MSSMCT (1-loop counter terms)

[FF] 2 Charginos

$$\underset{468}{C}\left(\tilde{\chi}^{+}_{c1}, \tilde{\chi}^{-}_{c2}\right) = \frac{i}{2}\left[\begin{array}{c} -\delta\overline{Z}^{\tilde{\chi}^{-},L}_{c1,c2} - \delta Z^{\tilde{\chi}^{-},L}_{c1,c2} \\ \hline \delta\overline{Z}^{\tilde{\chi}^{-},R}_{c1,c2} + \delta Z^{\tilde{\chi}^{-},R}_{c1,c2} \\ \hline -m_{\tilde{\chi}^{-}_{c2}}\delta\overline{Z}^{\tilde{\chi}^{-},R}_{c1,c2} - 2\delta m^{\tilde{\chi}^{-}}_{c1,c2} - m_{\tilde{\chi}^{-}_{c1}}\delta Z^{\tilde{\chi}^{-},L}_{c1,c2} \\ \hline -m_{\tilde{\chi}^{-}_{c2}}\delta\overline{Z}^{\tilde{\chi}^{-},L}_{c1,c2} - 2\delta m^{\tilde{\chi}^{-}*}_{c2,c1} - m_{\tilde{\chi}^{-}_{c1}}\delta Z^{\tilde{\chi}^{-},R}_{c1,c2} \end{array}\right]$$

[FF] 2 Gluinos

$$\underset{489}{C}\left(\tilde{g}, \tilde{g}\right) = \frac{1}{2}i\delta_{g1,g2}\left[\begin{array}{c} -\delta\overline{Z}^{L}_{\tilde{g}} - \delta Z^{L}_{\tilde{g}} \\ \hline \delta\overline{Z}^{R}_{\tilde{g}} + \delta Z^{R}_{\tilde{g}} \\ \hline -2\left(\delta m_{\tilde{g}}\right) - m_{\tilde{g}}\left(\delta\overline{Z}^{R}_{\tilde{g}} + \delta Z^{L}_{\tilde{g}}\right) \\ \hline -2\delta m^{*}_{\tilde{g}} - m_{\tilde{g}}\left(\delta\overline{Z}^{L}_{\tilde{g}} + \delta Z^{R}_{\tilde{g}}\right) \end{array}\right]$$

[FF] 2 Leptons

$$\underset{443}{C}\left(\overline{\nu}_{g1}, \nu_{g2}\right) = \frac{1}{2}i\delta_{g1,g2}\left[\begin{array}{c} -\delta\overline{Z}^{\nu,L}_{g1,g1} - \delta Z^{\nu,L}_{g1,g1} \\ \hline \delta\overline{Z}^{\nu,R}_{g1,g1} + \delta Z^{\nu,R}_{g1,g1} \\ \hline 0 \\ \hline 0 \end{array}\right]$$

$$\underset{444}{C}\left(\bar{e}_{g1}, e_{g2}\right) = \frac{1}{2} i \delta_{g1,g2} \begin{bmatrix} -\delta\overline{Z}^{e,L}_{g1,g1} - \delta Z^{e,L}_{g1,g1} \\ \hline \delta\overline{Z}^{e,R}_{g1,g1} + \delta Z^{e,R}_{g1,g1} \\ \hline -2\delta m^{e_g}_{g1} - m_{e_{g1}}\left(\delta\overline{Z}^{e,R}_{g1,g1} + \delta Z^{e,L}_{g1,g1}\right) \\ \hline -2\delta m^{e_g}_{g1} - m_{e_{g1}}\left(\delta\overline{Z}^{e,L}_{g1,g1} + \delta Z^{e,R}_{g1,g1}\right) \end{bmatrix}$$

[FF] 2 Neutralinos

$$\underset{469}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^0_{n2}\right) = \frac{i}{2} \begin{bmatrix} -\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,n2} - \delta Z^{\tilde{\chi}^0,L}_{n1,n2} \\ \hline \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,n2} + \delta Z^{\tilde{\chi}^0,R}_{n1,n2} \\ \hline -m_{\tilde{\chi}^0_{n2}}\delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,n2} - 2\delta m^{\tilde{\chi}^0}_{n1,n2} - m_{\tilde{\chi}^0_{n1}}\delta Z^{\tilde{\chi}^0,L}_{n1,n2} \\ \hline -m_{\tilde{\chi}^0_{n2}}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,n2} - 2\delta m^{\tilde{\chi}^{0*}}_{n2,n1} - m_{\tilde{\chi}^0_{n1}}\delta Z^{\tilde{\chi}^0,R}_{n1,n2} \end{bmatrix}$$

[FF] 2 Quarks

$$\underset{445}{C}\left(\bar{u}_{g1}, u_{g2}\right) = \frac{i}{2} \begin{bmatrix} -\delta\overline{Z}^{u,L}_{g2,g1} - \delta Z^{u,L}_{g1,g2} \\ \hline \delta\overline{Z}^{u,R}_{g2,g1} + \delta Z^{u,R}_{g1,g2} \\ \hline -m_{u_{g2}}\delta\overline{Z}^{u,R}_{g1,g2} - 2\delta_{g1,g2}\delta m^{u_g}_{g1} - m_{u_{g1}}\delta Z^{u,L}_{g1,g2} \\ \hline -m_{u_{g2}}\delta\overline{Z}^{u,L}_{g1,g2} - 2\delta_{g1,g2}\delta m^{u_g}_{g1} - m_{u_{g1}}\delta Z^{u,R}_{g1,g2} \end{bmatrix}$$

$$\underset{446}{C}\left(\bar{d}_{g1}, d_{g2}\right) = \frac{i}{2}\begin{bmatrix} -\delta\overline{Z}^{d,L}_{g2,g1} - \delta Z^{d,L}_{g1,g2} \\ \hline \delta\overline{Z}^{d,R}_{g2,g1} + \delta Z^{d,R}_{g1,g2} \\ \hline -m_{d_{g2}}\delta\overline{Z}^{d,R}_{g1,g2} - 2\delta_{g1,g2}\delta m^{d_g}_{g1} - m_{d_{g1}}\delta Z^{d,L}_{g1,g2} \\ \hline -m_{d_{g2}}\delta\overline{Z}^{d,L}_{g1,g2} - 2\delta_{g1,g2}\delta m^{d_g}_{g1} - m_{d_{g1}}\delta Z^{d,R}_{g1,g2} \end{bmatrix}$$

[SS] 2 Higgs

$$\underset{472}{C}\left(h^0, h^0\right) = -i\begin{bmatrix} \delta Z_{hh} \\ \hline \left(\delta Z_{hh}\right) M^{tree2}_{h^0} + \delta M^2_{hh} \end{bmatrix}$$

$$\underset{473}{C}\left(h^0, H^0\right) = -i\begin{bmatrix} \delta Z_{hH} \\ \hline \frac{1}{2}\left(\left(\delta Z_{hH}\right)\left(M^{tree2}_{h^0} + M^{tree2}_{H^0}\right) + 2\delta M^2_{hH}\right) \end{bmatrix}$$

$$\underset{474}{C}\left(h^0, A^0\right) = -i\begin{bmatrix} \delta Z_{hA} \\ \hline \frac{1}{2}\left(\left(\delta Z_{hA}\right)\left(M^{tree2}_{A^0} + M^{tree2}_{h^0}\right) + 2\delta M^2_{hA}\right) \end{bmatrix}$$

$$\underset{475}{C}\left(h^0, G^0\right) = -i\begin{bmatrix} \delta Z_{hG} \\ \hline \frac{1}{2}\left(\left(\delta Z_{hG}\right) M^{tree2}_{h^0} + 2\delta M^2_{hG}\right) \end{bmatrix}$$

$$\underset{476}{C}\left(H^0, H^0\right) = -i\begin{bmatrix} \delta Z_{HH} \\ \hline \left(\delta Z_{HH}\right) M^{tree2}_{H^0} + \delta M^2_{HH} \end{bmatrix}$$

$$\underset{477}{C}\left(H^0, A^0\right) = -i\begin{bmatrix} \delta Z_{HA} \\ \hline \frac{1}{2}\left(\left(\delta Z_{HA}\right)\left(M^{tree2}_{A^0} + M^{tree2}_{H^0}\right) + 2\delta M^2_{HA}\right) \end{bmatrix}$$

$$C\left(H^0, G^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{HG}}}{\frac{1}{2}\left(\left(\delta Z_{\mathrm{HG}}\right) M^{\mathrm{tree}2}_{H^0} + 2\delta M^2_{\mathrm{HG}}\right)}\right]$$

$$C\left(A^0, A^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{AA}}}{\left(\delta Z_{\mathrm{AA}}\right) M^{\mathrm{tree}2}_{A^0} + \delta M^2_{\mathrm{AA}}}\right]$$

$$C\left(A^0, G^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{AG}}}{\frac{1}{2}\left(\left(\delta Z_{\mathrm{AG}}\right) M^{\mathrm{tree}2}_{A^0} + 2\delta M^2_{\mathrm{AG}}\right)}\right]$$

$$C\left(G^0, G^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{GG}}}{\delta M^2_{\mathrm{GG}}}\right]$$

$$C\left(H^-, H^+\right) = -\frac{\mathrm{i}}{2}\left[\frac{\delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}}}{\left(\delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}}\right) M^{\mathrm{tree}2}_{H^-} + 2\delta M^2_{\mathrm{H^-H^-}}}\right]$$

$$C\left(H^-, G^+\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{G^-H^-}}}{\frac{1}{2}\left(\left(\delta Z_{\mathrm{H^-G^-}}\right) M^{\mathrm{tree}2}_{H^-} + 2\delta M^2_{\mathrm{G^-H^-}}\right)}\right]$$

$$C\left(G^-, H^+\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{H^-G^-}}}{\frac{1}{2}\left(\left(\delta Z_{\mathrm{G^-H^-}}\right) M^{\mathrm{tree}2}_{H^-} + 2\delta M^2_{\mathrm{H^-G^-}}\right)}\right]$$

$$C\left(G^-, G^+\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{G^-G^-}}}{\delta M^2_{\mathrm{G^-G^-}}}\right]$$

[SS] 2 Sleptons

$$\underset{470}{C}\left(\tilde{\nu}_{g1}^{\dagger}, \tilde{\nu}_{g2}\right) = -\frac{1}{2}\mathrm{i}\delta_{g1,g2}\left[\frac{\delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}}{2\delta M_{1,1}^{\tilde{\nu}} + m_{\tilde{\nu}_{g1}}^2\left(\delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)}\right]$$

$$\underset{471}{C}\left(\tilde{e}_{g1}^{s1,\dagger}, \tilde{e}_{g2}^{s2}\right) = -\frac{1}{2}\mathrm{i}\delta_{g1,g2}\left[\frac{\delta\overline{Z}_{s2,s1}^{\tilde{e}_{g2}} + \delta Z_{s1,s2}^{\tilde{e}_{g1}}}{m_{\tilde{e}_{g2}^{s2}}^2\delta\overline{Z}_{s2,s1}^{\tilde{e}_{g2}} + 2\delta M_{s1,s2}^{\tilde{e}_{g1}} + m_{\tilde{e}_{g1}^{s1}}^2\delta Z_{s1,s2}^{\tilde{e}_{g1}}}\right]$$

[SS] 2 Squarks

$$\underset{486}{C}\left(\tilde{u}_{g1}^{s1,\dagger}, \tilde{u}_{g2}^{s2}\right) = -\frac{1}{2}\mathrm{i}\delta_{g1,g2}\left[\frac{\delta\overline{Z}_{s2,s1}^{\tilde{u}_{g2}} + \delta Z_{s1,s2}^{\tilde{u}_{g1}}}{m_{\tilde{u}_{g2}^{s2}}^2\delta\overline{Z}_{s2,s1}^{\tilde{u}_{g2}} + 2\delta M_{s1,s2}^{\tilde{u}_{g1}} + m_{\tilde{u}_{g1}^{s1}}^2\delta Z_{s1,s2}^{\tilde{u}_{g1}}}\right]$$

$$\underset{487}{C}\left(\tilde{d}_{g1}^{s1,\dagger}, \tilde{d}_{g2}^{s2}\right) = -\frac{1}{2}\mathrm{i}\delta_{g1,g2}\left[\frac{\delta\overline{Z}_{s2,s1}^{\tilde{d}_{g2}} + \delta Z_{s1,s2}^{\tilde{d}_{g1}}}{m_{\tilde{d}_{g2}^{s2}}^2\delta\overline{Z}_{s2,s1}^{\tilde{d}_{g2}} + 2\delta M_{s1,s2}^{\tilde{d}_{g1}} + m_{\tilde{d}_{g1}^{s1}}^2\delta Z_{s1,s2}^{\tilde{d}_{g1}}}\right]$$

[SV] Higgs – Gauge Boson

$$\underset{426}{C}\left(A^0, Z\right) = -M_Z\left(\delta Z_{AG}\right)\left[\frac{1}{0}\right]$$

$$\underset{427}{C}\left(G^0, Z\right) = -\frac{M_Z}{2}\left(\frac{\delta M_Z^2}{M_Z^2} + \delta Z_{ZZ} + \delta Z_{GG}\right)\left[\frac{1}{0}\right]$$

$$\underset{428}{C}\left(G^0, \gamma\right) = -\frac{1}{2}M_Z\left(\delta Z_{Z\gamma}\right)\left[\frac{1}{0}\right]$$

$$C_{429}\left(H^-, W^+\right) = \mathrm{i} M_W \left(\delta Z_{G^- H^-}\right) \left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$C_{430}\left(H^+, W^-\right) = -\mathrm{i} M_W \left(\delta Z_{H^- G^-}\right) \left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$C_{431}\left(G^-, W^+\right) = \left(\frac{1}{2}\mathrm{i} M_W\right) \left(\frac{\delta M_W^2}{M_W^2} + \delta Z_W + \delta Z_{G^- G^-}\right) \left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$C_{432}\left(G^+, W^-\right) = -\left(\frac{1}{2}\mathrm{i} M_W\right) \left(\frac{\delta M_W^2}{M_W^2} + \delta Z_W + \delta Z_{G^- G^-}\right) \left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

[UU] 2 Ghosts

$$C_{437}\left(u_\gamma, \overline{u}_\gamma\right) = \mathrm{i} \left(\frac{1}{2}\left(\delta Z_{\gamma\gamma}\right) - \delta U_{\gamma\gamma}\right) \left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$C_{438}\left(u_Z, \overline{u}_Z\right) = -\mathrm{i} \left[\begin{array}{c} -\left(\frac{1}{2}\left(\delta Z_{ZZ}\right)\right) + \delta U_{ZZ} \\ \hline \frac{\xi_Z}{2}\left(\left(2\left(\delta U_{ZZ}\right) - \delta Z_{G^0}\right) M_Z^2 + \delta M_Z^2\right) \end{array}\right]$$

$$C_{439}\left(u_Z, \overline{u}_\gamma\right) = \mathrm{i} \left(\frac{1}{2}\left(\delta Z_{\gamma Z}\right) - \delta U_{\gamma Z}\right) \left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$C_{440}\left(u_\gamma, \overline{u}_Z\right) = -\mathrm{i} \left[\begin{array}{c} -\left(\frac{1}{2}\left(\delta Z_{Z\gamma}\right)\right) + \delta U_{Z\gamma} \\ \hline \xi_Z \left(\delta U_{Z\gamma}\right) M_Z^2 \end{array}\right]$$

$$C_{441}(u_-, \overline{u}_-) = -\mathrm{i}\left[\frac{-\left(\frac{1}{2}(\delta Z_W)\right) + \delta U_W}{\frac{\xi_W}{2}\left(\left(2(\delta U_W) - \delta Z_G\right) M_W^2 + \delta M_W^2\right)}\right]$$

$$C_{442}(u_+, \overline{u}_+) = -\mathrm{i}\left[\frac{-\left(\frac{1}{2}(\delta Z_W)\right) + \delta U_W}{\frac{\xi_W}{2}\left(\left(2(\delta U_W) - \delta Z_G\right) M_W^2 + \delta M_W^2\right)}\right]$$

[VV] 2 Gauge Bosons

$$C_{433}\left(W^+, W^-\right) = \mathrm{i}\left[\begin{array}{c} \delta Z_W \\ \hline (\delta Z_W) M_W^2 + \delta M_W^2 \\ \hline -\delta Z_W \end{array}\right]$$

$$C_{434}(Z, Z) = \mathrm{i}\left[\begin{array}{c} \delta Z_{ZZ} \\ \hline (\delta Z_{ZZ}) M_Z^2 + \delta M_Z^2 \\ \hline -\delta Z_{ZZ} \end{array}\right]$$

$$C_{435}(\gamma, \gamma) = \mathrm{i}(\delta Z_{\gamma\gamma})\left[\begin{array}{c} 1 \\ \hline 0 \\ \hline -1 \end{array}\right]$$

$$C_{436}(\gamma, Z) = \frac{\mathrm{i}}{2}\left[\begin{array}{c} \delta Z_{Z\gamma} + \delta Z_{\gamma Z} \\ \hline (\delta Z_{Z\gamma}) M_Z^2 \\ \hline -(\delta Z_{Z\gamma}) - \delta Z_{\gamma Z} \end{array}\right]$$

[VV] 2 Gluons

$$\underset{488}{C}(g,g) = \mathrm{i}\delta_{\mathrm{g1,g2}}\left(\delta Z_{gg}\right)\begin{bmatrix} 1 \\ \hline 0 \\ \hline -1 \end{bmatrix}$$

[FFS] Chargino – Lepton – Slepton

$$\underset{269}{C}\left(\tilde{\chi}^{-}_{\mathrm{c1}},\bar{e}_{\mathrm{g2}},\tilde{\nu}_{\mathrm{g3}}\right) = \frac{\mathrm{i}e\delta_{\mathrm{g2,g3}}}{2s_{\mathrm{W}}^2}\begin{bmatrix} \frac{1}{\sqrt{2}c_\beta^2 M_{\mathrm{W}}^3} \\ \hline V_{\mathrm{c1,1}}\left(2\left(\delta s_{\mathrm{W}}\right) - s_{\mathrm{W}}\left(2\left(\delta \mathrm{Z_e}\right) + \delta\overline{Z}^{e,\mathrm{L}}_{\mathrm{g2,g2}} + \delta Z^{\tilde{\nu}}_{\mathrm{1,1}}\right)\right) - s_{\mathrm{W}}\left(V_{\mathrm{1,1}}\delta Z^{\tilde{\chi}^-,\mathrm{R}}_{\mathrm{1,c1}} + V_{\mathrm{2,1}}\delta Z^{\tilde{\chi}^-,\mathrm{R}}_{\mathrm{2,c1}}\right) \end{bmatrix}$$

$$\boxed{1} = \begin{array}{l} c_\beta m_{e_{\mathrm{g3}}} s_{\mathrm{W}} M_{\mathrm{W}}^2\left(\delta Z^{\tilde{\chi}^-,\mathrm{L}}_{\mathrm{1,c1}} U^*_{\mathrm{1,2}} + \delta Z^{\tilde{\chi}^-,\mathrm{L}}_{\mathrm{2,c1}} U^*_{\mathrm{2,2}}\right) + \\ \left(2c_\beta s_{\mathrm{W}}\delta m^{e_{\mathrm{g}}}_{\mathrm{g3}} M_{\mathrm{W}}^2 - \left(\begin{array}{l} c_\beta\left(s_{\mathrm{W}}\delta M_{\mathrm{W}}^2 + 2\left(\delta s_{\mathrm{W}}\right)M_{\mathrm{W}}^2\right) + \\ s_{\mathrm{W}}\left(2\left(\delta c_\beta\right) - c_\beta\left(2\left(\delta \mathrm{Z_e}\right) + \delta\overline{Z}^{e,\mathrm{R}}_{\mathrm{g2,g2}} + \delta Z^{\tilde{\nu}}_{\mathrm{1,1}}\right)\right)M_{\mathrm{W}}^2 \end{array}\right) m_{e_{\mathrm{g3}}}\right) U^*_{\mathrm{c1,2}} \end{array}$$

$$\underset{270}{C}\left(\tilde{\chi}^{+}_{\mathrm{c1}},\overline{\nu}_{\mathrm{g2}},\tilde{e}^{s3}_{\mathrm{g3}}\right) = -\frac{\mathrm{i}e(\boxed{2})\delta_{\mathrm{g2,g3}}}{4c_\beta^2 M_{\mathrm{W}}^3 s_{\mathrm{W}}^2}\begin{bmatrix} 0 \\ \hline 1 \end{bmatrix}$$

$$\boxed{2} = \begin{array}{l} 2\left(s_{\mathrm{W}}\left(U_{\mathrm{1,1}}\delta\overline{Z}^{\tilde{\chi}^-,\mathrm{L}}_{\mathrm{c1,1}} + U_{\mathrm{2,1}}\delta\overline{Z}^{\tilde{\chi}^-,\mathrm{L}}_{\mathrm{c1,2}}\right) - U_{\mathrm{c1,1}}\left(2\left(\delta s_{\mathrm{W}}\right) - s_{\mathrm{W}}\left(2\left(\delta \mathrm{Z_e}\right) + \delta\overline{Z}^{\nu,\mathrm{L}}_{\mathrm{g2,g2}}\right)\right)\right)c_\beta^2 M_{\mathrm{W}}^3 U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{s3,1}} - \sqrt{2}(\boxed{1})U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{s3,2}} + \\ c_\beta s_{\mathrm{W}} M_{\mathrm{W}}^2\left(2c_\beta M_{\mathrm{W}} U_{\mathrm{c1,1}}\left(\delta Z^{\tilde{e}_{\mathrm{g3}}}_{\mathrm{1,s3}} U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{1,1}} + \delta Z^{\tilde{e}_{\mathrm{g3}}}_{\mathrm{2,s3}} U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{2,1}}\right) - \sqrt{2}m_{e_{\mathrm{g2}}} U_{\mathrm{c1,2}}\left(\delta Z^{\tilde{e}_{\mathrm{g3}}}_{\mathrm{1,s3}} U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{1,2}} + \delta Z^{\tilde{e}_{\mathrm{g3}}}_{\mathrm{2,s3}} U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{2,2}}\right)\right) \end{array}$$

$$\boxed{1} = U_{\mathrm{c1,2}}\left(2c_\beta s_{\mathrm{W}} M_{\mathrm{W}}^2\delta m^{e_{\mathrm{g}}}_{\mathrm{g2}} - m_{e_{\mathrm{g2}}}\left(\begin{array}{l} s_{\mathrm{W}}\left(2\left(\delta c_\beta\right) - c_\beta\left(2\left(\delta \mathrm{Z_e}\right) + \delta\overline{Z}^{\nu,\mathrm{L}}_{\mathrm{g2,g2}}\right)\right)M_{\mathrm{W}}^2 + \\ c_\beta\left(s_{\mathrm{W}}\delta M_{\mathrm{W}}^2 + 2\left(\delta s_{\mathrm{W}}\right)M_{\mathrm{W}}^2\right) \end{array}\right)\right) + c_\beta s_{\mathrm{W}} m_{e_{\mathrm{g2}}} M_{\mathrm{W}}^2\left(U_{\mathrm{1,2}}\delta\overline{Z}^{\tilde{\chi}^-,\mathrm{L}}_{\mathrm{c1,1}} + U_{\mathrm{2,2}}\delta\overline{Z}^{\tilde{\chi}^-,\mathrm{L}}_{\mathrm{c1,2}}\right)$$

$$\underset{273}{C}\left(e_{\mathrm{g1}},\tilde{\chi}^{+}_{\mathrm{c2}},\tilde{\nu}^{\dagger}_{\mathrm{g3}}\right) = \frac{\mathrm{i}e\delta_{\mathrm{g1,g3}}}{2s_{\mathrm{W}}^2}\begin{bmatrix} -s_{\mathrm{W}}\left(V^*_{\mathrm{1,1}}\delta\overline{Z}^{\tilde{\chi}^-,\mathrm{R}}_{\mathrm{c2,1}} + V^*_{\mathrm{2,1}}\delta\overline{Z}^{\tilde{\chi}^-,\mathrm{R}}_{\mathrm{c2,2}}\right) + V^*_{\mathrm{c2,1}}\left(2\left(\delta s_{\mathrm{W}}\right) - s_{\mathrm{W}}\left(2\left(\delta \mathrm{Z_e}\right) + \delta\overline{Z}^{\tilde{\nu}}_{\mathrm{1,1}} + \delta Z^{e,\mathrm{L}}_{\mathrm{g1,g1}}\right)\right) \\ \hline \frac{1}{\sqrt{2}c_\beta^2 M_{\mathrm{W}}^3} \end{bmatrix}$$

$$
\boxed{1} = \begin{array}{l} c_\beta m_{e_{g3}} s_W \left(U_{1,2} \delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + U_{2,2} \delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,2} \right) M_W^2 + \\ U_{c2,2} \left(2 c_\beta s_W \delta m^{e_g}_{g3} M_W^2 - \left(\begin{array}{l} c_\beta \left(s_W \delta M_W^2 + 2 (\delta s_W) M_W^2 \right) + \\ s_W \left(2 (\delta c_\beta) - c_\beta \left(2 (\delta Z_e) + \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{e,R}_{g1,g1} \right) \right) M_W^2 \end{array} \right) m_{e_{g3}} \right) \end{array}
$$

$$
\underset{274}{C} \left(\nu_{g1}, \tilde{\chi}^-_{c2}, \tilde{e}^{s3,\dagger}_{g3} \right) = -\frac{ie(\boxed{2})\delta_{g1,g3}}{4 c_\beta^2 M_W^3 s_W^2} \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}
$$

$$
\boxed{2} = \begin{array}{l} 2 c_\beta^2 M_W^3 U^*_{c2,1} \left(s_W \left(\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g1}}_{2,1} \right) - \left(2 (\delta s_W) - s_W \left(2 (\delta Z_e) + \delta Z^{\nu,L}_{g1,g1} \right) \right) U^{\tilde{e}_{g1}}_{s3,1} \right) - \sqrt{2}(\boxed{1}) U^*_{c2,2} + \\ c_\beta s_W M_W^2 \left(2 c_\beta M_W \left(\delta Z^{\tilde{\chi}^-,L}_{1,c2} U^*_{1,1} + \delta Z^{\tilde{\chi}^-,L}_{2,c2} U^*_{2,1} \right) U^{\tilde{e}_{g1}}_{s3,1} - \sqrt{2} m_{e_{g1}} \left(\delta Z^{\tilde{\chi}^-,L}_{1,c2} U^*_{1,2} + \delta Z^{\tilde{\chi}^-,L}_{2,c2} U^*_{2,2} \right) U^{\tilde{e}_{g1}}_{s3,2} \right) \end{array}
$$

$$
\boxed{1} = \begin{array}{l} c_\beta m_{e_{g1}} s_W M_W^2 \left(\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g1}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g1}}_{2,2} \right) + \\ \left(2 c_\beta s_W \delta m^{e_g}_{g1} M_W^2 - \left(\begin{array}{l} c_\beta \left(s_W \delta M_W^2 + 2 (\delta s_W) M_W^2 \right) + \\ s_W \left(2 (\delta c_\beta) - c_\beta \left(2 (\delta Z_e) + \delta Z^{\nu,L}_{g1,g1} \right) \right) M_W^2 \end{array} \right) m_{e_{g1}} \right) U^{\tilde{e}_{g1}}_{s3,2} \end{array}
$$

[FFS] Chargino – Neutralino – Higgs

$$
\underset{255}{C} \left(\tilde{\chi}^0_{n1}, \tilde{\chi}^+_{c2}, H^- \right) = -\frac{ie}{s_W^2} \begin{bmatrix} \dfrac{1}{4 c_W^3} \left((\boxed{2}) c_W^2 + \sqrt{2} \left(\begin{array}{l} (\boxed{1}) c_W^2 + \\ \left(s_\beta \left(\delta Z_{G^-H^-} \right) c_W^2 + c_\beta \left(2 s_W (\delta s_W) + (2 (\delta Z_e) + \delta Z_{H^-H^-}) c_W^2 \right) \right) s_W^2 Z^*_{n1,1} \end{array} \right) V^*_{c2,2} \right) \\ \hline -\frac{1}{2} \left(\begin{array}{l} s_\beta \left((\boxed{3}) s_W + \left(\sqrt{2} U_{c2,2} \left(\dfrac{Z_{n1,1} s_W^3}{c_W^3} - Z_{n1,2} \right) + 2 U_{c2,1} Z_{n1,3} \right) (\delta s_W) \right) - \\ c_\beta s_W \left(\dfrac{U_{c2,2}}{\sqrt{2}} \left(\dfrac{s_W Z_{n1,1}}{c_W} + Z_{n1,2} \right) - U_{c2,1} Z_{n1,3} \right) (\delta Z_{G^-H^-}) \end{array} \right) \end{bmatrix}
$$

$$
\boxed{3} = \begin{array}{l} \left(\dfrac{U_{1,2}}{\sqrt{2}} \left(\dfrac{s_W Z_{n1,1}}{c_W} + Z_{n1,2} \right) - U_{1,1} Z_{n1,3} \right) \delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + \left(\dfrac{U_{2,2}}{\sqrt{2}} \left(\dfrac{s_W Z_{n1,1}}{c_W} + Z_{n1,2} \right) - U_{2,1} Z_{n1,3} \right) \delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,2} + \\ (2 (\delta Z_e) + \delta Z_{H^-H^-}) \left(\dfrac{U_{c2,2}}{\sqrt{2}} \left(\dfrac{s_W Z_{n1,1}}{c_W} + Z_{n1,2} \right) - U_{c2,1} Z_{n1,3} \right) + \\ \left(\dfrac{U_{c2,2}}{\sqrt{2}} \left(\dfrac{s_W Z_{1,1}}{c_W} + Z_{1,2} \right) - U_{c2,1} Z_{1,3} \right) \delta Z^{\tilde{\chi}^0,R}_{1,n1} + \left(\dfrac{U_{c2,2}}{\sqrt{2}} \left(\dfrac{s_W Z_{2,1}}{c_W} + Z_{2,2} \right) - U_{c2,1} Z_{2,3} \right) \delta Z^{\tilde{\chi}^0,R}_{2,n1} + \\ \left(\dfrac{U_{c2,2}}{\sqrt{2}} \left(\dfrac{s_W Z_{3,1}}{c_W} + Z_{3,2} \right) - U_{c2,1} Z_{3,3} \right) \delta Z^{\tilde{\chi}^0,R}_{3,n1} + \left(\dfrac{U_{c2,2}}{\sqrt{2}} \left(\dfrac{s_W Z_{4,1}}{c_W} + Z_{4,2} \right) - U_{c2,1} Z_{4,3} \right) \delta Z^{\tilde{\chi}^0,R}_{4,n1} \end{array}
$$

$$2 = \begin{pmatrix} \delta\overline{Z}^{\tilde{\chi}^-,\mathrm{R}}_{\mathrm{c}2,1}\left(\sqrt{2}V^*_{1,2}\left(s_{\mathrm{W}}Z^*_{\mathrm{n}1,1}+c_{\mathrm{W}}Z^*_{\mathrm{n}1,2}\right)+2c_{\mathrm{W}}V^*_{1,1}Z^*_{\mathrm{n}1,4}\right)+ \\ \delta\overline{Z}^{\tilde{\chi}^-,\mathrm{R}}_{\mathrm{c}2,2}\left(\sqrt{2}V^*_{2,2}\left(s_{\mathrm{W}}Z^*_{\mathrm{n}1,1}+c_{\mathrm{W}}Z^*_{\mathrm{n}1,2}\right)+2c_{\mathrm{W}}V^*_{2,1}Z^*_{\mathrm{n}1,4}\right) \end{pmatrix} c_\beta s_{\mathrm{W}} + 2\begin{pmatrix} \left(\left(\delta Z_{\mathrm{G}^-\mathrm{H}^-}\right)s_{\mathrm{W}}s_\beta - c_\beta\left(2\left(\delta s_{\mathrm{W}}\right)-\left(2\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\mathrm{H}^-\mathrm{H}^-}\right)s_{\mathrm{W}}\right)\right)Z^*_{\mathrm{n}1,4}+ \\ c_\beta s_{\mathrm{W}}\left(\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{1,\mathrm{n}1}Z^*_{1,4}+\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{2,\mathrm{n}1}Z^*_{2,4}+\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{3,\mathrm{n}1}Z^*_{3,4}+\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{4,\mathrm{n}1}Z^*_{4,4}\right) \end{pmatrix} c_{\mathrm{W}}V^*_{\mathrm{c}2,1}$$

$$1 = c_{\mathrm{W}}\left(\left(\delta Z_{\mathrm{G}^-\mathrm{H}^-}\right)s_{\mathrm{W}}s_\beta - c_\beta\left(2\left(\delta s_{\mathrm{W}}\right)-\left(2\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\mathrm{H}^-\mathrm{H}^-}\right)s_{\mathrm{W}}\right)\right)Z^*_{\mathrm{n}1,2} + \begin{pmatrix} \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{1,\mathrm{n}1}\left(s_{\mathrm{W}}Z^*_{1,1}+c_{\mathrm{W}}Z^*_{1,2}\right)+\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{2,\mathrm{n}1}\left(s_{\mathrm{W}}Z^*_{2,1}+c_{\mathrm{W}}Z^*_{2,2}\right)+ \\ \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{3,\mathrm{n}1}\left(s_{\mathrm{W}}Z^*_{3,1}+c_{\mathrm{W}}Z^*_{3,2}\right)+\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{4,\mathrm{n}1}\left(s_{\mathrm{W}}Z^*_{4,1}+c_{\mathrm{W}}Z^*_{4,2}\right) \end{pmatrix} c_\beta s_{\mathrm{W}}$$

$$\underset{256}{C}\left(\tilde{\chi}^0_{\mathrm{n}1},\tilde{\chi}^+_{\mathrm{c}2},G^-\right) = \frac{ie}{s^2_{\mathrm{W}}}\left[\frac{-\frac{1}{4c^3_{\mathrm{W}}}\left((2)c^2_{\mathrm{W}}+\sqrt{2}\begin{pmatrix}(1)c^2_{\mathrm{W}}+ \\ \left(2s_{\mathrm{W}}s_\beta\left(\delta s_{\mathrm{W}}\right)+\left(s_\beta\left(2\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\mathrm{G}^-\mathrm{G}^-}\right)+c_\beta\left(\delta Z_{\mathrm{H}^-\mathrm{G}^-}\right)\right)c^2_{\mathrm{W}}\right)s^2_{\mathrm{W}}Z^*_{\mathrm{n}1,1}\end{pmatrix}V^*_{\mathrm{c}2,2}\right)}{\frac{1}{2}(4)}\right]$$

$$4 = \begin{pmatrix} -c_\beta\left((3)s_{\mathrm{W}}+\left(\delta s_{\mathrm{W}}\right)\left(\sqrt{2}U_{\mathrm{c}2,2}\left(\frac{Z_{\mathrm{n}1,1}s^3_{\mathrm{W}}}{c^3_{\mathrm{W}}}-Z_{\mathrm{n}1,2}\right)+2U_{\mathrm{c}2,1}Z_{\mathrm{n}1,3}\right)\right)- \\ s_{\mathrm{W}}\left(\left(\delta Z_{\mathrm{G}^-\mathrm{G}^-}\right)c_\beta-\left(\delta Z_{\mathrm{H}^-\mathrm{G}^-}\right)s_\beta\right)\left(\frac{U_{\mathrm{c}2,2}}{\sqrt{2}}\left(\frac{s_{\mathrm{W}}Z_{\mathrm{n}1,1}}{c_{\mathrm{W}}}+Z_{\mathrm{n}1,2}\right)-U_{\mathrm{c}2,1}Z_{\mathrm{n}1,3}\right) \end{pmatrix}$$

$$3 = \begin{pmatrix} 2\left(\delta Z_{\mathrm{e}}\right)\left(\frac{U_{\mathrm{c}2,2}}{\sqrt{2}}\left(\frac{s_{\mathrm{W}}Z_{\mathrm{n}1,1}}{c_{\mathrm{W}}}+Z_{\mathrm{n}1,2}\right)-U_{\mathrm{c}2,1}Z_{\mathrm{n}1,3}\right)+\left(\frac{U_{1,2}}{\sqrt{2}}\left(\frac{s_{\mathrm{W}}Z_{\mathrm{n}1,1}}{c_{\mathrm{W}}}+Z_{\mathrm{n}1,2}\right)-U_{1,1}Z_{\mathrm{n}1,3}\right)\delta\overline{Z}^{\tilde{\chi}^-,\mathrm{L}}_{\mathrm{c}2,1}+ \\ \left(\frac{U_{2,2}}{\sqrt{2}}\left(\frac{s_{\mathrm{W}}Z_{\mathrm{n}1,1}}{c_{\mathrm{W}}}+Z_{\mathrm{n}1,2}\right)-U_{2,1}Z_{\mathrm{n}1,3}\right)\delta\overline{Z}^{\tilde{\chi}^-,\mathrm{L}}_{\mathrm{c}2,2}+\left(\frac{U_{\mathrm{c}2,2}}{\sqrt{2}}\left(\frac{s_{\mathrm{W}}Z_{1,1}}{c_{\mathrm{W}}}+Z_{1,2}\right)-U_{\mathrm{c}2,1}Z_{1,3}\right)\delta Z^{\tilde{\chi}^0,\mathrm{R}}_{1,\mathrm{n}1}+ \\ \left(\frac{U_{\mathrm{c}2,2}}{\sqrt{2}}\left(\frac{s_{\mathrm{W}}Z_{2,1}}{c_{\mathrm{W}}}+Z_{2,2}\right)-U_{\mathrm{c}2,1}Z_{2,3}\right)\delta Z^{\tilde{\chi}^0,\mathrm{R}}_{2,\mathrm{n}1}+\left(\frac{U_{\mathrm{c}2,2}}{\sqrt{2}}\left(\frac{s_{\mathrm{W}}Z_{3,1}}{c_{\mathrm{W}}}+Z_{3,2}\right)-U_{\mathrm{c}2,1}Z_{3,3}\right)\delta Z^{\tilde{\chi}^0,\mathrm{R}}_{3,\mathrm{n}1}+ \\ \left(\frac{U_{\mathrm{c}2,2}}{\sqrt{2}}\left(\frac{s_{\mathrm{W}}Z_{4,1}}{c_{\mathrm{W}}}+Z_{4,2}\right)-U_{\mathrm{c}2,1}Z_{4,3}\right)\delta Z^{\tilde{\chi}^0,\mathrm{R}}_{4,\mathrm{n}1} \end{pmatrix}$$

$$2 = \begin{pmatrix} \delta\overline{Z}^{\tilde{\chi}^-,\mathrm{R}}_{\mathrm{c}2,1}\left(\sqrt{2}V^*_{1,2}\left(s_{\mathrm{W}}Z^*_{\mathrm{n}1,1}+c_{\mathrm{W}}Z^*_{\mathrm{n}1,2}\right)+2c_{\mathrm{W}}V^*_{1,1}Z^*_{\mathrm{n}1,4}\right)+ \\ \delta\overline{Z}^{\tilde{\chi}^-,\mathrm{R}}_{\mathrm{c}2,2}\left(\sqrt{2}V^*_{2,2}\left(s_{\mathrm{W}}Z^*_{\mathrm{n}1,1}+c_{\mathrm{W}}Z^*_{\mathrm{n}1,2}\right)+2c_{\mathrm{W}}V^*_{2,1}Z^*_{\mathrm{n}1,4}\right) \end{pmatrix} s_{\mathrm{W}}s_\beta - 2\begin{pmatrix} \left(2\left(\delta s_{\mathrm{W}}\right)s_\beta - s_{\mathrm{W}}\left(\left(\delta Z_{\mathrm{H}^-\mathrm{G}^-}\right)c_\beta+\left(2\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\mathrm{G}^-\mathrm{G}^-}\right)s_\beta\right)\right)Z^*_{\mathrm{n}1,4}- \\ s_{\mathrm{W}}s_\beta\left(\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{1,\mathrm{n}1}Z^*_{1,4}+\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{2,\mathrm{n}1}Z^*_{2,4}+\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{3,\mathrm{n}1}Z^*_{3,4}+\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{4,\mathrm{n}1}Z^*_{4,4}\right) \end{pmatrix} c_{\mathrm{W}}V^*_{\mathrm{c}2,1}$$

$$\boxed{1} = \begin{array}{l} -c_W \left(2 \left(\delta s_W\right) s_\beta - s_W \left(\left(\delta Z_{H^- G^-}\right) c_\beta + \left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-}\right) s_\beta\right)\right) Z^*_{n1,2} + \\ \left(\begin{array}{l} \delta Z^{\tilde{\chi}^0,L}_{1,n1} \left(s_W Z^*_{1,1} + c_W Z^*_{1,2}\right) + \delta Z^{\tilde{\chi}^0,L}_{2,n1} \left(s_W Z^*_{2,1} + c_W Z^*_{2,2}\right) + \\ \delta Z^{\tilde{\chi}^0,L}_{3,n1} \left(s_W Z^*_{3,1} + c_W Z^*_{3,2}\right) + \delta Z^{\tilde{\chi}^0,L}_{4,n1} \left(s_W Z^*_{4,1} + c_W Z^*_{4,2}\right) \end{array} \right) s_W s_\beta \end{array}$$

$$\underset{257}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^0_{n2}, H^+\right) = \frac{ie}{s^2_W} \left[\frac{\frac{1}{4c^3_W} \left(\left(\boxed{2}\right) c^2_W + \sqrt{2} \left(\begin{array}{l} \left(\boxed{1}\right) c^2_W + \\ \left(2 s_W s_\beta \left(\delta s_W\right) + \left(s_\beta \left(2 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-}\right) - c_\beta \left(\delta Z_{H^- G^-}\right)\right) c^2_W\right) s^2_W Z^*_{n2,1} \end{array} \right) U^*_{c1,2} \right)}{\frac{1}{2} \left(\begin{array}{l} c_\beta \left(\sqrt{2} V_{c1,2} Z_{n2,2} + 2 V_{c1,1} Z_{n2,4}\right) \left(\delta s_W\right) - \\ s_W \left(\left(\boxed{3}\right) c_\beta + s_\beta \left(\frac{V_{c1,2}}{\sqrt{2}} \left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2} \right) + V_{c1,1} Z_{n2,4} \right) \left(\delta Z_{H^- G^-}\right) \right) \end{array} \right) } \right]$$

$$\boxed{3} = \begin{array}{l} \frac{\sqrt{2} V_{c1,2} Z_{n2,1} \left(\delta s_W\right) s^2_W}{c^3_W} + \left(2 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-}\right) \left(\frac{V_{c1,2}}{\sqrt{2}} \left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2} \right) + V_{c1,1} Z_{n2,4} \right) + \\ \left(\frac{V_{1,2}}{\sqrt{2}} \left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2} \right) + V_{1,1} Z_{n2,4} \right) \delta Z^{\tilde{\chi}^-,R}_{1,c1} + \left(\frac{V_{c1,2}}{\sqrt{2}} \left(\frac{s_W Z_{1,1}}{c_W} + Z_{1,2} \right) + V_{c1,1} Z_{1,4} \right) \delta Z^{\tilde{\chi}^0,R}_{1,n2} + \\ \left(\frac{V_{2,2}}{\sqrt{2}} \left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2} \right) + V_{2,1} Z_{n2,4} \right) \delta Z^{\tilde{\chi}^-,R}_{2,c1} + \left(\frac{V_{c1,2}}{\sqrt{2}} \left(\frac{s_W Z_{2,1}}{c_W} + Z_{2,2} \right) + V_{c1,1} Z_{2,4} \right) \delta Z^{\tilde{\chi}^0,R}_{2,n2} + \\ \left(\frac{V_{c1,2}}{\sqrt{2}} \left(\frac{s_W Z_{3,1}}{c_W} + Z_{3,2} \right) + V_{c1,1} Z_{3,4} \right) \delta Z^{\tilde{\chi}^0,R}_{3,n2} + \left(\frac{V_{c1,2}}{\sqrt{2}} \left(\frac{s_W Z_{4,1}}{c_W} + Z_{4,2} \right) + V_{c1,1} Z_{4,4} \right) \delta Z^{\tilde{\chi}^0,R}_{4,n2} \end{array}$$

$$\boxed{2} = \begin{array}{l} 2 \left(\begin{array}{l} \left(2 \left(\delta s_W\right) s_\beta - s_W \left(\left(2 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-}\right) s_\beta - \left(\delta Z_{H^- G^-}\right) c_\beta\right)\right) Z^*_{n2,3} - \\ s_W s_\beta \left(\delta Z^{\tilde{\chi}^0,L}_{1,n2} Z^*_{1,3} + \delta Z^{\tilde{\chi}^0,L}_{2,n2} Z^*_{2,3} + \delta Z^{\tilde{\chi}^0,L}_{3,n2} Z^*_{3,3} + \delta Z^{\tilde{\chi}^0,L}_{4,n2} Z^*_{4,3} \right) \end{array} \right) c_W U^*_{c1,1} + \\ \left(\begin{array}{l} \delta Z^{\tilde{\chi}^-,L}_{1,c1} \left(\sqrt{2} U^*_{1,2} \left(s_W Z^*_{n2,1} + c_W Z^*_{n2,2}\right) - 2 c_W U^*_{1,1} Z^*_{n2,3} \right) + \\ \delta Z^{\tilde{\chi}^-,L}_{2,c1} \left(\sqrt{2} U^*_{2,2} \left(s_W Z^*_{n2,1} + c_W Z^*_{n2,2}\right) - 2 c_W U^*_{2,1} Z^*_{n2,3} \right) \end{array} \right) s_W s_\beta \end{array}$$

$$\boxed{1} = \begin{array}{l} -c_W \left(2 \left(\delta s_W\right) s_\beta - s_W \left(\left(2 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-}\right) s_\beta - \left(\delta Z_{H^- G^-}\right) c_\beta\right)\right) Z^*_{n2,2} + \\ \left(\begin{array}{l} \delta Z^{\tilde{\chi}^0,L}_{1,n2} \left(s_W Z^*_{1,1} + c_W Z^*_{1,2}\right) + \delta Z^{\tilde{\chi}^0,L}_{2,n2} \left(s_W Z^*_{2,1} + c_W Z^*_{2,2}\right) + \\ \delta Z^{\tilde{\chi}^0,L}_{3,n2} \left(s_W Z^*_{3,1} + c_W Z^*_{3,2}\right) + \delta Z^{\tilde{\chi}^0,L}_{4,n2} \left(s_W Z^*_{4,1} + c_W Z^*_{4,2}\right) \end{array} \right) s_W s_\beta \end{array}$$

$$\underset{258}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^0_{n2}, G^+\right) = \frac{ie}{s^2_W} \left[\frac{-\frac{1}{4c^3_W} \left(\left(\boxed{2}\right) c^2_W + \sqrt{2} \left(\begin{array}{l} \left(\boxed{1}\right) c^2_W - \\ \left(s_\beta \left(\delta Z_{G^- H^-}\right) c^2_W - c_\beta \left(2 s_W \left(\delta s_W\right) + \left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-}\right) c^2_W\right)\right) s^2_W Z^*_{n2,1} \end{array} \right) U^*_{c1,2} \right)}{\frac{1}{2} \left(\begin{array}{l} s_\beta \left(\sqrt{2} V_{c1,2} Z_{n2,2} + 2 V_{c1,1} Z_{n2,4}\right) \left(\delta s_W\right) - \\ s_W \left(\left(\boxed{3}\right) s_\beta + \left(\frac{V_{c1,2}}{\sqrt{2}} \left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2} \right) + V_{c1,1} Z_{n2,4} \right) \left(s_\beta \left(\delta Z_{G^- G^-}\right) + c_\beta \left(\delta Z_{G^- H^-}\right)\right) \right) \end{array} \right) } \right]$$

$$
\boxed{3} = \begin{array}{l}
\frac{\sqrt{2}V_{c1,2}Z_{n2,1}\left(\delta s_W\right)s_W^2}{c_W^3} + 2\left(\delta Z_e\right)\left(\frac{V_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2}\right) + V_{c1,1}Z_{n2,4}\right) + \\
\left(\frac{V_{1,2}}{\sqrt{2}}\left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2}\right) + V_{1,1}Z_{n2,4}\right)\delta Z^{\tilde{\chi}^-,R}_{1,c1} + \left(\frac{V_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z_{1,1}}{c_W} + Z_{1,2}\right) + V_{c1,1}Z_{1,4}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n2} + \\
\left(\frac{V_{2,2}}{\sqrt{2}}\left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2}\right) + V_{2,1}Z_{n2,4}\right)\delta Z^{\tilde{\chi}^-,R}_{2,c1} + \left(\frac{V_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z_{2,1}}{c_W} + Z_{2,2}\right) + V_{c1,1}Z_{2,4}\right)\delta Z^{\tilde{\chi}^0,R}_{2,n2} + \\
\left(\frac{V_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z_{3,1}}{c_W} + Z_{3,2}\right) + V_{c1,1}Z_{3,4}\right)\delta Z^{\tilde{\chi}^0,R}_{3,n2} + \left(\frac{V_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z_{4,1}}{c_W} + Z_{4,2}\right) + V_{c1,1}Z_{4,4}\right)\delta Z^{\tilde{\chi}^0,R}_{4,n2}
\end{array}
$$

$$
\boxed{2} = \begin{array}{l}
2\left(\begin{array}{l}\left(c_\beta\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right)s_W\right) + \left(\delta Z_{G^-H^-}\right)s_W s_\beta\right)Z^*_{n2,3} - \\ c_\beta s_W\left(\delta Z^{\tilde{\chi}^0,L}_{1,n2}Z^*_{1,3} + \delta Z^{\tilde{\chi}^0,L}_{2,n2}Z^*_{2,3} + \delta Z^{\tilde{\chi}^0,L}_{3,n2}Z^*_{3,3} + \delta Z^{\tilde{\chi}^0,L}_{4,n2}Z^*_{4,3}\right)\end{array}\right)c_W U^*_{c1,1} + \\
\left(\begin{array}{l}\delta Z^{\tilde{\chi}^-,L}_{1,c1}\left(\sqrt{2}U^*_{1,2}\left(s_W Z^*_{n2,1} + c_W Z^*_{n2,2}\right) - 2c_W U^*_{1,1}Z^*_{n2,3}\right) + \\ \delta Z^{\tilde{\chi}^-,L}_{2,c1}\left(\sqrt{2}U^*_{2,2}\left(s_W Z^*_{n2,1} + c_W Z^*_{n2,2}\right) - 2c_W U^*_{2,1}Z^*_{n2,3}\right)\end{array}\right)c_\beta s_W
\end{array}
$$

$$
\boxed{1} = \begin{array}{l}
-c_W\left(c_\beta\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right)s_W\right) + \left(\delta Z_{G^-H^-}\right)s_W s_\beta\right)Z^*_{n2,2} + \\
\left(\begin{array}{l}\delta Z^{\tilde{\chi}^0,L}_{1,n2}\left(s_W Z^*_{1,1} + c_W Z^*_{1,2}\right) + \delta Z^{\tilde{\chi}^0,L}_{2,n2}\left(s_W Z^*_{2,1} + c_W Z^*_{2,2}\right) + \\ \delta Z^{\tilde{\chi}^0,L}_{3,n2}\left(s_W Z^*_{3,1} + c_W Z^*_{3,2}\right) + \delta Z^{\tilde{\chi}^0,L}_{4,n2}\left(s_W Z^*_{4,1} + c_W Z^*_{4,2}\right)\end{array}\right)c_\beta s_W
\end{array}
$$

[FFS] Chargino – Quark – Squark

$$
\underset{267}{C}\left(\tilde{\chi}^-_{c1}, \bar{d}_{g2}, \tilde{u}^{s3}_{g3}\right) = \frac{ie}{M_W^3 s_W^2}\left[\begin{array}{l}\frac{1}{2\sqrt{2}c_\beta^2}\left(\begin{array}{l}2c_\beta m_{d_{g2}}s_W M_W^2 U^*_{c1,2}U^{\tilde{u}_{g3}*}_{s3,1}\delta CKM^*_{g3,g2} + \\ CKM^*_{g3,g2}\left(\left(\boxed{1}\right)U^*_{c1,2} + c_\beta m_{d_{g2}}s_W M_W^2 U^{\tilde{u}_{g3}*}_{s3,1}\left(U^*_{1,2}\delta Z^{\tilde{\chi}^-,L}_{1,c1} + U^*_{2,2}\delta Z^{\tilde{\chi}^-,L}_{2,c1}\right)\right)\end{array}\right) \\ -\frac{1}{4s_\beta^2}\left(\left(\boxed{3}\right)CKM^*_{g3,g2} + 2s_W s_\beta M_W^2\left(2M_W s_\beta V_{c1,1}U^{\tilde{u}_{g3}*}_{s3,1} - \sqrt{2}m_{u_{g3}}V_{c1,2}U^{\tilde{u}_{g3}*}_{s3,2}\right)\delta CKM^*_{g3,g2}\right)\end{array}\right]
$$

$$
\boxed{3} = \begin{array}{l}
-2\left(V_{c1,1}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{d,L}_{g2,g2}\right)\right) - s_W\left(V_{1,1}\delta Z^{\tilde{\chi}^-,R}_{1,c1} + V_{2,1}\delta Z^{\tilde{\chi}^-,R}_{2,c1}\right)\right)M_W^3 s_\beta^2 U^{\tilde{u}_{g3}*}_{s3,1} - \sqrt{2}\left(\boxed{2}\right)U^{\tilde{u}_{g3}*}_{s3,2} + \\
s_W s_\beta M_W^2\left(2M_W s_\beta V_{c1,1}\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,1}\right) - \sqrt{2}m_{u_{g3}}V_{c1,2}\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,2}\right)\right)
\end{array}
$$

$$
\boxed{2} = V_{c1,2}\left(m_{u_{g3}}\left(\begin{array}{l}s_W s_\beta\left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{d,L}_{g2,g2}\right)M_W^2 - \delta M_W^2\right) - \\ 2\left(\left(\delta s_\beta\right)s_W + \left(\delta s_W\right)s_\beta\right)M_W^2\end{array}\right) + 2s_\beta s_W M_W^2\delta m^{u_g}_{g3}\right) + s_\beta s_W m_{u_{g3}}M_W^2\left(V_{1,2}\delta Z^{\tilde{\chi}^-,R}_{1,c1} + V_{2,2}\delta Z^{\tilde{\chi}^-,R}_{2,c1}\right)
$$

$$\boxed{1} = \begin{array}{l} c_\beta m_{d_{g2}} s_W M_W^2 \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1}\right) + \\ \left(2 c_\beta s_W \delta m^{d_g}_{g2} M_W^2 - \left(\begin{array}{l} s_W \left(2\left(\delta c_\beta\right) - c_\beta \left(2\left(\delta Z_e\right) + \delta \overline{Z}^{d,R}_{g2,g2}\right)\right) M_W^2 + \\ c_\beta \left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right) \end{array}\right) m_{d_{g2}}\right) U^{\tilde{u}_{g3}*}_{s3,1} \end{array}$$

$$\underset{268}{C}\left(\tilde{\chi}^+_{c1}, \overline{u}_{g2}, \tilde{d}^{s3}_{g3}\right) = \frac{ie}{M_W^3 s_W^2} \left[\begin{array}{l} \frac{1}{2\sqrt{2} s_\beta^2} \left(\begin{array}{l} 2 m_{u_{g2}} s_W s_\beta \left(\delta CKM_{g2,g3}\right) M_W^2 U^{\tilde{d}_{g3}*}_{s3,1} V^*_{c1,2} + \\ CKM_{g2,g3} \left(\left(\boxed{1}\right) V^*_{c1,2} + m_{u_{g2}} s_W s_\beta M_W^2 U^{\tilde{d}_{g3}*}_{s3,1} \left(V^*_{1,2} \delta \overline{Z}^{\tilde{\chi}^-,R}_{c1,1} + V^*_{2,2} \delta \overline{Z}^{\tilde{\chi}^-,R}_{c1,2}\right)\right) \end{array}\right) \\ -\frac{1}{4 c_\beta^2} \left(\left(\boxed{3}\right) CKM_{g2,g3} + 2 c_\beta s_W \left(\delta CKM_{g2,g3}\right) M_W^2 \left(2 c_\beta M_W U_{c1,1} U^{\tilde{d}_{g3}*}_{s3,1} - \sqrt{2} m_{d_{g3}} U_{c1,2} U^{\tilde{d}_{g3}*}_{s3,2}\right)\right) \end{array}\right]$$

$$\boxed{3} = \begin{array}{l} 2\left(s_W \left(U_{1,1} \delta \overline{Z}^{\tilde{\chi}^-,L}_{c1,1} + U_{2,1} \delta \overline{Z}^{\tilde{\chi}^-,L}_{c1,2}\right) - U_{c1,1} \left(2\left(\delta s_W\right) - s_W \left(2\left(\delta Z_e\right) + \delta \overline{Z}^{u,L}_{g2,g2}\right)\right)\right) c_\beta^2 M_W^3 U^{\tilde{d}_{g3}*}_{s3,1} - \sqrt{2}\left(\boxed{2}\right) U^{\tilde{d}_{g3}*}_{s3,2} + \\ c_\beta s_W M_W^2 \left(2 c_\beta M_W U_{c1,1} \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1}\right) - \sqrt{2} m_{d_{g3}} U_{c1,2} \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,2}\right)\right) \end{array}$$

$$\boxed{2} = U_{c1,2} \left(2 c_\beta s_W M_W^2 \delta m^{d_g}_{g3} - m_{d_{g3}} \left(\begin{array}{l} s_W \left(2\left(\delta c_\beta\right) - c_\beta \left(2\left(\delta Z_e\right) + \delta \overline{Z}^{u,L}_{g2,g2}\right)\right) M_W^2 + \\ c_\beta \left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right) \end{array}\right)\right) + c_\beta s_W m_{d_{g3}} M_W^2 \left(U_{1,2} \delta \overline{Z}^{\tilde{\chi}^-,L}_{c1,1} + U_{2,2} \delta \overline{Z}^{\tilde{\chi}^-,L}_{c1,2}\right)$$

$$\boxed{1} = \begin{array}{l} m_{u_{g2}} s_W s_\beta M_W^2 \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1}\right) + \\ \left(\left(\begin{array}{l} s_W s_\beta \left(\left(2\left(\delta Z_e\right) + \delta \overline{Z}^{u,R}_{g2,g2}\right) M_W^2 - \delta M_W^2\right) - \\ 2\left(\left(\delta s_\beta\right) s_W + \left(\delta s_W\right) s_\beta\right) M_W^2 \end{array}\right) m_{u_{g2}} + 2 s_W s_\beta \delta m^{u_g}_{g2} M_W^2\right) U^{\tilde{d}_{g3}*}_{s3,1} \end{array}$$

$$\underset{271}{C}\left(d_{g1}, \tilde{\chi}^+_{c2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \frac{ie}{M_W^3 s_W^2} \left[\begin{array}{l} -\frac{1}{4 s_\beta^2} \left(\left(\boxed{2}\right) CKM_{g3,g1} + 2 s_W s_\beta \left(\delta CKM_{g3,g1}\right) M_W^2 \left(2 M_W s_\beta U^{\tilde{u}_{g3}}_{s3,1} V^*_{c2,1} - \sqrt{2} m_{u_{g3}} U^{\tilde{u}_{g3}}_{s3,2} V^*_{c2,2}\right)\right) \\ \frac{1}{2\sqrt{2} c_\beta^2} \left(\begin{array}{l} 2 c_\beta m_{d_{g1}} s_W U_{c2,2} \left(\delta CKM_{g3,g1}\right) M_W^2 U^{\tilde{u}_{g3}}_{s3,1} + \\ CKM_{g3,g1} \left(\left(\boxed{3}\right) U^{\tilde{u}_{g3}}_{s3,1} + c_\beta m_{d_{g1}} s_W U_{c2,2} M_W^2 \left(U^{\tilde{u}_{g3}}_{1,1} \delta \overline{Z}^{\tilde{u}_{g3}}_{1,s3} + U^{\tilde{u}_{g3}}_{2,1} \delta \overline{Z}^{\tilde{u}_{g3}}_{2,s3}\right)\right) \end{array}\right) \end{array}\right]$$

$$\boxed{3} = U_{c2,2} \left(2 c_\beta s_W M_W^2 \delta m^{d_g}_{g1} - m_{d_{g1}} \left(\begin{array}{l} c_\beta \left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right) + \\ s_W \left(2\left(\delta c_\beta\right) - c_\beta \left(2\left(\delta Z_e\right) + \delta Z^{d,R}_{g1,g1}\right)\right) M_W^2 \end{array}\right)\right) + c_\beta s_W m_{d_{g1}} M_W^2 \left(U_{1,2} \delta \overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + U_{2,2} \delta \overline{Z}^{\tilde{\chi}^-,L}_{c2,2}\right)$$

$$\boxed{2} = \begin{array}{l} 2 M_W^3 s_\beta^2 \left(s_W \left(\delta \overline{Z}^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}}_{1,1} + \delta \overline{Z}^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}}_{2,1}\right) - \left(2\left(\delta s_W\right) - s_W \left(2\left(\delta Z_e\right) + \delta Z^{d,L}_{g1,g1}\right)\right) U^{\tilde{u}_{g3}}_{s3,1}\right) V^*_{c2,1} - \sqrt{2}\left(\boxed{1}\right) V^*_{c2,2} + \\ s_W s_\beta M_W^2 \left(2 M_W s_\beta U^{\tilde{u}_{g3}}_{s3,1} \left(\delta \overline{Z}^{\tilde{\chi}^-,R}_{c2,1} V^*_{1,1} + \delta \overline{Z}^{\tilde{\chi}^-,R}_{c2,2} V^*_{2,1}\right) - \sqrt{2} m_{u_{g3}} U^{\tilde{u}_{g3}}_{s3,2} \left(\delta \overline{Z}^{\tilde{\chi}^-,R}_{c2,1} V^*_{1,2} + \delta \overline{Z}^{\tilde{\chi}^-,R}_{c2,2} V^*_{2,2}\right)\right) \end{array}$$

$$1 = U^{\tilde{u}_{g3}}_{s3,2}\left(2s_\beta s_W M_W^2 \delta m^{u_g}_{g3} - m_{u_{g3}}\left(\begin{array}{l} 2\left(\left(\delta s_\beta\right)s_W + \left(\delta s_W\right)s_\beta\right)M_W^2 + \\ s_W s_\beta\left(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z^{d,L}_{g1,g1}\right)M_W^2\right)\end{array}\right)\right) + s_\beta s_W m_{u_{g3}} M_W^2\left(U^{\tilde{u}_{g3}}_{1,2}\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3} + U^{\tilde{u}_{g3}}_{2,2}\delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}\right)$$

$$C_{272}\left(u_{g1}, \tilde{\chi}^-_{c2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \frac{ie}{M_W^3 s_W^2}\left[\begin{array}{l} -\frac{1}{4c_\beta^2}\left((2)\mathrm{CKM}^*_{g1,g3} + 2c_\beta s_W M_W^2\left(2c_\beta M_W U^*_{c2,1}U^{\tilde{d}_{g3}}_{s3,1} - \sqrt{2}m_{d_{g3}}U^*_{c2,2}U^{\tilde{d}_{g3}}_{s3,2}\right)\delta\mathrm{CKM}^*_{g1,g3}\right) \\ \frac{1}{2\sqrt{2}s_\beta^2}\left(\begin{array}{l} 2m_{u_{g1}}s_W s_\beta V_{c2,2}M_W^2 U^{\tilde{d}_{g3}}_{s3,1}\delta\mathrm{CKM}^*_{g1,g3} + \\ \mathrm{CKM}^*_{g1,g3}\left((3)U^{\tilde{d}_{g3}}_{s3,1} + m_{u_{g1}}s_W s_\beta V_{c2,2}M_W^2\left(U^{\tilde{d}_{g3}}_{1,1}\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3} + U^{\tilde{d}_{g3}}_{2,1}\delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3}\right)\right)\end{array}\right)\end{array}\right]$$

$$3 = V_{c2,2}\left(2s_\beta s_W M_W^2\delta m^{u_g}_{g1} - m_{u_{g1}}\left(\begin{array}{l} 2\left(\left(\delta s_\beta\right)s_W + \left(\delta s_W\right)s_\beta\right)M_W^2 + \\ s_W s_\beta\left(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z^{u,R}_{g1,g1}\right)M_W^2\right)\end{array}\right)\right) + s_\beta s_W m_{u_{g1}}M_W^2\left(V_{1,2}\delta Z^{\tilde{\chi}^-,R}_{1,c2} + V_{2,2}\delta Z^{\tilde{\chi}^-,R}_{2,c2}\right)$$

$$2 = \begin{array}{l} 2c_\beta^2 M_W^3 U^*_{c2,1}\left(s_W\left(\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3}U^{\tilde{d}_{g3}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3}U^{\tilde{d}_{g3}}_{2,1}\right) - \left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z^{u,L}_{g1,g1}\right)\right)U^{\tilde{d}_{g3}}_{s3,1}\right) - \sqrt{2}(1)U^*_{c2,2} + \\ c_\beta s_W M_W^2\left(2c_\beta M_W\left(\delta Z^{\tilde{\chi}^-,L}_{1,c2}U^*_{1,1} + \delta Z^{\tilde{\chi}^-,L}_{2,c2}U^*_{2,1}\right)U^{\tilde{d}_{g3}}_{s3,1} - \sqrt{2}m_{d_{g3}}\left(\delta Z^{\tilde{\chi}^-,L}_{1,c2}U^*_{1,2} + \delta Z^{\tilde{\chi}^-,L}_{2,c2}U^*_{2,2}\right)U^{\tilde{d}_{g3}}_{s3,2}\right)\end{array}$$

$$1 = \begin{array}{l} c_\beta m_{d_{g3}}s_W M_W^2\left(\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3}U^{\tilde{d}_{g3}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3}U^{\tilde{d}_{g3}}_{2,2}\right) + \\ \left(2c_\beta s_W\delta m^{d_g}_{g3}M_W^2 - \left(\begin{array}{l} c_\beta\left(s_W\delta M_W^2 + 2\left(\delta s_W\right)M_W^2\right) + \\ s_W\left(2\left(\delta c_\beta\right) - c_\beta\left(2\left(\delta Z_e\right) + \delta Z^{u,L}_{g1,g1}\right)\right)M_W^2\end{array}\right)m_{d_{g3}}\right)U^{\tilde{d}_{g3}}_{s3,2}\end{array}$$

[FFS] Gluino – Quark – Squark

$$C_{456}\left(\tilde{g}, \overline{u}_{g2}, \tilde{u}^{s3}_{g3}\right) = \frac{ig_s\delta_{g2,g3}T^{g1}_{c2,c3}}{\sqrt{2}}\left[\frac{\mathfrak{e}^*_{\tilde{g}}\left(U^{\tilde{u}_{g2}*}_{s3,2}\left(2\left(\delta Z_{g_s}\right) + \delta\overline{Z}^{u,R}_{g2,g2} + \delta Z^L_{\tilde{g}}\right) + U^{\tilde{u}_{g2}*}_{1,2}\delta Z^{\tilde{u}_{g3}}_{1,s3} + U^{\tilde{u}_{g2}*}_{2,2}\delta Z^{\tilde{u}_{g3}}_{2,s3}\right)}{-\mathfrak{e}_{\tilde{g}}\left(U^{\tilde{u}_{g2}*}_{s3,1}\left(2\left(\delta Z_{g_s}\right) + \delta\overline{Z}^{u,L}_{g2,g2} + \delta Z^R_{\tilde{g}}\right) + U^{\tilde{u}_{g2}*}_{1,1}\delta Z^{\tilde{u}_{g3}}_{1,s3} + U^{\tilde{u}_{g2}*}_{2,1}\delta Z^{\tilde{u}_{g3}}_{2,s3}\right)}\right]$$

$$C_{457}\left(\tilde{g}, \overline{d}_{g2}, \tilde{d}^{s3}_{g3}\right) = \frac{ig_s\delta_{g2,g3}T^{g1}_{c2,c3}}{\sqrt{2}}\left[\frac{\mathfrak{e}^*_{\tilde{g}}\left(U^{\tilde{d}_{g2}*}_{s3,2}\left(2\left(\delta Z_{g_s}\right) + \delta\overline{Z}^{d,R}_{g2,g2} + \delta Z^L_{\tilde{g}}\right) + U^{\tilde{d}_{g2}*}_{1,2}\delta Z^{\tilde{d}_{g3}}_{1,s3} + U^{\tilde{d}_{g2}*}_{2,2}\delta Z^{\tilde{d}_{g3}}_{2,s3}\right)}{-\mathfrak{e}_{\tilde{g}}\left(U^{\tilde{d}_{g2}*}_{s3,1}\left(2\left(\delta Z_{g_s}\right) + \delta\overline{Z}^{d,L}_{g2,g2} + \delta Z^R_{\tilde{g}}\right) + U^{\tilde{d}_{g2}*}_{1,1}\delta Z^{\tilde{d}_{g3}}_{1,s3} + U^{\tilde{d}_{g2}*}_{2,1}\delta Z^{\tilde{d}_{g3}}_{2,s3}\right)}\right]$$

$$C_{458}\left(\tilde{g}, u_{g2}, \tilde{u}_{g3}^{s3,\dagger}\right) = \frac{i g_s \delta_{g2,g3} T_{c3,c2}^{g1}}{\sqrt{2}} \left[\begin{array}{c} -\mathfrak{e}_{\tilde{g}}^{*}\left(U_{1,1}^{\tilde{u}_{g2}} \delta\overline{Z}_{1,s3}^{\tilde{u}_{g3}} + U_{2,1}^{\tilde{u}_{g2}} \delta\overline{Z}_{2,s3}^{\tilde{u}_{g3}} + U_{s3,1}^{\tilde{u}_{g2}}\left(2\left(\delta Z_{g_s}\right) + \delta Z_{\tilde{g}}^{L} + \delta Z_{g2,g2}^{u,L}\right)\right) \\ \hline \mathfrak{e}_{\tilde{g}}\left(U_{1,2}^{\tilde{u}_{g2}} \delta\overline{Z}_{1,s3}^{\tilde{u}_{g3}} + U_{2,2}^{\tilde{u}_{g2}} \delta\overline{Z}_{2,s3}^{\tilde{u}_{g3}} + U_{s3,2}^{\tilde{u}_{g2}}\left(2\left(\delta Z_{g_s}\right) + \delta Z_{\tilde{g}}^{R} + \delta Z_{g2,g2}^{u,R}\right)\right) \end{array}\right]$$

$$C_{459}\left(\tilde{g}, d_{g2}, \tilde{d}_{g3}^{s3,\dagger}\right) = \frac{i g_s \delta_{g2,g3} T_{c3,c2}^{g1}}{\sqrt{2}} \left[\begin{array}{c} -\mathfrak{e}_{\tilde{g}}^{*}\left(U_{1,1}^{\tilde{d}_{g2}} \delta\overline{Z}_{1,s3}^{\tilde{d}_{g3}} + U_{2,1}^{\tilde{d}_{g2}} \delta\overline{Z}_{2,s3}^{\tilde{d}_{g3}} + U_{s3,1}^{\tilde{d}_{g2}}\left(2\left(\delta Z_{g_s}\right) + \delta Z_{\tilde{g}}^{L} + \delta Z_{g2,g2}^{d,L}\right)\right) \\ \hline \mathfrak{e}_{\tilde{g}}\left(U_{1,2}^{\tilde{d}_{g2}} \delta\overline{Z}_{1,s3}^{\tilde{d}_{g3}} + U_{2,2}^{\tilde{d}_{g2}} \delta\overline{Z}_{2,s3}^{\tilde{d}_{g3}} + U_{s3,2}^{\tilde{d}_{g2}}\left(2\left(\delta Z_{g_s}\right) + \delta Z_{\tilde{g}}^{R} + \delta Z_{g2,g2}^{d,R}\right)\right) \end{array}\right]$$

[FFS] Lepton – Neutralino – Slepton

$$C_{259}\left(\tilde{\chi}_{n1}^{0}, \overline{\nu}_{g2}, \tilde{\nu}_{g3}\right) = \frac{i e \delta_{g2,g3}}{2\sqrt{2} c_W^3 s_W^2}\left((1) s_W + Z_{n1,2} c_W^3\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{g2,g2}^{\nu,L} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right)\right)\left[\begin{array}{c} 0 \\ \hline 1 \end{array}\right]$$

$$(1) = c_W^2\left(\begin{array}{l} \left(s_W Z_{1,1} - c_W Z_{1,2}\right)\delta Z_{1,n1}^{\tilde{\chi}^0,R} + \left(s_W Z_{2,1} - c_W Z_{2,2}\right)\delta Z_{2,n1}^{\tilde{\chi}^0,R} + \\ \left(s_W Z_{3,1} - c_W Z_{3,2}\right)\delta Z_{3,n1}^{\tilde{\chi}^0,R} + \left(s_W Z_{4,1} - c_W Z_{4,2}\right)\delta Z_{4,n1}^{\tilde{\chi}^0,R} \end{array}\right) + s_W Z_{n1,1}\left(c_W^2\left(\delta\overline{Z}_{g2,g2}^{\nu,L} + \delta Z_{1,1}^{\tilde{\nu}}\right) + 2\left(c_W^2\left(\delta Z_e\right) + s_W\left(\delta s_W\right)\right)\right)$$

$$C_{260}\left(\tilde{\chi}_{n1}^{0}, \overline{e}_{g2}, \tilde{e}_{g3}^{s3}\right) = \frac{i e \delta_{g2,g3}}{2\sqrt{2} c_W^3 c_\beta^2 M_W^3 s_W^2}\left[\begin{array}{c} -c_W^2\left((2) c_\beta s_W M_W^2 + (1) c_W Z_{n1,3}^{*}\right) - \\ 2\left(\begin{array}{l} U_{s3,2}^{\tilde{e}_{g2}*}\left(2 s_W\left(\delta s_W\right) + c_W^2\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{g2,g2}^{e,R}\right)\right) + \\ c_W^2\left(U_{1,2}^{\tilde{e}_{g2}*}\delta Z_{1,s3}^{\tilde{e}_{g3}} + U_{2,2}^{\tilde{e}_{g2}*}\delta Z_{2,s3}^{\tilde{e}_{g3}}\right) \end{array}\right) c_\beta^2 M_W^3 s_W^2 Z_{n1,1}^{*} \\ \hline (5) c_W^2 + (3) c_\beta^2 M_W^3 U_{s3,1}^{\tilde{e}_{g2}*} \end{array}\right]$$

$$(5) = c_\beta s_W M_W^2\left(\begin{array}{l} c_\beta M_W\left(s_W Z_{n1,1} + c_W Z_{n1,2}\right)\left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g2}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g2}*}\right) - \\ c_W m_{e_{g2}} Z_{n1,3}\left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g2}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g2}*}\right) \end{array}\right) + c_W (4) U_{s3,2}^{\tilde{e}_{g2}*}$$

$$(4) = \begin{array}{l} m_{e_{g2}} s_W Z_{n1,3}\left(2\left(\delta c_\beta\right) - c_\beta\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{g2,g2}^{e,L}\right)\right) M_W^2 + \\ c_\beta\left(m_{e_{g2}} s_W Z_{n1,3}\delta M_W^2 + \left(\begin{array}{l} 2\left(\delta s_W\right) m_{e_{g2}} Z_{n1,3} - \\ \left(\begin{array}{l} 2 Z_{n1,3}\delta m_{g2}^{e_g} + \\ m_{e_{g2}}\left(Z_{1,3}\delta Z_{1,n1}^{\tilde{\chi}^0,R} + Z_{2,3}\delta Z_{2,n1}^{\tilde{\chi}^0,R} + Z_{3,3}\delta Z_{3,n1}^{\tilde{\chi}^0,R} + Z_{4,3}\delta Z_{4,n1}^{\tilde{\chi}^0,R}\right) \end{array}\right) s_W \end{array}\right) M_W^2\right) \end{array}$$

$$\boxed{3} = \begin{array}{l} Z_{n1,1}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta\overline{Z}^{e,L}_{g2,g2}\right)c_W^2\right)s_W^2 - Z_{n1,2}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{e,L}_{g2,g2}\right)\right)c_W^3 + \\ s_W\left(\left(\begin{array}{l}\left(s_W Z_{1,1} + c_W Z_{1,2}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n1} + \left(s_W Z_{2,1} + c_W Z_{2,2}\right)\delta Z^{\tilde{\chi}^0,R}_{2,n1} + \\ s_W Z_{3,1}\delta Z^{\tilde{\chi}^0,R}_{3,n1} + \left(s_W Z_{4,1} + c_W Z_{4,2}\right)\delta Z^{\tilde{\chi}^0,R}_{4,n1}\end{array}\right)c_W^2 + Z_{3,2}\delta Z^{\tilde{\chi}^0,R}_{3,n1}c_W^3\right) \end{array}$$

$$\boxed{2} = \begin{array}{l} 2c_\beta M_W s_W U^{\tilde{e}_{g2}*}_{s3,2}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n1}Z^*_{1,1} + \delta Z^{\tilde{\chi}^0,L}_{2,n1}Z^*_{2,1} + \delta Z^{\tilde{\chi}^0,L}_{3,n1}Z^*_{3,1} + \delta Z^{\tilde{\chi}^0,L}_{4,n1}Z^*_{4,1}\right) + \\ c_W m_{e_{g2}} U^{\tilde{e}_{g2}*}_{s3,1}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n1}Z^*_{1,3} + \delta Z^{\tilde{\chi}^0,L}_{2,n1}Z^*_{2,3} + \delta Z^{\tilde{\chi}^0,L}_{3,n1}Z^*_{3,3} + \delta Z^{\tilde{\chi}^0,L}_{4,n1}Z^*_{4,3}\right) \end{array}$$

$$\boxed{1} = \begin{array}{l} c_\beta m_{e_{g2}} s_W M_W^2\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g2}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g2}*}_{2,1}\right) + \\ \left(2c_\beta s_W \delta m^{e_g}_{g2}M_W^2 - \left(\begin{array}{l} s_W\left(2\left(\delta c_\beta\right) - c_\beta\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{e,R}_{g2,g2}\right)\right)M_W^2 + \\ c_\beta\left(s_W\delta M_W^2 + 2\left(\delta s_W\right)M_W^2\right)\end{array}\right)m_{e_{g2}}\right)U^{\tilde{e}_{g2}*}_{s3,1} \end{array}$$

$$\underset{263}{C}\left(\nu_{g1}, \tilde{\chi}^0_{n2}, \tilde{\nu}^\dagger_{g3}\right) = \frac{ie\delta_{g1,g3}}{2\sqrt{2}c_W^3 s_W^2}\left(\left(\boxed{1}\right)c_W^2 + s_W^2 Z^*_{n2,1}\left(2\left(s_W\left(\delta s_W\right) + \left(\delta Z_e\right)c_W^2\right) + c_W^2\left(\delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\nu,L}_{g1,g1}\right)\right)\right)\begin{bmatrix}1\\\hline 0\end{bmatrix}$$

$$\boxed{1} = s_W\left(\begin{array}{l}\delta Z^{\tilde{\chi}^0,L}_{1,n2}\left(s_W Z^*_{1,1} - c_W Z^*_{1,2}\right) + \delta Z^{\tilde{\chi}^0,L}_{2,n2}\left(s_W Z^*_{2,1} - c_W Z^*_{2,2}\right) + \\ \delta Z^{\tilde{\chi}^0,L}_{3,n2}\left(s_W Z^*_{3,1} - c_W Z^*_{3,2}\right) + \delta Z^{\tilde{\chi}^0,L}_{4,n2}\left(s_W Z^*_{4,1} - c_W Z^*_{4,2}\right)\end{array}\right) - c_W Z^*_{n2,2}\left(s_W\left(\delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\nu,L}_{g1,g1}\right) + 2\left(s_W\left(\delta Z_e\right) - \delta s_W\right)\right)$$

$$\underset{264}{C}\left(e_{g1}, \tilde{\chi}^0_{n2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \frac{ie\delta_{g1,g3}}{2\sqrt{2}c_W^3 c_\beta^2 M_W^3 s_W^2}\begin{bmatrix}\boxed{3}\\\hline \boxed{5}\end{bmatrix}$$

$$\boxed{5} = \begin{array}{l} m_{e_{g1}}s_W Z_{n2,3}\left(2\left(\delta c_\beta\right) - c_\beta\left(2\left(\delta Z_e\right) + \delta Z^{e,R}_{g1,g1}\right)\right)c_W^3 M_W^2 U^{\tilde{e}_{g1}}_{s3,1} - \left(\boxed{4}\right)c_\beta c_W^2 - \\ 2\left(\begin{array}{l}\left(Z_{1,1}\delta Z^{\tilde{\chi}^0,R}_{1,n2} + Z_{2,1}\delta Z^{\tilde{\chi}^0,R}_{2,n2} + Z_{3,1}\delta Z^{\tilde{\chi}^0,R}_{3,n2} + Z_{4,1}\delta Z^{\tilde{\chi}^0,R}_{4,n2}\right)c_W^2 + \\ Z_{n2,1}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta Z^{e,R}_{g1,g1}\right)c_W^2\right)\end{array}\right)c_\beta^2 M_W^3 s_W^2 U^{\tilde{e}_{g1}}_{s3,2} \end{array}$$

$$\boxed{4} = \begin{array}{l} -c_W\left(m_{e_{g1}}s_W Z_{n2,3}\delta M_W^2 + \left(\begin{array}{l} 2\left(\delta s_W\right)m_{e_{g1}}Z_{n2,3} - \\ \left(\begin{array}{l} 2Z_{n2,3}\delta m^{e_g}_{g1} + \\ m_{e_{g1}}\left(Z_{1,3}\delta Z^{\tilde{\chi}^0,R}_{1,n2} + Z_{2,3}\delta Z^{\tilde{\chi}^0,R}_{2,n2} + Z_{3,3}\delta Z^{\tilde{\chi}^0,R}_{3,n2} + Z_{4,3}\delta Z^{\tilde{\chi}^0,R}_{4,n2}\right)\end{array}\right)s_W\end{array}\right)M_W^2\right)U^{\tilde{e}_{g1}}_{s3,1} + \\ \left(\begin{array}{l}\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3}\left(c_W m_{e_{g1}}Z_{n2,3}U^{\tilde{e}_{g1}}_{1,1} + 2c_\beta M_W s_W Z_{n2,1}U^{\tilde{e}_{g1}}_{1,2}\right) + \\ \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3}\left(c_W m_{e_{g1}}Z_{n2,3}U^{\tilde{e}_{g1}}_{2,1} + 2c_\beta M_W s_W Z_{n2,1}U^{\tilde{e}_{g1}}_{2,2}\right)\end{array}\right)s_W M_W^2 \end{array}$$

$$
\begin{aligned}
\boxed{3} = \; & c_\beta^2 M_W^3 s_W^2 \left(c_W^2 \left(\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g1}}_{2,1} \right) + \left(2\left(\delta s_W\right) s_W + \left(2\left(\delta Z_e\right) + \delta Z^{e,L}_{g1,g1} \right) c_W^2 \right) U^{\tilde{e}_{g1}}_{s3,1} \right) Z^*_{n2,1} + \\
& c_W^2 \left((\boxed{1}) c_\beta s_W M_W^2 - c_W \left((\boxed{2}) Z^*_{n2,3} - \left(\begin{array}{l} s_W \left(\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g1}}_{2,1} \right) - \\ \left(2\left(\delta s_W\right) - s_W \left(2\left(\delta Z_e\right) + \delta Z^{e,L}_{g1,g1} \right) \right) U^{\tilde{e}_{g1}}_{s3,1} \end{array} \right) c_\beta^2 M_W^3 Z^*_{n2,2} \right) \right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{2} = \; & c_\beta m_{e_{g1}} s_W M_W^2 \left(\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g1}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g1}}_{2,2} \right) + \\
& \left(2 c_\beta s_W \delta m^{e_g}_{g1} M_W^2 - \left(\begin{array}{l} c_\beta \left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2 \right) + \\ s_W \left(2\left(\delta c_\beta\right) - c_\beta \left(2\left(\delta Z_e\right) + \delta Z^{e,L}_{g1,g1} \right) \right) M_W^2 \end{array} \right) m_{e_{g1}} \right) U^{\tilde{e}_{g1}}_{s3,2}
\end{aligned}
$$

$$
\begin{aligned}
\boxed{1} = \; & -c_W m_{e_{g1}} U^{\tilde{e}_{g1}}_{s3,2} \left(\delta Z^{\tilde{\chi}^0,L}_{1,n2} Z^*_{1,3} + \delta Z^{\tilde{\chi}^0,L}_{2,n2} Z^*_{2,3} + \delta Z^{\tilde{\chi}^0,L}_{3,n2} Z^*_{3,3} + \delta Z^{\tilde{\chi}^0,L}_{4,n2} Z^*_{4,3} \right) + \\
& \left(\begin{array}{l} \delta Z^{\tilde{\chi}^0,L}_{1,n2} \left(s_W Z^*_{1,1} + c_W Z^*_{1,2} \right) + \delta Z^{\tilde{\chi}^0,L}_{2,n2} \left(s_W Z^*_{2,1} + c_W Z^*_{2,2} \right) + \\ \delta Z^{\tilde{\chi}^0,L}_{3,n2} \left(s_W Z^*_{3,1} + c_W Z^*_{3,2} \right) + \delta Z^{\tilde{\chi}^0,L}_{4,n2} \left(s_W Z^*_{4,1} + c_W Z^*_{4,2} \right) \end{array} \right) c_\beta M_W U^{\tilde{e}_{g1}}_{s3,1}
\end{aligned}
$$

[FFS] Neutralino – Quark – Squark

$$
\underset{261}{C}\left(\tilde{\chi}^0_{n1}, \overline{u}_{g2}, \tilde{u}^{s3}_{g3} \right) = \frac{i e \delta_{g2,g3}}{6\sqrt{2} c_W^3 M_W^3 s_W^2 s_\beta^2} \left[\frac{\begin{array}{l} c_W^2 \left((\boxed{2}) s_W s_\beta M_W^2 - 3(\boxed{1}) c_W Z^*_{n1,4} \right) + \\ 4 \left(\begin{array}{l} U^{\tilde{u}_{g2}*}_{s3,2} \left(2 s_W \left(\delta s_W\right) + c_W^2 \left(2\left(\delta Z_e\right) + \delta\overline{Z}^{u,R}_{g2,g2} \right) \right) + \\ c_W^2 \left(U^{\tilde{u}_{g2}*}_{1,2} \delta Z^{\tilde{u}_{g3}}_{1,s3} + U^{\tilde{u}_{g2}*}_{2,2} \delta Z^{\tilde{u}_{g3}}_{2,s3} \right) \end{array} \right) M_W^3 s_W^2 s_\beta^2 Z^*_{n1,1} \end{array}}{-(\boxed{5}) c_W^2 - (\boxed{3}) M_W^3 s_\beta^2 U^{\tilde{u}_{g2}*}_{s3,1}} \right]
$$

$$
\boxed{5} = s_\beta s_W M_W^2 \left(\begin{array}{l} M_W s_\beta \left(s_W Z_{n1,1} + 3 c_W Z_{n1,2} \right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g2}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g2}*}_{2,1} \right) + \\ 3 c_W m_{u_{g2}} Z_{n1,4} \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g2}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g2}*}_{2,2} \right) \end{array} \right) - 3 c_W (\boxed{4}) U^{\tilde{u}_{g2}*}_{s3,2}
$$

$$
\begin{aligned}
\boxed{4} = \; & -m_{u_{g2}} s_W s_\beta Z_{n1,4} \left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{u,L}_{g2,g2} \right) M_W^2 - \delta M_W^2 \right) + \\
& \left(\left(\begin{array}{l} 2\left(\delta s_W\right) m_{u_{g2}} Z_{n1,4} - \\ \left(\begin{array}{l} 2 Z_{n1,4} \delta m^{u_g}_{g2} + \\ m_{u_{g2}} \left(Z_{1,4} \delta Z^{\tilde{\chi}^0,R}_{1,n1} + Z_{2,4} \delta Z^{\tilde{\chi}^0,R}_{2,n1} + Z_{3,4} \delta Z^{\tilde{\chi}^0,R}_{3,n1} + Z_{4,4} \delta Z^{\tilde{\chi}^0,R}_{4,n1} \right) \end{array} \right) s_W \end{array} \right) s_\beta + 2\left(\delta s_\beta\right) m_{u_{g2}} s_W Z_{n1,4} \right) M_W^2
\end{aligned}
$$

$$
\boxed{3} = \begin{array}{l} Z_{n1,1}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta\overline{Z}^{u,L}_{g2,g2}\right)c_W^2\right)s_W^2 - Z_{n1,2}\left(6\left(\delta s_W\right) - s_W\left(6\left(\delta Z_e\right) + 3\delta\overline{Z}^{u,L}_{g2,g2}\right)\right)c_W^3 + \\ s_W\left(\left(\begin{array}{l}\left(s_W Z_{1,1} + 3c_W Z_{1,2}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n1} + \left(s_W Z_{2,1} + 3c_W Z_{2,2}\right)\delta Z^{\tilde{\chi}^0,R}_{2,n1} + \\ s_W Z_{3,1}\delta Z^{\tilde{\chi}^0,R}_{3,n1} + \left(s_W Z_{4,1} + 3c_W Z_{4,2}\right)\delta Z^{\tilde{\chi}^0,R}_{4,n1}\end{array}\right)c_W^2 + 3Z_{3,2}\delta Z^{\tilde{\chi}^0,R}_{3,n1}c_W^3\right) \end{array}
$$

$$
\boxed{2} = \begin{array}{l} 4M_W s_W s_\beta U^{\tilde{u}_{g2}*}_{s3,2}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n1}Z^*_{1,1} + \delta Z^{\tilde{\chi}^0,L}_{2,n1}Z^*_{2,1} + \delta Z^{\tilde{\chi}^0,L}_{3,n1}Z^*_{3,1} + \delta Z^{\tilde{\chi}^0,L}_{4,n1}Z^*_{4,1}\right) - \\ 3c_W m_{u_{g2}}U^{\tilde{u}_{g2}*}_{s3,1}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n1}Z^*_{1,4} + \delta Z^{\tilde{\chi}^0,L}_{2,n1}Z^*_{2,4} + \delta Z^{\tilde{\chi}^0,L}_{3,n1}Z^*_{3,4} + \delta Z^{\tilde{\chi}^0,L}_{4,n1}Z^*_{4,4}\right) \end{array}
$$

$$
\boxed{1} = \begin{array}{l} m_{u_{g2}}s_W s_\beta M_W^2\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g2}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g2}*}_{2,1}\right) + \\ \left(\left(\begin{array}{l} s_W s_\beta\left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{u,R}_{g2,g2}\right)M_W^2 - \delta M_W^2\right) - \\ 2\left(\left(\delta s_\beta\right)s_W + \left(\delta s_W\right)s_\beta\right)M_W^2\end{array}\right)m_{u_{g2}} + 2s_W s_\beta\delta m^{u_g}_{g2}M_W^2\right)U^{\tilde{u}_{g2}*}_{s3,1} \end{array}
$$

$$
C_{262}\left(\tilde{\chi}^0_{n1}, \overline{d}_{g2}, \tilde{d}^{s3}_{g3}\right) = \frac{ie\delta_{g2,g3}}{6\sqrt{2}c_W^3c_\beta^2M_W^3s_W^2}\left[\frac{\begin{array}{l} -c_W^2\left(\left(\boxed{2}\right)c_\beta s_W M_W^2 + 3\left(\boxed{1}\right)c_W Z^*_{n1,3}\right) - \\ 2\left(\begin{array}{l} U^{\tilde{d}_{g2}*}_{s3,2}\left(2s_W\left(\delta s_W\right) + c_W^2\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{d,R}_{g2,g2}\right)\right) + \\ c_W^2\left(U^{\tilde{d}_{g2}*}_{1,2}\delta Z^{\tilde{d}_{g3}}_{1,s3} + U^{\tilde{d}_{g2}*}_{2,2}\delta Z^{\tilde{d}_{g3}}_{2,s3}\right)\end{array}\right)c_\beta^2M_W^3s_W^2Z^*_{n1,1}\end{array}}{-\left(\boxed{5}\right)c_W^2 + \left(\boxed{3}\right)c_\beta^2M_W^3U^{\tilde{d}_{g2}*}_{s3,1}}\right]
$$

$$
\boxed{5} = c_\beta s_W M_W^2\left(\begin{array}{l} c_\beta M_W\left(s_W Z_{n1,1} - 3c_W Z_{n1,2}\right)\left(\delta Z^{\tilde{d}_{g3}}_{1,s3}U^{\tilde{d}_{g2}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3}U^{\tilde{d}_{g2}*}_{2,1}\right) + \\ 3c_W m_{d_{g2}}Z_{n1,3}\left(\delta Z^{\tilde{d}_{g3}}_{1,s3}U^{\tilde{d}_{g2}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3}U^{\tilde{d}_{g2}*}_{2,2}\right)\end{array}\right) - 3c_W\left(\boxed{4}\right)U^{\tilde{d}_{g2}*}_{s3,2}
$$

$$
\boxed{4} = \begin{array}{l} m_{d_{g2}}s_W Z_{n1,3}\left(2\left(\delta c_\beta\right) - c_\beta\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{d,L}_{g2,g2}\right)\right)M_W^2 + \\ c_\beta\left(m_{d_{g2}}s_W Z_{n1,3}\delta M_W^2 + \left(\begin{array}{l} 2\left(\delta s_W\right)m_{d_{g2}}Z_{n1,3} - \\ \left(\begin{array}{l} 2Z_{n1,3}\delta m^{d_g}_{g2} + \\ m_{d_{g2}}\left(Z_{1,3}\delta Z^{\tilde{\chi}^0,R}_{1,n1} + Z_{2,3}\delta Z^{\tilde{\chi}^0,R}_{2,n1} + Z_{3,3}\delta Z^{\tilde{\chi}^0,R}_{3,n1} + Z_{4,3}\delta Z^{\tilde{\chi}^0,R}_{4,n1}\right)\end{array}\right)s_W\end{array}\right)M_W^2\right) \end{array}
$$

$$
\boxed{3} = \begin{array}{l} -3Z_{n1,2}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{d,L}_{g2,g2}\right)\right)c_W^3 - Z_{n1,1}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta\overline{Z}^{d,L}_{g2,g2}\right)c_W^2\right)s_W^2 + \\ s_W\left(3Z_{3,2}\delta Z^{\tilde{\chi}^0,R}_{3,n1}c_W^3 - \left(\begin{array}{l}\left(s_W Z_{1,1} - 3c_W Z_{1,2}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n1} + \left(s_W Z_{2,1} - 3c_W Z_{2,2}\right)\delta Z^{\tilde{\chi}^0,R}_{2,n1} + \\ s_W Z_{3,1}\delta Z^{\tilde{\chi}^0,R}_{3,n1} + \left(s_W Z_{4,1} - 3c_W Z_{4,2}\right)\delta Z^{\tilde{\chi}^0,R}_{4,n1}\end{array}\right)c_W^2\right) \end{array}
$$

$$\boxed{2} = \begin{array}{l} 2c_\beta M_W s_W U^{\tilde{d}_{g2}*}_{s3,2}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n1} Z^*_{1,1} + \delta Z^{\tilde{\chi}^0,L}_{2,n1} Z^*_{2,1} + \delta Z^{\tilde{\chi}^0,L}_{3,n1} Z^*_{3,1} + \delta Z^{\tilde{\chi}^0,L}_{4,n1} Z^*_{4,1}\right) + \\ 3c_W m_{d_{g2}} U^{\tilde{d}_{g2}*}_{s3,1}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n1} Z^*_{1,3} + \delta Z^{\tilde{\chi}^0,L}_{2,n1} Z^*_{2,3} + \delta Z^{\tilde{\chi}^0,L}_{3,n1} Z^*_{3,3} + \delta Z^{\tilde{\chi}^0,L}_{4,n1} Z^*_{4,3}\right) \end{array}$$

$$\boxed{1} = \begin{array}{l} c_\beta m_{d_{g2}} s_W M_W^2\left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g2}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g2}*}_{2,1}\right) + \\ \left(2c_\beta s_W \delta m^{d_g}_{g2} M_W^2 - \left(\begin{array}{l} s_W\left(2\left(\delta c_\beta\right) - c_\beta\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{d,R}_{g2,g2}\right)\right) M_W^2 + \\ c_\beta\left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right) \end{array}\right) m_{d_{g2}}\right) U^{\tilde{d}_{g2}*}_{s3,1} \end{array}$$

$$\underset{265}{C}\left(u_{g1}, \tilde{\chi}^0_{n2}, \tilde{u}^{s3,\dagger}_{g3}\right) = -\frac{ie\delta_{g1,g3}}{6\sqrt{2}c_W^3 M_W^3 s_W^2 s_\beta^2}\left[\frac{\boxed{3}}{\boxed{5}}\right]$$

$$\boxed{5} = \begin{array}{l} -(\boxed{4})c_W^3 U^{\tilde{u}_{g1}}_{s3,1} + \\ \left(\begin{array}{l} \delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3}\left(3c_W m_{u_{g1}} Z_{n2,4} U^{\tilde{u}_{g1}}_{1,1} - 4M_W s_W s_\beta Z_{n2,1} U^{\tilde{u}_{g1}}_{1,2}\right) + \\ \delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}\left(3c_W m_{u_{g1}} Z_{n2,4} U^{\tilde{u}_{g1}}_{2,1} - 4M_W s_W s_\beta Z_{n2,1} U^{\tilde{u}_{g1}}_{2,2}\right) \end{array}\right) s_W s_\beta c_W^2 M_W^2 - \\ 4\left(\begin{array}{l} \left(2\left(\delta Z_e\right) Z_{n2,1} + Z_{1,1}\delta Z^{\tilde{\chi}^0,R}_{1,n2} + Z_{2,1}\delta Z^{\tilde{\chi}^0,R}_{2,n2} + Z_{3,1}\delta Z^{\tilde{\chi}^0,R}_{3,n2} + Z_{4,1}\delta Z^{\tilde{\chi}^0,R}_{4,n2}\right) c_W^2 + \\ Z_{n2,1}\left(2\left(\delta s_W\right) s_W + \delta Z^{u,R}_{g1,g1} c_W^2\right) \end{array}\right) M_W^3 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s3,2} \end{array}$$

$$\boxed{4} = \begin{array}{l} m_{u_{g1}} s_W s_\beta Z_{n2,4}\left(3\delta M_W^2 - 3\left(2\left(\delta Z_e\right) + \delta Z^{u,R}_{g1,g1}\right) M_W^2\right) + \\ \left(\begin{array}{l} 6Z_{n2,4}\left(m_{u_{g1}}\left(\left(\delta s_\beta\right) s_W + \left(\delta s_W\right) s_\beta\right) - s_W s_\beta \delta m^{u_g}_{g1}\right) - \\ 3m_{u_{g1}} s_W s_\beta\left(Z_{1,4}\delta Z^{\tilde{\chi}^0,R}_{1,n2} + Z_{2,4}\delta Z^{\tilde{\chi}^0,R}_{2,n2} + Z_{3,4}\delta Z^{\tilde{\chi}^0,R}_{3,n2} + Z_{4,4}\delta Z^{\tilde{\chi}^0,R}_{4,n2}\right) \end{array}\right) M_W^2 \end{array}$$

$$\boxed{3} = \begin{array}{l} M_W^3 s_W^2 s_\beta^2\left(c_W^2\left(\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g1}}_{2,1}\right) + \left(2\left(\delta s_W\right) s_W + \left(2\left(\delta Z_e\right) + \delta Z^{u,L}_{g1,g1}\right) c_W^2\right) U^{\tilde{u}_{g1}}_{s3,1}\right) Z^*_{n2,1} + \\ c_W^2\left((\boxed{1}) s_W s_\beta M_W^2 + 3c_W\left(\left(\begin{array}{l} s_W\left(\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g1}}_{2,1}\right) - \\ \left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z^{u,L}_{g1,g1}\right)\right) U^{\tilde{u}_{g1}}_{s3,1} \end{array}\right) M_W^3 s_\beta^2 Z^*_{n2,2} + (\boxed{2}) Z^*_{n2,4}\right)\right) \end{array}$$

$$\boxed{2} = U^{\tilde{u}_{g1}}_{s3,2}\left(2s_\beta s_W M_W^2 \delta m^{u_g}_{g1} - m_{u_{g1}}\left(\begin{array}{l} 2\left(\left(\delta s_\beta\right) s_W + \left(\delta s_W\right) s_\beta\right) M_W^2 + \\ s_W s_\beta\left(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z^{u,L}_{g1,g1}\right) M_W^2\right) \end{array}\right)\right) + s_\beta s_W m_{u_{g1}} M_W^2\left(U^{\tilde{u}_{g1}}_{1,2}\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3} + U^{\tilde{u}_{g1}}_{2,2}\delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}\right)$$

$$
\boxed{1} = \begin{array}{l} 3c_{\mathrm{W}} m_{u_{\mathrm{g1}}} U^{\tilde{u}_{\mathrm{g1}}}_{\mathrm{s3,2}} \left(\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{1,n2}} Z^{*}_{\mathrm{1,4}} + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{2,n2}} Z^{*}_{\mathrm{2,4}} + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{3,n2}} Z^{*}_{\mathrm{3,4}} + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{4,n2}} Z^{*}_{\mathrm{4,4}} \right) + \\ \left(\begin{array}{l} \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{1,n2}} \left(s_{\mathrm{W}} Z^{*}_{\mathrm{1,1}} + 3c_{\mathrm{W}} Z^{*}_{\mathrm{1,2}} \right) + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{2,n2}} \left(s_{\mathrm{W}} Z^{*}_{\mathrm{2,1}} + 3c_{\mathrm{W}} Z^{*}_{\mathrm{2,2}} \right) + \\ \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{3,n2}} \left(s_{\mathrm{W}} Z^{*}_{\mathrm{3,1}} + 3c_{\mathrm{W}} Z^{*}_{\mathrm{3,2}} \right) + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{4,n2}} \left(s_{\mathrm{W}} Z^{*}_{\mathrm{4,1}} + 3c_{\mathrm{W}} Z^{*}_{\mathrm{4,2}} \right) \end{array} \right) M_{\mathrm{W}} s_{\beta} U^{\tilde{u}_{\mathrm{g1}}}_{\mathrm{s3,1}} \end{array}
$$

$$
\underset{266}{C} \left(d_{\mathrm{g1}}, \tilde{\chi}^0_{\mathrm{n2}}, \tilde{d}^{\mathrm{s3},\dagger}_{\mathrm{g3}} \right) = \frac{\mathrm{i}e\delta_{\mathrm{g1,g3}}}{6\sqrt{2} c^3_{\mathrm{W}} c^2_{\beta} M^3_{\mathrm{W}} s^2_{\mathrm{W}}} \left[\begin{array}{c} \boxed{3} \\ \hline \boxed{5} \end{array} \right]
$$

$$
\boxed{5} = \begin{array}{l} 3m_{d_{\mathrm{g1}}} s_{\mathrm{W}} Z_{\mathrm{n2,3}} \left(2 \left(\delta c_{\beta} \right) - c_{\beta} \left(2 \left(\delta \mathrm{Z_e} \right) + \delta Z^{d,\mathrm{R}}_{\mathrm{g1,g1}} \right) \right) c^3_{\mathrm{W}} M^2_{\mathrm{W}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s3,1}} - (\boxed{4}) c_{\beta} c^2_{\mathrm{W}} - \\ 2 \left(\begin{array}{l} \left(Z_{1,1} \delta Z^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{1,n2}} + Z_{2,1} \delta Z^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{2,n2}} + Z_{3,1} \delta Z^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{3,n2}} + Z_{4,1} \delta Z^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{4,n2}} \right) c^2_{\mathrm{W}} + \\ Z_{\mathrm{n2},1} \left(2 \left(\delta s_{\mathrm{W}} \right) s_{\mathrm{W}} + \left(2 \left(\delta \mathrm{Z_e} \right) + \delta Z^{d,\mathrm{R}}_{\mathrm{g1,g1}} \right) c^2_{\mathrm{W}} \right) \end{array} \right) c^2_{\beta} M^3_{\mathrm{W}} s^2_{\mathrm{W}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s3,2}} \end{array}
$$

$$
\boxed{4} = \begin{array}{l} \left(\begin{array}{l} \delta \overline{Z}^{\tilde{d}_{\mathrm{g3}}}_{\mathrm{1,s3}} \left(3c_{\mathrm{W}} m_{d_{\mathrm{g1}}} Z_{\mathrm{n2,3}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{1,1}} + 2c_{\beta} M_{\mathrm{W}} s_{\mathrm{W}} Z_{\mathrm{n2},1} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{1,2}} \right) + \\ \delta \overline{Z}^{\tilde{d}_{\mathrm{g3}}}_{\mathrm{2,s3}} \left(3c_{\mathrm{W}} m_{d_{\mathrm{g1}}} Z_{\mathrm{n2,3}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{2,1}} + 2c_{\beta} M_{\mathrm{W}} s_{\mathrm{W}} Z_{\mathrm{n2},1} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{2,2}} \right) \end{array} \right) s_{\mathrm{W}} M^2_{\mathrm{W}} + \\ \left(\begin{array}{l} Z_{\mathrm{n2,3}} \left(6 s_{\mathrm{W}} \delta m^{d_{\mathrm{g}}}_{\mathrm{g1}} M^2_{\mathrm{W}} - 3 m_{d_{\mathrm{g1}}} \left(s_{\mathrm{W}} \delta M^2_{\mathrm{W}} + 2 \left(\delta s_{\mathrm{W}} \right) M^2_{\mathrm{W}} \right) \right) + \\ 3 m_{d_{\mathrm{g1}}} s_{\mathrm{W}} \left(Z_{1,3} \delta Z^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{1,n2}} + Z_{2,3} \delta Z^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{2,n2}} + Z_{3,3} \delta Z^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{3,n2}} + Z_{4,3} \delta Z^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{4,n2}} \right) M^2_{\mathrm{W}} \end{array} \right) c_{\mathrm{W}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s3,1}} \end{array}
$$

$$
\boxed{3} = \begin{array}{l} -c^2_{\beta} M^3_{\mathrm{W}} s^2_{\mathrm{W}} \left(c^2_{\mathrm{W}} \left(\delta \overline{Z}^{\tilde{d}_{\mathrm{g3}}}_{\mathrm{1,s3}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{1,1}} + \delta \overline{Z}^{\tilde{d}_{\mathrm{g3}}}_{\mathrm{2,s3}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{2,1}} \right) + \left(2 \left(\delta s_{\mathrm{W}} \right) s_{\mathrm{W}} + \left(2 \left(\delta \mathrm{Z_e} \right) + \delta Z^{d,\mathrm{L}}_{\mathrm{g1,g1}} \right) c^2_{\mathrm{W}} \right) U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s3,1}} \right) Z^{*}_{\mathrm{n2},1} - \\ c^2_{\mathrm{W}} \left((\boxed{1}) c_{\beta} s_{\mathrm{W}} M^2_{\mathrm{W}} + c_{\mathrm{W}} \left(3 (\boxed{2}) Z^{*}_{\mathrm{n2,3}} - 3 \left(\begin{array}{l} s_{\mathrm{W}} \left(\delta \overline{Z}^{\tilde{d}_{\mathrm{g3}}}_{\mathrm{1,s3}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{1,1}} + \delta \overline{Z}^{\tilde{d}_{\mathrm{g3}}}_{\mathrm{2,s3}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{2,1}} \right) - \\ \left(2 \left(\delta s_{\mathrm{W}} \right) - s_{\mathrm{W}} \left(2 \left(\delta \mathrm{Z_e} \right) + \delta Z^{d,\mathrm{L}}_{\mathrm{g1,g1}} \right) \right) U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s3,1}} \end{array} \right) c^2_{\beta} M^3_{\mathrm{W}} Z^{*}_{\mathrm{n2,2}} \right) \right) \end{array}
$$

$$
\boxed{2} = \begin{array}{l} c_{\beta} m_{d_{\mathrm{g1}}} s_{\mathrm{W}} M^2_{\mathrm{W}} \left(\delta \overline{Z}^{\tilde{d}_{\mathrm{g3}}}_{\mathrm{1,s3}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{1,2}} + \delta \overline{Z}^{\tilde{d}_{\mathrm{g3}}}_{\mathrm{2,s3}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{2,2}} \right) + \\ \left(2 c_{\beta} s_{\mathrm{W}} \delta m^{d_{\mathrm{g}}}_{\mathrm{g1}} M^2_{\mathrm{W}} - \left(\begin{array}{l} c_{\beta} \left(s_{\mathrm{W}} \delta M^2_{\mathrm{W}} + 2 \left(\delta s_{\mathrm{W}} \right) M^2_{\mathrm{W}} \right) + \\ s_{\mathrm{W}} \left(2 \left(\delta c_{\beta} \right) - c_{\beta} \left(2 \left(\delta \mathrm{Z_e} \right) + \delta Z^{d,\mathrm{L}}_{\mathrm{g1,g1}} \right) \right) M^2_{\mathrm{W}} \end{array} \right) m_{d_{\mathrm{g1}}} \right) U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s3,2}} \end{array}
$$

$$
\boxed{1} = \begin{array}{l} 3c_{\mathrm{W}} m_{d_{\mathrm{g1}}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s3,2}} \left(\delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{1,n2}} Z^{*}_{\mathrm{1,3}} + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{2,n2}} Z^{*}_{\mathrm{2,3}} + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{3,n2}} Z^{*}_{\mathrm{3,3}} + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{4,n2}} Z^{*}_{\mathrm{4,3}} \right) + \\ \left(\begin{array}{l} \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{1,n2}} \left(s_{\mathrm{W}} Z^{*}_{\mathrm{1,1}} - 3c_{\mathrm{W}} Z^{*}_{\mathrm{1,2}} \right) + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{2,n2}} \left(s_{\mathrm{W}} Z^{*}_{\mathrm{2,1}} - 3c_{\mathrm{W}} Z^{*}_{\mathrm{2,2}} \right) + \\ \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{3,n2}} \left(s_{\mathrm{W}} Z^{*}_{\mathrm{3,1}} - 3c_{\mathrm{W}} Z^{*}_{\mathrm{3,2}} \right) + \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{4,n2}} \left(s_{\mathrm{W}} Z^{*}_{\mathrm{4,1}} - 3c_{\mathrm{W}} Z^{*}_{\mathrm{4,2}} \right) \end{array} \right) c_{\beta} M_{\mathrm{W}} U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s3,1}} \end{array}
$$

[FFS] 2 Charginos – Higgs

$$\underset{251}{C}\left(\tilde{\chi}_{c1}^{-}, \tilde{\chi}_{c2}^{+}, h^{0}\right) = \frac{ie}{2\sqrt{2}s_W^2}\left[\begin{array}{c}1\\\hline 2\end{array}\right]$$

$$\begin{aligned}
2 = {} & -V_{c1,1}\left(\left(\left(\delta Z_{hH}\right)c_\alpha s_W + \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{hh}\right)s_W\right)s_\alpha\right)U_{c2,2} - s_W s_\alpha\left(U_{1,2}\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,L} + U_{2,2}\delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,L}\right)\right) + \\
& V_{c1,2}\left(\left(c_\alpha\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{hh}\right)s_W\right) - \left(\delta Z_{hH}\right)s_W s_\alpha\right)U_{c2,1} - c_\alpha s_W\left(U_{1,1}\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,L} + U_{2,1}\delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,L}\right)\right) + \\
& s_W\left(\left(s_\alpha U_{c2,2}V_{1,1} - c_\alpha U_{c2,1}V_{1,2}\right)\delta Z_{1,c1}^{\tilde{\chi}^-,R} + \left(s_\alpha U_{c2,2}V_{2,1} - c_\alpha U_{c2,1}V_{2,2}\right)\delta Z_{2,c1}^{\tilde{\chi}^-,R}\right)
\end{aligned}$$

$$\begin{aligned}
1 = {} & -U_{c1,2}^{*}\left(\left(\left(\delta Z_{hH}\right)c_\alpha s_W + \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{hh}\right)s_W\right)s_\alpha\right)V_{c2,1}^{*} - s_W s_\alpha\left(\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,R}V_{1,1}^{*} + \delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,R}V_{2,1}^{*}\right)\right) + \\
& U_{c1,1}^{*}\left(\left(c_\alpha\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{hh}\right)s_W\right) - \left(\delta Z_{hH}\right)s_W s_\alpha\right)V_{c2,2}^{*} - c_\alpha s_W\left(\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,R}V_{1,2}^{*} + \delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,R}V_{2,2}^{*}\right)\right) + \\
& s_W\left(\delta Z_{1,c1}^{\tilde{\chi}^-,L}\left(s_\alpha U_{1,2}^{*}V_{c2,1}^{*} - c_\alpha U_{1,1}^{*}V_{c2,2}^{*}\right) + \delta Z_{2,c1}^{\tilde{\chi}^-,L}\left(s_\alpha U_{2,2}^{*}V_{c2,1}^{*} - c_\alpha U_{2,1}^{*}V_{c2,2}^{*}\right)\right)
\end{aligned}$$

$$\underset{252}{C}\left(\tilde{\chi}_{c1}^{-}, \tilde{\chi}_{c2}^{+}, H^{0}\right) = -\frac{ie}{2\sqrt{2}s_W^2}\left[\begin{array}{c}1\\\hline 2\end{array}\right]$$

$$\begin{aligned}
2 = {} & -V_{c1,1}\left(\left(c_\alpha\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{HH}\right)s_W\right) + \left(\delta Z_{hH}\right)s_W s_\alpha\right)U_{c2,2} - c_\alpha s_W\left(U_{1,2}\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,L} + U_{2,2}\delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,L}\right)\right) + \\
& V_{c1,2}\left(\left(\left(\delta Z_{hH}\right)c_\alpha s_W - \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{HH}\right)s_W\right)s_\alpha\right)U_{c2,1} + s_W s_\alpha\left(U_{1,1}\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,L} + U_{2,1}\delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,L}\right)\right) + \\
& s_W\left(\left(c_\alpha U_{c2,2}V_{1,1} + s_\alpha U_{c2,1}V_{1,2}\right)\delta Z_{1,c1}^{\tilde{\chi}^-,R} + \left(c_\alpha U_{c2,2}V_{2,1} + s_\alpha U_{c2,1}V_{2,2}\right)\delta Z_{2,c1}^{\tilde{\chi}^-,R}\right)
\end{aligned}$$

$$\begin{aligned}
1 = {} & -U_{c1,2}^{*}\left(\left(c_\alpha\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{HH}\right)s_W\right) + \left(\delta Z_{hH}\right)s_W s_\alpha\right)V_{c2,1}^{*} - c_\alpha s_W\left(\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,R}V_{1,1}^{*} + \delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,R}V_{2,1}^{*}\right)\right) + \\
& U_{c1,1}^{*}\left(s_W s_\alpha\left(\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,R}V_{1,2}^{*} + \delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,R}V_{2,2}^{*}\right) + \left(\left(\delta Z_{hH}\right)c_\alpha s_W - \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{HH}\right)s_W\right)s_\alpha\right)V_{c2,2}^{*}\right) + \\
& s_W\left(\delta Z_{1,c1}^{\tilde{\chi}^-,L}\left(c_\alpha U_{1,2}^{*}V_{c2,1}^{*} + s_\alpha U_{1,1}^{*}V_{c2,2}^{*}\right) + \delta Z_{2,c1}^{\tilde{\chi}^-,L}\left(c_\alpha U_{2,2}^{*}V_{c2,1}^{*} + s_\alpha U_{2,1}^{*}V_{c2,2}^{*}\right)\right)
\end{aligned}$$

$$\underset{253}{C}\left(\tilde{\chi}_{c1}^{-}, \tilde{\chi}_{c2}^{+}, A^{0}\right) = \frac{e}{2\sqrt{2}s_W^2}\left[\begin{array}{c}1\\\hline 2\end{array}\right]$$

$$
\begin{aligned}
\boxed{2} = {} & -V_{c1,1}\left(\left(\left(\delta Z_{AG}\right)c_\beta s_W + \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{AA}\right)s_W\right)s_\beta\right)U_{c2,2} - s_W s_\beta\left(U_{1,2}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + U_{2,2}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,2}\right)\right) - \\
& V_{c1,2}\left(\left(c_\beta\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{AA}\right)s_W\right) - \left(\delta Z_{AG}\right)s_W s_\beta\right)U_{c2,1} - c_\beta s_W\left(U_{1,1}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + U_{2,1}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,2}\right)\right) + \\
& s_W\left(\left(s_\beta U_{c2,2}V_{1,1} + c_\beta U_{c2,1}V_{1,2}\right)\delta Z^{\tilde{\chi}^-,R}_{1,c1} + \left(s_\beta U_{c2,2}V_{2,1} + c_\beta U_{c2,1}V_{2,2}\right)\delta Z^{\tilde{\chi}^-,R}_{2,c1}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{1} = {} & U^*_{c1,2}\left(\left(\left(\delta Z_{AG}\right)c_\beta s_W + \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{AA}\right)s_W\right)s_\beta\right)V^*_{c2,1} - s_W s_\beta\left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,1}V^*_{1,1} + \delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,2}V^*_{2,1}\right)\right) + \\
& U^*_{c1,1}\left(\left(c_\beta\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{AA}\right)s_W\right) - \left(\delta Z_{AG}\right)s_W s_\beta\right)V^*_{c2,2} - c_\beta s_W\left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,1}V^*_{1,2} + \delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,2}V^*_{2,2}\right)\right) - \\
& s_W\left(\delta Z^{\tilde{\chi}^-,L}_{1,c1}\left(s_\beta U^*_{1,2}V^*_{c2,1} + c_\beta U^*_{1,1}V^*_{c2,2}\right) + \delta Z^{\tilde{\chi}^-,L}_{2,c1}\left(s_\beta U^*_{2,2}V^*_{c2,1} + c_\beta U^*_{2,1}V^*_{c2,2}\right)\right)
\end{aligned}
$$

$$
\underset{254}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^+_{c2}, G^0\right) = \frac{e}{2\sqrt{2}s^2_W}\left[\frac{1}{2}\right]
$$

$$
\begin{aligned}
\boxed{2} = {} & V_{c1,1}\left(\left(c_\beta\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right)s_W\right) + \left(\delta Z_{AG}\right)s_W s_\beta\right)U_{c2,2} - c_\beta s_W\left(U_{1,2}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + U_{2,2}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,2}\right)\right) + \\
& V_{c1,2}\left(\left(\left(\delta Z_{AG}\right)c_\beta s_W - \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right)s_W\right)s_\beta\right)U_{c2,1} + s_W s_\beta\left(U_{1,1}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + U_{2,1}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,2}\right)\right) - \\
& s_W\left(\left(c_\beta U_{c2,2}V_{1,1} - s_\beta U_{c2,1}V_{1,2}\right)\delta Z^{\tilde{\chi}^-,R}_{1,c1} + \left(c_\beta U_{c2,2}V_{2,1} - s_\beta U_{c2,1}V_{2,2}\right)\delta Z^{\tilde{\chi}^-,R}_{2,c1}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{1} = {} & -U^*_{c1,2}\left(\left(c_\beta\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right)s_W\right) + \left(\delta Z_{AG}\right)s_W s_\beta\right)V^*_{c2,1} - c_\beta s_W\left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,1}V^*_{1,1} + \delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,2}V^*_{2,1}\right)\right) + \\
& U^*_{c1,1}\left(\left(2\left(\delta s_W\right)s_\beta - s_W\left(\left(\delta Z_{AG}\right)c_\beta + \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right)s_\beta\right)\right)V^*_{c2,2} - s_W s_\beta\left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,1}V^*_{1,2} + \delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,2}V^*_{2,2}\right)\right) + \\
& s_W\left(\delta Z^{\tilde{\chi}^-,L}_{1,c1}\left(c_\beta U^*_{1,2}V^*_{c2,1} - s_\beta U^*_{1,1}V^*_{c2,2}\right) + \delta Z^{\tilde{\chi}^-,L}_{2,c1}\left(c_\beta U^*_{2,2}V^*_{c2,1} - s_\beta U^*_{2,1}V^*_{c2,2}\right)\right)
\end{aligned}
$$

[FFS] 2 Leptons – Higgs

$$
\underset{183}{C}\left(e_{g1}, \bar{e}_{g2}, h^0\right) = \frac{ie\delta_{g1,g2}}{4c^2_\beta M^3_W s^2_W}\left[\frac{1}{2}\right]
$$

$$
\begin{aligned}
\boxed{2} = {} & 2c_\beta s_\alpha s_W M^2_W \delta m^{e_g}_{g1} - m_{e_{g1}}\left(\begin{array}{l} s_\alpha\left(2\left(\delta c_\beta\right)s_W M^2_W - c_\beta\left(2\left(\left(\delta Z_e\right)s_W - \delta s_W\right)M^2_W - s_W\delta M^2_W\right)\right) + \\ c_\beta s_W\left(\left(\delta Z_{hH}\right)c_\alpha - s_\alpha\left(\delta Z_{hh} + \delta\overline{Z}^{e,L}_{g2,g2} + \delta Z^{e,R}_{g1,g1}\right)\right)M^2_W\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{1} = {} & 2c_\beta s_\alpha s_W M^2_W \delta m^{e_g}_{g1} - m_{e_{g1}}\left(\begin{array}{l} s_\alpha\left(2\left(\delta c_\beta\right)s_W M^2_W - c_\beta\left(2\left(\left(\delta Z_e\right)s_W - \delta s_W\right)M^2_W - s_W\delta M^2_W\right)\right) + \\ c_\beta s_W\left(\left(\delta Z_{hH}\right)c_\alpha - s_\alpha\left(\delta Z_{hh} + \delta\overline{Z}^{e,R}_{g2,g2} + \delta Z^{e,L}_{g1,g1}\right)\right)M^2_W\end{array}\right)
\end{aligned}
$$

$$\underset{186}{C}\left(e_{g1},\bar{e}_{g2},A^0\right) = \frac{e\delta_{g1,g2}}{4c_\beta^2 M_W^3 s_W^2}\left[\begin{array}{c} \left(\begin{array}{l} s_{2\beta}\left(s_W\left(\delta Z_e\right)-\delta s_W\right)M_W^2 - \\ \left(\begin{array}{l} s_\beta\left(2\left(\delta c_\beta\right)M_W^2+c_\beta\delta M_W^2\right)+ \\ c_\beta M_W^2\left(c_\beta\left(\delta Z_{AG}\right)-s_\beta\left(\delta Z_{AA}+\delta\overline{Z}^{e,R}_{g2,g2}+\delta Z^{e,L}_{g1,g1}\right)\right) \end{array}\right)s_W \end{array}\right)m_{e_{g1}}+s_{2\beta}s_W M_W^2\delta m^{e_g}_{g1} \\ \hline -\left(\begin{array}{l} s_{2\beta}\left(s_W\left(\delta Z_e\right)-\delta s_W\right)M_W^2 - \\ \left(\begin{array}{l} s_\beta\left(2\left(\delta c_\beta\right)M_W^2+c_\beta\delta M_W^2\right)+ \\ c_\beta M_W^2\left(c_\beta\left(\delta Z_{AG}\right)-s_\beta\left(\delta Z_{AA}+\delta\overline{Z}^{e,R}_{g2,g2}+\delta Z^{e,L}_{g1,g1}\right)\right) \end{array}\right)s_W \end{array}\right)m_{e_{g1}}-s_{2\beta}s_W M_W^2\delta m^{e_g}_{g1} \end{array}\right]$$

$$\underset{187}{C}\left(e_{g1},\bar{e}_{g2},G^0\right) = \frac{e\delta_{g1,g2}}{4c_\beta M_W^3 s_W^2}\left[\begin{array}{c} -2c_\beta s_W M_W^2\delta m^{e_g}_{g1}+ \\ \left(\begin{array}{l} c_\beta\left(2\left(\delta s_W\right)M_W^2+s_W\delta M_W^2\right)+ \\ s_W M_W^2\left(2\left(\delta c_\beta\right)+s_\beta\left(\delta Z_{AG}\right)-c_\beta\left(2\left(\delta Z_e\right)+\delta Z_{GG}+\delta\overline{Z}^{e,R}_{g2,g2}+\delta Z^{e,L}_{g1,g1}\right)\right) \end{array}\right)m_{e_{g1}} \\ \hline 2c_\beta s_W M_W^2\delta m^{e_g}_{g1} - \\ \left(\begin{array}{l} c_\beta\left(2\left(\delta s_W\right)M_W^2+s_W\delta M_W^2\right)+ \\ s_W M_W^2\left(2\left(\delta c_\beta\right)+s_\beta\left(\delta Z_{AG}\right)-c_\beta\left(2\left(\delta Z_e\right)+\delta Z_{GG}+\delta\overline{Z}^{e,L}_{g2,g2}+\delta Z^{e,R}_{g1,g1}\right)\right) \end{array}\right)m_{e_{g1}} \end{array}\right]$$

$$\underset{188}{C}\left(\nu_{g1},\bar{e}_{g2},H^-\right) = \frac{ie(\boxed{1})\delta_{g1,g2}}{2\sqrt{2}c_\beta^2 M_W^3 s_W^2}\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$\boxed{1} = m_{e_{g2}}\left(s_{2\beta}M_W^2\left(s_W\left(\delta Z_e\right)-\delta s_W\right)-s_W\left(\begin{array}{l} s_\beta\left(c_\beta\delta M_W^2+2\left(\delta c_\beta\right)M_W^2\right)+ \\ c_\beta\left(\left(\delta Z_{G^-H^-}\right)c_\beta-s_\beta\left(\delta Z_{H^-H^-}+\delta\overline{Z}^{e,R}_{g2,g2}+\delta Z^{\nu,L}_{g1,g1}\right)\right)M_W^2 \end{array}\right)\right)+s_{2\beta}s_W M_W^2\delta m^{e_g}_{g2}$$

$$\underset{189}{C}\left(\nu_{g1},\bar{e}_{g2},G^-\right) = -\frac{ie\delta_{g1,g2}}{2\sqrt{2}c_\beta M_W^3 s_W^2}\left(\begin{array}{l} 2c_\beta s_W M_W^2\delta m^{e_g}_{g2} - \\ \left(\begin{array}{l} c_\beta\left(2\left(\delta s_W\right)M_W^2+s_W\delta M_W^2\right)+ \\ \left(\begin{array}{l} 2\left(\delta c_\beta\right)+s_\beta\left(\delta Z_{H^-G^-}\right)- \\ c_\beta\left(2\left(\delta Z_e\right)+\delta Z_{G^-G^-}+\delta\overline{Z}^{e,R}_{g2,g2}+\delta Z^{\nu,L}_{g1,g1}\right) \end{array}\right)s_W M_W^2 \end{array}\right)m_{e_{g2}} \end{array}\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$\underset{190}{C}\left(e_{g1},\overline{\nu}_{g2},H^+\right) = \frac{ie(\boxed{1})\delta_{g1,g2}}{4\sqrt{2}c_\beta^2 M_W^3 s_W^2}\left[\begin{array}{c} 0 \\ \hline 1 \end{array}\right]$$

$$1 = m_{e_{g1}} \left(s_{2\beta} \left(2M_W^2 \left(s_W \left(\delta Z_e \right) - \delta s_W \right) - s_W \delta M_W^2 \right) - s_W M_W^2 \left(\begin{array}{l} 4 \left(\delta c_\beta \right) s_\beta + 2 \left(\delta Z_{H^- G^-} \right) c_\beta^2 - \\ s_{2\beta} \left(\delta \overline{Z}_{H^- H^-} + \delta \overline{Z}_{g2,g2}^{\nu,L} + \delta Z_{g1,g1}^{e,R} \right) \end{array} \right) \right) + 2 s_{2\beta} s_W M_W^2 \delta m_{g1}^{e_g}$$

$$\underset{191}{C} \left(e_{g1}, \overline{\nu}_{g2}, G^+ \right) = - \frac{i e \delta_{g1,g2}}{2\sqrt{2} c_\beta M_W^3 s_W^2} \left(\begin{array}{l} 2 c_\beta s_W M_W^2 \delta m_{g1}^{e_g} - \\ \left(\begin{array}{l} c_\beta \left(2 \left(\delta s_W \right) M_W^2 + s_W \delta M_W^2 \right) + \\ \left(\begin{array}{l} 2 \left(\delta c_\beta \right) + s_\beta \left(\delta Z_{G^- H^-} \right) - \\ c_\beta \left(2 \left(\delta Z_e \right) + \delta Z_{G^- G^-} + \delta \overline{Z}_{g2,g2}^{\nu,L} + \delta Z_{g1,g1}^{e,R} \right) \end{array} \right) s_W M_W^2 \end{array} \right) m_{e_{g1}} \end{array} \right) \left[\begin{array}{c} 0 \\ \hline 1 \end{array} \right]$$

$$\underset{203}{C} \left(e_{g1}, \overline{e}_{g2}, H^0 \right) = - \frac{i e \delta_{g1,g2}}{4 c_\beta^2 M_W^3 s_W^2} \left[\begin{array}{c} 1 \\ \hline 2 \end{array} \right]$$

$$2 = 2 c_\alpha c_\beta s_W M_W^2 \delta m_{g1}^{e_g} - m_{e_{g1}} \left(2 c_\alpha s_W M_W^2 \left(\delta c_\beta \right) - c_\beta \left(\begin{array}{l} c_\alpha \left(2 \left(\left(\delta Z_e \right) s_W - \delta s_W \right) M_W^2 - s_W \delta M_W^2 \right) - \\ s_W \left(\left(\delta Z_{hH} \right) s_\alpha - c_\alpha \left(\delta Z_{HH} + \delta \overline{Z}_{g2,g2}^{e,L} + \delta Z_{g1,g1}^{e,R} \right) \right) M_W^2 \end{array} \right) \right)$$

$$1 = 2 c_\alpha c_\beta s_W M_W^2 \delta m_{g1}^{e_g} - m_{e_{g1}} \left(2 c_\alpha s_W M_W^2 \left(\delta c_\beta \right) - c_\beta \left(\begin{array}{l} c_\alpha \left(2 \left(\left(\delta Z_e \right) s_W - \delta s_W \right) M_W^2 - s_W \delta M_W^2 \right) - \\ s_W \left(\left(\delta Z_{hH} \right) s_\alpha - c_\alpha \left(\delta Z_{HH} + \delta \overline{Z}_{g2,g2}^{e,R} + \delta Z_{g1,g1}^{e,L} \right) \right) M_W^2 \end{array} \right) \right)$$

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$$\underset{247}{C} \left(\tilde{\chi}_{n1}^0, \tilde{\chi}_{n2}^0, h^0 \right) = - \frac{i e}{4 s_W^2} \left[\begin{array}{c} \frac{(2) s_W}{c_W} + \frac{2(1)}{c_W^3} \\ \hline \frac{1}{c_W^3} \left(2(3) + (4) s_W c_W^2 \right) \end{array} \right]$$

$$
\begin{aligned}
4 = {} & \left(\left(s_\alpha Z_{1,3} + c_\alpha Z_{1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W Z_{1,1} - c_W Z_{1,2}\right)\left(s_\alpha Z_{n2,3} + c_\alpha Z_{n2,4}\right)\right)\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,1} + \\
& \left(\left(s_\alpha Z_{2,3} + c_\alpha Z_{2,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W Z_{2,1} - c_W Z_{2,2}\right)\left(s_\alpha Z_{n2,3} + c_\alpha Z_{n2,4}\right)\right)\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,2} + \\
& \left(\left(s_\alpha Z_{3,3} + c_\alpha Z_{3,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W Z_{3,1} - c_W Z_{3,2}\right)\left(s_\alpha Z_{n2,3} + c_\alpha Z_{n2,4}\right)\right)\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,3} + \\
& \left(\left(s_\alpha Z_{4,3} + c_\alpha Z_{4,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W Z_{4,1} - c_W Z_{4,2}\right)\left(s_\alpha Z_{n2,3} + c_\alpha Z_{n2,4}\right)\right)\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,4} + \\
& \left(\left(\left(\delta Z_{hh}\right)s_\alpha - \left(\delta Z_{hH}\right)c_\alpha\right)Z_{n1,3} + \left(\left(\delta Z_{hh}\right)c_\alpha + \left(\delta Z_{hH}\right)s_\alpha\right)Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \\
& \left(s_W Z_{n1,1} - c_W Z_{n1,2}\right)\left(\left(\left(\delta Z_{hh}\right)s_\alpha - \left(\delta Z_{hH}\right)c_\alpha\right)Z_{n2,3} + \left(\left(\delta Z_{hh}\right)c_\alpha + \left(\delta Z_{hH}\right)s_\alpha\right)Z_{n2,4}\right) + \\
& \left(\left(s_\alpha Z_{1,3} + c_\alpha Z_{1,4}\right)\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) + \left(s_W Z_{1,1} - c_W Z_{1,2}\right)\left(s_\alpha Z_{n1,3} + c_\alpha Z_{n1,4}\right)\right)\delta Z^{\tilde{\chi}^0,R}_{1,n2} + \\
& \left(\left(s_\alpha Z_{2,3} + c_\alpha Z_{2,4}\right)\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) + \left(s_W Z_{2,1} - c_W Z_{2,2}\right)\left(s_\alpha Z_{n1,3} + c_\alpha Z_{n1,4}\right)\right)\delta Z^{\tilde{\chi}^0,R}_{2,n2} + \\
& \left(\left(s_\alpha Z_{3,3} + c_\alpha Z_{3,4}\right)\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) + \left(s_W Z_{3,1} - c_W Z_{3,2}\right)\left(s_\alpha Z_{n1,3} + c_\alpha Z_{n1,4}\right)\right)\delta Z^{\tilde{\chi}^0,R}_{3,n2} + \\
& \left(\left(s_\alpha Z_{4,3} + c_\alpha Z_{4,4}\right)\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) + \left(s_W Z_{4,1} - c_W Z_{4,2}\right)\left(s_\alpha Z_{n1,3} + c_\alpha Z_{n1,4}\right)\right)\delta Z^{\tilde{\chi}^0,R}_{4,n2}
\end{aligned}
$$

$$
\begin{aligned}
3 = {} & -\left(s_\alpha Z_{n2,3} + c_\alpha Z_{n2,4}\right)\left(\left(\left(\delta Z_e\right)s_W - \delta s_W\right)Z_{n1,2}c_W^3 - Z_{n1,1}\left(\left(\delta s_W\right)s_W + \left(\delta Z_e\right)c_W^2\right)s_W^2\right) - \\
& \left(s_\alpha Z_{n1,3} + c_\alpha Z_{n1,4}\right)\left(\left(\left(\delta Z_e\right)s_W - \delta s_W\right)Z_{n2,2}c_W^3 - Z_{n2,1}\left(\left(\delta s_W\right)s_W + \left(\delta Z_e\right)c_W^2\right)s_W^2\right)
\end{aligned}
$$

$$
\begin{aligned}
2 = {} & \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,1}\left(\left(s_\alpha Z^*_{1,3} + c_\alpha Z^*_{1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \left(s_W Z^*_{1,1} - c_W Z^*_{1,2}\right)\left(s_\alpha Z^*_{n2,3} + c_\alpha Z^*_{n2,4}\right)\right) + \\
& \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,2}\left(\left(s_\alpha Z^*_{2,3} + c_\alpha Z^*_{2,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \left(s_W Z^*_{2,1} - c_W Z^*_{2,2}\right)\left(s_\alpha Z^*_{n2,3} + c_\alpha Z^*_{n2,4}\right)\right) + \\
& \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,3}\left(\left(s_\alpha Z^*_{3,3} + c_\alpha Z^*_{3,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \left(s_W Z^*_{3,1} - c_W Z^*_{3,2}\right)\left(s_\alpha Z^*_{n2,3} + c_\alpha Z^*_{n2,4}\right)\right) + \\
& \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,4}\left(\left(s_\alpha Z^*_{4,3} + c_\alpha Z^*_{4,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \left(s_W Z^*_{4,1} - c_W Z^*_{4,2}\right)\left(s_\alpha Z^*_{n2,3} + c_\alpha Z^*_{n2,4}\right)\right) + \\
& \left(\delta Z_{hh}\right)\left(\left(s_\alpha Z^*_{n1,3} + c_\alpha Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right)\left(s_\alpha Z^*_{n2,3} + c_\alpha Z^*_{n2,4}\right)\right) - \\
& \left(\delta Z_{hH}\right)\left(\left(c_\alpha Z^*_{n1,3} - s_\alpha Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right)\left(c_\alpha Z^*_{n2,3} - s_\alpha Z^*_{n2,4}\right)\right) + \\
& \delta Z^{\tilde{\chi}^0,L}_{1,n2}\left(\left(s_\alpha Z^*_{1,3} + c_\alpha Z^*_{1,4}\right)\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) + \left(s_W Z^*_{1,1} - c_W Z^*_{1,2}\right)\left(s_\alpha Z^*_{n1,3} + c_\alpha Z^*_{n1,4}\right)\right) + \\
& \delta Z^{\tilde{\chi}^0,L}_{2,n2}\left(\left(s_\alpha Z^*_{2,3} + c_\alpha Z^*_{2,4}\right)\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) + \left(s_W Z^*_{2,1} - c_W Z^*_{2,2}\right)\left(s_\alpha Z^*_{n1,3} + c_\alpha Z^*_{n1,4}\right)\right) + \\
& \delta Z^{\tilde{\chi}^0,L}_{3,n2}\left(\left(s_\alpha Z^*_{3,3} + c_\alpha Z^*_{3,4}\right)\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) + \left(s_W Z^*_{3,1} - c_W Z^*_{3,2}\right)\left(s_\alpha Z^*_{n1,3} + c_\alpha Z^*_{n1,4}\right)\right) + \\
& \delta Z^{\tilde{\chi}^0,L}_{4,n2}\left(\left(s_\alpha Z^*_{4,3} + c_\alpha Z^*_{4,4}\right)\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) + \left(s_W Z^*_{4,1} - c_W Z^*_{4,2}\right)\left(s_\alpha Z^*_{n1,3} + c_\alpha Z^*_{n1,4}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = {} & \left(\left(\left(\delta s_W\right)s_W + \left(\delta Z_e\right)c_W^2\right)s_W^2 Z^*_{n1,1} - \left(\left(\delta Z_e\right)s_W - \delta s_W\right)c_W^3 Z^*_{n1,2}\right)\left(s_\alpha Z^*_{n2,3} + c_\alpha Z^*_{n2,4}\right) + \\
& \left(s_\alpha Z^*_{n1,3} + c_\alpha Z^*_{n1,4}\right)\left(\left(\left(\delta s_W\right)s_W + \left(\delta Z_e\right)c_W^2\right)s_W^2 Z^*_{n2,1} - \left(\left(\delta Z_e\right)s_W - \delta s_W\right)c_W^3 Z^*_{n2,2}\right)
\end{aligned}
$$

$$\underset{248}{C}\left(\tilde{\chi}^0_{n1},\tilde{\chi}^0_{n2},H^0\right)=\frac{ie}{4s_W^2}\left[\frac{\frac{(2)s_W}{c_W}+\frac{2(1)}{c_W^3}}{\frac{1}{c_W^3}\left(2(3)+(4)s_Wc_W^2\right)}\right]$$

$$\begin{aligned}
4 = {} & ((c_\alpha Z_{1,3}-s_\alpha Z_{1,4})(s_W Z_{n2,1}-c_W Z_{n2,2})+(s_W Z_{1,1}-c_W Z_{1,2})(c_\alpha Z_{n2,3}-s_\alpha Z_{n2,4}))\,\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,1}+\\
& ((c_\alpha Z_{2,3}-s_\alpha Z_{2,4})(s_W Z_{n2,1}-c_W Z_{n2,2})+(s_W Z_{2,1}-c_W Z_{2,2})(c_\alpha Z_{n2,3}-s_\alpha Z_{n2,4}))\,\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,2}+\\
& ((c_\alpha Z_{3,3}-s_\alpha Z_{3,4})(s_W Z_{n2,1}-c_W Z_{n2,2})+(s_W Z_{3,1}-c_W Z_{3,2})(c_\alpha Z_{n2,3}-s_\alpha Z_{n2,4}))\,\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,3}+\\
& ((c_\alpha Z_{4,3}-s_\alpha Z_{4,4})(s_W Z_{n2,1}-c_W Z_{n2,2})+(s_W Z_{4,1}-c_W Z_{4,2})(c_\alpha Z_{n2,3}-s_\alpha Z_{n2,4}))\,\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,4}-\\
& (\delta Z_{hH})((s_\alpha Z_{n1,3}+c_\alpha Z_{n1,4})(s_W Z_{n2,1}-c_W Z_{n2,2})+(s_W Z_{n1,1}-c_W Z_{n1,2})(s_\alpha Z_{n2,3}+c_\alpha Z_{n2,4}))+\\
& (\delta Z_{HH})((c_\alpha Z_{n1,3}-s_\alpha Z_{n1,4})(s_W Z_{n2,1}-c_W Z_{n2,2})+(s_W Z_{n1,1}-c_W Z_{n1,2})(c_\alpha Z_{n2,3}-s_\alpha Z_{n2,4}))+\\
& ((c_\alpha Z_{1,3}-s_\alpha Z_{1,4})(s_W Z_{n1,1}-c_W Z_{n1,2})+(s_W Z_{1,1}-c_W Z_{1,2})(c_\alpha Z_{n1,3}-s_\alpha Z_{n1,4}))\,\delta Z^{\tilde{\chi}^0,R}_{1,n2}+\\
& ((c_\alpha Z_{2,3}-s_\alpha Z_{2,4})(s_W Z_{n1,1}-c_W Z_{n1,2})+(s_W Z_{2,1}-c_W Z_{2,2})(c_\alpha Z_{n1,3}-s_\alpha Z_{n1,4}))\,\delta Z^{\tilde{\chi}^0,R}_{2,n2}+\\
& ((c_\alpha Z_{3,3}-s_\alpha Z_{3,4})(s_W Z_{n1,1}-c_W Z_{n1,2})+(s_W Z_{3,1}-c_W Z_{3,2})(c_\alpha Z_{n1,3}-s_\alpha Z_{n1,4}))\,\delta Z^{\tilde{\chi}^0,R}_{3,n2}+\\
& ((c_\alpha Z_{4,3}-s_\alpha Z_{4,4})(s_W Z_{n1,1}-c_W Z_{n1,2})+(s_W Z_{4,1}-c_W Z_{4,2})(c_\alpha Z_{n1,3}-s_\alpha Z_{n1,4}))\,\delta Z^{\tilde{\chi}^0,R}_{4,n2}
\end{aligned}$$

$$\begin{aligned}
3 = {} & -(c_\alpha Z_{n2,3}-s_\alpha Z_{n2,4})\left(((\delta Z_e)s_W-\delta s_W)Z_{n1,2}c_W^3-Z_{n1,1}\left((\delta s_W)s_W+(\delta Z_e)c_W^2\right)s_W^2\right)-\\
& (c_\alpha Z_{n1,3}-s_\alpha Z_{n1,4})\left(((\delta Z_e)s_W-\delta s_W)Z_{n2,2}c_W^3-Z_{n2,1}\left((\delta s_W)s_W+(\delta Z_e)c_W^2\right)s_W^2\right)
\end{aligned}$$

$$\begin{aligned}
2 = {} & \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,1}((c_\alpha Z^*_{1,3}-s_\alpha Z^*_{1,4})(s_W Z^*_{n2,1}-c_W Z^*_{n2,2})+(s_W Z^*_{1,1}-c_W Z^*_{1,2})(c_\alpha Z^*_{n2,3}-s_\alpha Z^*_{n2,4}))+\\
& \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,2}((c_\alpha Z^*_{2,3}-s_\alpha Z^*_{2,4})(s_W Z^*_{n2,1}-c_W Z^*_{n2,2})+(s_W Z^*_{2,1}-c_W Z^*_{2,2})(c_\alpha Z^*_{n2,3}-s_\alpha Z^*_{n2,4}))+\\
& \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,3}((c_\alpha Z^*_{3,3}-s_\alpha Z^*_{3,4})(s_W Z^*_{n2,1}-c_W Z^*_{n2,2})+(s_W Z^*_{3,1}-c_W Z^*_{3,2})(c_\alpha Z^*_{n2,3}-s_\alpha Z^*_{n2,4}))+\\
& \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,4}((c_\alpha Z^*_{4,3}-s_\alpha Z^*_{4,4})(s_W Z^*_{n2,1}-c_W Z^*_{n2,2})+(s_W Z^*_{4,1}-c_W Z^*_{4,2})(c_\alpha Z^*_{n2,3}-s_\alpha Z^*_{n2,4}))-\\
& (\delta Z_{hH})((s_\alpha Z^*_{n1,3}+c_\alpha Z^*_{n1,4})(s_W Z^*_{n2,1}-c_W Z^*_{n2,2})+(s_W Z^*_{n1,1}-c_W Z^*_{n1,2})(s_\alpha Z^*_{n2,3}+c_\alpha Z^*_{n2,4}))+\\
& (\delta Z_{HH})((c_\alpha Z^*_{n1,3}-s_\alpha Z^*_{n1,4})(s_W Z^*_{n2,1}-c_W Z^*_{n2,2})+(s_W Z^*_{n1,1}-c_W Z^*_{n1,2})(c_\alpha Z^*_{n2,3}-s_\alpha Z^*_{n2,4}))+\\
& \delta Z^{\tilde{\chi}^0,L}_{1,n2}((c_\alpha Z^*_{1,3}-s_\alpha Z^*_{1,4})(s_W Z^*_{n1,1}-c_W Z^*_{n1,2})+(s_W Z^*_{1,1}-c_W Z^*_{1,2})(c_\alpha Z^*_{n1,3}-s_\alpha Z^*_{n1,4}))+\\
& \delta Z^{\tilde{\chi}^0,L}_{2,n2}((c_\alpha Z^*_{2,3}-s_\alpha Z^*_{2,4})(s_W Z^*_{n1,1}-c_W Z^*_{n1,2})+(s_W Z^*_{2,1}-c_W Z^*_{2,2})(c_\alpha Z^*_{n1,3}-s_\alpha Z^*_{n1,4}))+\\
& \delta Z^{\tilde{\chi}^0,L}_{3,n2}((c_\alpha Z^*_{3,3}-s_\alpha Z^*_{3,4})(s_W Z^*_{n1,1}-c_W Z^*_{n1,2})+(s_W Z^*_{3,1}-c_W Z^*_{3,2})(c_\alpha Z^*_{n1,3}-s_\alpha Z^*_{n1,4}))+\\
& \delta Z^{\tilde{\chi}^0,L}_{4,n2}((c_\alpha Z^*_{4,3}-s_\alpha Z^*_{4,4})(s_W Z^*_{n1,1}-c_W Z^*_{n1,2})+(s_W Z^*_{4,1}-c_W Z^*_{4,2})(c_\alpha Z^*_{n1,3}-s_\alpha Z^*_{n1,4}))
\end{aligned}$$

$$1 = \left(\left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2\right) s_W^2 Z^*_{n1,1} - \left((\delta Z_e)\, s_W - \delta s_W\right) c_W^3 Z^*_{n1,2}\right)\left(c_\alpha Z^*_{n2,3} - s_\alpha Z^*_{n2,4}\right) + \left(c_\alpha Z^*_{n1,3} - s_\alpha Z^*_{n1,4}\right)\left(\left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2\right) s_W^2 Z^*_{n2,1} - \left((\delta Z_e)\, s_W - \delta s_W\right) c_W^3 Z^*_{n2,2}\right)$$

$$\underset{249}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^0_{n2}, A^0\right) = \frac{e}{4 c_W^3 s_W^2}\left[\frac{2}{4}\right]$$

$$4 = \left(2 s_\beta Z_{n2,3} - 2 c_\beta Z_{n2,4}\right)\left(\left((\delta Z_e)\, s_W - \delta s_W\right) Z_{n1,2} c_W^3 - Z_{n1,1}\left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2\right) s_W^2\right) - (3) s_W c_W^2 + 2\left(s_\beta Z_{n1,3} - c_\beta Z_{n1,4}\right)\left(\left((\delta Z_e)\, s_W - \delta s_W\right) Z_{n2,2} c_W^3 - Z_{n2,1}\left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2\right) s_W^2\right)$$

$$\begin{aligned}
3 = {} & \left(\left(s_\beta Z_{1,3} - c_\beta Z_{1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W Z_{1,1} - c_W Z_{1,2}\right)\left(s_\beta Z_{n2,3} - c_\beta Z_{n2,4}\right)\right) \delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,1} + \\
& \left(\left(s_\beta Z_{2,3} - c_\beta Z_{2,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W Z_{2,1} - c_W Z_{2,2}\right)\left(s_\beta Z_{n2,3} - c_\beta Z_{n2,4}\right)\right) \delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,2} + \\
& \left(\left(s_\beta Z_{3,3} - c_\beta Z_{3,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W Z_{3,1} - c_W Z_{3,2}\right)\left(s_\beta Z_{n2,3} - c_\beta Z_{n2,4}\right)\right) \delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,3} + \\
& \left(\left(s_\beta Z_{4,3} - c_\beta Z_{4,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W Z_{4,1} - c_W Z_{4,2}\right)\left(s_\beta Z_{n2,3} - c_\beta Z_{n2,4}\right)\right) \delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,4} + \\
& \left(\left((\delta Z_{AA})\, s_\beta - (\delta Z_{AG})\, c_\beta\right) Z_{n1,3} - \left((\delta Z_{AA})\, c_\beta + (\delta Z_{AG})\, s_\beta\right) Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \\
& \left(s_W Z_{n1,1} - c_W Z_{n1,2}\right)\left(\left((\delta Z_{AA})\, s_\beta - (\delta Z_{AG})\, c_\beta\right) Z_{n2,3} - \left((\delta Z_{AA})\, c_\beta + (\delta Z_{AG})\, s_\beta\right) Z_{n2,4}\right) + \\
& \left(\left(s_\beta Z_{1,3} - c_\beta Z_{1,4}\right)\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) + \left(s_W Z_{1,1} - c_W Z_{1,2}\right)\left(s_\beta Z_{n1,3} - c_\beta Z_{n1,4}\right)\right) \delta Z^{\tilde{\chi}^0,R}_{1,n2} + \\
& \left(\left(s_\beta Z_{2,3} - c_\beta Z_{2,4}\right)\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) + \left(s_W Z_{2,1} - c_W Z_{2,2}\right)\left(s_\beta Z_{n1,3} - c_\beta Z_{n1,4}\right)\right) \delta Z^{\tilde{\chi}^0,R}_{2,n2} + \\
& \left(\left(s_\beta Z_{3,3} - c_\beta Z_{3,4}\right)\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) + \left(s_W Z_{3,1} - c_W Z_{3,2}\right)\left(s_\beta Z_{n1,3} - c_\beta Z_{n1,4}\right)\right) \delta Z^{\tilde{\chi}^0,R}_{3,n2} + \\
& \left(\left(s_\beta Z_{4,3} - c_\beta Z_{4,4}\right)\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) + \left(s_W Z_{4,1} - c_W Z_{4,2}\right)\left(s_\beta Z_{n1,3} - c_\beta Z_{n1,4}\right)\right) \delta Z^{\tilde{\chi}^0,R}_{4,n2}
\end{aligned}$$

$$2 = (1) s_W c_W^2 + \left(\left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2\right) s_W^2 Z^*_{n1,1} - \left((\delta Z_e)\, s_W - \delta s_W\right) c_W^3 Z^*_{n1,2}\right)\left(2 s_\beta Z^*_{n2,3} - 2 c_\beta Z^*_{n2,4}\right) + 2\left(s_\beta Z^*_{n1,3} - c_\beta Z^*_{n1,4}\right)\left(\left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2\right) s_W^2 Z^*_{n2,1} - \left((\delta Z_e)\, s_W - \delta s_W\right) c_W^3 Z^*_{n2,2}\right)$$

$$
\begin{aligned}
\boxed{1} = \;& \delta\overline{Z}^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{n1},1}\left(\left(s_\beta Z^*_{1,3}-c_\beta Z^*_{1,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2},1}-c_\mathrm{W} Z^*_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z^*_{1,1}-c_\mathrm{W} Z^*_{1,2}\right)\left(s_\beta Z^*_{\mathrm{n2},3}-c_\beta Z^*_{\mathrm{n2},4}\right)\right)+\\
& \delta\overline{Z}^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{n1},2}\left(\left(s_\beta Z^*_{2,3}-c_\beta Z^*_{2,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2},1}-c_\mathrm{W} Z^*_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z^*_{2,1}-c_\mathrm{W} Z^*_{2,2}\right)\left(s_\beta Z^*_{\mathrm{n2},3}-c_\beta Z^*_{\mathrm{n2},4}\right)\right)+\\
& \delta\overline{Z}^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{n1},3}\left(\left(s_\beta Z^*_{3,3}-c_\beta Z^*_{3,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2},1}-c_\mathrm{W} Z^*_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z^*_{3,1}-c_\mathrm{W} Z^*_{3,2}\right)\left(s_\beta Z^*_{\mathrm{n2},3}-c_\beta Z^*_{\mathrm{n2},4}\right)\right)+\\
& \delta\overline{Z}^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{n1},4}\left(\left(s_\beta Z^*_{4,3}-c_\beta Z^*_{4,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2},1}-c_\mathrm{W} Z^*_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z^*_{4,1}-c_\mathrm{W} Z^*_{4,2}\right)\left(s_\beta Z^*_{\mathrm{n2},3}-c_\beta Z^*_{\mathrm{n2},4}\right)\right)+\\
& \left(\delta Z_{\mathrm{AA}}\right)\left(\left(s_\beta Z^*_{\mathrm{n1},3}-c_\beta Z^*_{\mathrm{n1},4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2},1}-c_\mathrm{W} Z^*_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z^*_{\mathrm{n1},1}-c_\mathrm{W} Z^*_{\mathrm{n1},2}\right)\left(s_\beta Z^*_{\mathrm{n2},3}-c_\beta Z^*_{\mathrm{n2},4}\right)\right)-\\
& \left(\delta Z_{\mathrm{AG}}\right)\left(\left(c_\beta Z^*_{\mathrm{n1},3}+s_\beta Z^*_{\mathrm{n1},4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2},1}-c_\mathrm{W} Z^*_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z^*_{\mathrm{n1},1}-c_\mathrm{W} Z^*_{\mathrm{n1},2}\right)\left(c_\beta Z^*_{\mathrm{n2},3}+s_\beta Z^*_{\mathrm{n2},4}\right)\right)+\\
& \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{1,\mathrm{n2}}\left(\left(s_\beta Z^*_{1,3}-c_\beta Z^*_{1,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n1},1}-c_\mathrm{W} Z^*_{\mathrm{n1},2}\right)+\left(s_\mathrm{W} Z^*_{1,1}-c_\mathrm{W} Z^*_{1,2}\right)\left(s_\beta Z^*_{\mathrm{n1},3}-c_\beta Z^*_{\mathrm{n1},4}\right)\right)+\\
& \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{2,\mathrm{n2}}\left(\left(s_\beta Z^*_{2,3}-c_\beta Z^*_{2,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n1},1}-c_\mathrm{W} Z^*_{\mathrm{n1},2}\right)+\left(s_\mathrm{W} Z^*_{2,1}-c_\mathrm{W} Z^*_{2,2}\right)\left(s_\beta Z^*_{\mathrm{n1},3}-c_\beta Z^*_{\mathrm{n1},4}\right)\right)+\\
& \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{3,\mathrm{n2}}\left(\left(s_\beta Z^*_{3,3}-c_\beta Z^*_{3,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n1},1}-c_\mathrm{W} Z^*_{\mathrm{n1},2}\right)+\left(s_\mathrm{W} Z^*_{3,1}-c_\mathrm{W} Z^*_{3,2}\right)\left(s_\beta Z^*_{\mathrm{n1},3}-c_\beta Z^*_{\mathrm{n1},4}\right)\right)+\\
& \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{4,\mathrm{n2}}\left(\left(s_\beta Z^*_{4,3}-c_\beta Z^*_{4,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n1},1}-c_\mathrm{W} Z^*_{\mathrm{n1},2}\right)+\left(s_\mathrm{W} Z^*_{4,1}-c_\mathrm{W} Z^*_{4,2}\right)\left(s_\beta Z^*_{\mathrm{n1},3}-c_\beta Z^*_{\mathrm{n1},4}\right)\right)
\end{aligned}
$$

$$
\underset{250}{C}\left(\tilde{\chi}^0_{\mathrm{n1}},\tilde{\chi}^0_{\mathrm{n2}},G^0\right) = \frac{e}{4c^3_\mathrm{W}s^2_\mathrm{W}}\left[\frac{-2(\boxed{1})-(\boxed{2})s_\mathrm{W}c^2_\mathrm{W}}{2(\boxed{3})+(\boxed{4})s_\mathrm{W}c^2_\mathrm{W}}\right]
$$

$$
\begin{aligned}
\boxed{4} = \;& \left(\left(c_\beta Z_{1,3}+s_\beta Z_{1,4}\right)\left(s_\mathrm{W} Z_{\mathrm{n2},1}-c_\mathrm{W} Z_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z_{1,1}-c_\mathrm{W} Z_{1,2}\right)\left(c_\beta Z_{\mathrm{n2},3}+s_\beta Z_{\mathrm{n2},4}\right)\right)\delta\overline{Z}^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{n1},1}+\\
& \left(\left(c_\beta Z_{2,3}+s_\beta Z_{2,4}\right)\left(s_\mathrm{W} Z_{\mathrm{n2},1}-c_\mathrm{W} Z_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z_{2,1}-c_\mathrm{W} Z_{2,2}\right)\left(c_\beta Z_{\mathrm{n2},3}+s_\beta Z_{\mathrm{n2},4}\right)\right)\delta\overline{Z}^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{n1},2}+\\
& \left(\left(c_\beta Z_{3,3}+s_\beta Z_{3,4}\right)\left(s_\mathrm{W} Z_{\mathrm{n2},1}-c_\mathrm{W} Z_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z_{3,1}-c_\mathrm{W} Z_{3,2}\right)\left(c_\beta Z_{\mathrm{n2},3}+s_\beta Z_{\mathrm{n2},4}\right)\right)\delta\overline{Z}^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{n1},3}+\\
& \left(\left(c_\beta Z_{4,3}+s_\beta Z_{4,4}\right)\left(s_\mathrm{W} Z_{\mathrm{n2},1}-c_\mathrm{W} Z_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z_{4,1}-c_\mathrm{W} Z_{4,2}\right)\left(c_\beta Z_{\mathrm{n2},3}+s_\beta Z_{\mathrm{n2},4}\right)\right)\delta\overline{Z}^{\tilde{\chi}^0,\mathrm{L}}_{\mathrm{n1},4}-\\
& \left(\delta Z_{\mathrm{AG}}\right)\left(\left(s_\beta Z_{\mathrm{n1},3}-c_\beta Z_{\mathrm{n1},4}\right)\left(s_\mathrm{W} Z_{\mathrm{n2},1}-c_\mathrm{W} Z_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z_{\mathrm{n1},1}-c_\mathrm{W} Z_{\mathrm{n1},2}\right)\left(s_\beta Z_{\mathrm{n2},3}-c_\beta Z_{\mathrm{n2},4}\right)\right)+\\
& \left(\delta Z_{\mathrm{GG}}\right)\left(\left(c_\beta Z_{\mathrm{n1},3}+s_\beta Z_{\mathrm{n1},4}\right)\left(s_\mathrm{W} Z_{\mathrm{n2},1}-c_\mathrm{W} Z_{\mathrm{n2},2}\right)+\left(s_\mathrm{W} Z_{\mathrm{n1},1}-c_\mathrm{W} Z_{\mathrm{n1},2}\right)\left(c_\beta Z_{\mathrm{n2},3}+s_\beta Z_{\mathrm{n2},4}\right)\right)+\\
& \left(\left(c_\beta Z_{1,3}+s_\beta Z_{1,4}\right)\left(s_\mathrm{W} Z_{\mathrm{n1},1}-c_\mathrm{W} Z_{\mathrm{n1},2}\right)+\left(s_\mathrm{W} Z_{1,1}-c_\mathrm{W} Z_{1,2}\right)\left(c_\beta Z_{\mathrm{n1},3}+s_\beta Z_{\mathrm{n1},4}\right)\right)\delta Z^{\tilde{\chi}^0,\mathrm{R}}_{1,\mathrm{n2}}+\\
& \left(\left(c_\beta Z_{2,3}+s_\beta Z_{2,4}\right)\left(s_\mathrm{W} Z_{\mathrm{n1},1}-c_\mathrm{W} Z_{\mathrm{n1},2}\right)+\left(s_\mathrm{W} Z_{2,1}-c_\mathrm{W} Z_{2,2}\right)\left(c_\beta Z_{\mathrm{n1},3}+s_\beta Z_{\mathrm{n1},4}\right)\right)\delta Z^{\tilde{\chi}^0,\mathrm{R}}_{2,\mathrm{n2}}+\\
& \left(\left(c_\beta Z_{3,3}+s_\beta Z_{3,4}\right)\left(s_\mathrm{W} Z_{\mathrm{n1},1}-c_\mathrm{W} Z_{\mathrm{n1},2}\right)+\left(s_\mathrm{W} Z_{3,1}-c_\mathrm{W} Z_{3,2}\right)\left(c_\beta Z_{\mathrm{n1},3}+s_\beta Z_{\mathrm{n1},4}\right)\right)\delta Z^{\tilde{\chi}^0,\mathrm{R}}_{3,\mathrm{n2}}+\\
& \left(\left(c_\beta Z_{4,3}+s_\beta Z_{4,4}\right)\left(s_\mathrm{W} Z_{\mathrm{n1},1}-c_\mathrm{W} Z_{\mathrm{n1},2}\right)+\left(s_\mathrm{W} Z_{4,1}-c_\mathrm{W} Z_{4,2}\right)\left(c_\beta Z_{\mathrm{n1},3}+s_\beta Z_{\mathrm{n1},4}\right)\right)\delta Z^{\tilde{\chi}^0,\mathrm{R}}_{4,\mathrm{n2}}
\end{aligned}
$$

$$
\begin{aligned}
\boxed{3} = \;& -\left(c_\beta Z_{\mathrm{n2},3}+s_\beta Z_{\mathrm{n2},4}\right)\left(\left(\left(\delta Z_\mathrm{e}\right)s_\mathrm{W}-\delta s_\mathrm{W}\right)Z_{\mathrm{n1},2}c^3_\mathrm{W}-Z_{\mathrm{n1},1}\left(\left(\delta s_\mathrm{W}\right)s_\mathrm{W}+\left(\delta Z_\mathrm{e}\right)c^2_\mathrm{W}\right)s^2_\mathrm{W}\right)-\\
& \left(c_\beta Z_{\mathrm{n1},3}+s_\beta Z_{\mathrm{n1},4}\right)\left(\left(\left(\delta Z_\mathrm{e}\right)s_\mathrm{W}-\delta s_\mathrm{W}\right)Z_{\mathrm{n2},2}c^3_\mathrm{W}-Z_{\mathrm{n2},1}\left(\left(\delta s_\mathrm{W}\right)s_\mathrm{W}+\left(\delta Z_\mathrm{e}\right)c^2_\mathrm{W}\right)s^2_\mathrm{W}\right)
\end{aligned}
$$

$$
\begin{aligned}
2 = {} & \delta\overline{Z}^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{n1,1}} \left(\left(c_\beta Z^*_{1,3} + s_\beta Z^*_{1,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2,1}} - c_\mathrm{W} Z^*_{\mathrm{n2,2}}\right) + \left(s_\mathrm{W} Z^*_{1,1} - c_\mathrm{W} Z^*_{1,2}\right)\left(c_\beta Z^*_{\mathrm{n2,3}} + s_\beta Z^*_{\mathrm{n2,4}}\right)\right) + \\
& \delta\overline{Z}^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{n1,2}} \left(\left(c_\beta Z^*_{2,3} + s_\beta Z^*_{2,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2,1}} - c_\mathrm{W} Z^*_{\mathrm{n2,2}}\right) + \left(s_\mathrm{W} Z^*_{2,1} - c_\mathrm{W} Z^*_{2,2}\right)\left(c_\beta Z^*_{\mathrm{n2,3}} + s_\beta Z^*_{\mathrm{n2,4}}\right)\right) + \\
& \delta\overline{Z}^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{n1,3}} \left(\left(c_\beta Z^*_{3,3} + s_\beta Z^*_{3,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2,1}} - c_\mathrm{W} Z^*_{\mathrm{n2,2}}\right) + \left(s_\mathrm{W} Z^*_{3,1} - c_\mathrm{W} Z^*_{3,2}\right)\left(c_\beta Z^*_{\mathrm{n2,3}} + s_\beta Z^*_{\mathrm{n2,4}}\right)\right) + \\
& \delta\overline{Z}^{\tilde{\chi}^0,\mathrm{R}}_{\mathrm{n1,4}} \left(\left(c_\beta Z^*_{4,3} + s_\beta Z^*_{4,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2,1}} - c_\mathrm{W} Z^*_{\mathrm{n2,2}}\right) + \left(s_\mathrm{W} Z^*_{4,1} - c_\mathrm{W} Z^*_{4,2}\right)\left(c_\beta Z^*_{\mathrm{n2,3}} + s_\beta Z^*_{\mathrm{n2,4}}\right)\right) - \\
& \left(\delta Z_{\mathrm{AG}}\right)\left(\left(s_\beta Z^*_{\mathrm{n1,3}} - c_\beta Z^*_{\mathrm{n1,4}}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2,1}} - c_\mathrm{W} Z^*_{\mathrm{n2,2}}\right) + \left(s_\mathrm{W} Z^*_{\mathrm{n1,1}} - c_\mathrm{W} Z^*_{\mathrm{n1,2}}\right)\left(s_\beta Z^*_{\mathrm{n2,3}} - c_\beta Z^*_{\mathrm{n2,4}}\right)\right) + \\
& \left(\delta Z_{\mathrm{GG}}\right)\left(\left(c_\beta Z^*_{\mathrm{n1,3}} + s_\beta Z^*_{\mathrm{n1,4}}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n2,1}} - c_\mathrm{W} Z^*_{\mathrm{n2,2}}\right) + \left(s_\mathrm{W} Z^*_{\mathrm{n1,1}} - c_\mathrm{W} Z^*_{\mathrm{n1,2}}\right)\left(c_\beta Z^*_{\mathrm{n2,3}} + s_\beta Z^*_{\mathrm{n2,4}}\right)\right) + \\
& \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{1,\mathrm{n2}} \left(\left(c_\beta Z^*_{1,3} + s_\beta Z^*_{1,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n1,1}} - c_\mathrm{W} Z^*_{\mathrm{n1,2}}\right) + \left(s_\mathrm{W} Z^*_{1,1} - c_\mathrm{W} Z^*_{1,2}\right)\left(c_\beta Z^*_{\mathrm{n1,3}} + s_\beta Z^*_{\mathrm{n1,4}}\right)\right) + \\
& \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{2,\mathrm{n2}} \left(\left(c_\beta Z^*_{2,3} + s_\beta Z^*_{2,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n1,1}} - c_\mathrm{W} Z^*_{\mathrm{n1,2}}\right) + \left(s_\mathrm{W} Z^*_{2,1} - c_\mathrm{W} Z^*_{2,2}\right)\left(c_\beta Z^*_{\mathrm{n1,3}} + s_\beta Z^*_{\mathrm{n1,4}}\right)\right) + \\
& \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{3,\mathrm{n2}} \left(\left(c_\beta Z^*_{3,3} + s_\beta Z^*_{3,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n1,1}} - c_\mathrm{W} Z^*_{\mathrm{n1,2}}\right) + \left(s_\mathrm{W} Z^*_{3,1} - c_\mathrm{W} Z^*_{3,2}\right)\left(c_\beta Z^*_{\mathrm{n1,3}} + s_\beta Z^*_{\mathrm{n1,4}}\right)\right) + \\
& \delta Z^{\tilde{\chi}^0,\mathrm{L}}_{4,\mathrm{n2}} \left(\left(c_\beta Z^*_{4,3} + s_\beta Z^*_{4,4}\right)\left(s_\mathrm{W} Z^*_{\mathrm{n1,1}} - c_\mathrm{W} Z^*_{\mathrm{n1,2}}\right) + \left(s_\mathrm{W} Z^*_{4,1} - c_\mathrm{W} Z^*_{4,2}\right)\left(c_\beta Z^*_{\mathrm{n1,3}} + s_\beta Z^*_{\mathrm{n1,4}}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = {} & \left(\left(\left(\delta s_\mathrm{W}\right) s_\mathrm{W} + \left(\delta Z_\mathrm{e}\right) c_\mathrm{W}^2\right) s_\mathrm{W}^2 Z^*_{\mathrm{n1,1}} - \left(\left(\delta Z_\mathrm{e}\right) s_\mathrm{W} - \delta s_\mathrm{W}\right) c_\mathrm{W}^3 Z^*_{\mathrm{n1,2}}\right)\left(c_\beta Z^*_{\mathrm{n2,3}} + s_\beta Z^*_{\mathrm{n2,4}}\right) + \\
& \left(c_\beta Z^*_{\mathrm{n1,3}} + s_\beta Z^*_{\mathrm{n1,4}}\right)\left(\left(\left(\delta s_\mathrm{W}\right) s_\mathrm{W} + \left(\delta Z_\mathrm{e}\right) c_\mathrm{W}^2\right) s_\mathrm{W}^2 Z^*_{\mathrm{n2,1}} - \left(\left(\delta Z_\mathrm{e}\right) s_\mathrm{W} - \delta s_\mathrm{W}\right) c_\mathrm{W}^3 Z^*_{\mathrm{n2,2}}\right)
\end{aligned}
$$

[FFS] 2 Quarks – Higgs

$$
\underset{184}{C}\left(u_{\mathrm{g1}}, \overline{u}_{\mathrm{g2}}, h^0\right) = -\frac{\mathrm{i}e\delta_{\mathrm{g1,g2}}}{4M_\mathrm{W}^3 s_\mathrm{W}^2 s_\beta^2}
\left[\frac{
\begin{aligned}
& 2c_\alpha s_\mathrm{W} s_\beta M_\mathrm{W}^2 \delta m^{u_\mathrm{g}}_{\mathrm{g1}} + \\
& \left(\begin{aligned}
& s_\mathrm{W} s_\alpha s_\beta \left(\delta Z_\mathrm{hH}\right) M_\mathrm{W}^2 - \\
& \left(\begin{aligned}
& 2\left(s_\beta\left(\delta s_\mathrm{W}\right) + s_\mathrm{W}\left(\delta s_\beta\right)\right) M_\mathrm{W}^2 + \\
& s_\mathrm{W} s_\beta\left(\delta M_\mathrm{W}^2 - M_\mathrm{W}^2\left(2\left(\delta Z_\mathrm{e}\right) + \delta Z_\mathrm{hh} + \delta\overline{Z}^{u,\mathrm{R}}_{\mathrm{g2,g2}} + \delta Z^{u,\mathrm{L}}_{\mathrm{g1,g1}}\right)\right)
\end{aligned}\right) c_\alpha
\end{aligned}\right) m_{u_{\mathrm{g1}}}
\end{aligned}
}{
\begin{aligned}
& 2c_\alpha s_\mathrm{W} s_\beta M_\mathrm{W}^2 \delta m^{u_\mathrm{g}}_{\mathrm{g1}} + \\
& \left(\begin{aligned}
& s_\mathrm{W} s_\alpha s_\beta \left(\delta Z_\mathrm{hH}\right) M_\mathrm{W}^2 - \\
& \left(\begin{aligned}
& 2\left(s_\beta\left(\delta s_\mathrm{W}\right) + s_\mathrm{W}\left(\delta s_\beta\right)\right) M_\mathrm{W}^2 + \\
& s_\mathrm{W} s_\beta\left(\delta M_\mathrm{W}^2 - M_\mathrm{W}^2\left(2\left(\delta Z_\mathrm{e}\right) + \delta Z_\mathrm{hh} + \delta\overline{Z}^{u,\mathrm{L}}_{\mathrm{g2,g2}} + \delta Z^{u,\mathrm{R}}_{\mathrm{g1,g1}}\right)\right)
\end{aligned}\right) c_\alpha
\end{aligned}\right) m_{u_{\mathrm{g1}}}
\end{aligned}
}\right]
$$

$$
\underset{185}{C}\left(d_{\mathrm{g1}}, \overline{d}_{\mathrm{g2}}, h^0\right) = \frac{\mathrm{i}e\delta_{\mathrm{g1,g2}}}{4c_\beta^2 M_\mathrm{W}^3 s_\mathrm{W}^2}
\left[\frac{1}{2}\right]
$$

$$2 = 2c_\beta s_\alpha s_W M_W^2 \delta m_{g1}^{d_g} - m_{d_{g1}} \left(\begin{array}{l} s_\alpha \left(2 \left(\delta c_\beta \right) s_W M_W^2 - c_\beta \left(2 \left(\left(\delta Z_e \right) s_W - \delta s_W \right) M_W^2 - s_W \delta M_W^2 \right) \right) + \\ c_\beta s_W \left(\left(\delta Z_{hH} \right) c_\alpha - s_\alpha \left(\delta Z_{hh} + \delta \overline{Z}_{g2,g2}^{d,L} + \delta Z_{g1,g1}^{d,R} \right) \right) M_W^2 \end{array} \right)$$

$$1 = 2c_\beta s_\alpha s_W M_W^2 \delta m_{g1}^{d_g} - m_{d_{g1}} \left(\begin{array}{l} s_\alpha \left(2 \left(\delta c_\beta \right) s_W M_W^2 - c_\beta \left(2 \left(\left(\delta Z_e \right) s_W - \delta s_W \right) M_W^2 - s_W \delta M_W^2 \right) \right) + \\ c_\beta s_W \left(\left(\delta Z_{hH} \right) c_\alpha - s_\alpha \left(\delta Z_{hh} + \delta \overline{Z}_{g2,g2}^{d,L} + \delta Z_{g1,g1}^{d,R} \right) \right) M_W^2 \end{array} \right)$$

$$C_{192}\left(u_{g1}, \overline{u}_{g2}, A^0\right) = \frac{e\delta_{g1,g2}}{8M_W^3 s_W^2 s_\beta^2} \left[\begin{array}{l} 2s_{2\beta} s_W M_W^2 \delta m_{g1}^{u_g} + \\ \left(\begin{array}{l} s_{2\beta} \left(2 \left(s_W \left(\delta Z_e \right) - \delta s_W \right) M_W^2 - s_W \delta M_W^2 \right) - \\ s_W M_W^2 \left(4c_\beta \left(\delta s_\beta \right) - 2 \left(\delta Z_{AG} \right) s_\beta^2 - s_{2\beta} \left(\delta Z_{AA} + \delta \overline{Z}_{g2,g2}^{u,R} + \delta Z_{g1,g1}^{u,L} \right) \right) \end{array} \right) m_{u_{g1}} \\ \hline -2s_{2\beta} s_W M_W^2 \delta m_{g1}^{u_g} - \\ \left(\begin{array}{l} s_{2\beta} \left(2 \left(s_W \left(\delta Z_e \right) - \delta s_W \right) M_W^2 - s_W \delta M_W^2 \right) - \\ s_W M_W^2 \left(4c_\beta \left(\delta s_\beta \right) - 2 \left(\delta Z_{AG} \right) s_\beta^2 - s_{2\beta} \left(\delta Z_{AA} + \delta \overline{Z}_{g2,g2}^{u,L} + \delta Z_{g1,g1}^{u,R} \right) \right) \end{array} \right) m_{u_{g1}} \end{array} \right]$$

$$C_{193}\left(u_{g1}, \overline{u}_{g2}, G^0\right) = \frac{e\delta_{g1,g2}}{4s_\beta M_W^3 s_W^2} \left[\begin{array}{l} 2s_W s_\beta M_W^2 \delta m_{g1}^{u_g} + \\ \left(\begin{array}{l} s_W \left(2 \left(s_\beta \left(\delta Z_e \right) - \delta s_\beta \right) M_W^2 - s_\beta \delta M_W^2 \right) - \\ M_W^2 \left(2s_\beta \left(\delta s_W \right) - s_W \left(c_\beta \left(\delta Z_{AG} \right) + s_\beta \left(\delta Z_{GG} + \delta \overline{Z}_{g2,g2}^{u,R} + \delta Z_{g1,g1}^{u,L} \right) \right) \right) \end{array} \right) m_{u_{g1}} \\ \hline -2s_W s_\beta M_W^2 \delta m_{g1}^{u_g} - \\ \left(\begin{array}{l} s_W \left(2 \left(s_\beta \left(\delta Z_e \right) - \delta s_\beta \right) M_W^2 - s_\beta \delta M_W^2 \right) - \\ M_W^2 \left(2s_\beta \left(\delta s_W \right) - s_W \left(c_\beta \left(\delta Z_{AG} \right) + s_\beta \left(\delta Z_{GG} + \delta \overline{Z}_{g2,g2}^{u,L} + \delta Z_{g1,g1}^{u,R} \right) \right) \right) \end{array} \right) m_{u_{g1}} \end{array} \right]$$

$$C_{194}\left(d_{g1}, \overline{d}_{g2}, A^0\right) = \frac{e\delta_{g1,g2}}{4c_\beta^2 M_W^3 s_W^2} \left[\begin{array}{l} \left(\begin{array}{l} s_{2\beta} \left(s_W \left(\delta Z_e \right) - \delta s_W \right) M_W^2 - \\ \left(\begin{array}{l} s_\beta \left(2 \left(\delta c_\beta \right) M_W^2 + c_\beta \delta M_W^2 \right) + \\ c_\beta M_W^2 \left(c_\beta \left(\delta Z_{AG} \right) - s_\beta \left(\delta Z_{AA} + \delta \overline{Z}_{g2,g2}^{d,R} + \delta Z_{g1,g1}^{d,L} \right) \right) \end{array} \right) s_W \end{array} \right) m_{d_{g1}} + s_{2\beta} s_W M_W^2 \delta m_{g1}^{d_g} \\ \hline - \left(\begin{array}{l} s_{2\beta} \left(s_W \left(\delta Z_e \right) - \delta s_W \right) M_W^2 - \\ \left(\begin{array}{l} s_\beta \left(2 \left(\delta c_\beta \right) M_W^2 + c_\beta \delta M_W^2 \right) + \\ c_\beta M_W^2 \left(c_\beta \left(\delta Z_{AG} \right) - s_\beta \left(\delta Z_{AA} + \delta \overline{Z}_{g2,g2}^{d,L} + \delta Z_{g1,g1}^{d,R} \right) \right) \end{array} \right) s_W \end{array} \right) m_{d_{g1}} - s_{2\beta} s_W M_W^2 \delta m_{g1}^{d_g} \end{array} \right]$$

$$\underset{195}{C}\left(d_{g1},\overline{d}_{g2},G^{0}\right)=\frac{e\delta_{g1,g2}}{4c_{\beta}M_{W}^{3}s_{W}^{2}}\left[\begin{array}{l}-2c_{\beta}s_{W}M_{W}^{2}\delta m_{g1}^{d_{g}}+\\\left(\begin{array}{l}c_{\beta}\left(2\left(\delta s_{W}\right)M_{W}^{2}+s_{W}\delta M_{W}^{2}\right)+\\s_{W}M_{W}^{2}\left(2\left(\delta c_{\beta}\right)+s_{\beta}\left(\delta Z_{AG}\right)-c_{\beta}\left(2\left(\delta Z_{e}\right)+\delta Z_{GG}+\delta\overline{Z}_{g2,g2}^{d,R}+\delta Z_{g1,g1}^{d,L}\right)\right)\end{array}\right)m_{d_{g1}}\\\hline 2c_{\beta}s_{W}M_{W}^{2}\delta m_{g1}^{d_{g}}-\\\left(\begin{array}{l}c_{\beta}\left(2\left(\delta s_{W}\right)M_{W}^{2}+s_{W}\delta M_{W}^{2}\right)+\\s_{W}M_{W}^{2}\left(2\left(\delta c_{\beta}\right)+s_{\beta}\left(\delta Z_{AG}\right)-c_{\beta}\left(2\left(\delta Z_{e}\right)+\delta Z_{GG}+\delta\overline{Z}_{g2,g2}^{d,R}+\delta Z_{g1,g1}^{d,L}\right)\right)\end{array}\right)m_{d_{g1}}\end{array}\right]$$

$$\underset{204}{C}\left(u_{g1},\overline{u}_{g2},H^{0}\right)=-\frac{ie\delta_{g1,g2}}{4M_{W}^{3}s_{W}^{2}s_{\beta}^{2}}\left[\begin{array}{l}1\\\hline 2\end{array}\right]$$

$$2=2s_{\alpha}s_{\beta}s_{W}M_{W}^{2}\delta m_{g1}^{u_{g}}-m_{u_{g1}}\left(\begin{array}{l}s_{\alpha}\left(2\left(\delta s_{W}\right)s_{\beta}M_{W}^{2}-s_{W}\left(2\left(\left(\delta Z_{e}\right)s_{\beta}-\delta s_{\beta}\right)M_{W}^{2}-s_{\beta}\delta M_{W}^{2}\right)\right)-\\s_{W}s_{\beta}\left(\left(\delta Z_{hH}\right)c_{\alpha}+s_{\alpha}\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{u,L}+\delta Z_{g1,g1}^{u,R}\right)\right)M_{W}^{2}\end{array}\right)$$

$$1=2s_{\alpha}s_{\beta}s_{W}M_{W}^{2}\delta m_{g1}^{u_{g}}-m_{u_{g1}}\left(\begin{array}{l}s_{\alpha}\left(2\left(\delta s_{W}\right)s_{\beta}M_{W}^{2}-s_{W}\left(2\left(\left(\delta Z_{e}\right)s_{\beta}-\delta s_{\beta}\right)M_{W}^{2}-s_{\beta}\delta M_{W}^{2}\right)\right)-\\s_{W}s_{\beta}\left(\left(\delta Z_{hH}\right)c_{\alpha}+s_{\alpha}\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{u,L}+\delta Z_{g1,g1}^{u,R}\right)\right)M_{W}^{2}\end{array}\right)$$

$$\underset{205}{C}\left(d_{g1},\overline{d}_{g2},H^{0}\right)=-\frac{ie\delta_{g1,g2}}{4c_{\beta}^{2}M_{W}^{3}s_{W}^{2}}\left[\begin{array}{l}1\\\hline 2\end{array}\right]$$

$$2=2c_{\alpha}c_{\beta}s_{W}M_{W}^{2}\delta m_{g1}^{d_{g}}-m_{d_{g1}}\left(2c_{\alpha}s_{W}M_{W}^{2}\left(\delta c_{\beta}\right)-c_{\beta}\left(\begin{array}{l}c_{\alpha}\left(2\left(\left(\delta Z_{e}\right)s_{W}-\delta s_{W}\right)M_{W}^{2}-s_{W}\delta M_{W}^{2}\right)-\\s_{W}\left(\left(\delta Z_{hH}\right)s_{\alpha}-c_{\alpha}\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{d,R}+\delta Z_{g1,g1}^{d,L}\right)\right)M_{W}^{2}\end{array}\right)\right)$$

$$1=2c_{\alpha}c_{\beta}s_{W}M_{W}^{2}\delta m_{g1}^{d_{g}}-m_{d_{g1}}\left(2c_{\alpha}s_{W}M_{W}^{2}\left(\delta c_{\beta}\right)-c_{\beta}\left(\begin{array}{l}c_{\alpha}\left(2\left(\left(\delta Z_{e}\right)s_{W}-\delta s_{W}\right)M_{W}^{2}-s_{W}\delta M_{W}^{2}\right)-\\s_{W}\left(\left(\delta Z_{hH}\right)s_{\alpha}-c_{\alpha}\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{d,R}+\delta Z_{g1,g1}^{d,L}\right)\right)M_{W}^{2}\end{array}\right)\right)$$

$$\underset{208}{C}\left(u_{g1},\overline{d}_{g2},H^{-}\right)=\frac{ie}{\sqrt{2}M_{W}^{3}s_{W}^{2}}\left[\begin{array}{l}\frac{1}{2c_{\beta}^{2}}\left(\left(1\right)\mathrm{CKM}_{g1,g2}^{*}+m_{d_{g2}}s_{2\beta}s_{W}M_{W}^{2}\delta\mathrm{CKM}_{g1,g2}^{*}\right)\\\hline\frac{1}{4s_{\beta}^{2}}\left(\left(2\right)\mathrm{CKM}_{g1,g2}^{*}+2m_{u_{g1}}s_{2\beta}s_{W}M_{W}^{2}\delta\mathrm{CKM}_{g1,g2}^{*}\right)\end{array}\right]$$

$$2 = m_{u_{g1}} \left(s_{2\beta} \left(2M_W^2 \left(s_W \left(\delta Z_e \right) - \delta s_W \right) - s_W \delta M_W^2 \right) - s_W M_W^2 \left(\begin{array}{l} 4 \left(\delta s_\beta \right) c_\beta - 2 \left(\delta Z_{G^- H^-} \right) s_\beta^2 - \\ s_{2\beta} \left(\delta Z_{H^- H^-} + \delta \overline{Z}^{d,L}_{g2,g2} + \delta Z^{u,R}_{g1,g1} \right) \end{array} \right) \right) + 2 s_{2\beta} s_W M_W^2 \delta m^{u_g}_{g1}$$

$$1 = m_{d_{g2}} \left(s_{2\beta} M_W^2 \left(s_W \left(\delta Z_e \right) - \delta s_W \right) - s_W \left(\begin{array}{l} s_\beta \left(c_\beta \delta M_W^2 + 2 \left(\delta c_\beta \right) M_W^2 \right) + \\ c_\beta \left(\left(\delta Z_{G^- H^-} \right) c_\beta - s_\beta \left(\delta Z_{H^- H^-} + \delta \overline{Z}^{d,R}_{g2,g2} + \delta Z^{u,L}_{g1,g1} \right) \right) M_W^2 \end{array} \right) \right) + s_{2\beta} s_W M_W^2 \delta m^{d_g}_{g2}$$

$$\underset{209}{C} \left(u_{g1}, \overline{d}_{g2}, G^- \right) = \frac{ie}{2\sqrt{2} M_W^3 s_W^2} \begin{bmatrix} -\frac{1}{c_\beta} \\ \frac{2}{s_\beta} \end{bmatrix}$$

$$2 = \begin{array}{l} 2 m_{u_{g1}} s_W s_\beta \delta \mathrm{CKM}^*_{g1,g2} M_W^2 + \\ \mathrm{CKM}^*_{g1,g2} \left(\left(\begin{array}{l} s_W \left(2 \left(\left(\delta Z_e \right) s_\beta - \delta s_\beta \right) M_W^2 - s_\beta \delta M_W^2 \right) - \\ \left(2 \left(\delta s_W \right) s_\beta - s_W \left(\left(\delta Z_{H^- G^-} \right) c_\beta + s_\beta \left(\delta Z_{G^- G^-} + \delta \overline{Z}^{d,L}_{g2,g2} + \delta Z^{u,R}_{g1,g1} \right) \right) \right) M_W^2 \end{array} \right) m_{u_{g1}} + 2 s_W s_\beta \delta m^{u_g}_{g1} M_W^2 \right) \end{array}$$

$$1 = \mathrm{CKM}^*_{g1,g2} \left(2 c_\beta s_W M_W^2 \delta m^{d_g}_{g2} - m_{d_{g2}} \left(\begin{array}{l} c_\beta \left(s_W \delta M_W^2 + 2 \left(\delta s_W \right) M_W^2 \right) + \\ \left(\begin{array}{l} 2 \left(\delta c_\beta \right) + \left(\delta Z_{H^- G^-} \right) s_\beta - \\ c_\beta \left(2 \left(\delta Z_e \right) + \delta Z_{G^- G^-} + \delta \overline{Z}^{d,R}_{g2,g2} + \delta Z^{u,L}_{g1,g1} \right) \end{array} \right) s_W M_W^2 \end{array} \right) \right) + 2 c_\beta s_W m_{d_{g2}} M_W^2 \delta \mathrm{CKM}^*_{g1,g2}$$

$$\underset{210}{C} \left(d_{g1}, \overline{u}_{g2}, H^+ \right) = \frac{ie}{4\sqrt{2} M_W^3 s_W^2} \begin{bmatrix} \frac{1}{s_\beta^2} \left((1) m_{u_{g2}} + 2 \mathrm{CKM}_{g2,g1} s_{2\beta} s_W M_W^2 \delta m^{u_g}_{g2} \right) \\ \frac{1}{c_\beta^2} \left((2) m_{d_{g1}} + 2 \mathrm{CKM}_{g2,g1} s_{2\beta} s_W M_W^2 \delta m^{d_g}_{g1} \right) \end{bmatrix}$$

$$2 = \mathrm{CKM}_{g2,g1} \left(s_{2\beta} \left(2 M_W^2 \left(s_W \left(\delta Z_e \right) - \delta s_W \right) - s_W \delta M_W^2 \right) - s_W M_W^2 \left(\begin{array}{l} 4 \left(\delta c_\beta \right) s_\beta + 2 \left(\delta Z_{H^- G^-} \right) c_\beta^2 - \\ s_{2\beta} \left(\delta \overline{Z}_{H^- H^-} + \delta \overline{Z}^{u,L}_{g2,g2} + \delta Z^{d,R}_{g1,g1} \right) \end{array} \right) \right) + 2 s_{2\beta} s_W M_W^2 \left(\delta \mathrm{CKM}_{g2,g1} \right)$$

$$1 = \mathrm{CKM}_{g2,g1} \left(s_{2\beta} \left(2 M_W^2 \left(s_W \left(\delta Z_e \right) - \delta s_W \right) - s_W \delta M_W^2 \right) - s_W M_W^2 \left(\begin{array}{l} 4 \left(\delta s_\beta \right) c_\beta - 2 \left(\delta Z_{H^- G^-} \right) s_\beta^2 - \\ s_{2\beta} \left(\delta \overline{Z}_{H^- H^-} + \delta \overline{Z}^{u,R}_{g2,g2} + \delta Z^{d,L}_{g1,g1} \right) \end{array} \right) \right) + 2 s_{2\beta} s_W M_W^2 \left(\delta \mathrm{CKM}_{g2,g1} \right)$$

$$\underset{211}{C}\left(d_{g1},\overline{u}_{g2},G^{+}\right)=\frac{ie}{2\sqrt{2}M_W^3 s_W^2}\left[\frac{\frac{1}{s_\beta}\left((\boxed{1})m_{u_{g2}}+2\mathrm{CKM}_{g2,g1}s_W s_\beta M_W^2\delta m_{g2}^{u_g}\right)}{-\frac{\boxed{2}}{c_\beta}}\right]$$

$$\boxed{2}=\mathrm{CKM}_{g2,g1}\left(2c_\beta s_W M_W^2\delta m_{g1}^{d_g}-m_{d_{g1}}\left(\begin{array}{l}c_\beta\left(s_W\delta M_W^2+2\left(\delta s_W\right)M_W^2\right)+\\\left(\begin{array}{l}2\left(\delta c_\beta\right)+\left(\delta Z_{G^-H^-}\right)s_\beta-\\c_\beta\left(2\left(\delta Z_e\right)+\delta Z_{G^-G^-}+\delta\overline{Z}_{g2,g2}^{u,L}+\delta Z_{g1,g1}^{d,R}\right)\end{array}\right)s_W M_W^2\end{array}\right)\right)+2c_\beta s_W m_{d_{g1}}M_W^2\left(\delta\mathrm{CKM}_{g2,g1}\right)$$

$$\boxed{1}=\mathrm{CKM}_{g2,g1}\left(\begin{array}{l}s_W\left(2\left(\left(\delta Z_e\right)s_\beta-\delta s_\beta\right)M_W^2-s_\beta\delta M_W^2\right)-\\\left(2\left(\delta s_W\right)s_\beta-s_W\left(\left(\delta Z_{G^-H^-}\right)c_\beta+s_\beta\left(\delta Z_{G^-G^-}+\delta\overline{Z}_{g2,g2}^{u,R}+\delta Z_{g1,g1}^{d,L}\right)\right)\right)M_W^2\end{array}\right)+2s_\beta s_W M_W^2\left(\delta\mathrm{CKM}_{g2,g1}\right)$$

[FFV] Chargino – Neutralino – Gauge Boson

$$\underset{276}{C}\left(\tilde{\chi}_{n1}^0,\tilde{\chi}_{c2}^+,W^-\right)=\frac{ie}{4s_W^2}\left[\frac{\boxed{1}}{\boxed{2}}\right]$$

$$\boxed{2}=\begin{array}{l}\left(\begin{array}{l}2U_{c2,1}\left(\delta\overline{Z}_{n1,1}^{\tilde{\chi}^0,R}Z_{1,2}^*+\delta\overline{Z}_{n1,2}^{\tilde{\chi}^0,R}Z_{2,2}^*+\delta\overline{Z}_{n1,3}^{\tilde{\chi}^0,R}Z_{3,2}^*+\delta\overline{Z}_{n1,4}^{\tilde{\chi}^0,R}Z_{4,2}^*\right)+\\\sqrt{2}U_{c2,2}\left(\delta\overline{Z}_{n1,1}^{\tilde{\chi}^0,R}Z_{1,3}^*+\delta\overline{Z}_{n1,2}^{\tilde{\chi}^0,R}Z_{2,3}^*+\delta\overline{Z}_{n1,3}^{\tilde{\chi}^0,R}Z_{3,3}^*+\delta\overline{Z}_{n1,4}^{\tilde{\chi}^0,R}Z_{4,3}^*\right)\end{array}\right)s_W+\\2\left(\begin{array}{l}s_W\left(U_{1,1}\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,L}+U_{2,1}\delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,L}\right)-\\\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_W\right)s_W\right)U_{c2,1}\end{array}\right)Z_{n1,2}^*+\\\sqrt{2}\left(\begin{array}{l}s_W\left(U_{1,2}\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,L}+U_{2,2}\delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,L}\right)-\\\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_W\right)s_W\right)U_{c2,2}\end{array}\right)Z_{n1,3}^*\end{array}$$

$$\boxed{1}=\begin{array}{l}s_W\left(2Z_{n1,2}\left(\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,R}V_{1,1}^*+\delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,R}V_{2,1}^*\right)-\sqrt{2}Z_{n1,4}\left(\delta\overline{Z}_{c2,1}^{\tilde{\chi}^-,R}V_{1,2}^*+\delta\overline{Z}_{c2,2}^{\tilde{\chi}^-,R}V_{2,2}^*\right)\right)-\\2\left(\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_W\right)s_W\right)Z_{n1,2}-s_W\left(Z_{1,2}\delta\overline{Z}_{n1,1}^{\tilde{\chi}^0,L}+Z_{2,2}\delta\overline{Z}_{n1,2}^{\tilde{\chi}^0,L}+Z_{3,2}\delta\overline{Z}_{n1,3}^{\tilde{\chi}^0,L}+Z_{4,2}\delta\overline{Z}_{n1,4}^{\tilde{\chi}^0,L}\right)\right)V_{c2,1}^*+\\\sqrt{2}\left(\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_W\right)s_W\right)Z_{n1,4}-s_W\left(Z_{1,4}\delta\overline{Z}_{n1,1}^{\tilde{\chi}^0,L}+Z_{2,4}\delta\overline{Z}_{n1,2}^{\tilde{\chi}^0,L}+Z_{3,4}\delta\overline{Z}_{n1,3}^{\tilde{\chi}^0,L}+Z_{4,4}\delta\overline{Z}_{n1,4}^{\tilde{\chi}^0,L}\right)\right)V_{c2,2}^*\end{array}$$

$$\underset{277}{C}\left(\tilde{\chi}_{c1}^{-}, \tilde{\chi}_{n2}^{0}, W^{+}\right) = \frac{ie}{4s_W^2}\left[\begin{array}{c} 1 \\ \hline 2 \end{array}\right]$$

$$\begin{aligned} \boxed{2} = {} & s_W\left(2Z_{n2,2}\left(\delta Z_{1,c1}^{\tilde{\chi}^-,L}U_{1,1}^{*} + \delta Z_{2,c1}^{\tilde{\chi}^-,L}U_{2,1}^{*}\right) + \sqrt{2}Z_{n2,3}\left(\delta Z_{1,c1}^{\tilde{\chi}^-,L}U_{1,2}^{*} + \delta Z_{2,c1}^{\tilde{\chi}^-,L}U_{2,2}^{*}\right)\right) + \\ & 2\left(\left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W\right)s_W - 2\left(\delta s_W\right)\right)Z_{n2,2} + s_W\left(Z_{1,2}\delta Z_{1,n2}^{\tilde{\chi}^0,R} + Z_{2,2}\delta Z_{2,n2}^{\tilde{\chi}^0,R} + Z_{3,2}\delta Z_{3,n2}^{\tilde{\chi}^0,R} + Z_{4,2}\delta Z_{4,n2}^{\tilde{\chi}^0,R}\right)\right)U_{c1,1}^{*} + \\ & \sqrt{2}\left(\left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W\right)s_W - 2\left(\delta s_W\right)\right)Z_{n2,3} + s_W\left(Z_{1,3}\delta Z_{1,n2}^{\tilde{\chi}^0,R} + Z_{2,3}\delta Z_{2,n2}^{\tilde{\chi}^0,R} + Z_{3,3}\delta Z_{3,n2}^{\tilde{\chi}^0,R} + Z_{4,3}\delta Z_{4,n2}^{\tilde{\chi}^0,R}\right)\right)U_{c1,2}^{*} \end{aligned}$$

$$\begin{aligned} \boxed{1} = {} & 2\left(\begin{array}{l}\left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W\right)s_W - 2\left(\delta s_W\right)\right)V_{c1,1} + \\ s_W\left(V_{1,1}\delta Z_{1,c1}^{\tilde{\chi}^-,R} + V_{2,1}\delta Z_{2,c1}^{\tilde{\chi}^-,R}\right)\end{array}\right)Z_{n2,2}^{*} - \\ & \sqrt{2}\left(\begin{array}{l}\left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W\right)s_W - 2\left(\delta s_W\right)\right)V_{c1,2} + \\ s_W\left(V_{1,2}\delta Z_{1,c1}^{\tilde{\chi}^-,R} + V_{2,2}\delta Z_{2,c1}^{\tilde{\chi}^-,R}\right)\end{array}\right)Z_{n2,4}^{*} + \\ & \left(\begin{array}{l} 2V_{c1,1}\left(\delta Z_{1,n2}^{\tilde{\chi}^0,L}Z_{1,2}^{*} + \delta Z_{2,n2}^{\tilde{\chi}^0,L}Z_{2,2}^{*} + \delta Z_{3,n2}^{\tilde{\chi}^0,L}Z_{3,2}^{*} + \delta Z_{4,n2}^{\tilde{\chi}^0,L}Z_{4,2}^{*}\right) - \\ \sqrt{2}V_{c1,2}\left(\delta Z_{1,n2}^{\tilde{\chi}^0,L}Z_{1,4}^{*} + \delta Z_{2,n2}^{\tilde{\chi}^0,L}Z_{2,4}^{*} + \delta Z_{3,n2}^{\tilde{\chi}^0,L}Z_{3,4}^{*} + \delta Z_{4,n2}^{\tilde{\chi}^0,L}Z_{4,4}^{*}\right) \end{array}\right)s_W \end{aligned}$$

[FFV] 2 Charginos – Gauge Boson

$$\underset{278}{C}\left(\tilde{\chi}_{c1}^{+}, \tilde{\chi}_{c2}^{-}, \gamma\right) = \frac{ie}{4c_W s_W}\left[\begin{array}{c} \left(\delta Z_{Z\gamma}\right)\left(2U_{c1,1}U_{c2,1}^{*} + U_{c1,2}U_{c2,2}^{*}\right) - \\ 2\left(\begin{array}{l} s_W\left(\delta Z_{Z\gamma}\right) - c_W\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) - \\ c_W\left(\delta\overline{Z}_{c1,1}^{\tilde{\chi}^-,L} + \delta\overline{Z}_{c1,2}^{\tilde{\chi}^-,L} + \delta Z_{1,c2}^{\tilde{\chi}^-,L} + \delta Z_{2,c2}^{\tilde{\chi}^-,L}\right)\end{array}\right)s_W \\ \hline -2\left(\begin{array}{l} s_W\left(\delta Z_{Z\gamma}\right) - c_W\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) - \\ c_W\left(\delta\overline{Z}_{c1,1}^{\tilde{\chi}^-,R} + \delta\overline{Z}_{c1,2}^{\tilde{\chi}^-,R} + \delta Z_{1,c2}^{\tilde{\chi}^-,R} + \delta Z_{2,c2}^{\tilde{\chi}^-,R}\right)\end{array}\right)s_W + \left(\delta Z_{Z\gamma}\right)\left(2V_{c2,1}V_{c1,1}^{*} + V_{c2,2}V_{c1,2}^{*}\right) \end{array}\right]$$

$$\underset{279}{C}\left(\tilde{\chi}_{c1}^{+}, \tilde{\chi}_{c2}^{-}, Z\right) = \frac{ie}{4c_W^3 s_W^2}\left[\begin{array}{c} 2 \\ \hline 4 \end{array}\right]$$

$$\begin{aligned} \boxed{4} = {} & 2s_W V_{c2,1}\left(c_W^2\left(\delta\overline{Z}_{c1,1}^{\tilde{\chi}^-,R}V_{1,1}^{*} + \delta\overline{Z}_{c1,2}^{\tilde{\chi}^-,R}V_{2,1}^{*}\right) + 2\left(\delta s_W\right)s_W V_{c1,1}^{*}\right) - \left(\boxed{3}\right)c_W^2 - \\ & V_{c2,2}\left(\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right)V_{c1,2}^{*} - s_W c_W^2\left(\delta\overline{Z}_{c1,1}^{\tilde{\chi}^-,R}V_{1,2}^{*} + \delta\overline{Z}_{c1,2}^{\tilde{\chi}^-,R}V_{2,2}^{*}\right)\right) - \\ & s_W^2\left(2\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 - 2\left(\delta Z_{\gamma Z}\right)c_W^3 + 4\left(\delta s_W\right)s_W^2\right) \end{aligned}$$

$$3 = s_W \begin{pmatrix} \delta Z^{\tilde{\chi}^-,R}_{1,c2} \left(2s^2_W - 2V_{1,1}V^*_{c1,1} - V_{1,2}V^*_{c1,2}\right) + \\ \delta Z^{\tilde{\chi}^-,R}_{2,c2} \left(2s^2_W - 2V_{2,1}V^*_{c1,1} - V_{2,2}V^*_{c1,2}\right) \end{pmatrix} + 2s^3_W \left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c1,1} + \delta\overline{Z}^{\tilde{\chi}^-,R}_{c1,2}\right) + 2V_{c2,1}V^*_{c1,1}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)\right)$$

$$2 = \begin{array}{l} -(1)c^2_W - s^2_W \left(2\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c^2_W - 2\left(\delta Z_{\gamma Z}\right)c^3_W + 4\left(\delta s_W\right)s^2_W - 4\left(\delta s_W\right)U_{c1,1}U^*_{c2,1}\right) + \\ s_W \left(U_{c1,2}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)c^2_W\right)U^*_{c2,2} - \begin{pmatrix} \delta Z^{\tilde{\chi}^-,L}_{1,c2}\left(2s^2_W - 2U_{c1,1}U^*_{1,1} - U_{c1,2}U^*_{1,2}\right) + \\ \delta Z^{\tilde{\chi}^-,L}_{2,c2}\left(2s^2_W - 2U_{c1,1}U^*_{2,1} - U_{c1,2}U^*_{2,2}\right) \end{pmatrix} c^2_W\right) \end{array}$$

$$1 = \begin{array}{l} 2\left(\delta\overline{Z}^{\tilde{\chi}^-,L}_{c1,1} + \delta\overline{Z}^{\tilde{\chi}^-,L}_{c1,2}\right)s^3_W + \left(2\left(\delta s_W\right)U_{c1,2} - s_W\left(U_{1,2}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c1,1} + U_{2,2}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c1,2}\right)\right)U^*_{c2,2} + \\ 2\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)U_{c1,1} - s_W\left(U_{1,1}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c1,1} + U_{2,1}\delta\overline{Z}^{\tilde{\chi}^-,L}_{c1,2}\right)\right)U^*_{c2,1} \end{array}$$

[FFV] 2 Gluinos – Gluon

$$\underset{453}{C}\left(\tilde{g},\tilde{g},g\right) = -\frac{1}{2}g_s f^{g1,g2,g3}\left[\frac{\delta Z_{gg} + 2\left(\delta Z_{g_s} + \delta Z^L_{\tilde{g}}\right)}{\delta Z_{gg} + 2\left(\delta Z_{g_s} + \delta Z^R_{\tilde{g}}\right)}\right]$$

[FFV] 2 Leptons – Gauge Boson

$$\underset{196}{C}\left(\bar{e}_{g1}, e_{g2}, \gamma\right) = ie\delta_{g1,g2}\left[\begin{array}{c} \frac{1}{4}\left(4\left(\delta Z_e\right) + 2\left(\delta Z_{\gamma\gamma}\right) + \frac{1}{c_W s_W}\left(\delta Z_{Z\gamma} - 2\left(\delta Z_{Z\gamma}\right)s^2_W\right) + 2\left(\delta\overline{Z}^{e,L}_{g1,g1} + \delta Z^{e,L}_{g1,g1}\right)\right) \\ -\frac{1}{2c_W}\left(s_W\left(\delta Z_{Z\gamma}\right) - c_W\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma} + \delta\overline{Z}^{e,R}_{g1,g1} + \delta Z^{e,R}_{g1,g1}\right)\right) \end{array}\right]$$

$$\underset{199}{C}\left(\overline{\nu}_{g1}, \nu_{g2}, Z\right) = -\frac{ie\delta_{g1,g2}}{4c^3_W s^2_W}\left(2\left(\delta s_W\right)s^2_W - c^2_W\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta\overline{Z}^{\nu,L}_{g1,g1} + \delta Z^{\nu,L}_{g1,g1}\right)\right)\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$\underset{200}{C}\left(\bar{e}_{g1}, e_{g2}, Z\right) = -\frac{ie\delta_{g1,g2}}{c^3_W}\left[\begin{array}{c} \frac{1}{4s^2_W}\left(2\left(\delta s_W - \left(\delta Z_{\gamma Z}\right)c^3_W\right)s^2_W + c^2_W\left(2\left(\delta s_W\right) + s_W\left(1 - 2c^2_W\right)\left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta\overline{Z}^{e,L}_{g1,g1} + \delta Z^{e,L}_{g1,g1}\right)\right)\right) \\ \frac{1}{2}\left(2\left(\delta s_W\right) - c^2_W\left(c_W\left(\delta Z_{\gamma Z}\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta\overline{Z}^{e,R}_{g1,g1} + \delta Z^{e,R}_{g1,g1}\right)\right)\right) \end{array}\right]$$

$$\underset{206}{C}\left(\bar{e}_{g1}, \nu_{g2}, W^-\right) = \frac{ie\delta_{g1,g2}}{2\sqrt{2}s_W^2}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_W + \delta\overline{Z}^{e,L}_{g1,g1} + \delta Z^{\nu,L}_{g1,g1}\right)\right)\begin{bmatrix}1\\\hline 0\end{bmatrix}$$

$$\underset{207}{C}\left(\bar{\nu}_{g1}, e_{g2}, W^+\right) = \frac{ie\delta_{g1,g2}}{2\sqrt{2}s_W^2}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_W + \delta\overline{Z}^{\nu,L}_{g1,g1} + \delta Z^{e,L}_{g1,g1}\right)\right)\begin{bmatrix}1\\\hline 0\end{bmatrix}$$

$$\underset{447}{C}\left(\bar{\nu}_{g1}, \nu_{g2}, \gamma\right) = -\frac{ie\delta_{g1,g2}\left(\delta Z_{Z\gamma}\right)}{4c_W s_W}\begin{bmatrix}1\\\hline 0\end{bmatrix}$$

[FFV] 2 Neutralinos – Gauge Boson

$$\underset{275}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^0_{n2}, Z\right) = \frac{ie}{4c_W^3 s_W^2}\begin{bmatrix}1\\\hline 2\end{bmatrix}$$

$$\begin{aligned}2 = &\left(\begin{array}{l} Z_{n2,3}\left(\delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,1}Z^*_{1,3} + \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,2}Z^*_{2,3} + \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,3}Z^*_{3,3} + \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,4}Z^*_{4,3}\right) - \\ Z_{n2,4}\left(\delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,1}Z^*_{1,4} + \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,2}Z^*_{2,4} + \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,3}Z^*_{3,4} + \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,4}Z^*_{4,4}\right)\end{array}\right) s_W c_W^2 - \\ &\left(\begin{array}{l} Z_{n2,3}\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right) - \\ s_W\left(Z_{1,3}\delta Z^{\tilde{\chi}^0,R}_{1,n2} + Z_{2,3}\delta Z^{\tilde{\chi}^0,R}_{2,n2} + Z_{3,3}\delta Z^{\tilde{\chi}^0,R}_{3,n2} + Z_{4,3}\delta Z^{\tilde{\chi}^0,R}_{4,n2}\right)c_W^2\end{array}\right) Z^*_{n1,3} + \\ &\left(\begin{array}{l} Z_{n2,4}\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right) - \\ s_W\left(Z_{1,4}\delta Z^{\tilde{\chi}^0,R}_{1,n2} + Z_{2,4}\delta Z^{\tilde{\chi}^0,R}_{2,n2} + Z_{3,4}\delta Z^{\tilde{\chi}^0,R}_{3,n2} + Z_{4,4}\delta Z^{\tilde{\chi}^0,R}_{4,n2}\right)c_W^2\end{array}\right) Z^*_{n1,4}\end{aligned}$$

$$
\begin{aligned}
1 = & -\left(\begin{pmatrix} s_W\left(Z_{1,3}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,1} + Z_{2,3}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,2} + Z_{3,3}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,3} + Z_{4,3}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,4}\right) - \\ \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)Z_{n1,3} \end{pmatrix} c_W^2 + 2\left(\delta s_W\right)Z_{n1,3}s_W^2\right)Z^*_{n2,3} + \\
& \left(\begin{pmatrix} s_W\left(Z_{1,4}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,1} + Z_{2,4}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,2} + Z_{3,4}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,3} + Z_{4,4}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,4}\right) - \\ \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)Z_{n1,4} \end{pmatrix} c_W^2 + 2\left(\delta s_W\right)Z_{n1,4}s_W^2\right)Z^*_{n2,4} - \\
& \begin{pmatrix} Z_{n1,3}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n2}Z^*_{1,3} + \delta Z^{\tilde{\chi}^0,L}_{2,n2}Z^*_{2,3} + \delta Z^{\tilde{\chi}^0,L}_{3,n2}Z^*_{3,3} + \delta Z^{\tilde{\chi}^0,L}_{4,n2}Z^*_{4,3}\right) - \\ Z_{n1,4}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n2}Z^*_{1,4} + \delta Z^{\tilde{\chi}^0,L}_{2,n2}Z^*_{2,4} + \delta Z^{\tilde{\chi}^0,L}_{3,n2}Z^*_{3,4} + \delta Z^{\tilde{\chi}^0,L}_{4,n2}Z^*_{4,4}\right) \end{pmatrix} s_W c_W^2
\end{aligned}
$$

$$
\underset{406}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^0_{n2}, \gamma\right) = \frac{ie\left(\delta Z_{Z\gamma}\right)}{4c_W s_W}\left[\frac{-Z_{n1,3}Z^*_{n2,3} + Z_{n1,4}Z^*_{n2,4}}{Z_{n2,3}Z^*_{n1,3} - Z_{n2,4}Z^*_{n1,4}}\right]
$$

[FFV] 2 Quarks – Gauge Boson

$$
\underset{197}{C}\left(\overline{u}_{g1}, u_{g2}, \gamma\right) = -\frac{ie}{c_W}\left[\frac{\frac{1}{12s_W}\left(\delta_{g1,g2}\left(4c_W s_W\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) - \left(\delta Z_{Z\gamma}\right)\left(1 - 4c_W^2\right)\right) + 4c_W s_W\left(\delta\overline{Z}^{u,L}_{g2,g1} + \delta Z^{u,L}_{g1,g2}\right)\right)}{-\frac{1}{3}\left(\delta_{g1,g2}\left(s_W\left(\delta Z_{Z\gamma}\right) - c_W\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right)\right) - c_W\left(\delta\overline{Z}^{u,R}_{g2,g1} + \delta Z^{u,R}_{g1,g2}\right)\right)}\right]
$$

$$
\underset{198}{C}\left(\overline{d}_{g1}, d_{g2}, \gamma\right) = \frac{ie}{c_W}\left[\frac{\frac{1}{12s_W}\left(\delta_{g1,g2}\left(\delta Z_{Z\gamma} + 2\left(c_W s_W\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) + \left(\delta Z_{Z\gamma}\right)c_W^2\right)\right) + 2c_W s_W\left(\delta\overline{Z}^{d,L}_{g2,g1} + \delta Z^{d,L}_{g1,g2}\right)\right)}{-\frac{1}{6}\left(\delta_{g1,g2}\left(s_W\left(\delta Z_{Z\gamma}\right) - c_W\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right)\right) - c_W\left(\delta\overline{Z}^{d,R}_{g2,g1} + \delta Z^{d,R}_{g1,g2}\right)\right)}\right]
$$

$$
\underset{201}{C}\left(\overline{u}_{g1}, u_{g2}, Z\right) = \frac{ie}{c_W^3}\left[\frac{\frac{1}{12s_W^2}\left(\begin{pmatrix}\left(6\left(\delta s_W\right) + s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)\left(1 - 4c_W^2\right)\right)c_W^2 + \\ 2\left(\delta s_W - 2\left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2\end{pmatrix}\delta_{g1,g2} + s_W\left(1 - 4c_W^2\right)c_W^2\left(\delta\overline{Z}^{u,L}_{g2,g1} + \delta Z^{u,L}_{g1,g2}\right)\right)}{\frac{1}{3}\left(\delta_{g1,g2}\left(2\left(\delta s_W\right) + \left(s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right) - c_W\left(\delta Z_{\gamma Z}\right)\right)c_W^2\right) + s_W c_W^2\left(\delta\overline{Z}^{u,R}_{g2,g1} + \delta Z^{u,R}_{g1,g2}\right)\right)}\right]
$$

$$
\underset{202}{C}\left(\overline{d}_{g1}, d_{g2}, Z\right) = \frac{ie}{c_W^3}\left[\frac{\frac{1}{12s_W^2}\left(-\begin{pmatrix}c_W^2\left(6\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)\left(1 + 2c_W^2\right)\right) - \\ 2\left(\delta s_W + \left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2\end{pmatrix}\delta_{g1,g2} + s_W c_W^2\left(1 + 2c_W^2\right)\left(\delta\overline{Z}^{d,L}_{g2,g1} + \delta Z^{d,L}_{g1,g2}\right)\right)}{-\frac{1}{6}\left(\delta_{g1,g2}\left(2\left(\delta s_W\right) + \left(s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right) - c_W\left(\delta Z_{\gamma Z}\right)\right)c_W^2\right) + s_W c_W^2\left(\delta\overline{Z}^{d,R}_{g2,g1} + \delta Z^{d,R}_{g1,g2}\right)\right)}\right]
$$

$$\underset{212}{C}\left(\bar{d}_{g1}, u_{g2}, W^-\right) = \frac{ie(\boxed{1})}{2\sqrt{2}s_W^2}\begin{bmatrix}1\\ \hline 0\end{bmatrix}$$

$$\boxed{1} = \mathrm{CKM}^*_{g2,g1}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_W\right)\right) - s_W\begin{pmatrix} 2\delta\mathrm{CKM}^*_{g2,g1} + \mathrm{CKM}^*_{g2,1}\delta\bar{Z}^{d,L}_{g1,1} + \mathrm{CKM}^*_{g2,2}\delta\bar{Z}^{d,L}_{g1,2} + \mathrm{CKM}^*_{g2,3}\delta\bar{Z}^{d,L}_{g1,3} + \mathrm{CKM}^*_{1,g1}\delta Z^{u,L}_{1,g2} + \\ \mathrm{CKM}^*_{2,g1}\delta Z^{u,L}_{2,g2} + \mathrm{CKM}^*_{3,g1}\delta Z^{u,L}_{3,g2}\end{pmatrix}$$

$$\underset{213}{C}\left(\bar{u}_{g1}, d_{g2}, W^+\right) = \frac{ie(\boxed{1})}{2\sqrt{2}s_W^2}\begin{bmatrix}1\\ \hline 0\end{bmatrix}$$

$$\boxed{1} = \mathrm{CKM}_{g1,g2}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_W\right)\right) - s_W\begin{pmatrix} 2\left(\delta\mathrm{CKM}_{g1,g2}\right) + \mathrm{CKM}_{1,g2}\delta\bar{Z}^{u,L}_{g1,1} + \mathrm{CKM}_{2,g2}\delta\bar{Z}^{u,L}_{g1,2} + \mathrm{CKM}_{3,g2}\delta\bar{Z}^{u,L}_{g1,3} + \mathrm{CKM}_{g1,1}\delta Z^{d,L}_{1,g2} + \\ \mathrm{CKM}_{g1,2}\delta Z^{d,L}_{2,g2} + \mathrm{CKM}_{g1,3}\delta Z^{d,L}_{3,g2}\end{pmatrix}$$

[FFV] 2 Quarks – Gluon

$$\underset{451}{C}\left(\bar{u}_{g1}, u_{g2}, g\right) = -\frac{1}{2}ig_s\delta_{g1,g2}T^{g3}_{c1,c2}\begin{bmatrix}2\left(\delta Z_{g_s}\right) + \delta Z_{gg} + \delta\bar{Z}^{u,L}_{g1,g1} + \delta Z^{u,L}_{g2,g2}\\ \hline 2\left(\delta Z_{g_s}\right) + \delta Z_{gg} + \delta\bar{Z}^{u,R}_{g1,g1} + \delta Z^{u,R}_{g2,g2}\end{bmatrix}$$

$$\underset{452}{C}\left(\bar{d}_{g1}, d_{g2}, g\right) = -\frac{1}{2}ig_s\delta_{g1,g2}T^{g3}_{c1,c2}\begin{bmatrix}2\left(\delta Z_{g_s}\right) + \delta Z_{gg} + \delta\bar{Z}^{d,L}_{g1,g1} + \delta Z^{d,L}_{g2,g2}\\ \hline 2\left(\delta Z_{g_s}\right) + \delta Z_{gg} + \delta\bar{Z}^{d,R}_{g1,g1} + \delta Z^{d,R}_{g2,g2}\end{bmatrix}$$

[SSS] 3 Higgs

$$\underset{43}{C}\left(h^0, h^0, h^0\right) = \begin{bmatrix}-\frac{3ie(\boxed{1})}{4M_W c_W^4 s_W^2}\end{bmatrix}$$

$$\boxed{1} = \begin{array}{l} c_{2\alpha}\left(4\left(\delta s_W\right)s_{\alpha+\beta}M_W^2 s_W^2 - c_W^2\left(2\left(\delta s_W\right)s_{\alpha+\beta}M_W^2 - s_W\left(s_{\alpha+\beta}\delta M_W^2 + \left(\left(2\left(\delta Z_e\right) + 3\left(\delta Z_{hh}\right)\right)s_{\alpha+\beta} + 2\left(\delta t_\beta\right)c_{\alpha+\beta}c_\beta^2\right)M_W^2\right)\right)\right) - \\ \left(\delta Z_{hH}\right)s_W\left(c_{2\alpha}c_{\alpha+\beta} - 2s_{2\alpha}s_{\alpha+\beta}\right)c_W^2 M_W^2\end{array}$$

$$\underset{44}{C}\left(h^0,h^0,H^0\right) = \left[-\frac{ie(1)}{4M_W c_W^4 s_W^2} \right]$$

$$1 = \begin{pmatrix} s_W s_{\alpha+\beta} c_W^2 \left(\delta Z_{hH} + 2\left(\delta t_\beta\right) c_\beta^2\right) M_W^2 - \\ c_{\alpha+\beta}\left(4\left(\delta s_W\right) M_W^2 s_W^2 - c_W^2\left(2\left(\delta s_W\right) M_W^2 - s_W\left(\delta M_W^2 + \left(2\left(\delta Z_e + \delta Z_{hh}\right) + \delta Z_{HH}\right) M_W^2\right)\right)\right) \end{pmatrix} c_{2\alpha} + \\ 2 s_{2\alpha}\left(4\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 s_W^2 - \begin{pmatrix} 2\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 - \\ s_W\left(s_{\alpha+\beta}\delta M_W^2 + \left(\left(2\left(\delta Z_e + \delta Z_{hh}\right) + \delta Z_{HH}\right) s_{\alpha+\beta} - 2 c_{\alpha+\beta}\left(\delta Z_{hH} - \left(\delta t_\beta\right) c_\beta^2\right)\right) M_W^2\right) \end{pmatrix} c_W^2\right)$$

$$\underset{45}{C}\left(h^0,H^0,H^0\right) = \left[-\frac{ie(1)}{4M_W c_W^4 s_W^2} \right]$$

$$1 = \begin{pmatrix} 4 s_{2\alpha} s_W c_W^2 \left(\delta Z_{hH} + \left(\delta t_\beta\right) c_\beta^2\right) M_W^2 - \\ c_{2\alpha}\left(4\left(\delta s_W\right) M_W^2 s_W^2 - c_W^2\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{hh} + 2\left(\delta Z_{HH}\right)\right) s_W\right) M_W^2 - s_W \delta M_W^2\right)\right) \end{pmatrix} s_{\alpha+\beta} - \\ c_{\alpha+\beta}\left(8\left(\delta s_W\right) s_{2\alpha} M_W^2 s_W^2 - c_W^2\left(4\left(\delta s_W\right) s_{2\alpha} M_W^2 - \begin{pmatrix} 2 s_{2\alpha}\delta M_W^2 + \\ \left(\left(4\left(\delta Z_e\right) + 2\left(\delta Z_{hh}\right) + 4\left(\delta Z_{HH}\right)\right) s_{2\alpha} - c_{2\alpha}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right) c_\beta^2\right)\right) M_W^2 \end{pmatrix} s_W\right)\right)$$

$$\underset{46}{C}\left(H^0,H^0,H^0\right) = \left[\frac{3ie(1)}{4M_W c_W^4 s_W^2} \right]$$

$$1 = c_{2\alpha}\begin{pmatrix} s_W s_{\alpha+\beta} c_W^2 \left(\delta Z_{hH} + 2\left(\delta t_\beta\right) c_\beta^2\right) M_W^2 - \\ c_{\alpha+\beta}\left(4\left(\delta s_W\right) M_W^2 s_W^2 - c_W^2\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + 3\left(\delta Z_{HH}\right)\right) s_W\right) M_W^2 - s_W \delta M_W^2\right)\right) \end{pmatrix} + 2 s_{2\alpha} c_{\alpha+\beta} s_W c_W^2 M_W^2 \left(\delta Z_{hH}\right)$$

$$\underset{47}{C}\left(h^0,A^0,A^0\right) = \left[-\frac{ie(1)}{4M_W c_W^4 s_W^2} \right]$$

$$1 = \begin{matrix} 2\left(\delta Z_{AG}\right) s_{2\beta} s_W s_{\alpha+\beta} c_W^2 M_W^2 + \\ c_{2\beta}\left(4\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 s_W^2 - \begin{pmatrix} 2\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 - \\ s_W\left(s_{\alpha+\beta}\delta M_W^2 + \left(\left(2\left(\delta Z_e\right) + 2\left(\delta Z_{AA}\right) + \delta Z_{hh}\right) s_{\alpha+\beta} - c_{\alpha+\beta}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right) c_\beta^2\right)\right) M_W^2\right) \end{pmatrix} c_W^2\right) \end{matrix}$$

$$\underset{48}{C}\left(h^0,G^0,G^0\right) = \left[-\frac{ie(1)}{4M_W c_W^4 s_W^2} \right]$$

$$\boxed{1} = \begin{array}{l} 2\left(\delta Z_{\mathrm{AG}}\right) s_{2\beta} s_{\mathrm{W}} s_{\alpha+\beta} c_{\mathrm{W}}^2 M_{\mathrm{W}}^2 - \\ c_{2\beta}\left(4\left(\delta s_{\mathrm{W}}\right) s_{\alpha+\beta} M_{\mathrm{W}}^2 s_{\mathrm{W}}^2 - \left(\begin{array}{l} 2\left(\delta s_{\mathrm{W}}\right) s_{\alpha+\beta} M_{\mathrm{W}}^2 - \\ s_{\mathrm{W}}\left(s_{\alpha+\beta}\delta M_{\mathrm{W}}^2 + \left(\left(2\left(\delta Z_{\mathrm{e}}\right) + 2\left(\delta Z_{\mathrm{GG}}\right) + \delta Z_{\mathrm{hh}}\right) s_{\alpha+\beta} - c_{\alpha+\beta}\left(\delta Z_{\mathrm{hH}} - 2\left(\delta t_\beta\right) c_\beta^2\right)\right) M_{\mathrm{W}}^2\right) \end{array}\right) c_{\mathrm{W}}^2\right) \end{array}$$

$$\underset{49}{C}\left(h^0, A^0, G^0\right) = \left[-\frac{\mathrm{i}e s_{2\beta}}{4 M_{\mathrm{W}} c_{\mathrm{W}}^4 s_{\mathrm{W}}^2}\left(-\left(\begin{array}{l} 2 s_{\alpha+\beta}\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 - \\ s_{\mathrm{W}}\left(\left(\begin{array}{l} s_{\alpha+\beta}\left(2\left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{AA}} + \delta Z_{\mathrm{GG}} + \delta Z_{\mathrm{hh}}\right) - \\ c_{\alpha+\beta}\left(\delta Z_{\mathrm{hH}} - 2\left(\delta t_\beta\right) c_\beta^2\right) \end{array}\right) M_{\mathrm{W}}^2 + s_{\alpha+\beta}\delta M_{\mathrm{W}}^2\right) \end{array}\right) c_{\mathrm{W}}^2 + 4 s_{\alpha+\beta}\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 s_{\mathrm{W}}^2\right)\right]$$

$$\underset{50}{C}\left(H^0, A^0, A^0\right) = \left[-\frac{\mathrm{i}e(\boxed{1})}{4 M_{\mathrm{W}} c_{\mathrm{W}}^4 s_{\mathrm{W}}^2} \right]$$

$$\boxed{1} = c_{2\beta}\left(\begin{array}{l} s_{\mathrm{W}} s_{\alpha+\beta} c_{\mathrm{W}}^2\left(\delta Z_{\mathrm{hH}} + 2\left(\delta t_\beta\right) c_\beta^2\right) M_{\mathrm{W}}^2 - \\ c_{\alpha+\beta}\left(4\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 s_{\mathrm{W}}^2 - c_{\mathrm{W}}^2\left(2\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 - s_{\mathrm{W}}\left(\delta M_{\mathrm{W}}^2 + \left(2\left(\delta Z_{\mathrm{e}}\right) + 2\left(\delta Z_{\mathrm{AA}}\right) + \delta Z_{\mathrm{HH}}\right) M_{\mathrm{W}}^2\right)\right)\right) \end{array}\right) - 2 s_{2\beta} c_{\alpha+\beta} s_{\mathrm{W}} c_{\mathrm{W}}^2 M_{\mathrm{W}}^2\left(\delta Z_{\mathrm{AG}}\right)$$

$$\underset{51}{C}\left(H^0, G^0, G^0\right) = \left[\frac{\mathrm{i}e(\boxed{1})}{4 M_{\mathrm{W}} c_{\mathrm{W}}^4 s_{\mathrm{W}}^2} \right]$$

$$\boxed{1} = c_{2\beta}\left(\begin{array}{l} s_{\mathrm{W}} s_{\alpha+\beta} c_{\mathrm{W}}^2\left(\delta Z_{\mathrm{hH}} + 2\left(\delta t_\beta\right) c_\beta^2\right) M_{\mathrm{W}}^2 - \\ c_{\alpha+\beta}\left(4\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 s_{\mathrm{W}}^2 - c_{\mathrm{W}}^2\left(2\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 - s_{\mathrm{W}}\left(\delta M_{\mathrm{W}}^2 + \left(2\left(\delta Z_{\mathrm{e}}\right) + 2\left(\delta Z_{\mathrm{GG}}\right) + \delta Z_{\mathrm{HH}}\right) M_{\mathrm{W}}^2\right)\right)\right) \end{array}\right) + 2 s_{2\beta} c_{\alpha+\beta} s_{\mathrm{W}} c_{\mathrm{W}}^2 M_{\mathrm{W}}^2\left(\delta Z_{\mathrm{AG}}\right)$$

$$\underset{52}{C}\left(H^0, A^0, G^0\right) = \left[-\frac{\mathrm{i}e s_{2\beta}}{4 M_{\mathrm{W}} c_{\mathrm{W}}^4 s_{\mathrm{W}}^2}\left(\begin{array}{l} s_{\mathrm{W}} s_{\alpha+\beta} c_{\mathrm{W}}^2\left(\delta Z_{\mathrm{hH}} + 2\left(\delta t_\beta\right) c_\beta^2\right) M_{\mathrm{W}}^2 - \\ c_{\alpha+\beta}\left(4\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 s_{\mathrm{W}}^2 - c_{\mathrm{W}}^2\left(2\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 - s_{\mathrm{W}}\left(\left(2\left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{AA}} + \delta Z_{\mathrm{GG}} + \delta Z_{\mathrm{HH}}\right) M_{\mathrm{W}}^2 + \delta M_{\mathrm{W}}^2\right)\right)\right) \end{array}\right)\right]$$

$$\underset{53}{C}\left(h^0, H^-, H^+\right) = \left[\frac{\mathrm{i}e}{4 M_{\mathrm{W}} c_{\mathrm{W}}^4 s_{\mathrm{W}}^2}\left((\boxed{1}) c_{2\beta} - (\boxed{2}) c_{\mathrm{W}}^2\right) \right]$$

$$\boxed{2} = \begin{array}{l} s_{\mathrm{W}} M_{\mathrm{W}}^2\left(\left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}}\right) s_{2\beta} s_{\alpha+\beta} s_{\mathrm{W}}^2 - s_\alpha\left(2\left(\left(\delta s_\beta\right) s_{2\beta} - \left(\delta Z_{\mathrm{hH}}\right) s_\beta\right) c_{\mathrm{W}}^2 + \left(\delta c_\beta\right)\left(2 - 4 c_\beta^2 s_{\mathrm{W}}^2\right)\right)\right) + \\ c_\beta\left(2\left(\delta s_{\mathrm{W}}\right) s_\alpha M_{\mathrm{W}}^2 + s_{\mathrm{W}}\left(\left(\left(\delta Z_{\mathrm{hH}}\right) c_\alpha - \left(2\left(\delta Z_{\mathrm{e}}\right) + \delta\overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{hh}} + \delta Z_{\mathrm{H^-H^-}}\right) s_\alpha\right) M_{\mathrm{W}}^2 - s_\alpha \delta M_{\mathrm{W}}^2\right)\right)\left(-2 c_\beta^2 s_{\mathrm{W}}^2 + 2 c_{\mathrm{W}}^2 s_\beta^2 + 1\right) + \\ 2 c_\alpha\left(\left(\delta s_\beta\right) s_{\mathrm{W}} M_{\mathrm{W}}^2\left(1 - 2 s_{\mathrm{W}}^2 s_\beta^2\right) - c_{\mathrm{W}}^2\left(2\left(\delta s_{\mathrm{W}}\right) s_\beta M_{\mathrm{W}}^2 - s_{\mathrm{W}}\left(s_\beta \delta M_{\mathrm{W}}^2 + \left(\left(\delta c_\beta\right) s_{2\beta} + \left(2\left(\delta Z_{\mathrm{e}}\right) + \delta\overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{hh}} + \delta Z_{\mathrm{H^-H^-}}\right) s_\beta\right) M_{\mathrm{W}}^2\right)\right)\right) \end{array}$$

$$\boxed{1} = \begin{array}{l} -s_{\mathrm{W}}\left(4\left(\delta s_{\mathrm{W}}\right) s_{\mathrm{W}} s_{\alpha+\beta} + \left(\delta Z_{\mathrm{hH}}\right) s_\alpha s_\beta c_{\mathrm{W}}^2 - \left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}}\right) c_{\alpha+\beta} c_{\mathrm{W}}^4\right) M_{\mathrm{W}}^2 + \\ c_\alpha s_\beta c_{\mathrm{W}}^2\left(2\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 - s_{\mathrm{W}}\left(\delta M_{\mathrm{W}}^2 + \left(2\left(\delta Z_{\mathrm{e}}\right) + \delta\overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{hh}} + \delta Z_{\mathrm{H^-H^-}}\right) M_{\mathrm{W}}^2\right)\right) \end{array}$$

$$\underset{54}{C}\left(h^0,G^-,G^+\right) = \left[\frac{ie}{4M_W c_W^4 s_W^2}\left((1)c_{2\beta} - \left(\begin{array}{l} c_\alpha\left(\delta s_\beta\right)\left(2-4c_\beta^2 s_W^2\right) - s_\alpha\left(\delta c_\beta\right)\left(2-4s_W^2 s_\beta^2\right) - \\ s_{2\beta}\left(2\left(c_\alpha\left(\delta c_\beta\right) - s_\alpha\left(\delta s_\beta\right)\right)c_W^2 - s_{\alpha+\beta}\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)s_W^2\right)\end{array}\right)s_W c_W^2 M_W^2\right)\right]$$

$$\begin{array}{l} (1) = -c_W^2\left(2\left(\delta s_W\right)s_{\alpha+\beta}M_W^2 + s_W\left(\left(\left(\delta Z_{hH}\right)c_{\alpha+\beta} - \left(2\left(\delta Z_e\right) + \delta Z_{hh} + 2\left(\delta Z_{G^-G^-}\right)\right)s_{\alpha+\beta}\right)M_W^2 - s_{\alpha+\beta}\delta M_W^2\right)\right) + \\ M_W^2\left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)c_{\alpha+\beta}s_W c_W^4 + 4\left(\delta s_W\right)s_{\alpha+\beta}s_W^2\right)\end{array}$$

$$\underset{55}{C}\left(h^0,H^-,G^+\right) = \left[-\frac{ie}{4M_W c_W^4 s_W^2}\left((1)s_W - \left(\begin{array}{l} s_W s_{\alpha+\beta}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right)c_\beta^2\right)M_W^2 - \\ c_{\alpha+\beta}\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\left(2\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)M_W^2 + \delta M_W^2\right)\right)\end{array}\right)c_{2\beta}c_W^4\right)\right]$$

$$\begin{array}{l} (1) = 2M_W^2\left(\left(\delta Z_{G^-H^-}\right)s_{\beta\text{-}\alpha}c_W^4 + 2\left(\delta s_W\right)s_{2\beta}s_{\alpha+\beta}s_W^3\right) + \\ s_{2\beta}s_W c_W^2\left(2\left(\delta s_W\right)s_{\alpha+\beta}M_W^2 + s_W\left(s_{\alpha+\beta}\delta M_W^2 - \left(\begin{array}{l} c_{\alpha+\beta}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right)c_\beta^2\right) - \\ \left(2\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)s_{\alpha+\beta}\end{array}\right)M_W^2\right)\right)\end{array}$$

$$\underset{56}{C}\left(h^0,G^-,H^+\right) = \left[-\frac{ie}{4M_W c_W^4 s_W^2}\left((1)s_W - \left(\begin{array}{l} s_W s_{\alpha+\beta}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right)c_\beta^2\right)M_W^2 - \\ c_{\alpha+\beta}\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh} + \delta Z_{G^-G^-}\right)M_W^2 + \delta M_W^2\right)\right)\end{array}\right)c_{2\beta}c_W^4\right)\right]$$

$$\begin{array}{l} (1) = M_W^2\left(4\left(\delta s_W\right)s_{2\beta}s_{\alpha+\beta}s_W^3 + \left(\delta Z_{H^-G^-}\right)c_W^4\left(c_{\alpha+\beta}s_{2\beta} - 2s_\alpha c_\beta^3 + 2c_\alpha s_\beta^3\right)\right) + \\ s_{2\beta}s_W c_W^2\left(2\left(\delta s_W\right)s_{\alpha+\beta}M_W^2 + s_W\left(s_{\alpha+\beta}\delta M_W^2 - \left(\begin{array}{l} c_{\alpha+\beta}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right)c_\beta^2\right) - \\ \left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh} + \delta Z_{G^-G^-}\right)s_{\alpha+\beta}\end{array}\right)M_W^2\right)\right)\end{array}$$

$$\underset{57}{C}\left(H^0,H^-,H^+\right) = \left[-\frac{ie}{4M_W c_W^4 s_W^2}\left(-\left(\begin{array}{l} M_W^2\left(s_W s_{\alpha+\beta}\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)c_W^4 + 4c_{\alpha+\beta}\left(\delta s_W\right)s_W^2\right) + \\ s_\alpha s_\beta c_W^2\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{HH} + \delta Z_{H^-H^-}\right)M_W^2 + \delta M_W^2\right)\right)\end{array}\right)c_{2\beta} + (2)c_W^2\right)\right]$$

$$\begin{array}{l} (2) = (1)c_\alpha - s_W M_W^2\left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)c_{\alpha+\beta}s_{2\beta}s_W^2 + s_\alpha\left(\left(\delta Z_{hH}\right)\left(c_\beta - 2c_\beta^3 s_W^2\right) - \left(\delta s_\beta\right)\left(2-4s_W^2 s_\beta^2\right)\right)\right) - \\ 2s_\alpha c_W^2\left(2\left(\delta s_W\right)s_\beta M_W^2 - s_W\left(\left(\delta c_\beta\right)s_{2\beta}M_W^2 - s_\beta\left(\left(\frac{1}{2}s_{2\beta}\left(\delta Z_{hH}\right) - 2\left(\delta Z_e\right) - \delta\overline{Z}_{H^-H^-} - \delta Z_{HH} - \delta Z_{H^-H^-}\right)M_W^2 - \delta M_W^2\right)\right)\right)\end{array}$$

$$\begin{array}{l} (1) = s_W M_W^2\left(2\left(\delta s_\beta\right)s_{2\beta}c_W^2 + \left(\delta Z_{hH}\right)s_\beta\left(c_{2\beta} + 2c_W^2\right) + \left(\delta c_\beta\right)\left(2-4c_\beta^2 s_W^2\right)\right) - \\ c_\beta\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\delta M_W^2 + \left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{HH} + \delta Z_{H^-H^-}\right)M_W^2\right)\right)\left(-2c_\beta^2 s_W^2 + 2c_W^2 s_\beta^2 + 1\right)\end{array}$$

$$\underset{58}{C}\left(H^0,G^-,G^+\right) = \left[-\frac{ie(2)}{4M_W c_W^4 s_W^2}\right]$$

$$2 = -c_{2\beta}\left((1)c_W^2 + M_W^2\left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)s_W s_{\alpha+\beta}c_W^4 - 4\left(\delta s_W\right)c_{\alpha+\beta}s_W^2\right)\right) + \left(\begin{array}{l}\left(\delta s_\beta\right)s_\alpha\left(2 - 4c_\beta^2 s_W^2\right) + \left(\delta c_\beta\right)c_\alpha\left(2 - 4s_W^2 s_\beta^2\right) - \\ s_{2\beta}\left(2\left(\left(\delta s_\beta\right)c_\alpha + \left(\delta c_\beta\right)s_\alpha\right)c_W^2 + \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)c_{\alpha+\beta}s_W^2\right)\end{array}\right)s_W c_W^2 M_W^2$$

$$1 = \left(\delta Z_{hH}\right)s_W s_{\alpha+\beta}M_W^2 + c_\alpha c_\beta\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\delta M_W^2 + \left(2\left(\delta Z_e\right) + \delta Z_{HH} + 2\left(\delta Z_{G^-G^-}\right)\right)M_W^2\right)\right) - s_\alpha s_\beta\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{HH} + 2\left(\delta Z_{G^-G^-}\right)\right)s_W\right)M_W^2 - s_W\delta M_W^2\right)$$

$$\underset{59}{C}\left(H^0, H^-, G^+\right) = \left[-\frac{ie}{4M_W c_W^4 s_W^2}\left((1)s_W + \left(\begin{array}{l}2s_{\alpha+\beta}\left(\delta s_W\right)M_W^2 - \\ s_W\left(\left(\begin{array}{l}c_{\alpha+\beta}\left(\delta Z_{hH} + 2\left(\delta t_\beta\right)c_\beta^2\right) + \\ s_{\alpha+\beta}\left(2\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)\end{array}\right)M_W^2 + s_{\alpha+\beta}\delta M_W^2\right)\end{array}\right)c_{2\beta}c_W^4\right)\right]$$

$$1 = c_W^2 M_W^2\left(s_{2\beta}s_{\alpha+\beta}\left(\delta Z_{hH} + 2\left(\delta t_\beta\right)c_\beta^2\right)s_W^2 + \left(\delta Z_{G^-H^-}\right)c_W^2\left(s_{2\beta}\left(2c_\beta s_\alpha - s_{\alpha+\beta}\right) + 2\left(c_\alpha\left(s_{2\beta}s_\beta + c_\beta^3\right) + s_\alpha s_\beta^3\right)\right)\right) - c_{\alpha+\beta}s_{2\beta}s_W\left(c_W^2\left(s_W\delta M_W^2 + \left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)s_W\right)M_W^2\right) + 4\left(\delta s_W\right)M_W^2 s_W^2\right)$$

$$\underset{60}{C}\left(H^0, G^-, H^+\right) = \left[-\frac{ie}{4M_W c_W^4 s_W^2}\left((1)s_W + \left(\begin{array}{l}2s_{\alpha+\beta}\left(\delta s_W\right)M_W^2 - \\ s_W\left(\left(\begin{array}{l}c_{\alpha+\beta}\left(\delta Z_{hH} + 2\left(\delta t_\beta\right)c_\beta^2\right) + \\ s_{\alpha+\beta}\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{HH} + \delta Z_{G^-G^-}\right)\end{array}\right)M_W^2 + s_{\alpha+\beta}\delta M_W^2\right)\end{array}\right)c_{2\beta}c_W^4\right)\right]$$

$$1 = -c_{\alpha+\beta}s_{2\beta}s_W\left(c_W^2\left(s_W\delta M_W^2 + \left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{HH} + \delta Z_{G^-G^-}\right)s_W\right)M_W^2\right) + 4\left(\delta s_W\right)M_W^2 s_W^2\right) + c_W^2 M_W^2\left(s_{2\beta}s_{\alpha+\beta}\left(\delta Z_{hH} + 2\left(\delta t_\beta\right)c_\beta^2\right)s_W^2 + \left(\delta Z_{H^-G^-}\right)c_W^2\left(s_{2\beta}s_{\alpha+\beta} + 2c_\alpha c_\beta^3 + 2s_\alpha s_\beta^3\right)\right)$$

$$\underset{61}{C}\left(A^0, H^-, G^+\right) = \left[\frac{e}{4M_W s_W^2}\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^-H^-}\right)\right)M_W^2 - s_W\left(\left(2\left(c_\beta\left(\delta c_\beta\right) + s_\beta\left(\delta s_\beta\right)\right) + \delta Z_{G^-G^-}\right)M_W^2 + \delta M_W^2\right)\right)\right]$$

$$\underset{62}{C}\left(A^0, G^-, H^+\right) = \left[-\frac{e}{4M_W s_W^2}\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right)\right)M_W^2 - s_W\left(\left(\delta\overline{Z}_{H^-H^-} + 2\left(c_\beta\left(\delta c_\beta\right) + s_\beta\left(\delta s_\beta\right)\right)\right)M_W^2 + \delta M_W^2\right)\right)\right]$$

$$\underset{63}{C}\left(G^0, H^-, G^+\right) = \left[-\frac{eM_W}{4s_W}\left(2s_\beta\left(\delta c_\beta\right) - 2c_\beta\left(\delta s_\beta\right) + \delta Z_{AG}\right)\right]$$

$$\underset{64}{C}\left(G^0, G^-, H^+\right) = \left[\frac{eM_W}{4s_W}\left(2s_\beta\left(\delta c_\beta\right) - 2c_\beta\left(\delta s_\beta\right) + \delta Z_{AG}\right)\right]$$

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$$\underset{214}{C}\left(A^0, \tilde{e}^{s2}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[\frac{e\delta_{g2,g3}}{4c_\beta^2 M_W^3 s_W^2}\left((1)m_{e_{g2}}s_W - \left(\begin{array}{l}\left((3)c_\beta + (2)m_{e_{g2}}\right)s_W - \\ 2\left(\begin{array}{l}\left(\mu c_\beta + s_\beta A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \\ \left(c_\beta\mu^* + s_\beta A^{e}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)c_\beta m_{e_{g2}}(\delta s_W)\end{array}\right)M_W^2\right)\right]$$

$$(3) = 2\delta m^{e_g}_{g2}\left(\begin{array}{l}\left(\mu c_\beta + s_\beta A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \\ \left(c_\beta\mu^* + s_\beta A^{e}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right) - m_{e_{g2}}\left(\begin{array}{l}\left(c_\beta\mu^* + s_\beta A^{e}_{g2,g2}\right)\left(\delta Z^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g2}*}_{1,1} + \delta Z^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g2}*}_{2,1}\right)U^{\tilde{e}_{g2}}_{s3,2} - \\ \left(\mu c_\beta + s_\beta A^{e*}_{g2,g2}\right)\left(\delta Z^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g2}*}_{1,2} + \delta Z^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g2}*}_{2,2}\right)U^{\tilde{e}_{g2}}_{s3,1}\end{array}\right)$$

$$(2) = \begin{array}{l}\left(s_{2\beta}\delta A^{e*}_{g2,g2} + 2(\delta\mu)c_\beta^2\right)U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \left(s_{2\beta}\delta A^{e}_{g2,g2} + 2\delta\mu^* c_\beta^2\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2} + \\ \left(\begin{array}{l}\left(\mu c_\beta + s_\beta A^{e*}_{g2,g2}\right)\left(\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g2}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g2}}_{2,1}\right)U^{\tilde{e}_{g2}*}_{s2,2} - \\ \left(c_\beta\mu^* + s_\beta A^{e}_{g2,g2}\right)\left(\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g2}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g2}}_{2,2}\right)U^{\tilde{e}_{g2}*}_{s2,1}\end{array}\right)c_\beta\end{array}$$

$$(1) = \begin{array}{l} - \left(\begin{array}{l}\left(\mu s_\beta - c_\beta A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \\ \left(s_\beta\mu^* - c_\beta A^{e}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)(\delta Z_{AG})c_\beta M_W^2 + \\ \left(\begin{array}{l}\left(\mu c_\beta + s_\beta A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \\ \left(c_\beta\mu^* + s_\beta A^{e}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)\left(c_\beta\delta M_W^2 + \left(2(\delta c_\beta) - \left(2(\delta Z_e) + \delta Z_{AA}\right)c_\beta\right)M_W^2\right)\end{array}$$

$$\underset{215}{C}\left(G^0, \tilde{e}^{s2}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[\frac{e(3)\delta_{g2,g3}}{4c_\beta^2 M_W^3 s_W^2}\right]$$

$$(3) = \begin{array}{l}\left(\begin{array}{l}\left(\mu s_\beta - c_\beta A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \\ \left(s_\beta\mu^* - c_\beta A^{e}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)m_{e_{g2}}s_W\left(c_\beta\delta M_W^2 + \left(2(\delta c_\beta) - \left(2(\delta Z_e) + \delta Z_{GG}\right)c_\beta\right)M_W^2\right) - \\ \left((2)s_W - 2\left(\begin{array}{l}\left(\mu s_\beta - c_\beta A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \\ \left(s_\beta\mu^* - c_\beta A^{e}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)(\delta s_W)c_\beta m_{e_{g2}}\right)M_W^2\end{array}$$

$$(2) = m_{e_{g2}}\left(\begin{array}{l}(1)c_\beta - 2\delta A^{e*}_{g2,g2}c_\beta^2 U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \\ \left(s_{2\beta}\delta\mu^* - 2\delta A^{e}_{g2,g2}c_\beta^2\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right) + 2c_\beta\delta m^{e_g}_{g2}\left(\begin{array}{l}\left(\mu s_\beta - c_\beta A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \\ \left(s_\beta\mu^* - c_\beta A^{e}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)$$

$$
\begin{aligned}
\boxed{1} = \; & -\left(s_\beta \mu^* - c_\beta A^e_{g2,g2}\right)\left(\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g2}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g2}}_{2,2}\right) U^{\tilde{e}_{g2}*}_{s2,1} + \\
& U^{\tilde{e}_{g2}*}_{s2,2}\left(\left(\mu s_\beta - c_\beta A^{e*}_{g2,g2}\right)\left(\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g2}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g2}}_{2,1}\right) + 2(\delta\mu) s_\beta U^{\tilde{e}_{g2}}_{s3,1}\right) + \\
& (\delta Z_{AG})\left(\left(\mu c_\beta + s_\beta A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}*}_{s2,2} U^{\tilde{e}_{g2}}_{s3,1} - \left(c_\beta \mu^* + s_\beta A^e_{g2,g2}\right) U^{\tilde{e}_{g2}*}_{s2,1} U^{\tilde{e}_{g2}}_{s3,2}\right) + \\
& \delta Z^{\tilde{e}_{g2}}_{1,s2}\left(\left(\mu s_\beta - c_\beta A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}*}_{1,2} U^{\tilde{e}_{g2}}_{s3,1} - \left(s_\beta \mu^* - c_\beta A^e_{g2,g2}\right) U^{\tilde{e}_{g2}*}_{1,1} U^{\tilde{e}_{g2}}_{s3,2}\right) + \\
& \delta Z^{\tilde{e}_{g2}}_{2,s2}\left(\left(\mu s_\beta - c_\beta A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}*}_{2,2} U^{\tilde{e}_{g2}}_{s3,1} - \left(s_\beta \mu^* - c_\beta A^e_{g2,g2}\right) U^{\tilde{e}_{g2}*}_{2,1} U^{\tilde{e}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\underset{220}{C}\left(h^0, \tilde{\nu}_{g2}, \tilde{\nu}^\dagger_{g3}\right) = \left[-\frac{ie(\boxed{1})\delta_{g2,g3}}{4 M_Z c_W^3 s_W^2} \right]
$$

$$
\begin{aligned}
\boxed{1} = \; & c_W^2\left(2\left(\delta s_W\right) s_{\alpha+\beta} M_Z^2 - s_W\left(s_{\alpha+\beta}\delta M_Z^2 + 2\left(\left(\delta Z_e\right) s_{\alpha+\beta} + \left(\delta t_\beta\right) c_{\alpha+\beta} c_\beta^2\right) M_Z^2\right)\right) - \\
& M_Z^2\left(2\left(\delta s_W\right) s_{\alpha+\beta} s_W^2 - s_W\left(\left(\delta Z_{hH}\right) c_{\alpha+\beta} - s_{\alpha+\beta}\left(\delta Z_{hh} + \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right) c_W^2\right)
\end{aligned}
$$

$$
\underset{221}{C}\left(H^0, \tilde{\nu}_{g2}, \tilde{\nu}^\dagger_{g3}\right) = \left[-\frac{ie\delta_{g2,g3}}{4 M_Z c_W^3 s_W^2}\left(\begin{array}{l} c_{\alpha+\beta} c_W^2\left(2\left(s_W\left(\delta Z_e\right) - \delta s_W\right) M_Z^2 + s_W \delta M_Z^2\right) + \\ \left(\begin{array}{l} 2 c_{\alpha+\beta} s_W\left(\delta s_W\right) - \\ c_W^2\left(s_{\alpha+\beta}\left(\delta Z_{hH} + 2\left(\delta t_\beta\right) c_\beta^2\right) - c_{\alpha+\beta}\left(\delta Z_{HH} + \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right) \end{array} \right) s_W M_Z^2 \end{array} \right) \right]
$$

$$
\underset{222}{C}\left(h^0, \tilde{e}^{s2}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[\left(\frac{1}{4} ie \delta_{g2,g3}\right)\left(\begin{array}{l} \frac{\boxed{4}}{c_\beta M_W} + \frac{\boxed{10}}{s_W} + \\ 2\left(\frac{s_{\alpha+\beta}\left(\delta s_W\right)}{c_W^3} + \frac{c_{\alpha+\beta}\left(\delta t_\beta\right) c_\beta^2}{c_W s_W}\right) M_Z\left(\left(1 - 2c_W^2\right) U^{\tilde{e}_{g2}*}_{s2,1} U^{\tilde{e}_{g2}}_{s3,1} - 2 s_W^2 U^{\tilde{e}_{g2}*}_{s2,2} U^{\tilde{e}_{g2}}_{s3,2}\right) \end{array} \right) \right]
$$

$$
\begin{aligned}
\boxed{10} = \; & \frac{\boxed{9}}{c_\beta M_W} + \frac{s_{\alpha+\beta}\delta M_Z^2}{c_W M_Z}\left(\left(1 - 2c_W^2\right) U^{\tilde{e}_{g2}*}_{s2,1} U^{\tilde{e}_{g2}}_{s3,1} - 2 s_W^2 U^{\tilde{e}_{g2}*}_{s2,2} U^{\tilde{e}_{g2}}_{s3,2}\right) - \\
& \frac{m_{e_{g2}}}{c_\beta^2 M_W^3}\left(\begin{array}{l} U^{\tilde{e}_{g2}*}_{s2,2}\left(\left(\mu c_\alpha + s_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} + 2 m_{e_{g2}} s_\alpha U^{\tilde{e}_{g2}}_{s3,2}\right) + \\ U^{\tilde{e}_{g2}*}_{s2,1}\left(2 m_{e_{g2}} s_\alpha U^{\tilde{e}_{g2}}_{s3,1} + \left(c_\alpha \mu^* + s_\alpha A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2}\right) \end{array} \right)\left(c_\beta \delta M_W^2 + 2\left(\delta c_\beta\right) M_W^2\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{9} = \; & \frac{1}{c_W}\left(\left(\boxed{5}\right)\left(2\left(\delta Z_e\right) + \delta Z_{hh}\right) - \left(\boxed{6}\right)\left(\delta Z_{hH}\right) + \left(\boxed{7}\right)\delta Z^{\tilde{e}_{g2}}_{1,s2} + \left(\boxed{8}\right)\delta Z^{\tilde{e}_{g2}}_{2,s2}\right) + \\
& 2\left(\begin{array}{l} U^{\tilde{e}_{g2}*}_{s2,2}\left(\left(\mu c_\alpha + s_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} + 4 m_{e_{g2}} s_\alpha U^{\tilde{e}_{g2}}_{s3,2}\right) + \\ U^{\tilde{e}_{g2}*}_{s2,1}\left(4 m_{e_{g2}} s_\alpha U^{\tilde{e}_{g2}}_{s3,1} + \left(c_\alpha \mu^* + s_\alpha A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2}\right) \end{array} \right) \delta m^{e_g}_{g2}
\end{aligned}
$$

$$
\begin{aligned}
\boxed{8} = \; & U^{\tilde{e}_{g2}*}_{2,1}\left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(1 - 2c_W^2\right) + 2 c_W s_\alpha m^2_{e_{g2}}\right) U^{\tilde{e}_{g2}}_{s3,1} + c_W m_{e_{g2}}\left(c_\alpha \mu^* + s_\alpha A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2}\right) + \\
& U^{\tilde{e}_{g2}*}_{2,2}\left(c_W m_{e_{g2}}\left(\mu c_\alpha + s_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} + \left(2 c_W s_\alpha m^2_{e_{g2}} - 2 c_\beta M_W M_Z s_{\alpha+\beta} s_W^2\right) U^{\tilde{e}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\boxed{7} = \begin{array}{l} U_{1,1}^{\tilde{e}_{g2}*}\left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(1-2c_W^2\right)+2c_W s_\alpha m_{e_{g2}}^2\right)U_{s3,1}^{\tilde{e}_{g2}}+c_W m_{e_{g2}}\left(c_\alpha\mu^*+s_\alpha A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}}\right)+ \\ U_{1,2}^{\tilde{e}_{g2}*}\left(c_W m_{e_{g2}}\left(\mu c_\alpha+s_\alpha A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}}+\left(2c_W s_\alpha m_{e_{g2}}^2-2c_\beta M_W M_Z s_{\alpha+\beta}s_W^2\right)U_{s3,2}^{\tilde{e}_{g2}}\right) \end{array}
$$

$$
\boxed{6} = \begin{array}{l} -U_{s2,2}^{\tilde{e}_{g2}*}\left(c_W m_{e_{g2}}\left(\mu s_\alpha-c_\alpha A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}}-2\left(c_W c_\alpha m_{e_{g2}}^2-c_{\alpha+\beta}c_\beta M_W M_Z s_W^2\right)U_{s3,2}^{\tilde{e}_{g2}}\right)+ \\ U_{s2,1}^{\tilde{e}_{g2}*}\left(\left(c_{\alpha+\beta}c_\beta M_W M_Z\left(1-2c_W^2\right)+2c_W c_\alpha m_{e_{g2}}^2\right)U_{s3,1}^{\tilde{e}_{g2}}-c_W m_{e_{g2}}\left(s_\alpha\mu^*-c_\alpha A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}}\right) \end{array}
$$

$$
\boxed{5} = \begin{array}{l} U_{s2,1}^{\tilde{e}_{g2}*}\left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(1-2c_W^2\right)+2c_W s_\alpha m_{e_{g2}}^2\right)U_{s3,1}^{\tilde{e}_{g2}}+c_W m_{e_{g2}}\left(c_\alpha\mu^*+s_\alpha A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}}\right)+ \\ U_{s2,2}^{\tilde{e}_{g2}*}\left(c_W m_{e_{g2}}\left(\mu c_\alpha+s_\alpha A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}}+\left(2c_W s_\alpha m_{e_{g2}}^2-2c_\beta M_W M_Z s_{\alpha+\beta}s_W^2\right)U_{s3,2}^{\tilde{e}_{g2}}\right) \end{array}
$$

$$
\boxed{4} = \frac{1}{s_W}\left(2m_{e_{g2}}\left(\begin{array}{l}\left((\delta\mu)c_\alpha+s_\alpha\delta A_{g2,g2}^{e*}\right)U_{s2,2}^{\tilde{e}_{g2}*}U_{s3,1}^{\tilde{e}_{g2}}+ \\ \left(c_\alpha\delta\mu^*+s_\alpha\delta A_{g2,g2}^{e}\right)U_{s2,1}^{\tilde{e}_{g2}*}U_{s3,2}^{\tilde{e}_{g2}}\end{array}\right)+\frac{1}{c_W}\left((\boxed{1})\delta\overline{Z}_{1,s3}^{\tilde{e}_{g3}}+(\boxed{2})\delta\overline{Z}_{2,s3}^{\tilde{e}_{g3}}\right)\right)+\frac{2(\boxed{3})(\delta s_W)}{c_W s_W^2}
$$

$$
\boxed{3} = \begin{array}{l} U_{s2,1}^{\tilde{e}_{g2}*}\left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(3-2c_W^2\right)-2c_W s_\alpha m_{e_{g2}}^2\right)U_{s3,1}^{\tilde{e}_{g2}}-c_W m_{e_{g2}}\left(c_\alpha\mu^*+s_\alpha A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}}\right)- \\ U_{s2,2}^{\tilde{e}_{g2}*}\left(c_W m_{e_{g2}}\left(\mu c_\alpha+s_\alpha A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}}+2\left(c_W s_\alpha m_{e_{g2}}^2+c_\beta M_W M_Z s_{\alpha+\beta}s_W^2\right)U_{s3,2}^{\tilde{e}_{g2}}\right) \end{array}
$$

$$
\boxed{2} = \begin{array}{l} \left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(1-2c_W^2\right)+2c_W s_\alpha m_{e_{g2}}^2\right)U_{2,1}^{\tilde{e}_{g2}}+c_W m_{e_{g2}}\left(c_\alpha\mu^*+s_\alpha A_{g2,g2}^{e}\right)U_{2,2}^{\tilde{e}_{g2}}\right)U_{s2,1}^{\tilde{e}_{g2}*}+ \\ \left(c_W m_{e_{g2}}\left(\mu c_\alpha+s_\alpha A_{g2,g2}^{e*}\right)U_{2,1}^{\tilde{e}_{g2}}+\left(2c_W s_\alpha m_{e_{g2}}^2-2c_\beta M_W M_Z s_{\alpha+\beta}s_W^2\right)U_{2,2}^{\tilde{e}_{g2}}\right)U_{s2,2}^{\tilde{e}_{g2}*} \end{array}
$$

$$
\boxed{1} = \begin{array}{l} \left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(1-2c_W^2\right)+2c_W s_\alpha m_{e_{g2}}^2\right)U_{1,1}^{\tilde{e}_{g2}}+c_W m_{e_{g2}}\left(c_\alpha\mu^*+s_\alpha A_{g2,g2}^{e}\right)U_{1,2}^{\tilde{e}_{g2}}\right)U_{s2,1}^{\tilde{e}_{g2}*}+ \\ \left(c_W m_{e_{g2}}\left(\mu c_\alpha+s_\alpha A_{g2,g2}^{e*}\right)U_{1,1}^{\tilde{e}_{g2}}+\left(2c_W s_\alpha m_{e_{g2}}^2-2c_\beta M_W M_Z s_{\alpha+\beta}s_W^2\right)U_{1,2}^{\tilde{e}_{g2}}\right)U_{s2,2}^{\tilde{e}_{g2}*} \end{array}
$$

$$
\underset{223}{C}\left(H^0,\tilde{e}_{g2}^{s2},\tilde{e}_{g3}^{s3,\dagger}\right) = \left[\frac{ie\delta_{g2,g3}}{4s_W^2}\left((\boxed{9})s_W-\frac{1}{c_W c_\beta M_W}\left((\boxed{1})U_{s2,1}^{\tilde{e}_{g2}*}-(\boxed{2})U_{s2,2}^{\tilde{e}_{g2}*}\right)\right)\right]
$$

$$
\boxed{9} = \begin{array}{l} -\frac{\boxed{8}}{c_\beta M_W}-\frac{1}{c_W}\left(\frac{1}{c_\beta M_W}\left((\boxed{3})U_{s2,1}^{\tilde{e}_{g2}*}-(\boxed{4})U_{s2,2}^{\tilde{e}_{g2}*}\right)+\frac{c_{\alpha+\beta}\delta M_Z^2}{M_Z}\left(\left(1-2c_W^2\right)U_{s2,1}^{\tilde{e}_{g2}*}U_{s3,1}^{\tilde{e}_{g2}}-2s_W^2U_{s2,2}^{\tilde{e}_{g2}*}U_{s3,2}^{\tilde{e}_{g2}}\right)\right)- \\ \frac{m_{e_{g2}}}{c_\beta^2M_W^3}\left(\begin{array}{l}U_{s2,2}^{\tilde{e}_{g2}*}\left(\left(\mu s_\alpha-c_\alpha A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}}-2c_\alpha m_{e_{g2}}U_{s3,2}^{\tilde{e}_{g2}}\right)- \\ U_{s2,1}^{\tilde{e}_{g2}*}\left(2c_\alpha m_{e_{g2}}U_{s3,1}^{\tilde{e}_{g2}}-\left(s_\alpha\mu^*-c_\alpha A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}}\right)\end{array}\right)\left(c_\beta\delta M_W^2+2\left(\delta c_\beta\right)M_W^2\right)- \\ \frac{2M_Z}{c_W^3}\left(\left(\delta s_W\right)c_{\alpha+\beta}s_W-\left(\delta t_\beta\right)s_{\alpha+\beta}c_W^2c_\beta^2\right)\left(\left(1-2c_W^2\right)U_{s2,1}^{\tilde{e}_{g2}*}U_{s3,1}^{\tilde{e}_{g2}}-2s_W^2U_{s2,2}^{\tilde{e}_{g2}*}U_{s3,2}^{\tilde{e}_{g2}}\right) \end{array}
$$

$$
\boxed{8} = \frac{1}{c_W}\left((\boxed{6})\delta Z_{1,s2}^{\tilde{e}_{g2}}+(\boxed{7})\delta Z_{2,s2}^{\tilde{e}_{g2}}+(\boxed{5})\left(2\left(\delta Z_e\right)+\delta Z_{HH}\right)\right)-2\delta m_{g2}^{e_g}\left(\begin{array}{l}U_{s2,2}^{\tilde{e}_{g2}*}\left(\left(\mu s_\alpha-c_\alpha A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}}-4c_\alpha m_{e_{g2}}U_{s3,2}^{\tilde{e}_{g2}}\right)- \\ U_{s2,1}^{\tilde{e}_{g2}*}\left(4c_\alpha m_{e_{g2}}U_{s3,1}^{\tilde{e}_{g2}}-\left(s_\alpha\mu^*-c_\alpha A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}}\right)\end{array}\right)
$$

$$
\begin{aligned}
7 = {} & -U_{2,2}^{\tilde{e}_{g2}*}\left(c_W m_{e_{g2}}\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}} - 2\left(c_W c_\alpha m_{e_{g2}}^2 - c_{\alpha+\beta}c_\beta M_W M_Z s_W^2\right)U_{s3,2}^{\tilde{e}_{g2}}\right) + \\
& U_{2,1}^{\tilde{e}_{g2}*}\left(\left(c_{\alpha+\beta}c_\beta M_W M_Z\left(1-2c_W^2\right) + 2c_W c_\alpha m_{e_{g2}}^2\right)U_{s3,1}^{\tilde{e}_{g2}} - c_W m_{e_{g2}}\left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}}\right)
\end{aligned}
$$

$$
\begin{aligned}
6 = {} & -U_{1,2}^{\tilde{e}_{g2}*}\left(c_W m_{e_{g2}}\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}} - 2\left(c_W c_\alpha m_{e_{g2}}^2 - c_{\alpha+\beta}c_\beta M_W M_Z s_W^2\right)U_{s3,2}^{\tilde{e}_{g2}}\right) + \\
& U_{1,1}^{\tilde{e}_{g2}*}\left(\left(c_{\alpha+\beta}c_\beta M_W M_Z\left(1-2c_W^2\right) + 2c_W c_\alpha m_{e_{g2}}^2\right)U_{s3,1}^{\tilde{e}_{g2}} - c_W m_{e_{g2}}\left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}}\right)
\end{aligned}
$$

$$
\begin{aligned}
5 = {} & -U_{s2,2}^{\tilde{e}_{g2}*}\left(c_W m_{e_{g2}}\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}} - 2\left(c_W c_\alpha m_{e_{g2}}^2 - c_{\alpha+\beta}c_\beta M_W M_Z s_W^2\right)U_{s3,2}^{\tilde{e}_{g2}}\right) + \\
& U_{s2,1}^{\tilde{e}_{g2}*}\left(\left(c_{\alpha+\beta}c_\beta M_W M_Z\left(1-2c_W^2\right) + 2c_W c_\alpha m_{e_{g2}}^2\right)U_{s3,1}^{\tilde{e}_{g2}} - c_W m_{e_{g2}}\left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}}\right)
\end{aligned}
$$

$$
\begin{aligned}
4 = {} & 2c_W m_{e_{g2}}\left((\delta\mu)s_\alpha - c_\alpha \delta A_{g2,g2}^{e*}\right)U_{s3,1}^{\tilde{e}_{g2}} + \\
& \delta\overline{Z}_{1,s3}^{\tilde{e}_{g3}}\left(2c_{\alpha+\beta}c_\beta M_W M_Z s_W^2 U_{1,2}^{\tilde{e}_{g2}} + c_W\left(m_{e_{g2}}\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{e*}\right)U_{1,1}^{\tilde{e}_{g2}} - 2c_\alpha m_{e_{g2}}^2 U_{1,2}^{\tilde{e}_{g2}}\right)\right) + \\
& \delta\overline{Z}_{2,s3}^{\tilde{e}_{g3}}\left(2c_{\alpha+\beta}c_\beta M_W M_Z s_W^2 U_{2,2}^{\tilde{e}_{g2}} + c_W\left(m_{e_{g2}}\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{e*}\right)U_{2,1}^{\tilde{e}_{g2}} - 2c_\alpha m_{e_{g2}}^2 U_{2,2}^{\tilde{e}_{g2}}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
3 = {} & -2c_W m_{e_{g2}}\left(s_\alpha \delta\mu^* - c_\alpha \delta A_{g2,g2}^{e}\right)U_{s3,2}^{\tilde{e}_{g2}} + \\
& \delta\overline{Z}_{1,s3}^{\tilde{e}_{g3}}\left(\left(c_{\alpha+\beta}c_\beta M_W M_Z\left(1-2c_W^2\right) + 2c_W c_\alpha m_{e_{g2}}^2\right)U_{1,1}^{\tilde{e}_{g2}} - c_W m_{e_{g2}}\left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{e}\right)U_{1,2}^{\tilde{e}_{g2}}\right) + \\
& \delta\overline{Z}_{2,s3}^{\tilde{e}_{g3}}\left(\left(c_{\alpha+\beta}c_\beta M_W M_Z\left(1-2c_W^2\right) + 2c_W c_\alpha m_{e_{g2}}^2\right)U_{2,1}^{\tilde{e}_{g2}} - c_W m_{e_{g2}}\left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{e}\right)U_{2,2}^{\tilde{e}_{g2}}\right)
\end{aligned}
$$

$$
\begin{aligned}
2 = {} & c_W\left(\begin{array}{l} 2\left(2\left(\delta s_W\right)c_\alpha + \left(\delta Z_{hH}\right)s_W s_\alpha\right)m_{e_{g2}}^2 U_{s3,2}^{\tilde{e}_{g2}} - \\ \left(\begin{array}{l}\mu\left(2\left(\delta s_W\right)s_\alpha - \left(\delta Z_{hH}\right)c_\alpha s_W\right) - \\ \left(2\left(\delta s_W\right)c_\alpha + \left(\delta Z_{hH}\right)s_W s_\alpha\right)A_{g2,g2}^{e*}\end{array}\right)m_{e_{g2}}U_{s3,1}^{\tilde{e}_{g2}}\end{array}\right) + 2c_\beta M_W M_Z s_W^2 U_{s3,2}^{\tilde{e}_{g2}}\left(2c_{\alpha+\beta}\left(\delta s_W\right) - s_{\alpha+\beta}s_W\left(\delta Z_{hH}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = {} & c_W m_{e_{g2}}U_{s3,2}^{\tilde{e}_{g2}}\left(\begin{array}{l}\left(2\left(\delta s_W\right)s_\alpha - \left(\delta Z_{hH}\right)c_\alpha s_W\right)\mu^* - \\ \left(2\left(\delta s_W\right)c_\alpha + \left(\delta Z_{hH}\right)s_W s_\alpha\right)A_{g2,g2}^{e}\end{array}\right) - U_{s3,1}^{\tilde{e}_{g2}}\left(\begin{array}{l}2c_W\left(2\left(\delta s_W\right)c_\alpha + \left(\delta Z_{hH}\right)s_W s_\alpha\right)m_{e_{g2}}^2 + \\ c_\beta M_W M_Z\left(\left(\delta Z_{hH}\right)s_W s_{\alpha+\beta}\left(1-2c_W^2\right) - 2\left(\delta s_W\right)c_{\alpha+\beta}\left(3-2c_W^2\right)\right)\end{array}\right)
\end{aligned}
$$

$$
\underset{230}{C}\left(H^+, \tilde{e}_{g2}^{s2}, \tilde{\nu}_{g3}^{\dagger}\right) = \left[\frac{ie(3)\delta_{g2,g3}}{2\sqrt{2}c_\beta^2 M_W^3 s_W^2}\right]
$$

$$
\boxed{3} = \begin{array}{l} -\left((\boxed{2})m_{e_{g3}} - 2c_\beta s_W \delta m^{e_g}_{g3}\left(\mu c_\beta + s_\beta A^{e*}_{g3,g3}\right) M_W^2\right) U^{\tilde{e}_{g3}*}_{s2,2} - \\ \left(\begin{array}{l} (\boxed{1})s_W + m_{e_{g3}} s_{2\beta}\left((\delta s_W)\, m_{e_{g3}} - 2 s_W \delta m^{e_g}_{g3}\right) M_W^2 - \\ 2c_\beta^3\left((2(\delta s_W) s_\beta - (\delta s_\beta) s_W) M_W^4 - s_W s_\beta \delta M_W^2 M_W^2\right) \end{array}\right) U^{\tilde{e}_{g3}*}_{s2,1} + \\ \left(\begin{array}{l} \left(s_\beta m^2_{e_{g3}} - c_\beta s_{2\beta} M_W^2\right)\left(\delta Z^{\tilde{e}_{g2}}_{1,s2} U^{\tilde{e}_{g3}*}_{1,1} + \delta Z^{\tilde{e}_{g2}}_{2,s2} U^{\tilde{e}_{g3}*}_{2,1}\right) + \\ m_{e_{g3}}\left(\mu c_\beta + s_\beta A^{e*}_{g3,g3}\right)\left(\delta Z^{\tilde{e}_{g2}}_{1,s2} U^{\tilde{e}_{g3}*}_{1,2} + \delta Z^{\tilde{e}_{g2}}_{2,s2} U^{\tilde{e}_{g3}*}_{2,2}\right) \end{array}\right) c_\beta s_W M_W^2 \end{array}
$$

$$
\boxed{2} = \begin{array}{l} A^{e*}_{g3,g3}\left(s_W\left(2(\delta c_\beta) s_\beta + (\delta Z_{H^-G^-}) c_\beta^2\right) M_W^2 + \frac{s_{2\beta}}{2}\left(2(\delta s_W) M_W^2 - s_W\left(\left(2(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right) M_W^2 - \delta M_W^2\right)\right)\right) - \\ \left(\begin{array}{l} c_\beta\left(2(\delta\mu) s_W M_W^2 - \mu\left(s_W \delta M_W^2 + 2(\delta s_W) M_W^2\right)\right) + \\ s_W\left(2 s_\beta \delta A^{e*}_{g3,g3} - \mu\left(2(\delta c_\beta) - (\delta Z_{H^-G^-}) s_\beta - c_\beta\left(2(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)\right)\right) M_W^2 \end{array}\right) c_\beta \end{array}
$$

$$
\boxed{1} = \begin{array}{l} c_\beta\left(\left(\delta c_\beta + \left(2(\delta Z_e) + \delta\overline{Z}_{H^-H^-}\right) c_\beta\right) s_{2\beta} - (\delta Z_{H^-G^-}) c_{2\beta} c_\beta\right) M_W^4 - \\ \frac{1}{2}\left(s_{2\beta}\delta\overline{Z}^{\tilde{\nu}}_{1,1} M_W^2\left(m^2_{e_{g3}} - 2c_\beta^2 M_W^2\right) + m^2_{e_{g3}}\left(\left(\left(2(\delta Z_e) + \delta\overline{Z}_{H^-H^-}\right) s_{2\beta} - 4(\delta c_\beta) s_\beta - 2(\delta Z_{H^-G^-}) c_\beta^2\right) M_W^2 - s_{2\beta}\delta M_W^2\right)\right) \end{array}
$$

$$
\underset{231}{C}\left(H^-, \tilde{\nu}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[-\frac{i e \delta_{g2,g3}}{2\sqrt{2} c_\beta^2 M_W^3 s_W^2}\left((\boxed{2}) s_W + (\boxed{4}) U^{\tilde{e}_{g2}}_{s3,1} + (\boxed{3}) m_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,2}\right)\right]
$$

$$
\boxed{4} = \begin{array}{l} m_{e_{g2}} s_{2\beta}\left((\delta s_W) m_{e_{g2}} - 2 s_W \delta m^{e_g}_{g2}\right) M_W^2 - 2c_\beta^3\left((2(\delta s_W) s_\beta - (\delta s_\beta) s_W) M_W^4 - s_W s_\beta \delta M_W^2 M_W^2\right) - \\ \left(\frac{1}{4} s_W M_W^4\right)\left((\delta Z_{G^-H^-})\left(4c_\beta^4 - s_{2\beta}^2\right) - 4 s_{2\beta}\left((\delta c_\beta) c_\beta + \left(2(\delta Z_e) + \delta Z_{H^-H^-} + \delta Z^{\tilde{\nu}}_{1,1}\right) c_\beta^2\right)\right) \end{array}
$$

$$
\boxed{3} = \begin{array}{l} c_\beta^2\left(s_W \mu^* \delta M_W^2 + \left(2(\delta s_W)\mu^* - 2 s_W \delta\mu^*\right) M_W^2\right) - A^e_{g2,g2}\left(s_{2\beta}\left((\delta Z_e) s_W - \delta s_W\right) M_W^2 - s_W s_\beta\left(c_\beta \delta M_W^2 + 2(\delta c_\beta) M_W^2\right)\right) - \\ \left(\frac{1}{2} s_W M_W^2\right)\left(\begin{array}{l} 2 s_{2\beta}\delta A^e_{g2,g2} - \\ A^e_{g2,g2}\left(2(\delta Z_{G^-H^-}) c_\beta^2 - s_{2\beta}\left(\delta Z_{H^-H^-} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right) - \\ \mu^*\left(4(\delta c_\beta) c_\beta - (\delta Z_{G^-H^-}) s_{2\beta} - 2\left(2(\delta Z_e) + \delta Z_{H^-H^-} + \delta Z^{\tilde{\nu}}_{1,1}\right) c_\beta^2\right) \end{array}\right) \end{array}
$$

$$
\boxed{2} = \begin{array}{l} M_W^2\left((\boxed{1}) c_\beta - \delta m^{e_g}_{g2}\left(s_{2\beta} A^e_{g2,g2} + 2\mu^* c_\beta^2\right) U^{\tilde{e}_{g2}}_{s3,2}\right) + \\ \left(\frac{1}{2} m^2_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,1}\right)\left(\left(-\left(2(\delta Z_e) + \delta Z_{H^-H^-}\right) s_{2\beta} + 4(\delta c_\beta) s_\beta + 2(\delta Z_{G^-H^-}) c_\beta^2\right) M_W^2 + s_{2\beta}\left(\delta M_W^2 - \delta Z^{\tilde{\nu}}_{1,1} M_W^2\right)\right) \end{array}
$$

$$
\boxed{1} = \begin{array}{l} -\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3}\left(\left(s_\beta m^2_{e_{g2}} - c_\beta s_{2\beta} M_W^2\right) U^{\tilde{e}_{g2}}_{1,1} + m_{e_{g2}}\left(c_\beta \mu^* + s_\beta A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{1,2}\right) - \\ \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3}\left(\left(s_\beta m^2_{e_{g2}} - c_\beta s_{2\beta} M_W^2\right) U^{\tilde{e}_{g2}}_{2,1} + m_{e_{g2}}\left(c_\beta \mu^* + s_\beta A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{2,2}\right) \end{array}
$$

$$\underset{234}{C}\left(G^{+},\tilde{e}^{s2}_{g2},\tilde{\nu}^{\dagger}_{g3}\right) = \left[\frac{ie\delta_{g2,g3}}{2\sqrt{2}c_\beta^2 M_W^3 s_W^2}\left((3)c_\beta - U^{\tilde{e}_{g3}*}_{s2,2}\left((1)m_{e_{g3}} - s_W\left(\mu s_{2\beta} - 2A^{e*}_{g3,g3}c_\beta^2\right)M_W^2\delta m^{e_g}_{g3}\right)\right)\right]$$

$$3 = U^{\tilde{e}_{g3}*}_{s2,1}\left(\begin{array}{l}(2)s_W M_W^2 + (\delta s_W)\left(s_{2\beta}s_\beta - 2c_\beta^3\right)M_W^4 + \\ c_\beta m^2_{e_{g3}}\left(s_W\delta M_W^2 + 2(\delta s_W)M_W^2\right)\end{array}\right) - s_W M_W^2\left(\begin{array}{l}c_\beta\left(m^2_{e_{g3}} - c_{2\beta}M_W^2\right)\left(\delta Z^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g3}*}_{1,1} + \delta Z^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g3}*}_{2,1}\right) - \\ m_{e_{g3}}\left(\mu s_\beta - c_\beta A^{e*}_{g3,g3}\right)\left(\delta Z^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g3}*}_{1,2} + \delta Z^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g3}*}_{2,2}\right)\end{array}\right)$$

$$2 = \begin{array}{l}(2(\delta c_\beta) - (2(\delta Z_e) + \delta Z_{G^-G^-})c_\beta + (\delta Z_{G^-H^-})s_\beta)m^2_{e_{g3}} - c_\beta\delta\overline{Z}^{\tilde{\nu}}_{1,1}\left(m^2_{e_{g3}} - c_{2\beta}M_W^2\right) - \\ \frac{1}{2}\left(\begin{array}{l}8c_\beta m_{e_{g3}}\delta m^{e_g}_{g3} + \left(s_{2\beta}s_\beta - 2c_\beta^3\right)\left(\delta M_W^2 + 2(\delta Z_e)M_W^2\right) + \\ \left(2((\delta s_\beta)s_{2\beta} - c_\beta((\delta Z_{G^-G^-})c_{2\beta} - (\delta Z_{G^-H^-})s_{2\beta})) - 4(\delta c_\beta)c_\beta^2\right)M_W^2\end{array}\right)\end{array}$$

$$1 = \begin{array}{l}-s_{2\beta}((\delta\mu + \mu(\delta Z_e))s_W - \mu(\delta s_W))M_W^2 - \\ c_\beta A^{e*}_{g3,g3}\left(s_W\left(2(\delta c_\beta) + (\delta Z_{G^-H^-})s_\beta - c_\beta\delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)M_W^2 + c_\beta\left(2(\delta s_W)M_W^2 - s_W\left((2(\delta Z_e) + \delta Z_{G^-G^-})M_W^2 - \delta M_W^2\right)\right)\right) - \\ s_W\left(\left(\frac{1}{2}M_W^2\right)\left(\mu s_{2\beta}\left(\delta Z_{G^-G^-} + \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right) + \left(2\mu(\delta Z_{G^-H^-}) - 4\delta A^{e*}_{g3,g3}\right)c_\beta^2\right) - \mu s_\beta\left(c_\beta\delta M_W^2 + 2(\delta c_\beta)M_W^2\right)\right)\end{array}$$

$$\underset{235}{C}\left(G^{-},\tilde{\nu}_{g2},\tilde{e}^{s3,\dagger}_{g3}\right) = \left[-\frac{ie(4)\delta_{g2,g3}}{2\sqrt{2}c_\beta^2 M_W^3 s_W^2}\right]$$

$$4 = \begin{array}{l}(1)U^{\tilde{e}_{g2}}_{s3,1} - M_W^2\left(2(\delta s_W)m_{e_{g2}}A^e_{g2,g2}c_\beta^2 U^{\tilde{e}_{g2}}_{s3,2} + s_W\left((3)c_\beta + \delta m^{e_g}_{g2}\left(s_{2\beta}\mu^* - 2A^e_{g2,g2}c_\beta^2\right)U^{\tilde{e}_{g2}}_{s3,2}\right)\right) - \\ m_{e_{g2}}\left((2)s_W + \mu^*\left(s_{2\beta}((\delta Z_e)s_W - \delta s_W)M_W^2 - s_W s_\beta\left(c_\beta\delta M_W^2 + 2(\delta c_\beta)M_W^2\right)\right)\right)U^{\tilde{e}_{g2}}_{s3,2}\end{array}$$

$$3 = \begin{array}{l}-\delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3}\left(c_\beta\left(m^2_{e_{g2}} - c_{2\beta}M_W^2\right)U^{\tilde{e}_{g2}}_{1,1} - m_{e_{g2}}\left(s_\beta\mu^* - c_\beta A^e_{g2,g2}\right)U^{\tilde{e}_{g2}}_{1,2}\right) - \\ \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3}\left(c_\beta\left(m^2_{e_{g2}} - c_{2\beta}M_W^2\right)U^{\tilde{e}_{g2}}_{2,1} - m_{e_{g2}}\left(s_\beta\mu^* - c_\beta A^e_{g2,g2}\right)U^{\tilde{e}_{g2}}_{2,2}\right) + \\ \left(2(\delta c_\beta) + (\delta Z_{H^-G^-})s_\beta - c_\beta\left(2(\delta Z_e) + \delta Z_{G^-G^-} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right)m^2_{e_{g2}}U^{\tilde{e}_{g2}}_{s3,1}\end{array}$$

$$2 = c_\beta\left(M_W^2\left(\begin{array}{l}(\delta Z_{H^-G^-})\left(c_\beta\mu^* + s_\beta A^e_{g2,g2}\right) - 2c_\beta\delta A^e_{g2,g2} + \\ \left(\delta Z_{G^-G^-} + \delta Z^{\tilde{\nu}}_{1,1}\right)\left(s_\beta\mu^* - c_\beta A^e_{g2,g2}\right)\end{array}\right) + A^e_{g2,g2}\left(2M_W^2(\delta c_\beta) - c_\beta\left(2M_W^2(\delta Z_e) - \delta M_W^2\right)\right)\right) + s_{2\beta}M_W^2\delta\mu^*$$

$$1 = \left(\tfrac{1}{4}s_W M_W^2\right)\left(\begin{array}{l}16m_{e_{g2}}\delta m^{e_g}_{g2}c_\beta^2 + \\ \left(4s_{2\beta}\left((\delta s_\beta)c_\beta + (\delta Z_{H^-G^-})c_\beta^2\right) - 8(\delta c_\beta)c_\beta^3\right)M_W^2 - \\ \left(\delta M_W^2 + \left(2(\delta Z_e) + \delta Z_{G^-G^-} + \delta Z^{\tilde{\nu}}_{1,1}\right)M_W^2\right)\left(4c_\beta^4 - s_{2\beta}^2\right)\end{array}\right) + \left(4c_\beta^4 - s_{2\beta}^2\right)\left(\tfrac{1}{2}(\delta s_W)M_W^4\right) - c_\beta^2 m^2_{e_{g2}}\left(s_W\delta M_W^2 + 2M_W^2(\delta s_W)\right)$$

[SSS] Higgs – 2 Squarks

$$\underset{216}{C}\left(A^0, \tilde{u}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[\frac{e\delta_{g2,g3}}{4M_W^3 s_W^2 s_\beta^2} \left(\begin{array}{l} (3) M_W^2 - \\ \left(\begin{array}{l} \left(\mu s_\beta + c_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \\ \left(s_\beta \mu^* + c_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right) m_{u_{g2}} s_W s_\beta \left(\left(2\left(\delta Z_e\right) + \delta Z_{AA}\right) M_W^2 - \delta M_W^2 \right) \end{array} \right) \right]$$

$$\begin{array}{rl} (3) = & 2 \left(\begin{array}{l} \left(\mu s_\beta + c_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \\ \left(s_\beta \mu^* + c_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right) m_{u_{g2}} \left(\left(\delta s_\beta\right) s_W + \left(\delta s_W\right) s_\beta \right) - \\ & s_W \left((1) m_{u_{g2}} + s_\beta \left((2) m_{u_{g2}} + 2 \left(\begin{array}{l} \left(\mu s_\beta + c_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \\ \left(s_\beta \mu^* + c_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right) \delta m^{u_g}_{g2} \right) \right) \end{array}$$

$$\begin{array}{rl} (2) = & -\left(\delta Z_{AG}\right) \left(\left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \left(c_\beta \mu^* - s_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \right) + \\ & \delta Z^{\tilde{u}_{g2}}_{1,s2} \left(\left(\mu s_\beta + c_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{1,2} U^{\tilde{u}_{g2}}_{s3,1} - \left(s_\beta \mu^* + c_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{1,1} U^{\tilde{u}_{g2}}_{s3,2} \right) + \\ & \delta Z^{\tilde{u}_{g2}}_{2,s2} \left(\left(\mu s_\beta + c_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{2,2} U^{\tilde{u}_{g2}}_{s3,1} - \left(s_\beta \mu^* + c_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{2,1} U^{\tilde{u}_{g2}}_{s3,2} \right) \end{array}$$

$$\begin{array}{rl} (1) = & \left(s_{2\beta} \delta A^{u*}_{g2,g2} + 2(\delta\mu) s_\beta^2\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \left(s_{2\beta} \delta A^{u}_{g2,g2} + 2\delta\mu^* s_\beta^2\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} + \\ & \left(\begin{array}{l} \left(\mu s_\beta + c_\beta A^{u*}_{g2,g2}\right) \left(\delta \overline{Z}^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g2}}_{1,1} + \delta \overline{Z}^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g2}}_{2,1}\right) U^{\tilde{u}_{g2}*}_{s2,2} - \\ \left(s_\beta \mu^* + c_\beta A^{u}_{g2,g2}\right) \left(\delta \overline{Z}^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g2}}_{1,2} + \delta \overline{Z}^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g2}}_{2,2}\right) U^{\tilde{u}_{g2}*}_{s2,1} \end{array} \right) s_\beta \end{array}$$

$$\underset{217}{C}\left(G^0, \tilde{u}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[-\frac{e(4)\delta_{g2,g3}}{4M_W^3 s_W^2 s_\beta^2} \right]$$

$$(4) = s_\beta s_W m_{u_{g2}} (1) - M_W^2 \left(s_W \left(m_{u_{g2}} (2) + s_\beta (3) \right) - 2 m_{u_{g2}} \left(s_W \left(\delta s_\beta\right) + s_\beta \left(\delta s_W\right) \right) \left(\begin{array}{l} \left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \\ \left(c_\beta \mu^* - s_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right) \right)$$

$$\begin{array}{rl} (3) = & 2\delta m^{u_g}_{g2} \left(\begin{array}{l} \left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \\ \left(c_\beta \mu^* - s_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right) - m_{u_{g2}} \left(\begin{array}{l} \left(c_\beta \mu^* - s_\beta A^{u}_{g2,g2}\right) \left(\delta Z^{\tilde{u}_{g2}}_{1,s2} U^{\tilde{u}_{g2}*}_{1,1} + \delta Z^{\tilde{u}_{g2}}_{2,s2} U^{\tilde{u}_{g2}*}_{2,1}\right) U^{\tilde{u}_{g2}}_{s3,2} - \\ \left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) \left(\delta Z^{\tilde{u}_{g2}}_{1,s2} U^{\tilde{u}_{g2}*}_{1,2} + \delta Z^{\tilde{u}_{g2}}_{2,s2} U^{\tilde{u}_{g2}*}_{2,2}\right) U^{\tilde{u}_{g2}}_{s3,1} \end{array} \right) \end{array}$$

$$\begin{array}{rl} (2) = & \left((\delta\mu) s_{2\beta} - 2\delta A^{u*}_{g2,g2} s_\beta^2 \right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \left(s_{2\beta} \delta\mu^* - 2\delta A^{u}_{g2,g2} s_\beta^2 \right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} + \\ & \left(\begin{array}{l} \left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) \left(\delta \overline{Z}^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g2}}_{1,1} + \delta \overline{Z}^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g2}}_{2,1}\right) U^{\tilde{u}_{g2}*}_{s2,2} - \\ \left(c_\beta \mu^* - s_\beta A^{u}_{g2,g2}\right) \left(\delta \overline{Z}^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g2}}_{1,2} + \delta \overline{Z}^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g2}}_{2,2}\right) U^{\tilde{u}_{g2}*}_{s2,1} \end{array} \right) s_\beta \end{array}$$

$$1 = M_W^2 (\delta Z_{AG}) \left(\begin{array}{l} \left(\mu s_\beta + c_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \\ \left(s_\beta \mu^* + c_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right) - \left(M_W^2 (2 (\delta Z_e) + \delta Z_{GG}) - \delta M_W^2\right) \left(\begin{array}{l} \left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \\ \left(c_\beta \mu^* - s_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right)$$

$$\underset{218}{C}\left(A^0, \tilde{d}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left[\frac{e \delta_{g2,g3}}{4 c_\beta^2 M_W^3 s_W^2} \left((1) m_{d_{g2}} s_W - \left(\begin{array}{l} \left((3) c_\beta + (2) m_{d_{g2}}\right) s_W - \\ 2 \left(\begin{array}{l} \left(\mu c_\beta + s_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(c_\beta \mu^* + s_\beta A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) c_\beta m_{d_{g2}} (\delta s_W) \end{array} \right) M_W^2 \right) \right]$$

$$3 = 2 \delta m^{d_g}_{g2} \left(\begin{array}{l} \left(\mu c_\beta + s_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(c_\beta \mu^* + s_\beta A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) - m_{d_{g2}} \left(\begin{array}{l} \left(c_\beta \mu^* + s_\beta A^{d}_{g2,g2}\right) \left(\delta Z^{\tilde{d}_{g2}}_{1,s2} U^{\tilde{d}_{g2}*}_{1,1} + \delta Z^{\tilde{d}_{g2}}_{2,s2} U^{\tilde{d}_{g2}*}_{2,1}\right) U^{\tilde{d}_{g2}}_{s3,2} - \\ \left(\mu c_\beta + s_\beta A^{d*}_{g2,g2}\right) \left(\delta Z^{\tilde{d}_{g2}}_{1,s2} U^{\tilde{d}_{g2}*}_{1,2} + \delta Z^{\tilde{d}_{g2}}_{2,s2} U^{\tilde{d}_{g2}*}_{2,2}\right) U^{\tilde{d}_{g2}}_{s3,1} \end{array} \right)$$

$$2 = \begin{array}{l} \left(s_{2\beta} \delta A^{d*}_{g2,g2} + 2 (\delta \mu) c_\beta^2\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \left(s_{2\beta} \delta A^{d}_{g2,g2} + 2 \delta \mu^* c_\beta^2\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} + \\ \left(\begin{array}{l} \left(\mu c_\beta + s_\beta A^{d*}_{g2,g2}\right) \left(\delta \overline{Z}^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g2}}_{1,1} + \delta \overline{Z}^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g2}}_{2,1}\right) U^{\tilde{d}_{g2}*}_{s2,2} - \\ \left(c_\beta \mu^* + s_\beta A^{d}_{g2,g2}\right) \left(\delta \overline{Z}^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g2}}_{1,2} + \delta \overline{Z}^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g2}}_{2,2}\right) U^{\tilde{d}_{g2}*}_{s2,1} \end{array} \right) c_\beta \end{array}$$

$$1 = \begin{array}{l} - \left(\begin{array}{l} \left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(s_\beta \mu^* - c_\beta A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) (\delta Z_{AG}) c_\beta M_W^2 + \\ \left(\begin{array}{l} \left(\mu c_\beta + s_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(c_\beta \mu^* + s_\beta A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) \left(c_\beta \delta M_W^2 + (2 (\delta c_\beta) - (2 (\delta Z_e) + \delta Z_{AA}) c_\beta) M_W^2\right) \end{array}$$

$$\underset{219}{C}\left(G^0, \tilde{d}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left[\frac{e (3) \delta_{g2,g3}}{4 c_\beta^2 M_W^3 s_W^2} \right]$$

$$3 = \begin{array}{l} \left(\begin{array}{l} \left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(s_\beta \mu^* - c_\beta A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) m_{d_{g2}} s_W \left(c_\beta \delta M_W^2 + (2 (\delta c_\beta) - (2 (\delta Z_e) + \delta Z_{GG}) c_\beta) M_W^2\right) - \\ \left((2) s_W - 2 \left(\begin{array}{l} \left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(s_\beta \mu^* - c_\beta A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) (\delta s_W) c_\beta m_{d_{g2}} \right) M_W^2 \end{array}$$

$$2 = m_{d_{g2}} \left(\begin{array}{l} (1) c_\beta - 2 \delta A^{d*}_{g2,g2} c_\beta^2 U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(s_{2\beta} \delta \mu^* - 2 \delta A^{d}_{g2,g2} c_\beta^2\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) + 2 c_\beta \delta m^{d_g}_{g2} \left(\begin{array}{l} \left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(s_\beta \mu^* - c_\beta A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right)$$

$$
\begin{aligned}
&-\left(s_\beta \mu^* - c_\beta A^d_{g2,g2}\right)\left(\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g2}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g2}}_{2,2}\right) U^{\tilde{d}_{g2}*}_{s2,1} + \\
&U^{\tilde{d}_{g2}*}_{s2,2}\left(\left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right)\left(\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g2}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g2}}_{2,1}\right) + 2(\delta\mu) s_\beta U^{\tilde{d}_{g2}}_{s3,1}\right) + \\
\boxed{1} = \;&(\delta Z_{AG})\left(\left(\mu c_\beta + s_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \left(c_\beta \mu^* + s_\beta A^d_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2}\right) + \\
&\delta Z^{\tilde{d}_{g2}}_{1,s2}\left(\left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{1,2} U^{\tilde{d}_{g2}}_{s3,1} - \left(s_\beta \mu^* - c_\beta A^d_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{1,1} U^{\tilde{d}_{g2}}_{s3,2}\right) + \\
&\delta Z^{\tilde{d}_{g2}}_{2,s2}\left(\left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{2,2} U^{\tilde{d}_{g2}}_{s3,1} - \left(s_\beta \mu^* - c_\beta A^d_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{2,1} U^{\tilde{d}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\underset{224}{C}\left(h^0, \tilde{u}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[-\left(\frac{1}{12} i e \delta_{g2,g3}\right)\left(\begin{array}{l} \frac{\boxed{10}}{s_W} + \frac{\boxed{5}}{M_W s_\beta} + \\ 2\left(\frac{s_{\alpha+\beta}\left(\delta s_W\right)}{c_W^3} + \frac{c_{\alpha+\beta}\left(\delta t_\beta\right) c_\beta^2}{c_W s_W}\right) M_Z\left(\left(1-4c_W^2\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,1} - 4 s_W^2 U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,2}\right) \end{array} \right) \right]
$$

$$
\begin{aligned}
\boxed{10} = \;&\frac{\boxed{9}}{M_W s_\beta} + \frac{s_{\alpha+\beta}\delta M_Z^2}{c_W M_Z}\left(\left(1-4c_W^2\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,1} - 4 s_W^2 U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,2}\right) - \\
&\frac{3 m_{u_{g2}}}{M_W^3 s_\beta^2}\left(\begin{array}{l} U^{\tilde{u}_{g2}*}_{s2,2}\left(\left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} + 2 c_\alpha m_{u_{g2}} U^{\tilde{u}_{g2}}_{s3,2}\right) + \\ U^{\tilde{u}_{g2}*}_{s2,1}\left(2 c_\alpha m_{u_{g2}} U^{\tilde{u}_{g2}}_{s3,1} + \left(s_\alpha \mu^* + c_\alpha A^u_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}\right) \end{array} \right)\left(s_\beta \delta M_W^2 + 2\left(\delta s_\beta\right) M_W^2\right)
\end{aligned}
$$

$$
\boxed{9} = 6\delta m^{u_g}_{g2}\left(\begin{array}{l} U^{\tilde{u}_{g2}*}_{s2,2}\left(\left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} + 4 c_\alpha m_{u_{g2}} U^{\tilde{u}_{g2}}_{s3,2}\right) + \\ U^{\tilde{u}_{g2}*}_{s2,1}\left(4 c_\alpha m_{u_{g2}} U^{\tilde{u}_{g2}}_{s3,1} + \left(s_\alpha \mu^* + c_\alpha A^u_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}\right) \end{array} \right) + \frac{1}{c_W}\left((\boxed{7})\delta Z^{\tilde{u}_{g2}}_{1,s2} + (\boxed{8})\delta Z^{\tilde{u}_{g2}}_{2,s2} + (\boxed{6})\left(2\left(\delta Z_e\right) + \delta Z_{hh}\right)\right)
$$

$$
\begin{aligned}
\boxed{8} = \;&U^{\tilde{u}_{g2}*}_{2,1}\left(\left(M_W M_Z s_{\alpha+\beta} s_\beta\left(1-4c_W^2\right) + 6 c_W c_\alpha m^2_{u_{g2}}\right) U^{\tilde{u}_{g2}}_{s3,1} + 3 c_W m_{u_{g2}}\left(s_\alpha \mu^* + c_\alpha A^u_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}\right) + \\
&U^{\tilde{u}_{g2}*}_{2,2}\left(3 c_W m_{u_{g2}}\left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} + \left(6 c_W c_\alpha m^2_{u_{g2}} - 4 M_W M_Z s_{\alpha+\beta} s_\beta s_W^2\right) U^{\tilde{u}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{7} = \;&U^{\tilde{u}_{g2}*}_{1,1}\left(\left(M_W M_Z s_{\alpha+\beta} s_\beta\left(1-4c_W^2\right) + 6 c_W c_\alpha m^2_{u_{g2}}\right) U^{\tilde{u}_{g2}}_{s3,1} + 3 c_W m_{u_{g2}}\left(s_\alpha \mu^* + c_\alpha A^u_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}\right) + \\
&U^{\tilde{u}_{g2}*}_{1,2}\left(3 c_W m_{u_{g2}}\left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} + \left(6 c_W c_\alpha m^2_{u_{g2}} - 4 M_W M_Z s_{\alpha+\beta} s_\beta s_W^2\right) U^{\tilde{u}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{6} = \;&U^{\tilde{u}_{g2}*}_{s2,1}\left(\left(M_W M_Z s_{\alpha+\beta} s_\beta\left(1-4c_W^2\right) + 6 c_W c_\alpha m^2_{u_{g2}}\right) U^{\tilde{u}_{g2}}_{s3,1} + 3 c_W m_{u_{g2}}\left(s_\alpha \mu^* + c_\alpha A^u_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}\right) + \\
&U^{\tilde{u}_{g2}*}_{s2,2}\left(3 c_W m_{u_{g2}}\left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} + \left(6 c_W c_\alpha m^2_{u_{g2}} - 4 M_W M_Z s_{\alpha+\beta} s_\beta s_W^2\right) U^{\tilde{u}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\boxed{5} = \frac{1}{s_W}\left(6 m_{u_{g2}}\left(\begin{array}{l} \left((\delta\mu) s_\alpha + c_\alpha \delta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} + \\ \left(s_\alpha \delta\mu^* + c_\alpha \delta A^u_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right) + \frac{1}{c_W}\left((\boxed{1})\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3} + (\boxed{2})\delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}\right)\right) + \frac{1}{c_W s_W^2}\left((\boxed{3}) U^{\tilde{u}_{g2}*}_{s2,1} - (\boxed{4}) U^{\tilde{u}_{g2}*}_{s2,2}\right)
$$

$$4 = c_W \left(\begin{array}{l} 6\left(2\left(\delta s_W\right) c_\alpha - \left(\delta Z_{hH}\right) s_W s_\alpha\right) m_{u_{g2}}^2 U_{s3,2}^{\tilde{u}_{g2}} + \\ 3\left(\begin{array}{l} \mu\left(\left(\delta Z_{hH}\right) c_\alpha s_W + 2\left(\delta s_W\right) s_\alpha\right) + \\ \left(2\left(\delta s_W\right) c_\alpha - \left(\delta Z_{hH}\right) s_W s_\alpha\right) A_{g2,g2}^{u*} \end{array} \right) m_{u_{g2}} U_{s3,1}^{\tilde{u}_{g2}} \end{array} \right) + 4 M_W M_Z s_\beta s_W^2 U_{s3,2}^{\tilde{u}_{g2}} \left(2 s_{\alpha+\beta}\left(\delta s_W\right) - c_{\alpha+\beta} s_W \left(\delta Z_{hH}\right)\right)$$

$$3 = U_{s3,1}^{\tilde{u}_{g2}} \left(- \left(\begin{array}{l} M_W M_Z s_\beta \left(\left(\delta Z_{hH}\right) c_{\alpha+\beta} s_W \left(1 - 4c_W^2\right) - 2\left(\delta s_W\right) s_{\alpha+\beta}\left(7 - 4c_W^2\right)\right) + \\ 6 c_W \left(2\left(\delta s_W\right) c_\alpha - \left(\delta Z_{hH}\right) s_W s_\alpha\right) m_{u_{g2}}^2 \end{array} \right) \right) - 3 c_W m_{u_{g2}} U_{s3,2}^{\tilde{u}_{g2}} \left(\begin{array}{l} \left(\left(\delta Z_{hH}\right) c_\alpha s_W + 2\left(\delta s_W\right) s_\alpha\right) \mu^* + \\ \left(2\left(\delta s_W\right) c_\alpha - \left(\delta Z_{hH}\right) s_W s_\alpha\right) A_{g2,g2}^{u} \end{array} \right)$$

$$2 = \begin{array}{l} \left(\left(M_W M_Z s_{\alpha+\beta} s_\beta \left(1 - 4c_W^2\right) + 6 c_W c_\alpha m_{u_{g2}}^2 \right) U_{2,1}^{\tilde{u}_{g2}} + 3 c_W m_{u_{g2}} \left(s_\alpha \mu^* + c_\alpha A_{g2,g2}^{u} \right) U_{2,2}^{\tilde{u}_{g2}} \right) U_{s2,1}^{\tilde{u}_{g2}*} + \\ \left(3 c_W m_{u_{g2}} \left(\mu s_\alpha + c_\alpha A_{g2,g2}^{u*} \right) U_{2,1}^{\tilde{u}_{g2}} + \left(6 c_W c_\alpha m_{u_{g2}}^2 - 4 M_W M_Z s_{\alpha+\beta} s_\beta s_W^2 \right) U_{2,2}^{\tilde{u}_{g2}} \right) U_{s2,2}^{\tilde{u}_{g2}*} \end{array}$$

$$1 = \begin{array}{l} \left(\left(M_W M_Z s_{\alpha+\beta} s_\beta \left(1 - 4c_W^2\right) + 6 c_W c_\alpha m_{u_{g2}}^2 \right) U_{1,1}^{\tilde{u}_{g2}} + 3 c_W m_{u_{g2}} \left(s_\alpha \mu^* + c_\alpha A_{g2,g2}^{u} \right) U_{1,2}^{\tilde{u}_{g2}} \right) U_{s2,1}^{\tilde{u}_{g2}*} + \\ \left(3 c_W m_{u_{g2}} \left(\mu s_\alpha + c_\alpha A_{g2,g2}^{u*} \right) U_{1,1}^{\tilde{u}_{g2}} + \left(6 c_W c_\alpha m_{u_{g2}}^2 - 4 M_W M_Z s_{\alpha+\beta} s_\beta s_W^2 \right) U_{1,2}^{\tilde{u}_{g2}} \right) U_{s2,2}^{\tilde{u}_{g2}*} \end{array}$$

$$\underset{225}{C}\left(H^0, \tilde{u}_{g2}^{s2}, \tilde{u}_{g3}^{s3,\dagger}\right) = \left[-\frac{i e \delta_{g2,g3}}{12 s_W^2} \left((4) s_W - \frac{1}{c_W M_W s_\beta} \left(2(5)\left(\delta s_W\right) + s_W \left((6)\left(2\left(\delta Z_e\right) + \delta Z_{HH}\right) + (7) \delta Z_{1,s2}^{\tilde{u}_{g2}} + (8) \delta Z_{2,s2}^{\tilde{u}_{g2}} \right) \right) \right) \right]$$

$$8 = \begin{array}{l} U_{2,1}^{\tilde{u}_{g2}*} \left(\left(c_{\alpha+\beta} M_W M_Z s_\beta \left(1 - 4c_W^2\right) - 6 c_W s_\alpha m_{u_{g2}}^2 \right) U_{s3,1}^{\tilde{u}_{g2}} + 3 c_W m_{u_{g2}} \left(c_\alpha \mu^* - s_\alpha A_{g2,g2}^{u} \right) U_{s3,2}^{\tilde{u}_{g2}} \right) + \\ U_{2,2}^{\tilde{u}_{g2}*} \left(3 c_W m_{u_{g2}} \left(\mu c_\alpha - s_\alpha A_{g2,g2}^{u*} \right) U_{s3,1}^{\tilde{u}_{g2}} - 2 \left(3 c_W s_\alpha m_{u_{g2}}^2 + 2 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2 \right) U_{s3,2}^{\tilde{u}_{g2}} \right) \end{array}$$

$$7 = \begin{array}{l} U_{1,1}^{\tilde{u}_{g2}*} \left(\left(c_{\alpha+\beta} M_W M_Z s_\beta \left(1 - 4c_W^2\right) - 6 c_W s_\alpha m_{u_{g2}}^2 \right) U_{s3,1}^{\tilde{u}_{g2}} + 3 c_W m_{u_{g2}} \left(c_\alpha \mu^* - s_\alpha A_{g2,g2}^{u} \right) U_{s3,2}^{\tilde{u}_{g2}} \right) + \\ U_{1,2}^{\tilde{u}_{g2}*} \left(3 c_W m_{u_{g2}} \left(\mu c_\alpha - s_\alpha A_{g2,g2}^{u*} \right) U_{s3,1}^{\tilde{u}_{g2}} - 2 \left(3 c_W s_\alpha m_{u_{g2}}^2 + 2 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2 \right) U_{s3,2}^{\tilde{u}_{g2}} \right) \end{array}$$

$$6 = \begin{array}{l} U_{s2,1}^{\tilde{u}_{g2}*} \left(\left(c_{\alpha+\beta} M_W M_Z s_\beta \left(1 - 4c_W^2\right) - 6 c_W s_\alpha m_{u_{g2}}^2 \right) U_{s3,1}^{\tilde{u}_{g2}} + 3 c_W m_{u_{g2}} \left(c_\alpha \mu^* - s_\alpha A_{g2,g2}^{u} \right) U_{s3,2}^{\tilde{u}_{g2}} \right) + \\ U_{s2,2}^{\tilde{u}_{g2}*} \left(3 c_W m_{u_{g2}} \left(\mu c_\alpha - s_\alpha A_{g2,g2}^{u*} \right) U_{s3,1}^{\tilde{u}_{g2}} - 2 \left(3 c_W s_\alpha m_{u_{g2}}^2 + 2 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2 \right) U_{s3,2}^{\tilde{u}_{g2}} \right) \end{array}$$

$$5 = \begin{array}{l} U_{s2,1}^{\tilde{u}_{g2}*} \left(\left(c_{\alpha+\beta} M_W M_Z s_\beta \left(7 - 4c_W^2\right) + 6 c_W s_\alpha m_{u_{g2}}^2 \right) U_{s3,1}^{\tilde{u}_{g2}} - 3 c_W m_{u_{g2}} \left(c_\alpha \mu^* - s_\alpha A_{g2,g2}^{u} \right) U_{s3,2}^{\tilde{u}_{g2}} \right) - \\ U_{s2,2}^{\tilde{u}_{g2}*} \left(3 c_W m_{u_{g2}} \left(\mu c_\alpha - s_\alpha A_{g2,g2}^{u*} \right) U_{s3,1}^{\tilde{u}_{g2}} - \left(6 c_W s_\alpha m_{u_{g2}}^2 - 4 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2 \right) U_{s3,2}^{\tilde{u}_{g2}} \right) \end{array}$$

$$
\begin{aligned}
\boxed{4} = & -\frac{1}{c_W}\left(\frac{1}{M_W s_\beta}\left((\boxed{1})U^{\tilde{u}_{g2}*}_{s2,1} - (\boxed{2})U^{\tilde{u}_{g2}*}_{s2,2}\right) + \frac{c_{\alpha+\beta}\delta M_Z^2}{M_Z}\left(\left(1-4c_W^2\right)U^{\tilde{u}_{g2}*}_{s2,1}U^{\tilde{u}_{g2}}_{s3,1} - 4s_W^2 U^{\tilde{u}_{g2}*}_{s2,2}U^{\tilde{u}_{g2}}_{s3,2}\right)\right) + \\
& \frac{3m_{u_{g2}}}{M_W^3 s_\beta^2}\begin{pmatrix} U^{\tilde{u}_{g2}*}_{s2,2}\left(\left(\mu c_\alpha - s_\alpha A^{u*}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{s3,1} - 2m_{u_{g2}}s_\alpha U^{\tilde{u}_{g2}}_{s3,2}\right) - \\ U^{\tilde{u}_{g2}*}_{s2,1}\left(2m_{u_{g2}}s_\alpha U^{\tilde{u}_{g2}}_{s3,1} - \left(c_\alpha\mu^* - s_\alpha A^{u}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{s3,2}\right) \end{pmatrix}\left(s_\beta\delta M_W^2 + 2\left(\delta s_\beta\right)M_W^2\right) - \\
& \frac{2M_Z}{c_W^3}\left(\left(\delta s_W\right)c_{\alpha+\beta}s_W - \left(\delta t_\beta\right)s_{\alpha+\beta}c_W^2 c_\beta^2\right)\left(\left(1-4c_W^2\right)U^{\tilde{u}_{g2}*}_{s2,1}U^{\tilde{u}_{g2}}_{s3,1} - 4s_W^2 U^{\tilde{u}_{g2}*}_{s2,2}U^{\tilde{u}_{g2}}_{s3,2}\right) + \\
& \frac{1}{M_W s_\beta}\left(\frac{(\boxed{3})\left(\delta Z_{hH}\right)}{c_W} - 6\begin{pmatrix} U^{\tilde{u}_{g2}*}_{s2,2}\left(\left(\mu c_\alpha - s_\alpha A^{u*}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{s3,1} - 4m_{u_{g2}}s_\alpha U^{\tilde{u}_{g2}}_{s3,2}\right) - \\ U^{\tilde{u}_{g2}*}_{s2,1}\left(4m_{u_{g2}}s_\alpha U^{\tilde{u}_{g2}}_{s3,1} - \left(c_\alpha\mu^* - s_\alpha A^{u}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{s3,2}\right) \end{pmatrix}\delta m^{u_g}_{g2}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{3} = & U^{\tilde{u}_{g2}*}_{s2,1}\left(\left(M_W M_Z s_{\alpha+\beta}s_\beta\left(1-4c_W^2\right) + 6c_W c_\alpha m^2_{u_{g2}}\right)U^{\tilde{u}_{g2}}_{s3,1} + 3c_W m_{u_{g2}}\left(s_\alpha\mu^* + c_\alpha A^{u}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{s3,2}\right) + \\
& U^{\tilde{u}_{g2}*}_{s2,2}\left(3c_W m_{u_{g2}}\left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{s3,1} + \left(6c_W c_\alpha m^2_{u_{g2}} - 4M_W M_Z s_{\alpha+\beta}s_\beta s_W^2\right)U^{\tilde{u}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{2} = & -6c_W m_{u_{g2}}\left((\delta\mu)c_\alpha - s_\alpha\delta A^{u*}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{s3,1} + \\
& \delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3}\left(4c_{\alpha+\beta}M_W M_Z s_\beta s_W^2 U^{\tilde{u}_{g2}}_{1,2} - c_W\left(3m_{u_{g2}}\left(\mu c_\alpha - s_\alpha A^{u*}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{1,1} - 6s_\alpha m^2_{u_{g2}}U^{\tilde{u}_{g2}}_{1,2}\right)\right) + \\
& \delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}\left(4c_{\alpha+\beta}M_W M_Z s_\beta s_W^2 U^{\tilde{u}_{g2}}_{2,2} - c_W\left(3m_{u_{g2}}\left(\mu c_\alpha - s_\alpha A^{u*}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{2,1} - 6s_\alpha m^2_{u_{g2}}U^{\tilde{u}_{g2}}_{2,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{1} = & 6c_W m_{u_{g2}}\left(c_\alpha\delta\mu^* - s_\alpha\delta A^{u}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{s3,2} + \\
& \delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3}\left(\left(c_{\alpha+\beta}M_W M_Z s_\beta\left(1-4c_W^2\right) - 6c_W s_\alpha m^2_{u_{g2}}\right)U^{\tilde{u}_{g2}}_{1,1} + 3c_W m_{u_{g2}}\left(c_\alpha\mu^* - s_\alpha A^{u}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{1,2}\right) + \\
& \delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}\left(\left(c_{\alpha+\beta}M_W M_Z s_\beta\left(1-4c_W^2\right) - 6c_W s_\alpha m^2_{u_{g2}}\right)U^{\tilde{u}_{g2}}_{2,1} + 3c_W m_{u_{g2}}\left(c_\alpha\mu^* - s_\alpha A^{u}_{g2,g2}\right)U^{\tilde{u}_{g2}}_{2,2}\right)
\end{aligned}
$$

$$
\underset{226}{C}\left(h^0, \tilde{d}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left[-\left(\frac{1}{12}ie\delta_{g2,g3}\right)\left(\begin{array}{l} \frac{\boxed{4}}{c_\beta M_W} + \frac{\boxed{10}}{s_W} + \\ 2\left(\frac{s_{\alpha+\beta}\left(\delta s_W\right)}{c_W^3} + \frac{c_{\alpha+\beta}\left(\delta t_\beta\right)c_\beta^2}{c_W s_W}\right)M_Z\left(\left(1+2c_W^2\right)U^{\tilde{d}_{g2}*}_{s2,1}U^{\tilde{d}_{g2}}_{s3,1} + 2s_W^2 U^{\tilde{d}_{g2}*}_{s2,2}U^{\tilde{d}_{g2}}_{s3,2}\right) \end{array}\right)\right]
$$

$$
\begin{aligned}
\boxed{10} = & \frac{s_{\alpha+\beta}\delta M_Z^2}{c_W M_Z}\left(\left(2c_W^2+1\right)U^{\tilde{d}_{g2}*}_{s2,1}U^{\tilde{d}_{g2}}_{s3,1} + 2s_W^2 U^{\tilde{d}_{g2}*}_{s2,2}U^{\tilde{d}_{g2}}_{s3,2}\right) - \frac{\boxed{9}}{c_\beta M_W} + \\
& \frac{3m_{d_{g2}}}{c_\beta^2 M_W^3}\begin{pmatrix} U^{\tilde{d}_{g2}*}_{s2,2}\left(\left(\mu c_\alpha + s_\alpha A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,1} + 2m_{d_{g2}}s_\alpha U^{\tilde{d}_{g2}}_{s3,2}\right) + \\ U^{\tilde{d}_{g2}*}_{s2,1}\left(2m_{d_{g2}}s_\alpha U^{\tilde{d}_{g2}}_{s3,1} + \left(c_\alpha\mu^* + s_\alpha A^{d}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,2}\right) \end{pmatrix}\left(c_\beta\delta M_W^2 + 2\left(\delta c_\beta\right)M_W^2\right)
\end{aligned}
$$

$$
\begin{aligned}
9 &= -\frac{1}{c_W}\left((5)\left(2\left(\delta Z_e\right)+\delta Z_{hh}\right)-(6)\left(\delta Z_{hH}\right)+(7)\delta Z^{\tilde{d}_{g2}}_{1,s2}+(8)\delta Z^{\tilde{d}_{g2}}_{2,s2}\right)+ \\
&\quad 6\left(\begin{array}{l} U^{\tilde{d}_{g2}*}_{s2,2}\left(\left(\mu c_\alpha+s_\alpha A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,1}+4m_{d_{g2}}s_\alpha U^{\tilde{d}_{g2}}_{s3,2}\right)+ \\ U^{\tilde{d}_{g2}*}_{s2,1}\left(4m_{d_{g2}}s_\alpha U^{\tilde{d}_{g2}}_{s3,1}+\left(c_\alpha\mu^*+s_\alpha A^{d}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,2}\right)\end{array}\right)\delta m^{d_g}_{g2}
\end{aligned}
$$

$$
\begin{aligned}
8 &= U^{\tilde{d}_{g2}*}_{2,1}\left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(2c_W^2+1\right)-6c_W s_\alpha m^2_{d_{g2}}\right)U^{\tilde{d}_{g2}}_{s3,1}-3c_W m_{d_{g2}}\left(c_\alpha\mu^*+s_\alpha A^{d}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,2}\right)- \\
&\quad U^{\tilde{d}_{g2}*}_{2,2}\left(3c_W m_{d_{g2}}\left(\mu c_\alpha+s_\alpha A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,1}+\left(6c_W s_\alpha m^2_{d_{g2}}-2c_\beta M_W M_Z s_{\alpha+\beta}s_W^2\right)U^{\tilde{d}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
7 &= U^{\tilde{d}_{g2}*}_{1,1}\left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(2c_W^2+1\right)-6c_W s_\alpha m^2_{d_{g2}}\right)U^{\tilde{d}_{g2}}_{s3,1}-3c_W m_{d_{g2}}\left(c_\alpha\mu^*+s_\alpha A^{d}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,2}\right)- \\
&\quad U^{\tilde{d}_{g2}*}_{1,2}\left(3c_W m_{d_{g2}}\left(\mu c_\alpha+s_\alpha A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,1}+\left(6c_W s_\alpha m^2_{d_{g2}}-2c_\beta M_W M_Z s_{\alpha+\beta}s_W^2\right)U^{\tilde{d}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
6 &= U^{\tilde{d}_{g2}*}_{s2,2}\left(3c_W m_{d_{g2}}\left(\mu s_\alpha-c_\alpha A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,1}-2\left(3c_W c_\alpha m^2_{d_{g2}}-c_{\alpha+\beta}c_\beta M_W M_Z s_W^2\right)U^{\tilde{d}_{g2}}_{s3,2}\right)+ \\
&\quad U^{\tilde{d}_{g2}*}_{s2,1}\left(\left(c_{\alpha+\beta}c_\beta M_W M_Z\left(2c_W^2+1\right)-6c_W c_\alpha m^2_{d_{g2}}\right)U^{\tilde{d}_{g2}}_{s3,1}+3c_W m_{d_{g2}}\left(s_\alpha\mu^*-c_\alpha A^{d}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
5 &= U^{\tilde{d}_{g2}*}_{s2,1}\left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(2c_W^2+1\right)-6c_W s_\alpha m^2_{d_{g2}}\right)U^{\tilde{d}_{g2}}_{s3,1}-3c_W m_{d_{g2}}\left(c_\alpha\mu^*+s_\alpha A^{d}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,2}\right)- \\
&\quad U^{\tilde{d}_{g2}*}_{s2,2}\left(3c_W m_{d_{g2}}\left(\mu c_\alpha+s_\alpha A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,1}+\left(6c_W s_\alpha m^2_{d_{g2}}-2c_\beta M_W M_Z s_{\alpha+\beta}s_W^2\right)U^{\tilde{d}_{g2}}_{s3,2}\right)
\end{aligned}
$$

$$
4 = \frac{1}{s_W}\left(\frac{1}{c_W}\left((1)\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3}+(2)\delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3}\right)-6m_{d_{g2}}\left(\begin{array}{l}\left((\delta\mu)c_\alpha+s_\alpha\delta A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}*}_{s2,2}U^{\tilde{d}_{g2}}_{s3,1}+ \\ \left(c_\alpha\delta\mu^*+s_\alpha\delta A^{d}_{g2,g2}\right)U^{\tilde{d}_{g2}*}_{s2,1}U^{\tilde{d}_{g2}}_{s3,2}\end{array}\right)\right)-\frac{2(3)(\delta s_W)}{c_W s_W^2}
$$

$$
\begin{aligned}
3 &= U^{\tilde{d}_{g2}*}_{s2,1}\left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(5-2c_W^2\right)-6c_W s_\alpha m^2_{d_{g2}}\right)U^{\tilde{d}_{g2}}_{s3,1}-3c_W m_{d_{g2}}\left(c_\alpha\mu^*+s_\alpha A^{d}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,2}\right)- \\
&\quad U^{\tilde{d}_{g2}*}_{s2,2}\left(2c_\beta M_W M_Z s_{\alpha+\beta}s_W^2U^{\tilde{d}_{g2}}_{s3,2}+c_W\left(3m_{d_{g2}}\left(\mu c_\alpha+s_\alpha A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{s3,1}+6s_\alpha m^2_{d_{g2}}U^{\tilde{d}_{g2}}_{s3,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
2 &= \left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(2c_W^2+1\right)-6c_W s_\alpha m^2_{d_{g2}}\right)U^{\tilde{d}_{g2}}_{2,1}-3c_W m_{d_{g2}}\left(c_\alpha\mu^*+s_\alpha A^{d}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{2,2}\right)U^{\tilde{d}_{g2}*}_{s2,1}- \\
&\quad \left(3c_W m_{d_{g2}}\left(\mu c_\alpha+s_\alpha A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}}_{2,1}+\left(6c_W s_\alpha m^2_{d_{g2}}-2c_\beta M_W M_Z s_{\alpha+\beta}s_W^2\right)U^{\tilde{d}_{g2}}_{2,2}\right)U^{\tilde{d}_{g2}*}_{s2,2}
\end{aligned}
$$

$$\boxed{1} = \begin{pmatrix} \left(c_\beta M_W M_Z s_{\alpha+\beta}\left(2c_W^2+1\right) - 6c_W s_\alpha m_{d_{g2}}^2\right) U_{1,1}^{\tilde{d}_{g2}} - 3c_W m_{d_{g2}}\left(c_\alpha \mu^* + s_\alpha A_{g2,g2}^{d}\right) U_{1,2}^{\tilde{d}_{g2}} \end{pmatrix} U_{s2,1}^{\tilde{d}_{g2}*} - \\ \left(3c_W m_{d_{g2}}\left(\mu c_\alpha + s_\alpha A_{g2,g2}^{d*}\right) U_{1,1}^{\tilde{d}_{g2}} + \left(6c_W s_\alpha m_{d_{g2}}^2 - 2c_\beta M_W M_Z s_{\alpha+\beta} s_W^2\right) U_{1,2}^{\tilde{d}_{g2}}\right) U_{s2,2}^{\tilde{d}_{g2}*}$$

$$\underset{227}{C}\left(H^0, \tilde{d}_{g2}^{s2}, \tilde{d}_{g3}^{s3,\dagger}\right) = \left[\ \frac{1}{12} ie(\boxed{10}) \delta_{g2,g3}\ \right]$$

$$\boxed{10} = \frac{1}{c_W c_\beta M_W}\left(\frac{1}{s_W}\left((\boxed{1}) U_{s2,1}^{\tilde{d}_{g2}*} + (\boxed{2}) U_{s2,2}^{\tilde{d}_{g2}*}\right) - \frac{1}{s_W^2}\left((\boxed{3}) U_{s2,1}^{\tilde{d}_{g2}*} - (\boxed{4}) U_{s2,2}^{\tilde{d}_{g2}*}\right)\right) - \frac{\boxed{9}}{s_W c_\beta^2} + \\ \left(\frac{\delta M_Z^2}{c_W M_Z s_W} + \frac{2M_Z(\delta s_W)}{c_W^3}\right) c_{\alpha+\beta}\left(\left(2c_W^2+1\right) U_{s2,1}^{\tilde{d}_{g2}*} U_{s3,1}^{\tilde{d}_{g2}} + 2s_W^2 U_{s2,2}^{\tilde{d}_{g2}*} U_{s3,2}^{\tilde{d}_{g2}}\right)$$

$$\boxed{9} = \frac{(\boxed{8}) c_\beta}{M_W} + \frac{2M_Z s_{\alpha+\beta}(\delta t_\beta) c_\beta^4}{c_W}\left(\left(2c_W^2+1\right) U_{s2,1}^{\tilde{d}_{g2}*} U_{s3,1}^{\tilde{d}_{g2}} + 2s_W^2 U_{s2,2}^{\tilde{d}_{g2}*} U_{s3,2}^{\tilde{d}_{g2}}\right) + \\ \frac{3m_{d_{g2}}}{M_W^3}\begin{pmatrix} U_{s2,2}^{\tilde{d}_{g2}*}\left(\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{d*}\right) U_{s3,1}^{\tilde{d}_{g2}} - 2c_\alpha m_{d_{g2}} U_{s3,2}^{\tilde{d}_{g2}}\right) - \\ U_{s2,1}^{\tilde{d}_{g2}*}\left(2c_\alpha m_{d_{g2}} U_{s3,1}^{\tilde{d}_{g2}} - \left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{d}\right) U_{s3,2}^{\tilde{d}_{g2}}\right) \end{pmatrix}\left(c_\beta \delta M_W^2 + 2(\delta c_\beta) M_W^2\right)$$

$$\boxed{8} = -6\delta m_{g2}^{d_g}\begin{pmatrix} U_{s2,2}^{\tilde{d}_{g2}*}\left(\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{d*}\right) U_{s3,1}^{\tilde{d}_{g2}} - 4c_\alpha m_{d_{g2}} U_{s3,2}^{\tilde{d}_{g2}}\right) - \\ U_{s2,1}^{\tilde{d}_{g2}*}\left(4c_\alpha m_{d_{g2}} U_{s3,1}^{\tilde{d}_{g2}} - \left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{d}\right) U_{s3,2}^{\tilde{d}_{g2}}\right) \end{pmatrix} - \frac{1}{c_W}\left((\boxed{6}) \delta Z_{1,s2}^{\tilde{d}_{g2}} + (\boxed{7}) \delta Z_{2,s2}^{\tilde{d}_{g2}} + (\boxed{5})\left(2(\delta Z_e) + \delta Z_{HH}\right)\right)$$

$$\boxed{7} = \begin{pmatrix} U_{2,2}^{\tilde{d}_{g2}*}\left(3c_W m_{d_{g2}}\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{d*}\right) U_{s3,1}^{\tilde{d}_{g2}} - 2\left(3c_W c_\alpha m_{d_{g2}}^2 - c_{\alpha+\beta} c_\beta M_W M_Z s_W^2\right) U_{s3,2}^{\tilde{d}_{g2}}\right) + \\ U_{2,1}^{\tilde{d}_{g2}*}\left(\left(c_{\alpha+\beta} c_\beta M_W M_Z\left(2c_W^2+1\right) - 6c_W c_\alpha m_{d_{g2}}^2\right) U_{s3,1}^{\tilde{d}_{g2}} + 3c_W m_{d_{g2}}\left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{d}\right) U_{s3,2}^{\tilde{d}_{g2}}\right) \end{pmatrix}$$

$$\boxed{6} = \begin{pmatrix} U_{1,2}^{\tilde{d}_{g2}*}\left(3c_W m_{d_{g2}}\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{d*}\right) U_{s3,1}^{\tilde{d}_{g2}} - 2\left(3c_W c_\alpha m_{d_{g2}}^2 - c_{\alpha+\beta} c_\beta M_W M_Z s_W^2\right) U_{s3,2}^{\tilde{d}_{g2}}\right) + \\ U_{1,1}^{\tilde{d}_{g2}*}\left(\left(c_{\alpha+\beta} c_\beta M_W M_Z\left(2c_W^2+1\right) - 6c_W c_\alpha m_{d_{g2}}^2\right) U_{s3,1}^{\tilde{d}_{g2}} + 3c_W m_{d_{g2}}\left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{d}\right) U_{s3,2}^{\tilde{d}_{g2}}\right) \end{pmatrix}$$

$$\boxed{5} = \begin{pmatrix} U_{s2,2}^{\tilde{d}_{g2}*}\left(3c_W m_{d_{g2}}\left(\mu s_\alpha - c_\alpha A_{g2,g2}^{d*}\right) U_{s3,1}^{\tilde{d}_{g2}} - 2\left(3c_W c_\alpha m_{d_{g2}}^2 - c_{\alpha+\beta} c_\beta M_W M_Z s_W^2\right) U_{s3,2}^{\tilde{d}_{g2}}\right) + \\ U_{s2,1}^{\tilde{d}_{g2}*}\left(\left(c_{\alpha+\beta} c_\beta M_W M_Z\left(2c_W^2+1\right) - 6c_W c_\alpha m_{d_{g2}}^2\right) U_{s3,1}^{\tilde{d}_{g2}} + 3c_W m_{d_{g2}}\left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{d}\right) U_{s3,2}^{\tilde{d}_{g2}}\right) \end{pmatrix}$$

$$4 = c_W \left(\begin{array}{l} 6\left(2\left(\delta s_W\right) c_\alpha + \left(\delta Z_{hH}\right) s_W s_\alpha\right) m_{d_{g2}}^2 U_{s3,2}^{\tilde{d}_{g2}} - \\ 3\left(\begin{array}{l} \mu\left(2\left(\delta s_W\right) s_\alpha - \left(\delta Z_{hH}\right) c_\alpha s_W\right) - \\ \left(2\left(\delta s_W\right) c_\alpha + \left(\delta Z_{hH}\right) s_W s_\alpha\right) A_{g2,g2}^{d*} \end{array} \right) m_{d_{g2}} U_{s3,1}^{\tilde{d}_{g2}} \end{array} \right) + 2 c_\beta M_W M_Z s_W^2 U_{s3,2}^{\tilde{d}_{g2}} \left(2 c_{\alpha+\beta}\left(\delta s_W\right) - s_{\alpha+\beta} s_W \left(\delta Z_{hH}\right)\right)$$

$$3 = 3 c_W m_{d_{g2}} U_{s3,2}^{\tilde{d}_{g2}} \left(\begin{array}{l} \left(2\left(\delta s_W\right) s_\alpha - \left(\delta Z_{hH}\right) c_\alpha s_W\right) \mu^* - \\ \left(2\left(\delta s_W\right) c_\alpha + \left(\delta Z_{hH}\right) s_W s_\alpha\right) A_{g2,g2}^{d} \end{array} \right) - U_{s3,1}^{\tilde{d}_{g2}} \left(\begin{array}{l} 6 c_W \left(2\left(\delta s_W\right) c_\alpha + \left(\delta Z_{hH}\right) s_W s_\alpha\right) m_{d_{g2}}^2 - \\ c_\beta M_W M_Z \left(2\left(\delta s_W\right) c_{\alpha+\beta}\left(5 - 2 c_W^2\right) + \left(\delta Z_{hH}\right) s_W s_{\alpha+\beta}\left(2 c_W^2 + 1\right)\right) \end{array} \right)$$

$$2 = \begin{array}{l} 6 c_W m_{d_{g2}} \left((\delta\mu) s_\alpha - c_\alpha \delta A_{g2,g2}^{d*}\right) U_{s3,1}^{\tilde{d}_{g2}} + \\ \delta\overline{Z}_{1,s3}^{\tilde{d}_{g3}} \left(2 c_{\alpha+\beta} c_\beta M_W M_Z s_W^2 U_{1,2}^{\tilde{d}_{g2}} + c_W \left(3 m_{d_{g2}} \left(\mu s_\alpha - c_\alpha A_{g2,g2}^{d*}\right) U_{1,1}^{\tilde{d}_{g2}} - 6 c_\alpha m_{d_{g2}}^2 U_{1,2}^{\tilde{d}_{g2}}\right)\right) + \\ \delta\overline{Z}_{2,s3}^{\tilde{d}_{g3}} \left(2 c_{\alpha+\beta} c_\beta M_W M_Z s_W^2 U_{2,2}^{\tilde{d}_{g2}} + c_W \left(3 m_{d_{g2}} \left(\mu s_\alpha - c_\alpha A_{g2,g2}^{d*}\right) U_{2,1}^{\tilde{d}_{g2}} - 6 c_\alpha m_{d_{g2}}^2 U_{2,2}^{\tilde{d}_{g2}}\right)\right) \end{array}$$

$$1 = \begin{array}{l} 6 c_W m_{d_{g2}} \left(s_\alpha \delta\mu^* - c_\alpha \delta A_{g2,g2}^{d}\right) U_{s3,2}^{\tilde{d}_{g2}} + \\ \delta\overline{Z}_{1,s3}^{\tilde{d}_{g3}} \left(\left(c_{\alpha+\beta} c_\beta M_W M_Z \left(2 c_W^2 + 1\right) - 6 c_W c_\alpha m_{d_{g2}}^2\right) U_{1,1}^{\tilde{d}_{g2}} + 3 c_W m_{d_{g2}} \left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{d}\right) U_{1,2}^{\tilde{d}_{g2}}\right) + \\ \delta\overline{Z}_{2,s3}^{\tilde{d}_{g3}} \left(\left(c_{\alpha+\beta} c_\beta M_W M_Z \left(2 c_W^2 + 1\right) - 6 c_W c_\alpha m_{d_{g2}}^2\right) U_{2,1}^{\tilde{d}_{g2}} + 3 c_W m_{d_{g2}} \left(s_\alpha \mu^* - c_\alpha A_{g2,g2}^{d}\right) U_{2,2}^{\tilde{d}_{g2}}\right) \end{array}$$

$$\underset{228}{C}\left(H^+, \tilde{d}_{g2}^{s2}, \tilde{u}_{g3}^{s3,\dagger}\right) = \left[\frac{i e}{2\sqrt{2} M_W s_W^2} \left(\begin{array}{l} \left(\frac{7}{s_{2\beta}} - 2(3)\right) \mathrm{CKM}_{g3,g2} s_W - \\ \frac{2}{s_{2\beta}} \left(\begin{array}{l} s_W \left(\frac{(2)\mathrm{CKM}_{g3,g2} \delta M_W^2}{M_W^2} - (1)\left(2\left(\delta\mathrm{CKM}_{g3,g2}\right) + \mathrm{CKM}_{g3,g2}\left(\delta\overline{Z}_{H^- H^-}\right)\right)\right) - \\ (1)\mathrm{CKM}_{g3,g2}\left(2 s_W\left(\delta Z_e\right) - 2\left(\delta s_W\right)\right) \end{array} \right) \end{array} \right) \right]$$

$$7 = \begin{array}{l} 2(6) + m_{d_{g2}} \left(\delta Z_{1,s2}^{\tilde{d}_{g2}} U_{1,2}^{\tilde{d}_{g2}*} + \delta Z_{2,s2}^{\tilde{d}_{g2}} U_{2,2}^{\tilde{d}_{g2}*}\right) \left(\left(\mu s_{2\beta} + 2 A_{g2,g2}^{d*} s_\beta^2\right) U_{s3,1}^{\tilde{u}_{g3}} + 2 m_{u_{g3}} U_{s3,2}^{\tilde{u}_{g3}}\right) - \\ \left(\begin{array}{l} \left(M_W^2 s_{2\beta}^2 - 2\left(c_\beta^2 m_{u_{g3}}^2 + m_{d_{g2}}^2 s_\beta^2\right)\right) U_{s3,1}^{\tilde{u}_{g3}} - \\ m_{u_{g3}} \left(s_{2\beta} \mu^* + 2 A_{g3,g3}^{u} c_\beta^2\right) U_{s3,2}^{\tilde{u}_{g3}} \end{array} \right) \left(\delta Z_{1,s2}^{\tilde{d}_{g2}} U_{1,1}^{\tilde{d}_{g2}*} + \delta Z_{2,s2}^{\tilde{d}_{g2}} U_{2,1}^{\tilde{d}_{g2}*}\right) \end{array}$$

$$
\begin{aligned}
6 =\ & (4)\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3} + (5)\delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3} + \\
& \begin{pmatrix} m_{u_{g3}}\left(s_{2\beta}\delta\mu^* + 2\delta A^{u}_{g3,g3}c^2_\beta\right)U^{\tilde{u}_{g3}}_{s3,2} + \\ 4m_{d_{g2}}\delta m^{d_g}_{g2}s^2_\beta U^{\tilde{u}_{g3}}_{s3,1} + \\ \delta m^{u_g}_{g3}\left(4m_{u_{g3}}c^2_\beta U^{\tilde{u}_{g3}}_{s3,1} + \left(s_{2\beta}\mu^* + 2A^{u}_{g3,g3}c^2_\beta\right)U^{\tilde{u}_{g3}}_{s3,2}\right) \end{pmatrix} U^{\tilde{d}_{g2}*}_{s2,1} + \\
& U^{\tilde{d}_{g2}*}_{s2,2}\left(\delta m^{d_g}_{g2}\left(\left(\mu s_{2\beta} + 2A^{d*}_{g2,g2}s^2_\beta\right)U^{\tilde{u}_{g3}}_{s3,1} + 2m_{u_{g3}}U^{\tilde{u}_{g3}}_{s3,2}\right) + m_{d_{g2}}\left(\left((\delta\mu)s_{2\beta} + 2\delta A^{d*}_{g2,g2}s^2_\beta\right)U^{\tilde{u}_{g3}}_{s3,1} + 2\delta m^{u_g}_{g3}U^{\tilde{u}_{g3}}_{s3,2}\right)\right) + \\
& (\delta Z_{H^-G^-})\left(m_{d_{g2}}s_\beta\left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}*}_{s2,2}U^{\tilde{u}_{g3}}_{s3,1} - \begin{pmatrix} s_\beta\left(m^2_{d_{g2}} - m^2_{u_{g3}} - c_{2\beta}M^2_W\right)U^{\tilde{u}_{g3}}_{s3,1} + \\ m_{u_{g3}}\left(c_\beta\mu^* - s_\beta A^{u}_{g3,g3}\right)U^{\tilde{u}_{g3}}_{s3,2}\end{pmatrix} c_\beta U^{\tilde{d}_{g2}*}_{s2,1}\right)
\end{aligned}
$$

$$
5 = m_{d_{g2}}U^{\tilde{d}_{g2}*}_{s2,2}\left(s_\beta U^{\tilde{u}_{g3}}_{2,1}\left(s_\beta A^{d*}_{g2,g2} + \mu c_\beta\right) + m_{u_{g3}}U^{\tilde{u}_{g3}}_{2,2}\right) - U^{\tilde{d}_{g2}*}_{s2,1}\begin{pmatrix}\left(\frac{1}{2}M^2_W s^2_{2\beta} - c^2_\beta m^2_{u_{g3}} - m^2_{d_{g2}}s^2_\beta\right)U^{\tilde{u}_{g3}}_{2,1} - \\ c_\beta m_{u_{g3}}\left(s_\beta\mu^* + c_\beta A^{u}_{g3,g3}\right)U^{\tilde{u}_{g3}}_{2,2}\end{pmatrix}
$$

$$
4 = m_{d_{g2}}U^{\tilde{d}_{g2}*}_{s2,2}\left(s_\beta U^{\tilde{u}_{g3}}_{1,1}\left(s_\beta A^{d*}_{g2,g2} + \mu c_\beta\right) + m_{u_{g3}}U^{\tilde{u}_{g3}}_{1,2}\right) - U^{\tilde{d}_{g2}*}_{s2,1}\begin{pmatrix}\left(\frac{1}{2}M^2_W s^2_{2\beta} - c^2_\beta m^2_{u_{g3}} - m^2_{d_{g2}}s^2_\beta\right)U^{\tilde{u}_{g3}}_{1,1} - \\ c_\beta m_{u_{g3}}\left(s_\beta\mu^* + c_\beta A^{u}_{g3,g3}\right)U^{\tilde{u}_{g3}}_{1,2}\end{pmatrix}
$$

$$
\begin{aligned}
3 =\ & \frac{\delta c_\beta}{c^2_\beta}\left(s_\beta\left(m^2_{d_{g2}} + c^2_\beta M^2_W\right)U^{\tilde{d}_{g2}*}_{s2,1}U^{\tilde{u}_{g3}}_{s3,1} + m_{d_{g2}}U^{\tilde{d}_{g2}*}_{s2,2}\left(\left(\mu c_\beta + s_\beta A^{d*}_{g2,g2}\right)U^{\tilde{u}_{g3}}_{s3,1} + m_{u_{g3}}s_\beta U^{\tilde{u}_{g3}}_{s3,2}\right)\right) + \\
& \frac{\delta s_\beta}{s^2_\beta}\left(c_\beta m_{d_{g2}}m_{u_{g3}}U^{\tilde{d}_{g2}*}_{s2,2}U^{\tilde{u}_{g3}}_{s3,2} + U^{\tilde{d}_{g2}*}_{s2,1}\left(c_\beta\left(m^2_{u_{g3}} + M^2_W s^2_\beta\right)U^{\tilde{u}_{g3}}_{s3,1} + m_{u_{g3}}\left(s_\beta\mu^* + c_\beta A^{u}_{g3,g3}\right)U^{\tilde{u}_{g3}}_{s3,2}\right)\right)
\end{aligned}
$$

$$
2 = U^{\tilde{d}_{g2}*}_{s2,1}\begin{pmatrix}\left(c^2_\beta m^2_{u_{g3}} + \left(m^2_{d_{g2}} + 2c^2_\beta M^2_W\right)s^2_\beta\right)U^{\tilde{u}_{g3}}_{s3,1} + \\ c_\beta m_{u_{g3}}\left(s_\beta\mu^* + c_\beta A^{u}_{g3,g3}\right)U^{\tilde{u}_{g3}}_{s3,2}\end{pmatrix} + m_{d_{g2}}U^{\tilde{d}_{g2}*}_{s2,2}\left(s_\beta U^{\tilde{u}_{g3}}_{s3,1}\left(s_\beta A^{d*}_{g2,g2} + \mu c_\beta\right) + m_{u_{g3}}U^{\tilde{u}_{g3}}_{s3,2}\right)
$$

$$
1 = m_{d_{g2}}U^{\tilde{d}_{g2}*}_{s2,2}\left(s_\beta U^{\tilde{u}_{g3}}_{s3,1}\left(s_\beta A^{d*}_{g2,g2} + \mu c_\beta\right) + m_{u_{g3}}U^{\tilde{u}_{g3}}_{s3,2}\right) - U^{\tilde{d}_{g2}*}_{s2,1}\begin{pmatrix}\left(\frac{1}{2}M^2_W s^2_{2\beta} - c^2_\beta m^2_{u_{g3}} - m^2_{d_{g2}}s^2_\beta\right)U^{\tilde{u}_{g3}}_{s3,1} - \\ \left(\frac{1}{2}m_{u_{g3}}U^{\tilde{u}_{g3}}_{s3,2}\right)\left(s_{2\beta}\mu^* + 2A^{u}_{g3,g3}c^2_\beta\right)\end{pmatrix}
$$

$$
\underset{229}{C}\left(H^-, \tilde{u}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left[\ \frac{ie}{2\sqrt{2}M_W s^2_W}\begin{pmatrix}\left(\frac{2(3)}{s_{2\beta}} - \frac{2(4)}{s^2_{2\beta}}\right)s_W CKM^*_{g2,g3} + \\ \frac{2}{s_{2\beta}}\left((7)s_W + \left(\frac{1}{2}(8)s_W + (6)\left(2s_W\left(\delta Z_e\right) - 2\left(\delta s_W\right)\right)\right)CKM^*_{g2,g3}\right)\end{pmatrix}\ \right]
$$

$$
\begin{aligned}
8 = & \; m_{u_{g2}} \left(\delta Z^{\tilde{u}_{g2}}_{1,s2} U^{\tilde{u}_{g2}*}_{1,2} + \delta Z^{\tilde{u}_{g2}}_{2,s2} U^{\tilde{u}_{g2}*}_{2,2} \right) \left(\left(\mu s_{2\beta} + 2 A^{u*}_{g2,g2} c^2_\beta \right) U^{\tilde{d}_{g3}}_{s3,1} + 2 m_{d_{g3}} U^{\tilde{d}_{g3}}_{s3,2} \right) - \\
& \left(\begin{array}{l} \left(M^2_W s^2_{2\beta} - 2 \left(c^2_\beta m^2_{u_{g2}} + m^2_{d_{g3}} s^2_\beta \right) \right) U^{\tilde{d}_{g3}}_{s3,1} - \\ m_{d_{g3}} \left(s_{2\beta} \mu^* + 2 A^d_{g3,g3} s^2_\beta \right) U^{\tilde{d}_{g3}}_{s3,2} \end{array} \right) \left(\delta Z^{\tilde{u}_{g2}}_{1,s2} U^{\tilde{u}_{g2}*}_{1,1} + \delta Z^{\tilde{u}_{g2}}_{2,s2} U^{\tilde{u}_{g2}*}_{2,1} \right)
\end{aligned}
$$

$$
\begin{aligned}
7 = & \; \left(6 \right) \left(\left(\delta Z_{H^- H^-} \right) \mathrm{CKM}^*_{g2,g3} + 2 \delta \mathrm{CKM}^*_{g2,g3} \right) + \\
& \frac{\mathrm{CKM}^*_{g2,g3}}{2 M^2_W} \left(\left(5 \right) U^{\tilde{u}_{g2}*}_{s2,1} - \left(\begin{array}{l} 2 m_{d_{g3}} \delta M^2_W U^{\tilde{d}_{g3}}_{s3,2} + \\ \left(\begin{array}{l} \mu \left(s_{2\beta} \delta M^2_W + 2 \left(\delta Z_{G^- H^-} \right) c^2_\beta M^2_W \right) - \\ A^{u*}_{g2,g2} \left(\left(\delta Z_{G^- H^-} \right) s_{2\beta} M^2_W - 2 \delta M^2_W c^2_\beta \right) \end{array} \right) U^{\tilde{d}_{g3}}_{s3,1} \end{array} \right) m_{u_{g2}} U^{\tilde{u}_{g2}*}_{s2,2} \right)
\end{aligned}
$$

$$
\begin{aligned}
6 = & \; m_{u_{g2}} U^{\tilde{u}_{g2}*}_{s2,2} \left(c_\beta U^{\tilde{d}_{g3}}_{s3,1} \left(c_\beta A^{u*}_{g2,g2} + \mu s_\beta \right) + m_{d_{g3}} U^{\tilde{d}_{g3}}_{s3,2} \right) - U^{\tilde{u}_{g2}*}_{s2,1} \left(\begin{array}{l} \left(\frac{1}{2} M^2_W s^2_{2\beta} - c^2_\beta m^2_{u_{g2}} - m^2_{d_{g3}} s^2_\beta \right) U^{\tilde{d}_{g3}}_{s3,1} - \\ \left(\frac{1}{2} m_{d_{g3}} U^{\tilde{d}_{g3}}_{s3,2} \right) \left(s_{2\beta} \mu^* + 2 A^d_{g3,g3} s^2_\beta \right) \end{array} \right)
\end{aligned}
$$

$$
\begin{aligned}
5 = & \; U^{\tilde{d}_{g3}}_{s3,1} \left(- \left(\begin{array}{l} \delta M^2_W \left(M^2_W s^2_{2\beta} + 2 \left(c^2_\beta m^2_{u_{g2}} + m^2_{d_{g3}} s^2_\beta \right) \right) + \\ \left(\delta Z_{G^- H^-} \right) s_{2\beta} M^2_W \left(m^2_{d_{g3}} - m^2_{u_{g2}} - c_{2\beta} M^2_W \right) \end{array} \right) \right) - m_{d_{g3}} U^{\tilde{d}_{g3}}_{s3,2} \left(\begin{array}{l} A^d_{g3,g3} \left(\left(\delta Z_{G^- H^-} \right) s_{2\beta} M^2_W + 2 \delta M^2_W s^2_\beta \right) - \\ \mu^* \left(2 \left(\delta Z_{G^- H^-} \right) M^2_W s^2_\beta - s_{2\beta} \delta M^2_W \right) \end{array} \right)
\end{aligned}
$$

$$
\begin{aligned}
4 = & \; U^{\tilde{u}_{g2}*}_{s2,1} \left(\begin{array}{l} 2 \left(\delta c_\beta \right) m_{d_{g3}} s_\beta \left(s_{2\beta} \mu^* + 2 A^d_{g3,g3} s^2_\beta \right) U^{\tilde{d}_{g3}}_{s3,2} + \\ \left(\begin{array}{l} \left(\left(\delta s_\beta \right) c_\beta + \left(\delta c_\beta \right) s_\beta \right) M^2_W s^2_{2\beta} + \\ 4 \left(\left(\delta s_\beta \right) c^3_\beta m^2_{u_{g2}} + \left(\delta c_\beta \right) m^2_{d_{g3}} s^3_\beta \right) \end{array} \right) U^{\tilde{d}_{g3}}_{s3,1} \end{array} \right) + 2 m_{u_{g2}} U^{\tilde{u}_{g2}*}_{s2,2} \left(\begin{array}{l} \left(\delta s_\beta \right) c_\beta \left(\mu s_{2\beta} + 2 A^{u*}_{g2,g2} c^2_\beta \right) U^{\tilde{d}_{g3}}_{s3,1} + \\ 2 m_{d_{g3}} \left(\left(\delta s_\beta \right) c^3_\beta + \left(\delta c_\beta \right) s^3_\beta \right) U^{\tilde{d}_{g3}}_{s3,2} \end{array} \right)
\end{aligned}
$$

$$
\begin{aligned}
3 = & \; \left(1 \right) \delta \overline{Z}^{\tilde{d}_{g3}}_{1,s3} + \left(2 \right) \delta \overline{Z}^{\tilde{d}_{g3}}_{2,s3} + \left(\begin{array}{l} \delta m^{u_g}_{g2} \left(\left(\mu s_{2\beta} + 2 A^{u*}_{g2,g2} c^2_\beta \right) U^{\tilde{d}_{g3}}_{s3,1} + 2 m_{d_{g3}} U^{\tilde{d}_{g3}}_{s3,2} \right) + \\ m_{u_{g2}} \left(\left(\left(\delta \mu \right) s_{2\beta} + 2 \delta \mathrm{A}^{u*}_{g2,g2} c^2_\beta \right) U^{\tilde{d}_{g3}}_{s3,1} + 2 \delta m^{d_g}_{g3} U^{\tilde{d}_{g3}}_{s3,2} \right) \end{array} \right) U^{\tilde{u}_{g2}*}_{s2,2} + \\
& \left(\begin{array}{l} m_{d_{g3}} \left(s_{2\beta} \delta \mu^* + 2 \delta \mathrm{A}^d_{g3,g3} s^2_\beta \right) U^{\tilde{d}_{g3}}_{s3,2} + \\ 4 m_{u_{g2}} \delta m^{u_g}_{g2} c^2_\beta U^{\tilde{d}_{g3}}_{s3,1} + \\ \delta m^{d_g}_{g3} \left(4 m_{d_{g3}} s^2_\beta U^{\tilde{d}_{g3}}_{s3,1} + \left(s_{2\beta} \mu^* + 2 A^d_{g3,g3} s^2_\beta \right) U^{\tilde{d}_{g3}}_{s3,2} \right) \end{array} \right) U^{\tilde{u}_{g2}*}_{s2,1}
\end{aligned}
$$

$$
\begin{aligned}
2 = & \; U^{\tilde{u}_{g2}*}_{s2,1} \left(s_\beta \left(\begin{array}{l} \left(s_\beta m^2_{d_{g3}} - c_\beta s_{2\beta} M^2_W \right) U^{\tilde{d}_{g3}}_{2,1} + \\ m_{d_{g3}} \left(c_\beta \mu^* + s_\beta A^d_{g3,g3} \right) U^{\tilde{d}_{g3}}_{2,2} \end{array} \right) + c^2_\beta m^2_{u_{g2}} U^{\tilde{d}_{g3}}_{2,1} \right) + m_{u_{g2}} U^{\tilde{u}_{g2}*}_{s2,2} \left(c_\beta U^{\tilde{d}_{g3}}_{2,1} \left(c_\beta A^{u*}_{g2,g2} + \mu s_\beta \right) + m_{d_{g3}} U^{\tilde{d}_{g3}}_{2,2} \right)
\end{aligned}
$$

$$\boxed{1} = U^{\tilde{u}_{g2}*}_{s2,1}\left(s_\beta\left(\begin{array}{l}\left(s_\beta m^2_{d_{g3}} - c_\beta s_{2\beta} M^2_W\right) U^{\tilde{d}_{g3}}_{1,1} + \\ m_{d_{g3}}\left(c_\beta \mu^* + s_\beta A^d_{g3,g3}\right) U^{\tilde{d}_{g3}}_{1,2}\end{array}\right) + c^2_\beta m^2_{u_{g2}} U^{\tilde{d}_{g3}}_{1,1}\right) + m_{u_{g2}} U^{\tilde{u}_{g2}*}_{s2,2}\left(c_\beta U^{\tilde{d}_{g3}}_{1,1}\left(c_\beta A^{u*}_{g2,g2} + \mu s_\beta\right) + m_{d_{g3}} U^{\tilde{d}_{g3}}_{1,2}\right)$$

$$\underset{232}{C}\left(G^+, \tilde{d}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[-\frac{ie}{2\sqrt{2} M_W s^2_W}\left(\frac{2(\boxed{3})}{s_{2\beta}} - (\boxed{6})\mathrm{CKM}_{g3,g2} s_W\right)\right]$$

$$\begin{aligned}\boxed{6} = & \frac{\boxed{5}}{s_{2\beta}} - 2(\boxed{4}) + \frac{2(\delta c_\beta)}{c^2_\beta}\left(c_\beta\left(m^2_{d_{g2}} + c^2_\beta M^2_W\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{u}_{g3}}_{s3,1} - m_{d_{g2}} U^{\tilde{d}_{g2}*}_{s2,2}\left(\left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{u}_{g3}}_{s3,1} - c_\beta m_{u_{g3}} U^{\tilde{u}_{g3}}_{s3,2}\right)\right) + \\ & \left(\begin{array}{l}\frac{m_{d_{g2}} U^{\tilde{u}_{g3}}_{1,1} U^{\tilde{d}_{g2}*}_{s2,2}}{c_\beta}\left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) - \\ \left(\begin{array}{l}\left(m^2_{d_{g2}} - m^2_{u_{g3}} - c_{2\beta} M^2_W\right) U^{\tilde{u}_{g3}}_{1,1} + \\ \frac{m_{u_{g3}} U^{\tilde{u}_{g3}}_{1,2}}{s_\beta}\left(c_\beta \mu^* - s_\beta A^u_{g3,g3}\right)\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,1}\end{array}\right) \delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3} + \\ & \delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}\left(\frac{m_{d_{g2}} U^{\tilde{u}_{g3}}_{2,1} U^{\tilde{d}_{g2}*}_{s2,2}}{c_\beta}\left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) - \left(\begin{array}{l}\left(m^2_{d_{g2}} - m^2_{u_{g3}} - c_{2\beta} M^2_W\right) U^{\tilde{u}_{g3}}_{2,1} + \\ \frac{m_{u_{g3}} U^{\tilde{u}_{g3}}_{2,2}}{s_\beta}\left(c_\beta \mu^* - s_\beta A^u_{g3,g3}\right)\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,1}\right) - \\ & \frac{2(\delta s_\beta)}{s^2_\beta}\left(m_{d_{g2}} m_{u_{g3}} s_\beta U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{u}_{g3}}_{s3,2} + U^{\tilde{d}_{g2}*}_{s2,1}\left(s_\beta\left(m^2_{u_{g3}} + M^2_W s^2_\beta\right) U^{\tilde{u}_{g3}}_{s3,1} - m_{u_{g3}}\left(c_\beta \mu^* - s_\beta A^u_{g3,g3}\right) U^{\tilde{u}_{g3}}_{s3,2}\right)\right)\end{aligned}$$

$$\begin{aligned}\boxed{5} = & -m_{d_{g2}}\left(s_{2\beta} A^{d*}_{g2,g2} - 2\mu s^2_\beta\right)\left(\delta Z^{\tilde{d}_{g2}}_{1,s2} U^{\tilde{d}_{g2}*}_{1,2} + \delta Z^{\tilde{d}_{g2}}_{2,s2} U^{\tilde{d}_{g2}*}_{2,2}\right) U^{\tilde{u}_{g3}}_{s3,1} - \\ & \left(\begin{array}{l}s_{2\beta}\left(m^2_{d_{g2}} - m^2_{u_{g3}} - c_{2\beta} M^2_W\right) U^{\tilde{u}_{g3}}_{s3,1} - \\ m_{u_{g3}}\left(s_{2\beta} A^u_{g3,g3} - 2\mu^* c^2_\beta\right) U^{\tilde{u}_{g3}}_{s3,2}\end{array}\right)\left(\delta Z^{\tilde{d}_{g2}}_{1,s2} U^{\tilde{d}_{g2}*}_{1,1} + \delta Z^{\tilde{d}_{g2}}_{2,s2} U^{\tilde{d}_{g2}*}_{2,1}\right)\end{aligned}$$

$$\begin{aligned}\boxed{4} = & \frac{U^{\tilde{u}_{g3}}_{s3,1}}{c_\beta}\left(2c_\beta m_{d_{g2}} \delta m^{d_g}_{g2} U^{\tilde{d}_{g2}*}_{s2,1} - \left(m_{d_{g2}}\left((\delta\mu) s_\beta - c_\beta \delta A^{d*}_{g2,g2}\right) + \delta m^{d_g}_{g2}\left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right)\right) U^{\tilde{d}_{g2}*}_{s2,2}\right) + \\ & \frac{U^{\tilde{d}_{g2}*}_{s2,1}}{s_\beta}\left(m_{u_{g3}}\left(c_\beta \delta\mu^* - s_\beta \delta A^u_{g3,g3}\right) U^{\tilde{u}_{g3}}_{s3,2} - \delta m^{u_g}_{g3}\left(2m_{u_{g3}} s_\beta U^{\tilde{u}_{g3}}_{s3,1} - \left(c_\beta \mu^* - s_\beta A^u_{g3,g3}\right) U^{\tilde{u}_{g3}}_{s3,2}\right)\right)\end{aligned}$$

$$\boxed{3} = s_W(-(\boxed{2})) - \mathrm{CKM}_{g3,g2}\left(2s_W(\delta Z_e) - 2(\delta s_W)\right)\left(\begin{array}{l}m_{d_{g2}} s_\beta\left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{u}_{g3}}_{s3,1} - \\ \left(\begin{array}{l}s_\beta\left(m^2_{d_{g2}} - m^2_{u_{g3}} - c_{2\beta} M^2_W\right) U^{\tilde{u}_{g3}}_{s3,1} + \\ m_{u_{g3}}\left(c_\beta \mu^* - s_\beta A^u_{g3,g3}\right) U^{\tilde{u}_{g3}}_{s3,2}\end{array}\right) c_\beta U^{\tilde{d}_{g2}*}_{s2,1}\end{array}\right)$$

$$2 = \begin{pmatrix} m_{d_{g2}} s_\beta \left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{u}_{g3}}_{s3,1} - \\ \left(\begin{array}{l} s_\beta \left(m^2_{d_{g2}} - m^2_{u_{g3}} - c_{2\beta} M^2_W\right) U^{\tilde{u}_{g3}}_{s3,1} + \\ m_{u_{g3}} \left(c_\beta \mu^* - s_\beta A^u_{g3,g3}\right) U^{\tilde{u}_{g3}}_{s3,2} \end{array}\right) c_\beta U^{\tilde{d}_{g2}*}_{s2,1} \end{pmatrix} \left(2\left(\delta \mathrm{CKM}_{g3,g2}\right) + \mathrm{CKM}_{g3,g2}\left(\delta Z_{G^-G^-}\right)\right) + \frac{\mathrm{CKM}_{g3,g2}}{2M^2_W} \left((1) U^{\tilde{d}_{g2}*}_{s2,1} + m_{d_{g2}} U^{\tilde{d}_{g2}*}_{s2,2} \left(\begin{array}{l} \mu \left(\left(\delta Z_{G^-H^-}\right) s_{2\beta} M^2_W - 2\delta M^2_W s^2_\beta\right) + \\ A^{d*}_{g2,g2} \left(s_{2\beta} \delta M^2_W + 2\left(\delta Z_{G^-H^-}\right) M^2_W s^2_\beta\right) \end{array} \right) U^{\tilde{u}_{g3}}_{s3,1} + 2\left(\delta Z_{G^-H^-}\right) m_{u_{g3}} M^2_W U^{\tilde{u}_{g3}}_{s3,2} \right)$$

$$1 = U^{\tilde{u}_{g3}}_{s3,1} \begin{pmatrix} m^2_{u_{g3}} \left(2\left(\delta Z_{G^-H^-}\right) c^2_\beta M^2_W - s_{2\beta} \delta M^2_W\right) - \\ s_{2\beta} M^2_W \left(\left(\delta Z_{G^-H^-}\right) s_{2\beta} M^2_W - c_{2\beta} \delta M^2_W\right) + \\ m^2_{d_{g2}} \left(s_{2\beta} \delta M^2_W + 2\left(\delta Z_{G^-H^-}\right) M^2_W s^2_\beta\right) \end{pmatrix} + m_{u_{g3}} U^{\tilde{u}_{g3}}_{s3,2} \begin{pmatrix} A^u_{g3,g3} \left(2\left(\delta Z_{G^-H^-}\right) c^2_\beta M^2_W - s_{2\beta} \delta M^2_W\right) + \\ \mu^* \left(2\delta M^2_W c^2_\beta + \left(\delta Z_{G^-H^-}\right) s_{2\beta} M^2_W\right) \end{pmatrix}$$

$$\underset{233}{C}\left(G^-, \tilde{u}^{s2}_{g2}, \bar{\tilde{d}}^{s3,\dagger}_{g3}\right) = \left[-\frac{ie(4)}{2\sqrt{2} M_W s^2_W} \right]$$

$$4 = \begin{array}{l} (3) s_W \mathrm{CKM}^*_{g2,g3} + \\ \dfrac{1}{s_{2\beta}} \begin{pmatrix} m_{u_{g2}} \left(s_{2\beta} A^{u*}_{g2,g2} - 2\mu c^2_\beta\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{d}_{g3}}_{s3,1} - \\ \left(\begin{array}{l} s_{2\beta} \left(m^2_{d_{g3}} - m^2_{u_{g2}} - c_{2\beta} M^2_W\right) U^{\tilde{d}_{g3}}_{s3,1} + \\ m_{d_{g3}} \left(s_{2\beta} A^d_{g3,g3} - 2\mu^* s^2_\beta\right) U^{\tilde{d}_{g3}}_{s3,2} \end{array}\right) U^{\tilde{u}_{g2}*}_{s2,1} \end{pmatrix} \left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) s_W\right) \mathrm{CKM}^*_{g2,g3} - 2 s_W \delta \mathrm{CKM}^*_{g2,g3}\right) \end{array}$$

$$
\begin{aligned}
&\left(\begin{array}{l}\frac{m_{u_{g2}} U^{\tilde{d}_{g3}}_{1,1} U^{\tilde{u}_{g2}*}_{s2,2}}{s_\beta}\left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) + \\ \left(\begin{array}{l}\left(m^2_{d_{g3}} - m^2_{u_{g2}} - c_{2\beta} M^2_W\right) U^{\tilde{d}_{g3}}_{1,1} - \\ \frac{m_{d_{g3}} U^{\tilde{d}_{g3}}_{1,2}}{c_\beta}\left(s_\beta \mu^* - c_\beta A^d_{g3,g3}\right)\end{array}\right) U^{\tilde{u}_{g2}*}_{s2,1}\end{array}\right) \delta \overline{Z}^{\tilde{d}_{g3}}_{1,s3} + \\
3 = \;& \delta \overline{Z}^{\tilde{d}_{g3}}_{2,s3}\left(\frac{m_{u_{g2}} U^{\tilde{d}_{g3}}_{2,1} U^{\tilde{u}_{g2}*}_{s2,2}}{s_\beta}\left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) + \left(\begin{array}{l}\left(m^2_{d_{g3}} - m^2_{u_{g2}} - c_{2\beta} M^2_W\right) U^{\tilde{d}_{g3}}_{2,1} - \\ \frac{m_{d_{g3}} U^{\tilde{d}_{g3}}_{2,2}}{c_\beta}\left(s_\beta \mu^* - c_\beta A^d_{g3,g3}\right)\end{array}\right) U^{\tilde{u}_{g2}*}_{s2,1}\right) - \\
& \frac{2\left(\delta c_\beta\right)}{c^2_\beta}\left(c_\beta m_{d_{g3}} m_{u_{g2}} U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{d}_{g3}}_{s3,2} + U^{\tilde{u}_{g2}*}_{s2,1}\left(c_\beta\left(m^2_{d_{g3}} + c^2_\beta M^2_W\right) U^{\tilde{d}_{g3}}_{s3,1} - m_{d_{g3}}\left(s_\beta \mu^* - c_\beta A^d_{g3,g3}\right) U^{\tilde{d}_{g3}}_{s3,2}\right)\right) - \\
& \frac{1}{s_\beta}\left(\frac{2}{c_\beta} + 2\left(2 m_{u_{g2}} s_\beta \delta m^{u_g}_{g2} U^{\tilde{u}_{g2}*}_{s2,1} - \left(m_{u_{g2}}\left((\delta\mu) c_\beta - s_\beta \delta A^{u*}_{g2,g2}\right) + \delta m^{u_g}_{g2}\left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right)\right) U^{\tilde{u}_{g2}*}_{s2,2}\right) U^{\tilde{d}_{g3}}_{s3,1}\right) - \\
& \frac{2 U^{\tilde{u}_{g2}*}_{s2,1}}{c_\beta}\left(m_{d_{g3}}\left(s_\beta \delta\mu^* - c_\beta \delta A^d_{g3,g3}\right) U^{\tilde{d}_{g3}}_{s3,2} - \delta m^{d_g}_{g3}\left(2 c_\beta m_{d_{g3}} U^{\tilde{d}_{g3}}_{s3,1} - \left(s_\beta \mu^* - c_\beta A^d_{g3,g3}\right) U^{\tilde{d}_{g3}}_{s3,2}\right)\right) - \\
& \frac{(1)\left(\delta Z_{H^- G^-}\right)}{s_{2\beta}} - \frac{2\left(\delta s_\beta\right)}{s^2_\beta}\left(s_\beta\left(m^2_{u_{g2}} + M^2_W s^2_\beta\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{d}_{g3}}_{s3,1} - m_{u_{g2}} U^{\tilde{u}_{g2}*}_{s2,2}\left(\left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{d}_{g3}}_{s3,1} - m_{d_{g3}} s_\beta U^{\tilde{d}_{g3}}_{s3,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
&\frac{\delta M^2_W}{M^2_W}\left(\begin{array}{l}c_\beta m_{u_{g2}}\left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{d}_{g3}}_{s3,1} + \\ \left(\begin{array}{l}c_\beta\left(m^2_{d_{g3}} - m^2_{u_{g2}} + c_{2\beta} M^2_W\right) U^{\tilde{d}_{g3}}_{s3,1} - \\ m_{d_{g3}}\left(s_\beta \mu^* - c_\beta A^d_{g3,g3}\right) U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right) s_\beta U^{\tilde{u}_{g2}*}_{s2,1}\end{array}\right) - \\
2 = \;& \left(\begin{array}{l}c_\beta m_{u_{g2}}\left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{1,2} U^{\tilde{d}_{g3}}_{s3,1} + \\ \left(\begin{array}{l}c_\beta\left(m^2_{d_{g3}} - m^2_{u_{g2}} - c_{2\beta} M^2_W\right) U^{\tilde{d}_{g3}}_{s3,1} - \\ m_{d_{g3}}\left(s_\beta \mu^* - c_\beta A^d_{g3,g3}\right) U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right) s_\beta U^{\tilde{u}_{g2}*}_{1,1}\end{array}\right) \delta Z^{\tilde{u}_{g2}}_{1,s2} - \\
& \delta Z^{\tilde{u}_{g2}}_{2,s2}\left(\left(\begin{array}{l}c_\beta\left(m^2_{d_{g3}} - m^2_{u_{g2}} - c_{2\beta} M^2_W\right) U^{\tilde{d}_{g3}}_{s3,1} - \\ m_{d_{g3}}\left(s_\beta \mu^* - c_\beta A^d_{g3,g3}\right) U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right) s_\beta U^{\tilde{u}_{g2}*}_{2,1} + c_\beta m_{u_{g2}}\left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{2,2} U^{\tilde{d}_{g3}}_{s3,1}\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = \;& m_{u_{g2}} U^{\tilde{u}_{g2}*}_{s2,2}\left(U^{\tilde{d}_{g3}}_{s3,1}\left(2 c^2_\beta A^{u*}_{g2,g2} + \mu s_{2\beta}\right) + 2 m_{d_{g3}} U^{\tilde{d}_{g3}}_{s3,2}\right) - U^{\tilde{u}_{g2}*}_{s2,1}\left(\begin{array}{l}\left(M^2_W s^2_{2\beta} - 2\left(c^2_\beta m^2_{u_{g2}} + m^2_{d_{g3}} s^2_\beta\right)\right) U^{\tilde{d}_{g3}}_{s3,1} - \\ m_{d_{g3}}\left(s_{2\beta}\mu^* + 2 A^d_{g3,g3} s^2_\beta\right) U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)
\end{aligned}
$$

[SSV] 2 Higgs – Gauge Boson

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

$$\underset{2}{C}\left(G^-,G^+,Z\right) = \left[-\frac{ie}{4c_W^3 s_W^2}\left(\begin{array}{l}\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+2\left(\delta Z_{G^-G^-}\right)\right)\right)c_W^4+2\left(\delta s_W\right)s_W^4+\\ \left(\left(4\left(\delta s_W\right)+s_W\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+2\left(\delta Z_{G^-G^-}\right)\right)\right)c_W^2-2\left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2\end{array}\right)\right]$$

$$\underset{3}{C}\left(G^0,G^-,W^+\right) = \left[-\frac{e}{4s_W^2}\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{GG}+\delta Z_{G^-G^-}\right)\right)\right]$$

$$\underset{4}{C}\left(G^0,G^+,W^-\right) = \left[-\frac{e}{4s_W^2}\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta Z_W+\delta Z_{GG}+\delta Z_{G^-G^-}\right)\right)\right]$$

$$\underset{65}{C}\left(h^0,A^0,Z\right) = \left[\frac{e}{4c_W^3 s_W^2}\left(s_W s_{\beta\text{-}\alpha}\left(\delta Z_{AG}-\delta Z_{hH}\right)c_W^2-c_{\beta\text{-}\alpha}\left(\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{AA}+\delta Z_{hh}\right)\right)c_W^2-2\left(\delta s_W\right)s_W^2\right)\right)\right]$$

$$\underset{66}{C}\left(h^0,G^0,Z\right) = \left[\frac{e}{4c_W^3 s_W^2}\left(-\left(\begin{array}{l}2s_{\beta\text{-}\alpha}\left(\delta s_W\right)-\\ s_W\left(s_{\beta\text{-}\alpha}\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{GG}+\delta Z_{hh}\right)+c_{\beta\text{-}\alpha}\left(\delta Z_{AG}+\delta Z_{hH}\right)\right)\end{array}\right)c_W^2+2s_{\beta\text{-}\alpha}\left(\delta s_W\right)s_W^2\right)\right]$$

$$\underset{67}{C}\left(H^0,A^0,Z\right) = \left[-\frac{e}{4c_W^3 s_W^2}\left(-\left(\begin{array}{l}2s_{\beta\text{-}\alpha}\left(\delta s_W\right)+\\ s_W\left(c_{\beta\text{-}\alpha}\left(\delta Z_{AG}+\delta Z_{hH}\right)-s_{\beta\text{-}\alpha}\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{AA}+\delta Z_{HH}\right)\right)\end{array}\right)c_W^2+2s_{\beta\text{-}\alpha}\left(\delta s_W\right)s_W^2\right)\right]$$

$$\underset{68}{C}\left(H^0,G^0,Z\right) = \left[-\frac{e}{4c_W^3 s_W^2}\left(s_W s_{\beta\text{-}\alpha}\left(\delta Z_{AG}-\delta Z_{hH}\right)c_W^2+c_{\beta\text{-}\alpha}\left(\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{GG}+\delta Z_{HH}\right)\right)c_W^2-2\left(\delta s_W\right)s_W^2\right)\right)\right]$$

$$\underset{69}{C}\left(H^-,H^+,\gamma\right) = \left[\left(\frac{1}{4}ie\right)\left(4\left(\delta Z_e\right)+\left(\frac{c_W}{s_W}-\frac{s_W}{c_W}\right)\left(\delta Z_{Z\gamma}\right)+2\left(\delta Z_{\gamma\gamma}\right)+2\left(\delta\overline{Z}_{H^-H^-}+\delta Z_{H^-H^-}\right)\right)\right]$$

$$\underset{70}{C}\left(H^-,H^+,Z\right) = \left[-\frac{ie}{4c_W^3 s_W^2}\left(\begin{array}{l}\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{ZZ}+\delta Z_{H^-H^-}\right)\right)c_W^4+2\left(\delta s_W\right)s_W^4+\\ \left(\left(4\left(\delta s_W\right)+s_W\left(2\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{ZZ}+\delta Z_{H^-H^-}\right)\right)c_W^2-2\left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2\end{array}\right)\right]$$

$$\underset{71}{C}\left(h^0,H^-,W^+\right) = \left[\frac{ie}{4s_W^2}\left(s_W s_{\beta\text{-}\alpha}\left(\delta Z_{hH}-\delta Z_{G^-H^-}\right)+c_{\beta\text{-}\alpha}\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{hh}+\delta Z_{H^-H^-}\right)\right)\right)\right]$$

$$\underset{72}{C}\left(h^0,G^-,W^+\right) = \left[\frac{ie}{4s_W^2}\left(2s_{\beta\text{-}\alpha}\left(\delta s_W\right)-s_W\left(s_{\beta\text{-}\alpha}\left(2\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{hh}+\delta Z_{G^-G^-}\right)+c_{\beta\text{-}\alpha}\left(\delta Z_{hH}+\delta Z_{H^-G^-}\right)\right)\right)\right]$$

$$C_{73}\left(H^0,H^-,W^+\right) = \left[-\frac{ie}{4s_W^2}\left(2s_{\beta\text{-}\alpha}\left(\delta s_W\right) + s_W\left(c_{\beta\text{-}\alpha}\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) - s_{\beta\text{-}\alpha}\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{HH} + \delta Z_{H^-H^-}\right)\right)\right)\right]$$

$$C_{74}\left(H^0,G^-,W^+\right) = \left[\frac{ie}{4s_W^2}\left(c_{\beta\text{-}\alpha}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{HH} + \delta Z_{G^-G^-}\right)\right) - s_W s_{\beta\text{-}\alpha}\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right)\right)\right]$$

$$C_{75}\left(h^0,H^+,W^-\right) = \left[-\frac{ie}{4s_W^2}\left(c_{\beta\text{-}\alpha}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{hh}\right)\right) + s_W s_{\beta\text{-}\alpha}\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right)\right)\right]$$

$$C_{76}\left(h^0,G^+,W^-\right) = \left[-\frac{ie}{4s_W^2}\left(2s_{\beta\text{-}\alpha}\left(\delta s_W\right) - s_W\left(s_{\beta\text{-}\alpha}\left(2\left(\delta Z_e\right) + \delta Z_W + \delta Z_{hh} + \delta Z_{G^-G^-}\right) + c_{\beta\text{-}\alpha}\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right)\right)\right)\right]$$

$$C_{77}\left(H^0,H^+,W^-\right) = \left[\frac{ie}{4s_W^2}\left(2s_{\beta\text{-}\alpha}\left(\delta s_W\right) - s_W\left(s_{\beta\text{-}\alpha}\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{HH}\right) - c_{\beta\text{-}\alpha}\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right)\right)\right)\right]$$

$$C_{78}\left(H^0,G^+,W^-\right) = \left[-\frac{ie}{4s_W^2}\left(c_{\beta\text{-}\alpha}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_W + \delta Z_{HH} + \delta Z_{G^-G^-}\right)\right) - s_W s_{\beta\text{-}\alpha}\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right)\right)\right]$$

$$C_{79}\left(A^0,H^-,W^+\right) = \left[-\frac{e}{4s_W^2}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{AA} + \delta Z_{H^-H^-}\right)\right)\right]$$

$$C_{80}\left(A^0,H^+,W^-\right) = \left[-\frac{e}{4s_W^2}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{AA}\right)\right)\right]$$

$$C_{413}\left(h^0,A^0,\gamma\right) = \left[\frac{ec_{\beta\text{-}\alpha}\left(\delta Z_{Z\gamma}\right)}{4c_W s_W}\right]$$

$$C_{414}\left(h^0,G^0,\gamma\right) = \left[\frac{es_{\beta\text{-}\alpha}\left(\delta Z_{Z\gamma}\right)}{4c_W s_W}\right]$$

$$C_{415}\left(H^0,A^0,\gamma\right) = \left[-\frac{es_{\beta\text{-}\alpha}\left(\delta Z_{Z\gamma}\right)}{4c_W s_W}\right]$$

$$C_{416}\left(H^0,G^0,\gamma\right) = \left[\frac{ec_{\beta\text{-}\alpha}\left(\delta Z_{Z\gamma}\right)}{4c_W s_W}\right]$$

$$C_{417}\left(H^-,G^+,\gamma\right) = \left[ie\left(\delta Z_{G^-H^-}\right)\right]$$

$$C_{418}\left(G^-,H^+,\gamma\right) = \left[ie\left(\delta Z_{H^-G^-}\right)\right]$$

$$C_{419}\left(H^-,G^+,Z\right) = \left[-\frac{ie\left(\delta Z_{G^-H^-}\right)}{2c_W s_W}\left(1-2c_W^2\right)\right]$$

$$C_{420}\left(G^-, H^+, Z\right) = \left[-\frac{ie\left(\delta Z_{H^-G^-}\right)}{2c_W s_W}\left(1-2c_W^2\right) \right]$$

$$C_{421}\left(A^0, G^-, W^+\right) = \left[\frac{e}{4s_W}\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) \right]$$

$$C_{422}\left(A^0, G^+, W^-\right) = \left[\frac{e}{4s_W}\left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) \right]$$

$$C_{423}\left(G^0, H^-, W^+\right) = \left[\frac{e}{4s_W}\left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) \right]$$

$$C_{424}\left(G^0, H^+, W^-\right) = \left[\frac{e}{4s_W}\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) \right]$$

[SSV] 2 Sleptons – Gauge Boson

$$C_{236}\left(\tilde{\nu}_{g1}, \tilde{\nu}_{g2}^{\dagger}, Z\right) = \left[-\frac{ie\delta_{g1,g2}}{4c_W^3 s_W^2}\left(2\left(\delta s_W\right)s_W^2 - c_W^2\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right)\right) \right]$$

$$C_{237}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, \gamma\right) = \left[\frac{ie(1)\delta_{g1,g2}}{4c_W s_W} \right]$$

$$1 = 2c_W s_W \left(\begin{array}{l} \delta_{s1,s2}\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) + \delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}} + \delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}} + \\ \delta_{s2,1}\delta Z_{1,s1}^{\tilde{e}_{g1}} + \delta_{s2,2}\delta Z_{2,s1}^{\tilde{e}_{g1}} \end{array} \right) + \left(\delta Z_{Z\gamma}\right)\left(\left(1-2s_W^2\right)U_{s2,1}^{\tilde{e}_{g1}}U_{s1,1}^{\tilde{e}_{g1}*} - 2s_W^2 U_{s2,2}^{\tilde{e}_{g1}}U_{s1,2}^{\tilde{e}_{g1}*}\right)$$

$$C_{238}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, Z\right) = \left[\frac{ie(2)\delta_{g1,g2}}{4c_W^3 s_W^2} \right]$$

$$2 = -U_{s1,1}^{\tilde{e}_{g1}*}\left(\begin{array}{l} s_W\left(1-2c_W^2\right)c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,1}^{\tilde{e}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,1}^{\tilde{e}_{g1}}\right) + \\ \left(\left(\left(\delta s_W\right)\left(6-4c_W^2\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\left(1-2c_W^2\right)\right)c_W^2 - \left(\delta s_W\right)\left(2s_W^2 - 4s_W^4\right)\right)U_{s2,1}^{\tilde{e}_{g1}} \end{array} \right) + s_W(-(1)) + 2s_W^2 c_W^3\left(\delta Z_{\gamma Z}\right)\delta_{s1,s2}$$

$$1 = \begin{array}{l} 2s_W U_{s1,2}^{\tilde{e}_{g1}*}\left(s_W c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,2}^{\tilde{e}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,2}^{\tilde{e}_{g1}}\right) + \left(\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 + 2\left(\delta s_W\right)s_W^2\right)U_{s2,2}^{\tilde{e}_{g1}}\right) + \\ c_W^2\left(\left(1-2c_W^2\right)\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,1}^{\tilde{e}_{g1}*} + \delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,1}^{\tilde{e}_{g1}*}\right)U_{s2,1}^{\tilde{e}_{g1}} + 2s_W^2\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,2}^{\tilde{e}_{g1}*} + \delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,2}^{\tilde{e}_{g1}*}\right)U_{s2,2}^{\tilde{e}_{g1}}\right) \end{array}$$

$$C_{245}\left(\tilde{\nu}_{g1}, \tilde{e}_{g2}^{s2,\dagger}, W^-\right) = \left[-\frac{ie\delta_{g1,g2}}{2\sqrt{2}s_W^2}\left(\begin{array}{l} s_W\left(U_{1,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}} + U_{2,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}\right) - \\ U_{s2,1}^{\tilde{e}_{g1}}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_W + \delta Z_{1,1}^{\tilde{\nu}}\right)\right) \end{array} \right) \right]$$

$$\underset{246}{C}\left(\tilde{e}^{s1}_{g1}, \tilde{\nu}^{\dagger}_{g2}, W^{+}\right) = \left[\frac{ie\delta_{g1,g2}}{2\sqrt{2}s_W^2} \left(\begin{array}{l} U^{\tilde{e}_{g2}*}_{s1,1}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)\right) - \\ s_W\left(U^{\tilde{e}_{g2}*}_{1,1}\delta Z^{\tilde{e}_{g1}}_{1,s1} + U^{\tilde{e}_{g2}*}_{2,1}\delta Z^{\tilde{e}_{g1}}_{2,s1}\right) \end{array} \right) \right]$$

$$\underset{425}{C}\left(\tilde{\nu}_{g1}, \tilde{\nu}^{\dagger}_{g2}, \gamma\right) = \left[-\frac{ie\delta_{g1,g2}\left(\delta Z_{Z\gamma}\right)}{4c_W s_W} \right]$$

[SSV] 2 Squarks – Gauge Boson

$$\underset{239}{C}\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, \gamma\right) = \left[-\frac{ie(1)\delta_{g1,g2}}{12c_W s_W} \right]$$

$$1 = 4c_W s_W \left(\begin{array}{l} \delta_{s1,s2}\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) + \delta_{s1,1}\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2} + \delta_{s1,2}\delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2} + \\ \delta_{s2,1}\delta Z^{\tilde{u}_{g1}}_{1,s1} + \delta_{s2,2}\delta Z^{\tilde{u}_{g1}}_{2,s1} \end{array} \right) + \left(\delta Z_{Z\gamma}\right)\left(\left(3 - 4s_W^2\right)U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g1}*}_{s1,1} - 4s_W^2 U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g1}*}_{s1,2}\right)$$

$$\underset{240}{C}\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, Z\right) = \left[-\frac{ie(2)\delta_{g1,g2}}{12c_W^3 s_W^2} \right]$$

$$2 = -U^{\tilde{u}_{g1}*}_{s1,1}\left(\begin{array}{l} s_W\left(1 - 4c_W^2\right)c_W^2\left(\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}U^{\tilde{u}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}U^{\tilde{u}_{g1}}_{2,1}\right) + \\ \left(\left(\left(\delta s_W\right)\left(14 - 8c_W^2\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\left(1 - 4c_W^2\right)\right)c_W^2 + 2\left(\delta s_W\right)\left(1 - 4c_W^2\right)s_W^2\right)U^{\tilde{u}_{g1}}_{s2,1} \end{array} \right) + s_W(-(1)) + 4s_W^2 c_W^3\left(\delta Z_{\gamma Z}\right)\delta_{s1,s2}$$

$$1 = \begin{array}{l} 4s_W U^{\tilde{u}_{g1}*}_{s1,2}\left(s_W c_W^2\left(\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}U^{\tilde{u}_{g1}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}U^{\tilde{u}_{g1}}_{2,2}\right) + \left(\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 + 2\left(\delta s_W\right)s_W^2\right)U^{\tilde{u}_{g1}}_{s2,2}\right) + \\ c_W^2\left(\left(1 - 4c_W^2\right)\left(\delta Z^{\tilde{u}_{g1}}_{1,s1}U^{\tilde{u}_{g1}*}_{1,1} + \delta Z^{\tilde{u}_{g1}}_{2,s1}U^{\tilde{u}_{g1}*}_{2,1}\right)U^{\tilde{u}_{g1}}_{s2,1} + 4s_W^2\left(\delta Z^{\tilde{u}_{g1}}_{1,s1}U^{\tilde{u}_{g1}*}_{1,2} + \delta Z^{\tilde{u}_{g1}}_{2,s1}U^{\tilde{u}_{g1}*}_{2,2}\right)U^{\tilde{u}_{g1}}_{s2,2}\right) \end{array}$$

$$\underset{241}{C}\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, \gamma\right) = \left[\frac{ie(1)\delta_{g1,g2}}{12c_W s_W} \right]$$

$$1 = 2c_W s_W \left(\begin{array}{l} \delta_{s1,s2}\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) + \delta_{s1,1}\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2} + \delta_{s1,2}\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2} + \\ \delta_{s2,1}\delta Z^{\tilde{d}_{g1}}_{1,s1} + \delta_{s2,2}\delta Z^{\tilde{d}_{g1}}_{2,s1} \end{array} \right) + \left(\delta Z_{Z\gamma}\right)\left(\left(3 - 2s_W^2\right)U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g1}*}_{s1,1} - 2s_W^2 U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g1}*}_{s1,2}\right)$$

$$\underset{242}{C}\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, Z\right) = \left[-\frac{ie\delta_{g1,g2}}{12c_W^3 s_W^2}\left((2)s_W - 2\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right)c_W^3 s_W^2 - (1)U^{\tilde{d}_{g1}*}_{s1,1}\right) \right]$$

$$2 = \begin{array}{l} 2s_W U^{\tilde{d}_{g1}*}_{s1,2}\left(s_W c_W^2\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g1}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g1}}_{2,2}\right) + \left(\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 + 2\left(\delta s_W\right)s_W^2\right)U^{\tilde{d}_{g1}}_{s2,2}\right) - \\ c_W^2\left(\left(2c_W^2 + 1\right)\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,1} + \delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,1}\right)U^{\tilde{d}_{g1}}_{s2,1} - 2s_W^2\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,2} + \delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,2}\right)U^{\tilde{d}_{g1}}_{s2,2}\right) \end{array}$$

$$1 = U^{\tilde{d}_{g1}}_{s2,1}\left(\begin{array}{l} c_W^2\left(\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W-2\left(\delta s_W\right)\left(5-2s_W^2\right)\right)+ \\ 2\left(\left(2\left(\delta s_W\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)c_W^4+\left(\delta s_W\right)s_W^2\right)\end{array}\right)+s_W c_W^2\left(2c_W^2+1\right)\left(U^{\tilde{d}_{g1}}_{2,1}\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}+U^{\tilde{d}_{g1}}_{1,1}\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}\right)$$

$$\underset{243}{C}\left(\tilde{u}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},W^-\right) = \left[-\frac{ie(1)}{2\sqrt{2}s_W^2}\right]$$

$$1 = \mathrm{CKM}^*_{g1,g2}\left(\begin{array}{l} s_W\left(\delta Z^{\tilde{u}_{g1}}_{1,s1}U^{\tilde{u}_{g1}*}_{1,1}+\delta Z^{\tilde{u}_{g1}}_{2,s1}U^{\tilde{u}_{g1}*}_{2,1}\right)U^{\tilde{d}_{g2}}_{s2,1}+ \\ \left(\begin{array}{l} s_W\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g2}}_{2,1}\right)- \\ \left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_W\right)s_W\right)U^{\tilde{d}_{g2}}_{s2,1}\end{array}\right)U^{\tilde{u}_{g1}*}_{s1,1}\end{array}\right)+2s_W U^{\tilde{d}_{g2}}_{s2,1}\delta\mathrm{CKM}^*_{g1,g2}U^{\tilde{u}_{g1}*}_{s1,1}$$

$$\underset{244}{C}\left(\tilde{d}^{s1}_{g1},\tilde{u}^{s2,\dagger}_{g2},W^+\right) = \left[-\frac{ie(1)}{2\sqrt{2}s_W^2}\right]$$

$$1 = \mathrm{CKM}_{g2,g1}\left(\begin{array}{l} s_W\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,1}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,1}\right)U^{\tilde{u}_{g2}}_{s2,1}+ \\ \left(\begin{array}{l} s_W\left(\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}U^{\tilde{u}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}U^{\tilde{u}_{g2}}_{2,1}\right)+ \\ \left(\left(2\left(\delta Z_e\right)+\delta\overline{Z}_W\right)s_W-2\left(\delta s_W\right)\right)U^{\tilde{u}_{g2}}_{s2,1}\end{array}\right)U^{\tilde{d}_{g1}*}_{s1,1}\end{array}\right)+2s_W\left(\delta\mathrm{CKM}_{g2,g1}\right)U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{d}_{g1}*}_{s1,1}$$

[SSV] 2 Squarks – Gluon

$$\underset{454}{C}\left(\tilde{u}^{s1}_{g1},\tilde{u}^{s2,\dagger}_{g2},g\right) = \left[-\left(\frac{1}{2}ig_s\delta_{g1,g2}T^{g3}_{c2,c1}\right)\left(\begin{array}{l}\delta_{s1,s2}\left(2\left(\delta Z_{g_s}\right)+\delta Z_{gg}\right)+\delta_{s1,1}\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}+\delta_{s1,2}\delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}+\delta_{s2,1}\delta Z^{\tilde{u}_{g1}}_{1,s1}+ \\ \delta_{s2,2}\delta Z^{\tilde{u}_{g1}}_{2,s1}\end{array}\right)\right]$$

$$\underset{455}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},g\right) = \left[-\left(\frac{1}{2}ig_s\delta_{g1,g2}T^{g3}_{c2,c1}\right)\left(\begin{array}{l}\delta_{s1,s2}\left(2\left(\delta Z_{g_s}\right)+\delta Z_{gg}\right)+\delta_{s1,1}\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}+\delta_{s1,2}\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}+\delta_{s2,1}\delta Z^{\tilde{d}_{g1}}_{1,s1}+ \\ \delta_{s2,2}\delta Z^{\tilde{d}_{g1}}_{2,s1}\end{array}\right)\right]$$

[SVV] Higgs – 2 Gauge Bosons

$$\underset{5}{C}\left(G^-,\gamma,W^+\right) = \left[-\frac{ie}{2c_W M_W}\left(s_W\left(\delta Z_{Z\gamma}\right)M_W^2-c_W\left(\left(2\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{\gamma\gamma}+\delta Z_{G^-G^-}\right)M_W^2+\delta M_W^2\right)\right)\right]$$

$$\underset{6}{C}\left(G^+,\gamma,W^-\right) = \left[-\frac{ie}{2c_W M_W}\left(s_W\left(\delta Z_{Z\gamma}\right)M_W^2-c_W\left(\left(2\left(\delta Z_e\right)+\delta Z_W+\delta Z_{\gamma\gamma}+\delta Z_{G^-G^-}\right)M_W^2+\delta M_W^2\right)\right)\right]$$

$$\underset{7}{C}\left(G^-,Z,W^+\right) = \left[\frac{ie}{2M_W c_W^3}\left(M_W^2\left(\left(\delta Z_{\gamma Z}\right)c_W^3 - 2\left(\delta s_W\right)s_W^2\right) - c_W^2\left(\left(2\left(\delta s_W\right) + s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{ZZ} + \delta Z_{G^-G^-}\right)\right)M_W^2 + s_W\delta M_W^2\right)\right)\right]$$

$$\underset{8}{C}\left(G^+,Z,W^-\right) = \left[\frac{ie}{2M_W c_W^3}\left(M_W^2\left(\left(\delta Z_{\gamma Z}\right)c_W^3 - 2\left(\delta s_W\right)s_W^2\right) - c_W^2\left(\left(2\left(\delta s_W\right) + s_W\left(2\left(\delta Z_e\right) + \delta Z_W + \delta Z_{ZZ} + \delta Z_{G^-G^-}\right)\right)M_W^2 + s_W\delta M_W^2\right)\right)\right]$$

$$\underset{81}{C}\left(h^0,Z,Z\right) = \left[\frac{ie}{2M_W c_W^4 s_W^2}\left(\begin{array}{l} 4s_{\beta\text{-}\alpha}\left(\delta s_W\right)M_W^2 s_W^2 - \\ \left(\begin{array}{l} 2s_{\beta\text{-}\alpha}\left(\delta s_W\right)M_W^2 - \\ s_W\left(\left(s_{\beta\text{-}\alpha}\left(2\left(\delta Z_e + \delta Z_{ZZ}\right) + \delta Z_{hh}\right) + c_{\beta\text{-}\alpha}\left(\delta Z_{hH} + 2\left(\delta t_\beta\right)c_\beta^2\right)\right)M_W^2 + s_{\beta\text{-}\alpha}\delta M_W^2\right) \end{array} \right)c_W^2 \end{array} \right)\right]$$

$$\underset{82}{C}\left(H^0,Z,Z\right) = \left[\frac{ie}{2M_W c_W^4 s_W^2}\left(\begin{array}{l} s_W s_{\beta\text{-}\alpha}c_W^2\left(\delta Z_{hH} - 2\left(\delta t_\beta\right)c_\beta^2\right)M_W^2 + \\ c_{\beta\text{-}\alpha}\left(4\left(\delta s_W\right)M_W^2 s_W^2 - c_W^2\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\left(2\left(\delta Z_e + \delta Z_{ZZ}\right) + \delta Z_{HH}\right)M_W^2 + \delta M_W^2\right)\right)\right) \end{array} \right)\right]$$

$$\underset{83}{C}\left(h^0,W^-,W^+\right) = \left[-\frac{ie}{2M_W s_W^2}\left(\begin{array}{l} 2s_{\beta\text{-}\alpha}\left(\delta s_W\right)M_W^2 - \\ s_W\left(\left(s_{\beta\text{-}\alpha}\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_W + \delta Z_{hh}\right) + c_{\beta\text{-}\alpha}\left(\delta Z_{hH} + 2\left(\delta t_\beta\right)c_\beta^2\right)\right)M_W^2 + s_{\beta\text{-}\alpha}\delta M_W^2\right) \end{array} \right)\right]$$

$$\underset{84}{C}\left(H^0,W^-,W^+\right) = \left[\frac{ie}{2M_W s_W^2}\left(s_W s_{\beta\text{-}\alpha}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right)c_\beta^2\right)M_W^2 - c_{\beta\text{-}\alpha}\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\left(2\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_W + \delta Z_{HH}\right)M_W^2 + \delta M_W^2\right)\right)\right)\right]$$

$$\underset{407}{C}\left(h^0,Z,\gamma\right) = \left[\frac{ieM_W s_{\beta\text{-}\alpha}\left(\delta Z_{Z\gamma}\right)}{2s_W c_W^2}\right]$$

$$\underset{408}{C}\left(H^0,Z,\gamma\right) = \left[\frac{iec_{\beta\text{-}\alpha}M_W\left(\delta Z_{Z\gamma}\right)}{2s_W c_W^2}\right]$$

$$\underset{409}{C}\left(H^-,\gamma,W^+\right) = \left[-\left(\frac{1}{2}ieM_W\right)\left(2s_\beta\left(\delta c_\beta\right) - 2c_\beta\left(\delta s_\beta\right) - \delta Z_{G^-H^-}\right)\right]$$

$$\underset{410}{C}\left(H^+,\gamma,W^-\right) = \left[-\left(\frac{1}{2}ieM_W\right)\left(2s_\beta\left(\delta c_\beta\right) - 2c_\beta\left(\delta s_\beta\right) - \delta Z_{H^-G^-}\right)\right]$$

$$\underset{411}{C}\left(H^-,Z,W^+\right) = \left[\frac{ieM_W s_W}{2c_W}\left(2s_\beta\left(\delta c_\beta\right) - 2c_\beta\left(\delta s_\beta\right) - \delta Z_{G^-H^-}\right)\right]$$

$$\underset{412}{C}\left(H^+,Z,W^-\right) = \left[\frac{ieM_W s_W}{2c_W}\left(2s_\beta\left(\delta c_\beta\right) - 2c_\beta\left(\delta s_\beta\right) - \delta Z_{H^-G^-}\right)\right]$$

[UUV] 2 Ghosts – Gauge Boson

$$C_{19}(\overline{u}_-, u_-, \gamma) = -\left(\frac{1}{2}ie\right)\left(\frac{c_W(\delta Z_{Z\gamma})}{s_W} + 2(\delta Z_e) + 2(\delta U_W) - \delta Z_W + \delta Z_{\gamma\gamma}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{20}(\overline{u}_+, u_+, \gamma) = \left(\frac{1}{2}ie\right)\left(\frac{c_W(\delta Z_{Z\gamma})}{s_W} + 2(\delta Z_e) + 2(\delta U_W) - \delta Z_W + \delta Z_{\gamma\gamma}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{21}(\overline{u}_-, u_-, Z) = \frac{ie}{2c_W s_W^2}(2(\delta s_W) - c_W s_W(c_W(2(\delta Z_e + \delta U_W) - \delta Z_W + \delta Z_{ZZ}) + s_W(\delta Z_{\gamma Z})))\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{22}(\overline{u}_+, u_+, Z) = -\frac{ie}{2c_W s_W^2}(2(\delta s_W) - c_W s_W(c_W(2(\delta Z_e + \delta U_W) - \delta Z_W + \delta Z_{ZZ}) + s_W(\delta Z_{\gamma Z})))\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{23}(\overline{u}_-, u_\gamma, W^-) = ie\left(\frac{c_W(\delta U_{Z\gamma})}{s_W} + \delta Z_e + \delta U_{\gamma\gamma}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{24}(\overline{u}_+, u_\gamma, W^+) = -ie\left(\frac{c_W(\delta U_{Z\gamma})}{s_W} + \delta Z_e + \delta U_{\gamma\gamma}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{25}(\overline{u}_\gamma, u_+, W^-) = \left(\frac{1}{2}ie\right)\left(\frac{c_W(\delta Z_{\gamma Z})}{s_W} - 2(\delta Z_e) - 2(\delta U_W) - \delta Z_W + \delta Z_{\gamma\gamma}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{26}(\overline{u}_\gamma, u_-, W^+) = ie\left(\delta U_W - \frac{1}{2}\left(\frac{c_W(\delta Z_{\gamma Z})}{s_W} - 2(\delta Z_e) - \delta Z_W + \delta Z_{\gamma\gamma}\right)\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$\underset{27}{C}\left(\overline{u}_{-}, u_{Z}, W^{-}\right) = -\frac{\mathrm{i}e}{c_{W}s_{W}^{2}}\left(\delta s_{W} - c_{W}s_{W}\left(c_{W}\left(\delta Z_{e} + \delta U_{ZZ}\right) + s_{W}\left(\delta U_{\gamma Z}\right)\right)\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$\underset{28}{C}\left(\overline{u}_{+}, u_{Z}, W^{+}\right) = \frac{\mathrm{i}e}{c_{W}s_{W}^{2}}\left(\delta s_{W} - c_{W}s_{W}\left(c_{W}\left(\delta Z_{e} + \delta U_{ZZ}\right) + s_{W}\left(\delta U_{\gamma Z}\right)\right)\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$\underset{29}{C}\left(\overline{u}_{Z}, u_{+}, W^{-}\right) = \frac{\mathrm{i}e}{2c_{W}s_{W}^{2}}\left(2\left(\delta s_{W}\right) - c_{W}s_{W}\left(c_{W}\left(2\left(\delta Z_{e} + \delta U_{W}\right) + \delta Z_{W} - \delta Z_{ZZ}\right) - s_{W}\left(\delta Z_{Z\gamma}\right)\right)\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$\underset{30}{C}\left(\overline{u}_{Z}, u_{-}, W^{+}\right) = -\frac{\mathrm{i}e}{2c_{W}s_{W}^{2}}\left(2\left(\delta s_{W}\right) - c_{W}s_{W}\left(c_{W}\left(2\left(\delta Z_{e} + \delta U_{W}\right) + \delta Z_{W} - \delta Z_{ZZ}\right) - s_{W}\left(\delta Z_{Z\gamma}\right)\right)\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

[VVV] 3 Gauge Bosons

$$\underset{9}{C}\left(\gamma, W^{+}, W^{-}\right) = \left[\ -\left(\frac{1}{2}\mathrm{i}e\right)\left(\frac{c_{W}\left(\delta Z_{Z\gamma}\right)}{s_{W}} + 2\left(\delta Z_{e} + \delta Z_{W}\right) + \delta Z_{\gamma\gamma}\right)\ \right]$$

$$\underset{10}{C}\left(Z, W^{+}, W^{-}\right) = \left[\ \frac{\mathrm{i}e}{2c_{W}s_{W}^{2}}\left(2\left(\delta s_{W}\right) - c_{W}s_{W}\left(c_{W}\left(2\left(\delta Z_{e} + \delta Z_{W}\right) + \delta Z_{ZZ}\right) + s_{W}\left(\delta Z_{\gamma Z}\right)\right)\right)\ \right]$$

[VVV] 3 Gluons

$$\underset{449}{C}(g, g, g) = \left[\ \left(\frac{1}{2}g_{s}f^{g1,g2,g3}\right)\left(2\left(\delta Z_{g_{s}}\right) + 3\left(\delta Z_{gg}\right)\right)\ \right]$$

[SSSS] 4 Higgs

$$\underset{91}{C}\left(h^{0}, h^{0}, h^{0}, h^{0}\right) = \left[\ -\frac{3\mathrm{i}e^{2}c_{2\alpha}}{2c_{W}^{4}s_{W}^{3}}\left(s_{2\alpha}s_{W}\left(\delta Z_{hH}\right)c_{W}^{2} - c_{2\alpha}\left(\left(\delta s_{W} - s_{W}\left(\delta Z_{e} + \delta Z_{hh}\right)\right)c_{W}^{2} - \left(\delta s_{W}\right)s_{W}^{2}\right)\right)\ \right]$$

$$C_{92}\left(h^0,h^0,h^0,H^0\right) = \left[-\frac{3ie^2 s_{2\alpha}}{8c_W^4 s_W^3}\left(2s_{2\alpha}s_W\left(\delta Z_{hH}\right)c_W^2 - c_{2\alpha}\left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + 3\left(\delta Z_{hh}\right) + \delta Z_{HH}\right)\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right)\right)\right]$$

$$C_{93}\left(h^0,h^0,H^0,H^0\right) = \left[-\frac{ie^2}{4c_W^4 s_W^3}\left(1 - 3s_{2\alpha}^2\right)\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH}\right)\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{94}\left(h^0,H^0,H^0,H^0\right) = \left[-\frac{3ie^2 s_{2\alpha}}{8c_W^4 s_W^3}\left(2s_{2\alpha}s_W\left(\delta Z_{hH}\right)c_W^2 + c_{2\alpha}\left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta Z_{hh} + 3\left(\delta Z_{HH}\right)\right)\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right)\right)\right]$$

$$C_{95}\left(H^0,H^0,H^0,H^0\right) = \left[\frac{3ie^2 c_{2\alpha}}{2c_W^4 s_W^3}\left(s_{2\alpha}s_W\left(\delta Z_{hH}\right)c_W^2 + c_{2\alpha}\left(\left(\delta s_W - s_W\left(\delta Z_e + \delta Z_{HH}\right)\right)c_W^2 - \left(\delta s_W\right)s_W^2\right)\right)\right]$$

$$C_{96}\left(h^0,h^0,A^0,A^0\right) = \left[-\frac{ie^2}{4c_W^4 s_W^3}\left(\left(\begin{array}{l} s_{2\beta}s_W\left(\delta Z_{AG}\right)c_W^2 - \\ c_{2\beta}\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{hh}\right)\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right) \end{array}\right)c_{2\alpha} + c_{2\beta}s_{2\alpha}s_W\left(\delta Z_{hH}\right)c_W^2\right)\right]$$

$$C_{97}\left(h^0,h^0,G^0,G^0\right) = \left[\frac{ie^2}{4c_W^4 s_W^3}\left(-\left(\begin{array}{l} s_{2\beta}s_W\left(\delta Z_{AG}\right)c_W^2 + \\ c_{2\beta}\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{hh}\right)\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right) \end{array}\right)c_{2\alpha} + c_{2\beta}s_{2\alpha}s_W\left(\delta Z_{hH}\right)c_W^2\right)\right]$$

$$C_{98}\left(h^0,h^0,A^0,G^0\right) = \left[\frac{ie^2 s_{2\beta}}{8c_W^4 s_W^3}\left(\begin{array}{l} c_{2\alpha}\left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG} + 2\left(\delta Z_{hh}\right)\right)\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right) - \\ 2s_{2\alpha}s_W\left(\delta Z_{hH}\right)c_W^2 \end{array}\right)\right]$$

$$C_{99}\left(h^0,H^0,A^0,A^0\right) = \left[-\frac{ie^2 s_{2\alpha}}{8c_W^4 s_W^3}\left(\begin{array}{l} 2s_{2\beta}s_W\left(\delta Z_{AG}\right)c_W^2 - \\ c_{2\beta}\left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + 2\left(\delta Z_{AA}\right) + \delta Z_{hh} + \delta Z_{HH}\right)\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right) \end{array}\right)\right]$$

$$C_{100}\left(h^0,H^0,G^0,G^0\right) = \left[-\frac{ie^2 s_{2\alpha}}{8c_W^4 s_W^3}\left(\begin{array}{l} 2s_{2\beta}s_W\left(\delta Z_{AG}\right)c_W^2 + \\ c_{2\beta}\left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + 2\left(\delta Z_{GG}\right) + \delta Z_{hh} + \delta Z_{HH}\right)\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right) \end{array}\right)\right]$$

$$C_{101}\left(h^0,H^0,A^0,G^0\right) = \left[\frac{ie^2 s_{2\alpha}s_{2\beta}}{8c_W^4 s_W^3}\left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG} + \delta Z_{hh} + \delta Z_{HH}\right)\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{102}\left(H^0,H^0,A^0,A^0\right) = \left[\frac{ie^2}{4c_W^4 s_W^3}\left(-\left(\begin{array}{l} s_{2\alpha}s_W\left(\delta Z_{hH}\right)c_W^2 + \\ c_{2\alpha}\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{HH}\right)\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right) \end{array}\right)c_{2\beta} + c_{2\alpha}s_{2\beta}s_W\left(\delta Z_{AG}\right)c_W^2\right)\right]$$

$$C_{103}\left(H^0,H^0,G^0,G^0\right) = \left[\frac{ie^2}{4c_W^4 s_W^3}\left(\left(\begin{array}{l} s_{2\beta}s_W\left(\delta Z_{AG}\right)c_W^2 + \\ c_{2\beta}\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{HH}\right)\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right) \end{array}\right)c_{2\alpha} + c_{2\beta}s_{2\alpha}s_W\left(\delta Z_{hH}\right)c_W^2\right)\right]$$

$$C_{104}\left(H^0,H^0,A^0,G^0\right) = \left[-\frac{ie^2 s_{2\beta}}{8c_W^4 s_W^3}\left(\begin{array}{l} 2s_{2\alpha}s_W\left(\delta Z_{hH}\right)c_W^2 + \\ c_{2\alpha}\left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG} + 2\left(\delta Z_{HH}\right)\right)\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right) \end{array} \right) \right]$$

$$C_{105}\left(h^0,h^0,H^-,H^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} (1)c_W^4 - 4c_{2\alpha}c_{2\beta}\left(\delta s_W\right)s_W^4 - \\ \left(\left(\begin{array}{l} s_{2\beta}\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) + \\ c_{2\beta}\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{hh}\right) + \delta Z_{H^-H^-}\right) \end{array} \right)c_{2\alpha} + 2c_{2\beta}s_{2\alpha}\left(\delta Z_{hH}\right)\right)c_W^2 s_W^3 \end{array} \right) \right]$$

$$1 = 4\left(1 - s_{2\alpha}s_{2\beta}\right)\left(\delta s_W\right) - s_W\left(\begin{array}{l} 4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{hh}\right) + \delta Z_{H^-H^-} + \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)c_{2\beta}s_{2\alpha} + \\ \left(2\left(\delta Z_{hH}\right)c_{2\alpha} - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{hh}\right) + \delta Z_{H^-H^-}\right)s_{2\alpha}\right)s_{2\beta} \end{array} \right)$$

$$C_{106}\left(h^0,h^0,G^-,G^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} (1)c_W^4 + 4c_{2\alpha}c_{2\beta}\left(\delta s_W\right)s_W^4 + \\ \left(\begin{array}{l} 2c_{2\beta}s_{2\alpha}\left(\delta Z_{hH}\right) + \\ c_{2\alpha}\left(2c_{2\beta}\left(2\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-}\right) - s_{2\beta}\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)\right) \end{array} \right)c_W^2 s_W^3 \end{array} \right) \right]$$

$$1 = 4\left(s_{2\alpha}s_{2\beta} + 1\right)\left(\delta s_W\right) - s_W\left(\begin{array}{l} 4\left(\delta Z_e\right)\left(s_{2\alpha}s_{2\beta} + 1\right) + 2\left(\delta Z_{hh} + \delta Z_{G^-G^-} - \left(\left(\delta Z_{hH}\right)c_{2\alpha} - \left(\delta Z_{hh} + \delta Z_{G^-G^-}\right)s_{2\alpha}\right)s_{2\beta}\right) + \\ \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)c_{2\beta}s_{2\alpha} \end{array} \right)$$

$$C_{107}\left(h^0,h^0,H^-,G^+\right) = \left[\frac{ie^2(1)}{8c_W^4 s_W^3} \right]$$

$$1 = \begin{array}{l} c_{2\beta}\left(4\left(\delta s_W\right)s_{2\alpha} + \left(2\left(\delta Z_{hH}\right)c_{2\alpha} - \left(4\left(\delta Z_e\right) + 2\left(\delta Z_{hh}\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)s_{2\alpha}\right)s_W\right)c_W^4 - \\ s_W\left(2\left(\delta Z_{G^-H^-}\right)c_W^4 + s_{2\beta}\left(2\left(\delta Z_{hH}\right)s_{2\alpha}c_W^2 + c_{2\alpha}\left(4\left(\delta s_W\right)s_W + \left(4\left(\delta Z_e\right) + 2\left(\delta Z_{hh}\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)c_W^2\right)\right)s_W^2\right) \end{array}$$

$$C_{108}\left(h^0,h^0,G^-,H^+\right) = \left[\frac{ie^2(1)}{8c_W^4 s_W^3} \right]$$

$$1 = \begin{array}{l} c_{2\beta}\left(4\left(\delta s_W\right)s_{2\alpha} + \left(2\left(\delta Z_{hH}\right)c_{2\alpha} - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{hh}\right) + \delta Z_{G^-G^-}\right)s_{2\alpha}\right)s_W\right)c_W^4 - \\ s_W\left(2\left(\delta Z_{H^-G^-}\right)c_W^4 + s_{2\beta}\left(2\left(\delta Z_{hH}\right)s_{2\alpha}c_W^2 + c_{2\alpha}\left(4\left(\delta s_W\right)s_W + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{hh}\right) + \delta Z_{G^-G^-}\right)c_W^2\right)\right)s_W^2\right) \end{array}$$

$$C_{109}\left(h^0,H^0,H^-,H^+\right) = \left[-\frac{ie^2(1)}{8c_W^4 s_W^3} \right]$$

$$\boxed{1} = \begin{aligned} & s_W c_W^2 \left(2\left(\delta Z_{hH}\right) c_W^2 + \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_{2\alpha} s_{2\beta} s_W^2\right) + \\ & c_{2\beta} s_{2\alpha} \left(4\left(\delta s_W\right) s_W + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) c_W^2\right) s_W^3 - \\ & c_{2\alpha}\left(4\left(\delta s_W\right) s_{2\beta} + \left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) c_{2\beta} - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_{2\beta}\right) s_W\right) c_W^4 \end{aligned}$$

$$\underset{110}{C}\left(h^0, H^0, G^-, G^+\right) = \left[-\frac{ie^2(\boxed{1})}{8 c_W^4 s_W^3} \right]$$

$$\boxed{1} = \begin{aligned} & -c_{2\beta} s_{2\alpha} \left(4\left(\delta s_W\right) s_W + \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH} + 2\left(\delta Z_{G^-G^-}\right)\right) c_W^2\right) s_W^3 + \\ & s_W c_W^2 \left(2\left(\delta Z_{hH}\right) c_W^2 + \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_{2\alpha} s_{2\beta} s_W^2\right) + \\ & c_{2\alpha}\left(4\left(\delta s_W\right) s_{2\beta} - \left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) c_{2\beta} + \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH} + 2\left(\delta Z_{G^-G^-}\right)\right) s_{2\beta}\right) s_W\right) c_W^4 \end{aligned}$$

$$\underset{111}{C}\left(h^0, H^0, H^-, G^+\right) = \left[-\frac{ie^2(\boxed{1})}{8 c_W^4 s_W^3} \right]$$

$$\boxed{1} = \begin{aligned} & s_{2\alpha} s_{2\beta} \left(4\left(\delta s_W\right) s_W + \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH} + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right) c_W^2\right) s_W^3 + \\ & c_{2\alpha} c_{2\beta} \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH} + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right) s_W\right) c_W^4 \end{aligned}$$

$$\underset{112}{C}\left(h^0, H^0, G^-, H^+\right) = \left[-\frac{ie^2(\boxed{1})}{8 c_W^4 s_W^3} \right]$$

$$\boxed{1} = \begin{aligned} & s_{2\alpha} s_{2\beta} \left(4\left(\delta s_W\right) s_W + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) c_W^2\right) s_W^3 + \\ & c_{2\alpha} c_{2\beta} \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_W\right) c_W^4 \end{aligned}$$

$$\underset{113}{C}\left(H^0, H^0, H^-, H^+\right) = \left[\frac{ie^2}{8 c_W^4 s_W^3} \left(\begin{aligned} & (\boxed{1}) c_W^4 + 4 c_{2\alpha} c_{2\beta} \left(\delta s_W\right) s_W^4 - \\ & \left(- \left(\begin{aligned} & s_{2\beta}\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) + \\ & c_{2\beta}\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{HH}\right) + \delta Z_{H^-H^-}\right) \end{aligned} \right) c_{2\alpha} + 2 c_{2\beta} s_{2\alpha} \left(\delta Z_{hH}\right) \right) c_W^2 s_W^3 \end{aligned} \right) \right]$$

$$\boxed{1} = 4\left(s_{2\alpha} s_{2\beta} + 1\right)\left(\delta s_W\right) - s_W \left(\begin{aligned} & \delta\overline{Z}_{H^-H^-} + \delta Z_{H^-H^-} + 2\left(\delta Z_{HH} + \left(\delta Z_{hH}\right) c_{2\alpha} s_{2\beta}\right) + 4\left(\delta Z_e\right)\left(s_{2\alpha} s_{2\beta} + 1\right) - \\ & s_{2\alpha}\left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) c_{2\beta} - \left(\delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{HH}\right) + \delta Z_{H^-H^-}\right) s_{2\beta}\right) \end{aligned} \right)$$

$$\underset{114}{C}\left(H^0, H^0, G^-, G^+\right) = \left[\frac{ie^2}{8 c_W^4 s_W^3} \left(\begin{aligned} & (\boxed{1}) c_W^4 - 4 c_{2\alpha} c_{2\beta} \left(\delta s_W\right) s_W^4 + \\ & \left(\begin{aligned} & 2 c_{2\beta} s_{2\alpha} \left(\delta Z_{hH}\right) - \\ & c_{2\alpha}\left(2 c_{2\beta}\left(2\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-}\right) - s_{2\beta}\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)\right) \end{aligned} \right) c_W^2 s_W^3 \end{aligned} \right) \right]$$

$$1 = (4 - 4s_{2\alpha}s_{2\beta})(\delta s_W) - s_W \left(\begin{array}{l} 4(\delta Z_e) + 2(\delta Z_{HH} + \delta Z_{G^-G^-}) - 2((\delta Z_{hH})c_{2\alpha} + (2(\delta Z_e) + \delta Z_{HH} + \delta Z_{G^-G^-})s_{2\alpha})s_{2\beta} - \\ (\delta Z_{G^-H^-} + \delta Z_{H^-G^-})c_{2\beta}s_{2\alpha} \end{array} \right)$$

$$C_{115}\left(H^0, H^0, H^-, G^+\right) = \left[-\frac{ie^2(1)}{8c_W^4 s_W^3} \right]$$

$$1 = \begin{array}{l} s_{2\beta}\left(2(\delta Z_{hH})s_{2\alpha}c_W^2 - c_{2\alpha}\left(4(\delta s_W)s_W + (4(\delta Z_e) + 2(\delta Z_{HH}) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-})c_W^2\right)\right)s_W^3 + \\ (2(\delta Z_{G^-H^-})s_W + c_{2\beta}(4(\delta s_W)s_{2\alpha} - (2(\delta Z_{hH})c_{2\alpha} + (4(\delta Z_e) + 2(\delta Z_{HH}) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-})s_{2\alpha})s_W))c_W^4 \end{array}$$

$$C_{116}\left(H^0, H^0, G^-, H^+\right) = \left[-\frac{ie^2(1)}{8c_W^4 s_W^3} \right]$$

$$1 = \begin{array}{l} s_{2\beta}\left(2(\delta Z_{hH})s_{2\alpha}c_W^2 - c_{2\alpha}\left(4(\delta s_W)s_W + (4(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + 2(\delta Z_{HH}) + \delta Z_{G^-G^-})c_W^2\right)\right)s_W^3 + \\ (2(\delta Z_{H^-G^-})s_W + c_{2\beta}(4(\delta s_W)s_{2\alpha} - (2(\delta Z_{hH})c_{2\alpha} + (4(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + 2(\delta Z_{HH}) + \delta Z_{G^-G^-})s_{2\alpha})s_W))c_W^4 \end{array}$$

$$C_{117}\left(h^0, A^0, H^-, G^+\right) = \left[-\frac{e^2(1)}{8s_W^3} \right]$$

$$1 = \begin{array}{l} (\delta Z_{G^-G^-})s_W s_{\beta-\alpha} - (c_\alpha(4(\delta s_W) - (4(\delta Z_e) + \delta Z_{AA} + \delta Z_{hh} + \delta Z_{H^-H^-})s_W) + (\delta Z_{AG} - \delta Z_{hH})s_W s_\alpha)s_\beta + \\ c_\beta(4(\delta s_W)s_\alpha - s_W((\delta Z_{AG} - \delta Z_{hH})c_\alpha + (4(\delta Z_e) + \delta Z_{AA} + \delta Z_{hh} + \delta Z_{H^-H^-})s_\alpha)) \end{array}$$

$$C_{118}\left(h^0, A^0, G^-, H^+\right) = \left[\frac{e^2(1)}{8s_W^3} \right]$$

$$1 = \begin{array}{l} s_W\left((\delta\overline{Z}_{H^-H^-})s_{\beta-\alpha} - (\delta Z_{AG} - \delta Z_{hH})s_\alpha s_\beta\right) - c_\alpha(4(\delta s_W) - (4(\delta Z_e) + \delta Z_{AA} + \delta Z_{hh} + \delta Z_{G^-G^-})s_W)s_\beta + \\ c_\beta(4(\delta s_W)s_\alpha - s_W((\delta Z_{AG} - \delta Z_{hH})c_\alpha + (4(\delta Z_e) + \delta Z_{AA} + \delta Z_{hh} + \delta Z_{G^-G^-})s_\alpha)) \end{array}$$

$$C_{119}\left(h^0, G^0, H^-, G^+\right) = \left[-\frac{e^2(1)}{8s_W^3} \right]$$

$$1 = \begin{array}{l} c_\alpha c_\beta(4(\delta s_W) - (4(\delta Z_e) + \delta Z_{GG} + \delta Z_{hh} + \delta Z_{H^-H^-})s_W) + ((\delta Z_{AG} + \delta Z_{hH})c_\alpha s_W + 4(\delta s_W)s_\alpha)s_\beta - \\ s_W((\delta Z_{G^-G^-})c_{\beta-\alpha} + s_\alpha((\delta Z_{AG} + \delta Z_{hH})c_\beta + (4(\delta Z_e) + \delta Z_{GG} + \delta Z_{hh} + \delta Z_{H^-H^-})s_\beta)) \end{array}$$

$$C_{120}\left(h^0, G^0, G^-, H^+\right) = \left[\frac{e^2(1)}{8s_W^3} \right]$$

$$\boxed{1} = c_\alpha c_\beta \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_W\right) + \left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\alpha s_W + 4\left(\delta s_W\right) s_\alpha\right) s_\beta - s_W\left(\left(\delta \overline{Z}_{H^-H^-}\right) c_{\beta\text{-}\alpha} + s_\alpha\left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\beta + \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_\beta\right)\right)$$

$$\underset{121}{C}\left(H^0, A^0, H^-, G^+\right) = \left[\frac{e^2(\boxed{1})}{8 s_W^3}\right]$$

$$\boxed{1} = 4\left(\delta s_W\right) s_\alpha s_\beta - c_\alpha\left(\left(\delta Z_{AG} + \delta Z_{hH}\right) s_W s_\beta - c_\beta\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_W\right)\right) - s_W\left(\left(\delta Z_{G^-G^-}\right) c_{\beta\text{-}\alpha} - s_\alpha\left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\beta - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_\beta\right)\right)$$

$$\underset{122}{C}\left(H^0, A^0, G^-, H^+\right) = \left[-\frac{e^2(\boxed{1})}{8 s_W^3}\right]$$

$$\boxed{1} = 4\left(\delta s_W\right) s_\alpha s_\beta - c_\alpha\left(\left(\delta Z_{AG} + \delta Z_{hH}\right) s_W s_\beta - c_\beta\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_W\right)\right) - s_W\left(\left(\delta \overline{Z}_{H^-H^-}\right) c_{\beta\text{-}\alpha} - s_\alpha\left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\beta - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_\beta\right)\right)$$

$$\underset{123}{C}\left(H^0, G^0, H^-, G^+\right) = \left[\frac{e^2(\boxed{1})}{8 s_W^3}\right]$$

$$\boxed{1} = c_\alpha\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_W\right) s_\beta - s_W\left(\left(\delta Z_{AG} - \delta Z_{hH}\right) s_\alpha s_\beta + \left(\delta Z_{G^-G^-}\right) s_{\beta\text{-}\alpha}\right) - c_\beta\left(4\left(\delta s_W\right) s_\alpha + s_W\left(\left(\delta Z_{AG} - \delta Z_{hH}\right) c_\alpha - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_\alpha\right)\right)$$

$$\underset{124}{C}\left(H^0, G^0, G^-, H^+\right) = \left[\frac{e^2(\boxed{1})}{8 s_W^3}\right]$$

$$\boxed{1} = s_W\left(\left(\delta Z_{AG} - \delta Z_{hH}\right) s_\alpha s_\beta + \left(\delta \overline{Z}_{H^-H^-}\right) s_{\beta\text{-}\alpha}\right) - c_\alpha\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_W\right) s_\beta + c_\beta\left(4\left(\delta s_W\right) s_\alpha + s_W\left(\left(\delta Z_{AG} - \delta Z_{hH}\right) c_\alpha - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_\alpha\right)\right)$$

$$\underset{125}{C}\left(A^0, A^0, A^0, A^0\right) = \left[\frac{3 i e^2(\boxed{4})}{64 c_W^4 s_W^3}\right]$$

$$\boxed{4} = (\boxed{3}) s_{2\beta} - (\boxed{2}) c_W^2 + \left(\delta s_W\right) s_W^2\left(9 s_{2\beta}^6 - 32 s_\beta^{12} - 2 s_{2\beta}^4\left(-4 c_{2\beta} - s_\beta^4 + 8\right) + 16 s_{2\beta}^2\left(2 - 3 s_\beta^4\right) s_\beta^4\right) + 32 c_\beta^{12}\left(\left(\delta s_W - \left(\delta Z_e + \delta Z_{AA}\right) s_W\right) c_W^2 - \left(\delta s_W\right) s_W^2\right) - 2 c_\beta^2 s_{2\beta}^2\left(\left(\delta Z_{AG}\right) s_{2\beta} s_W c_W^2\left(14 - 3 s_{2\beta}^2\right) - 4 c_{2\beta}\left(4 - s_{2\beta}^2\right)\left(\left(\delta s_W - \left(\delta Z_e + \delta Z_{AA}\right) s_W\right) c_W^2 - \left(\delta s_W\right) s_W^2\right)\right)$$

$$3 = -2c_\beta^4\left(8\left(\delta Z_{AG}\right)c_{2\beta}s_W c_W^2\left(3s_{2\beta}^2+1\right)+s_{2\beta}\left(-24c_{2\beta}^2-11s_{2\beta}^2+16\right)\left(\left(\delta s_W-\left(\delta Z_e+\delta Z_{AA}\right)s_W\right)c_W^2-\left(\delta s_W\right)s_W^2\right)\right)+$$
$$4c_\beta^6\left(\left(\delta Z_{AG}\right)s_W c_W^2\left(5s_{2\beta}^2+4\right)-8c_{2\beta}s_{2\beta}\left(\left(\delta s_W-\left(\delta Z_e+\delta Z_{AA}\right)s_W\right)c_W^2-\left(\delta s_W\right)s_W^2\right)\right)$$

$$2 = (1)s_W-\left(\delta s_W-\left(\delta Z_e+\delta Z_{AA}\right)s_W\right)\left(8\left(2-c_{2\beta}\right)s_{2\beta}^4-9s_{2\beta}^6+32s_\beta^{12}-\left(32s_{2\beta}^2+2s_{2\beta}^4\right)s_\beta^4+48s_{2\beta}^2s_\beta^8\right)+$$
$$\left(\delta Z_{AG}\right)s_{2\beta}s_W\left(16\left(c_\beta^{10}+c_{2\beta}c_\beta^8\right)+2\left(s_{2\beta}^2s_\beta^2\left(3s_{2\beta}^2-2\left(-s_\beta^2-6s_\beta^4+7\right)\right)+c_{2\beta}\left(11s_{2\beta}^4-12s_{2\beta}^2\left(1-2s_\beta^4\right)+8\left(s_\beta^4+s_\beta^8\right)\right)\right)\right)$$

$$1 = 128\left(\delta c_\beta\right)c_\beta^{11}-32\left(\delta s_\beta\right)c_{2\beta}s_{2\beta}c_\beta^7+128\left(\delta s_\beta\right)s_\beta^{11}+144\left(\delta s_\beta\right)s_{2\beta}^2s_\beta^7+96\left(\delta c_\beta\right)s_{2\beta}s_\beta^9+$$
$$2c_\beta\left(\left(\delta s_\beta\right)s_{2\beta}\left(16-15s_{2\beta}^2\right)+2\left(\delta c_\beta\right)c_{2\beta}\left(12-5s_{2\beta}^2\right)\right)s_{2\beta}^2-\left(32\left(\delta c_\beta\right)s_{2\beta}-112\left(\delta s_\beta\right)c_{2\beta}s_{2\beta}^2-32\left(\delta c_\beta\right)s_{2\beta}^3\right)s_\beta^5-$$
$$\left(48\left(\delta s_\beta\right)s_{2\beta}^2-16\left(\delta c_\beta\right)c_{2\beta}s_{2\beta}^3+24\left(\delta s_\beta\right)s_{2\beta}^4\right)s_\beta^3-$$
$$s_\beta\left(48\left(\delta s_\beta\right)c_{2\beta}s_{2\beta}^2-8\left(\delta c_\beta\right)\left(4-c_{2\beta}\right)s_{2\beta}^3-20\left(\delta s_\beta\right)c_{2\beta}s_{2\beta}^4+42\left(\delta c_\beta\right)s_{2\beta}^5\right)+$$
$$s_{2\beta}\left(8c_\beta^3\left(18\left(\delta c_\beta\right)s_{2\beta}c_{2\beta}^2+\left(\delta s_\beta\right)c_{2\beta}\left(4-3s_{2\beta}^2\right)-6\left(\delta c_\beta\right)s_{2\beta}\left(1-s_{2\beta}^2\right)\right)-16c_\beta^5\left(7\left(\delta c_\beta\right)c_{2\beta}s_{2\beta}-\left(\delta s_\beta\right)\left(4-s_{2\beta}^2\right)\right)\right)$$

$$C_{126}\left(A^0,A^0,A^0,G^0\right) = \left[-\frac{3ie^2}{16c_W^4s_W^3}\left(2(5)+(2)c_{2\beta}s_{2\beta}\right)\right]$$

$$5 = \frac{1}{32}(3)s_W c_W^2-c_\beta^{11}\left(\left(4\left(\delta s_W\right)s_\beta-s_W\left(2\left(\delta s_\beta\right)+\left(4\left(\delta Z_e\right)+3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)s_\beta\right)\right)c_W^2-4\left(\delta s_W\right)s_\beta s_W^2\right)+(4)s_\beta^2-$$
$$\left(\frac{1}{2}s_{2\beta}s_\beta^5\right)\left(s_\beta c_\beta^2\left(\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)s_W\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)\left(s_\beta^2+1\right)-2\left(\delta s_\beta\right)s_W c_W^2\left(3-7s_\beta^4\right)\right)-$$
$$\left(\frac{1}{8}s_\beta s_{2\beta}^3\right)\left(4\left(\delta s_W\right)s_\beta s_W^2\left(7-5s_\beta^4\right)-\left(\begin{array}{l}4\left(\delta s_W\right)s_\beta\left(7-5s_\beta^4\right)-\\ s_W\left(\left(\delta s_\beta\right)\left(38-74s_\beta^4\right)+\left(4\left(\delta Z_e\right)+3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)s_\beta\left(7-5s_\beta^4\right)\right)\end{array}\right)c_W^2\right)-$$
$$c_\beta^7\left(4\left(\delta s_W\right)s_\beta s_W^2\left(6s_\beta^4+1\right)+c_W^2\left(s_W\left(\left(4\left(\delta Z_e\right)+3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)s_\beta\left(6s_\beta^4+1\right)+\left(\delta s_\beta\right)\left(44s_\beta^4+2\right)\right)-4\left(\delta s_W\right)\left(s_\beta+6s_\beta^5\right)\right)\right)$$

$$4 = -c_\beta^9\left(\left(6\left(\delta s_\beta\right)s_W-5\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)s_W\right)s_\beta\right)c_W^2+20\left(\delta s_W\right)s_\beta s_W^2\right)+$$
$$c_\beta^5\left(4\left(\delta s_W\right)s_\beta s_W^2\left(6s_\beta^4+7\right)-c_W^2\left(4\left(\delta s_W\right)s_\beta\left(6s_\beta^4+7\right)-s_W\left(\left(4\left(\delta Z_e\right)+3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)s_\beta\left(6s_\beta^4+7\right)+2\left(\delta s_\beta\right)\left(26s_\beta^4+9\right)\right)\right)\right)$$

$$3 = \left(\delta Z_{AG}\right)\left(\begin{array}{l}32c_\beta^{12}-32c_\beta^8+39s_{2\beta}^6-s_{2\beta}^4\left(44-94s_\beta^4\right)-32\left(1-s_\beta^4\right)s_\beta^8+\\ s_{2\beta}^2\left(2c_\beta^4\left(24c_{2\beta}^2+59s_{2\beta}^2+16\right)+16s_\beta^4\left(3s_\beta^4+2\right)\right)\end{array}\right)+4s_{2\beta}\left(\delta c_\beta\right)\left(\begin{array}{l}56c_\beta^9+c_\beta\left(38-13s_{2\beta}^2\right)s_{2\beta}^2-2c_\beta^5\left(37s_{2\beta}^2+12\right)+\\ 2s_{2\beta}s_\beta^3\left(11s_{2\beta}^2-2\left(-s_\beta^2-4s_\beta^4+9\right)\right)\end{array}\right)$$

$$2 = -(1)s_\beta-s_W c_W^2\left(\left(\delta Z_{AG}\right)s_{2\beta}\left(c_\beta^2+1\right)\left(4c_\beta^2-4c_\beta^4-s_{2\beta}^2\right)-2\left(\delta c_\beta\right)\left(8c_\beta^7+2c_\beta^3\left(9s_{2\beta}^2+2\right)-s_{2\beta}s_\beta\left(-11s_{2\beta}^2-12s_\beta^4+6\right)\right)\right)-$$
$$c_\beta^8\left(\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)s_W\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)+$$
$$c_\beta^4\left(4\left(\delta s_W\right)s_W^2\left(22s_\beta^4+1\right)-c_W^2\left(\left(\delta s_W\right)\left(88s_\beta^4+4\right)-s_W\left(176\left(\delta s_\beta\right)s_\beta^3+\left(3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)\left(22s_\beta^4+1\right)+\left(\delta Z_e\right)\left(88s_\beta^4+4\right)\right)\right)\right)$$

$$\boxed{1} = (\delta s_\beta)\, s_W c_W^2 \left(24c_\beta^2 - 48c_\beta^6\right) - s_{2\beta}\left(3c_\beta - 6c_\beta^5\right)\left(\left(4\,(\delta s_W) - \left(4\,(\delta Z_e) + 3\,(\delta Z_{AA}) + \delta Z_{GG}\right) s_W\right) c_W^2 - 4\,(\delta s_W)\, s_W^2\right) - s_\beta^2\left(4\,(\delta s_W)\, s_\beta s_W^2\left(3s_{2\beta}^2 + s_\beta^4 + 1\right) - c_W^2\left(4\,(\delta s_W)\left(3s_{2\beta}^2 s_\beta + s_\beta + s_\beta^5\right) - \left(\begin{array}{l} 4\,(\delta s_\beta)\left(9s_{2\beta}^2 + 4s_\beta^4 + 2\right) + \\ \left(4\,(\delta Z_e) + 3\,(\delta Z_{AA}) + \delta Z_{GG}\right) s_\beta\left(3s_{2\beta}^2 + s_\beta^4 + 1\right)\end{array}\right) s_W\right)\right)$$

$$\underset{127}{C}\left(A^0, A^0, G^0, G^0\right) = \left[\; -\frac{ie^2(\boxed{2})}{32c_W^4 s_W^3}\;\right]$$

$$\boxed{2} = 2\,(\delta s_W)\, s_W^2\left(12s_{2\beta}^6 - 3s_{2\beta}^4\left(-2c_{2\beta} - 8s_\beta^4 + 5\right) + 16s_{2\beta}^2 s_\beta^4 - 8s_\beta^8\right) + c_W^2\left((\boxed{1}) s_W + 2\,(\delta s_W)\left(3\left(-2c_{2\beta} - 4s_{2\beta}^2 + 5\right)s_{2\beta}^4 - 8s_{2\beta}^2\left(3s_{2\beta}^2 + 2\right)s_\beta^4 + 8s_\beta^8\right)\right) + \left(8c_\beta^8 - s_{2\beta}^2\left(c_{2\beta}\left(24c_\beta^6 - 6c_\beta^2\left(4 - s_{2\beta}^2\right)\right) + 8c_\beta^4\left(3s_{2\beta}^2 + 2\right)\right)\right)\left(\left(2\,(\delta s_W) - \left(2\,(\delta Z_e) + \delta Z_{AA} + \delta Z_{GG}\right) s_W\right) c_W^2 - 2\,(\delta s_W)\, s_W^2\right)$$

$$\boxed{1} = -48\,(\delta s_\beta)\, s_{2\beta} c_\beta^9 - 6c_\beta\left(2\,(\delta s_\beta)\, s_{2\beta}\left(5 - 8s_{2\beta}^2\right) + (\delta c_\beta)\, c_{2\beta}\left(12 - 5s_{2\beta}^2\right)\right)s_{2\beta}^2 - (\delta s_\beta)\left(32 - 24s_{2\beta}^2\right)s_\beta^7 - 48\,(\delta c_\beta)\, s_{2\beta} s_\beta^9 - 12s_{2\beta} c_\beta^3\left((\delta s_\beta)\, c_{2\beta}\left(4 - 3s_{2\beta}^2\right) - (\delta c_\beta)\, s_{2\beta}\left(13s_{2\beta}^2 + 4\right)\right) - \left(32\,(\delta c_\beta)\, s_{2\beta} - 168\,(\delta s_\beta)\, c_{2\beta} s_{2\beta}^2 + 72\,(\delta c_\beta)\, s_{2\beta}^3\right)s_\beta^5 + \left(48\,(\delta s_\beta)\, s_{2\beta}^2 - 24\,(\delta c_\beta)\, c_{2\beta} s_{2\beta}^3 + 156\,(\delta s_\beta)\, s_{2\beta}^4\right)s_\beta^3 + s_\beta\left(72\,(\delta s_\beta)\, c_{2\beta} s_{2\beta}^2 - 12\,(\delta c_\beta)\,(5 - c_{2\beta})\, s_{2\beta}^3 - 30\,(\delta s_\beta)\, c_{2\beta} s_{2\beta}^4 + 96\,(\delta c_\beta)\, s_{2\beta}^5\right) + 8\left(c_\beta^7\left(6\,(\delta s_\beta)\, c_{2\beta} s_{2\beta} - (\delta c_\beta)\left(4 - 3s_{2\beta}^2\right)\right) + s_{2\beta} c_\beta^5\left(21\,(\delta c_\beta)\, c_{2\beta} s_{2\beta} + (\delta s_\beta)\left(9s_{2\beta}^2 + 4\right)\right)\right) - \left(2\,(\delta Z_e) + \delta Z_{AA} + \delta Z_{GG}\right)\left(3\,(5 - 2c_{2\beta})\, s_{2\beta}^4 - 12s_{2\beta}^6 - \left(16s_{2\beta}^2 + 24s_{2\beta}^4\right)s_\beta^4 + 8s_\beta^8\right)$$

$$\underset{128}{C}\left(A^0, G^0, G^0, G^0\right) = \left[\; \frac{3ie^2}{16c_W^4 s_W^3}\left(2(\boxed{5}) + (\boxed{2}) c_{2\beta} s_{2\beta}\right)\;\right]$$

$$\boxed{5} = \frac{1}{32}(\boxed{3}) s_W c_W^2 - c_\beta^{11}\left(\left(4\,(\delta s_W)\, s_\beta - s_W\left(2\,(\delta s_\beta) + \left(4\,(\delta Z_e) + \delta Z_{AA} + 3\,(\delta Z_{GG})\right) s_\beta\right)\right) c_W^2 - 4\,(\delta s_W)\, s_\beta s_W^2\right) + (\boxed{4}) s_\beta^2 - \left(\frac{1}{2} s_{2\beta} s_\beta^5\right)\left(s_\beta c_\beta^2\left(\left(4\,(\delta s_W) - \left(4\,(\delta Z_e) + \delta Z_{AA} + 3\,(\delta Z_{GG})\right) s_W\right) c_W^2 - 4\,(\delta s_W)\, s_W^2\right)\left(s_\beta^2 + 1\right) - 2\,(\delta s_\beta)\, s_W c_W^2\left(3 - 7s_\beta^4\right)\right) - \left(\frac{1}{8} s_\beta s_{2\beta}^3\right)\left(4\,(\delta s_W)\, s_\beta s_W^2\left(7 - 5s_\beta^4\right) - \left(\begin{array}{l} 4\,(\delta s_W)\, s_\beta\left(7 - 5s_\beta^4\right) - \\ s_W\left((\delta s_\beta)\left(38 - 74s_\beta^4\right) + \left(4\,(\delta Z_e) + \delta Z_{AA} + 3\,(\delta Z_{GG})\right) s_\beta\left(7 - 5s_\beta^4\right)\right)\end{array}\right) c_W^2\right) - c_\beta^7\left(4\,(\delta s_W)\, s_\beta s_W^2\left(6s_\beta^4 + 1\right) + c_W^2\left(s_W\left(\left(4\,(\delta Z_e) + \delta Z_{AA} + 3\,(\delta Z_{GG})\right) s_\beta\left(6s_\beta^4 + 1\right) + (\delta s_\beta)\left(44s_\beta^4 + 2\right)\right) - 4\,(\delta s_W)\left(s_\beta + 6s_\beta^5\right)\right)\right)$$

$$\boxed{4} = -c_\beta^9\left(\left(6\,(\delta s_\beta)\, s_W - 5\left(4\,(\delta s_W) - \left(4\,(\delta Z_e) + \delta Z_{AA} + 3\,(\delta Z_{GG})\right) s_W\right) s_\beta\right) c_W^2 + 20\,(\delta s_W)\, s_\beta s_W^2\right) + c_\beta^5\left(4\,(\delta s_W)\, s_\beta s_W^2\left(6s_\beta^4 + 7\right) - c_W^2\left(4\,(\delta s_W)\, s_\beta\left(6s_\beta^4 + 7\right) - s_W\left(\left(4\,(\delta Z_e) + \delta Z_{AA} + 3\,(\delta Z_{GG})\right) s_\beta\left(6s_\beta^4 + 7\right) + 2\,(\delta s_\beta)\left(26s_\beta^4 + 9\right)\right)\right)\right)$$

$$3 = 4s_{2\beta}\left(\delta c_\beta\right)\left(\begin{array}{l} 56c_\beta^9 + c_\beta\left(38 - 13s_{2\beta}^2\right)s_{2\beta}^2 - 2c_\beta^5\left(37s_{2\beta}^2 + 12\right) + \\ 2s_{2\beta}s_\beta^3\left(11s_{2\beta}^2 - 2\left(-s_\beta^2 - 4s_\beta^4 + 9\right)\right)\end{array}\right) - \left(\delta Z_{AG}\right)\left(\begin{array}{l} 32c_\beta^{12} - 32c_\beta^8 + 39s_{2\beta}^6 - s_{2\beta}^4\left(44 - 94s_\beta^4\right) - 32\left(1 - s_\beta^4\right)s_\beta^8 + \\ s_{2\beta}^2\left(2c_\beta^4\left(24c_{2\beta}^2 + 59s_{2\beta}^2 + 16\right) + 16s_\beta^4\left(3s_\beta^4 + 2\right)\right)\end{array}\right)$$

$$\begin{array}{rl} 2 = & s_W c_W^2\left(\left(\delta Z_{AG}\right)s_{2\beta}\left(c_\beta^2 + 1\right)\left(4c_\beta^2 - 4c_\beta^4 - s_{2\beta}^2\right) + 2\left(\delta c_\beta\right)\left(8c_\beta^7 + 2c_\beta^3\left(9s_{2\beta}^2 + 2\right) - s_{2\beta}s_\beta\left(-11s_{2\beta}^2 - 12s_\beta^4 + 6\right)\right)\right) - (1)s_\beta - \\ 2 = & c_\beta^8\left(\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + 3\left(\delta Z_{GG}\right)\right)s_W\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right) + \\ & c_\beta^4\left(4\left(\delta s_W\right)s_W^2\left(22s_\beta^4 + 1\right) - c_W^2\left(\left(\delta s_W\right)\left(88s_\beta^4 + 4\right) - s_W\left(176\left(\delta s_\beta\right)s_\beta^3 + \left(\delta Z_{AA} + 3\left(\delta Z_{GG}\right)\right)\left(22s_\beta^4 + 1\right) + \left(\delta Z_e\right)\left(88s_\beta^4 + 4\right)\right)\right)\right)\end{array}$$

$$\begin{array}{rl} 1 = & \left(\delta s_\beta\right)s_W c_W^2\left(24c_\beta^2 - 48c_\beta^6\right) - s_{2\beta}\left(3c_\beta - 6c_\beta^5\right)\left(\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + 3\left(\delta Z_{GG}\right)\right)s_W\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right) - \\ & s_\beta^2\left(4\left(\delta s_W\right)s_\beta s_W^2\left(3s_{2\beta}^2 + s_\beta^4 + 1\right) - c_W^2\left(4\left(\delta s_W\right)\left(3s_{2\beta}^2 s_\beta + s_\beta + s_\beta^5\right) - \left(\begin{array}{l} 4\left(\delta s_\beta\right)\left(9s_{2\beta}^2 + 4s_\beta^4 + 2\right) + \\ \left(4\left(\delta Z_e\right) + \delta Z_{AA} + 3\left(\delta Z_{GG}\right)\right)s_\beta\left(3s_{2\beta}^2 + s_\beta^4 + 1\right)\end{array}\right)s_W\right)\right)\end{array}$$

$$\underset{129}{C}\left(G^0, G^0, G^0, G^0\right) = \left[\frac{3ie^2(3)}{64c_W^4 s_W^3}\right]$$

$$\begin{array}{rl} 3 = & -(2)s_{2\beta} + 32c_\beta^{12}\left(\left(\delta s_W - \left(\delta Z_e + \delta Z_{GG}\right)s_W\right)c_W^2 - \left(\delta s_W\right)s_W^2\right) + \left(\delta s_W\right)s_W^2\left(9s_{2\beta}^6 - 32s_\beta^{12} - 2s_{2\beta}^4\left(-4c_{2\beta} - s_\beta^4 + 8\right) + 16s_{2\beta}^2\left(2 - 3s_\beta^4\right)s_\beta^4\right) - \\ 3 = & c_W^2\left((1)s_W + \left(\delta s_W\right)\left(9s_{2\beta}^6 - 32s_\beta^{12} - 2s_{2\beta}^4\left(-4c_{2\beta} - s_\beta^4 + 8\right) + 16s_{2\beta}^2\left(2 - 3s_\beta^4\right)s_\beta^4\right)\right) + \\ & c_\beta^2 s_{2\beta}^2\left(2\left(\delta Z_{AG}\right)s_{2\beta}s_W c_W^2\left(14 - 3s_{2\beta}^2\right) + 8c_{2\beta}\left(4 - s_{2\beta}^2\right)\left(\left(\delta s_W - \left(\delta Z_e + \delta Z_{GG}\right)s_W\right)c_W^2 - \left(\delta s_W\right)s_W^2\right)\right)\end{array}$$

$$\begin{array}{rl} 2 = & 4c_\beta^6\left(\left(\delta Z_{AG}\right)s_W c_W^2\left(5s_{2\beta}^2 + 4\right) + 8c_{2\beta}s_{2\beta}\left(\left(\delta s_W - \left(\delta Z_e + \delta Z_{GG}\right)s_W\right)c_W^2 - \left(\delta s_W\right)s_W^2\right)\right) - \\ & 2c_\beta^4\left(c_W^2\left(\left(\delta Z_{AG}\right)c_{2\beta}s_W\left(24s_{2\beta}^2 + 8\right) - \left(\delta s_W - \left(\delta Z_e + \delta Z_{GG}\right)s_W\right)\left(8s_{2\beta}\left(2 - 3c_{2\beta}^2\right) - 11s_{2\beta}^3\right)\right) + \left(\delta s_W\right)s_{2\beta}\left(-24c_{2\beta}^2 - 11s_{2\beta}^2 + 16\right)s_W^2\right)\end{array}$$

$$1 = \begin{aligned} &128\left(\delta c_\beta\right) c_\beta^{11} - 16\left(\delta Z_{\mathrm{AG}}\right) s_{2\beta}\left(c_\beta^{10} + c_{2\beta} c_\beta^{8}\right) - \left(\delta Z_{\mathrm{e}}\right)\left(9 s_{2\beta}^{6} - 32 s_\beta^{12} - 2 s_{2\beta}^{4}\left(-4 c_{2\beta} - s_\beta^4 + 8\right) + 16 s_{2\beta}^{2}\left(2 - 3 s_\beta^4\right) s_\beta^4\right) + \\ &2 c_\beta\left(\left(\delta s_\beta\right) s_{2\beta}\left(16 - 15 s_{2\beta}^2\right) + 2\left(\delta c_\beta\right) c_{2\beta}\left(12 - 5 s_{2\beta}^2\right)\right) s_{2\beta}^2 - \\ &\left(\delta Z_{\mathrm{GG}}\right)\left(9 s_{2\beta}^{6} - 32 s_\beta^{12} - 2 s_{2\beta}^{4}\left(8 - s_\beta^4\right) + 16 s_{2\beta}^{2}\left(2 - 3 s_\beta^4\right) s_\beta^4\right) \\ &\left(\begin{array}{l} 32\left(\delta s_\beta\right) c_{2\beta} c_\beta^7 + 16 c_\beta^5\left(7\left(\delta c_\beta\right) c_{2\beta} s_{2\beta} - \left(\delta s_\beta\right)\left(4 - s_{2\beta}^2\right)\right) - \\ 8 c_\beta^3\left(18\left(\delta c_\beta\right) s_{2\beta} c_{2\beta}^2 + \left(\delta s_\beta\right) c_{2\beta}\left(4 - 3 s_{2\beta}^2\right) - 6\left(\delta c_\beta\right) s_{2\beta}\left(1 - s_{2\beta}^2\right)\right) \end{array}\right) s_{2\beta} - \\ &2\left(\begin{array}{l} \left(\delta c_\beta\right) s_{2\beta}\left(21 s_{2\beta}^4 + 16 s_\beta^4 - 16 s_{2\beta}^2\left(s_\beta^4 + 1\right) - 48 s_\beta^8\right) + \\ \left(\begin{array}{l} 4\left(\delta s_\beta\right) s_\beta\left(3 s_{2\beta}^4 + s_{2\beta}^2\left(6 - 18 s_\beta^4\right) - 16 s_\beta^8\right) + \\ \left(\delta Z_{\mathrm{AG}}\right) s_{2\beta}^3\left(3 s_{2\beta}^2 - 2\left(-s_\beta^2 - 6 s_\beta^4 + 7\right)\right) \end{array}\right) s_\beta \end{array}\right) s_\beta - \\ &2\left(\begin{array}{l} s_\beta\left(4\left(\delta c_\beta\right) s_{2\beta}^2\left(1 - 2 s_\beta^2\right) + 2\left(\delta s_\beta\right) s_{2\beta}\left(-5 s_{2\beta}^2 - 28 s_\beta^4 + 12\right)\right) + \\ 4\left(\delta Z_{\mathrm{GG}}\right) s_{2\beta}^3 + \left(\delta Z_{\mathrm{AG}}\right)\left(11 s_{2\beta}^4 - 12 s_{2\beta}^2\left(1 - 2 s_\beta^4\right) + 8\left(s_\beta^4 + s_\beta^8\right)\right) \end{array}\right) c_{2\beta} s_{2\beta} \end{aligned}$$

$$\underset{130}{C}\left(A^0, A^0, H^-, H^+\right) = \left[-\frac{i e^2 c_{2\beta}}{8 c_{\mathrm{W}}^4 s_{\mathrm{W}}^3}\left(\begin{array}{l} s_{2\beta} s_{\mathrm{W}}\left(2\left(\delta Z_{\mathrm{AG}}\right) + \delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}}\right) c_{\mathrm{W}}^2 + \\ \left(\begin{array}{l} 4\left(\delta s_{\mathrm{W}}\right) s_{\mathrm{W}}^2 - \\ \left(4\left(\delta s_{\mathrm{W}}\right) - s_{\mathrm{W}}\left(4\left(\delta Z_{\mathrm{e}}\right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + 16 c_\beta\left(\delta c_\beta\right) + 16 s_\beta\left(\delta s_\beta\right) + 2\left(\delta Z_{\mathrm{AA}}\right) + \delta Z_{\mathrm{H^-H^-}}\right)\right) c_{\mathrm{W}}^2 \end{array}\right) c_{2\beta} \end{array}\right)\right]$$

$$\underset{131}{C}\left(A^0, A^0, H^-, G^+\right) = \left[-\frac{i e^2 (1)}{8 c_{\mathrm{W}}^4 s_{\mathrm{W}}^3} \right]$$

$$1 = \begin{aligned} &-2 s_{\mathrm{W}} c_{\mathrm{W}}^2\left(\left(\delta Z_{\mathrm{AG}} - \delta Z_{\mathrm{G^-H^-}}\right) c_{\mathrm{W}}^2 - \left(\delta Z_{\mathrm{AG}}\right) s_{2\beta}^2\right) - \\ &c_{2\beta} s_{2\beta}\left(\left(4\left(\delta s_{\mathrm{W}}\right) - s_{\mathrm{W}}\left(4\left(\delta Z_{\mathrm{e}}\right) + 2\left(\delta Z_{\mathrm{AA}}\right) + \delta Z_{\mathrm{G^-G^-}} + \delta Z_{\mathrm{H^-H^-}} + 16\left(\delta c_\beta\right) c_\beta + 16\left(\delta s_\beta\right) s_\beta\right)\right) c_{\mathrm{W}}^2 - 4\left(\delta s_{\mathrm{W}}\right) s_{\mathrm{W}}^2\right) \end{aligned}$$

$$\underset{132}{C}\left(A^0, A^0, G^-, H^+\right) = \left[-\frac{i e^2 (1)}{8 c_{\mathrm{W}}^4 s_{\mathrm{W}}^3} \right]$$

$$1 = \begin{aligned} &-c_{2\beta} s_{2\beta}\left(\left(4\left(\delta s_{\mathrm{W}}\right) - s_{\mathrm{W}}\left(4\left(\delta Z_{\mathrm{e}}\right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + 2\left(\delta Z_{\mathrm{AA}}\right) + \delta Z_{\mathrm{G^-G^-}} + 16\left(\delta c_\beta\right) c_\beta + 16\left(\delta s_\beta\right) s_\beta\right)\right) c_{\mathrm{W}}^2 - 4\left(\delta s_{\mathrm{W}}\right) s_{\mathrm{W}}^2\right) - \\ &2 s_{\mathrm{W}} c_{\mathrm{W}}^2\left(\left(\delta Z_{\mathrm{AG}} - \delta Z_{\mathrm{H^-G^-}}\right) c_{\mathrm{W}}^2 - \left(\delta Z_{\mathrm{AG}}\right) s_{2\beta}^2\right) \end{aligned}$$

$$\underset{133}{C}\left(A^0, A^0, G^-, G^+\right) = \left[\frac{i e^2 (1)}{8 c_{\mathrm{W}}^4 s_{\mathrm{W}}^3} \right]$$

$$1 = \begin{array}{l} -4\left(c_W^4\left(s_W\left(2\left(\delta Z_e\right)+\delta Z_{AA}+\delta Z_{G^-G^-}+6\left(\delta c_\beta\right)c_\beta+6\left(\delta s_\beta\right)s_\beta\right)-\left(\delta s_W\right)\left(s_{2\beta}^2+1\right)\right)-\left(\delta s_W\right)c_{2\beta}^2 s_W^4\right)+ \\ c_{2\beta}s_W\left(\left(2\left(\delta Z_{AG}\right)-\delta Z_{G^-H^-}-\delta Z_{H^-G^-}\right)s_{2\beta}+2c_{2\beta}\left(2\left(\delta Z_e\right)+\delta Z_{AA}+\delta Z_{G^-G^-}+8\left(\delta c_\beta\right)c_\beta+8\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2 \end{array}$$

$$C_{134}\left(A^0,G^0,H^-,H^+\right) = \left[-\frac{ie^2(1)}{8c_W^4 s_W^3} \right]$$

$$1 = \begin{array}{l} -c_{2\beta}s_{2\beta}\left(\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{H^-H^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)+ \\ \left(\begin{array}{l}\left(2\left(\delta Z_{AG}\right)-\delta Z_{G^-H^-}-\delta Z_{H^-G^-}\right)c_W^2+ \\ \left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_{2\beta}^2\end{array}\right)s_W c_W^2 \end{array}$$

$$C_{135}\left(A^0,G^0,H^-,G^+\right) = \left[\frac{ie^2}{32c_W^4 s_W^3}\left(-\left(\begin{array}{l}\left(\delta s_W\right)\left(16-8\left(s_{2\beta}^2+s_{2\beta}^4\right)+s_{2\beta}^6\right)- \\ 4s_W\left(4\left(\delta Z_e\right)+16c_\beta\left(\delta c_\beta\right)+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}+16s_\beta\left(\delta s_\beta\right)c_{2\beta}^2\right)\end{array}\right)c_W^4+(1)s_{2\beta}^2\right) \right]$$

$$1 = \begin{array}{l} -\left(\delta s_W\right)s_W^2\left(\left(-8s_{2\beta}^2+s_{2\beta}^4+24\right)s_W^2-8\left(c_\beta^8+s_\beta^8\right)\right)- \\ 4c_W^2\left(s_W\left(4\left(\delta Z_e\right)+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta s_W^2\right)-\left(\delta s_W\right)\left(2-4s_W^2\right)\left(c_\beta^8+s_\beta^8\right)\right) \end{array}$$

$$C_{136}\left(A^0,G^0,G^-,H^+\right) = \left[\frac{ie^2}{32c_W^4 s_W^3}\left(-\left(\begin{array}{l}\left(\delta s_W\right)\left(16-8\left(s_{2\beta}^2+s_{2\beta}^4\right)+s_{2\beta}^6\right)- \\ 4s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+16c_\beta\left(\delta c_\beta\right)+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{G^-G^-}+16s_\beta\left(\delta s_\beta\right)c_{2\beta}^2\right)\end{array}\right)c_W^4+(1)s_{2\beta}^2\right) \right]$$

$$1 = \begin{array}{l} -\left(\delta s_W\right)s_W^2\left(\left(-8s_{2\beta}^2+s_{2\beta}^4+24\right)s_W^2-8\left(c_\beta^8+s_\beta^8\right)\right)- \\ 4c_W^2\left(s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{G^-G^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta s_W^2\right)-\left(\delta s_W\right)\left(2-4s_W^2\right)\left(c_\beta^8+s_\beta^8\right)\right) \end{array}$$

$$C_{137}\left(A^0,G^0,G^-,G^+\right) = \left[-\frac{ie^2(1)}{8c_W^4 s_W^3} \right]$$

$$1 = \begin{array}{l} c_{2\beta}s_{2\beta}\left(\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta Z_{AA}+\delta Z_{GG}+2\left(\delta Z_{G^-G^-}\right)+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)+ \\ \left(\begin{array}{l}\left(2\left(\delta Z_{AG}\right)-\delta Z_{G^-H^-}-\delta Z_{H^-G^-}\right)c_W^2+ \\ \left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_{2\beta}^2\end{array}\right)s_W c_W^2 \end{array}$$

$$C_{138}\left(G^0,G^0,H^-,H^+\right) = \left[\frac{ie^2(1)}{8c_W^4 s_W^3} \right]$$

$$1 = \begin{aligned} & 4\left(\delta s_W\right) c_{2\beta}^2 s_W^4 - c_W^4 \left(2 s_W \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{GG}\right) + \delta Z_{H^-H^-} + 12\left(\delta c_\beta\right) c_\beta + 12\left(\delta s_\beta\right) s_\beta\right) - 4\left(\delta s_W\right)\left(s_{2\beta}^2 + 1\right)\right) - \\ & c_{2\beta} s_W \left(\left(2\left(\delta Z_{AG}\right) - \delta Z_{G^-H^-} - \delta Z_{H^-G^-}\right) s_{2\beta} - c_{2\beta}\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{GG}\right) + \delta Z_{H^-H^-} + 16\left(\delta c_\beta\right) c_\beta + 16\left(\delta s_\beta\right) s_\beta\right)\right) c_W^2 \end{aligned}$$

$$\underset{139}{C}\left(G^0, G^0, H^-, G^+\right) = \left[\ \frac{i e^2 (1)}{8 c_W^4 s_W^3}\ \right]$$

$$1 = \begin{aligned} & s_W \left(2\left(\delta Z_{AG}\right)\left(c_W - s_{2\beta}\right)\left(c_W + s_{2\beta}\right) c_W^2 - 2\left(\delta Z_{G^-H^-}\right) c_W^4\right) - \\ & c_{2\beta} s_{2\beta} \left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + 2\left(\delta Z_{GG}\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-} + 16\left(\delta c_\beta\right) c_\beta + 16\left(\delta s_\beta\right) s_\beta\right)\right) c_W^2 - 4\left(\delta s_W\right) s_W^2\right) \end{aligned}$$

$$\underset{140}{C}\left(G^0, G^0, G^-, H^+\right) = \left[\ \frac{i e^2 (1)}{8 c_W^4 s_W^3}\ \right]$$

$$1 = \begin{aligned} & -c_{2\beta} s_{2\beta} \left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{GG}\right) + \delta Z_{G^-G^-} + 16\left(\delta c_\beta\right) c_\beta + 16\left(\delta s_\beta\right) s_\beta\right)\right) c_W^2 - 4\left(\delta s_W\right) s_W^2\right) + \\ & s_W \left(2\left(\delta Z_{AG}\right)\left(c_W - s_{2\beta}\right)\left(c_W + s_{2\beta}\right) c_W^2 - 2\left(\delta Z_{H^-G^-}\right) c_W^4\right) \end{aligned}$$

$$\underset{141}{C}\left(G^0, G^0, G^-, G^+\right) = \left[\ -\frac{i e^2 c_{2\beta}}{8 c_W^4 s_W^3}\left(\begin{array}{l} 2\left(\begin{array}{l} 2\left(\delta s_W\right) s_W^2 - \\ \left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + 8 c_\beta\left(\delta c_\beta\right) + 8 s_\beta\left(\delta s_\beta\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right)\right) c_W^2 \end{array}\right) c_{2\beta} - \\ s_{2\beta} s_W \left(2\left(\delta Z_{AG}\right) + \delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) c_W^2 \end{array}\right)\ \right]$$

$$\underset{142}{C}\left(H^-, H^-, H^+, H^+\right) = \left[\ \frac{i e^2 (1) c_{2\beta}}{2 c_W^4 s_W^3}\ \right]$$

$$1 = \begin{aligned} & c_\beta^2 \left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{H^-H^-}\right) s_W\right) c_W^2 - 2\left(\delta s_W\right) s_W^2\right) + 2\left(\delta s_W\right) s_W^2 s_\beta^2 - \\ & \left(\begin{array}{l} \left(\left(\delta\overline{Z}_{H^-H^-}\right) c_{2\beta} + \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_{2\beta}\right) s_W + \\ \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{H^-H^-}\right) s_W\right) s_\beta^2 \end{array}\right) c_W^2 \end{aligned}$$

$$\underset{143}{C}\left(H^-, H^-, H^+, G^+\right) = \left[\ -\frac{i e^2 (1)}{4 c_W^4 s_W^3}\ \right]$$

$$1 = \begin{aligned} & -c_{2\beta} s_{2\beta} \left(\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{G^-G^-} + 2\left(\delta Z_{H^-H^-}\right)\right) s_W\right) c_W^2 - 4\left(\delta s_W\right) s_W^2\right) + \\ & \left(\frac{1}{2} s_W c_W^2\right)\left(\begin{array}{l} \left(\delta Z_{G^-H^-}\right)\left(2 c_{2\beta}^2 - 2 c_\beta^4 + 3 s_{2\beta}^2 - 2 s_\beta^4\right) + \\ 2 s_{2\beta}\left(\left(\delta\overline{Z}_{H^-H^-}\right) c_{2\beta} + \left(\delta Z_{H^-G^-}\right) s_{2\beta}\right) \end{array}\right) \end{aligned}$$

$$C_{144}\left(H^-,H^-,G^+,G^+\right) = \left[\frac{ie^2 s_{2\beta}^2}{2c_W^4 s_W^3}\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{145}\left(H^-,G^-,H^+,H^+\right) = \left[\frac{ie^2(1)s_{2\beta}}{4c_W^4 s_W^3}\right]$$

$$1 = c_\beta^2\left(\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)s_W\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right) + 4\left(\delta s_W\right)s_W^2 s_\beta^2 - \left(\begin{array}{l}\left(2\left(\delta\overline{Z}_{H^-H^-}\right)c_{2\beta} + \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)s_{2\beta}\right)s_W + \\ \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)s_W\right)s_\beta^2\end{array}\right)c_W^2$$

$$C_{146}\left(H^-,G^-,H^+,G^+\right) = \left[-\frac{ie^2}{8c_W^4 s_W^3}\left(1 - 2s_{2\beta}^2\right)\left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{G^-G^-}\right) + \delta Z_{H^-H^-}\right)\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{147}\left(H^-,G^-,G^+,G^+\right) = \left[-\frac{ie^2(1)s_{2\beta}}{4c_W^4 s_W^3}\right]$$

$$1 = c_\beta^2\left(\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)s_W\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right) + 4\left(\delta s_W\right)s_W^2 s_\beta^2 - \left(\begin{array}{l}\left(2\left(\delta Z_{G^-G^-}\right)c_{2\beta} - \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)s_{2\beta}\right)s_W + \\ \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)s_W\right)s_\beta^2\end{array}\right)c_W^2$$

$$C_{148}\left(G^-,G^-,H^+,H^+\right) = \left[\frac{ie^2 s_{2\beta}^2}{2c_W^4 s_W^3}\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{G^-G^-}\right)\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{149}\left(G^-,G^-,H^+,G^+\right) = \left[-\frac{ie^2 s_{2\beta}}{4c_W^4 s_W^3}\left(\begin{array}{l}c_{2\beta}\left(\left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + 3\left(\delta Z_{G^-G^-}\right)\right)\right)c_W^2 - 4\left(\delta s_W\right)s_W^2\right) - \\ s_W\left(c_{2\beta}\left(\delta\overline{Z}_{H^-H^-}\right) - s_{2\beta}\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)\right)c_W^2\end{array}\right)\right]$$

$$C_{150}\left(G^-,G^-,G^+,G^+\right) = \left[\frac{ie^2(1)c_{2\beta}}{2c_W^4 s_W^3}\right]$$

$$1 = c_W^2\left(-\left(\begin{array}{l}\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + 3\left(\delta Z_{G^-G^-}\right)\right)s_W\right)s_\beta^2 + \\ \left(\delta Z_{G^-G^-} - \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)s_{2\beta}\right)s_W\end{array}\right)\right) + c_\beta^2\left(c_W^2\left(2\left(\delta s_W\right) - s_W\left(\delta Z_{G^-G^-} + 2\left(\delta Z_e\right)\right)\right) - 2s_W^2\left(\delta s_W\right)\right) + 2s_\beta^2 s_W^2\left(\delta s_W\right)$$

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$$\underset{380}{C}\left(\tilde{e}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{\mathrm{i}e^2(\,19\,)}{8c_W^4 c_\beta^3 M_W^4 s_W^3} \right]$$

$$19 = \left((\,14\,)\delta_{g1,g4}\delta_{g2,g3} + (\,18\,)\delta_{g1,g2}\delta_{g3,g4}\right) U^{\tilde{e}_{g1}*}_{s1,1} - 2\left((\,6\,)\delta_{g1,g4}\delta_{g2,g3} + (\,10\,)\delta_{g1,g2}\delta_{g3,g4}\right) U^{\tilde{e}_{g1}*}_{s1,2} + \begin{pmatrix} (\,1\,)\left(\delta Z^{\tilde{e}_{g1}}_{1,s1} U^{\tilde{e}_{g1}*}_{1,1} + \delta Z^{\tilde{e}_{g1}}_{2,s1} U^{\tilde{e}_{g1}*}_{2,1}\right) - \\ 2(\,2\,)\left(\delta Z^{\tilde{e}_{g1}}_{1,s1} U^{\tilde{e}_{g1}*}_{1,2} + \delta Z^{\tilde{e}_{g1}}_{2,s1} U^{\tilde{e}_{g1}*}_{2,2}\right) \end{pmatrix} c_\beta s_W c_W^2 M_W^2$$

$$18 = (\,15\,)s_W - \begin{pmatrix} 2c_W^2 c_\beta^3 M_W^4 s_W^3 U^{\tilde{e}_{g3}}_{2,2} U^{\tilde{e}_{g1}}_{s2,1} - \\ 2c_\beta m_{e_{g1}} m_{e_{g3}} s_W c_W^4 M_W^2 U^{\tilde{e}_{g3}}_{2,1} U^{\tilde{e}_{g1}}_{s2,2} \end{pmatrix} \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}*}_{s3,2} + (\,17\,)U^{\tilde{e}_{g3}}_{s4,1} - 2\begin{pmatrix} c_W^2\left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g3}*}_{1,2} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g3}*}_{2,2}\right) U^{\tilde{e}_{g1}}_{s2,1} + \\ \begin{pmatrix} c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2} U^{\tilde{e}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2} U^{\tilde{e}_{g1}}_{2,1}\right) + \\ 4\left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2\right) U^{\tilde{e}_{g1}}_{s2,1} \end{pmatrix} U^{\tilde{e}_{g3}*}_{s3,2} \end{pmatrix} c_\beta^3 M_W^4 s_W^3 U^{\tilde{e}_{g3}}_{s4,2}$$

$$17 = \begin{pmatrix} c_\beta^2 M_W^2\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2} U^{\tilde{e}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2} U^{\tilde{e}_{g1}}_{2,1}\right) U^{\tilde{e}_{g3}*}_{s3,1} + \\ 2m_{e_{g1}} m_{e_{g3}} c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2} U^{\tilde{e}_{g1}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2} U^{\tilde{e}_{g1}}_{2,2}\right) U^{\tilde{e}_{g3}*}_{s3,2} \end{pmatrix} c_\beta s_W c_W^2 M_W^2 - (\,16\,)c_W^4 U^{\tilde{e}_{g1}}_{s2,2} + \begin{pmatrix} 4\left(((\delta Z_e)\, s_W - \delta s_W)\, c_W^2 + (\delta s_W)\, s_W^2\right) U^{\tilde{e}_{g3}*}_{s3,1} + \\ s_W c_W^2\left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g3}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g3}*}_{2,1}\right) \end{pmatrix} c_\beta^3 M_W^4 U^{\tilde{e}_{g1}}_{s2,1}$$

$$16 = -4c_\beta\left(m_{e_{g1}} s_W \delta m^{e_g}_{g3} M_W^2 + m_{e_{g3}}\left(s_W \delta m^{e_g}_{g1} M_W^2 - m_{e_{g1}}\left(s_W \delta M_W^2 + 2\,(\delta s_W)\, M_W^2\right)\right)\right) U^{\tilde{e}_{g3}*}_{s3,2} - m_{e_{g1}} m_{e_{g3}} s_W M_W^2\left(2c_\beta\left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g3}*}_{1,2} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g3}*}_{2,2}\right) + 8\left((\delta Z_e)\, c_\beta - \delta c_\beta\right) U^{\tilde{e}_{g3}*}_{s3,2}\right)$$

$$15 = \delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,1}\left(c_W^2 c_\beta^3 M_W^4 U^{\tilde{e}_{g1}}_{s2,1} U^{\tilde{e}_{g3}*}_{s3,1} + 2c_\beta m_{e_{g1}} m_{e_{g3}} c_W^4 M_W^2 U^{\tilde{e}_{g1}}_{s2,2} U^{\tilde{e}_{g3}*}_{s3,2}\right) - c_W^2 c_\beta^3 M_W^4 U^{\tilde{e}_{g1}}_{s2,1}\left(2\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4} s_W^2 U^{\tilde{e}_{g3}}_{1,2} U^{\tilde{e}_{g3}*}_{s3,2} - \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,1} U^{\tilde{e}_{g3}*}_{s3,1}\right)$$

$$14 = s_W U^{\tilde{e}_{g2}}_{s2,1}\begin{pmatrix} c_W^2 c_\beta^3 M_W^4\left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g2}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g2}*}_{2,1}\right) U^{\tilde{e}_{g1}}_{s4,1} + \\ 2c_\beta m_{e_{g1}} m_{e_{g2}} c_W^4 M_W^2\left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g2}*}_{1,2} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g2}*}_{2,2}\right) U^{\tilde{e}_{g1}}_{s4,2} \end{pmatrix} + 2(\,12\,)U^{\tilde{e}_{g2}*}_{s3,2} + c_\beta^3 M_W^4(\,13\,)$$

$$13 = U^{\tilde{e}_{g2}*}_{s3,1}\left(\begin{array}{l} s_W c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g2}}_{2,1}\right)U^{\tilde{e}_{g1}}_{s4,1}+ \\ \left(\begin{array}{l} s_W c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g1}}_{2,1}\right)+ \\ 4\left(\left(\left(\delta Z_e\right)s_W-\delta s_W\right)c_W^2+\left(\delta s_W\right)s_W^2\right)U^{\tilde{e}_{g1}}_{s4,1}\end{array}\right)U^{\tilde{e}_{g2}}_{s2,1}\end{array}\right)-2c_W^2s_W^3U^{\tilde{e}_{g1}}_{s4,1}U^{\tilde{e}_{g2}}_{s2,2}\left(U^{\tilde{e}_{g2}*}_{1,2}\delta Z^{\tilde{e}_{g3}}_{1,s3}+U^{\tilde{e}_{g2}*}_{2,2}\delta Z^{\tilde{e}_{g3}}_{2,s3}\right)$$

$$\begin{array}{rl} 12 = & -(11)c_W^4U^{\tilde{e}_{g2}}_{s2,1}-\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}\left(c_W^2c_\beta^3M_W^4s_W^3U^{\tilde{e}_{g2}}_{1,2}U^{\tilde{e}_{g1}}_{s4,1}-c_\beta m_{e_{g1}}m_{e_{g2}}s_Wc_W^4M_W^2U^{\tilde{e}_{g2}}_{1,1}U^{\tilde{e}_{g1}}_{s4,2}\right)- \\ & \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}\left(c_W^2c_\beta^3M_W^4s_W^3U^{\tilde{e}_{g2}}_{2,2}U^{\tilde{e}_{g1}}_{s4,1}-c_\beta m_{e_{g1}}m_{e_{g2}}s_Wc_W^4M_W^2U^{\tilde{e}_{g2}}_{2,1}U^{\tilde{e}_{g1}}_{s4,2}\right)- \\ & c_\beta^3M_W^4s_W^3U^{\tilde{e}_{g2}}_{s2,2}\left(c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g1}}_{2,1}\right)+4\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)U^{\tilde{e}_{g1}}_{s4,1}\right)\end{array}$$

$$\begin{array}{rl} 11 = & -4\left(\left(\delta Z_e\right)c_\beta-\delta c_\beta\right)m_{e_{g1}}m_{e_{g2}}s_WM_W^2U^{\tilde{e}_{g1}}_{s4,2}- \\ & \left(\begin{array}{l} m_{e_{g1}}m_{e_{g2}}s_WM_W^2\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g1}}_{1,2}+\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g1}}_{2,2}\right)+ \\ 2\left(m_{e_{g1}}s_W\delta m^{e_g}_{g2}M_W^2+m_{e_{g2}}\left(s_W\delta m^{e_g}_{g1}M_W^2-m_{e_{g1}}\left(s_W\delta M_W^2+2\left(\delta s_W\right)M_W^2\right)\right)\right)U^{\tilde{e}_{g1}}_{s4,2}\end{array}\right)c_\beta\end{array}$$

$$\begin{array}{rl} 10 = & -(7)c_\beta^3M_W^4s_W^3-\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}\left(c_\beta m_{e_{g1}}m_{e_{g3}}s_Wc_W^4M_W^2U^{\tilde{e}_{g3}}_{1,2}U^{\tilde{e}_{g1}}_{s2,1}-c_W^2c_\beta^3M_W^4s_W^3U^{\tilde{e}_{g3}}_{1,1}U^{\tilde{e}_{g1}}_{s2,2}\right)U^{\tilde{e}_{g3}*}_{s3,1}-(9)U^{\tilde{e}_{g3}}_{s4,2}- \\ & \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,2}\left(c_\beta m_{e_{g1}}m_{e_{g3}}s_Wc_W^4M_W^2U^{\tilde{e}_{g1}}_{s2,1}U^{\tilde{e}_{g3}*}_{s3,1}+2c_W^2c_\beta^3M_W^4s_W^3U^{\tilde{e}_{g1}}_{s2,2}U^{\tilde{e}_{g3}*}_{s3,2}\right)\end{array}$$

$$\begin{array}{rl} 9 = & \delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}\left(c_\beta m_{e_{g1}}m_{e_{g3}}s_Wc_W^4M_W^2U^{\tilde{e}_{g1}}_{1,1}U^{\tilde{e}_{g3}*}_{s3,1}+2c_W^2c_\beta^3M_W^4s_W^3U^{\tilde{e}_{g1}}_{1,2}U^{\tilde{e}_{g3}*}_{s3,2}\right)-(8)c_W^4U^{\tilde{e}_{g1}}_{s2,1}+ \\ & \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}\left(c_\beta m_{e_{g1}}m_{e_{g3}}s_Wc_W^4M_W^2U^{\tilde{e}_{g1}}_{2,1}U^{\tilde{e}_{g3}*}_{s3,1}+2c_W^2c_\beta^3M_W^4s_W^3U^{\tilde{e}_{g1}}_{2,2}U^{\tilde{e}_{g3}*}_{s3,2}\right)+ \\ & 2c_\beta^3M_W^4s_W^3U^{\tilde{e}_{g1}}_{s2,2}\left(c_W^2\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g3}*}_{1,2}+\delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g3}*}_{2,2}\right)+4\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)U^{\tilde{e}_{g3}*}_{s3,2}\right)\end{array}$$

$$8 = s_Wm_{e_{g1}}m_{e_{g3}}M_W^2\left(-\left(\begin{array}{l} 4\left(\left(\delta Z_e\right)c_\beta-\delta c_\beta\right)U^{\tilde{e}_{g3}*}_{s3,1}+ \\ c_\beta\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g3}*}_{1,1}+\delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g3}*}_{2,1}\right)\end{array}\right)\right)-c_\beta U^{\tilde{e}_{g3}*}_{s3,1}\left(\begin{array}{l} 2s_W\left(m_{e_{g3}}\delta m^{e_g}_{g1}+m_{e_{g1}}\delta m^{e_g}_{g3}\right)M_W^2- \\ 2m_{e_{g1}}m_{e_{g3}}\left(s_W\delta M_W^2+2\left(\delta s_W\right)M_W^2\right)\end{array}\right)$$

$$\begin{array}{rl} 7 = & c_W^2U^{\tilde{e}_{g1}}_{s2,2}\left(2\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g3}}_{1,2}U^{\tilde{e}_{g3}*}_{s3,2}-\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,1}U^{\tilde{e}_{g3}*}_{s3,1}\right)- \\ & \left(\begin{array}{l} c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g1}}_{1,2}+\delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g1}}_{2,2}+4\left(\delta Z_e\right)U^{\tilde{e}_{g1}}_{s2,2}\right)U^{\tilde{e}_{g3}*}_{s3,1}+ \\ U^{\tilde{e}_{g1}}_{s2,2}\left(c_W^2\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g3}*}_{1,1}+\delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g3}*}_{2,1}\right)+4\left(\delta s_W\right)s_WU^{\tilde{e}_{g3}*}_{s3,1}\right)\end{array}\right)U^{\tilde{e}_{g3}}_{s4,1}\end{array}$$

$$6 = -2c_\beta^3s_W^3M_W^4U^{\tilde{e}_{g2}*}_{s3,2}\left(\begin{array}{l} c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g2}}_{1,2}+\delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g2}}_{2,2}\right)U^{\tilde{e}_{g1}}_{s4,2}+ \\ \left(\begin{array}{l} c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g1}}_{1,2}+\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g1}}_{2,2}\right)+ \\ 4\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)U^{\tilde{e}_{g1}}_{s4,2}\end{array}\right)U^{\tilde{e}_{g2}}_{s2,2}\end{array}\right)+(4)U^{\tilde{e}_{g2}*}_{s3,1}+c_W^2(-(5))$$

$$
\begin{aligned}
5 = {} & c_\beta s_W M_W^2 \left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g2}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g2}*}_{2,1}\right) \left(m_{e_{g1}} m_{e_{g2}} c_W^2 U^{\tilde{e}_{g2}}_{s2,2} U^{\tilde{e}_{g1}}_{s4,1} - c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g2}}_{s2,1} U^{\tilde{e}_{g1}}_{s4,2}\right) + \\
& 2 c_\beta^3 M_W^4 s_W^3 \left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g2}*}_{1,2} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g2}*}_{2,2}\right) U^{\tilde{e}_{g2}}_{s2,2} U^{\tilde{e}_{g1}}_{s4,2}
\end{aligned}
$$

$$
\begin{aligned}
4 = {} & (3) c_W^4 U^{\tilde{e}_{g2}}_{s2,2} - \delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2} \left(c_\beta m_{e_{g1}} m_{e_{g2}} s_W c_W^4 M_W^2 U^{\tilde{e}_{g2}}_{1,2} U^{\tilde{e}_{g1}}_{s4,1} - c_W^2 c_\beta^3 M_W^4 s_W^3 U^{\tilde{e}_{g2}}_{1,1} U^{\tilde{e}_{g1}}_{s4,2}\right) - \\
& \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2} \left(c_\beta m_{e_{g1}} m_{e_{g2}} s_W c_W^4 M_W^2 U^{\tilde{e}_{g2}}_{2,2} U^{\tilde{e}_{g1}}_{s4,1} - c_W^2 c_\beta^3 M_W^4 s_W^3 U^{\tilde{e}_{g2}}_{2,1} U^{\tilde{e}_{g1}}_{s4,2}\right) + \\
& c_\beta^3 M_W^4 s_W^3 U^{\tilde{e}_{g2}}_{s2,1} \left(c_W^2 \left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g1}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g1}}_{2,2}\right) + 4 \left(\left(\delta s_W\right) s_W + \left(\delta Z_e\right) c_W^2\right) U^{\tilde{e}_{g1}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
3 = c_\beta \Bigg(& 2 m_{e_{g1}} m_{e_{g2}} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right) U^{\tilde{e}_{g1}}_{s4,1} - \\
& \left(m_{e_{g1}} m_{e_{g2}} \left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g1}}_{2,1}\right) + \right. \\
& \left. 2 \left(m_{e_{g2}} \delta m^{e_g}_{g1} + m_{e_{g1}} \delta m^{e_g}_{g2}\right) U^{\tilde{e}_{g1}}_{s4,1} \right) s_W M_W^2 \Bigg) - 4 s_W m_{e_{g1}} m_{e_{g2}} M_W^2 \left(c_\beta \left(\delta Z_e\right) - \delta c_\beta\right) U^{\tilde{e}_{g1}}_{s4,1}
\end{aligned}
$$

$$
\begin{aligned}
2 = {} & -\delta_{g1,g4} \delta_{g2,g3} U^{\tilde{e}_{g2}*}_{s3,1} \left(m_{e_{g1}} m_{e_{g2}} c_W^2 U^{\tilde{e}_{g2}}_{s2,2} U^{\tilde{e}_{g1}}_{s4,1} - c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g2}}_{s2,1} U^{\tilde{e}_{g1}}_{s4,2}\right) - \\
& \delta_{g1,g2} \delta_{g3,g4} m_{e_{g1}} m_{e_{g3}} c_W^2 U^{\tilde{e}_{g1}}_{s2,1} U^{\tilde{e}_{g3}*}_{s3,1} U^{\tilde{e}_{g3}}_{s4,2} - \\
& c_\beta^2 M_W^2 s_W^2 \left(2 \delta_{g1,g4} \delta_{g2,g3} U^{\tilde{e}_{g2}}_{s2,2} U^{\tilde{e}_{g2}*}_{s3,2} U^{\tilde{e}_{g1}}_{s4,2} - \delta_{g1,g2} \delta_{g3,g4} U^{\tilde{e}_{g1}}_{s2,2} \left(U^{\tilde{e}_{g3}*}_{s3,1} U^{\tilde{e}_{g3}}_{s4,1} - 2 U^{\tilde{e}_{g3}*}_{s3,2} U^{\tilde{e}_{g3}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = {} & \delta_{g1,g4} \delta_{g2,g3} \left(c_\beta^2 M_W^2 \left(U^{\tilde{e}_{g2}}_{s2,1} U^{\tilde{e}_{g2}*}_{s3,1} - 2 s_W^2 U^{\tilde{e}_{g2}}_{s2,2} U^{\tilde{e}_{g2}*}_{s3,2}\right) U^{\tilde{e}_{g1}}_{s4,1} + 2 m_{e_{g1}} m_{e_{g2}} c_W^2 U^{\tilde{e}_{g2}}_{s2,1} U^{\tilde{e}_{g2}*}_{s3,2} U^{\tilde{e}_{g1}}_{s4,2}\right) + \\
& \delta_{g1,g2} \delta_{g3,g4} \left(2 m_{e_{g1}} m_{e_{g3}} c_W^2 U^{\tilde{e}_{g1}}_{s2,2} U^{\tilde{e}_{g3}*}_{s3,2} U^{\tilde{e}_{g3}}_{s4,1} + c_\beta^2 M_W^2 U^{\tilde{e}_{g1}}_{s2,1} \left(U^{\tilde{e}_{g3}*}_{s3,1} U^{\tilde{e}_{g3}}_{s4,1} - 2 s_W^2 U^{\tilde{e}_{g3}*}_{s3,2} U^{\tilde{e}_{g3}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\underset{381}{C}\left(\tilde{e}^{s1}_{g1}, \tilde{e}^{s2,\dagger}_{g2}, \tilde{\nu}_{g3}, \tilde{\nu}^\dagger_{g4}\right) = \left[-\frac{i e^2}{8 s_W^3} \left((4) s_W + 4 (1) \left(\delta s_W\right)\right) \right]
$$

$$
\begin{aligned}
&-\frac{1}{c_{\mathrm{W}}^2 c_\beta^3 M_{\mathrm{W}}^4}\left((2) c_\beta^3 M_{\mathrm{W}}^4+(3) \delta_{\mathrm{g1,g4}} \delta_{\mathrm{g2,g3}} c_{\mathrm{W}}^2 U_{\mathrm{s1,2}}^{\tilde{e}_{\mathrm{g1}}*}\right)+\\
&\left(\begin{array}{l}
\frac{\delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}}}{c_{\mathrm{W}}^2}\left(\left(1-2 c_{\mathrm{W}}^2\right) U_{\mathrm{s1,1}}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g1}}}-2 s_{\mathrm{W}}^2 U_{\mathrm{s1,2}}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g1}}}\right)+ \\
2 \delta_{\mathrm{g1,g4}} \delta_{\mathrm{g2,g3}}\left(\frac{m_{e_{\mathrm{g1}}} m_{e_{\mathrm{g2}}} U_{\mathrm{s1,2}}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g2}}}}{c_\beta^2 M_{\mathrm{W}}^2}+U_{\mathrm{s1,1}}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g2}}}\right)
\end{array}\right)\left(4\left(\delta Z_{\mathrm{e}}\right)+\delta \overline{Z}_{1,1}^{\tilde{\nu}}+\delta Z_{1,1}^{\tilde{\nu}}\right)+\\
\mathbf{4}=&\left(\begin{array}{l}
\frac{\delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}}}{c_{\mathrm{W}}^2}\left(\left(1-2 c_{\mathrm{W}}^2\right) U_{1,1}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g1}}}-2 s_{\mathrm{W}}^2 U_{1,2}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g1}}}\right)+ \\
2 \delta_{\mathrm{g1,g4}} \delta_{\mathrm{g2,g3}}\left(\frac{m_{e_{\mathrm{g1}}} m_{e_{\mathrm{g2}}} U_{1,2}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g2}}}}{c_\beta^2 M_{\mathrm{W}}^2}+U_{1,1}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g2}}}\right)
\end{array}\right) \delta Z_{1,\mathrm{s1}}^{\tilde{e}_{\mathrm{g1}}}+\\
&\left(\begin{array}{l}
\frac{\delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}}}{c_{\mathrm{W}}^2}\left(\left(1-2 c_{\mathrm{W}}^2\right) U_{2,1}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g1}}}-2 s_{\mathrm{W}}^2 U_{2,2}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g1}}}\right)+ \\
2 \delta_{\mathrm{g1,g4}} \delta_{\mathrm{g2,g3}}\left(\frac{m_{e_{\mathrm{g1}}} m_{e_{\mathrm{g2}}} U_{2,2}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g2}}}}{c_\beta^2 M_{\mathrm{W}}^2}+U_{2,1}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g2}}}\right)
\end{array}\right) \delta Z_{2,\mathrm{s1}}^{\tilde{e}_{\mathrm{g1}}}
\end{aligned}
$$

$$
\mathbf{3}=8 m_{e_{\mathrm{g1}}} m_{e_{\mathrm{g2}}} M_{\mathrm{W}}^2\left(\delta c_\beta\right) U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g2}}}-2 c_\beta\left(\begin{array}{l}
m_{e_{\mathrm{g1}}} m_{e_{\mathrm{g2}}} M_{\mathrm{W}}^2\left(\delta \overline{Z}_{1,\mathrm{s2}}^{\tilde{e}_{\mathrm{g2}}} U_{1,2}^{\tilde{e}_{\mathrm{g2}}}+\delta \overline{Z}_{2,\mathrm{s2}}^{\tilde{e}_{\mathrm{g2}}} U_{2,2}^{\tilde{e}_{\mathrm{g2}}}\right)+ \\
2\left(m_{e_{\mathrm{g1}}} \delta m_{\mathrm{g2}}^{e_{\mathrm{g}}} M_{\mathrm{W}}^2+m_{e_{\mathrm{g2}}}\left(\delta m_{\mathrm{g1}}^{e_{\mathrm{g}}} M_{\mathrm{W}}^2-m_{e_{\mathrm{g1}}} \delta M_{\mathrm{W}}^2\right)\right) U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g2}}}
\end{array}\right)
$$

$$
\begin{aligned}
&2 \delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}} s_{\mathrm{W}}^2\left(\delta \overline{Z}_{1,\mathrm{s2}}^{\tilde{e}_{\mathrm{g2}}} U_{1,2}^{\tilde{e}_{\mathrm{g1}}}+\delta \overline{Z}_{2,\mathrm{s2}}^{\tilde{e}_{\mathrm{g2}}} U_{2,2}^{\tilde{e}_{\mathrm{g1}}}\right) U_{\mathrm{s1,2}}^{\tilde{e}_{\mathrm{g1}}*}-\\
\mathbf{2}=&\left(\begin{array}{l}
\delta \overline{Z}_{1,\mathrm{s2}}^{\tilde{e}_{\mathrm{g2}}}\left(\delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}}\left(1-2 c_{\mathrm{W}}^2\right) U_{1,1}^{\tilde{e}_{\mathrm{g1}}}+2 \delta_{\mathrm{g1,g4}} \delta_{\mathrm{g2,g3}} c_{\mathrm{W}}^2 U_{1,1}^{\tilde{e}_{\mathrm{g2}}}\right)+ \\
\delta \overline{Z}_{2,\mathrm{s2}}^{\tilde{e}_{\mathrm{g2}}}\left(\delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}}\left(1-2 c_{\mathrm{W}}^2\right) U_{2,1}^{\tilde{e}_{\mathrm{g1}}}+2 \delta_{\mathrm{g1,g4}} \delta_{\mathrm{g2,g3}} c_{\mathrm{W}}^2 U_{2,1}^{\tilde{e}_{\mathrm{g2}}}\right)
\end{array}\right) U_{\mathrm{s1,1}}^{\tilde{e}_{\mathrm{g1}}*}
\end{aligned}
$$

$$
\begin{aligned}
&U_{\mathrm{s1,1}}^{\tilde{e}_{\mathrm{g1}}*}\left(\delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}} U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g1}}}-2 \delta_{\mathrm{g1,g4}} \delta_{\mathrm{g2,g3}} U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g2}}}\right)+\frac{\delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}} s_{\mathrm{W}}^4}{c_{\mathrm{W}}^4}\left(U_{\mathrm{s1,1}}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g1}}}-2 U_{\mathrm{s1,2}}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g1}}}\right)-\\
\mathbf{1}=&\frac{2 \delta_{\mathrm{g1,g4}} \delta_{\mathrm{g2,g3}} m_{e_{\mathrm{g1}}} m_{e_{\mathrm{g2}}} U_{\mathrm{s1,2}}^{\tilde{e}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g2}}}}{c_\beta^2 M_{\mathrm{W}}^2}
\end{aligned}
$$

$$
\underset{383}{C}\left(\tilde{\nu}_{\mathrm{g1}}, \tilde{\nu}_{\mathrm{g2}}^{\dagger}, \tilde{\nu}_{\mathrm{g3}}, \tilde{\nu}_{\mathrm{g4}}^{\dagger}\right)=\left[-\frac{\mathrm{i} e^2}{8 c_{\mathrm{W}}^4 s_{\mathrm{W}}^3}\left(\delta_{\mathrm{g1,g4}} \delta_{\mathrm{g2,g3}}+\delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}}\right)\left(4\left(\delta s_{\mathrm{W}}\right) s_{\mathrm{W}}^2+c_{\mathrm{W}}^2\left(4\left(s_{\mathrm{W}}\left(\delta Z_{\mathrm{e}}\right)-\delta s_{\mathrm{W}}\right)+s_{\mathrm{W}}\left(2 \delta \overline{Z}_{1,1}^{\tilde{\nu}}+2 \delta Z_{1,1}^{\tilde{\nu}}\right)\right)\right)\right]
$$

[SSSS] 4 Squarks

$$\underset{374}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{d}^{s3}_{g3},\tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{i}{72}\left(\begin{array}{l} e^2(6) + 144 g_s^2 (7)\,(\delta Z_{g_s}) + (28)\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2} + (10)\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} + (31)\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2} + (13)\delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} + \\ (16)\delta Z^{\tilde{d}_{g1}}_{1,s1} + (22)\delta Z^{\tilde{d}_{g3}}_{1,s3} + (19)\delta Z^{\tilde{d}_{g1}}_{2,s1} + (25)\delta Z^{\tilde{d}_{g3}}_{2,s3} \end{array} \right) \right]$$

$$\begin{aligned} (31) = {} & \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(29)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\,(T^x_{c2,c1}T^x_{c4,c3})\,g_s^2 \left(U^{\tilde{d}_{g1}}_{2,1}U^{\tilde{d}_{g1}*}_{s1,1} - U^{\tilde{d}_{g1}}_{2,2}U^{\tilde{d}_{g1}*}_{s1,2}\right)\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1} - U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right) + \\ & \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(30)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\,(T^x_{c2,c3}T^x_{c4,c1})\,g_s^2 \left(U^{\tilde{d}_{g2}}_{2,1}U^{\tilde{d}_{g2}*}_{s3,1} - U^{\tilde{d}_{g2}}_{2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s4,1} - U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s4,2}\right)\right) \end{aligned}$$

$$\begin{aligned} (30) = {} & U^{\tilde{d}_{g1}*}_{s1,1}\left(c_\beta^2 M_W^2 \left(\left(8c_W^2+1\right) U^{\tilde{d}_{g2}}_{2,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2s_W^2 U^{\tilde{d}_{g2}}_{2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right) U^{\tilde{d}_{g1}}_{s4,1} + 18 m_{d_{g1}} m_{d_{g2}} c_W^2 U^{\tilde{d}_{g2}}_{2,1}U^{\tilde{d}_{g2}*}_{s3,2}U^{\tilde{d}_{g1}}_{s4,2}\right) + \\ & 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9 m_{d_{g1}} m_{d_{g2}} c_W^2 U^{\tilde{d}_{g2}}_{2,2}U^{\tilde{d}_{g2}*}_{s3,1}U^{\tilde{d}_{g1}}_{s4,1} + c_\beta^2 M_W^2 s_W^2 \left(U^{\tilde{d}_{g2}}_{2,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2U^{\tilde{d}_{g2}}_{2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right) U^{\tilde{d}_{g1}}_{s4,2}\right) \end{aligned}$$

$$\begin{aligned} (29) = {} & 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9 m_{d_{g1}} m_{d_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{2,1}U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,2} + c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{2,2}\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1} + 2U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right) + \\ & U^{\tilde{d}_{g1}*}_{s1,1}\left(18 m_{d_{g1}} m_{d_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{2,2}U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,1} + c_\beta^2 M_W^2 U^{\tilde{d}_{g1}}_{2,1}\left(\left(8c_W^2+1\right) U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1} + 2s_W^2 U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right) \end{aligned}$$

$$\begin{aligned} (28) = {} & \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(26)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\,(T^x_{c2,c1}T^x_{c4,c3})\,g_s^2 \left(U^{\tilde{d}_{g1}}_{1,1}U^{\tilde{d}_{g1}*}_{s1,1} - U^{\tilde{d}_{g1}}_{1,2}U^{\tilde{d}_{g1}*}_{s1,2}\right)\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1} - U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right) + \\ & \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(27)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\,(T^x_{c2,c3}T^x_{c4,c1})\,g_s^2 \left(U^{\tilde{d}_{g2}}_{1,1}U^{\tilde{d}_{g2}*}_{s3,1} - U^{\tilde{d}_{g2}}_{1,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s4,1} - U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s4,2}\right)\right) \end{aligned}$$

$$\begin{aligned} (27) = {} & U^{\tilde{d}_{g1}*}_{s1,1}\left(c_\beta^2 M_W^2 \left(\left(8c_W^2+1\right) U^{\tilde{d}_{g2}}_{1,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2s_W^2 U^{\tilde{d}_{g2}}_{1,2}U^{\tilde{d}_{g2}*}_{s3,2}\right) U^{\tilde{d}_{g1}}_{s4,1} + 18 m_{d_{g1}} m_{d_{g2}} c_W^2 U^{\tilde{d}_{g2}}_{1,1}U^{\tilde{d}_{g2}*}_{s3,2}U^{\tilde{d}_{g1}}_{s4,2}\right) + \\ & 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9 m_{d_{g1}} m_{d_{g2}} c_W^2 U^{\tilde{d}_{g2}}_{1,2}U^{\tilde{d}_{g2}*}_{s3,1}U^{\tilde{d}_{g1}}_{s4,1} + c_\beta^2 M_W^2 s_W^2 \left(U^{\tilde{d}_{g2}}_{1,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2U^{\tilde{d}_{g2}}_{1,2}U^{\tilde{d}_{g2}*}_{s3,2}\right) U^{\tilde{d}_{g1}}_{s4,2}\right) \end{aligned}$$

$$\begin{aligned} (26) = {} & 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9 m_{d_{g1}} m_{d_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{1,1}U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,2} + c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{1,2}\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1} + 2U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right) + \\ & U^{\tilde{d}_{g1}*}_{s1,1}\left(18 m_{d_{g1}} m_{d_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{1,2}U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,1} + c_\beta^2 M_W^2 U^{\tilde{d}_{g1}}_{1,1}\left(\left(8c_W^2+1\right) U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1} + 2s_W^2 U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right) \end{aligned}$$

$$\begin{aligned} (25) = {} & \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(23)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\,(T^x_{c2,c1}T^x_{c4,c3})\,g_s^2 \left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1} - U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{d}_{g3}*}_{2,1}U^{\tilde{d}_{g3}}_{s4,1} - U^{\tilde{d}_{g3}*}_{2,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right) + \\ & \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(24)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\,(T^x_{c2,c3}T^x_{c4,c1})\,g_s^2 \left(U^{\tilde{d}_{g2}*}_{2,1}U^{\tilde{d}_{g2}}_{s2,1} - U^{\tilde{d}_{g2}*}_{2,2}U^{\tilde{d}_{g2}}_{s2,2}\right)\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s4,1} - U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s4,2}\right)\right) \end{aligned}$$

$$24 = U^{\tilde{d}_{g1}*}_{s1,1}\left(c_\beta^2 M_W^2\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g2}*}_{2,1}U^{\tilde{d}_{g2}}_{s2,1}+2s_W^2U^{\tilde{d}_{g2}*}_{2,2}U^{\tilde{d}_{g2}}_{s2,2}\right)U^{\tilde{d}_{g1}}_{s4,1}+18m_{d_{g1}}m_{d_{g2}}c_W^2U^{\tilde{d}_{g2}*}_{2,2}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g1}}_{s4,2}\right)+ 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9m_{d_{g1}}m_{d_{g2}}c_W^2U^{\tilde{d}_{g2}*}_{2,1}U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g1}}_{s4,1}+c_\beta^2M_W^2s_W^2\left(U^{\tilde{d}_{g2}*}_{2,1}U^{\tilde{d}_{g2}}_{s2,1}+2U^{\tilde{d}_{g2}*}_{2,2}U^{\tilde{d}_{g2}}_{s2,2}\right)U^{\tilde{d}_{g1}}_{s4,2}\right)$$

$$23 = 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9m_{d_{g1}}m_{d_{g3}}c_W^2U^{\tilde{d}_{g3}*}_{2,1}U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g3}}_{s4,2}+c_\beta^2M_W^2s_W^2U^{\tilde{d}_{g1}}_{s2,2}\left(U^{\tilde{d}_{g3}*}_{2,1}U^{\tilde{d}_{g3}}_{s4,1}+2U^{\tilde{d}_{g3}*}_{2,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right)+ U^{\tilde{d}_{g1}*}_{s1,1}\left(18m_{d_{g1}}m_{d_{g3}}c_W^2U^{\tilde{d}_{g3}*}_{2,2}U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g3}}_{s4,1}+c_\beta^2M_W^2U^{\tilde{d}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g3}*}_{2,1}U^{\tilde{d}_{g3}}_{s4,1}+2s_W^2U^{\tilde{d}_{g3}*}_{2,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right)$$

$$22 = \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(20)}{c_W^2c_\beta^2M_W^2s_W^2}+36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1}-U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{d}_{g3}*}_{1,1}U^{\tilde{d}_{g3}}_{s4,1}-U^{\tilde{d}_{g3}*}_{1,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right)+ \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(21)}{c_W^2c_\beta^2M_W^2s_W^2}+36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{d}_{g2}*}_{1,1}U^{\tilde{d}_{g2}}_{s2,1}-U^{\tilde{d}_{g2}*}_{1,2}U^{\tilde{d}_{g2}}_{s2,2}\right)\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s4,1}-U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s4,2}\right)\right)$$

$$21 = U^{\tilde{d}_{g1}*}_{s1,1}\left(c_\beta^2 M_W^2\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g2}*}_{1,1}U^{\tilde{d}_{g2}}_{s2,1}+2s_W^2U^{\tilde{d}_{g2}*}_{1,2}U^{\tilde{d}_{g2}}_{s2,2}\right)U^{\tilde{d}_{g1}}_{s4,1}+18m_{d_{g1}}m_{d_{g2}}c_W^2U^{\tilde{d}_{g2}*}_{1,2}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g1}}_{s4,2}\right)+ 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9m_{d_{g1}}m_{d_{g2}}c_W^2U^{\tilde{d}_{g2}*}_{1,1}U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g1}}_{s4,1}+c_\beta^2M_W^2s_W^2\left(U^{\tilde{d}_{g2}*}_{1,1}U^{\tilde{d}_{g2}}_{s2,1}+2U^{\tilde{d}_{g2}*}_{1,2}U^{\tilde{d}_{g2}}_{s2,2}\right)U^{\tilde{d}_{g1}}_{s4,2}\right)$$

$$20 = 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9m_{d_{g1}}m_{d_{g3}}c_W^2U^{\tilde{d}_{g3}*}_{1,1}U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g3}}_{s4,2}+c_\beta^2M_W^2s_W^2U^{\tilde{d}_{g1}}_{s2,2}\left(U^{\tilde{d}_{g3}*}_{1,1}U^{\tilde{d}_{g3}}_{s4,1}+2U^{\tilde{d}_{g3}*}_{1,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right)+ U^{\tilde{d}_{g1}*}_{s1,1}\left(18m_{d_{g1}}m_{d_{g3}}c_W^2U^{\tilde{d}_{g3}*}_{1,2}U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g3}}_{s4,1}+c_\beta^2M_W^2U^{\tilde{d}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g3}*}_{1,1}U^{\tilde{d}_{g3}}_{s4,1}+2s_W^2U^{\tilde{d}_{g3}*}_{1,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right)$$

$$19 = \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(17)}{c_W^2c_\beta^2M_W^2s_W^2}+36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{d}_{g1}*}_{2,1}U^{\tilde{d}_{g1}}_{s2,1}-U^{\tilde{d}_{g1}*}_{2,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1}-U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right)+ \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(18)}{c_W^2c_\beta^2M_W^2s_W^2}+36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1}-U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\left(U^{\tilde{d}_{g1}*}_{2,1}U^{\tilde{d}_{g1}}_{s4,1}-U^{\tilde{d}_{g1}*}_{2,2}U^{\tilde{d}_{g1}}_{s4,2}\right)\right)$$

$$18 = U^{\tilde{d}_{g1}*}_{2,1}\left(c_\beta^2 M_W^2\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1}+2s_W^2U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)U^{\tilde{d}_{g1}}_{s4,1}+18m_{d_{g1}}m_{d_{g2}}c_W^2U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,2}U^{\tilde{d}_{g1}}_{s4,2}\right)+ 2U^{\tilde{d}_{g1}*}_{2,2}\left(9m_{d_{g1}}m_{d_{g2}}c_W^2U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,1}U^{\tilde{d}_{g1}}_{s4,1}+c_\beta^2M_W^2s_W^2\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1}+2U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)U^{\tilde{d}_{g1}}_{s4,2}\right)$$

$$17 = 2U^{\tilde{d}_{g1}*}_{2,2}\left(9m_{d_{g1}}m_{d_{g3}}c_W^2U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,2}+c_\beta^2M_W^2s_W^2U^{\tilde{d}_{g1}}_{s2,2}\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1}+2U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right)+ U^{\tilde{d}_{g1}*}_{2,1}\left(18m_{d_{g1}}m_{d_{g3}}c_W^2U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,1}+c_\beta^2M_W^2U^{\tilde{d}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1}+2s_W^2U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right)$$

$$16 = \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(14)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{d}_{g1}*}_{1,1}U^{\tilde{d}_{g1}}_{s2,1} - U^{\tilde{d}_{g1}*}_{1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1} - U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right) +$$
$$\delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(15)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1} - U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\left(U^{\tilde{d}_{g1}*}_{1,1}U^{\tilde{d}_{g1}}_{s4,1} - U^{\tilde{d}_{g1}*}_{1,2}U^{\tilde{d}_{g1}}_{s4,2}\right)\right)$$

$$15 = U^{\tilde{d}_{g1}*}_{1,1}\left(c_\beta^2 M_W^2\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2s_W^2 U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)U^{\tilde{d}_{g1}}_{s4,1} + 18m_{d_{g1}}m_{d_{g2}}c_W^2 U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,2}U^{\tilde{d}_{g1}}_{s4,2}\right) +$$
$$2U^{\tilde{d}_{g1}*}_{1,2}\left(9m_{d_{g1}}m_{d_{g2}}c_W^2 U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,1}U^{\tilde{d}_{g1}}_{s4,1} + c_\beta^2 M_W^2 s_W^2\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)U^{\tilde{d}_{g1}}_{s4,2}\right)$$

$$14 = 2U^{\tilde{d}_{g1}*}_{1,2}\left(9m_{d_{g1}}m_{d_{g3}}c_W^2 U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,2} + c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{s2,2}\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1} + 2U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right) +$$
$$U^{\tilde{d}_{g1}*}_{1,1}\left(18m_{d_{g1}}m_{d_{g3}}c_W^2 U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,1} + c_\beta^2 M_W^2 U^{\tilde{d}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1} + 2s_W^2 U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\right)$$

$$13 = \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(11)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1} - U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{d}_{g3}}_{2,1}U^{\tilde{d}_{g3}*}_{s3,1} - U^{\tilde{d}_{g3}}_{2,2}U^{\tilde{d}_{g3}*}_{s3,2}\right)\right) +$$
$$\delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(12)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{d}_{g1}}_{2,1}U^{\tilde{d}_{g1}*}_{s1,1} - U^{\tilde{d}_{g1}}_{2,2}U^{\tilde{d}_{g1}*}_{s1,2}\right)\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1} - U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\right)$$

$$12 = 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9m_{d_{g1}}m_{d_{g2}}c_W^2 U^{\tilde{d}_{g1}}_{2,1}U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,1} + c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{2,2}\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\right) +$$
$$U^{\tilde{d}_{g1}*}_{s1,1}\left(18m_{d_{g1}}m_{d_{g2}}c_W^2 U^{\tilde{d}_{g1}}_{2,2}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,2} + c_\beta^2 M_W^2 U^{\tilde{d}_{g1}}_{2,1}\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2s_W^2 U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\right)$$

$$11 = 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9m_{d_{g1}}m_{d_{g3}}c_W^2 U^{\tilde{d}_{g3}}_{2,2}U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g3}*}_{s3,1} + c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{s2,2}\left(U^{\tilde{d}_{g3}}_{2,1}U^{\tilde{d}_{g3}*}_{s3,1} + 2U^{\tilde{d}_{g3}}_{2,2}U^{\tilde{d}_{g3}*}_{s3,2}\right)\right) +$$
$$U^{\tilde{d}_{g1}*}_{s1,1}\left(18m_{d_{g1}}m_{d_{g3}}c_W^2 U^{\tilde{d}_{g3}}_{2,1}U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g3}*}_{s3,2} + c_\beta^2 M_W^2 U^{\tilde{d}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g3}}_{2,1}U^{\tilde{d}_{g3}*}_{s3,1} + 2s_W^2 U^{\tilde{d}_{g3}}_{2,2}U^{\tilde{d}_{g3}*}_{s3,2}\right)\right)$$

$$10 = \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(8)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1} - U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{d}_{g3}}_{1,1}U^{\tilde{d}_{g3}*}_{s3,1} - U^{\tilde{d}_{g3}}_{1,2}U^{\tilde{d}_{g3}*}_{s3,2}\right)\right) +$$
$$\delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(9)}{c_W^2 c_\beta^2 M_W^2 s_W^2} + 36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{d}_{g1}}_{1,1}U^{\tilde{d}_{g1}*}_{s1,1} - U^{\tilde{d}_{g1}}_{1,2}U^{\tilde{d}_{g1}*}_{s1,2}\right)\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1} - U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\right)$$

$$9 = 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9m_{d_{g1}}m_{d_{g2}}c_W^2 U^{\tilde{d}_{g1}}_{1,1}U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,1} + c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{1,2}\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\right) +$$
$$U^{\tilde{d}_{g1}*}_{s1,1}\left(18m_{d_{g1}}m_{d_{g2}}c_W^2 U^{\tilde{d}_{g1}}_{1,2}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,2} + c_\beta^2 M_W^2 U^{\tilde{d}_{g1}}_{1,1}\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1} + 2s_W^2 U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\right)$$

$$
\begin{aligned}
8 = {} & 2U^{\tilde{d}_{g1}*}_{s1,2}\left(9m_{d_{g1}}m_{d_{g3}}c_W^2U^{\tilde{d}_{g3}}_{1,2}U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g3}*}_{s3,1}+c_\beta^2M_W^2s_W^2U^{\tilde{d}_{g1}}_{s2,2}\left(U^{\tilde{d}_{g3}}_{1,1}U^{\tilde{d}_{g3}*}_{s3,1}+2U^{\tilde{d}_{g3}}_{1,2}U^{\tilde{d}_{g3}*}_{s3,2}\right)\right)+\\
& U^{\tilde{d}_{g1}*}_{s1,1}\left(18m_{d_{g1}}m_{d_{g3}}c_W^2U^{\tilde{d}_{g3}}_{1,1}U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g3}*}_{s3,2}+c_\beta^2M_W^2U^{\tilde{d}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{d}_{g3}}_{1,1}U^{\tilde{d}_{g3}*}_{s3,1}+2s_W^2U^{\tilde{d}_{g3}}_{1,2}U^{\tilde{d}_{g3}*}_{s3,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
7 = {} & \left(T^x_{c2,c1}T^x_{c4,c3}\right)\delta_{g1,g2}\delta_{g3,g4}\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1}-U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1}-U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)+\\
& \left(T^x_{c2,c3}T^x_{c4,c1}\right)\delta_{g1,g4}\delta_{g2,g3}\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1}-U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s4,1}-U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s4,2}\right)
\end{aligned}
$$

$$
6 = \frac{4}{c_W^4c_\beta^3M_W^4s_W^3}\left(c_\beta^3M_W^4(5)-c_W^4\left(\begin{array}{l}18(2)\left(\delta c_\beta\right)m_{d_{g1}}s_WM_W^2-\\ 9(3)c_\beta\left(s_W\delta m^{d_g}_{g1}M_W^2-m_{d_{g1}}\left(2\left(\delta s_W\right)M_W^2-s_W\left(2\left(\delta Z_e\right)M_W^2-\delta M_W^2\right)\right)\right)\end{array}\right)\right)+\frac{36(1)m_{d_{g1}}}{c_\beta^2M_W^2s_W^2}
$$

$$
\begin{aligned}
5 = {} & 2s_W^3\left(c_W^2\left(\delta Z_e\right)+s_W\left(\delta s_W\right)\right)U^{\tilde{d}_{g1}*}_{s1,2}\left(\begin{array}{l}\delta_{g1,g4}\delta_{g2,g3}\left(U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1}+2U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)U^{\tilde{d}_{g1}}_{s4,2}+\\ \delta_{g1,g2}\delta_{g3,g4}U^{\tilde{d}_{g1}}_{s2,2}\left(U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1}+2U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)\end{array}\right)+(4)U^{\tilde{d}_{g1}*}_{s1,1}
\end{aligned}
$$

$$
\begin{aligned}
4 = {} & \delta_{g1,g4}\delta_{g2,g3}\left(\left(\left(\left(\delta Z_e\right)s_W-\delta s_W\right)\left(c_W^2+8c_W^4\right)+\left(\delta s_W\right)s_W^2\right)U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,1}+2\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)s_W^3U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,2}\right)U^{\tilde{d}_{g1}}_{s4,1}+\\
& \delta_{g1,g2}\delta_{g3,g4}U^{\tilde{d}_{g1}}_{s2,1}\left(\left(\left(\left(\delta Z_e\right)s_W-\delta s_W\right)\left(c_W^2+8c_W^4\right)+\left(\delta s_W\right)s_W^2\right)U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,1}+2\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)s_W^3U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
3 = {} & U^{\tilde{d}_{g1}*}_{s1,1}\left(\begin{array}{l}\delta_{g1,g2}\delta_{g3,g4}m_{d_{g3}}U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,1}+\\ \delta_{g1,g4}\delta_{g2,g3}m_{d_{g2}}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,2}U^{\tilde{d}_{g1}}_{s4,2}\end{array}\right)+U^{\tilde{d}_{g1}*}_{s1,2}\left(\begin{array}{l}\delta_{g1,g4}\delta_{g2,g3}m_{d_{g2}}U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,1}U^{\tilde{d}_{g1}}_{s4,1}+\\ \delta_{g1,g2}\delta_{g3,g4}m_{d_{g3}}U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,2}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
2 = {} & \delta_{g1,g4}\delta_{g2,g3}m_{d_{g2}}\left(U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,1}U^{\tilde{d}_{g1}}_{s4,1}+U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,2}U^{\tilde{d}_{g1}}_{s4,2}\right)+\\
& \delta_{g1,g2}\delta_{g3,g4}m_{d_{g3}}\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,1}+U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = {} & \delta_{g1,g4}\delta_{g2,g3}\delta m^{d_g}_{g2}\left(U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g2}}_{s2,2}U^{\tilde{d}_{g2}*}_{s3,1}U^{\tilde{d}_{g1}}_{s4,1}+U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{d}_{g2}*}_{s3,2}U^{\tilde{d}_{g1}}_{s4,2}\right)+\\
& \delta_{g1,g2}\delta_{g3,g4}\delta m^{d_g}_{g3}\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{d}_{g3}*}_{s3,2}U^{\tilde{d}_{g3}}_{s4,1}+U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{d}_{g3}}_{s4,2}\right)
\end{aligned}
$$

$$
\underset{377}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{u}^{s3}_{g3},\tilde{u}^{s4,\dagger}_{g4}\right) = \left[\frac{1}{2}(22)\right]
$$

$$
\begin{aligned}
22 = & -\left(\frac{1}{9}\mathrm{i}(5)\delta_{g1,g2}\delta_{g3,g4}\right) + (15)\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2} + (7)\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} + \\
& (17)\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2} + (9)\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} + (19)\delta Z^{\tilde{d}_{g1}}_{1,s1} + (11)\delta Z^{\tilde{u}_{g3}}_{1,s3} + \\
& (21)\delta Z^{\tilde{d}_{g1}}_{2,s1} \\
& \left(\begin{array}{l} \frac{\mathrm{i}}{M_W^4 s_{2\beta}^3 s_W^3}\left((3)U^{\tilde{u}_{g3}*}_{s3,1} + 4c_\beta^2\left((4)\mathrm{CKM}_{g4,g1} + \left(\delta\mathrm{CKM}_{g4,g1}\right) m_{u_{g3}} m_{u_{g4}} s_{2\beta} s_W \mathrm{CKM}^*_{g3,g2} M_W^2\right) U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2}\right) - \\ \frac{\mathrm{i}(1)\left(\delta Z_e\right)}{9 s_W^2} \end{array} \right) e^2 + \\
& (13)\delta Z^{\tilde{u}_{g3}}_{2,s3}
\end{aligned}
$$

$$
\begin{aligned}
21 = & (20)\delta_{g1,g2}\delta_{g3,g4} - \\
& \frac{2\mathrm{i}e^2 \mathrm{CKM}_{g4,g1}\mathrm{CKM}^*_{g3,g2}}{M_W^2 s_{2\beta}^2 s_W^2}\left(\begin{array}{l} \left(\frac{1}{4}U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g4}}_{s4,1}\right)\left(M_W^2 s_{2\beta}^2 U^{\tilde{d}_{g1}*}_{2,1}U^{\tilde{d}_{g2}}_{s2,1} + 4m_{d_{g1}}m_{d_{g2}}s_\beta^2 U^{\tilde{d}_{g1}*}_{2,2}U^{\tilde{d}_{g2}}_{s2,2}\right) + \\ m_{u_{g3}}m_{u_{g4}}c_\beta^2 U^{\tilde{d}_{g1}*}_{2,1}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right)
\end{aligned}
$$

$$
\begin{aligned}
20 = & -\mathrm{i}\left(T^x_{c2,c1}T^x_{c4,c3}\right) g_s^2\left(U^{\tilde{d}_{g1}*}_{2,1}U^{\tilde{d}_{g1}}_{s2,1} - U^{\tilde{d}_{g1}*}_{2,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1} - U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right) - \\
& \frac{\mathrm{i}e^2}{36 c_W^2 s_W^2}\left(\begin{array}{l} \left(\left(1 - 10c_W^2\right)U^{\tilde{d}_{g1}*}_{2,1}U^{\tilde{d}_{g1}}_{s2,1} + 2s_W^2 U^{\tilde{d}_{g1}*}_{2,2}U^{\tilde{d}_{g1}}_{s2,2}\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1} - \\ 4s_W^2\left(U^{\tilde{d}_{g1}*}_{2,1}U^{\tilde{d}_{g1}}_{s2,1} + 2U^{\tilde{d}_{g1}*}_{2,2}U^{\tilde{d}_{g1}}_{s2,2}\right)U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2} \end{array} \right)
\end{aligned}
$$

$$
\begin{aligned}
19 = & (18)\delta_{g1,g2}\delta_{g3,g4} - \\
& \frac{2\mathrm{i}e^2 \mathrm{CKM}_{g4,g1}\mathrm{CKM}^*_{g3,g2}}{M_W^2 s_{2\beta}^2 s_W^2}\left(\begin{array}{l} \left(\frac{1}{4}U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g4}}_{s4,1}\right)\left(M_W^2 s_{2\beta}^2 U^{\tilde{d}_{g1}*}_{1,1}U^{\tilde{d}_{g2}}_{s2,1} + 4m_{d_{g1}}m_{d_{g2}}s_\beta^2 U^{\tilde{d}_{g1}*}_{1,2}U^{\tilde{d}_{g2}}_{s2,2}\right) + \\ m_{u_{g3}}m_{u_{g4}}c_\beta^2 U^{\tilde{d}_{g1}*}_{1,1}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right)
\end{aligned}
$$

$$
\begin{aligned}
18 = & -\mathrm{i}\left(T^x_{c2,c1}T^x_{c4,c3}\right) g_s^2\left(U^{\tilde{d}_{g1}*}_{1,1}U^{\tilde{d}_{g1}}_{s2,1} - U^{\tilde{d}_{g1}*}_{1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1} - U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right) - \\
& \frac{\mathrm{i}e^2}{36 c_W^2 s_W^2}\left(\begin{array}{l} \left(\left(1 - 10c_W^2\right)U^{\tilde{d}_{g1}*}_{1,1}U^{\tilde{d}_{g1}}_{s2,1} + 2s_W^2 U^{\tilde{d}_{g1}*}_{1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1} - \\ 4s_W^2\left(U^{\tilde{d}_{g1}*}_{1,1}U^{\tilde{d}_{g1}}_{s2,1} + 2U^{\tilde{d}_{g1}*}_{1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2} \end{array} \right)
\end{aligned}
$$

$$
\begin{aligned}
17 = & (16)\delta_{g1,g2}\delta_{g3,g4} - \\
& \frac{2\mathrm{i}e^2 \mathrm{CKM}_{g4,g1}\mathrm{CKM}^*_{g3,g2}}{M_W^2 s_{2\beta}^2 s_W^2}\left(\begin{array}{l} \left(\frac{1}{4}U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g4}}_{s4,1}\right)\left(M_W^2 s_{2\beta}^2 U^{\tilde{d}_{g2}}_{2,1}U^{\tilde{d}_{g1}*}_{s1,1} + 4m_{d_{g1}}m_{d_{g2}}s_\beta^2 U^{\tilde{d}_{g2}}_{2,2}U^{\tilde{d}_{g1}*}_{s1,2}\right) + \\ m_{u_{g3}}m_{u_{g4}}c_\beta^2 U^{\tilde{d}_{g2}}_{2,1}U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right)
\end{aligned}
$$

$$
\begin{aligned}
&-\mathrm{i}\left(T^{\mathrm{x}}_{\mathrm{c2,c1}}T^{\mathrm{x}}_{\mathrm{c4,c3}}\right)g_{\mathrm{s}}^{2}\left(U^{\tilde{d}_{\mathrm{g1}}}_{2,1}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}-U^{\tilde{d}_{\mathrm{g1}}}_{2,2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}\right)\left(U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},1}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},1}-U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},2}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},2}\right)-\\
\boxed{16}=&\frac{\mathrm{i}e^{2}}{36c_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}\left(\left(1-10c_{\mathrm{W}}^{2}\right)U^{\tilde{d}_{\mathrm{g1}}}_{2,1}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}+2s_{\mathrm{W}}^{2}U^{\tilde{d}_{\mathrm{g1}}}_{2,2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}\right)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},1}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},1}-\\ 4s_{\mathrm{W}}^{2}\left(U^{\tilde{d}_{\mathrm{g1}}}_{2,1}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}+2U^{\tilde{d}_{\mathrm{g1}}}_{2,2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}\right)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},2}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},2}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
&(\boxed{14})\delta_{\mathrm{g1,g2}}\delta_{\mathrm{g3,g4}}-\\
\boxed{15}=&\frac{2\mathrm{i}e^{2}\mathrm{CKM}_{\mathrm{g4,g1}}\mathrm{CKM}^{*}_{\mathrm{g3,g2}}}{M_{\mathrm{W}}^{2}s_{2\beta}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}\left(\frac{1}{4}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},1}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},1}\right)\left(M_{\mathrm{W}}^{2}s_{2\beta}^{2}U^{\tilde{d}_{\mathrm{g2}}}_{1,1}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}+4m_{d_{\mathrm{g1}}}m_{d_{\mathrm{g2}}}s_{\beta}^{2}U^{\tilde{d}_{\mathrm{g2}}}_{1,2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}\right)+\\ m_{u_{\mathrm{g3}}}m_{u_{\mathrm{g4}}}c_{\beta}^{2}U^{\tilde{d}_{\mathrm{g2}}}_{1,1}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},2}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},2}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
&-\mathrm{i}\left(T^{\mathrm{x}}_{\mathrm{c2,c1}}T^{\mathrm{x}}_{\mathrm{c4,c3}}\right)g_{\mathrm{s}}^{2}\left(U^{\tilde{d}_{\mathrm{g1}}}_{1,1}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}-U^{\tilde{d}_{\mathrm{g1}}}_{1,2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}\right)\left(U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},1}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},1}-U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},2}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},2}\right)-\\
\boxed{14}=&\frac{\mathrm{i}e^{2}}{36c_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}\left(\left(1-10c_{\mathrm{W}}^{2}\right)U^{\tilde{d}_{\mathrm{g1}}}_{1,1}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}+2s_{\mathrm{W}}^{2}U^{\tilde{d}_{\mathrm{g1}}}_{1,2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}\right)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},1}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},1}-\\ 4s_{\mathrm{W}}^{2}\left(U^{\tilde{d}_{\mathrm{g1}}}_{1,1}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}+2U^{\tilde{d}_{\mathrm{g1}}}_{1,2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}\right)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},2}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},2}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
&(\boxed{12})\delta_{\mathrm{g1,g2}}\delta_{\mathrm{g3,g4}}-\\
\boxed{13}=&\frac{2\mathrm{i}e^{2}\mathrm{CKM}_{\mathrm{g4,g1}}\mathrm{CKM}^{*}_{\mathrm{g3,g2}}}{M_{\mathrm{W}}^{2}s_{2\beta}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}\left(\frac{1}{4}U^{\tilde{u}_{\mathrm{g3}}*}_{2,1}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},1}\right)\left(M_{\mathrm{W}}^{2}s_{2\beta}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},1}+4m_{d_{\mathrm{g1}}}m_{d_{\mathrm{g2}}}s_{\beta}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},2}\right)+\\ m_{u_{\mathrm{g3}}}m_{u_{\mathrm{g4}}}c_{\beta}^{2}U^{\tilde{u}_{\mathrm{g3}}*}_{2,2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},1}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},2}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
&-\mathrm{i}\left(T^{\mathrm{x}}_{\mathrm{c2,c1}}T^{\mathrm{x}}_{\mathrm{c4,c3}}\right)g_{\mathrm{s}}^{2}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2},1}-U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2},2}\right)\left(U^{\tilde{u}_{\mathrm{g3}}*}_{2,1}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},1}-U^{\tilde{u}_{\mathrm{g3}}*}_{2,2}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},2}\right)-\\
\boxed{12}=&\frac{\mathrm{i}e^{2}}{36c_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}U^{\tilde{u}_{\mathrm{g3}}*}_{2,1}\left(\left(1-10c_{\mathrm{W}}^{2}\right)U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2},1}+2s_{\mathrm{W}}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2},2}\right)U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},1}-\\ 4s_{\mathrm{W}}^{2}U^{\tilde{u}_{\mathrm{g3}}*}_{2,2}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2},1}+2U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2},2}\right)U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4},2}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
&(\boxed{10})\delta_{\mathrm{g1,g2}}\delta_{\mathrm{g3,g4}}-\\
\boxed{11}=&\frac{2\mathrm{i}e^{2}\mathrm{CKM}_{\mathrm{g4,g1}}\mathrm{CKM}^{*}_{\mathrm{g3,g2}}}{M_{\mathrm{W}}^{2}s_{2\beta}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}\left(\frac{1}{4}U^{\tilde{u}_{\mathrm{g3}}*}_{1,1}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},1}\right)\left(M_{\mathrm{W}}^{2}s_{2\beta}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},1}+4m_{d_{\mathrm{g1}}}m_{d_{\mathrm{g2}}}s_{\beta}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},2}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},2}\right)+\\ m_{u_{\mathrm{g3}}}m_{u_{\mathrm{g4}}}c_{\beta}^{2}U^{\tilde{u}_{\mathrm{g3}}*}_{1,2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1},1}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},1}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},2}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
10 = & -\mathrm{i}\left(T^{\mathrm{x}}_{\mathrm{c2,c1}}T^{\mathrm{x}}_{\mathrm{c4,c3}}\right)g_{\mathrm{s}}^{2}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}-U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)\left(U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{1,1}}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4,1}}-U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{1,2}}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4,2}}\right)- \\
& \frac{\mathrm{i}e^{2}}{36c_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{1,1}}\left(\left(1-10c_{\mathrm{W}}^{2}\right)U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}+2s_{\mathrm{W}}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4,1}}- \\ 4s_{\mathrm{W}}^{2}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{1,2}}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}+2U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4,2}}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
9 = & \left(8\right)\delta_{\mathrm{g1,g2}}\delta_{\mathrm{g3,g4}}- \\
& \frac{2\mathrm{i}e^{2}\mathrm{CKM}_{\mathrm{g4,g1}}\mathrm{CKM}^{*}_{\mathrm{g3,g2}}}{M_{\mathrm{W}}^{2}s_{2\beta}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}\left(\frac{1}{4}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{2,1}}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}}\right)\left(M_{\mathrm{W}}^{2}s_{2\beta}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2,1}}+4m_{d_{\mathrm{g1}}}m_{d_{\mathrm{g2}}}s_{\beta}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2,2}}\right)+ \\ m_{u_{\mathrm{g3}}}m_{u_{\mathrm{g4}}}c_{\beta}^{2}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{2,2}}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2,1}}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
8 = & -\mathrm{i}\left(T^{\mathrm{x}}_{\mathrm{c2,c1}}T^{\mathrm{x}}_{\mathrm{c4,c3}}\right)g_{\mathrm{s}}^{2}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}-U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)\left(U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{2,1}}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}}-U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{2,2}}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}}\right)- \\
& \frac{\mathrm{i}e^{2}}{36c_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{2,1}}\left(\left(1-10c_{\mathrm{W}}^{2}\right)U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}+2s_{\mathrm{W}}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}}- \\ 4s_{\mathrm{W}}^{2}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{2,2}}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}+2U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
7 = & \left(6\right)\delta_{\mathrm{g1,g2}}\delta_{\mathrm{g3,g4}}- \\
& \frac{2\mathrm{i}e^{2}\mathrm{CKM}_{\mathrm{g4,g1}}\mathrm{CKM}^{*}_{\mathrm{g3,g2}}}{M_{\mathrm{W}}^{2}s_{2\beta}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}\left(\frac{1}{4}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{1,1}}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}}\right)\left(M_{\mathrm{W}}^{2}s_{2\beta}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2,1}}+4m_{d_{\mathrm{g1}}}m_{d_{\mathrm{g2}}}s_{\beta}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2,2}}\right)+ \\ m_{u_{\mathrm{g3}}}m_{u_{\mathrm{g4}}}c_{\beta}^{2}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{1,2}}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2,1}}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
6 = & -\mathrm{i}\left(T^{\mathrm{x}}_{\mathrm{c2,c1}}T^{\mathrm{x}}_{\mathrm{c4,c3}}\right)g_{\mathrm{s}}^{2}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}-U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)\left(U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{1,1}}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}}-U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{1,2}}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}}\right)- \\
& \frac{\mathrm{i}e^{2}}{36c_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}}\left(\begin{array}{l}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{1,1}}\left(\left(1-10c_{\mathrm{W}}^{2}\right)U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}+2s_{\mathrm{W}}^{2}U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}}- \\ 4s_{\mathrm{W}}^{2}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{1,2}}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}+2U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
5 = & \frac{e^{2}s_{\mathrm{W}}\left(\delta s_{\mathrm{W}}\right)}{c_{\mathrm{W}}^{4}}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}+2U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)\left(U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4,1}}-4U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4,2}}\right)+ \\
& 36\left(T^{\mathrm{x}}_{\mathrm{c2,c1}}T^{\mathrm{x}}_{\mathrm{c4,c3}}\right)\left(\delta Z_{g_{\mathrm{s}}}\right)g_{\mathrm{s}}^{2}\left(U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,1}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,1}}-U^{\tilde{d}_{\mathrm{g1}}*}_{\mathrm{s1,2}}U^{\tilde{d}_{\mathrm{g1}}}_{\mathrm{s2,2}}\right)\left(U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4,1}}-U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g3}}}_{\mathrm{s4,2}}\right)
\end{aligned}
$$

$$
\begin{aligned}
4 = & \mathrm{CKM}^{*}_{\mathrm{g3,g2}}\left(\begin{array}{l}m_{u_{\mathrm{g3}}}s_{2\beta}s_{\mathrm{W}}\delta m^{u_{\mathrm{g}}}_{\mathrm{g4}}M_{\mathrm{W}}^{2}+ \\ \left(\begin{array}{l}s_{2\beta}s_{\mathrm{W}}\delta m^{u_{\mathrm{g}}}_{\mathrm{g3}}M_{\mathrm{W}}^{2}- \\ m_{u_{\mathrm{g3}}}\left(s_{2\beta}s_{\mathrm{W}}\delta M_{\mathrm{W}}^{2}+\left(2\left(\delta s_{\mathrm{W}}\right)s_{2\beta}+4\left(\delta s_{\beta}\right)c_{\beta}s_{\mathrm{W}}\right)M_{\mathrm{W}}^{2}\right)\end{array}\right)m_{u_{\mathrm{g4}}}\end{array}\right)+s_{2\beta}s_{\mathrm{W}}m_{u_{\mathrm{g3}}}m_{u_{\mathrm{g4}}}M_{\mathrm{W}}^{2}\delta\mathrm{CKM}^{*}_{\mathrm{g3,g2}}
\end{aligned}
$$

$$
\begin{aligned}
3 = & \left(\begin{array}{l} 4\left((2)\mathrm{CKM}_{g4,g1} + \left(\delta\mathrm{CKM}_{g4,g1}\right) m_{d_{g1}} m_{d_{g2}} s_{2\beta} s_W \mathrm{CKM}^*_{g3,g2} M_W^2\right) s_\beta^2 U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{u}_{g4}}_{s4,1} + \\ \delta_{g1,g2}\delta_{g3,g4}\left(\delta s_W\right) U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{u}_{g3}}_{s4,1} + \\ \left(\left(\delta\mathrm{CKM}_{g4,g1}\right) s_W \mathrm{CKM}^*_{g3,g2} - \mathrm{CKM}_{g4,g1}\left(2\left(\delta s_W\right)\mathrm{CKM}^*_{g3,g2} - s_W \delta\mathrm{CKM}^*_{g3,g2}\right)\right) U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{u}_{g4}}_{s4,1} \end{array}\right) M_W^4 s_{2\beta}^3 U^{\tilde{d}_{g1}*}_{s1,1} \\
2 = & \mathrm{CKM}^*_{g3,g2}\left(\begin{array}{l} m_{d_{g1}} s_{2\beta} s_W \delta m^{d_g}_{g2} M_W^2 + \\ \left(\begin{array}{l} s_{2\beta} s_W \delta m^{d_g}_{g1} M_W^2 - \\ m_{d_{g1}}\left(4\left(\delta c_\beta\right) s_W s_\beta M_W^2 + s_{2\beta}\left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right)\right) \end{array}\right) m_{d_{g2}} \end{array}\right) + s_{2\beta} s_W m_{d_{g1}} m_{d_{g2}} M_W^2 \delta\mathrm{CKM}^*_{g3,g2} \\
1 = & -\frac{\delta_{g1,g2}\delta_{g3,g4}}{c_W^2}\left(\begin{array}{l} \left(\left(1 - 10c_W^2\right) U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,1} + 2s_W^2 U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s2,2}\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} - \\ 4s_W^2\left(U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,1} + 2U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s2,2}\right) U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2} \end{array}\right) - \\
& \frac{18\mathrm{CKM}_{g4,g1}\mathrm{CKM}^*_{g3,g2}}{M_W^2 s_{2\beta}^2}\left(\begin{array}{l} \left(M_W^2 s_{2\beta}^2 U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g2}}_{s2,1} + 4m_{d_{g1}} m_{d_{g2}} s_\beta^2 U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g2}}_{s2,2}\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ 4m_{u_{g3}} m_{u_{g4}} c_\beta^2 U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array}\right)
\end{aligned}
$$

$$
\underset{385}{C}\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{i}{72}\left(\begin{array}{l} e^2(6) + 144 g_s^2 (7)\left(\delta Z_{g_s}\right) + (28)\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2} + (10)\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} + (31)\delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2} + (13)\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} + \\ (16)\delta Z^{\tilde{u}_{g1}}_{1,s1} + (22)\delta Z^{\tilde{u}_{g3}}_{1,s3} + (19)\delta Z^{\tilde{u}_{g1}}_{2,s1} + (25)\delta Z^{\tilde{u}_{g3}}_{2,s3} \end{array}\right)\right]
$$

$$
\begin{aligned}
31 = & \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(29)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c1} T^x_{c4,c3}\right) g_s^2\left(U^{\tilde{u}_{g1}}_{2,1} U^{\tilde{u}_{g1}*}_{s1,1} - U^{\tilde{u}_{g1}}_{2,2} U^{\tilde{u}_{g1}*}_{s1,2}\right)\left(U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} - U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2}\right)\right) + \\
& \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(30)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c3} T^x_{c4,c1}\right) g_s^2\left(U^{\tilde{u}_{g2}}_{2,1} U^{\tilde{u}_{g2}*}_{s3,1} - U^{\tilde{u}_{g2}}_{2,2} U^{\tilde{u}_{g2}*}_{s3,2}\right)\left(U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{u}_{g1}}_{s4,1} - U^{\tilde{u}_{g1}*}_{s1,2} U^{\tilde{u}_{g1}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
30 = & U^{\tilde{u}_{g1}*}_{s1,1}\left(M_W^2 s_\beta^2\left(\left(8c_W^2 + 1\right) U^{\tilde{u}_{g2}}_{2,1} U^{\tilde{u}_{g2}*}_{s3,1} - 4s_W^2 U^{\tilde{u}_{g2}}_{2,2} U^{\tilde{u}_{g2}*}_{s3,2}\right) U^{\tilde{u}_{g1}}_{s4,1} + 18 m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g2}}_{2,1} U^{\tilde{u}_{g2}*}_{s3,2} U^{\tilde{u}_{g1}}_{s4,2}\right) + \\
& 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9 m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g2}}_{2,2} U^{\tilde{u}_{g2}*}_{s3,1} U^{\tilde{u}_{g1}}_{s4,1} - 2M_W^2 s_W^2 s_\beta^2\left(U^{\tilde{u}_{g2}}_{2,1} U^{\tilde{u}_{g2}*}_{s3,1} - 4U^{\tilde{u}_{g2}}_{2,2} U^{\tilde{u}_{g2}*}_{s3,2}\right) U^{\tilde{u}_{g1}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
29 = & 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9 m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g1}}_{2,1} U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,2} - 2M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{2,2}\left(U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} - 4U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2}\right)\right) + \\
& U^{\tilde{u}_{g1}*}_{s1,1}\left(18 m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g1}}_{2,2} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,1} + M_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{2,1}\left(\left(8c_W^2 + 1\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} - 4s_W^2 U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
28 = & \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(26)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c1} T^x_{c4,c3}\right) g_s^2\left(U^{\tilde{u}_{g1}}_{1,1} U^{\tilde{u}_{g1}*}_{s1,1} - U^{\tilde{u}_{g1}}_{1,2} U^{\tilde{u}_{g1}*}_{s1,2}\right)\left(U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} - U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2}\right)\right) + \\
& \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(27)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c3} T^x_{c4,c1}\right) g_s^2\left(U^{\tilde{u}_{g2}}_{1,1} U^{\tilde{u}_{g2}*}_{s3,1} - U^{\tilde{u}_{g2}}_{1,2} U^{\tilde{u}_{g2}*}_{s3,2}\right)\left(U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{u}_{g1}}_{s4,1} - U^{\tilde{u}_{g1}*}_{s1,2} U^{\tilde{u}_{g1}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
27 = {} & U^{\tilde{u}_{g1}*}_{s1,1}\left(M_W^2 s_\beta^2\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g2}}_{1,1}U^{\tilde{u}_{g2}*}_{s3,1}-4s_W^2U^{\tilde{u}_{g2}}_{1,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)U^{\tilde{u}_{g1}}_{s4,1}+18m_{u_{g1}}m_{u_{g2}}c_W^2U^{\tilde{u}_{g2}}_{1,1}U^{\tilde{u}_{g2}*}_{s3,2}U^{\tilde{u}_{g1}}_{s4,2}\right)+\\
& 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9m_{u_{g1}}m_{u_{g2}}c_W^2U^{\tilde{u}_{g2}}_{1,2}U^{\tilde{u}_{g2}*}_{s3,1}U^{\tilde{u}_{g1}}_{s4,1}-2M_W^2s_W^2s_\beta^2\left(U^{\tilde{u}_{g2}}_{1,1}U^{\tilde{u}_{g2}*}_{s3,1}-4U^{\tilde{u}_{g2}}_{1,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)U^{\tilde{u}_{g1}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
26 = {} & 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9m_{u_{g1}}m_{u_{g3}}c_W^2U^{\tilde{u}_{g1}}_{1,1}U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,2}-2M_W^2s_W^2s_\beta^2U^{\tilde{u}_{g1}}_{1,2}\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}-4U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)+\\
& U^{\tilde{u}_{g1}*}_{s1,1}\left(18m_{u_{g1}}m_{u_{g3}}c_W^2U^{\tilde{u}_{g1}}_{1,2}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,1}+M_W^2s_\beta^2U^{\tilde{u}_{g1}}_{1,1}\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}-4s_W^2U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
25 = {} & \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(23)}{c_W^2M_W^2s_W^2s_\beta^2}+36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s2,1}-U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}*}_{2,1}U^{\tilde{u}_{g3}}_{s4,1}-U^{\tilde{u}_{g3}*}_{2,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)+\\
& \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(24)}{c_W^2M_W^2s_W^2s_\beta^2}+36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{u}_{g2}*}_{2,1}U^{\tilde{u}_{g2}}_{s2,1}-U^{\tilde{u}_{g2}*}_{2,2}U^{\tilde{u}_{g2}}_{s2,2}\right)\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s4,1}-U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
24 = {} & U^{\tilde{u}_{g1}*}_{s1,1}\left(M_W^2s_\beta^2\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g2}*}_{2,1}U^{\tilde{u}_{g2}}_{s2,1}-4s_W^2U^{\tilde{u}_{g2}*}_{2,2}U^{\tilde{u}_{g2}}_{s2,2}\right)U^{\tilde{u}_{g1}}_{s4,1}+18m_{u_{g1}}m_{u_{g2}}c_W^2U^{\tilde{u}_{g2}*}_{2,2}U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g1}}_{s4,2}\right)+\\
& 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9m_{u_{g1}}m_{u_{g2}}c_W^2U^{\tilde{u}_{g2}*}_{2,1}U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g1}}_{s4,1}-2M_W^2s_W^2s_\beta^2\left(U^{\tilde{u}_{g2}*}_{2,1}U^{\tilde{u}_{g2}}_{s2,1}-4U^{\tilde{u}_{g2}*}_{2,2}U^{\tilde{u}_{g2}}_{s2,2}\right)U^{\tilde{u}_{g1}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
23 = {} & 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9m_{u_{g1}}m_{u_{g3}}c_W^2U^{\tilde{u}_{g3}*}_{2,1}U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g3}}_{s4,2}-2M_W^2s_W^2s_\beta^2U^{\tilde{u}_{g1}}_{s2,2}\left(U^{\tilde{u}_{g3}*}_{2,1}U^{\tilde{u}_{g3}}_{s4,1}-4U^{\tilde{u}_{g3}*}_{2,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)+\\
& U^{\tilde{u}_{g1}*}_{s1,1}\left(18m_{u_{g1}}m_{u_{g3}}c_W^2U^{\tilde{u}_{g3}*}_{2,2}U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g3}}_{s4,1}+M_W^2s_\beta^2U^{\tilde{u}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g3}*}_{2,1}U^{\tilde{u}_{g3}}_{s4,1}-4s_W^2U^{\tilde{u}_{g3}*}_{2,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
22 = {} & \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(20)}{c_W^2M_W^2s_W^2s_\beta^2}+36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s2,1}-U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}*}_{1,1}U^{\tilde{u}_{g3}}_{s4,1}-U^{\tilde{u}_{g3}*}_{1,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)+\\
& \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(21)}{c_W^2M_W^2s_W^2s_\beta^2}+36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{u}_{g2}*}_{1,1}U^{\tilde{u}_{g2}}_{s2,1}-U^{\tilde{u}_{g2}*}_{1,2}U^{\tilde{u}_{g2}}_{s2,2}\right)\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s4,1}-U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
21 = {} & U^{\tilde{u}_{g1}*}_{s1,1}\left(M_W^2s_\beta^2\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g2}*}_{1,1}U^{\tilde{u}_{g2}}_{s2,1}-4s_W^2U^{\tilde{u}_{g2}*}_{1,2}U^{\tilde{u}_{g2}}_{s2,2}\right)U^{\tilde{u}_{g1}}_{s4,1}+18m_{u_{g1}}m_{u_{g2}}c_W^2U^{\tilde{u}_{g2}*}_{1,2}U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g1}}_{s4,2}\right)+\\
& 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9m_{u_{g1}}m_{u_{g2}}c_W^2U^{\tilde{u}_{g2}*}_{1,1}U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g1}}_{s4,1}-2M_W^2s_W^2s_\beta^2\left(U^{\tilde{u}_{g2}*}_{1,1}U^{\tilde{u}_{g2}}_{s2,1}-4U^{\tilde{u}_{g2}*}_{1,2}U^{\tilde{u}_{g2}}_{s2,2}\right)U^{\tilde{u}_{g1}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
20 = {} & 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9m_{u_{g1}}m_{u_{g3}}c_W^2U^{\tilde{u}_{g3}*}_{1,1}U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g3}}_{s4,2}-2M_W^2s_W^2s_\beta^2U^{\tilde{u}_{g1}}_{s2,2}\left(U^{\tilde{u}_{g3}*}_{1,1}U^{\tilde{u}_{g3}}_{s4,1}-4U^{\tilde{u}_{g3}*}_{1,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)+\\
& U^{\tilde{u}_{g1}*}_{s1,1}\left(18m_{u_{g1}}m_{u_{g3}}c_W^2U^{\tilde{u}_{g3}*}_{1,2}U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g3}}_{s4,1}+M_W^2s_\beta^2U^{\tilde{u}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g3}*}_{1,1}U^{\tilde{u}_{g3}}_{s4,1}-4s_W^2U^{\tilde{u}_{g3}*}_{1,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
19 = {} & \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(17)}{c_W^2M_W^2s_W^2s_\beta^2}+36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{u}_{g1}*}_{2,1}U^{\tilde{u}_{g1}}_{s2,1}-U^{\tilde{u}_{g1}*}_{2,2}U^{\tilde{u}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}-U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)+\\
& \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(18)}{c_W^2M_W^2s_W^2s_\beta^2}+36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1}-U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)\left(U^{\tilde{u}_{g1}*}_{2,1}U^{\tilde{u}_{g1}}_{s4,1}-U^{\tilde{u}_{g1}*}_{2,2}U^{\tilde{u}_{g1}}_{s4,2}\right)\right)
\end{aligned}
$$

$$18 = U^{\tilde{u}_{g1}*}_{2,1}\left(M_W^2 s_\beta^2\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1} - 4s_W^2 U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)U^{\tilde{u}_{g1}}_{s4,1} + 18 m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,2}U^{\tilde{u}_{g1}}_{s4,2}\right) + 2U^{\tilde{u}_{g1}*}_{2,2}\left(9 m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,1}U^{\tilde{u}_{g1}}_{s4,1} - 2M_W^2 s_W^2 s_\beta^2\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1} - 4U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)U^{\tilde{u}_{g1}}_{s4,2}\right)$$

$$17 = 2U^{\tilde{u}_{g1}*}_{2,2}\left(9 m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,2} - 2M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,2}\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1} - 4U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right) + U^{\tilde{u}_{g1}*}_{2,1}\left(18 m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,1} + M_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1} - 4s_W^2 U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)$$

$$16 = \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(14)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{u}_{g1}*}_{1,1}U^{\tilde{u}_{g1}}_{s2,1} - U^{\tilde{u}_{g1}*}_{1,2}U^{\tilde{u}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1} - U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right) + \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(15)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1} - U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)\left(U^{\tilde{u}_{g1}*}_{1,1}U^{\tilde{u}_{g1}}_{s4,1} - U^{\tilde{u}_{g1}*}_{1,2}U^{\tilde{u}_{g1}}_{s4,2}\right)\right)$$

$$15 = U^{\tilde{u}_{g1}*}_{1,1}\left(M_W^2 s_\beta^2\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1} - 4s_W^2 U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)U^{\tilde{u}_{g1}}_{s4,1} + 18 m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,2}U^{\tilde{u}_{g1}}_{s4,2}\right) + 2U^{\tilde{u}_{g1}*}_{1,2}\left(9 m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,1}U^{\tilde{u}_{g1}}_{s4,1} - 2M_W^2 s_W^2 s_\beta^2\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1} - 4U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)U^{\tilde{u}_{g1}}_{s4,2}\right)$$

$$14 = 2U^{\tilde{u}_{g1}*}_{1,2}\left(9 m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,2} - 2M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,2}\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1} - 4U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right) + U^{\tilde{u}_{g1}*}_{1,1}\left(18 m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,1} + M_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1} - 4s_W^2 U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\right)$$

$$13 = \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(11)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s2,1} - U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}}_{2,1}U^{\tilde{u}_{g3}*}_{s3,1} - U^{\tilde{u}_{g3}}_{2,2}U^{\tilde{u}_{g3}*}_{s3,2}\right)\right) + \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(12)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{u}_{g1}}_{2,1}U^{\tilde{u}_{g1}*}_{s1,1} - U^{\tilde{u}_{g1}}_{2,2}U^{\tilde{u}_{g1}*}_{s1,2}\right)\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1} - U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)\right)$$

$$12 = 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9 m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g1}}_{2,1}U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,1} - 2M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{2,2}\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1} - 4U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)\right) + U^{\tilde{u}_{g1}*}_{s1,1}\left(18 m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g1}}_{2,2}U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,2} + M_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{2,1}\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1} - 4s_W^2 U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)\right)$$

$$11 = 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9 m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g3}}_{2,2}U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,1} - 2M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,2}\left(U^{\tilde{u}_{g3}}_{2,1}U^{\tilde{u}_{g3}*}_{s3,1} - 4U^{\tilde{u}_{g3}}_{2,2}U^{\tilde{u}_{g3}*}_{s3,2}\right)\right) + U^{\tilde{u}_{g1}*}_{s1,1}\left(18 m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g3}}_{2,1}U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g3}*}_{s3,2} + M_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g3}}_{2,1}U^{\tilde{u}_{g3}*}_{s3,1} - 4s_W^2 U^{\tilde{u}_{g3}}_{2,2}U^{\tilde{u}_{g3}*}_{s3,2}\right)\right)$$

$$10 = \delta_{g1,g2}\delta_{g3,g4}\left(\frac{e^2(8)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c1}T^x_{c4,c3}\right)g_s^2\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s2,1} - U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}}_{1,1}U^{\tilde{u}_{g3}*}_{s3,1} - U^{\tilde{u}_{g3}}_{1,2}U^{\tilde{u}_{g3}*}_{s3,2}\right)\right) + \delta_{g1,g4}\delta_{g2,g3}\left(\frac{e^2(9)}{c_W^2 M_W^2 s_W^2 s_\beta^2} + 36\left(T^x_{c2,c3}T^x_{c4,c1}\right)g_s^2\left(U^{\tilde{u}_{g1}}_{1,1}U^{\tilde{u}_{g1}*}_{s1,1} - U^{\tilde{u}_{g1}}_{1,2}U^{\tilde{u}_{g1}*}_{s1,2}\right)\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1} - U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)\right)$$

$$
\begin{aligned}
9 = {} & 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9m_{u_{g1}}m_{u_{g2}}c_W^2U^{\tilde{u}_{g1}}_{1,1}U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,1}-2M_W^2s_W^2s_\beta^2U^{\tilde{u}_{g1}}_{1,2}\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1}-4U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)\right)+\\
& U^{\tilde{u}_{g1}*}_{s1,1}\left(18m_{u_{g1}}m_{u_{g2}}c_W^2U^{\tilde{u}_{g1}}_{1,2}U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,2}+M_W^2s_\beta^2U^{\tilde{u}_{g1}}_{1,1}\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1}-4s_W^2U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
8 = {} & 2U^{\tilde{u}_{g1}*}_{s1,2}\left(9m_{u_{g1}}m_{u_{g3}}c_W^2U^{\tilde{u}_{g3}}_{1,2}U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,1}-2M_W^2s_W^2s_\beta^2U^{\tilde{u}_{g1}}_{s2,2}\left(U^{\tilde{u}_{g3}}_{1,1}U^{\tilde{u}_{g3}*}_{s3,1}-4U^{\tilde{u}_{g3}}_{1,2}U^{\tilde{u}_{g3}*}_{s3,2}\right)\right)+\\
& U^{\tilde{u}_{g1}*}_{s1,1}\left(18m_{u_{g1}}m_{u_{g3}}c_W^2U^{\tilde{u}_{g3}}_{1,1}U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g3}*}_{s3,2}+M_W^2s_\beta^2U^{\tilde{u}_{g1}}_{s2,1}\left(\left(8c_W^2+1\right)U^{\tilde{u}_{g3}}_{1,1}U^{\tilde{u}_{g3}*}_{s3,1}-4s_W^2U^{\tilde{u}_{g3}}_{1,2}U^{\tilde{u}_{g3}*}_{s3,2}\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
7 = {} & \left(T^x_{c2,c1}T^x_{c4,c3}\right)\delta_{g1,g2}\delta_{g3,g4}\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s2,1}-U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}-U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)+\\
& \left(T^x_{c2,c3}T^x_{c4,c1}\right)\delta_{g1,g4}\delta_{g2,g3}\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1}-U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s4,1}-U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s4,2}\right)
\end{aligned}
$$

$$
6 = \frac{36(1)m_{u_{g1}}}{M_W^2s_W^2s_\beta^2}-\frac{4}{c_W^4M_W^4s_W^3s_\beta^2}\left(s_\beta^3M_W^4(3)-c_W^4\left(\begin{array}{l}9(4)s_\beta\left(s_W\delta m^{u_g}_{g1}M_W^2-m_{u_{g1}}\left(2\left(\delta s_W\right)M_W^2-s_W\left(2\left(\delta Z_e\right)M_W^2-\delta M_W^2\right)\right)\right)-\\ 18(5)\left(\delta s_\beta\right)m_{u_{g1}}s_WM_W^2\end{array}\right)\right)
$$

$$
\begin{aligned}
5 = {} & \delta_{g1,g4}\delta_{g2,g3}m_{u_{g2}}\left(U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,1}U^{\tilde{u}_{g1}}_{s4,1}+U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,2}U^{\tilde{u}_{g1}}_{s4,2}\right)+\\
& \delta_{g1,g2}\delta_{g3,g4}m_{u_{g3}}\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,1}+U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
4 = {} & U^{\tilde{u}_{g1}*}_{s1,1}\left(\begin{array}{l}\delta_{g1,g2}\delta_{g3,g4}m_{u_{g3}}U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,1}+\\ \delta_{g1,g4}\delta_{g2,g3}m_{u_{g2}}U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,2}U^{\tilde{u}_{g1}}_{s4,2}\end{array}\right)+U^{\tilde{u}_{g1}*}_{s1,2}\left(\begin{array}{l}\delta_{g1,g4}\delta_{g2,g3}m_{u_{g2}}U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,1}U^{\tilde{u}_{g1}}_{s4,1}+\\ \delta_{g1,g2}\delta_{g3,g4}m_{u_{g3}}U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,2}\end{array}\right)
\end{aligned}
$$

$$
\begin{aligned}
3 = {} & 4s_W^3\left(c_W^2\left(\delta Z_e\right)+s_W\left(\delta s_W\right)\right)U^{\tilde{u}_{g1}*}_{s1,2}\left(\begin{array}{l}\delta_{g1,g4}\delta_{g2,g3}\left(U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1}-4U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)U^{\tilde{u}_{g1}}_{s4,2}+\\ \delta_{g1,g2}\delta_{g3,g4}U^{\tilde{u}_{g1}}_{s2,2}\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}-4U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\end{array}\right)-(2)U^{\tilde{u}_{g1}*}_{s1,1}
\end{aligned}
$$

$$
\begin{aligned}
2 = {} & \delta_{g1,g4}\delta_{g2,g3}\left(\left(\left(\left(\delta Z_e\right)s_W-\delta s_W\right)\left(c_W^2+8c_W^4\right)+\left(\delta s_W\right)s_W^2\right)U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,1}-4\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)s_W^3U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,2}\right)U^{\tilde{u}_{g1}}_{s4,1}+\\
& \delta_{g1,g2}\delta_{g3,g4}U^{\tilde{u}_{g1}}_{s2,1}\left(\left(\left(\left(\delta Z_e\right)s_W-\delta s_W\right)\left(c_W^2+8c_W^4\right)+\left(\delta s_W\right)s_W^2\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}-4\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)s_W^3U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = {} & \delta_{g1,g4}\delta_{g2,g3}\delta m^{u_g}_{g2}\left(U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g2}}_{s2,2}U^{\tilde{u}_{g2}*}_{s3,1}U^{\tilde{u}_{g1}}_{s4,1}+U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g2}}_{s2,1}U^{\tilde{u}_{g2}*}_{s3,2}U^{\tilde{u}_{g1}}_{s4,2}\right)+\\
& \delta_{g1,g2}\delta_{g3,g4}\delta m^{u_g}_{g3}\left(U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s2,2}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,1}+U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,2}\right)
\end{aligned}
$$

[SSSS] 2 Higgs – 2 Sleptons

$$
\underset{280}{C}\left(h^0,h^0,\tilde{\nu}_{g3},\tilde{\nu}^\dagger_{g4}\right)=\left[\frac{ie^2\delta_{g3,g4}}{8c_W^4s_W^3}\left(\begin{array}{l}4c_{2\alpha}\left(\left(s_W\left(\delta Z_e\right)-\delta s_W\right)c_W^2+\left(\delta s_W\right)s_W^2\right)+\\ s_Wc_W^2\left(2s_{2\alpha}\left(\delta Z_{hH}\right)+c_{2\alpha}\left(2\left(\delta Z_{hh}\right)+\delta\overline{Z}^{\tilde{\nu}}_{1,1}+\delta Z^{\tilde{\nu}}_{1,1}\right)\right)\end{array}\right)\right]
$$

$$\underset{281}{C}\left(h^0, h^0, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} \frac{ie^2(4)\delta_{g3,g4}}{8c_W^4 c_\beta^3 M_W^4 s_W^3} \end{array}\right]$$

$$\begin{array}{l} 4 = (3)c_\beta s_W c_W^2 M_W^2 + U^{\tilde{e}_{g4}*}_{s3,1}\left(c_\beta s_W c_W^2 M_W^2\left(c_{2\alpha}\left(1-2c_W^2\right)c_\beta^2 M_W^2 - 2c_W^2 m^2_{e_{g4}} s_\alpha^2\right)\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g4}}_{2,1}\right) + 2(1)U^{\tilde{e}_{g4}}_{s4,1}\right) - \\ 2U^{\tilde{e}_{g4}*}_{s3,2}\left(c_\beta s_W c_W^2 M_W^2\left(c_{2\alpha}c_\beta^2 M_W^2 s_W^2 + c_W^2 m^2_{e_{g4}} s_\alpha^2\right)\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g4}}_{2,2}\right) + (2)U^{\tilde{e}_{g4}}_{s4,2}\right) \end{array}$$

$$\begin{array}{l} 3 = \left(c_{2\alpha}\left(1-2c_W^2\right)c_\beta^2 M_W^2 - 2c_W^2 m^2_{e_{g4}} s_\alpha^2\right)\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g4}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g4}*}_{2,1}\right)U^{\tilde{e}_{g4}}_{s4,1} - \\ 2\left(c_{2\alpha}c_\beta^2 M_W^2 s_W^2 + c_W^2 m^2_{e_{g4}} s_\alpha^2\right)\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g4}*}_{1,2} + \delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g4}*}_{2,2}\right)U^{\tilde{e}_{g4}}_{s4,2} \end{array}$$

$$\begin{array}{l} 2 = 2\left(\left(\delta Z_{hH}\right)s_{2\alpha}c_W^2 + c_{2\alpha}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta Z_{hh}\right)c_W^2\right)\right)c_\beta^3 M_W^4 s_W^3 + \\ m_{e_{g4}}c_W^4\left(4c_\beta s_W \delta m^{e_g}_{g4} M_W^2 s_\alpha^2 - m_{e_{g4}}\left(\left(\begin{array}{l} 4\left(\delta s_W\right)M_W^2 s_\alpha^2 + \\ s_W\left(\left(\delta Z_{hH}\right)s_{2\alpha}M_W^2 - 2\left(\left(2\left(\delta Z_e\right) + \delta Z_{hh}\right)M_W^2 - \delta M_W^2\right)s_\alpha^2\right) \end{array}\right)c_\beta + 4\left(\delta c_\beta\right)s_W M_W^2 s_\alpha^2\right)\right) \end{array}$$

$$\begin{array}{l} 1 = \left(\begin{array}{l} \left(\delta Z_{hH}\right)s_{2\alpha}s_W\left(1-2c_W^2\right)c_W^2 + \\ \left(\begin{array}{l} 2\left(\delta s_W\right)\left(1-2c_W^2\right)s_W^2 + \\ \left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{hh}\right)s_W\left(1-2c_W^2\right)\right)c_W^2 \end{array}\right)c_{2\alpha} \end{array}\right)c_\beta^3 M_W^4 - \\ m_{e_{g4}}c_W^4\left(4c_\beta s_W \delta m^{e_g}_{g4} M_W^2 s_\alpha^2 - m_{e_{g4}}\left(\left(\begin{array}{l} 4\left(\delta s_W\right)M_W^2 s_\alpha^2 + \\ s_W\left(\left(\delta Z_{hH}\right)s_{2\alpha}M_W^2 - 2\left(\left(2\left(\delta Z_e\right) + \delta Z_{hh}\right)M_W^2 - \delta M_W^2\right)s_\alpha^2\right) \end{array}\right)c_\beta + 4\left(\delta c_\beta\right)s_W M_W^2 s_\alpha^2\right)\right) \end{array}$$

$$\underset{284}{C}\left(H^0, H^0, \tilde{\nu}_{g3}, \tilde{\nu}^\dagger_{g4}\right) = \left[\begin{array}{l} -\frac{ie^2\delta_{g3,g4}}{8c_W^4 s_W^3}\left(\begin{array}{l} 4c_{2\alpha}\left(\left(s_W\left(\delta Z_e\right) - \delta s_W\right)c_W^2 + \left(\delta s_W\right)s_W^2\right) - \\ s_W c_W^2\left(2s_{2\alpha}\left(\delta Z_{hH}\right) - c_{2\alpha}\left(2\left(\delta Z_{HH}\right) + \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right) \end{array}\right) \end{array}\right]$$

$$\underset{285}{C}\left(H^0, H^0, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} -\frac{ie^2(4)\delta_{g3,g4}}{8c_W^4 c_\beta^3 M_W^4 s_W^3} \end{array}\right]$$

$$\begin{array}{l} 4 = (3)c_\beta s_W c_W^2 M_W^2 - U^{\tilde{e}_{g4}*}_{s3,1}\left(2(1)U^{\tilde{e}_{g4}}_{s4,1} - c_\beta s_W c_W^2 M_W^2\left(2c_W^2 c_\alpha^2 m^2_{e_{g4}} + c_{2\alpha}\left(1-2c_W^2\right)c_\beta^2 M_W^2\right)\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g4}}_{2,1}\right)\right) + \\ 2U^{\tilde{e}_{g4}*}_{s3,2}\left(c_\beta s_W c_W^2 M_W^2\left(c_W^2 c_\alpha^2 m^2_{e_{g4}} - c_{2\alpha}c_\beta^2 M_W^2 s_W^2\right)\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g4}}_{2,2}\right) + (2)U^{\tilde{e}_{g4}}_{s4,2}\right) \end{array}$$

$$\begin{array}{l} 3 = \left(2c_W^2 c_\alpha^2 m^2_{e_{g4}} + c_{2\alpha}\left(1-2c_W^2\right)c_\beta^2 M_W^2\right)\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g4}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g4}*}_{2,1}\right)U^{\tilde{e}_{g4}}_{s4,1} + \\ 2\left(c_W^2 c_\alpha^2 m^2_{e_{g4}} - c_{2\alpha}c_\beta^2 M_W^2 s_W^2\right)\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g4}*}_{1,2} + \delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g4}*}_{2,2}\right)U^{\tilde{e}_{g4}}_{s4,2} \end{array}$$

$$
\begin{aligned}
\boxed{2} = {} & 2\left(\left(\delta Z_{hH}\right) s_{2\alpha} c_W^2 - c_{2\alpha}\left(2\left(\delta s_W\right) s_W + \left(2\left(\delta Z_e\right) + \delta Z_{HH}\right) c_W^2\right)\right) c_\beta^3 M_W^4 s_W^3 + \\
& m_{e_{g4}} c_W^4 \left(4 c_\beta s_W \delta m_{g4}^{e_g} c_\alpha^2 M_W^2 - \left(\begin{array}{l} \left(\delta Z_{hH}\right) c_\beta s_{2\alpha} s_W M_W^2 + \\ 2 c_\alpha^2 \left(2\left(\delta c_\beta\right) s_W M_W^2 + c_\beta\left(2\left(\delta s_W\right) M_W^2 - s_W\left(\left(2\left(\delta Z_e\right) + \delta Z_{HH}\right) M_W^2 - \delta M_W^2\right)\right)\right) \end{array}\right) m_{e_{g4}}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{1} = {} & \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_{2\alpha} s_W \left(1 - 2c_W^2\right) c_W^2 - \\ \left(\begin{array}{l} 2\left(\delta s_W\right)\left(1 - 2c_W^2\right) s_W^2 + \\ \left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{HH}\right) s_W\left(1 - 2c_W^2\right)\right) c_W^2 \end{array}\right) c_{2\alpha} \end{array}\right) c_\beta^3 M_W^4 - \\
& m_{e_{g4}} c_W^4 \left(4 c_\beta s_W \delta m_{g4}^{e_g} c_\alpha^2 M_W^2 - \left(\begin{array}{l} \left(\delta Z_{hH}\right) c_\beta s_{2\alpha} s_W M_W^2 + \\ 2 c_\alpha^2 \left(2\left(\delta c_\beta\right) s_W M_W^2 + c_\beta\left(2\left(\delta s_W\right) M_W^2 - s_W\left(\left(2\left(\delta Z_e\right) + \delta Z_{HH}\right) M_W^2 - \delta M_W^2\right)\right)\right) \end{array}\right) m_{e_{g4}}\right)
\end{aligned}
$$

$$
\underset{288}{C}\left(A^0, A^0, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\frac{i e^2 \delta_{g3,g4}}{8 c_W^4 s_W^3}\left(\begin{array}{l} 4 c_{2\beta}\left(\left(s_W\left(\delta Z_e\right) - \delta s_W\right) c_W^2 + \left(\delta s_W\right) s_W^2\right) + \\ s_W c_W^2\left(2 s_{2\beta}\left(\delta Z_{AG}\right) + c_{2\beta}\left(2\left(\delta Z_{AA}\right) + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right) \end{array}\right)\right]
$$

$$
\underset{289}{C}\left(G^0, G^0, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{8 c_W^4 s_W^3}\left(\begin{array}{l} 4 c_{2\beta}\left(\left(s_W\left(\delta Z_e\right) - \delta s_W\right) c_W^2 + \left(\delta s_W\right) s_W^2\right) - \\ s_W c_W^2\left(2 s_{2\beta}\left(\delta Z_{AG}\right) - c_{2\beta}\left(2\left(\delta Z_{GG}\right) + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right) \end{array}\right)\right]
$$

$$
\underset{290}{C}\left(A^0, G^0, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\frac{i e^2 \delta_{g3,g4} s_{2\beta}}{8 c_W^4 s_W^3}\left(4\left(\delta s_W\right) s_W^2 + c_W^2\left(4\left(s_W\left(\delta Z_e\right) - \delta s_W\right) + s_W\left(\delta Z_{AA} + \delta Z_{GG} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right)\right)\right]
$$

$$
\underset{291}{C}\left(A^0, A^0, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2 (\boxed{4}) \delta_{g3,g4}}{8 c_W^4 c_\beta^3 M_W^4 s_W^3}\right]
$$

$$
\begin{aligned}
\boxed{4} = {} & (\boxed{3}) c_\beta s_W c_W^2 M_W^2 + U_{s3,1}^{\tilde{e}_{g4}*}\left(2(\boxed{1}) U_{s4,1}^{\tilde{e}_{g4}} - s_W c_W^2 M_W^2\left(s_{2\beta} s_\beta c_W^2 m_{e_{g4}}^2 - c_{2\beta}\left(1 - 2c_W^2\right) c_\beta^3 M_W^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,1}^{\tilde{e}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,1}^{\tilde{e}_{g4}}\right)\right) - \\
& 2 U_{s3,2}^{\tilde{e}_{g4}*}\left(c_\beta s_W c_W^2 M_W^2\left(c_{2\beta} c_\beta^2 M_W^2 s_W^2 + c_W^2 m_{e_{g4}}^2 s_\beta^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,2}^{\tilde{e}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,2}^{\tilde{e}_{g4}}\right) + 2(\boxed{2}) U_{s4,2}^{\tilde{e}_{g4}}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{3} = {} & \left(c_{2\beta}\left(1 - 2c_W^2\right) c_\beta^2 M_W^2 - 2 c_W^2 m_{e_{g4}}^2 s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g4}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g4}*}\right) U_{s4,1}^{\tilde{e}_{g4}} - \\
& 2\left(c_{2\beta} c_\beta^2 M_W^2 s_W^2 + c_W^2 m_{e_{g4}}^2 s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g4}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g4}*}\right) U_{s4,2}^{\tilde{e}_{g4}}
\end{aligned}
$$

$$
\begin{aligned}
\boxed{2} = {} & \left(\left(\delta Z_{AG}\right) s_{2\beta} c_W^2 + c_{2\beta}\left(2\left(\delta s_W\right) s_W + \left(2\left(\delta Z_e\right) + \delta Z_{AA}\right) c_W^2\right)\right) c_\beta^3 M_W^4 s_W^3 + \\
& m_{e_{g4}} s_\beta c_W^4 \left(s_{2\beta} s_W \delta m_{g4}^{e_g} M_W^2 - \left(\begin{array}{l} \frac{s_{2\beta}}{2}\left(2\left(\delta s_W\right) M_W^2 - s_W\left(\left(2\left(\delta Z_e\right) + \delta Z_{AA}\right) M_W^2 - \delta M_W^2\right)\right) + \\ s_W\left(2\left(\delta c_\beta\right) s_\beta + \left(\delta Z_{AG}\right) c_\beta^2\right) M_W^2 \end{array}\right) m_{e_{g4}}\right)
\end{aligned}
$$

$$\boxed{1} = \begin{array}{l} c_\beta^3 M_W^4 \left((\delta Z_{AG})\, s_{2\beta} s_W \left(1 - 2c_W^2\right) c_W^2 + c_{2\beta} \left(\left(2\,(\delta s_W) + (2\,(\delta Z_e) + \delta Z_{AA})\, s_W \left(1 - 2c_W^2\right)\right) c_W^2 + 2\,(\delta s_W) \left(1 - 2c_W^2\right) s_W^2 \right) \right) - \\ 2 m_{e_{g4}} s_\beta c_W^4 \left(s_{2\beta} s_W \delta m_{g4}^{e_g} M_W^2 - \left(\begin{array}{l} \frac{s_{2\beta}}{2} \left(2\,(\delta s_W) M_W^2 - s_W \left((2\,(\delta Z_e) + \delta Z_{AA}) M_W^2 - \delta M_W^2 \right)\right) + \\ s_W \left(2\,(\delta c_\beta)\, s_\beta + (\delta Z_{AG})\, c_\beta^2\right) M_W^2 \end{array} \right) m_{e_{g4}} \right) \end{array}$$

$$\underset{292}{C}\left(G^0, G^0, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[-\frac{i e^2 (\boxed{3}) \delta_{g3,g4}}{8 c_\beta c_W^4 M_W^4 s_W^3} \right]$$

$$\boxed{3} = \begin{array}{l} -U_{s3,1}^{\tilde{e}_{g4}*} \left(2(\boxed{2}) U_{s4,1}^{\tilde{e}_{g4}} - c_\beta s_W c_W^2 M_W^2 \left(2c_W^2 m_{e_{g4}}^2 + c_{2\beta}\left(1 - 2c_W^2\right) M_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,1}^{\tilde{e}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,1}^{\tilde{e}_{g4}}\right)\right) - \\ 2 U_{s3,2}^{\tilde{e}_{g4}*} \left(2(\boxed{1}) U_{s4,2}^{\tilde{e}_{g4}} - c_\beta s_W c_W^2 M_W^2 \left(c_W^2 m_{e_{g4}}^2 - c_{2\beta} M_W^2 s_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,2}^{\tilde{e}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,2}^{\tilde{e}_{g4}}\right)\right) + \\ \left(\begin{array}{l} \left(2c_W^2 m_{e_{g4}}^2 + c_{2\beta}\left(1 - 2c_W^2\right) M_W^2\right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g4}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g4}*}\right) U_{s4,1}^{\tilde{e}_{g4}} + \\ 2\left(c_W^2 m_{e_{g4}}^2 - c_{2\beta} M_W^2 s_W^2\right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g4}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g4}*}\right) U_{s4,2}^{\tilde{e}_{g4}} \end{array} \right) c_\beta s_W c_W^2 M_W^2 \end{array}$$

$$\boxed{2} = \begin{array}{l} 2 \left(\begin{array}{l} s_W \left(2\,(\delta c_\beta) + (\delta Z_{AG})\, s_\beta\right) M_W^2 + \\ c_\beta \left(2\,(\delta s_W) M_W^2 - s_W \left((2\,(\delta Z_e) + \delta Z_{GG}) M_W^2 - \delta M_W^2 \right)\right) \end{array} \right) c_W^4 m_{e_{g4}}^2 - \\ c_\beta \left(4 m_{e_{g4}} s_W \delta m_{g4}^{e_g} c_W^4 M_W^2 - \left((\delta Z_{AG})\, s_{2\beta} s_W \left(1 - 2c_W^2\right) c_W^2 - \left(\begin{array}{l} 2\,(\delta s_W) \left(1 - 2c_W^2\right) s_W^2 + \\ \left(2\,(\delta s_W) + (2\,(\delta Z_e) + \delta Z_{GG})\, s_W \left(1 - 2c_W^2\right)\right) c_W^2 \end{array} \right) c_{2\beta} \right) M_W^4 \right) \end{array}$$

$$\boxed{1} = \begin{array}{l} -c_\beta \left(2 m_{e_{g4}} s_W \delta m_{g4}^{e_g} c_W^4 M_W^2 + \left((\delta Z_{AG})\, s_{2\beta} c_W^2 - c_{2\beta} \left(2\,(\delta s_W)\, s_W + (2\,(\delta Z_e) + \delta Z_{GG})\, c_W^2\right)\right) M_W^4 s_W^3 \right) + \\ c_W^4 m_{e_{g4}}^2 \left(s_W \left(2\,(\delta c_\beta) + (\delta Z_{AG})\, s_\beta\right) M_W^2 + c_\beta \left(2\,(\delta s_W) M_W^2 - s_W \left((2\,(\delta Z_e) + \delta Z_{GG}) M_W^2 - \delta M_W^2 \right)\right)\right) \end{array}$$

$$\underset{293}{C}\left(A^0, G^0, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2 (\boxed{3}) \delta_{g3,g4}}{8 c_W^4 c_\beta^2 M_W^4 s_W^3} \right]$$

$$\boxed{3} = \begin{array}{l} U_{s3,1}^{\tilde{e}_{g4}*} \left(s_{2\beta} s_W c_W^2 M_W^2 \left(c_W^2 m_{e_{g4}}^2 + \left(1 - 2c_W^2\right) c_\beta^2 M_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,1}^{\tilde{e}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,1}^{\tilde{e}_{g4}}\right) + (\boxed{2}) U_{s4,1}^{\tilde{e}_{g4}} \right) - \\ U_{s3,2}^{\tilde{e}_{g4}*} \left((\boxed{1}) U_{s4,2}^{\tilde{e}_{g4}} - s_{2\beta} s_W c_W^2 M_W^2 \left(c_W^2 m_{e_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,2}^{\tilde{e}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,2}^{\tilde{e}_{g4}}\right)\right) + \\ \left(\begin{array}{l} \left(c_W^2 m_{e_{g4}}^2 + \left(1 - 2c_W^2\right) c_\beta^2 M_W^2\right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g4}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g4}*}\right) U_{s4,1}^{\tilde{e}_{g4}} + \\ \left(c_W^2 m_{e_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g4}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g4}*}\right) U_{s4,2}^{\tilde{e}_{g4}} \end{array} \right) s_{2\beta} s_W c_W^2 M_W^2 \end{array}$$

$$2 = m_{e_{g4}} c_W^4 \left(4 s_{2\beta} s_W \delta m_{g4}^{e_g} M_W^2 - m_{e_{g4}} \left(\left(\begin{array}{l} 2 s_{2\beta} \delta M_W^2 + \\ \left(2 \left(\delta Z_{AG}\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) s_{2\beta} + 8 \left(\delta c_\beta\right) s_\beta\right) M_W^2 \end{array} \right) s_W + 4 \left(\delta s_W\right) s_{2\beta} M_W^2 \right) \right) - \left(\begin{array}{l} 4 \left(\left(\left(\delta Z_e\right) s_W - \delta s_W \right) c_W^2 \left(1 - 2 s_W^2\right) - \left(\delta s_W\right) s_W^2 \right) - \\ \left(\delta Z_{AA} + \delta Z_{GG}\right) s_W \left(1 - 2 c_W^2\right) c_W^2 \end{array} \right) s_{2\beta} c_\beta^2 M_W^4$$

$$1 = \begin{array}{l} 2 s_{2\beta} \left(4 \left(\delta s_W\right) s_W + \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) c_W^2\right) c_\beta^2 M_W^4 s_W^3 - \\ m_{e_{g4}} c_W^4 \left(4 s_{2\beta} s_W \delta m_{g4}^{e_g} M_W^2 - \left(\begin{array}{l} s_{2\beta} \left(4 \left(\delta s_W\right) M_W^2 - 2 s_W \left(2 \left(\delta Z_e\right) M_W^2 - \delta M_W^2\right)\right) + \\ s_W \left(2 \left(\delta Z_{AG}\right) - \left(\delta Z_{AA} + \delta Z_{GG}\right) s_{2\beta} + 8 \left(\delta c_\beta\right) s_\beta\right) M_W^2 \end{array} \right) m_{e_{g4}} \right) \end{array}$$

$$C\left(h^0, H^0, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\frac{i e^2 \delta_{g3,g4} s_{2\alpha}}{8 c_W^4 s_W^3} \left(4 \left(\delta s_W\right) s_W^2 + c_W^2 \left(4 \left(s_W \left(\delta Z_e\right) - \delta s_W\right) + s_W \left(\delta Z_{hh} + \delta Z_{HH} + \delta \overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right)\right) \right]$$

$$C\left(h^0, H^0, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2 (4) \delta_{g3,g4}}{8 c_W^4 c_\beta^3 M_W^4 s_W^3} \right]$$

$$4 = s_{2\alpha} c_\beta s_W c_W^2 M_W^2 \left(\begin{array}{l} \left(c_W^2 m_{e_{g4}}^2 + \left(1 - 2 c_W^2\right) c_\beta^2 M_W^2\right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g4}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g4}*}\right) U_{s4,1}^{\tilde{e}_{g4}} + \\ \left(c_W^2 m_{e_{g4}}^2 - 2 c_\beta^2 M_W^2 s_W^2\right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g4}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g4}*}\right) U_{s4,2}^{\tilde{e}_{g4}} \end{array} \right) + (3) U_{s3,1}^{\tilde{e}_{g4}*} - (2) U_{s3,2}^{\tilde{e}_{g4}*}$$

$$3 = \begin{array}{l} c_\beta s_{2\alpha} s_W c_W^2 M_W^2 \left(c_W^2 m_{e_{g4}}^2 + \left(1 - 2 c_W^2\right) c_\beta^2 M_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,1}^{\tilde{e}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,1}^{\tilde{e}_{g4}}\right) + \\ \left((1) m_{e_{g4}} c_W^4 + s_{2\alpha} c_\beta^3 M_W^4 \left(\left(4 \left(\delta s_W\right) + \left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH}\right) s_W \left(1 - 2 c_W^2\right)\right) c_W^2 + 4 \left(\delta s_W\right) \left(1 - 2 c_W^2\right) s_W^2 \right)\right) U_{s4,1}^{\tilde{e}_{g4}} \end{array}$$

$$2 = \begin{array}{l} -c_\beta s_{2\alpha} s_W c_W^2 M_W^2 \left(c_W^2 m_{e_{g4}}^2 - 2 c_\beta^2 M_W^2 s_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,2}^{\tilde{e}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,2}^{\tilde{e}_{g4}}\right) - \\ \left((1) m_{e_{g4}} c_W^4 - 2 s_{2\alpha} \left(4 \left(\delta s_W\right) s_W + \left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH}\right) c_W^2\right) c_\beta^3 M_W^4 s_W^3\right) U_{s4,2}^{\tilde{e}_{g4}} \end{array}$$

$$1 = 4 s_{2\alpha} c_\beta s_W M_W^2 \delta m_{g4}^{e_g} - m_{e_{g4}} \left(c_\beta \left(\begin{array}{l} 4 \left(\delta s_W\right) s_{2\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 s_{2\alpha} \delta M_W^2 - \\ M_W^2 \left(\left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH}\right) s_{2\alpha} - 2 \left(\delta Z_{hH}\right) \left(c_\alpha^2 + s_\alpha^2\right) \right) \end{array} \right) s_W \end{array} \right) + 4 s_{2\alpha} s_W M_W^2 \left(\delta c_\beta\right) \right)$$

$$C\left(h^0, H^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{4 \sqrt{2} c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} (2) U_{s4,1}^{\tilde{e}_{g3}} - \\ c_\beta s_W M_W^2 \left(s_\alpha s_\beta m_{e_{g3}}^2 + c_{\alpha+\beta} c_\beta^2 M_W^2\right) \left(U_{1,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} + U_{2,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}}\right) \end{array} \right) \right]$$

$$
\begin{aligned}
\boxed{2} = & \frac{1}{2}(\boxed{1})c_\beta^2 M_W^4 - m_{e_{g3}} s_{2\beta} s_\alpha \left(2 s_W \delta m_{g3}^{e_g} M_W^2 - m_{e_{g3}} \left(s_W \delta M_W^2 + 2(\delta s_W) M_W^2\right)\right) - \\
& \left(\frac{1}{2} s_W M_W^2\right) \left(\delta Z_{1,1}^{\tilde{\nu}} \left(s_{2\beta} s_\alpha m_{e_{g3}}^2 + 2 c_{\alpha+\beta} c_\beta^3 M_W^2\right) - \left(\begin{array}{l} s_\alpha \left(8(\delta c_\beta) s_\beta + 2(\delta Z_{G^- H^-}) c_\beta^2\right) + \\ s_{2\beta}\left((\delta Z_{hH}) c_\alpha - (4(\delta Z_e) + \delta Z_{hh} + \delta Z_{H^- H^-}) s_\alpha\right) \end{array}\right) m_{e_{g3}}^2\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{1} = & s_W s_\alpha \left((4(\delta Z_e) + \delta Z_{hh} + \delta Z_{H^- H^-}) s_{2\beta} - 2(\delta Z_{hH} + \delta Z_{G^- H^-}) c_\beta^2\right) - s_{2\beta}\left((\delta Z_{hH} + \delta Z_{G^- H^-}) c_\alpha s_W + 4(\delta s_W) s_\alpha\right) + \\
& 2 c_\alpha \left(4(\delta s_W) - (4(\delta Z_e) + \delta Z_{hh} + \delta Z_{H^- H^-}) s_W\right) c_\beta^2
\end{aligned}
$$

$$
\underset{317}{C}\left(h^0, G^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} (\boxed{2}) U_{s4,1}^{\tilde{e}_{g3}} + \\ c_\beta s_W M_W^2 \left(s_\alpha m_{e_{g3}}^2 - c_\beta s_{\alpha+\beta} M_W^2\right) \left(U_{1,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} + U_{2,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}}\right) \end{array}\right)\right]
$$

$$
\begin{aligned}
\boxed{2} = & c_\beta \left(\frac{1}{2}(\boxed{1}) M_W^4 + 2 m_{e_{g3}} s_\alpha \left(2 s_W \delta m_{g3}^{e_g} M_W^2 - m_{e_{g3}} \left(s_W \delta M_W^2 + 2(\delta s_W) M_W^2\right)\right)\right) + \\
& s_W M_W^2 \left(c_\beta \delta Z_{1,1}^{\tilde{\nu}} \left(s_\alpha m_{e_{g3}}^2 - c_\beta s_{\alpha+\beta} M_W^2\right) - \left(\begin{array}{l} c_\beta \left((\delta Z_{hH}) c_\alpha - (4(\delta Z_e) + \delta Z_{hh} + \delta Z_{G^- G^-}) s_\alpha\right) + \\ s_\alpha \left(4(\delta c_\beta) + (\delta Z_{H^- G^-}) s_\beta\right) \end{array}\right) m_{e_{g3}}^2\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{1} = & (8(\delta s_W) s_\alpha - 2 s_W \left((4(\delta Z_e) + \delta Z_{hh} + \delta Z_{G^- G^-}) s_\alpha - (\delta Z_{hH} - \delta Z_{H^- G^-}) c_\alpha\right)) c_\beta^2 + \\
& s_{2\beta}\left(c_\alpha \left(4(\delta s_W) - (4(\delta Z_e) + \delta Z_{hh} + \delta Z_{G^- G^-}) s_W\right) - (\delta Z_{hH} - \delta Z_{H^- G^-}) s_W s_\alpha\right)
\end{aligned}
$$

$$
\underset{318}{C}\left(h^0, H^+, \tilde{e}_{g3}^{s3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\frac{i e^2 \delta_{g3,g4}}{8\sqrt{2} c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} (\boxed{2}) U_{s3,1}^{\tilde{e}_{g4}*} - \\ s_W M_W^2 \left(s_{2\beta} s_\alpha m_{e_{g4}}^2 + 2 c_{\alpha+\beta} c_\beta^3 M_W^2\right) \left(U_{1,1}^{\tilde{e}_{g4}*} \delta Z_{1,s3}^{\tilde{e}_{g3}} + U_{2,1}^{\tilde{e}_{g4}*} \delta Z_{2,s3}^{\tilde{e}_{g3}}\right) \end{array}\right)\right]
$$

$$
\begin{aligned}
\boxed{2} = & s_W s_\alpha \left(8(\delta c_\beta) s_\beta + 2(\delta Z_{H^- G^-}) c_\beta^2\right) m_{e_{g4}}^2 M_W^2 + (\boxed{1}) M_W^4 - \\
& m_{e_{g4}} s_{2\beta} \left(4 s_W s_\alpha \delta m_{g4}^{e_g} M_W^2 - \left(\begin{array}{l} s_\alpha \left(4(\delta s_W) - s_W \delta \overline{Z}_{1,1}^{\tilde{\nu}}\right) M_W^2 - \\ s_W \left(\left((4(\delta Z_e) + \delta \overline{Z}_{H^- H^-} + \delta Z_{hh}) s_\alpha - (\delta Z_{hH}) c_\alpha\right) M_W^2 - 2 s_\alpha \delta M_W^2\right) \end{array}\right) m_{e_{g4}}\right)
\end{aligned}
$$

$$
\begin{aligned}
\boxed{1} = & -2 s_W \left(\left(\delta \overline{Z}_{H^- H^-}\right) c_{\alpha+\beta} + (\delta Z_{H^- G^-}) s_{\alpha+\beta}\right) c_\beta^3 - 2\left((\delta Z_{hH}) s_W s_\alpha - c_\alpha \left(4(\delta s_W) - s_W \left(4(\delta Z_e) + \delta Z_{hh} + \delta \overline{Z}_{1,1}^{\tilde{\nu}}\right)\right)\right) c_\beta^4 - \\
& \left(\begin{array}{l} s_\alpha \left(4(\delta s_W) - s_W \delta \overline{Z}_{1,1}^{\tilde{\nu}}\right) - \\ s_W \left((4(\delta Z_e) + \delta Z_{hh}) s_\alpha - (\delta Z_{hH}) c_\alpha\right) \end{array}\right) s_{2\beta} c_\beta^2
\end{aligned}
$$

$$
\underset{319}{C}\left(h^0, G^+, \tilde{e}_{g3}^{s3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\frac{i e^2 \delta_{g3,g4}}{8\sqrt{2} c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} (\boxed{2}) U_{s3,1}^{\tilde{e}_{g4}*} + \\ 2 c_\beta s_W M_W^2 \left(s_\alpha m_{e_{g4}}^2 - c_\beta s_{\alpha+\beta} M_W^2\right) \left(U_{1,1}^{\tilde{e}_{g4}*} \delta Z_{1,s3}^{\tilde{e}_{g3}} + U_{2,1}^{\tilde{e}_{g4}*} \delta Z_{2,s3}^{\tilde{e}_{g3}}\right) \end{array}\right)\right]
$$

$$
\begin{aligned}
2 = {} & (1) M_W^4 - s_W s_\alpha \left(8 \left(\delta c_\beta\right) + 2 \left(\delta Z_{G^- H^-}\right) s_\beta\right) m_{e_{g4}}^2 M_W^2 + \\
& 2 c_\beta m_{e_{g4}} \left(4 s_W s_\alpha \delta m_{g4}^{e_g} M_W^2 - \left(\begin{array}{l} s_\alpha \left(4 \left(\delta s_W\right) - s_W \delta \overline{Z}_{1,1}^{\tilde{\nu}}\right) M_W^2 + \\ s_W \left(2 s_\alpha \delta M_W^2 + \left(\left(\delta Z_{hH}\right) c_\alpha - \left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^- G^-}\right) s_\alpha\right) M_W^2\right) \end{array}\right) m_{e_{g4}}\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = {} & c_\beta s_{2\beta} \left(c_\alpha \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{hh}\right) s_W\right) - \left(\delta Z_{hH}\right) s_W s_\alpha\right) + 2 \left(4 \left(\delta s_W\right) s_\alpha - s_W \left(\left(4 \left(\delta Z_e\right) + \delta Z_{hh}\right) s_\alpha - \left(\delta Z_{hH}\right) c_\alpha\right)\right) c_\beta^3 - \\
& 2 s_W \left(\left(\delta Z_{G^- H^-}\right) c_{\alpha+\beta} + s_{\alpha+\beta} \left(\delta Z_{G^- G^-} + \delta \overline{Z}_{1,1}^{\tilde{\nu}}\right)\right) c_\beta^2
\end{aligned}
$$

$$
\underset{320}{C}\left(A^0, H^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} \frac{1}{4} (1) U_{s4,1}^{\tilde{e}_{g3}} + \\ c_\beta s_W M_W^2 \left(c_{2\beta} c_\beta^2 M_W^2 + m_{e_{g3}}^2 s_\beta^2\right) \left(U_{1,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} + U_{2,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}}\right) \end{array}\right)\right]
$$

$$
\begin{aligned}
1 = {} & - s_W m_{e_{g3}}^2 M_W^2 \left(2 \left(\delta Z_{AG} + \delta Z_{G^- H^-}\right) c_\beta s_{2\beta} + 16 \left(\delta c_\beta\right) s_\beta^2\right) - \\
& M_W^4 \left(\left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^- H^-}\right) s_W\right) \left(4 c_\beta^5 - c_\beta s_{2\beta}^2\right) - 4 s_W \left(\left(\delta Z_{AG} + \delta Z_{G^- H^-}\right) s_{2\beta} + c_{2\beta} \delta Z_{1,1}^{\tilde{\gamma}}\right) c_\beta^3\right) + \\
& 2 m_{e_{g3}} s_{2\beta} s_\beta \left(4 s_W \delta m_{g3}^{e_g} M_W^2 + m_{e_{g3}} \left(s_W \left(\left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^- H^-}\right) M_W^2 - 2 \delta M_W^2\right) - \left(4 \left(\delta s_W\right) - s_W \delta Z_{1,1}^{\tilde{\gamma}}\right) M_W^2\right)\right)
\end{aligned}
$$

$$
\underset{321}{C}\left(G^0, G^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta M_W^4 s_W^3} \left((1) U_{s4,1}^{\tilde{e}_{g3}} + c_\beta s_W M_W^2 \left(m_{e_{g3}}^2 - c_{2\beta} M_W^2\right) \left(U_{1,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} + U_{2,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}}\right)\right)\right]
$$

$$
\begin{aligned}
1 = {} & 2 c_\beta m_{e_{g3}} \left(2 s_W \delta m_{g3}^{e_g} M_W^2 - m_{e_{g3}} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right)\right) + \\
& \left(\frac{1}{2} M_W^4\right) \left(\left(8 \left(\delta s_W\right) - 2 \left(4 \left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^- G^-}\right) s_W\right) c_\beta^3 - \left(\begin{array}{l} \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^- G^-}\right) s_W\right) s_\beta - \\ 2 \left(\delta Z_{AG} + \delta Z_{H^- G^-}\right) c_\beta s_W \end{array}\right) s_{2\beta}\right) - \\
& s_W M_W^2 \left(\left(4 \left(\delta c_\beta\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^- G^-}\right) c_\beta + \left(\delta Z_{AG} + \delta Z_{H^- G^-}\right) s_\beta\right) m_{e_{g3}}^2 - c_\beta \delta Z_{1,1}^{\tilde{\nu}} \left(m_{e_{g3}}^2 - c_{2\beta} M_W^2\right)\right)
\end{aligned}
$$

$$
\underset{322}{C}\left(A^0, G^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[-\frac{e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} (1) U_{s4,1}^{\tilde{e}_{g3}} + \\ \left(\frac{1}{2} s_{2\beta} s_W M_W^2\right) \left(m_{e_{g3}}^2 - 2 c_\beta^2 M_W^2\right) \left(U_{1,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} + U_{2,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}}\right) \end{array}\right)\right]
$$

$$
\begin{aligned}
1 = {} & - 2 m_{e_{g3}} s_{2\beta} \left(\left(\delta s_W\right) m_{e_{g3}} - s_W \delta m_{g3}^{e_g}\right) M_W^2 + \\
& \left(\frac{1}{4} M_W^4\right) \left(\begin{array}{l} 4 s_{2\beta} \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^- G^-}\right) s_W\right) c_\beta^2 + \\ \left(\delta Z_{AG} - \delta Z_{H^- G^-}\right) s_W \left(4 c_\beta^4 - s_{2\beta}^2\right) \end{array}\right) + \\
& s_W \left(\left(\frac{1}{2} s_{2\beta} M_W^2 \delta Z_{1,1}^{\tilde{\nu}}\right) \left(m_{e_{g3}}^2 - 2 c_\beta^2 M_W^2\right) - \left(\left(\frac{1}{2} M_W^2\right) \left(\begin{array}{l} 8 \left(\delta c_\beta\right) s_\beta - \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^- G^-}\right) s_{2\beta} + \\ 2 \left(\left(\delta Z_{AG}\right) c_\beta^2 + \left(\delta Z_{H^- G^-}\right) s_\beta^2\right) \end{array}\right) + s_{2\beta} \delta M_W^2\right) m_{e_{g3}}^2\right)
\end{aligned}
$$

$$\underset{323}{C}\left(G^0, H^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} (1) U^{\tilde{e}_{g3}}_{s4,1} + \\ \left(\frac{1}{2} s_{2\beta} s_W M_W^2\right) \left(m^2_{e_{g3}} - 2c_\beta^2 M_W^2\right) \left(U^{\tilde{e}_{g3}}_{1,1} \delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4} + U^{\tilde{e}_{g3}}_{2,1} \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}\right) \end{array} \right) \right]$$

$$\begin{aligned} 1 = & \; m_{e_{g3}} s_{2\beta} \left(2 s_W \delta m^{e_g}_{g3} M_W^2 - m_{e_{g3}} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right)\right) + \\ & \left(\frac{1}{4} M_W^4\right) \left(4 s_{2\beta} \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{H^-H^-}\right) s_W\right) c_\beta^2 - \left(\delta Z_{AG} - \delta Z_{G^-H^-}\right) s_W \left(4 c_\beta^4 - s_{2\beta}^2\right)\right) - \\ & \left(\frac{1}{2} s_W M_W^2\right) \left(m^2_{e_{g3}} \left(-\left(4 \left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{H^-H^-}\right) s_{2\beta} + 8 \left(\delta c_\beta\right) s_\beta + 2 \left(\delta Z_{G^-H^-}\right) c_\beta^2 + 2 \left(\delta Z_{AG}\right) s_\beta^2\right) - s_{2\beta} \delta Z^{\tilde{\nu}}_{1,1} \left(m^2_{e_{g3}} - 2 c_\beta^2 M_W^2\right)\right) \end{aligned}$$

$$\underset{324}{C}\left(A^0, H^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{e^2 \delta_{g3,g4}}{16\sqrt{2} c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} (1) U^{\tilde{e}_{g4}*}_{s3,1} + \\ 2 s_W M_W^2 \left(s_{2\beta} s_\beta m^2_{e_{g4}} + 2 c_{2\beta} c_\beta^3 M_W^2\right) \left(U^{\tilde{e}_{g4}*}_{1,1} \delta Z^{\tilde{e}_{g3}}_{1,s3} + U^{\tilde{e}_{g4}*}_{2,1} \delta Z^{\tilde{e}_{g3}}_{2,s3}\right) \end{array} \right) \right]$$

$$\begin{aligned} 1 = & \; 2 m_{e_{g4}} s_{2\beta} s_\beta \left(4 s_W \delta m^{e_g}_{g4} M_W^2 - m_{e_{g4}} \left(\left(4 \left(\delta s_W\right) - s_W \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right) M_W^2 - s_W \left(\left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{AA}\right) M_W^2 - 2\delta M_W^2\right)\right)\right) - \\ & s_W m^2_{e_{g4}} M_W^2 \left(2 \left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) c_\beta s_{2\beta} + 16 \left(\delta c_\beta\right) s_\beta^2\right) - \\ & M_W^4 \left(\left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{AA}\right) s_W\right) \left(4 c_\beta^5 - c_\beta s_{2\beta}^2\right) - 4 s_W \left(\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) s_{2\beta} + c_{2\beta} \left(\delta\overline{Z}_{H^-H^-} + \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)\right) c_\beta^3\right) \end{aligned}$$

$$\underset{325}{C}\left(G^0, G^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta M_W^4 s_W^3} \left((1) U^{\tilde{e}_{g4}*}_{s3,1} + c_\beta s_W M_W^2 \left(m^2_{e_{g4}} - c_{2\beta} M_W^2\right) \left(U^{\tilde{e}_{g4}*}_{1,1} \delta Z^{\tilde{e}_{g3}}_{1,s3} + U^{\tilde{e}_{g4}*}_{2,1} \delta Z^{\tilde{e}_{g3}}_{2,s3}\right)\right) \right]$$

$$\begin{aligned} 1 = & \; \left(\frac{1}{2} M_W^4\right) \left(\begin{array}{l} \left(8 \left(\delta s_W\right) - 2 \left(4 \left(\delta Z_e\right) + \delta Z_{GG}\right) s_W\right) c_\beta^3 - \\ s_{2\beta} \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{GG}\right) s_W\right) s_\beta - \\ 2 c_\beta \left(\left(\delta Z_{G^-G^-}\right) c_{2\beta} - \left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) s_{2\beta}\right) s_W \end{array} \right) + 2 c_\beta m_{e_{g4}} \left(2 s_W \delta m^{e_g}_{g4} M_W^2 - m_{e_{g4}} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right)\right) - \\ & s_W M_W^2 \left(\left(4 \left(\delta c_\beta\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right) c_\beta + \left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) s_\beta\right) m^2_{e_{g4}} - c_\beta \delta\overline{Z}^{\tilde{\nu}}_{1,1} \left(m^2_{e_{g4}} - c_{2\beta} M_W^2\right)\right) \end{aligned}$$

$$\underset{326}{C}\left(A^0, G^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} (1) U^{\tilde{e}_{g4}*}_{s3,1} + \\ \left(\frac{1}{2} s_{2\beta} s_W M_W^2\right) \left(m^2_{e_{g4}} - 2 c_\beta^2 M_W^2\right) \left(U^{\tilde{e}_{g4}*}_{1,1} \delta Z^{\tilde{e}_{g3}}_{1,s3} + U^{\tilde{e}_{g4}*}_{2,1} \delta Z^{\tilde{e}_{g3}}_{2,s3}\right) \end{array} \right) \right]$$

$$\begin{aligned} 1 = & \; -2 m_{e_{g4}} s_{2\beta} \left(\left(\delta s_W\right) m_{e_{g4}} - s_W \delta m^{e_g}_{g4}\right) M_W^2 + \\ & \left(\frac{1}{4} M_W^4\right) \left(4 \left(4 \left(\delta s_W\right) s_{2\beta} - \left(\left(\delta Z_{G^-H^-}\right) c_{2\beta} + \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right) s_{2\beta}\right) s_W\right) c_\beta^2 + \left(\delta Z_{AG}\right) s_W \left(4 c_\beta^4 - s_{2\beta}^2\right)\right) + \\ & s_W \left(\left(\frac{1}{2} s_{2\beta} M_W^2 \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right) \left(m^2_{e_{g4}} - 2 c_\beta^2 M_W^2\right) - \left(\left(\frac{1}{2} M_W^2\right) \left(\begin{array}{l} 8 \left(\delta c_\beta\right) s_\beta - \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right) s_{2\beta} + \\ 2 \left(\left(\delta Z_{AG}\right) c_\beta^2 + \left(\delta Z_{G^-H^-}\right) s_\beta^2\right) \end{array} \right) + s_{2\beta} \delta M_W^2\right) m^2_{e_{g4}}\right) \end{aligned}$$

$$\underset{327}{C}\left(G^0, H^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{e^2\delta_{g3,g4}}{16\sqrt{2}c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} (1) U^{\tilde{e}_{g4}*}_{s3,1} - \\ 2s_{2\beta}s_W M_W^2 \left(m^2_{e_{g4}} - 2c_\beta^2 M_W^2\right) \left(U^{\tilde{e}_{g4}*}_{1,1}\delta Z^{\tilde{e}_{g3}}_{1,s3} + U^{\tilde{e}_{g4}*}_{2,1}\delta Z^{\tilde{e}_{g3}}_{2,s3}\right) \end{array} \right) \right]$$

$$\begin{aligned} 1 = {} & M_W^4 \left((\delta Z_{AG})\, s_W \left(4c_\beta^4 - s_{2\beta}^2\right) - 4s_{2\beta}\left(4(\delta s_W) - s_W\left(4(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + \delta Z_{GG} + \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)\right)c_\beta^2\right) - \\ & 2m_{e_{g4}}s_{2\beta}\left(4s_W\delta m^{e_g}_{g4}M_W^2 - m_{e_{g4}}\left(\left(4(\delta s_W) - s_W\delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)M_W^2 - s_W\left(\left(4(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + \delta Z_{GG}\right)M_W^2 - 2\delta M_W^2\right)\right)\right) + \\ & s_W M_W^2\left(4(\delta Z_{H^-G^-})\, c_\beta^2\left(m^2_{e_{g4}} - c_{2\beta}M_W^2\right) + m^2_{e_{g4}}\left(16(\delta c_\beta)\, s_\beta + 4(\delta Z_{AG})\, s_\beta^2\right)\right) \end{aligned}$$

$$\underset{332}{C}\left(H^0, H^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{4\sqrt{2}c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} (1) U^{\tilde{e}_{g3}}_{s4,1} + \\ c_\beta s_W M_W^2 \left(c_\alpha s_\beta m^2_{e_{g3}} - s_{\alpha+\beta}c_\beta^2 M_W^2\right) \left(U^{\tilde{e}_{g3}}_{1,1}\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4} + U^{\tilde{e}_{g3}}_{2,1}\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}\right) \end{array} \right) \right]$$

$$\begin{aligned} 1 = {} & c_\alpha m_{e_{g3}}\left(2s_{2\beta}s_W\delta m^{e_g}_{g3}M_W^2 - m_{e_{g3}}\left(2(\delta s_W)\, s_{2\beta}M_W^2 + s_W\left(4(\delta c_\beta)\, s_\beta M_W^2 - s_{2\beta}\left(2(\delta Z_e)\, M_W^2 - \delta M_W^2\right)\right)\right)\right) - \\ & \left(4\left((\delta Z_e)\, s_W - \delta s_W\right)s_{\alpha+\beta} - \left(\begin{array}{l} s_\alpha\left((\delta Z_{hH} - \delta Z_{G^-H^-})\, s_\beta - (\delta Z_{HH} + \delta Z_{H^-H^-})\, c_\beta\right) - \\ c_\alpha\left((\delta Z_{hH} - \delta Z_{G^-H^-})\, c_\beta + (\delta Z_{HH} + \delta Z_{H^-H^-})\, s_\beta\right) \end{array} \right) s_W\right) c_\beta^3 M_W^4 - \\ & \left(\frac{1}{2}s_W M_W^2\right)\left(\left(s_{2\beta}\left((\delta Z_{hH})\, s_\alpha - (\delta Z_{HH} + \delta Z_{H^-H^-})\, c_\alpha\right) + 2(\delta Z_{G^-H^-})\, c_\alpha c_\beta^2\right) m^2_{e_{g3}} - \delta Z^{\tilde{\nu}}_{1,1}\left(c_\alpha s_{2\beta}m^2_{e_{g3}} - 2s_{\alpha+\beta}c_\beta^3 M_W^2\right)\right) \end{aligned}$$

$$\underset{333}{C}\left(H^0, G^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{4\sqrt{2}c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} (2) U^{\tilde{e}_{g3}}_{s4,1} - \\ c_\beta s_W M_W^2 \left(c_\alpha m^2_{e_{g3}} - c_{\alpha+\beta}c_\beta M_W^2\right) \left(U^{\tilde{e}_{g3}}_{1,1}\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4} + U^{\tilde{e}_{g3}}_{2,1}\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}\right) \end{array} \right) \right]$$

$$\begin{aligned} 2 = {} & \frac{1}{2}(1)c_\beta M_W^4 - c_\alpha\left(4c_\beta m_{e_{g3}}s_W\delta m^{e_g}_{g3}M_W^2 - 2m^2_{e_{g3}}\left(2(\delta c_\beta)\, s_W M_W^2 - c_\beta\left(\left(2(\delta Z_e)\, s_W - 2(\delta s_W)\right)M_W^2 - s_W\delta M_W^2\right)\right)\right) + \\ & s_W M_W^2\left(\left(c_\beta\left((\delta Z_{hH})\, s_\alpha - (\delta Z_{HH} + \delta Z_{G^-G^-})\, c_\alpha\right) + (\delta Z_{H^-G^-})\, c_\alpha s_\beta\right) m^2_{e_{g3}} - c_\beta\delta Z^{\tilde{\nu}}_{1,1}\left(c_\alpha m^2_{e_{g3}} - c_{\alpha+\beta}c_\beta M_W^2\right)\right) \end{aligned}$$

$$\begin{aligned} 1 = {} & -2\left(c_\alpha\left(4(\delta s_W) - \left(4(\delta Z_e) + \delta Z_{HH} + \delta Z_{G^-G^-}\right)s_W\right) + \left(\delta Z_{hH} + \delta Z_{H^-G^-}\right)s_W s_\alpha\right)c_\beta^2 + \\ & s_{2\beta}\left(4(\delta s_W)\, s_\alpha - s_W\left(\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right)c_\alpha + \left(4(\delta Z_e) + \delta Z_{HH} + \delta Z_{G^-G^-}\right)s_\alpha\right)\right) \end{aligned}$$

$$\underset{334}{C}\left(H^0, H^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{8\sqrt{2}c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} (2) U^{\tilde{e}_{g4}*}_{s3,1} + \\ s_W M_W^2 \left(c_\alpha s_{2\beta}m^2_{e_{g4}} - 2s_{\alpha+\beta}c_\beta^3 M_W^2\right) \left(U^{\tilde{e}_{g4}*}_{1,1}\delta Z^{\tilde{e}_{g3}}_{1,s3} + U^{\tilde{e}_{g4}*}_{2,1}\delta Z^{\tilde{e}_{g3}}_{2,s3}\right) \end{array} \right) \right]$$

$$\begin{aligned} 2 = {} & (1)M_W^4 - c_\alpha s_W\left(8(\delta c_\beta)\, s_\beta + 2(\delta Z_{H^-G^-})\, c_\beta^2\right)m^2_{e_{g4}}M_W^2 + \\ & m_{e_{g4}}s_{2\beta}\left(4c_\alpha s_W\delta m^{e_g}_{g4}M_W^2 - \left(\begin{array}{l} s_W\left((\delta Z_{hH})\, s_\alpha - c_\alpha\delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)M_W^2 + \\ c_\alpha\left(4(\delta s_W)\, M_W^2 - s_W\left(\left(4(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + \delta Z_{HH}\right)M_W^2 - 2\delta M_W^2\right)\right) \end{array} \right) m_{e_{g4}}\right) \end{aligned}$$

$$1 = \begin{array}{l} s_{2\beta}\left(c_\alpha\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{HH}\right)s_W\right) + \left(\delta Z_{hH}\right)s_W s_\alpha\right)c_\beta^2 + 2\left(4\left(\delta s_W\right)s_\alpha - s_W\left(\left(\delta Z_{hH}\right)c_\alpha + \left(4\left(\delta Z_e\right) + \delta Z_{HH}\right)s_\alpha\right)\right)c_\beta^4 + \\ 2s_W\left(\left(\delta Z_{H^-G^-}\right)c_{\alpha+\beta} - s_{\alpha+\beta}\left(\delta\overline{Z}_{H^-H^-} + \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)\right)c_\beta^3 \end{array}$$

$$\underset{335}{C}\left(H^0, G^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^\dagger_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{8\sqrt{2}c_\beta^2 M_W^4 s_W^3}\left(\begin{array}{l}(2)U^{\tilde{e}_{g4}*}_{s3,1} - \\ 2c_\beta s_W M_W^2\left(c_\alpha m^2_{e_{g4}} - c_{\alpha+\beta}c_\beta M_W^2\right)\left(U^{\tilde{e}_{g4}*}_{1,1}\delta Z^{\tilde{e}_{g3}}_{1,s3} + U^{\tilde{e}_{g4}*}_{2,1}\delta Z^{\tilde{e}_{g3}}_{2,s3}\right)\end{array}\right)\right]$$

$$2 = \begin{array}{l} c_\alpha s_W\left(8\left(\delta c_\beta\right) + 2\left(\delta Z_{G^-H^-}\right)s_\beta\right)m^2_{e_{g4}}M_W^2 + (1)M_W^4 - \\ 2c_\beta m_{e_{g4}}\left(4c_\alpha s_W\delta m^{e_g}_{g4}M_W^2 - \left(\begin{array}{l} s_W\left(\left(\delta Z_{hH}\right)s_\alpha - c_\alpha\delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)M_W^2 + \\ c_\alpha\left(4\left(\delta s_W\right)M_W^2 - s_W\left(\left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-}\right)M_W^2 - 2\delta M_W^2\right)\right)\end{array}\right)m_{e_{g4}}\right)\end{array}$$

$$1 = s_{2\beta}c_\beta\left(4s_\alpha\left(\delta s_W\right) - s_W\left(c_\alpha\left(\delta Z_{hH}\right) + s_\alpha\left(4\left(\delta Z_e\right) + \delta Z_{HH}\right)\right)\right) - 2\left(\begin{array}{l}\left(c_\alpha\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{HH}\right)s_W\right) + \left(\delta Z_{hH}\right)s_W s_\alpha\right)c_\beta^3 + \\ s_W\left(\left(\delta Z_{G^-H^-}\right)s_{\alpha+\beta} - c_{\alpha+\beta}\left(\delta Z_{G^-G^-} + \delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)\right)c_\beta^2\end{array}\right)$$

$$\underset{336}{C}\left(H^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}^\dagger_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{32c_W^4c_\beta^3M_W^4s_W^3}\left((2)c_W^4 - (1)c_\beta M_W^4\right)\right]$$

$$2 = 16s_{2\beta}s_\beta s_W m_{e_{g3}}M_W^2\delta m^{e_g}_{g3} - 4m^2_{e_{g3}}\left(\begin{array}{l} s_W M_W^2\left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)c_\beta s_{2\beta} + 8\left(\delta c_\beta\right)s_\beta^2\right) - \\ \left(\begin{array}{l}\left(\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-}\right)s_W - 4\left(\delta s_W\right)\right)M_W^2 - \\ s_W\left(2\delta M_W^2 - \left(\delta Z_{H^-H^-} + \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right)M_W^2\right)\end{array}\right)s_{2\beta}s_\beta\end{array}\right)$$

$$1 = \begin{array}{l} 4\left(\left(\delta\overline{Z}_{H^-H^-}\right)c_{2\beta}s_W\left(1 - 2c_W^2\right)c_W^2c_\beta^2 + \left(4c_\beta^4 - s_{2\beta}^2\right)\left(\left(\left(\delta Z_e\right)s_W - \delta s_W\right)\left(c_W^2 - 2c_W^4\right) + \left(\delta s_W\right)s_W^2\right)\right) + \\ s_W\left(1 - 2c_W^2\right)c_W^2\left(4\left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)s_{2\beta} + c_{2\beta}\left(\delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right)c_\beta^2 + \left(\delta Z_{H^-H^-}\right)\left(4c_\beta^4 - s_{2\beta}^2\right)\right)\end{array}$$

$$\underset{337}{C}\left(G^-, G^+, \tilde{\nu}_{g3}, \tilde{\nu}^\dagger_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{16c_\beta c_W^4M_W^4s_W^3}\left((1)c_W^2 + 4\left(s_{2\beta}s_\beta - 2c_\beta^3\right)M_W^4\left(\left(s_W\left(\delta Z_e\right) - \delta s_W\right)\left(c_W^2 - 2c_W^4\right) + \left(\delta s_W\right)s_W^2\right)\right)\right]$$

$$1 = \begin{array}{l} -4\left(\begin{array}{l} c_\beta\left(4\left(\left(\delta Z_e\right)s_W - \delta s_W\right)M_W^2 - 2s_W\delta M_W^2\right) - \\ \left(\begin{array}{l} 4\left(\delta c_\beta\right) + \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)s_\beta - \\ c_\beta\left(2\left(\delta Z_{G^-G^-}\right) + \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right)\end{array}\right)s_W M_W^2\end{array}\right)c_W^2m^2_{e_{g3}} - \\ s_W\left(16c_\beta m_{e_{g3}}\delta m^{e_g}_{g3}c_W^2M_W^2 + \left(\begin{array}{l} 2c_{2\beta}c_\beta\left(\delta Z_{G^-G^-} + \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right) + 2\left(\delta Z_{G^-G^-}\right)c_\beta^3 - \\ s_{2\beta}\left(2\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)c_\beta + \left(\delta Z_{G^-G^-}\right)s_\beta\right)\end{array}\right)\left(1 - 2c_W^2\right)M_W^4\right)\end{array}$$

$$\underset{338}{C}\left(H^-, G^+, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[-\frac{i e^2 (1) \delta_{g3,g4}}{8 c_W^4 c_\beta^2 M_W^4 s_W^3} \right]$$

$$1 = -c_W^4 m_{e_{g3}}^2 \left(s_{2\beta}\left(4\left(\left(\delta Z_e\right) s_W - \delta s_W\right) M_W^2 - 2 s_W \delta M_W^2\right) - s_W\left(2\left(\delta Z_{G^-H^-}\right) + 8\left(\delta c_\beta\right) s_\beta - s_{2\beta}\left(\delta Z_{G^-G^-} + \delta Z_{H^-H^-} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right) M_W^2\right) - s_{2\beta}\left(4 m_{e_{g3}} s_W \delta m_{g3}^{e_g} c_W^4 M_W^2 + \left(\begin{array}{l} 4\left(\left(\left(\delta Z_e\right) s_W - \delta s_W\right)\left(c_W^2 - 2c_W^4\right) + \left(\delta s_W\right) s_W^2\right) + \\ s_W\left(\delta Z_{G^-G^-} + \delta Z_{H^-H^-} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\left(1 - 2c_W^2\right) c_W^2 \end{array}\right) c_\beta^2 M_W^4\right)$$

$$\underset{339}{C}\left(G^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\frac{i e^2 \delta_{g3,g4}}{8 c_W^4 c_\beta^2 M_W^4 s_W^3} \left((1) s_{2\beta} - \left(\begin{array}{l} s_{2\beta}\left(4\left(\delta s_W\right) M_W^2 + 2 s_W \delta M_W^2\right) + \\ \left(\begin{array}{l} 8 s_\beta\left(\delta c_\beta\right) + 2\left(\delta Z_{H^-G^-}\right) - \\ s_{2\beta}\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{G^-G^-} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right) \end{array}\right) s_W M_W^2 \end{array}\right) c_W^4 m_{e_{g3}}^2 \right) \right]$$

$$1 = 4 s_W m_{e_{g3}} M_W^2 c_W^4 \delta m_{g3}^{e_g} - c_\beta^2 M_W^4 \left(\begin{array}{l} \left(2\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-}\right) s_W - 8\left(\delta s_W\right)\right) c_W^4 - 4\left(\delta s_W\right) s_W^2 + \\ \left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \left(\delta Z_{G^-G^-} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\left(1 - 2c_W^2\right)\right)\right) c_W^2 \end{array}\right)$$

$$\underset{340}{C}\left(H^-, H^+, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{8 c_W^4 c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} (3) c_\beta M_W^2 + \\ 2\left(\begin{array}{l} (1) U_{s4,2}^{\tilde{e}_{g3}} - \\ c_\beta s_W c_W^2 M_W^2\left(c_{2\beta} c_\beta^2 M_W^2 s_W^2 + c_W^2 m_{e_{g3}}^2 s_\beta^2\right)\left(U_{1,2}^{\tilde{e}_{g3}} \delta\overline{Z}_{1,s4}^{\tilde{e}_{g4}} + U_{2,2}^{\tilde{e}_{g3}} \delta\overline{Z}_{2,s4}^{\tilde{e}_{g4}}\right) \end{array}\right) U_{s3,2}^{\tilde{e}_{g3}*} \end{array}\right) \right]$$

$$3 = \left(\begin{array}{l} c_{2\beta} s_W c_W^2 c_\beta^2\left(\delta\overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,1}^{\tilde{e}_{g3}} + \delta\overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,1}^{\tilde{e}_{g3}}\right) - \\ \left((2) s_W c_\beta^2 - \left(\delta s_W\right)\left(4 c_\beta^8 s_W^2 - 4 c_W^2 c_\beta^2\left(-2 c_W^2 s_\beta^2 + 2 c_{2\beta} s_W^2 s_\beta^4 + 1\right)\right)\right) U_{s4,1}^{\tilde{e}_{g3}} \end{array}\right) M_W^2 U_{s3,1}^{\tilde{e}_{g3}*} + \left(\begin{array}{l} c_{2\beta} c_\beta^2 M_W^2\left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g3}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g3}*}\right) U_{s4,1}^{\tilde{e}_{g3}} - \\ 2\left(c_{2\beta} c_\beta^2 M_W^2 s_W^2 + c_W^2 m_{e_{g3}}^2 s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g3}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g3}*}\right) U_{s4,2}^{\tilde{e}_{g3}} \end{array}\right) s_W c_W^2$$

$$2 = \left(\begin{array}{l} 4\left(\delta s_W\right) s_W s_\beta^6 - c_{2\beta}\left(\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{H^-H^-}\right) c_W^2 + \left(\delta s_W\right) s_W s_{2\beta}^2\right) - \\ \left(\begin{array}{l} 8\left(\delta c_\beta\right) c_\beta + \left(\delta s_\beta\right)\left(8 s_\beta - 16 s_\beta^3\right) - \\ s_{2\beta}\left(-\left(\delta Z_{G^-H^-}\right) - \delta Z_{H^-G^-} + 8\left(\delta c_\beta\right) s_\beta - 2\left(\delta s_W\right) s_{2\beta} s_W\left(2 s_\beta^2 + 1\right)\right) \end{array}\right) c_W^2 \end{array}\right)$$

$$\boxed{1} = -\left(\begin{array}{l} 4 m_{e_{g3}} \delta m_{g3}^{e_g} c_W^4 s_\beta^2 + \\ \left(\begin{array}{l} \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) s_{2\beta} c_W^2 + \\ c_{2\beta} \left(4 \left(\delta s_W\right) s_W + \left(4 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{H^- H^-} \right) c_W^2 \right) \end{array} \right) c_\beta^2 M_W^2 s_W^2 \end{array} \right) c_\beta s_W M_W^2 + \left(\begin{array}{l} \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) s_W c_\beta^2 M_W^2 + \\ s_\beta \left(4 \left(\delta c_\beta\right) s_W M_W^2 + c_\beta \left(2 s_W \delta M_W^2 + \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{H^- H^-} \right) s_W \right) M_W^2 \right) \right) \end{array} \right) s_\beta c_W^4 m_{e_{g3}}^2$$

$$\underset{341}{C}\left(G^-, G^+, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{8 c_\beta c_W^4 M_W^4 s_W^3} \left(\begin{array}{l} (\boxed{3}) M_W^2 - \\ 2 \left(\begin{array}{l} (\boxed{1}) U_{s4,2}^{\tilde{e}_{g3}} - \\ c_\beta s_W c_W^2 M_W^2 \left(c_W^2 m_{e_{g3}}^2 - c_{2\beta} M_W^2 s_W^2 \right) \left(U_{1,2}^{\tilde{e}_{g3}} \delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} + U_{2,2}^{\tilde{e}_{g3}} \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} \right) \end{array} \right) U_{s3,2}^{\tilde{e}_{g3}*} \end{array} \right) \right]$$

$$\boxed{3} = \begin{array}{l} M_W^2 U_{s3,1}^{\tilde{e}_{g3}*} \left(c_{2\beta} c_\beta s_W c_W^2 \left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,1}^{\tilde{e}_{g3}} + \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,1}^{\tilde{e}_{g3}} \right) + (\boxed{2}) U_{s4,1}^{\tilde{e}_{g3}} \right) + \\ \left(\begin{array}{l} c_{2\beta} M_W^2 \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g3}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g3}*} \right) U_{s4,1}^{\tilde{e}_{g3}} + \\ 2 \left(c_W^2 m_{e_{g3}}^2 - c_{2\beta} M_W^2 s_W^2 \right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g3}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g3}*} \right) U_{s4,2}^{\tilde{e}_{g3}} \end{array} \right) c_\beta s_W c_W^2 \end{array}$$

$$\boxed{2} = \begin{array}{l} 4 \left(\delta c_\beta\right) c_{2\beta} s_W c_W^2 c_\beta^2 + 2 s_{2\beta} \left(\left(\left(\delta s_\beta\right) c_{2\beta} s_W + 2 \left(\delta s_W\right) s_\beta \right) c_W^2 - 2 \left(\delta s_W\right) s_\beta s_W^2 \right) - \\ c_\beta \left(\left(4 \left(\delta s_W\right) - \left(2 \left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-} \right) c_{2\beta} - \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-} \right) s_{2\beta} \right) s_W \right) c_W^2 - 4 \left(\delta s_W\right) s_W^2 \right) \end{array}$$

$$\boxed{1} = \begin{array}{l} -c_\beta \left(4 m_{e_{g3}} s_W \delta m_{g3}^{e_g} c_W^4 M_W^2 + \left(\left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-} \right) s_{2\beta} c_W^2 - 2 c_{2\beta} \left(2 \left(\delta s_W\right) s_W + \left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-} \right) c_W^2 \right) \right) M_W^4 s_W^3 \right) + \\ c_W^4 m_{e_{g3}}^2 \left(s_W \left(4 \left(\delta c_\beta\right) + \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-} \right) s_\beta \right) M_W^2 + c_\beta \left(4 \left(\delta s_W\right) M_W^2 - 2 s_W \left(\left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-} \right) M_W^2 - \delta M_W^2 \right) \right) \right) \end{array}$$

$$\underset{342}{C}\left(H^-, G^+, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{8 c_W^4 c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} 2(\boxed{3}) + \\ c_\beta^3 M_W^4 U_{s3,1}^{\tilde{e}_{g3}*} \left(\frac{1}{2} (\boxed{1}) U_{s4,1}^{\tilde{e}_{g3}} + 2 s_W s_\beta c_W^2 \left(U_{1,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} + U_{2,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} \right) \right) \end{array} \right) \right]$$

$$\boxed{3} = \begin{array}{l} -U_{s3,2}^{\tilde{e}_{g3}*} \left((\boxed{2}) U_{s4,2}^{\tilde{e}_{g3}} - \left(\frac{1}{2} s_{2\beta} s_W c_W^2 M_W^2 \right) \left(c_W^2 m_{e_{g3}}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) \left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,2}^{\tilde{e}_{g3}} + \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,2}^{\tilde{e}_{g3}} \right) \right) + \\ \left(\frac{1}{2} s_{2\beta} s_W c_W^2 M_W^2 \right) \left(\begin{array}{l} c_\beta^2 M_W^2 \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g3}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g3}*} \right) U_{s4,1}^{\tilde{e}_{g3}} + \\ \left(c_W^2 m_{e_{g3}}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g3}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g3}*} \right) U_{s4,2}^{\tilde{e}_{g3}} \end{array} \right) \end{array}$$

$$\boxed{2} = \begin{array}{l} \left(\frac{1}{2} s_{2\beta} s_W M_W^2 \right) \left(2 \left(4 \left(\delta s_W\right) s_W + \left(4 \left(\delta Z_e\right) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-} \right) c_W^2 \right) c_\beta^2 M_W^2 s_W^2 - 4 m_{e_{g3}} \delta m_{g3}^{e_g} c_W^4 \right) + \\ c_W^4 m_{e_{g3}}^2 \left(s_W \left(\delta Z_{G^- H^-} + 4 \left(\delta c_\beta\right) s_\beta \right) M_W^2 + \frac{s_{2\beta}}{2} \left(2 s_W \delta M_W^2 + \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-} \right) s_W \right) M_W^2 \right) \right) \end{array}$$

$$\boxed{1} = s_W c_W^2 \left(\begin{array}{l} 4\left(\delta c_\beta\right) s_{2\beta}\left(s_\beta^2+3\right)+\left(\delta s_\beta\right)\left(5 s_{2\beta}^2+4 s_\beta^2-4\left(5-12 s_W^2\right) s_\beta^4\right)+ \\ 4\left(4\left(\delta Z_e\right)+\delta Z_{G^- G^-}+\delta Z_{H^- H^-}-4\left(\delta s_W\right) s_W\right) s_\beta \end{array} \right) + s_\beta \left(16 s_W^2\left(\delta s_W\right)-16 c_W^4\left(\delta s_W-3 s_W s_\beta^3\left(\delta s_\beta\right)\right)\right)$$

$$\underset{343}{C}\left(G^-, H^+, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{8 c_W^4 c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} 2(\boxed{3})+ \\ c_\beta^3 M_W^4 U_{s3,1}^{\tilde{e}_{g3}*}\left(\frac{1}{2}(\boxed{1}) U_{s4,1}^{\tilde{e}_{g3}}+2 s_W s_\beta c_W^2\left(U_{1,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}}+U_{2,1}^{\tilde{e}_{g3}} \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}}\right)\right) \end{array} \right) \right]$$

$$\boxed{3} = \begin{array}{l} -U_{s3,2}^{\tilde{e}_{g3}*}\left((\boxed{2}) U_{s4,2}^{\tilde{e}_{g3}}-\left(\frac{1}{2} s_{2\beta} s_W c_W^2 M_W^2\right)\left(c_W^2 m_{e_{g3}}^2-2 c_\beta^2 M_W^2 s_W^2\right)\left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,2}^{\tilde{e}_{g3}}+\delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,2}^{\tilde{e}_{g3}}\right)\right)+ \\ \left(\frac{1}{2} s_{2\beta} s_W c_W^2 M_W^2\right)\left(\begin{array}{l} c_\beta^2 M_W^2\left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g3}*}+\delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g3}*}\right) U_{s4,1}^{\tilde{e}_{g3}}+ \\ \left(c_W^2 m_{e_{g3}}^2-2 c_\beta^2 M_W^2 s_W^2\right)\left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g3}*}+\delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g3}*}\right) U_{s4,2}^{\tilde{e}_{g3}} \end{array} \right) \end{array}$$

$$\boxed{2} = \begin{array}{l} \left(\frac{1}{2} s_{2\beta} s_W M_W^2\right)\left(2\left(4\left(\delta s_W\right) s_W+\left(4\left(\delta Z_e\right)+\delta \overline{Z}_{H^- H^-}+\delta Z_{G^- G^-}\right) c_W^2\right) c_\beta^2 M_W^2 s_W^2-4 m_{e_{g3}} \delta m_{g3}^{e_g} c_W^4\right)+ \\ c_W^4 m_{e_{g3}}^2\left(s_W\left(\delta Z_{H^- G^-}+4\left(\delta c_\beta\right) s_\beta\right) M_W^2+\frac{s_{2\beta}}{2}\left(2 s_W \delta M_W^2+\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta \overline{Z}_{H^- H^-}+\delta Z_{G^- G^-}\right) s_W\right) M_W^2\right)\right) \end{array}$$

$$\boxed{1} = s_W c_W^2 \left(\begin{array}{l} 4\left(\delta c_\beta\right) s_{2\beta}\left(s_\beta^2+3\right)+\left(\delta s_\beta\right)\left(5 s_{2\beta}^2+4 s_\beta^2-4\left(5-12 s_W^2\right) s_\beta^4\right)+ \\ 4\left(4\left(\delta Z_e\right)+\delta \overline{Z}_{H^- H^-}+\delta Z_{G^- G^-}-4\left(\delta s_W\right) s_W\right) s_\beta \end{array} \right) + s_\beta \left(16 s_W^2\left(\delta s_W\right)-16 c_W^4\left(\delta s_W-3 s_W s_\beta^3\left(\delta s_\beta\right)\right)\right)$$

[SSSS] 2 Higgs – 2 Squarks

$$\underset{282}{C}\left(h^0, h^0, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{i e^2 (\boxed{4}) \delta_{g3,g4}}{24 c_W^4 M_W^4 s_W^3 s_\beta^3} \right]$$

$$\boxed{4} = \begin{array}{l} (\boxed{3}) s_W s_\beta c_W^2 M_W^2+U_{s3,1}^{\tilde{u}_{g4}*}\left(s_W s_\beta c_W^2 M_W^2\left(6 c_W^2 c_\alpha^2 m_{u_{g4}}^2+c_{2\alpha}\left(1-4 c_W^2\right) M_W^2 s_\beta^2\right)\left(\delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,1}^{\tilde{u}_{g4}}+\delta \overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,1}^{\tilde{u}_{g4}}\right)+2(\boxed{2}) U_{s4,1}^{\tilde{u}_{g4}}\right)- \\ 2 U_{s3,2}^{\tilde{u}_{g4}*}\left((\boxed{1}) U_{s4,2}^{\tilde{u}_{g4}}-s_W s_\beta c_W^2 M_W^2\left(3 c_W^2 c_\alpha^2 m_{u_{g4}}^2-2 c_{2\alpha} M_W^2 s_W^2 s_\beta^2\right)\left(\delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,2}^{\tilde{u}_{g4}}+\delta \overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,2}^{\tilde{u}_{g4}}\right)\right) \end{array}$$

$$\boxed{3} = \begin{array}{l} \left(6 c_W^2 c_\alpha^2 m_{u_{g4}}^2+c_{2\alpha}\left(1-4 c_W^2\right) M_W^2 s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,1}^{\tilde{u}_{g4}*}+\delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,1}^{\tilde{u}_{g4}*}\right) U_{s4,1}^{\tilde{u}_{g4}}+ \\ 2\left(3 c_W^2 c_\alpha^2 m_{u_{g4}}^2-2 c_{2\alpha} M_W^2 s_W^2 s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,2}^{\tilde{u}_{g4}*}+\delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,2}^{\tilde{u}_{g4}*}\right) U_{s4,2}^{\tilde{u}_{g4}} \end{array}$$

$$2 = \left(\begin{array}{l} (\delta Z_{hH})\, s_{2\alpha} s_W \left(1 - 4c_W^2\right) c_W^2 + \\ \left(\begin{array}{l} 2\,(\delta s_W) \left(1 - 4c_W^2\right) s_W^2 + \\ \left(6\,(\delta s_W) + (2\,(\delta Z_e) + \delta Z_{hh})\, s_W \left(1 - 4c_W^2\right)\right) c_W^2 \end{array} \right) c_{2\alpha} \end{array} \right) M_W^4 s_\beta^3 +$$
$$3 m_{u_{g4}} c_W^4 \left(4 s_W s_\beta \delta m_{g4}^{u_g} c_\alpha^2 M_W^2 - \left(\begin{array}{l} 2c_\alpha^2 \left(2\,(\delta s_\beta)\, s_W M_W^2 + s_\beta \left(2\,(\delta s_W)\, M_W^2 - s_W \left((2\,(\delta Z_e) + \delta Z_{hh})\, M_W^2 - \delta M_W^2\right)\right)\right) - \\ (\delta Z_{hH})\, s_{2\alpha} s_W s_\beta M_W^2 \end{array} \right) m_{u_{g4}} \right)$$

$$1 = 4\left((\delta Z_{hH})\, s_{2\alpha} c_W^2 + c_{2\alpha}\left(2\,(\delta s_W)\, s_W + (2\,(\delta Z_e) + \delta Z_{hh})\, c_W^2\right)\right) M_W^4 s_W^3 s_\beta^3 -$$
$$3 m_{u_{g4}} c_W^4 \left(4 s_W s_\beta \delta m_{g4}^{u_g} c_\alpha^2 M_W^2 - \left(\begin{array}{l} 2c_\alpha^2 \left(2\,(\delta s_\beta)\, s_W M_W^2 + s_\beta \left(2\,(\delta s_W)\, M_W^2 - s_W \left((2\,(\delta Z_e) + \delta Z_{hh})\, M_W^2 - \delta M_W^2\right)\right)\right) - \\ (\delta Z_{hH})\, s_{2\alpha} s_W s_\beta M_W^2 \end{array} \right) m_{u_{g4}} \right)$$

$$C_{283}\left(h^0, h^0, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{i e^2 (4) \delta_{g3,g4}}{24 c_W^4 c_\beta^3 M_W^4 s_W^3} \right]$$

$$4 = (3) c_\beta s_W c_W^2 M_W^2 + U_{s3,1}^{\tilde{d}_{g4}*} \left(c_\beta s_W c_W^2 M_W^2 \left(c_{2\alpha}\left(2c_W^2 + 1\right) c_\beta^2 M_W^2 + 6 c_W^2 m_{d_{g4}}^2 s_\alpha^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,1}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,1}^{\tilde{d}_{g4}}\right) + 2(2) U_{s4,1}^{\tilde{d}_{g4}} \right) +$$
$$2 U_{s3,2}^{\tilde{d}_{g4}*} \left(c_\beta s_W c_W^2 M_W^2 \left(c_{2\alpha} c_\beta^2 M_W^2 s_W^2 + 3 c_W^2 m_{d_{g4}}^2 s_\alpha^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,2}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,2}^{\tilde{d}_{g4}}\right) + (1) U_{s4,2}^{\tilde{d}_{g4}} \right)$$

$$3 = \left(c_{2\alpha}\left(2c_W^2 + 1\right) c_\beta^2 M_W^2 + 6 c_W^2 m_{d_{g4}}^2 s_\alpha^2\right) \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,1}^{\tilde{d}_{g4}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,1}^{\tilde{d}_{g4}*}\right) U_{s4,1}^{\tilde{d}_{g4}} +$$
$$2 \left(c_{2\alpha} c_\beta^2 M_W^2 s_W^2 + 3 c_W^2 m_{d_{g4}}^2 s_\alpha^2\right) \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,2}^{\tilde{d}_{g4}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,2}^{\tilde{d}_{g4}*}\right) U_{s4,2}^{\tilde{d}_{g4}}$$

$$2 = \left(\begin{array}{l} (\delta Z_{hH})\, s_{2\alpha} s_W c_W^2 \left(2c_W^2 + 1\right) + \\ \left(\begin{array}{l} 2\,(\delta s_W) \left(2c_W^2 + 1\right) s_W^2 - \\ c_W^2 \left(6\,(\delta s_W) - (2\,(\delta Z_e) + \delta Z_{hh})\, s_W \left(2c_W^2 + 1\right)\right) \end{array} \right) c_{2\alpha} \end{array} \right) c_\beta^3 M_W^4 +$$
$$3 m_{d_{g4}} c_W^4 \left(4 c_\beta s_W \delta m_{g4}^{d_g} M_W^2 s_\alpha^2 - m_{d_{g4}} \left(\left(\begin{array}{l} 4\,(\delta s_W)\, M_W^2 s_\alpha^2 + \\ s_W \left((\delta Z_{hH})\, s_{2\alpha} M_W^2 - 2\left((2\,(\delta Z_e) + \delta Z_{hh})\, M_W^2 - \delta M_W^2\right) s_\alpha^2\right) \end{array} \right) c_\beta + 4\,(\delta c_\beta)\, s_W M_W^2 s_\alpha^2 \right) \right)$$

$$1 = 2\left((\delta Z_{hH})\, s_{2\alpha} c_W^2 + c_{2\alpha}\left(2\,(\delta s_W)\, s_W + (2\,(\delta Z_e) + \delta Z_{hh})\, c_W^2\right)\right) c_\beta^3 M_W^4 s_W^3 +$$
$$3 m_{d_{g4}} c_W^4 \left(4 c_\beta s_W \delta m_{g4}^{d_g} M_W^2 s_\alpha^2 - m_{d_{g4}} \left(\left(\begin{array}{l} 4\,(\delta s_W)\, M_W^2 s_\alpha^2 + \\ s_W \left((\delta Z_{hH})\, s_{2\alpha} M_W^2 - 2\left((2\,(\delta Z_e) + \delta Z_{hh})\, M_W^2 - \delta M_W^2\right) s_\alpha^2\right) \end{array} \right) c_\beta + 4\,(\delta c_\beta)\, s_W M_W^2 s_\alpha^2 \right) \right)$$

$$\underset{286}{C}\left(H^0, H^0, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\frac{ie^2(4)\delta_{g3,g4}}{24c_W^4 M_W^4 s_W^3 s_\beta^3}\right]$$

$$\begin{aligned}
4 = {} & (3)s_W s_\beta c_W^2 M_W^2 - U_{s3,1}^{\tilde{u}_{g4}*}\left(s_W s_\beta c_W^2 M_W^2\left(6c_W^2 m_{u_{g4}}^2 s_\alpha^2 - c_{2\alpha}\left(1-4c_W^2\right)M_W^2 s_\beta^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,1}^{\tilde{u}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,1}^{\tilde{u}_{g4}}\right) + 2(1)U_{s4,1}^{\tilde{u}_{g4}}\right) + \\
& 2U_{s3,2}^{\tilde{u}_{g4}*}\left((2)U_{s4,2}^{\tilde{u}_{g4}} - s_W s_\beta c_W^2 M_W^2\left(3c_W^2 m_{u_{g4}}^2 s_\alpha^2 + 2c_{2\alpha}M_W^2 s_W^2 s_\beta^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,2}^{\tilde{u}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,2}^{\tilde{u}_{g4}}\right)\right)
\end{aligned}$$

$$\begin{aligned}
3 = {} & -\left(6c_W^2 m_{u_{g4}}^2 s_\alpha^2 - c_{2\alpha}\left(1-4c_W^2\right)M_W^2 s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}}U_{1,1}^{\tilde{u}_{g4}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}}U_{2,1}^{\tilde{u}_{g4}*}\right)U_{s4,1}^{\tilde{u}_{g4}} - \\
& 2\left(3c_W^2 m_{u_{g4}}^2 s_\alpha^2 + 2c_{2\alpha}M_W^2 s_W^2 s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}}U_{1,2}^{\tilde{u}_{g4}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}}U_{2,2}^{\tilde{u}_{g4}*}\right)U_{s4,2}^{\tilde{u}_{g4}}
\end{aligned}$$

$$\begin{aligned}
2 = {} & 4\left(\left(\delta Z_{hH}\right)s_{2\alpha}c_W^2 - c_{2\alpha}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta Z_{HH}\right)c_W^2\right)\right)M_W^4 s_W^3 s_\beta^3 - \\
& 3m_{u_{g4}}c_W^4\left(4s_W s_\beta \delta m_{g4}^{u_g} M_W^2 s_\alpha^2 - \left(\begin{array}{l} 4\left(\delta s_\beta\right)s_W M_W^2 s_\alpha^2 + \\ \left(\begin{array}{l} 4\left(\delta s_W\right)M_W^2 s_\alpha^2 - \\ s_W\left(M_W^2\left(\left(\delta Z_{hH}\right)s_{2\alpha} + \left(4\left(\delta Z_e\right) + 2\left(\delta Z_{HH}\right)\right)s_\alpha^2\right) - 2\delta M_W^2 s_\alpha^2\right) \end{array}\right)s_\beta \end{array}\right)m_{u_{g4}}\right)
\end{aligned}$$

$$\begin{aligned}
1 = {} & M_W^4\left(\left(\delta Z_{hH}\right)s_{2\alpha}s_W\left(1-4c_W^2\right)c_W^2 - c_{2\alpha}\left(\left(6\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{HH}\right)s_W\left(1-4c_W^2\right)\right)c_W^2 + 2\left(\delta s_W\right)\left(1-4c_W^2\right)s_W^2\right)\right)s_\beta^3 + \\
& 3m_{u_{g4}}c_W^4\left(4s_W s_\beta \delta m_{g4}^{u_g} M_W^2 s_\alpha^2 - \left(\begin{array}{l} 4\left(\left(\delta s_\beta\right)s_W + \left(\delta s_W\right)s_\beta\right)M_W^2 s_\alpha^2 - \\ s_W s_\beta\left(M_W^2\left(\left(\delta Z_{hH}\right)s_{2\alpha} + \left(4\left(\delta Z_e\right) + 2\left(\delta Z_{HH}\right)\right)s_\alpha^2\right) - 2\delta M_W^2 s_\alpha^2\right) \end{array}\right)m_{u_{g4}}\right)
\end{aligned}$$

$$\underset{287}{C}\left(H^0, H^0, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[\frac{ie^2(4)\delta_{g3,g4}}{24c_W^4 c_\beta^3 M_W^4 s_W^3}\right]$$

$$\begin{aligned}
4 = {} & (3)c_\beta s_W c_W^2 M_W^2 - U_{s3,1}^{\tilde{d}_{g4}*}\left(c_\beta s_W c_W^2 M_W^2\left(6c_W^2 c_\alpha^2 m_{d_{g4}}^2 - c_{2\alpha}\left(2c_W^2+1\right)c_\beta^2 M_W^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{d}_{g4}}U_{1,1}^{\tilde{d}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{d}_{g4}}U_{2,1}^{\tilde{d}_{g4}}\right) + 2(2)U_{s4,1}^{\tilde{d}_{g4}}\right) - \\
& 2U_{s3,2}^{\tilde{d}_{g4}*}\left(c_\beta s_W c_W^2 M_W^2\left(3c_W^2 c_\alpha^2 m_{d_{g4}}^2 - c_{2\alpha}c_\beta^2 M_W^2 s_W^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{d}_{g4}}U_{1,2}^{\tilde{d}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{d}_{g4}}U_{2,2}^{\tilde{d}_{g4}}\right) + (1)U_{s4,2}^{\tilde{d}_{g4}}\right)
\end{aligned}$$

$$\begin{aligned}
3 = {} & -\left(6c_W^2 c_\alpha^2 m_{d_{g4}}^2 - c_{2\alpha}\left(2c_W^2+1\right)c_\beta^2 M_W^2\right)\left(\delta Z_{1,s3}^{\tilde{d}_{g3}}U_{1,1}^{\tilde{d}_{g4}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}}U_{2,1}^{\tilde{d}_{g4}*}\right)U_{s4,1}^{\tilde{d}_{g4}} - \\
& 2\left(3c_W^2 c_\alpha^2 m_{d_{g4}}^2 - c_{2\alpha}c_\beta^2 M_W^2 s_W^2\right)\left(\delta Z_{1,s3}^{\tilde{d}_{g3}}U_{1,2}^{\tilde{d}_{g4}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}}U_{2,2}^{\tilde{d}_{g4}*}\right)U_{s4,2}^{\tilde{d}_{g4}}
\end{aligned}$$

$$
\begin{aligned}
2 &= \left(\begin{array}{l} (\delta Z_{hH})\, s_{2\alpha} s_W c_W^2 \left(2c_W^2+1\right) - \\ \left(\begin{array}{l} 2\,(\delta s_W)\left(2c_W^2+1\right) s_W^2 - \\ c_W^2\left(6\,(\delta s_W) - (2\,(\delta Z_e)+\delta Z_{HH})\, s_W \left(2c_W^2+1\right)\right) \end{array} \right) c_{2\alpha} \end{array} \right) c_\beta^3 M_W^4 + \\
&\quad 3 m_{d_{g4}} c_W^4 \left(4 c_\beta s_W \delta m_{g4}^{d_g} c_\alpha^2 M_W^2 - \left(\begin{array}{l} (\delta Z_{hH})\, c_\beta s_{2\alpha} s_W M_W^2 + \\ 2 c_\alpha^2 \left(2\,(\delta c_\beta)\, s_W M_W^2 + c_\beta \left(2\,(\delta s_W)\, M_W^2 - s_W \left((2\,(\delta Z_e)+\delta Z_{HH})\, M_W^2 - \delta M_W^2 \right) \right) \right) \end{array} \right) m_{d_{g4}} \right)
\end{aligned}
$$

$$
\begin{aligned}
1 &= 2\left((\delta Z_{hH})\, s_{2\alpha} c_W^2 - c_{2\alpha} \left(2\,(\delta s_W)\, s_W + (2\,(\delta Z_e)+\delta Z_{HH})\, c_W^2 \right) \right) c_\beta^3 M_W^4 s_W^3 + \\
&\quad 3 m_{d_{g4}} c_W^4 \left(4 c_\beta s_W \delta m_{g4}^{d_g} c_\alpha^2 M_W^2 - \left(\begin{array}{l} (\delta Z_{hH})\, c_\beta s_{2\alpha} s_W M_W^2 + \\ 2 c_\alpha^2 \left(2\,(\delta c_\beta)\, s_W M_W^2 + c_\beta \left(2\,(\delta s_W)\, M_W^2 - s_W \left((2\,(\delta Z_e)+\delta Z_{HH})\, M_W^2 - \delta M_W^2 \right) \right) \right) \end{array} \right) m_{d_{g4}} \right)
\end{aligned}
$$

$$
\underset{294}{C}\left(A^0, A^0, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{24 c_W^4 M_W^4 s_W^3 s_\beta^3} \left(\begin{array}{l} (4) s_W s_\beta c_W^2 M_W^2 + (2) U_{s3,1}^{\tilde{u}_{g4}*} + \\ 2 \left(\begin{array}{l} 2(3) U_{s4,2}^{\tilde{u}_{g4}} + \\ s_W s_\beta c_W^2 M_W^2 \left(3 c_W^2 c_\beta^2 m_{u_{g4}}^2 - 2 c_{2\beta} M_W^2 s_W^2 s_\beta^2 \right) \left(U_{1,2}^{\tilde{u}_{g4}} \delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}} + U_{2,2}^{\tilde{u}_{g4}} \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}} \right) \end{array} \right) U_{s3,2}^{\tilde{u}_{g4}*} \end{array} \right) \right]
$$

$$
\begin{aligned}
4 &= \left(6 c_W^2 c_\beta^2 m_{u_{g4}}^2 + c_{2\beta} \left(1 - 4 c_W^2\right) M_W^2 s_\beta^2 \right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,1}^{\tilde{u}_{g4}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,1}^{\tilde{u}_{g4}*} \right) U_{s4,1}^{\tilde{u}_{g4}} + \\
&\quad 2 \left(3 c_W^2 c_\beta^2 m_{u_{g4}}^2 - 2 c_{2\beta} M_W^2 s_W^2 s_\beta^2 \right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,2}^{\tilde{u}_{g4}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,2}^{\tilde{u}_{g4}*} \right) U_{s4,2}^{\tilde{u}_{g4}}
\end{aligned}
$$

$$
\begin{aligned}
3 &= -2 \left(\begin{array}{l} \left(2\,(\delta s_W)\, s_W + (2\,(\delta Z_e)+\delta Z_{AA})\, c_W^2 \right) c_\beta^2 - 2\,(\delta s_W)\, s_W s_\beta^2 + \\ c_W^2 \left((\delta Z_{AG})\, s_{2\beta} - (2\,(\delta Z_e)+\delta Z_{AA})\, s_\beta^2 \right) \end{array} \right) M_W^4 s_W^3 s_\beta^3 + \\
&\quad 3 c_\beta m_{u_{g4}} c_W^4 \left(s_{2\beta} s_W \delta m_{g4}^{u_g} M_W^2 - \left(\frac{1}{2} m_{u_{g4}} \right) \left(\begin{array}{l} 2\,(\delta s_W)\, s_{2\beta} M_W^2 + \\ s_W \left(s_{2\beta} \delta M_W^2 + M_W^2 \left(4\,(\delta s_\beta)\, c_\beta - (2\,(\delta Z_e)+\delta Z_{AA})\, s_{2\beta} - 2\,(\delta Z_{AG})\, s_\beta^2 \right) \right) \end{array} \right) \right)
\end{aligned}
$$

$$
\begin{aligned}
2 &= s_W s_\beta c_W^2 M_W^2 \left(6 c_W^2 c_\beta^2 m_{u_{g4}}^2 + c_{2\beta} \left(1 - 4 c_W^2\right) M_W^2 s_\beta^2 \right) \left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,1}^{\tilde{u}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,1}^{\tilde{u}_{g4}} \right) - \\
&\quad 2 \left(\begin{array}{l} (1) M_W^4 s_\beta^3 - 6 c_\beta m_{u_{g4}} c_W^4 \left(\left(\begin{array}{l} (\delta Z_{AG})\, s_W M_W^2 s_\beta^2 - \\ \left(\begin{array}{l} 2\,(\delta s_\beta)\, s_W M_W^2 + \\ s_\beta \left(2\,(\delta s_W)\, M_W^2 - s_W \left((2\,(\delta Z_e)+\delta Z_{AA})\, M_W^2 - \delta M_W^2 \right) \right) \end{array} \right) c_\beta \end{array} \right) m_{u_{g4}} + s_{2\beta} s_W \delta m_{g4}^{u_g} M_W^2 \right) \end{array} \right) U_{s4,1}^{\tilde{u}_{g4}}
\end{aligned}
$$

$$
\begin{aligned}
1 &= -(\delta Z_{AG})\, s_{2\beta} s_W \left(1 - 4 c_W^2\right) c_W^2 - c_\beta^2 \left(\left(6\,(\delta s_W) + (2\,(\delta Z_e)+\delta Z_{AA})\, s_W \left(1 - 4 c_W^2\right) \right) c_W^2 - (\delta s_W) \left(6 s_W^2 - 8 s_W^4 \right) \right) + \\
&\quad \left(\left(6\,(\delta s_W) + (2\,(\delta Z_e)+\delta Z_{AA})\, s_W \left(1 - 4 c_W^2\right) \right) c_W^2 + 2\,(\delta s_W) \left(1 - 4 c_W^2\right) s_W^2 \right) s_\beta^2
\end{aligned}
$$

$$\underset{295}{C}\left(G^0, G^0, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} \frac{ie^2\delta_{g3,g4}}{24 s_\beta c_W^4 M_W^4 s_W^3}\left(\begin{array}{l} (4) s_W s_\beta c_W^2 M_W^2 + (3) U^{\tilde{u}_{g4}*}_{s3,1} + \\ 2\left(\begin{array}{l} 2(1) U^{\tilde{u}_{g4}}_{s4,2} - \\ s_W s_\beta c_W^2 M_W^2 \left(3 c_W^2 m^2_{u_{g4}} + 2 c_{2\beta} M_W^2 s_W^2\right)\left(U^{\tilde{u}_{g4}}_{1,2}\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} + U^{\tilde{u}_{g4}}_{2,2}\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4}\right) \end{array}\right) U^{\tilde{u}_{g4}*}_{s3,2} \end{array}\right) \end{array}\right]$$

$$(4) = \begin{array}{l} -\left(6 c_W^2 m^2_{u_{g4}} - c_{2\beta}\left(1 - 4c_W^2\right) M_W^2\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g4}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g4}*}_{2,1}\right) U^{\tilde{u}_{g4}}_{s4,1} - \\ 2\left(3 c_W^2 m^2_{u_{g4}} + 2 c_{2\beta} M_W^2 s_W^2\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g4}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g4}*}_{2,2}\right) U^{\tilde{u}_{g4}}_{s4,2} \end{array}$$

$$(3) = \begin{array}{l} -s_W s_\beta c_W^2 M_W^2 \left(6 c_W^2 m^2_{u_{g4}} - c_{2\beta}\left(1 - 4c_W^2\right) M_W^2\right)\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,1}\right) - \\ 2\left(\begin{array}{l} s_\beta\left(12 m_{u_{g4}} s_W \delta m^{u_g}_{g4} c_W^4 M_W^2 + (2) M_W^4\right) - \\ 6 c_W^4 m^2_{u_{g4}}\left(2\left(\delta s_W\right) s_\beta M_W^2 + s_W\left(s_\beta \delta M_W^2 + \left(2\left(\delta s_\beta\right) - \left(\delta Z_{AG}\right) c_\beta - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_\beta\right) M_W^2\right)\right) \end{array}\right) U^{\tilde{u}_{g4}}_{s4,1} \end{array}$$

$$(2) = \begin{array}{l} \left(\delta Z_{AG}\right) s_{2\beta} s_W \left(1 - 4c_W^2\right) c_W^2 + \left(\left(6\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_W\left(1 - 4c_W^2\right)\right) c_W^2 - \left(\delta s_W\right)\left(6 s_W^2 - 8 s_W^4\right)\right) s_\beta^2 - \\ c_\beta^2\left(\left(6\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_W\left(1 - 4c_W^2\right)\right) c_W^2 + 2\left(\delta s_W\right)\left(1 - 4c_W^2\right) s_W^2\right) \end{array}$$

$$(1) = \begin{array}{l} s_\beta\left(2\left(\left(\delta Z_{AG}\right) s_{2\beta} c_W^2 - c_{2\beta}\left(2\left(\delta s_W\right) s_W + \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) c_W^2\right)\right) M_W^4 s_W^3 - 6 m_{u_{g4}} s_W \delta m^{u_g}_{g4} c_W^4 M_W^2\right) + \\ 3 c_W^4 m^2_{u_{g4}}\left(2\left(\delta s_W\right) s_\beta M_W^2 + s_W\left(s_\beta \delta M_W^2 + \left(2\left(\delta s_\beta\right) - \left(\delta Z_{AG}\right) c_\beta - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_\beta\right) M_W^2\right)\right) \end{array}$$

$$\underset{296}{C}\left(A^0, G^0, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2(3)\delta_{g3,g4}}{24 c_W^4 M_W^4 s_W^3 s_\beta^2}\right]$$

$$(3) = \begin{array}{l} -U^{\tilde{u}_{g4}*}_{s3,1}\left((2) U^{\tilde{u}_{g4}}_{s4,1} - s_{2\beta} s_W c_W^2 M_W^2\left(3 c_W^2 m^2_{u_{g4}} + \left(1 - 4c_W^2\right) M_W^2 s_\beta^2\right)\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,1}\right)\right) - \\ U^{\tilde{u}_{g4}*}_{s3,2}\left(2(1) U^{\tilde{u}_{g4}}_{s4,2} - s_{2\beta} s_W c_W^2 M_W^2\left(3 c_W^2 m^2_{u_{g4}} - 4 M_W^2 s_W^2 s_\beta^2\right)\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,2}\right)\right) + \\ \left(\begin{array}{l} \left(3 c_W^2 m^2_{u_{g4}} + \left(1 - 4c_W^2\right) M_W^2 s_\beta^2\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g4}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g4}*}_{2,1}\right) U^{\tilde{u}_{g4}}_{s4,1} + \\ \left(3 c_W^2 m^2_{u_{g4}} - 4 M_W^2 s_W^2 s_\beta^2\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g4}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g4}*}_{2,2}\right) U^{\tilde{u}_{g4}}_{s4,2} \end{array}\right) s_{2\beta} s_W c_W^2 M_W^2 \end{array}$$

$$(2) = \begin{array}{l} 6 c_W^4 m^2_{u_{g4}}\left(2\left(\delta s_W\right) s_{2\beta} M_W^2 + \frac{s_W}{2}\left(2 s_{2\beta}\delta M_W^2 + \left(-2\left(\delta Z_{AG}\right) + 8\left(\delta s_\beta\right) c_\beta - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) s_{2\beta}\right) M_W^2\right)\right) - \\ c_\beta\left(24 m_{u_{g4}} s_W s_\beta \delta m^{u_g}_{g4} c_W^4 M_W^2 - 2\left(\begin{array}{l} 4\left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) s_W c_W^4 - 4\left(\delta s_W\right) s_W^2 - \\ c_W^2\left(\left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) s_W + 4\left(\delta s_W\right)\left(3 - 4 s_W^2\right)\right) \end{array}\right) M_W^4 s_\beta^3\right) \end{array}$$

$$(1) = \begin{array}{l} c_\beta\left(4\left(4\left(\delta s_W\right) s_W + \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) c_W^2\right) M_W^4 s_W^3 s_\beta^3 - 12 m_{u_{g4}} s_W s_\beta \delta m^{u_g}_{g4} c_W^4 M_W^2\right) + \\ \left(\frac{3}{2} c_W^4 m^2_{u_{g4}}\right)\left(4\left(\delta s_W\right) s_{2\beta} M_W^2 + s_W\left(2 s_{2\beta}\delta M_W^2 + \left(-2\left(\delta Z_{AG}\right) + 8\left(\delta s_\beta\right) c_\beta - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) s_{2\beta}\right) M_W^2\right)\right) \end{array}$$

$$\underset{297}{C}\left(A^0, A^0, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{24c_W^4 c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} (\boxed{4})c_\beta s_W c_W^2 M_W^2 + (\boxed{3})U^{\tilde{d}_{g4}*}_{s3,1} + \\ 2\left(\begin{array}{l} 2(\boxed{1})U^{\tilde{d}_{g4}}_{s4,2} + \\ c_\beta s_W c_W^2 M_W^2 \left(c_{2\beta} c_\beta^2 M_W^2 s_W^2 + 3c_W^2 m^2_{d_{g4}} s_\beta^2\right)\left(U^{\tilde{d}_{g4}}_{1,2}\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} + U^{\tilde{d}_{g4}}_{2,2}\delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4}\right) \end{array} \right) U^{\tilde{d}_{g4}*}_{s3,2} \end{array} \right) \right]$$

$$\boxed{4} = \begin{array}{l} \left(c_{2\beta}\left(2c_W^2+1\right)c_\beta^2 M_W^2 + 6c_W^2 m^2_{d_{g4}} s_\beta^2\right)\left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g4}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g4}*}_{2,1}\right) U^{\tilde{d}_{g4}}_{s4,1} + \\ 2\left(c_{2\beta} c_\beta^2 M_W^2 s_W^2 + 3c_W^2 m^2_{d_{g4}} s_\beta^2\right)\left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g4}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g4}*}_{2,2}\right) U^{\tilde{d}_{g4}}_{s4,2} \end{array}$$

$$\boxed{3} = \begin{array}{l} s_W c_W^2 M_W^2 \left(3s_{2\beta} s_\beta c_W^2 m^2_{d_{g4}} + c_{2\beta}\left(2c_W^2+1\right)c_\beta^3 M_W^2\right)\left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1}\right) + \\ 2\left(6m_{d_{g4}} s_\beta c_W^4 \left(s_{2\beta} s_W \delta m^{d_g}_{g4} M_W^2 - \left(\begin{array}{l} \frac{s_{2\beta}}{2}\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\left(2\left(\delta Z_e\right)+\delta Z_{AA}\right)M_W^2 - \delta M_W^2\right)\right) + \\ s_W\left(2\left(\delta c_\beta\right)s_\beta + \left(\delta Z_{AG}\right)c_\beta^2\right)M_W^2 \end{array} \right) m_{d_{g4}}\right) + (\boxed{2})c_\beta^3 M_W^4\right) U^{\tilde{d}_{g4}}_{s4,1} \end{array}$$

$$\boxed{2} = \begin{array}{l} \left(\delta Z_{AG}\right)s_{2\beta} s_W c_W^2\left(2c_W^2+1\right) - c_\beta^2\left(c_W^2\left(6\left(\delta s_W\right) - \left(2\left(\delta Z_e\right)+\delta Z_{AA}\right)s_W\left(2c_W^2+1\right)\right) - 2\left(\delta s_W\right)\left(2c_W^2+1\right)s_W^2\right) + \\ \left(c_W^2\left(6\left(\delta s_W\right) - \left(2\left(\delta Z_e\right)+\delta Z_{AA}\right)s_W\left(2c_W^2+1\right)\right) - \left(\delta s_W\right)\left(6s_W^2 - 4s_W^4\right)\right)s_\beta^2 \end{array}$$

$$\boxed{1} = \begin{array}{l} \left(\left(\delta Z_{AG}\right)s_{2\beta} c_W^2 + c_{2\beta}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right)+\delta Z_{AA}\right)c_W^2\right)\right)c_\beta^3 M_W^4 s_W^3 + \\ 3m_{d_{g4}} s_\beta c_W^4 \left(s_{2\beta} s_W \delta m^{d_g}_{g4} M_W^2 - \left(\begin{array}{l} \frac{s_{2\beta}}{2}\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\left(2\left(\delta Z_e\right)+\delta Z_{AA}\right)M_W^2 - \delta M_W^2\right)\right) + \\ s_W\left(2\left(\delta c_\beta\right)s_\beta + \left(\delta Z_{AG}\right)c_\beta^2\right)M_W^2 \end{array} \right) m_{d_{g4}}\right) \end{array}$$

$$\underset{298}{C}\left(G^0, G^0, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{24c_\beta c_W^4 M_W^4 s_W^3} \left(\begin{array}{l} (\boxed{4})c_\beta s_W c_W^2 M_W^2 + (\boxed{3})U^{\tilde{d}_{g4}*}_{s3,1} + \\ 2\left(\begin{array}{l} 2(\boxed{1})U^{\tilde{d}_{g4}}_{s4,2} - \\ c_\beta s_W c_W^2 M_W^2 \left(3c_W^2 m^2_{d_{g4}} - c_{2\beta} M_W^2 s_W^2\right)\left(U^{\tilde{d}_{g4}}_{1,2}\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} + U^{\tilde{d}_{g4}}_{2,2}\delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4}\right) \end{array} \right) U^{\tilde{d}_{g4}*}_{s3,2} \end{array} \right) \right]$$

$$\boxed{4} = \begin{array}{l} -\left(6c_W^2 m^2_{d_{g4}} - c_{2\beta}\left(2c_W^2+1\right)M_W^2\right)\left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g4}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g4}*}_{2,1}\right) U^{\tilde{d}_{g4}}_{s4,1} - \\ 2\left(3c_W^2 m^2_{d_{g4}} - c_{2\beta} M_W^2 s_W^2\right)\left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g4}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g4}*}_{2,2}\right) U^{\tilde{d}_{g4}}_{s4,2} \end{array}$$

$$\boxed{3} = \begin{array}{l} -c_\beta s_W c_W^2 M_W^2 \left(6c_W^2 m^2_{d_{g4}} - c_{2\beta}\left(2c_W^2+1\right)M_W^2\right)\left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1}\right) - \\ 2\left(c_\beta\left(12m_{d_{g4}} s_W \delta m^{d_g}_{g4} c_W^4 M_W^2 + (\boxed{2})M_W^4\right) - 6\left(\begin{array}{l} s_W\left(2\left(\delta c_\beta\right) + \left(\delta Z_{AG}\right)s_\beta\right)M_W^2 + \\ c_\beta\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\left(2\left(\delta Z_e\right)+\delta Z_{GG}\right)M_W^2 - \delta M_W^2\right)\right) \end{array} \right) c_W^4 m^2_{d_{g4}}\right) U^{\tilde{d}_{g4}}_{s4,1} \end{array}$$

$$\boxed{2} = \begin{array}{l}(\delta Z_{AG})\, s_{2\beta} s_W c_W^2 \left(2c_W^2+1\right) + c_\beta^2 \left(c_W^2 \left(6\,(\delta s_W) - (2\,(\delta Z_e) + \delta Z_{GG})\, s_W \left(2c_W^2+1\right)\right) - 2\,(\delta s_W)\left(2c_W^2+1\right) s_W^2\right) - \\ \left(c_W^2 \left(6\,(\delta s_W) - (2\,(\delta Z_e) + \delta Z_{GG})\, s_W \left(2c_W^2+1\right)\right) - (\delta s_W)\left(6s_W^2 - 4s_W^4\right)\right) s_\beta^2\end{array}$$

$$\boxed{1} = \begin{array}{l}-c_\beta \left(6 m_{d_{g4}} s_W \delta m_{g4}^{d_g} c_W^4 M_W^2 + \left((\delta Z_{AG})\, s_{2\beta} c_W^2 - c_{2\beta}\left(2\,(\delta s_W)\, s_W + (2\,(\delta Z_e) + \delta Z_{GG})\, c_W^2\right)\right) M_W^4 s_W^3\right) + \\ 3c_W^4 m_{d_{g4}}^2 \left(s_W\,(2\,(\delta c_\beta) + (\delta Z_{AG})\, s_\beta)\, M_W^2 + c_\beta \left(2\,(\delta s_W)\, M_W^2 - s_W\left((2\,(\delta Z_e) + \delta Z_{GG})\, M_W^2 - \delta M_W^2\right)\right)\right)\end{array}$$

$$\underset{299}{C}\left(A^0, G^0, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2(\boxed{3})\delta_{g3,g4}}{24 c_W^4 c_\beta^2 M_W^4 s_W^3} \right]$$

$$\boxed{3} = \begin{array}{l}U_{s3,1}^{\tilde{d}_{g4}*}\left((\boxed{2})U_{s4,1}^{\tilde{d}_{g4}} - s_{2\beta} s_W c_W^2 M_W \left(3c_W^2 m_{d_{g4}}^2 - \left(2c_W^2+1\right) c_\beta^2 M_W^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,1}^{\tilde{d}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,1}^{\tilde{d}_{g4}}\right)\right) + \\ U_{s3,2}^{\tilde{d}_{g4}*}\left(2(\boxed{1})U_{s4,2}^{\tilde{d}_{g4}} - s_{2\beta} s_W c_W^2 M_W \left(3c_W^2 m_{d_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,2}^{\tilde{d}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,2}^{\tilde{d}_{g4}}\right)\right) - \\ \left(\begin{array}{l}\left(3c_W^2 m_{d_{g4}}^2 - \left(2c_W^2+1\right) c_\beta^2 M_W^2\right)\left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,1}^{\tilde{d}_{g4}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,1}^{\tilde{d}_{g4}*}\right) U_{s4,1}^{\tilde{d}_{g4}} + \\ \left(3c_W^2 m_{d_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right)\left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,2}^{\tilde{d}_{g4}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,2}^{\tilde{d}_{g4}*}\right) U_{s4,2}^{\tilde{d}_{g4}}\end{array}\right) s_{2\beta} s_W c_W^2 M_W^2\end{array}$$

$$\boxed{2} = \begin{array}{l}6c_W^4 m_{d_{g4}}^2 \left(s_W\,(\delta Z_{AG} + 4\,(\delta c_\beta)\, s_\beta)\, M_W^2 + \frac{s_{2\beta}}{2}\left(4\,(\delta s_W)\, M_W^2 - s_W\left((4\,(\delta Z_e) + \delta Z_{AA} + \delta Z_{GG})\, M_W^2 - 2\delta M_W^2\right)\right)\right) - \\ s_\beta \left(24 c_\beta m_{d_{g4}} s_W \delta m_{g4}^{d_g} c_W^4 M_W^2 - 2\left(\begin{array}{l}2\,(4\,(\delta Z_e) + \delta Z_{AA} + \delta Z_{GG})\, s_W c_W^4 + 4\,(\delta s_W)\, s_W^2 + \\ c_W^2\left((4\,(\delta Z_e) + \delta Z_{AA} + \delta Z_{GG})\, s_W - 4\,(\delta s_W)\left(3 - 2s_W^2\right)\right)\end{array}\right) c_\beta^3 M_W^4\right)\end{array}$$

$$\boxed{1} = \begin{array}{l}s_\beta \left(2\left(4\,(\delta s_W)\, s_W + (4\,(\delta Z_e) + \delta Z_{AA} + \delta Z_{GG})\, c_W^2\right) c_\beta^3 M_W^4 s_W^3 - 12 c_\beta m_{d_{g4}} s_W \delta m_{g4}^{d_g} c_W^4 M_W^2\right) + \\ 3c_W^4 m_{d_{g4}}^2 \left(s_W\,(\delta Z_{AG} + 4\,(\delta c_\beta)\, s_\beta)\, M_W^2 + \frac{s_{2\beta}}{2}\left(4\,(\delta s_W)\, M_W^2 - s_W\left((4\,(\delta Z_e) + \delta Z_{AA} + \delta Z_{GG})\, M_W^2 - 2\delta M_W^2\right)\right)\right)\end{array}$$

$$\underset{302}{C}\left(h^0, H^0, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2(\boxed{4})\delta_{g3,g4}}{24 c_W^4 M_W^4 s_W^3 s_\beta^3} \right]$$

$$\boxed{4} = s_{2\alpha} s_\beta s_W c_W^2 M_W^2 \left(\begin{array}{l}\left(3c_W^2 m_{u_{g4}}^2 + \left(1 - 4c_W^2\right) M_W^2 s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,1}^{\tilde{u}_{g4}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,1}^{\tilde{u}_{g4}*}\right) U_{s4,1}^{\tilde{u}_{g4}} + \\ \left(3c_W^2 m_{u_{g4}}^2 - 4M_W^2 s_W^2 s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,2}^{\tilde{u}_{g4}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,2}^{\tilde{u}_{g4}*}\right) U_{s4,2}^{\tilde{u}_{g4}}\end{array} \right) + (\boxed{3}) U_{s3,1}^{\tilde{u}_{g4}*} - (\boxed{2}) U_{s3,2}^{\tilde{u}_{g4}*}$$

$$\boxed{3} = \begin{array}{l}s_{2\alpha} s_W s_\beta c_W^2 M_W^2 \left(3c_W^2 m_{u_{g4}}^2 + \left(1 - 4c_W^2\right) M_W^2 s_\beta^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,1}^{\tilde{u}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,1}^{\tilde{u}_{g4}}\right) + \\ \left((3(\boxed{1}) m_{u_{g4}} c_W^4 + s_{2\alpha} M_W^4\left(\left(12\,(\delta s_W) + (4\,(\delta Z_e) + \delta Z_{hh} + \delta Z_{HH})\, s_W\left(1 - 4c_W^2\right)\right) c_W^2 + 4\,(\delta s_W)\left(1 - 4c_W^2\right) s_W^2\right) s_\beta^3\right) U_{s4,1}^{\tilde{u}_{g4}}\end{array}$$

$$\boxed{2} = \begin{array}{l} -s_{2\alpha} s_W s_\beta c_W^2 M_W^2 \left(3 c_W^2 m_{u_{g4}}^2 - 4 M_W^2 s_W^2 s_\beta^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,2}^{\tilde{u}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,2}^{\tilde{u}_{g4}}\right) - \\ \left(3(\boxed{1}) m_{u_{g4}} c_W^4 - 4 s_{2\alpha} \left(4 (\delta s_W) s_W + (4 (\delta Z_e) + \delta Z_{hh} + \delta Z_{HH}) c_W^2\right) M_W^4 s_W^3 s_\beta^3\right) U_{s4,2}^{\tilde{u}_{g4}} \end{array}$$

$$\boxed{1} = 4 s_{2\alpha} s_\beta s_W M_W^2 \delta m_{g4}^{u_g} - m_{u_{g4}} \left(s_W \left(\begin{array}{l} 4 (\delta s_\beta) s_{2\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 s_{2\alpha} \delta M_W^2 - \\ M_W^2 \left((4 (\delta Z_e) + \delta Z_{hh} + \delta Z_{HH}) s_{2\alpha} + 2 (\delta Z_{hH}) \left(c_\alpha^2 + s_\alpha^2\right)\right) \end{array} \right) s_\beta \end{array} \right) + 4 s_{2\alpha} s_\beta M_W^2 (\delta s_W) \right)$$

$$\underset{303}{C}\left(h^0, H^0, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{i e^2 (\boxed{4}) \delta_{g3,g4}}{24 c_W^4 c_\beta^3 M_W^4 s_W^3} \right]$$

$$\boxed{4} = s_{2\alpha} c_\beta s_W c_W^2 M_W^2 \left(- \left(\begin{array}{l} \left(3 c_W^2 m_{d_{g4}}^2 - \left(2 c_W^2 + 1\right) c_\beta^2 M_W^2\right) \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,1}^{\tilde{d}_{g4}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,1}^{\tilde{d}_{g4}*}\right) U_{s4,1}^{\tilde{d}_{g4}} + \\ \left(3 c_W^2 m_{d_{g4}}^2 - 2 c_\beta^2 M_W^2 s_W^2\right) \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,2}^{\tilde{d}_{g4}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,2}^{\tilde{d}_{g4}*}\right) U_{s4,2}^{\tilde{d}_{g4}} \end{array} \right) \right) + (\boxed{3}) U_{s3,1}^{\tilde{d}_{g4}*} + (\boxed{2}) U_{s3,2}^{\tilde{d}_{g4}*}$$

$$\boxed{3} = \begin{array}{l} -c_\beta s_{2\alpha} s_W c_W^2 M_W^2 \left(3 c_W^2 m_{d_{g4}}^2 - \left(2 c_W^2 + 1\right) c_\beta^2 M_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,1}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,1}^{\tilde{d}_{g4}}\right) - \\ \left(3(\boxed{1}) m_{d_{g4}} c_W^4 + s_{2\alpha} c_\beta^3 M_W^4 \left(c_W^2 \left(12 (\delta s_W) - (4 (\delta Z_e) + \delta Z_{hh} + \delta Z_{HH}) s_W \left(2 c_W^2 + 1\right)\right) - 4 (\delta s_W) \left(2 c_W^2 + 1\right) s_W^2\right)\right) U_{s4,1}^{\tilde{d}_{g4}} \end{array}$$

$$\boxed{2} = \begin{array}{l} -c_\beta s_{2\alpha} s_W c_W^2 M_W^2 \left(3 c_W^2 m_{d_{g4}}^2 - 2 c_\beta^2 M_W^2 s_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,2}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,2}^{\tilde{d}_{g4}}\right) - \\ \left(3(\boxed{1}) m_{d_{g4}} c_W^4 - 2 s_{2\alpha} \left(4 (\delta s_W) s_W + (4 (\delta Z_e) + \delta Z_{hh} + \delta Z_{HH}) c_W^2\right) c_\beta^3 M_W^4 s_W^3\right) U_{s4,2}^{\tilde{d}_{g4}} \end{array}$$

$$\boxed{1} = 4 s_{2\alpha} c_\beta s_W M_W^2 \delta m_{g4}^{d_g} - m_{d_{g4}} \left(c_\beta \left(\begin{array}{l} 4 (\delta s_W) s_{2\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 s_{2\alpha} \delta M_W^2 - \\ M_W^2 \left((4 (\delta Z_e) + \delta Z_{hh} + \delta Z_{HH}) s_{2\alpha} - 2 (\delta Z_{hH}) \left(c_\alpha^2 + s_\alpha^2\right)\right) \end{array} \right) s_W \end{array} \right) + 4 s_{2\alpha} s_W M_W^2 (\delta c_\beta) \right)$$

$$\underset{304}{C}\left(h^0, H^-, \tilde{u}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{\sqrt{2} i e^2}{M_W^4 s_{2\beta}^3 s_W^3} \left(\begin{array}{l} (\boxed{6}) \mathrm{CKM}_{g3,g4}^* - \\ \left(\begin{array}{l} \left(c_\alpha c_\beta^3 m_{u_{g3}}^2 - \left(s_\alpha s_\beta m_{d_{g4}}^2 + c_{\alpha+\beta} c_\beta^2 M_W^2\right) s_\beta^2\right) U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{d}_{g4}} + \\ \frac{1}{2} m_{d_{g4}} m_{u_{g3}} s_{2\beta} s_{\beta-\alpha} U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{d}_{g4}} \end{array} \right) s_{2\beta} s_W M_W^2 \delta \mathrm{CKM}_{g3,g4}^* \end{array} \right) \right]$$

$$\boxed{6} = \begin{array}{l} -\frac{s_{2\beta}}{2} \left((\boxed{5}) s_W M_W^2 + (\boxed{4}) U_{s3,2}^{\tilde{u}_{g3}*}\right) - \\ \left(\begin{array}{l} \left((\boxed{1}) c_\beta^3 + (\boxed{2}) s_\beta^3\right) U_{s4,1}^{\tilde{d}_{g4}} + \\ \left(\frac{1}{8} s_{2\beta} s_W M_W^2\right) \left(4 c_\alpha c_\beta^3 m_{u_{g3}}^2 - c_{\alpha+\beta} M_W^2 s_{2\beta}^2 - 4 s_\alpha m_{d_{g4}}^2 s_\beta^3\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,1}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,1}^{\tilde{d}_{g4}}\right) \end{array} \right) U_{s3,1}^{\tilde{u}_{g3}*} \end{array}$$

$$\boxed{5} = \left(c_\alpha c_\beta^3 m_{u_{g3}}^2 - \left(s_\alpha s_\beta m_{d_{g4}}^2 + c_{\alpha+\beta} c_\beta^2 M_W^2\right) s_\beta^2\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,1}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,1}^{\tilde{u}_{g3}*}\right) U_{s4,1}^{\tilde{d}_{g4}} + \left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} s_{2\beta} s_{\beta\text{-}\alpha} U_{s4,2}^{\tilde{d}_{g4}}\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,2}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,2}^{\tilde{u}_{g3}*}\right)$$

$$\boxed{4} = \left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} s_{2\beta} s_W s_{\beta\text{-}\alpha} M_W^2\right)\left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,2}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,2}^{\tilde{d}_{g4}}\right) - \left(m_{d_{g4}}\left((\boxed{3}) m_{u_{g3}} - s_{2\beta} s_W s_{\beta\text{-}\alpha} \delta m_{g3}^{u_g} M_W^2\right) - m_{u_{g3}} s_{2\beta} s_W s_{\beta\text{-}\alpha} \delta m_{g4}^{d_g} M_W^2\right) U_{s4,2}^{\tilde{d}_{g4}}$$

$$\boxed{3} = c_\beta \left(\begin{array}{l} 4\left(\delta s_W\right) s_\beta s_{\beta\text{-}\alpha} M_W^2 + \\ \left(\begin{array}{l} 2\left(\delta s_\beta\right) s_{\beta\text{-}\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 s_{\beta\text{-}\alpha} \delta M_W^2 - \\ \left(\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right) c_{\beta\text{-}\alpha} + \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_{\beta\text{-}\alpha}\right) M_W^2 \end{array} \right) s_\beta \end{array} \right) s_W \end{array} \right) + 2 s_\beta s_{\beta\text{-}\alpha} s_W M_W^2 \left(\delta c_\beta\right)$$

$$\boxed{2} = \begin{array}{l} -2 m_{d_{g4}} s_{2\beta} s_W s_\alpha \delta m_{g4}^{d_g} M_W^2 - \\ \left(\begin{array}{l} \left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) s_W s_{\alpha+\beta} - \\ c_{\alpha+\beta}\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_W\right) \end{array} \right) c_\beta^3 M_W^4 \quad + \\ \left(\begin{array}{l} s_W s_\alpha \left(4\left(\delta c_\beta\right) s_\beta + \left(\delta Z_{G^-H^-}\right) c_\beta^2\right) M_W^2 + \\ \frac{s_{2\beta}}{2}\left(4\left(\delta s_W\right) s_\alpha M_W^2 + s_W\left(2 s_\alpha \delta M_W^2 + \left(\left(\delta Z_{hH}\right) c_\alpha - \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_\alpha\right) M_W^2\right)\right) \end{array} \right) m_{d_{g4}}^2 \end{array}$$

$$\boxed{1} = \begin{array}{l} 2 c_\alpha m_{u_{g3}} s_{2\beta} s_W \delta m_{g3}^{u_g} M_W^2 + \\ \left(\frac{1}{2} m_{u_{g3}}^2\right) \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_{2\beta} s_W s_\alpha M_W^2 - \\ c_\alpha \left(\left(\begin{array}{l} 2 s_{2\beta} \delta M_W^2 + \\ M_W^2 \left(8\left(\delta s_\beta\right) c_\beta - \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_{2\beta} - 2\left(\delta Z_{G^-H^-}\right) s_\beta^2\right) \end{array} \right) s_W + 4\left(\delta s_W\right) s_{2\beta} M_W^2 \right) \end{array} \right) \end{array}$$

$$\underset{305}{C}\left(h^0, G^-, \tilde{u}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{\sqrt{2} i e^2 c_\beta}{M_W^4 s_{2\beta}^3 s_W^3} \left(\begin{array}{l} (\boxed{6}) \mathrm{CKM}_{g3,g4}^* - \\ 2\left(\begin{array}{l} \left(s_\alpha s_\beta m_{d_{g4}}^2 + c_\beta\left(c_\alpha m_{u_{g3}}^2 - s_{\alpha+\beta} s_\beta M_W^2\right)\right) U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{d}_{g4}} - \\ c_{\beta\text{-}\alpha} m_{d_{g4}} m_{u_{g3}} U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{d}_{g4}} \end{array} \right) \end{array} \right) c_\beta s_W M_W^2 s_\beta^2 \delta \mathrm{CKM}_{g3,g4}^* \right]$$

$$
\begin{aligned}
\boxed{6} = & \\
& \left(\begin{array}{l} s_\beta \left(\frac{1}{2} (\boxed{5}) s_{2\beta} s_W M_W^2 + (\boxed{4}) U_{s3,2}^{\tilde{u}_{g3}*} \right) - \\ \left(\frac{1}{2} (\boxed{2}) c_\beta m_{u_{g3}} s_{2\beta} + (\boxed{1}) s_\beta^3 \right) U_{s4,1}^{\tilde{d}_{g4}} + \\ c_\beta s_W M_W^2 \left(s_\alpha s_\beta m_{d_{g4}}^2 + c_\beta \left(c_\alpha m_{u_{g3}}^2 - s_{\alpha+\beta} s_\beta M_W^2 \right) \right) s_\beta^2 \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,1}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,1}^{\tilde{d}_{g4}} \right) \end{array} \right) U_{s3,1}^{\tilde{u}_{g3}*} \\
\boxed{5} = & \\
& \begin{array}{l} - \left(s_\alpha s_\beta m_{d_{g4}}^2 + c_\beta \left(c_\alpha m_{u_{g3}}^2 - s_{\alpha+\beta} s_\beta M_W^2 \right) \right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,1}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,1}^{\tilde{u}_{g3}*} \right) U_{s4,1}^{\tilde{d}_{g4}} + \\ c_{\beta-\alpha} m_{d_{g4}} m_{u_{g3}} \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,2}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,2}^{\tilde{u}_{g3}*} \right) U_{s4,2}^{\tilde{d}_{g4}} \end{array} \\
\boxed{4} = & \\
& \begin{array}{l} \left(\frac{1}{2} c_{\beta-\alpha} m_{d_{g4}} m_{u_{g3}} s_{2\beta} s_W M_W^2 \right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,2}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,2}^{\tilde{d}_{g4}} \right) - \\ \left(m_{d_{g4}} \left(\frac{1}{2} (\boxed{3}) m_{u_{g3}} - c_{\beta-\alpha} s_{2\beta} s_W \delta m_{g3}^{u_g} M_W^2 \right) - c_{\beta-\alpha} m_{u_{g3}} s_{2\beta} s_W \delta m_{g4}^{d_g} M_W^2 \right) U_{s4,2}^{\tilde{d}_{g4}} \end{array} \\
\boxed{3} = & \\
& \begin{array}{l} c_{\beta-\alpha} \left(4 (\delta s_W) s_{2\beta} M_W^2 + s_W \left(2 s_{2\beta} \delta M_W^2 + \left(4 \left((\delta s_\beta) c_\beta + (\delta c_\beta) s_\beta \right) - \left(4 (\delta Z_e) + \delta Z_{hh} + \delta Z_{G^- G^-} \right) s_{2\beta} \right) M_W^2 \right) \right) + \\ \left(\delta Z_{hH} + \delta Z_{H^- G^-} \right) s_{2\beta} s_W s_{\beta-\alpha} M_W^2 \end{array} \\
\boxed{2} = & \\
& \begin{array}{l} 4 c_\alpha s_W s_\beta \delta m_{g3}^{u_g} M_W^2 + \\ \left(\begin{array}{l} (\delta Z_{hH}) s_W s_\alpha s_\beta M_W^2 - \\ c_\alpha \left(4 (\delta s_W) s_\beta M_W^2 + s_W \left(2 s_\beta \delta M_W^2 + \left(4 (\delta s_\beta) - (\delta Z_{H^- G^-}) c_\beta - \left(4 (\delta Z_e) + \delta Z_{hh} + \delta Z_{G^- G^-} \right) s_\beta \right) M_W^2 \right) \right) \end{array} \right) m_{u_{g3}} \end{array} \\
\boxed{1} = & \\
& \begin{array}{l} 4 c_\beta m_{d_{g4}} s_W s_\alpha \delta m_{g4}^{d_g} M_W^2 + \left(4 (\delta s_W) s_{\alpha+\beta} - s_W \left(\left(4 (\delta Z_e) + \delta Z_{hh} + \delta Z_{G^- G^-} \right) s_{\alpha+\beta} - (\delta Z_{hH} - \delta Z_{H^- G^-}) c_{\alpha+\beta} \right) \right) c_\beta^2 M_W^4 - \\ \left(\begin{array}{l} c_\beta \left(4 (\delta s_W) s_\alpha M_W^2 + s_W \left(2 s_\alpha \delta M_W^2 + \left((\delta Z_{hH}) c_\alpha - \left(4 (\delta Z_e) + \delta Z_{hh} + \delta Z_{G^- G^-} \right) s_\alpha \right) M_W^2 \right) \right) + \\ s_W s_\alpha \left(4 (\delta c_\beta) + (\delta Z_{H^- G^-}) s_\beta \right) M_W^2 \end{array} \right) m_{d_{g4}}^2 \end{array}
\end{aligned}
$$

$$
\underset{306}{C} \left(h^0, H^+, \tilde{d}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger} \right) = \left[-\frac{\sqrt{2} i e^2}{M_W^4 s_{2\beta}^3 s_W^3} \left(\begin{array}{l} (\boxed{6}) \mathrm{CKM}_{g4,g3} - \\ \left(\begin{array}{l} \left(c_\alpha c_\beta^3 m_{u_{g4}}^2 - \left(s_\alpha s_\beta m_{d_{g3}}^2 + c_{\alpha+\beta} c_\beta^2 M_W^2 \right) s_\beta^2 \right) U_{s3,1}^{\tilde{d}_{g3}*} U_{s4,1}^{\tilde{u}_{g4}} + \\ \frac{1}{2} m_{d_{g3}} m_{u_{g4}} s_{2\beta} s_{\beta-\alpha} U_{s3,2}^{\tilde{d}_{g3}*} U_{s4,2}^{\tilde{u}_{g4}} \end{array} \right) s_{2\beta} s_W \left(\delta \mathrm{CKM}_{g4,g3} \right) M_W^2 \end{array} \right) \right]
$$

$$
\begin{aligned}
\boxed{6} = & \\
& \left(\begin{array}{l} -\frac{s_{2\beta}}{2} \left((\boxed{5}) s_W M_W^2 + (\boxed{4}) U_{s3,2}^{\tilde{d}_{g3}*} \right) - \\ \left((\boxed{2}) c_\beta^3 + (\boxed{1}) s_\beta^3 \right) U_{s4,1}^{\tilde{u}_{g4}} + \\ \left(\frac{1}{8} s_{2\beta} s_W M_W^2 \right) \left(4 c_\alpha c_\beta^3 m_{u_{g4}}^2 - c_{\alpha+\beta} M_W^2 s_{2\beta}^2 - 4 s_\alpha m_{d_{g3}}^2 s_\beta^3 \right) \left(\delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,1}^{\tilde{u}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,1}^{\tilde{u}_{g4}} \right) \end{array} \right) U_{s3,1}^{\tilde{d}_{g3}*}
\end{aligned}
$$

$$
\boxed{5} = \begin{array}{l} \left(c_\alpha c_\beta^3 m_{u_{g4}}^2 - \left(s_\alpha s_\beta m_{d_{g3}}^2 + c_{\alpha+\beta} c_\beta^2 M_W^2\right) s_\beta^2\right) \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,1}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,1}^{\tilde{d}_{g3}*}\right) U_{s4,1}^{\tilde{u}_{g4}} + \\ \left(\frac{1}{2} m_{d_{g3}} m_{u_{g4}} s_{2\beta} s_{\beta\text{-}\alpha} U_{s4,2}^{\tilde{u}_{g4}}\right) \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,2}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,2}^{\tilde{d}_{g3}*}\right) \end{array}
$$

$$
\boxed{4} = \begin{array}{l} \left(\frac{1}{2} m_{d_{g3}} m_{u_{g4}} s_{2\beta} s_W s_{\beta\text{-}\alpha} M_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,2}^{\tilde{u}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,2}^{\tilde{u}_{g4}}\right) + \\ \left(m_{u_{g4}} s_{2\beta} s_W s_{\beta\text{-}\alpha} \delta m_{g3}^{d_g} M_W^2 - m_{d_{g3}} \left((\boxed{3}) m_{u_{g4}} - s_{2\beta} s_W s_{\beta\text{-}\alpha} \delta m_{g4}^{u_g} M_W^2\right)\right) U_{s4,2}^{\tilde{u}_{g4}} \end{array}
$$

$$
\boxed{3} = c_\beta \left(\begin{array}{l} 4 \left(\delta s_W\right) s_\beta s_{\beta\text{-}\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 \left(\delta s_\beta\right) s_{\beta\text{-}\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 s_{\beta\text{-}\alpha} \delta M_W^2 - \\ \left(\left(\delta Z_{hH} - \delta Z_{H^- G^-}\right) c_{\beta\text{-}\alpha} + \left(4 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{hh}\right) s_{\beta\text{-}\alpha}\right) M_W^2 \end{array} \right) s_\beta \end{array} \right) s_W \end{array} \right) + 2 s_\beta s_{\beta\text{-}\alpha} s_W M_W^2 \left(\delta c_\beta\right)
$$

$$
\boxed{2} = \begin{array}{l} 2 c_\alpha m_{u_{g4}} s_{2\beta} s_W \delta m_{g4}^{u_g} M_W^2 + \\ \left(\frac{1}{2} m_{u_{g4}}^2\right) \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_{2\beta} s_W s_\alpha M_W^2 - \\ c_\alpha \left(\left(\begin{array}{l} 2 s_{2\beta} \delta M_W^2 + \\ M_W^2 \left(8 \left(\delta s_\beta\right) c_\beta - \left(4 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{hh}\right) s_{2\beta} - 2 \left(\delta Z_{H^- G^-}\right) s_\beta^2\right) \end{array} \right) s_W + 4 \left(\delta s_W\right) s_{2\beta} M_W^2 \right) \end{array} \right) \end{array}
$$

$$
\boxed{1} = \begin{array}{l} -2 m_{d_{g3}} s_{2\beta} s_W s_\alpha \delta m_{g3}^{d_g} M_W^2 + \\ \left(\begin{array}{l} c_{\alpha+\beta} \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{hh}\right) s_W\right) - \\ \left(\delta Z_{hH} + \delta Z_{H^- G^-}\right) s_W s_{\alpha+\beta} \end{array} \right) c_\beta^3 M_W^4 + \\ \left(\begin{array}{l} \frac{s_{2\beta}}{2} \left(4 \left(\delta s_W\right) s_\alpha M_W^2 - s_W \left(\left(\left(4 \left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{hh}\right) s_\alpha - \left(\delta Z_{hH}\right) c_\alpha\right) M_W^2 - 2 s_\alpha \delta M_W^2\right)\right) + \\ s_W s_\alpha \left(4 \left(\delta c_\beta\right) s_\beta + \left(\delta Z_{H^- G^-}\right) c_\beta^2\right) M_W^2 \end{array} \right) m_{d_{g3}}^2 \end{array}
$$

$$
\underset{307}{C}\left(h^0, G^+, \tilde{d}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{\sqrt{2} i e^2 c_\beta}{M_W^4 s_{2\beta}^3 s_W^3} \left(\begin{array}{l} (\boxed{6}) \mathrm{CKM}_{g4,g3} - \\ 2 \left(\begin{array}{l} \left(s_\alpha s_\beta m_{d_{g3}}^2 + c_\beta \left(c_\alpha m_{u_{g4}}^2 - s_{\alpha+\beta} s_\beta M_W^2\right)\right) U_{s3,1}^{\tilde{d}_{g3}*} U_{s4,1}^{\tilde{u}_{g4}} - \\ c_{\beta\text{-}\alpha} m_{d_{g3}} m_{u_{g4}} U_{s3,2}^{\tilde{d}_{g3}*} U_{s4,2}^{\tilde{u}_{g4}} \end{array} \right) c_\beta s_W \left(\delta \mathrm{CKM}_{g4,g3}\right) M_W^2 s_\beta^2 \end{array} \right) \right]
$$

$$
\begin{aligned}
6 = & \; s_\beta \left(\frac{1}{2}(5) s_{2\beta} s_W M_W^2 + (4) U_{s3,2}^{\tilde{d}_{g3}*} \right) - \\
& \left(\begin{array}{l} \left(\frac{1}{2}(2) c_\beta m_{u_{g4}} s_{2\beta} + (1) s_\beta^3 \right) U_{s4,1}^{\tilde{u}_{g4}} + \\ c_\beta s_W M_W^2 \left(s_\alpha s_\beta m_{d_{g3}}^2 + c_\beta \left(c_\alpha m_{u_{g4}}^2 - s_{\alpha+\beta} s_\beta M_W^2 \right) \right) s_\beta^2 \left(\delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,1}^{\tilde{u}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,1}^{\tilde{u}_{g4}} \right) \end{array} \right) U_{s3,1}^{\tilde{d}_{g3}*} \\
5 = & \; - \left(s_\alpha s_\beta m_{d_{g3}}^2 + c_\beta \left(c_\alpha m_{u_{g4}}^2 - s_{\alpha+\beta} s_\beta M_W^2 \right) \right) \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,1}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,1}^{\tilde{d}_{g3}*} \right) U_{s4,1}^{\tilde{u}_{g4}} + \\
& c_{\beta-\alpha} m_{d_{g3}} m_{u_{g4}} \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,2}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,2}^{\tilde{d}_{g3}*} \right) U_{s4,2}^{\tilde{u}_{g4}} \\
4 = & \; \left(\frac{1}{2} c_{\beta-\alpha} m_{d_{g3}} m_{u_{g4}} s_{2\beta} s_W M_W^2 \right) \left(\delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,2}^{\tilde{u}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,2}^{\tilde{u}_{g4}} \right) + \\
& \left(c_{\beta-\alpha} m_{u_{g4}} s_{2\beta} s_W \delta m_{g3}^{d_g} M_W^2 - m_{d_{g3}} \left(\frac{1}{2}(3) m_{u_{g4}} - c_{\beta-\alpha} s_{2\beta} s_W \delta m_{g4}^{u_g} M_W^2 \right) \right) U_{s4,2}^{\tilde{u}_{g4}} \\
3 = & \; c_{\beta-\alpha} \left(4 \left(\delta s_W \right) s_{2\beta} M_W^2 + s_W \left(2 s_{2\beta} \delta M_W^2 + \left(4 \left(\left(\delta s_\beta \right) c_\beta + \left(\delta c_\beta \right) s_\beta \right) - \left(4 \left(\delta Z_e \right) + \delta Z_{hh} + \delta Z_{G^- G^-} \right) s_{2\beta} \right) M_W^2 \right) \right) + \\
& \left(\delta Z_{hH} + \delta Z_{G^- H^-} \right) s_{2\beta} s_W s_{\beta-\alpha} M_W^2 \\
2 = & \; 4 c_\alpha s_W s_\beta \delta m_{g4}^{u_g} M_W^2 + \\
& \left(\begin{array}{l} \left(\delta Z_{hH} \right) s_W s_\alpha s_\beta M_W^2 - \\ c_\alpha \left(4 \left(\delta s_W \right) s_\beta M_W^2 + s_W \left(2 s_\beta \delta M_W^2 + \left(4 \left(\delta s_\beta \right) - \left(\delta Z_{G^- H^-} \right) c_\beta - \left(4 \left(\delta Z_e \right) + \delta Z_{hh} + \delta Z_{G^- G^-} \right) s_\beta \right) M_W^2 \right) \right) \end{array} \right) m_{u_{g4}} \\
1 = & \; 4 c_\beta m_{d_{g3}} s_W s_\alpha \delta m_{g3}^{d_g} M_W^2 + \left(4 \left(\delta s_W \right) s_{\alpha+\beta} - s_W \left(\left(4 \left(\delta Z_e \right) + \delta Z_{hh} + \delta Z_{G^- G^-} \right) s_{\alpha+\beta} - \left(\delta Z_{hH} - \delta Z_{G^- H^-} \right) c_{\alpha+\beta} \right) \right) c_\beta^2 M_W^4 - \\
& \left(\begin{array}{l} c_\beta \left(4 \left(\delta s_W \right) s_\alpha M_W^2 + s_W \left(2 s_\alpha \delta M_W^2 + \left(\left(\delta Z_{hH} \right) c_\alpha - \left(4 \left(\delta Z_e \right) + \delta Z_{hh} + \delta Z_{G^- G^-} \right) s_\alpha \right) M_W^2 \right) \right) + \\ s_W s_\alpha \left(4 \left(\delta c_\beta \right) + \left(\delta Z_{G^- H^-} \right) s_\beta \right) M_W^2 \end{array} \right) m_{d_{g3}}^2
\end{aligned}
$$

$$
\underset{308}{C} \left(A^0, H^-, \tilde{u}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger} \right) = \left[\frac{\sqrt{2} e^2}{M_W^4 s_{2\beta}^3 s_W^3} \left(\begin{array}{l} (4) \mathrm{CKM}_{g3,g4}^* + \\ s_{2\beta} s_W M_W^2 \left(\frac{1}{4} c_{2\beta} M_W^2 s_{2\beta}^2 - c_\beta^4 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^4 \right) U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{d}_{g4}} \delta \mathrm{CKM}_{g3,g4}^* \end{array} \right) \right]
$$

$$
\begin{aligned}
4 = & \left(\tfrac{1}{2} s_{2\beta} s_W M_W^2 \right) \left(\begin{array}{l} \left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} s_{2\beta} U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{d}_{g4}} \right) \left(\delta Z_{AG} - \delta Z_{G^- H^-} \right) + \\ \left(\frac{1}{4} c_{2\beta} M_W^2 s_{2\beta}^2 - c_\beta^4 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^4 \right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,1}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,1}^{\tilde{u}_{g3}*} \right) U_{s4,1}^{\tilde{d}_{g4}} \end{array} \right) + (3) U_{s3,1}^{\tilde{u}_{g3}*}
\end{aligned}
$$

$$\boxed{3} = -\left(\frac{1}{8}s_{2\beta}s_W M_W^2\right)\left(4c_\beta^4 m_{u_{g3}}^2 - c_{2\beta}M_W^2 s_{2\beta}^2 - 4m_{d_{g4}}^2 s_\beta^4\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{d}_{g4}}U_{1,1}^{\tilde{d}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{d}_{g4}}U_{2,1}^{\tilde{d}_{g4}}\right) - \left((\boxed{2})c_\beta^4 - \left((\boxed{1})s_\beta + \left(\left(\delta Z_{AG} + \delta Z_{G^-H^-}\right)s_{2\beta}s_W - c_{2\beta}\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^-H^-}\right)s_W\right)\right)c_\beta^3 M_W^4\right)s_\beta^3\right)U_{s4,1}^{\tilde{d}_{g4}}$$

$$\boxed{2} = m_{u_{g3}}^2\left(\begin{array}{l}\left(\delta Z_{AG} + \delta Z_{G^-H^-}\right)s_W M_W^2 s_\beta^2 - \\ c_\beta\left(4\left(\delta s_W\right)s_\beta M_W^2 + s_W\left(4\left(\delta s_\beta\right)M_W^2 - s_\beta\left(\left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^-H^-}\right)M_W^2 - 2\delta M_W^2\right)\right)\right)\end{array}\right) + 2s_{2\beta}s_W m_{u_{g3}}M_W^2\delta m_{g3}^{u_g}$$

$$\boxed{1} = 2s_{2\beta}s_W m_{d_{g4}}M_W^2\delta m_{g4}^{d_g} - m_{d_{g4}}^2\left(\begin{array}{l}s_W\left(4\left(\delta c_\beta\right)s_\beta + \left(\delta Z_{AG} + \delta Z_{G^-H^-}\right)c_\beta^2\right)M_W^2 + \\ \frac{s_{2\beta}}{2}\left(4\left(\delta s_W\right)M_W^2 - s_W\left(\left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^-H^-}\right)M_W^2 - 2\delta M_W^2\right)\right)\end{array}\right)$$

$$\underset{309}{C}\left(G^0, G^-, \tilde{u}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{e^2}{2\sqrt{2}s_{2\beta}M_W^4 s_W^3}\left((\boxed{3})\mathrm{CKM}_{g3,g4}^* - s_{2\beta}s_W M_W^2\left(m_{d_{g4}}^2 - m_{u_{g3}}^2 - c_{2\beta}M_W^2\right)U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{d}_{g4}}\delta\mathrm{CKM}_{g3,g4}^*\right)\right]$$

$$\boxed{3} = \begin{array}{l}-U_{s3,1}^{\tilde{u}_{g3}*}\left(\left(\frac{1}{2}s_{2\beta}s_W M_W^2\right)\left(m_{d_{g4}}^2 - m_{u_{g3}}^2 - c_{2\beta}M_W^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{d}_{g4}}U_{1,1}^{\tilde{d}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{d}_{g4}}U_{2,1}^{\tilde{d}_{g4}}\right) + (\boxed{2})U_{s4,1}^{\tilde{d}_{g4}}\right) + \\ \left(\begin{array}{l}\left(\delta Z_{AG} - \delta Z_{H^-G^-}\right)m_{d_{g4}}m_{u_{g3}}U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{d}_{g4}} - \\ \left(\frac{1}{2}s_{2\beta}U_{s4,1}^{\tilde{d}_{g4}}\right)\left(m_{d_{g4}}^2 - m_{u_{g3}}^2 - c_{2\beta}M_W^2\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}}U_{1,1}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}}U_{2,1}^{\tilde{u}_{g3}*}\right)\end{array}\right)s_W M_W^2\end{array}$$

$$\boxed{2} = \begin{array}{l}(\boxed{1})c_\beta + \left(\frac{1}{2}s_{2\beta}M_W^4\right)\left(\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right)s_{2\beta}s_W + \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right)s_W\right)\left(c_\beta^2 - s_\beta^2\right)\right) - \\ s_W m_{d_{g4}}^2\left(s_{2\beta}\delta M_W^2 + \left(\frac{1}{2}M_W^2\right)\left(-\left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right)s_{2\beta} + 8\left(\delta c_\beta\right)s_\beta + 2\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right)s_\beta^2\right)\right)\end{array}$$

$$\boxed{1} = \begin{array}{l}-s_\beta\left(4m_{u_{g3}}s_W\delta m_{g3}^{u_g} + 4m_{d_{g4}}\left(\left(\delta s_W\right)m_{d_{g4}} - s_W\delta m_{g4}^{d_g}\right)\right)M_W^2 + \\ m_{u_{g3}}^2\left(4\left(\delta s_W\right)s_\beta M_W^2 + s_W\left(2s_\beta\delta M_W^2 + \left(4\left(\delta s_\beta\right) - \left(\delta Z_{AG} + \delta Z_{H^-G^-}\right)c_\beta - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right)s_\beta\right)M_W^2\right)\right)\end{array}$$

$$\underset{310}{C}\left(A^0, G^-, \tilde{u}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{e^2}{\sqrt{2}M_W^4 s_{2\beta}^2 s_W^3}\left(\begin{array}{l}(\boxed{4})\mathrm{CKM}_{g3,g4}^* - \\ \left(\begin{array}{l}\left(\frac{1}{2}M_W^2 s_{2\beta}^2 - c_\beta^2 m_{u_{g3}}^2 - m_{d_{g4}}^2 s_\beta^2\right)U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{d}_{g4}} - \\ m_{d_{g4}}m_{u_{g3}}U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{d}_{g4}}\end{array}\right)s_{2\beta}s_W M_W^2\delta\mathrm{CKM}_{g3,g4}^*\end{array}\right)\right]$$

$$
\begin{aligned}
4 = & -(3) U_{s4,2}^{\tilde{d}_{g4}} + \\
& U_{s3,1}^{\tilde{u}_{g3}*} \left(\left((1) c_\beta^2 + (2) s_\beta^2 \right) U_{s4,1}^{\tilde{d}_{g4}} - \left(\frac{1}{4} s_{2\beta} s_W M_W^2 \right) \left(M_W^2 s_{2\beta}^2 - 2 \left(c_\beta^2 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^2 \right) \right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,1}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,1}^{\tilde{d}_{g4}} \right) \right) + \\
& \left(\begin{array}{l} \left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} U_{s3,2}^{\tilde{u}_{g3}*} \right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,2}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,2}^{\tilde{d}_{g4}} \right) - \\ \left(\frac{1}{4} U_{s4,1}^{\tilde{d}_{g4}} \right) \left(M_W^2 s_{2\beta}^2 - 2 \left(c_\beta^2 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^2 \right) \right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,1}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,1}^{\tilde{u}_{g3}*} \right) \end{array} \right) s_{2\beta} s_W M_W^2
\end{aligned}
$$

$$
\begin{aligned}
3 = & 2 c_\beta \left(m_{d_{g4}} \left(m_{u_{g3}} \left((\delta s_\beta) s_W + 2 (\delta s_W) s_\beta \right) - s_W s_\beta \delta m_{g3}^{u_g} \right) - m_{u_{g3}} s_W s_\beta \delta m_{g4}^{d_g} \right) M_W^2 U_{s3,2}^{\tilde{u}_{g3}*} + \\
& \left(\begin{array}{l} \left(s_{2\beta} \delta M_W^2 + (2 (\delta c_\beta) - (4 (\delta Z_e) + \delta Z_{AA} + \delta Z_{G^- G^-}) c_\beta) s_\beta M_W^2 \right) U_{s3,2}^{\tilde{u}_{g3}*} - \\ \left(\frac{1}{2} s_{2\beta} M_W^2 \right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,2}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,2}^{\tilde{u}_{g3}*} \right) \end{array} \right) m_{d_{g4}} m_{u_{g3}} s_W
\end{aligned}
$$

$$
\begin{aligned}
2 = & 2 m_{d_{g4}} s_{2\beta} s_W \delta m_{g4}^{d_g} M_W^2 + (4 (\delta s_W) s_{2\beta} - ((4 (\delta Z_e) + \delta Z_{AA} + \delta Z_{G^- G^-}) s_{2\beta} - (\delta Z_{AG} - \delta Z_{H^- G^-}) c_{2\beta}) s_W) c_\beta^2 M_W^4 - \\
& m_{d_{g4}}^2 \left(\frac{s_{2\beta}}{2} \left(4 (\delta s_W) M_W^2 - s_W \left((4 (\delta Z_e) + \delta Z_{AA} + \delta Z_{G^- G^-}) M_W^2 - 2 \delta M_W^2 \right) \right) + s_W M_W^2 \left(4 (\delta c_\beta) s_\beta + (\delta Z_{AG}) c_\beta^2 + (\delta Z_{H^- G^-}) s_\beta^2 \right) \right)
\end{aligned}
$$

$$
1 = 2 s_{2\beta} s_W m_{u_{g3}} M_W^2 \delta m_{g3}^{u_g} - m_{u_{g3}}^2 \left(\begin{array}{l} c_\beta \left(4 (\delta s_W) s_\beta M_W^2 + s_W \left(4 (\delta s_\beta) M_W^2 - s_\beta \left((4 (\delta Z_e) + \delta Z_{AA} + \delta Z_{G^- G^-}) M_W^2 - 2 \delta M_W^2 \right) \right) \right) - \\ s_W M_W^2 \left((\delta Z_{H^- G^-}) c_\beta^2 + (\delta Z_{AG}) s_\beta^2 \right) \end{array} \right)
$$

$$
\underset{311}{C} \left(G^0, H^-, \tilde{u}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger} \right) = \left[\frac{e^2 (5)}{\sqrt{2} M_W^4 s_{2\beta}^2 s_W^3} \right]
$$

$$
\begin{aligned}
5 = & \left(\begin{array}{l} \left(\frac{1}{2} M_W^2 s_{2\beta}^2 - c_\beta^2 m_{u_{g3}}^2 - m_{d_{g4}}^2 s_\beta^2 \right) U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{d}_{g4}} + \\ m_{d_{g4}} m_{u_{g3}} U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{d}_{g4}} \end{array} \right) s_{2\beta} s_W \delta \mathrm{CKM}_{g3,g4}^* M_W^2 + \\
& \mathrm{CKM}_{g3,g4}^* \left((3) s_W - \left(\begin{array}{l} \left((2) c_\beta^2 + (1) s_\beta^2 \right) U_{s4,1}^{\tilde{d}_{g4}} - \\ \left(\frac{1}{4} s_{2\beta} s_W M_W^2 \right) \left(M_W^2 s_{2\beta}^2 - 2 \left(c_\beta^2 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^2 \right) \right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,1}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,1}^{\tilde{d}_{g4}} \right) \end{array} \right) U_{s3,1}^{\tilde{u}_{g3}*} - (4) U_{s4,2}^{\tilde{d}_{g4}} \right)
\end{aligned}
$$

$$
\begin{aligned}
4 = & 2 c_\beta \left(m_{d_{g4}} \left(m_{u_{g3}} \left((\delta s_\beta) s_W + 2 (\delta s_W) s_\beta \right) - s_W s_\beta \delta m_{g3}^{u_g} \right) - m_{u_{g3}} s_W s_\beta \delta m_{g4}^{d_g} \right) M_W^2 U_{s3,2}^{\tilde{u}_{g3}*} + \\
& \left(\begin{array}{l} \left(s_{2\beta} \delta M_W^2 + (2 (\delta c_\beta) - (4 (\delta Z_e) + \delta Z_{GG} + \delta Z_{H^- H^-}) c_\beta) s_\beta M_W^2 \right) U_{s3,2}^{\tilde{u}_{g3}*} - \\ \left(\frac{1}{2} s_{2\beta} M_W^2 \right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,2}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,2}^{\tilde{u}_{g3}*} \right) \end{array} \right) m_{d_{g4}} m_{u_{g3}} s_W
\end{aligned}
$$

$$\boxed{3} = \left(\begin{array}{l} \left(\frac{1}{4} M_{\mathrm{W}}^4 s_{2\beta}^3 U_{\mathrm{s4},1}^{\tilde{d}_{\mathrm{g4}}}\right) \left(\delta Z_{1,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}} U_{1,1}^{\tilde{u}_{\mathrm{g3}}*} + \delta Z_{2,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}} U_{2,1}^{\tilde{u}_{\mathrm{g3}}*}\right) + \\ \left(\frac{1}{2} m_{d_{\mathrm{g4}}} m_{u_{\mathrm{g3}}} U_{\mathrm{s3},2}^{\tilde{u}_{\mathrm{g3}}*}\right) \left(\delta \overline{Z}_{1,\mathrm{s4}}^{\tilde{d}_{\mathrm{g4}}} U_{1,2}^{\tilde{d}_{\mathrm{g4}}} + \delta \overline{Z}_{2,\mathrm{s4}}^{\tilde{d}_{\mathrm{g4}}} U_{2,2}^{\tilde{d}_{\mathrm{g4}}}\right) - \\ \left(\frac{1}{2} U_{\mathrm{s4},1}^{\tilde{d}_{\mathrm{g4}}}\right) \left(c_\beta^2 m_{u_{\mathrm{g3}}}^2 + m_{d_{\mathrm{g4}}}^2 s_\beta^2\right) \left(\delta Z_{1,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}} U_{1,1}^{\tilde{u}_{\mathrm{g3}}*} + \delta Z_{2,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}} U_{2,1}^{\tilde{u}_{\mathrm{g3}}*}\right) \end{array} \right) s_{2\beta} M_{\mathrm{W}}^2$$

$$\boxed{2} = m_{u_{\mathrm{g3}}}^2 \left(\begin{array}{l} s_{\mathrm{W}} M_{\mathrm{W}}^2 \left(\left(\delta Z_{\mathrm{AG}}\right) c_\beta^2 + \left(\delta Z_{\mathrm{G^-H^-}}\right) s_\beta^2 \right) - \\ c_\beta \left(4 \left(\delta s_{\mathrm{W}}\right) s_\beta M_{\mathrm{W}}^2 + s_{\mathrm{W}} \left(4 \left(\delta s_\beta\right) M_{\mathrm{W}}^2 - s_\beta \left(\left(4 \left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{GG}} + \delta Z_{\mathrm{H^-H^-}}\right) M_{\mathrm{W}}^2 - 2\delta M_{\mathrm{W}}^2 \right) \right) \right) \end{array} \right) + 2 s_{2\beta} s_{\mathrm{W}} m_{u_{\mathrm{g3}}} M_{\mathrm{W}}^2 \delta m_{\mathrm{g3}}^{u_{\mathrm{g}}}$$

$$\boxed{1} = \begin{array}{l} 2 m_{d_{\mathrm{g4}}} s_{2\beta} s_{\mathrm{W}} \delta m_{\mathrm{g4}}^{d_{\mathrm{g}}} M_{\mathrm{W}}^2 + \left(4 \left(\delta s_{\mathrm{W}}\right) s_{2\beta} - \left(\left(\delta Z_{\mathrm{AG}} - \delta Z_{\mathrm{G^-H^-}}\right) c_{2\beta} + \left(4 \left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{GG}} + \delta Z_{\mathrm{H^-H^-}}\right) s_{2\beta} \right) s_{\mathrm{W}} \right) c_\beta^2 M_{\mathrm{W}}^4 - \\ m_{d_{\mathrm{g4}}}^2 \left(\frac{s_{2\beta}}{2} \left(4 \left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 - s_{\mathrm{W}} \left(\left(4 \left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{GG}} + \delta Z_{\mathrm{H^-H^-}}\right) M_{\mathrm{W}}^2 - 2\delta M_{\mathrm{W}}^2 \right) \right) + s_{\mathrm{W}} M_{\mathrm{W}}^2 \left(4 \left(\delta c_\beta\right) s_\beta + \left(\delta Z_{\mathrm{G^-H^-}}\right) c_\beta^2 + \left(\delta Z_{\mathrm{AG}}\right) s_\beta^2 \right) \right) \end{array}$$

$$\underset{312}{C}\left(A^0, H^+, \tilde{d}_{\mathrm{g3}}^{\mathrm{s3}}, \tilde{u}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[-\frac{\sqrt{2} e^2}{M_{\mathrm{W}}^4 s_{2\beta}^3 s_{\mathrm{W}}^3} \left(\begin{array}{l} (\boxed{4}) \mathrm{CKM}_{\mathrm{g4,g3}} + \\ s_{2\beta} s_{\mathrm{W}} \left(\delta \mathrm{CKM}_{\mathrm{g4,g3}}\right) M_{\mathrm{W}}^2 \left(\frac{1}{4} c_{2\beta} M_{\mathrm{W}}^2 s_{2\beta}^2 - c_\beta^4 m_{u_{\mathrm{g4}}}^2 + m_{d_{\mathrm{g3}}}^2 s_\beta^4 \right) U_{\mathrm{s3},1}^{\tilde{d}_{\mathrm{g3}}*} U_{\mathrm{s4},1}^{\tilde{u}_{\mathrm{g4}}} \end{array} \right) \right]$$

$$\boxed{4} = \left(\tfrac{1}{2} s_{2\beta} s_{\mathrm{W}} M_{\mathrm{W}}^2\right) \left(\begin{array}{l} \left(\frac{1}{2} m_{d_{\mathrm{g3}}} m_{u_{\mathrm{g4}}} s_{2\beta} U_{\mathrm{s3},2}^{\tilde{d}_{\mathrm{g3}}*} U_{\mathrm{s4},2}^{\tilde{u}_{\mathrm{g4}}}\right) \left(\delta Z_{\mathrm{AG}} - \delta Z_{\mathrm{H^-G^-}}\right) + \\ \left(\frac{1}{4} c_{2\beta} M_{\mathrm{W}}^2 s_{2\beta}^2 - c_\beta^4 m_{u_{\mathrm{g4}}}^2 + m_{d_{\mathrm{g3}}}^2 s_\beta^4\right) \left(\delta Z_{1,\mathrm{s3}}^{\tilde{d}_{\mathrm{g3}}} U_{1,1}^{\tilde{d}_{\mathrm{g3}}*} + \delta Z_{2,\mathrm{s3}}^{\tilde{d}_{\mathrm{g3}}} U_{2,1}^{\tilde{d}_{\mathrm{g3}}*}\right) U_{\mathrm{s4},1}^{\tilde{u}_{\mathrm{g4}}} \end{array} \right) + (\boxed{3}) U_{\mathrm{s3},1}^{\tilde{d}_{\mathrm{g3}}*}$$

$$\boxed{3} = \begin{array}{l} -\left(\frac{1}{8} s_{2\beta} s_{\mathrm{W}} M_{\mathrm{W}}^2\right) \left(4 c_\beta^4 m_{u_{\mathrm{g4}}}^2 - c_{2\beta} M_{\mathrm{W}}^2 s_{2\beta}^2 - 4 m_{d_{\mathrm{g3}}}^2 s_\beta^4\right) \left(\delta \overline{Z}_{1,\mathrm{s4}}^{\tilde{u}_{\mathrm{g4}}} U_{1,1}^{\tilde{u}_{\mathrm{g4}}} + \delta \overline{Z}_{2,\mathrm{s4}}^{\tilde{u}_{\mathrm{g4}}} U_{2,1}^{\tilde{u}_{\mathrm{g4}}}\right) - \\ \left((\boxed{1}) c_\beta^4 - \left((\boxed{2}) s_\beta - \left(c_{2\beta} \left(4 \left(\delta s_{\mathrm{W}}\right) - \left(4 \left(\delta Z_{\mathrm{e}}\right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{AA}}\right) s_{\mathrm{W}}\right) - \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{H^-G^-}}\right) s_{2\beta} s_{\mathrm{W}}\right) c_\beta^3 M_{\mathrm{W}}^4 \right) s_\beta^3 \right) U_{\mathrm{s4},1}^{\tilde{u}_{\mathrm{g4}}} \end{array}$$

$$\boxed{2} = 2 s_{2\beta} s_{\mathrm{W}} m_{d_{\mathrm{g3}}} M_{\mathrm{W}}^2 \delta m_{\mathrm{g3}}^{d_{\mathrm{g}}} - m_{d_{\mathrm{g3}}}^2 \left(\begin{array}{l} \frac{s_{2\beta}}{2} \left(4 \left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 - s_{\mathrm{W}} \left(\left(4 \left(\delta Z_{\mathrm{e}}\right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{AA}}\right) M_{\mathrm{W}}^2 - 2\delta M_{\mathrm{W}}^2 \right) \right) + \\ s_{\mathrm{W}} \left(4 \left(\delta c_\beta\right) s_\beta + \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{H^-G^-}}\right) c_\beta^2 \right) M_{\mathrm{W}}^2 \end{array} \right)$$

$$\boxed{1} = 2 s_{2\beta} s_{\mathrm{W}} m_{u_{\mathrm{g4}}} M_{\mathrm{W}}^2 \delta m_{\mathrm{g4}}^{u_{\mathrm{g}}} - m_{u_{\mathrm{g4}}}^2 \left(\begin{array}{l} c_\beta \left(4 \left(\delta s_{\mathrm{W}}\right) s_\beta M_{\mathrm{W}}^2 + s_{\mathrm{W}} \left(4 \left(\delta s_\beta\right) M_{\mathrm{W}}^2 - s_\beta \left(\left(4 \left(\delta Z_{\mathrm{e}}\right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{AA}}\right) M_{\mathrm{W}}^2 - 2\delta M_{\mathrm{W}}^2 \right) \right) \right) - \\ \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{H^-G^-}}\right) s_{\mathrm{W}} M_{\mathrm{W}}^2 s_\beta^2 \end{array} \right)$$

$$\underset{313}{C}\left(G^0, G^+, \tilde{d}_{\mathrm{g3}}^{\mathrm{s3}}, \tilde{u}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[\frac{e^2}{2\sqrt{2} s_{2\beta} M_{\mathrm{W}}^4 s_{\mathrm{W}}^3} \left((\boxed{3}) \mathrm{CKM}_{\mathrm{g4,g3}} - s_{2\beta} s_{\mathrm{W}} \left(\delta \mathrm{CKM}_{\mathrm{g4,g3}}\right) M_{\mathrm{W}}^2 \left(m_{d_{\mathrm{g3}}}^2 - m_{u_{\mathrm{g4}}}^2 - c_{2\beta} M_{\mathrm{W}}^2 \right) U_{\mathrm{s3},1}^{\tilde{d}_{\mathrm{g3}}*} U_{\mathrm{s4},1}^{\tilde{u}_{\mathrm{g4}}} \right) \right]$$

$$
\begin{aligned}
3 = & -U_{s3,1}^{\tilde{d}_{g3}*}\left(\left(\frac{1}{2}s_{2\beta}s_W M_W^2\right)\left(m_{d_{g3}}^2 - m_{u_{g4}}^2 - c_{2\beta}M_W^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,1}^{\tilde{u}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,1}^{\tilde{u}_{g4}}\right) + (2)U_{s4,1}^{\tilde{u}_{g4}}\right) + \\
& \left(\begin{array}{l}(\delta Z_{AG} - \delta Z_{G^-H^-})\, m_{d_{g3}} m_{u_{g4}} U_{s3,2}^{\tilde{d}_{g3}*} U_{s4,2}^{\tilde{u}_{g4}} - \\ \left(\frac{1}{2}s_{2\beta}U_{s4,1}^{\tilde{u}_{g4}}\right)\left(m_{d_{g3}}^2 - m_{u_{g4}}^2 - c_{2\beta}M_W^2\right)\left(\delta Z_{1,s3}^{\tilde{d}_{g3}}U_{1,1}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}}U_{2,1}^{\tilde{d}_{g3}*}\right)\end{array}\right) s_W M_W^2
\end{aligned}
$$

$$
\begin{aligned}
2 = & (1)c_\beta + \left(\frac{1}{2}s_{2\beta}M_W^4\right)\left((\delta Z_{AG} + \delta Z_{G^-H^-})\, s_{2\beta}s_W + (4(\delta s_W) - (4(\delta Z_e) + \delta Z_{GG} + \delta Z_{G^-G^-})\, s_W)\left(c_\beta^2 - s_\beta^2\right)\right) - \\
& s_W m_{d_{g3}}^2\left(s_{2\beta}\delta M_W^2 + \left(\frac{1}{2}M_W^2\right)\left(-(4(\delta Z_e) + \delta Z_{GG} + \delta Z_{G^-G^-})\, s_{2\beta} + 8(\delta c_\beta)\, s_\beta + 2(\delta Z_{AG} + \delta Z_{G^-H^-})\, s_\beta^2\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = & -s_\beta\left(4m_{d_{g3}}\left((\delta s_W)\, m_{d_{g3}} - s_W\delta m_{g3}^{d_g}\right) + 4m_{u_{g4}}s_W\delta m_{g4}^{u_g}\right)M_W^2 + \\
& m_{u_{g4}}^2\left(4(\delta s_W)\, s_\beta M_W^2 + s_W\left(2s_\beta\delta M_W^2 + (4(\delta s_\beta) - (\delta Z_{AG} + \delta Z_{G^-H^-})\, c_\beta - (4(\delta Z_e) + \delta Z_{GG} + \delta Z_{G^-G^-})\, s_\beta)\, M_W^2\right)\right)
\end{aligned}
$$

$$
\underset{314}{C}\left(A^0, G^+, \tilde{d}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\frac{e^2}{\sqrt{2}M_W^4 s_{2\beta}^2 s_W^3}\left(\begin{array}{l}(4)\mathrm{CKM}_{g4,g3} - \\ \left(\begin{array}{l}\left(\frac{1}{2}M_W^2 s_{2\beta}^2 - c_\beta^2 m_{u_{g4}}^2 - m_{d_{g3}}^2 s_\beta^2\right)U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{u}_{g4}} - \\ m_{d_{g3}}m_{u_{g4}}U_{s3,2}^{\tilde{d}_{g3}*}U_{s4,2}^{\tilde{u}_{g4}}\end{array}\right) s_{2\beta}s_W\left(\delta\mathrm{CKM}_{g4,g3}\right)M_W^2\end{array}\right)\right]
$$

$$
\begin{aligned}
4 = & -(3)U_{s4,2}^{\tilde{u}_{g4}} + \\
& U_{s3,1}^{\tilde{d}_{g3}*}\left(\left((1)c_\beta^2 + (2)s_\beta^2\right)U_{s4,1}^{\tilde{u}_{g4}} - \left(\frac{1}{4}s_{2\beta}s_W M_W^2\right)\left(M_W^2 s_{2\beta}^2 - 2\left(c_\beta^2 m_{u_{g4}}^2 + m_{d_{g3}}^2 s_\beta^2\right)\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,1}^{\tilde{u}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,1}^{\tilde{u}_{g4}}\right)\right) + \\
& \left(\begin{array}{l}\left(\frac{1}{2}m_{d_{g3}}m_{u_{g4}}U_{s3,2}^{\tilde{d}_{g3}*}\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,2}^{\tilde{u}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,2}^{\tilde{u}_{g4}}\right) - \\ \left(\frac{1}{4}U_{s4,1}^{\tilde{u}_{g4}}\right)\left(M_W^2 s_{2\beta}^2 - 2\left(c_\beta^2 m_{u_{g4}}^2 + m_{d_{g3}}^2 s_\beta^2\right)\right)\left(\delta Z_{1,s3}^{\tilde{d}_{g3}}U_{1,1}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}}U_{2,1}^{\tilde{d}_{g3}*}\right)\end{array}\right) s_{2\beta}s_W M_W^2
\end{aligned}
$$

$$
\begin{aligned}
3 = & -2c_\beta\left(m_{u_{g4}}s_W s_\beta\delta m_{g3}^{d_g} - m_{d_{g3}}\left(m_{u_{g4}}\left((\delta s_\beta)\, s_W + 2(\delta s_W)\, s_\beta\right) - s_W s_\beta\delta m_{g4}^{u_g}\right)\right)M_W^2 U_{s3,2}^{\tilde{d}_{g3}*} + \\
& \left(\begin{array}{l}\left(s_{2\beta}\delta M_W^2 + (2(\delta c_\beta) - (4(\delta Z_e) + \delta Z_{AA} + \delta Z_{G^-G^-})\, c_\beta)\, s_\beta M_W^2\right)U_{s3,2}^{\tilde{d}_{g3}*} - \\ \left(\frac{1}{2}s_{2\beta}M_W^2\right)\left(\delta Z_{1,s3}^{\tilde{d}_{g3}}U_{1,2}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}}U_{2,2}^{\tilde{d}_{g3}*}\right)\end{array}\right) m_{d_{g3}}m_{u_{g4}}s_W
\end{aligned}
$$

$$
\begin{aligned}
2 = & 2m_{d_{g3}}s_{2\beta}s_W\delta m_{g3}^{d_g}M_W^2 + (4(\delta s_W)\, s_{2\beta} - ((4(\delta Z_e) + \delta Z_{AA} + \delta Z_{G^-G^-})\, s_{2\beta} - (\delta Z_{AG} - \delta Z_{G^-H^-})\, c_{2\beta})\, s_W)\, c_\beta^2 M_W^4 - \\
& m_{d_{g3}}^2\left(\frac{s_{2\beta}}{2}\left(4(\delta s_W)\, M_W^2 - s_W\left((4(\delta Z_e) + \delta Z_{AA} + \delta Z_{G^-G^-})\, M_W^2 - 2\delta M_W^2\right)\right) + s_W M_W^2\left(4(\delta c_\beta)\, s_\beta + (\delta Z_{AG})\, c_\beta^2 + (\delta Z_{G^-H^-})\, s_\beta^2\right)\right)
\end{aligned}
$$

$$
\begin{aligned}
1 = & 2s_{2\beta}s_W m_{u_{g4}}M_W^2\delta m_{g4}^{u_g} - m_{u_{g4}}^2\left(\begin{array}{l}c_\beta\left(4(\delta s_W)\, s_\beta M_W^2 + s_W\left(4(\delta s_\beta)\, M_W^2 - s_\beta\left((4(\delta Z_e) + \delta Z_{AA} + \delta Z_{G^-G^-})\, M_W^2 - 2\delta M_W^2\right)\right)\right) - \\ s_W M_W^2\left((\delta Z_{G^-H^-})\, c_\beta^2 + (\delta Z_{AG})\, s_\beta^2\right)\end{array}\right)
\end{aligned}
$$

$$\underset{315}{C}\left(G^0, H^+, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{e^2(5)}{\sqrt{2}M_W^4 s_{2\beta}^2 s_W^3} \right]$$

$$5 = \left(\begin{array}{l} \left(\frac{1}{2}M_W^2 s_{2\beta}^2 - c_\beta^2 m_{u_{g4}}^2 - m_{d_{g3}}^2 s_\beta^2\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ m_{d_{g3}} m_{u_{g4}} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) (\delta \mathrm{CKM}_{g4,g3})\, s_{2\beta} s_W M_W^2 +$$
$$\mathrm{CKM}_{g4,g3} \left((3) s_W - \left(\begin{array}{l} \left((2) c_\beta^2 + (1) s_\beta^2\right) U^{\tilde{u}_{g4}}_{s4,1} - \\ \left(\frac{1}{4} s_{2\beta} s_W M_W^2\right) \left(M_W^2 s_{2\beta}^2 - 2\left(c_\beta^2 m_{u_{g4}}^2 + m_{d_{g3}}^2 s_\beta^2\right)\right) \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,1}\right) \end{array} \right) U^{\tilde{d}_{g3}*}_{s3,1} - (4) U^{\tilde{u}_{g4}}_{s4,2} \right)$$

$$4 = \left(\begin{array}{l} -2c_\beta \left(m_{u_{g4}} s_W s_\beta \delta m^{d_g}_{g3} - m_{d_{g3}} \left(m_{u_{g4}} \left((\delta s_\beta) s_W + 2 (\delta s_W) s_\beta \right) - s_W s_\beta \delta m^{u_g}_{g4} \right) \right) M_W^2 U^{\tilde{d}_{g3}*}_{s3,2} + \\ \left(\begin{array}{l} \left(s_{2\beta} \delta M_W^2 + \left(2(\delta c_\beta) - \left(4(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + \delta Z_{GG}\right) c_\beta\right) s_\beta M_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,2} - \\ \left(\frac{1}{2} s_{2\beta} M_W^2\right) \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,2} \right) \end{array} \right) m_{d_{g3}} m_{u_{g4}} s_W \end{array} \right)$$

$$3 = \left(\begin{array}{l} \left(\frac{1}{4} M_W^4 s_{2\beta}^3 U^{\tilde{u}_{g4}}_{s4,1}\right) \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1} \right) + \\ \left(\begin{array}{l} \left(\frac{1}{2} m_{d_{g3}} m_{u_{g4}} U^{\tilde{d}_{g3}*}_{s3,2}\right) \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,2} \right) - \\ \left(\frac{1}{2} U^{\tilde{u}_{g4}}_{s4,1}\right) \left(c_\beta^2 m_{u_{g4}}^2 + m_{d_{g3}}^2 s_\beta^2\right) \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1} \right) \end{array} \right) s_{2\beta} M_W^2 \end{array} \right)$$

$$2 = 2 s_{2\beta} s_W m_{u_{g4}} M_W^2 \delta m^{u_g}_{g4} - m_{u_{g4}}^2 \left(\begin{array}{l} c_\beta \left(4(\delta s_W) s_\beta M_W^2 + s_W \left(4(\delta s_\beta) M_W^2 - s_\beta \left(\left(4(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + \delta Z_{GG}\right) M_W^2 - 2\delta M_W^2 \right) \right) \right) - \\ s_W M_W^2 \left((\delta Z_{AG}) c_\beta^2 + (\delta Z_{H^-G^-}) s_\beta^2 \right) \end{array} \right)$$

$$1 = \left(\begin{array}{l} 2 m_{d_{g3}} s_{2\beta} s_W \delta m^{d_g}_{g3} M_W^2 + \left(4(\delta s_W) s_{2\beta} - \left((\delta Z_{AG} - \delta Z_{H^-G^-}) c_{2\beta} + \left(4(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + \delta Z_{GG}\right) s_{2\beta} \right) s_W \right) c_\beta^2 M_W^4 - \\ m_{d_{g3}}^2 \left(\frac{s_{2\beta}}{2} \left(4(\delta s_W) M_W^2 - s_W \left(\left(4(\delta Z_e) + \delta\overline{Z}_{H^-H^-} + \delta Z_{GG}\right) M_W^2 - 2\delta M_W^2 \right) \right) + s_W M_W^2 \left(4(\delta c_\beta) s_\beta + (\delta Z_{H^-G^-}) c_\beta^2 + (\delta Z_{AG}) s_\beta^2 \right) \right) \end{array} \right)$$

$$\underset{328}{C}\left(H^0, H^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{\sqrt{2} i e^2}{M_W^4 s_{2\beta}^3 s_W^3} \left(\begin{array}{l} (6) \mathrm{CKM}^*_{g3,g4} + \\ \left(\frac{1}{4} s_{2\beta} s_W M_W^2 \delta \mathrm{CKM}^*_{g3,g4}\right) \left(\begin{array}{l} \left(s_{\alpha+\beta} M_W^2 s_{2\beta}^2 - 4\left(s_\alpha c_\beta^3 m_{u_{g3}}^2 + c_\alpha m_{d_{g4}}^2 s_\beta^3 \right) \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} - \\ 2 c_{\beta-\alpha} m_{d_{g4}} m_{u_{g3}} s_{2\beta} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) \end{array} \right) \right]$$

$$6 = \left(\begin{array}{l} \frac{s_{2\beta}}{2} \left((5) s_W M_W^2 - (4) U^{\tilde{u}_{g3}*}_{s3,2} \right) - \\ \left(\begin{array}{l} \left((2) c_\beta^3 + (1) s_\beta^3\right) U^{\tilde{d}_{g4}}_{s4,1} - \\ \left(\frac{1}{8} s_{2\beta} s_W M_W^2\right) \left(s_{\alpha+\beta} M_W^2 s_{2\beta}^2 - 4\left(s_\alpha c_\beta^3 m_{u_{g3}}^2 + c_\alpha m_{d_{g4}}^2 s_\beta^3 \right) \right) \left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1} \right) \end{array} \right) U^{\tilde{u}_{g3}*}_{s3,1} \end{array} \right)$$

$$5 = \left(\frac{1}{4}U^{\tilde{d}_{g4}}_{s4,1}\right)\left(s_{\alpha+\beta}M_W^2 s_{2\beta}^2 - 4\left(s_\alpha c_\beta^3 m^2_{u_{g3}} + c_\alpha m^2_{d_{g4}} s_\beta^3\right)\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,1}\right) - \left(\frac{1}{2}c_{\beta-\alpha}m_{d_{g4}}m_{u_{g3}}s_{2\beta}U^{\tilde{d}_{g4}}_{s4,2}\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,2}\right)$$

$$4 = \left(\frac{1}{2}c_{\beta-\alpha}m_{d_{g4}}m_{u_{g3}}s_{2\beta}s_W M_W^2\right)\left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4}U^{\tilde{d}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4}U^{\tilde{d}_{g4}}_{2,2}\right) - \left(\left(\frac{1}{2}m_{d_{g4}}\right)\left((3)m_{u_{g3}} - 2c_{\beta-\alpha}s_{2\beta}s_W\delta m^{u_g}_{g3}M_W^2\right) - c_{\beta-\alpha}m_{u_{g3}}s_{2\beta}s_W\delta m^{d_g}_{g4}M_W^2\right)U^{\tilde{d}_{g4}}_{s4,2}$$

$$3 = -\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right)s_{2\beta}s_W s_{\beta-\alpha}M_W^2 + c_{\beta-\alpha}\left(4\left(\delta s_W\right)s_{2\beta}M_W^2 + s_W\left(2s_{2\beta}\delta M_W^2 + \left(4\left(\left(\delta s_\beta\right)c_\beta + \left(\delta c_\beta\right)s_\beta\right) - \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{H^-H^-}\right)s_{2\beta}\right)M_W^2\right)\right)$$

$$2 = m^2_{u_{g3}}\left(\left(\delta Z_{G^-H^-}\right)s_W s_\alpha M_W^2 s_\beta^2 - \left(\left(4\left(\delta s_W\right)s_\alpha s_\beta M_W^2 + \left(\left(4\left(\delta s_\beta\right)s_\alpha M_W^2 - \left(s_\beta\left(\left(\left(\delta Z_{hH}\right)c_\alpha + \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{H^-H^-}\right)s_\alpha\right)M_W^2 - 2s_\alpha\delta M_W^2\right)\right)\right)s_W\right)c_\beta\right) + 2s_{2\beta}s_\alpha s_W m_{u_{g3}}M_W^2\delta m^{u_g}_{g3}$$

$$1 = 2c_\alpha m_{d_{g4}}s_{2\beta}s_W\delta m^{d_g}_{g4}M_W^2 + \left(4\left(\delta s_W\right)s_{\alpha+\beta} - s_W\left(\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right)c_{\alpha+\beta} + \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{H^-H^-}\right)s_{\alpha+\beta}\right)\right)c_\beta^3 M_W^4 - \left(\frac{1}{2}s_{2\beta}s_W s_\alpha\left(\delta Z_{hH}\right)M_W^2 + \left(\left(s_W\left(4\left(\delta c_\beta\right)s_\beta + \left(\delta Z_{G^-H^-}\right)c_\beta^2\right)M_W^2 + \frac{s_{2\beta}}{2}\left(4\left(\delta s_W\right)M_W^2 - s_W\left(\left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{H^-H^-}\right)M_W^2 - 2\delta M_W^2\right)\right)\right)c_\alpha\right)m^2_{d_{g4}}$$

$$\underset{329}{C}\left(H^0, G^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[\frac{\sqrt{2}ie^2}{M_W^4 s_{2\beta}^3 s_W^3}\left((6)\mathrm{CKM}^*_{g3,g4} - \left(\frac{1}{2}s_W M_W^2 s_{2\beta}^2\delta\mathrm{CKM}^*_{g3,g4}\right)\left(\left(c_\alpha s_\beta m^2_{d_{g4}} - c_\beta\left(s_\alpha m^2_{u_{g3}} + c_{\alpha+\beta}s_\beta M_W^2\right)\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1} - m_{d_{g4}}m_{u_{g3}}s_{\beta-\alpha}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\right)\right)\right]$$

$$6 = \frac{s_{2\beta}}{2}\left(\frac{1}{2}(5)s_{2\beta}s_W M_W^2 + (4)U^{\tilde{u}_{g3}*}_{s3,2}\right) + \left(s_{2\beta}\left(\frac{1}{2}(1)m_{u_{g3}}c_\beta^2 - (2)s_\beta^2\right)U^{\tilde{d}_{g4}}_{s4,1} - \left(\frac{1}{8}s_W M_W^2 s_{2\beta}^2\right)\left(2c_\alpha s_\beta m^2_{d_{g4}} - 2c_\beta s_\alpha m^2_{u_{g3}} - c_{\alpha+\beta}s_{2\beta}M_W^2\right)\left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4}U^{\tilde{d}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4}U^{\tilde{d}_{g4}}_{2,1}\right)\right)U^{\tilde{u}_{g3}*}_{s3,1}$$

$$5 = -\left(c_\alpha s_\beta m^2_{d_{g4}} - c_\beta\left(s_\alpha m^2_{u_{g3}} + c_{\alpha+\beta}s_\beta M_W^2\right)\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,1}\right)U^{\tilde{d}_{g4}}_{s4,1} + m_{d_{g4}}m_{u_{g3}}s_{\beta-\alpha}\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,2}\right)U^{\tilde{d}_{g4}}_{s4,2}$$

$$\boxed{4} = \left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} s_{2\beta} s_W s_{\beta\text{-}\alpha} M_W^2\right) \left(\delta \overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,2} + \delta \overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,2}\right) - \left(m_{d_{g4}} \left((\boxed{3}) m_{u_{g3}} - s_{2\beta} s_W s_{\beta\text{-}\alpha} \delta m^{u_g}_{g3} M_W^2\right) - m_{u_{g3}} s_{2\beta} s_W s_{\beta\text{-}\alpha} \delta m^{d_g}_{g4} M_W^2\right) U^{\tilde{d}_{g4}}_{s4,2}$$

$$\boxed{3} = c_\beta \left(\begin{array}{l} 4 \left(\delta s_W\right) s_\beta s_{\beta\text{-}\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 \left(\delta s_\beta\right) s_{\beta\text{-}\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 s_{\beta\text{-}\alpha} \delta M_W^2 - \\ \left(\left(4 \left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^- G^-}\right) s_{\beta\text{-}\alpha} - \left(\delta Z_{hH} - \delta Z_{H^- G^-}\right) c_{\beta\text{-}\alpha}\right) M_W^2 \end{array} \right) s_\beta \end{array} \right) s_W \end{array} \right) + 2 s_\beta s_{\beta\text{-}\alpha} s_W M_W^2 \left(\delta c_\beta\right)$$

$$\boxed{2} = \left(\frac{1}{2} c_\beta^2 M_W^4\right) \left(\begin{array}{l} c_{\alpha+\beta} \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^- G^-}\right) s_W\right) + \\ \left(\delta Z_{hH} + \delta Z_{H^- G^-}\right) s_W s_{\alpha+\beta} \end{array} \right) + 2 c_\alpha c_\beta m_{d_{g4}} s_W \delta m^{d_g}_{g4} M_W^2 - \left(\frac{1}{2} m_{d_{g4}}^2\right) \left(\left(\begin{array}{l} c_\beta \left(4 \left(\delta s_W\right) M_W^2 - s_W \left(\left(4 \left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^- G^-}\right) M_W^2 - 2 \delta M_W^2\right)\right) + \\ s_W \left(4 \left(\delta c_\beta\right) + \left(\delta Z_{H^- G^-}\right) s_\beta\right) M_W^2 \end{array} \right) c_\alpha + \left(\delta Z_{hH}\right) c_\beta s_W s_\alpha M_W^2 \right)$$

$$\boxed{1} = 4 s_\alpha s_\beta s_W M_W^2 \delta m^{u_g}_{g3} - m_{u_{g3}} \left(s_W \left(\begin{array}{l} s_\alpha \left(2 s_\beta \delta M_W^2 + 4 \left(\delta s_\beta\right) M_W^2\right) - \\ \left(\left(\delta Z_{hH}\right) c_\alpha + \left(4 \left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^- G^-}\right) s_\alpha\right) s_\beta + \\ \left(\delta Z_{H^- G^-}\right) c_\beta s_\alpha \end{array} \right) M_W^2 \right) + 4 s_\alpha s_\beta M_W^2 \left(\delta s_W\right)$$

$$\underset{330}{C}\left(H^0, H^+, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{\sqrt{2} i e^2}{M_W^4 s_{2\beta}^3 s_W^3} \left(\begin{array}{l} (\boxed{6}) \mathrm{CKM}_{g4,g3} + \\ \left(\frac{1}{4} s_{2\beta} s_W \left(\delta \mathrm{CKM}_{g4,g3}\right) M_W^2\right) \left(\begin{array}{l} \left(s_{\alpha+\beta} M_W^2 s_{2\beta}^2 - 4 \left(s_\alpha c_\beta^3 m_{u_{g4}}^2 + c_\alpha m_{d_{g3}}^2 s_\beta^3\right)\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} - \\ 2 c_{\beta\text{-}\alpha} m_{d_{g3}} m_{u_{g4}} s_{2\beta} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) \end{array} \right) \right]$$

$$\boxed{6} = \frac{s_{2\beta}}{2} \left((\boxed{5}) s_W M_W^2 - (\boxed{4}) U^{\tilde{d}_{g3}*}_{s3,2} \right) - \left(\begin{array}{l} \left((\boxed{1}) c_\beta^3 + (\boxed{2}) s_\beta^3\right) U^{\tilde{u}_{g4}}_{s4,1} - \\ \left(\frac{1}{8} s_{2\beta} s_W M_W^2\right) \left(s_{\alpha+\beta} M_W^2 s_{2\beta}^2 - 4 \left(s_\alpha c_\beta^3 m_{u_{g4}}^2 + c_\alpha m_{d_{g3}}^2 s_\beta^3\right)\right) \left(\delta \overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,1} + \delta \overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,1}\right) \end{array} \right) U^{\tilde{d}_{g3}*}_{s3,1}$$

$$\boxed{5} = \left(\frac{1}{4} U^{\tilde{u}_{g4}}_{s4,1}\right) \left(s_{\alpha+\beta} M_W^2 s_{2\beta}^2 - 4 \left(s_\alpha c_\beta^3 m_{u_{g4}}^2 + c_\alpha m_{d_{g3}}^2 s_\beta^3\right)\right) \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1}\right) - \left(\frac{1}{2} c_{\beta\text{-}\alpha} m_{d_{g3}} m_{u_{g4}} s_{2\beta} U^{\tilde{u}_{g4}}_{s4,2}\right) \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,2}\right)$$

$$\boxed{4} = \begin{pmatrix} \left(\frac{1}{2} c_{\beta\text{-}\alpha} m_{d_{g3}} m_{u_{g4}} s_{2\beta} s_W M_W^2\right) \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,2}\right) + \\ \left(c_{\beta\text{-}\alpha} m_{u_{g4}} s_{2\beta} s_W \delta m^{d_g}_{g3} M_W^2 - \left(\frac{1}{2} m_{d_{g3}}\right) \left((\boxed{3}) m_{u_{g4}} - 2 c_{\beta\text{-}\alpha} s_{2\beta} s_W \delta m^{u_g}_{g4} M_W^2\right)\right) U^{\tilde{u}_{g4}}_{s4,2} \end{pmatrix}$$

$$\boxed{3} = \begin{array}{l} c_{\beta\text{-}\alpha} \left(4 \left(\delta s_W\right) s_{2\beta} M_W^2 + s_W \left(2 s_{2\beta} \delta M_W^2 + \left(4 \left(\left(\delta s_\beta\right) c_\beta + \left(\delta c_\beta\right) s_\beta\right) - \left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^- H^-} + \delta Z_{HH}\right) s_{2\beta}\right) M_W^2\right)\right) - \\ \left(\delta Z_{hH} + \delta Z_{H^- G^-}\right) s_{2\beta} s_W s_{\beta\text{-}\alpha} M_W^2 \end{array}$$

$$\boxed{2} = \begin{array}{l} 2 c_\alpha m_{d_{g3}} s_{2\beta} s_W \delta m^{d_g}_{g3} M_W^2 + \left(4 \left(\delta s_W\right) s_{\alpha+\beta} - s_W \left(\left(\delta Z_{hH} - \delta Z_{H^- G^-}\right) c_{\alpha+\beta} + \left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^- H^-} + \delta Z_{HH}\right) s_{\alpha+\beta}\right)\right) c_\beta^3 M_W^4 - \\ \left(\frac{1}{2} s_{2\beta} s_W s_\alpha \left(\delta Z_{hH}\right) M_W^2 + \left(\begin{array}{l} \frac{s_{2\beta}}{2} \left(4 \left(\delta s_W\right) M_W^2 - s_W \left(\left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^- H^-} + \delta Z_{HH}\right) M_W^2 - 2 \delta M_W^2\right)\right) + \\ s_W \left(4 \left(\delta c_\beta\right) s_\beta + \left(\delta Z_{H^- G^-}\right) c_\beta^2\right) M_W^2 \end{array}\right) c_\alpha\right) m_{d_{g3}}^2 \end{array}$$

$$\boxed{1} = m_{u_{g4}}^2 \left(\begin{array}{l} \left(\delta Z_{H^- G^-}\right) s_W s_\alpha M_W^2 s_\beta^2 - \\ \left(\begin{array}{l} 4 \left(\delta s_W\right) s_\alpha s_\beta M_W^2 + \\ \left(\begin{array}{l} 4 \left(\delta s_\beta\right) s_\alpha M_W^2 - \\ s_\beta \left(\left(\left(\delta Z_{hH}\right) c_\alpha + \left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^- H^-} + \delta Z_{HH}\right) s_\alpha\right) M_W^2 - 2 s_\alpha \delta M_W^2\right) \end{array}\right) s_W \end{array}\right) c_\beta \end{array}\right) + 2 s_{2\beta} s_\alpha s_W m_{u_{g4}} M_W^2 \delta m^{u_g}_{g4}$$

$$\underset{331}{C}\left(H^0, G^+, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[\frac{\sqrt{2} i e^2}{M_W^4 s_{2\beta}^3 s_W^3} \left(\begin{array}{l} (\boxed{6}) \mathrm{CKM}_{g4,g3} - \\ \left(\frac{1}{2} s_W \left(\delta \mathrm{CKM}_{g4,g3}\right) M_W^2 s_{2\beta}^2\right) \left(\begin{array}{l} \left(c_\alpha s_\beta m_{d_{g3}}^2 - c_\beta \left(s_\alpha m_{u_{g4}}^2 + c_{\alpha+\beta} s_\beta M_W^2\right)\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} - \\ m_{d_{g3}} m_{u_{g4}} s_{\beta\text{-}\alpha} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array}\right) \end{array}\right)\right]$$

$$\boxed{6} = \begin{array}{l} \frac{s_{2\beta}}{2} \left(\frac{1}{2} (\boxed{5}) s_{2\beta} s_W M_W^2 + (\boxed{4}) U^{\tilde{d}_{g3}*}_{s3,2}\right) + \\ \left(\begin{array}{l} s_{2\beta} \left(\frac{1}{2} (\boxed{1}) m_{u_{g4}} c_\beta^2 - (\boxed{2}) s_\beta^2\right) U^{\tilde{u}_{g4}}_{s4,1} - \\ \left(\frac{1}{8} s_W M_W^2 s_{2\beta}^2\right) \left(2 c_\alpha s_\beta m_{d_{g3}}^2 - 2 c_\beta s_\alpha m_{u_{g4}}^2 - c_{\alpha+\beta} s_{2\beta} M_W^2\right) \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,1}\right) \end{array}\right) U^{\tilde{d}_{g3}*}_{s3,1} \end{array}$$

$$\boxed{5} = \begin{array}{l} - \left(c_\alpha s_\beta m_{d_{g3}}^2 - c_\beta \left(s_\alpha m_{u_{g4}}^2 + c_{\alpha+\beta} s_\beta M_W^2\right)\right) \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1}\right) U^{\tilde{u}_{g4}}_{s4,1} + \\ m_{d_{g3}} m_{u_{g4}} s_{\beta\text{-}\alpha} \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,2}\right) U^{\tilde{u}_{g4}}_{s4,2} \end{array}$$

$$\boxed{4} = \begin{pmatrix} \left(\frac{1}{2} m_{d_{g3}} m_{u_{g4}} s_{2\beta} s_W s_{\beta\text{-}\alpha} M_W^2\right) \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,2}\right) + \\ \left(m_{u_{g4}} s_{2\beta} s_W s_{\beta\text{-}\alpha} \delta m^{d_g}_{g3} M_W^2 - m_{d_{g3}} \left((\boxed{3}) m_{u_{g4}} - s_{2\beta} s_W s_{\beta\text{-}\alpha} \delta m^{u_g}_{g4} M_W^2\right)\right) U^{\tilde{u}_{g4}}_{s4,2} \end{pmatrix}$$

$$
\boxed{3} = c_\beta \left(\begin{array}{l} 4\left(\delta s_{\mathrm{W}}\right) s_\beta s_{\beta\text{-}\alpha} M_{\mathrm{W}}^2 + \\ \left(\begin{array}{l} 2\left(\delta s_\beta\right) s_{\beta\text{-}\alpha} M_{\mathrm{W}}^2 + \\ \left(\begin{array}{l} 2 s_{\beta\text{-}\alpha} \delta M_{\mathrm{W}}^2 - \\ \left(\left(4\left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{HH}} + \delta Z_{\mathrm{G^-G^-}}\right) s_{\beta\text{-}\alpha} - \left(\delta Z_{\mathrm{hH}} - \delta Z_{\mathrm{G^-H^-}}\right) c_{\beta\text{-}\alpha} \right) M_{\mathrm{W}}^2 \end{array} \right) s_\beta \end{array} \right) s_{\mathrm{W}} \end{array} \right) + 2 s_\beta s_{\beta\text{-}\alpha} s_{\mathrm{W}} M_{\mathrm{W}}^2 \left(\delta c_\beta\right)
$$

$$
\boxed{2} = \begin{array}{l} \left(\frac{1}{2} c_\beta^2 M_{\mathrm{W}}^4 \right) \left(\begin{array}{l} c_{\alpha+\beta} \left(4\left(\delta s_{\mathrm{W}}\right) - \left(4\left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{HH}} + \delta Z_{\mathrm{G^-G^-}}\right) s_{\mathrm{W}}\right) + \\ \left(\delta Z_{\mathrm{hH}} + \delta Z_{\mathrm{G^-H^-}}\right) s_{\mathrm{W}} s_{\alpha+\beta} \end{array} \right) + 2 c_\alpha c_\beta m_{d_{\mathrm{g3}}} s_{\mathrm{W}} \delta m_{\mathrm{g3}}^{d_{\mathrm{g}}} M_{\mathrm{W}}^2 - \\ \left(\frac{1}{2} m_{d_{\mathrm{g3}}}^2 \right) \left(\left(\begin{array}{l} c_\beta \left(4\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 - s_{\mathrm{W}} \left(\left(4\left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{HH}} + \delta Z_{\mathrm{G^-G^-}}\right) M_{\mathrm{W}}^2 - 2\delta M_{\mathrm{W}}^2 \right) \right) + \\ s_{\mathrm{W}} \left(4\left(\delta c_\beta\right) + \left(\delta Z_{\mathrm{G^-H^-}}\right) s_\beta\right) M_{\mathrm{W}}^2 \end{array} \right) c_\alpha + \left(\delta Z_{\mathrm{hH}}\right) c_\beta s_{\mathrm{W}} s_\alpha M_{\mathrm{W}}^2 \right) \end{array}
$$

$$
\boxed{1} = 4 s_\alpha s_\beta s_{\mathrm{W}} M_{\mathrm{W}}^2 \delta m_{\mathrm{g4}}^{u_{\mathrm{g}}} - m_{u_{\mathrm{g4}}} \left(s_{\mathrm{W}} \left(\begin{array}{l} s_\alpha \left(2 s_\beta \delta M_{\mathrm{W}}^2 + 4\left(\delta s_\beta\right) M_{\mathrm{W}}^2 \right) - \\ \left(\begin{array}{l} \left(\left(\delta Z_{\mathrm{hH}}\right) c_\alpha + \left(4\left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{HH}} + \delta Z_{\mathrm{G^-G^-}}\right) s_\alpha\right) s_\beta + \\ \left(\delta Z_{\mathrm{G^-H^-}}\right) c_\beta s_\alpha \end{array} \right) M_{\mathrm{W}}^2 \end{array} \right) + 4 s_\alpha s_\beta M_{\mathrm{W}}^2 \left(\delta s_{\mathrm{W}}\right) \right)
$$

$$
\underset{344}{C}\left(H^-, H^+, \tilde{u}_{\mathrm{g3}}^{\mathrm{s3}}, \tilde{u}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[-\frac{\mathrm{i} e^2 (\boxed{9})}{3 c_{\mathrm{W}}^4 M_{\mathrm{W}}^4 s_{2\beta}^3 s_{\mathrm{W}}^3} \right]
$$

$$
\boxed{9} = \begin{array}{l} (\boxed{6}) s_\beta^3 U_{\mathrm{s3},1}^{\tilde{u}_{\mathrm{g3}}*} + \\ \left(\begin{array}{l} (\boxed{8}) s_{\mathrm{W}} s_\beta c_{\mathrm{W}}^2 M_{\mathrm{W}}^2 - \\ 2\delta_{\mathrm{g3,g4}} c_\beta^2 U_{\mathrm{s3},2}^{\tilde{u}_{\mathrm{g3}}*} \left((\boxed{7}) U_{\mathrm{s4},2}^{\tilde{u}_{\mathrm{g4}}} - s_{\mathrm{W}} s_\beta c_{\mathrm{W}}^2 M_{\mathrm{W}}^2 \left(3 c_{\mathrm{W}}^2 c_\beta^2 m_{u_{\mathrm{g3}}}^2 - 2 c_{2\beta} M_{\mathrm{W}}^2 s_{\mathrm{W}}^2 s_\beta^2 \right) \left(\delta \overline{Z}_{1,\mathrm{s4}}^{\tilde{u}_{\mathrm{g4}}} U_{1,2}^{\tilde{u}_{\mathrm{g4}}} + \delta \overline{Z}_{2,\mathrm{s4}}^{\tilde{u}_{\mathrm{g4}}} U_{2,2}^{\tilde{u}_{\mathrm{g4}}} \right) \right) \end{array} \right) c_\beta \end{array}
$$

$$
\boxed{8} = \begin{array}{l} \left(\begin{array}{l} \delta_{\mathrm{g3,g4}} c_{2\beta} \left(2 c_{\mathrm{W}}^2 + 1 \right) c_\beta^2 M_{\mathrm{W}}^2 + \\ 6 c_{\mathrm{W}}^2 \left(\mathrm{CKM}_{\mathrm{g4,1}} \mathrm{CKM}_{\mathrm{g3,1}}^* m_{d_1}^2 + \mathrm{CKM}_{\mathrm{g4,2}} \mathrm{CKM}_{\mathrm{g3,2}}^* m_{d_2}^2 + \mathrm{CKM}_{\mathrm{g4,3}} \mathrm{CKM}_{\mathrm{g3,3}}^* m_{d_3}^2 \right) s_\beta^2 \end{array} \right) s_\beta^2 \left(\delta Z_{1,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}} U_{1,1}^{\tilde{u}_{\mathrm{g3}}*} + \delta Z_{2,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}} U_{2,1}^{\tilde{u}_{\mathrm{g3}}*} \right) U_{\mathrm{s4},1}^{\tilde{u}_{\mathrm{g4}}} + \\ \delta_{\mathrm{g3,g4}} \left(6 c_{\mathrm{W}}^2 c_\beta^4 m_{u_{\mathrm{g3}}}^2 - c_{2\beta} M_{\mathrm{W}}^2 s_{2\beta}^2 s_{\mathrm{W}}^2 \right) \left(\delta Z_{1,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}} U_{1,2}^{\tilde{u}_{\mathrm{g3}}*} + \delta Z_{2,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}} U_{2,2}^{\tilde{u}_{\mathrm{g3}}*} \right) U_{\mathrm{s4},2}^{\tilde{u}_{\mathrm{g4}}} \end{array}
$$

$$
\boxed{7} = \begin{array}{l} 2 \left(\begin{array}{l} \left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}}\right) s_{2\beta} c_{\mathrm{W}}^2 + \\ c_{2\beta} \left(4\left(\delta s_{\mathrm{W}}\right) s_{\mathrm{W}} + \left(4\left(\delta Z_{\mathrm{e}}\right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}}\right) c_{\mathrm{W}}^2 \right) \end{array} \right) M_{\mathrm{W}}^4 s_{\mathrm{W}}^3 s_\beta^3 - \\ 3 c_\beta m_{u_{\mathrm{g3}}} c_{\mathrm{W}}^4 \left(\left(\begin{array}{l} \left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}}\right) s_{\mathrm{W}} M_{\mathrm{W}}^2 s_\beta^2 - \\ c_\beta \left(4\left(\delta s_{\mathrm{W}}\right) s_\beta M_{\mathrm{W}}^2 + s_{\mathrm{W}} \left(4\left(\delta s_\beta\right) M_{\mathrm{W}}^2 - s_\beta \left(\left(4\left(\delta Z_{\mathrm{e}}\right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}}\right) M_{\mathrm{W}}^2 - 2\delta M_{\mathrm{W}}^2 \right) \right) \right) \end{array} \right) m_{u_{\mathrm{g3}}} + 2 s_{2\beta} s_{\mathrm{W}} \delta m_{\mathrm{g3}}^{u_{\mathrm{g}}} M_{\mathrm{W}}^2 \right) \end{array}
$$

$$6 = s_W c_W^2 M_W^2 \left(U_{2,1}^{\tilde{u}_{g4}} \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}} + U_{1,1}^{\tilde{u}_{g4}} \delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}\right) \left(\begin{array}{l} \delta_{g3,g4} c_{2\beta} \left(2c_W^2 + 1\right) c_\beta^3 M_W^2 + \\ 3 s_{2\beta} s_\beta c_W^2 \left(\mathrm{CKM}_{g4,1} \mathrm{CKM}_{g3,1}^* m_{d_1}^2 + \mathrm{CKM}_{g4,2} \mathrm{CKM}_{g3,2}^* m_{d_2}^2 + \mathrm{CKM}_{g4,3} \mathrm{CKM}_{g3,3}^* m_{d_3}^2\right) \end{array} \right) + (5) U_{s4,1}^{\tilde{u}_{g4}}$$

$$5 = 6 s_\beta c_W^4 \left(\begin{array}{l} (4) \mathrm{CKM}_{g4,1} m_{d_1} + (3) s_W m_{d_3}^2 + (2) M_W^2 + \\ \left(\begin{array}{l} \left(\delta\mathrm{CKM}_{g4,1}\right) s_W \mathrm{CKM}_{g3,1}^* m_{d_1}^2 M_W^2 + \\ \mathrm{CKM}_{g4,2} m_{d_2} \mathrm{CKM}_{g3,2}^* \left(2 s_W \delta m_2^{d_g} M_W^2 - m_{d_2} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right)\right) \end{array} \right) s_{2\beta} \end{array} \right) + c_\beta^3 M_W^4 (1) \delta_{g3,g4}$$

$$4 = \mathrm{CKM}_{g3,1}^* \left(\begin{array}{l} 2 s_{2\beta} s_W \delta m_1^{d_g} M_W^2 - \\ \left(\begin{array}{l} s_W \left(4 \left(\delta c_\beta\right) s_\beta + \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) c_\beta^2\right) M_W^2 + \\ \frac{s_{2\beta}}{2} \left(4 \left(\delta s_W\right) M_W^2 - s_W \left(\left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^- H^-} + \delta Z_{H^- H^-}\right) M_W^2 - 2\delta M_W^2\right)\right) \end{array} \right) m_{d_1} \end{array} \right) + s_{2\beta} s_W m_{d_1} M_W^2 \delta\mathrm{CKM}_{g3,1}^*$$

$$3 = \begin{array}{l} -\mathrm{CKM}_{g4,3} \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) \mathrm{CKM}_{g3,3}^* c_\beta^2 M_W^2 + \\ s_\beta \left(2 \left(\delta\mathrm{CKM}_{g4,3}\right) c_\beta \mathrm{CKM}_{g3,3}^* M_W^2 + \mathrm{CKM}_{g4,3} \left(2 c_\beta \delta\mathrm{CKM}_{g3,3}^* M_W^2 - \mathrm{CKM}_{g3,3}^* \left(4 \left(\delta c_\beta\right) M_W^2 - c_\beta \left(\left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^- H^-} + \delta Z_{H^- H^-}\right) M_W^2 - 2\delta M_W^2\right)\right)\right)\right) \end{array}$$

$$2 = \begin{array}{l} -2\mathrm{CKM}_{g4,3} m_{d_3} s_{2\beta} \mathrm{CKM}_{g3,3}^* \left(\left(\delta s_W\right) m_{d_3} - s_W \delta m_3^{d_g}\right) + \\ s_W \left(\begin{array}{l} \left(\delta\mathrm{CKM}_{g4,2}\right) s_{2\beta} \mathrm{CKM}_{g3,2}^* + \left(\frac{1}{2}\mathrm{CKM}_{g4,2}\right) \left(2 s_{2\beta} \delta\mathrm{CKM}_{g3,2}^* - \left(\begin{array}{l} 8 \left(\delta c_\beta\right) s_\beta + 2 \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) c_\beta^2 - \\ \left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^- H^-} + \delta Z_{H^- H^-}\right) s_{2\beta} \end{array} \right) \mathrm{CKM}_{g3,2}^* \right) \end{array} \right) m_{d_2}^2 \end{array}$$

$$1 = s_{2\beta} s_W c_W^2 \left(2c_W^2 + 1\right) \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) - c_{2\beta} \left(\begin{array}{l} \left(8 \left(\delta s_W\right) - 2 \left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^- H^-} + \delta Z_{H^- H^-}\right) s_W\right) c_W^4 - 4 \left(\delta s_W\right) s_W^2 + \\ \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta\overline{Z}_{H^- H^-} + \delta Z_{H^- H^-}\right) s_W\right) c_W^2 \end{array} \right)$$

$$\underset{345}{C}\left(G^-, G^+, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2}{12 s_{2\beta} c_W^4 M_W^4 s_W^3} \left(\begin{array}{l} (6) s_\beta U_{s3,1}^{\tilde{u}_{g3}*} + \\ \left(\begin{array}{l} (8) s_W s_\beta c_W^2 M_W^2 + \\ 2 \left(\begin{array}{l} (7) U_{s4,2}^{\tilde{u}_{g4}} - \\ s_W s_\beta c_W^2 M_W^2 \left(3c_W^2 m_{u_{g3}}^2 + 2 c_{2\beta} M_W^2 s_W^2\right) \left(U_{1,2}^{\tilde{u}_{g4}} \delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}} + U_{2,2}^{\tilde{u}_{g4}} \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}\right) \end{array} \right) \delta_{g3,g4} U_{s3,2}^{\tilde{u}_{g3}*} \end{array} \right) c_\beta \end{array} \right) \right]$$

$$8 = \begin{array}{l} -\left(\begin{array}{l} 6c_W^2 \left(\mathrm{CKM}_{g4,1} \mathrm{CKM}_{g3,1}^* m_{d_1}^2 + \mathrm{CKM}_{g4,2} \mathrm{CKM}_{g3,2}^* m_{d_2}^2 + \mathrm{CKM}_{g4,3} \mathrm{CKM}_{g3,3}^* m_{d_3}^2\right) - \\ \delta_{g3,g4} c_{2\beta} \left(2c_W^2 + 1\right) M_W^2 \end{array} \right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,1}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,1}^{\tilde{u}_{g3}*}\right) U_{s4,1}^{\tilde{u}_{g4}} - \\ 2\delta_{g3,g4} \left(3c_W^2 m_{u_{g3}}^2 + 2 c_{2\beta} M_W^2 s_W^2\right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,2}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,2}^{\tilde{u}_{g3}*}\right) U_{s4,2}^{\tilde{u}_{g4}} \end{array}$$

$$\boxed{7} = \begin{array}{l} s_\beta \left(2 \left(\left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) s_{2\beta} c_W^2 - 2 c_{2\beta} \left(2 \left(\delta s_W\right) s_W + \left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-}\right) c_W^2\right)\right) M_W^4 s_W^3 - 12 m_{u_{g3}} s_W \delta m_{g3}^{u_g} c_W^4 M_W^2\right) + \\ 3 c_W^4 m_{u_{g3}}^2 \left(4 \left(\delta s_W\right) s_\beta M_W^2 + s_W \left(2 s_\beta \delta M_W^2 + \left(4 \left(\delta s_\beta\right) - \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) c_\beta - 2 \left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-}\right) s_\beta\right) M_W^2\right)\right) \end{array}$$

$$\boxed{6} = c_\beta s_W c_W^2 M_W^2 \left(U_{2,1}^{\tilde{u}_{g4}} \delta \overline{Z}_{2,s4}^{\tilde{u}_{g4}} + U_{1,1}^{\tilde{u}_{g4}} \delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}}\right) \left(- \left(\begin{array}{l} 6 c_W^2 \left(\mathrm{CKM}_{g4,1} \mathrm{CKM}_{g3,1}^* m_{d_1}^2 + \mathrm{CKM}_{g4,2} \mathrm{CKM}_{g3,2}^* m_{d_2}^2 + \mathrm{CKM}_{g4,3} \mathrm{CKM}_{g3,3}^* m_{d_3}^2\right) - \\ \delta_{g3,g4} c_{2\beta} \left(2 c_W^2 + 1\right) M_W^2 \end{array}\right)\right) - 2(\boxed{5}) U_{s4,1}^{\tilde{u}_{g4}}$$

$$\boxed{5} = 3 c_W^4 \left(\begin{array}{l} (\boxed{4}) \mathrm{CKM}_{g4,1} m_{d_1} - (\boxed{2}) s_W m_{d_3}^2 + (\boxed{3}) M_W^2 + \\ 2 \left(\begin{array}{l} \left(\delta \mathrm{CKM}_{g4,1}\right) s_W \mathrm{CKM}_{g3,1}^* m_{d_1}^2 M_W^2 + \\ \mathrm{CKM}_{g4,2} m_{d_2} \mathrm{CKM}_{g3,2}^* \left(2 s_W \delta m_2^{d_g} M_W^2 - m_{d_2} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right)\right) \end{array}\right) c_\beta \end{array}\right) + c_\beta M_W^4 (\boxed{1}) \delta_{g3,g4}$$

$$\boxed{4} = \mathrm{CKM}_{g3,1}^* \left(4 c_\beta s_W M_W^2 \delta m_1^{d_g} - m_{d_1} \left(\begin{array}{l} c_\beta \left(4 \left(\delta s_W\right) M_W^2 - 2 s_W \left(\left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-}\right) M_W^2 - \delta M_W^2\right)\right) + \\ s_W \left(4 \left(\delta c_\beta\right) + \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) s_\beta\right) M_W^2 \end{array}\right)\right) + 2 c_\beta s_W m_{d_1} M_W^2 \delta \mathrm{CKM}_{g3,1}^*$$

$$\boxed{3} = \begin{array}{l} c_\beta \left(2 \left(\delta \mathrm{CKM}_{g4,2}\right) s_W \mathrm{CKM}_{g3,2}^* m_{d_2}^2 - 4 \mathrm{CKM}_{g4,3} m_{d_3} \mathrm{CKM}_{g3,3}^* \left(\left(\delta s_W\right) m_{d_3} - s_W \delta m_3^{d_g}\right)\right) - \\ \mathrm{CKM}_{g4,2} s_W \left(\left(4 \left(\delta c_\beta\right) - 2 \left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-}\right) c_\beta + \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) s_\beta\right) \mathrm{CKM}_{g3,2}^* - 2 c_\beta \delta \mathrm{CKM}_{g3,2}^*\right) m_{d_2}^2 \end{array}$$

$$\boxed{2} = \begin{array}{l} -\mathrm{CKM}_{g4,3} \left(2 c_\beta \delta \mathrm{CKM}_{g3,3}^* M_W^2 + \mathrm{CKM}_{g3,3}^* \left(4 \left(\left(\delta Z_e\right) c_\beta - \delta c_\beta\right) M_W^2 - 2 c_\beta \delta M_W^2\right)\right) - \\ \left(2 \left(\delta \mathrm{CKM}_{g4,3}\right) c_\beta + \mathrm{CKM}_{g4,3} \left(2 \left(\delta Z_{G^- G^-}\right) c_\beta - \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right) s_\beta\right)\right) \mathrm{CKM}_{g3,3}^* M_W^2 \end{array}$$

$$\boxed{1} = c_{2\beta} \left(\begin{array}{l} \left(4 \left(\delta s_W\right) - 2 \left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-}\right) s_W\right) c_W^4 - 2 \left(\delta s_W\right) s_W^2 + \\ \left(2 \left(\delta s_W\right) - \left(2 \left(\delta Z_e\right) + \delta Z_{G^- G^-}\right) s_W\right) c_W^2 \end{array}\right) + \left(2 c_W^2 + 1\right) \left(\tfrac{1}{2} s_{2\beta} s_W c_W^2\right) \left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right)$$

$$\underset{346}{C}\left(H^-, G^+, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{\mathrm{i} e^2 (\boxed{8})}{3 c_W^4 M_W^4 s_{2\beta}^2 s_W^3} \right]$$

$$\boxed{8} = c_\beta \left(\begin{array}{l} (\boxed{7}) s_W s_\beta c_W^2 M_W^2 - \\ \left(\frac{1}{2} \delta_{g3,g4} c_\beta U_{s3,2}^{\tilde{u}_{g3}*}\right) \left(\begin{array}{l} (\boxed{6}) U_{s4,2}^{\tilde{u}_{g4}} - \\ s_{2\beta} s_W c_W^2 M_W^2 \left(3 c_W^2 m_{u_{g3}}^2 - 4 M_W^2 s_W^2 s_\beta^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1,2}^{\tilde{u}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{u}_{g4}} U_{2,2}^{\tilde{u}_{g4}}\right) \end{array}\right) \end{array}\right) + s_\beta^2 (\boxed{5}) U_{s3,1}^{\tilde{u}_{g3}*}$$

$$\boxed{7} = \begin{array}{l} -\left(\begin{array}{l} 3 c_W^2 \left(\mathrm{CKM}_{g4,1} \mathrm{CKM}_{g3,1}^* m_{d_1}^2 + \mathrm{CKM}_{g4,2} \mathrm{CKM}_{g3,2}^* m_{d_2}^2 + \mathrm{CKM}_{g4,3} \mathrm{CKM}_{g3,3}^* m_{d_3}^2\right) - \\ \delta_{g3,g4} \left(2 c_W^2 + 1\right) c_\beta^2 M_W^2 \end{array}\right) s_\beta^2 \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,1}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,1}^{\tilde{u}_{g3}*}\right) U_{s4,1}^{\tilde{u}_{g4}} + \\ \delta_{g3,g4} \left(3 c_W^2 c_\beta^2 m_{u_{g3}}^2 - M_W^2 s_{2\beta}^2 s_W^2\right) \left(\delta Z_{1,s3}^{\tilde{u}_{g3}} U_{1,2}^{\tilde{u}_{g3}*} + \delta Z_{2,s3}^{\tilde{u}_{g3}} U_{2,2}^{\tilde{u}_{g3}*}\right) U_{s4,2}^{\tilde{u}_{g4}} \end{array}$$

$$\boxed{6} = \begin{array}{l} s_{2\beta}\left(4\left(4\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}+\left(4\left(\delta \mathrm{Z}_{\mathrm{e}}\right)+\delta Z_{\mathrm{G}^{-}\mathrm{G}^{-}}+\delta Z_{\mathrm{H}^{-}\mathrm{H}^{-}}\right)c_{\mathrm{W}}^{2}\right)M_{\mathrm{W}}^{4}s_{\mathrm{W}}^{3}s_{\beta}^{2}-12m_{u_{\mathrm{g}3}}s_{\mathrm{W}}\delta m_{\mathrm{g}3}^{u_{\mathrm{g}}}c_{\mathrm{W}}^{4}M_{\mathrm{W}}^{2}\right)+ \\ 3c_{\mathrm{W}}^{4}m_{u_{\mathrm{g}3}}^{2}\left(4\left(\delta s_{\mathrm{W}}\right)s_{2\beta}M_{\mathrm{W}}^{2}+s_{\mathrm{W}}\left(2s_{2\beta}\delta M_{\mathrm{W}}^{2}+\left(-2\left(\delta Z_{\mathrm{G}^{-}\mathrm{H}^{-}}\right)+8\left(\delta s_{\beta}\right)c_{\beta}-\left(4\left(\delta \mathrm{Z}_{\mathrm{e}}\right)+\delta Z_{\mathrm{G}^{-}\mathrm{G}^{-}}+\delta Z_{\mathrm{H}^{-}\mathrm{H}^{-}}\right)s_{2\beta}\right)M_{\mathrm{W}}^{2}\right)\right) \end{array}$$

$$\boxed{5} = (\boxed{4})U_{\mathrm{s4},1}^{\tilde{u}_{\mathrm{g4}}}-\left(\tfrac{1}{2}s_{2\beta}s_{\mathrm{W}}c_{\mathrm{W}}^{2}M_{\mathrm{W}}^{2}\right)\left(U_{2,1}^{\tilde{u}_{\mathrm{g4}}}\delta\overline{Z}_{2,\mathrm{s4}}^{\tilde{u}_{\mathrm{g4}}}+U_{1,1}^{\tilde{u}_{\mathrm{g4}}}\delta\overline{Z}_{1,\mathrm{s4}}^{\tilde{u}_{\mathrm{g4}}}\right)\left(\begin{array}{l} 3c_{\mathrm{W}}^{2}\left(\mathrm{CKM}_{\mathrm{g4},1}\mathrm{CKM}_{\mathrm{g3},1}^{*}m_{d_1}^{2}+\mathrm{CKM}_{\mathrm{g4},2}\mathrm{CKM}_{\mathrm{g3},2}^{*}m_{d_2}^{2}+\mathrm{CKM}_{\mathrm{g4},3}\mathrm{CKM}_{\mathrm{g3},3}^{*}m_{d_3}^{2}\right)- \\ \delta_{\mathrm{g3,g4}}\left(2c_{\mathrm{W}}^{2}+1\right)c_{\beta}^{2}M_{\mathrm{W}}^{2} \end{array}\right)$$

$$\boxed{4} = \begin{array}{l} -3c_{\mathrm{W}}^{4}\left((\boxed{3})\mathrm{CKM}_{\mathrm{g4},1}m_{d_1}+\left(\begin{array}{l}\left(\delta\mathrm{CKM}_{\mathrm{g4},1}\right)s_{\mathrm{W}}\mathrm{CKM}_{\mathrm{g3},1}^{*}m_{d_1}^{2}M_{\mathrm{W}}^{2}+ \\ \mathrm{CKM}_{\mathrm{g4},2}m_{d_2}\mathrm{CKM}_{\mathrm{g3},2}^{*}\left(2s_{\mathrm{W}}\delta m_{2}^{d_{\mathrm{g}}}M_{\mathrm{W}}^{2}-m_{d_2}\left(s_{\mathrm{W}}\delta M_{\mathrm{W}}^{2}+2\left(\delta s_{\mathrm{W}}\right)M_{\mathrm{W}}^{2}\right)\right)\end{array}\right)s_{2\beta}+(\boxed{2})s_{\mathrm{W}}m_{d_3}^{2}+(\boxed{1})M_{\mathrm{W}}^{2}\right)- \\ \left(\frac{1}{2}\delta_{\mathrm{g3,g4}}s_{2\beta}c_{\beta}^{2}M_{\mathrm{W}}^{4}\right)\left(\begin{array}{l}\left(8\left(\delta s_{\mathrm{W}}\right)-2\left(4\left(\delta \mathrm{Z}_{\mathrm{e}}\right)+\delta Z_{\mathrm{G}^{-}\mathrm{G}^{-}}+\delta Z_{\mathrm{H}^{-}\mathrm{H}^{-}}\right)s_{\mathrm{W}}\right)c_{\mathrm{W}}^{4}-4\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}^{2}+ \\ \left(4\left(\delta s_{\mathrm{W}}\right)-\left(4\left(\delta \mathrm{Z}_{\mathrm{e}}\right)+\delta Z_{\mathrm{G}^{-}\mathrm{G}^{-}}+\delta Z_{\mathrm{H}^{-}\mathrm{H}^{-}}\right)s_{\mathrm{W}}\right)c_{\mathrm{W}}^{2}\end{array}\right) \end{array}$$

$$\boxed{3} = \mathrm{CKM}_{\mathrm{g3},1}^{*}\left(\begin{array}{l} 2s_{2\beta}s_{\mathrm{W}}\delta m_{1}^{d_{\mathrm{g}}}M_{\mathrm{W}}^{2}- \\ \left(\begin{array}{l} s_{\mathrm{W}}\left(\delta Z_{\mathrm{G}^{-}\mathrm{H}^{-}}+4\left(\delta c_{\beta}\right)s_{\beta}\right)M_{\mathrm{W}}^{2}+ \\ \frac{s_{2\beta}}{2}\left(4\left(\delta s_{\mathrm{W}}\right)M_{\mathrm{W}}^{2}-s_{\mathrm{W}}\left(\left(4\left(\delta \mathrm{Z}_{\mathrm{e}}\right)+\delta Z_{\mathrm{G}^{-}\mathrm{G}^{-}}+\delta Z_{\mathrm{H}^{-}\mathrm{H}^{-}}\right)M_{\mathrm{W}}^{2}-2\delta M_{\mathrm{W}}^{2}\right)\right)\end{array}\right)m_{d_1}\end{array}\right)+s_{2\beta}s_{\mathrm{W}}m_{d_1}M_{\mathrm{W}}^{2}\delta\mathrm{CKM}_{\mathrm{g3},1}^{*}$$

$$\boxed{2} = \left(\tfrac{1}{2}\mathrm{CKM}_{\mathrm{g4},3}\right)\left(\begin{array}{l} 2s_{2\beta}\delta\mathrm{CKM}_{\mathrm{g3},3}^{*}M_{\mathrm{W}}^{2}- \\ \mathrm{CKM}_{\mathrm{g3},3}^{*}\left(2s_{2\beta}\delta M_{\mathrm{W}}^{2}+\left(2\left(\delta Z_{\mathrm{G}^{-}\mathrm{H}^{-}}\right)-\left(4\left(\delta \mathrm{Z}_{\mathrm{e}}\right)+\delta Z_{\mathrm{G}^{-}\mathrm{G}^{-}}+\delta Z_{\mathrm{H}^{-}\mathrm{H}^{-}}\right)s_{2\beta}+8\left(\delta c_{\beta}\right)s_{\beta}\right)M_{\mathrm{W}}^{2}\right)\end{array}\right)+s_{2\beta}M_{\mathrm{W}}^{2}\mathrm{CKM}_{\mathrm{g3},3}^{*}\left(\delta\mathrm{CKM}_{\mathrm{g4},3}\right)$$

$$\boxed{1} = \begin{array}{l} s_{2\beta}\left(\left(\delta\mathrm{CKM}_{\mathrm{g4},2}\right)s_{\mathrm{W}}\mathrm{CKM}_{\mathrm{g3},2}^{*}m_{d_2}^{2}-2\mathrm{CKM}_{\mathrm{g4},3}m_{d_3}\mathrm{CKM}_{\mathrm{g3},3}^{*}\left(\left(\delta s_{\mathrm{W}}\right)m_{d_3}-s_{\mathrm{W}}\delta m_{3}^{d_{\mathrm{g}}}\right)\right)- \\ \left(\frac{1}{2}\mathrm{CKM}_{\mathrm{g4},2}s_{\mathrm{W}}m_{d_2}^{2}\right)\left(\left(2\left(\delta Z_{\mathrm{G}^{-}\mathrm{H}^{-}}\right)-\left(4\left(\delta \mathrm{Z}_{\mathrm{e}}\right)+\delta Z_{\mathrm{G}^{-}\mathrm{G}^{-}}+\delta Z_{\mathrm{H}^{-}\mathrm{H}^{-}}\right)s_{2\beta}+8\left(\delta c_{\beta}\right)s_{\beta}\right)\mathrm{CKM}_{\mathrm{g3},2}^{*}-2s_{2\beta}\delta\mathrm{CKM}_{\mathrm{g3},2}^{*}\right) \end{array}$$

$$\underset{347}{C}\left(G^{-},H^{+},\tilde{u}_{\mathrm{g3}}^{\mathrm{s3}},\tilde{u}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[-\frac{\mathrm{i}e^{2}(\boxed{8})}{3c_{\mathrm{W}}^{4}M_{\mathrm{W}}^{4}s_{2\beta}^{2}s_{\mathrm{W}}^{3}}\right]$$

$$\boxed{8} = c_{\beta}\left(\begin{array}{l}(\boxed{7})s_{\mathrm{W}}s_{\beta}c_{\mathrm{W}}^{2}M_{\mathrm{W}}^{2}- \\ \left(\frac{1}{2}\delta_{\mathrm{g3,g4}}c_{\beta}U_{\mathrm{s3},2}^{\tilde{u}_{\mathrm{g3}}*}\right)\left(\begin{array}{l}(\boxed{6})U_{\mathrm{s4},2}^{\tilde{u}_{\mathrm{g4}}}- \\ s_{2\beta}s_{\mathrm{W}}c_{\mathrm{W}}^{2}M_{\mathrm{W}}^{2}\left(3c_{\mathrm{W}}^{2}m_{u_{\mathrm{g}3}}^{2}-4M_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}s_{\beta}^{2}\right)\left(\delta\overline{Z}_{1,\mathrm{s4}}^{\tilde{u}_{\mathrm{g4}}}U_{1,2}^{\tilde{u}_{\mathrm{g4}}}+\delta\overline{Z}_{2,\mathrm{s4}}^{\tilde{u}_{\mathrm{g4}}}U_{2,2}^{\tilde{u}_{\mathrm{g4}}}\right)\end{array}\right)\end{array}\right)+s_{\beta}^{2}(\boxed{5})U_{\mathrm{s3},1}^{\tilde{u}_{\mathrm{g3}}*}$$

$$\boxed{7} = \begin{array}{l} -\left(\begin{array}{l} 3c_{\mathrm{W}}^{2}\left(\mathrm{CKM}_{\mathrm{g4},1}\mathrm{CKM}_{\mathrm{g3},1}^{*}m_{d_1}^{2}+\mathrm{CKM}_{\mathrm{g4},2}\mathrm{CKM}_{\mathrm{g3},2}^{*}m_{d_2}^{2}+\mathrm{CKM}_{\mathrm{g4},3}\mathrm{CKM}_{\mathrm{g3},3}^{*}m_{d_3}^{2}\right)- \\ \delta_{\mathrm{g3,g4}}\left(2c_{\mathrm{W}}^{2}+1\right)c_{\beta}^{2}M_{\mathrm{W}}^{2}\end{array}\right)s_{\beta}^{2}\left(\delta Z_{1,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}}U_{1,1}^{\tilde{u}_{\mathrm{g3}}*}+\delta Z_{2,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}}U_{2,1}^{\tilde{u}_{\mathrm{g3}}*}\right)U_{\mathrm{s4},1}^{\tilde{u}_{\mathrm{g4}}}+ \\ \delta_{\mathrm{g3,g4}}\left(3c_{\mathrm{W}}^{2}c_{\beta}^{2}m_{u_{\mathrm{g}3}}^{2}-M_{\mathrm{W}}^{2}s_{2\beta}^{2}s_{\mathrm{W}}^{2}\right)\left(\delta Z_{1,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}}U_{1,2}^{\tilde{u}_{\mathrm{g3}}*}+\delta Z_{2,\mathrm{s3}}^{\tilde{u}_{\mathrm{g3}}}U_{2,2}^{\tilde{u}_{\mathrm{g3}}*}\right)U_{\mathrm{s4},2}^{\tilde{u}_{\mathrm{g4}}} \end{array}$$

$$\boxed{6} = \begin{array}{l} s_{2\beta}\left(4\left(4\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}+\left(4\left(\delta \mathrm{Z_e}\right)+\delta\overline{Z}_{\mathrm{H^-H^-}}+\delta Z_{\mathrm{G^-G^-}}\right)c_{\mathrm{W}}^2\right)M_{\mathrm{W}}^4 s_{\mathrm{W}}^3 s_\beta^2 - 12 m_{u_{\mathrm{g3}}} s_{\mathrm{W}} \delta m_{\mathrm{g3}}^{u_{\mathrm{g}}} c_{\mathrm{W}}^4 M_{\mathrm{W}}^2\right) + \\ 3c_{\mathrm{W}}^4 m_{u_{\mathrm{g3}}}^2\left(4\left(\delta s_{\mathrm{W}}\right)s_{2\beta}M_{\mathrm{W}}^2 + s_{\mathrm{W}}\left(2s_{2\beta}\delta M_{\mathrm{W}}^2 + \left(-2\left(\delta Z_{\mathrm{H^-G^-}}\right)+8\left(\delta s_\beta\right)c_\beta - \left(4\left(\delta \mathrm{Z_e}\right)+\delta\overline{Z}_{\mathrm{H^-H^-}}+\delta Z_{\mathrm{G^-G^-}}\right)s_{2\beta}\right)M_{\mathrm{W}}^2\right)\right) \end{array}$$

$$\boxed{5} = (\boxed{4})U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}} - \left(\tfrac{1}{2}s_{2\beta}s_{\mathrm{W}}c_{\mathrm{W}}^2 M_{\mathrm{W}}^2\right)\left(U_{\mathrm{2,1}}^{\tilde{u}_{\mathrm{g4}}}\delta\overline{Z}_{\mathrm{2,s4}}^{\tilde{u}_{\mathrm{g4}}} + U_{\mathrm{1,1}}^{\tilde{u}_{\mathrm{g4}}}\delta\overline{Z}_{\mathrm{1,s4}}^{\tilde{u}_{\mathrm{g4}}}\right)\left(\begin{array}{l} 3c_{\mathrm{W}}^2\left(\mathrm{CKM_{g4,1}CKM_{g3,1}^*}m_{d_1}^2 + \mathrm{CKM_{g4,2}CKM_{g3,2}^*}m_{d_2}^2 + \mathrm{CKM_{g4,3}CKM_{g3,3}^*}m_{d_3}^2\right) - \\ \delta_{\mathrm{g3,g4}}\left(2c_{\mathrm{W}}^2+1\right)c_\beta^2 M_{\mathrm{W}}^2 \end{array}\right)$$

$$\boxed{4} = \begin{array}{l} -3c_{\mathrm{W}}^4\left((\boxed{2})\mathrm{CKM_{g4,1}}m_{d_1} + \left(\begin{array}{l}\left(\delta\mathrm{CKM_{g4,1}}\right)s_{\mathrm{W}}\mathrm{CKM_{g3,1}^*}m_{d_1}^2 M_{\mathrm{W}}^2 + \\ \mathrm{CKM_{g4,2}}m_{d_2}\mathrm{CKM_{g3,2}^*}\left(2s_{\mathrm{W}}\delta m_2^{d_{\mathrm{g}}}M_{\mathrm{W}}^2 - m_{d_2}\left(s_{\mathrm{W}}\delta M_{\mathrm{W}}^2 + 2\left(\delta s_{\mathrm{W}}\right)M_{\mathrm{W}}^2\right)\right)\end{array}\right)s_{2\beta} + (\boxed{3})s_{\mathrm{W}}m_{d_3}^2 + (\boxed{1})M_{\mathrm{W}}^2\right) - \\ \left(\frac{1}{2}\delta_{\mathrm{g3,g4}}s_{2\beta}c_\beta^2 M_{\mathrm{W}}^4\right)\left(\begin{array}{l}\left(8\left(\delta s_{\mathrm{W}}\right) - 2\left(4\left(\delta \mathrm{Z_e}\right)+\delta\overline{Z}_{\mathrm{H^-H^-}}+\delta Z_{\mathrm{G^-G^-}}\right)s_{\mathrm{W}}\right)c_{\mathrm{W}}^4 - 4\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}^2 + \\ \left(4\left(\delta s_{\mathrm{W}}\right) - \left(4\left(\delta \mathrm{Z_e}\right)+\delta\overline{Z}_{\mathrm{H^-H^-}}+\delta Z_{\mathrm{G^-G^-}}\right)s_{\mathrm{W}}\right)c_{\mathrm{W}}^2\end{array}\right) \end{array}$$

$$\boxed{3} = \left(\tfrac{1}{2}\mathrm{CKM_{g4,3}}\right)\left(\begin{array}{l} 2s_{2\beta}\delta\mathrm{CKM_{g3,3}^*}M_{\mathrm{W}}^2 - \\ \mathrm{CKM_{g3,3}^*}\left(2s_{2\beta}\delta M_{\mathrm{W}}^2 + \left(2\left(\delta Z_{\mathrm{H^-G^-}}\right) - \left(4\left(\delta \mathrm{Z_e}\right)+\delta\overline{Z}_{\mathrm{H^-H^-}}+\delta Z_{\mathrm{G^-G^-}}\right)s_{2\beta} + 8\left(\delta c_\beta\right)s_\beta\right)M_{\mathrm{W}}^2\right)\end{array}\right) + s_{2\beta}M_{\mathrm{W}}^2\mathrm{CKM_{g3,3}^*}\left(\delta\mathrm{CKM_{g4,3}}\right)$$

$$\boxed{2} = \mathrm{CKM_{g3,1}^*}\left(\begin{array}{l} 2s_{2\beta}s_{\mathrm{W}}\delta m_1^{d_{\mathrm{g}}}M_{\mathrm{W}}^2 - \\ \left(\begin{array}{l}\frac{s_{2\beta}}{2}\left(4\left(\delta s_{\mathrm{W}}\right)M_{\mathrm{W}}^2 - s_{\mathrm{W}}\left(\left(4\left(\delta \mathrm{Z_e}\right)+\delta\overline{Z}_{\mathrm{H^-H^-}}+\delta Z_{\mathrm{G^-G^-}}\right)M_{\mathrm{W}}^2 - 2\delta M_{\mathrm{W}}^2\right)\right) + \\ s_{\mathrm{W}}\left(\delta Z_{\mathrm{H^-G^-}} + 4\left(\delta c_\beta\right)s_\beta\right)M_{\mathrm{W}}^2\end{array}\right)m_{d_1}\end{array}\right) + s_{2\beta}s_{\mathrm{W}}m_{d_1}M_{\mathrm{W}}^2\delta\mathrm{CKM_{g3,1}^*}$$

$$\boxed{1} = \begin{array}{l} s_{2\beta}\left(\left(\delta\mathrm{CKM_{g4,2}}\right)s_{\mathrm{W}}\mathrm{CKM_{g3,2}^*}m_{d_2}^2 - 2\mathrm{CKM_{g4,3}}m_{d_3}\mathrm{CKM_{g3,3}^*}\left(\left(\delta s_{\mathrm{W}}\right)m_{d_3} - s_{\mathrm{W}}\delta m_3^{d_{\mathrm{g}}}\right)\right) - \\ \left(\frac{1}{2}\mathrm{CKM_{g4,2}}s_{\mathrm{W}}m_{d_2}^2\right)\left(\left(2\left(\delta Z_{\mathrm{H^-G^-}}\right) - \left(4\left(\delta \mathrm{Z_e}\right)+\delta\overline{Z}_{\mathrm{H^-H^-}}+\delta Z_{\mathrm{G^-G^-}}\right)s_{2\beta} + 8\left(\delta c_\beta\right)s_\beta\right)\mathrm{CKM_{g3,2}^*} - 2s_{2\beta}\delta\mathrm{CKM_{g3,2}^*}\right) \end{array}$$

$$\underset{348}{C}\left(H^-, H^+, \tilde{d}_{\mathrm{g3}}^{\mathrm{s3}}, \tilde{d}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[\begin{array}{l} -\dfrac{\mathrm{i}e^2(\boxed{9})}{3c_{\mathrm{W}}^4 M_{\mathrm{W}}^4 s_{2\beta}^3 s_{\mathrm{W}}^3} \end{array}\right]$$

$$\boxed{9} = \begin{array}{l} (\boxed{6})c_\beta^3 U_{\mathrm{s3,1}}^{\tilde{d}_{\mathrm{g3}}*} + \\ \left(\begin{array}{l}(\boxed{8})c_\beta s_{\mathrm{W}}c_{\mathrm{W}}^2 M_{\mathrm{W}}^2 + \\ 2\delta_{\mathrm{g3,g4}}s_\beta^2 U_{\mathrm{s3,2}}^{\tilde{d}_{\mathrm{g3}}*}\left(c_\beta s_{\mathrm{W}}c_{\mathrm{W}}^2 M_{\mathrm{W}}^2\left(c_{2\beta}c_\beta^2 M_{\mathrm{W}}^2 s_{\mathrm{W}}^2 + 3c_{\mathrm{W}}^2 m_{d_{\mathrm{g3}}}^2 s_\beta^2\right)\left(\delta\overline{Z}_{\mathrm{1,s4}}^{\tilde{d}_{\mathrm{g4}}}U_{\mathrm{1,2}}^{\tilde{d}_{\mathrm{g4}}} + \delta\overline{Z}_{\mathrm{2,s4}}^{\tilde{d}_{\mathrm{g4}}}U_{\mathrm{2,2}}^{\tilde{d}_{\mathrm{g4}}}\right) + (\boxed{7})U_{\mathrm{s4,2}}^{\tilde{d}_{\mathrm{g4}}}\right)\end{array}\right)s_\beta \end{array}$$

$$
\begin{aligned}
8 = & \left(\begin{array}{l} 6c_{\mathrm{W}}^2 c_\beta^2 \left(\mathrm{CKM}_{1,g3} \mathrm{CKM}_{1,g4}^* m_{u_1}^2 + \mathrm{CKM}_{2,g3} \mathrm{CKM}_{2,g4}^* m_{u_2}^2 + \mathrm{CKM}_{3,g3} \mathrm{CKM}_{3,g4}^* m_{u_3}^2 \right) + \\ \delta_{g3,g4} c_{2\beta} \left(1 - 4c_{\mathrm{W}}^2 \right) M_{\mathrm{W}}^2 s_\beta^2 \end{array} \right) c_\beta^2 \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,1}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,1}^{\tilde{d}_{g3}*} \right) U_{s4,1}^{\tilde{d}_{g4}} + \\
& \left(\frac{1}{2} \delta_{g3,g4} U_{s4,2}^{\tilde{d}_{g4}} \right) \left(c_{2\beta} M_{\mathrm{W}}^2 s_{2\beta}^2 s_{\mathrm{W}}^2 + 12 c_{\mathrm{W}}^2 m_{d_{g3}}^2 s_\beta^4 \right) \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,2}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,2}^{\tilde{d}_{g3}*} \right)
\end{aligned}
$$

$$
\begin{aligned}
7 = & \left(\left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}} \right) s_{2\beta} c_{\mathrm{W}}^2 + c_{2\beta} \left(4 \left(\delta s_{\mathrm{W}} \right) s_{\mathrm{W}} + \left(4 \left(\delta \mathrm{Z_e} \right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}} \right) c_{\mathrm{W}}^2 \right) \right) c_\beta^3 M_{\mathrm{W}}^4 s_{\mathrm{W}}^3 + \\
& 3 m_{d_{g3}} s_\beta c_{\mathrm{W}}^4 \left(2 s_{2\beta} s_{\mathrm{W}} \delta m_{g3}^{d_g} M_{\mathrm{W}}^2 - \left(\begin{array}{l} s_{\mathrm{W}} \left(4 \left(\delta c_\beta \right) s_\beta + \left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}} \right) c_\beta^2 \right) M_{\mathrm{W}}^2 + \\ \frac{s_{2\beta}}{2} \left(4 \left(\delta s_{\mathrm{W}} \right) M_{\mathrm{W}}^2 - s_{\mathrm{W}} \left(\left(4 \left(\delta \mathrm{Z_e} \right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}} \right) M_{\mathrm{W}}^2 - 2 \delta M_{\mathrm{W}}^2 \right) \right) \end{array} \right) m_{d_{g3}} \right)
\end{aligned}
$$

$$
\begin{aligned}
6 = & \left(6(5) c_\beta c_{\mathrm{W}}^4 + (1) \delta_{g3,g4} M_{\mathrm{W}}^4 s_\beta^3 \right) U_{s4,1}^{\tilde{d}_{g4}} + \\
& \left(\begin{array}{l} 6c_{\mathrm{W}}^2 c_\beta^2 \left(\mathrm{CKM}_{1,g3} \mathrm{CKM}_{1,g4}^* m_{u_1}^2 + \mathrm{CKM}_{2,g3} \mathrm{CKM}_{2,g4}^* m_{u_2}^2 + \mathrm{CKM}_{3,g3} \mathrm{CKM}_{3,g4}^* m_{u_3}^2 \right) + \\ \delta_{g3,g4} c_{2\beta} \left(1 - 4c_{\mathrm{W}}^2 \right) M_{\mathrm{W}}^2 s_\beta^2 \end{array} \right) s_{\mathrm{W}} s_\beta c_{\mathrm{W}}^2 M_{\mathrm{W}}^2 \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,1}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,1}^{\tilde{d}_{g4}} \right)
\end{aligned}
$$

$$
5 = -M_{\mathrm{W}}^2 \left(\begin{array}{l} 2 \mathrm{CKM}_{3,g3} m_{u_3} \mathrm{CKM}_{3,g4}^* \left(m_{u_3} \left(\left(\delta s_{\mathrm{W}} \right) s_{2\beta} + 2 \left(\delta s_\beta \right) c_\beta s_{\mathrm{W}} \right) - s_{2\beta} s_{\mathrm{W}} \delta m_3^{u_g} \right) - \\ \mathrm{CKM}_{2,g3} \left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}} \right) s_{\mathrm{W}} \mathrm{CKM}_{2,g4}^* m_{u_2}^2 s_\beta^2 \end{array} \right) + m_{u_1} (4) \mathrm{CKM}_{1,g3} + c_\beta m_{u_2} (2) + s_{\mathrm{W}} (3)
$$

$$
\begin{aligned}
4 = & \mathrm{CKM}_{1,g4}^* \left(\begin{array}{l} 2 s_{2\beta} s_{\mathrm{W}} \delta m_1^{u_g} M_{\mathrm{W}}^2 - \\ \left(\frac{1}{2} m_{u_1} \right) \left(\begin{array}{l} 4 \left(\delta s_{\mathrm{W}} \right) s_{2\beta} M_{\mathrm{W}}^2 + \\ s_{\mathrm{W}} \left(2 s_{2\beta} \delta M_{\mathrm{W}}^2 + \left(\begin{array}{l} 8 \left(\delta s_\beta \right) c_\beta - 2 \left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}} \right) s_\beta^2 - \\ \left(4 \left(\delta \mathrm{Z_e} \right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}} \right) s_{2\beta} \end{array} \right) M_{\mathrm{W}}^2 \right) \end{array} \right) \end{array} \right) + s_{2\beta} s_{\mathrm{W}} m_{u_1} M_{\mathrm{W}}^2 \delta \mathrm{CKM}_{1,g4}^*
\end{aligned}
$$

$$
\begin{aligned}
3 = & \left(\delta \mathrm{CKM}_{1,g3} \right) s_{2\beta} \mathrm{CKM}_{1,g4}^* m_{u_1}^2 M_{\mathrm{W}}^2 + \\
& \left(\begin{array}{l} \mathrm{CKM}_{3,g3} \left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}} \right) s_\beta \mathrm{CKM}_{3,g4}^* M_{\mathrm{W}}^2 + \\ c_\beta \left(2 \left(\delta \mathrm{CKM}_{3,g3} \right) \mathrm{CKM}_{3,g4}^* M_{\mathrm{W}}^2 + \mathrm{CKM}_{3,g3} \left(2 \delta \mathrm{CKM}_{3,g4}^* M_{\mathrm{W}}^2 + \mathrm{CKM}_{3,g4}^* \left(\left(4 \left(\delta \mathrm{Z_e} \right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}} \right) M_{\mathrm{W}}^2 - 2 \delta M_{\mathrm{W}}^2 \right) \right) \right) \end{array} \right) s_\beta m_{u_3}^2
\end{aligned}
$$

$$
\begin{aligned}
2 = & -4 \mathrm{CKM}_{2,g3} \mathrm{CKM}_{2,g4}^* \left(m_{u_2} \left(\left(\delta s_\beta \right) s_{\mathrm{W}} + \left(\delta s_{\mathrm{W}} \right) s_\beta \right) - s_{\mathrm{W}} s_\beta \delta m_2^{u_g} \right) M_{\mathrm{W}}^2 + \\
& m_{u_2} s_{\mathrm{W}} s_\beta \left(2 \left(\delta \mathrm{CKM}_{2,g3} \right) \mathrm{CKM}_{2,g4}^* M_{\mathrm{W}}^2 + \mathrm{CKM}_{2,g3} \left(2 \delta \mathrm{CKM}_{2,g4}^* M_{\mathrm{W}}^2 + \mathrm{CKM}_{2,g4}^* \left(\left(4 \left(\delta \mathrm{Z_e} \right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}} \right) M_{\mathrm{W}}^2 - 2 \delta M_{\mathrm{W}}^2 \right) \right) \right)
\end{aligned}
$$

$$
\begin{aligned}
1 = & s_{2\beta} s_{\mathrm{W}} \left(1 - 4c_{\mathrm{W}}^2 \right) c_{\mathrm{W}}^2 \left(\delta Z_{\mathrm{G^-H^-}} + \delta Z_{\mathrm{H^-G^-}} \right) - c_{2\beta} \left(\begin{array}{l} \left(4 \left(\delta s_{\mathrm{W}} \right) - \left(4 \left(\delta \mathrm{Z_e} \right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}} \right) s_{\mathrm{W}} \right) c_{\mathrm{W}}^2 - \\ 4 \left(\left(4 \left(\delta s_{\mathrm{W}} \right) - \left(4 \left(\delta \mathrm{Z_e} \right) + \delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}} \right) s_{\mathrm{W}} \right) c_{\mathrm{W}}^4 + \left(\delta s_{\mathrm{W}} \right) s_{\mathrm{W}}^2 \right) \end{array} \right)
\end{aligned}
$$

$$\underset{349}{C}\left(G^-,G^+,\tilde{d}^{s3}_{g3},\tilde{d}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2}{12 s_{2\beta} c_W^4 M_W^4 s_W^3}\left(\begin{array}{l}(5) c_\beta U^{\tilde{d}_{g3}*}_{s3,1} + \\ \left(\begin{array}{l}(7) c_\beta s_W c_W^2 M_W^2 + \\ 2\left(\begin{array}{l}(6) U^{\tilde{d}_{g4}}_{s4,2} - \\ c_\beta s_W c_W^2 M_W^2\left(3c_W^2 m^2_{d_{g3}} - c_{2\beta} M_W^2 s_W^2\right)\left(U^{\tilde{d}_{g4}}_{1,2}\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} + U^{\tilde{d}_{g4}}_{2,2}\delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4}\right)\end{array}\right)\delta_{g3,g4} U^{\tilde{d}_{g3}*}_{s3,2}\end{array}\right) s_\beta\end{array}\right)\right]$$

$$\begin{array}{l}(7) = -\left(\begin{array}{l}6c_W^2\left(CKM_{1,g3}CKM^*_{1,g4}m^2_{u_1} + CKM_{2,g3}CKM^*_{2,g4}m^2_{u_2} + CKM_{3,g3}CKM^*_{3,g4}m^2_{u_3}\right) - \\ \delta_{g3,g4} c_{2\beta}\left(1 - 4c_W^2\right) M_W^2\end{array}\right)\left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1}\right) U^{\tilde{d}_{g4}}_{s4,1} - \\ 2\delta_{g3,g4}\left(3c_W^2 m^2_{d_{g3}} - c_{2\beta} M_W^2 s_W^2\right)\left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,2}\right) U^{\tilde{d}_{g4}}_{s4,2}\end{array}$$

$$(6) = -c_\beta\left(12 m_{d_{g3}} s_W \delta m^{d_g}_{g3} c_W^4 M_W^2 + \left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_{2\beta} c_W^2 - 2c_{2\beta}\left(2\left(\delta s_W\right) s_W + \left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) c_W^2\right)\right) M_W^4 s_W^3\right) + 3c_W^4 m^2_{d_{g3}}\left(s_W\left(4\left(\delta c_\beta\right) + \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_\beta\right) M_W^2 + c_\beta\left(4\left(\delta s_W\right) M_W^2 - 2s_W\left(\left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) M_W^2 - \delta M_W^2\right)\right)\right)$$

$$\begin{array}{l}(5) = -2\left(3c_W^4\left((3) CKM_{1,g3} m_{u_1} + (4) s_W + (2) M_W^2\right) + (1)\delta_{g3,g4} s_\beta M_W^4\right) U^{\tilde{d}_{g4}}_{s4,1} - \\ \left(\begin{array}{l}6c_W^2\left(CKM_{1,g3}CKM^*_{1,g4}m^2_{u_1} + CKM_{2,g3}CKM^*_{2,g4}m^2_{u_2} + CKM_{3,g3}CKM^*_{3,g4}m^2_{u_3}\right) - \\ \delta_{g3,g4} c_{2\beta}\left(1 - 4c_W^2\right) M_W^2\end{array}\right) s_W s_\beta c_W^2 M_W^2\left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1}\right)\end{array}$$

$$\begin{array}{l}(4) = \left(\begin{array}{l}2\left(\delta CKM_{1,g3}\right) CKM^*_{1,g4} m^2_{u_1} M_W^2 + \\ \left(\begin{array}{l}2\left(\delta CKM_{2,g3}\right) CKM^*_{2,g4} M_W^2 + \\ CKM_{2,g3}\left(2\delta CKM^*_{2,g4} M_W^2 + 2CKM^*_{2,g4}\left(2\left(\delta Z_e\right) M_W^2 - \delta M_W^2\right)\right)\end{array}\right) m^2_{u_2}\end{array}\right) s_\beta + \\ m^2_{u_3}\left(\left(\begin{array}{l}2 s_\beta \delta CKM^*_{3,g4} M_W^2 + \\ CKM^*_{3,g4}\left(\left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) c_\beta + 2\left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) s_\beta\right) M_W^2 - 2 s_\beta \delta M_W^2\right)\end{array}\right) CKM_{3,g3} + 2\left(\delta CKM_{3,g3}\right) s_\beta CKM^*_{3,g4} M_W^2\right)\end{array}$$

$$(3) = CKM^*_{1,g4}\left(\begin{array}{l}4 s_W s_\beta \delta m_1^{u_g} M_W^2 - \\ \left(\begin{array}{l}4\left(\delta s_W\right) s_\beta M_W^2 + \\ \left(\begin{array}{l}2 s_\beta \delta M_W^2 + \\ \left(4\left(\delta s_\beta\right) - \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) c_\beta - 2\left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) s_\beta\right) M_W^2\end{array}\right) s_W\end{array}\right) m_{u_1}\end{array}\right) + 2 s_\beta s_W m_{u_1} M_W^2 \delta CKM^*_{1,g4}$$

$$\boxed{2} = \begin{array}{l} -4\mathrm{CKM}_{3,g3} m_{u_3} \mathrm{CKM}^*_{3,g4} \left(m_{u_3} \left((\delta s_\beta)\, s_W + (\delta s_W)\, s_\beta \right) - s_W s_\beta \delta m_3^{u_g} \right) - \\ \left(\begin{array}{l} 4 m_{u_2} \left(m_{u_2} \left((\delta s_\beta)\, s_W + (\delta s_W)\, s_\beta \right) - s_W s_\beta \delta m_2^{u_g} \right) - \\ s_W \left((\delta Z_{G^- H^-} + \delta Z_{H^- G^-})\, c_\beta + 2 (\delta Z_{G^- G^-})\, s_\beta \right) m_{u_2}^2 \end{array} \right) \mathrm{CKM}_{2,g3} \mathrm{CKM}^*_{2,g4} \end{array}$$

$$\boxed{1} = \left(1 - 4c_W^2\right) \left(\tfrac{1}{2} s_{2\beta} s_W c_W^2\right) (\delta Z_{G^- H^-} + \delta Z_{H^- G^-}) - c_{2\beta} \left(\begin{array}{l} (8\,(\delta s_W) - 4\,(2\,(\delta Z_e) + \delta Z_{G^- G^-})\, s_W)\, c_W^4 + 2\,(\delta s_W)\, s_W^2 - \\ (2\,(\delta s_W) - (2\,(\delta Z_e) + \delta Z_{G^- G^-})\, s_W)\, c_W^2 \end{array} \right)$$

$$\underset{350}{C}\left(H^-, G^+, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{\mathrm{i}e^2(\boxed{9})}{3 c_W^4 M_W^4 s_{2\beta}^2 s_W^3} \right]$$

$$\boxed{9} = s_\beta \left(\begin{array}{l} (\boxed{8}) c_\beta s_W c_W^2 M_W^2 + \\ \left(\begin{array}{l} (\boxed{7}) U^{\tilde{d}_{g4}}_{s4,2} - \\ \left(\frac{1}{2} s_{2\beta} s_W c_W^2 M_W^2\right) \left(3 c_W^2 m^2_{d_{g3}} - 2 c_\beta^2 M_W^2 s_W^2\right) \left(\delta \overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,2} + \delta \overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,2}\right) \end{array} \right) \delta_{g3,g4} s_\beta U^{\tilde{d}_{g3}*}_{s3,2} \end{array} \right) + c_\beta^2 (\boxed{6}) U^{\tilde{d}_{g3}*}_{s3,1}$$

$$\boxed{8} = \begin{array}{l} \left(\begin{array}{l} 3 c_W^2 \left(\mathrm{CKM}_{1,g3} \mathrm{CKM}^*_{1,g4} m^2_{u_1} + \mathrm{CKM}_{2,g3} \mathrm{CKM}^*_{2,g4} m^2_{u_2} + \mathrm{CKM}_{3,g3} \mathrm{CKM}^*_{3,g4} m^2_{u_3} \right) + \\ \delta_{g3,g4} \left(1 - 4c_W^2\right) M_W^2 s_\beta^2 \end{array} \right) c_\beta^2 \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1} \right) U^{\tilde{d}_{g4}}_{s4,1} - \\ \delta_{g3,g4} \left(3 c_W^2 m^2_{d_{g3}} - 2 c_\beta^2 M_W^2 s_W^2\right) s_\beta^2 \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,2} \right) U^{\tilde{d}_{g4}}_{s4,2} \end{array}$$

$$\boxed{7} = \begin{array}{l} s_\beta \left(2 \left(4\,(\delta s_W)\, s_W + (4\,(\delta Z_e) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-})\, c_W^2 \right) c_\beta^3 M_W^4 s_W^3 - 12 c_\beta m_{d_{g3}} s_W \delta m^{d_g}_{g3} c_W^4 M_W^2 \right) + \\ 3 c_W^4 m^2_{d_{g3}} \left(s_W \left(\delta Z_{G^- H^-} + 4\,(\delta c_\beta)\, s_\beta\right) M_W^2 + \frac{s_{2\beta}}{2} \left(4\,(\delta s_W)\, M_W^2 - s_W \left((4\,(\delta Z_e) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-})\, M_W^2 - 2\delta M_W^2 \right) \right) \right) \end{array}$$

$$\boxed{6} = \left(\tfrac{1}{2} s_{2\beta} s_W c_W^2 M_W^2\right) \left(U^{\tilde{d}_{g4}}_{2,1} \delta \overline{Z}^{\tilde{d}_{g4}}_{2,s4} + U^{\tilde{d}_{g4}}_{1,1} \delta \overline{Z}^{\tilde{d}_{g4}}_{1,s4} \right) \left(\begin{array}{l} 3 c_W^2 \left(\mathrm{CKM}_{1,g3} \mathrm{CKM}^*_{1,g4} m^2_{u_1} + \mathrm{CKM}_{2,g3} \mathrm{CKM}^*_{2,g4} m^2_{u_2} + \mathrm{CKM}_{3,g3} \mathrm{CKM}^*_{3,g4} m^2_{u_3} \right) + \\ \delta_{g3,g4} \left(1 - 4c_W^2\right) M_W^2 s_\beta^2 \end{array} \right) + (\boxed{5}) U^{\tilde{d}_{g4}}_{s4,1}$$

$$\boxed{5} = 3 c_W^4 (\boxed{4}) - \left(\tfrac{1}{2} \delta_{g3,g4} s_{2\beta} M_W^4 s_\beta^2\right) \left(\begin{array}{l} (4\,(\delta s_W) - (4\,(\delta Z_e) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-})\, s_W)\, c_W^2 - \\ 4 \left((4\,(\delta s_W) - (4\,(\delta Z_e) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-})\, s_W)\, c_W^4 + (\delta s_W)\, s_W^2 \right) \end{array} \right)$$

$$\boxed{4} = -M_W^2 \left(\begin{array}{l} 2 \mathrm{CKM}_{3,g3} m_{u_3} \mathrm{CKM}^*_{3,g4} \left(m_{u_3} \left((\delta s_W)\, s_{2\beta} + 2\,(\delta s_\beta)\, c_\beta s_W \right) - s_{2\beta} s_W \delta m_3^{u_g} \right) - \\ \left(\frac{1}{2} \mathrm{CKM}_{2,g3} s_W \mathrm{CKM}^*_{2,g4} m^2_{u_2} \right) (2\,(\delta Z_{G^- H^-}) + (\delta Z_{G^- G^-})\, s_{2\beta}) \end{array} \right) + m_{u_1} (\boxed{2}) \mathrm{CKM}_{1,g3} + c_\beta m_{u_2} (\boxed{1}) + s_W (\boxed{3})$$

$$\boxed{3} = m_{u_3}^2 \left(\begin{array}{l} \left(\delta \mathrm{CKM}_{3,g3}\right) s_{2\beta} \mathrm{CKM}_{3,g4}^* M_W^2 + \\ \left(\frac{1}{2}\mathrm{CKM}_{3,g3}\right) \left(\begin{array}{l} 2 s_{2\beta} \delta \mathrm{CKM}_{3,g4}^* M_W^2 + \\ \mathrm{CKM}_{3,g4}^* \left(\left(2\left(\delta Z_{G^- H^-}\right) + \left(4\left(\delta Z_e\right) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-}\right) s_{2\beta}\right) M_W^2 - 2 s_{2\beta} \delta M_W^2 \right) \end{array} \right) \end{array} \right) + s_{2\beta} M_W^2 m_{u_1}^2 \mathrm{CKM}_{1,g4}^* \left(\delta \mathrm{CKM}_{1,g3}\right)$$

$$\boxed{2} = \mathrm{CKM}_{1,g4}^* \left(\begin{array}{l} 2 s_{2\beta} s_W \delta m_1^{u_g} M_W^2 - \\ \left(\begin{array}{l} 2\left(\delta s_W\right) s_{2\beta} M_W^2 + \\ \frac{s_W}{2} \left(\begin{array}{l} 2 s_{2\beta} \delta M_W^2 + \\ \left(-2\left(\delta Z_{G^- H^-}\right) + 8\left(\delta s_\beta\right) c_\beta - \left(4\left(\delta Z_e\right) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-}\right) s_{2\beta}\right) M_W^2 \end{array} \right) \end{array} \right) m_{u_1} \end{array} \right) + s_{2\beta} s_W m_{u_1} M_W^2 \delta \mathrm{CKM}_{1,g4}^*$$

$$\boxed{1} = \begin{array}{l} -4 \mathrm{CKM}_{2,g3} \mathrm{CKM}_{2,g4}^* \left(m_{u_2} \left(\left(\delta s_\beta\right) s_W + \left(\delta s_W\right) s_\beta \right) - s_W s_\beta \delta m_2^{u_g} \right) M_W^2 + \\ m_{u_2} s_W s_\beta \left(2\left(\delta \mathrm{CKM}_{2,g3}\right) \mathrm{CKM}_{2,g4}^* M_W^2 + \mathrm{CKM}_{2,g3} \left(2 \delta \mathrm{CKM}_{2,g4}^* M_W^2 + \mathrm{CKM}_{2,g4}^* \left(\left(4\left(\delta Z_e\right) + \delta Z_{H^- H^-}\right) M_W^2 - 2 \delta M_W^2 \right) \right) \right) \end{array}$$

$$\underset{351}{C}\left(G^-, H^+, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{\mathrm{i} e^2 (\boxed{9})}{3 c_W^4 M_W^4 s_{2\beta}^2 s_W^3} \right]$$

$$\boxed{9} = s_\beta \left(\begin{array}{l} (\boxed{8}) c_\beta s_W c_W^2 M_W^2 + \\ \left(\begin{array}{l} (\boxed{7}) U_{s4,2}^{\tilde{d}_{g4}} - \\ \left(\frac{1}{2} s_{2\beta} s_W c_W^2 M_W^2\right) \left(3 c_W^2 m_{d_{g3}}^2 - 2 c_\beta^2 M_W^2 s_W^2\right) \left(\delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} U_{1,2}^{\tilde{d}_{g4}} + \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} U_{2,2}^{\tilde{d}_{g4}} \right) \end{array} \right) \delta_{g3,g4} s_\beta U_{s3,2}^{\tilde{d}_{g3}*} \end{array} \right) + c_\beta^2 (\boxed{6}) U_{s3,1}^{\tilde{d}_{g3}*}$$

$$\boxed{8} = \begin{array}{l} \left(\begin{array}{l} 3 c_W^2 \left(\mathrm{CKM}_{1,g3} \mathrm{CKM}_{1,g4}^* m_{u_1}^2 + \mathrm{CKM}_{2,g3} \mathrm{CKM}_{2,g4}^* m_{u_2}^2 + \mathrm{CKM}_{3,g3} \mathrm{CKM}_{3,g4}^* m_{u_3}^2 \right) + \\ \delta_{g3,g4} \left(1 - 4 c_W^2\right) M_W^2 s_\beta^2 \end{array} \right) c_\beta^2 \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,1}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,1}^{\tilde{d}_{g3}*} \right) U_{s4,1}^{\tilde{d}_{g4}} - \\ \delta_{g3,g4} \left(3 c_W^2 m_{d_{g3}}^2 - 2 c_\beta^2 M_W^2 s_W^2\right) s_\beta^2 \left(\delta Z_{1,s3}^{\tilde{d}_{g3}} U_{1,2}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}} U_{2,2}^{\tilde{d}_{g3}*} \right) U_{s4,2}^{\tilde{d}_{g4}} \end{array}$$

$$\boxed{7} = \begin{array}{l} s_\beta \left(2 \left(4\left(\delta s_W\right) s_W + \left(4\left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{G^- G^-}\right) c_W^2 \right) c_\beta^3 M_W^4 s_W^3 - 12 c_\beta m_{d_{g3}} s_W \delta m_{g3}^{d_g} c_W^4 M_W^2 \right) + \\ 3 c_W^4 m_{d_{g3}}^2 \left(s_W \left(\delta Z_{H^- G^-} + 4\left(\delta c_\beta\right) s_\beta \right) M_W^2 + \frac{s_{2\beta}}{2} \left(4\left(\delta s_W\right) M_W^2 - s_W \left(\left(4\left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{G^- G^-}\right) M_W^2 - 2 \delta M_W^2 \right) \right) \right) \end{array}$$

$$\boxed{6} = \left(\tfrac{1}{2} s_{2\beta} s_W c_W^2 M_W^2\right) \left(U_{2,1}^{\tilde{d}_{g4}} \delta \overline{Z}_{2,s4}^{\tilde{d}_{g4}} + U_{1,1}^{\tilde{d}_{g4}} \delta \overline{Z}_{1,s4}^{\tilde{d}_{g4}} \right) \left(\begin{array}{l} 3 c_W^2 \left(\mathrm{CKM}_{1,g3} \mathrm{CKM}_{1,g4}^* m_{u_1}^2 + \mathrm{CKM}_{2,g3} \mathrm{CKM}_{2,g4}^* m_{u_2}^2 + \mathrm{CKM}_{3,g3} \mathrm{CKM}_{3,g4}^* m_{u_3}^2 \right) + \\ \delta_{g3,g4} \left(1 - 4 c_W^2\right) M_W^2 s_\beta^2 \end{array} \right) + (\boxed{5}) U_{s4,1}^{\tilde{d}_{g4}}$$

$$\boxed{5} = 3 c_W^4 (\boxed{4}) - \left(\tfrac{1}{2} \delta_{g3,g4} s_{2\beta} M_W^4 s_\beta^2\right) \left(\begin{array}{l} \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{G^- G^-}\right) s_W\right) c_W^2 - \\ 4 \left(\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta \overline{Z}_{H^- H^-} + \delta Z_{G^- G^-}\right) s_W\right) c_W^4 + \left(\delta s_W\right) s_W^2 \right) \end{array} \right)$$

$$\boxed{4} = -M_W^2 \left(\begin{array}{l} 2\mathrm{CKM}_{3,g3} m_{u_3} \mathrm{CKM}^*_{3,g4} \left(m_{u_3} \left((\delta s_W)\, s_{2\beta} + 2\,(\delta s_\beta)\, c_\beta s_W \right) - s_{2\beta} s_W \delta m_3^{u_g} \right) - \\ \left(\frac{1}{2} \mathrm{CKM}_{2,g3} s_W \mathrm{CKM}^*_{2,g4} m_{u_2}^2 \right) \left(2\,(\delta Z_{H^- G^-}) + (\delta Z_{G^- G^-})\, s_{2\beta} \right) \end{array} \right) + m_{u_1} (\boxed{2}) \mathrm{CKM}_{1,g3} + c_\beta m_{u_2} (\boxed{1}) + s_W (\boxed{3})$$

$$\boxed{3} = m_{u_3}^2 \left(\begin{array}{l} (\delta \mathrm{CKM}_{3,g3})\, s_{2\beta} \mathrm{CKM}^*_{3,g4} M_W^2 + \\ \left(\frac{1}{2} \mathrm{CKM}_{3,g3} \right) \left(\begin{array}{l} 2 s_{2\beta} \delta \mathrm{CKM}^*_{3,g4} M_W^2 + \\ \mathrm{CKM}^*_{3,g4} \left(\left(2\,(\delta Z_{H^- G^-}) + \left(4\,(\delta Z_e) + \delta \overline{Z}_{H^- H^-} + \delta Z_{G^- G^-} \right) s_{2\beta} \right) M_W^2 - 2 s_{2\beta} \delta M_W^2 \right) \end{array} \right) \end{array} \right) + s_{2\beta} M_W^2 m_{u_1}^2 \mathrm{CKM}^*_{1,g4} \left(\delta \mathrm{CKM}_{1,g3} \right)$$

$$\boxed{2} = \mathrm{CKM}^*_{1,g4} \left(\begin{array}{l} 2 s_{2\beta} s_W \delta m_1^{u_g} M_W^2 - \\ \left(\begin{array}{l} 2\,(\delta s_W)\, s_{2\beta} M_W^2 + \\ \frac{s_W}{2} \left(\begin{array}{l} 2 s_{2\beta} \delta M_W^2 + \\ \left(-2\,(\delta Z_{H^- G^-}) + 8\,(\delta s_\beta)\, c_\beta - \left(4\,(\delta Z_e) + \delta \overline{Z}_{H^- H^-} + \delta Z_{G^- G^-} \right) s_{2\beta} \right) M_W^2 \end{array} \right) \end{array} \right) m_{u_1} \end{array} \right) + s_{2\beta} s_W m_{u_1} M_W^2 \delta \mathrm{CKM}^*_{1,g4}$$

$$\boxed{1} = \begin{array}{l} m_{u_2} s_W s_\beta \left(2\,(\delta \mathrm{CKM}_{2,g3})\, \mathrm{CKM}^*_{2,g4} M_W^2 + \mathrm{CKM}_{2,g3} \left(2 \delta \mathrm{CKM}^*_{2,g4} M_W^2 + \mathrm{CKM}^*_{2,g4} \left(\left(4\,(\delta Z_e) + \delta \overline{Z}_{H^- H^-} \right) M_W^2 - 2 \delta M_W^2 \right) \right) \right) - \\ 4 \mathrm{CKM}_{2,g3} \mathrm{CKM}^*_{2,g4} \left(m_{u_2} \left((\delta s_\beta)\, s_W + (\delta s_W)\, s_\beta \right) - s_W s_\beta \delta m_2^{u_g} \right) M_W^2 \end{array}$$

[SSSS] 2 Sleptons – 2 Squarks

$$\underset{375}{C} \left(\tilde{d}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger} \right) = \left[-\frac{i e^2 \delta_{g1,g2} \delta_{g3,g4}}{24 c_W^4 c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} (\boxed{9}) c_\beta s_W c_W^2 M_W^2 + 2 \left((\boxed{8}) c_\beta s_W M_W^2 + (\boxed{6}) U_{s1,1}^{\tilde{d}_{g1}*} \right) U_{s3,2}^{\tilde{e}_{g3}*} - \\ \left((\boxed{4}) c_\beta s_W c_W^2 M_W^2 + (\boxed{1}) c_\beta^3 M_W^4 U_{s1,1}^{\tilde{d}_{g1}*} - 2 (\boxed{3}) U_{s1,2}^{\tilde{d}_{g1}*} \right) U_{s3,1}^{\tilde{e}_{g3}*} \end{array} \right) \right]$$

$$\boxed{9} = \begin{array}{l} - \left(\begin{array}{l} \left(1 - 4 c_W^2 \right) c_\beta^2 M_W^2 U_{s1,1}^{\tilde{d}_{g1}*} U_{s2,1}^{\tilde{d}_{g1}} U_{s4,1}^{\tilde{e}_{g3}} + \\ 2 U_{s1,2}^{\tilde{d}_{g1}*} \left(c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d}_{g1}} U_{s4,1}^{\tilde{e}_{g3}} - 3 m_{d_{g1}} m_{e_{g3}} c_W^2 U_{s2,1}^{\tilde{d}_{g1}} U_{s4,2}^{\tilde{e}_{g3}} \right) \end{array} \right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g3}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g3}*} \right) + \\ 2 \left(\begin{array}{l} 3 m_{d_{g1}} m_{e_{g3}} c_W^2 U_{s1,1}^{\tilde{d}_{g1}*} U_{s2,2}^{\tilde{d}_{g1}} U_{s4,1}^{\tilde{e}_{g3}} + \\ c_\beta^2 M_W^2 s_W^2 \left(U_{s1,1}^{\tilde{d}_{g1}*} U_{s2,1}^{\tilde{d}_{g1}} + 2 U_{s1,2}^{\tilde{d}_{g1}*} U_{s2,2}^{\tilde{d}_{g1}} \right) U_{s4,2}^{\tilde{e}_{g3}} \end{array} \right) \left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,2}^{\tilde{e}_{g3}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,2}^{\tilde{e}_{g3}*} \right) \end{array}$$

$$\boxed{8} = 2 c_\beta^2 M_W^2 s_W^2 U_{s1,2}^{\tilde{d}_{g1}*} \left(U_{s2,2}^{\tilde{d}_{g1}} \left(\begin{array}{l} c_W^2 \left(\delta \overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,2}^{\tilde{e}_{g3}} + \delta \overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,2}^{\tilde{e}_{g3}} \right) + \\ 4 \left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2 \right) U_{s4,2}^{\tilde{e}_{g3}} \end{array} \right) + c_W^2 U_{s4,2}^{\tilde{e}_{g3}} \left(U_{1,2}^{\tilde{d}_{g1}} \delta \overline{Z}_{1,s2}^{\tilde{d}_{g2}} + U_{2,2}^{\tilde{d}_{g1}} \delta \overline{Z}_{2,s2}^{\tilde{d}_{g2}} \right) \right) + c_W^2 (\boxed{7})$$

$$
\begin{aligned}
7 = & \left(\delta Z^{\tilde{d}_{g1}}_{1,s1} U^{\tilde{d}_{g1}*}_{1,1} + \delta Z^{\tilde{d}_{g1}}_{2,s1} U^{\tilde{d}_{g1}*}_{2,1}\right) \left(3 m_{d_{g1}} m_{e_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{e}_{g3}}_{s4,1} + c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{e}_{g3}}_{s4,2}\right) + \\
& 2 c_\beta^2 M_W^2 s_W^2 \left(\delta Z^{\tilde{d}_{g1}}_{1,s1} U^{\tilde{d}_{g1}*}_{1,2} + \delta Z^{\tilde{d}_{g1}}_{2,s1} U^{\tilde{d}_{g1}*}_{2,2}\right) U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{e}_{g3}}_{s4,2}
\end{aligned}
$$

$$
\begin{aligned}
6 = & \delta \overline{Z}^{\tilde{d}_{g2}}_{1,s2} \left(3 c_\beta m_{d_{g1}} m_{e_{g3}} s_W c_W^4 M_W^2 U^{\tilde{d}_{g1}}_{1,2} U^{\tilde{e}_{g3}}_{s4,1} + c_W^2 c_\beta^3 M_W^4 s_W^3 U^{\tilde{d}_{g1}}_{1,1} U^{\tilde{e}_{g3}}_{s4,2}\right) - (5) c_W^4 U^{\tilde{d}_{g1}}_{s2,2} + \\
6 = & \delta \overline{Z}^{\tilde{d}_{g2}}_{2,s2} \left(3 c_\beta m_{d_{g1}} m_{e_{g3}} s_W c_W^4 M_W^2 U^{\tilde{d}_{g1}}_{2,2} U^{\tilde{e}_{g3}}_{s4,1} + c_W^2 c_\beta^3 M_W^4 s_W^3 U^{\tilde{d}_{g1}}_{2,1} U^{\tilde{e}_{g3}}_{s4,2}\right) + \\
& c_\beta^3 M_W^4 s_W^3 U^{\tilde{d}_{g1}}_{s2,1} \left(c_W^2 \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,2} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,2}\right) + 4 \left(\left(\delta s_W\right) s_W + \left(\delta Z_e\right) c_W^2\right) U^{\tilde{e}_{g3}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
5 = c_\beta \Bigg(& \Bigg(6 m_{d_{g1}} m_{e_{g3}} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right) U^{\tilde{e}_{g3}}_{s4,1} - \\
& \Bigg(3 m_{d_{g1}} m_{e_{g3}} \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,1} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,1}\right) + \\
& 6 \left(m_{e_{g3}} \delta m^{d_g}_{g1} + m_{d_{g1}} \delta m^{e_g}_{g3}\right) U^{\tilde{e}_{g3}}_{s4,1} \Bigg) s_W M_W^2 \Bigg) - 12 s_W m_{d_{g1}} m_{e_{g3}} M_W^2 \left(c_\beta \left(\delta Z_e\right) - \delta c_\beta\right) U^{\tilde{e}_{g3}}_{s4,1}
\end{aligned}
$$

$$
\begin{aligned}
4 = & \left(1 - 4 c_W^2\right) c_\beta^2 M_W^2 \left(\delta Z^{\tilde{d}_{g1}}_{1,s1} U^{\tilde{d}_{g1}*}_{1,1} + \delta Z^{\tilde{d}_{g1}}_{2,s1} U^{\tilde{d}_{g1}*}_{2,1}\right) U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{e}_{g3}}_{s4,1} + \\
& 2 \left(\delta Z^{\tilde{d}_{g1}}_{1,s1} U^{\tilde{d}_{g1}*}_{1,2} + \delta Z^{\tilde{d}_{g1}}_{2,s1} U^{\tilde{d}_{g1}*}_{2,2}\right) \left(c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{e}_{g3}}_{s4,1} - 3 m_{d_{g1}} m_{e_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{e}_{g3}}_{s4,2}\right)
\end{aligned}
$$

$$
\begin{aligned}
3 = & -(2) c_W^4 U^{\tilde{d}_{g1}}_{s2,1} - \delta \overline{Z}^{\tilde{d}_{g2}}_{1,s2} \left(c_W^2 c_\beta^3 M_W^4 s_W^3 U^{\tilde{d}_{g1}}_{1,2} U^{\tilde{e}_{g3}}_{s4,1} - 3 c_\beta m_{d_{g1}} m_{e_{g3}} s_W c_W^4 M_W^2 U^{\tilde{d}_{g1}}_{1,1} U^{\tilde{e}_{g3}}_{s4,2}\right) - \\
3 = & \delta \overline{Z}^{\tilde{d}_{g2}}_{2,s2} \left(c_W^2 c_\beta^3 M_W^4 s_W^3 U^{\tilde{d}_{g1}}_{2,2} U^{\tilde{e}_{g3}}_{s4,1} - 3 c_\beta m_{d_{g1}} m_{e_{g3}} s_W c_W^4 M_W^2 U^{\tilde{d}_{g1}}_{2,1} U^{\tilde{e}_{g3}}_{s4,2}\right) - \\
& c_\beta^3 M_W^4 s_W^3 U^{\tilde{d}_{g1}}_{s2,2} \left(c_W^2 \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,1} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,1}\right) + 4 \left(\left(\delta s_W\right) s_W + \left(\delta Z_e\right) c_W^2\right) U^{\tilde{e}_{g3}}_{s4,1}\right)
\end{aligned}
$$

$$
\begin{aligned}
2 = c_\beta \Bigg(& \Bigg(6 m_{d_{g1}} m_{e_{g3}} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right) U^{\tilde{e}_{g3}}_{s4,2} - \\
& \Bigg(3 m_{d_{g1}} m_{e_{g3}} \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,2} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,2}\right) + \\
& 6 \left(m_{e_{g3}} \delta m^{d_g}_{g1} + m_{d_{g1}} \delta m^{e_g}_{g3}\right) U^{\tilde{e}_{g3}}_{s4,2} \Bigg) s_W M_W^2 \Bigg) - 12 s_W m_{d_{g1}} m_{e_{g3}} M_W^2 \left(c_\beta \left(\delta Z_e\right) - \delta c_\beta\right) U^{\tilde{e}_{g3}}_{s4,2}
\end{aligned}
$$

$$
\begin{aligned}
1 = U^{\tilde{d}_{g1}}_{s2,1} \Bigg(& s_W \left(1 - 4 c_W^2\right) c_W^2 \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,1} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,1}\right) - \\
& 4 \left(3 \left(\left(\delta Z_e\right) s_W - \delta s_W\right) c_W^4 - \left(\delta Z_e\right) c_W^2 s_W^3 - \left(\delta s_W\right) s_W^4\right) U^{\tilde{e}_{g3}}_{s4,1} \Bigg) + s_W \left(1 - 4 c_W^2\right) c_W^2 U^{\tilde{e}_{g3}}_{s4,1} \left(U^{\tilde{d}_{g1}}_{2,1} \delta \overline{Z}^{\tilde{d}_{g2}}_{2,s2} + U^{\tilde{d}_{g1}}_{1,1} \delta \overline{Z}^{\tilde{d}_{g2}}_{1,s2}\right)
\end{aligned}
$$

$$
\underset{376}{C}\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{i e^2 (2) \delta_{g1,g2} \delta_{g3,g4}}{24 c_W^4 s_W^3} \right]
$$

$$2 = U^{\tilde{d}_{g1}*}_{s1,1}\left(\begin{array}{l} s_W c_W^2\left(2c_W^2+1\right)\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g1}}_{2,1}\right)+ \\ \left(s_W\left(\delta\overline{Z}^{\tilde{\nu}}_{1,1}+\delta Z^{\tilde{\nu}}_{1,1}\right)c_W^2\left(2c_W^2+1\right)+\left(4\left(\delta Z_e\right)s_W-4\left(\delta s_W\right)\right)\left(c_W^2+2c_W^4\right)+4\left(\delta s_W\right)s_W^2\right)U^{\tilde{d}_{g1}}_{s2,1}\end{array}\right)+s_W(1)$$

$$1 = \begin{array}{l} 2s_W^2U^{\tilde{d}_{g1}*}_{s1,2}\left(c_W^2\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g1}}_{1,2}+\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g1}}_{2,2}\right)+\left(\left(\delta\overline{Z}^{\tilde{\nu}}_{1,1}+\delta Z^{\tilde{\nu}}_{1,1}\right)c_W^2+4\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)\right)U^{\tilde{d}_{g1}}_{s2,2}\right)+ \\ c_W^2\left(\left(2c_W^2+1\right)\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,1}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,1}\right)U^{\tilde{d}_{g1}}_{s2,1}+2s_W^2\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,2}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,2}\right)U^{\tilde{d}_{g1}}_{s2,2}\right)\end{array}$$

$$\underset{378}{C}\left(\tilde{d}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{\nu}_{g3},\tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g2,g3}}{4c_\beta^3M_W^4s_W^3}\left(\begin{array}{l}(2)\mathrm{CKM}_{g4,g1}+ \\ 2c_\beta s_W\left(\delta\mathrm{CKM}_{g4,g1}\right)M_W^2\left(c_\beta^2M_W^2U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{e}_{g2}}_{s2,1}+m_{d_{g1}}m_{e_{g2}}U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{e}_{g2}}_{s2,2}\right)U^{\tilde{u}_{g4}}_{s4,1}\end{array}\right)\right]$$

$$2 = \begin{array}{l} U^{\tilde{d}_{g1}*}_{s1,2}\left(c_\beta m_{d_{g1}}m_{e_{g2}}s_WM_W^2\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4}U^{\tilde{u}_{g4}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4}U^{\tilde{u}_{g4}}_{2,1}\right)U^{\tilde{e}_{g2}}_{s2,2}+(1)U^{\tilde{u}_{g4}}_{s4,1}\right)+ \\ c_\beta^3M_W^4U^{\tilde{d}_{g1}*}_{s1,1}\left(s_W\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4}U^{\tilde{u}_{g4}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4}U^{\tilde{u}_{g4}}_{2,1}\right)U^{\tilde{e}_{g2}}_{s2,1}+\left(\begin{array}{l}s_W\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g2}}_{2,1}\right)- \\ \left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta Z^{\tilde{\nu}}_{1,1}\right)\right)U^{\tilde{e}_{g2}}_{s2,1}\end{array}\right)U^{\tilde{u}_{g4}}_{s4,1}\right)+ \\ c_\beta s_WM_W^2\left(c_\beta^2M_W^2\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,1}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,1}\right)U^{\tilde{e}_{g2}}_{s2,1}+m_{d_{g1}}m_{e_{g2}}\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,2}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,2}\right)U^{\tilde{e}_{g2}}_{s2,2}\right)U^{\tilde{u}_{g4}}_{s4,1}\end{array}$$

$$1 = \begin{array}{l} c_\beta m_{d_{g1}}m_{e_{g2}}s_WM_W^2\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g2}}_{1,2}+\delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g2}}_{2,2}\right)+ \\ \left(2c_\beta m_{e_{g2}}s_W\delta m^{d_g}_{g1}M_W^2+m_{d_{g1}}\left(2c_\beta s_W\delta m^{e_g}_{g2}M_W^2-\left(\begin{array}{l}c_\beta\left(2s_W\delta M_W^2+4\left(\delta s_W\right)M_W^2\right)+ \\ s_W\left(4\left(\delta c_\beta\right)-c_\beta\left(4\left(\delta Z_e\right)+\delta Z^{\tilde{\nu}}_{1,1}\right)\right)M_W^2\end{array}\right)m_{e_{g2}}\right)\right)U^{\tilde{e}_{g2}}_{s2,2}\end{array}$$

$$\underset{379}{C}\left(\tilde{e}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{u}^{s3}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g1,g4}}{4c_\beta^3M_W^4s_W^3}\left(\begin{array}{l}(2)\mathrm{CKM}^*_{g3,g2}+ \\ 2c_\beta s_WM_W^2\left(c_\beta^2M_W^2U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1}+m_{d_{g2}}m_{e_{g1}}U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{d}_{g2}}_{s2,2}\right)U^{\tilde{u}_{g3}*}_{s3,1}\delta\mathrm{CKM}^*_{g3,g2}\end{array}\right)\right]$$

$$2 = \begin{array}{l} c_\beta s_WM_W^2\left(c_\beta^2M_W^2\left(\delta Z^{\tilde{e}_{g1}}_{1,s1}U^{\tilde{e}_{g1}*}_{1,1}+\delta Z^{\tilde{e}_{g1}}_{2,s1}U^{\tilde{e}_{g1}*}_{2,1}\right)U^{\tilde{d}_{g2}}_{s2,1}+m_{d_{g2}}m_{e_{g1}}\left(\delta Z^{\tilde{e}_{g1}}_{1,s1}U^{\tilde{e}_{g1}*}_{1,2}+\delta Z^{\tilde{e}_{g1}}_{2,s1}U^{\tilde{e}_{g1}*}_{2,2}\right)U^{\tilde{d}_{g2}}_{s2,2}\right)U^{\tilde{u}_{g3}*}_{s3,1}+ \\ c_\beta^3M_W^4U^{\tilde{e}_{g1}*}_{s1,1}\left(s_W\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,1}+\delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,1}\right)U^{\tilde{d}_{g2}}_{s2,1}+\left(\begin{array}{l}s_W\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g2}}_{2,1}\right)- \\ \left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)\right)U^{\tilde{d}_{g2}}_{s2,1}\end{array}\right)U^{\tilde{u}_{g3}*}_{s3,1}\right)+ \\ U^{\tilde{e}_{g1}*}_{s1,2}\left(c_\beta m_{d_{g2}}m_{e_{g1}}s_WM_W^2\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,1}+\delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,1}\right)U^{\tilde{d}_{g2}}_{s2,2}+(1)U^{\tilde{u}_{g3}*}_{s3,1}\right)\end{array}$$

$$
\boxed{1} = \begin{array}{l} c_\beta m_{d_{g2}} m_{e_{g1}} s_W M_W^2 \left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2} U^{\tilde{d}_{g2}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2} U^{\tilde{d}_{g2}}_{2,2} \right) + \\ \left(2c_\beta m_{e_{g1}} s_W \delta m^{d_g}_{g2} M_W^2 + m_{d_{g2}} \left(2c_\beta s_W \delta m^{e_g}_{g1} M_W^2 - \begin{pmatrix} s_W \left(4\left(\delta c_\beta\right) - c_\beta \left(4\left(\delta Z_e\right) + \delta\overline{Z}^{\tilde{\nu}}_{1,1} \right) \right) M_W^2 + \\ c_\beta \left(2 s_W \delta M_W^2 + 4\left(\delta s_W\right) M_W^2 \right) \end{pmatrix} m_{e_{g1}} \right) \right) U^{\tilde{d}_{g2}}_{s2,2} \end{array}
$$

$$
\underset{382}{C}\left(\tilde{e}^{s1}_{g1}, \tilde{e}^{s2,\dagger}_{g2}, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4} \right) = \left[-\frac{i e^2 \delta_{g1,g2} \delta_{g3,g4}}{24 c_W^4 s_W^3} \left(s_W \left((\boxed{1}) c_W^2 + 2(\boxed{2}) s_W^2 U^{\tilde{e}_{g1}*}_{s1,2} \right) - U^{\tilde{e}_{g1}*}_{s1,1} \left((\boxed{4}) s_W + (\boxed{3}) U^{\tilde{u}_{g3}*}_{s3,1} \right) \right) \right]
$$

$$
\boxed{4} = c_W^2 U^{\tilde{e}_{g1}}_{s2,1} \begin{pmatrix} \left(2c_W^2 + 1\right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1} \right) U^{\tilde{u}_{g3}}_{s4,1} - \\ 4 s_W^2 \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,2} \right) U^{\tilde{u}_{g3}}_{s4,2} \end{pmatrix} - 4 s_W^2 U^{\tilde{u}_{g3}*}_{s3,2} \begin{pmatrix} c_W^2 \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g3}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g3}}_{2,2} \right) U^{\tilde{e}_{g1}}_{s2,1} + \\ \begin{pmatrix} c_W^2 \left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2} U^{\tilde{e}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2} U^{\tilde{e}_{g1}}_{2,1} \right) + \\ 4 \left(\left(\delta s_W\right) s_W + \left(\delta Z_e\right) c_W^2 \right) U^{\tilde{e}_{g1}}_{s2,1} \end{pmatrix} U^{\tilde{u}_{g3}}_{s4,2} \end{pmatrix}
$$

$$
\boxed{3} = U^{\tilde{u}_{g3}}_{s4,1} \begin{pmatrix} s_W c_W^2 \left(2c_W^2 + 1\right) \left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2} U^{\tilde{e}_{g1}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2} U^{\tilde{e}_{g1}}_{2,1} \right) + \\ 4 \left(\left(\left(\delta Z_e\right) s_W - \delta s_W \right) \left(c_W^2 + 2c_W^4 \right) + \left(\delta s_W\right) s_W^2 \right) U^{\tilde{e}_{g1}}_{s2,1} \end{pmatrix} + s_W c_W^2 \left(2c_W^2 + 1\right) U^{\tilde{e}_{g1}}_{s2,1} \left(U^{\tilde{u}_{g3}}_{2,1} \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} + U^{\tilde{u}_{g3}}_{1,1} \delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} \right)
$$

$$
\boxed{2} = \begin{array}{l} \begin{pmatrix} c_W^2 \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g3}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g3}}_{2,1} \right) U^{\tilde{e}_{g1}}_{s2,2} + \\ \begin{pmatrix} c_W^2 \left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2} U^{\tilde{e}_{g1}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2} U^{\tilde{e}_{g1}}_{2,2} \right) + \\ 4 \left(\left(\delta s_W\right) s_W + \left(\delta Z_e\right) c_W^2 \right) U^{\tilde{e}_{g1}}_{s2,2} \end{pmatrix} U^{\tilde{u}_{g3}}_{s4,1} \end{pmatrix} U^{\tilde{u}_{g3}*}_{s3,1} - \\ 4 U^{\tilde{u}_{g3}*}_{s3,2} \left(c_W^2 \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g3}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g3}}_{2,2} \right) U^{\tilde{e}_{g1}}_{s2,2} + \begin{pmatrix} c_W^2 \left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2} U^{\tilde{e}_{g1}}_{1,2} + \delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2} U^{\tilde{e}_{g1}}_{2,2} \right) + \\ 4 \left(\left(\delta s_W\right) s_W + \left(\delta Z_e\right) c_W^2 \right) U^{\tilde{e}_{g1}}_{s2,2} \end{pmatrix} U^{\tilde{u}_{g3}}_{s4,2} \right) + \\ \begin{pmatrix} \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1} \right) U^{\tilde{u}_{g3}}_{s4,1} - \\ 4 \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,2} \right) U^{\tilde{u}_{g3}}_{s4,2} \end{pmatrix} c_W^2 U^{\tilde{e}_{g1}}_{s2,2} \end{array}
$$

$$
\boxed{1} = \begin{array}{l} -\left(\delta Z^{\tilde{e}_{g1}}_{1,s1} U^{\tilde{e}_{g1}*}_{1,1} + \delta Z^{\tilde{e}_{g1}}_{2,s1} U^{\tilde{e}_{g1}*}_{2,1} \right) U^{\tilde{e}_{g1}}_{s2,1} \left(\left(2c_W^2 + 1\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} - 4 s_W^2 U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2} \right) + \\ 2 s_W^2 \left(\delta Z^{\tilde{e}_{g1}}_{1,s1} U^{\tilde{e}_{g1}*}_{1,2} + \delta Z^{\tilde{e}_{g1}}_{2,s1} U^{\tilde{e}_{g1}*}_{2,2} \right) U^{\tilde{e}_{g1}}_{s2,2} \left(U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} - 4 U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2} \right) \end{array}
$$

$$
\underset{384}{C}\left(\tilde{\nu}_{g1}, \tilde{\nu}^\dagger_{g2}, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4} \right) = \left[\frac{i e^2 (\boxed{2}) \delta_{g1,g2} \delta_{g3,g4}}{24 c_W^4 s_W^3} \right]
$$

$$
\boxed{2} = U^{\tilde{u}_{g3}*}_{s3,1} \begin{pmatrix} s_W \left(1 - 4c_W^2\right) c_W^2 \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g3}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g3}}_{2,1} \right) - \\ \left(\left(\delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1} \right) \left(3 s_W c_W^4 - c_W^2 s_W^3 \right) + 4 \left(3 \left(\left(\delta Z_e\right) s_W - \delta s_W \right) c_W^4 - \left(\delta Z_e\right) c_W^2 s_W^3 - \left(\delta s_W\right) s_W^4 \right) \right) U^{\tilde{u}_{g3}}_{s4,1} \end{pmatrix} - s_W (\boxed{1})
$$

$$1 = 4s_W^2 U_{s3,2}^{\tilde{u}_{g3}*}\left(c_W^2\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,2}^{\tilde{u}_{g3}}+\delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,2}^{\tilde{u}_{g3}}\right)+\left(\left(\delta\overline{Z}_{1,1}^{\tilde{\nu}}+\delta Z_{1,1}^{\tilde{\nu}}\right)c_W^2+4\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)\right)U_{s4,2}^{\tilde{u}_{g3}}\right)-$$
$$c_W^2\left(\left(1-4c_W^2\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}}U_{1,1}^{\tilde{u}_{g3}*}+\delta Z_{2,s3}^{\tilde{u}_{g3}}U_{2,1}^{\tilde{u}_{g3}*}\right)U_{s4,1}^{\tilde{u}_{g3}}-4s_W^2\left(\delta Z_{1,s3}^{\tilde{u}_{g3}}U_{1,2}^{\tilde{u}_{g3}*}+\delta Z_{2,s3}^{\tilde{u}_{g3}}U_{2,2}^{\tilde{u}_{g3}*}\right)U_{s4,2}^{\tilde{u}_{g3}}\right)$$

[SSVV] 2 Higgs – 2 Gauge Bosons

$$C_{31}\left(h^0,h^0,Z,Z\right) = \left[-\frac{ie^2}{2c_W^4s_W^3}\left(\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{hh}\right)\right)c_W^2-2\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{32}\left(h^0,h^0,W^-,W^+\right) = \left[-\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_W+2\left(\delta Z_{hh}\right)\right)\right)\right]$$

$$C_{33}\left(G^0,G^0,Z,Z\right) = \left[-\frac{ie^2}{2c_W^4s_W^3}\left(\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{GG}\right)\right)c_W^2-2\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{34}\left(G^0,G^0,W^-,W^+\right) = \left[-\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_W+2\left(\delta Z_{GG}\right)\right)\right)\right]$$

$$C_{35}\left(G^-,G^+,\gamma,\gamma\right) = \left[\frac{ie^2}{c_Ws_W}\left(2c_Ws_W\left(2\left(\delta Z_e\right)+\delta Z_{\gamma\gamma}+\delta Z_{G^-G^-}\right)+\left(\delta Z_{Z\gamma}\right)\left(c_W^2-s_W^2\right)\right)\right]$$

$$C_{36}\left(G^-,G^+,\gamma,Z\right) = \left[-\frac{ie^2(1)}{4c_W^3s_W^2}\right]$$

$$1 = 2\left(2\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}+2\left(\delta Z_{G^-G^-}\right)\right)s_W\right)c_W^4+4\left(\delta s_W\right)s_W^4-\left(\delta Z_{Z\gamma}\right)\left(c_W^5+c_Ws_W^4\right)+$$
$$\left(2\left(4\left(\delta s_W\right)+\left(4\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}+2\left(\delta Z_{G^-G^-}\right)\right)s_W\right)c_W^2+2\left(\delta Z_{Z\gamma}-2\left(\delta Z_{\gamma Z}\right)\right)c_W^3\right)s_W^2$$

$$C_{37}\left(G^-,G^+,Z,Z\right) = \left[\frac{ie^2}{2c_W^4s_W^3}\left(\begin{array}{l}\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{G^-G^-}\right)\right)c_W^4+2\left(\delta s_W\right)s_W^4+\\ \left(\left(4\left(\delta s_W\right)+s_W\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{G^-G^-}\right)\right)c_W^2-2\left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2\end{array}\right)\left(1-2c_W^2\right)\right]$$

$$C_{38}\left(G^-,G^+,W^-,W^+\right) = \left[-\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_W+2\left(\delta Z_{G^-G^-}\right)\right)\right)\right]$$

$$C_{151}\left(h^0,H^-,\gamma,W^+\right) = \left[-\frac{ie^2}{4c_Ws_W^2}\left(\begin{array}{l}c_Ws_Ws_{\beta\text{-}\alpha}\left(\delta Z_{hH}-\delta Z_{G^-H^-}\right)+\\ c_{\beta\text{-}\alpha}\left(c_W\left(2\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{\gamma\gamma}+\delta Z_{hh}+\delta Z_{H^-H^-}\right)\right)+\left(\delta Z_{Z\gamma}\right)s_W^2\right)\end{array}\right)\right]$$

$$C_{152}\left(h^0, G^-, \gamma, W^+\right) = \left[-\frac{ie^2}{4c_W s_W^2} \left(c_W \left(- \left(\begin{array}{l} s_{\beta-\alpha}\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{\gamma\gamma} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) + \\ c_{\beta-\alpha}\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right) \end{array} \right) s_W + 2 s_{\beta-\alpha}\left(\delta s_W\right) \right) + s_{\beta-\alpha}\left(\delta Z_{Z\gamma}\right) s_W^2 \right) \right]$$

$$C_{153}\left(h^0, H^-, Z, W^+\right) = \left[\frac{ie^2}{4 s_W c_W^3} \left(\left(\begin{array}{l} \left(\delta Z_{\gamma Z}\right) c_W^3 - 2\left(\delta s_W\right) s_W^2 - \\ s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{ZZ} + \delta Z_{hh} + \delta Z_{H^-H^-}\right) c_W^2 \end{array} \right) c_{\beta-\alpha} + s_W s_{\beta-\alpha}\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right) c_W^2 \right) \right]$$

$$C_{154}\left(h^0, G^-, Z, W^+\right) = \left[\frac{ie^2}{4 s_W c_W^3} \left(- \left(\begin{array}{l} s_{\beta-\alpha}\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{ZZ} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) + \\ c_{\beta-\alpha}\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right) \end{array} \right) s_W c_W^2 + s_{\beta-\alpha}\left(\left(\delta Z_{\gamma Z}\right) c_W^3 - 2\left(\delta s_W\right) s_W^2\right) \right) \right]$$

$$C_{155}\left(h^0, H^+, \gamma, W^-\right) = \left[-\frac{ie^2}{4 c_W s_W^2} \left(\begin{array}{l} c_{\beta-\alpha}\left(c_W\left(2\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{\gamma\gamma} + \delta Z_{hh}\right)\right) + \left(\delta Z_{Z\gamma}\right) s_W^2\right) + \\ c_W s_W s_{\beta-\alpha}\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) \end{array} \right) \right]$$

$$C_{156}\left(h^0, G^+, \gamma, W^-\right) = \left[-\frac{ie^2}{4 c_W s_W^2} \left(c_W \left(- \left(\begin{array}{l} s_{\beta-\alpha}\left(4\left(\delta Z_e\right) + \delta Z_W + \delta Z_{\gamma\gamma} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) + \\ c_{\beta-\alpha}\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) \end{array} \right) s_W + 2 s_{\beta-\alpha}\left(\delta s_W\right) \right) + s_{\beta-\alpha}\left(\delta Z_{Z\gamma}\right) s_W^2 \right) \right]$$

$$C_{157}\left(h^0, H^+, Z, W^-\right) = \left[\frac{ie^2}{4 s_W c_W^3} \left(\left(\begin{array}{l} \left(\delta Z_{\gamma Z}\right) c_W^3 - 2\left(\delta s_W\right) s_W^2 - \\ s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{ZZ} + \delta Z_{hh}\right) c_W^2 \end{array} \right) c_{\beta-\alpha} + s_W s_{\beta-\alpha}\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) c_W^2 \right) \right]$$

$$C_{158}\left(h^0, G^+, Z, W^-\right) = \left[\frac{ie^2}{4 s_W c_W^3} \left(- \left(\begin{array}{l} s_{\beta-\alpha}\left(4\left(\delta Z_e\right) + \delta Z_W + \delta Z_{ZZ} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) + \\ c_{\beta-\alpha}\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) \end{array} \right) s_W c_W^2 + s_{\beta-\alpha}\left(\left(\delta Z_{\gamma Z}\right) c_W^3 - 2\left(\delta s_W\right) s_W^2\right) \right) \right]$$

$$C_{159}\left(H^0, H^0, Z, Z\right) = \left[-\frac{ie^2}{2 c_W^4 s_W^3} \left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{HH}\right)\right) c_W^2 - 2\left(\delta s_W\right) s_W^2 \right) \right]$$

$$C_{160}\left(H^0, H^0, W^-, W^+\right) = \left[-\frac{ie^2}{4 s_W^3} \left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_W + 2\left(\delta Z_{HH}\right)\right)\right) \right]$$

$$C_{161}\left(H^0, H^-, \gamma, W^+\right) = \left[\frac{ie^2}{4 c_W s_W^2} \left(c_W \left(\left(\begin{array}{l} c_{\beta-\alpha}\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) - \\ s_{\beta-\alpha}\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{\gamma\gamma} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) \end{array} \right) s_W + 2 s_{\beta-\alpha}\left(\delta s_W\right) \right) + s_{\beta-\alpha}\left(\delta Z_{Z\gamma}\right) s_W^2 \right) \right]$$

$$C_{162}\left(H^0, G^-, \gamma, W^+\right) = \left[-\frac{ie^2}{4 c_W s_W^2} \left(\begin{array}{l} c_{\beta-\alpha}\left(c_W\left(2\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{\gamma\gamma} + \delta Z_{HH} + \delta Z_{G^-G^-}\right)\right) + \left(\delta Z_{Z\gamma}\right) s_W^2\right) - \\ c_W s_W s_{\beta-\alpha}\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) \end{array} \right) \right]$$

$$C_{163}\left(H^0,H^-,Z,W^+\right) = \left[-\frac{ie^2}{4s_W c_W^3}\left(\begin{array}{l} c_{\beta\text{-}\alpha}\left(\delta Z_{hH}+\delta Z_{G^-H^-}\right) - \\ s_{\beta\text{-}\alpha}\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{ZZ}+\delta Z_{HH}+\delta Z_{H^-H^-}\right)\end{array}\right) s_W c_W^2 + s_{\beta\text{-}\alpha}\left(\left(\delta Z_{\gamma Z}\right)c_W^3 - 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{164}\left(H^0,G^-,Z,W^+\right) = \left[-\frac{ie^2}{4s_W c_W^3}\left(-\left(\begin{array}{l} \left(\delta Z_{\gamma Z}\right)c_W^3 - 2\left(\delta s_W\right)s_W^2 - \\ s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{ZZ}+\delta Z_{HH}+\delta Z_{G^-G^-}\right)c_W^2\end{array}\right) c_{\beta\text{-}\alpha} + s_W s_{\beta\text{-}\alpha}\left(\delta Z_{hH}-\delta Z_{H^-G^-}\right)c_W^2\right)\right]$$

$$C_{165}\left(H^0,H^+,\gamma,W^-\right) = \left[\frac{ie^2}{4c_W s_W^2}\left(c_W\left(-\left(\begin{array}{l} s_{\beta\text{-}\alpha}\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_W+\delta Z_{\gamma\gamma}+\delta Z_{HH}\right) - \\ c_{\beta\text{-}\alpha}\left(\delta Z_{hH}+\delta Z_{H^-G^-}\right)\end{array}\right) s_W + 2 s_{\beta\text{-}\alpha}\left(\delta s_W\right)\right) + s_{\beta\text{-}\alpha}\left(\delta Z_{Z\gamma}\right)s_W^2\right)\right]$$

$$C_{166}\left(H^0,G^+,\gamma,W^-\right) = \left[-\frac{ie^2}{4c_W s_W^2}\left(\begin{array}{l} c_{\beta\text{-}\alpha}\left(c_W\left(2\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta Z_W+\delta Z_{\gamma\gamma}+\delta Z_{HH}+\delta Z_{G^-G^-}\right)\right)+\left(\delta Z_{Z\gamma}\right)s_W^2\right) - \\ c_W s_W s_{\beta\text{-}\alpha}\left(\delta Z_{hH}-\delta Z_{G^-H^-}\right)\end{array}\right)\right]$$

$$C_{167}\left(H^0,H^+,Z,W^-\right) = \left[-\frac{ie^2}{4s_W c_W^3}\left(-\left(\begin{array}{l} s_{\beta\text{-}\alpha}\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_W+\delta Z_{ZZ}+\delta Z_{HH}\right) - \\ c_{\beta\text{-}\alpha}\left(\delta Z_{hH}+\delta Z_{H^-G^-}\right)\end{array}\right) s_W c_W^2 + s_{\beta\text{-}\alpha}\left(\left(\delta Z_{\gamma Z}\right)c_W^3 - 2\left(\delta s_W\right)s_W^2\right)\right)\right]$$

$$C_{168}\left(H^0,G^+,Z,W^-\right) = \left[-\frac{ie^2}{4s_W c_W^3}\left(-\left(\begin{array}{l} \left(\delta Z_{\gamma Z}\right)c_W^3 - 2\left(\delta s_W\right)s_W^2 - \\ s_W\left(4\left(\delta Z_e\right)+\delta Z_W+\delta Z_{ZZ}+\delta Z_{HH}+\delta Z_{G^-G^-}\right)c_W^2\end{array}\right) c_{\beta\text{-}\alpha} + s_W s_{\beta\text{-}\alpha}\left(\delta Z_{hH}-\delta Z_{G^-H^-}\right)c_W^2\right)\right]$$

$$C_{169}\left(A^0,A^0,Z,Z\right) = \left[-\frac{ie^2}{2c_W^4 s_W^3}\left(\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{AA}\right)\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{170}\left(A^0,A^0,W^-,W^+\right) = \left[-\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_W+2\left(\delta Z_{AA}\right)\right)\right)\right]$$

$$C_{171}\left(A^0,H^-,\gamma,W^+\right) = \left[\frac{e^2}{4c_W s_W^2}\left(c_W\left(2\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{\gamma\gamma}+\delta Z_{AA}+\delta Z_{H^-H^-}\right)\right)+\left(\delta Z_{Z\gamma}\right)s_W^2\right)\right]$$

$$C_{172}\left(A^0,H^-,Z,W^+\right) = \left[\frac{e^2}{4s_W c_W^3}\left(s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{ZZ}+\delta Z_{AA}+\delta Z_{H^-H^-}\right)c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$C_{173}\left(A^0,H^+,\gamma,W^-\right) = \left[-\frac{e^2}{4c_W s_W^2}\left(c_W\left(2\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_W+\delta Z_{\gamma\gamma}+\delta Z_{AA}\right)\right)+\left(\delta Z_{Z\gamma}\right)s_W^2\right)\right]$$

$$C_{174}\left(A^0,H^+,Z,W^-\right) = \left[-\frac{e^2}{4s_W c_W^3}\left(s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_W+\delta Z_{ZZ}+\delta Z_{AA}\right)c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$\underset{175}{C}\left(G^0,G^-,\gamma,W^+\right) = \left[\ \frac{e^2}{4c_W s_W^2}\left(c_W\left(2\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{\gamma\gamma}+\delta Z_{GG}+\delta Z_{G^-G^-}\right)\right)+\left(\delta Z_{Z\gamma}\right)s_W^2\right)\ \right]$$

$$\underset{176}{C}\left(G^0,G^-,Z,W^+\right) = \left[\ \frac{e^2}{4s_W c_W^3}\left(s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{ZZ}+\delta Z_{GG}+\delta Z_{G^-G^-}\right)c_W^2-\left(\delta Z_{\gamma Z}\right)c_W^3+2\left(\delta s_W\right)s_W^2\right)\ \right]$$

$$\underset{177}{C}\left(G^0,G^+,\gamma,W^-\right) = \left[\ -\frac{e^2}{4c_W s_W^2}\left(c_W\left(2\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta Z_W+\delta Z_{\gamma\gamma}+\delta Z_{GG}+\delta Z_{G^-G^-}\right)\right)+\left(\delta Z_{Z\gamma}\right)s_W^2\right)\ \right]$$

$$\underset{178}{C}\left(G^0,G^+,Z,W^-\right) = \left[\ -\frac{e^2}{4s_W c_W^3}\left(s_W\left(4\left(\delta Z_e\right)+\delta Z_W+\delta Z_{ZZ}+\delta Z_{GG}+\delta Z_{G^-G^-}\right)c_W^2-\left(\delta Z_{\gamma Z}\right)c_W^3+2\left(\delta s_W\right)s_W^2\right)\ \right]$$

$$\underset{179}{C}\left(H^-,H^+,\gamma,\gamma\right) = \left[\ \frac{ie^2}{c_W s_W}\left(c_W s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+2\left(\delta Z_{\gamma\gamma}\right)+\delta Z_{H^-H^-}\right)+\left(\delta Z_{Z\gamma}\right)\left(c_W^2-s_W^2\right)\right)\ \right]$$

$$\underset{180}{C}\left(H^-,H^+,\gamma,Z\right) = \left[\ -\frac{ie^2(1)}{4c_W^3 s_W^2}\ \right]$$

$$1 = 2\left(2\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}+\delta Z_{H^-H^-}\right)s_W\right)c_W^4+4\left(\delta s_W\right)s_W^4-\left(\delta Z_{Z\gamma}\right)\left(c_W^5+c_W s_W^4\right)+\left(2\left(4\left(\delta s_W\right)+\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}+\delta Z_{H^-H^-}\right)s_W\right)c_W^2+2\left(\delta Z_{Z\gamma}-2\left(\delta Z_{\gamma Z}\right)\right)c_W^3\right)s_W^2$$

$$\underset{181}{C}\left(H^-,H^+,Z,Z\right) = \left[\ \frac{ie^2}{4c_W^4 s_W^3}\left(\begin{array}{l}\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+2\left(\delta Z_{ZZ}\right)+\delta Z_{H^-H^-}\right)\right)c_W^4+4\left(\delta s_W\right)s_W^4+\\ \left(\left(8\left(\delta s_W\right)+s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+2\left(\delta Z_{ZZ}\right)+\delta Z_{H^-H^-}\right)\right)c_W^2-4\left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2\end{array}\right)\left(1-2c_W^2\right)\ \right]$$

$$\underset{182}{C}\left(H^-,H^+,W^-,W^+\right) = \left[\ -\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta\overline{Z}_{H^-H^-}+\delta Z_W+\delta Z_{H^-H^-}\right)\right)\ \right]$$

$$\underset{386}{C}\left(G^0,H^-,\gamma,W^+\right) = \left[\ -\frac{e^2}{4s_W}\left(\delta Z_{AG}+\delta Z_{G^-H^-}\right)\ \right]$$

$$\underset{387}{C}\left(G^0,H^+,\gamma,W^-\right) = \left[\ \frac{e^2}{4s_W}\left(\delta Z_{AG}+\delta Z_{H^-G^-}\right)\ \right]$$

$$\underset{388}{C}\left(G^0,H^-,Z,W^+\right) = \left[\ \frac{e^2}{4c_W}\left(\delta Z_{AG}+\delta Z_{G^-H^-}\right)\ \right]$$

$$\underset{389}{C}\left(G^0,H^+,Z,W^-\right) = \left[\ -\frac{e^2}{4c_W}\left(\delta Z_{AG}+\delta Z_{H^-G^-}\right)\ \right]$$

$$C_{390}\left(A^0, G^-, \gamma, W^+\right) = \left[-\frac{e^2}{4 s_W} \left(\delta Z_{AG} + \delta Z_{H^- G^-}\right) \right]$$

$$C_{391}\left(A^0, G^+, \gamma, W^-\right) = \left[\frac{e^2}{4 s_W} \left(\delta Z_{AG} + \delta Z_{G^- H^-}\right) \right]$$

$$C_{392}\left(A^0, G^-, Z, W^+\right) = \left[\frac{e^2}{4 c_W} \left(\delta Z_{AG} + \delta Z_{H^- G^-}\right) \right]$$

$$C_{393}\left(A^0, G^+, Z, W^-\right) = \left[-\frac{e^2}{4 c_W} \left(\delta Z_{AG} + \delta Z_{G^- H^-}\right) \right]$$

$$C_{394}\left(H^0, h^0, Z, Z\right) = \left[\frac{\mathrm{i} e^2 \left(\delta Z_{hH}\right)}{2 c_W^2 s_W^2} \right]$$

$$C_{395}\left(G^0, A^0, Z, Z\right) = \left[\frac{\mathrm{i} e^2 \left(\delta Z_{AG}\right)}{2 c_W^2 s_W^2} \right]$$

$$C_{396}\left(H^0, h^0, W^-, W^+\right) = \left[\frac{\mathrm{i} e^2 \left(\delta Z_{hH}\right)}{2 s_W^2} \right]$$

$$C_{397}\left(G^0, A^0, W^-, W^+\right) = \left[\frac{\mathrm{i} e^2 \left(\delta Z_{AG}\right)}{2 s_W^2} \right]$$

$$C_{398}\left(G^-, H^+, \gamma, \gamma\right) = \left[2\mathrm{i} e^2 \left(\delta Z_{H^- G^-}\right) \right]$$

$$C_{399}\left(H^-, G^+, \gamma, \gamma\right) = \left[2\mathrm{i} e^2 \left(\delta Z_{G^- H^-}\right) \right]$$

$$C_{400}\left(G^-, H^+, Z, \gamma\right) = \left[-\frac{\mathrm{i} e^2 \left(\delta Z_{H^- G^-}\right)}{c_W s_W} \left(1 - 2 c_W^2\right) \right]$$

$$C_{401}\left(H^-, G^+, Z, \gamma\right) = \left[-\frac{\mathrm{i} e^2 \left(\delta Z_{G^- H^-}\right)}{c_W s_W} \left(1 - 2 c_W^2\right) \right]$$

$$C_{402}\left(G^-, H^+, Z, Z\right) = \left[\frac{\mathrm{i} \left(\delta Z_{H^- G^-}\right)}{2 c_W^2 s_W^2} \left(e - 2 e c_W^2\right)^2 \right]$$

$$C_{403}\left(H^-, G^+, Z, Z\right) = \left[\frac{\mathrm{i} \left(\delta Z_{G^- H^-}\right)}{2 c_W^2 s_W^2} \left(e - 2 e c_W^2\right)^2 \right]$$

$$C_{404}\left(G^-, H^+, W^-, W^+\right) = \left[\frac{\mathrm{i} e^2 \left(\delta Z_{H^- G^-}\right)}{2 s_W^2} \right]$$

$$\underset{405}{C}\left(H^-, G^+, W^+, W^-\right) = \left[\frac{ie^2 \left(\delta Z_{G^-H^-}\right)}{2 s_W^2} \right]$$

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$$\underset{462}{C}\left(\tilde{u}_{g1}^{s1}, \tilde{u}_{g2}^{s2,\dagger}, g, \gamma\right) = \left[\frac{ie g_s(1) \delta_{g1,g2} T^{g3}_{c2,c1}}{6 c_W s_W} \right]$$

$$1 = 4 c_W s_W \left(\begin{array}{l} \delta_{s1,1} \delta \overline{Z}^{\tilde{u}_{g2}}_{1,s2} + \delta_{s1,2} \delta \overline{Z}^{\tilde{u}_{g2}}_{2,s2} + \delta_{s2,1} \delta Z^{\tilde{u}_{g1}}_{1,s1} + \delta_{s2,2} \delta Z^{\tilde{u}_{g1}}_{2,s1} + \\ \delta_{s1,s2} \left(2 \left(\delta Z_e\right) + \delta Z_{\gamma\gamma} + \delta Z_{gg} + 2 \left(\delta Z_{g_s}\right)\right) \end{array} \right) - \left(\delta Z_{Z\gamma}\right) \left(4 s_W^2 \delta_{s1,s2} - 3 U^{\tilde{u}_{g1}}_{s2,1} U^{\tilde{u}_{g1}*}_{s1,1}\right)$$

$$\underset{463}{C}\left(\tilde{d}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, g, \gamma\right) = \left[-\frac{ie g_s(1) \delta_{g1,g2} T^{g3}_{c2,c1}}{6 c_W s_W} \right]$$

$$1 = 2 c_W s_W \left(\begin{array}{l} \delta_{s1,1} \delta \overline{Z}^{\tilde{d}_{g2}}_{1,s2} + \delta_{s1,2} \delta \overline{Z}^{\tilde{d}_{g2}}_{2,s2} + \delta_{s2,1} \delta Z^{\tilde{d}_{g1}}_{1,s1} + \delta_{s2,2} \delta Z^{\tilde{d}_{g1}}_{2,s1} + \\ \delta_{s1,s2} \left(2 \left(\delta Z_e\right) + \delta Z_{\gamma\gamma} + \delta Z_{gg} + 2 \left(\delta Z_{g_s}\right)\right) \end{array} \right) - \left(\delta Z_{Z\gamma}\right) \left(2 s_W^2 \delta_{s1,s2} - 3 U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{d}_{g1}*}_{s1,1}\right)$$

$$\underset{464}{C}\left(\tilde{u}_{g1}^{s1}, \tilde{u}_{g2}^{s2,\dagger}, g, Z\right) = \left[\frac{ie g_s(1) \delta_{g1,g2} T^{g3}_{c2,c1}}{6 c_W^3 s_W^2} \right]$$

$$1 = \begin{array}{l} -\delta_{s1,s2} s_W^2 \left(4 \left(2 \left(\delta s_W\right) + \left(2 \left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{gg} + 2 \left(\delta Z_{g_s}\right)\right) s_W\right) c_W^2 - 4 \left(\delta Z_{\gamma Z}\right) c_W^3 + 8 \left(\delta s_W\right) s_W^2\right) + \\ U^{\tilde{u}_{g1}*}_{s1,1} \left(\left(\begin{array}{l} 3 s_W \left(\delta \overline{Z}^{\tilde{u}_{g2}}_{1,s2} U^{\tilde{u}_{g1}}_{1,1} + \delta \overline{Z}^{\tilde{u}_{g2}}_{2,s2} U^{\tilde{u}_{g1}}_{2,1}\right) - \\ \left(6 \left(\delta s_W\right) - 3 \left(2 \left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{gg} + 2 \left(\delta Z_{g_s}\right)\right) s_W\right) U^{\tilde{u}_{g1}}_{s2,1} \end{array} \right) c_W^2 + 6 \left(\delta s_W\right) s_W^2 U^{\tilde{u}_{g1}}_{s2,1} \right) - \\ \left(\begin{array}{l} 4 \left(\delta_{s1,1} \delta \overline{Z}^{\tilde{u}_{g2}}_{1,s2} + \delta_{s1,2} \delta \overline{Z}^{\tilde{u}_{g2}}_{2,s2}\right) s_W^3 + \\ \left(\begin{array}{l} \delta Z^{\tilde{u}_{g1}}_{1,s1} \left(4 \delta_{s2,1} s_W^2 - 3 U^{\tilde{u}_{g1}*}_{1,1} U^{\tilde{u}_{g1}}_{s2,1}\right) + \\ \delta Z^{\tilde{u}_{g1}}_{2,s1} \left(4 \delta_{s2,2} s_W^2 - 3 U^{\tilde{u}_{g1}*}_{2,1} U^{\tilde{u}_{g1}}_{s2,1}\right) \end{array} \right) s_W \end{array} \right) c_W^2 \end{array}$$

$$\underset{465}{C}\left(\tilde{d}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, g, Z\right) = \left[-\frac{ie g_s(1) \delta_{g1,g2} T^{g3}_{c2,c1}}{6 c_W^3 s_W^2} \right]$$

$$
\begin{aligned}
1 = {} & -\delta_{s1,s2} s_W^2 \left(2\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{gg} + 2\left(\delta Z_{g_s}\right)\right) s_W\right) c_W^2 - 2\left(\delta Z_{\gamma Z}\right) c_W^3 + 4\left(\delta s_W\right) s_W^2\right) + \\
& U_{s1,1}^{\tilde{d}_{g1}*} \left(\left(\begin{array}{l} 3 s_W \left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}} U_{1,1}^{\tilde{d}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}} U_{2,1}^{\tilde{d}_{g1}} \right) - \\ \left(6\left(\delta s_W\right) - 3\left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{gg} + 2\left(\delta Z_{g_s}\right)\right) s_W\right) U_{s2,1}^{\tilde{d}_{g1}} \end{array} \right) c_W^2 + 6\left(\delta s_W\right) s_W^2 U_{s2,1}^{\tilde{d}_{g1}} \right) - \\
& \left(\begin{array}{l} 2\left(\delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}} + \delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}\right) s_W^3 + \\ \left(\begin{array}{l} \delta Z_{1,s1}^{\tilde{d}_{g1}} \left(2\delta_{s2,1} s_W^2 - 3 U_{1,1}^{\tilde{d}_{g1}*} U_{s2,1}^{\tilde{d}_{g1}}\right) + \\ \delta Z_{2,s1}^{\tilde{d}_{g1}} \left(2\delta_{s2,2} s_W^2 - 3 U_{2,1}^{\tilde{d}_{g1}*} U_{s2,1}^{\tilde{d}_{g1}}\right) \end{array} \right) s_W \end{array} \right) c_W^2
\end{aligned}
$$

$$
C_{466}\left(\tilde{u}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, g, W^-\right) = \left[\frac{i e g_s T_{c2,c1}^{g3}}{\sqrt{2} s_W^2} \left((1) \mathrm{CKM}_{g1,g2}^* + 2 s_W U_{s1,1}^{\tilde{u}_{g1}*} U_{s2,1}^{\tilde{d}_{g2}} \delta\mathrm{CKM}_{g1,g2}^* \right) \right]
$$

$$
\begin{aligned}
1 = {} & U_{s1,1}^{\tilde{u}_{g1}*} \left(\begin{array}{l} s_W \left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}} U_{1,1}^{\tilde{d}_{g2}} + \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}} U_{2,1}^{\tilde{d}_{g2}} \right) - \\ \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_W + \delta Z_{gg} + 2\left(\delta Z_{g_s}\right)\right) s_W\right) U_{s2,1}^{\tilde{d}_{g2}} \end{array} \right) + \\
& s_W U_{s2,1}^{\tilde{d}_{g2}} \left(U_{2,1}^{\tilde{u}_{g1}*} \delta Z_{2,s1}^{\tilde{u}_{g1}} + U_{1,1}^{\tilde{u}_{g1}*} \delta Z_{1,s1}^{\tilde{u}_{g1}} \right)
\end{aligned}
$$

$$
C_{467}\left(\tilde{d}_{g1}^{s1}, \tilde{u}_{g2}^{s2,\dagger}, g, W^+\right) = \left[\frac{i e g_s T_{c2,c1}^{g3}}{\sqrt{2} s_W^2} \left((1) \mathrm{CKM}_{g2,g1} + 2 s_W \left(\delta\mathrm{CKM}_{g2,g1}\right) U_{s1,1}^{\tilde{d}_{g1}*} U_{s2,1}^{\tilde{u}_{g2}} \right) \right]
$$

$$
\begin{aligned}
1 = {} & U_{s1,1}^{\tilde{d}_{g1}*} \left(\begin{array}{l} s_W \left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}} U_{1,1}^{\tilde{u}_{g2}} + \delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}} U_{2,1}^{\tilde{u}_{g2}} \right) - \\ \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{gg} + 2\left(\delta Z_{g_s}\right)\right) s_W\right) U_{s2,1}^{\tilde{u}_{g2}} \end{array} \right) + \\
& s_W U_{s2,1}^{\tilde{u}_{g2}} \left(U_{2,1}^{\tilde{d}_{g1}*} \delta Z_{2,s1}^{\tilde{d}_{g1}} + U_{1,1}^{\tilde{d}_{g1}*} \delta Z_{1,s1}^{\tilde{d}_{g1}} \right)
\end{aligned}
$$

[SSVV] 2 Sleptons – 2 Gauge Bosons

$$
C_{352}\left(\tilde{\nu}_{g1}, \tilde{\nu}_{g2}^{\dagger}, Z, Z\right) = \left[\frac{i e^2 \delta_{g1,g2}}{4 c_W^4 s_W^3} \left(4\left(\delta s_W\right) s_W^2 - c_W^2 \left(4\left(\delta s_W\right) - s_W \left(2\left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right) + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}} \right) \right) \right) \right]
$$

$$
C_{353}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, \gamma, \gamma\right) = \left[\frac{i e^2 (1) \delta_{g1,g2}}{c_W s_W} \right]
$$

$$
\begin{aligned}
1 = {} & \left(\delta Z_{Z\gamma}\right) \left(\left(1 - 2 s_W^2\right) U_{s1,1}^{\tilde{e}_{g1}*} U_{s2,1}^{\tilde{e}_{g1}} - 2 s_W^2 U_{s1,2}^{\tilde{e}_{g1}*} U_{s2,2}^{\tilde{e}_{g1}} \right) + \\
& c_W s_W \left(2\delta_{s1,s2}\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) + \delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}} + \delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}} + \delta_{s2,1}\delta Z_{1,s1}^{\tilde{e}_{g1}} + \delta_{s2,2}\delta Z_{2,s1}^{\tilde{e}_{g1}} \right)
\end{aligned}
$$

$$\underset{354}{C}\left(\tilde{e}_{g1}^{s1},\tilde{e}_{g2}^{s2,\dagger},\gamma,Z\right) = \left[-\frac{ie^2\delta_{g1,g2}}{4c_W^3 s_W^2}\left(2(\boxed{2})s_W - 4\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right)c_W^3 s_W^2 + (\boxed{1})U_{s1,1}^{\tilde{e}_{g1}*}\right)\right]$$

$$\boxed{2} = 2s_W U_{s1,2}^{\tilde{e}_{g1}*}\left(\begin{array}{l} s_W c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,2}^{\tilde{e}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,2}^{\tilde{e}_{g1}}\right) + \\ \left(\begin{array}{l}(2\left(\delta s_W\right) - \left(\delta Z_{\gamma\gamma}\right)c_W)s_W^2 + \\ (2\left(\delta s_W\right) + (4\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma})s_W)c_W^2\end{array}\right)U_{s2,2}^{\tilde{e}_{g1}}\end{array}\right) + c_W^2\left(\begin{array}{l}\left(1-2c_W^2\right)\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,1}^{\tilde{e}_{g1}*} + \delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,1}^{\tilde{e}_{g1}*}\right)U_{s2,1}^{\tilde{e}_{g1}} + \\ 2s_W^2\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,2}^{\tilde{e}_{g1}*} + \delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,2}^{\tilde{e}_{g1}*}\right)U_{s2,2}^{\tilde{e}_{g1}}\end{array}\right)$$

$$\boxed{1} = 2s_W\left(1-2c_W^2\right)c_W^2\left(U_{2,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}} + U_{1,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}\right) - U_{s2,1}^{\tilde{e}_{g1}}\left(\begin{array}{l}\left(\delta Z_{\gamma Z}\right)c_W\left(1-2c_W^2\right)^2 + \left(\delta s_W\right)\left(4s_W^2 - 8s_W^4\right) - \\ 2\left(\left(\delta s_W\right)\left(6-4c_W^2\right) + \left(4\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma}\right)s_W\left(1-2c_W^2\right)\right)c_W^2\end{array}\right)$$

$$\underset{355}{C}\left(\tilde{e}_{g1}^{s1},\tilde{e}_{g2}^{s2,\dagger},Z,Z\right) = \left[\frac{ie^2\delta_{g1,g2}}{4c_W^4 s_W^3}\left((\boxed{2})s_W + (\boxed{1})\left(1-2c_W^2\right)U_{s1,1}^{\tilde{e}_{g1}*}\right)\right]$$

$$\boxed{2} = \begin{array}{l} 4\left(\begin{array}{l} s_W c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,2}^{\tilde{e}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,2}^{\tilde{e}_{g1}}\right) + \\ 2\left(\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)U_{s2,2}^{\tilde{e}_{g1}}\end{array}\right)s_W^3 U_{s1,2}^{\tilde{e}_{g1}*} + \\ \left(\begin{array}{l}\left(1-2c_W^2\right)^2\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,1}^{\tilde{e}_{g1}*} + \delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,1}^{\tilde{e}_{g1}*}\right)U_{s2,1}^{\tilde{e}_{g1}} + \\ 4s_W^4\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,2}^{\tilde{e}_{g1}*} + \delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,2}^{\tilde{e}_{g1}*}\right)U_{s2,2}^{\tilde{e}_{g1}}\end{array}\right)c_W^2\end{array}$$

$$\boxed{1} = s_W\left(1-2c_W^2\right)c_W^2\left(U_{2,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}} + U_{1,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}\right) - 2U_{s2,1}^{\tilde{e}_{g1}}\left(\begin{array}{l}2\left(\delta s_W + \left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2 - 4\left(\delta s_W\right)s_W^4 - \\ \left(\left(\delta s_W\right)\left(6-4c_W^2\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\left(1-2c_W^2\right)\right)c_W^2\end{array}\right)$$

$$\underset{364}{C}\left(\tilde{\nu}_{g1},\tilde{e}_{g2}^{s2,\dagger},\gamma,W^-\right) = \left[-\frac{ie^2\delta_{g1,g2}}{2\sqrt{2}c_W s_W^2}\left(\begin{array}{l}c_W s_W\left(U_{1,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}} + U_{2,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}\right) - \\ U_{s2,1}^{\tilde{e}_{g1}}\left(\left(\delta Z_{\gamma Z}\right)s_W^2 + c_W\left(2\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta Z_W + \delta Z_{\gamma\gamma} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right)\right)\end{array}\right)\right]$$

$$\underset{365}{C}\left(\tilde{e}_{g1}^{s1},\tilde{\nu}_{g2}^{\dagger},\gamma,W^+\right) = \left[\frac{ie^2\delta_{g1,g2}}{2\sqrt{2}c_W s_W^2}\left(\begin{array}{l}U_{s1,1}^{\tilde{e}_{g2}*}\left(\left(\delta Z_{\gamma Z}\right)s_W^2 + c_W\left(2\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{\gamma\gamma} + \delta\overline{Z}_{1,1}^{\tilde{\nu}}\right)\right)\right) - \\ c_W s_W\left(U_{1,1}^{\tilde{e}_{g2}*}\delta Z_{1,s1}^{\tilde{e}_{g1}} + U_{2,1}^{\tilde{e}_{g2}*}\delta Z_{2,s1}^{\tilde{e}_{g1}}\right)\end{array}\right)\right]$$

$$\underset{368}{C}\left(\tilde{\nu}_{g1},\tilde{e}_{g2}^{s2,\dagger},Z,W^-\right) = \left[\frac{ie^2\delta_{g1,g2}}{2\sqrt{2}s_W c_W^3}\left(\begin{array}{l}s_W c_W^2\left(U_{1,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}} + U_{2,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}\right) - \\ U_{s2,1}^{\tilde{e}_{g1}}\left(\left(\delta Z_{\gamma Z}\right)c_W^3 - 2\left(\delta s_W\right)s_W^2 - s_W c_W^2\left(4\left(\delta Z_e\right) + \delta Z_W + \delta Z_{ZZ} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right)\end{array}\right)\right]$$

$$\underset{369}{C}\left(\tilde{e}_{g1}^{s1},\tilde{\nu}_{g2}^{\dagger},Z,W^+\right) = \left[-\frac{ie^2\delta_{g1,g2}}{2\sqrt{2}s_W c_W^3}\left(\begin{array}{l}U_{s1,1}^{\tilde{e}_{g2}*}\left(\left(\delta Z_{\gamma Z}\right)c_W^3 - 2\left(\delta s_W\right)s_W^2 - s_W c_W^2\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{ZZ} + \delta\overline{Z}_{1,1}^{\tilde{\nu}}\right)\right) - \\ s_W c_W^2\left(U_{1,1}^{\tilde{e}_{g2}*}\delta Z_{1,s1}^{\tilde{e}_{g1}} + U_{2,1}^{\tilde{e}_{g2}*}\delta Z_{2,s1}^{\tilde{e}_{g1}}\right)\end{array}\right)\right]$$

$$\underset{370}{C}\left(\tilde{\nu}_{g1},\tilde{\nu}_{g2}^{\dagger},W^{-},W^{+}\right)=\left[-\frac{ie^{2}\delta_{g1,g2}}{4s_{W}^{3}}\left(4\left(\delta s_{W}\right)-s_{W}\left(4\left(\delta Z_{e}\right)+\delta\overline{Z}_{W}+\delta Z_{W}+\delta\overline{Z}_{1,1}^{\tilde{\nu}}+\delta Z_{1,1}^{\tilde{\nu}}\right)\right)\right]$$

$$\underset{371}{C}\left(\tilde{e}_{g1}^{s1},\tilde{e}_{g2}^{s2,\dagger},W^{-},W^{+}\right)=\left[\frac{ie^{2}\delta_{g1,g2}}{4s_{W}^{3}}\left(\begin{array}{l}s_{W}U_{s2,1}^{\tilde{e}_{g1}}\left(U_{1,1}^{\tilde{e}_{g1}*}\delta Z_{1,s1}^{\tilde{e}_{g1}}+U_{2,1}^{\tilde{e}_{g1}*}\delta Z_{2,s1}^{\tilde{e}_{g1}}\right)+\\\left(\begin{array}{l}s_{W}\left(U_{1,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}+U_{2,1}^{\tilde{e}_{g1}}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}\right)-\\\left(4\left(\delta s_{W}\right)-s_{W}\left(4\left(\delta Z_{e}\right)+\delta\overline{Z}_{W}+\delta Z_{W}\right)\right)U_{s2,1}^{\tilde{e}_{g1}}\end{array}\right)U_{s1,1}^{\tilde{e}_{g1}*}\end{array}\right)\right]$$

[SSVV] 2 Squarks – 2 Gauge Bosons

$$\underset{356}{C}\left(\tilde{u}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},\gamma,\gamma\right)=\left[\frac{2ie^{2}(\boxed{1})\delta_{g1,g2}}{9c_{W}s_{W}}\right]$$

$$\boxed{1}=\begin{array}{l}\left(\delta Z_{Z\gamma}\right)\left(\left(3-4s_{W}^{2}\right)U_{s1,1}^{\tilde{u}_{g1}*}U_{s2,1}^{\tilde{u}_{g1}}-4s_{W}^{2}U_{s1,2}^{\tilde{u}_{g1}*}U_{s2,2}^{\tilde{u}_{g1}}\right)+\\2c_{W}s_{W}\left(\delta_{s1,s2}\left(4\left(\delta Z_{e}\right)+2\left(\delta Z_{\gamma\gamma}\right)\right)+\delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}+\delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}+\delta_{s2,1}\delta Z_{1,s1}^{\tilde{u}_{g1}}+\delta_{s2,2}\delta Z_{2,s1}^{\tilde{u}_{g1}}\right)\end{array}$$

$$\underset{357}{C}\left(\tilde{u}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},\gamma,Z\right)=\left[-\frac{ie^{2}\delta_{g1,g2}}{36c_{W}^{3}s_{W}^{2}}\left(4(\boxed{2})s_{W}-16\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right)c_{W}^{3}s_{W}^{2}+(\boxed{1})U_{s1,1}^{\tilde{u}_{g1}*}\right)\right]$$

$$\boxed{2}=4s_{W}U_{s1,2}^{\tilde{u}_{g1}*}\left(\begin{array}{l}s_{W}c_{W}^{2}\left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}U_{1,2}^{\tilde{u}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}U_{2,2}^{\tilde{u}_{g1}}\right)+\\\left(\begin{array}{l}\left(2\left(\delta s_{W}\right)-\left(\delta Z_{Z\gamma}\right)c_{W}\right)s_{W}^{2}+\\\left(2\left(\delta s_{W}\right)+\left(4\left(\delta Z_{e}\right)+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}\right)s_{W}\right)c_{W}^{2}\end{array}\right)U_{s2,2}^{\tilde{u}_{g1}}\end{array}\right)+c_{W}^{2}\left(\begin{array}{l}\left(1-4c_{W}^{2}\right)\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,1}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,1}^{\tilde{u}_{g1}*}\right)U_{s2,1}^{\tilde{u}_{g1}}+\\4s_{W}^{2}\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,2}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,2}^{\tilde{u}_{g1}*}\right)U_{s2,2}^{\tilde{u}_{g1}}\end{array}\right)$$

$$\boxed{1}=4s_{W}\left(1-4c_{W}^{2}\right)c_{W}^{2}\left(U_{2,1}^{\tilde{u}_{g1}}\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}+U_{1,1}^{\tilde{u}_{g1}}\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}\right)-U_{s2,1}^{\tilde{u}_{g1}}\left(\begin{array}{l}\left(\delta Z_{Z\gamma}\right)c_{W}\left(1-4c_{W}^{2}\right)^{2}-8\left(\delta s_{W}\right)\left(1-4c_{W}^{2}\right)s_{W}^{2}-\\4\left(\left(\delta s_{W}\right)\left(14-8c_{W}^{2}\right)+\left(4\left(\delta Z_{e}\right)+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}\right)s_{W}\left(1-4c_{W}^{2}\right)\right)c_{W}^{2}\end{array}\right)$$

$$\underset{358}{C}\left(\tilde{u}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},Z,Z\right)=\left[\frac{ie^{2}\delta_{g1,g2}}{36c_{W}^{4}s_{W}^{3}}\left((\boxed{2})s_{W}+(\boxed{1})\left(1-4c_{W}^{2}\right)U_{s1,1}^{\tilde{u}_{g1}*}\right)\right]$$

$$\boxed{2}=\begin{array}{l}16\left(\begin{array}{l}s_{W}c_{W}^{2}\left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}U_{1,2}^{\tilde{u}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}U_{2,2}^{\tilde{u}_{g1}}\right)+\\2\left(\left(2\left(\delta s_{W}\right)+\left(2\left(\delta Z_{e}\right)+\delta Z_{ZZ}\right)s_{W}\right)c_{W}^{2}-\left(\delta Z_{\gamma Z}\right)c_{W}^{3}+2\left(\delta s_{W}\right)s_{W}^{2}\right)U_{s2,2}^{\tilde{u}_{g1}}\end{array}\right)s_{W}^{3}U_{s1,2}^{\tilde{u}_{g1}*}+\\\left(\begin{array}{l}\left(1-4c_{W}^{2}\right)^{2}\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,1}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,1}^{\tilde{u}_{g1}*}\right)U_{s2,1}^{\tilde{u}_{g1}}+\\16s_{W}^{4}\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,2}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,2}^{\tilde{u}_{g1}*}\right)U_{s2,2}^{\tilde{u}_{g1}}\end{array}\right)c_{W}^{2}\end{array}$$

$$1 = s_W \left(1 - 4c_W^2\right) c_W^2 \left(U_{2,1}^{\tilde{u}_{g1}} \delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}} + U_{1,1}^{\tilde{u}_{g1}} \delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}\right) - 2U_{s2,1}^{\tilde{u}_{g1}} \left(\begin{array}{c} \left(6\left(\delta s_W\right) + 4\left(\delta Z_{\gamma Z}\right) c_W^3\right) s_W^2 - 8\left(\delta s_W\right) s_W^4 - \\ \left(\delta s_W\right)\left(14 - 8c_W^2\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right) s_W \left(1 - 4c_W^2\right) \end{array} \right) c_W^2$$

$$C_{359}\left(\tilde{d}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, \gamma, \gamma\right) = \left[\frac{ie^2(1)\delta_{g1,g2}}{9c_W s_W} \right]$$

$$1 = \begin{array}{l} \left(\delta Z_{Z\gamma}\right)\left(\left(3 - 2s_W^2\right) U_{s1,1}^{\tilde{d}_{g1}*} U_{s2,1}^{\tilde{d}_{g1}} - 2s_W^2 U_{s1,2}^{\tilde{d}_{g1}*} U_{s2,2}^{\tilde{d}_{g1}}\right) + \\ c_W s_W \left(2\delta_{s1,s2}\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) + \delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}} + \delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}} + \delta_{s2,1}\delta Z_{1,s1}^{\tilde{d}_{g1}} + \delta_{s2,2}\delta Z_{2,s1}^{\tilde{d}_{g1}}\right) \end{array}$$

$$C_{360}\left(\tilde{d}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, \gamma, Z\right) = \left[-\frac{ie^2\delta_{g1,g2}}{36c_W^3 s_W^2}\left(2(2)s_W - 4\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right) c_W^3 s_W^2 - (1) U_{s1,1}^{\tilde{d}_{g1}*}\right) \right]$$

$$2 = 2s_W U_{s1,2}^{\tilde{d}_{g1}*} \left(\begin{array}{c} s_W c_W^2 \left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}} U_{1,2}^{\tilde{d}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}} U_{2,2}^{\tilde{d}_{g1}}\right) + \\ \left(\begin{array}{l} \left(2\left(\delta s_W\right) - \left(\delta Z_{Z\gamma}\right) c_W\right) s_W^2 + \\ \left(2\left(\delta s_W\right) + \left(4\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma}\right) s_W\right) c_W^2 \end{array} \right) U_{s2,2}^{\tilde{d}_{g1}} \end{array} \right) - c_W^2 \left(\begin{array}{c} \left(2c_W^2 + 1\right)\left(\delta Z_{1,s1}^{\tilde{d}_{g1}} U_{1,1}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}} U_{2,1}^{\tilde{d}_{g1}*}\right) U_{s2,1}^{\tilde{d}_{g1}} - \\ 2s_W^2\left(\delta Z_{1,s1}^{\tilde{d}_{g1}} U_{1,2}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}} U_{2,2}^{\tilde{d}_{g1}*}\right) U_{s2,2}^{\tilde{d}_{g1}} \end{array} \right)$$

$$1 = U_{s2,1}^{\tilde{d}_{g1}} \left(\begin{array}{l} \left(\delta Z_{Z\gamma}\right) c_W \left(2c_W^2 + 1\right)^2 + 4\left(\delta s_W\right) s_W^2 \left(2c_W^2 + 1\right) - \\ 2c_W^2\left(\left(\delta s_W\right)\left(10 - 4c_W^2\right) - \left(4\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma}\right) s_W \left(2c_W^2 + 1\right)\right) \end{array} \right) + 2s_W c_W^2 \left(2c_W^2 + 1\right)\left(U_{2,1}^{\tilde{d}_{g1}} \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}} + U_{1,1}^{\tilde{d}_{g1}} \delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}\right)$$

$$C_{361}\left(\tilde{d}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, Z, Z\right) = \left[\frac{ie^2\delta_{g1,g2}}{36c_W^4 s_W^3}\left((2)s_W + (1)\left(1 + 2c_W^2\right) U_{s1,1}^{\tilde{d}_{g1}*}\right) \right]$$

$$2 = \begin{array}{l} 4\left(\begin{array}{c} s_W c_W^2 \left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}} U_{1,2}^{\tilde{d}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}} U_{2,2}^{\tilde{d}_{g1}}\right) + \\ 2\left(\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right) s_W\right) c_W^2 - \left(\delta Z_{\gamma Z}\right) c_W^3 + 2\left(\delta s_W\right) s_W^2\right) U_{s2,2}^{\tilde{d}_{g1}} \end{array} \right) s_W^3 U_{s1,2}^{\tilde{d}_{g1}*} + \\ \left(\begin{array}{l} \left(2c_W^2 + 1\right)^2 \left(\delta Z_{1,s1}^{\tilde{d}_{g1}} U_{1,1}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}} U_{2,1}^{\tilde{d}_{g1}*}\right) U_{s2,1}^{\tilde{d}_{g1}} + \\ 4s_W^4\left(\delta Z_{1,s1}^{\tilde{d}_{g1}} U_{1,2}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}} U_{2,2}^{\tilde{d}_{g1}*}\right) U_{s2,2}^{\tilde{d}_{g1}} \end{array} \right) c_W^2 \end{array}$$

$$1 = 2U_{s2,1}^{\tilde{d}_{g1}} \left(\begin{array}{l} 2\left(3\left(\delta s_W\right) + \left(\delta Z_{\gamma Z}\right) c_W^3\right) s_W^2 - 4\left(\delta s_W\right) s_W^4 - \\ c_W^2\left(\left(\delta s_W\right)\left(10 - 4c_W^2\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right) s_W \left(2c_W^2 + 1\right)\right) \end{array} \right) + s_W c_W^2 \left(2c_W^2 + 1\right)\left(U_{2,1}^{\tilde{d}_{g1}} \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}} + U_{1,1}^{\tilde{d}_{g1}} \delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}\right)$$

$$C_{362}\left(\tilde{u}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\gamma,W^-\right) = \left[\frac{ie^2}{6\sqrt{2}c_W s_W^2}\left((1)\mathrm{CKM}^*_{g1,g2} + 2c_W s_W U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{d}_{g2}}_{s2,1}\delta\mathrm{CKM}^*_{g1,g2}\right)\right]$$

$$1 = U^{\tilde{u}_{g1}*}_{s1,1}\left(\begin{array}{l} c_W s_W\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g2}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g2}}_{2,1}\right) - \\ \left(c_W\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_W + \delta Z_{\gamma\gamma}\right)s_W\right) + \left(\delta Z_{Z\gamma}\right)s_W^2\right)U^{\tilde{d}_{g2}}_{s2,1}\end{array}\right) + c_W s_W U^{\tilde{d}_{g2}}_{s2,1}\left(U^{\tilde{u}_{g1}*}_{2,1}\delta Z^{\tilde{u}_{g1}}_{2,s1} + U^{\tilde{u}_{g1}*}_{1,1}\delta Z^{\tilde{u}_{g1}}_{1,s1}\right)$$

$$C_{363}\left(\tilde{d}^{s1}_{g1},\tilde{u}^{s2,\dagger}_{g2},\gamma,W^+\right) = \left[\frac{ie^2}{6\sqrt{2}c_W s_W^2}\left((1)\mathrm{CKM}_{g2,g1} + 2c_W s_W\left(\delta\mathrm{CKM}_{g2,g1}\right)U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{u}_{g2}}_{s2,1}\right)\right]$$

$$1 = U^{\tilde{d}_{g1}*}_{s1,1}\left(\begin{array}{l} c_W s_W\left(\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}U^{\tilde{u}_{g2}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}U^{\tilde{u}_{g2}}_{2,1}\right) - \\ \left(c_W\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{\gamma\gamma}\right)s_W\right) + \left(\delta Z_{Z\gamma}\right)s_W^2\right)U^{\tilde{u}_{g2}}_{s2,1}\end{array}\right) + c_W s_W U^{\tilde{u}_{g2}}_{s2,1}\left(U^{\tilde{d}_{g1}*}_{2,1}\delta Z^{\tilde{d}_{g1}}_{2,s1} + U^{\tilde{d}_{g1}*}_{1,1}\delta Z^{\tilde{d}_{g1}}_{1,s1}\right)$$

$$C_{366}\left(\tilde{u}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},Z,W^-\right) = \left[-\frac{ie^2}{6\sqrt{2}s_W c_W^3}\left((1)\mathrm{CKM}^*_{g1,g2} + 2s_W c_W^2 U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1}\delta\mathrm{CKM}^*_{g1,g2}\right)\right]$$

$$1 = U^{\tilde{u}_{g1}*}_{s1,1}\left(\begin{array}{l} s_W c_W^2\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g2}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g2}}_{2,1}\right) + \\ \left(\left(4\left(\delta Z_e\right) + \delta Z_W + \delta Z_{ZZ}\right)s_W c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)U^{\tilde{d}_{g2}}_{s2,1}\end{array}\right) + s_W c_W^2 U^{\tilde{d}_{g2}}_{s2,1}\left(U^{\tilde{u}_{g1}*}_{2,1}\delta Z^{\tilde{u}_{g1}}_{2,s1} + U^{\tilde{u}_{g1}*}_{1,1}\delta Z^{\tilde{u}_{g1}}_{1,s1}\right)$$

$$C_{367}\left(\tilde{d}^{s1}_{g1},\tilde{u}^{s2,\dagger}_{g2},Z,W^+\right) = \left[-\frac{ie^2}{6\sqrt{2}s_W c_W^3}\left((1)\mathrm{CKM}_{g2,g1} + 2s_W\left(\delta\mathrm{CKM}_{g2,g1}\right)c_W^2 U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{u}_{g2}}_{s2,1}\right)\right]$$

$$1 = U^{\tilde{d}_{g1}*}_{s1,1}\left(\begin{array}{l} s_W c_W^2\left(\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}U^{\tilde{u}_{g2}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}U^{\tilde{u}_{g2}}_{2,1}\right) + \\ \left(\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{ZZ}\right)s_W c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)U^{\tilde{u}_{g2}}_{s2,1}\end{array}\right) + s_W c_W^2 U^{\tilde{u}_{g2}}_{s2,1}\left(U^{\tilde{d}_{g1}*}_{2,1}\delta Z^{\tilde{d}_{g1}}_{2,s1} + U^{\tilde{d}_{g1}*}_{1,1}\delta Z^{\tilde{d}_{g1}}_{1,s1}\right)$$

$$C_{372}\left(\tilde{u}^{s1}_{g1},\tilde{u}^{s2,\dagger}_{g2},W^-,W^+\right) = \left[\frac{ie^2\delta_{g1,g2}}{4s_W^3}\left(\begin{array}{l} s_W U^{\tilde{u}_{g1}}_{s2,1}\left(U^{\tilde{u}_{g1}*}_{1,1}\delta Z^{\tilde{u}_{g1}}_{1,s1} + U^{\tilde{u}_{g1}*}_{2,1}\delta Z^{\tilde{u}_{g1}}_{2,s1}\right) + \\ \left(\begin{array}{l} s_W\left(U^{\tilde{u}_{g1}}_{1,1}\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2} + U^{\tilde{u}_{g1}}_{2,1}\delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}\right) - \\ \left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_W\right)\right)U^{\tilde{u}_{g1}}_{s2,1}\end{array}\right)U^{\tilde{u}_{g1}*}_{s1,1}\end{array}\right)\right]$$

$$C_{373}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},W^-,W^+\right) = \left[\frac{ie^2\delta_{g1,g2}}{4s_W^3}\left(\begin{array}{l} s_W U^{\tilde{d}_{g1}}_{s2,1}\left(U^{\tilde{d}_{g1}*}_{1,1}\delta Z^{\tilde{d}_{g1}}_{1,s1} + U^{\tilde{d}_{g1}*}_{2,1}\delta Z^{\tilde{d}_{g1}}_{2,s1}\right) + \\ \left(\begin{array}{l} s_W\left(U^{\tilde{d}_{g1}}_{1,1}\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2} + U^{\tilde{d}_{g1}}_{2,1}\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}\right) - \\ \left(4\left(\delta s_W\right) - s_W\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_W\right)\right)U^{\tilde{d}_{g1}}_{s2,1}\end{array}\right)U^{\tilde{d}_{g1}*}_{s1,1}\end{array}\right)\right]$$

[SSVV] 2 Squarks – 2 Gluons

$$C_{460}\left(\tilde{u}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},g,g\right) = \left[\left(\frac{1}{2}ig_s^2\delta_{g1,g2}\right)\left(\begin{array}{l}2\delta_{s1,s2}\left(2\left(\delta Z_{g_s}\right)+\delta Z_{gg}\right)+\delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}+\delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}+\\ \delta_{s2,1}\delta Z_{1,s1}^{\tilde{u}_{g1}}+\delta_{s2,2}\delta Z_{2,s1}^{\tilde{u}_{g1}}\end{array}\right)\left(\left(T^{g3}T^{g4}\right)_{c2,c1}+\left(T^{g4}T^{g3}\right)_{c2,c1}\right)\right]$$

$$C_{461}\left(\tilde{d}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},g,g\right) = \left[\left(\frac{1}{2}ig_s^2\delta_{g1,g2}\right)\left(\begin{array}{l}2\delta_{s1,s2}\left(2\left(\delta Z_{g_s}\right)+\delta Z_{gg}\right)+\delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}+\delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}+\\ \delta_{s2,1}\delta Z_{1,s1}^{\tilde{d}_{g1}}+\delta_{s2,2}\delta Z_{2,s1}^{\tilde{d}_{g1}}\end{array}\right)\left(\left(T^{g3}T^{g4}\right)_{c2,c1}+\left(T^{g4}T^{g3}\right)_{c2,c1}\right)\right]$$

[VVVV] 4 Gauge Bosons

$$C_{39}\left(\gamma,\gamma,W^-,W^+\right) = \frac{ie^2}{s_W}\left(c_W\left(\delta Z_{Z\gamma}\right)+s_W\left(2\left(\delta Z_e\right)+\delta Z_W+\delta Z_{\gamma\gamma}\right)\right)\begin{bmatrix}-2\\ \hline 1\\ \hline 1\end{bmatrix}$$

$$C_{40}\left(\gamma,Z,W^-,W^+\right) = \frac{ie^2}{c_W s_W^2}\left(2\left(\delta s_W\right)-c_W\left(c_W s_W\left(4\left(\delta Z_e\right)+2\left(\delta Z_W\right)+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}\right)+\left(\delta Z_{Z\gamma}\right)c_W^2+\left(\delta Z_{\gamma Z}\right)s_W^2\right)\right)\begin{bmatrix}1\\ \hline -\frac{1}{2}\\ \hline -\frac{1}{2}\end{bmatrix}$$

$$C_{41}\left(Z,Z,W^-,W^+\right) = \frac{ie^2}{s_W^3}\left(2\left(\delta s_W\right)-c_W s_W\left(c_W\left(2\left(\delta Z_e\right)+\delta Z_W+\delta Z_{ZZ}\right)+s_W\left(\delta Z_{\gamma Z}\right)\right)\right)\begin{bmatrix}2\\ \hline -1\\ \hline -1\end{bmatrix}$$

$$C_{42}\left(W^-,W^-,W^+,W^+\right) = \frac{ie^2}{s_W^3}\left(\delta s_W-s_W\left(\delta Z_e+\delta Z_W\right)\right)\begin{bmatrix}-4\\ \hline 2\\ \hline 2\end{bmatrix}$$

[VVVV] 4 Gluons

$$\underset{448}{C}(g,g,g,g) = 2ig_s^2\left(\delta Z_{g_s} + \delta Z_{gg}\right)\left[\begin{array}{c} -\left(f^{g1,g3,x}f^{x,g2,g4}\right) + f^{g1,g4,x}f^{x,g3,g2} \\ \hline -\left(f^{g1,g2,x}f^{x,g3,g4}\right) - f^{g1,g4,x}f^{x,g3,g2} \\ \hline f^{g1,g2,x}f^{x,g3,g4} + f^{g1,g3,x}f^{x,g2,g4} \end{array}\right]$$