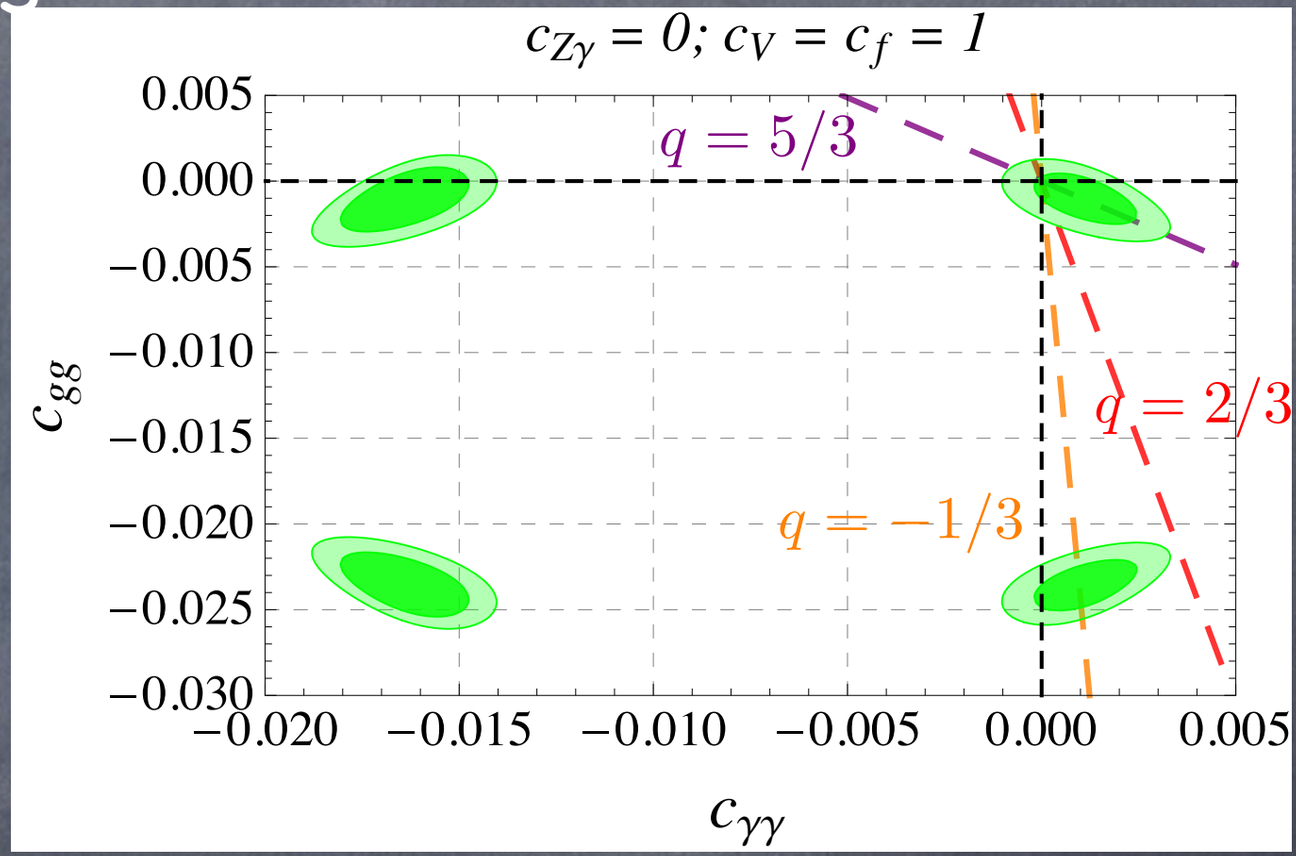
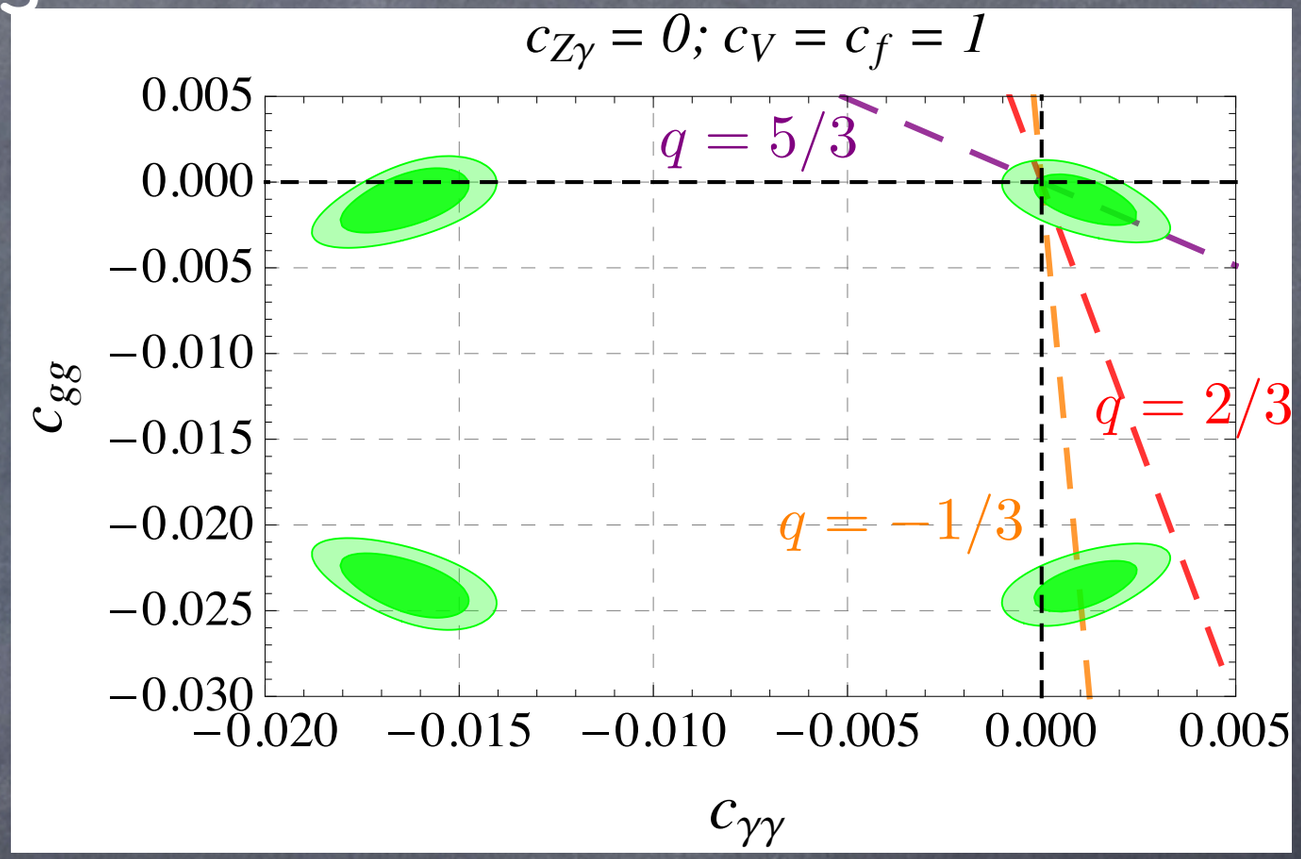
NGBHiggs loop-level couplings

CH models include states with q=5/3 (top partners):
Are gluon and photon couplings enhanced?



NGBHiggs loop-level couplings

CH models include states with q=5/3 (top partners):
Are gluon and photon couplings enhanced?



Typically* NO:

1) Shift-symmetry

$$\mathcal{O}_\gamma \equiv \frac{{g_Y}^2}{16\pi^2 f^2}\frac{y_{sm}^2}{g_\rho^2} H^\dagger H B_{\mu\nu} B^{\mu\nu}$$

2) Even if some states are light, effect compensated by modification of yukawa

Giudice,Grojean,Pomarol,Rattazzi '07
Falkowski'07; Low,Vichi'10; Azatov,Galloway '11;

3) $c_{Z\gamma}$ can be sizable...

* Exceptions: fully composite light flavors, large fermion representations

Delaunay,Grojean,Perez'13; Montull,FR,Salvioni,Torre' in progress...

3. SUSY

Two Higgs Doublets Models

heavy Higgs

$$m_h^2 \approx m_Z^2 + 16\delta_\lambda v^2$$

$$125^2\mathrm{GeV}^2 = 91^2\mathrm{GeV}^2 + 86^2\mathrm{GeV}^2$$

Blum,D'Agnolo,Fan'12; Azatov,Chang,Craig,Galloway'12

*Ignoring loop effects that couple b and Hu (Gupta,Rzehak,Wells'12)

Montull,Gupta, FR, '12

Two Higgs Doublets Models

heavy Higgs ⟷ modified Higgs couplings

$$m_h^2 \approx m_Z^2 + 16\delta_\lambda v^2$$

$$125^2\mathrm{GeV}^2 = 91^2\mathrm{GeV}^2 + 86^2\mathrm{GeV}^2$$

Need ~~SUSY~~ contributions to V(h,H)
(Heavy stops,D-terms,F-terms,...)

$$\Delta V = \delta_\lambda h^4 + \delta h^3 H + ...$$

Blum,D'Agnolo,Fan'12; Azatov,Chang,Craig,Galloway'12
Montull,Gupta, FR, '12

*Ignoring loop effects that couple b and Hu (Gupta,Rzehak,Wells'12)

Two Higgs Doublets Models

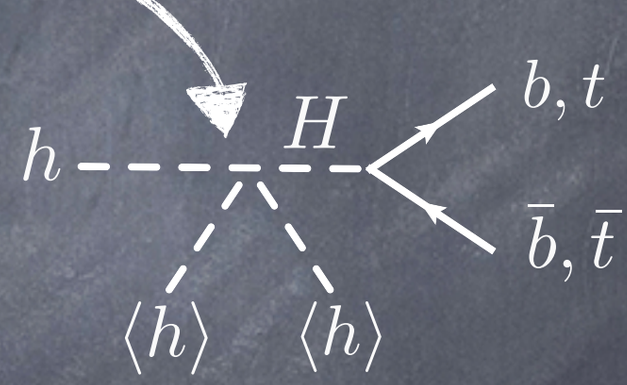
heavy Higgs ⟷ modified Higgs couplings

$$m_h^2 \approx m_Z^2 + 16\delta_\lambda v^2$$

$$125^2\mathrm{GeV}^2 = 91^2\mathrm{GeV}^2 + 86^2\mathrm{GeV}^2$$

Need ~~SUSY~~ contributions to V(h,H)
(Heavy stops,D-terms,F-terms,...)

$$\Delta V = \delta_\lambda h^4 + \delta h^3 H + \ldots$$



$$\frac{y_b}{y_b^{SM}} = 1 - 4\delta \tan\tilde{\beta}\frac{v^2}{m_H^2}$$

$$\frac{y_t}{y_t^{SM}} = 1 + 4\delta \cot\tilde{\beta}\frac{v^2}{m_H^2}$$

Blum,D'Agnolo,Fan'12; Azatov,Chang,Craig,Galloway'12
Montull,Gupta, FR, '12

*Ignoring loop effects that couple b and Hu (Gupta,Rzehak,Wells'12)