$\tilde{e}_L$ and $\tilde{\nu}_e$ Analysis Status
and
Slepton Note Status
Outline

- Motivation
- $\tilde{e}_L$,$\tilde{\nu}_e$ and Background cross sections
- Lepton Momentum and Boson Mass resolution
- Lepton Momentum and angular distributions
- Mass fit
- Summary

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$\tilde{e}_L$ and $\tilde{\nu}_e$ Analysis motivation

The processes:

- $e^- e^+ \rightarrow \tilde{\nu}_e \tilde{\nu}_e \rightarrow e^- e^+ \tilde{\chi}^-_1 \tilde{\chi}^+_1 \rightarrow e^- e^+ W^- W^+ \tilde{\chi}^0_1 \tilde{\chi}^0_1$
- $e^- e^+ \rightarrow \tilde{e}^-_L \tilde{e}^+_L \rightarrow e^- e^+ \tilde{\chi}_2 \tilde{\chi}^0_2 \rightarrow e^- e^+ h^0 h^0 \tilde{\chi}^0_1 \tilde{\chi}^0_1$

Allow to assess the physics performances, of 2L + 4 Jets final states, measure the $\tilde{e}_L$, $\tilde{\nu}_e$, cross sections and the $\tilde{\nu}_e$ and $\tilde{\chi}^{\pm}_1$ masses. It is essential to measure the $\tilde{e}_L$, $\tilde{\nu}_e$ cross sections which are irreducible backgrounds for charginos and neutralinos.

The $\tilde{\chi}^{\pm}$ masse is measured in other Susy processes, using the $W^{\pm}$ energy distribution.

In the slepton process the mass is derived from the e^-, e^+ energy distributions, the hadronic final state is used only to tell apart the W^-W^+ final state from the h^0h^0 final state

S , B Cross Sections

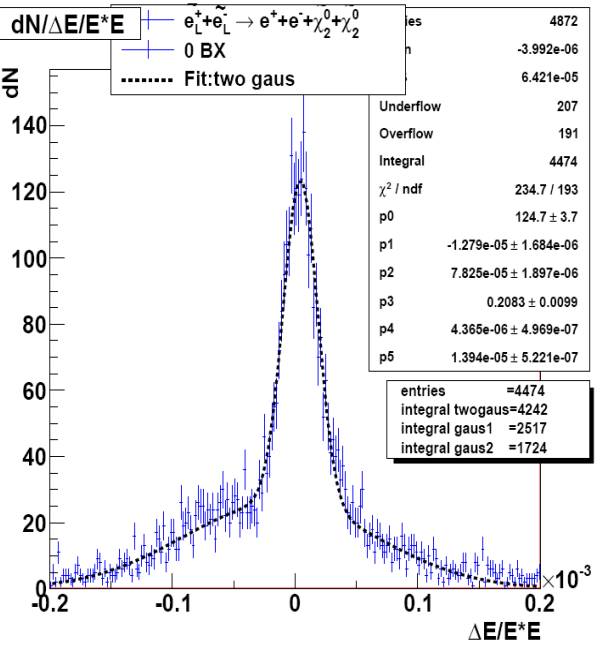
Process	σ fb	σx Br(2L+4J) fb	ε (2l+4J)
$e^- e^+ \to \tilde{\nu}_e \tilde{\nu}_e \to e^- e^+ \tilde{\chi}^-_1 \tilde{\chi}^+_1 \to e^- e^+ W^- W^+ \tilde{\chi}^0_1 \tilde{\chi}^0_1$ (S1	13.75	1.82	0.48
$e^- e^+ \to \tilde{e}^- \tilde{e}^+$ (L) $\to e^- e^+ \tilde{\chi}_2 \tilde{\chi}^0_2 \to e^- e^+ h^0 h^0 \tilde{\chi}^0_1 \tilde{\chi}^0_1$ (S2	3.06	0.14	0.66
$e^- e^+ \to W W Z$ (B1	40.1	0.34	0.17
$e^- e^+ \to ZZZ$ (B2	0.4	0.0008	0.19
$e^- e^+ \to \tilde{\chi}_2^+ \tilde{\chi}_2^- \to W^- W^+ \tilde{\chi}^0_2 \tilde{\chi}^0_2 \to W^- W^+ h^0 h^0 \tilde{\chi}^0_1 \tilde{\chi}^0_1$ (B3	10.5	0.045	0.25
$e^- e^+ \to \tilde{\chi}^0_3 \tilde{\chi}^0_4 \to W^- W^+ \tilde{\chi}^-_1 \tilde{\chi}^+_1 \to W^- W^+ W^- W^+ \tilde{\chi}^0_1 \tilde{\chi}^0_1$ (B4	4.3	0.031	0.24

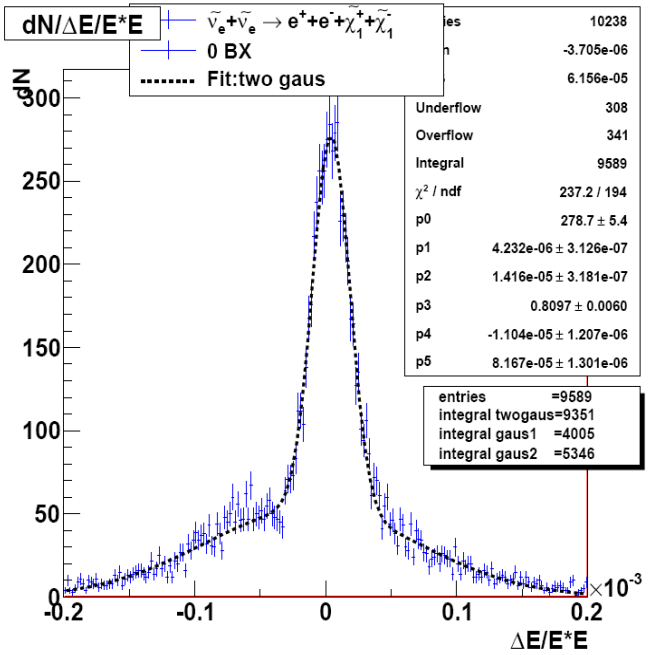
Produced 80K $\tilde{\nu}e$, 80K $\tilde{e}L$, 20k WWZ, 10K ZZZ, 80K SUSY.
B1 and B2 rejected by cuts on acoplanarity and Lepton Inv Mass
B3 and B4 rejected by cuts on acolinearity and Lepton Inv Mass
S2/S1 is background of S1/S2

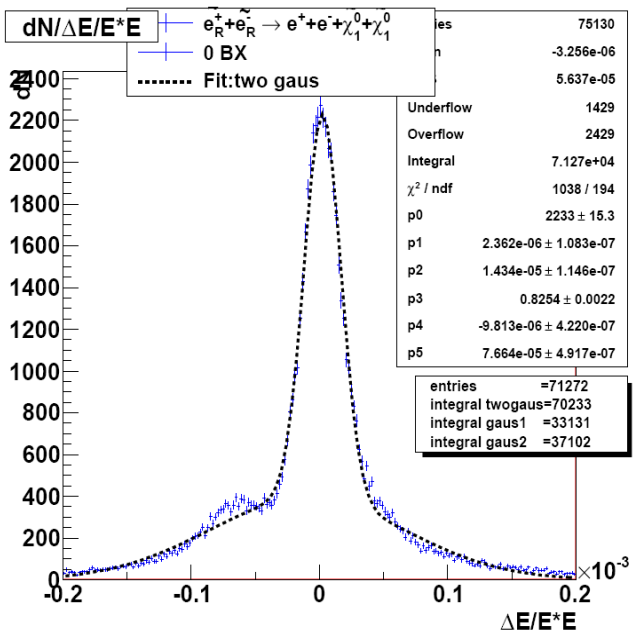
Analysis method

- Select pfos with Pt>0,25 GeV.
- Use Marco's Fastjet processor to force events into 6 jets with Emin>20 GeV
- Identify the lepton jets; identify isolated electrons (or e+γ)
- Correct the e energy when $E\gamma>10$ Gev && $E\gamma>3x2.10^{-5}xEe^{2}$
- Compute the boson masses, pair with minimum mass difference
- Compute the event Btag (not yet done)

Electron Energy Resolution
2L+4J and 2L without overlay

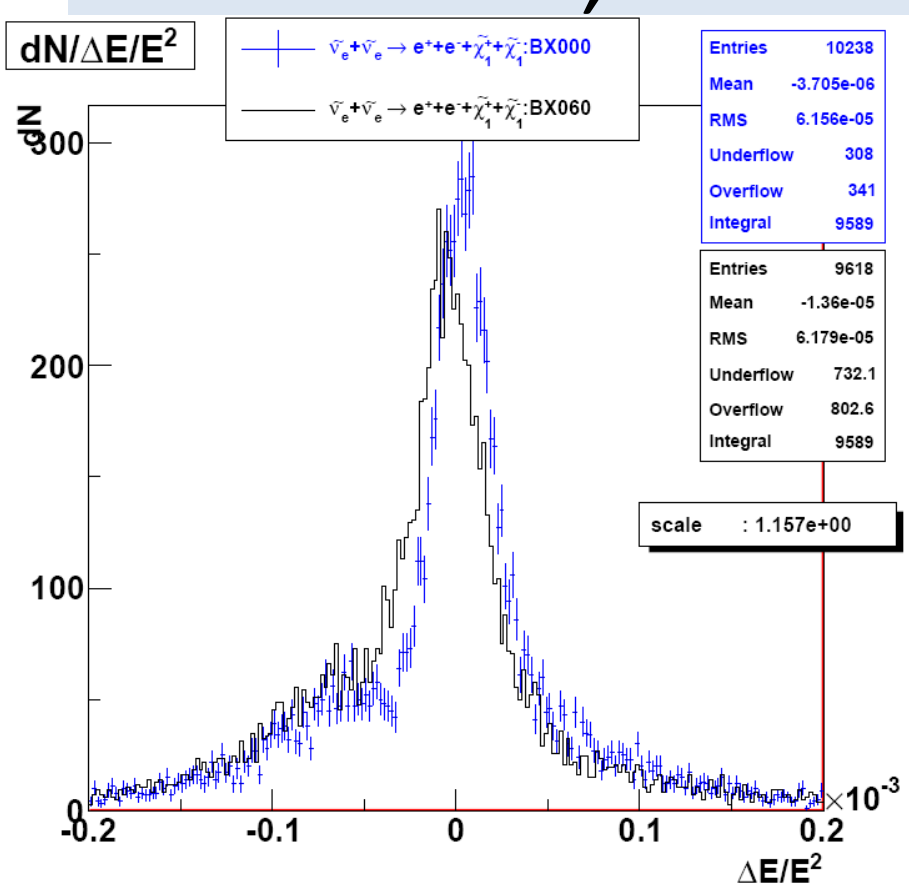


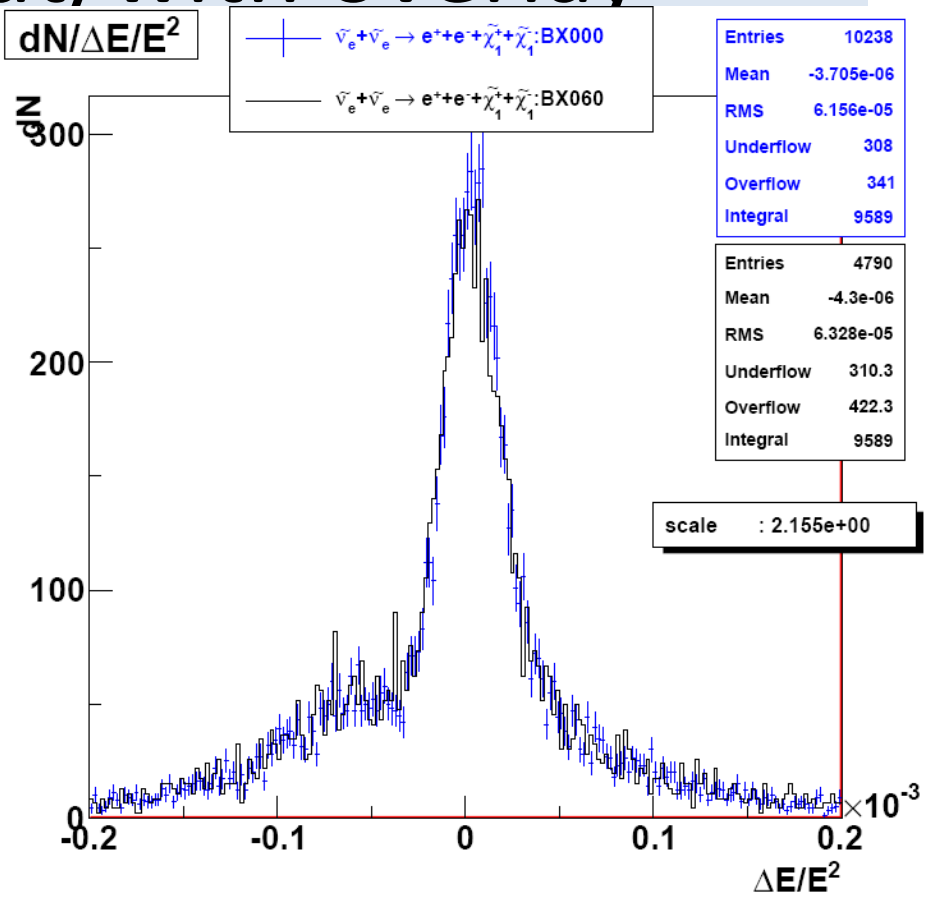




-The electron energy resolution for ẽL and ν̃e in (2L + 4J) final state is similar to the ẽR (2L) final state

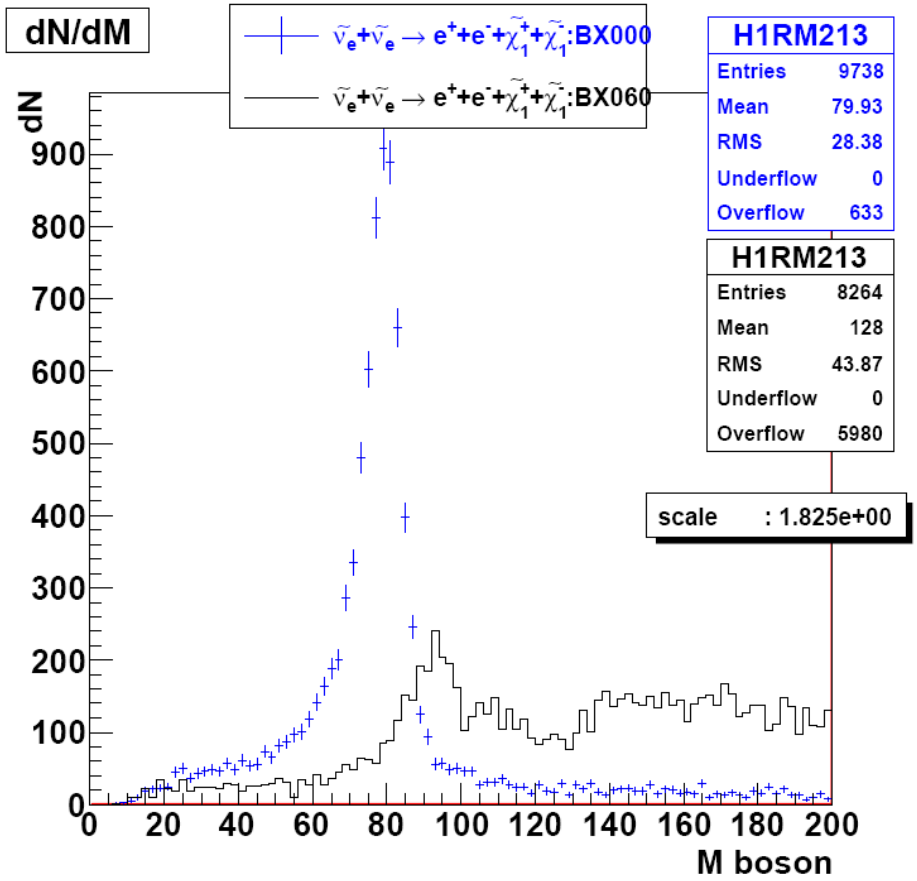
Electron Energy Resolution
2L + 4J, without/with overlay

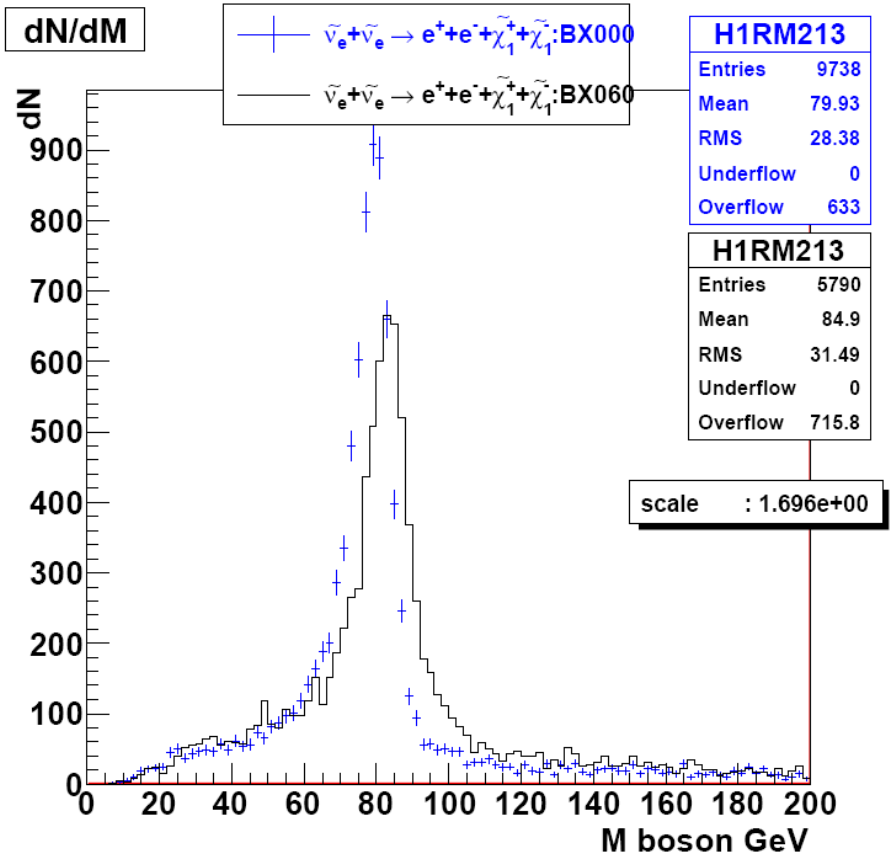




-The electron energy resolution for ν̃e in (2L + 4J) final state without and with is similar when the tight timing cut is applied.

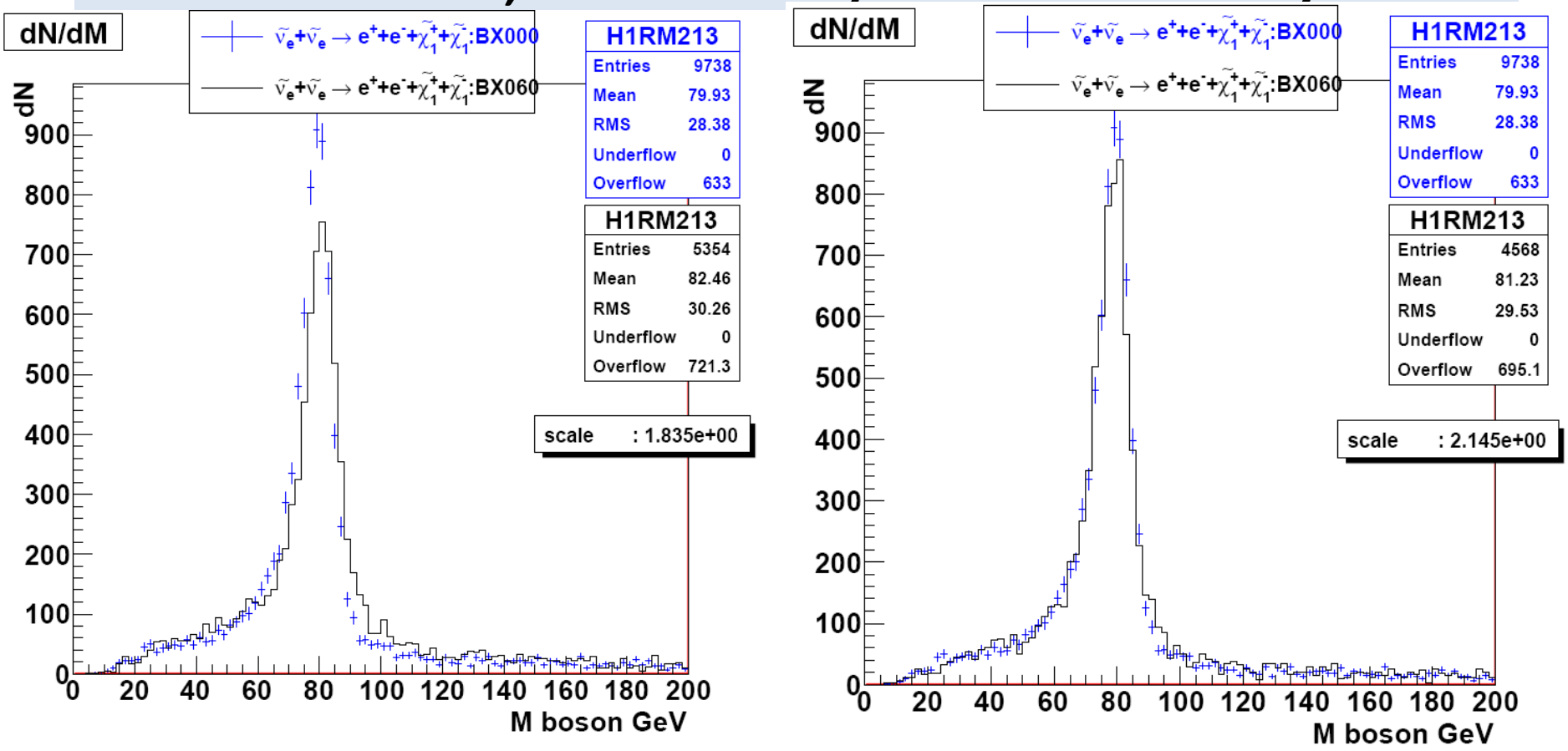
Boson Mass Resolution
2L + 4J, without/with overlay





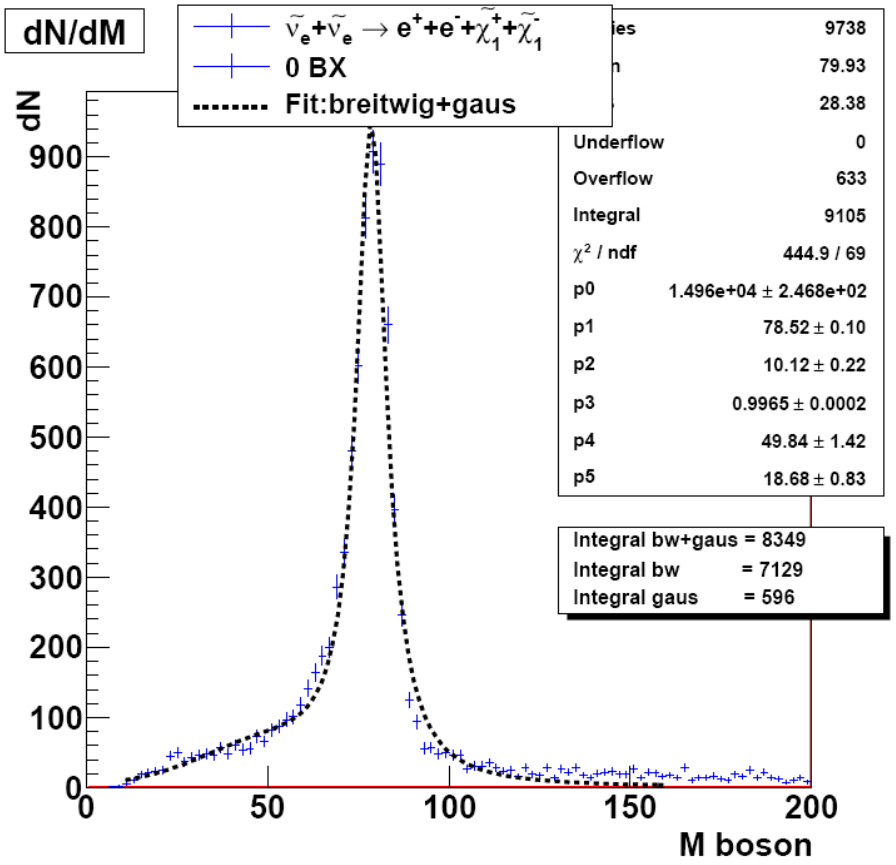
-Boson mass resolution for ν̃e in (2L + 4J) final state without and with overlay no time cut (left), loose time cut (right)

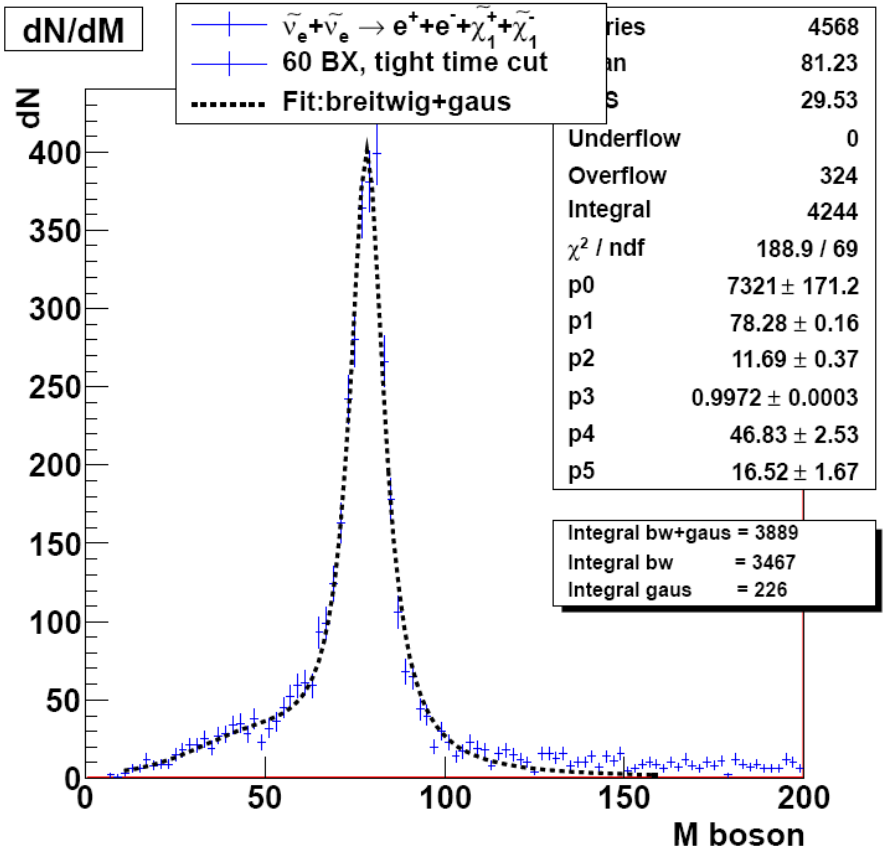
Boson Mass Resolution
2L + 4J, without/with overlay



-Boson mass resolution for ν̃e in (2L + 4J) final state without and with overlay standard time cut (left), tight time cut (right), the cut inefficiency is 5%.

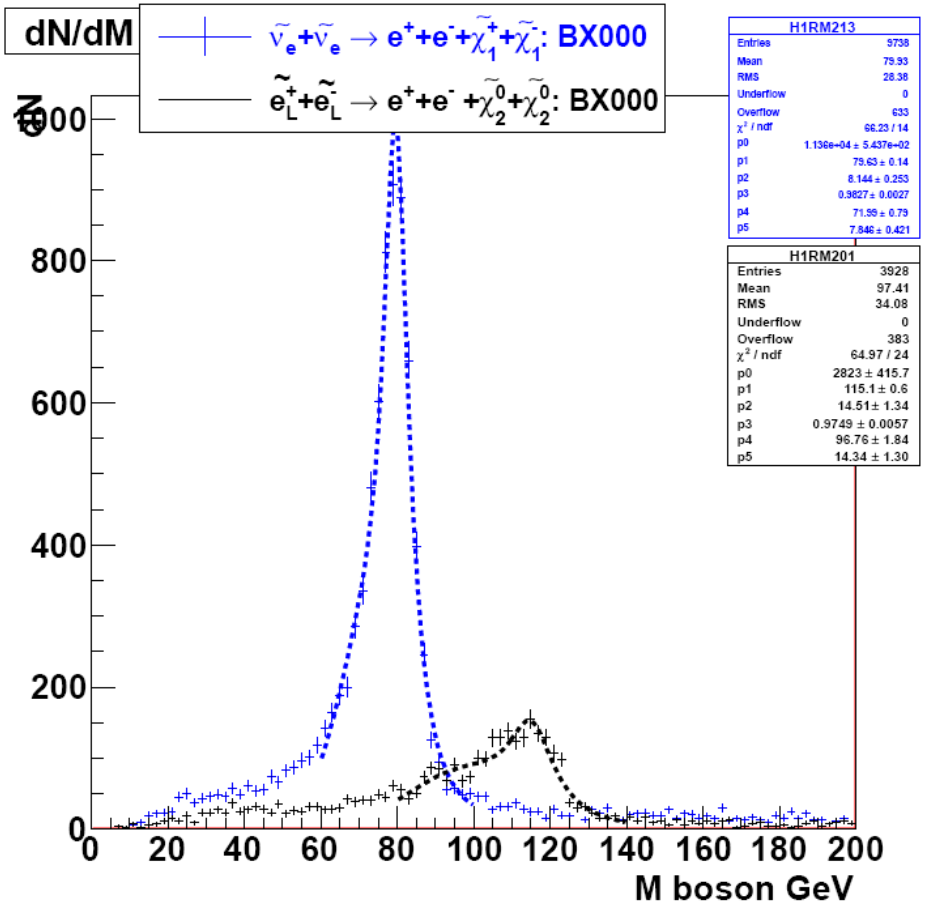
W Boson Mass Resolution Fit without/ with overlay





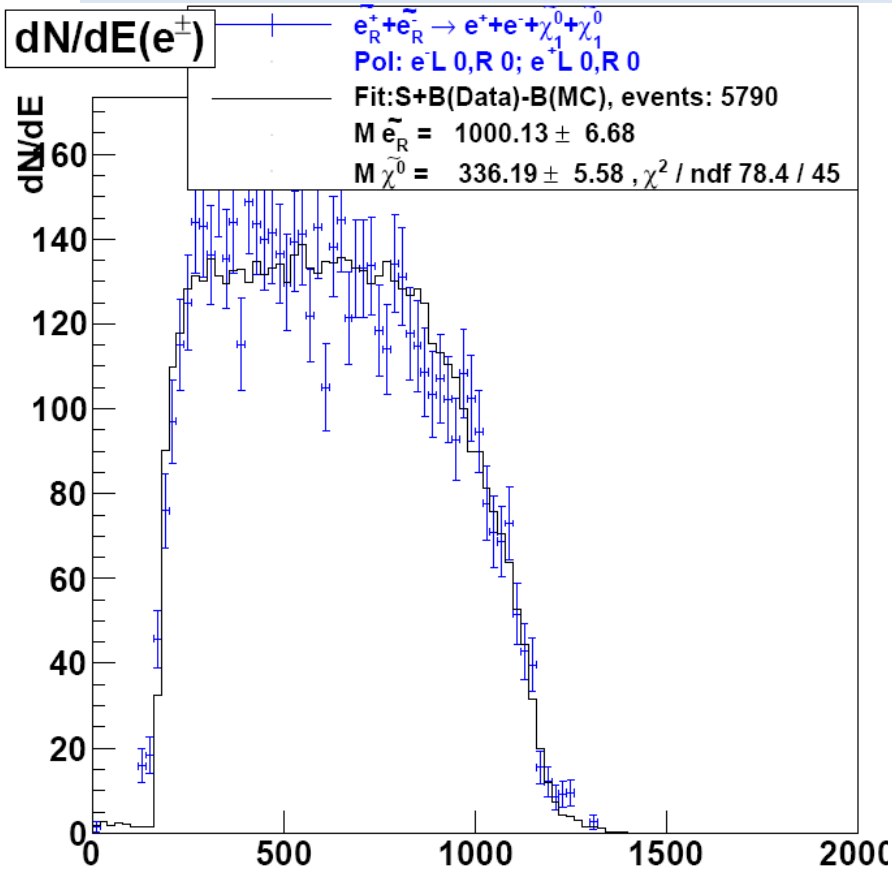
Boson mass distribution fit : without overlay m(W)= 78.5 GeV, σ(m)=10.1 GeV
with overlay, tight time cut: m(W)=78.3, σ(m)=11.7 GeV.

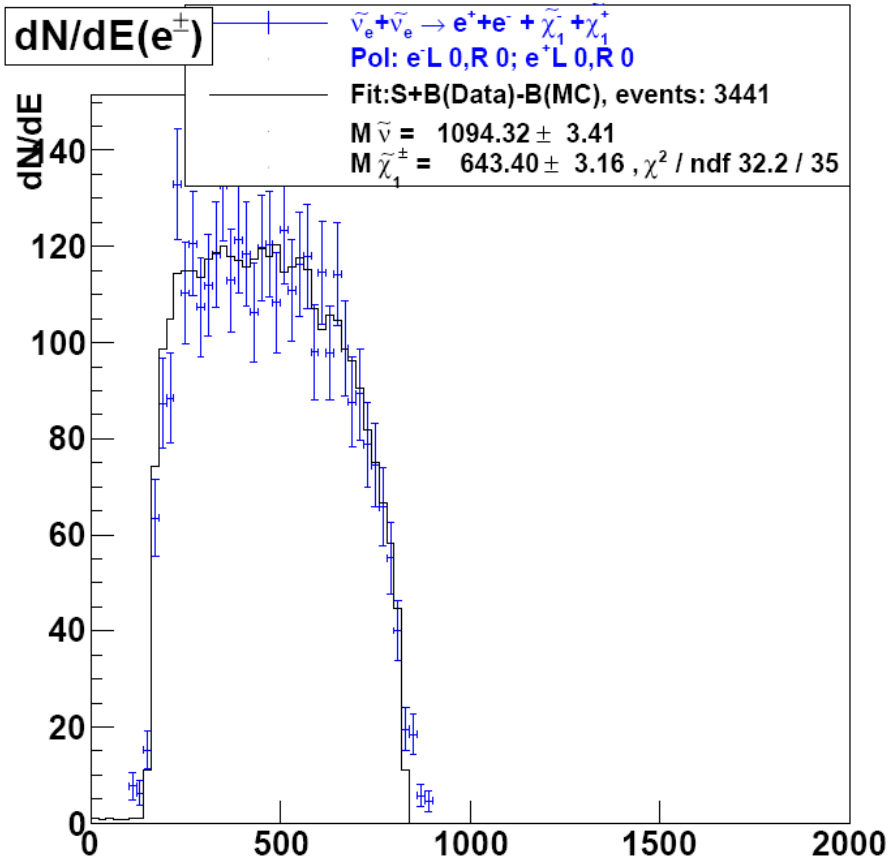
W and h^o Boson Mass Resolution Fit without overlay



Boson mass distribution fit : without overlay m(W)= 79.6 GeV, σ(m)=8.1 GeV
m(h^o)=115.1, σ(m)=14.5 GeV.

$\tilde{e}_R$ and $\tilde{\nu}_e$ dN/dE fit





dN/dE (e^-,e^+) ; S+B (left); S+B-B fit (right) ; with 2000 fb^{-1} $m\tilde{\nu}_e$ and $m\tilde{\chi}^{\pm}_1$ can be measured wit a statistical accuracy of ~0.5% .

Beamstrahlumg impact smaller => sharper edges.

Summary

In processes with final states composed of 2L and 4 jets, the electron energy resolution is similar to the 2L final states resolution.

The lepton energy resolution and boson mass resolution without and with overlay are similar if a tight time cut is applied.

The boson mass resolution and and B tagging should allow to tell apart the W^-W^+ final state from the h^oh^o final state, offering the possibility to determine the $\tilde{e}_L$, $\tilde{\nu}_e$ cross sections and the the $\tilde{\nu}_e$,and the $\tilde{\chi}^{\pm}_1$ masses.

Btag work not yet done

Slepton Note Status

Draft ready

Abstract

The determination of selectron, smuon, sneutrino, chargino and neutralino masses in selectron, smuon and sneutrino pair production is an important part of the program of spectroscopic studies of Supersymmetry at a high energy linear collider. In this note we present results of a study of the processes: $e^+e^- \to \tilde{e}_R^+ \tilde{e}_R^- \to e^+e^- \tilde{\chi}_1^0 \tilde{\chi}_1^0$, $e^+e^- \to \tilde{\mu}_R^+ \tilde{\mu}_R^- \to e^+e^- \tilde{\chi}_1^0 \tilde{\chi}_1^0$, $e^+e^- \to \tilde{e}_L^+ \tilde{e}_L^- \to e^+ e^- \tilde{\chi}_2^0 \tilde{\chi}_2^0$ and $e^+e^- \to \tilde{\nu}_e \tilde{\nu}_e \to e^+ e^- \tilde{\chi}_1^+ \tilde{\chi}_1^-$ in a Supersymmetric scenario at 3 TeV at CLIC. We report the expected accuracy on the production cross sections and on the $\tilde{e}_L$, $\tilde{e}_R$, $\tilde{\mu}_R$, $\tilde{\nu}_e$, $\tilde{\chi}_2^0$, $\tilde{\chi}_1^\pm$ and $\tilde{\chi}_1^0$ mass measurements. We report the performances on the lepton energy resolution and boson mass resolution, we discuss the requirements on the luminosity spectrum, boson tagging, as well as on the detector time stamping capability and beam polarization. Results are obtained after full simulation and reconstruction with beam-beam induced background overlay.

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