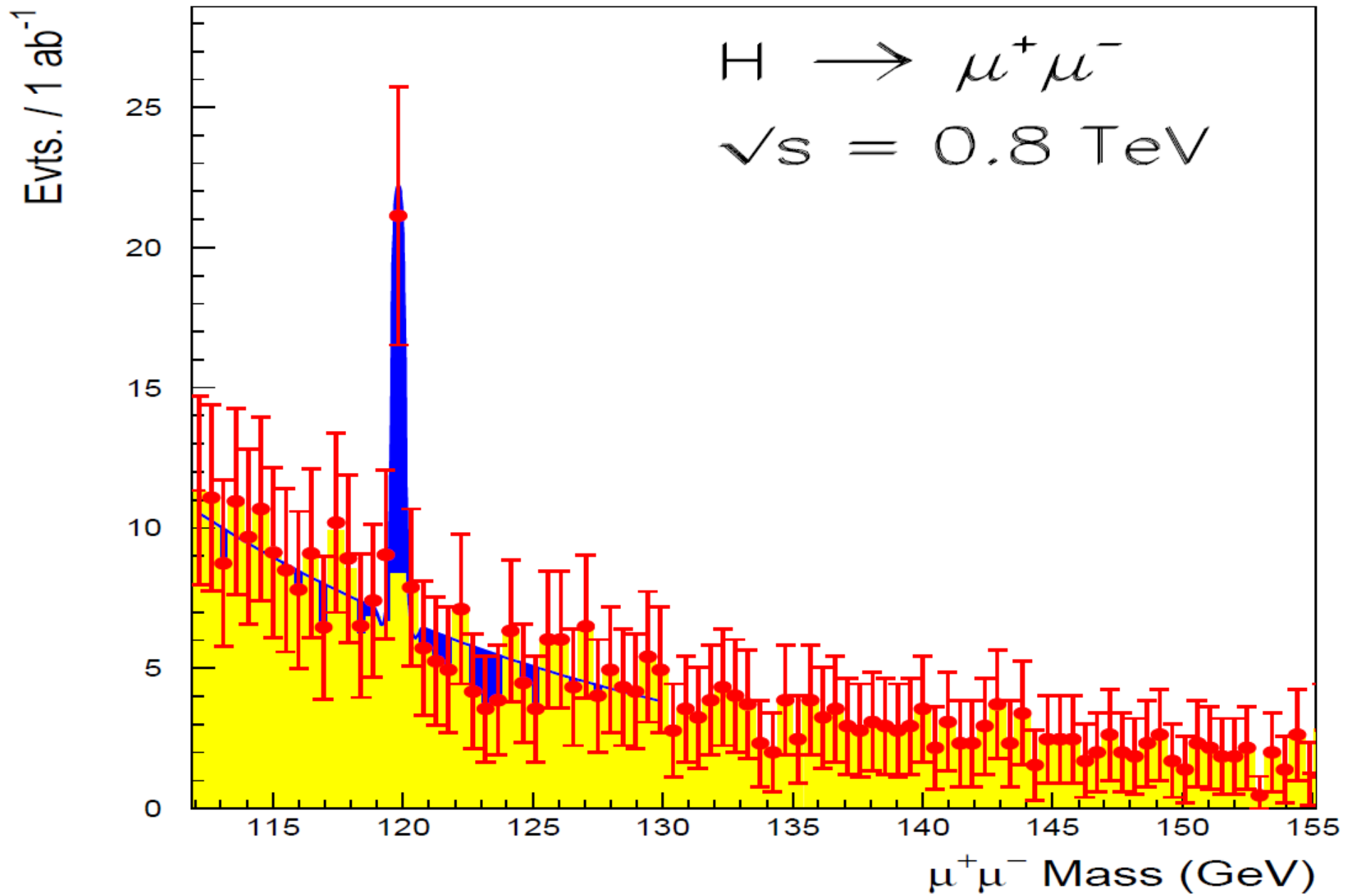


$\Delta\text{BR}(\text{H} \rightarrow \mu^+ \mu^-)$ vs. Tracker Momentum Error @ 1 TeV

Tim Barklow

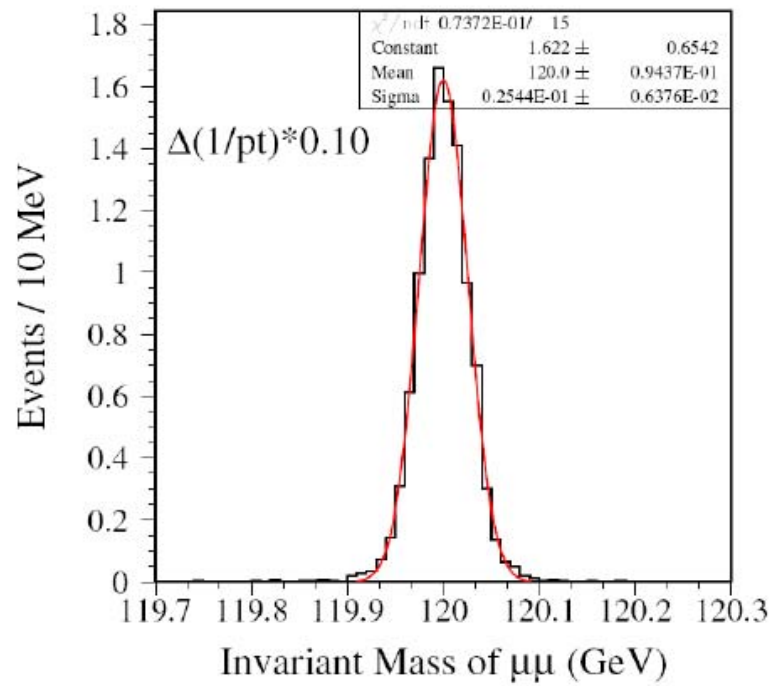
SLAC

Jan 30, 2007

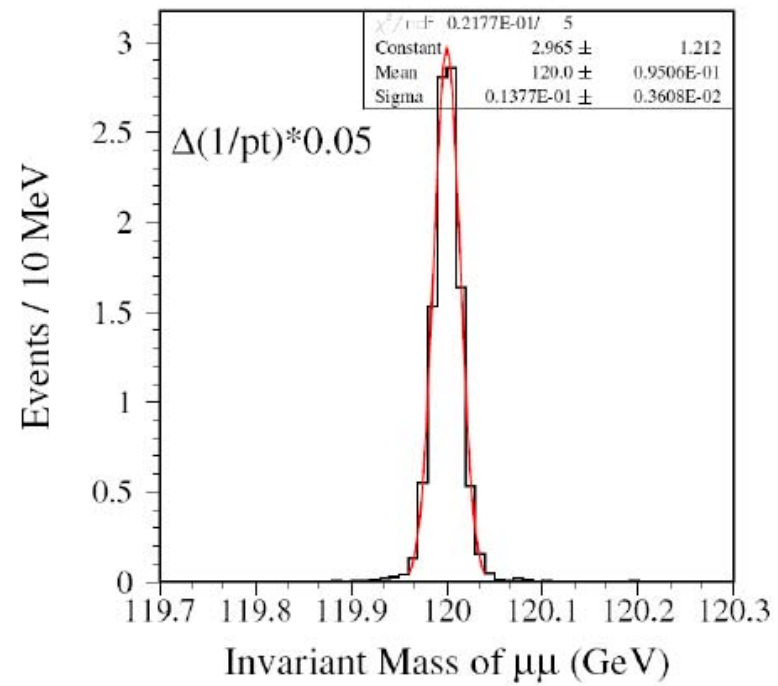


M. Battaglia et al.

ILC500, SDMar01, $Z \rightarrow \text{all}$, $H \rightarrow \mu\mu$, 1000 fb^{-1}



ILC500, SDMar01, $Z \rightarrow \text{all}$, $H \rightarrow \mu\mu$, 1000 fb^{-1}



12/19/2006

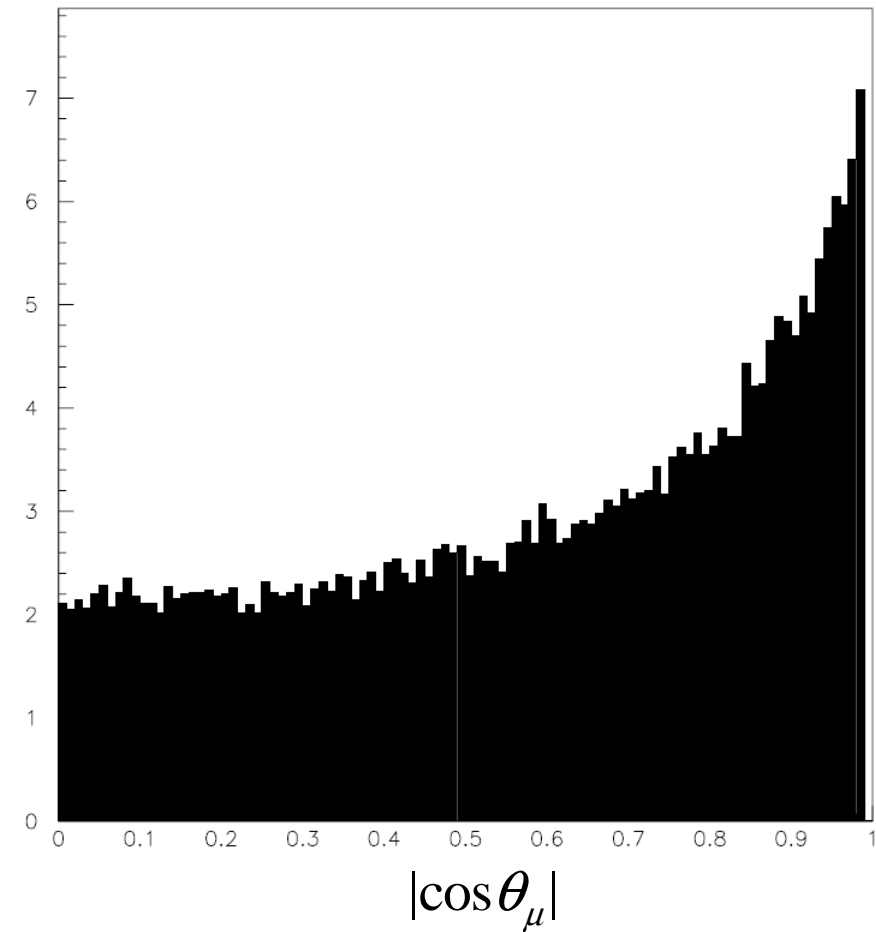
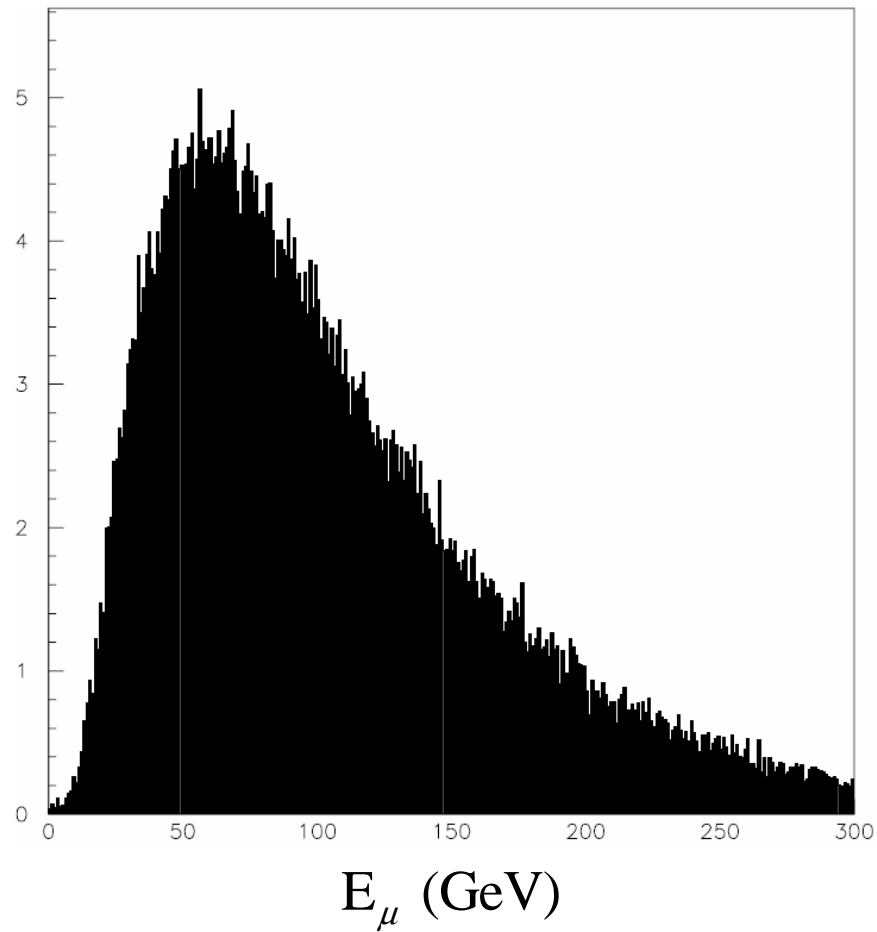
H.J. Yang - SiD Meeting

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can measure $\text{Br}(H \rightarrow \mu\mu)$ to 47%.

Energy and $|\cos\theta|$ distributions for muons from

$$e^+e^- \rightarrow \nu_e\bar{\nu}_e h \rightarrow \nu_e\bar{\nu}_e \mu^+\mu^- \text{ at } \sqrt{s} = 1 \text{ TeV}$$



Preselection

Require:

$$|\cos \theta_{thrust}| < 0.95$$

$$100 \text{ GeV} < E(\text{visible}) < 400 \text{ GeV}$$

$$20 \text{ GeV} < P_T(\text{visible}) < 500 \text{ GeV}$$

$$N_{\text{chrg tracks}} = 2$$

$$\text{Total Charge} = 0$$

$$N_{\text{chrg tracks}}(\text{large impact parameter}) = 0$$

$$N_{\text{isolated muons}} = 2$$

$$N_{\text{jets}} \leq 2 \text{ where jet-finding is done after removing muons}$$

$$E_{\text{jet}}(\text{photons}) / E_{\text{jet}}(\text{total}) > 0.99 \text{ for all jets}$$

NN

- Use signal and background events that pass preselection to train NN
- Use the following variables in the neural net:

$E(visible)$

$P_T(visible)$

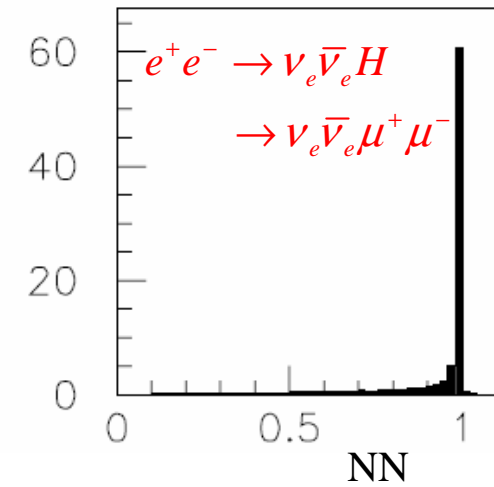
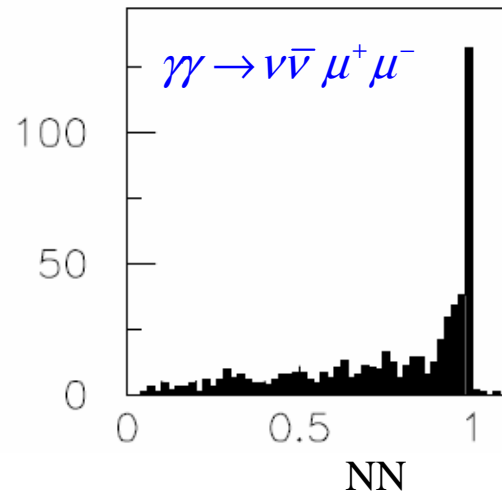
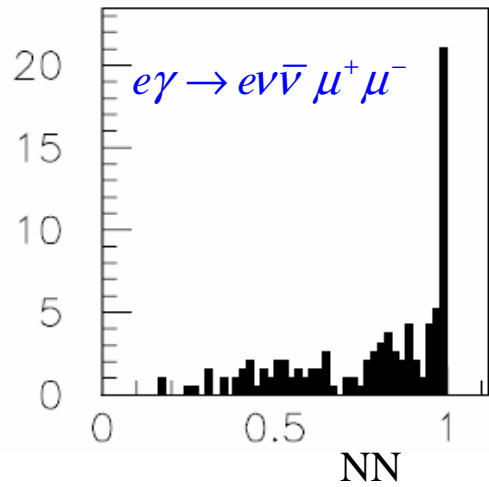
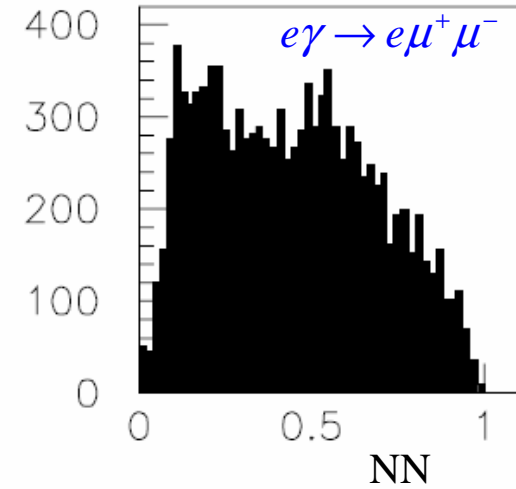
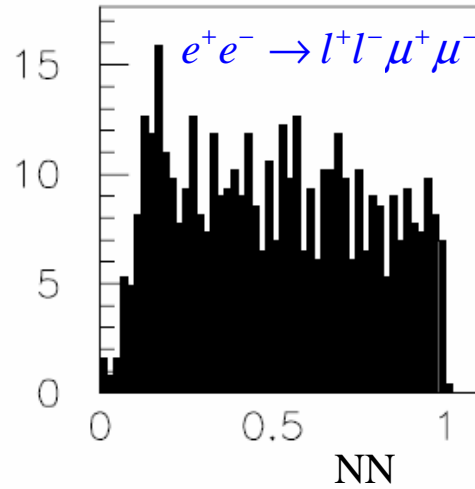
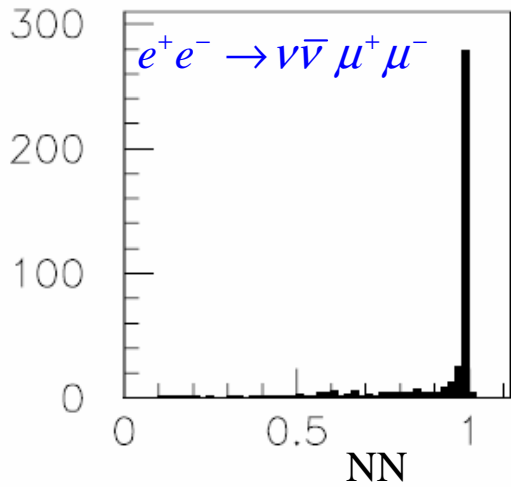
$|\cos \theta_{thrust}|$

jets

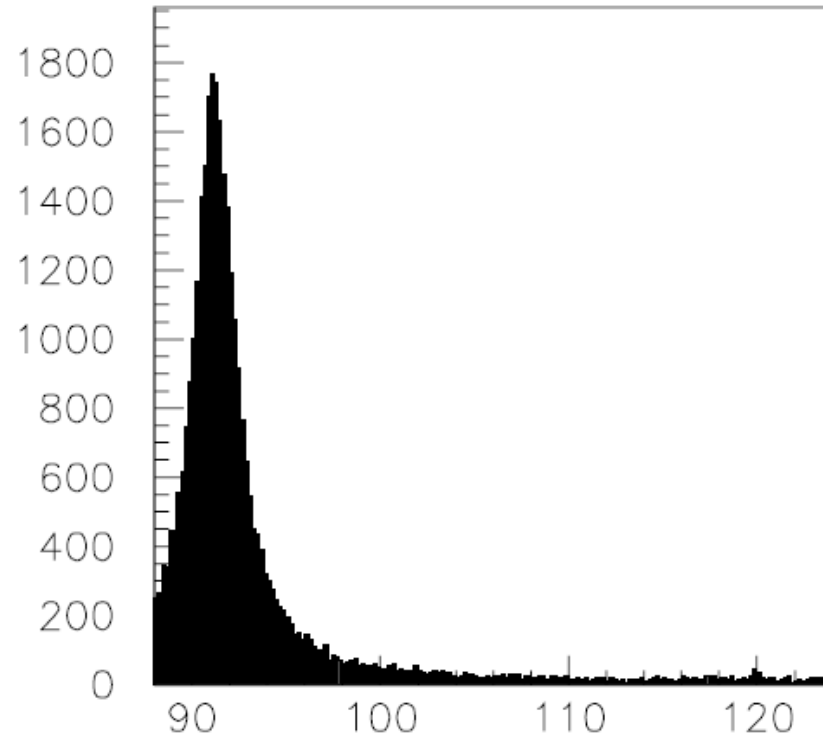
Event acollinearity

Event acoplanarity

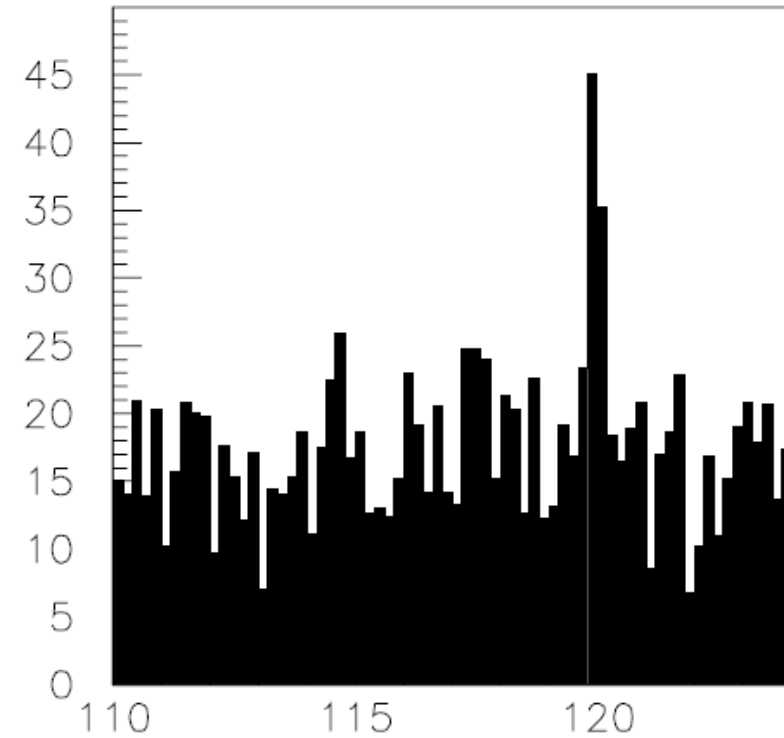
NN Distributions following preselection



$M_{\mu\mu}$ Distributions for $NN>0.95$ for signal and background summed



$M_{\mu^+\mu^-}$ (GeV)



$M_{\mu^+\mu^-}$ (GeV)

$M_{\mu\mu}$ Distributions for Different Random Number Seeds

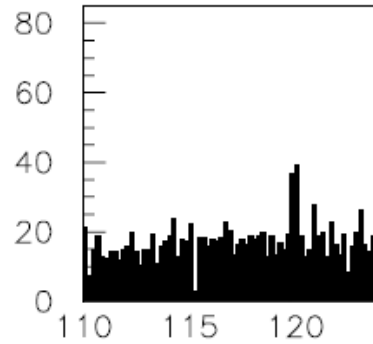
$$\sqrt{s} = 1 \text{ TeV}$$

$$L = 1000 \text{ fb}^{-1}$$

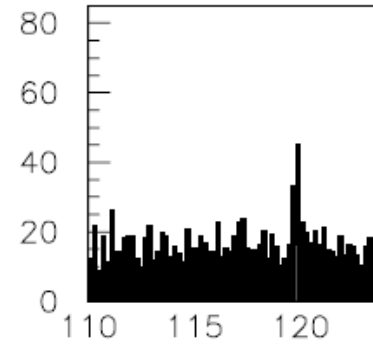
$$a = 2 \times 10^{-5}$$

$$b = 1 \times 10^{-3}$$

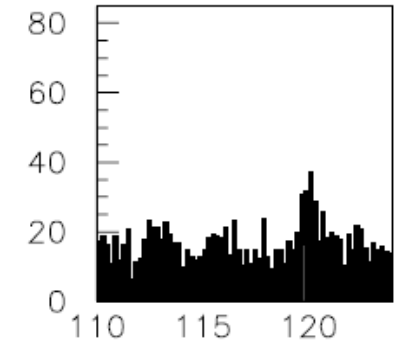
$$\frac{\delta p_t}{p_t^2} = a \oplus \frac{b}{p_t \sin \theta}$$



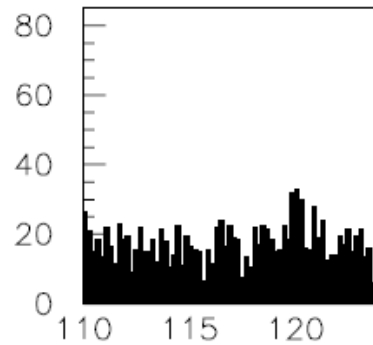
sum bgnd



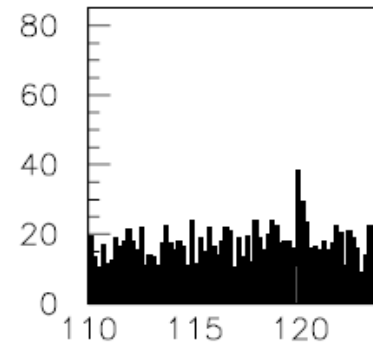
sum bgnd



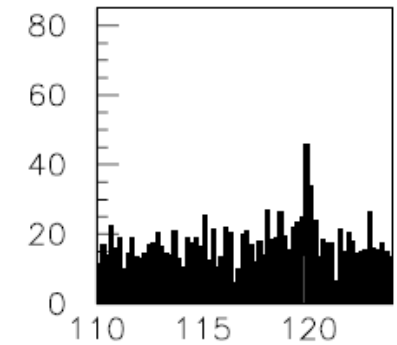
sum bgnd



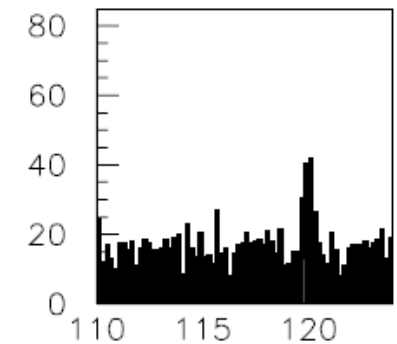
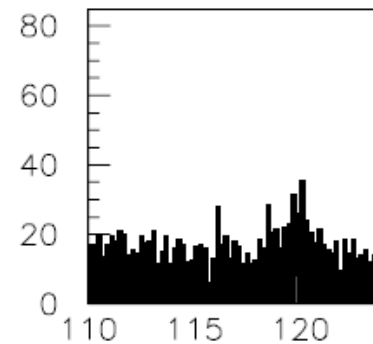
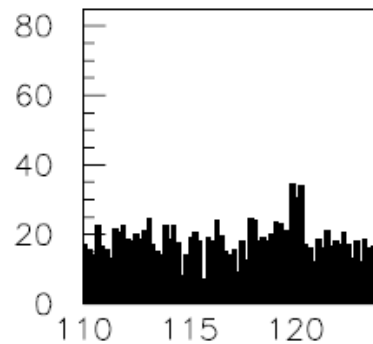
sum bgnd



sum bgnd



sum bgnd



$M_{\mu^+\mu^-}$ (GeV)

$M_{\mu\mu}$ Distributions for Different Random Number Seeds

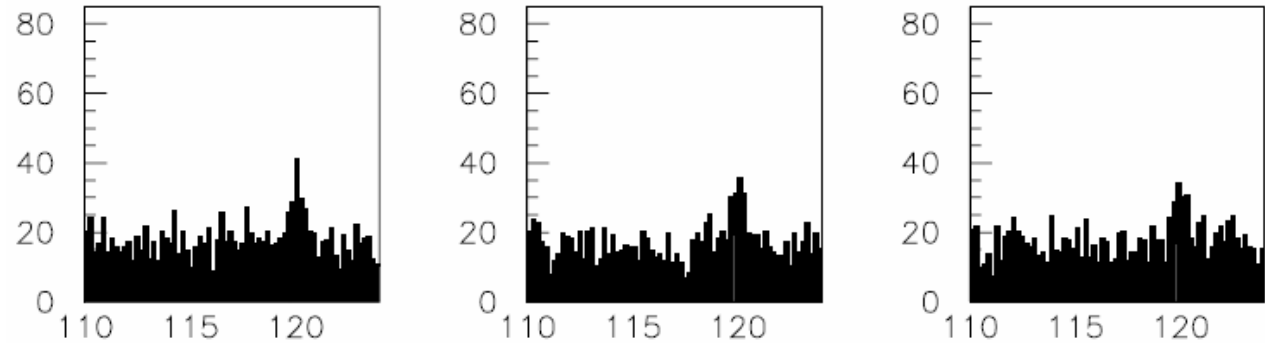
$$\sqrt{s} = 1 \text{ TeV}$$

$$L = 1000 \text{ fb}^{-1}$$

$$a = 4 \times 10^{-5}$$

$$b = 1 \times 10^{-3}$$

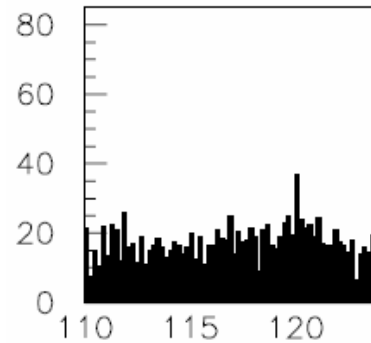
$$\frac{\delta p_t}{p_t^2} = a \oplus \frac{b}{p_t \sin \theta}$$



sum bgnd

sum bgnd

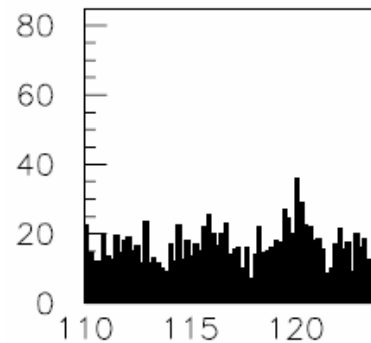
sum bgnd



sum bgnd

sum bgnd

sum bgnd



sum bgnd

sum bgnd

$M_{\mu^+\mu^-}$ (GeV)

$M_{\mu\mu}$ Distributions for Different Random Number Seeds

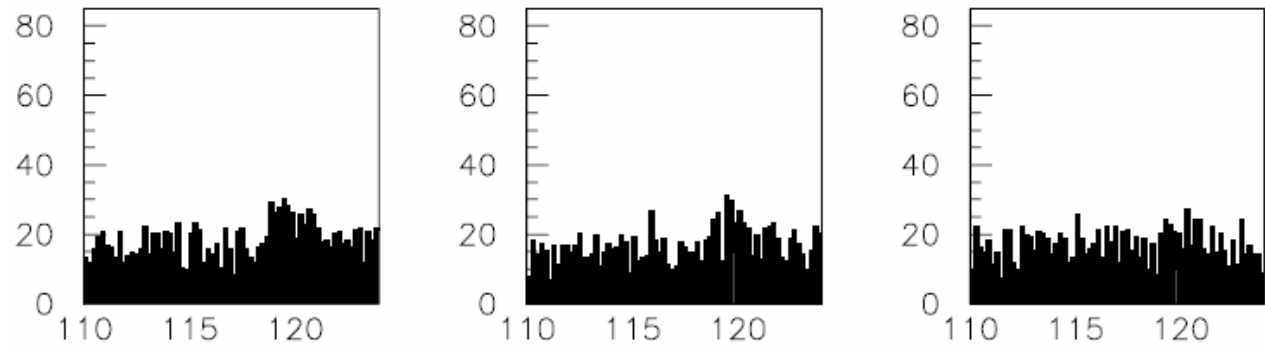
$$\sqrt{s} = 1 \text{ TeV}$$

$$L = 1000 \text{ fb}^{-1}$$

$$a = 8 \times 10^{-5}$$

$$b = 1 \times 10^{-3}$$

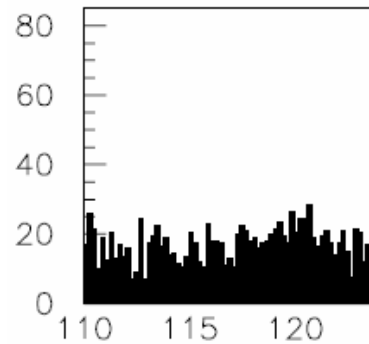
$$\frac{\delta p_t}{p_t^2} = a \oplus \frac{b}{p_t \sin \theta}$$



sum bgnd

sum bgnd

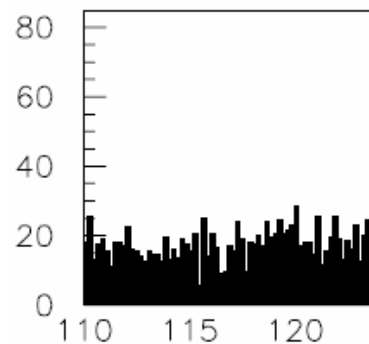
sum bgnd



sum bgnd

sum bgnd

sum bgnd



sum bgnd

sum bgnd

$M_{\mu^+\mu^-}$ (GeV)

$M_{\mu\mu}$ Distributions for Different Random Number Seeds

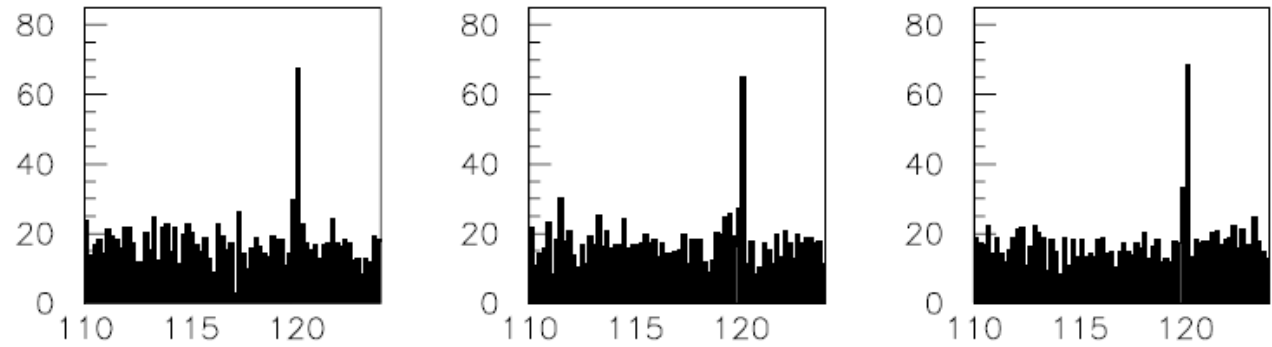
$$\sqrt{s} = 1 \text{ TeV}$$

$$L = 1000 \text{ fb}^{-1}$$

$$a = 0$$

$$b = 0$$

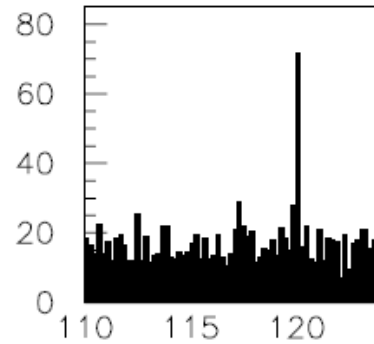
$$\frac{\delta p_t}{p_t^2} = a \oplus \frac{b}{p_t \sin \theta}$$



sum bgnd

sum bgnd

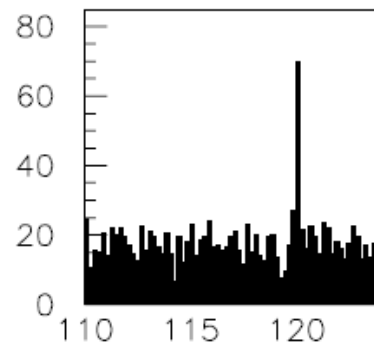
sum bgnd



sum bgnd

sum bgnd

sum bgnd



$M_{\mu^+\mu^-}$ (GeV)

Resolution for
BR(H → μμ)
 vs a or b

$$e^+e^- \rightarrow \nu_e \bar{\nu}_e h \rightarrow \nu_e \bar{\nu}_e \mu^+ \mu^-$$

$$\sqrt{s} = 1 \text{ TeV}$$

$$L = 1000 \text{ fb}^{-1}$$

$$\Delta \text{BR}(h \rightarrow \mu^+ \mu^-)$$

