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

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SLAC

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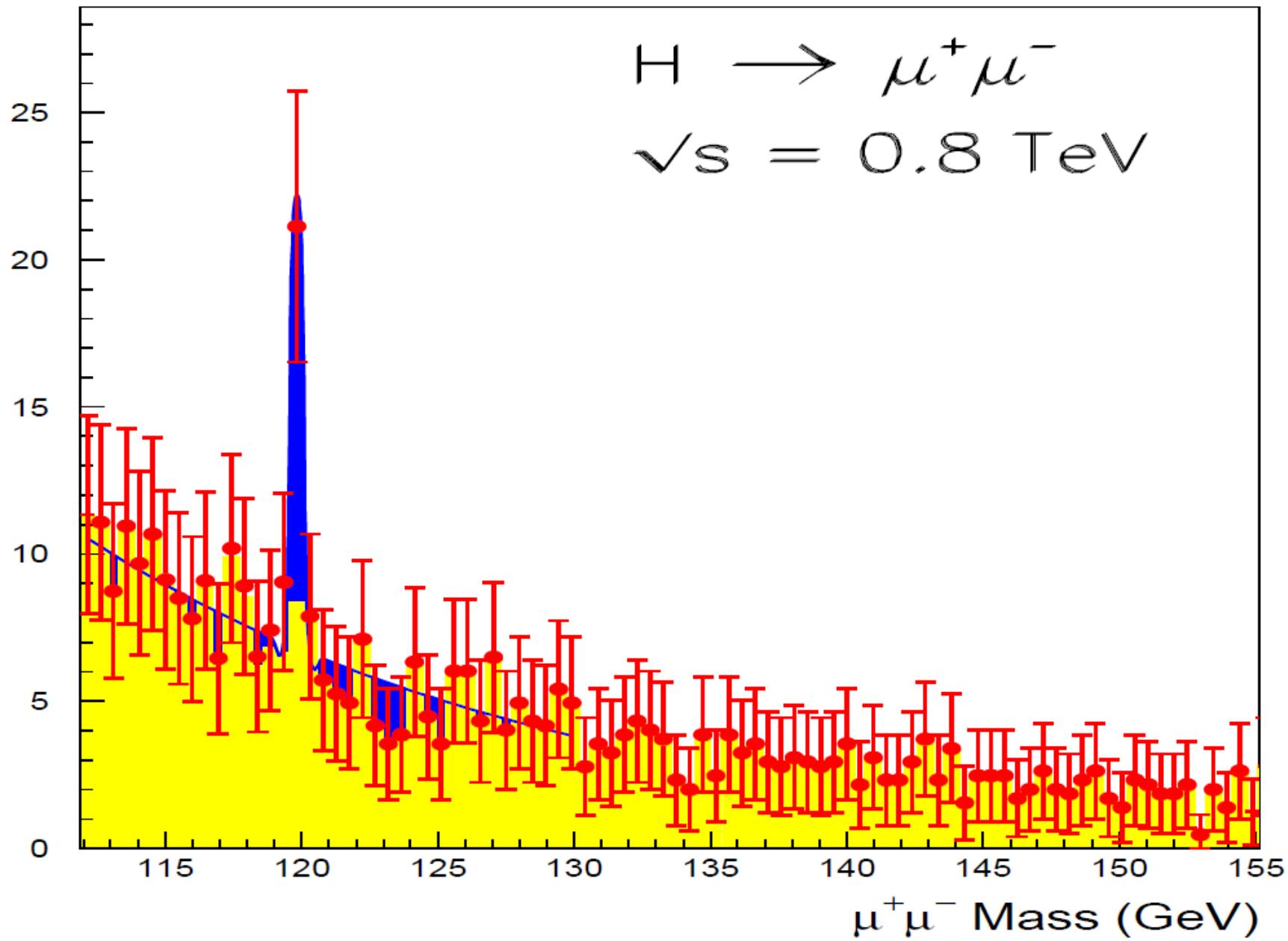
M. Battaglia et al.

ILC500, SDMar01, Z→all, H→μμ, 1000 fb^{-1}
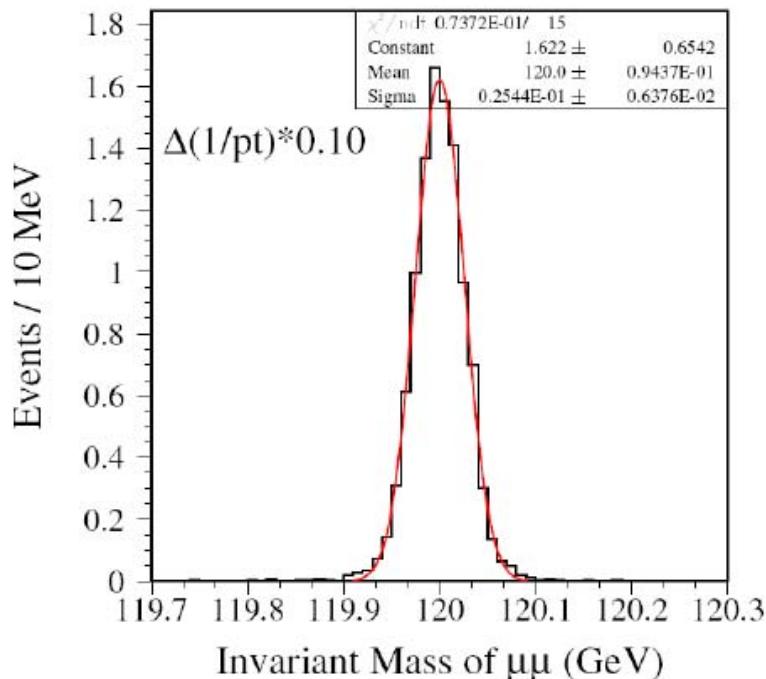
ILC500, SDMar01, Z→all, H→μμ, 1000 fb^{-1}

Δ(1/pt)*0.10

Δ(1/pt)*0.05
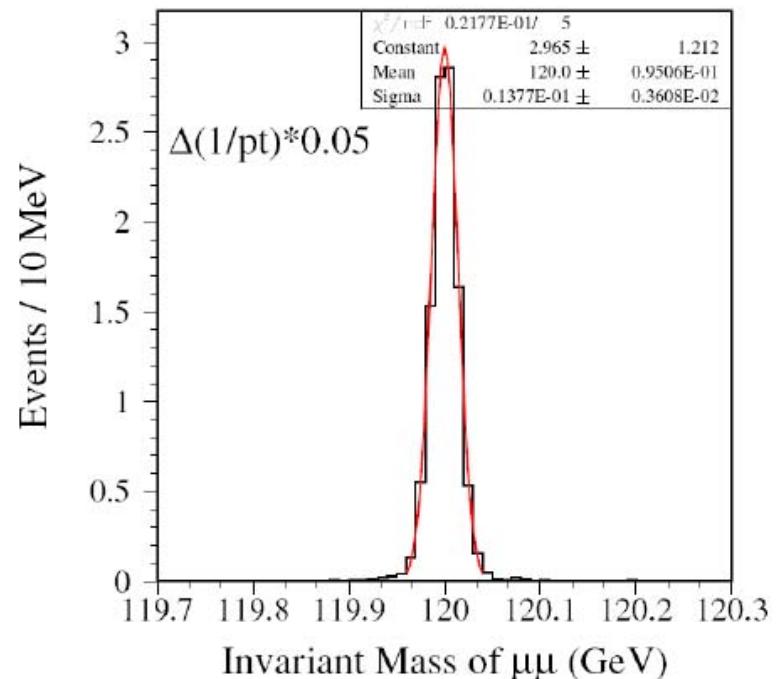
can measure Br(H→μμ) to 47%.

Energy and $|\cos\theta|$ distributions for muons from
$e^+e^- \to \nu_e\bar{\nu}_e h \to \nu_e\bar{\nu}_e \mu^+\mu^-$ at $\sqrt{s} = 1$ TeV

E_μ (GeV)

$|\cos\theta_\mu|$
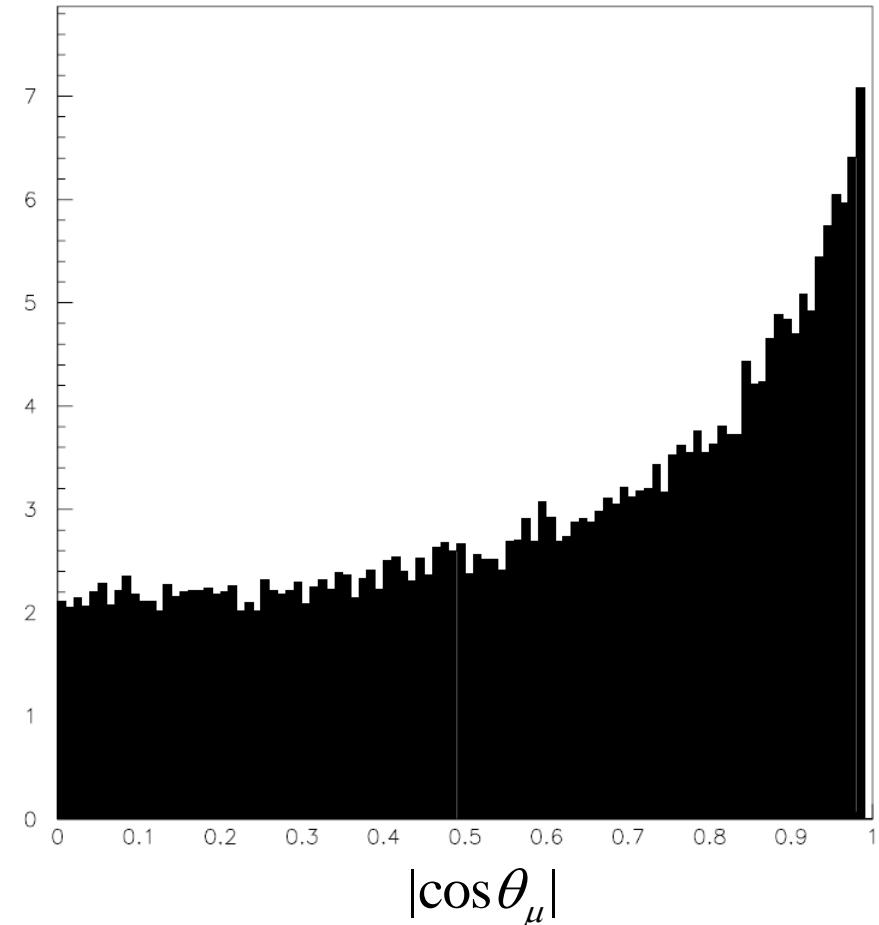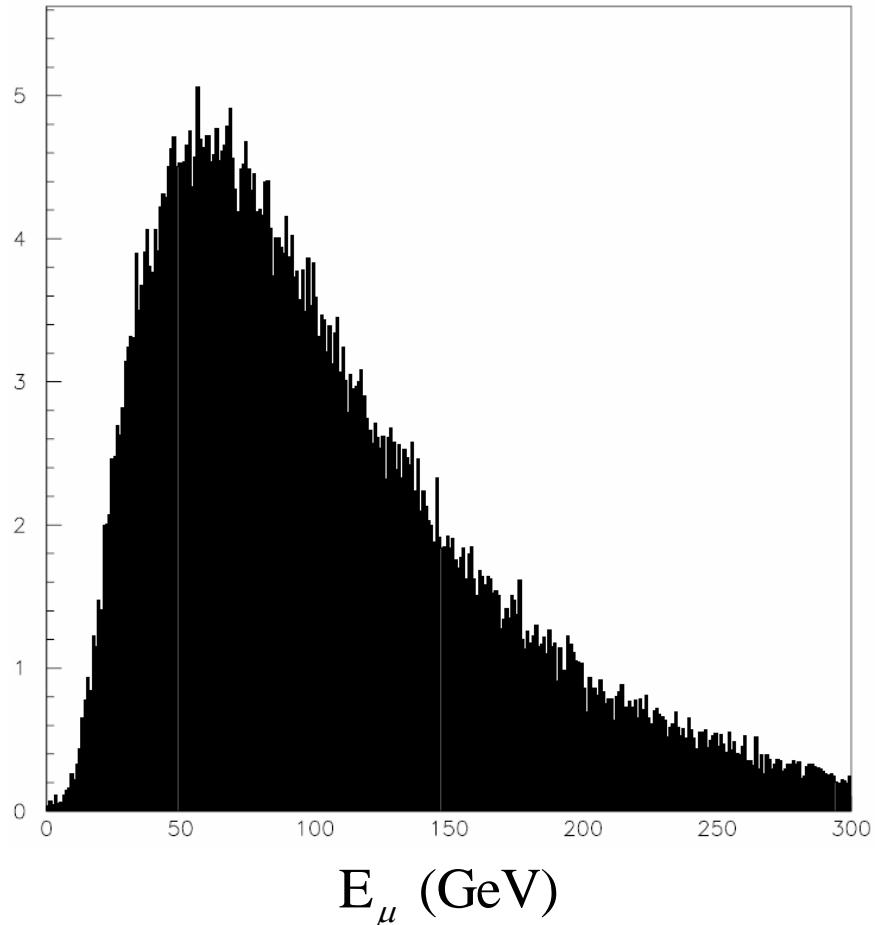
Preselection

Require:

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

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

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

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

Total Charge = 0

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

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

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

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

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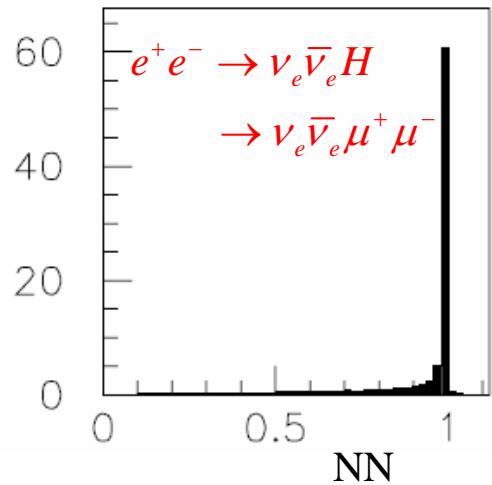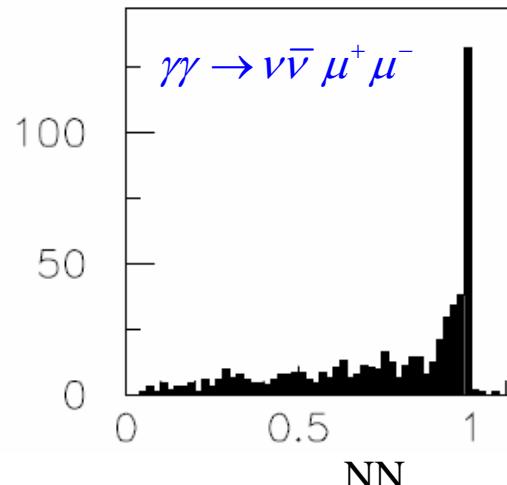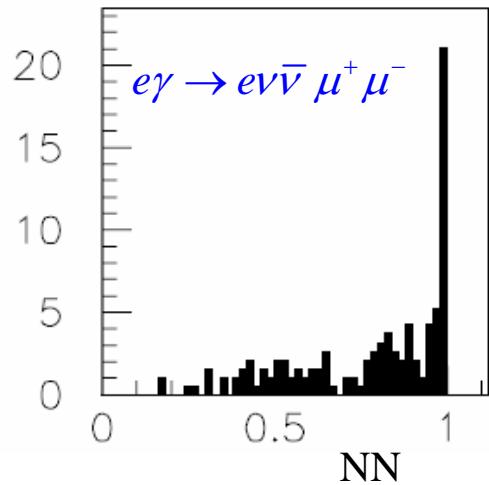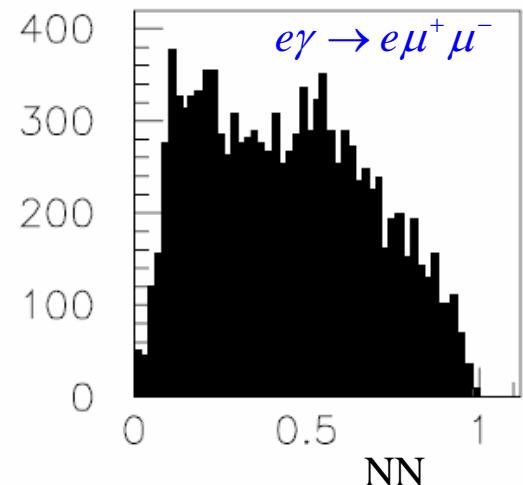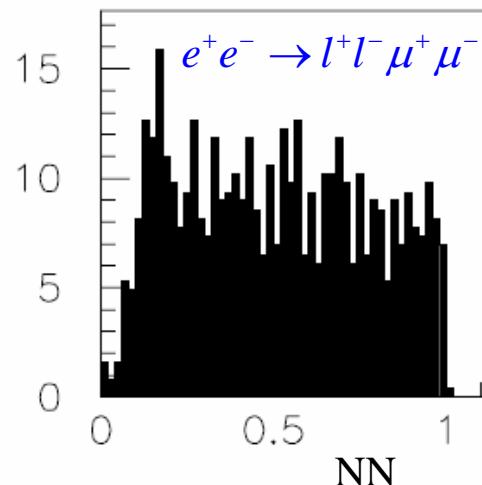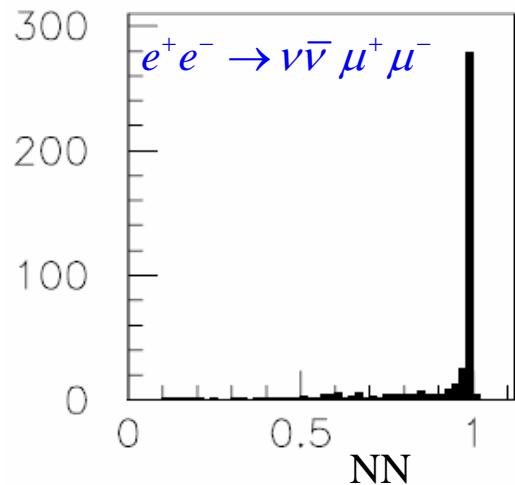
M$_{\mu\mu}$ Distributions for NN>0.95 for signal and background summed

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

$M_{\mu^+\mu^-}$ (GeV)
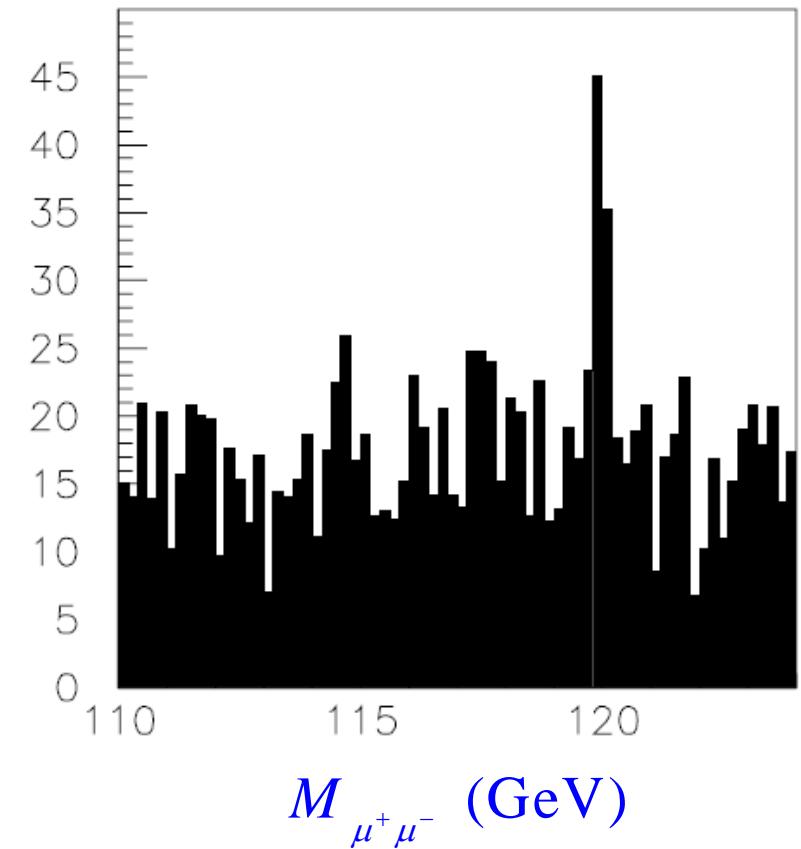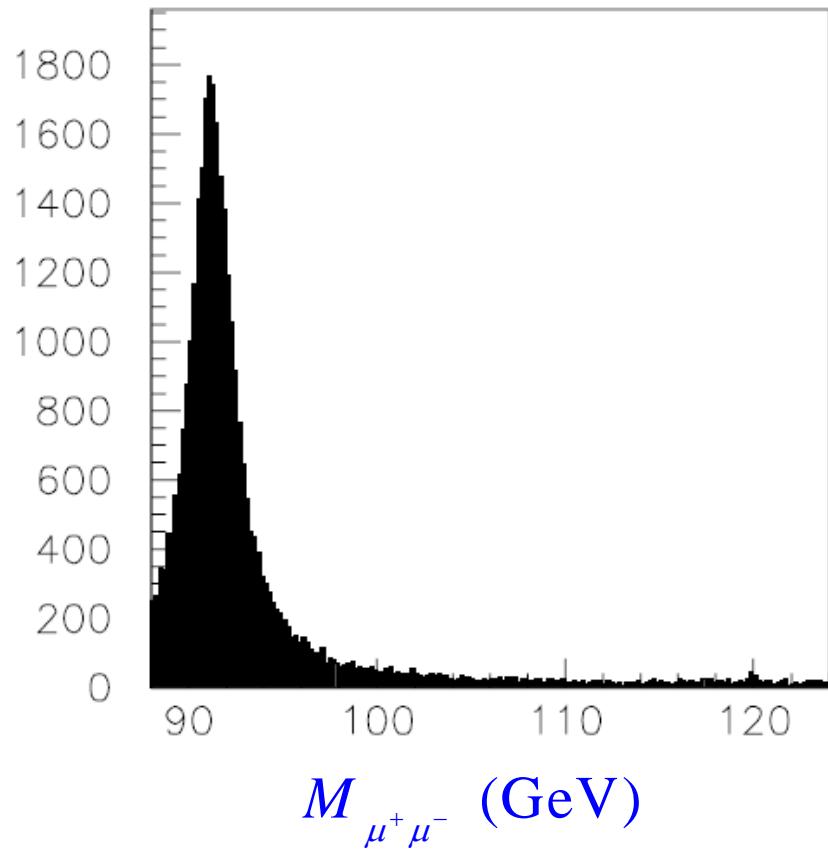
$M_{\mu\mu}$ Distributions for Different Random Number Seeds

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

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

$a = 2\times10^{-5}$

$b = 1\times10^{-3}$

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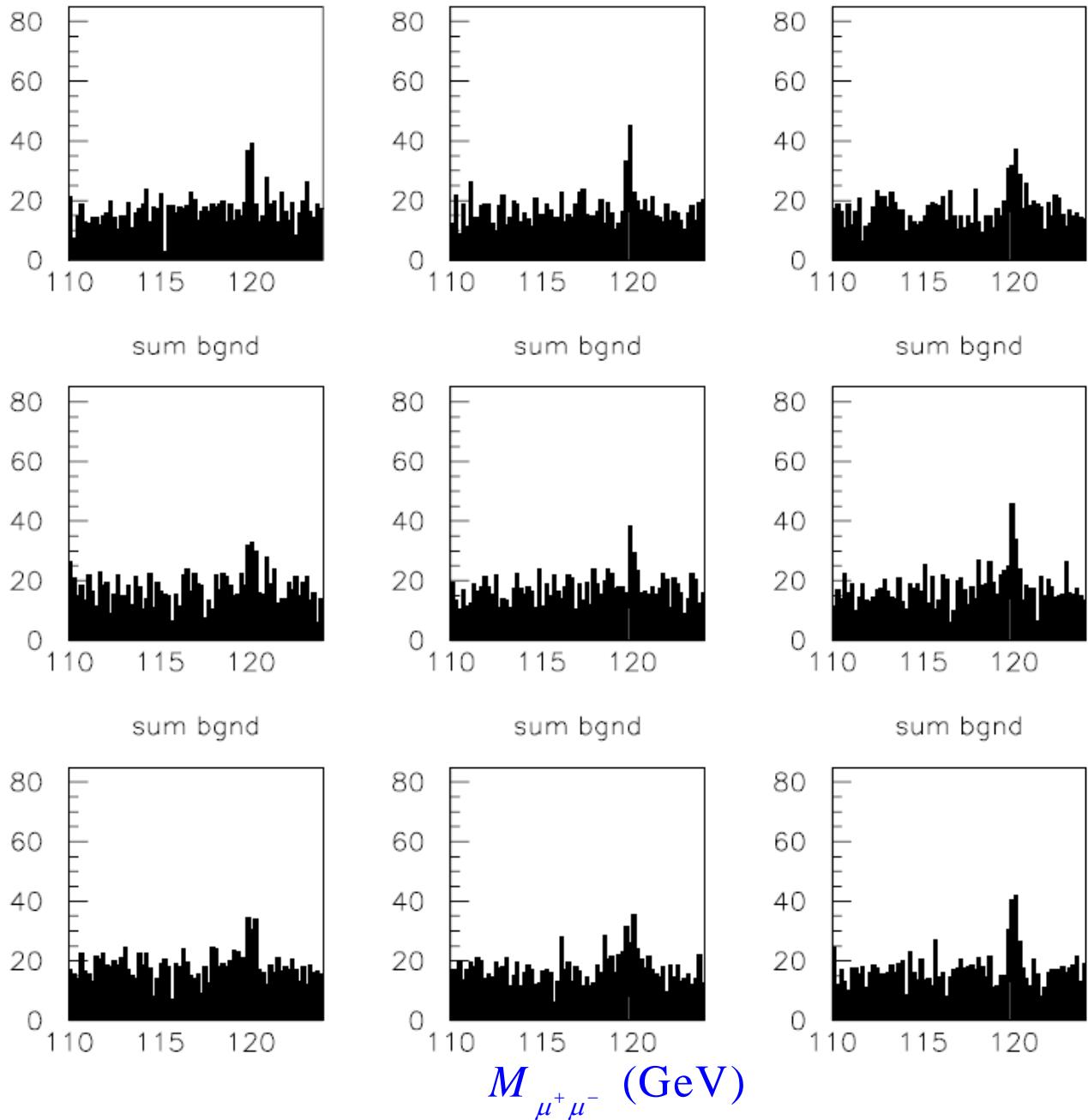
sum bgnd

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

M$_{\mu\mu}$ Distributions for Different Random Number Seeds

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

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

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

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

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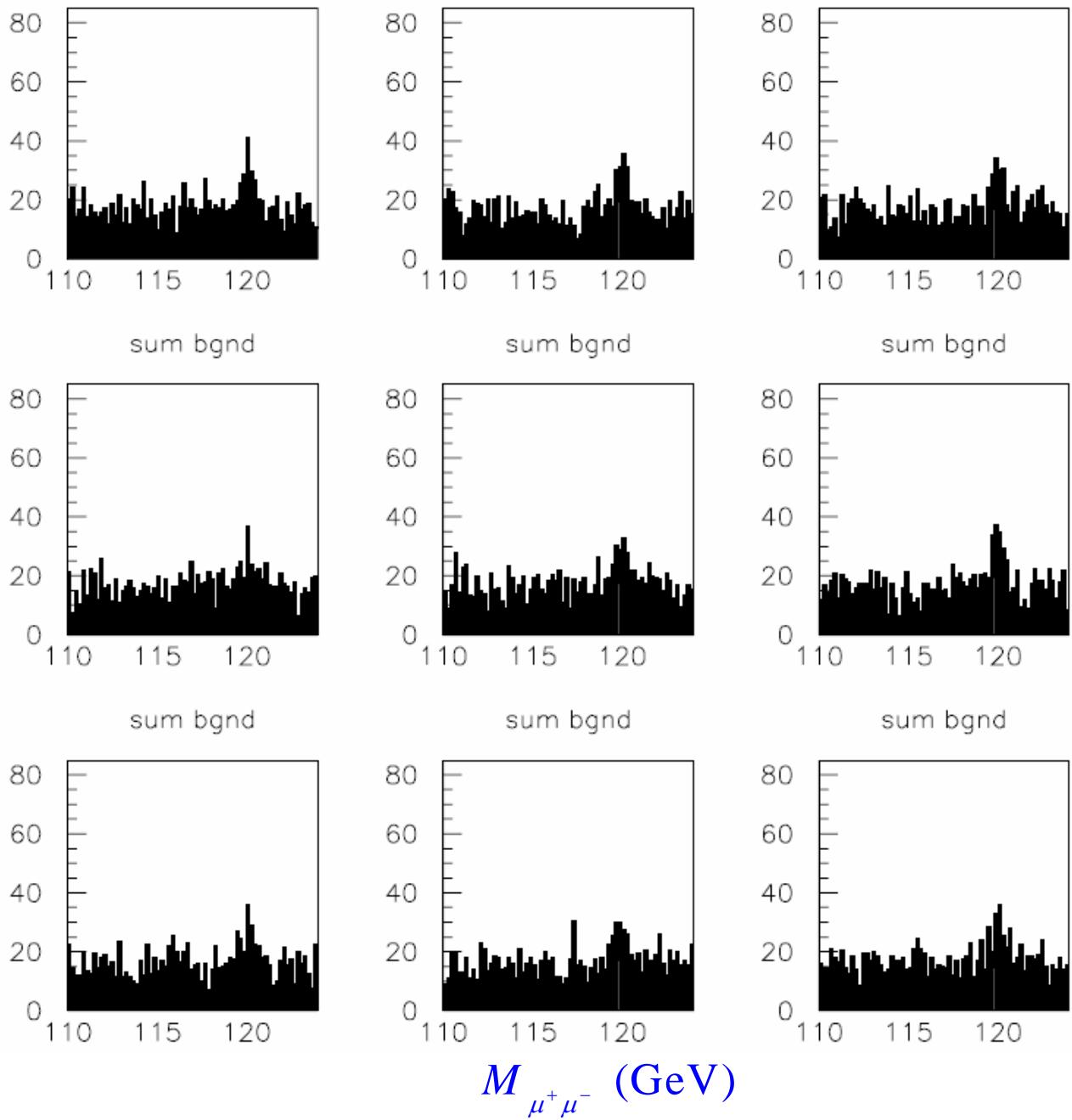
sum bgnd

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

M$_{\mu\mu}$ Distributions for Different Random Number Seeds

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

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

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

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

$$\frac{\delta p_t}{p_t^2} = a \oplus \frac{b}{p_t \sin \theta}$$
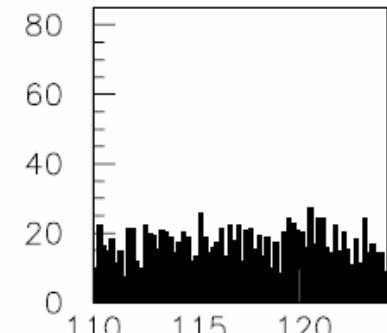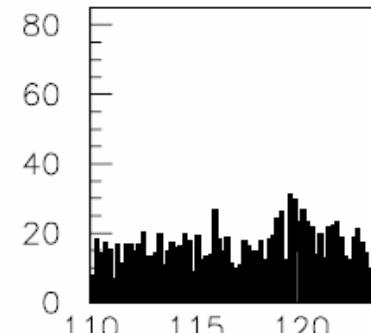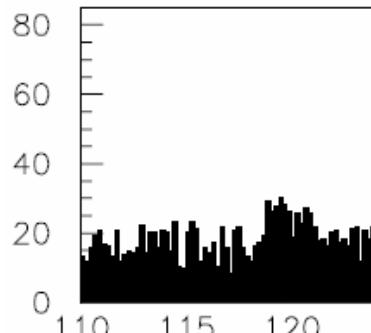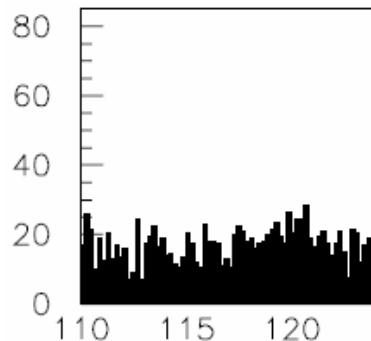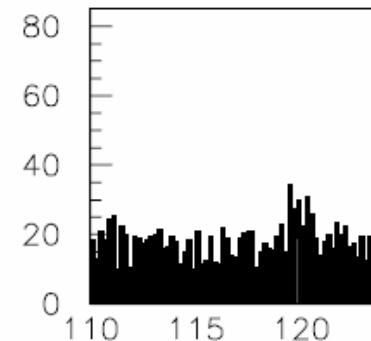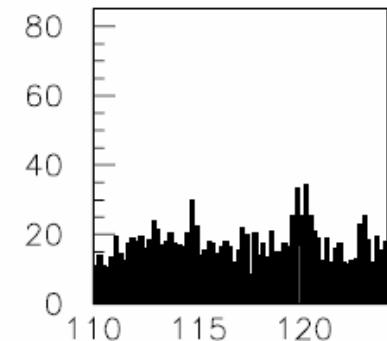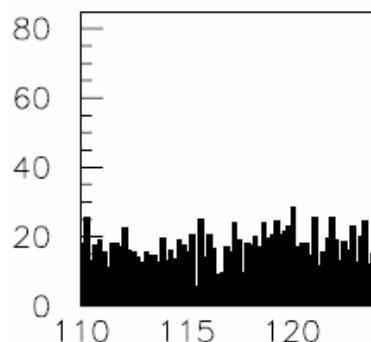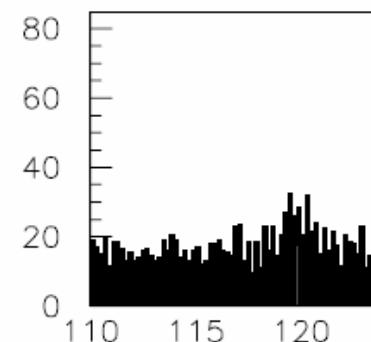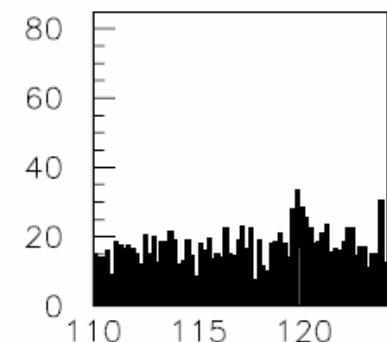
$M_{\mu^+ \mu^-}$ (GeV)

M$_{\mu\mu}$ Distributions for Different Random Number Seeds

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

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

$a = 0$

$b = 0$

$$\frac{\delta p_t}{p_t^2} = a \oplus \frac{b}{p_t \sin\theta}$$
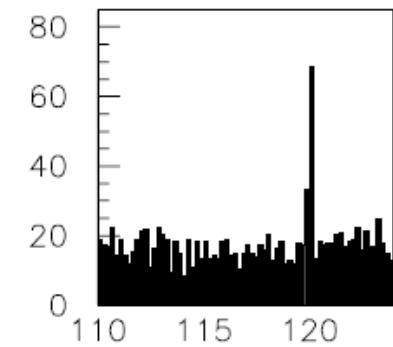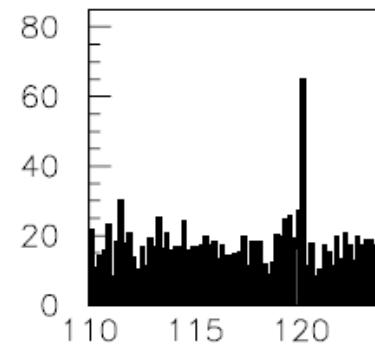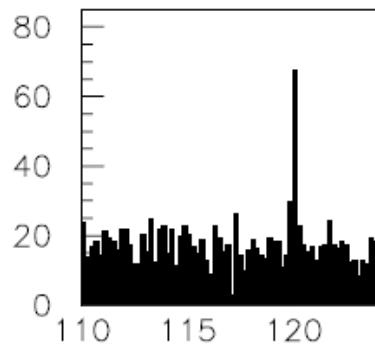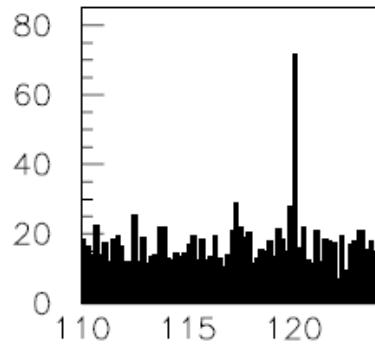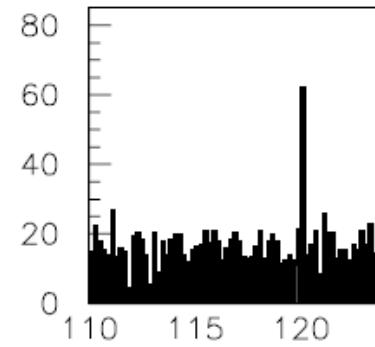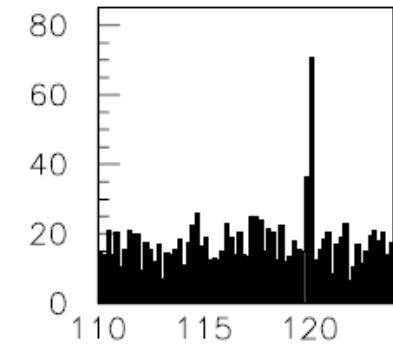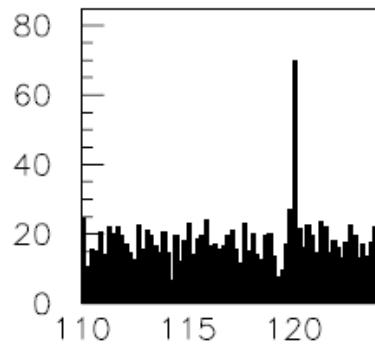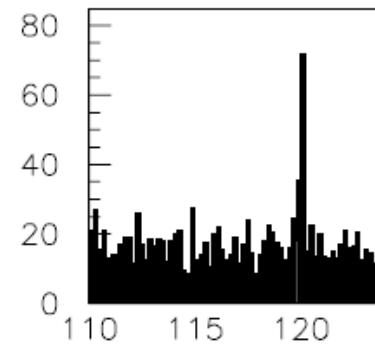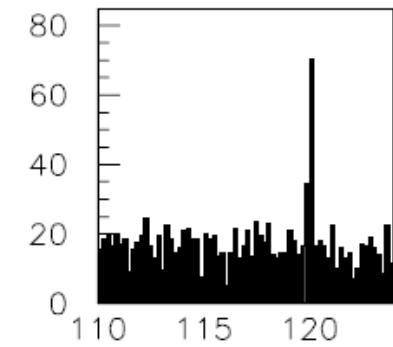
$M_{\mu^+\mu^-}$ (GeV)

Resolution for
BR(H→ μμ)
 vs *a* or *b*

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

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

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

$\Delta\mathrm{BR}(h \to \mu^+ \mu^-)$

ΔBR vs b

$a = 2 \times 10^{-3}$

ΔBR vs a

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

ΔBR SiD

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

$a \times 10^{-5}$ or $b \times 10^{-3}$