Benchmarking SiD

Tim Barklow

SLAC

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We have examples of physics benchmarking of the SiD Detector

Talks at LCWS05:

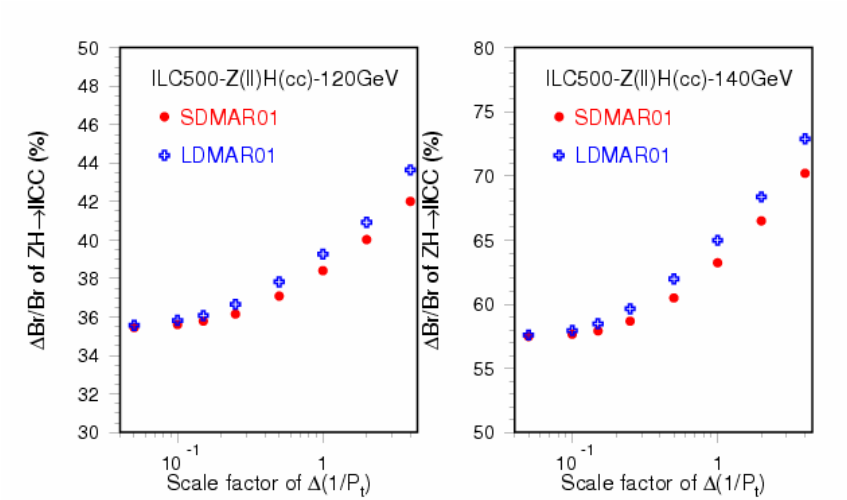
Hai-Jun Yang & Keith Riles – Impact of Tracker Design on Higgs/SUSY Measurment

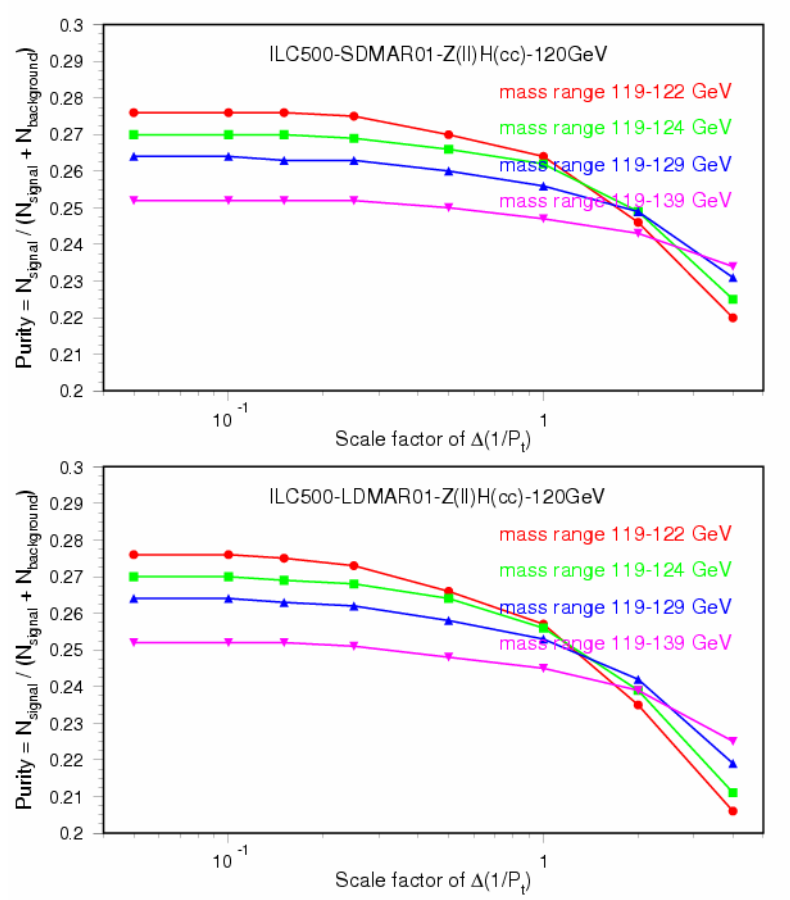
Bruce Schumm – SUSY Constraints on Forward Tracking

Tim Barklow – Physics Impact of Detector Perfomance

Now we would like to organize the effort and systematically evaluate the consequences of design choices and the performance of the integrated SiD detector

Branching Ratio of H → CC





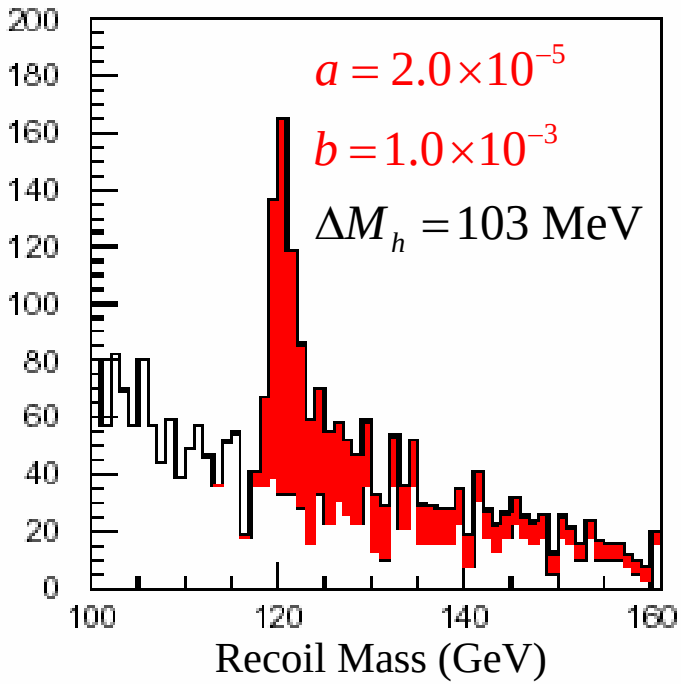
* C-tagging Eff = 50% (assuming)
  Eff of B quark = 4.4%
  Eff of UDS quark = 0.5%
* Br (H→CC) =
  2.8% (120GeV), 1.4% (140GeV)

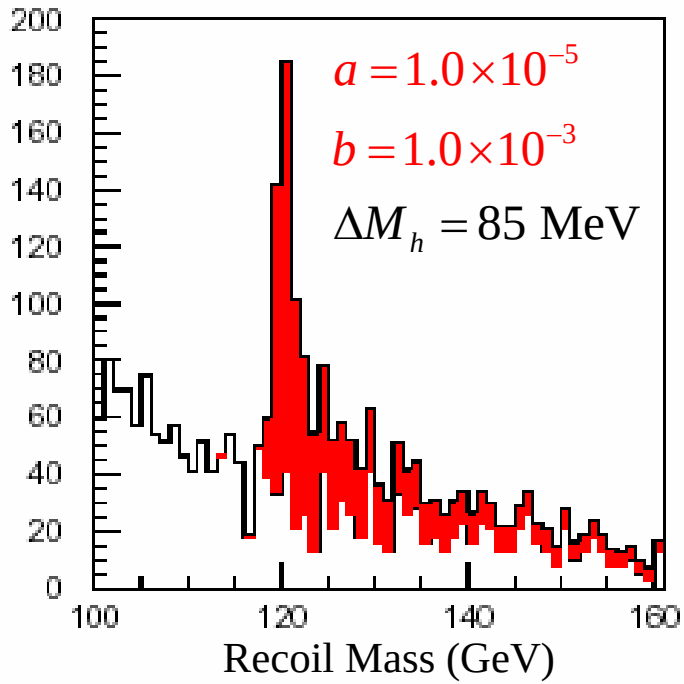
→ ΔBr/Br ~ 39% (120GeV), 64% (140GeV) **for Z→l+l-, 1000 fb^{-1}**
→ ΔBr (H→CC) is insensitive to track momentum resolution.

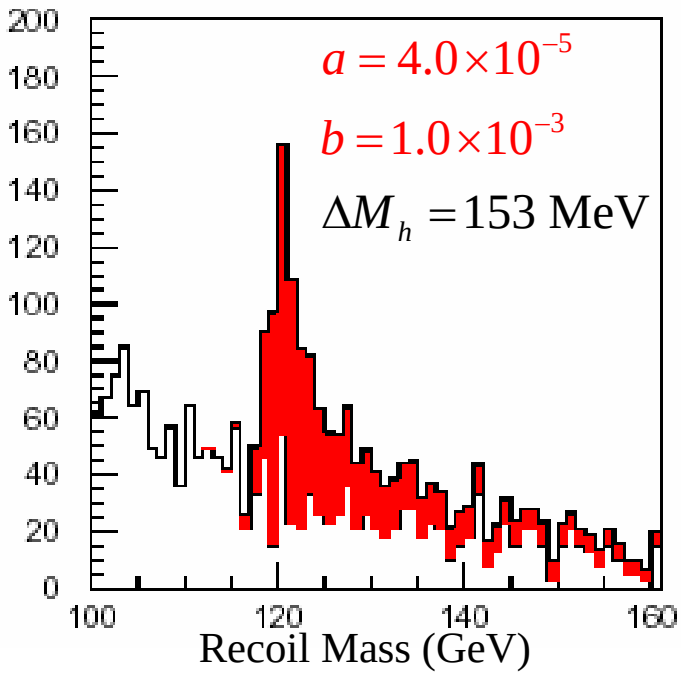
$$e^+e^- \rightarrow ZH$$
$$\rightarrow \mu^+\mu^- X$$

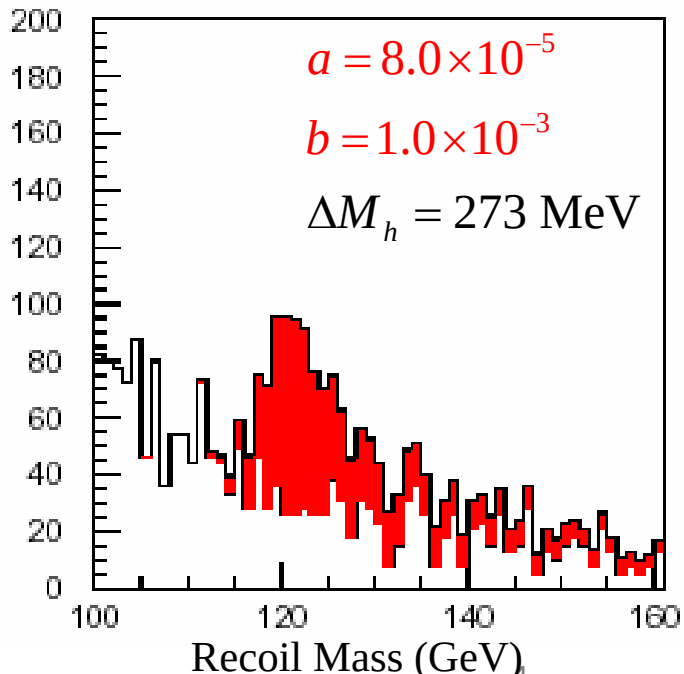
$$\sqrt{s} = 350\ GeV$$
$$L = 500\ fb^{-1}$$

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







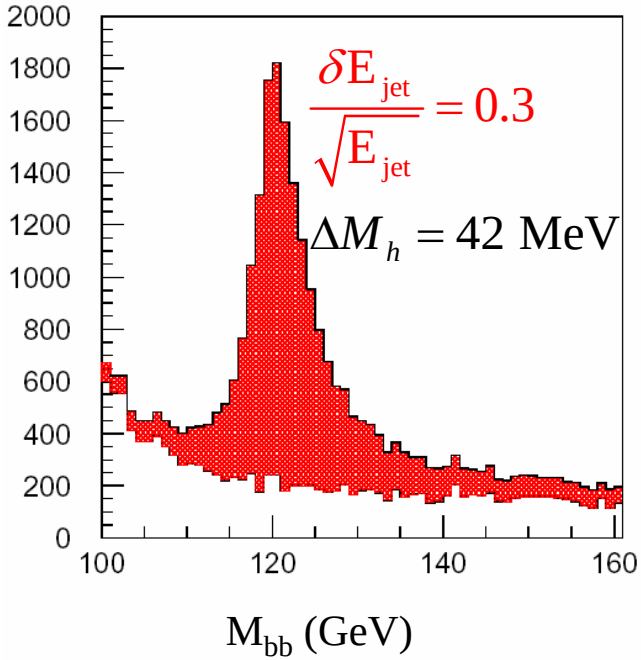


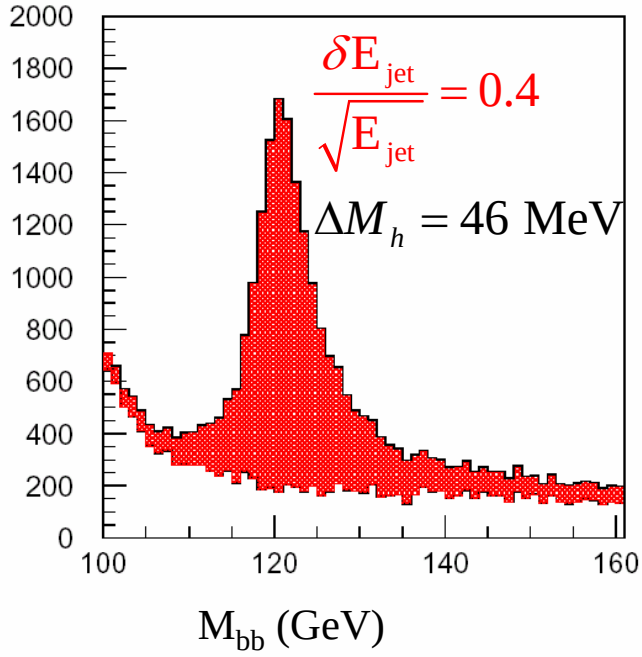
$e^+e^- \rightarrow ZH$

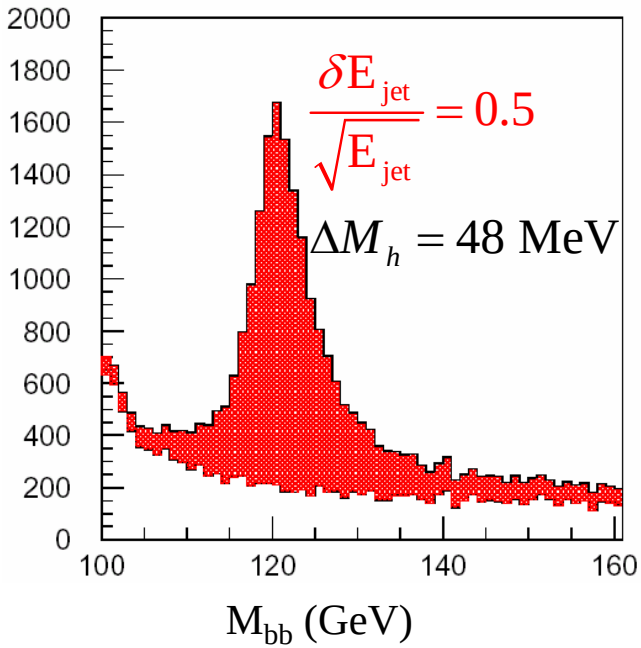
$\rightarrow qqb\bar{b}$

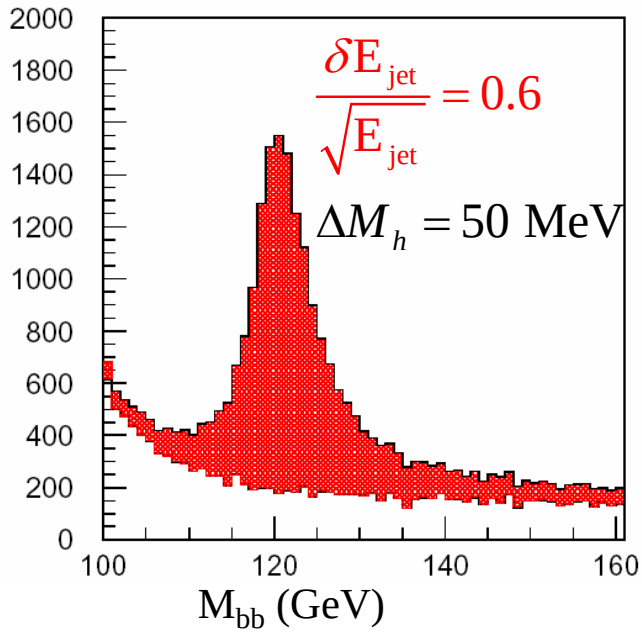
$\sqrt{s} = 350\ GeV$

$L = 500\ fb^{-1}$









Goals

- Select Physics Benchmarks e.g.

M_h $BR(H \to b\bar{b}, WW^*, ...)$ g_{hhh} $M_{\tilde{\chi}_j^0}$ $M_{\tilde{\chi}_j^+}$

$\sigma(WW \to WW, ZZ, t\bar{t})$

(also select $\sqrt{s}$, new particles masses, etc.)

What criteria? At least 1 benchmark per major subsystem? How many benchmarks to test detector integration? Should theory interest/importance be factored in when making the selection?

Goals

- Select Detector Parameters to vary. e.g.

  $R_{calorimeter}$ B_{field} # silicon layers, ...

  (if possible do variable transformation

  to $\Delta \frac{1}{p_t}$ $\frac{\Delta E_{jet}}{E_{jet}}$, ... so that Fast MC can

  be used)

Goals

- Generate Events in coordination with Simulation Group. Envision that a few analyses done with full MC, many done with fast MC (most of TESLA TDR physics analyses done with fast MC.)

Goals

- Perform physics analyses using as input energy flow objects. An energy flow object is $E, \vec{p},$ impact params, charge, id$(e^-, \mu^-, \pi^+, \gamma, K_L^0)$ and errors

Help other groups produce energy flow objects.