H→WW* at 1.4 TeV

Mark Thomson
University of Cambridge
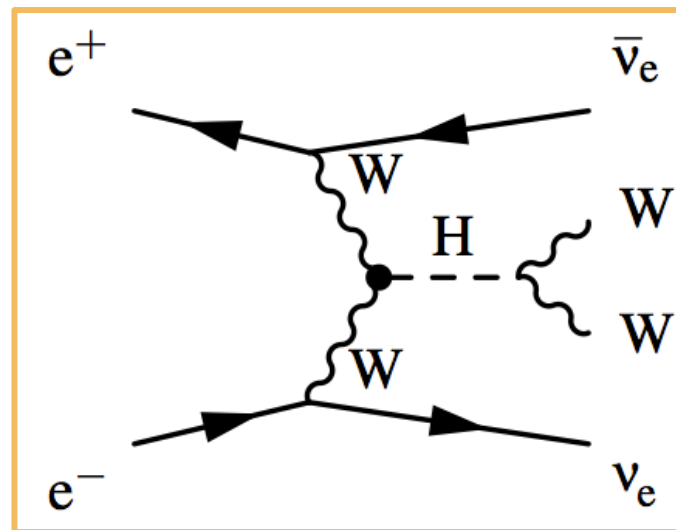
NEW: improved treatment of H->ZZ*

Higgs backgrounds

Process	$\sigma/$fb	$\varepsilon_{\text{presel}}$	$\varepsilon_{\mathscr{L}>0.35}$	$N_{\mathscr{L}>0.35}$
$H \to WW^* \to q\bar{q}q\bar{q}$		32.4 %	18.1 %	7518
$H \to WW^* \to q\bar{q}l\nu$		4.4 %	0.6 %	253
$H \to b\bar{b}$		1.9 %	0.4 %	774
$H \to c\bar{c}$		8.1 %	2.1 %	209
$H \to gg$		19.1 %	7.1 %	1736
$H \to ZZ$		12.0 %	5.0 %	556
$H \to$ other		0.7 %	0.2 %	55

Signal (brackets the first two rows: $H \to WW^* \to q\bar{q}q\bar{q}$ and $H \to WW^* \to q\bar{q}l\nu$)

★ **A few important things to note**
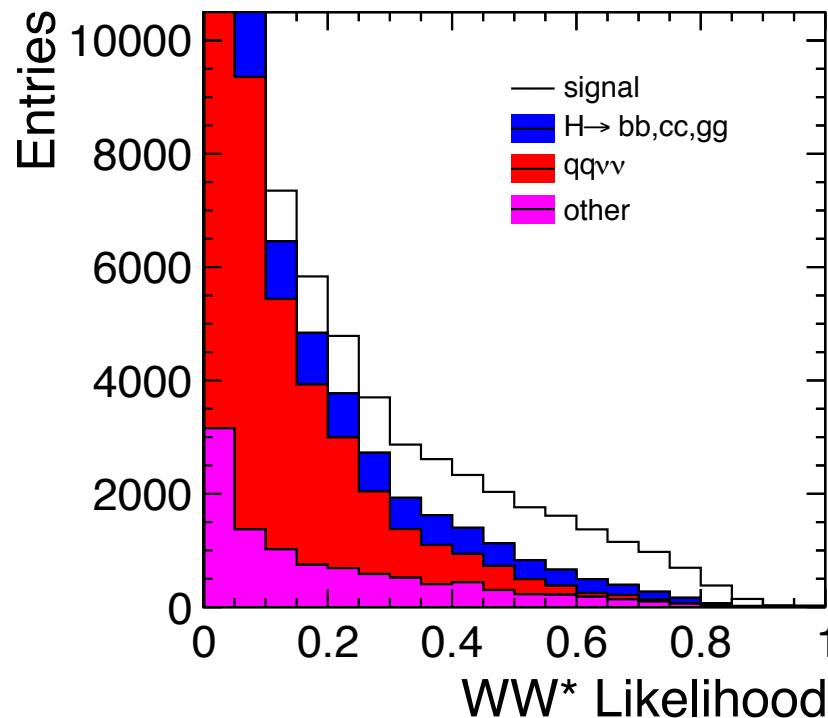 - **ZZ* → qqqq is similar to WW* → qqqq**
    (efficiency same order of magnitude: 10 % c.f. 18 %)
  - **Now constrain this background using result from Gordana**

Fitting

★ **Rather than a simple cut**

   ■ **Fit likelihood distribution, varying contributing components**

★ **NOTE: Constrain backgrounds using other analyses**

Constrained Fit

★ **Since signal and Higgs background shapes not so different**
   ▪ **Need additional information**
★ **Constrain Higgs to BRs using results**
   from 1.4 TeV Higgs analysis + assume signal/back sys.
★ **Implement in MINUIT fit as nuissance parameters**

$$\chi^2 \to \chi^2 + \frac{(1 - s_{\mathrm{gg}})^2}{\sigma_{\mathrm{gg}}^2} + \frac{(1 - s_{\mathrm{c\bar{c}}})^2}{\sigma_{\mathrm{c\bar{c}}}^2} + \frac{(1 - s_{\mathrm{b\bar{b}}})^2}{\sigma_{\mathrm{b\bar{b}}}^2} + \frac{(1 - s_{\mathrm{ZZ}})^2}{\sigma_{\mathrm{ZZ}}^2} + \frac{(1 - b)^2}{\sigma_b^2} + \frac{(1 - \varepsilon)^2}{\sigma_\varepsilon^2}$$

$\sigma_{\mathrm{gg}} = 1.8\,\%$

$\sigma_{\mathrm{c\bar{c}}} = 2.9\,\%$

$\sigma_{\mathrm{b\bar{b}}} = 0.3\,\%$

$\sigma_{\mathrm{ZZ}} = 5.6\,\%$

$\sigma_b = 1.0\,\%$

$\sigma_\varepsilon = 0.8\,\%$

FIT

	σ x BR
WW*	1.4 %

$\sigma_{\mathrm{ZZ}} = 0\,\%$

	σ x BR
WW*	1.7 %

$\sigma_{\mathrm{ZZ}} = 5.6\,\%$