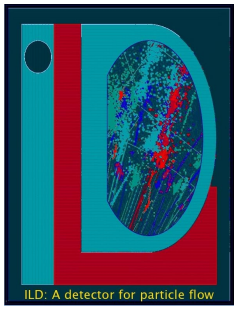
ee→ ZH and SB2009



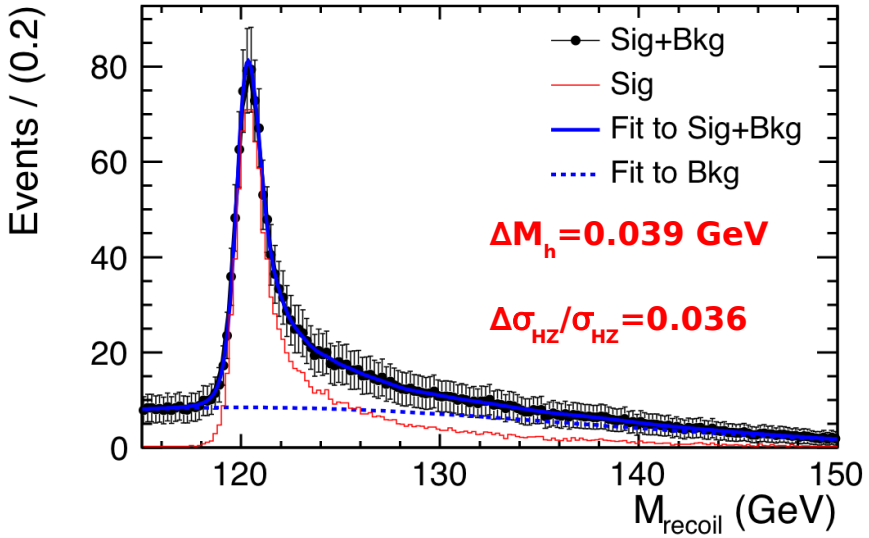
Roman Pöschl

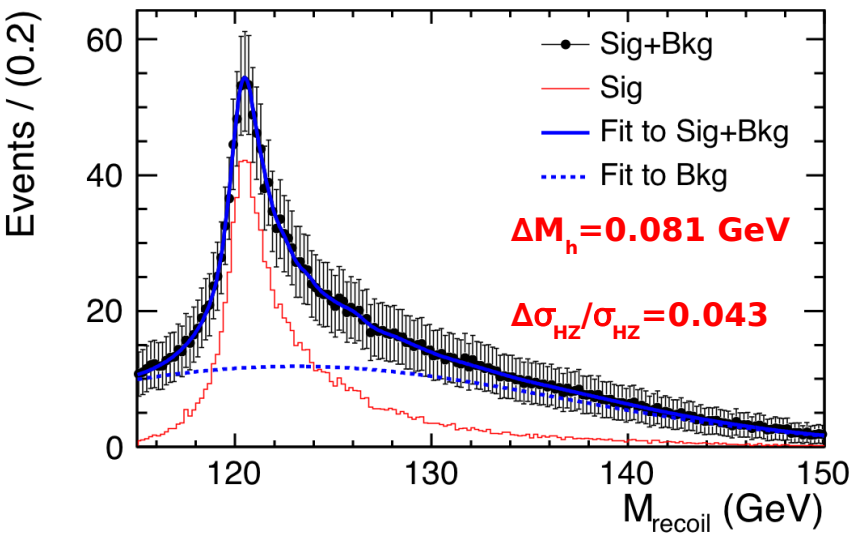
LABORATOIRE DE L'ACCÉLÉRATEUR LINÉAIRE

ILD Workshop – Jan. 2010 Paris/France

Higgs-strahlung studies – The Status

LOI and PhD Thesis of H.Li, see also LC-PHSIM-2009-006





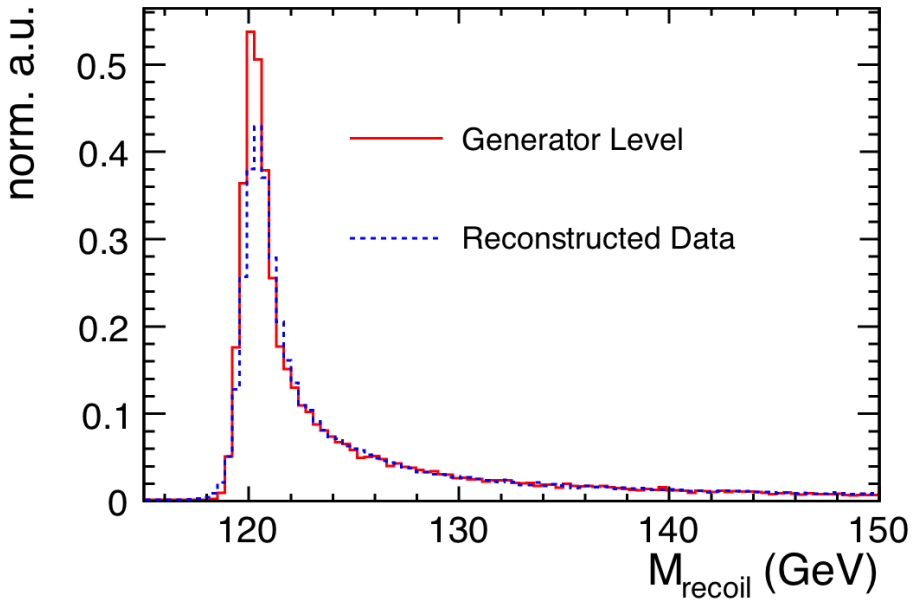
Excellent Signal/Background Ratio: 8/1

=> $s(\sigma_{HZ}) \sim 3\% <=> s(g_{HZZ}) \sim 1\text{-}2\%$

$\Delta M_h \sim 30$ MeV

Influence of Machine Parameters

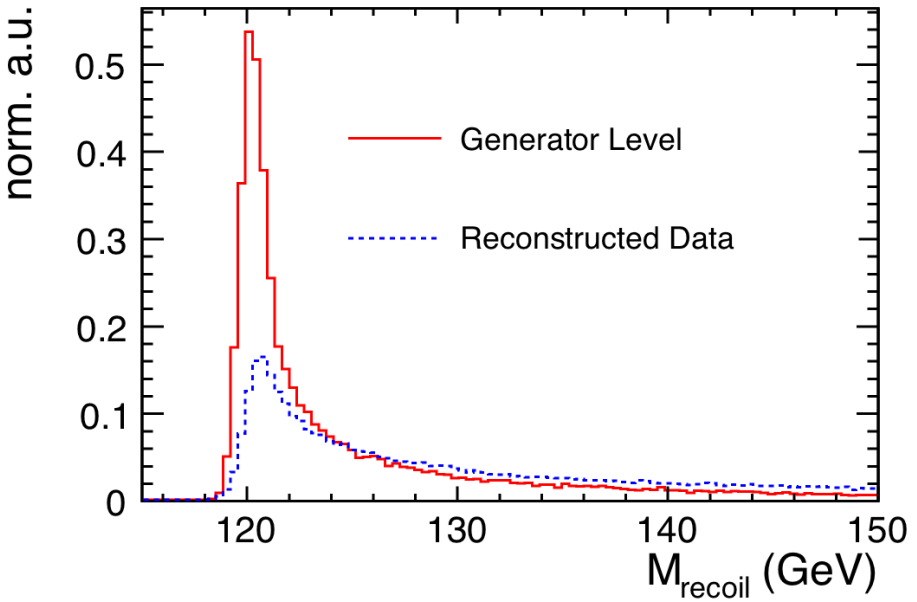
Muon Channel



ΔM_{tot} = 650 MeV

$\Delta M_{mach.}$ = 560 MeV $\Delta M_{det.}$ = 330 MeV

Electron Channel



ΔM_{tot} = 750 MeV

$\Delta M_{mach.}$ = 560 MeV $\Delta M_{det.}$ = 500 MeV

Uncertainties of incoming beams are dominant source of Statistical Error

(even in Electron Channel)

Higgs-strahlung is key process when responding to varying beam parameters!!!!

E.g. SB2009

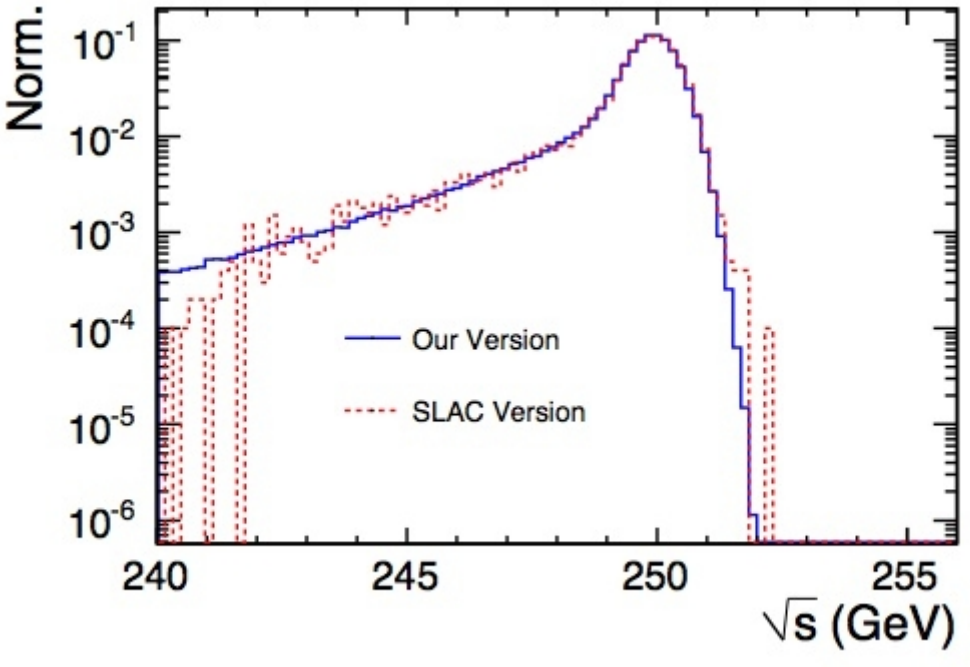
Fast Simulation of ee->HZ

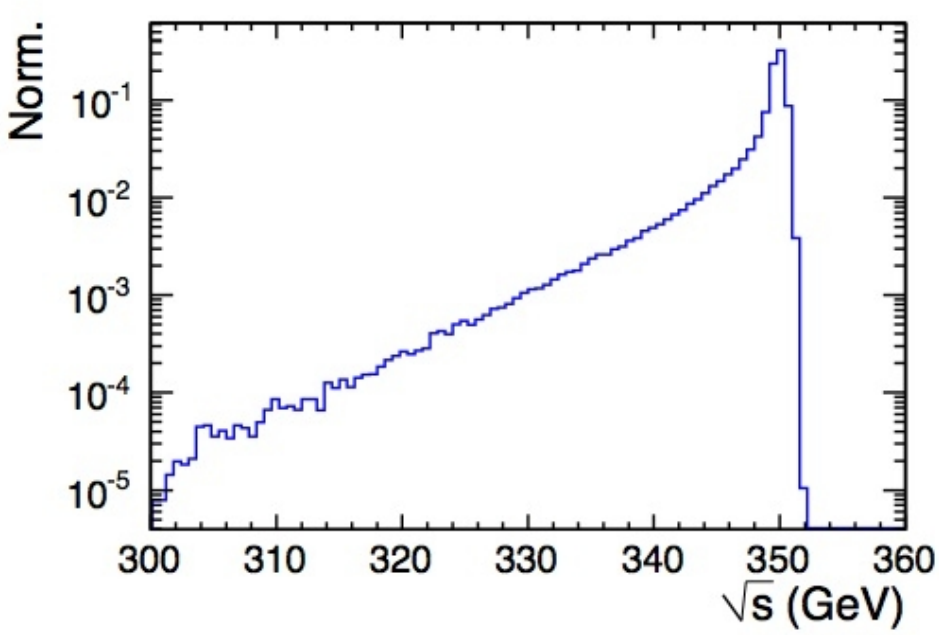
Developped by H.Li now at LPSC Grenoble

Complete suite: Beam Generation – Event Genration – Detector Response

Guinea Pig ->(CALYPSO) PYTHIA Momentum Smearing

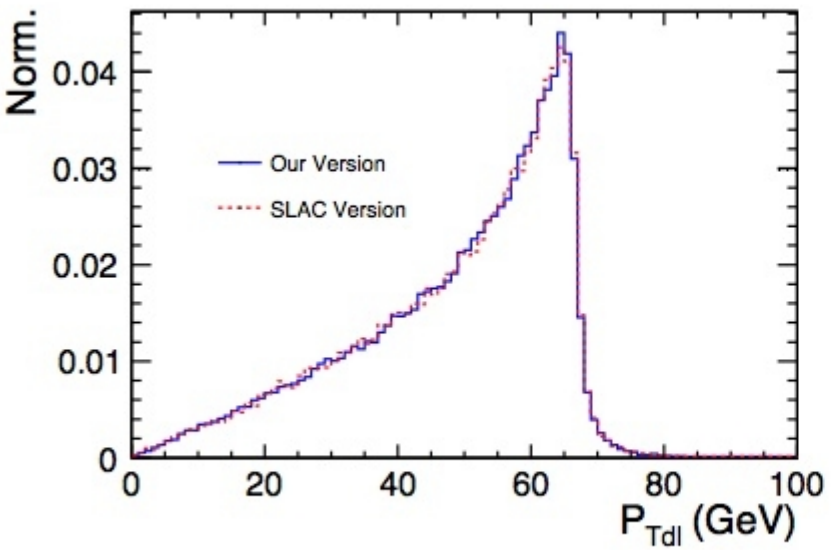
Genated cms energy

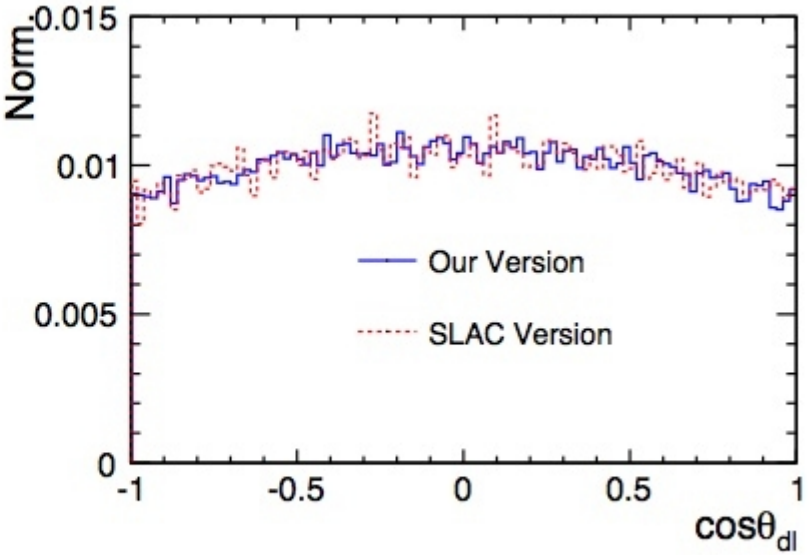




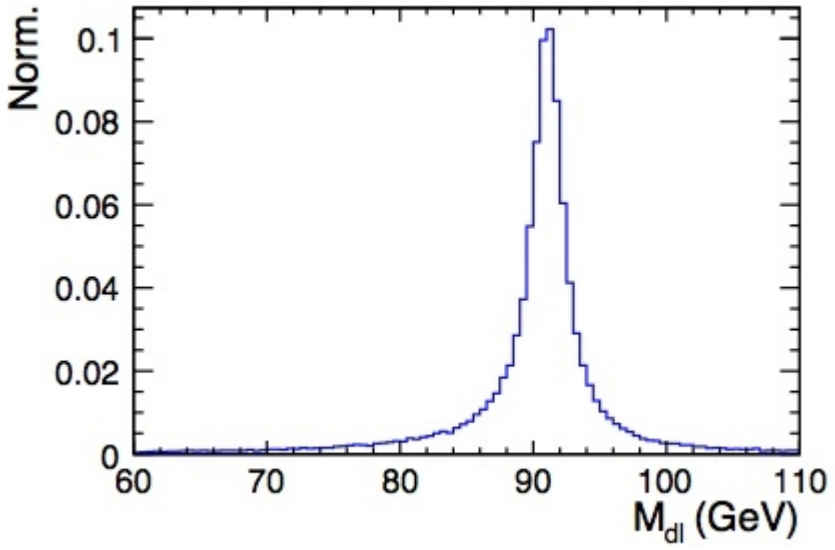
Compatible with SLAC LOI samples

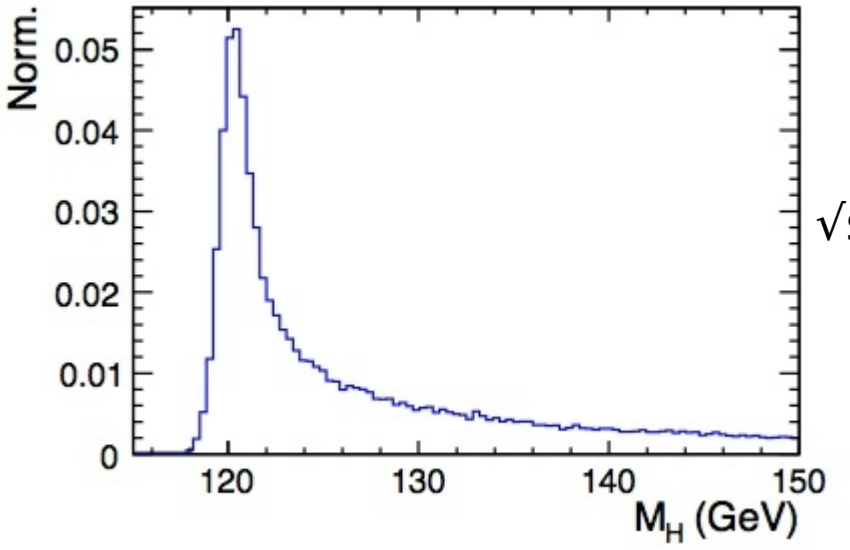
Event Generation





√s= 250 GeV



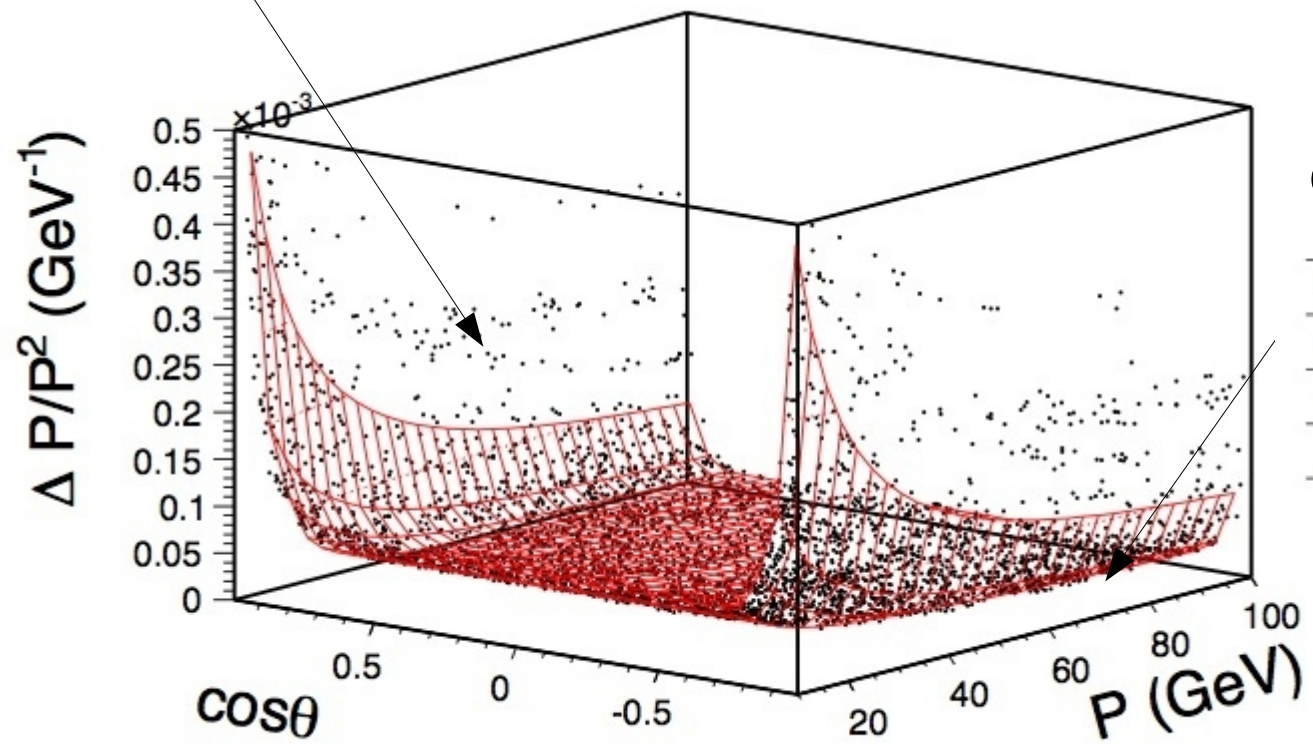


√s= 350 GeV

Detector Response

$$\frac{\delta P}{P^2} = \begin{cases} a_1 \oplus b_1/P & : \ |\cos\theta| < 0.78 \\ (a_2 \oplus b_2/P) \Big/ \sin\left(1 - |\cos\theta|\right) & : \ |\cos\theta| > 0.78 \end{cases}$$

Points full simulation

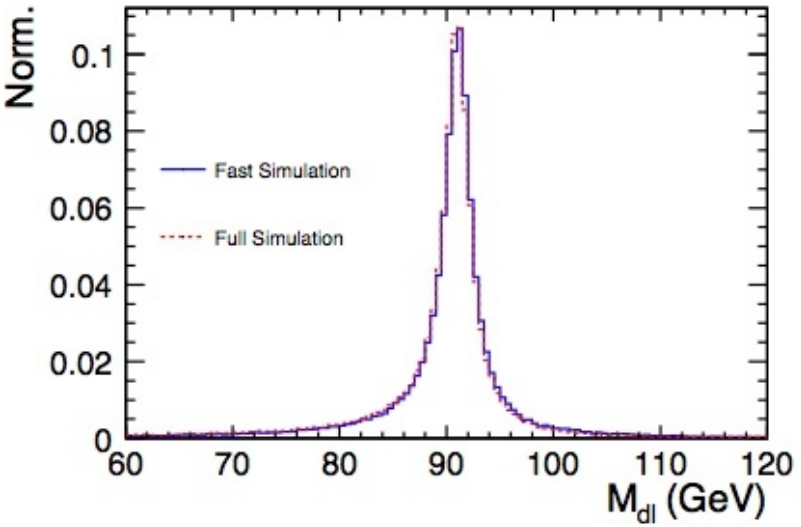


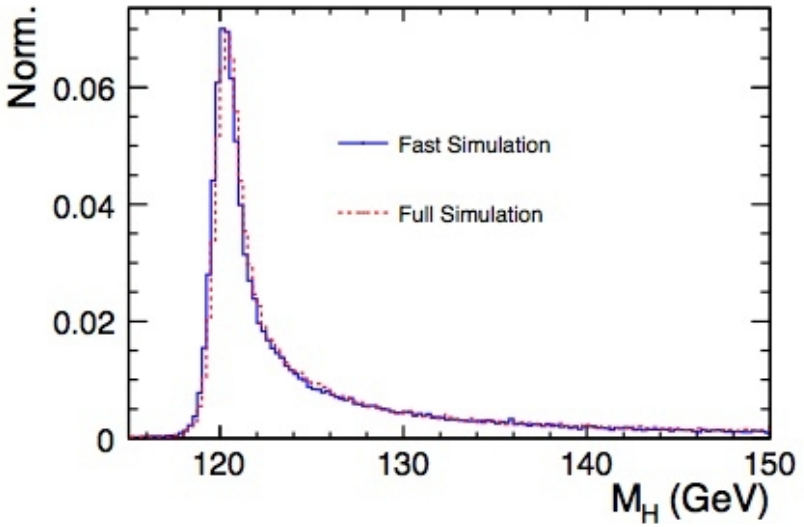
Grid fast simulation

a_1	2.08×10^{-5} (1/GeV)
b_1	8.86×10^{-4}
a_2	3.16×10^{-6} (1/GeV)
b_2	2.45×10^{-4}

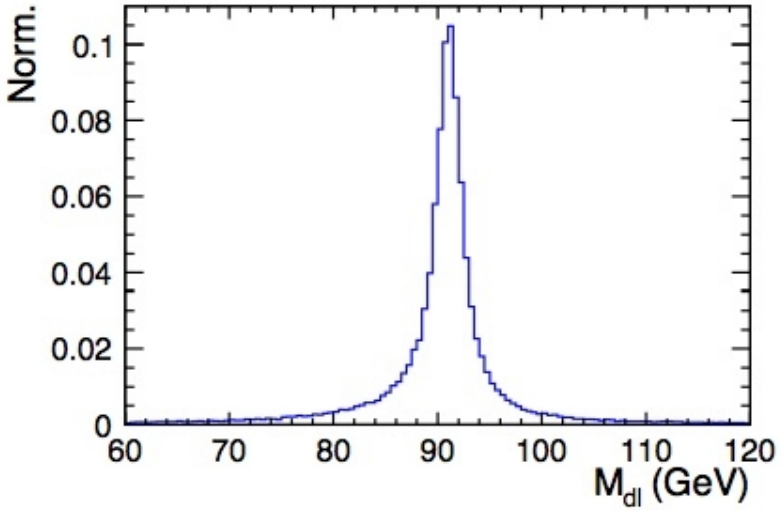
Detector Response

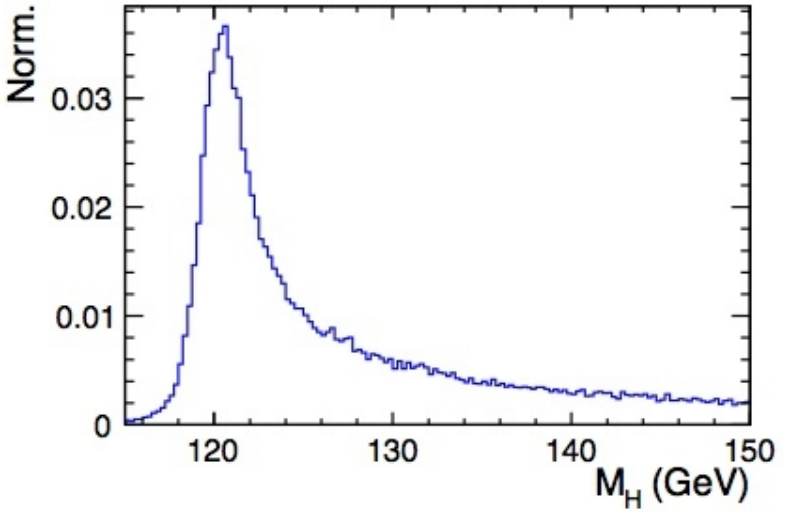
Signal Distributions





√s= 250 GeV

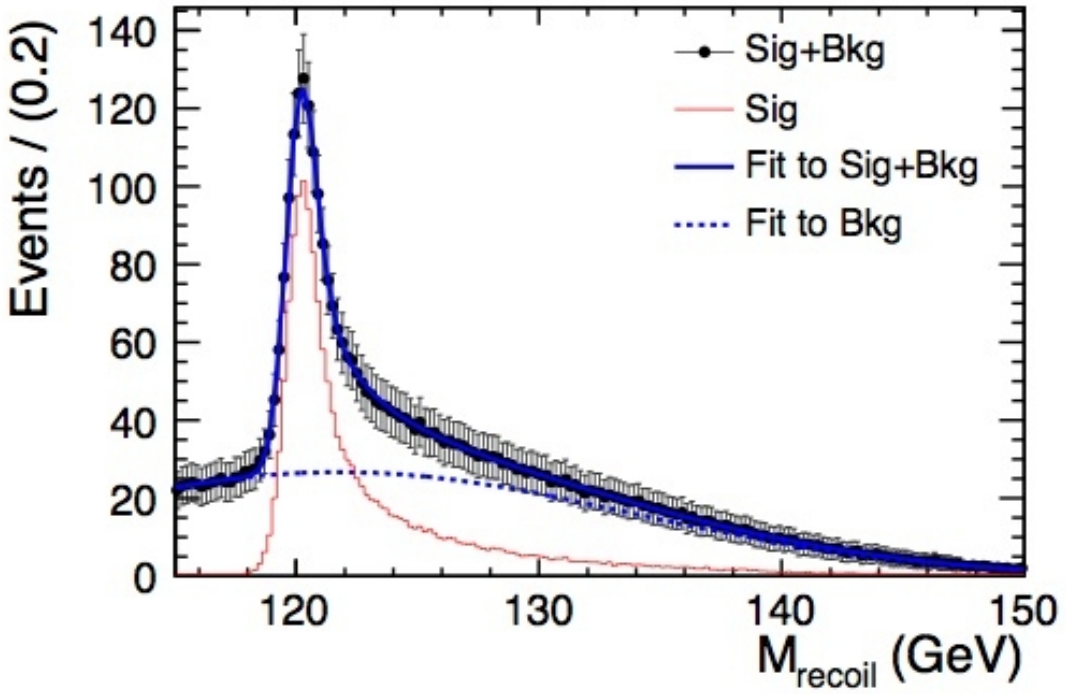




√s= 350 GeV

Signal + Background

ee-> HZ, Z->μμ, √s = 250 GeV



Cut-Chain
(1) $\lvert\cos\theta_\mu\rvert < 0.99$ (2) $P_{Tdl} > 20$ GeV
(3) $M_{dl} \in (80,\ 100)$ GeV
(4) $acop \in (0.2,\ 3.0)$
(8) $M_{recoil} \in (115,\ 150)$ GeV
(9) Likelihood Further Rejection

Fast

ΔM_h=0.038 GeV

$\Delta\sigma_{HZ}/\sigma_{HZ}$=0.035

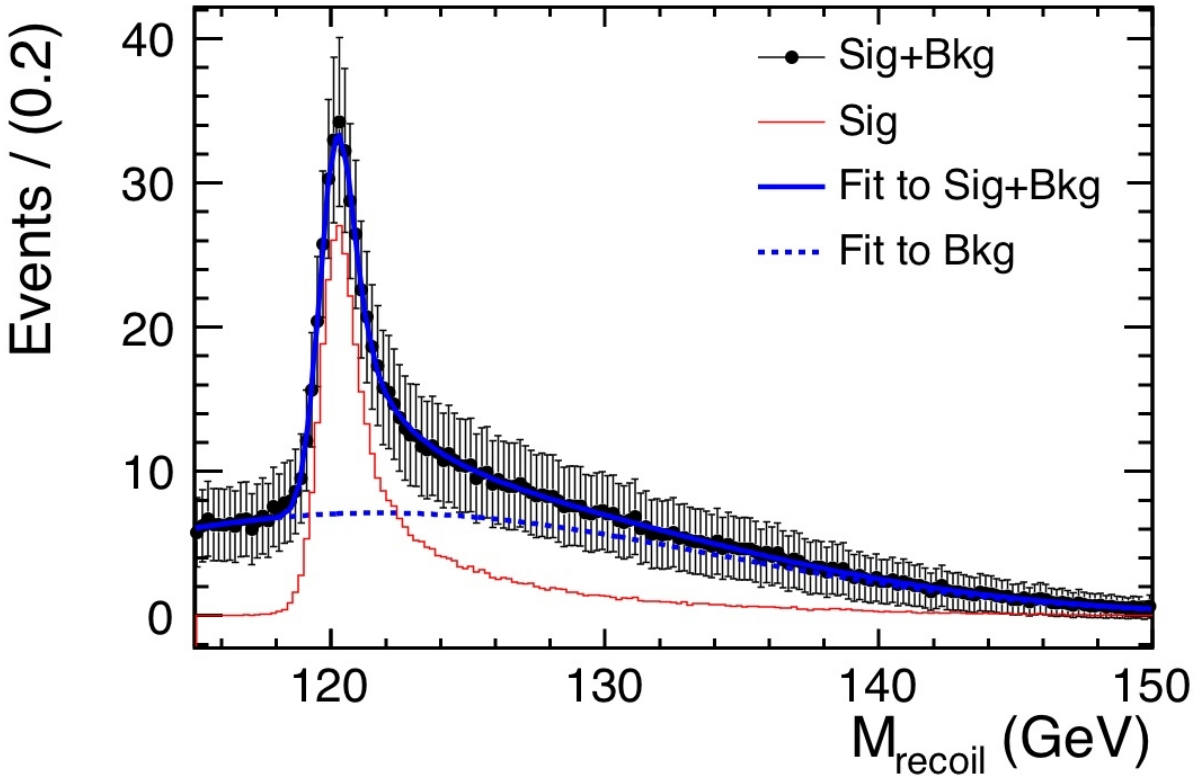
Full

ΔM_h=0.037 GeV

$\Delta\sigma_{HZ}/\sigma_{HZ}$=0.034

Signal + Background: Towards SB2009

ee-> HZ, Z->μμ, √s = 250 GeV, Pe-=-80%, Pe+=30%



Fast: full lumi

ΔM_h=0.038 GeV

$\Delta\sigma_{HZ}/\sigma_{HZ}$=0.035

Fast: L=67fb^{-1}

ΔM_h=0.074 GeV

$\Delta\sigma_{HZ}/\sigma_{HZ}$=0.065

Summary and Outlook

- Fast Simulation tool to study Impact of Beam Parameters under development (H.Li)

  Looks reliable

- Could in principle be used straight ahead for SB2009

  Wait however for new SLAC samples

- Will study mainly DiBoson background

- Tool looks mature enough to avoid detailed simulation on this issue