SM (1-loop counter terms)

[FF] 2 Leptons

$$\underset{18}{C}\left(\overline{\nu}_{g1},\nu_{g2}\right) = \mathrm{i}\left[\begin{array}{c} -\left(\frac{1}{2}\delta_{g1,g2}\delta Z^{\nu,L}_{g1,g1}\right) - \frac{1}{2}\delta_{g1,g2}\delta Z^{\nu,L*}_{g1,g1} \\ \hline \frac{1}{2}\delta_{g1,g2}\delta Z^{\nu,R}_{g1,g1} + \frac{1}{2}\delta_{g1,g2}\delta Z^{\nu,R*}_{g1,g1} \\ \hline 0 \\ \hline 0 \end{array}\right]$$

$$\underset{19}{C}\left(\overline{e}_{g1},e_{g2}\right) = \mathrm{i}\left[\begin{array}{c} -\left(\frac{1}{2}\delta_{g1,g2}\delta Z^{e,L}_{g1,g1}\right) - \frac{1}{2}\delta_{g1,g2}\delta Z^{e,L*}_{g1,g1} \\ \hline \frac{1}{2}\delta_{g1,g2}\delta Z^{e,R}_{g1,g1} + \frac{1}{2}\delta_{g1,g2}\delta Z^{e,R*}_{g1,g1} \\ \hline -\left(\frac{1}{2}\delta_{g1,g2}m_{e_{g1}}\delta Z^{e,L}_{g1,g1}\right) - \frac{1}{2}\delta_{g1,g2}m_{e_{g2}}\delta Z^{e,R*}_{g2,g2} - \delta_{g1,g2}\delta m^{e_g}_{g1} \\ \hline -\left(\frac{1}{2}\delta_{g1,g2}m_{e_{g1}}\delta Z^{e,R}_{g1,g1}\right) - \frac{1}{2}\delta_{g1,g2}m_{e_{g2}}\delta Z^{e,L*}_{g2,g2} - \delta_{g1,g2}\delta m^{e_g}_{g1} \end{array}\right]$$

[FF] 2 Quarks

$$\underset{20}{C}\left(\overline{u}_{g1},u_{g2}\right) = \mathrm{i}\left[\begin{array}{c} -\left(\frac{1}{2}\delta Z^{u,L}_{g1,g2}\right) - \frac{1}{2}\delta Z^{u,L*}_{g2,g1} \\ \hline \frac{1}{2}\delta Z^{u,R}_{g1,g2} + \frac{1}{2}\delta Z^{u,R*}_{g2,g1} \\ \hline -\left(\frac{1}{2}m_{u_{g1}}\delta Z^{u,L}_{g1,g2}\right) - \frac{1}{2}m_{u_{g2}}\delta Z^{u,R*}_{g2,g1} - \delta_{g1,g2}\delta m^{u_g}_{g1} \\ \hline -\left(\frac{1}{2}m_{u_{g1}}\delta Z^{u,R}_{g1,g2}\right) - \frac{1}{2}m_{u_{g2}}\delta Z^{u,L*}_{g2,g1} - \delta_{g1,g2}\delta m^{u_g}_{g1} \end{array}\right]$$

$$\underset{21}{C}\left(\bar{d}_{\mathrm{g1}}, d_{\mathrm{g2}}\right) = \mathrm{i}\left[\begin{array}{c} -\left(\frac{1}{2}\delta Z^{d,\mathrm{L}}_{\mathrm{g1,g2}}\right) - \frac{1}{2}\delta Z^{d,\mathrm{L}*}_{\mathrm{g2,g1}} \\ \hline \frac{1}{2}\delta Z^{d,\mathrm{R}}_{\mathrm{g1,g2}} + \frac{1}{2}\delta Z^{d,\mathrm{R}*}_{\mathrm{g2,g1}} \\ \hline -\left(\frac{1}{2}m_{d_{\mathrm{g1}}}\delta Z^{d,\mathrm{L}}_{\mathrm{g1,g2}}\right) - \frac{1}{2}m_{d_{\mathrm{g2}}}\delta Z^{d,\mathrm{R}*}_{\mathrm{g2,g1}} - \delta_{\mathrm{g1,g2}}\delta m^{d_{\mathrm{g}}}_{\mathrm{g1}} \\ \hline -\left(\frac{1}{2}m_{d_{\mathrm{g1}}}\delta Z^{d,\mathrm{R}}_{\mathrm{g1,g2}}\right) - \frac{1}{2}m_{d_{\mathrm{g2}}}\delta Z^{d,\mathrm{L}*}_{\mathrm{g2,g1}} - \delta_{\mathrm{g1,g2}}\delta m^{d_{\mathrm{g}}}_{\mathrm{g1}} \end{array}\right]$$

[SS] 2 Higgs

$$\underset{9}{C}(H,H) = -\mathrm{i}\left[\begin{array}{c} \delta Z_{\mathrm{H}} \\ \hline \delta M^2_{\mathrm{H}} + (\delta Z_{\mathrm{H}})\, M^2_{\mathrm{H}} \end{array}\right]$$

$$\underset{10}{C}\left(G^0, G^0\right) = \mathrm{i}\left[\begin{array}{c} -\delta Z_{\mathrm{G}^0} \\ \hline \frac{e\,(\delta \mathrm{T_H})}{2 M_{\mathrm{W}} s_{\mathrm{W}}} \end{array}\right]$$

$$\underset{11}{C}\left(G^-, G^+\right) = \mathrm{i}\left[\begin{array}{c} -\delta Z_{\mathrm{G}} \\ \hline \frac{e\,(\delta \mathrm{T_H})}{2 M_{\mathrm{W}} s_{\mathrm{W}}} \end{array}\right]$$

[SV] Higgs – Gauge Boson

$$\underset{5}{C}\left(G^-, W^+\right) = \left(\frac{1}{4}\mathrm{i}M_{\mathrm{W}}\right)\left(\frac{\delta M^2_{\mathrm{W}}}{M^2_{\mathrm{W}}} + \delta Z_{\mathrm{G}} + \delta Z_{\mathrm{W}}\right)\left[\begin{array}{c} -1 \\ \hline 1 \end{array}\right]$$

$$\underset{6}{C}\left(G^+, W^-\right) = \left(\frac{1}{4}\mathrm{i}M_{\mathrm{W}}\right)\left(\frac{\delta M^2_{\mathrm{W}}}{M^2_{\mathrm{W}}} + \delta Z_{\mathrm{G}} + \delta Z_{\mathrm{W}}\right)\left[\begin{array}{c} 1 \\ \hline -1 \end{array}\right]$$

$$C_{7}\left(G^{0},Z\right) = \frac{M_Z}{4}\left(\frac{\delta M_Z^2}{M_Z^2} + \delta Z_{ZZ} + \delta Z_{G^0}\right)\left[\begin{array}{c} 1 \\ \hline -1 \end{array}\right]$$

$$C_{8}\left(G^{0},\gamma\right) = \frac{1}{4}\left(\delta Z_{Z\gamma}\right) M_Z \left[\begin{array}{c} 1 \\ \hline -1 \end{array}\right]$$

[UU] 2 Ghosts

$$C_{12}\left(u_\gamma,\overline{u}_\gamma\right) = \mathrm{i}\left(\frac{1}{2}\left(\delta Z_{\gamma\gamma}\right) - \delta U_{\gamma\gamma}\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

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

$$C_{14}\left(u_Z,\overline{u}_\gamma\right) = \mathrm{i}\left(\frac{1}{2}\left(\delta Z_{\gamma Z}\right) - \delta U_{\gamma Z}\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$C_{15}\left(u_\gamma,\overline{u}_Z\right) = -\mathrm{i}\left[\begin{array}{c} -\left(\frac{1}{2}\left(\delta Z_{Z\gamma}\right)\right) + \delta U_{Z\gamma} \\ \hline \xi_Z\left(\delta U_{Z\gamma}\right) M_Z^2 \end{array}\right]$$

$$C_{16}\left(u_-,\overline{u}_-\right) = -\mathrm{i}\left[\begin{array}{c} -\left(\frac{1}{2}\left(\delta Z_W\right)\right) + \delta U_W \\ \hline \xi_W\left(\frac{1}{2}\delta M_W^2 - \left(\frac{1}{2}\left(\delta Z_G\right) - \delta U_W\right) M_W^2\right) \end{array}\right]$$

$$C_{17}\left(u_+,\overline{u}_+\right) = -\mathrm{i}\left[\begin{array}{c} -\left(\frac{1}{2}\left(\delta Z_W\right)\right) + \delta U_W \\ \hline \xi_W\left(\frac{1}{2}\delta M_W^2 - \left(\frac{1}{2}\left(\delta Z_G\right) - \delta U_W\right) M_W^2\right) \end{array}\right]$$

[VV] 2 Gauge Bosons

$$C_{1}\left(W^{+},W^{-}\right)=\mathrm{i}\left[\begin{array}{c}\delta Z_{\mathrm{W}}\\ \hline \delta M_{\mathrm{W}}^{2}+\left(\delta Z_{\mathrm{W}}\right)M_{\mathrm{W}}^{2}\\ \hline -\delta Z_{\mathrm{W}}\end{array}\right]$$

$$C_{2}(Z,Z)=\mathrm{i}\left[\begin{array}{c}\delta Z_{\mathrm{ZZ}}\\ \hline \delta M_{\mathrm{Z}}^{2}+\left(\delta Z_{\mathrm{ZZ}}\right)M_{\mathrm{Z}}^{2}\\ \hline -\delta Z_{\mathrm{ZZ}}\end{array}\right]$$

$$C_{3}(\gamma,\gamma)=\mathrm{i}\left(\delta Z_{\gamma\gamma}\right)\left[\begin{array}{c}1\\ \hline 0\\ \hline -1\end{array}\right]$$

$$C_{4}(\gamma,Z)=\mathrm{i}\left[\begin{array}{c}\frac{1}{2}\left(\delta Z_{\mathrm{Z}\gamma}\right)+\frac{1}{2}\left(\delta Z_{\gamma\mathrm{Z}}\right)\\ \hline \frac{1}{2}\left(\delta Z_{\mathrm{Z}\gamma}\right)M_{\mathrm{Z}}^{2}\\ \hline -\left(\frac{1}{2}\left(\delta Z_{\mathrm{Z}\gamma}\right)\right)-\frac{1}{2}\left(\delta Z_{\gamma\mathrm{Z}}\right)\end{array}\right]$$

[FFS] 2 Leptons – Higgs

$$C_{82}\left(\bar{e}_{\mathrm{g1}},e_{\mathrm{g2}},H\right)=-\frac{\mathrm{i}e}{2M_{\mathrm{W}}s_{\mathrm{W}}}\left[\begin{array}{c}\frac{1}{2}\delta_{\mathrm{g1,g2}}m_{e_{\mathrm{g1}}}\delta Z_{\mathrm{g1,g1}}^{e,\mathrm{L}}+\frac{1}{2}\delta_{\mathrm{g1,g2}}m_{e_{\mathrm{g2}}}\delta Z_{\mathrm{g2,g2}}^{e,\mathrm{R}*}+\delta_{\mathrm{g1,g2}}\left(\frac{1}{2}\left(\delta Z_{\mathrm{H}}\right)-\frac{\delta s_{\mathrm{W}}}{s_{\mathrm{W}}}+\frac{\delta m_{\mathrm{g1}}^{e_{\mathrm{g}}}}{m_{e_{\mathrm{g1}}}}-\frac{\delta M_{\mathrm{W}}^{2}}{2M_{\mathrm{W}}^{2}}+\delta Z_{\mathrm{e}}\right)m_{e_{\mathrm{g1}}}\\ \hline \frac{1}{2}\delta_{\mathrm{g1,g2}}m_{e_{\mathrm{g1}}}\delta Z_{\mathrm{g1,g1}}^{e,\mathrm{R}}+\frac{1}{2}\delta_{\mathrm{g1,g2}}m_{e_{\mathrm{g2}}}\delta Z_{\mathrm{g2,g2}}^{e,\mathrm{L}*}+\delta_{\mathrm{g1,g2}}\left(\frac{1}{2}\left(\delta Z_{\mathrm{H}}\right)-\frac{\delta s_{\mathrm{W}}}{s_{\mathrm{W}}}+\frac{\delta m_{\mathrm{g1}}^{e_{\mathrm{g}}}}{m_{e_{\mathrm{g1}}}}-\frac{\delta M_{\mathrm{W}}^{2}}{2M_{\mathrm{W}}^{2}}+\delta Z_{\mathrm{e}}\right)m_{e_{\mathrm{g1}}}\end{array}\right]$$

$$\underset{85}{C}\left(\bar{e}_{g1}, e_{g2}, G^0\right) = -\frac{e}{2M_W s_W}\left[\begin{array}{l} \frac{1}{2}\delta_{g1,g2} m_{e_{g1}} \delta Z^{e,L}_{g1,g1} + \frac{1}{2}\delta_{g1,g2} m_{e_{g2}} \delta Z^{e,R*}_{g2,g2} + \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_{G^0}\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{e_g}_{g1}}{m_{e_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{e_{g1}} \\ \hline -\left(\frac{1}{2}\delta_{g1,g2} m_{e_{g1}} \delta Z^{e,R}_{g1,g1}\right) - \frac{1}{2}\delta_{g1,g2} m_{e_{g2}} \delta Z^{e,L*}_{g2,g2} - \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_{G^0}\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{e_g}_{g1}}{m_{e_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{e_{g1}} \end{array}\right]$$

$$\underset{90}{C}\left(\bar{\nu}_{g1}, e_{g2}, G^+\right) = -\frac{ie\delta_{g1,g2} m_{e_{g1}}}{\sqrt{2} M_W s_W}\left(\frac{1}{2}\left(\delta Z_G\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{e_g}_{g1}}{m_{e_{g1}}} + \frac{1}{2}\delta Z^{e,R}_{g1,g1} + \frac{1}{2}\delta Z^{\nu,L*}_{g1,g1} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right)\left[\begin{array}{c} 0 \\ \hline 1 \end{array}\right]$$

$$\underset{91}{C}\left(\bar{e}_{g1}, \nu_{g2}, G^-\right) = -\frac{ie\delta_{g1,g2} m_{e_{g1}}}{\sqrt{2} M_W s_W}\left(\frac{1}{2}\left(\delta Z_G\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{e_g}_{g1}}{m_{e_{g1}}} + \frac{1}{2}\delta Z^{\nu,L}_{g1,g1} + \frac{1}{2}\delta Z^{e,R*}_{g1,g1} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

[FFS] 2 Quarks – Higgs

$$\underset{83}{C}\left(\bar{u}_{g1}, u_{g2}, H\right) = -\frac{ie}{2M_W s_W}\left[\begin{array}{l} \frac{1}{2} m_{u_{g1}} \delta Z^{u,L}_{g1,g2} + \frac{1}{2} m_{u_{g2}} \delta Z^{u,R*}_{g2,g1} + \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_H\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{u_g}_{g1}}{m_{u_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{u_{g1}} \\ \hline \frac{1}{2} m_{u_{g1}} \delta Z^{u,R}_{g1,g2} + \frac{1}{2} m_{u_{g2}} \delta Z^{u,L*}_{g2,g1} + \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_H\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{u_g}_{g1}}{m_{u_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{u_{g1}} \end{array}\right]$$

$$\underset{84}{C}\left(\bar{d}_{g1}, d_{g2}, H\right) = -\frac{ie}{2M_W s_W}\left[\begin{array}{l} \frac{1}{2} m_{d_{g1}} \delta Z^{d,L}_{g1,g2} + \frac{1}{2} m_{d_{g2}} \delta Z^{d,R*}_{g2,g1} + \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_H\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{d_g}_{g1}}{m_{d_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{d_{g1}} \\ \hline \frac{1}{2} m_{d_{g1}} \delta Z^{d,R}_{g1,g2} + \frac{1}{2} m_{d_{g2}} \delta Z^{d,L*}_{g2,g1} + \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_H\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{d_g}_{g1}}{m_{d_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{d_{g1}} \end{array}\right]$$

$$\underset{86}{C}\left(\bar{u}_{g1}, u_{g2}, G^0\right) = \frac{e}{2M_W s_W}\left[\begin{array}{l} \frac{1}{2} m_{u_{g1}} \delta Z^{u,L}_{g1,g2} + \frac{1}{2} m_{u_{g2}} \delta Z^{u,R*}_{g2,g1} + \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_{G^0}\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{u_g}_{g1}}{m_{u_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{u_{g1}} \\ \hline -\left(\frac{1}{2} m_{u_{g1}} \delta Z^{u,R}_{g1,g2}\right) - \frac{1}{2} m_{u_{g2}} \delta Z^{u,L*}_{g2,g1} - \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_{G^0}\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{u_g}_{g1}}{m_{u_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{u_{g1}} \end{array}\right]$$

$$\underset{87}{C}\left(\overline{d}_{g1}, d_{g2}, G^0\right) = -\frac{e}{2M_W s_W}\begin{bmatrix} \frac{1}{2}m_{d_{g1}}\delta Z^{d,L}_{g1,g2} + \frac{1}{2}m_{d_{g2}}\delta Z^{d,R*}_{g2,g1} + \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_{G^0}\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{d_g}_{g1}}{m_{d_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{d_{g1}} \\ -\left(\frac{1}{2}m_{d_{g1}}\delta Z^{d,R}_{g1,g2}\right) - \frac{1}{2}m_{d_{g2}}\delta Z^{d,L*}_{g2,g1} - \delta_{g1,g2}\left(\frac{1}{2}\left(\delta Z_{G^0}\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{d_g}_{g1}}{m_{d_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right) m_{d_{g1}} \end{bmatrix}$$

$$\underset{88}{C}\left(\overline{u}_{g1}, d_{g2}, G^+\right) = \frac{ie}{\sqrt{2}M_W s_W}\begin{bmatrix} \frac{1}{2}\left(\sum_{gn=1}^{3}\left(\mathrm{CKM}_{gn,g2}m_{u_{gn}}\delta Z^{u,R*}_{gn,g1} + \mathrm{CKM}_{g1,gn}m_{u_{g1}}\delta Z^{d,L}_{gn,g2}\right)\right) + \\ \left(\delta\mathrm{CKM}_{g1,g2} + \mathrm{CKM}_{g1,g2}\left(\frac{1}{2}\left(\delta Z_G\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{u_g}_{g1}}{m_{u_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right)\right) m_{u_{g1}} \\ -\frac{1}{2}\left(\sum_{gn=1}^{3}\left(\mathrm{CKM}_{gn,g2}m_{d_{g2}}\delta Z^{u,L*}_{gn,g1} + \mathrm{CKM}_{g1,gn}m_{d_{gn}}\delta Z^{d,R}_{gn,g2}\right)\right) - \\ \left(\delta\mathrm{CKM}_{g1,g2} + \mathrm{CKM}_{g1,g2}\left(\frac{1}{2}\left(\delta Z_G\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{d_g}_{g2}}{m_{d_{g2}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right)\right) m_{d_{g2}} \end{bmatrix}$$

$$\underset{89}{C}\left(\overline{d}_{g1}, u_{g2}, G^-\right) = -\frac{ie}{\sqrt{2}M_W s_W}\begin{bmatrix} \frac{1}{2}\left(\sum_{gn=1}^{3}\left(m_{d_{gn}}\mathrm{CKM}^*_{g2,gn}\delta Z^{d,R*}_{gn,g1} + m_{d_{g1}}\mathrm{CKM}^*_{gn,g1}\delta Z^{u,L}_{gn,g2}\right)\right) + \\ m_{d_{g1}}\left(\left(\frac{1}{2}\left(\delta Z_G\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{d_g}_{g1}}{m_{d_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right)\mathrm{CKM}^*_{g2,g1} + \delta\mathrm{CKM}^*_{g2,g1}\right) \\ -\frac{1}{2}\left(\sum_{gn=1}^{3}\left(m_{u_{g2}}\mathrm{CKM}^*_{g2,gn}\delta Z^{d,L*}_{gn,g1} + m_{u_{gn}}\mathrm{CKM}^*_{gn,g1}\delta Z^{u,R}_{gn,g2}\right)\right) - \\ m_{u_{g2}}\left(\left(\frac{1}{2}\left(\delta Z_G\right) - \frac{\delta s_W}{s_W} + \frac{\delta m^{u_g}_{g1}}{m_{u_{g1}}} - \frac{\delta M_W^2}{2M_W^2} + \delta Z_e\right)\mathrm{CKM}^*_{g2,g1} + \delta\mathrm{CKM}^*_{g2,g1}\right) \end{bmatrix}$$

[FFV] 2 Leptons – Gauge Boson

$$\underset{70}{C}\left(\overline{\nu}_{g1}, \nu_{g2}, \gamma\right) = \frac{ie\delta_{g1,g2}\left(\delta Z_{Z\gamma}\right)}{4c_W s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

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

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

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

$$\underset{78}{C}\left(\bar{\nu}_{g1}, e_{g2}, W^+\right) = \frac{ie\delta_{g1,g2}}{\sqrt{2}s_W}\left(\frac{1}{2}\left(\delta Z_W\right) - \frac{\delta s_W}{s_W} + \frac{1}{2}\delta Z^{e,L}_{g1,g1} + \frac{1}{2}\delta Z^{\nu,L*}_{g1,g1} + \delta Z_e\right) \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{79}{C}\left(\bar{e}_{g1}, \nu_{g2}, W^-\right) = \frac{ie\delta_{g1,g2}}{\sqrt{2}s_W}\left(\frac{1}{2}\left(\delta Z_W\right) - \frac{\delta s_W}{s_W} + \frac{1}{2}\delta Z^{\nu,L}_{g1,g1} + \frac{1}{2}\delta Z^{e,L*}_{g1,g1} + \delta Z_e\right) \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

[FFV] 2 Quarks – Gauge Boson

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

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

$$\underset{76}{C}\left(\overline{u}_{g1}, u_{g2}, Z\right) = ie \left[\begin{array}{c} \frac{1}{c_W s_W}\left(\frac{1}{2}\delta Z^{u,L}_{g1,g2} + \frac{1}{2}\delta Z^{u,L*}_{g2,g1}\right)\left(\frac{1}{2} - \frac{2}{3}s_W^2\right) - \\ \delta_{g1,g2}\left(\frac{1}{3}\left(\delta Z_{\gamma Z}\right) - \frac{\delta Z_{ZZ}}{2c_W s_W}\left(\frac{1}{2} - \frac{2}{3}s_W^2\right) + \frac{2s_W}{3c_W}\left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e\right) - \frac{1}{2c_W s_W}\left(\delta Z_e - \frac{\delta s_W}{s_W c_W^2}\left(c_W^2 - s_W^2\right)\right)\right) \\ \hline -\frac{2s_W}{3c_W}\left(\frac{1}{2}\delta Z^{u,R}_{g1,g2} + \frac{1}{2}\delta Z^{u,R*}_{g2,g1}\right) - \delta_{g1,g2}\left(\frac{1}{3}\left(\delta Z_{\gamma Z}\right) + \frac{\left(\delta Z_{ZZ}\right)s_W}{3c_W} + \frac{2s_W}{3c_W}\left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e\right)\right) \end{array} \right]$$

$$\underset{77}{C}\left(\overline{d}_{g1}, d_{g2}, Z\right) = ie \left[\begin{array}{c} -\frac{1}{c_W s_W}\left(\frac{1}{2}\delta Z^{d,L}_{g1,g2} + \frac{1}{2}\delta Z^{d,L*}_{g2,g1}\right)\left(\frac{1}{2} - \frac{1}{3}s_W^2\right) + \\ \delta_{g1,g2}\left(\frac{1}{6}\left(\delta Z_{\gamma Z}\right) - \frac{\delta Z_{ZZ}}{2c_W s_W}\left(\frac{1}{2} - \frac{1}{3}s_W^2\right) + \frac{s_W}{3c_W}\left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e\right) - \frac{1}{2c_W s_W}\left(\delta Z_e - \frac{\delta s_W}{s_W c_W^2}\left(c_W^2 - s_W^2\right)\right)\right) \\ \hline \frac{s_W}{3c_W}\left(\frac{1}{2}\delta Z^{d,R}_{g1,g2} + \frac{1}{2}\delta Z^{d,R*}_{g2,g1}\right) + \delta_{g1,g2}\left(\frac{1}{6}\left(\delta Z_{\gamma Z}\right) + \frac{\left(\delta Z_{ZZ}\right)s_W}{6c_W} + \frac{s_W}{3c_W}\left(\frac{\delta s_W}{s_W c_W^2} + \delta Z_e\right)\right) \end{array} \right]$$

$$\underset{80}{C}\left(\overline{u}_{g1}, d_{g2}, W^+\right) = \frac{ie}{\sqrt{2}s_W}\left(\frac{1}{2}\left(\sum_{gn=1}^{3}\left(\mathrm{CKM}_{gn,g2}\delta Z^{u,L*}_{gn,g1} + \mathrm{CKM}_{g1,gn}\delta Z^{d,L}_{gn,g2}\right)\right) + \delta\mathrm{CKM}_{g1,g2} + \mathrm{CKM}_{g1,g2}\left(\frac{1}{2}\left(\delta Z_W\right) - \frac{\delta s_W}{s_W} + \delta Z_e\right)\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$\underset{81}{C}\left(\overline{d}_{g1}, u_{g2}, W^-\right) = \frac{ie}{\sqrt{2}s_W}\left(\frac{1}{2}\left(\sum_{gn=1}^{3}\left(\mathrm{CKM}^*_{g2,gn}\delta Z^{d,L*}_{gn,g1} + \mathrm{CKM}^*_{gn,g1}\delta Z^{u,L}_{gn,g2}\right)\right) + \left(\frac{1}{2}\left(\delta Z_W\right) - \frac{\delta s_W}{s_W} + \delta Z_e\right)\mathrm{CKM}^*_{g2,g1} + \delta\mathrm{CKM}^*_{g2,g1}\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

[SSS] 3 Higgs

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

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

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

[SSV] 2 Higgs – Gauge Boson

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

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

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

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

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

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

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

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

[SUU] Higgs – 2 Ghosts

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

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

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

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

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

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

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

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

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

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

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

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

[SVV] Higgs – 2 Gauge Bosons

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

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

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

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

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

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

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

[UUV] 2 Ghosts – Gauge Boson

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

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

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

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

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

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

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

$$\underset{99}{C}\left(\overline{u}_{Z}, u_{+}, W^{-}\right) = \mathrm{i}e\left(\frac{1}{2}\left(\delta Z_{Z\gamma}\right) + \frac{c_{W}}{s_{W}}\left(\frac{1}{2}\left(\delta Z_{W}\right) - \frac{1}{2}\left(\delta Z_{ZZ}\right) - \frac{\delta s_{W}}{s_{W}c_{W}^{2}} + \delta Z_{e} + \delta U_{W}\right)\right)\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{100}{C}\left(\overline{u}_{-}, u_{\gamma}, W^{-}\right) = -\mathrm{i}e\left(\frac{\left(\delta U_{Z\gamma}\right)c_{W}}{s_{W}} - \delta Z_{e} - \delta U_{\gamma\gamma}\right)\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{101}{C}\left(\overline{u}_{\gamma}, u_{-}, W^{+}\right) = \mathrm{i}e\left(\frac{1}{2}\left(\delta Z_{W}\right) - \frac{1}{2}\left(\delta Z_{\gamma\gamma}\right) + \frac{\left(\delta Z_{\gamma Z}\right)c_{W}}{2s_{W}} + \delta Z_{e} + \delta U_{W}\right)\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{102}{C}\left(\overline{u}_{+}, u_{\gamma}, W^{+}\right) = \mathrm{i}e\left(\frac{\left(\delta U_{Z\gamma}\right)c_{W}}{s_{W}} - \delta Z_{e} - \delta U_{\gamma\gamma}\right)\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{103}{C}\left(\overline{u}_{\gamma}, u_{+}, W^{-}\right) = -\mathrm{i}e\left(\frac{1}{2}\left(\delta Z_{W}\right) - \frac{1}{2}\left(\delta Z_{\gamma\gamma}\right) + \frac{\left(\delta Z_{\gamma Z}\right)c_{W}}{2s_{W}} + \delta Z_{e} + \delta U_{W}\right)\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

[VVV] 3 Gauge Bosons

$$\underset{26}{C}\left(\gamma, W^{+}, W^{-}\right) = \left[\ -\mathrm{i}e\left(\frac{1}{2}\left(\delta Z_{\gamma\gamma}\right) - \frac{\left(\delta Z_{Z\gamma}\right)c_{W}}{2s_{W}} + \delta Z_{e} + \delta Z_{W}\right)\ \right]$$

$$\underset{27}{C}\left(Z, W^{+}, W^{-}\right) = \left[\ \frac{\mathrm{i}ec_{W}}{s_{W}}\left(\frac{1}{2}\left(\delta Z_{ZZ}\right) - \frac{\left(\delta Z_{\gamma Z}\right)s_{W}}{2c_{W}} - \frac{\delta s_{W}}{s_{W}c_{W}^{2}} + \delta Z_{e} + \delta Z_{W}\right)\ \right]$$

[SSSS] 4 Higgs

$$\underset{28}{C}(H, H, H, H) = \left[\ \frac{3\mathrm{i}e^{2}M_{H}^{2}}{4M_{W}^{2}s_{W}^{2}}\left(\frac{2\left(\delta s_{W}\right)}{s_{W}} - \frac{e\left(\delta \mathrm{T}_{H}\right)}{2M_{W}s_{W}M_{H}^{2}} - \frac{\delta M_{H}^{2}}{M_{H}^{2}} + \frac{\delta M_{W}^{2}}{M_{W}^{2}} - 2\left(\delta Z_{e}\right) - 2\left(\delta Z_{H}\right)\right)\ \right]$$

$$\underset{29}{C}\left(H, H, G^{0}, G^{0}\right) = \left[\ \frac{\mathrm{i}e^{2}M_{H}^{2}}{4M_{W}^{2}s_{W}^{2}}\left(\frac{2\left(\delta s_{W}\right)}{s_{W}} - \frac{e\left(\delta \mathrm{T}_{H}\right)}{2M_{W}s_{W}M_{H}^{2}} - \frac{\delta M_{H}^{2}}{M_{H}^{2}} + \frac{\delta M_{W}^{2}}{M_{W}^{2}} - 2\left(\delta Z_{e}\right) - \delta Z_{H} - \delta Z_{G^{0}}\right)\ \right]$$

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

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

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

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

[SSVV] 2 Higgs – 2 Gauge Bosons

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[VVVV] 4 Gauge Bosons

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

$$\underset{23}{C}\left(W^+,W^-,Z,Z\right) = -\frac{\mathrm{i}e^2c_\mathrm{W}^2}{s_\mathrm{W}^2}\left[\begin{array}{c} -\frac{2\left(\delta Z_{\gamma\mathrm{Z}}\right)s_\mathrm{W}}{c_\mathrm{W}} - \frac{4\left(\delta s_\mathrm{W}\right)}{s_\mathrm{W}c_\mathrm{W}^2} + 4\left(\delta \mathrm{Z_e}\right) + 2\left(\delta Z_\mathrm{W}\right) + 2\left(\delta Z_{\mathrm{ZZ}}\right) \\ \hline \frac{\left(\delta Z_{\gamma\mathrm{Z}}\right)s_\mathrm{W}}{c_\mathrm{W}} + \frac{2\left(\delta s_\mathrm{W}\right)}{s_\mathrm{W}c_\mathrm{W}^2} - 2\left(\delta \mathrm{Z_e}\right) - \delta Z_\mathrm{W} - \delta Z_{\mathrm{ZZ}} \\ \hline \frac{\left(\delta Z_{\gamma\mathrm{Z}}\right)s_\mathrm{W}}{c_\mathrm{W}} + \frac{2\left(\delta s_\mathrm{W}\right)}{s_\mathrm{W}c_\mathrm{W}^2} - 2\left(\delta \mathrm{Z_e}\right) - \delta Z_\mathrm{W} - \delta Z_{\mathrm{ZZ}} \end{array}\right]$$

$$\underset{24}{C}\left(W^+,W^-,\gamma,Z\right) = \frac{\mathrm{i}e^2c_\mathrm{W}}{s_\mathrm{W}}\left[\begin{array}{c} -\frac{\left(\delta Z_{\mathrm{Z}\gamma}\right)c_\mathrm{W}}{s_\mathrm{W}} - \frac{\left(\delta Z_{\gamma\mathrm{Z}}\right)s_\mathrm{W}}{c_\mathrm{W}} - \frac{2\left(\delta s_\mathrm{W}\right)}{s_\mathrm{W}c_\mathrm{W}^2} + 4\left(\delta \mathrm{Z_e}\right) + 2\left(\delta Z_\mathrm{W}\right) + \delta Z_{\mathrm{ZZ}} + \delta Z_{\gamma\gamma} \\ \hline -\left(\frac{1}{2}\left(\delta Z_{\mathrm{ZZ}}\right)\right) - \frac{1}{2}\left(\delta Z_{\gamma\gamma}\right) + \frac{\left(\delta Z_{\mathrm{Z}\gamma}\right)c_\mathrm{W}}{2s_\mathrm{W}} + \frac{\left(\delta Z_{\gamma\mathrm{Z}}\right)s_\mathrm{W}}{2c_\mathrm{W}} + \frac{\delta s_\mathrm{W}}{s_\mathrm{W}c_\mathrm{W}^2} - 2\left(\delta \mathrm{Z_e}\right) - \delta Z_\mathrm{W} \\ \hline -\left(\frac{1}{2}\left(\delta Z_{\mathrm{ZZ}}\right)\right) - \frac{1}{2}\left(\delta Z_{\gamma\gamma}\right) + \frac{\left(\delta Z_{\mathrm{Z}\gamma}\right)c_\mathrm{W}}{2s_\mathrm{W}} + \frac{\left(\delta Z_{\gamma\mathrm{Z}}\right)s_\mathrm{W}}{2c_\mathrm{W}} + \frac{\delta s_\mathrm{W}}{s_\mathrm{W}c_\mathrm{W}^2} - 2\left(\delta \mathrm{Z_e}\right) - \delta Z_\mathrm{W} \end{array}\right]$$

$$\underset{25}{C}\left(W^+,W^-,\gamma,\gamma\right) = -\mathrm{i}e^2\left[\begin{array}{c} -\frac{2\left(\delta Z_{\mathrm{Z}\gamma}\right)c_\mathrm{W}}{s_\mathrm{W}} + 4\left(\delta \mathrm{Z_e}\right) + 2\left(\delta Z_\mathrm{W}\right) + 2\left(\delta Z_{\gamma\gamma}\right) \\ \hline \frac{\left(\delta Z_{\mathrm{Z}\gamma}\right)c_\mathrm{W}}{s_\mathrm{W}} - 2\left(\delta \mathrm{Z_e}\right) - \delta Z_\mathrm{W} - \delta Z_{\gamma\gamma} \\ \hline \frac{\left(\delta Z_{\mathrm{Z}\gamma}\right)c_\mathrm{W}}{s_\mathrm{W}} - 2\left(\delta \mathrm{Z_e}\right) - \delta Z_\mathrm{W} - \delta Z_{\gamma\gamma} \end{array}\right]$$