Impact of Tracker Design on Higgs Mass Resolution

Haijun Yang **Keith Riles**

University of Michigan, Ann Arbor

Johns Hopkins University, Baltimore

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Monte Carlo Generator & Simulation

- MC Generator: PANDORA-PYTHIA V2.1

  $\Longrightarrow$ Thanks to Michael E. Peskin, Masako Iwasaki.

- Analysis Platform: JAVA Analysis Studio V2.2.1

  $\Longrightarrow$ Thanks to Tony Johnson, Mike Ronan.

- Fast MC with beam spot constraint

  $\Longrightarrow$ Thanks to Wolfgang Walkowiak.

- Full MC udscb comes from lcddata server

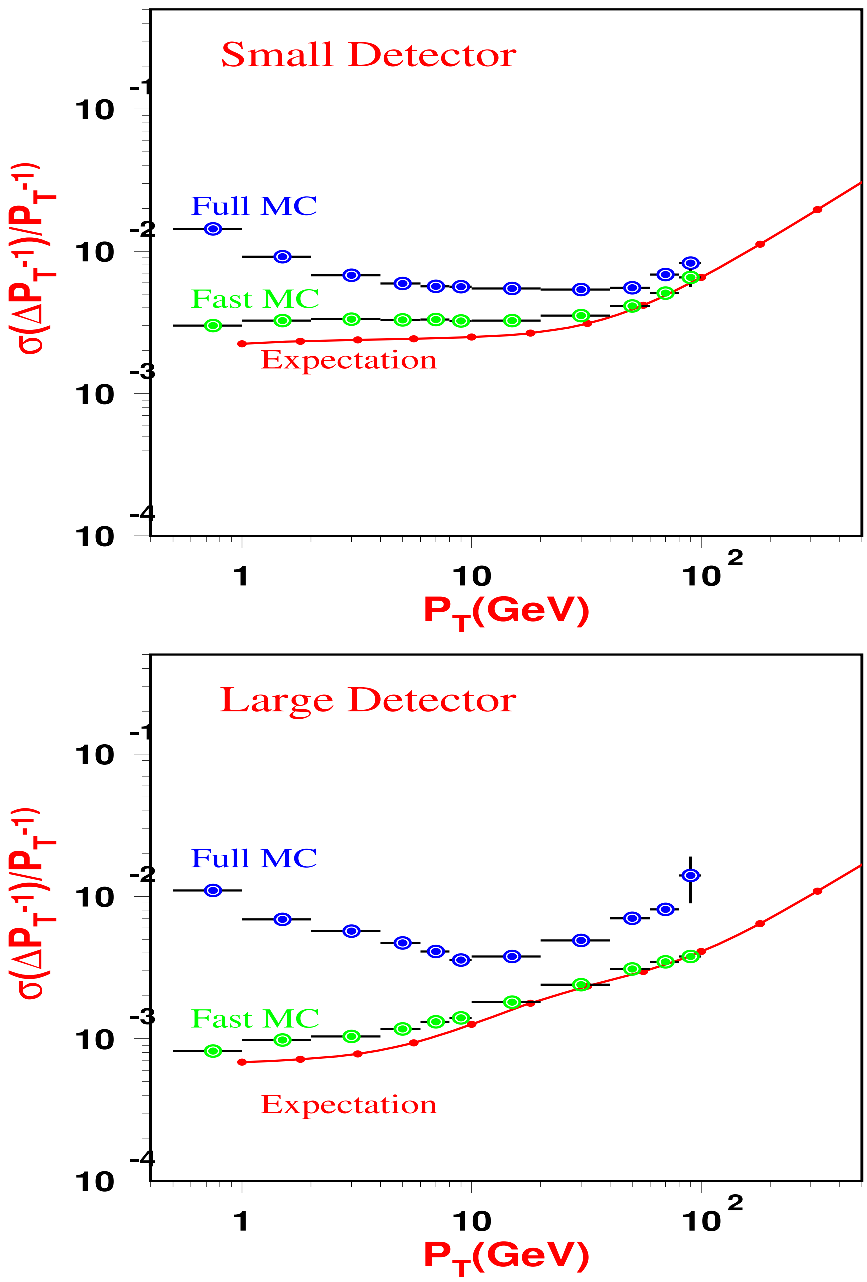
- Higgs mass resolution is based on Fast MC sample

- $e^+e^- \rightarrow ZH \rightarrow e^+e^- X(\gamma)$

  $\sqrt{S} = 350,\ 500$ GeV

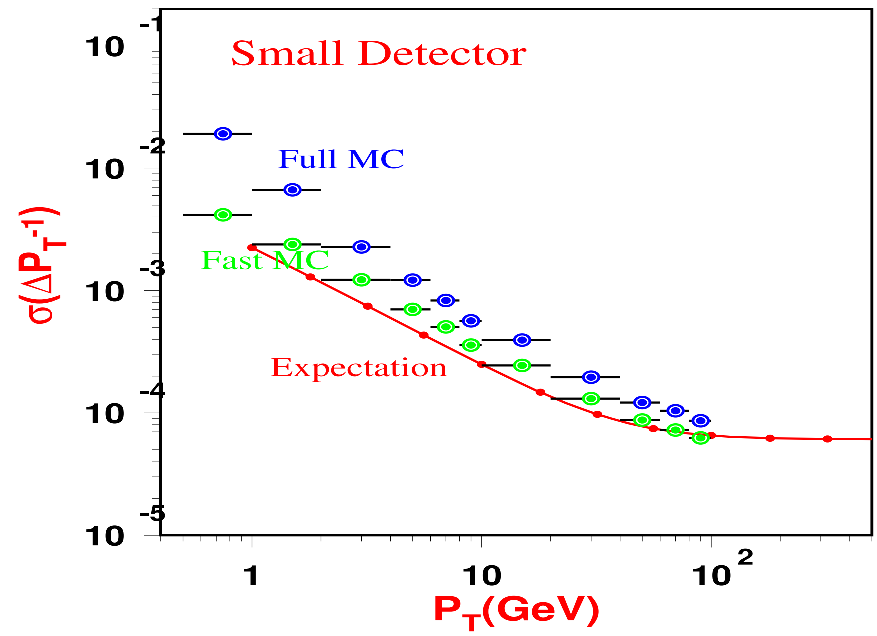
  $M_H = 140$ GeV, $\mathcal{L} = 500 fb^{-1}$

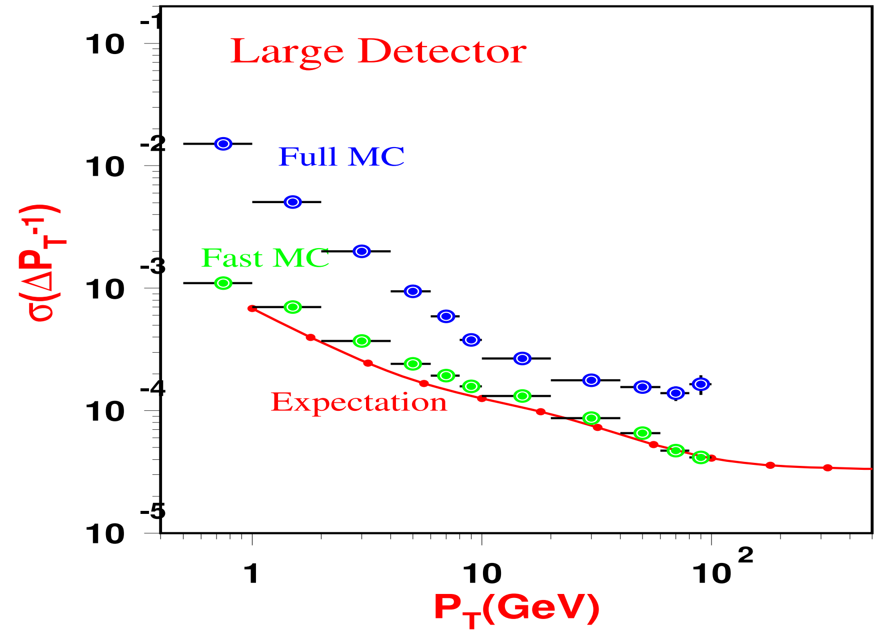
Track Momentum Resolution



- udscb Full MC at 500 GeV: 94315(L2),125039(S2)
- udscb Fast MC at 500 GeV: 95668(L2),117676(S2)

Track Momentum Resolution

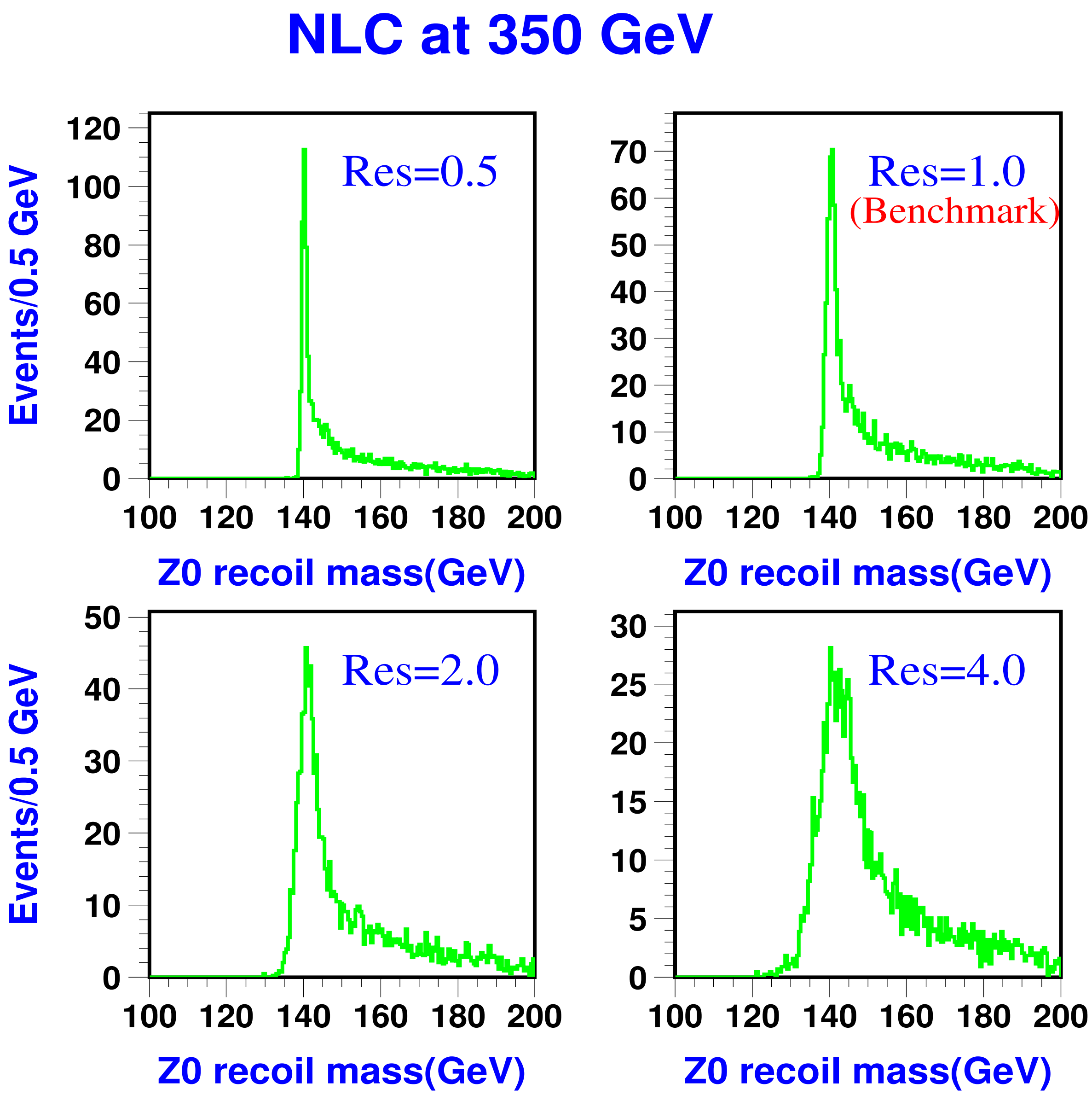




- Fitting by Gaussian Distribution

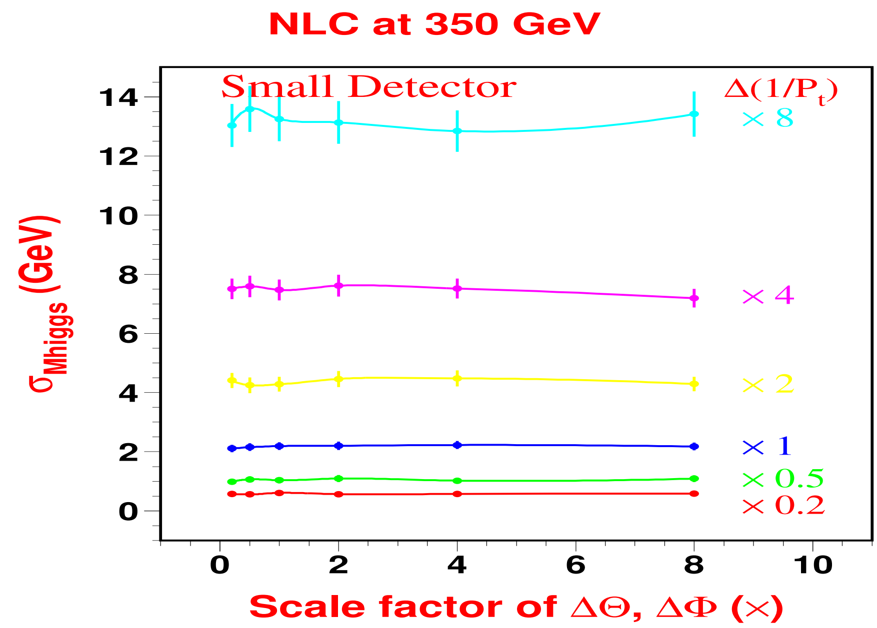
$\Longrightarrow$ Track resolution from full MC is worse than that from fast MC by factor of $2 \sim 4$.

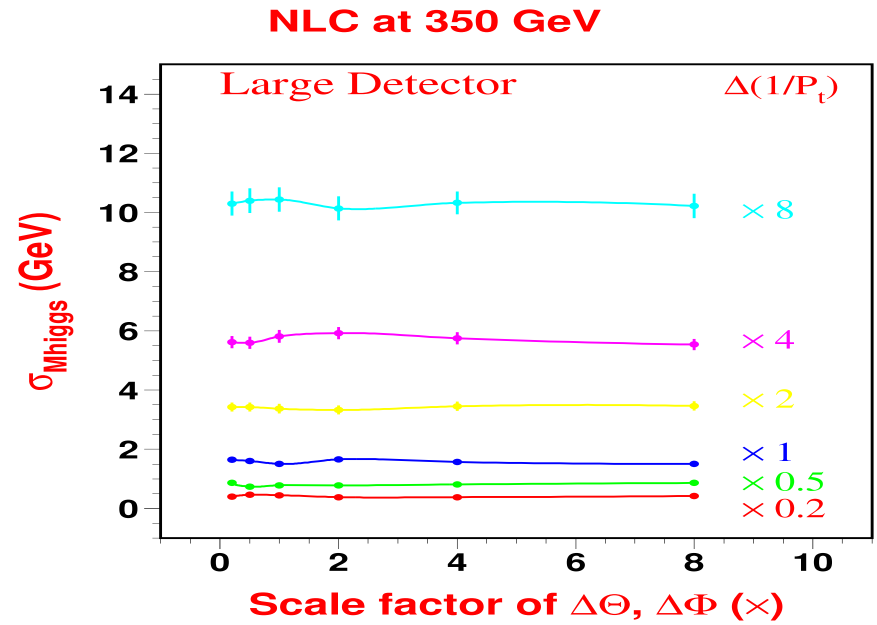
Higgs Mass Distributions



- FAST MC:$ZH \to e^+e^-X(\gamma)$, $M_H = 140$ GeV,$\mathcal{L} = 500 fb^{-1}$
- Higgs mass distributions are changed while track resolutions ($\Delta 1/P_t$, $\Delta\theta$, $\Delta\phi$) are scaled by factor Res(0.5, 1.0, 2.0, 4.0).

Higgs Mass Resolutions at 350 GeV

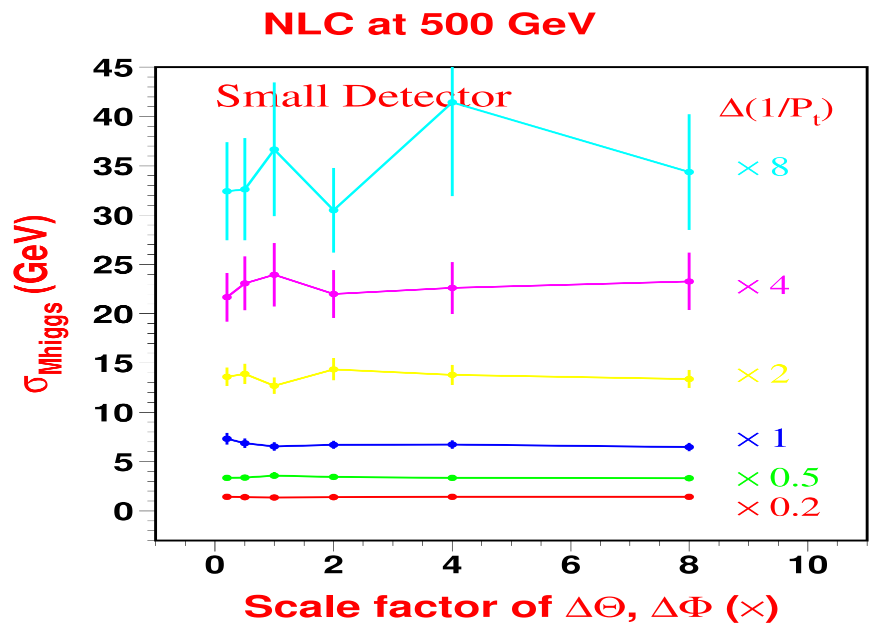


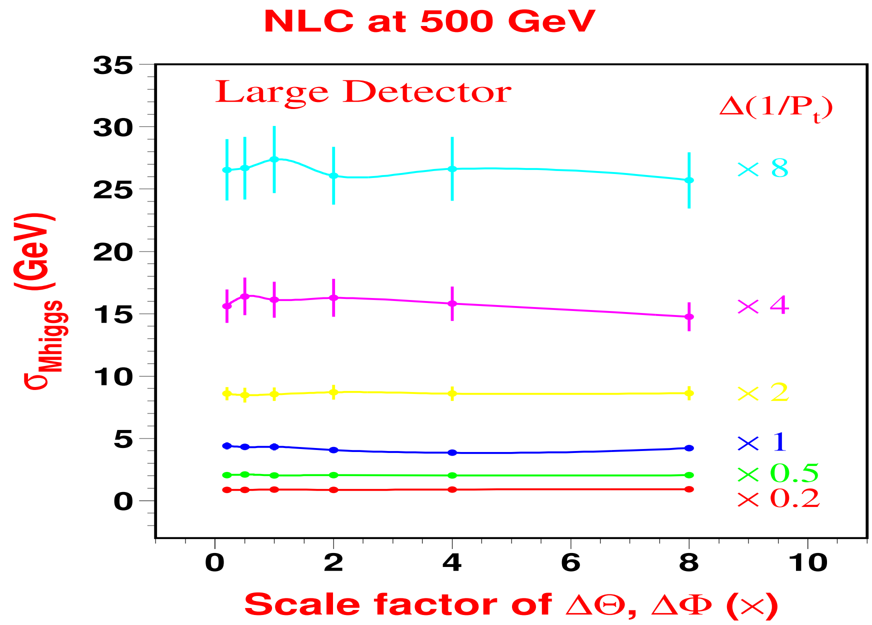


- Raw recoil mass is fitted by single gaussian.

$\Longrightarrow$ Higgs mass resolution is **insensitive** to track angular resolution.

Higgs Mass Resolutions at 500 GeV

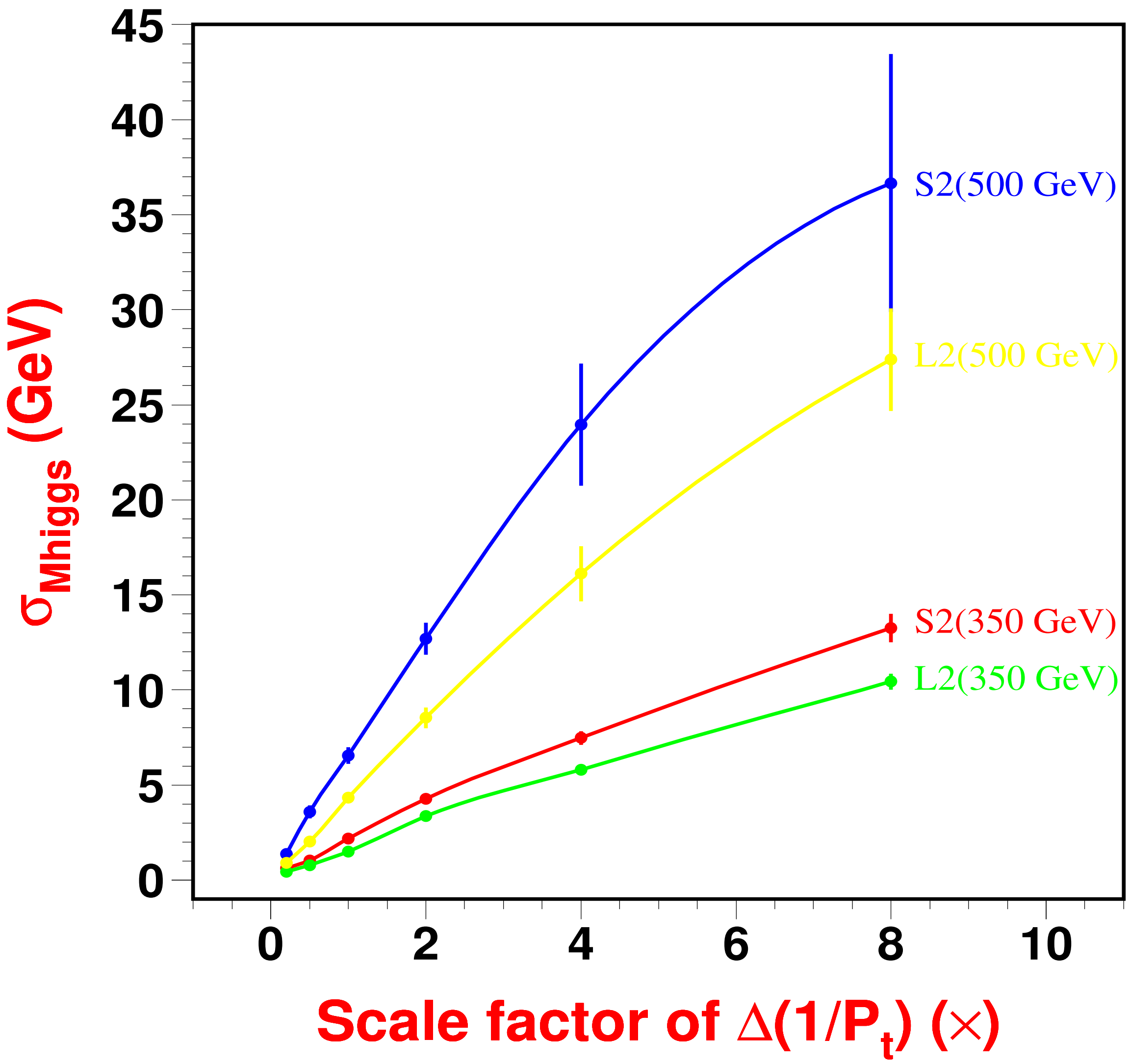




- Raw recoil mass is fitted by single gaussian.

$\Longrightarrow$ Higgs mass resolution is **insensitive** to track angular resolution.

Higgs Mass Resolutions



$\Longrightarrow$ Higgs mass resolution is **sensitive** to track momentum resolution.

Very Preliminary Conclusions

⟹ Track momentum resolution:

Full MC is worse than Fast MC

⟹ Track momentum resolution in Fast MC:

Large Detector is better than Small Detector

⟹ Higgs mass resolution:

insensitive to track angular resolutions

sensitive to track momentum resolution

Large Detector is better than Small Detector

NLC at 350 GeV is better than NLC at 500 GeV

⋆ Conclusions are based on raw recoil mass rms spread with no kinematic fitting and no fitting of recoil mass distribution with backgrounds.