Impact of Tracker Design on Higgs Mass Resolution & Cross Section

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Monte Carlo Generator & Simulation

- MC Generator: PANDORA-PYTHIA V2.1
  Using NLC Beamstrahlung Spectra
  $\Longrightarrow$ 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.

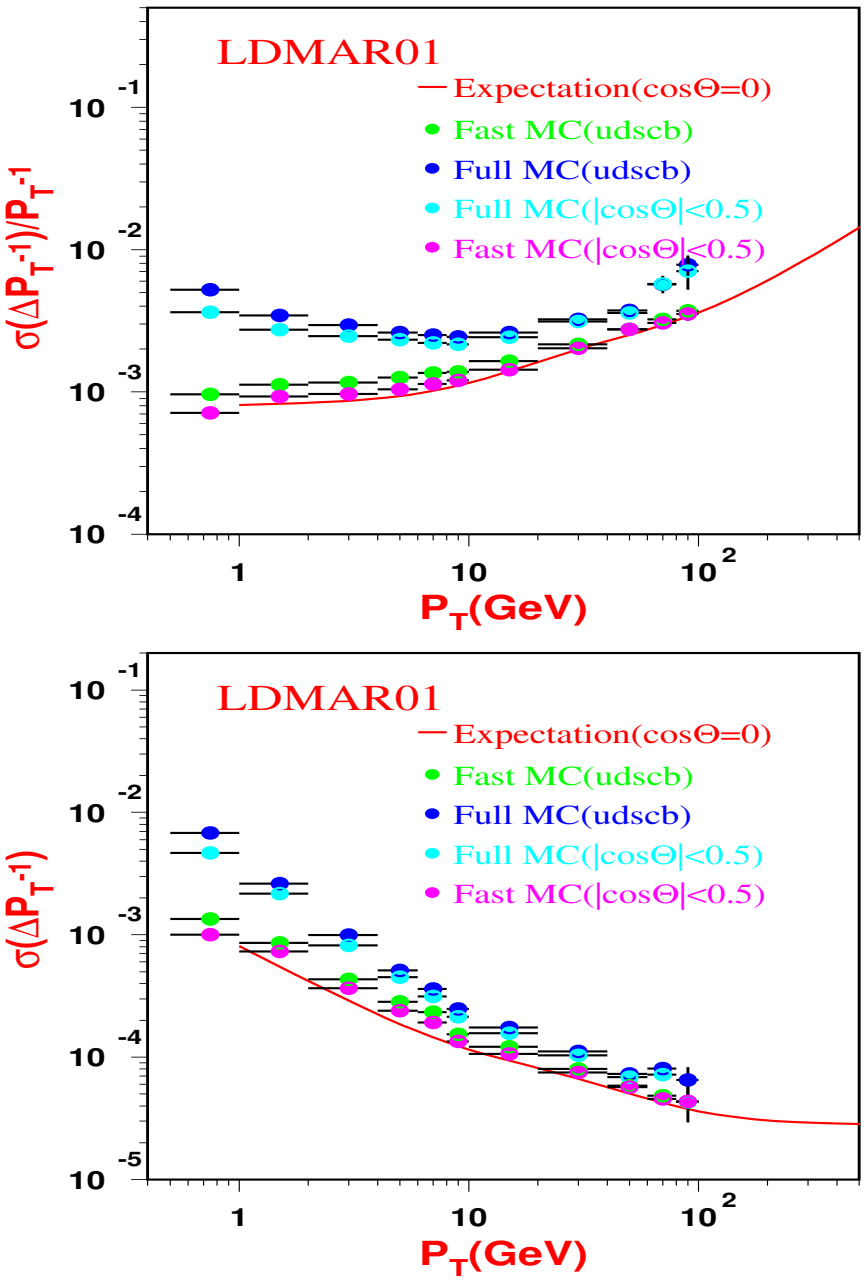
- Full MC udscb comes from lcddata server

- Detectors: LDMAR01(LD), SDMAR01(SD)

- $e^+e^- \rightarrow ZH \rightarrow e^+e^-X(\gamma)$
  $\sqrt{S} = 350,\ 500$ GeV
  $M_H = 140$ GeV, $\mathcal{L} = 500 fb^{-1}$

- The analysis is based on Fast MC sample

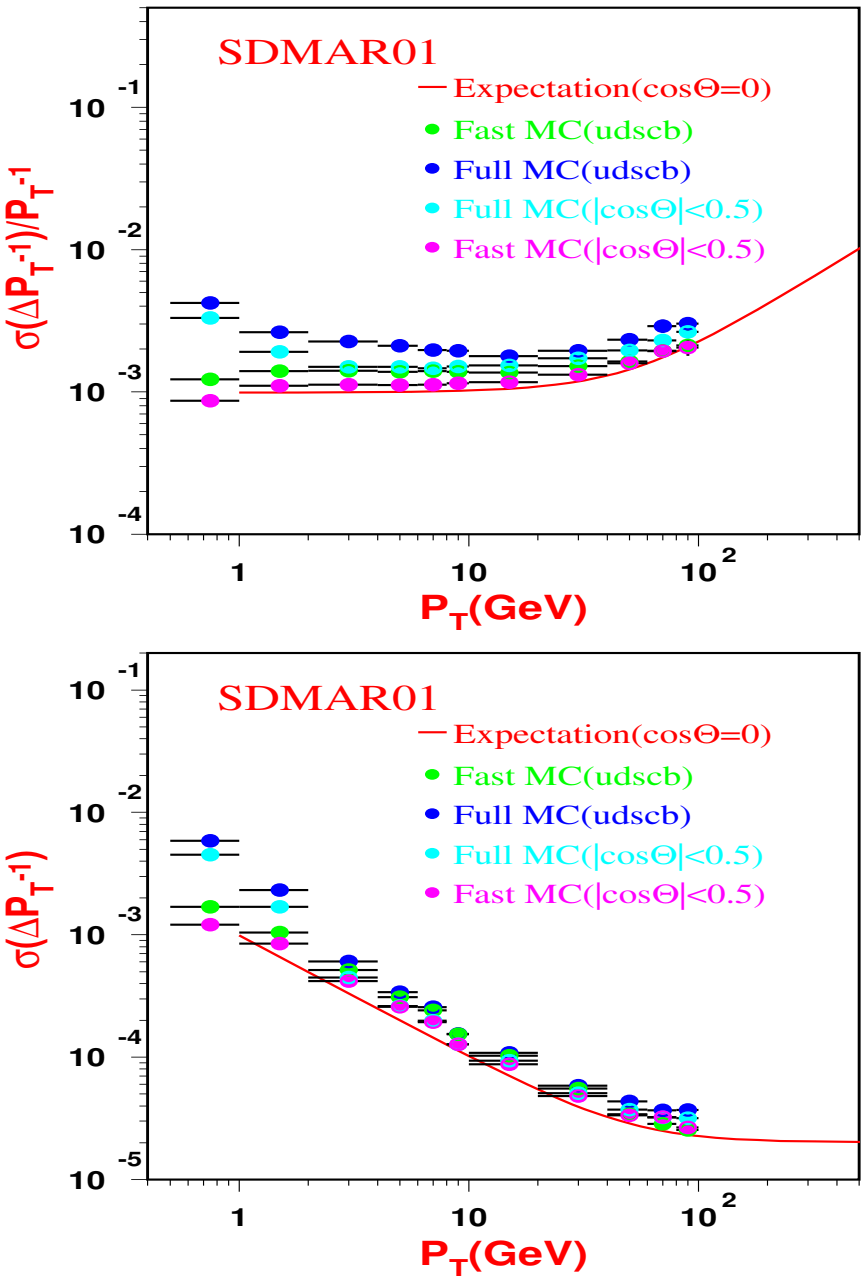
Track Momentum Resolution



- UDSCB Full and Fast MC at 500 GeV

$\Longrightarrow$ Thanks to Bruce A. Schumm for expected momentum resolution.

Track Momentum Resolution



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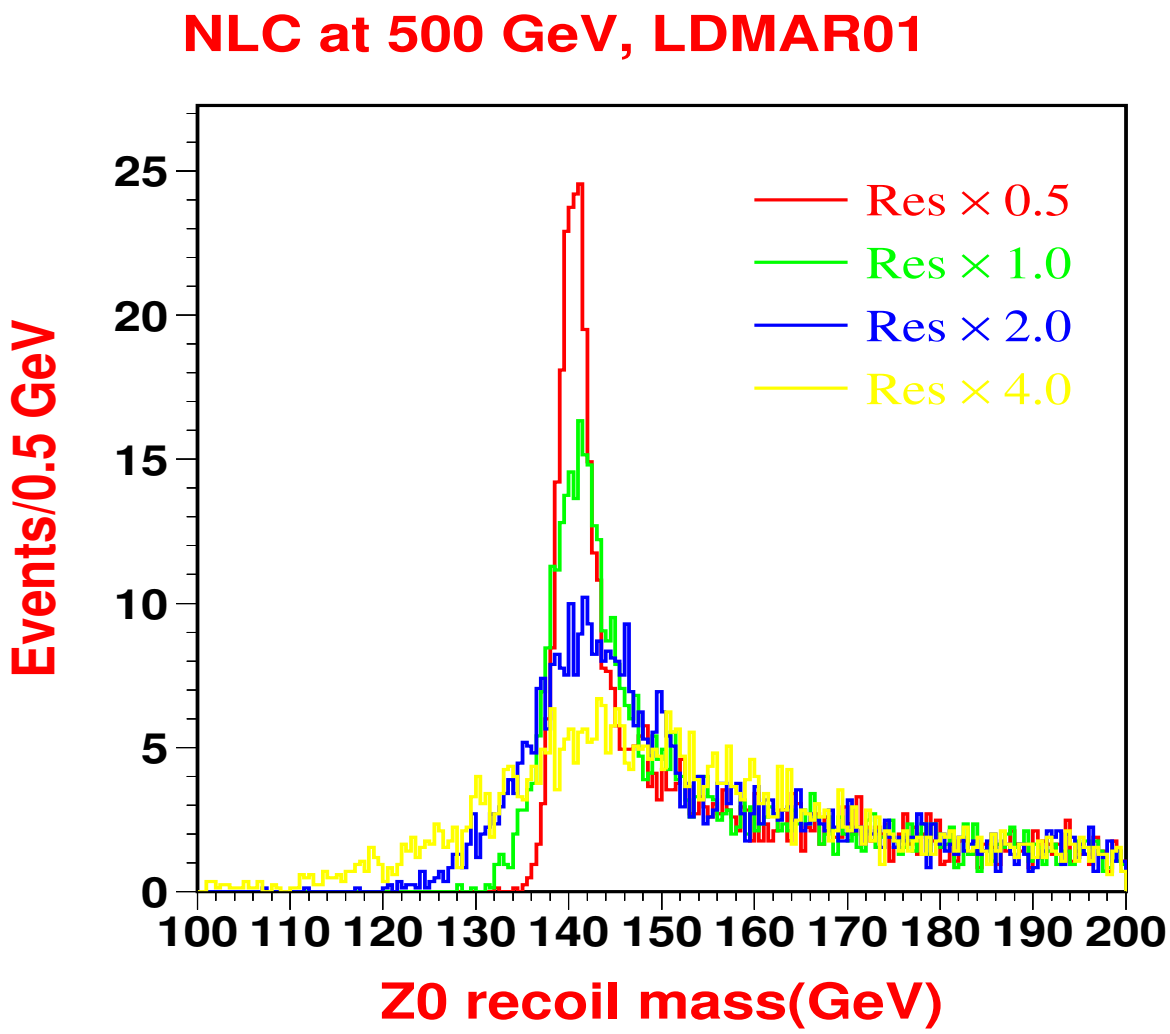
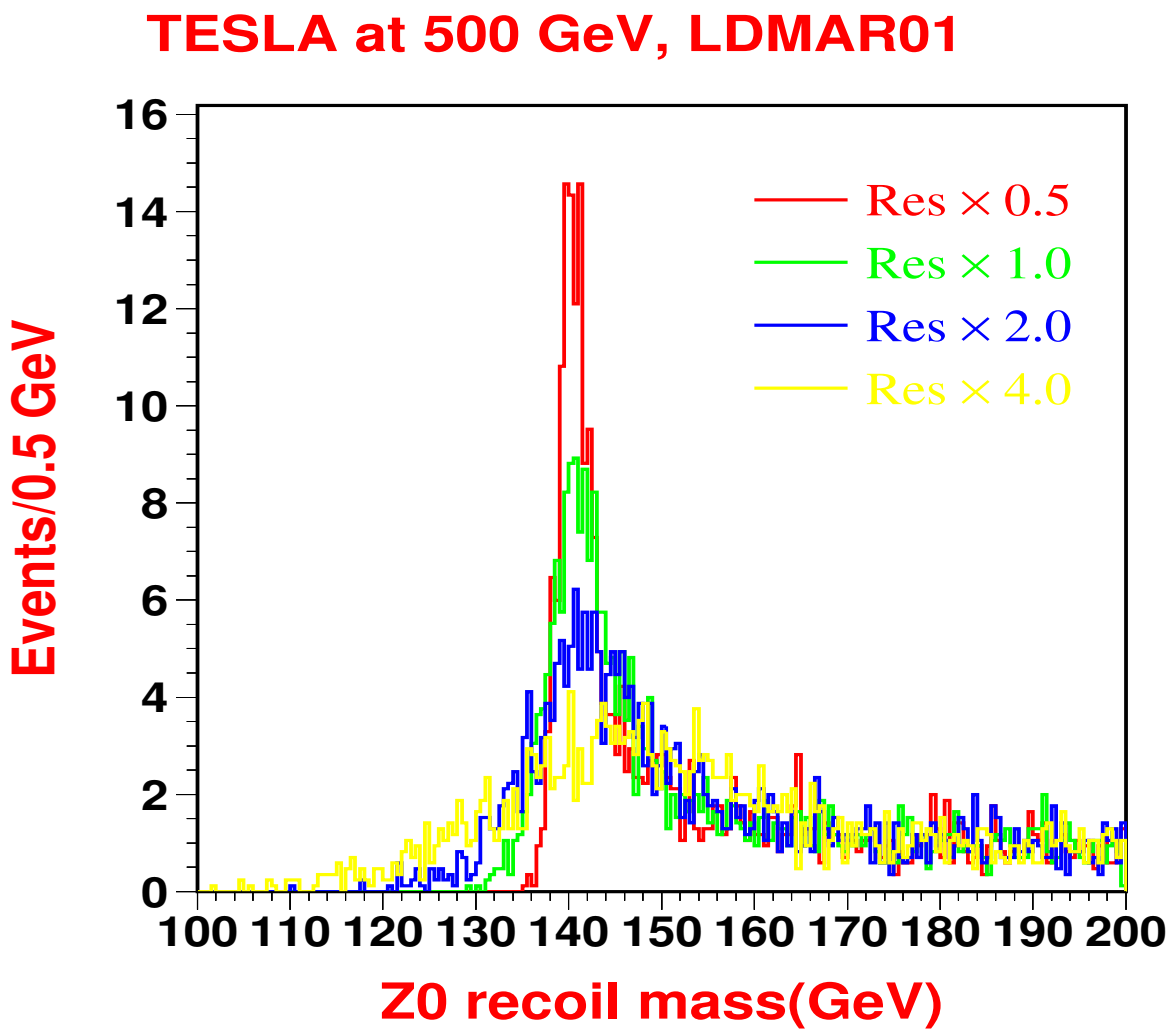
Higgs Mass Distributions



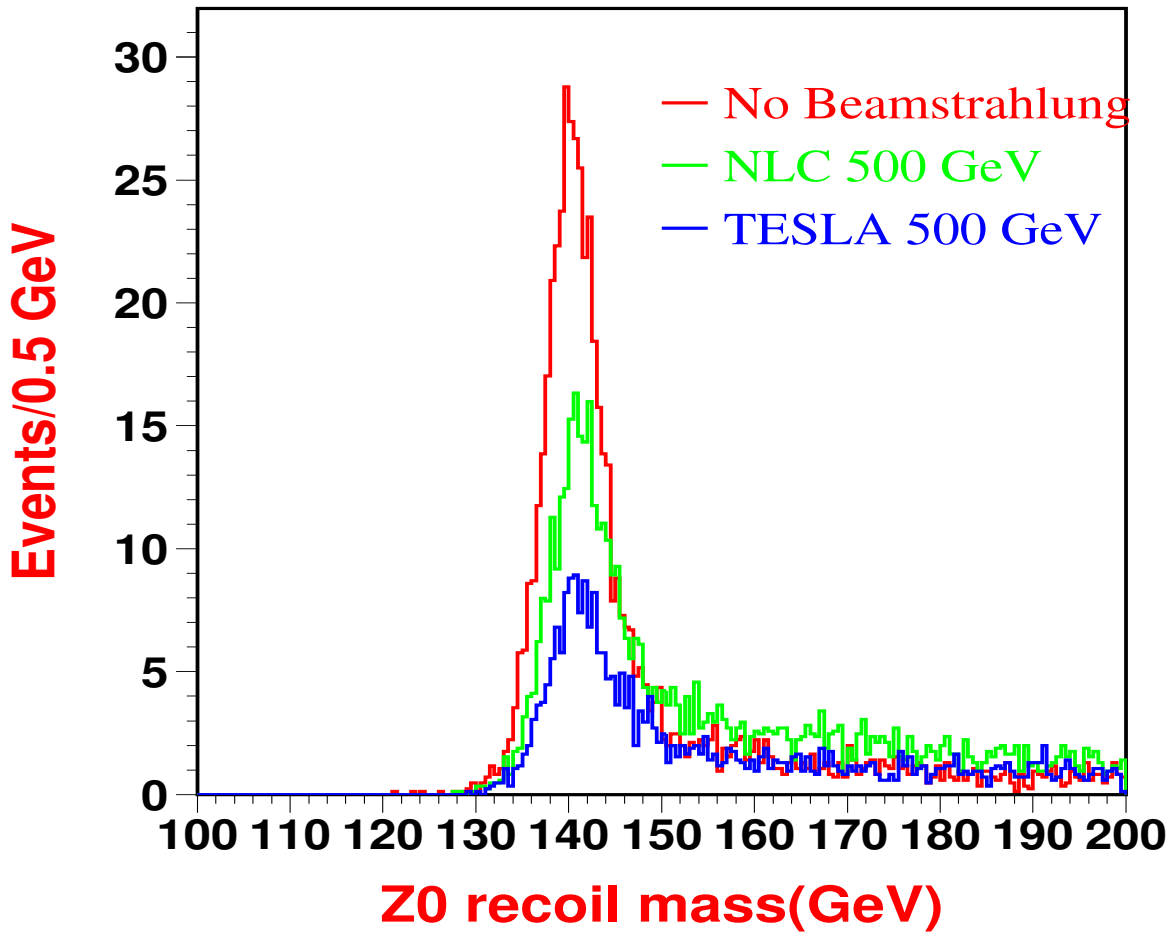
- FAST MC:$ZH \rightarrow e^+e^-X(\gamma)$, $M_H = 140$ GeV,$\mathcal{L} = 500 fb^{-1}$
- Comparision of Higgs mass distributions. Track momentum resolutions ($\Delta 1/P_t$) are scaled by factor Res(0.5, 1.0, 2.0, 4.0).

Higgs Mass Distributions



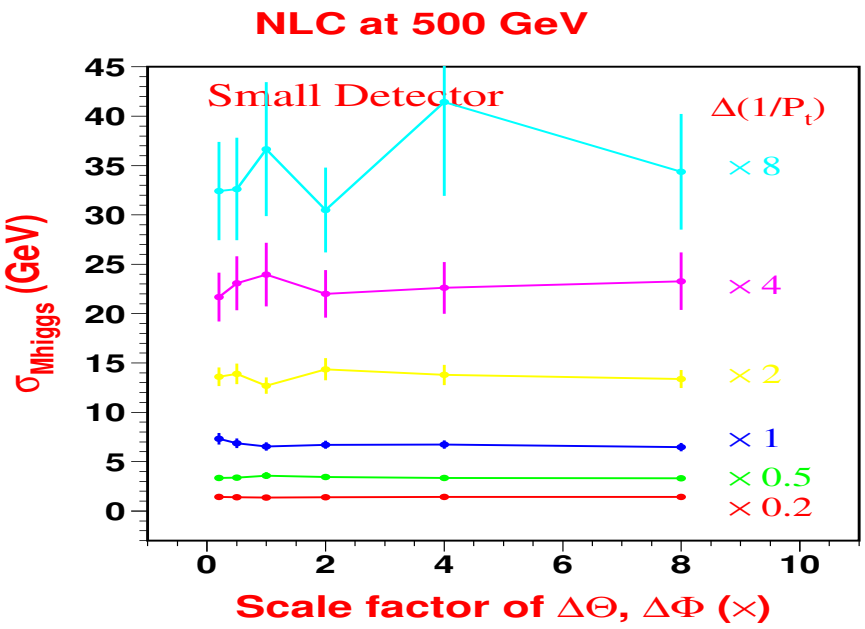
- Using TESLA 500 beamstrahlung spectra.

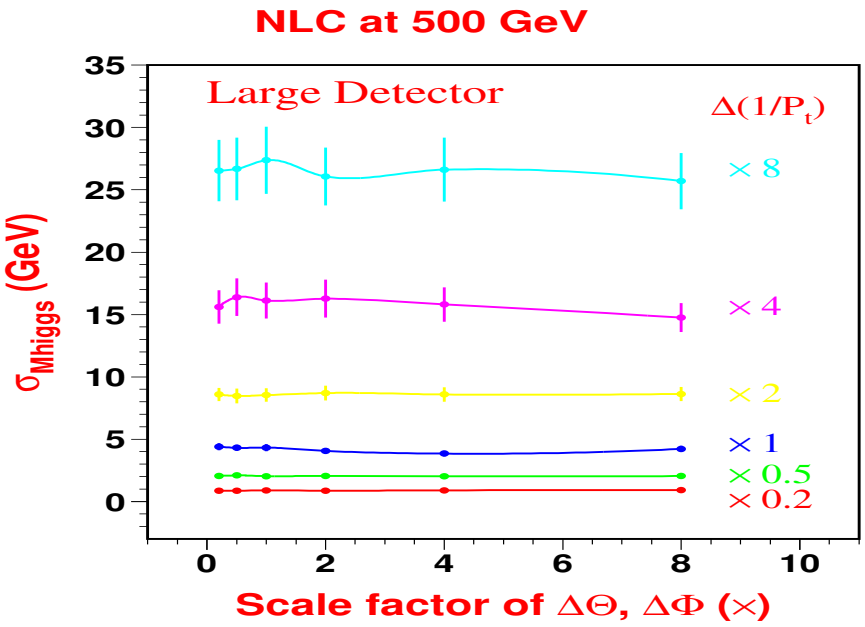
Higgs Mass Distributions



- Comparison of Recoil mass with/without beamstrahlung.

Higgs Mass Resolutions at 500 GeV

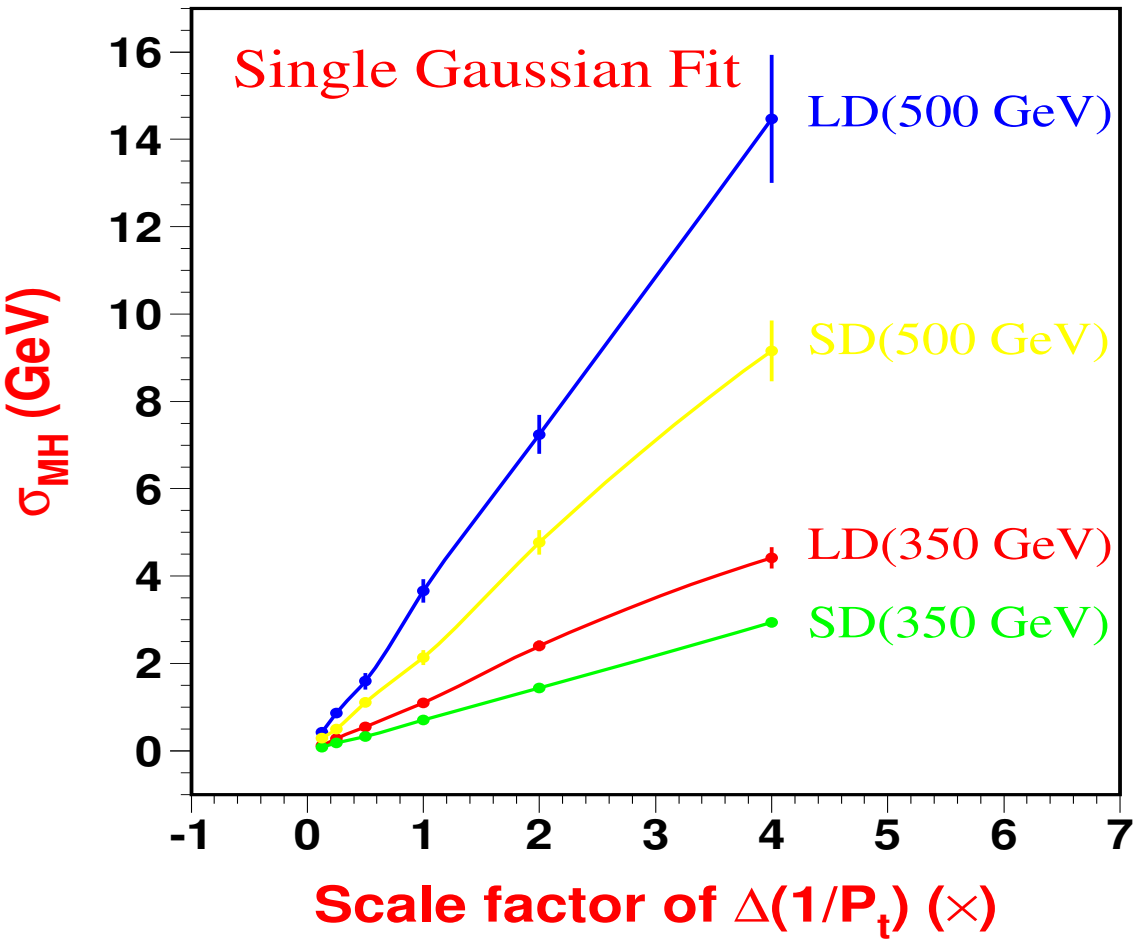




- Raw recoil mass is fitted by single gaussian.

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

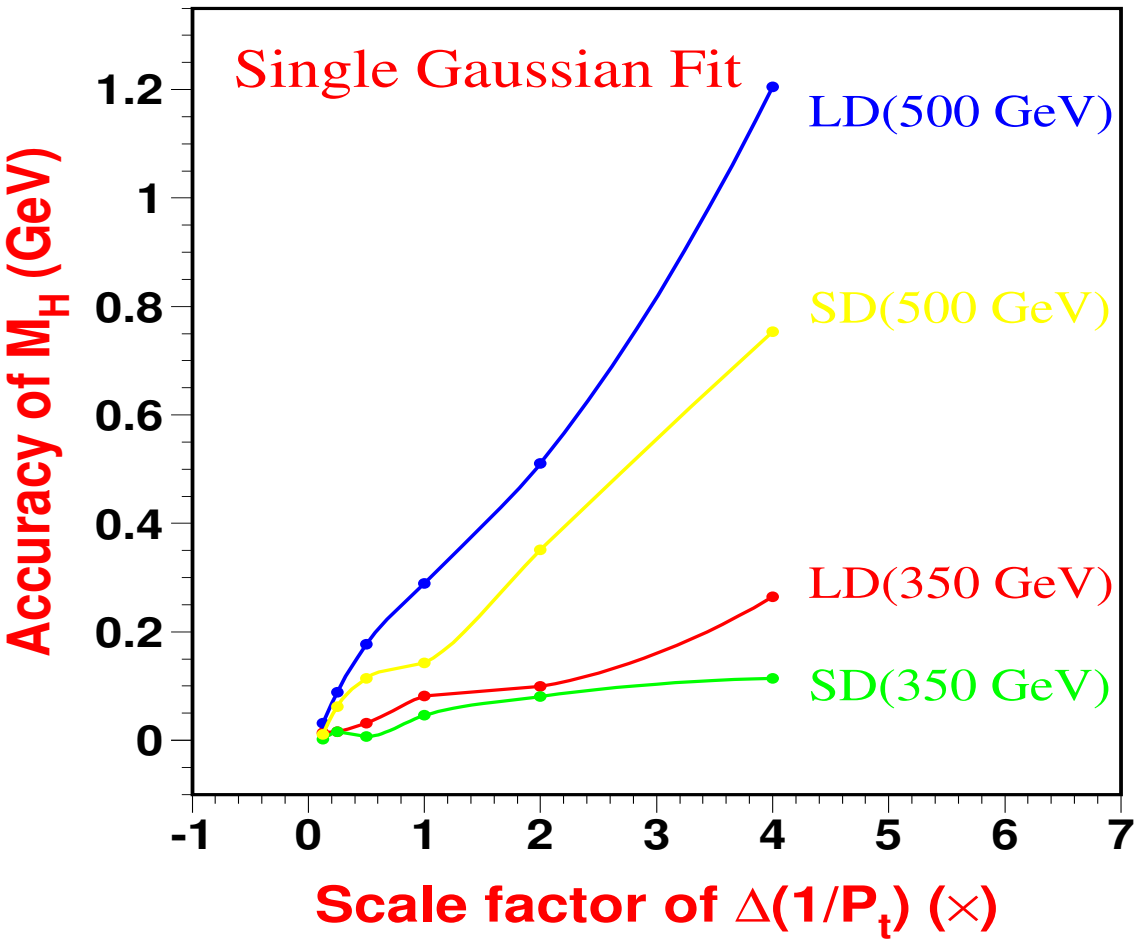
Higgs Mass Resolutions



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

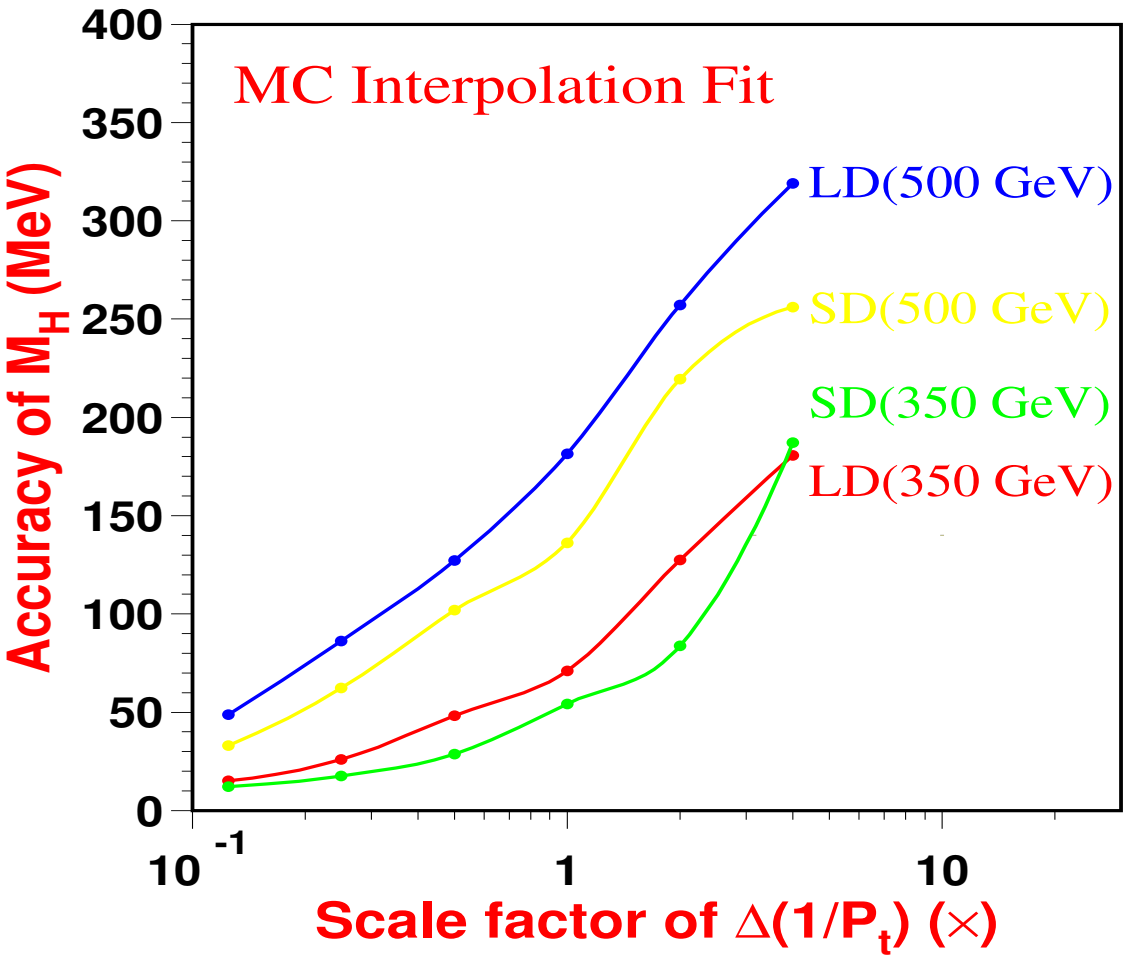
$\Longrightarrow$ SDMAR01 is better than LDMAR01

Higgs Mass Accuracy



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

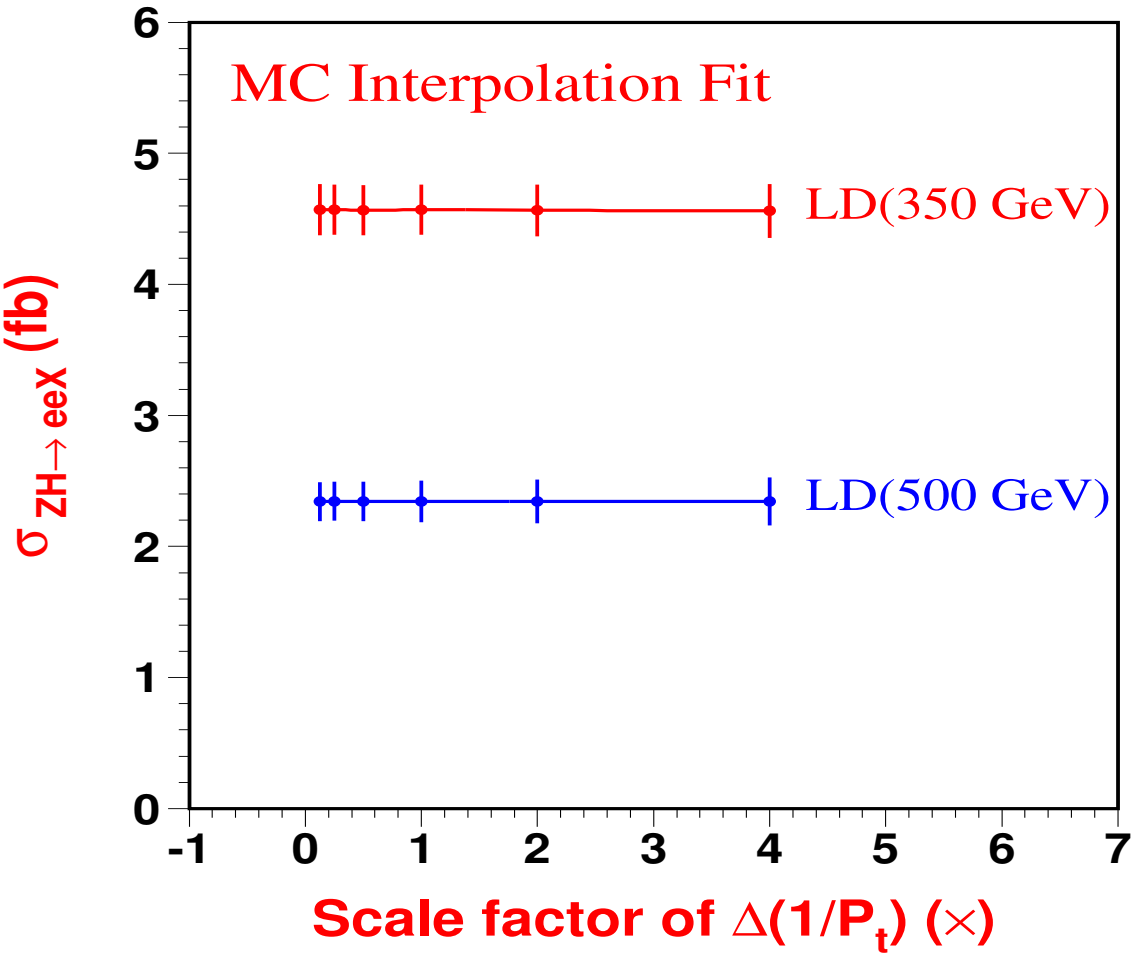
Higgs Mass Accuracy



• Backgrounds from ZZ and WW are considered in MC interpolation measurement.

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

Cross Section of $ZH \to e^+e^-X$



- Cross section for SDMAR01 is similar.

$\Longrightarrow$ Cross section of $ZH \to e^+e^-X$ is **insensitive** to track momentum resolution.

Preliminary Conclusions

$\Longrightarrow$ Track momentum resolution:

Full MC is worse than Fast MC

$\Longrightarrow$ Higgs mass resolution and accuracy:

insensitive to track angular resolutions

sensitive to track momentum resolution

SDMAR01 is better than LDMAR01

NLC 350 GeV is better than NLC 500 GeV

$\Longrightarrow$ Cross section of $ZH \to e^+e^-X$:

insensitive to track momentum resolution