LIGHT SM HIGGS ($M_h < 130$ GeV)

▷Some Cross-sections for SM Higgs production. (M. Spira)

M_h (GeV)	σ_{Wh} (fb)	σ_h (fb)	σ_{Zh} (fb)	$\sigma^{LO}_{t\bar{t}H}$ (fb)
100	308	1170	173	6.3
110	224	900	128	4.8
120	165	704	97	3.7
130	124	558	74	2.9
140	94	448	57	2.2

▷Some Branching Ratios (M. Spira):

M_h (GeV)	$BR_{b\bar{b}}$	$BR_{\tau\tau}$	$BR_{W^+W^-}$	$BR_{\gamma\gamma}$
100	81%	8%	1%	0.15%
110	77%	8%	5%	0.19%
120	68%	7%	13%	0.22%
130	53%	5%	29%	0.22%
140	34%	4%	49%	0.19%

▷Event Rates: Some Examples As Introduction:

Assume $m_h = 120$ GeV, 20 pb^{-1} *per detector* :

- ▷$Wh \to \ell\nu b\bar{b}$
  165 $fb\times$ 20 fb^{-1}= 3300 Wh events produced.
  $\times$ 0.68 = 2240 $Wb\bar{b}$ events produced.
  OR $\times$0.07 = 224 $W\tau\bar{\tau}$ events produced.
  $\times\frac{24}{81}$ = 665 $\ell\nu b\bar{b}$ events produced.
  OR $\times\frac{24}{81}$ = 66 $\ell\nu\tau\bar{\tau}$ events produced.
- ▷$Zh \to \nu\bar{\nu}b\bar{b}$ 97 $fb\times$ 20 fb^{-1}= 1940 Zh events produced.
  $\times$ 0.68 = 1320 $Zb\bar{b}$ events produced.
  OR $\times$0.07 = 136 $Z\tau\bar{\tau}$ events produced.
  $\times$ 0.2 = 260 $\nu\bar{\nu}b\bar{b}$ events produced.
  OR $\times$0.2 = 27 $\nu\bar{\nu}\tau\bar{\tau}$ events produced.
- ▷$t\bar{t}h \to WWb\bar{b} \to \ell\nu jjb\bar{b}b\bar{b}$ 3.7 $fb\times$ 20 fb^{-1}= 74 $t\bar{t}h$ events produced.
  $\times$ 0.68 = 50 $t\bar{t}b\bar{b} \to WWb\bar{b}b\bar{b}$ events produced.
  OR $\times$0.07 = 5 $t\bar{t}\tau\bar{\tau} \to WWb\bar{b}\tau\bar{\tau}$ events
  (N.B. LO calculation- may be 10-30% higher?).

▷Compare to Top Quark Discovery:

$\int \mathcal{L}dt = 67$ pb$^{-1}\times$ 6 pb $\overline{\sim}$ 400 $t\bar{t}$ events.

(New Detectors have > 2 in Acceptance.)