

SUSY STUDIES with SPS 5 mSUGRA PARAMETERS

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INTRODUCTION

Two sets of cascade decays were considered:

$$\tilde{q}_L \rightarrow \tilde{\chi}_2^0 q \rightarrow \tilde{l}_R l q \rightarrow \tilde{\chi}_1^0 l l q,$$

$$\tilde{g} \rightarrow \tilde{t}_1 t \rightarrow t b \tilde{\chi}_1^\pm \rightarrow t b W \tilde{\chi}_1^0,$$

and kinematic endpoints of invariant masses formed from subsets of decay products were fitted. Endpoints are function of sparticle masses which then could be extracted.

LEPTONIC SIGNATURES

$$\tilde{q}_L \rightarrow \tilde{\chi}_2^0 q \rightarrow \tilde{l}_R l q \rightarrow \tilde{\chi}_1^0 l l q$$

5 ENDPOINTS:

$$M_{ll}^{max}, M_{llq}^{max}, (M_{lq}^{low})^{max}, (M_{lq}^{high})^{max}, M_{llq}^{min}$$

CUTS APPLIED

- $E_{Tmissing} > 100$ GeV
- $n(jet) \geq 4$, $p_T^{j1} > 150$ GeV, $p_T^{j2} > 100$ GeV, $p_T^{j3,j4} > 50$ GeV
- 2 OSSF leptons, $p_T > 10$ GeV

STOP ANALYSIS

$$\tilde{g} \rightarrow \tilde{t}_1 t \rightarrow t b \tilde{\chi}_1^\pm \rightarrow t b W \tilde{\chi}_1^0$$

ENDPOINTS:

$$(M_{tb}^2)^{max} = m_t^2 + \frac{m_{\tilde{t}_1}^2 - m_{\tilde{\chi}_1^\pm}^2}{2m_{\tilde{t}_1}^2} \{ (m_g^2 - m_{\tilde{t}_1}^2 - m_t^2) + \dots = 255^2 \text{ GeV}^2$$

$$(M_{tbW})^{max} = \dots = 585 \text{ GeV}$$

tb, tbW RECONSTRUCTION

- $E_{Tmissing} > 200$ GeV
- $n(b\text{-jet})=2$, $30 < p_T(b1) < 150$ GeV, $30 < p_T(b2) < 50$ GeV
- $n_{jet} \geq 3$ ($\neq b, \tau$ jets), $p_T > 30$ GeV, $|\eta| < 3$, $p_T(j1) > 300$ GeV
- No leptons
- Excluding $j1, jj \Rightarrow |m_{jj} - m_W| < 15$ GeV
- bjj minimizing $|m_{bjj} - m_t|$
- Scaling $m_{jj} = m_W$, m_{bjj} recalculated, $|m_{bjj} - m_t| < 30$ GeV
- $m_{bjj} + b \text{ jet} \Rightarrow m_{tb}$
- $\Delta R(tb) < 2$
- "Sideband" subtraction
- Excluding $j1, jj \Rightarrow m_{jj}$
- $|m_{jj} - m_W| < 15$ GeV
- jj minimising $|m_{jj} - m_W|$
- Scaling $m_{jj} = m_W$
- $M_{tb} < 270 \text{ GeV} + W \Rightarrow M(tbW)$

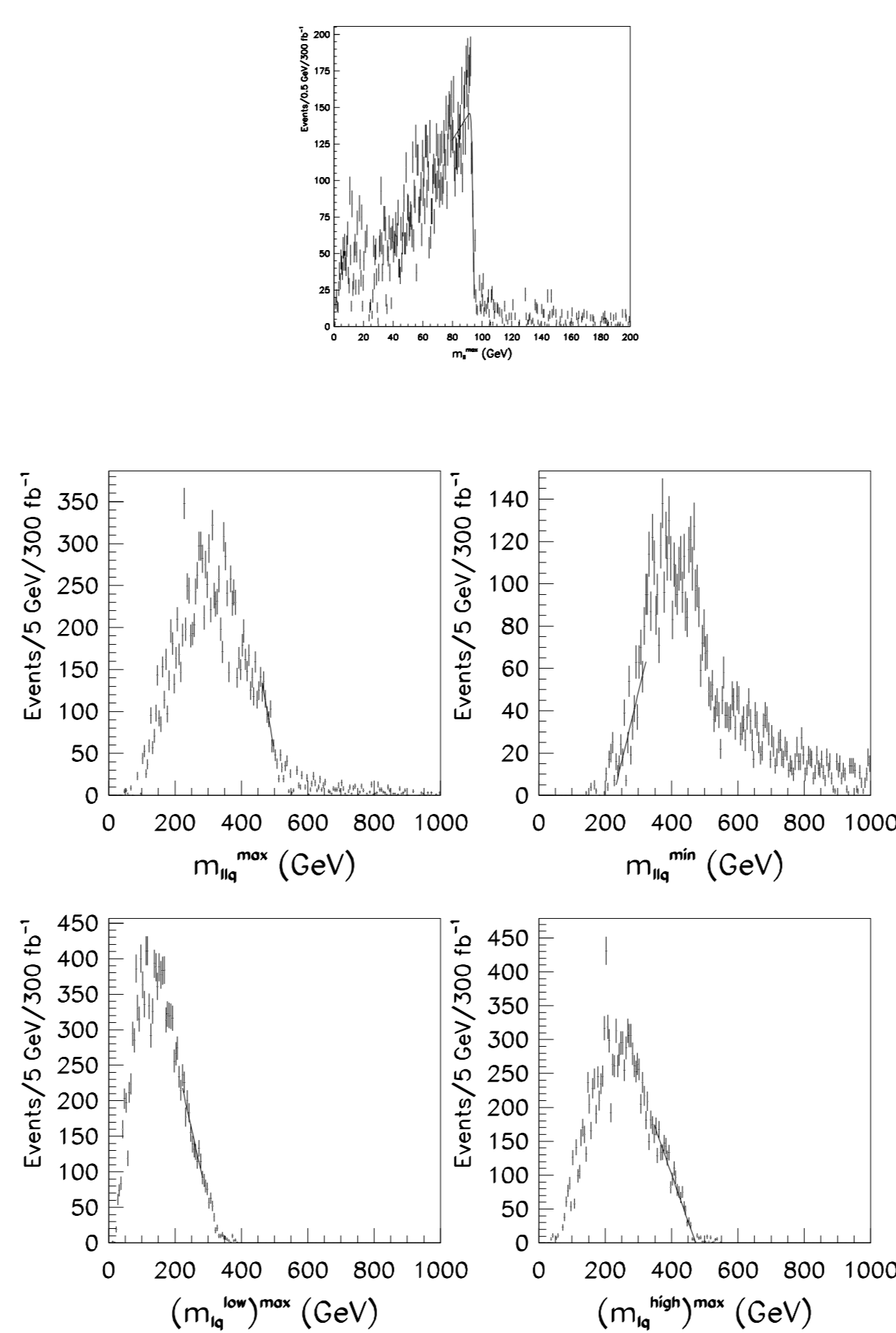
SPS 5

$$m_0 = 150 \text{ GeV} \quad m_{1/2} = 300 \text{ GeV} \quad A_0 = -1000$$

$$\tan \beta = 5 \quad \mu > 0$$

$$\text{VERY LIGHT STOP} \quad m(\tilde{t}_1) = 236 \text{ GeV}$$

$$\sigma(\text{allSUSY}) = 41.13 \text{ pb}$$

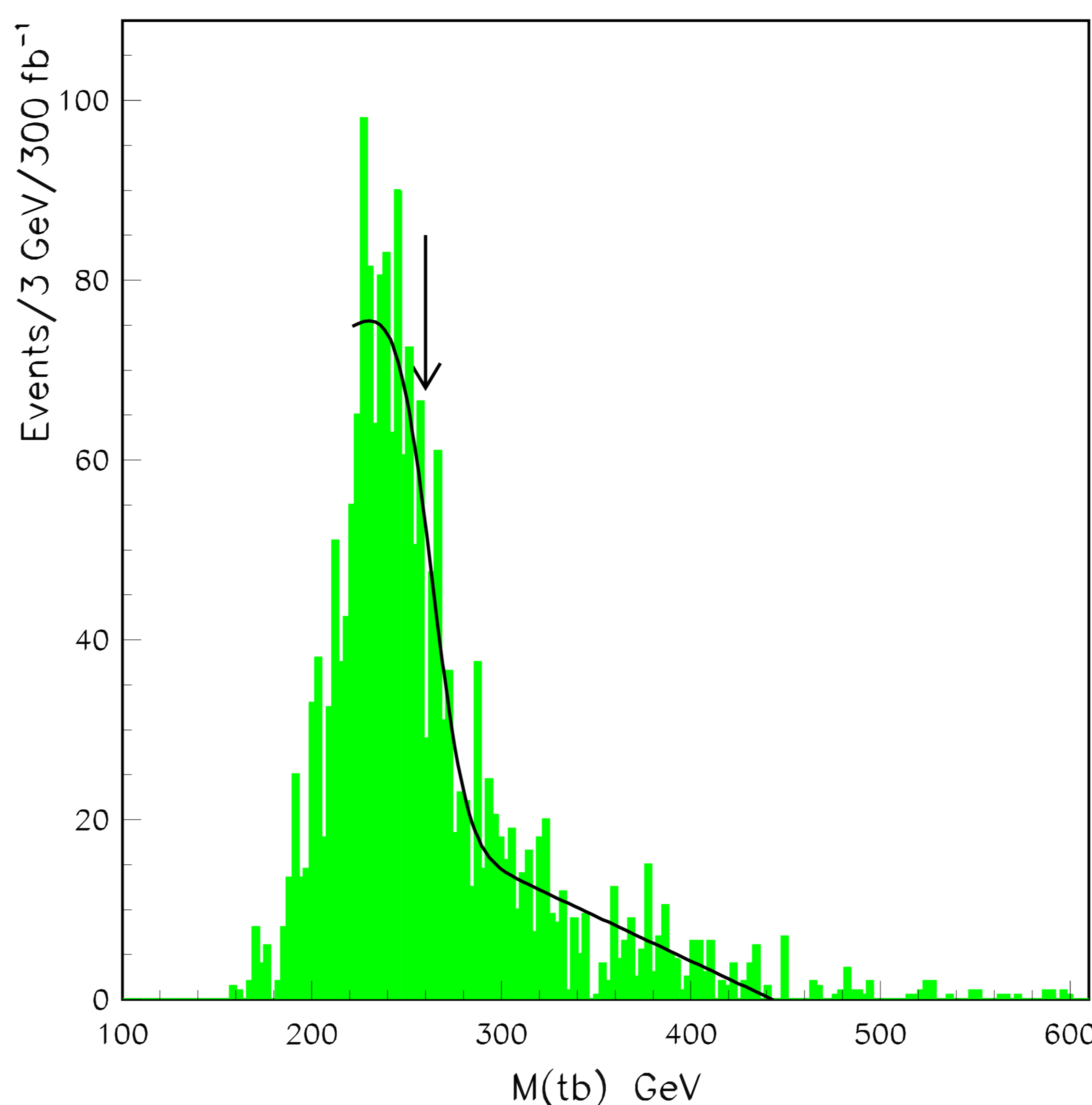
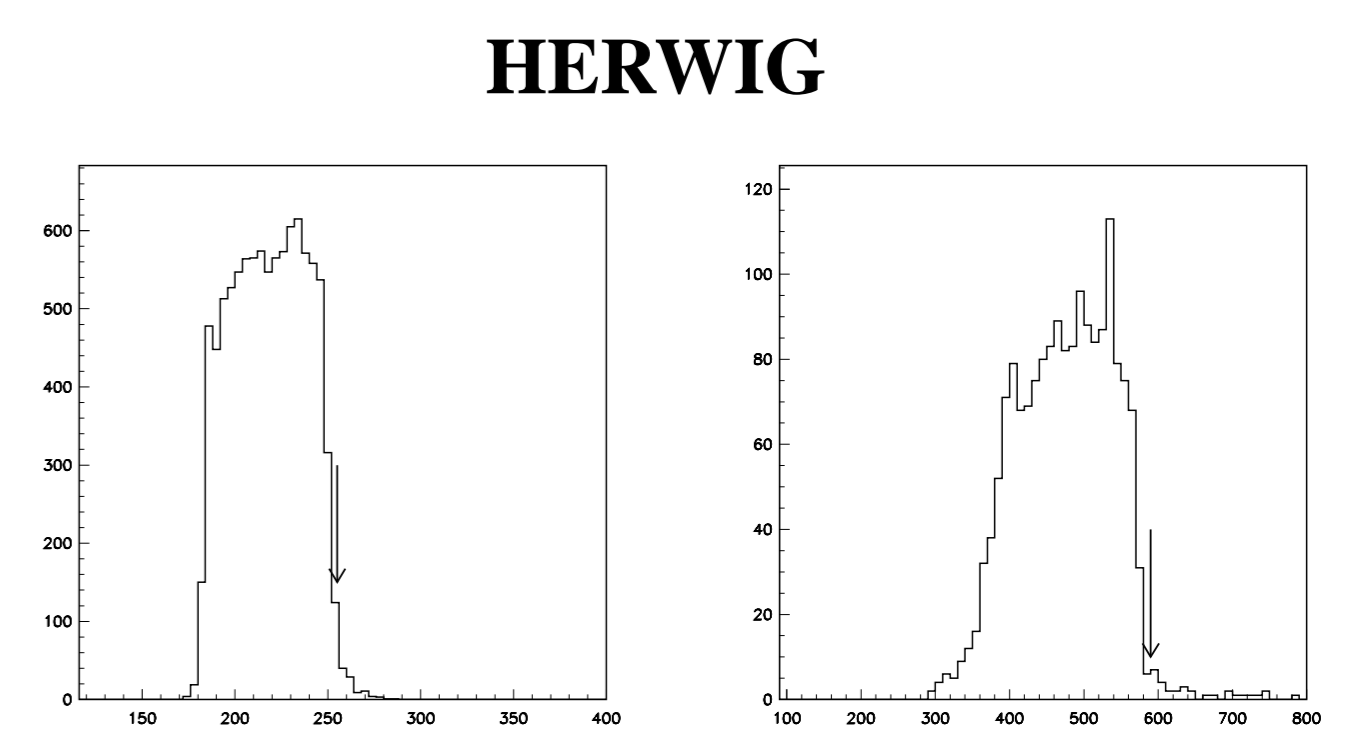
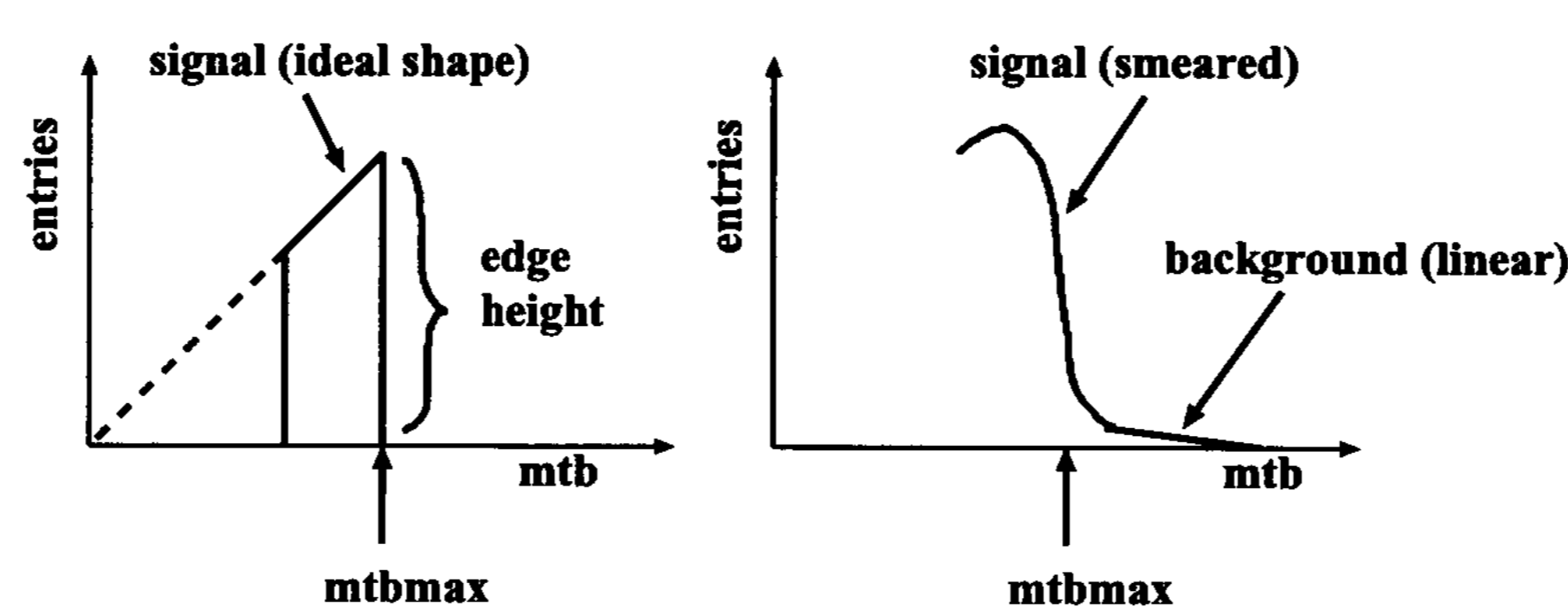


MONTE CARLO

- ISAJET 7.64
- HERWIG 6.5
- ATLFast
- $L(\text{SUSY}) \approx 300 \text{ fb}^{-1}$
- $L(t\bar{t}) \approx 10 \text{ fb}^{-1}$

EDGE	THEORY	FIT	SYS. ERROR	STAT. ERROR
M_{ll}^{max}	93.40	93.85	0.09	0.07
M_{llq}^{max}	511	525	5	11
$(M_{lq}^{high})^{max}$	470	472	5	1
$(M_{lq}^{low})^{max}$	320	326	3	7
M_{llq}^{min}	225	225	2	4

M(tb)



$$M(tb)^{fit} = 260.0 \pm 0.5 \text{ GeV.}$$

