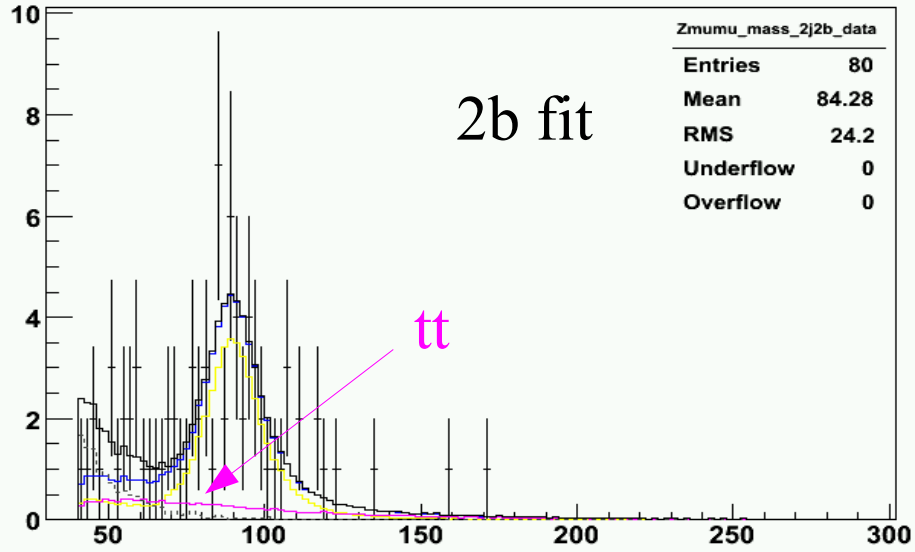
Use QCD shape from non-isolated data

Smear muons properly in MC
to describe Z shape better
-> Add "ApplyMuonSmear" processor

Consider tt contribution while fitting

Result:
Much less QCD in 2b channel:
27% -> 2%

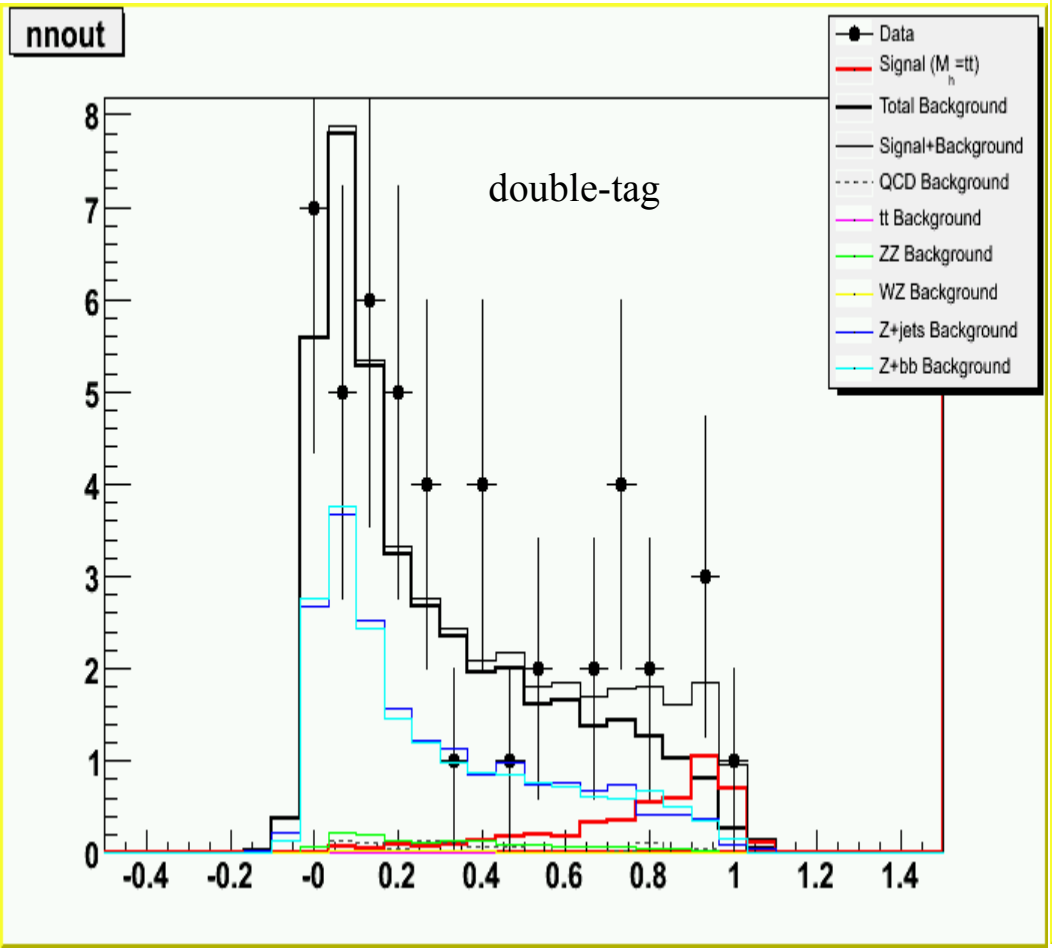


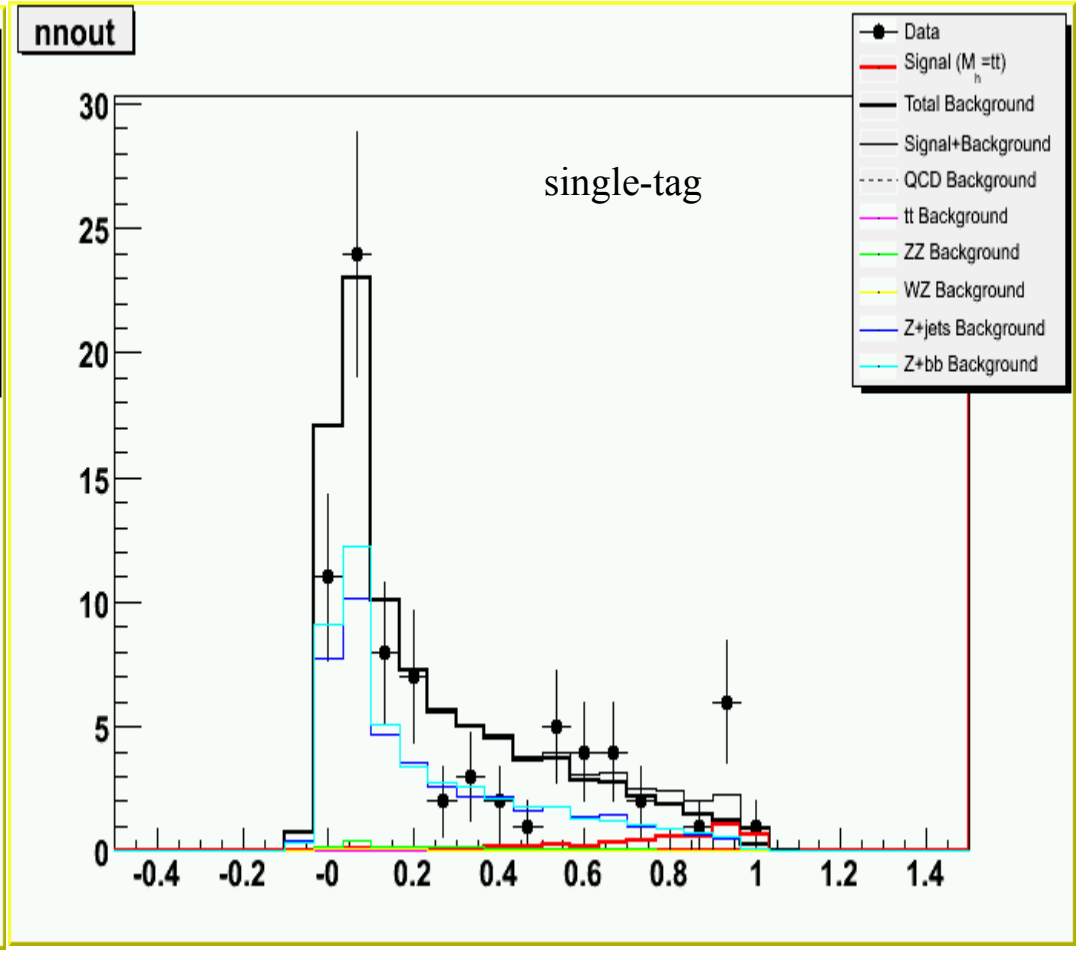


tt Cross-check

Train NN against tt as the signal

Some evidence for tt, consistent with expectations





tt Cross-check w/ Wider Acceptance

Widen Z mass window, 70-110 -> 40-500, accept more tt signal

Good evidence for tt, consistent with expectations