modern jet definitions:

sequential recombination:

• Durham algorithm:

distance between partons:
$$y_{ij} = \frac{2\min(E_i^2, E_j^2)(1 - \cos\theta_{ij})}{Q^2}$$

→ find the minimum y_{min} of all y_{ij}

→ if $y_{min} < y_{cut}$ recombine p_i, p_j to single 'pseudojet' with $p_{ij} = p_i + p_j$

→ stop, if there is no $y_{min} < y_{cut}$ left ⇒ all remaining 'pseudojets' are the jets

• k_T algorithm and variants:

$$d_{ij} = \min(k_{Ti}^{2p}, k_{Tj}^{2p})\frac{\Delta y^2 + \Delta\phi^2}{R^2} \qquad d_{iB} = k_{Ti}^{2p}$$

$p = 1$: k_T algorithm

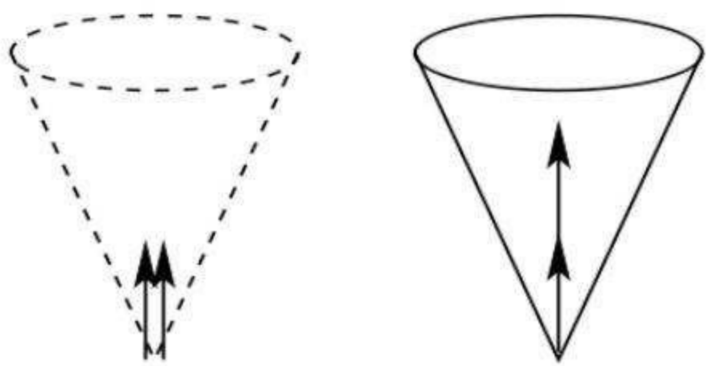
$p = 0$: Cambrige/Aachen algorithm

$p = -1$: anti-k_T algorithm

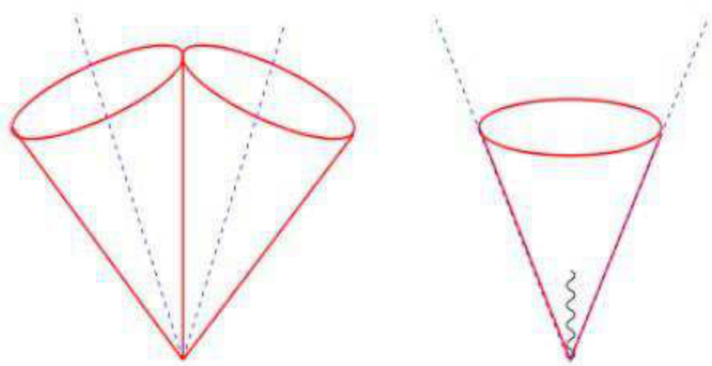
[if d_{iB} is smallest distance → discard parton i]

cone algorithms:

- find most energetic parton in event → SEED
- put a cone of radius R around the seed, sum up momenta of all particles enveloped by cone → TRIAL JET
- Compare trial jet axis with seed axis
- if identical within precision → STABLE CONE → JET
- remove all particles belonging to the jet, then proceed with next most energetic particle as seed
- otherwise, iterate with trial jet axis as new seed until convergence
- until no seeds above certain threshold (CMS: 1GeV) are left



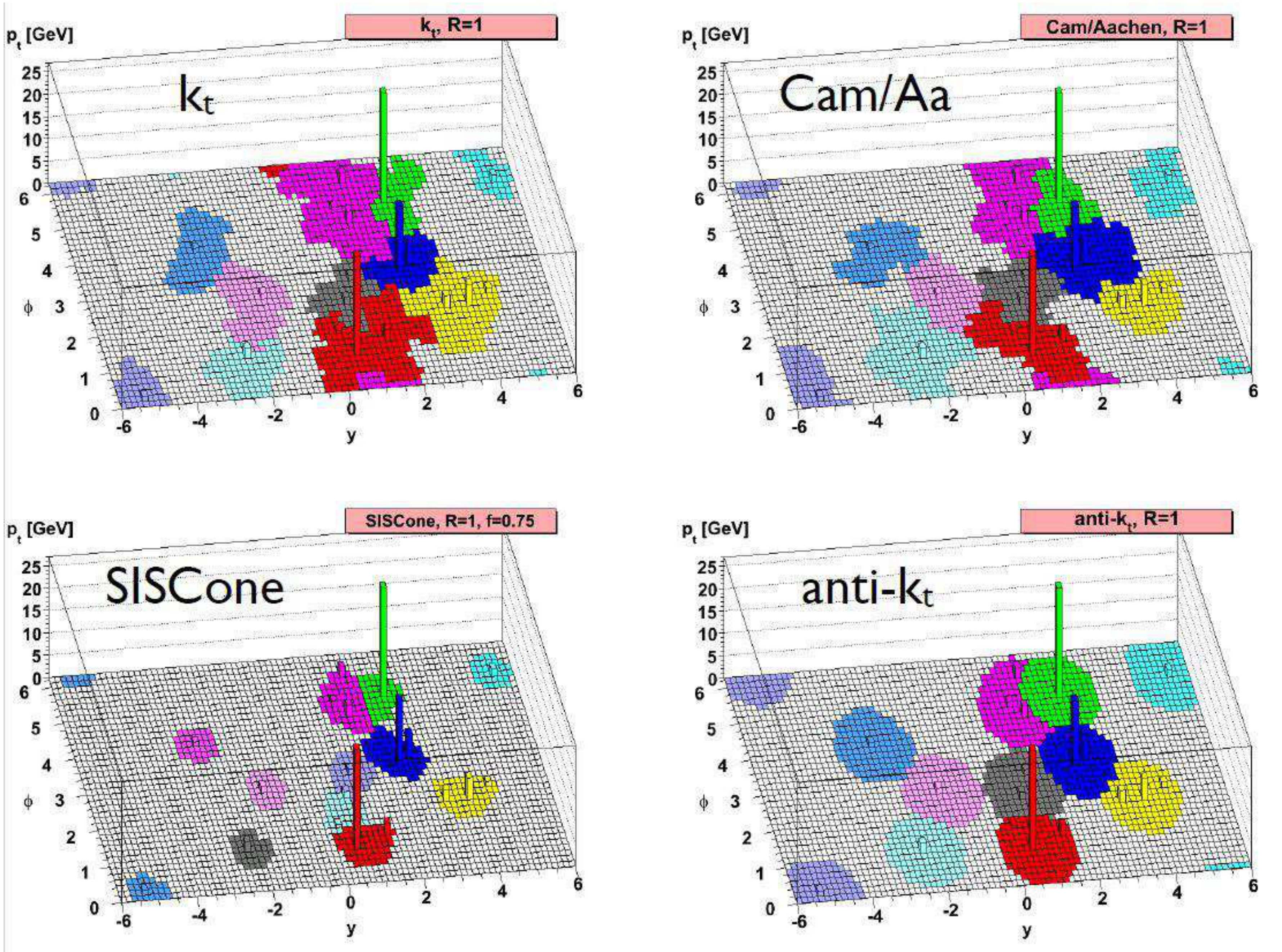
collinear safety



infrared safety

[→ seedless SISCONE algorithm]

jet areas:

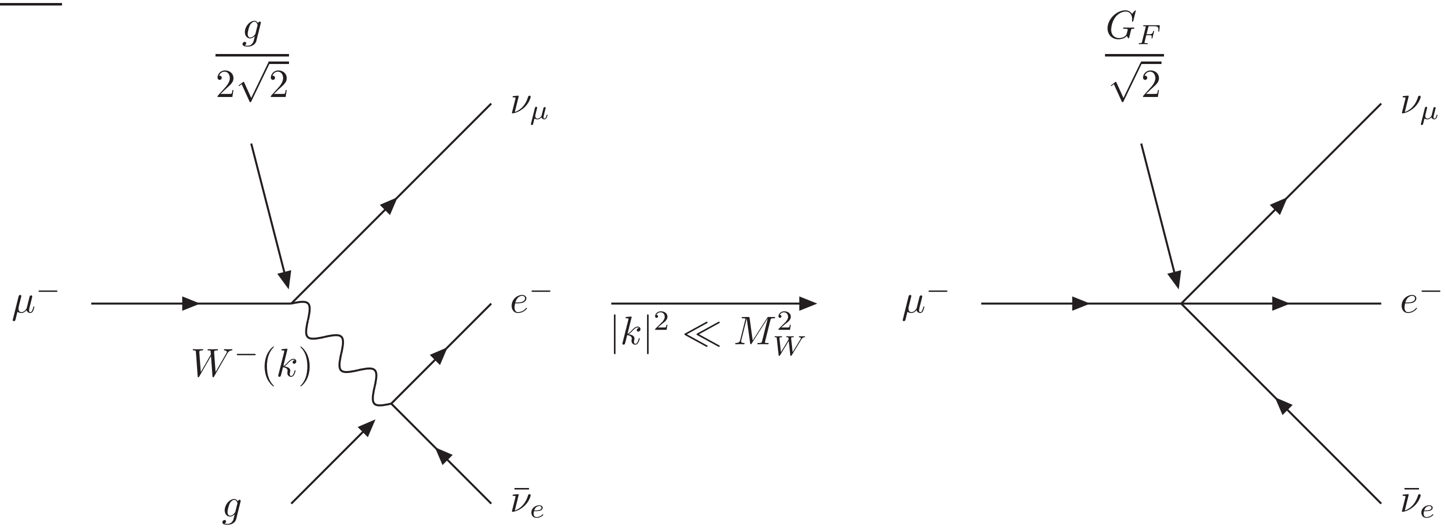


p_t [GeV]
k_t, R=1
k_t
Cam/Aachen, R=1
Cam/Aa
SISCone, R=1, f=0.75
SISCone
anti-k_t, R=1
anti-k_t
φ
y

§11. Effective Field Theories

(i) Fermi Theory

muon decay:



[Fermi theory]

$$\mathcal{L}_{eff} = \frac{G_F}{\sqrt{2}} \bar{\nu}_\mu (1-\gamma_5)\mu \cdot \bar{e}(1-\gamma_5)\nu_e \qquad \text{[4-fermion interaction]}$$

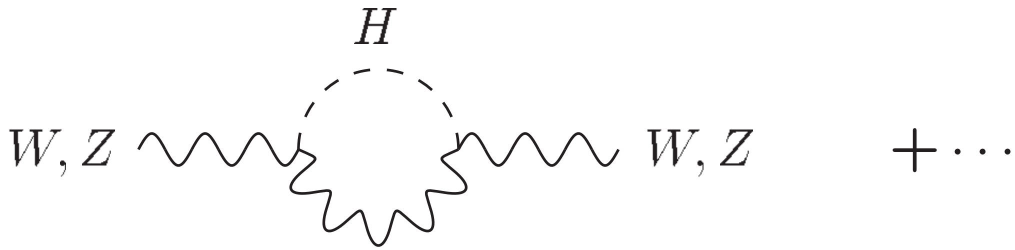
matching:

$$\boxed{\frac{G_F}{\sqrt{2}} = \frac{g^2}{8M_W^2} = \frac{\pi\alpha}{2M_W^2 \sin^2\theta_W}}$$

$$G_F = 1.1663788(7) \cdot 10^{-5}\ \text{GeV}^{-2}$$

$$v = \frac{2M_W}{g} = \frac{1}{\sqrt{\sqrt{2}G_F}} \approx 246\ \text{GeV}$$

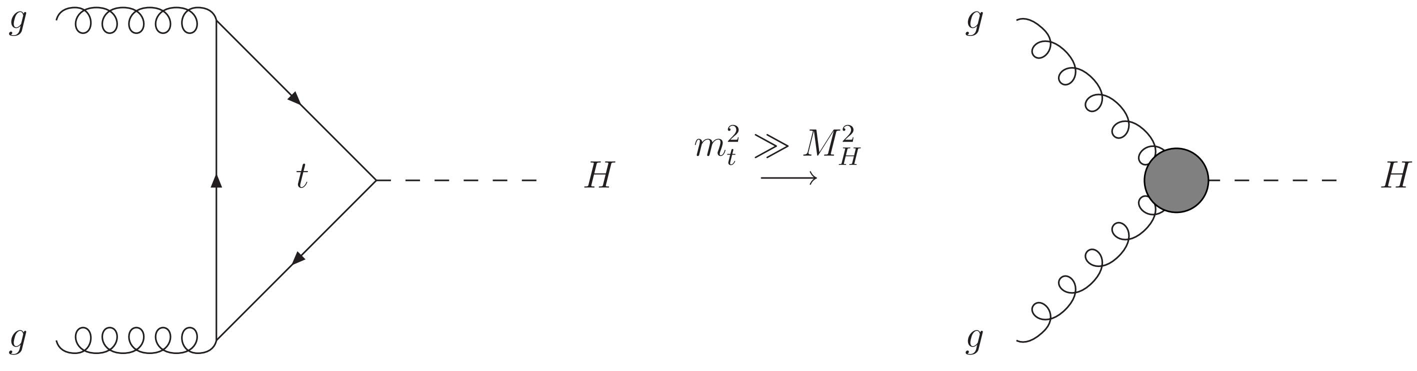
higher orders:



$$G_F = \frac{\pi\alpha}{\sqrt{2} M_W^2 \sin^2\theta_W}[1 + \Delta r]$$

$\Rightarrow$ matching: connection Wilson coeff. $\leftrightarrow$ full theory incl. HOs

(ii) Heavy Top Quark



$$\mathcal{M} = F(\tau)[k_{2\mu}k_{1\nu} - (k_1 k_2) g_{\mu\nu}]\epsilon_1^\mu \epsilon_2^\nu \qquad \tau = \frac{4m_t^2}{M_H^2}$$

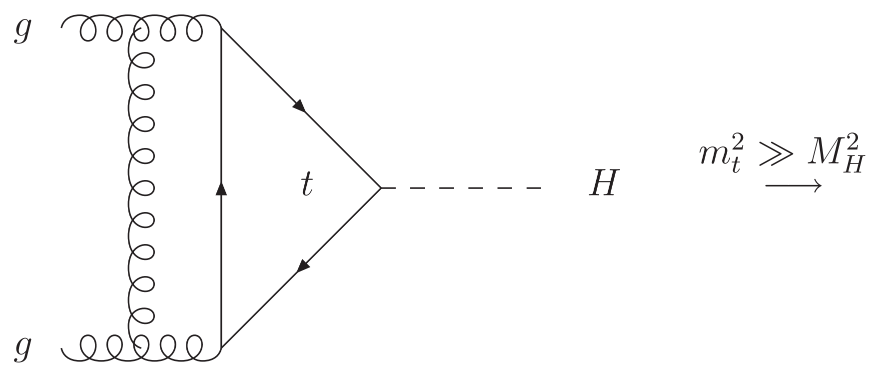
$$F(\tau) = \delta_{ab}\frac{\alpha_s}{2\pi v}\tau[1 + (1-\tau)f(\tau)]$$

$$f(\tau) = \begin{cases} \arcsin^2 \frac{1}{\sqrt{\tau}} & \tau \geq 1 \\ -\frac{1}{4}\left[\log\frac{1+\sqrt{1-\tau}}{1-\sqrt{1-\tau}} - i\pi\right]^2 & \tau < 1 \end{cases}$$

$$F(\tau) \to \delta_{ab}\frac{\alpha_s}{3\pi v} \qquad (m_t^2 \gg M_H^2)$$

$$\leftrightarrow \qquad \boxed{\mathcal{L}_{eff} = \frac{\alpha_s}{12\pi} G^{a\mu\nu} G^a_{\mu\nu} \frac{H}{v}}$$

NLO:



$$\mathcal{L}_{eff} = C_1 \frac{\alpha_s}{12\pi} G^{a\mu\nu} G^a_{\mu\nu} \frac{H}{v}$$
$$C_1 = 1 + \frac{11}{4}\frac{\alpha_s}{\pi}$$

NNLO: $(N_F = 5)$

$$C_1 = 1 + \frac{11}{4}\frac{\alpha_s}{\pi} + \left[\frac{2777}{288} + \frac{19}{16}(\Delta + L_t) + N_F\left(\frac{\Delta + L_t}{3} - \frac{67}{96}\right)\right]\left(\frac{\alpha_s}{\pi}\right)^2$$
$$L_t = \log\frac{\mu^2}{m_t^2}$$
$$\Delta = \frac{1}{\epsilon} - \gamma_E + \log(4\pi)$$

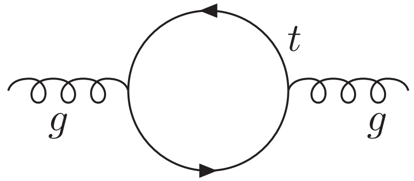
→ $\overline{\text{MS}}$ subtraction ($\Delta \to 0$) ⇒ C_1 renormalized at NNLO

C_1 known up to N^{4}LO → N^{3}LO used for N^{3}LO corrections to $gg \to H$

why $N_F = 5$?

- decoupling of heavy top quark (no logs!)

- running of α_s:



$$\alpha_s^{(5)}(\mu) = \alpha_s^{(6)}(\mu)\left[1 - \frac{\alpha_s}{6\pi}\log\frac{\mu^2}{m_t^2}\right]$$

generically:

$$\alpha_s^{(5)}(\mu) = \zeta_{\alpha_s}\ \alpha_s^{(6)}(\mu)$$

ζ_{α_s} known to N^{4}LO 5FS $\leftrightarrow$ 6FS [5FS: no top PDFs]

different counter terms for α_s: $\delta\alpha_s^{(5)} = \delta\alpha_s^{(6)} + \frac{\alpha_s^2}{6\pi}\log\frac{\mu^2}{m_t^2}$

[analogous: 4FS, 3FS]

(iii) SMEFT

- effective higher dimension operators up to dim 6

Buchmüller, Wyler
Grzadkowski, Iskrzynski, Misiak, Rosiek
Giudice, Grojean, Pomarol, Rattazzi

$$\begin{aligned}\mathcal{L} &= \mathcal{L}_{SM} + \frac{1}{\Lambda^2}\sum_i \alpha_i O_i \\ &\equiv \mathcal{L}_{SM} + \sum_i \bar{c}_i O_i \\ &\equiv \mathcal{L}_{SM} + \Delta\mathcal{L}_{SILH} + \Delta\mathcal{L}_{F_1} + \Delta\mathcal{L}_{F_2} + \Delta\mathcal{L}_{bos} + \Delta\mathcal{L}_{4f} + \Delta\mathcal{L}_{\mathcal{CP}}\end{aligned}$$

[assume Λ large]

- assume Higgs $SU(2)$-doublet

$$H = \begin{pmatrix} \phi^+ \\ \phi^0 \end{pmatrix}$$

$$
\begin{aligned}
\Delta\mathcal{L}_{SILH} &= \frac{\bar{c}_H}{2v^2}\,\partial^\mu\left(H^\dagger H\right)\partial_\mu\left(H^\dagger H\right) + \frac{\bar{c}_T}{2v^2}\left(H^\dagger \overleftrightarrow{D^\mu} H\right)\left(H^\dagger \overleftrightarrow{D}_\mu H\right) - \frac{\bar{c}_6\,\lambda}{v^2}\left(H^\dagger H\right)^3 \\
&+ \left(\frac{\bar{c}_u}{v^2}\,y_u\,H^\dagger H\,\bar{q}_L H^c u_R + \frac{\bar{c}_d}{v^2}\,y_d\,H^\dagger H\,\bar{q}_L H d_R + \frac{\bar{c}_l}{v^2}\,y_l\,H^\dagger H\,\bar{L}_L H l_R + h.c.\right) \\
&+ \frac{i\bar{c}_W\,g}{2m_W^2}\left(H^\dagger \sigma^i \overleftrightarrow{D^\mu} H\right)(D^\nu W_{\mu\nu})^i + \frac{i\bar{c}_B\,g'}{2m_W^2}\left(H^\dagger \overleftrightarrow{D^\mu} H\right)(\partial^\nu B_{\mu\nu}) \\
&+ \frac{i\bar{c}_{HW}\,g}{m_W^2}\,(D^\mu H)^\dagger \sigma^i (D^\nu H) W^i_{\mu\nu} + \frac{i\bar{c}_{HB}\,g'}{m_W^2}\,(D^\mu H)^\dagger (D^\nu H) B_{\mu\nu} \\
&+ \frac{\bar{c}_\gamma\,{g'}^2}{m_W^2}\,H^\dagger H B_{\mu\nu} B^{\mu\nu} + \frac{\bar{c}_g\,g_S^2}{m_W^2}\,H^\dagger H G^a_{\mu\nu} G^{a\mu\nu} \\
\Delta\mathcal{L}_{F_1} &= \frac{i\bar{c}_{Hq}}{v^2}\,(\bar{q}_L\gamma^\mu q_L)\left(H^\dagger \overleftrightarrow{D}_\mu H\right) + \frac{i\bar{c}'_{Hq}}{v^2}\left(\bar{q}_L\gamma^\mu\sigma^i q_L\right)\left(H^\dagger \sigma^i \overleftrightarrow{D}_\mu H\right) \\
&+ \frac{i\bar{c}_{Hu}}{v^2}\,(\bar{u}_R\gamma^\mu u_R)\left(H^\dagger \overleftrightarrow{D}_\mu H\right) + \frac{i\bar{c}_{Hd}}{v^2}\left(\bar{d}_R\gamma^\mu d_R\right)\left(H^\dagger \overleftrightarrow{D}_\mu H\right) \\
&+ \left(\frac{i\bar{c}_{Hud}}{v^2}\,(\bar{u}_R\gamma^\mu d_R)\left(H^{c\,\dagger} \overleftrightarrow{D}_\mu H\right) + h.c.\right) \\
&+ \frac{i\bar{c}_{HL}}{v^2}\left(\bar{L}_L\gamma^\mu L_L\right)\left(H^\dagger \overleftrightarrow{D}_\mu H\right) + \frac{i\bar{c}'_{HL}}{v^2}\left(\bar{L}_L\gamma^\mu\sigma^i L_L\right)\left(H^\dagger \sigma^i \overleftrightarrow{D}_\mu H\right) \\
&+ \frac{i\bar{c}_{Hl}}{v^2}\left(\bar{l}_R\gamma^\mu l_R\right)\left(H^\dagger \overleftrightarrow{D}_\mu H\right) \\
\Delta\mathcal{L}_{F_2} &= \frac{\bar{c}_{uB}\,g'}{m_W^2}\,y_u\,\bar{q}_L H^c \sigma^{\mu\nu} u_R\,B_{\mu\nu} + \frac{\bar{c}_{uW}\,g}{m_W^2}\,y_u\,\bar{q}_L \sigma^i H^c \sigma^{\mu\nu} u_R\,W^i_{\mu\nu} + \frac{\bar{c}_{uG}\,g_S}{m_W^2}\,y_u\,\bar{q}_L H^c \sigma^{\mu\nu}\lambda^a u_R\,G^a_{\mu\nu} \\
&+ \frac{\bar{c}_{dB}\,g'}{m_W^2}\,y_d\,\bar{q}_L H \sigma^{\mu\nu} d_R\,B_{\mu\nu} + \frac{\bar{c}_{dW}\,g}{m_W^2}\,y_d\,\bar{q}_L \sigma^i H \sigma^{\mu\nu} d_R\,W^i_{\mu\nu} + \frac{\bar{c}_{dG}\,g_S}{m_W^2}\,y_d\,\bar{q}_L H \sigma^{\mu\nu}\lambda^a d_R\,G^a_{\mu\nu} \\
&+ \frac{\bar{c}_{lB}\,g'}{m_W^2}\,y_l\,\bar{L}_L H \sigma^{\mu\nu} l_R\,B_{\mu\nu} + \frac{\bar{c}_{lW}\,g}{m_W^2}\,y_l\,\bar{L}_L \sigma^i H \sigma^{\mu\nu} l_R\,W^i_{\mu\nu} + h.c.
\end{aligned}
$$

$$
\begin{aligned}
\Delta\mathcal{L}_{bos} &= \frac{\bar{c}_{3W}\, g^3}{m_W^2}\,\epsilon^{ijk} W_\mu^{i\,\nu} W_\nu^{j\,\rho} W_\rho^{k\,\mu} + \frac{\bar{c}_{3G}\, g_S^3}{m_W^2}\, f^{abc} G_\mu^{a\,\nu} G_\nu^{b\,\rho} G_\rho^{c\,\mu} \\
&+ \frac{\bar{c}_{2W}}{m_W^2}\,(D^\mu W_{\mu\nu})^i\,(D_\rho W^{\rho\nu})^i + \frac{\bar{c}_{2B}}{m_W^2}\,(\partial^\mu B_{\mu\nu})\,(\partial_\rho B^{\rho\nu}) + \frac{\bar{c}_{2G}}{m_W^2}\,(D^\mu G_{\mu\nu})^a\,(D_\rho G^{\rho\nu})^a \\
\Delta\mathcal{L}_{4f} &= \sum_{\psi,L/R,T^a} \bar{\psi}_i \gamma^\mu T^a \psi_j \bar{\psi}_k \gamma_\mu T^a \psi_l + \bar{\psi}_i T^a \psi_j \bar{\psi}_k T^a \psi_l \\
\Delta\mathcal{L}_{\mathcal{CP}} &= \frac{i\tilde{c}_{HW}\, g}{m_W^2}\,(D^\mu H)^\dagger \sigma^i (D^\nu H)\tilde{W}^i_{\mu\nu} + \frac{i\tilde{c}_{HB}\, g'}{m_W^2}\,(D^\mu H)^\dagger (D^\nu H)\tilde{B}_{\mu\nu} \\
&+ \frac{\tilde{c}_\gamma\, g'^2}{m_W^2}\, H^\dagger H B_{\mu\nu}\tilde{B}^{\mu\nu} + \frac{\tilde{c}_g\, g_S^2}{m_W^2}\, H^\dagger H G^a_{\mu\nu}\tilde{G}^{a\mu\nu} \\
&+ \frac{\tilde{c}_{3W}\, g^3}{m_W^2}\,\epsilon^{ijk} W_\mu^{i\,\nu} W_\nu^{j\,\rho} \tilde{W}_\rho^{k\,\mu} + \frac{\tilde{c}_{3G}\, g_S^3}{m_W^2}\, f^{abc} G_\mu^{a\,\nu} G_\nu^{b\,\rho} \tilde{G}_\rho^{c\,\mu}
\end{aligned}
$$

$$
\tilde{V}_{\mu\nu} = \frac{1}{2}\epsilon_{\mu\nu\alpha\beta} V^{\alpha\beta}
$$

- after using EOM: 53 (59) independent dim6 operators

- 3 generations $\Rightarrow$ 2499 operators in total

- classification: $[\Phi = H,\ \tilde\Phi = i\sigma^2\Phi^*]$

Φ^6 and $\Phi^4 D^2$	$\psi^2\Phi^3$	X^3
$\mathcal{O}_\Phi = (\Phi^\dagger\Phi)^3$	$\mathcal{O}_{e\Phi} = (\Phi^\dagger\Phi)(\bar\ell\,\Gamma_e e\Phi)$	$\mathcal{O}_G = f^{ABC} G_\mu^{A\nu} G_\nu^{B\rho} G_\rho^{C\mu}$
$\mathcal{O}_{\Phi\Box} = (\Phi^\dagger\Phi)\Box(\Phi^\dagger\Phi)$	$\mathcal{O}_{u\Phi} = (\Phi^\dagger\Phi)(\bar q\,\Gamma_u u\widetilde\Phi)$	$\mathcal{O}_{\widetilde G} = f^{ABC} \widetilde G_\mu^{A\nu} G_\nu^{B\rho} G_\rho^{C\mu}$
$\mathcal{O}_{\Phi D} = (\Phi^\dagger D^\mu\Phi)^*(\Phi^\dagger D_\mu\Phi)$	$\mathcal{O}_{d\Phi} = (\Phi^\dagger\Phi)(\bar q\,\Gamma_d d\Phi)$	$\mathcal{O}_W = \varepsilon^{IJK} W_\mu^{I\nu} W_\nu^{J\rho} W_\rho^{K\mu}$
		$\mathcal{O}_{\widetilde W} = \varepsilon^{IJK} \widetilde W_\mu^{I\nu} W_\nu^{J\rho} W_\rho^{K\mu}$
$X^2\Phi^2$	$\psi^2 X\Phi$	$\psi^2\Phi^2 D$
$\mathcal{O}_{\Phi G} = (\Phi^\dagger\Phi) G_{\mu\nu}^A G^{A\mu\nu}$	$\mathcal{O}_{uG} = (\bar q\sigma^{\mu\nu}\frac{\lambda^A}{2}\Gamma_u u\widetilde\Phi) G_{\mu\nu}^A$	$\mathcal{O}_{\Phi\ell}^{(1)} = (\Phi^\dagger i\overleftrightarrow{D}_\mu\Phi)(\bar\ell\gamma^\mu\ell)$
$\mathcal{O}_{\Phi\widetilde G} = (\Phi^\dagger\Phi)\widetilde G_{\mu\nu}^A G^{A\mu\nu}$	$\mathcal{O}_{dG} = (\bar q\sigma^{\mu\nu}\frac{\lambda^A}{2}\Gamma_d d\Phi) G_{\mu\nu}^A$	$\mathcal{O}_{\Phi\ell}^{(3)} = (\Phi^\dagger i\overleftrightarrow{D}_\mu^I\Phi)(\bar\ell\gamma^\mu\tau^I\ell)$
$\mathcal{O}_{\Phi W} = (\Phi^\dagger\Phi) W_{\mu\nu}^I W^{I\mu\nu}$	$\mathcal{O}_{eW} = (\bar\ell\sigma^{\mu\nu}\Gamma_e e\tau^I\Phi) W_{\mu\nu}^I$	$\mathcal{O}_{\Phi e} = (\Phi^\dagger i\overleftrightarrow{D}_\mu\Phi)(\bar e\gamma^\mu e)$
$\mathcal{O}_{\Phi\widetilde W} = (\Phi^\dagger\Phi)\widetilde W_{\mu\nu}^I W^{I\mu\nu}$	$\mathcal{O}_{uW} = (\bar q\sigma^{\mu\nu}\Gamma_u u\tau^I\widetilde\Phi) W_{\mu\nu}^I$	$\mathcal{O}_{\Phi q}^{(1)} = (\Phi^\dagger i\overleftrightarrow{D}_\mu\Phi)(\bar q\gamma^\mu q)$
$\mathcal{O}_{\Phi B} = (\Phi^\dagger\Phi) B_{\mu\nu} B^{\mu\nu}$	$\mathcal{O}_{dW} = (\bar q\sigma^{\mu\nu}\Gamma_d d\tau^I\Phi) W_{\mu\nu}^I$	$\mathcal{O}_{\Phi q}^{(3)} = (\Phi^\dagger i\overleftrightarrow{D}_\mu^I\Phi)(\bar q\gamma^\mu\tau^I q)$
$\mathcal{O}_{\Phi\widetilde B} = (\Phi^\dagger\Phi)\widetilde B_{\mu\nu} B^{\mu\nu}$	$\mathcal{O}_{eB} = (\bar\ell\sigma^{\mu\nu}\Gamma_e e\Phi) B_{\mu\nu}$	$\mathcal{O}_{\Phi u} = (\Phi^\dagger i\overleftrightarrow{D}_\mu\Phi)(\bar u\gamma^\mu u)$
$\mathcal{O}_{\Phi WB} = (\Phi^\dagger\tau^I\Phi) W_{\mu\nu}^I B^{\mu\nu}$	$\mathcal{O}_{uB} = (\bar q\sigma^{\mu\nu}\Gamma_u u\widetilde\Phi) B_{\mu\nu}$	$\mathcal{O}_{\Phi d} = (\Phi^\dagger i\overleftrightarrow{D}_\mu\Phi)(\bar d\gamma^\mu d)$
$\mathcal{O}_{\Phi\widetilde WB} = (\Phi^\dagger\tau^I\Phi)\widetilde W_{\mu\nu}^I B^{\mu\nu}$	$\mathcal{O}_{dB} = (\bar q\sigma^{\mu\nu}\Gamma_d d\Phi) B_{\mu\nu}$	$\mathcal{O}_{\Phi ud} = i(\widetilde\Phi^\dagger D_\mu\Phi)(\bar u\gamma^\mu\Gamma_{ud} d)$

• power counting: $H \to \mathcal{O}(g_*/M = 1/f)$, $\partial_\mu \to \mathcal{O}(1/M)$

$\Rightarrow$ expansion in H/f and E/M

$$\bar{c}_H, \bar{c}_T, \bar{c}_6, \bar{c}_\psi \sim O\left(\frac{v^2}{f^2}\right), \quad \bar{c}_W, \bar{c}_B \sim O\left(\frac{m_W^2}{M^2}\right), \quad \bar{c}_{HW}, \bar{c}_{HB}, \bar{c}_\gamma, \bar{c}_g \sim O\left(\frac{m_W^2}{16\pi^2 f^2}\right)$$

$$\bar{c}_{H\psi}, \bar{c}'_{H\psi} \sim O\left(\frac{\lambda_\psi^2}{g_*^2}\frac{v^2}{f^2}\right), \quad \bar{c}_{Hud} \sim O\left(\frac{\lambda_u\lambda_d}{g_*^2}\frac{v^2}{f^2}\right), \quad \bar{c}_{\psi W}, \bar{c}_{\psi B}, \bar{c}_{\psi G} \sim O\left(\frac{m_W^2}{16\pi^2 f^2}\right)$$

Giudice, Grojean, Pomarol, Rattazzi

• canonical normalization, unitary gauge:

$$\begin{aligned} v^2 &= v_{SM}^2\left(1 + \frac{3}{4}\bar{c}_6\right) \\ h_{SM} &= h\left[1 - \frac{\bar{c}_H}{2} - \frac{\bar{c}_T}{8}\right] - \frac{3}{8}\bar{c}_6 v \\ m_h^2 &= m_{h_{SM}}^2\left[1 - \bar{c}_H + \frac{3}{2}\bar{c}_6 - \frac{1}{2}\bar{c}_T\right] \qquad etc. \end{aligned}$$

can be used at HO with $\overline{\text{MS}}$ renormalization [w/o matching]

$$\mathcal{L} = \frac{1}{2}\partial_\mu h\, \partial^\mu h - \frac{1}{2}m_h^2 h^2 - c_3 \frac{1}{6}\left(\frac{3m_h^2}{v}\right) h^3 - \sum_{\psi=u,d,l} m_{\psi^{(i)}}\, \bar{\psi}^{(i)}\psi^{(i)} \left(1 + c_\psi \frac{h}{v} + \dots\right)$$
$$+ m_W^2\, W_\mu W^\mu \left(1 + 2c_W \frac{h}{v} + \dots\right) + \frac{1}{2} m_Z^2\, Z_\mu Z^\mu \left(1 + 2c_Z \frac{h}{v} + \dots\right) + \dots$$
$$+ \left(c_{WW}\, W_{\mu\nu}^+ W^{-\mu\nu} + \frac{c_{ZZ}}{2} Z_{\mu\nu} Z^{\mu\nu} + c_{Z\gamma}\, Z_{\mu\nu}\gamma^{\mu\nu} + \frac{c_{\gamma\gamma}}{2}\gamma_{\mu\nu}\gamma^{\mu\nu} + \frac{c_{gg}}{2} G_{\mu\nu}^a G^{a\mu\nu}\right)\frac{h}{v}$$
$$+ \left(c_{W\partial W}\left(W_\nu^- D_\mu W^{+\mu\nu} + h.c.\right) + c_{Z\partial Z}\, Z_\nu \partial_\mu Z^{\mu\nu} + c_{Z\partial\gamma}\, Z_\nu \partial_\mu \gamma^{\mu\nu}\right)\frac{h}{v} + \dots$$

Higgs couplings	$\Delta\mathcal{L}_{SILH}$	MCHM4	MCHM5
c_W	$1 - \bar{c}_H/2$	$\sqrt{1-\xi}$	$\sqrt{1-\xi}$
c_Z	$1 - \bar{c}_H/2 - 2\bar{c}_T$	$\sqrt{1-\xi}$	$\sqrt{1-\xi}$
$c_\psi \;\; (\psi = u,d,l)$	$1 - (\bar{c}_H/2 + \bar{c}_\psi)$	$\sqrt{1-\xi}$	$\frac{1-2\xi}{\sqrt{1-\xi}}$
c_3	$1 + \bar{c}_6 - 3\bar{c}_H/2$	$\sqrt{1-\xi}$	$\frac{1-2\xi}{\sqrt{1-\xi}}$
c_{gg}	$8\,(\alpha_s/\alpha_2)\,\bar{c}_g$	0	0
$c_{\gamma\gamma}$	$8\sin^2\theta_W\,\bar{c}_\gamma$	0	0
$c_{Z\gamma}$	$\left(\bar{c}_{HB} - \bar{c}_{HW} - 8\,\bar{c}_\gamma \sin^2\theta_W\right)\tan\theta_W$	0	0
c_{WW}	$-2\,\bar{c}_{HW}$	0	0
c_{ZZ}	$-2\left(\bar{c}_{HW} + \bar{c}_{HB}\tan^2\theta_W - 4\bar{c}_\gamma \tan^2\theta_W \sin^2\theta_W\right)$	0	0
$c_{W\partial W}$	$-2(\bar{c}_W + \bar{c}_{HW})$	0	0
$c_{Z\partial Z}$	$-2(\bar{c}_W + \bar{c}_{HW}) - 2\,(\bar{c}_B + \bar{c}_{HB})\tan^2\theta_W$	0	0
$c_{Z\partial\gamma}$	$2\,(\bar{c}_B + \bar{c}_{HB} - \bar{c}_W - \bar{c}_{HW})\tan\theta_W$	0	0

small deviations from SM couplings

Contino, Ghezzi, Grojean, Mühlleitner, S.

- example: Hgg coupling

$$\mathcal{L}_{eff} \;\to\; \left\{ c_t \; C_1 \, \frac{\alpha_s}{12\pi} + \frac{c_{gg}}{2} \right\} G^{a\mu\nu} G^a_{\mu\nu} \frac{H}{v}$$

no radiative corrections to c_{gg}, but $\overline{\text{MS}}$-renormalized

directly applicable to $gg \to H$ and $h \to gg$