Systematic error on Heavy Slepton Masses

OUTLINE

- Slepton mass determination
- Beamstrahlung spectrum
- Systematic error due to luminosity spectum
- Systematic error due to event selection

Sleptons and Gauginos Mass Determination

The slepton mass is f(√s, E_H, E_L) (1)

the gauginos mass is f($m_{\tilde{l}}$, √s, E_H, E_L) (2)

Where EL and EH are the lower and upper edges of the lepton energy distribution.

The masses are determined using a 2 parameters fit to the reconstructed energy spectrum, dN/dE; S+B–B(MC).

For a set of masses, a uniform distribution of N events is modeled according to (3), N=Ndata.

For each event √S is generated taking into account ISR + Beamstrahlung spectrum.

The energy is smeared using $\Delta E/E^2$, slide 7,8.

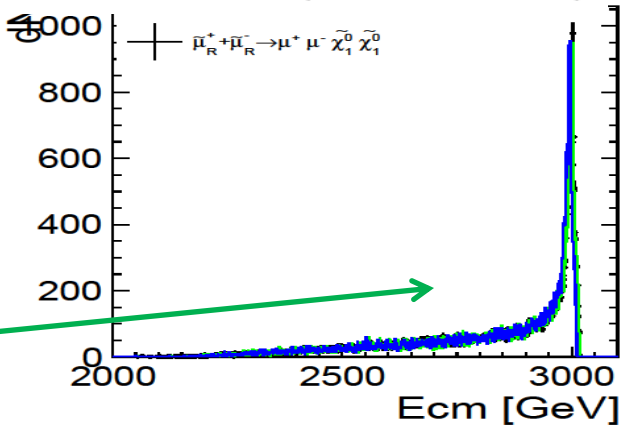
The chi2 = Σ(data-template)^2/err^2 is computed.

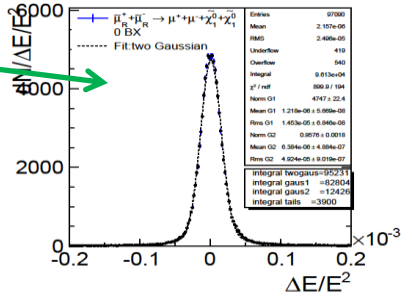
Minuit is used to iterate till the chi2 is minimized

$$m_{\tilde{\ell}^\pm} = \frac{\sqrt{s}}{2}\left(1 - \frac{(E_H - E_L)^2}{(E_H + E_L)^2}\right)^{1/2} \quad (1)$$

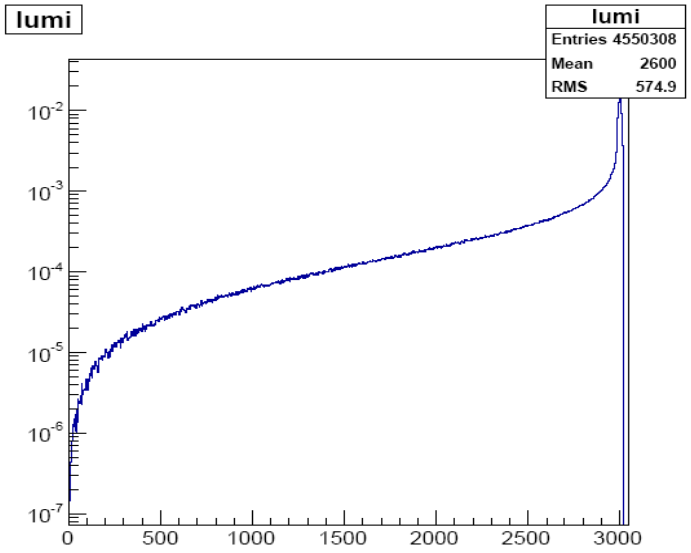
$$m_{\tilde{\chi}_1^0} \text{ or } m_{\tilde{\chi}_1^\pm} = m_{\tilde{\ell}^\pm}\left(1 - \frac{2(E_H + E_L)}{\sqrt{s}}\right)^{1/2} \quad (2)$$

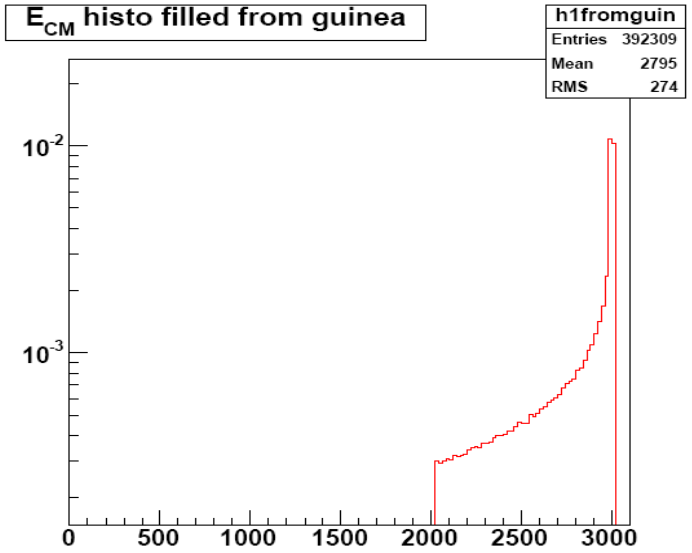
$$E_{L,H} = \frac{\sqrt{s}}{4}\left(1 - \frac{m^2_{\tilde{\chi}_1^0}}{m^2_{\tilde{\ell}^\pm}}\right)\left(1 \pm \sqrt{1 - 4\frac{m^2_{\tilde{\ell}^\pm}}{s}}\right) \quad (3)$$

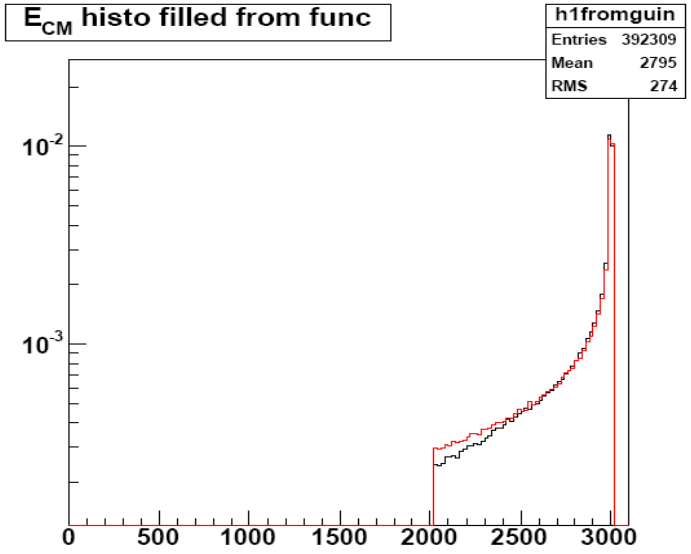


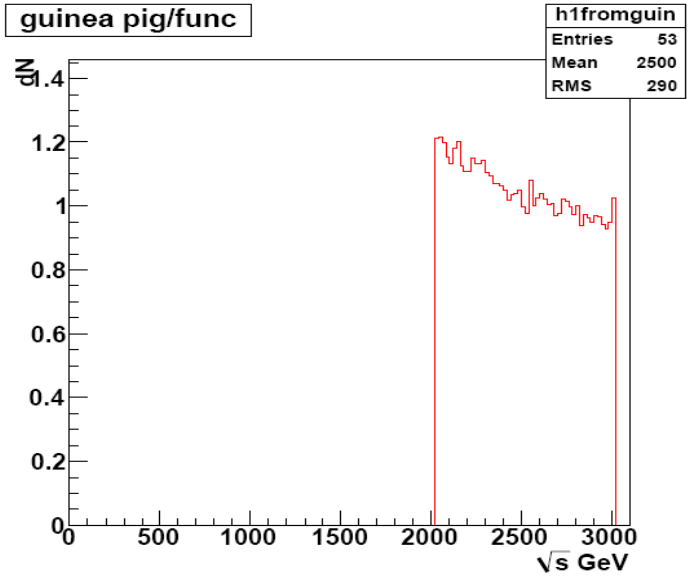


Beamstrahlung

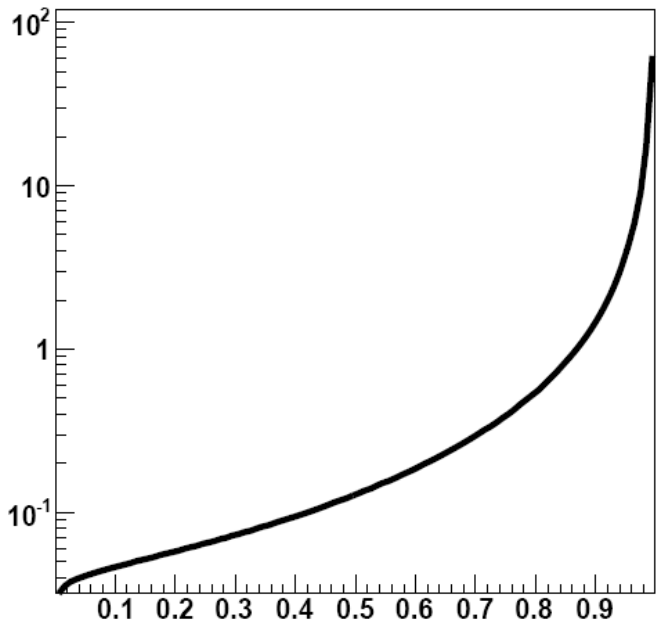


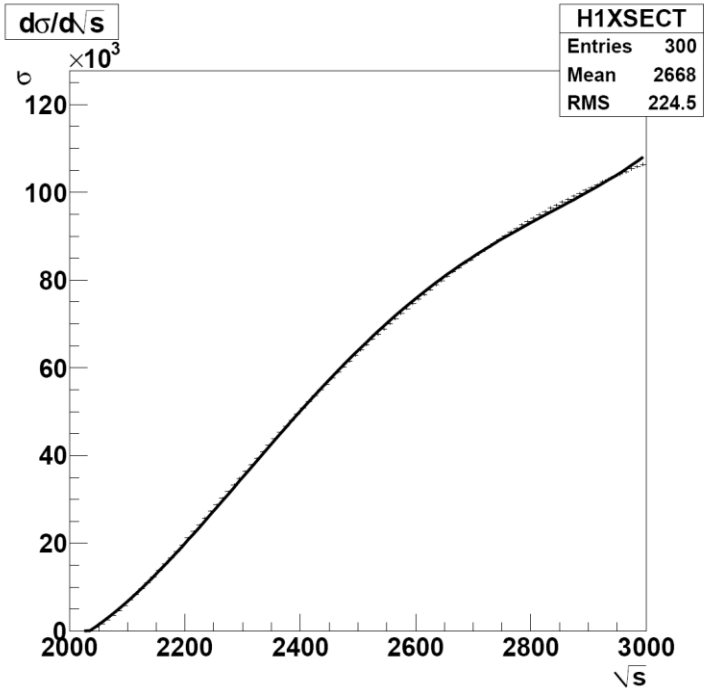






ISR and Cross Section √s dependence

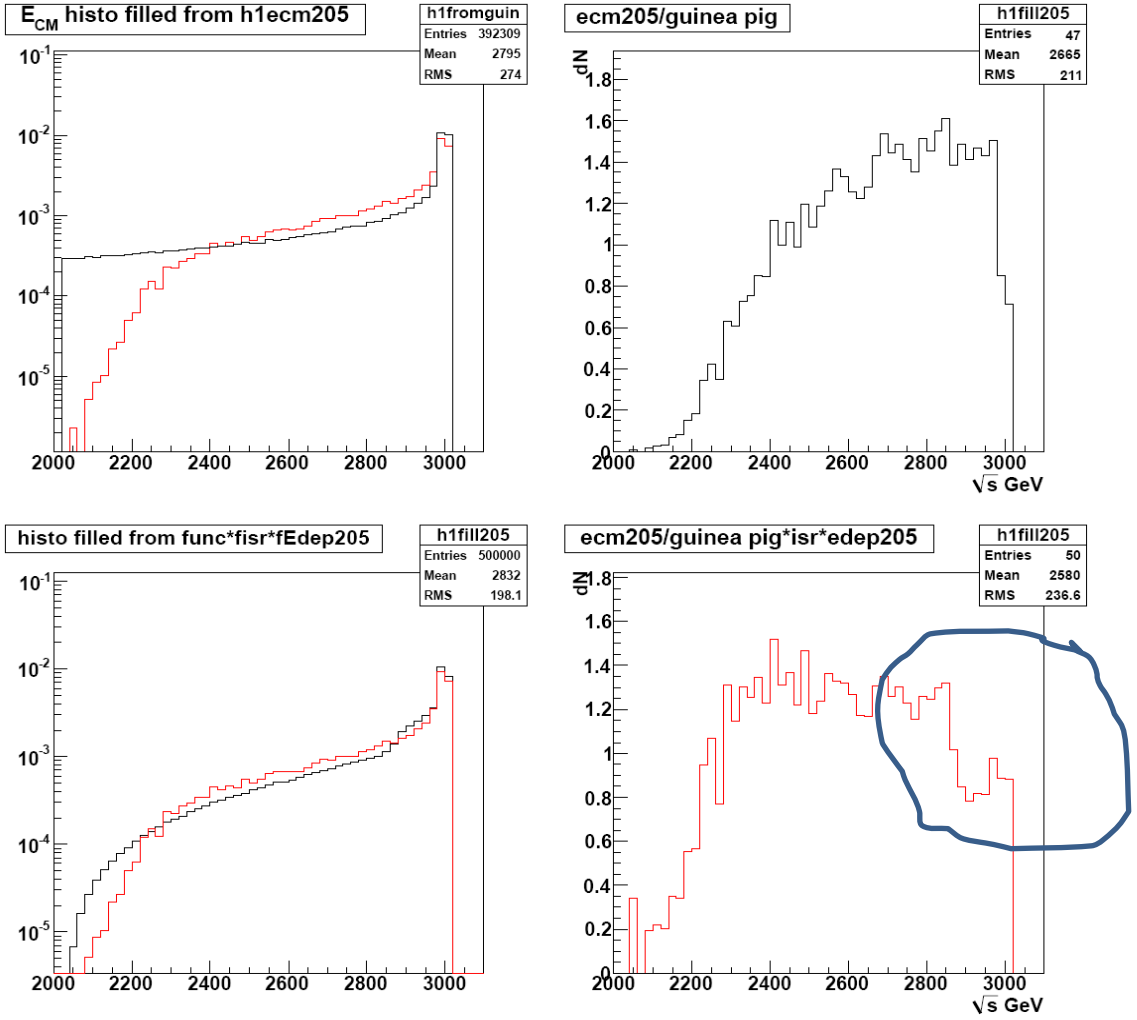




In addition to the beamstrahlung, one must take into account the ISR and the cross section √s dependence

ISR function provided by Marco, should be checked using Whizard.

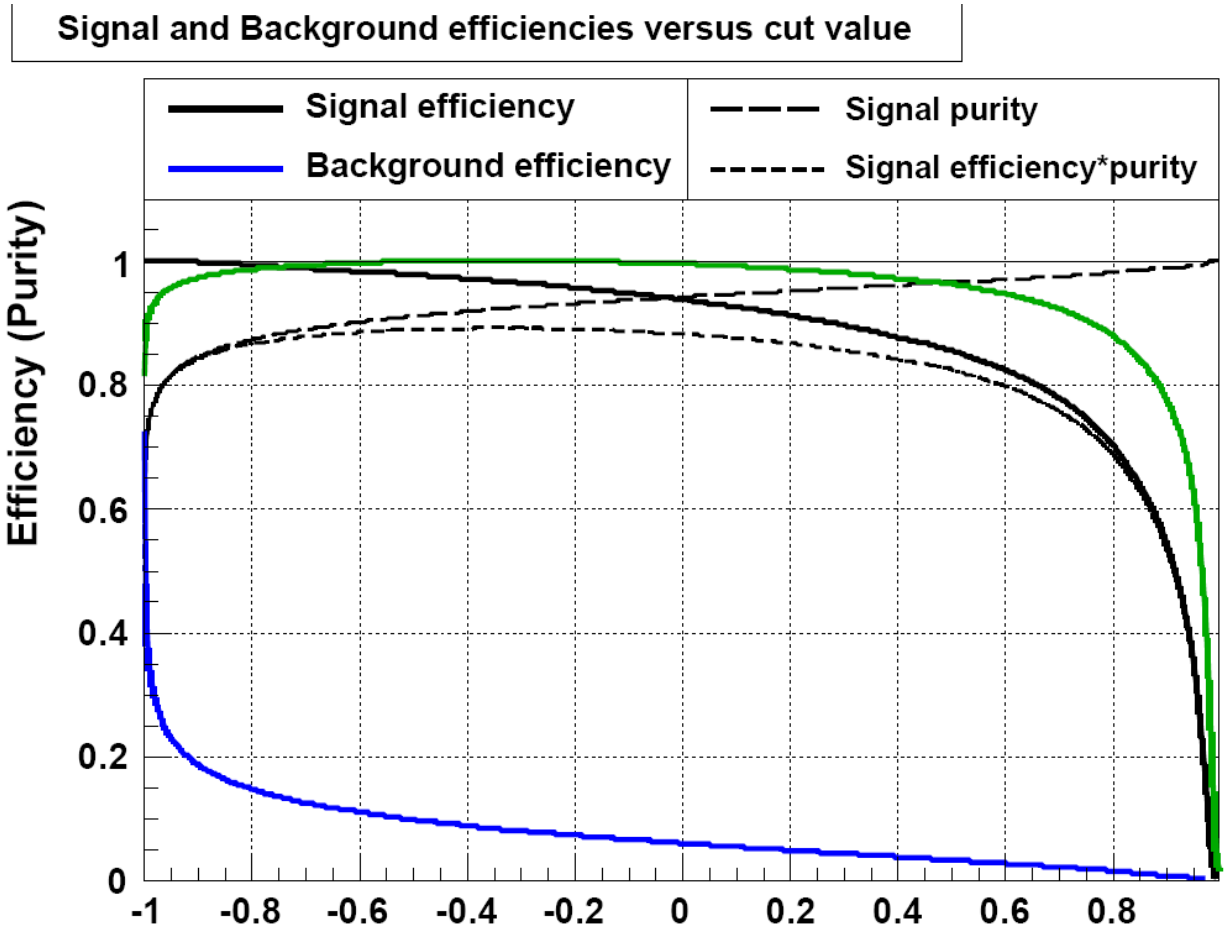
Beamstrahlung x ISR x Cross section



Fit with function x ISR x Cross section => mμ̃ = 1034Gev (1014 with red function)

To estimate systematic error use black function and ±1σ functions

Systematic error on μ̃ mass due to Event Selection and Back subtraction



Error estimated varying the cut value over the region where the significance is maximum

$\Rightarrow \Delta m_{\tilde{\mu}}$ =± 1 GeV (0.1%) (Statistical accuracy 0.6 %)

$\delta m_{\tilde{\chi}_1^0}$ =± 3 GeV (0.9%) (statistical accuracy 2.0 %)