

SM (1-loop counter terms)

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[FF] **2 Leptons**

$$C_{18}(\bar{\nu}_{g1}, \nu_{g2}) = i \begin{bmatrix} -\left(\frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{\nu,L}\right) - \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{\nu,L*} \\ \hline \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{\nu,R} + \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{\nu,R*} \\ \hline 0 \\ \hline 0 \end{bmatrix}$$

$$C_{19}(\bar{e}_{g1}, e_{g2}) = i \begin{bmatrix} -\left(\frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,L}\right) - \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,L*} \\ \hline \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,R} + \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,R*} \\ \hline -\left(\frac{1}{2}\delta_{g1,g2}m_{e_{g1}}\delta Z_{g1,g1}^{e,L}\right) - \frac{1}{2}\delta_{g1,g2}m_{e_{g2}}\delta Z_{g2,g2}^{e,R*} - \delta_{g1,g2}\delta m_{g1}^{e_g} \\ \hline -\left(\frac{1}{2}\delta_{g1,g2}m_{e_{g1}}\delta Z_{g1,g1}^{e,R}\right) - \frac{1}{2}\delta_{g1,g2}m_{e_{g2}}\delta Z_{g2,g2}^{e,L*} - \delta_{g1,g2}\delta m_{g1}^{e_g} \end{bmatrix}$$

[FF] **2 Quarks**

$$C_{20}(\bar{u}_{g1}, u_{g2}) = i \begin{bmatrix} -\left(\frac{1}{2}\delta Z_{g1,g2}^{u,L}\right) - \frac{1}{2}\delta Z_{g2,g1}^{u,L*} \\ \hline \frac{1}{2}\delta Z_{g1,g2}^{u,R} + \frac{1}{2}\delta Z_{g2,g1}^{u,R*} \\ \hline -\left(\frac{1}{2}m_{u_{g1}}\delta Z_{g1,g2}^{u,L}\right) - \frac{1}{2}m_{u_{g2}}\delta Z_{g2,g1}^{u,R*} - \delta_{g1,g2}\delta m_{g1}^{u_g} \\ \hline -\left(\frac{1}{2}m_{u_{g1}}\delta Z_{g1,g2}^{u,R}\right) - \frac{1}{2}m_{u_{g2}}\delta Z_{g2,g1}^{u,L*} - \delta_{g1,g2}\delta m_{g1}^{u_g} \end{bmatrix}$$

$$C_{21}(\bar{d}_{g1}, d_{g2}) = i \left[\frac{-\left(\frac{1}{2}\delta Z_{g1,g2}^{d,L}\right) - \frac{1}{2}\delta Z_{g2,g1}^{d,L*}}{\frac{1}{2}\delta Z_{g1,g2}^{d,R} + \frac{1}{2}\delta Z_{g2,g1}^{d,R*}} \right. \\ \left. - \left(\frac{1}{2}m_{d_{g1}}\delta Z_{g1,g2}^{d,L}\right) - \frac{1}{2}m_{d_{g2}}\delta Z_{g2,g1}^{d,R*} - \delta_{g1,g2}\delta m_{g1}^{d_g} \right. \\ \left. - \left(\frac{1}{2}m_{d_{g1}}\delta Z_{g1,g2}^{d,R}\right) - \frac{1}{2}m_{d_{g2}}\delta Z_{g2,g1}^{d,L*} - \delta_{g1,g2}\delta m_{g1}^{d_g} \right]$$

[SS] **2 Higgs**

$$C_9(H, H) = -i \left[\frac{\delta Z_H}{(\delta Z_H) M_H^2 + \delta M_H^2} \right]$$

$$C_{10}(G^0, G^0) = i \left[\frac{-\delta Z_{G^0}}{\frac{e(\delta T_H)}{2M_W s_W}} \right]$$

$$C_{11}(G^-, G^+) = i \left[\frac{-\delta Z_G}{\frac{e(\delta T_H)}{2M_W s_W}} \right]$$

[SV] **Higgs – Gauge Boson**

$$C_5(G^-, W^+) = \left(\frac{1}{4}iM_W\right) \left(\frac{\delta M_W^2}{M_W^2} + \delta Z_G + \delta Z_W\right) \left[\frac{-1}{1} \right]$$

$$C_6(G^+, W^-) = \left(\frac{1}{4}iM_W\right) \left(\frac{\delta M_W^2}{M_W^2} + \delta Z_G + \delta Z_W\right) \left[\frac{1}{-1} \right]$$

$$C_7(G^0, Z) = \frac{M_Z}{4} \left(\frac{\delta M_Z^2}{M_Z^2} + \delta Z_{ZZ} + \delta Z_{G^0} \right) \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$C_8(G^0, \gamma) = \frac{1}{4} M_Z (\delta Z_{Z\gamma}) \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

[UU] **2 Ghosts**

$$C_{12}(u_\gamma, \bar{u}_\gamma) = i \left(\frac{1}{2} (\delta Z_{\gamma\gamma}) - \delta U_{\gamma\gamma} \right) \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{13}(u_Z, \bar{u}_Z) = -i \left[\frac{-\left(\frac{1}{2} (\delta Z_{ZZ}) \right) + \delta U_{ZZ}}{\xi_Z \left(\frac{1}{2} \delta M_Z^2 - \left(\frac{1}{2} (\delta Z_{G^0}) - \delta U_{ZZ} \right) M_Z^2 \right)} \right]$$

$$C_{14}(u_Z, \bar{u}_\gamma) = i \left(\frac{1}{2} (\delta Z_{\gamma Z}) - \delta U_{\gamma Z} \right) \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{15}(u_\gamma, \bar{u}_Z) = -i \left[\frac{-\left(\frac{1}{2} (\delta Z_{Z\gamma}) \right) + \delta U_{Z\gamma}}{\xi_Z (\delta U_{Z\gamma}) M_Z^2} \right]$$

$$C_{16}(u_-, \bar{u}_-) = -i \left[\frac{-\left(\frac{1}{2} (\delta Z_W) \right) + \delta U_W}{\xi_W \left(\frac{1}{2} \delta M_W^2 - \left(\frac{1}{2} (\delta Z_G) - \delta U_W \right) M_W^2 \right)} \right]$$

$$C_{17}(u_+, \bar{u}_+) = -i \left[\frac{-\left(\frac{1}{2} (\delta Z_W) \right) + \delta U_W}{\xi_W \left(\frac{1}{2} \delta M_W^2 - \left(\frac{1}{2} (\delta Z_G) - \delta U_W \right) M_W^2 \right)} \right]$$

[VV] 2 Gauge Bosons

$$C_1(W^+, W^-) = i \begin{bmatrix} \delta Z_W \\ \hline (\delta Z_W) M_W^2 + \delta M_W^2 \\ \hline -\delta Z_W \end{bmatrix}$$

$$C_2(Z, Z) = i \begin{bmatrix} \delta Z_{ZZ} \\ \hline (\delta Z_{ZZ}) M_Z^2 + \delta M_Z^2 \\ \hline -\delta Z_{ZZ} \end{bmatrix}$$

$$C_3(\gamma, \gamma) = i(\delta Z_{\gamma\gamma}) \begin{bmatrix} 1 \\ \hline 0 \\ \hline -1 \end{bmatrix}$$

$$C_4(\gamma, Z) = i \begin{bmatrix} \frac{1}{2}(\delta Z_{Z\gamma}) + \frac{1}{2}(\delta Z_{\gamma Z}) \\ \hline \frac{1}{2}(\delta Z_{Z\gamma}) M_Z^2 \\ \hline -\left(\frac{1}{2}(\delta Z_{Z\gamma})\right) - \frac{1}{2}(\delta Z_{\gamma Z}) \end{bmatrix}$$

[FFS] 2 Leptons – Higgs

$$C_{82}(\bar{e}_{g1}, e_{g2}, H) = -\frac{ie}{2M_W s_W} \left[\frac{\frac{1}{2}\delta_{g1,g2}m_{e_{g1}}\delta Z_{g1,g1}^{e,L} + \frac{1}{2}\delta_{g1,g2}m_{e_{g2}}\delta Z_{g2,g2}^{e,R*} - \delta_{g1,g2}m_{e_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_H) - \frac{\delta m_{g1}^{e_g}}{m_{e_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)}{\frac{1}{2}\delta_{g1,g2}m_{e_{g1}}\delta Z_{g1,g1}^{e,R} + \frac{1}{2}\delta_{g1,g2}m_{e_{g2}}\delta Z_{g2,g2}^{e,L*} - \delta_{g1,g2}m_{e_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_H) - \frac{\delta m_{g1}^{e_g}}{m_{e_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)} \right]$$

$$C_{85}(\bar{e}_{g1}, e_{g2}, G^0) = -\frac{e}{2M_W s_W} \left[\frac{\frac{1}{2}\delta_{g1,g2}m_{e_{g1}}\delta Z_{g1,g1}^{e,L} + \frac{1}{2}\delta_{g1,g2}m_{e_{g2}}\delta Z_{g2,g2}^{e,R*} - \delta_{g1,g2}m_{e_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_{G^0}) - \frac{\delta m_{g1}^{e_g}}{m_{e_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)}{\frac{1}{2}\delta_{g1,g2}m_{e_{g1}}\delta Z_{g1,g1}^{e,R} - \frac{1}{2}\delta_{g1,g2}m_{e_{g2}}\delta Z_{g2,g2}^{e,L*} + \delta_{g1,g2}m_{e_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_{G^0}) - \frac{\delta m_{g1}^{e_g}}{m_{e_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)} \right]$$

$$C_{90}(\bar{\nu}_{g1}, e_{g2}, G^+) = \frac{ie\delta_{g1,g2}m_{e_{g1}}}{\sqrt{2}M_W s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{\delta m_{g1}^{e_g}}{m_{e_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \frac{1}{2}\delta Z_{g1,g1}^{e,R} - \frac{1}{2}\delta Z_{g1,g1}^{\nu,L*} - \delta Z_e \right) \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$C_{91}(\bar{e}_{g1}, \nu_{g2}, G^-) = \frac{ie\delta_{g1,g2}m_{e_{g1}}}{\sqrt{2}M_W s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{\delta m_{g1}^{e_g}}{m_{e_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \frac{1}{2}\delta Z_{g1,g1}^{\nu,L} - \frac{1}{2}\delta Z_{g1,g1}^{e,R*} - \delta Z_e \right) \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

[FFS] 2 Quarks – Higgs

$$C_{83}(\bar{u}_{g1}, u_{g2}, H) = -\frac{ie}{2M_W s_W} \left[\frac{\frac{1}{2}m_{u_{g1}}\delta Z_{g1,g2}^{u,L} + \frac{1}{2}m_{u_{g2}}\delta Z_{g2,g1}^{u,R*} - \delta_{g1,g2}m_{u_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_H) - \frac{\delta m_{g1}^{u_g}}{m_{u_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)}{\frac{1}{2}m_{u_{g1}}\delta Z_{g1,g2}^{u,R} + \frac{1}{2}m_{u_{g2}}\delta Z_{g2,g1}^{u,L*} - \delta_{g1,g2}m_{u_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_H) - \frac{\delta m_{g1}^{u_g}}{m_{u_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)} \right]$$

$$C_{84}(\bar{d}_{g1}, d_{g2}, H) = -\frac{ie}{2M_W s_W} \left[\frac{\frac{1}{2}m_{d_{g1}}\delta Z_{g1,g2}^{d,L} + \frac{1}{2}m_{d_{g2}}\delta Z_{g2,g1}^{d,R*} - \delta_{g1,g2}m_{d_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_H) - \frac{\delta m_{g1}^{d_g}}{m_{d_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)}{\frac{1}{2}m_{d_{g1}}\delta Z_{g1,g2}^{d,R} + \frac{1}{2}m_{d_{g2}}\delta Z_{g2,g1}^{d,L*} - \delta_{g1,g2}m_{d_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_H) - \frac{\delta m_{g1}^{d_g}}{m_{d_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)} \right]$$

$$C_{86}(\bar{u}_{g1}, u_{g2}, G^0) = \frac{e}{2M_W s_W} \left[\frac{\frac{1}{2}m_{u_{g1}}\delta Z_{g1,g2}^{u,L} + \frac{1}{2}m_{u_{g2}}\delta Z_{g2,g1}^{u,R*} - \delta_{g1,g2}m_{u_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_{G^0}) - \frac{\delta m_{g1}^{u_g}}{m_{u_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)}{\frac{1}{2}m_{u_{g1}}\delta Z_{g1,g2}^{u,R} - \frac{1}{2}m_{u_{g2}}\delta Z_{g2,g1}^{u,L*} + \delta_{g1,g2}m_{u_{g1}}\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_{G^0}) - \frac{\delta m_{g1}^{u_g}}{m_{u_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e\right)} \right]$$

$$C_{87}(\bar{d}_{g1}, d_{g2}, G^0) = -\frac{e}{2M_W s_W} \left[\frac{\frac{1}{2}m_{d_{g1}}\delta Z_{g1,g2}^{d,L} + \frac{1}{2}m_{d_{g2}}\delta Z_{g2,g1}^{d,R*} - \delta_{g1,g2}m_{d_{g1}} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_{G^0}) - \frac{\delta m_{g1}^{d_g}}{m_{d_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e \right)}{\frac{1}{2}m_{d_{g1}}\delta Z_{g1,g2}^{d,R} - \frac{1}{2}m_{d_{g2}}\delta Z_{g2,g1}^{d,L*} + \delta_{g1,g2}m_{d_{g1}} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_{G^0}) - \frac{\delta m_{g1}^{d_g}}{m_{d_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e \right)} \right]$$

$$C_{88}(\bar{u}_{g1}, d_{g2}, G^+) = \frac{ie}{\sqrt{2}M_W s_W} \left[\frac{\frac{1}{2} \left(\sum_{gn=1}^3 \left(\text{CKM}_{gn,g2} m_{u_{gn}} \delta Z_{gn,g1}^{u,R*} + \text{CKM}_{g1,gn} m_{u_{g1}} \delta Z_{gn,g2}^{d,L} \right) \right) + m_{u_{g1}} \left(\delta \text{CKM}_{g1,g2} - \text{CKM}_{g1,g2} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{\delta m_{g1}^{u_g}}{m_{u_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e \right) \right)}{-\frac{1}{2} \left(\sum_{gn=1}^3 \left(\text{CKM}_{gn,g2} m_{d_{g2}} \delta Z_{gn,g1}^{u,L*} + \text{CKM}_{g1,gn} m_{d_{gn}} \delta Z_{gn,g2}^{d,R} \right) \right) - m_{d_{g2}} \left(\delta \text{CKM}_{g1,g2} - \text{CKM}_{g1,g2} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{\delta m_{g2}^{d_g}}{m_{d_{g2}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e \right) \right)} \right]$$

$$C_{89}(\bar{d}_{g1}, u_{g2}, G^-) = -\frac{ie}{\sqrt{2}M_W s_W} \left[\frac{\frac{1}{2} \left(\sum_{gn=1}^3 \left(m_{d_{gn}} \text{CKM}_{g2,gn}^* \delta Z_{gn,g1}^{d,R*} + m_{d_{g1}} \text{CKM}_{gn,g1}^* \delta Z_{gn,g2}^{u,L} \right) \right) - m_{d_{g1}} \left(\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{\delta m_{g1}^{d_g}}{m_{d_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e \right) \text{CKM}_{g2,g1}^* - \delta \text{CKM}_{g2,g1}^* \right)}{-\frac{1}{2} \left(\sum_{gn=1}^3 \left(m_{u_{g2}} \text{CKM}_{g2,gn}^* \delta Z_{gn,g1}^{d,L*} + m_{u_{gn}} \text{CKM}_{gn,g1}^* \delta Z_{gn,g2}^{u,R} \right) \right) + m_{u_{g2}} \left(\left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{\delta m_{g1}^{u_g}}{m_{u_{g1}}} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e \right) \text{CKM}_{g2,g1}^* - \delta \text{CKM}_{g2,g1}^* \right)} \right]$$

[FFV] 2 Leptons – Gauge Boson

$$C_{70}(\bar{\nu}_{g1}, \nu_{g2}, \gamma) = \frac{ie\delta_{g1,g2}(\delta Z_{Z\gamma})}{4c_W s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{71}(\bar{e}_{g1}, e_{g2}, \gamma) = ie \left[\frac{\frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,L} + \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,L*} + \delta_{g1,g2} \left(\frac{1}{2}(\delta Z_{\gamma\gamma}) + \delta Z_e \right) - \frac{\delta_{g1,g2}(\delta Z_{Z\gamma})}{2c_W s_W} \left(\frac{1}{2} - s_W^2 \right)}{\frac{\delta_{g1,g2}s_W(\delta Z_{Z\gamma})}{2c_W} + \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,R} + \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,R*} + \delta_{g1,g2} \left(\frac{1}{2}(\delta Z_{\gamma\gamma}) + \delta Z_e \right)} \right]$$

$$C_{74}(\bar{\nu}_{g1}, \nu_{g2}, Z) = ie \left(\frac{1}{2c_W s_W} \left(\frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{\nu,L} + \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{\nu,L*} \right) + \delta_{g1,g2} \left(\frac{\delta Z_{ZZ}}{4c_W s_W} + \frac{1}{2c_W s_W} \left(\delta Z_e - \frac{\delta s_W}{s_W c_W^2} (c_W^2 - s_W^2) \right) \right) \right) \left[\frac{1}{0} \right]$$

$$C_{75}(\bar{e}_{g1}, e_{g2}, Z) = ie \left[\frac{\delta_{g1,g2} \left(\frac{1}{2}(\delta Z_{\gamma Z}) + \frac{s_W}{c_W} \left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e \right) - \frac{1}{2c_W s_W} \left(\delta Z_e - \frac{\delta s_W}{s_W c_W^2} (c_W^2 - s_W^2) \right) - \frac{\delta Z_{ZZ}}{2c_W s_W} \left(\frac{1}{2} - s_W^2 \right) \right) - \frac{1}{c_W s_W} \left(\frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,L} + \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,L*} \right) \left(\frac{1}{2} - s_W^2 \right)}{\delta_{g1,g2} \left(\frac{s_W(\delta Z_{ZZ})}{2c_W} + \frac{1}{2}(\delta Z_{\gamma Z}) + \frac{s_W}{c_W} \left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e \right) \right) + \frac{s_W}{c_W} \left(\frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,R} + \frac{1}{2}\delta_{g1,g2}\delta Z_{g1,g1}^{e,R*} \right)} \right]$$

$$C_{78}(\bar{\nu}_{g1}, e_{g2}, W^+) = -\frac{ie\delta_{g1,g2}}{\sqrt{2}s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_W) - \frac{1}{2}\delta Z_{g1,g1}^{e,L} - \frac{1}{2}\delta Z_{g1,g1}^{\nu,L*} - \delta Z_e \right) \left[\frac{1}{0} \right]$$

$$C_{79}(\bar{e}_{g1}, \nu_{g2}, W^-) = -\frac{ie\delta_{g1,g2}}{\sqrt{2}s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_W) - \frac{1}{2}\delta Z_{g1,g1}^{\nu,L} - \frac{1}{2}\delta Z_{g1,g1}^{e,L*} - \delta Z_e \right) \left[\frac{1}{0} \right]$$

[FFV] 2 Quarks – Gauge Boson

$$C_{72}(\bar{u}_{g1}, u_{g2}, \gamma) = ie \left[\frac{\frac{\delta_{g1,g2}(\delta Z_{Z\gamma})}{2c_W s_W} \left(\frac{1}{2} - \frac{2}{3}s_W^2 \right) - \frac{2}{3} \left(\frac{1}{2}\delta Z_{g1,g2}^{u,L} + \frac{1}{2}\delta Z_{g2,g1}^{u,L*} + \delta_{g1,g2} \left(\frac{1}{2}(\delta Z_{\gamma\gamma}) + \delta Z_e \right) \right)}{-\frac{\delta_{g1,g2}s_W(\delta Z_{Z\gamma})}{3c_W} - \frac{2}{3} \left(\frac{1}{2}\delta Z_{g1,g2}^{u,R} + \frac{1}{2}\delta Z_{g2,g1}^{u,R*} + \delta_{g1,g2} \left(\frac{1}{2}(\delta Z_{\gamma\gamma}) + \delta Z_e \right) \right)} \right]$$

$$C_{73}(\bar{d}_{g1}, d_{g2}, \gamma) = ie \left[\frac{-\frac{\delta_{g1,g2}(\delta Z_{Z\gamma})}{2c_W s_W} \left(\frac{1}{2} - \frac{1}{3}s_W^2 \right) + \frac{1}{3} \left(\frac{1}{2}\delta Z_{g1,g2}^{d,L} + \frac{1}{2}\delta Z_{g2,g1}^{d,L*} + \delta_{g1,g2} \left(\frac{1}{2}(\delta Z_{\gamma\gamma}) + \delta Z_e \right) \right)}{\frac{\delta_{g1,g2}s_W(\delta Z_{Z\gamma})}{6c_W} + \frac{1}{3} \left(\frac{1}{2}\delta Z_{g1,g2}^{d,R} + \frac{1}{2}\delta Z_{g2,g1}^{d,R*} + \delta_{g1,g2} \left(\frac{1}{2}(\delta Z_{\gamma\gamma}) + \delta Z_e \right) \right)} \right]$$

$$C_{76}(\bar{u}_{g1}, u_{g2}, Z) = ie \left[\frac{-\delta_{g1,g2} \left(\frac{1}{3} (\delta Z_{\gamma Z}) - \frac{\delta Z_{ZZ}}{2c_W s_W} \left(\frac{1}{2} - \frac{2}{3} s_W^2 \right) + \frac{2s_W}{3c_W} \left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e \right) - \frac{1}{2c_W s_W} \left(\delta Z_e - \frac{\delta s_W}{s_W c_W^2} (c_W^2 - s_W^2) \right) \right) + \frac{1}{c_W s_W} \left(\frac{1}{2} - \frac{2}{3} s_W^2 \right) \left(\frac{1}{2} \delta Z_{g1,g2}^{u,L} + \frac{1}{2} \delta Z_{g2,g1}^{u,L*} \right)}{-\delta_{g1,g2} \left(\frac{s_W (\delta Z_{ZZ})}{3c_W} + \frac{1}{3} (\delta Z_{\gamma Z}) + \frac{2s_W}{3c_W} \left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e \right) \right) - \frac{2s_W}{3c_W} \left(\frac{1}{2} \delta Z_{g1,g2}^{u,R} + \frac{1}{2} \delta Z_{g2,g1}^{u,R*} \right)} \right]$$

$$C_{77}(\bar{d}_{g1}, d_{g2}, Z) = ie \left[\frac{\delta_{g1,g2} \left(\frac{1}{6} (\delta Z_{\gamma Z}) - \frac{\delta Z_{ZZ}}{2c_W s_W} \left(\frac{1}{2} - \frac{1}{3} s_W^2 \right) + \frac{s_W}{3c_W} \left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e \right) - \frac{1}{2c_W s_W} \left(\delta Z_e - \frac{\delta s_W}{s_W c_W^2} (c_W^2 - s_W^2) \right) \right) - \frac{1}{c_W s_W} \left(\frac{1}{2} - \frac{1}{3} s_W^2 \right) \left(\frac{1}{2} \delta Z_{g1,g2}^{d,L} + \frac{1}{2} \delta Z_{g2,g1}^{d,L*} \right)}{\delta_{g1,g2} \left(\frac{s_W (\delta Z_{ZZ})}{6c_W} + \frac{1}{6} (\delta Z_{\gamma Z}) + \frac{s_W}{3c_W} \left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e \right) \right) + \frac{s_W}{3c_W} \left(\frac{1}{2} \delta Z_{g1,g2}^{d,R} + \frac{1}{2} \delta Z_{g2,g1}^{d,R*} \right)} \right]$$

$$C_{80}(\bar{u}_{g1}, d_{g2}, W^+) = \frac{ie}{\sqrt{2}s_W} \left(\frac{1}{2} \left(\sum_{gn=1}^3 \left(\text{CKM}_{gn,g2} \delta Z_{gn,g1}^{u,L*} + \text{CKM}_{g1,gn} \delta Z_{gn,g2}^{d,L} \right) \right) + \delta \text{CKM}_{g1,g2} - \text{CKM}_{g1,g2} \left(\frac{\delta s_W}{s_W} - \frac{1}{2} (\delta Z_W) - \delta Z_e \right) \right) \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{81}(\bar{d}_{g1}, u_{g2}, W^-) = \frac{ie}{\sqrt{2}s_W} \left(\frac{1}{2} \left(\sum_{gn=1}^3 \left(\text{CKM}_{g2,gn}^* \delta Z_{gn,g1}^{d,L*} + \text{CKM}_{gn,g1}^* \delta Z_{gn,g2}^{u,L} \right) \right) - \left(\frac{\delta s_W}{s_W} - \frac{1}{2} (\delta Z_W) - \delta Z_e \right) \text{CKM}_{g2,g1}^* + \delta \text{CKM}_{g2,g1}^* \right) \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

[SSS] **3 Higgs**

$$C_{34}(H, H, H) = \left[\frac{3ieM_H^2}{2M_W s_W} \left(\frac{\delta s_W}{s_W} - \frac{3}{2} (\delta Z_H) - \frac{e (\delta T_H)}{2M_W s_W M_H^2} - \frac{\delta M_H^2}{M_H^2} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e \right) \right]$$

$$C_{35}(H, G^0, G^0) = \left[\frac{ieM_H^2}{2M_W s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2} (\delta Z_H) - \frac{e (\delta T_H)}{2M_W s_W M_H^2} - \frac{\delta M_H^2}{M_H^2} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e - \delta Z_{G^0} \right) \right]$$

$$C_{36}(G^-, H, G^+) = \left[\frac{ieM_H^2}{2M_W s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2} (\delta Z_H) - \frac{e (\delta T_H)}{2M_W s_W M_H^2} - \frac{\delta M_H^2}{M_H^2} + \frac{\delta M_W^2}{2M_W^2} - \delta Z_e - \delta Z_G \right) \right]$$

[SSV] 2 Higgs – Gauge Boson

$$C_{55}(G^0, H, \gamma) = \left[\frac{e(\delta Z_{Z\gamma})}{4c_W s_W} \right]$$

$$C_{56}(G^0, H, Z) = \left[\frac{e}{2c_W s_W} \left(\frac{1}{2}(\delta Z_H) + \frac{1}{2}(\delta Z_{ZZ}) + \frac{1}{2}(\delta Z_{G^0}) + \delta Z_e - \frac{\delta s_W}{s_W c_W^2} (c_W^2 - s_W^2) \right) \right]$$

$$C_{57}(G^+, G^-, \gamma) = \left[-ie \left(\frac{1}{2}(\delta Z_{\gamma\gamma}) + \delta Z_e + \delta Z_G - \frac{\delta Z_{Z\gamma}}{4c_W s_W} (c_W^2 - s_W^2) \right) \right]$$

$$C_{58}(G^+, G^-, Z) = \left[\frac{ie}{2c_W s_W} \left(\frac{1}{2}(\delta Z_{ZZ}) - \frac{c_W s_W (\delta Z_{\gamma Z})}{c_W^2 - s_W^2} - \frac{\delta s_W}{s_W c_W^2 (c_W^2 - s_W^2)} + \delta Z_e + \delta Z_G \right) (c_W^2 - s_W^2) \right]$$

$$C_{59}(G^-, H, W^+) = \left[\frac{ie}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_H) - \frac{1}{2}(\delta Z_W) - \delta Z_e \right) \right]$$

$$C_{60}(G^+, H, W^-) = \left[-\frac{ie}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_H) - \frac{1}{2}(\delta Z_W) - \delta Z_e \right) \right]$$

$$C_{61}(G^-, G^0, W^+) = \left[-\frac{e}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_W) - \frac{1}{2}(\delta Z_{G^0}) - \delta Z_e \right) \right]$$

$$C_{62}(G^+, G^0, W^-) = \left[-\frac{e}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_W) - \frac{1}{2}(\delta Z_{G^0}) - \delta Z_e \right) \right]$$

[SUU] Higgs – 2 Ghosts

$$C_{104}(H, \bar{u}_Z, u_\gamma) = \left[-\frac{ie\xi_Z M_Z (\delta U_{Z\gamma})}{2c_W s_W} \right]$$

$$C_{105}(H, \bar{u}_Z, u_Z) = \left[-\frac{ie\xi_Z M_Z}{2c_W s_W} \left(\frac{1}{2}(\delta Z_H) - \frac{1}{2}(\delta Z_{G^0}) + \delta Z_e + \delta U_{ZZ} - \frac{\delta s_W}{s_W c_W^2} (c_W^2 - s_W^2) \right) \right]$$

$$C_{106}(H, \bar{u}_-, u_-) = \left[\frac{ie\xi_W M_W}{2s_W} \left(\frac{\delta s_W}{s_W} + \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_H) - \delta Z_e - \delta U_W \right) \right]$$

$$C_{107}(H, \bar{u}_+, u_+) = \left[\frac{ie\xi_W M_W}{2s_W} \left(\frac{\delta s_W}{s_W} + \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_H) - \delta Z_e - \delta U_W \right) \right]$$

$$10 \quad C_{108}(G^0, \bar{u}_+, u_+) = \left[-\frac{e\xi_W M_W}{2s_W} \left(\frac{\delta s_W}{s_W} + \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_{G^0}) - \delta Z_e - \delta U_W \right) \right]$$

$$C_{109}(G^0, \bar{u}_-, u_-) = \left[\frac{e\xi_W M_W}{2s_W} \left(\frac{\delta s_W}{s_W} + \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_{G^0}) - \delta Z_e - \delta U_W \right) \right]$$

$$C_{110}(G^+, \bar{u}_Z, u_-) = \left[-\frac{ie\xi_Z M_Z}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) + \frac{1}{2}(\delta Z_{G^0}) - \delta Z_e - \delta U_W \right) \right]$$

$$C_{111}(G^-, \bar{u}_Z, u_+) = \left[-\frac{ie\xi_Z M_Z}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) + \frac{1}{2}(\delta Z_{G^0}) - \delta Z_e - \delta U_W \right) \right]$$

$$C_{112}(G^+, \bar{u}_+, u_Z) = \left[\frac{ie\xi_W M_W}{2c_W s_W} \left(\frac{2c_W s_W (\delta U_{\gamma Z})}{c_W^2 - s_W^2} + \frac{\delta s_W}{s_W c_W^2 (c_W^2 - s_W^2)} - \delta Z_e - \delta U_{ZZ} \right) (c_W^2 - s_W^2) \right]$$

$$C_{113}(G^-, \bar{u}_-, u_Z) = \left[\frac{ie\xi_W M_W}{2c_W s_W} \left(\frac{2c_W s_W (\delta U_{\gamma Z})}{c_W^2 - s_W^2} + \frac{\delta s_W}{s_W c_W^2 (c_W^2 - s_W^2)} - \delta Z_e - \delta U_{ZZ} \right) (c_W^2 - s_W^2) \right]$$

$$C_{114}(G^+, \bar{u}_+, u_\gamma) = \left[ie\xi_W M_W \left(\delta Z_e + \delta U_{\gamma\gamma} - \frac{\delta U_{Z\gamma}}{2c_W s_W} (c_W^2 - s_W^2) \right) \right]$$

$$C_{115}(G^-, \bar{u}_-, u_\gamma) = \left[ie\xi_W M_W \left(\delta Z_e + \delta U_{\gamma\gamma} - \frac{\delta U_{Z\gamma}}{2c_W s_W} (c_W^2 - s_W^2) \right) \right]$$

[SVV] Higgs – 2 Gauge Bosons

$$C_{63}(H, W^+, W^-) = \left[-\frac{ieM_W}{s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_H) - \frac{\delta M_W^2}{2M_W^2} - \delta Z_e - \delta Z_W \right) \right]$$

$$C_{64}(H, Z, Z) = \left[\frac{ieM_W}{s_W c_W^2} \left(\frac{1}{2}(\delta Z_H) + \frac{\delta M_W^2}{2M_W^2} + \delta Z_e + \delta Z_{ZZ} - \frac{\delta s_W}{s_W c_W^2} (c_W^2 - 2s_W^2) \right) \right]$$

$$C_{65}(H, Z, \gamma) = \left[\frac{ieM_W (\delta Z_{Z\gamma})}{2s_W c_W^2} \right]$$

$$C_{66}(G^+, W^-, Z) = \left[-\frac{ieM_W s_W}{c_W} \left(\frac{1}{2}(\delta Z_G) + \frac{1}{2}(\delta Z_W) + \frac{1}{2}(\delta Z_{ZZ}) + \frac{c_W (\delta Z_{\gamma Z})}{2s_W} + \frac{\delta s_W}{s_W c_W^2} + \frac{\delta M_W^2}{2M_W^2} + \delta Z_e \right) \right]$$

$$C_{67}(G^-, W^+, Z) = \left[-\frac{ieM_W s_W}{c_W} \left(\frac{1}{2}(\delta Z_G) + \frac{1}{2}(\delta Z_W) + \frac{1}{2}(\delta Z_{ZZ}) + \frac{c_W (\delta Z_{\gamma Z})}{2s_W} + \frac{\delta s_W}{s_W c_W^2} + \frac{\delta M_W^2}{2M_W^2} + \delta Z_e \right) \right]$$

$$C_{68}(G^+, W^-, \gamma) = \left[-ieM_W \left(\frac{1}{2}(\delta Z_G) + \frac{1}{2}(\delta Z_W) + \frac{s_W (\delta Z_{Z\gamma})}{2c_W} + \frac{1}{2}(\delta Z_{\gamma\gamma}) + \frac{\delta M_W^2}{2M_W^2} + \delta Z_e \right) \right]$$

$$C_{69}(G^-, W^+, \gamma) = \left[-ieM_W \left(\frac{1}{2}(\delta Z_G) + \frac{1}{2}(\delta Z_W) + \frac{s_W(\delta Z_{Z\gamma})}{2c_W} + \frac{1}{2}(\delta Z_{\gamma\gamma}) + \frac{\delta M_W^2}{2M_W^2} + \delta Z_e \right) \right]$$

[UUUV] 2 Ghosts – Gauge Boson

$$C_{92}(\bar{u}_-, u_-, \gamma) = ie \left(\frac{1}{2}(\delta Z_W) + \frac{c_W(\delta Z_{Z\gamma})}{2s_W} - \frac{1}{2}(\delta Z_{\gamma\gamma}) - \delta Z_e - \delta U_W \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{93}(\bar{u}_+, u_+, \gamma) = -ie \left(\frac{1}{2}(\delta Z_W) + \frac{c_W(\delta Z_{Z\gamma})}{2s_W} - \frac{1}{2}(\delta Z_{\gamma\gamma}) - \delta Z_e - \delta U_W \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{94}(\bar{u}_-, u_-, Z) = -\frac{iec_W}{s_W} \left(\frac{1}{2}(\delta Z_W) - \frac{1}{2}(\delta Z_{ZZ}) + \frac{s_W(\delta Z_{\gamma Z})}{2c_W} + \frac{\delta s_W}{s_W c_W^2} - \delta Z_e - \delta U_W \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{95}(\bar{u}_+, u_+, Z) = \frac{iec_W}{s_W} \left(\frac{1}{2}(\delta Z_W) - \frac{1}{2}(\delta Z_{ZZ}) + \frac{s_W(\delta Z_{\gamma Z})}{2c_W} + \frac{\delta s_W}{s_W c_W^2} - \delta Z_e - \delta U_W \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{96}(\bar{u}_-, u_Z, W^-) = \frac{iec_W}{s_W} \left(\frac{s_W(\delta U_{\gamma Z})}{c_W} + \frac{\delta s_W}{s_W c_W^2} - \delta Z_e - \delta U_{ZZ} \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{97}(\bar{u}_Z, u_-, W^+) = -ie \left(\frac{1}{2}(\delta Z_{Z\gamma}) + \frac{c_W}{s_W} \left(\frac{1}{2}(\delta Z_W) - \frac{1}{2}(\delta Z_{ZZ}) - \frac{\delta s_W}{s_W c_W^2} + \delta Z_e + \delta U_W \right) \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{98}(\bar{u}_+, u_Z, W^+) = -\frac{iec_W}{s_W} \left(\frac{s_W(\delta U_{\gamma Z})}{c_W} + \frac{\delta s_W}{s_W c_W^2} - \delta Z_e - \delta U_{ZZ} \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{99}(\bar{u}_Z, u_+, W^-) = ie \left(\frac{1}{2} (\delta Z_{Z\gamma}) + \frac{c_W}{s_W} \left(\frac{1}{2} (\delta Z_W) - \frac{1}{2} (\delta Z_{ZZ}) - \frac{\delta s_W}{s_W c_W^2} + \delta Z_e + \delta U_W \right) \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{100}(\bar{u}_-, u_\gamma, W^-) = -ie \left(\frac{c_W (\delta U_{Z\gamma})}{s_W} - \delta Z_e - \delta U_{\gamma\gamma} \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{101}(\bar{u}_\gamma, u_-, W^+) = ie \left(\frac{1}{2} (\delta Z_W) + \frac{c_W (\delta Z_{\gamma Z})}{2s_W} - \frac{1}{2} (\delta Z_{\gamma\gamma}) + \delta Z_e + \delta U_W \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{102}(\bar{u}_+, u_\gamma, W^+) = ie \left(\frac{c_W (\delta U_{Z\gamma})}{s_W} - \delta Z_e - \delta U_{\gamma\gamma} \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

$$C_{103}(\bar{u}_\gamma, u_+, W^-) = -ie \left(\frac{1}{2} (\delta Z_W) + \frac{c_W (\delta Z_{\gamma Z})}{2s_W} - \frac{1}{2} (\delta Z_{\gamma\gamma}) + \delta Z_e + \delta U_W \right) \begin{bmatrix} 1 \\ - \\ 0 \end{bmatrix}$$

[VVV] 3 Gauge Bosons

$$C_{26}(\gamma, W^+, W^-) = \left[ie \left(\frac{c_W (\delta Z_{Z\gamma})}{2s_W} - \frac{1}{2} (\delta Z_{\gamma\gamma}) - \delta Z_e - \delta Z_W \right) \right]$$

$$C_{27}(Z, W^+, W^-) = \left[\frac{ie c_W}{s_W} \left(\frac{1}{2} (\delta Z_{ZZ}) - \frac{s_W (\delta Z_{\gamma Z})}{2c_W} - \frac{\delta s_W}{s_W c_W^2} + \delta Z_e + \delta Z_W \right) \right]$$

[SSSS] 4 Higgs

$$C_{28}(H, H, H, H) = \left[\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \left(\frac{2 (\delta s_W)}{s_W} - \frac{e (\delta T_H)}{2M_W s_W M_H^2} - \frac{\delta M_H^2}{M_H^2} + \frac{\delta M_W^2}{M_W^2} - 2 (\delta Z_e) - 2 (\delta Z_H) \right) \right]$$

$$C_{29}(H, H, G^0, G^0) = \left[\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \left(\frac{2 (\delta s_W)}{s_W} - \frac{e (\delta T_H)}{2M_W s_W M_H^2} - \frac{\delta M_H^2}{M_H^2} + \frac{\delta M_W^2}{M_W^2} - 2 (\delta Z_e) - \delta Z_H - \delta Z_{G^0} \right) \right]$$

$$C_{30}(H, H, G^-, G^+) = \left[\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \left(\frac{2(\delta s_W)}{s_W} - \frac{e(\delta T_H)}{2M_W s_W M_H^2} - \frac{\delta M_H^2}{M_H^2} + \frac{\delta M_W^2}{M_W^2} - 2(\delta Z_e) - \delta Z_G - \delta Z_H \right) \right]$$

$$C_{31}(G^0, G^0, G^0, G^0) = \left[\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \left(\frac{2(\delta s_W)}{s_W} - \frac{e(\delta T_H)}{2M_W s_W M_H^2} - \frac{\delta M_H^2}{M_H^2} + \frac{\delta M_W^2}{M_W^2} - 2(\delta Z_e) - 2(\delta Z_{G^0}) \right) \right]$$

$$C_{32}(G^0, G^0, G^-, G^+) = \left[\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \left(\frac{2(\delta s_W)}{s_W} - \frac{e(\delta T_H)}{2M_W s_W M_H^2} - \frac{\delta M_H^2}{M_H^2} + \frac{\delta M_W^2}{M_W^2} - 2(\delta Z_e) - \delta Z_G - \delta Z_{G^0} \right) \right]$$

$$C_{33}(G^-, G^-, G^+, G^+) = \left[\frac{ie^2 M_H^2}{2M_W^2 s_W^2} \left(\frac{2(\delta s_W)}{s_W} - \frac{e(\delta T_H)}{2M_W s_W M_H^2} - \frac{\delta M_H^2}{M_H^2} + \frac{\delta M_W^2}{M_W^2} - 2(\delta Z_e) - 2(\delta Z_G) \right) \right]$$

[SSVV] 2 Higgs – 2 Gauge Bosons

$$C_{37}(H, H, W^-, W^+) = \left[-\frac{ie^2}{2s_W^2} \left(\frac{2(\delta s_W)}{s_W} - 2(\delta Z_e) - \delta Z_H - \delta Z_W \right) \right]$$

$$C_{38}(G^0, G^0, W^-, W^+) = \left[-\frac{ie^2}{2s_W^2} \left(\frac{2(\delta s_W)}{s_W} - 2(\delta Z_e) - \delta Z_W - \delta Z_{G^0} \right) \right]$$

$$C_{39}(G^-, G^+, W^-, W^+) = \left[-\frac{ie^2}{2s_W^2} \left(\frac{2(\delta s_W)}{s_W} - 2(\delta Z_e) - \delta Z_G - \delta Z_W \right) \right]$$

$$C_{40}(G^-, G^+, Z, Z) = \left[-\frac{ie^2}{2c_W^2 s_W^2} \left(\frac{2c_W s_W (\delta Z_{\gamma Z})}{c_W^2 - s_W^2} + \frac{2(\delta s_W)}{s_W c_W^2 (c_W^2 - s_W^2)} - 2(\delta Z_e) - \delta Z_G - \delta Z_{ZZ} \right) (c_W^2 - s_W^2)^2 \right]$$

$$C_{41}(G^-, G^+, \gamma, Z) = \left[-\frac{ie^2}{c_W s_W} \left(\frac{1}{2}(\delta Z_{ZZ}) + \frac{1}{2}(\delta Z_{\gamma\gamma}) - \frac{c_W s_W (\delta Z_{\gamma Z})}{c_W^2 - s_W^2} - \frac{\delta s_W}{s_W c_W^2 (c_W^2 - s_W^2)} + 2(\delta Z_e) + \delta Z_G - \frac{\delta Z_{Z\gamma}}{4c_W s_W} (c_W^2 - s_W^2) \right) (c_W^2 - s_W^2) \right]$$

$$C_{42}(G^-, G^+, \gamma, \gamma) = \left[2ie^2 \left(2(\delta Z_e) + \delta Z_G + \delta Z_{\gamma\gamma} - \frac{\delta Z_{Z\gamma}}{2c_W s_W} (c_W^2 - s_W^2) \right) \right]$$

$$C_{43}(H, H, Z, Z) = \left[\frac{ie^2}{2c_W^2 s_W^2} \left(2(\delta Z_e) + \delta Z_H + \delta Z_{ZZ} - \frac{2(\delta s_W)}{s_W c_W^2} (c_W^2 - s_W^2) \right) \right]$$

$$C_{44}(G^0, G^0, Z, Z) = \left[\frac{ie^2}{2c_W^2 s_W^2} \left(2(\delta Z_e) + \delta Z_{ZZ} + \delta Z_{G^0} - \frac{2(\delta s_W)}{s_W c_W^2} (c_W^2 - s_W^2) \right) \right]$$

$$C_{45}(H, H, \gamma, Z) = \left[\frac{ie^2 (\delta Z_{\gamma Z})}{4c_W^2 s_W^2} \right]$$

$$C_{46}(G^0, G^0, \gamma, Z) = \left[\frac{ie^2 (\delta Z_{Z\gamma})}{4c_W^2 s_W^2} \right]$$

$$C_{47}(H, G^+, W^-, Z) = \left[\frac{ie^2}{2c_W} \left(\frac{\delta c_W}{c_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_H) - \frac{1}{2}(\delta Z_W) - \frac{1}{2}(\delta Z_{ZZ}) - \frac{c_W(\delta Z_{\gamma Z})}{2s_W} - 2(\delta Z_e) \right) \right]$$

$$C_{48}(H, G^-, W^+, Z) = \left[\frac{ie^2}{2c_W} \left(\frac{\delta c_W}{c_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_H) - \frac{1}{2}(\delta Z_W) - \frac{1}{2}(\delta Z_{ZZ}) - \frac{c_W(\delta Z_{\gamma Z})}{2s_W} - 2(\delta Z_e) \right) \right]$$

$$C_{49}(H, G^-, W^+, \gamma) = \left[\frac{ie^2}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_H) - \frac{1}{2}(\delta Z_W) - \frac{s_W(\delta Z_{Z\gamma})}{2c_W} - \frac{1}{2}(\delta Z_{\gamma\gamma}) - 2(\delta Z_e) \right) \right]$$

$$C_{50}(H, G^+, W^-, \gamma) = \left[\frac{ie^2}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_H) - \frac{1}{2}(\delta Z_W) - \frac{s_W(\delta Z_{Z\gamma})}{2c_W} - \frac{1}{2}(\delta Z_{\gamma\gamma}) - 2(\delta Z_e) \right) \right]$$

$$C_{51}(G^-, G^0, Z, W^+) = \left[-\frac{e^2}{2c_W} \left(\frac{\delta c_W}{c_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_W) - \frac{1}{2}(\delta Z_{ZZ}) - \frac{c_W(\delta Z_{\gamma Z})}{2s_W} - \frac{1}{2}(\delta Z_{G^0}) - 2(\delta Z_e) \right) \right]$$

$$C_{52}(G^+, G^0, Z, W^-) = \left[\frac{e^2}{2c_W} \left(\frac{\delta c_W}{c_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_W) - \frac{1}{2}(\delta Z_{ZZ}) - \frac{c_W(\delta Z_{\gamma Z})}{2s_W} - \frac{1}{2}(\delta Z_{G^0}) - 2(\delta Z_e) \right) \right]$$

$$C_{53}(G^-, G^0, \gamma, W^+) = \left[-\frac{e^2}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_W) - \frac{s_W(\delta Z_{Z\gamma})}{2c_W} - \frac{1}{2}(\delta Z_{\gamma\gamma}) - \frac{1}{2}(\delta Z_{G^0}) - 2(\delta Z_e) \right) \right]$$

$$C_{54}(G^+, G^0, \gamma, W^-) = \left[\frac{e^2}{2s_W} \left(\frac{\delta s_W}{s_W} - \frac{1}{2}(\delta Z_G) - \frac{1}{2}(\delta Z_W) - \frac{s_W(\delta Z_{Z\gamma})}{2c_W} - \frac{1}{2}(\delta Z_{\gamma\gamma}) - \frac{1}{2}(\delta Z_{G^0}) - 2(\delta Z_e) \right) \right]$$

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$$C_{22}(W^+, W^+, W^-, W^-) = \frac{ie^2}{s_W^2} \left[\begin{array}{c} -\frac{4(\delta s_W)}{s_W} + 4(\delta Z_e) + 4(\delta Z_W) \\ \hline \frac{2(\delta s_W)}{s_W} - 2(\delta Z_e) - 2(\delta Z_W) \\ \hline \frac{2(\delta s_W)}{s_W} - 2(\delta Z_e) - 2(\delta Z_W) \end{array} \right]$$

$$C_{23}(W^+, W^-, Z, Z) = -\frac{ie^2 c_W^2}{s_W^2} \left[\begin{array}{c} -\frac{2s_W(\delta Z_{\gamma Z})}{c_W} - \frac{4(\delta s_W)}{s_W c_W^2} + 4(\delta Z_e) + 2(\delta Z_W) + 2(\delta Z_{ZZ}) \\ \hline \frac{s_W(\delta Z_{\gamma Z})}{c_W} + \frac{2(\delta s_W)}{s_W c_W^2} - 2(\delta Z_e) - \delta Z_W - \delta Z_{ZZ} \\ \hline \frac{s_W(\delta Z_{\gamma Z})}{c_W} + \frac{2(\delta s_W)}{s_W c_W^2} - 2(\delta Z_e) - \delta Z_W - \delta Z_{ZZ} \end{array} \right]$$

$$C_{24}(W^+, W^-, \gamma, Z) = \frac{ie^2 c_W}{s_W} \left[\begin{array}{c} -\frac{c_W(\delta Z_{Z\gamma})}{s_W} - \frac{s_W(\delta Z_{\gamma Z})}{c_W} - \frac{2(\delta s_W)}{s_W c_W^2} + 4(\delta Z_e) + 2(\delta Z_W) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma} \\ \hline -\left(\frac{1}{2}(\delta Z_{ZZ})\right) + \frac{c_W(\delta Z_{Z\gamma})}{2s_W} + \frac{s_W(\delta Z_{\gamma Z})}{2c_W} - \frac{1}{2}(\delta Z_{\gamma\gamma}) + \frac{\delta s_W}{s_W c_W^2} - 2(\delta Z_e) - \delta Z_W \\ \hline -\left(\frac{1}{2}(\delta Z_{ZZ})\right) + \frac{c_W(\delta Z_{Z\gamma})}{2s_W} + \frac{s_W(\delta Z_{\gamma Z})}{2c_W} - \frac{1}{2}(\delta Z_{\gamma\gamma}) + \frac{\delta s_W}{s_W c_W^2} - 2(\delta Z_e) - \delta Z_W \end{array} \right]$$

$$C_{25}(W^+, W^-, \gamma, \gamma) = -ie^2 \left[\begin{array}{c} -\frac{2c_W(\delta Z_{Z\gamma})}{s_W} + 4(\delta Z_e) + 2(\delta Z_W) + 2(\delta Z_{\gamma\gamma}) \\ \hline \frac{c_W(\delta Z_{Z\gamma})}{s_W} - 2(\delta Z_e) - \delta Z_W - \delta Z_{\gamma\gamma} \\ \hline \frac{c_W(\delta Z_{Z\gamma})}{s_W} - 2(\delta Z_e) - \delta Z_W - \delta Z_{\gamma\gamma} \end{array} \right]$$