

Búsqueda de desintegraciones hadrónicas de los bosones gauge Z_H y W_H en el modelo Little Higgs para el experimento ATLAS

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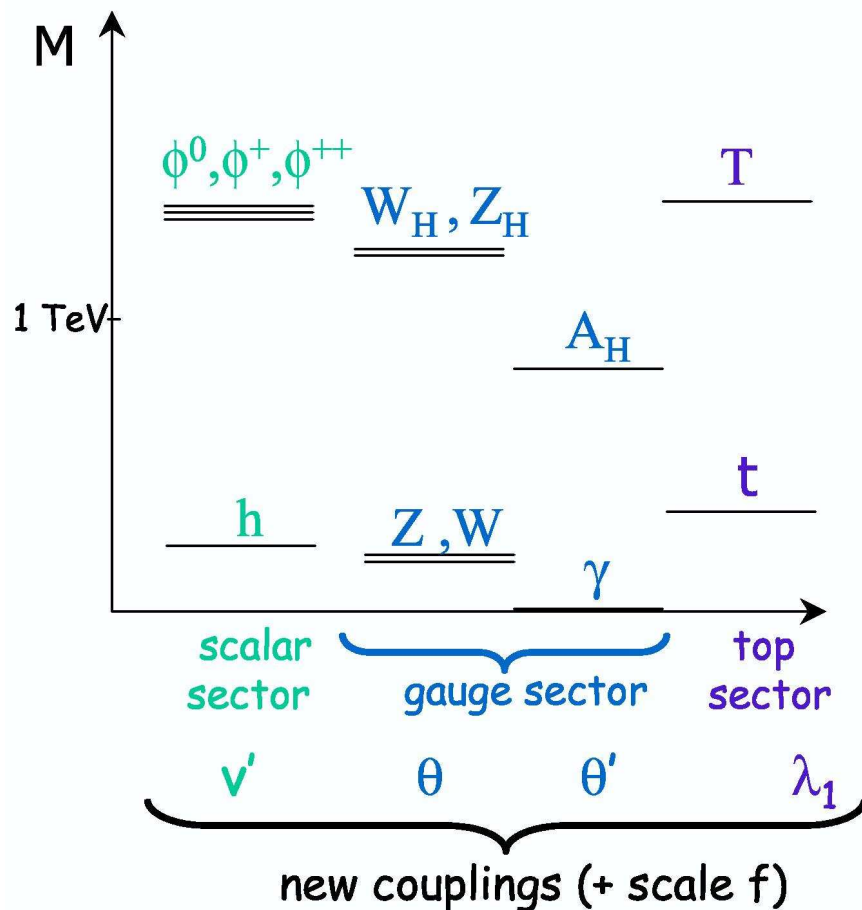
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ATL-COM-PHYS-2005-001

Presentado por: L. March



Modelo Little Higgs



Teoría

- *Arkani-Hamed et al., JHEP 207 (2002) 34*

Fenomenología

- *Han et al. Phys. Rev. D67 (2003) 95004*

Búsqueda en ATLAS

- *Exploring Little Higgs models with ATLAS at LHC*

G. Azuelos et al., ATLAS Note

SN-ATLAS-2004-038

Búsqueda en ATLAS

Ya publicadas

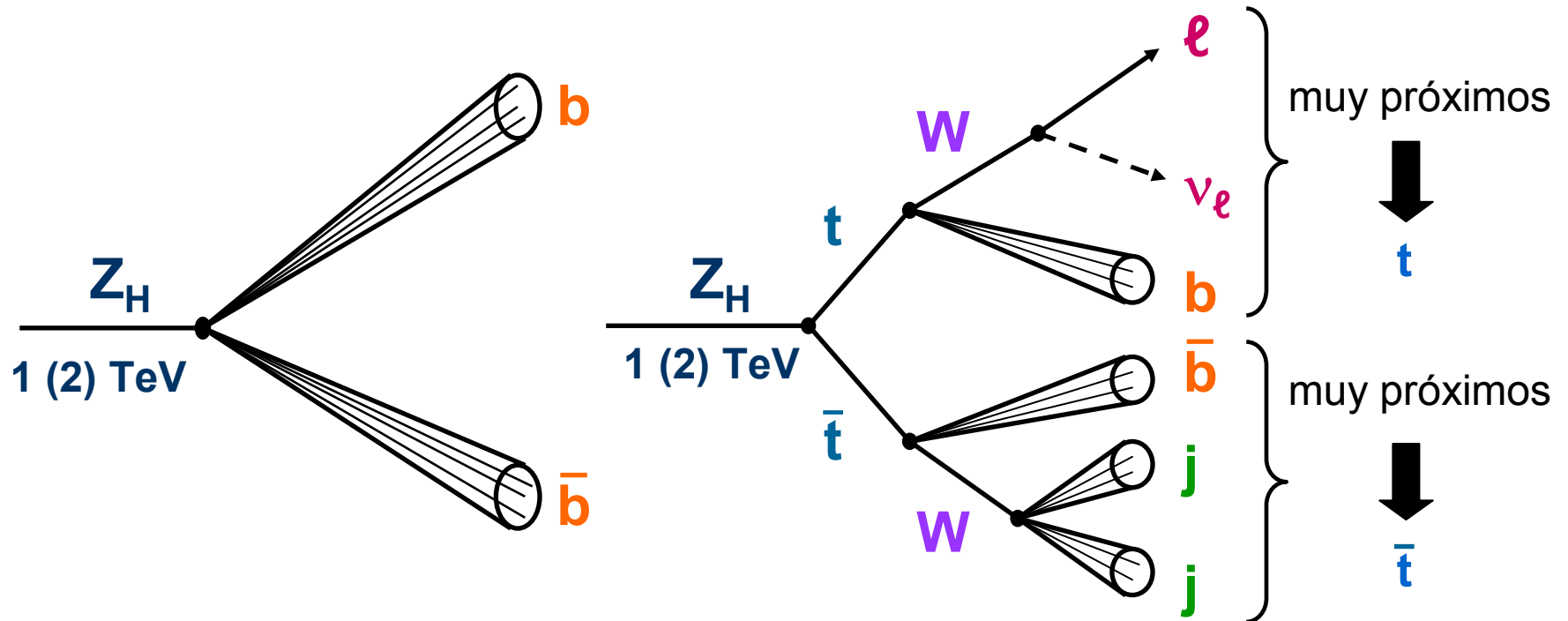
Desintegraciones $Z_H \rightarrow e^+ e^-$ $W_H \rightarrow e \nu_e$

Límites de descubrimiento
($\cot\theta = 1$) $M(Z_H) \sim 5 \text{ TeV}$ $M(W_H) \sim 5.5 \text{ TeV}$

En este análisis

$$Z_H \rightarrow \begin{cases} b \bar{b} \\ t \bar{t} \end{cases} \quad W_H \rightarrow t b$$

$$Z_H \rightarrow b \bar{b} \quad \text{and} \quad Z_H \rightarrow t \bar{t}$$



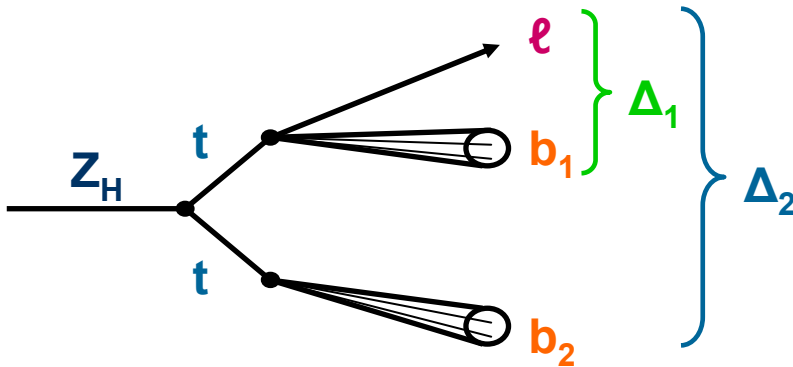
Cortes de selección

2 b-jets con $\left\{ \begin{array}{l} p_T > 250 \text{ (500) GeV} \\ |\eta| < 2.5 \end{array} \right.$
b-tagging

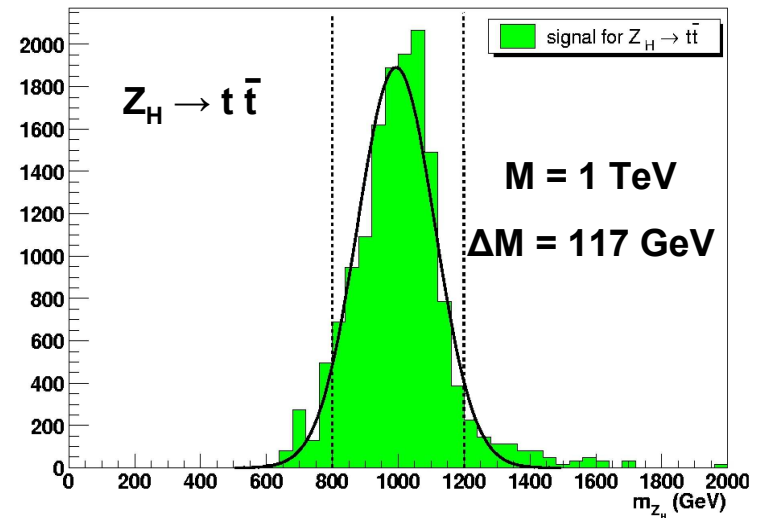
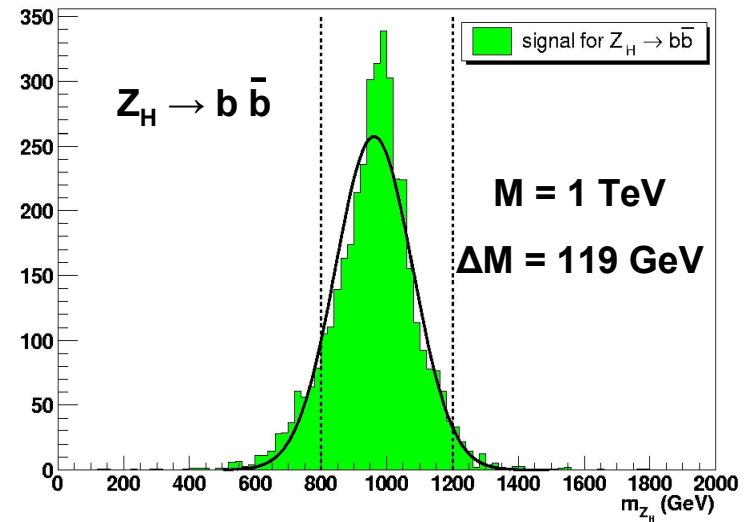
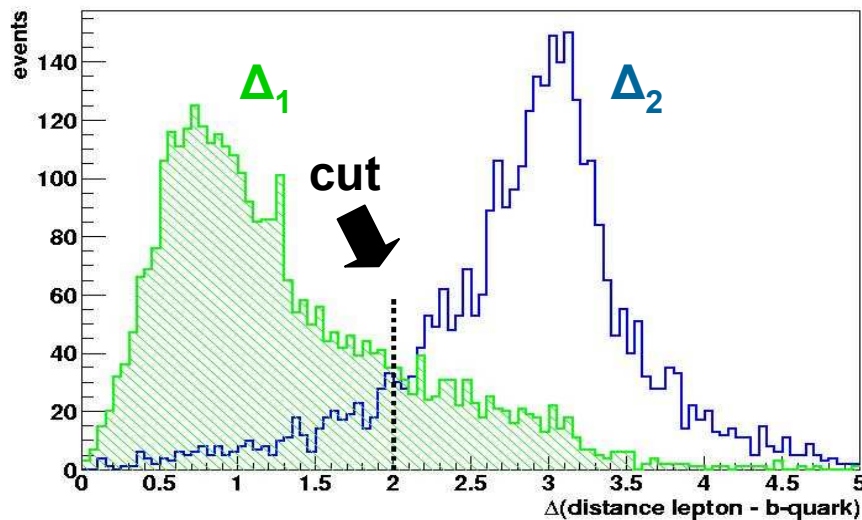
Cortes de selección

2 tops con, $p_T > 250 \text{ (500) GeV}$
lepton tag, $\cancel{E}_T$, b-tagging

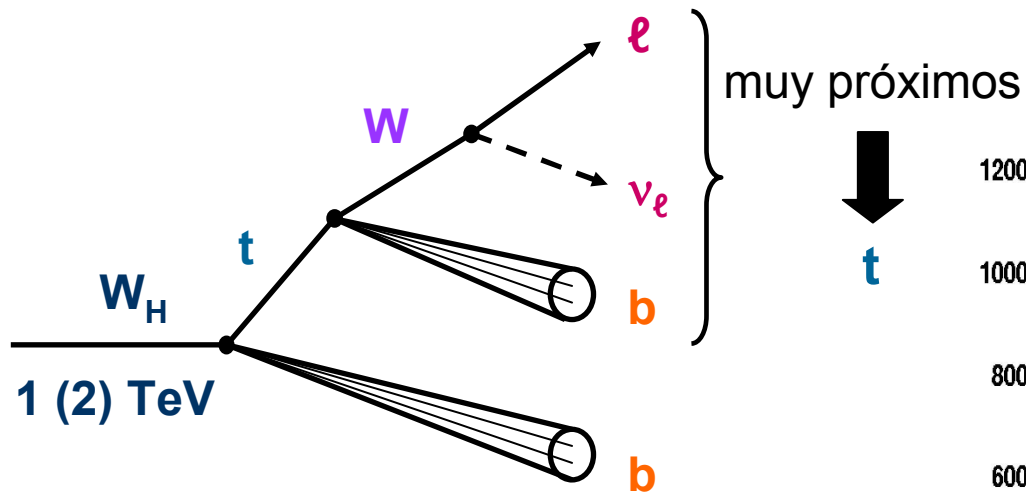
Identificación y reconstrucción de la masa



$$\Delta = \sqrt{(\Delta\phi)^2 + (\Delta\eta)^2}$$



$$W_H \rightarrow t b$$

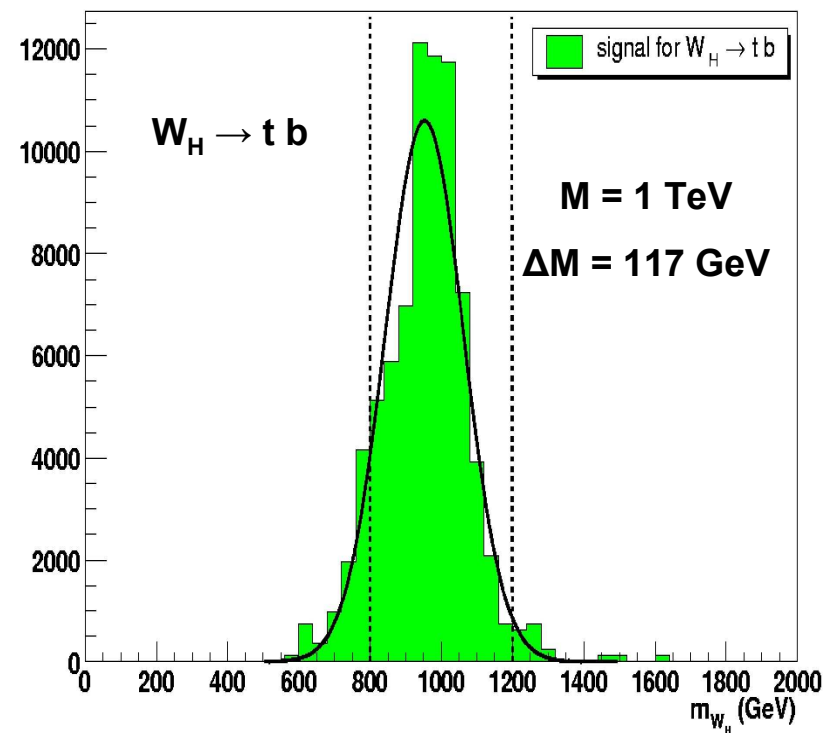


Cortes de selección

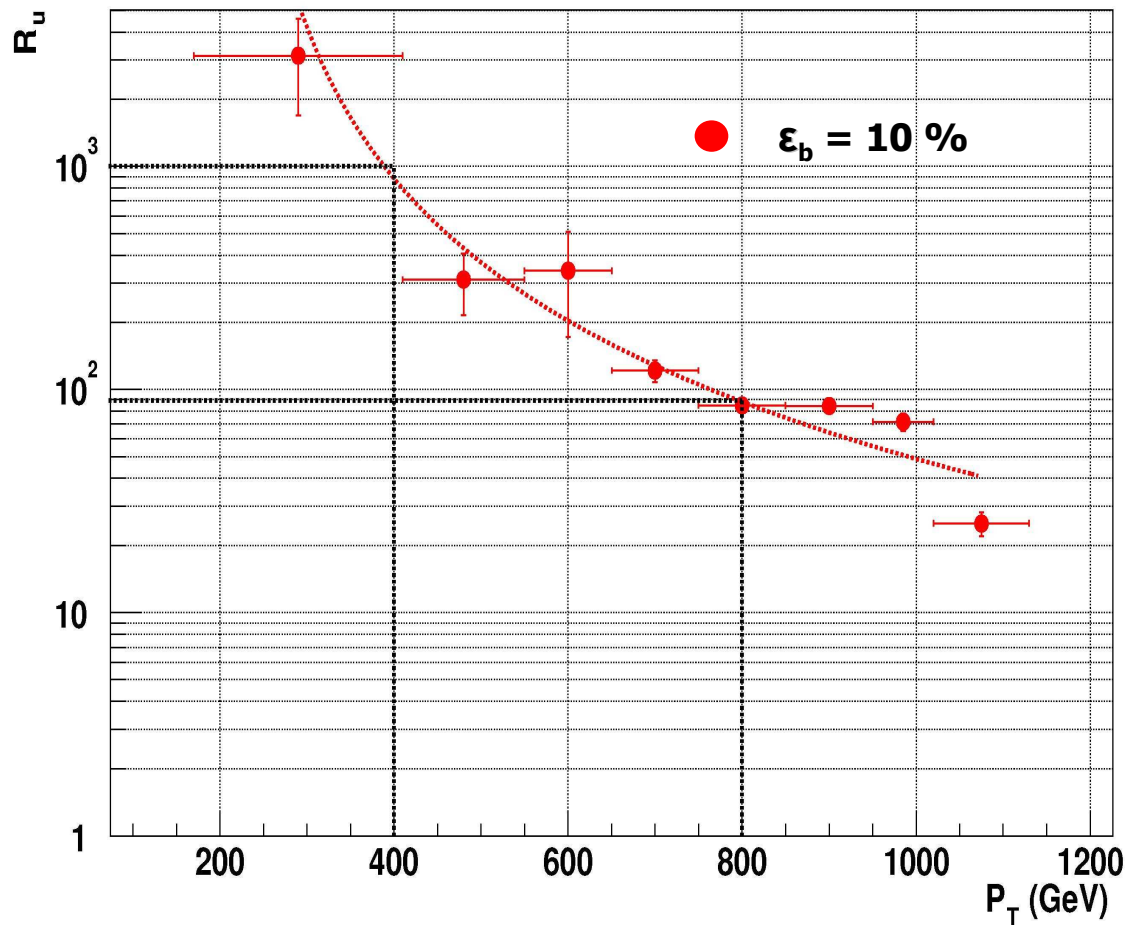
$p_T(\text{top}) > 250 \text{ (500) GeV}$

$p_T(\text{b-jet}) > 250 \text{ (500) GeV}$

lepton tag, $\cancel{E}_T$, b-tagging



b-tagging



muestras de DC1:

Z_H (2 TeV) $\rightarrow b \bar{b}, c \bar{c}, u \bar{u}$

Z_H (1 TeV) $\rightarrow b \bar{b}$

$\langle p_T(b) \rangle = 400$ GeV

$R_u = 10^3$

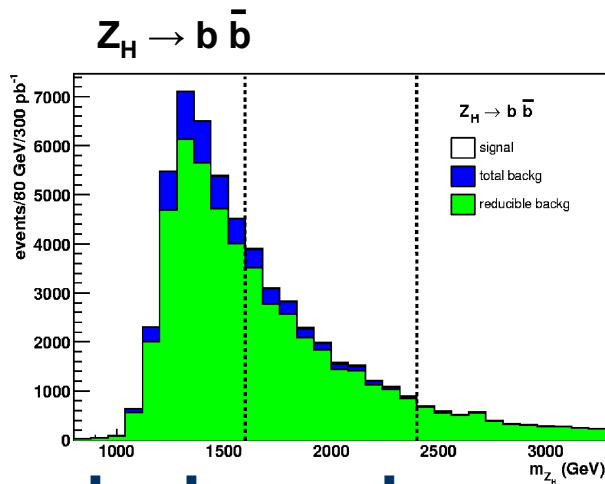
Z_H (2 TeV) $\rightarrow b \bar{b}$

$\langle p_T(b) \rangle = 800$ GeV

$R_u = 10^2$

Señal y fondo ($M = 2 \text{ TeV}$)

$$\mathcal{L} = 3 \cdot 10^5 \text{ pb}^{-1} \quad \cot\theta = 1$$

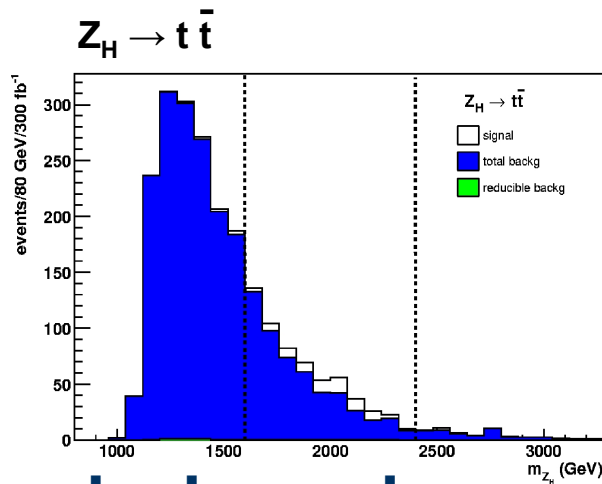


background

irreducible: $b \bar{b} X$

reducible: $j j X$

$$\frac{S}{\sqrt{B}} = 1.2$$

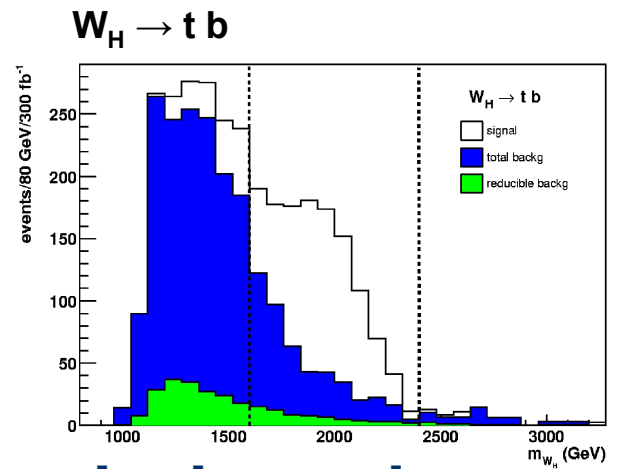


background

irreducible: $t \bar{t} X$

reducible: $W + \text{jets}$

$$\frac{S}{\sqrt{B}} = 3.2$$



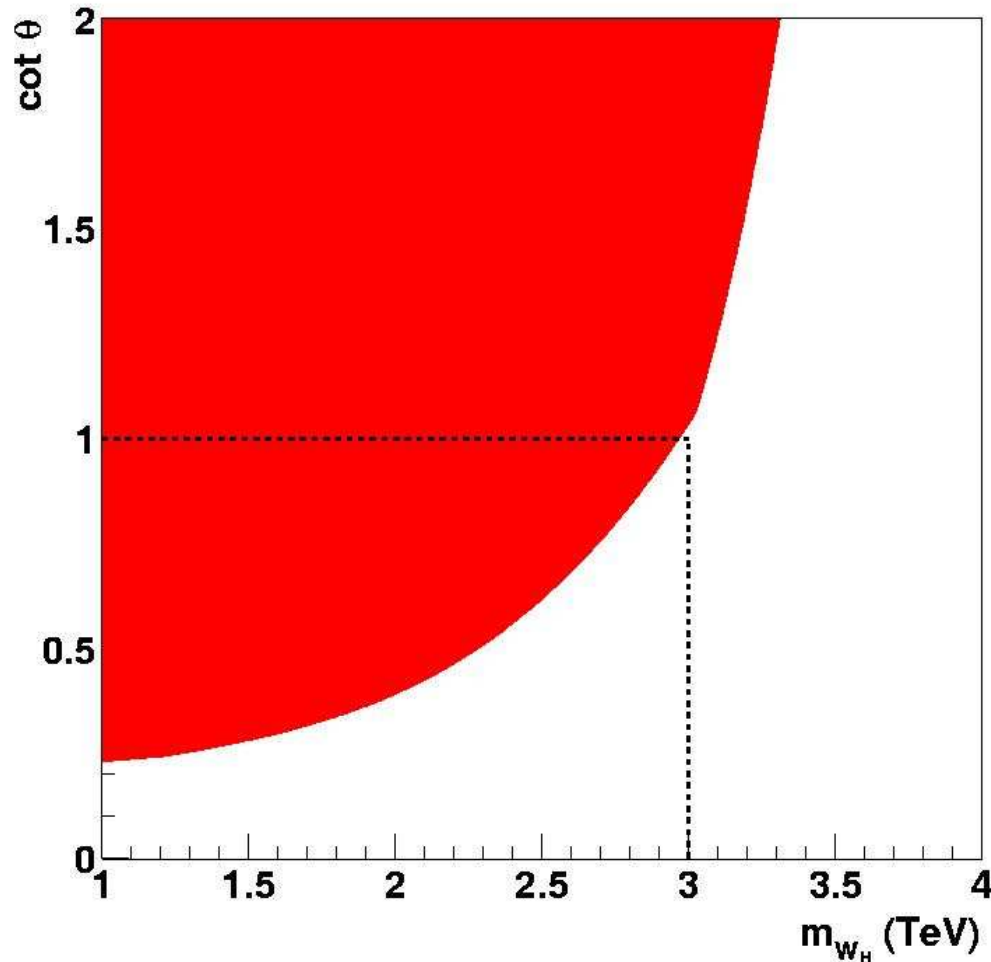
background

irreducible: $t \bar{t} X$

reducible: $W + \text{jets}$

$$\frac{S}{\sqrt{B}} = 37.6$$

Región de descubrimiento para $W_H \rightarrow t b$



$$\mathcal{L} = 3 \cdot 10^5 \text{ pb}^{-1}$$

$$S/\sqrt{B} > 5$$

$$N > 10$$

Conclusiones y perspectivas de futuro

Conclusiones

$Z_H \rightarrow b \bar{b}, t \bar{t}$ difícil de observar

$W_H \rightarrow t b$ puede observarse hasta $M(W_H) \sim 3 \text{ TeV}$

Si $W_H \rightarrow t b$ se observara, sería posible comprobar el modelo Little Higgs

$$\frac{BR(W_H \rightarrow tb)}{BR(W_H \rightarrow e \nu)} = 3$$

Perspectivas de futuro

ATLFAST  full simulation