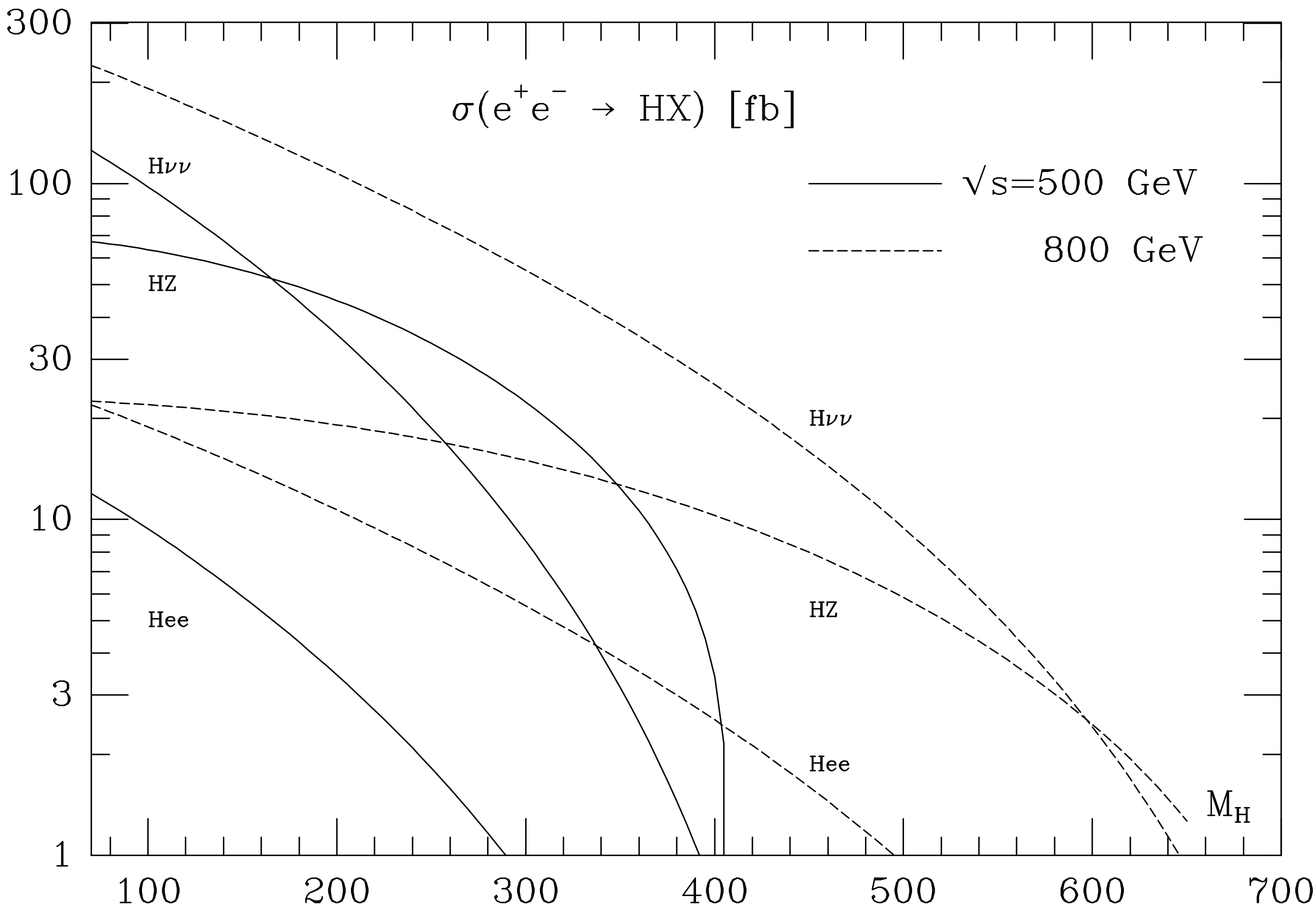
SM Higgs Production

Large production cross section above threshold



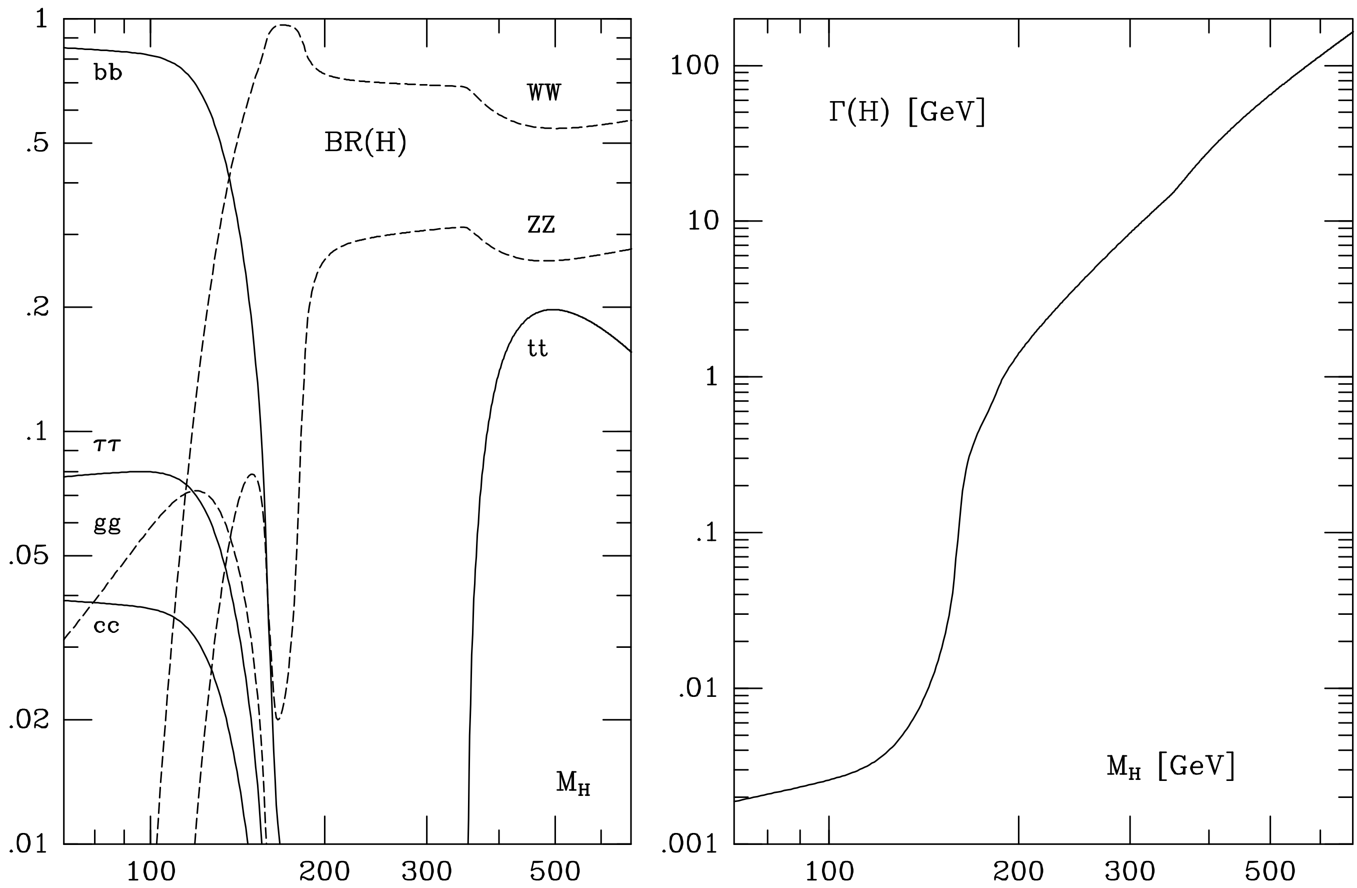
Higgs-strahlung dominates, boson fusion contributes to $H\nu\nu$ and Hee final states

SM Higgs Decay

Far above threshold:

$$\Gamma(\mathrm{H} \to f\bar{f}) = \frac{\mathrm{G_F N_C}}{4\sqrt{2}\pi} \mathrm{M}_f^2(\mathrm{M_H^2})\mathrm{M_H}$$

$$\Gamma(\mathrm{H} \to \mathrm{VV}) = 2(1)\frac{\sqrt{2}\mathrm{G_F}}{32\pi}\mathrm{M_H} \qquad V = W, (Z)$$



Higgs becomes wide above gauge boson threshold

Higgs Mass

G.W. Wilson and K. Desch, Obernai 99

From threshold excitation curve:

$$\Delta M_H = \sqrt{\sigma_{ZH}} \left| \frac{\partial M_H}{\partial \sigma_{ZH}} \right| \frac{1}{\sqrt{\varepsilon P \mathcal{L}}}$$

At $M_H = 120$ GeV with $\mathcal{L} = 130\ \mathrm{fb}^{-1}$:

$$\Delta M_H = \frac{30\mathrm{MeV}}{\sqrt{\varepsilon P}}$$

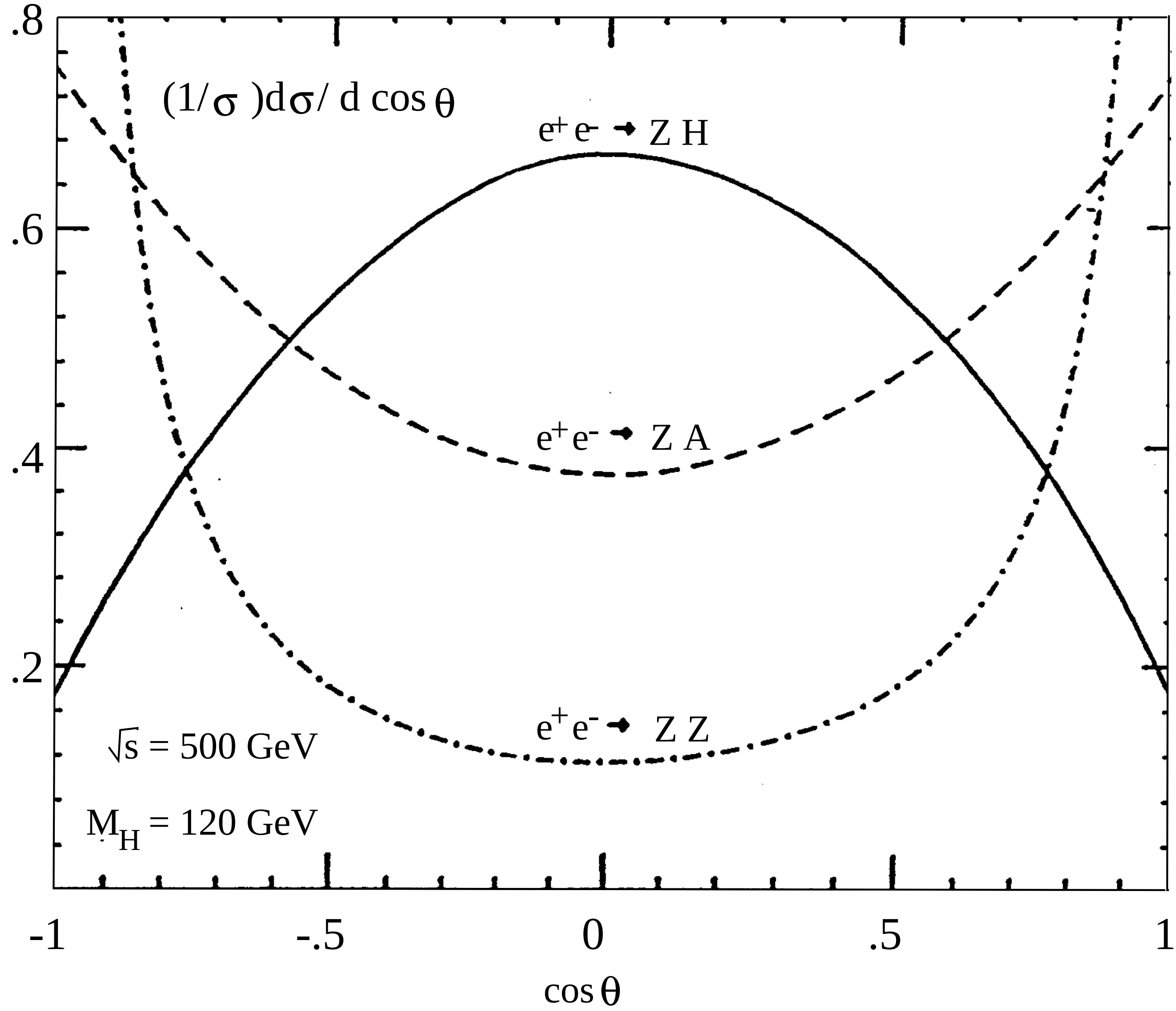
At $M_H = 180$ GeV with $\mathcal{L} = 170\ \mathrm{fb}^{-1}$:

$$\Delta M_H = \frac{60\mathrm{MeV}}{\sqrt{\varepsilon P}}$$

With all channels observed and polarisation to reduce WW-fusion background, one can hope for $\varepsilon P \simeq 0.5$ and thus $\Delta M_H = 40 - 50$ MeV and Higgs width to $\simeq 10\%$

Higgs Boson Spin

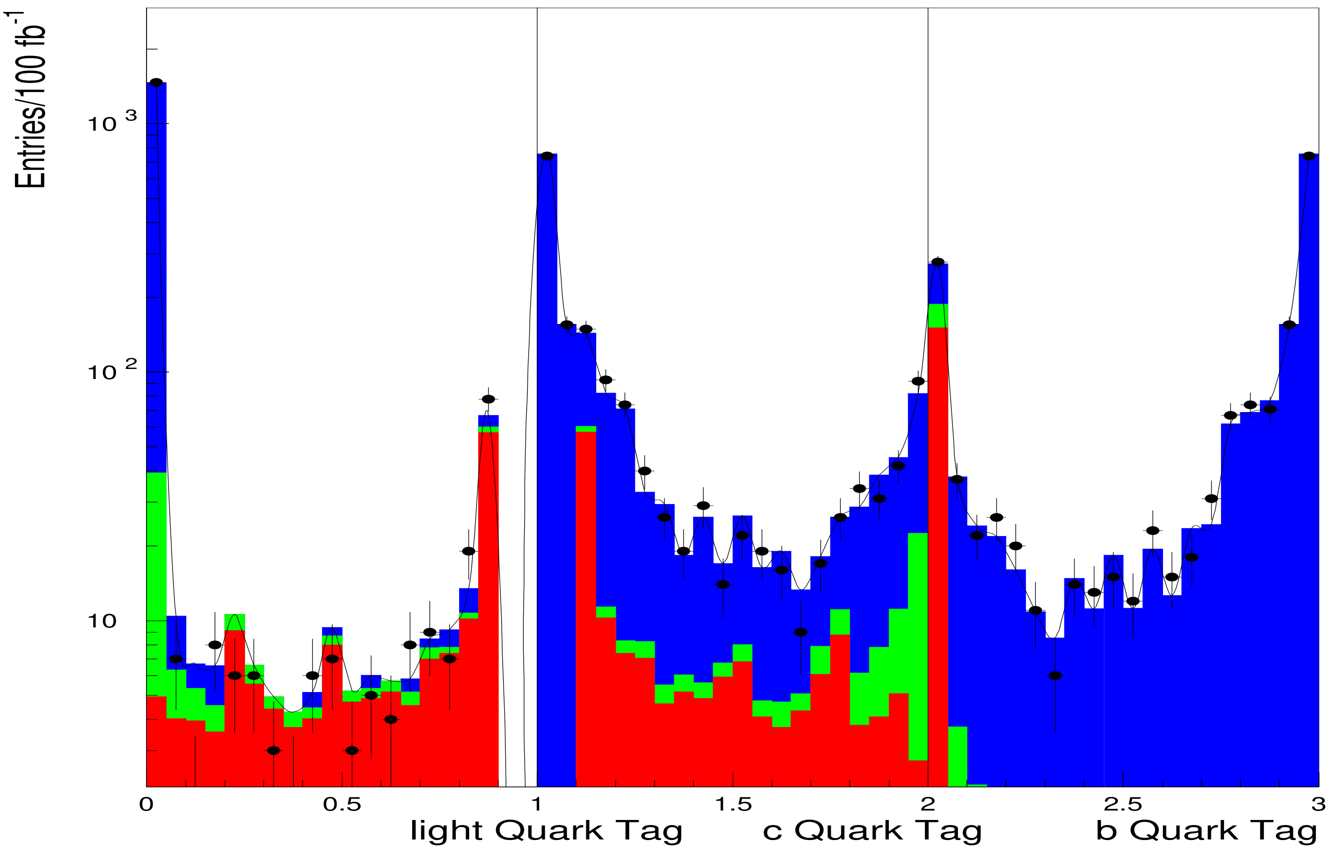
Distribution of production angle



Higgs Decay Tagging

- $\mathcal{L} = 100\text{fb}^{-1}$, $\sqrt{s} = 350 - 500$ GeV
- Secondary vertex tags: Multiplicity, mass, Π_{SV}, Π_{PV}
- Topological tags: lepton transverse momentum etc.

M. Battaglia, hep-ph/9910271



Higgs Decay Fractions

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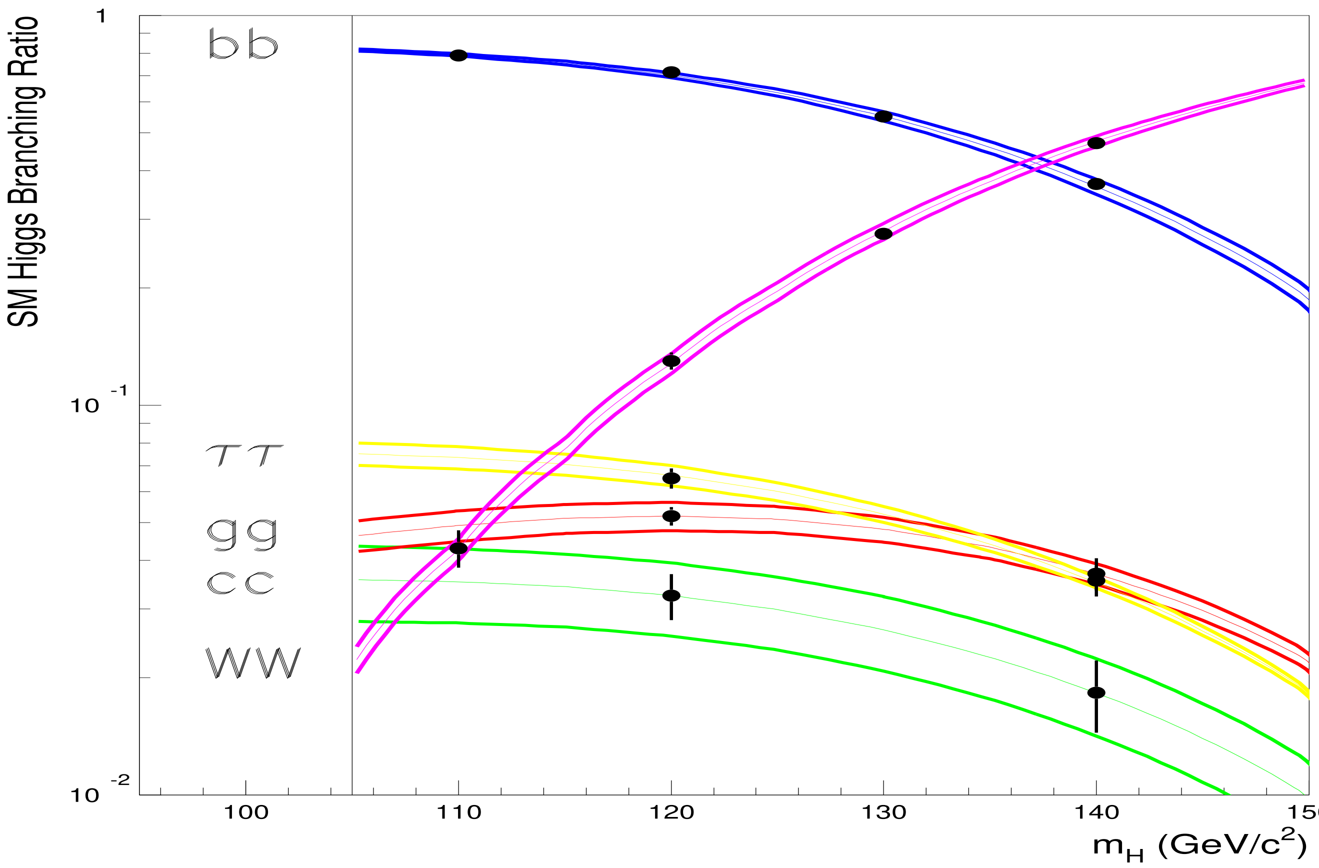

Expected accuracies:

$$\Delta BR(H \to b\bar{b}) \simeq 3\%$$

$$\Delta BR(H \to c\bar{c}) \simeq 8\%$$

$$\Delta BR(H \to gg) \simeq 6\%$$

$$\Delta BR(H \to \tau\bar{\tau}) \simeq 6\%$$

$$\Delta BR(H \to WW^*) \simeq 5\%$$

SM Higgs or MSSM Higgs?

$$\Gamma_{b\bar{b}}^{MSSM} \sim \Gamma_{b\bar{b}}^{SM} \frac{\sin^2 \alpha}{\cos^2 \beta}$$

$$\Gamma_{c\bar{c}}^{MSSM} \sim \Gamma_{c\bar{c}}^{SM} \frac{\cos^2 \alpha}{\sin^2 \beta}$$

$$\Gamma_{WW^*}^{MSSM} \sim \Gamma_{WW^*}^{SM}$$

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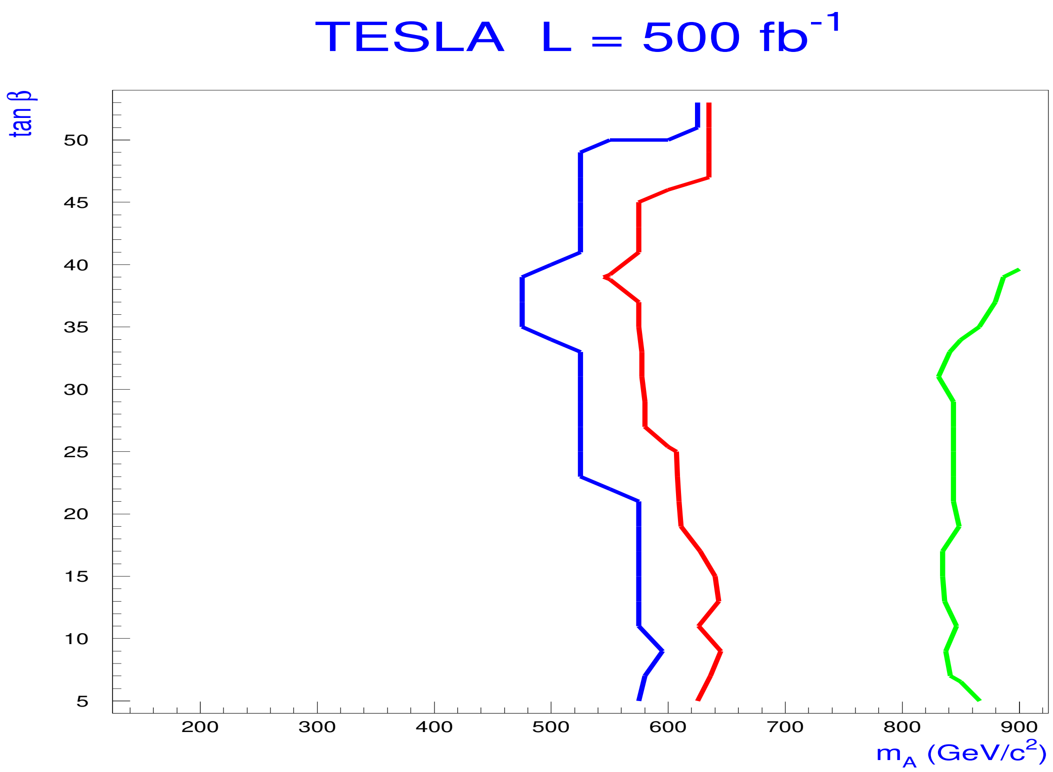

Distinguishable over large region in MSSM parameter space