Fermiophobic Higgs at the Tevatron

Heather Logan (Wisconsin)
with Hooman Davoudiasl and Tao Han

Why fermiophobic?

- Appears in feasible models for EWSB.
- Enhanced BRs to $\gamma\gamma$, WW^*, $\tau\tau$: can be easier to detect.

$\longrightarrow$ opportunity for Tevatron searches.

Concrete model: Two-Higgs-doublet model (2HDM)

h^0	f_i
Φ_1	Φ_2
v_1	v_2

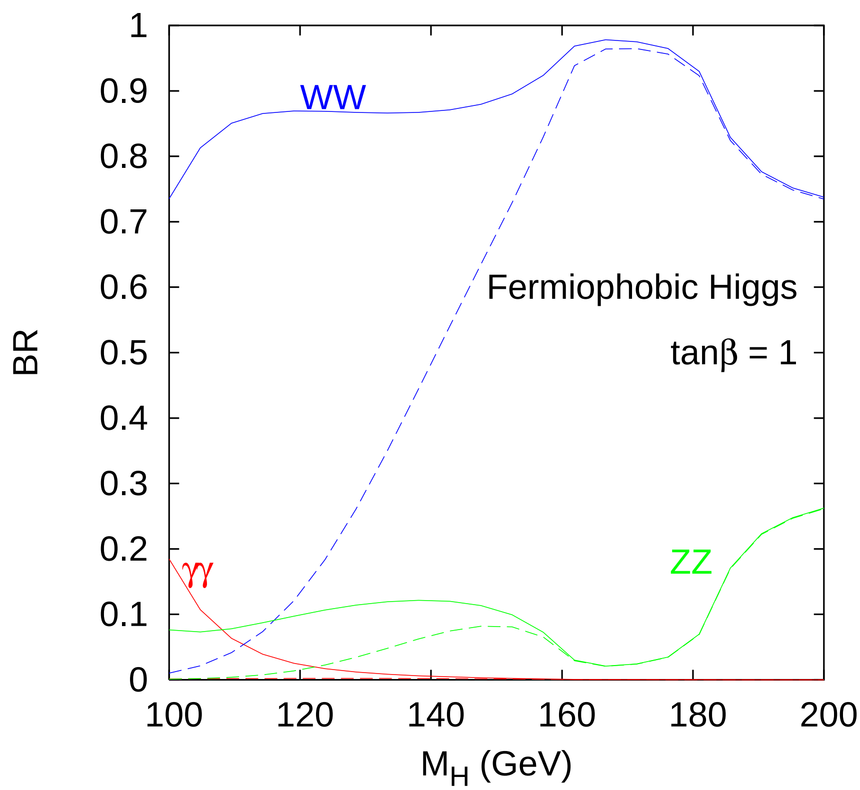
$$v_1^2 + v_2^2 = v_{SM}^2$$

hWW, hZZ coups $=$ SM $\times$ v_1^2/v_{SM}^2

Fermiophobic

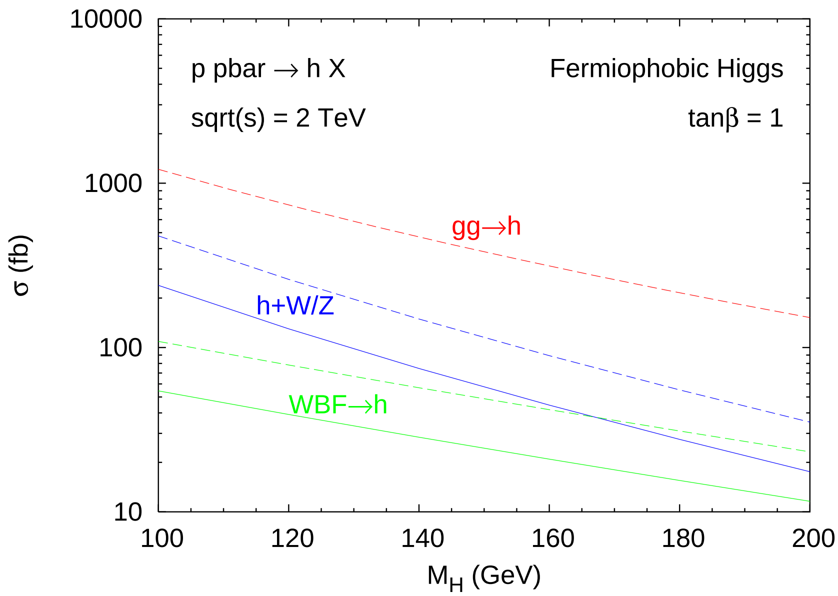
h^0	$t,\ b,\ \tau$
Φ_1	Φ_2
v_1	v_2

Choose $\tan\beta \equiv v_2/v_1 = 1$.

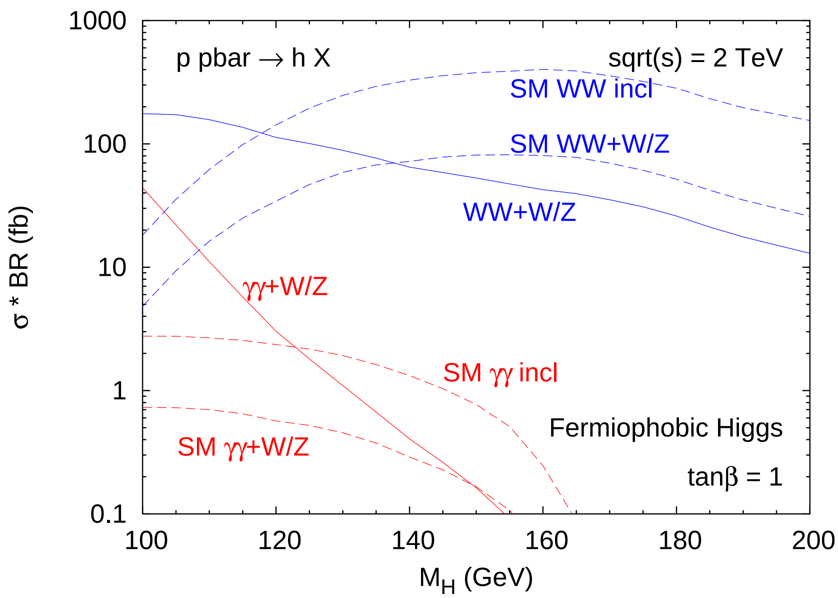


- $b\bar{b}$ gone
- $c\bar{c}$, gg, $\tau\tau$ gone
- enhanced $\gamma\gamma$, WW^* at low M_H

Fermiophobic, continued



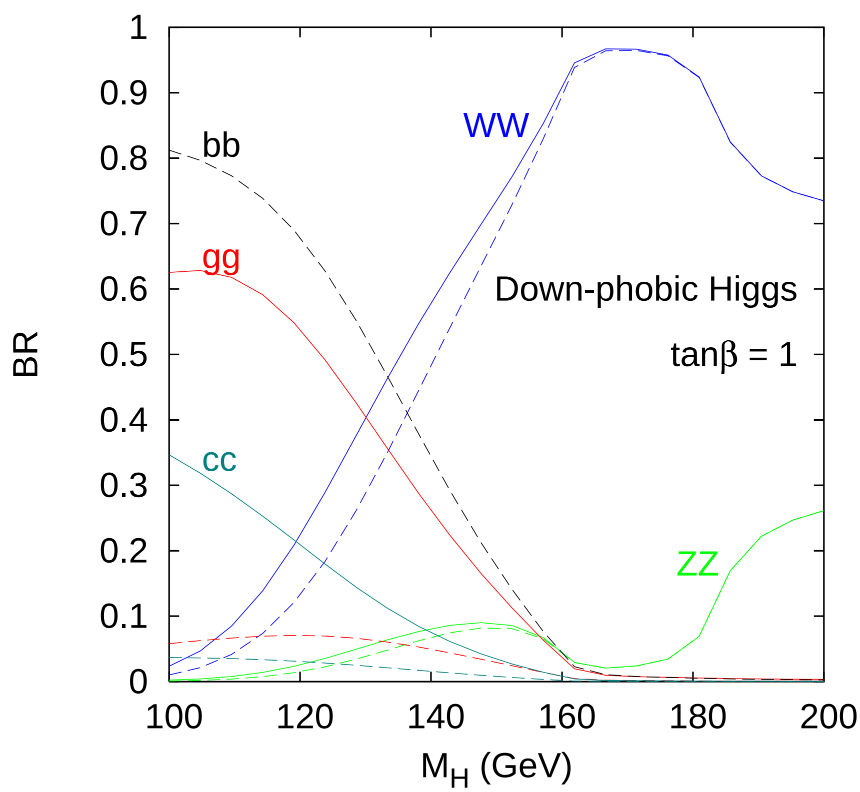
- $gg \to h$ gone
- $h + W/Z$, WBF $\propto v_1^2/v_{SM}^2$



- $\gamma\gamma + W/Z$ enhanced at low M_H
- $WW + W/Z$ enhanced at low M_H because of BR enhancements

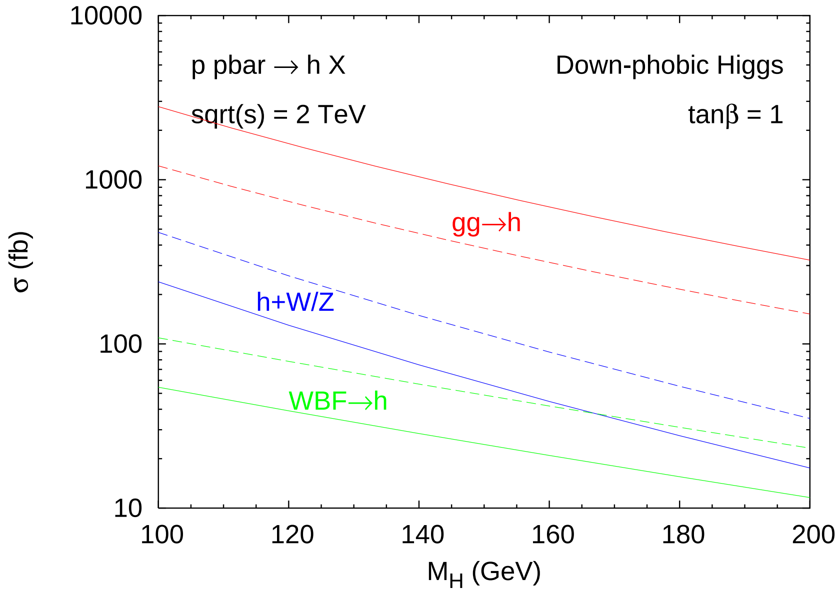
Down-phobic

h^0	
t	$b,\ \tau$
Φ_1	Φ_2
v_1	v_2

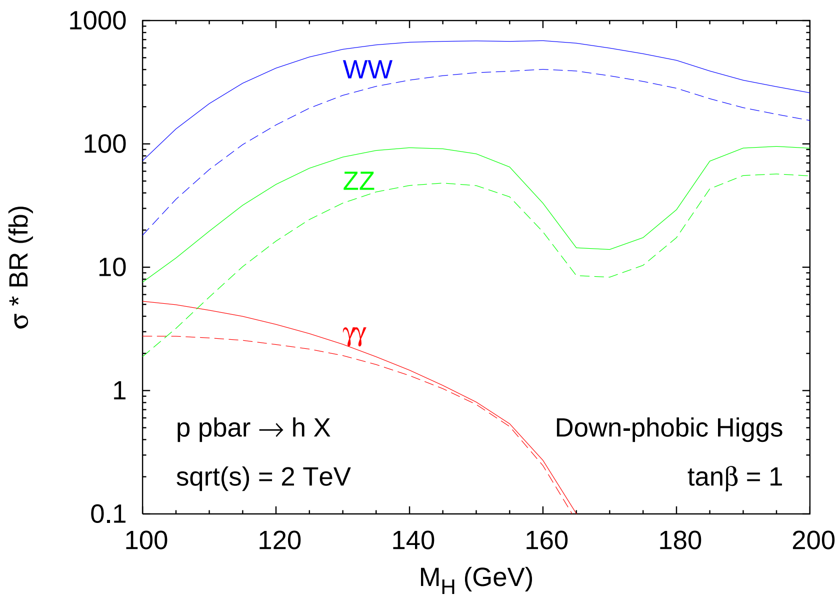


- $b\bar{b}$ gone

Down-phobic, continued



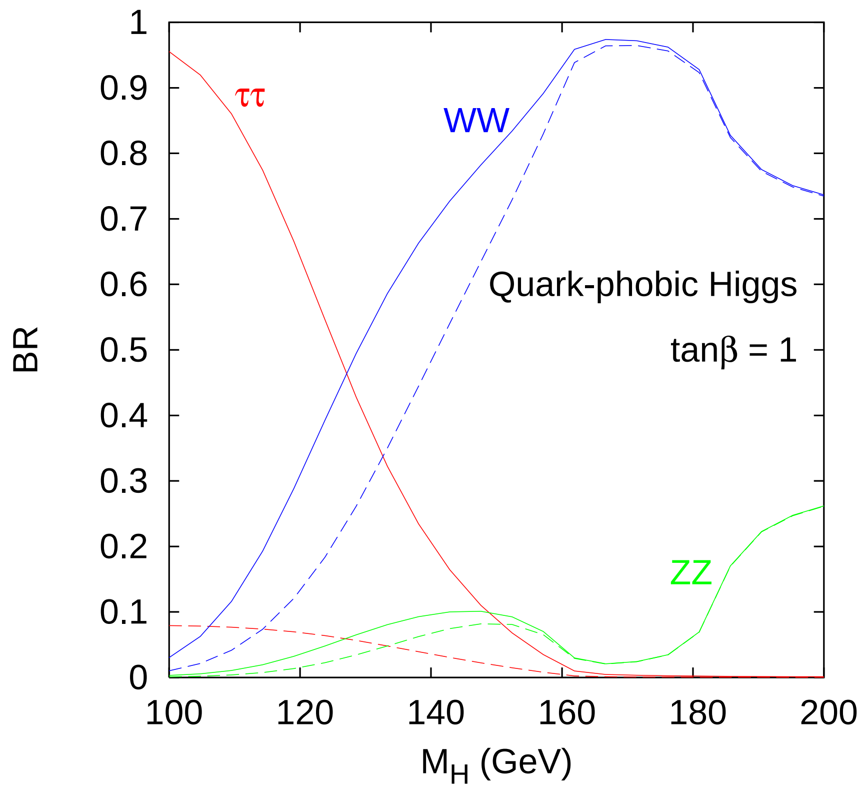
- $gg \to h$ enhanced: $t\bar{t}h = \text{SM} \times v_{SM}/v_1$
- $h + W/Z$, WBF $\propto v_1^2/v_{SM}^2$



- Overall enhancement of WW
- $b\bar{b}$ gone

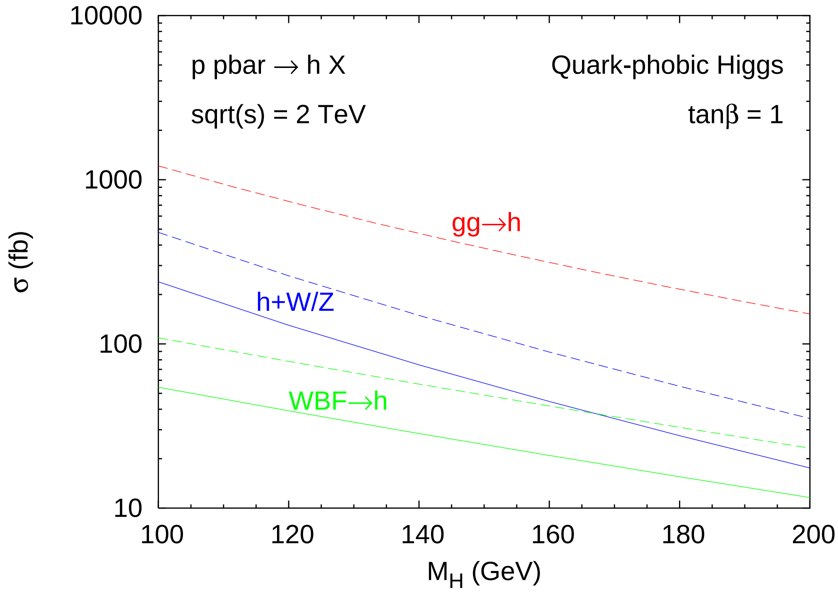
Quark-phobic

h^0	
τ	$t,\ b$
Φ_1	Φ_2
v_1	v_2

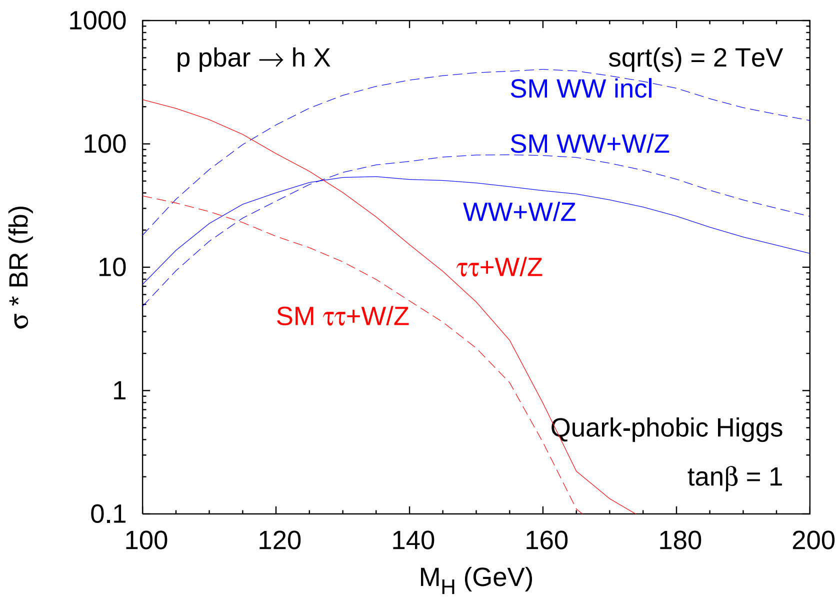


- $b\bar{b}$ gone
- $c\bar{c}$, gg gone
- $\tau\tau$ enhanced

Quark-phobic, continued



- $gg \to h$ gone
- $h + W/Z$, WBF $\propto v_1^2/v_{SM}^2$
- Identical to fermiophobic



- $\tau\tau + W/Z$ enhanced