MSSMCT (1-loop counter terms)

[FF] 2 Charginos

$$\underset{476}{C}\left(\tilde{\chi}^{+}_{c1}, \tilde{\chi}^{-}_{c2}\right) = \frac{i}{2}\left[\begin{array}{c} -\delta\overline{Z}^{\tilde{\chi}^{-},L}_{c1,c2} - \delta Z^{\tilde{\chi}^{-},L}_{c1,c2} \\ \hline \delta\overline{Z}^{\tilde{\chi}^{-},R}_{c1,c2} + \delta Z^{\tilde{\chi}^{-},R}_{c1,c2} \\ \hline -m_{\tilde{\chi}^{-}_{c2}}\delta\overline{Z}^{\tilde{\chi}^{-},R}_{c1,c2} - 2\delta m^{\tilde{\chi}^{-}}_{c1,c2} - m_{\tilde{\chi}^{-}_{c1}}\delta Z^{\tilde{\chi}^{-},L}_{c1,c2} \\ \hline -m_{\tilde{\chi}^{-}_{c2}}\delta\overline{Z}^{\tilde{\chi}^{-},L}_{c1,c2} - 2\delta m^{\tilde{\chi}^{-}*}_{c2,c1} - m_{\tilde{\chi}^{-}_{c1}}\delta Z^{\tilde{\chi}^{-},R}_{c1,c2} \end{array}\right]$$

[FF] 2 Gluinos

$$\underset{503}{C}\left(\tilde{g}, \tilde{g}\right) = \frac{1}{2}i\delta_{g1,g2}\left[\begin{array}{c} -\delta\overline{Z}^{L}_{\tilde{g}} - \delta Z^{L}_{\tilde{g}} \\ \hline \delta\overline{Z}^{R}_{\tilde{g}} + \delta Z^{R}_{\tilde{g}} \\ \hline -2\left(\delta m_{\tilde{g}}\right) - m_{\tilde{g}}\left(\delta\overline{Z}^{R}_{\tilde{g}} + \delta Z^{L}_{\tilde{g}}\right) \\ \hline -2\delta m^{*}_{\tilde{g}} - m_{\tilde{g}}\left(\delta\overline{Z}^{L}_{\tilde{g}} + \delta Z^{R}_{\tilde{g}}\right) \end{array}\right]$$

[FF] 2 Leptons

$$\underset{451}{C}\left(\overline{\nu}_{g1}, \nu_{g2}\right) = \frac{1}{2}i\delta_{g1,g2}\left[\begin{array}{c} -\delta\overline{Z}^{\nu,L}_{g1,g1} - \delta Z^{\nu,L}_{g1,g1} \\ \hline \delta\overline{Z}^{\nu,R}_{g1,g1} + \delta Z^{\nu,R}_{g1,g1} \\ \hline 0 \\ \hline 0 \end{array}\right]$$

$$\underset{452}{C}\left(\bar{e}_{g1}, e_{g2}\right) = \frac{1}{2} i \delta_{g1,g2} \begin{bmatrix} -\delta\overline{Z}^{e,L}_{g1,g1} - \delta Z^{e,L}_{g1,g1} \\ \hline \delta\overline{Z}^{e,R}_{g1,g1} + \delta Z^{e,R}_{g1,g1} \\ \hline -2\delta m^{e_g}_{g1} - m_{e_{g1}}\left(\delta\overline{Z}^{e,R}_{g1,g1} + \delta Z^{e,L}_{g1,g1}\right) \\ \hline -2\delta m^{e_g}_{g1} - m_{e_{g1}}\left(\delta\overline{Z}^{e,L}_{g1,g1} + \delta Z^{e,R}_{g1,g1}\right) \end{bmatrix}$$

[FF] 2 Neutralinos

$$\underset{477}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^0_{n2}\right) = \frac{i}{2} \begin{bmatrix} -\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,n2} - \delta Z^{\tilde{\chi}^0,L}_{n1,n2} \\ \hline \delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,n2} + \delta Z^{\tilde{\chi}^0,R}_{n1,n2} \\ \hline -m_{\tilde{\chi}^0_{n2}}\delta\overline{Z}^{\tilde{\chi}^0,R}_{n1,n2} - 2\delta m^{\tilde{\chi}^0}_{n1,n2} - m_{\tilde{\chi}^0_{n1}}\delta Z^{\tilde{\chi}^0,L}_{n1,n2} \\ \hline -m_{\tilde{\chi}^0_{n2}}\delta\overline{Z}^{\tilde{\chi}^0,L}_{n1,n2} - 2\delta m^{\tilde{\chi}^{0*}}_{n2,n1} - m_{\tilde{\chi}^0_{n1}}\delta Z^{\tilde{\chi}^0,R}_{n1,n2} \end{bmatrix}$$

[FF] 2 Quarks

$$\underset{453}{C}\left(\bar{u}_{g1}, u_{g2}\right) = \frac{i}{2} \begin{bmatrix} -\delta\overline{Z}^{u,L}_{g2,g1} - \delta Z^{u,L}_{g1,g2} \\ \hline \delta\overline{Z}^{u,R}_{g2,g1} + \delta Z^{u,R}_{g1,g2} \\ \hline -m_{u_{g2}}\delta\overline{Z}^{u,R}_{g1,g2} - 2\delta_{g1,g2}\delta m^{u_g}_{g1} - m_{u_{g1}}\delta Z^{u,L}_{g1,g2} \\ \hline -m_{u_{g2}}\delta\overline{Z}^{u,L}_{g1,g2} - 2\delta_{g1,g2}\delta m^{u_g}_{g1} - m_{u_{g1}}\delta Z^{u,R}_{g1,g2} \end{bmatrix}$$

$$\underset{454}{C}\left(\overline{d}_{\mathrm{g1}}, d_{\mathrm{g2}}\right) = \frac{\mathrm{i}}{2}\begin{bmatrix} -\delta\overline{Z}^{d,\mathrm{L}}_{\mathrm{g2,g1}} - \delta Z^{d,\mathrm{L}}_{\mathrm{g1,g2}} \\ \hline \delta\overline{Z}^{d,\mathrm{R}}_{\mathrm{g2,g1}} + \delta Z^{d,\mathrm{R}}_{\mathrm{g1,g2}} \\ \hline -m_{d_{\mathrm{g2}}}\delta\overline{Z}^{d,\mathrm{R}}_{\mathrm{g1,g2}} - 2\delta_{\mathrm{g1,g2}}\delta m^{d_{\mathrm{g}}}_{\mathrm{g1}} - m_{d_{\mathrm{g1}}}\delta Z^{d,\mathrm{L}}_{\mathrm{g1,g2}} \\ \hline -m_{d_{\mathrm{g2}}}\delta\overline{Z}^{d,\mathrm{L}}_{\mathrm{g1,g2}} - 2\delta_{\mathrm{g1,g2}}\delta m^{d_{\mathrm{g}}}_{\mathrm{g1}} - m_{d_{\mathrm{g1}}}\delta Z^{d,\mathrm{R}}_{\mathrm{g1,g2}} \end{bmatrix}$$

[SS] 2 Higgs

$$\underset{478}{C}\left(\tilde{\nu}^{\dagger}_{\mathrm{g1}}, \tilde{\nu}_{\mathrm{g2}}\right) = -\frac{1}{2}\mathrm{i}\delta_{\mathrm{g1,g2}}\begin{bmatrix} \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1} \\ \hline 2\delta M^{\tilde{\nu}}_{1,1} + \left(\delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right) m^2_{\tilde{\nu}_{\mathrm{g1}}} \end{bmatrix}$$

$$\underset{479}{C}\left(\tilde{e}^{\mathrm{s1},\dagger}_{\mathrm{g1}}, \tilde{e}^{\mathrm{s2}}_{\mathrm{g2}}\right) = -\frac{1}{2}\mathrm{i}\delta_{\mathrm{g1,g2}}\begin{bmatrix} \delta\overline{Z}^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s2,s1}} + \delta Z^{\tilde{e}_{\mathrm{g1}}}_{\mathrm{s1,s2}} \\ \hline 2\delta M^{\tilde{e}_{\mathrm{g1}}}_{\mathrm{s1,s2}} + \delta Z^{\tilde{e}_{\mathrm{g1}}}_{\mathrm{s1,s2}} m^2_{\tilde{e}^{\mathrm{s1}}_{\mathrm{g1}}} + \delta\overline{Z}^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s2,s1}} m^2_{\tilde{e}^{\mathrm{s2}}_{\mathrm{g2}}} \end{bmatrix}$$

$$\underset{480}{C}\left(h^0, h^0\right) = -\mathrm{i}\begin{bmatrix} \delta Z_{\mathrm{hh}} \\ \hline \delta M^2_{\mathrm{hh}} + \left(\delta Z_{\mathrm{hh}}\right) M^{\mathrm{tree2}}_{h^0} \end{bmatrix}$$

$$\underset{481}{C}\left(h^0, H^0\right) = -\mathrm{i}\begin{bmatrix} \delta Z_{\mathrm{hH}} \\ \hline \frac{1}{2}\left(2\delta M^2_{\mathrm{hH}} + \left(\delta Z_{\mathrm{hH}}\right)\left(M^{\mathrm{tree2}}_{h^0} + M^{\mathrm{tree2}}_{H^0}\right)\right) \end{bmatrix}$$

$$\underset{482}{C}\left(h^0, A^0\right) = -\mathrm{i}\begin{bmatrix} \delta Z_{\mathrm{hA}} \\ \hline \frac{1}{2}\left(2\delta M^2_{\mathrm{hA}} + \left(\delta Z_{\mathrm{hA}}\right)\left(M^{\mathrm{tree2}}_{A^0} + M^{\mathrm{tree2}}_{h^0}\right)\right) \end{bmatrix}$$

$$\underset{483}{C}\left(h^0, G^0\right) = -\mathrm{i}\begin{bmatrix} \delta Z_{\mathrm{hG}} \\ \hline \frac{1}{2}\left(2\delta M^2_{\mathrm{hG}} + \left(\delta Z_{\mathrm{hG}}\right) M^{\mathrm{tree2}}_{h^0}\right) \end{bmatrix}$$

$$\underset{484}{C}\left(H^0, h^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{hH}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{hH}} + \left(\delta Z_{\mathrm{hH}}\right)\left(M^{\mathrm{tree2}}_{h^0} + M^{\mathrm{tree2}}_{H^0}\right)\right)}\right]$$

$$\underset{485}{C}\left(H^0, H^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{HH}}}{\delta M^2_{\mathrm{HH}} + \left(\delta Z_{\mathrm{HH}}\right) M^{\mathrm{tree2}}_{H^0}}\right]$$

$$\underset{486}{C}\left(H^0, A^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{HA}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{HA}} + \left(\delta Z_{\mathrm{HA}}\right)\left(M^{\mathrm{tree2}}_{A^0} + M^{\mathrm{tree2}}_{H^0}\right)\right)}\right]$$

$$\underset{487}{C}\left(H^0, G^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{HG}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{HG}} + \left(\delta Z_{\mathrm{HG}}\right) M^{\mathrm{tree2}}_{H^0}\right)}\right]$$

$$\underset{488}{C}\left(A^0, h^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{hA}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{hA}} + \left(\delta Z_{\mathrm{hA}}\right)\left(M^{\mathrm{tree2}}_{A^0} + M^{\mathrm{tree2}}_{h^0}\right)\right)}\right]$$

$$\underset{489}{C}\left(A^0, H^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{HA}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{HA}} + \left(\delta Z_{\mathrm{HA}}\right)\left(M^{\mathrm{tree2}}_{A^0} + M^{\mathrm{tree2}}_{H^0}\right)\right)}\right]$$

$$\underset{490}{C}\left(A^0, A^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{AA}}}{\delta M^2_{\mathrm{AA}} + \left(\delta Z_{\mathrm{AA}}\right) M^{\mathrm{tree2}}_{A^0}}\right]$$

$$\underset{491}{C}\left(A^0, G^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{AG}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{AG}} + \left(\delta Z_{\mathrm{AG}}\right) M^{\mathrm{tree2}}_{A^0}\right)}\right]$$

$$\underset{492}{C}\left(G^0, h^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{hG}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{hG}} + \left(\delta Z_{\mathrm{hG}}\right) M^{\mathrm{tree2}}_{h^0}\right)}\right]$$

$$\underset{493}{C}\left(G^0, H^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{HG}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{HG}} + \left(\delta Z_{\mathrm{HG}}\right) M^{\mathrm{tree2}}_{H^0}\right)}\right]$$

$$\underset{494}{C}\left(G^0, A^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{AG}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{AG}} + \left(\delta Z_{\mathrm{AG}}\right) M^{\mathrm{tree2}}_{A^0}\right)}\right]$$

$$\underset{495}{C}\left(G^0, G^0\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{GG}}}{\delta M^2_{\mathrm{GG}}}\right]$$

$$\underset{496}{C}\left(H^-, H^+\right) = -\frac{\mathrm{i}}{2}\left[\frac{\delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}}}{2\delta M^2_{\mathrm{H^-H^-}} + \left(\delta \overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{H^-H^-}}\right) M^{\mathrm{tree2}}_{H^-}}\right]$$

$$\underset{497}{C}\left(H^-, G^+\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{G^-H^-}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{G^-H^-}} + \left(\delta Z_{\mathrm{H^-G^-}}\right) M^{\mathrm{tree2}}_{H^-}\right)}\right]$$

$$\underset{498}{C}\left(G^-, H^+\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{H^-G^-}}}{\frac{1}{2}\left(2\delta M^2_{\mathrm{H^-G^-}} + \left(\delta Z_{\mathrm{G^-H^-}}\right) M^{\mathrm{tree2}}_{H^-}\right)}\right]$$

$$\underset{499}{C}\left(G^-, G^+\right) = -\mathrm{i}\left[\frac{\delta Z_{\mathrm{G^-G^-}}}{\delta M^2_{\mathrm{G^-G^-}}}\right]$$

$$\underset{500}{C}\left(\tilde{u}_{g1}^{s1,\dagger},\tilde{u}_{g2}^{s2}\right) = -\frac{1}{2}\mathrm{i}\delta_{g1,g2}\begin{bmatrix}\delta\overline{Z}_{s2,s1}^{\tilde{u}_{g2}} + \delta Z_{s1,s2}^{\tilde{u}_{g1}} \\ \hline 2\delta M_{s1,s2}^{\tilde{u}_{g1}} + \delta Z_{s1,s2}^{\tilde{u}_{g1}} m_{\tilde{u}_{g1}^{s1}}^2 + \delta\overline{Z}_{s2,s1}^{\tilde{u}_{g2}} m_{\tilde{u}_{g2}^{s2}}^2\end{bmatrix}$$

$$\underset{501}{C}\left(\tilde{d}_{g1}^{s1,\dagger},\tilde{d}_{g2}^{s2}\right) = -\frac{1}{2}\mathrm{i}\delta_{g1,g2}\begin{bmatrix}\delta\overline{Z}_{s2,s1}^{\tilde{d}_{g2}} + \delta Z_{s1,s2}^{\tilde{d}_{g1}} \\ \hline 2\delta M_{s1,s2}^{\tilde{d}_{g1}} + \delta Z_{s1,s2}^{\tilde{d}_{g1}} m_{\tilde{d}_{g1}^{s1}}^2 + \delta\overline{Z}_{s2,s1}^{\tilde{d}_{g2}} m_{\tilde{d}_{g2}^{s2}}^2\end{bmatrix}$$

[SV] Higgs – Gauge Boson

$$\underset{434}{C}\left(A^0,Z\right) = -\left(\delta Z_{AG}\right) M_Z \begin{bmatrix}1 \\ \hline 0\end{bmatrix}$$

$$\underset{435}{C}\left(G^0,Z\right) = -\frac{M_Z}{2}\left(\frac{\delta M_Z^2}{M_Z^2} + \delta Z_{ZZ} + \delta Z_{GG}\right) \begin{bmatrix}1 \\ \hline 0\end{bmatrix}$$

$$\underset{436}{C}\left(G^0,\gamma\right) = -\frac{1}{2}\left(\delta Z_{Z\gamma}\right) M_Z \begin{bmatrix}1 \\ \hline 0\end{bmatrix}$$

$$\underset{437}{C}\left(H^-,W^+\right) = \mathrm{i}\left(\delta Z_{G^-H^-}\right) M_W \begin{bmatrix}1 \\ \hline 0\end{bmatrix}$$

$$\underset{438}{C}\left(H^+,W^-\right) = -\mathrm{i}\left(\delta Z_{H^-G^-}\right) M_W \begin{bmatrix}1 \\ \hline 0\end{bmatrix}$$

$$\underset{439}{C}\left(G^-,W^+\right) = \left(\frac{1}{2}\mathrm{i}M_W\right)\left(\frac{\delta M_W^2}{M_W^2} + \delta Z_W + \delta Z_{G^-G^-}\right) \begin{bmatrix}1 \\ \hline 0\end{bmatrix}$$

$$\underset{440}{C}\left(G^{+},W^{-}\right)=-\left(\frac{1}{2}\mathrm{i}M_{\mathrm{W}}\right)\left(\frac{\delta M_{\mathrm{W}}^{2}}{M_{\mathrm{W}}^{2}}+\delta Z_{\mathrm{W}}+\delta Z_{\mathrm{G}^{-}\mathrm{G}^{-}}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

[UU] 2 Ghosts

$$\underset{445}{C}\left(u_{\gamma},\overline{u}_{\gamma}\right)=\mathrm{i}\left(\frac{1}{2}\left(\delta Z_{\gamma\gamma}\right)-\delta U_{\gamma\gamma}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$\underset{446}{C}\left(u_{Z},\overline{u}_{Z}\right)=-\mathrm{i}\left[\begin{array}{c}-\left(\frac{1}{2}\left(\delta Z_{ZZ}\right)\right)+\delta U_{ZZ}\\\hline \frac{\xi_{Z}}{2}\left(\delta M_{Z}^{2}+\left(2\left(\delta U_{ZZ}\right)-\delta Z_{\mathrm{G}^{0}}\right)M_{Z}^{2}\right)\end{array}\right]$$

$$\underset{447}{C}\left(u_{Z},\overline{u}_{\gamma}\right)=\mathrm{i}\left(\frac{1}{2}\left(\delta Z_{\gamma Z}\right)-\delta U_{\gamma Z}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$\underset{448}{C}\left(u_{\gamma},\overline{u}_{Z}\right)=-\mathrm{i}\left[\begin{array}{c}-\left(\frac{1}{2}\left(\delta Z_{Z\gamma}\right)\right)+\delta U_{Z\gamma}\\\hline \xi_{Z}\left(\delta U_{Z\gamma}\right)M_{Z}^{2}\end{array}\right]$$

$$\underset{449}{C}\left(u_{-},\overline{u}_{-}\right)=-\mathrm{i}\left[\begin{array}{c}-\left(\frac{1}{2}\left(\delta Z_{\mathrm{W}}\right)\right)+\delta U_{\mathrm{W}}\\\hline \frac{\xi_{\mathrm{W}}}{2}\left(\delta M_{\mathrm{W}}^{2}+\left(2\left(\delta U_{\mathrm{W}}\right)-\delta Z_{\mathrm{G}}\right)M_{\mathrm{W}}^{2}\right)\end{array}\right]$$

$$\underset{450}{C}\left(u_{+},\overline{u}_{+}\right)=-\mathrm{i}\left[\begin{array}{c}-\left(\frac{1}{2}\left(\delta Z_{\mathrm{W}}\right)\right)+\delta U_{\mathrm{W}}\\\hline \frac{\xi_{\mathrm{W}}}{2}\left(\delta M_{\mathrm{W}}^{2}+\left(2\left(\delta U_{\mathrm{W}}\right)-\delta Z_{\mathrm{G}}\right)M_{\mathrm{W}}^{2}\right)\end{array}\right]$$

[VV] 2 Gauge Bosons

$$\underset{441}{C}\left(W^+, W^-\right) = \mathrm{i}\begin{bmatrix} \delta Z_W \\ \hline \delta M_W^2 + \left(\delta Z_W\right) M_W^2 \\ \hline -\delta Z_W \end{bmatrix}$$

$$\underset{442}{C}(Z, Z) = \mathrm{i}\begin{bmatrix} \delta Z_{ZZ} \\ \hline \delta M_Z^2 + \left(\delta Z_{ZZ}\right) M_Z^2 \\ \hline -\delta Z_{ZZ} \end{bmatrix}$$

$$\underset{443}{C}(\gamma, \gamma) = \mathrm{i}\left(\delta Z_{\gamma\gamma}\right)\begin{bmatrix} 1 \\ \hline 0 \\ \hline -1 \end{bmatrix}$$

$$\underset{444}{C}(\gamma, Z) = \frac{\mathrm{i}}{2}\begin{bmatrix} \delta Z_{Z\gamma} + \delta Z_{\gamma Z} \\ \hline \left(\delta Z_{Z\gamma}\right) M_Z^2 \\ \hline -\left(\delta Z_{Z\gamma}\right) - \delta Z_{\gamma Z} \end{bmatrix}$$

$$\underset{502}{C}(g, g) = \mathrm{i}\delta_{g1,g2}\left(\delta Z_{gg}\right)\begin{bmatrix} 1 \\ \hline 0 \\ \hline -1 \end{bmatrix}$$

[FFS] Chargino – Lepton – Higgs

$$\underset{269}{C}\left(\tilde{\chi}^-_{c1}, \bar{e}_{g2}, \tilde{\nu}_{g3}\right) = \frac{ie\delta_{g2,g3}}{2s_W^2} \left[\frac{\begin{pmatrix} c_\beta m_{e_{g3}} s_W M_W^2 \left(\delta Z^{\tilde{\chi}^-,L}_{1,c1} U^*_{1,2} + \delta Z^{\tilde{\chi}^-,L}_{2,c1} U^*_{2,2}\right) + \\ \left(\begin{array}{l} 2c_\beta s_W \delta m^{e_g}_{g3} M_W^2 - \\ m_{e_{g3}} \left(s_W \left(2\left(\delta c_\beta\right) - c_\beta \left(2\left(\delta Z_e\right) + \delta \overline{Z}^{e,R}_{g2,g2} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right) M_W^2 + c_\beta \left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right)\right) \end{array} \right) U^*_{c1,2} \end{pmatrix}}{V_{c1,1}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta \overline{Z}^{e,L}_{g2,g2} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right) - s_W\left(V_{1,1}\delta Z^{\tilde{\chi}^-,R}_{1,c1} + V_{2,1}\delta Z^{\tilde{\chi}^-,R}_{2,c1}\right)} \right]$$

$$\underset{270}{C}\left(\tilde{\chi}^+_{c1}, \overline{\nu}_{g2}, \tilde{e}^{s3}_{g3}\right) = -\frac{ie\delta_{g2,g3}}{4c_\beta^2 M_W^3 s_W^2} \begin{pmatrix} 2\left(s_W\left(U_{1,1}\delta \overline{Z}^{\tilde{\chi}^-,L}_{c1,1} + U_{2,1}\delta \overline{Z}^{\tilde{\chi}^-,L}_{c1,2}\right) - U_{c1,1}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta \overline{Z}^{\nu,L}_{g2,g2}\right)\right)\right) c_\beta^2 M_W^3 U^{\tilde{e}_{g2}*}_{s3,1} - \\ \sqrt{2}\begin{pmatrix} c_\beta m_{e_{g2}} s_W \left(U_{1,2}\delta \overline{Z}^{\tilde{\chi}^-,L}_{c1,1} + U_{2,2}\delta \overline{Z}^{\tilde{\chi}^-,L}_{c1,2}\right) M_W^2 + \\ \left(\begin{array}{l} 2c_\beta s_W \delta m^{e_g}_{g2} M_W^2 - \\ m_{e_{g2}} \left(s_W \left(2\left(\delta c_\beta\right) - c_\beta \left(2\left(\delta Z_e\right) + \delta \overline{Z}^{\nu,L}_{g2,g2}\right)\right) M_W^2 + c_\beta \left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right)\right) \end{array} \right) U_{c1,2} \end{pmatrix} U^{\tilde{e}_{g2}*}_{s3,2} + \\ \begin{pmatrix} 2c_\beta M_W U_{c1,1}\left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g2}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g2}*}_{2,1}\right) - \\ \sqrt{2} m_{e_{g2}} U_{c1,2}\left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g2}*}_{1,2} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g2}*}_{2,2}\right) \end{pmatrix} c_\beta s_W M_W^2 \end{pmatrix} \left[\begin{array}{c} 0 \\ \hline 1 \end{array}\right]$$

$$\underset{273}{C}\left(e_{g1}, \tilde{\chi}^+_{c2}, \tilde{\nu}^\dagger_{g3}\right) = \frac{ie\delta_{g1,g3}}{2s_W^2} \left[\frac{-s_W\left(\delta \overline{Z}^{\tilde{\chi}^-,R}_{c2,1} V^*_{1,1} + \delta \overline{Z}^{\tilde{\chi}^-,R}_{c2,2} V^*_{2,1}\right) + \left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta \overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{e,L}_{g1,g1}\right)\right) V^*_{c2,1}}{\begin{pmatrix} c_\beta m_{e_{g3}} s_W \left(U_{1,2}\delta \overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + U_{2,2}\delta \overline{Z}^{\tilde{\chi}^-,L}_{c2,2}\right) M_W^2 + \\ \left(\begin{array}{l} 2c_\beta s_W \delta m^{e_g}_{g3} M_W^2 - \\ m_{e_{g3}} \left(s_W \left(2\left(\delta c_\beta\right) - c_\beta \left(2\left(\delta Z_e\right) + \delta \overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{e,R}_{g1,g1}\right)\right) M_W^2 + c_\beta \left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right)\right) \end{array} \right) U_{c2,2} \end{pmatrix}} \right]$$

$$\underset{274}{C}\left(\nu_{g1}, \tilde{\chi}^-_{c2}, \tilde{e}^{s3,\dagger}_{g3}\right) = -\frac{ie\delta_{g1,g3}}{4c_\beta^2 M_W^3 s_W^2} \begin{pmatrix} 2\left(\begin{array}{l} s_W \left(\delta \overline{Z}^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g1}}_{1,1} + \delta \overline{Z}^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g1}}_{2,1}\right) - \\ \left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z^{\nu,L}_{g1,g1}\right)\right) U^{\tilde{e}_{g1}}_{s3,1} \end{array} \right) c_\beta^2 M_W^3 U^*_{c2,1} - \\ \sqrt{2}\begin{pmatrix} c_\beta m_{e_{g1}} s_W M_W^2 \left(\delta \overline{Z}^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g1}}_{1,2} + \delta \overline{Z}^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g1}}_{2,2}\right) + \\ \left(\begin{array}{l} 2c_\beta s_W \delta m^{e_g}_{g1} M_W^2 - \\ m_{e_{g1}} \left(s_W \left(2\left(\delta c_\beta\right) - c_\beta \left(2\left(\delta Z_e\right) + \delta Z^{\nu,L}_{g1,g1}\right)\right) M_W^2 + c_\beta \left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right)\right) \end{array} \right) U^{\tilde{e}_{g1}}_{s3,2} \end{pmatrix} U^*_{c2,2} + \\ \begin{pmatrix} 2c_\beta M_W \left(\delta Z^{\tilde{\chi}^-,L}_{1,c2} U^*_{1,1} + \delta Z^{\tilde{\chi}^-,L}_{2,c2} U^*_{2,1}\right) U^{\tilde{e}_{g1}}_{s3,1} - \\ \sqrt{2} m_{e_{g1}} \left(\delta Z^{\tilde{\chi}^-,L}_{1,c2} U^*_{1,2} + \delta Z^{\tilde{\chi}^-,L}_{2,c2} U^*_{2,2}\right) U^{\tilde{e}_{g1}}_{s3,2} \end{pmatrix} c_\beta s_W M_W^2 \end{pmatrix} \left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

[FFS] **Chargino – Neutralino – Higgs**

$$\underset{255}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^+_{c2}, H^-\right) = -\frac{ie}{s_W^2}$$

$$\left[\frac{1}{4c_W^3}\left(\sqrt{2}\left(\begin{array}{l}\left(\left(\delta Z_{G^-H^-}\right)s_\beta c_W^2 + c_\beta\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta Z_{H^-H^-}\right)c_W^2\right)\right)s_W^2 Z^*_{n1,1} - \\ \left(\begin{array}{l} c_W\left(c_\beta\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{H^-H^-}\right)s_W\right) - \left(\delta Z_{G^-H^-}\right)s_W s_\beta\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)c_\beta s_W\end{array}\right)c_W^2\end{array}\right)V^*_{c2,2} + \\ \left(\begin{array}{l}2\left(\begin{array}{l} c_\beta s_W\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) - \\ \left(c_\beta\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{H^-H^-}\right)s_W\right) - \left(\delta Z_{G^-H^-}\right)s_W s_\beta\right)Z^*_{n1,4}\end{array}\right)c_W V^*_{c2,1} + \\ \left(\begin{array}{l}\left(\begin{array}{l}\sqrt{2}V^*_{1,2}\left(s_W Z^*_{n1,1} + c_W Z^*_{n1,2}\right) + \\ 2c_W V^*_{1,1}Z^*_{n1,4}\end{array}\right)\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,1} + \\ \left(\begin{array}{l}\sqrt{2}V^*_{2,2}\left(s_W Z^*_{n1,1} + c_W Z^*_{n1,2}\right) + \\ 2c_W V^*_{2,1}Z^*_{n1,4}\end{array}\right)\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,2}\end{array}\right)c_\beta s_W\end{array}\right)c_W^2\end{array}\right)}{\frac{1}{2}\left(\begin{array}{l}\left(\delta Z_{G^-H^-}\right)c_\beta s_W\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2}\right) - U_{c2,1}Z_{n1,3}\right) - \\ \left(\begin{array}{l}\left(\delta s_W\right)\left(\sqrt{2}U_{c2,2}\left(\frac{Z_{n1,1}s_W^3}{c_W^3} - Z_{n1,2}\right) + 2U_{c2,1}Z_{n1,3}\right) + \\ \left(\begin{array}{l}\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{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(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{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(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{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(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{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} + \\ \left(\frac{U_{1,2}}{\sqrt{2}}\left(\frac{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(\frac{U_{2,2}}{\sqrt{2}}\left(\frac{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} + \\ \left(2\left(\delta Z_e\right) + \delta Z_{H^-H^-}\right)\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2}\right) - U_{c2,1}Z_{n1,3}\right)\end{array}\right)s_W\end{array}\right)s_\beta\end{array}\right)}\right]$$

$$\underset{256}{C}\left(\tilde{\chi}^0_{n1},\tilde{\chi}^+_{c2},G^-\right)=\frac{ie}{s_W^2}\left[-\frac{1}{4c_W^3}\left(\sqrt{2}\left(\begin{array}{l}\left(2\left(\delta s_W\right)s_W s_\beta+\left(\left(\delta Z_{H^-G^-}\right)c_\beta+\left(2\left(\delta Z_e\right)+\delta Z_{G^-G^-}\right)s_\beta\right)c_W^2\right)s_W^2 Z^*_{n1,1}-\\ \left(\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}\right)c_W^2\end{array}\right)V^*_{c2,2}+\\ \left(\begin{array}{l}2\left(\begin{array}{l}s_W s_\beta\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)-\\ \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^*_{n1,4}\end{array}\right)c_W V^*_{c2,1}+\\ \left(\begin{array}{l}\left(\begin{array}{l}\sqrt{2}V^*_{1,2}\left(s_W Z^*_{n1,1}+c_W Z^*_{n1,2}\right)+\\ 2c_W V^*_{1,1}Z^*_{n1,4}\end{array}\right)\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,1}+\\ \left(\begin{array}{l}\sqrt{2}V^*_{2,2}\left(s_W Z^*_{n1,1}+c_W Z^*_{n1,2}\right)+\\ 2c_W V^*_{2,1}Z^*_{n1,4}\end{array}\right)\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,2}\end{array}\right)s_W s_\beta\end{array}\right)c_W^2\end{array}\right)}{-\frac{1}{2}\left(\begin{array}{l}s_W\left(\left(\delta Z_{G^-G^-}\right)c_\beta-\left(\delta Z_{H^-G^-}\right)s_\beta\right)\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z_{n1,1}}{c_W}+Z_{n1,2}\right)-U_{c2,1}Z_{n1,3}\right)+\\ \left(\begin{array}{l}\left(\delta s_W\right)\left(\sqrt{2}U_{c2,2}\left(\frac{Z_{n1,1}s_W^3}{c_W^3}-Z_{n1,2}\right)+2U_{c2,1}Z_{n1,3}\right)+\\ \left(\begin{array}{l}\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{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(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{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(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{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(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{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}+\\ \left(\frac{U_{1,2}}{\sqrt{2}}\left(\frac{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(\frac{U_{2,2}}{\sqrt{2}}\left(\frac{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\left(\delta Z_e\right)\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z_{n1,1}}{c_W}+Z_{n1,2}\right)-U_{c2,1}Z_{n1,3}\right)\end{array}\right)s_W\end{array}\right)c_\beta\end{array}\right)}\right]$$

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

$$\underset{258}{C}\left(\tilde{\chi}_{c1}^{-},\tilde{\chi}_{n2}^{0},G^{+}\right)=\frac{ie}{s_{W}^{2}}\left[\frac{1}{4c_{W}^{3}}\left(\sqrt{2}\left(\begin{array}{l}\left(\left(\delta Z_{G^{-}H^{-}}\right)s_{\beta}c_{W}^{2}-c_{\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)s_{W}^{2}Z_{n2,1}^{*}+\\ \left(\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_{1,n2}^{\tilde{\chi}^{0},L}\left(s_{W}Z_{1,1}^{*}+c_{W}Z_{1,2}^{*}\right)+\\ \delta Z_{2,n2}^{\tilde{\chi}^{0},L}\left(s_{W}Z_{2,1}^{*}+c_{W}Z_{2,2}^{*}\right)+\\ \delta Z_{3,n2}^{\tilde{\chi}^{0},L}\left(s_{W}Z_{3,1}^{*}+c_{W}Z_{3,2}^{*}\right)+\\ \delta Z_{4,n2}^{\tilde{\chi}^{0},L}\left(s_{W}Z_{4,1}^{*}+c_{W}Z_{4,2}^{*}\right)\end{array}\right)c_{\beta}s_{W}\end{array}\right)c_{W}^{2}\end{array}\right)U_{c1,2}^{*}+\\ \left(\begin{array}{l}2\left(\begin{array}{l}c_{\beta}s_{W}\left(\delta Z_{1,n2}^{\tilde{\chi}^{0},L}Z_{1,3}^{*}+\delta Z_{2,n2}^{\tilde{\chi}^{0},L}Z_{2,3}^{*}+\delta Z_{3,n2}^{\tilde{\chi}^{0},L}Z_{3,3}^{*}+\delta Z_{4,n2}^{\tilde{\chi}^{0},L}Z_{4,3}^{*}\right)-\\ \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}^{*}\end{array}\right)c_{W}U_{c1,1}^{*}-\\ \left(\begin{array}{l}\left(\begin{array}{l}\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}^{*}\end{array}\right)\delta Z_{1,c1}^{\tilde{\chi}^{-},L}+\\ \left(\begin{array}{l}\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}^{*}\end{array}\right)\delta Z_{2,c1}^{\tilde{\chi}^{-},L}\end{array}\right)c_{\beta}s_{W}\end{array}\right)c_{W}^{2}\end{array}\right)\right)}{\frac{1}{2}\left(\begin{array}{l}\left(\delta s_{W}\right)s_{\beta}\left(\sqrt{2}V_{c1,2}Z_{n2,2}+2V_{c1,1}Z_{n2,4}\right)-\\ \left(\begin{array}{l}\left(\left(\delta Z_{G^{-}H^{-}}\right)c_{\beta}+\left(\delta Z_{G^{-}G^{-}}\right)s_{\beta}\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(\begin{array}{l}\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_{1,n2}^{\tilde{\chi}^{0},R}+\\ \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_{2,n2}^{\tilde{\chi}^{0},R}+\\ \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_{3,n2}^{\tilde{\chi}^{0},R}+\\ \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_{4,n2}^{\tilde{\chi}^{0},R}+\\ \frac{\sqrt{2}\left(\delta s_{W}\right)V_{c1,2}Z_{n2,1}s_{W}^{2}}{c_{W}^{3}}+\\ \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_{1,c1}^{\tilde{\chi}^{-},R}+\\ \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_{2,c1}^{\tilde{\chi}^{-},R}+\\ 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)\end{array}\right)s_{\beta}\end{array}\right)s_{W}\end{array}\right)}\right]$$

[FFS] **Chargino – Quark – Higgs**

$$\underset{267}{C}\left(\tilde{\chi}^-_{c1}, \bar{d}_{g2}, \tilde{u}^{s3}_{g3}\right) = \frac{ie}{M_W^3 s_W^2}$$

$$\left[\begin{array}{l}
\frac{1}{2\sqrt{2}c_\beta^2}\left(\begin{array}{l}
2c_\beta m_{d_{g2}} s_W \delta \mathrm{CKM}^*_{g3,g2} M_W^2 U^*_{c1,2} U^{\tilde{u}_{g3}*}_{s3,1} + \\
\left(\begin{array}{l}
c_\beta m_{d_{g2}} s_W M_W^2 \left(\delta Z^{\tilde{\chi}^-,L}_{1,c1} U^*_{1,2} + \delta Z^{\tilde{\chi}^-,L}_{2,c1} U^*_{2,2}\right) U^{\tilde{u}_{g3}*}_{s3,1} + \\
\left(\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(\begin{array}{l}
2c_\beta s_W \delta m^{d_g}_{g2} 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 \overline{Z}^{d,R}_{g2,g2}\right)\right) M_W^2
\end{array}\right) m_{d_{g2}}
\end{array}\right) U^{\tilde{u}_{g3}*}_{s3,1}
\end{array}\right) U^*_{c1,2}
\end{array}\right) \mathrm{CKM}^*_{g3,g2}
\end{array}\right) \\
\hline
-\frac{1}{4s_\beta^2}\left(\begin{array}{l}
2s_W s_\beta \delta \mathrm{CKM}^*_{g3,g2} 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) + \\
\left(\begin{array}{l}
2\left(\begin{array}{l}
s_W \left(V_{1,1} \delta Z^{\tilde{\chi}^-,R}_{1,c1} + V_{2,1} \delta Z^{\tilde{\chi}^-,R}_{2,c1}\right) - \\
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)
\end{array}\right) M_W^3 s_\beta^2 U^{\tilde{u}_{g3}*}_{s3,1} - \\
\sqrt{2}\left(\begin{array}{l}
m_{u_{g3}} s_W s_\beta \left(V_{1,2} \delta Z^{\tilde{\chi}^-,R}_{1,c1} + V_{2,2} \delta Z^{\tilde{\chi}^-,R}_{2,c1}\right) M_W^2 + \\
\left(\begin{array}{l}
2 s_W s_\beta \delta m^{u_g}_{g3} M_W^2 - \\
\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 \overline{Z}^{d,L}_{g2,g2}\right) M_W^2\right)
\end{array}\right) m_{u_{g3}}
\end{array}\right) V_{c1,2}
\end{array}\right) U^{\tilde{u}_{g3}*}_{s3,2} + \\
\left(\begin{array}{l}
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)
\end{array}\right) s_W s_\beta M_W^2
\end{array}\right) \mathrm{CKM}^*_{g3,g2}
\end{array}\right)
\end{array}\right]$$

$$\underset{268}{C}\left(\tilde{\chi}_{c1}^{+},\overline{u}_{g2},\tilde{d}_{g3}^{s3}\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\left(\delta\mathrm{CKM}_{g2,g3}\right)m_{u_{g2}}s_W s_\beta M_W^2 U_{s3,1}^{\tilde{d}_{g3}*}V_{c1,2}^{*}+\\ \left(\begin{array}{l}m_{u_{g2}}s_W s_\beta M_W^2 U_{s3,1}^{\tilde{d}_{g3}*}\left(\delta\overline{Z}_{c1,1}^{\tilde{\chi}^-,R}V_{1,2}^{*}+\delta\overline{Z}_{c1,2}^{\tilde{\chi}^-,R}V_{2,2}^{*}\right)+\\ \left(\begin{array}{l}m_{u_{g2}}s_W s_\beta M_W^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)+\\ \left(\begin{array}{l}2s_W s_\beta\delta m_{g2}^{u_g}M_W^2-\\ \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\overline{Z}_{g2,g2}^{u,R}\right)M_W^2\right)\end{array}\right)m_{u_{g2}}\end{array}\right)U_{s3,1}^{\tilde{d}_{g3}*}\end{array}\right)V_{c1,2}^{*}\end{array}\right)\mathrm{CKM}_{g2,g3}\end{array}\right)}{-\frac{1}{4c_\beta^2}\left(\begin{array}{l}2\left(\delta\mathrm{CKM}_{g2,g3}\right)c_\beta s_W M_W^2\left(2c_\beta M_W U_{c1,1}U_{s3,1}^{\tilde{d}_{g3}*}-\sqrt{2}m_{d_{g3}}U_{c1,2}U_{s3,2}^{\tilde{d}_{g3}*}\right)+\\ \left(\begin{array}{l}2\left(\begin{array}{l}s_W\left(U_{1,1}\delta\overline{Z}_{c1,1}^{\tilde{\chi}^-,L}+U_{2,1}\delta\overline{Z}_{c1,2}^{\tilde{\chi}^-,L}\right)-\\ U_{c1,1}\left(2\left(\delta s_W\right)-s_W\left(2\left(\delta Z_e\right)+\delta\overline{Z}_{g2,g2}^{u,L}\right)\right)\end{array}\right)c_\beta^2 M_W^3 U_{s3,1}^{\tilde{d}_{g3}*}-\\ \sqrt{2}\left(\begin{array}{l}c_\beta m_{d_{g3}}s_W\left(U_{1,2}\delta\overline{Z}_{c1,1}^{\tilde{\chi}^-,L}+U_{2,2}\delta\overline{Z}_{c1,2}^{\tilde{\chi}^-,L}\right)M_W^2+\\ \left(\begin{array}{l}2c_\beta s_W\delta m_{g3}^{d_g}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\overline{Z}_{g2,g2}^{u,L}\right)\right)M_W^2\end{array}\right)m_{d_{g3}}\end{array}\right)U_{c1,2}\end{array}\right)U_{s3,2}^{\tilde{d}_{g3}*}+\\ \left(\begin{array}{l}2c_\beta M_W U_{c1,1}\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)-\\ \sqrt{2}m_{d_{g3}}U_{c1,2}\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)\end{array}\right)c_\beta s_W M_W^2\end{array}\right)\mathrm{CKM}_{g2,g3}\end{array}\right)}\end{array}\right]$$

$$\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}{4s_\beta^2}\left(\begin{array}{l}
\left(\begin{array}{l}
2\left(\begin{array}{l}
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}
\end{array}\right)M_W^3 s_\beta^2 V^*_{c2,1}- \\
\sqrt{2}\left(\begin{array}{l}
m_{u_{g3}}s_W s_\beta M_W^2\left(\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}}_{1,2}+\delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}}_{2,2}\right)+ \\
\left(\begin{array}{l}
2s_W s_\beta\delta m^{u_g}_{g3}M_W^2- \\
\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)m_{u_{g3}}
\end{array}\right)U^{\tilde{u}_{g3}}_{s3,2}
\end{array}\right)V^*_{c2,2}+ \\
\left(\begin{array}{l}
2M_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)
\end{array}\right)s_W s_\beta M_W^2 \\
2\left(\delta\mathrm{CKM}_{g3,g1}\right)s_W s_\beta M_W^2\left(2M_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)
\end{array}\right)\mathrm{CKM}_{g3,g1}+ \\
\hline
\frac{1}{2\sqrt{2}c_\beta^2}\left(\begin{array}{l}
\left(\begin{array}{l}
c_\beta m_{d_{g1}}s_W U_{c2,2}M_W^2\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(\begin{array}{l}
c_\beta m_{d_{g1}}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+ \\
\left(\begin{array}{l}
2c_\beta s_W\delta m^{d_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^{d,R}_{g1,g1}\right)\right)M_W^2
\end{array}\right)m_{d_{g1}}
\end{array}\right)U_{c2,2}
\end{array}\right)U^{\tilde{u}_{g3}}_{s3,1}
\end{array}\right)\mathrm{CKM}_{g3,g1}+ \\
2\left(\delta\mathrm{CKM}_{g3,g1}\right)c_\beta m_{d_{g1}}s_W U_{c2,2}M_W^2 U^{\tilde{u}_{g3}}_{s3,1}
\end{array}\right)
\end{array}\right]$$

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

[FFS] Gluino – Quark – Higgs

$$\underset{464}{C}\left(\tilde{g},\overline{u}_{g2},\tilde{u}^{s3}_{g3}\right) = \frac{ig_s\delta_{g2,g3}T^{g1}_{c2,c3}}{\sqrt{2}}\left[\frac{\mathfrak{e}^{*}_{\tilde{g}}\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g2}*}_{1,2}+\delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g2}*}_{2,2}+\left(2\left(\delta Z_{g_s}\right)+\delta\overline{Z}^{u,R}_{g2,g2}+\delta Z^{L}_{\tilde{g}}\right)U^{\tilde{u}_{g2}*}_{s3,2}\right)}{-\mathfrak{e}_{\tilde{g}}\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g2}*}_{1,1}+\delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g2}*}_{2,1}+\left(2\left(\delta Z_{g_s}\right)+\delta\overline{Z}^{u,L}_{g2,g2}+\delta Z^{R}_{\tilde{g}}\right)U^{\tilde{u}_{g2}*}_{s3,1}\right)}\right]$$

$$\underset{465}{C}\left(\tilde{g},\overline{d}_{g2},\tilde{d}^{s3}_{g3}\right) = \frac{ig_s\delta_{g2,g3}T^{g1}_{c2,c3}}{\sqrt{2}}\left[\frac{\mathfrak{e}^{*}_{\tilde{g}}\left(\delta Z^{\tilde{d}_{g3}}_{1,s3}U^{\tilde{d}_{g2}*}_{1,2}+\delta Z^{\tilde{d}_{g3}}_{2,s3}U^{\tilde{d}_{g2}*}_{2,2}+\left(2\left(\delta Z_{g_s}\right)+\delta\overline{Z}^{d,R}_{g2,g2}+\delta Z^{L}_{\tilde{g}}\right)U^{\tilde{d}_{g2}*}_{s3,2}\right)}{-\mathfrak{e}_{\tilde{g}}\left(\delta Z^{\tilde{d}_{g3}}_{1,s3}U^{\tilde{d}_{g2}*}_{1,1}+\delta Z^{\tilde{d}_{g3}}_{2,s3}U^{\tilde{d}_{g2}*}_{2,1}+\left(2\left(\delta Z_{g_s}\right)+\delta\overline{Z}^{d,L}_{g2,g2}+\delta Z^{R}_{\tilde{g}}\right)U^{\tilde{d}_{g2}*}_{s3,1}\right)}\right]$$

$$\underset{466}{C}\left(\tilde{g}, u_{g2}, \tilde{u}_{g3}^{s3,\dagger}\right) = \frac{i g_s \delta_{g2,g3} T^{g1}_{c3,c2}}{\sqrt{2}} \begin{bmatrix} -e^*_{\tilde{g}} \left(\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g2}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g2}}_{2,1} + \left(2\left(\delta Z_{g_s}\right) + \delta Z^{L}_{\tilde{g}} + \delta Z^{u,L}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1}\right) \\ \hline e_{\tilde{g}} \left(\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g2}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g2}}_{2,2} + \left(2\left(\delta Z_{g_s}\right) + \delta Z^{R}_{\tilde{g}} + \delta Z^{u,R}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}\right) \end{bmatrix}$$

$$\underset{467}{C}\left(\tilde{g}, d_{g2}, \tilde{d}_{g3}^{s3,\dagger}\right) = \frac{i g_s \delta_{g2,g3} T^{g1}_{c3,c2}}{\sqrt{2}} \begin{bmatrix} -e^*_{\tilde{g}} \left(\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g2}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g2}}_{2,1} + \left(2\left(\delta Z_{g_s}\right) + \delta Z^{L}_{\tilde{g}} + \delta Z^{d,L}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,1}\right) \\ \hline e_{\tilde{g}} \left(\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g2}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g2}}_{2,2} + \left(2\left(\delta Z_{g_s}\right) + \delta Z^{R}_{\tilde{g}} + \delta Z^{d,R}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,2}\right) \end{bmatrix}$$

[FFS] Lepton – Neutralino – Higgs

$$\underset{259}{C}\left(\tilde{\chi}^0_{n1}, \overline{\nu}_{g2}, \tilde{\nu}_{g3}\right) = \frac{i e \delta_{g2,g3}}{2\sqrt{2} c_W^3 s_W^2} \begin{pmatrix} Z_{n1,2}\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta\overline{Z}^{\nu,L}_{g2,g2} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right) c_W^3 + \\ \left(\begin{array}{l} s_W Z_{n1,1}\left(\left(\delta\overline{Z}^{\nu,L}_{g2,g2} + \delta Z^{\tilde{\nu}}_{1,1}\right) c_W^2 + 2\left(\left(\delta s_W\right) s_W + \left(\delta Z_e\right) c_W^2\right)\right) + \\ \left(\begin{array}{l} \left(s_W Z_{1,1} - c_W Z_{1,2}\right) \delta Z^{\tilde{\chi}^0,R}_{1,n1} + \\ \left(s_W Z_{2,1} - c_W Z_{2,2}\right) \delta Z^{\tilde{\chi}^0,R}_{2,n1} + \\ \left(s_W Z_{3,1} - c_W Z_{3,2}\right) \delta Z^{\tilde{\chi}^0,R}_{3,n1} + \\ \left(s_W Z_{4,1} - c_W Z_{4,2}\right) \delta Z^{\tilde{\chi}^0,R}_{4,n1} \end{array}\right) c_W^2 \end{array}\right) s_W \end{pmatrix} \begin{bmatrix} 0 \\ \hline 1 \end{bmatrix}$$

$$\underset{260}{C}\left(\tilde{\chi}^0_{n1},\bar{e}_{g2},\tilde{e}^{s3}_{g3}\right)=\frac{ie\delta_{g2,g3}}{2\sqrt{2}c_W^3c_\beta^2M_W^3s_W^2}$$

$$\left[\begin{array}{l}
-2\left(\begin{array}{l}\left(2\left(\delta s_W\right)s_W+\left(2\left(\delta Z_e\right)+\delta\overline{Z}^{e,R}_{g2,g2}\right)c_W^2\right)U^{\tilde{e}_{g2}*}_{s3,2}+\\ c_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)\end{array}\right)c_\beta^2M_W^3s_W^2Z^*_{n1,1}-\\
\left(\begin{array}{l}\left(\begin{array}{l}2c_\beta M_Ws_WU^{\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_Wm_{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}\right)c_\beta s_WM_W^2+\\
\left(\begin{array}{l}c_\beta m_{e_{g2}}s_WM_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(\begin{array}{l}2c_\beta s_W\delta m^{e_g}_{g2}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\overline{Z}^{e,R}_{g2,g2}\right)\right)M_W^2\end{array}\right)m_{e_{g2}}\end{array}\right)U^{\tilde{e}_{g2}*}_{s3,1}\end{array}\right)c_WZ^*_{n1,3}\end{array}\right)c_W^2\\
\hline
\left(\begin{array}{l}\left(\begin{array}{l}c_\beta M_W\left(s_WZ_{n1,1}+c_WZ_{n1,2}\right)\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)-\\ c_Wm_{e_{g2}}Z_{n1,3}\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)\end{array}\right)c_\beta s_WM_W^2+\\
\left(\begin{array}{l}m_{e_{g2}}s_WZ_{n1,3}\left(2\left(\delta c_\beta\right)-c_\beta\left(2\left(\delta Z_e\right)+\delta\overline{Z}^{e,L}_{g2,g2}\right)\right)M_W^2+\\ \left(\begin{array}{l}m_{e_{g2}}s_WZ_{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}2Z_{n1,3}\delta m^{e_g}_{g2}+\\ \left(\begin{array}{l}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}\end{array}\right)m_{e_{g2}}\end{array}\right)s_W\end{array}\right)M_W^2\end{array}\right)c_\beta\end{array}\right)c_WU^{\tilde{e}_{g2}*}_{s3,2}\end{array}\right)c_W^2+\\
\left(\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+\\ \left(\begin{array}{l}Z_{3,2}\delta Z^{\tilde{\chi}^0,R}_{3,n1}c_W^3+\\ \left(\begin{array}{l}\left(s_WZ_{1,1}+c_WZ_{1,2}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n1}+\\ \left(s_WZ_{2,1}+c_WZ_{2,2}\right)\delta Z^{\tilde{\chi}^0,R}_{2,n1}+s_WZ_{3,1}\delta Z^{\tilde{\chi}^0,R}_{3,n1}+\\ \left(s_WZ_{4,1}+c_WZ_{4,2}\right)\delta Z^{\tilde{\chi}^0,R}_{4,n1}\end{array}\right)c_W^2\end{array}\right)s_W\end{array}\right)c_\beta^2M_W^3U^{\tilde{e}_{g2}*}_{s3,1}
\end{array}\right]$$

$$\underset{263}{C}\left(\nu_{g1},\tilde{\chi}^{0}_{n2},\tilde{\nu}^{\dagger}_{g3}\right)=\frac{ie\delta_{g1,g3}}{2\sqrt{2}c_W^3 s_W^2}\begin{pmatrix}\left(\left(\delta\overline{Z}^{\tilde{\nu}}_{1,1}+\delta Z^{\nu,L}_{g1,g1}\right)c_W^2+2\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)\right)s_W^2 Z^*_{n2,1}+\\ \left(c_W\left(2\left(\delta s_W-\left(\delta Z_e\right)s_W\right)-s_W\left(\delta\overline{Z}^{\tilde{\nu}}_{1,1}+\delta Z^{\nu,L}_{g1,g1}\right)\right)Z^*_{n2,2}+\right.\\ \left.\left(\begin{array}{l}\delta Z^{\tilde{\chi}^0,L}_{1,n2}\left(s_W Z^*_{1,1}-c_W Z^*_{1,2}\right)+\\ \delta Z^{\tilde{\chi}^0,L}_{2,n2}\left(s_W Z^*_{2,1}-c_W Z^*_{2,2}\right)+\\ \delta Z^{\tilde{\chi}^0,L}_{3,n2}\left(s_W Z^*_{3,1}-c_W Z^*_{3,2}\right)+\\ \delta Z^{\tilde{\chi}^0,L}_{4,n2}\left(s_W Z^*_{4,1}-c_W Z^*_{4,2}\right)\end{array}\right)s_W\end{pmatrix}c_W^2\begin{bmatrix}1\\\hline 0\end{bmatrix}$$

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

$$\left[\begin{array}{l}
\left(\begin{array}{l}
\left(\begin{array}{l}
\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}- \\
\left(\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(\begin{array}{l}
2c_\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}}
\end{array}\right)U^{\tilde{e}_{g1}}_{s3,2}
\end{array}\right)Z^*_{n2,3}
\end{array}\right)c_W+ \\
\left(\begin{array}{l}
\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}- \\
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)
\end{array}\right)c_\beta s_W M_W^2
\end{array}\right)c_W^2+ \\
\left(\begin{array}{l}
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}
\end{array}\right)c_\beta^2 M_W^3 s_W^2 Z^*_{n2,1} \\
\hline
-\left(\begin{array}{l}
\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- \\
\left(\begin{array}{l}
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}+ \\
\left(\begin{array}{l}
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}
\end{array}\right)m_{e_{g1}}
\end{array}\right)s_W
\end{array}\right)M_W^2
\end{array}\right)c_W U^{\tilde{e}_{g1}}_{s3,1}
\end{array}\right)c_\beta c_W^2+ \\
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}- \\
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}\right]$$

$$\underset{261}{C}\left(\tilde{\chi}^0_{n1}, \overline{u}_{g2}, \tilde{u}^{s3}_{g3}\right) = \frac{ie\delta_{g2,g3}}{6\sqrt{2}c_W^3 M_W^3 s_W^2 s_\beta^2}$$

$$\left[\begin{array}{l}
4\left(\begin{array}{l}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta\overline{Z}^{u,R}_{g2,g2}\right)c_W^2\right)U^{\tilde{u}_{g2}*}_{s3,2} + \\ c_W^2\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g2}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g2}*}_{2,2}\right)\end{array}\right)M_W^3 s_W^2 s_\beta^2 Z^*_{n1,1} + \\
\left(\begin{array}{l}\left(\begin{array}{l}4M_W s_W s_\beta U^{\tilde{u}_{g2}*}_{s3,2}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n1}Z^*_{1,1} + \delta Z^{\tilde{\chi}^0,L}_{2,n1}Z^*_{2,1} + \delta Z^{\tilde{\chi}^0,L}_{3,n1}Z^*_{3,1} + \delta Z^{\tilde{\chi}^0,L}_{4,n1}Z^*_{4,1}\right) - \\ 3c_W m_{u_{g2}}U^{\tilde{u}_{g2}*}_{s3,1}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n1}Z^*_{1,4} + \delta Z^{\tilde{\chi}^0,L}_{2,n1}Z^*_{2,4} + \delta Z^{\tilde{\chi}^0,L}_{3,n1}Z^*_{3,4} + \delta Z^{\tilde{\chi}^0,L}_{4,n1}Z^*_{4,4}\right)\end{array}\right)s_W s_\beta M_W^2 - \\
3\left(\begin{array}{l}m_{u_{g2}}s_W s_\beta M_W^2\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g2}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g2}*}_{2,1}\right) + \\ \left(\begin{array}{l}2s_W s_\beta \delta m^{u_g}_{g2}M_W^2 - \\ \left(\begin{array}{l}2\left(\left(\delta s_\beta\right)s_W + \left(\delta s_W\right)s_\beta\right)M_W^2 + \\ s_W s_\beta\left(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta\overline{Z}^{u,R}_{g2,g2}\right)M_W^2\right)\end{array}\right)m_{u_{g2}}\end{array}\right)U^{\tilde{u}_{g2}*}_{s3,1}\end{array}\right)c_W Z^*_{n1,4}
\end{array}\right)c_W^2$$

$$\begin{array}{l}
-\left(\begin{array}{l}\left(\begin{array}{l}M_W s_\beta\left(s_W Z_{n1,1} + 3c_W Z_{n1,2}\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g2}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g2}*}_{2,1}\right) + \\ 3c_W m_{u_{g2}}Z_{n1,4}\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g2}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g2}*}_{2,2}\right)\end{array}\right)s_W s_\beta M_W^2 - \\
3\left(\begin{array}{l}m_{u_{g2}}s_W s_\beta Z_{n1,4}\left(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta\overline{Z}^{u,L}_{g2,g2}\right)M_W^2\right) + \\ \left(\begin{array}{l}2\left(\delta s_\beta\right)m_{u_{g2}}s_W Z_{n1,4} + \\ \left(\begin{array}{l}2\left(\delta s_W\right)m_{u_{g2}}Z_{n1,4} - \\ \left(\begin{array}{l}2Z_{n1,4}\delta m^{u_g}_{g2} + \\ \left(\begin{array}{l}Z_{1,4}\delta Z^{\tilde{\chi}^0,R}_{1,n1} + \\ Z_{2,4}\delta Z^{\tilde{\chi}^0,R}_{2,n1} + \\ Z_{3,4}\delta Z^{\tilde{\chi}^0,R}_{3,n1} + \\ Z_{4,4}\delta Z^{\tilde{\chi}^0,R}_{4,n1}\end{array}\right)m_{u_{g2}}\end{array}\right)s_W\end{array}\right)s_\beta\end{array}\right)M_W^2\end{array}\right)c_W U^{\tilde{u}_{g2}*}_{s3,2}\end{array}\right)c_W^2 - \\
\left(\begin{array}{l}Z_{n1,1}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta\overline{Z}^{u,L}_{g2,g2}\right)c_W^2\right)s_W^2 - \\ Z_{n1,2}\left(6\left(\delta s_W\right) - s_W\left(6\left(\delta Z_e\right) + 3\delta\overline{Z}^{u,L}_{g2,g2}\right)\right)c_W^3 + \\ \left(\begin{array}{l}3Z_{3,2}\delta Z^{\tilde{\chi}^0,R}_{3,n1}c_W^3 + \\ \left(\begin{array}{l}\left(s_W Z_{1,1} + 3c_W Z_{1,2}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n1} + \\ \left(s_W Z_{2,1} + 3c_W Z_{2,2}\right)\delta Z^{\tilde{\chi}^0,R}_{2,n1} + \\ s_W Z_{3,1}\delta Z^{\tilde{\chi}^0,R}_{3,n1} + \\ \left(s_W Z_{4,1} + 3c_W Z_{4,2}\right)\delta Z^{\tilde{\chi}^0,R}_{4,n1}\end{array}\right)c_W^2\end{array}\right)s_W\end{array}\right)M_W^3 s_W^2 s_\beta^2 U^{\tilde{u}_{g2}*}_{s3,1}
\end{array}$$

$$\underset{262}{C}\left(\tilde{\chi}^0_{n1}, \bar{d}_{g2}, \tilde{d}^{s3}_{g3}\right) = \frac{i e \delta_{g2,g3}}{6\sqrt{2} c_W^3 c_\beta^2 M_W^3 s_W^2}$$

$$\left[\begin{array}{l}
-2\left(\begin{array}{l}\left(2\left(\delta s_W\right)s_W + \left(2\left(\delta Z_e\right) + \delta\overline{Z}^{d,R}_{g2,g2}\right)c_W^2\right)U^{\tilde{d}_{g2}*}_{s3,2} + \\ c_W^2\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)c_\beta^2 M_W^3 s_W^2 Z^*_{n1,1} - \\
\left(\begin{array}{l}\left(\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}\right)c_\beta s_W M_W^2 + \\
3\left(\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(\begin{array}{l}2c_\beta s_W \delta m^{d_g}_{g2} 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\overline{Z}^{d,R}_{g2,g2}\right)\right)M_W^2\end{array}\right)m_{d_{g2}}\end{array}\right)U^{\tilde{d}_{g2}*}_{s3,1}\end{array}\right)c_W Z^*_{n1,3}\end{array}\right)c_W^2 \\
\hline
-\left(\begin{array}{l}\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)c_\beta s_W M_W^2 - \\
3\left(\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 + \\ \left(\begin{array}{l}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} + \\ \left(\begin{array}{l}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}\end{array}\right)m_{d_{g2}}\end{array}\right)s_W\end{array}\right)M_W^2\end{array}\right)c_\beta\end{array}\right)c_W U^{\tilde{d}_{g2}*}_{s3,2}\end{array}\right)c_W^2 - \\
\left(\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}^{d,L}_{g2,g2}\right)c_W^2\right)s_W^2 + \\ 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 - \\ \left(\begin{array}{l}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\end{array}\right)s_W\end{array}\right)c_\beta^2 M_W^3 U^{\tilde{d}_{g2}*}_{s3,1}
\end{array}\right]$$

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

$$\left[\begin{array}{l}
\left(\begin{array}{l}
3\left(\begin{array}{l}
\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}+\\
\left(\begin{array}{l}
m_{u_{g1}}s_W s_\beta M_W^2\left(\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g1}}_{1,2}+\delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g1}}_{2,2}\right)+\\
\left(\begin{array}{l}
2s_W s_\beta\delta m^{u_g}_{g1}M_W^2-\\
\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)m_{u_{g1}}
\end{array}\right)U^{\tilde{u}_{g1}}_{s3,2}
\end{array}\right)Z^*_{n2,4}
\end{array}\right)c_W+\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\delta Z^{\tilde{\chi}^0,L}_{1,n2}\left(s_W Z^*_{1,1}+3c_W Z^*_{1,2}\right)+\\
\delta Z^{\tilde{\chi}^0,L}_{2,n2}\left(s_W Z^*_{2,1}+3c_W Z^*_{2,2}\right)+\\
\delta Z^{\tilde{\chi}^0,L}_{3,n2}\left(s_W Z^*_{3,1}+3c_W Z^*_{3,2}\right)+\\
\delta Z^{\tilde{\chi}^0,L}_{4,n2}\left(s_W Z^*_{4,1}+3c_W Z^*_{4,2}\right)
\end{array}\right)M_W s_\beta U^{\tilde{u}_{g1}}_{s3,1}+\\
3c_W m_{u_{g1}}U^{\tilde{u}_{g1}}_{s3,2}\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{array}\right)s_W s_\beta M_W^2
\end{array}\right)c_W^2+\\
\left(\begin{array}{l}
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}
\end{array}\right)M_W^3 s_W^2 s_\beta^2 Z^*_{n2,1}
\end{array}\right]$$

$$\left[\begin{array}{l}
\left(\begin{array}{l}
\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3}\left(3c_W m_{u_{g1}}Z_{n2,4}U^{\tilde{u}_{g1}}_{1,1}-4M_W s_W s_\beta Z_{n2,1}U^{\tilde{u}_{g1}}_{1,2}\right)+\\
\delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}\left(3c_W m_{u_{g1}}Z_{n2,4}U^{\tilde{u}_{g1}}_{2,1}-4M_W s_W s_\beta Z_{n2,1}U^{\tilde{u}_{g1}}_{2,2}\right)+
\end{array}\right)s_W s_\beta c_W^2 M_W^2-\\
\left(\begin{array}{l}
m_{u_{g1}}s_W s_\beta Z_{n2,4}\left(3\delta M_W^2-3\left(2\left(\delta Z_e\right)+\delta Z^{u,R}_{g1,g1}\right)M_W^2\right)-\\
\left(\begin{array}{l}
3m_{u_{g1}}s_W s_\beta\left(Z_{1,4}\delta Z^{\tilde{\chi}^0,R}_{1,n2}+Z_{2,4}\delta Z^{\tilde{\chi}^0,R}_{2,n2}+Z_{3,4}\delta Z^{\tilde{\chi}^0,R}_{3,n2}+Z_{4,4}\delta Z^{\tilde{\chi}^0,R}_{4,n2}\right)-\\
6Z_{n2,4}\left(m_{u_{g1}}\left(\left(\delta s_\beta\right)s_W+\left(\delta s_W\right)s_\beta\right)-s_W s_\beta\delta m^{u_g}_{g1}\right)
\end{array}\right)M_W^2
\end{array}\right)c_W^3 U^{\tilde{u}_{g1}}_{s3,1}-\\
4\left(\begin{array}{l}
Z_{n2,1}\left(2\left(\delta s_W\right)s_W+\delta Z^{u,R}_{g1,g1}c_W^2\right)+\\
\left(\begin{array}{l}
Z_{1,1}\delta Z^{\tilde{\chi}^0,R}_{1,n2}+Z_{2,1}\delta Z^{\tilde{\chi}^0,R}_{2,n2}+Z_{3,1}\delta Z^{\tilde{\chi}^0,R}_{3,n2}+\\
2\left(\delta Z_e\right)Z_{n2,1}+Z_{4,1}\delta Z^{\tilde{\chi}^0,R}_{4,n2}
\end{array}\right)c_W^2
\end{array}\right)M_W^3 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s3,2}
\end{array}\right]$$

$$\underset{266}{C}\left(d_{\mathrm{g1}},\tilde{\chi}^0_{\mathrm{n2}},\tilde{d}^{\mathrm{s3},\dagger}_{\mathrm{g3}}\right)=\frac{\mathrm{i}e\delta_{\mathrm{g1,g3}}}{6\sqrt{2}c_{\mathrm{W}}^3c_\beta^2M_{\mathrm{W}}^3s_{\mathrm{W}}^2}$$

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

[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}{l}
\left(
\begin{array}{l}
s_W s_\alpha \left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,1} V^*_{1,1} + \delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,2} V^*_{2,1}\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^*_{c2,1}
\end{array}
\right) U^*_{c1,2} - \\
\left(
\begin{array}{l}
c_\alpha 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) - \\
\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}
\end{array}
\right) U^*_{c1,1} + \\
\left(
\begin{array}{l}
\delta Z^{\tilde{\chi}^-,L}_{1,c1} \left(s_\alpha U^*_{1,2} V^*_{c2,1} - c_\alpha U^*_{1,1} V^*_{c2,2}\right) + \\
\delta Z^{\tilde{\chi}^-,L}_{2,c1} \left(s_\alpha U^*_{2,2} V^*_{c2,1} - c_\alpha U^*_{2,1} V^*_{c2,2}\right)
\end{array}
\right) s_W \\
\hline
- \left(
\begin{array}{l}
c_\alpha 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) - \\
\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}
\end{array}
\right) V_{c1,2} + \\
\left(
\begin{array}{l}
s_W s_\alpha \left(U_{1,2} \delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + U_{2,2} \delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,2}\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) U_{c2,2}
\end{array}
\right) V_{c1,1} + \\
\left(
\begin{array}{l}
\left(s_\alpha U_{c2,2} V_{1,1} - c_\alpha U_{c2,1} V_{1,2}\right) \delta Z^{\tilde{\chi}^-,R}_{1,c1} + \\
\left(s_\alpha U_{c2,2} V_{2,1} - c_\alpha U_{c2,1} V_{2,2}\right) \delta Z^{\tilde{\chi}^-,R}_{2,c1}
\end{array}
\right) s_W
\end{array}
\right]
$$

$$
\underset{252}{C}\left(\tilde{\chi}_{c1}^{-}, \tilde{\chi}_{c2}^{+}, H^{0}\right) = -\frac{ie}{2\sqrt{2}s_W^2}
\left[
\begin{array}{l}
\left(
\begin{array}{l}
c_\alpha 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) - \\
\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}
\end{array}
\right) U^*_{c1,2} + \\
\left(
\begin{array}{l}
s_W s_\alpha \left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,1} V^*_{1,2} + \delta\overline{Z}^{\tilde{\chi}^-,R}_{c2,2} 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}
\end{array}
\right) U^*_{c1,1} + \\
\left(
\begin{array}{l}
\delta Z^{\tilde{\chi}^-,L}_{1,c1} \left(c_\alpha U^*_{1,2} V^*_{c2,1} + s_\alpha U^*_{1,1} V^*_{c2,2}\right) + \\
\delta Z^{\tilde{\chi}^-,L}_{2,c1} \left(c_\alpha U^*_{2,2} V^*_{c2,1} + s_\alpha U^*_{2,1} V^*_{c2,2}\right)
\end{array}
\right) s_W \\
\hline
\left(
\begin{array}{l}
s_W s_\alpha \left(U_{1,1} \delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,1} + U_{2,1} \delta\overline{Z}^{\tilde{\chi}^-,L}_{c2,2}\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) U_{c2,1}
\end{array}
\right) V_{c1,2} + \\
\left(
\begin{array}{l}
c_\alpha 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) - \\
\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}
\end{array}
\right) V_{c1,1} + \\
\left(
\begin{array}{l}
\left(c_\alpha U_{c2,2} V_{1,1} + s_\alpha U_{c2,1} V_{1,2}\right) \delta Z^{\tilde{\chi}^-,R}_{1,c1} + \\
\left(c_\alpha U_{c2,2} V_{2,1} + s_\alpha U_{c2,1} V_{2,2}\right) \delta Z^{\tilde{\chi}^-,R}_{2,c1}
\end{array}
\right) s_W
\end{array}
\right]
$$

$$\underset{253}{C}\left(\tilde{\chi}_{c1}^{-},\tilde{\chi}_{c2}^{+},A^{0}\right)=\frac{e}{2\sqrt{2}s_{W}^{2}}\left[\begin{array}{l}-\left(\begin{array}{l}s_{W}s_{\beta}\left(\delta\overline{Z}_{c2,1}^{\tilde{\chi}^{-},R}V_{1,1}^{*}+\delta\overline{Z}_{c2,2}^{\tilde{\chi}^{-},R}V_{2,1}^{*}\right)-\\\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}^{*}\end{array}\right)U_{c1,2}^{*}-\\\left(\begin{array}{l}c_{\beta}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)-\\\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}^{*}\end{array}\right)U_{c1,1}^{*}-\\\left(\begin{array}{l}\delta Z_{1,c1}^{\tilde{\chi}^{-},L}\left(s_{\beta}U_{1,2}^{*}V_{c2,1}^{*}+c_{\beta}U_{1,1}^{*}V_{c2,2}^{*}\right)+\\\delta Z_{2,c1}^{\tilde{\chi}^{-},L}\left(s_{\beta}U_{2,2}^{*}V_{c2,1}^{*}+c_{\beta}U_{2,1}^{*}V_{c2,2}^{*}\right)\end{array}\right)s_{W}\\\hline\left(\begin{array}{l}c_{\beta}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(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}\end{array}\right)V_{c1,2}+\\\left(\begin{array}{l}s_{W}s_{\beta}\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(\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}\end{array}\right)V_{c1,1}+\\\left(\begin{array}{l}\left(s_{\beta}U_{c2,2}V_{1,1}+c_{\beta}U_{c2,1}V_{1,2}\right)\delta Z_{1,c1}^{\tilde{\chi}^{-},R}+\\\left(s_{\beta}U_{c2,2}V_{2,1}+c_{\beta}U_{c2,1}V_{2,2}\right)\delta Z_{2,c1}^{\tilde{\chi}^{-},R}\end{array}\right)s_{W}\end{array}\right]$$

$$\underset{254}{C}\left(\tilde{\chi}_{c1}^{-},\tilde{\chi}_{c2}^{+},G^{0}\right)=\frac{e}{2\sqrt{2}s_{W}^{2}}\left[\begin{array}{l}\left(\begin{array}{l}c_{\beta}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)-\\\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}^{*}\end{array}\right)U_{c1,2}^{*}-\\\left(\begin{array}{l}s_{W}s_{\beta}\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(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}^{*}\end{array}\right)U_{c1,1}^{*}+\\\left(\begin{array}{l}\delta Z_{1,c1}^{\tilde{\chi}^{-},L}\left(c_{\beta}U_{1,2}^{*}V_{c2,1}^{*}-s_{\beta}U_{1,1}^{*}V_{c2,2}^{*}\right)+\\\delta Z_{2,c1}^{\tilde{\chi}^{-},L}\left(c_{\beta}U_{2,2}^{*}V_{c2,1}^{*}-s_{\beta}U_{2,1}^{*}V_{c2,2}^{*}\right)\end{array}\right)s_{W}\\\hline\left(\begin{array}{l}s_{W}s_{\beta}\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(\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}\end{array}\right)V_{c1,2}-\\\left(\begin{array}{l}c_{\beta}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(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}\end{array}\right)V_{c1,1}-\\\left(\begin{array}{l}\left(c_{\beta}U_{c2,2}V_{1,1}-s_{\beta}U_{c2,1}V_{1,2}\right)\delta Z_{1,c1}^{\tilde{\chi}^{-},R}+\\\left(c_{\beta}U_{c2,2}V_{2,1}-s_{\beta}U_{c2,1}V_{2,2}\right)\delta Z_{2,c1}^{\tilde{\chi}^{-},R}\end{array}\right)s_{W}\end{array}\right]$$

[FFS] 2 Leptons – Higgs

$$C_{183}\left(e_{g1},\bar{e}_{g2},h^0\right) = \frac{ie\delta_{g1,g2}}{4c_\beta^2 M_W^3 s_W^2}\left[\begin{array}{l} 2c_\beta s_W s_\alpha \delta m_{g1}^{e_g} M_W^2 - \\ \left(\begin{array}{l} s_\alpha\left(2\left(\delta c_\beta\right)s_W M_W^2 + c_\beta\left(s_W\delta M_W^2 + 2\left(\delta s_W - \left(\delta Z_e\right)s_W\right)M_W^2\right)\right) + \\ c_\beta s_W\left(\left(\delta Z_{hH}\right)c_\alpha - s_\alpha\left(\delta Z_{hh} + \delta\overline{Z}_{g2,g2}^{e,R} + \delta Z_{g1,g1}^{e,L}\right)\right)M_W^2 \end{array}\right) m_{e_{g1}} \\ \hline 2c_\beta s_W s_\alpha \delta m_{g1}^{e_g} M_W^2 - \\ \left(\begin{array}{l} s_\alpha\left(2\left(\delta c_\beta\right)s_W M_W^2 + c_\beta\left(s_W\delta M_W^2 + 2\left(\delta s_W - \left(\delta Z_e\right)s_W\right)M_W^2\right)\right) + \\ c_\beta s_W\left(\left(\delta Z_{hH}\right)c_\alpha - s_\alpha\left(\delta Z_{hh} + \delta\overline{Z}_{g2,g2}^{e,L} + \delta Z_{g1,g1}^{e,R}\right)\right)M_W^2 \end{array}\right) m_{e_{g1}} \end{array}\right]$$

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

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

$$C_{188}\left(\nu_{g1},\bar{e}_{g2},H^-\right) = \frac{ie\delta_{g1,g2}}{2\sqrt{2}c_\beta^2 M_W^3 s_W^2}\left(\begin{array}{l} s_W s_{2\beta}\delta m_{g2}^{e_g} M_W^2 - \\ \left(\begin{array}{l} \left(\delta s_W - \left(\delta Z_e\right)s_W\right)s_{2\beta}M_W^2 + \\ s_W\left(c_\beta\left(\left(\delta Z_{G^-H^-}\right)c_\beta - s_\beta\left(\delta Z_{H^-H^-} + \delta\overline{Z}_{g2,g2}^{e,R} + \delta Z_{g1,g1}^{\nu,L}\right)\right)M_W^2 + s_\beta\left(c_\beta\delta M_W^2 + 2\left(\delta c_\beta\right)M_W^2\right)\right) \end{array}\right) m_{e_{g2}} \end{array}\right)\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

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

$$\underset{190}{C}\left(e_{g1},\overline{\nu}_{g2},H^{+}\right)=\frac{ie\delta_{g1,g2}}{4\sqrt{2}c_{\beta}^{2}M_{W}^{3}s_{W}^{2}}\left(\begin{array}{l}2s_{W}s_{2\beta}\delta m_{g1}^{e_{g}}M_{W}^{2}-\\\left(\begin{array}{l}s_{2\beta}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)M_{W}^{2}\right)+\\s_{W}\left(4\left(\delta c_{\beta}\right)s_{\beta}-s_{2\beta}\left(\delta\overline{Z}_{H^{-}H^{-}}+\delta\overline{Z}_{g2,g2}^{\nu,L}+\delta Z_{g1,g1}^{e,R}\right)+2\left(\delta Z_{H^{-}G^{-}}\right)c_{\beta}^{2}\right)M_{W}^{2}\end{array}\right)m_{e_{g1}}\end{array}\right)\left[\begin{array}{c}0\\\hline 1\end{array}\right]$$

$$\underset{191}{C}\left(e_{g1},\overline{\nu}_{g2},G^{+}\right)=-\frac{ie\delta_{g1,g2}}{2\sqrt{2}c_{\beta}M_{W}^{3}s_{W}^{2}}\left(\begin{array}{l}2c_{\beta}s_{W}\delta m_{g1}^{e_{g}}M_{W}^{2}-\\m_{e_{g1}}\left(s_{W}\left(2\left(\delta c_{\beta}\right)+\left(\delta Z_{G^{-}H^{-}}\right)s_{\beta}-c_{\beta}\left(2\left(\delta Z_{e}\right)+\delta Z_{G^{-}G^{-}}+\delta\overline{Z}_{g2,g2}^{\nu,L}+\delta Z_{g1,g1}^{e,R}\right)\right)M_{W}^{2}+c_{\beta}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}\right)M_{W}^{2}\right)\right)\end{array}\right)$$

$$\underset{203}{C}\left(e_{g1},\overline{e}_{g2},H^{0}\right)=-\frac{ie\delta_{g1,g2}}{4c_{\beta}^{2}M_{W}^{3}s_{W}^{2}}\left[\begin{array}{l}2c_{\alpha}c_{\beta}s_{W}\delta m_{g1}^{e_{g}}M_{W}^{2}-\\\left(\begin{array}{l}2\left(\delta c_{\beta}\right)c_{\alpha}s_{W}M_{W}^{2}+\\\left(\begin{array}{l}c_{\alpha}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)M_{W}^{2}\right)+\\s_{W}\left(\left(\delta Z_{hH}\right)s_{\alpha}-c_{\alpha}\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{e,R}+\delta Z_{g1,g1}^{e,L}\right)\right)M_{W}^{2}\end{array}\right)c_{\beta}\end{array}\right)m_{e_{g1}}\\\hline 2c_{\alpha}c_{\beta}s_{W}\delta m_{g1}^{e_{g}}M_{W}^{2}-\\\left(\begin{array}{l}2\left(\delta c_{\beta}\right)c_{\alpha}s_{W}M_{W}^{2}+\\\left(\begin{array}{l}c_{\alpha}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)M_{W}^{2}\right)+\\s_{W}\left(\left(\delta Z_{hH}\right)s_{\alpha}-c_{\alpha}\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{e,R}+\delta Z_{g1,g1}^{e,L}\right)\right)M_{W}^{2}\end{array}\right)c_{\beta}\end{array}\right)m_{e_{g1}}\end{array}\right]$$

$$
\underset{247}{C}\left(\tilde{\chi}^0_{n1},\tilde{\chi}^0_{n2},h^0\right) = -\frac{ie}{4s_W^2}
$$

$$
\left[
\begin{array}{l}
\frac{2}{c_W^3}\left(\begin{array}{l}\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(\delta s_W-\left(\delta Z_e\right)s_W\right)c_W^3 Z^*_{n2,2}\right)+\\ \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(\delta s_W-\left(\delta Z_e\right)s_W\right)c_W^3 Z^*_{n1,2}\right)\left(s_\alpha Z^*_{n2,3}+c_\alpha Z^*_{n2,4}\right)\end{array}\right)+\\
\frac{s_W}{c_W}\left(\begin{array}{l}\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{1,n2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{2,n2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{3,n2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{4,n2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,1}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,3}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,4}+\\
\left(\begin{array}{l}\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)\end{array}\right)\left(\delta Z_{hh}\right)-\\
\left(\begin{array}{l}\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)\end{array}\right)\left(\delta Z_{hH}\right)\end{array}\right)\\
\hline
\left(\begin{array}{l}2\left(\begin{array}{l}\left(s_\alpha Z_{n1,3}+c_\alpha Z_{n1,4}\right)\left(\left(\delta s_W-\left(\delta Z_e\right)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)+\\ \left(s_\alpha Z_{n2,3}+c_\alpha Z_{n2,4}\right)\left(\left(\delta s_W-\left(\delta Z_e\right)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)\end{array}\right)-\\
\left(\begin{array}{l}\left(\left(\left(\delta Z_{hH}\right)c_\alpha-\left(\delta Z_{hh}\right)s_\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)c_\alpha-\left(\delta Z_{hh}\right)s_\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(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n2}-\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{2,n2}-\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{3,n2}-\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{4,n2}-\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,1}-\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,2}-\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,3}-\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,4}-\\
\left(\begin{array}{l}\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)\end{array}\right)\left(\delta Z_{hh}\right)-\\
\left(\begin{array}{l}\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)\end{array}\right)\left(\delta Z_{hH}\right)\end{array}\right)\\
\hline
\left(\begin{array}{l}2\left(\begin{array}{l}\left(s_\alpha Z^*_{n1,3}+c_\alpha Z^*_{n1,4}\right)\left(\left(\delta s_W-\left(\delta Z_e\right)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)+\\ \left(s_\alpha Z^*_{n2,3}+c_\alpha Z^*_{n2,4}\right)\left(\left(\delta s_W-\left(\delta Z_e\right)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)\end{array}\right)-\\
\left(\begin{array}{l}\left(\left(\left(\delta Z_{hH}\right)c_\alpha-\left(\delta Z_{hh}\right)s_\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)c_\alpha-\left(\delta Z_{hh}\right)s_\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(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n2}-
\end{array}\right)
\end{array}
\right]
$$

$$
\begin{aligned}
\underset{248}{C}\left(\tilde{\chi}^0_{n1},\tilde{\chi}^0_{n2},H^0\right) = \frac{ie}{4s_W^2}
&\left[
\frac{2}{c_W^3}\left(
\begin{array}{l}
\left(c_\alpha Z^*_{n1,3} - s_\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(\delta s_W - \left(\delta Z_e\right)s_W\right)c_W^3 Z^*_{n2,2}\right) + \\
\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(\delta s_W - \left(\delta Z_e\right)s_W\right)c_W^3 Z^*_{n1,2}\right)\left(c_\alpha Z^*_{n2,3} - s_\alpha Z^*_{n2,4}\right)
\end{array}
\right) + \right. \\
&\frac{s_W}{c_W}\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(c_\alpha Z^*_{1,3} - s_\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(c_\alpha Z^*_{n1,3} - s_\alpha Z^*_{n1,4}\right)
\end{array}
\right)\delta Z^{\tilde{\chi}^0,L}_{1,n2} + \\
\left(
\begin{array}{l}
\left(c_\alpha Z^*_{2,3} - s_\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(c_\alpha Z^*_{n1,3} - s_\alpha Z^*_{n1,4}\right)
\end{array}
\right)\delta Z^{\tilde{\chi}^0,L}_{2,n2} + \\
\left(
\begin{array}{l}
\left(c_\alpha Z^*_{3,3} - s_\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(c_\alpha Z^*_{n1,3} - s_\alpha Z^*_{n1,4}\right)
\end{array}
\right)\delta Z^{\tilde{\chi}^0,L}_{3,n2} + \\
\left(
\begin{array}{l}
\left(c_\alpha Z^*_{4,3} - s_\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(c_\alpha Z^*_{n1,3} - s_\alpha Z^*_{n1,4}\right)
\end{array}
\right)\delta Z^{\tilde{\chi}^0,L}_{4,n2} + \\
\left(
\begin{array}{l}
\left(c_\alpha Z^*_{1,3} - s_\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(c_\alpha Z^*_{n2,3} - s_\alpha Z^*_{n2,4}\right)
\end{array}
\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,1} + \\
\left(
\begin{array}{l}
\left(c_\alpha Z^*_{2,3} - s_\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(c_\alpha Z^*_{n2,3} - s_\alpha Z^*_{n2,4}\right)
\end{array}
\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,2} + \\
\left(
\begin{array}{l}
\left(c_\alpha Z^*_{3,3} - s_\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(c_\alpha Z^*_{n2,3} - s_\alpha Z^*_{n2,4}\right)
\end{array}
\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,3} + \\
\left(
\begin{array}{l}
\left(c_\alpha Z^*_{4,3} - s_\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(c_\alpha Z^*_{n2,3} - s_\alpha Z^*_{n2,4}\right)
\end{array}
\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,4} - \\
\left(
\begin{array}{l}
\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)
\end{array}
\right)\left(\delta Z_{hH}\right) + \\
\left(
\begin{array}{l}
\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)
\end{array}
\right)\left(\delta Z_{HH}\right)
\end{array}
\right) \\
&\left.
\begin{array}{l}
\left(
\begin{array}{l}
2\left(
\begin{array}{l}
\left(c_\alpha Z_{n1,3} - s_\alpha Z_{n1,4}\right)\left(\left(\delta s_W - \left(\delta Z_e\right)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) + \\
\left(c_\alpha Z_{n2,3} - s_\alpha Z_{n2,4}\right)\left(\left(\delta s_W - \left(\delta Z_e\right)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)
\end{array}
\right) + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(c_\alpha Z_{1,3} - s_\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(c_\alpha Z_{n1,3} - s_\alpha Z_{n1,4}\right)
\end{array}
\right)\delta Z^{\tilde{\chi}^0,R}_{1,n2} + \\
\left(
\begin{array}{l}
\left(c_\alpha Z_{2,3} - s_\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(c_\alpha Z_{n1,3} - s_\alpha Z_{n1,4}\right)
\end{array}
\right)\delta Z^{\tilde{\chi}^0,R}_{2,n2} + \\
\left(
\end{array}
\right.
\end{aligned}
$$

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

$$
\begin{array}{l}
2\left(s_\beta Z^*_{n1,3}-c_\beta Z^*_{n1,4}\right)\left(\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)s_W^2Z^*_{n2,1}+\left(\delta s_W-\left(\delta Z_e\right)s_W\right)c_W^3Z^*_{n2,2}\right)+\\
\left(\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)s_W^2Z^*_{n1,1}+\left(\delta s_W-\left(\delta Z_e\right)s_W\right)c_W^3Z^*_{n1,2}\right)\left(2s_\beta Z^*_{n2,3}-2c_\beta Z^*_{n2,4}\right)+\\
\left(\begin{array}{l}
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{1,n2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{2,n2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{3,n2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{4,n2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,1}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,2}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,3}+\\
\left(\begin{array}{l}\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)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,4}+\\
\left(\begin{array}{l}\left(s_\beta Z^*_{n1,3}-c_\beta 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_\beta Z^*_{n2,3}-c_\beta Z^*_{n2,4}\right)\end{array}\right)\left(\delta Z_{AA}\right)-\\
\left(\begin{array}{l}\left(c_\beta Z^*_{n1,3}+s_\beta 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_\beta Z^*_{n2,3}+s_\beta Z^*_{n2,4}\right)\end{array}\right)\left(\delta Z_{AG}\right)
\end{array}\right)s_Wc_W^2\\
\hline
-2\left(s_\beta Z_{n1,3}-c_\beta Z_{n1,4}\right)\left(\left(\delta s_W-\left(\delta Z_e\right)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)-\\
\left(2s_\beta Z_{n2,3}-2c_\beta Z_{n2,4}\right)\left(\left(\delta s_W-\left(\delta Z_e\right)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(\begin{array}{l}
\left(\left(\left(\delta Z_{AG}\right)c_\beta-\left(\delta Z_{AA}\right)s_\beta\right)Z_{n1,3}+\left(\left(\delta Z_{AA}\right)c_\beta+\left(\delta Z_{AG}\right)s_\beta\right)Z_{n1,4}\right)\left(s_WZ_{n2,1}-c_WZ_{n2,2}\right)+\\
\left(s_WZ_{n1,1}-c_WZ_{n1,2}\right)\left(\left(\left(\delta Z_{AG}\right)c_\beta-\left(\delta Z_{AA}\right)s_\beta\right)Z_{n2,3}+\left(\left(\delta Z_{AA}\right)c_\beta+\left(\delta Z_{AG}\right)s_\beta\right)Z_{n2,4}\right)-\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n2}-\\
\left(\begin{array}{l}\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)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{2,n2}-
\end{array}\right.
\end{array}
$$

$$
\underset{250}{C}\left(\tilde{\chi}^0_{n1},\tilde{\chi}^0_{n2},G^0\right)=\frac{e}{4c_W^3s_W^2}
$$

$$
\begin{array}{l}
-2\left(\begin{array}{l}\left(c_\beta Z^*_{n1,3}+s_\beta Z^*_{n1,4}\right)\left(\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)s_W^2Z^*_{n2,1}+\left(\delta s_W-\left(\delta Z_e\right)s_W\right)c_W^3Z^*_{n2,2}\right)+\\ \left(\left(\left(\delta s_W\right)s_W+\left(\delta Z_e\right)c_W^2\right)s_W^2Z^*_{n1,1}+\left(\delta s_W-\left(\delta Z_e\right)s_W\right)c_W^3Z^*_{n1,2}\right)\left(c_\beta Z^*_{n2,3}+s_\beta Z^*_{n2,4}\right)\end{array}\right)-\\
\left(\begin{array}{l}\left(\begin{array}{l}\left(c_\beta Z^*_{1,3}+s_\beta Z^*_{1,4}\right)\left(s_WZ^*_{n1,1}-c_WZ^*_{n1,2}\right)+\\ \left(s_WZ^*_{1,1}-c_WZ^*_{1,2}\right)\left(c_\beta Z^*_{n1,3}+s_\beta Z^*_{n1,4}\right)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{1,n2}+\\
\left(\begin{array}{l}\left(c_\beta Z^*_{2,3}+s_\beta Z^*_{2,4}\right)\left(s_WZ^*_{n1,1}-c_WZ^*_{n1,2}\right)+\\ \left(s_WZ^*_{2,1}-c_WZ^*_{2,2}\right)\left(c_\beta Z^*_{n1,3}+s_\beta Z^*_{n1,4}\right)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{2,n2}+\\
\left(\begin{array}{l}\left(c_\beta Z^*_{3,3}+s_\beta Z^*_{3,4}\right)\left(s_WZ^*_{n1,1}-c_WZ^*_{n1,2}\right)+\\ \left(s_WZ^*_{3,1}-c_WZ^*_{3,2}\right)\left(c_\beta Z^*_{n1,3}+s_\beta Z^*_{n1,4}\right)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{3,n2}+\\
\left(\begin{array}{l}\left(c_\beta Z^*_{4,3}+s_\beta Z^*_{4,4}\right)\left(s_WZ^*_{n1,1}-c_WZ^*_{n1,2}\right)+\\ \left(s_WZ^*_{4,1}-c_WZ^*_{4,2}\right)\left(c_\beta Z^*_{n1,3}+s_\beta Z^*_{n1,4}\right)\end{array}\right)\delta Z^{\tilde{\chi}^0,L}_{4,n2}+\\
\left(\begin{array}{l}\left(c_\beta Z^*_{1,3}+s_\beta Z^*_{1,4}\right)\left(s_WZ^*_{n2,1}-c_WZ^*_{n2,2}\right)+\\ \left(s_WZ^*_{1,1}-c_WZ^*_{1,2}\right)\left(c_\beta Z^*_{n2,3}+s_\beta Z^*_{n2,4}\right)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,1}+\\
\left(\begin{array}{l}\left(c_\beta Z^*_{2,3}+s_\beta Z^*_{2,4}\right)\left(s_WZ^*_{n2,1}-c_WZ^*_{n2,2}\right)+\\ \left(s_WZ^*_{2,1}-c_WZ^*_{2,2}\right)\left(c_\beta Z^*_{n2,3}+s_\beta Z^*_{n2,4}\right)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,2}+\\
\left(\begin{array}{l}\left(c_\beta Z^*_{3,3}+s_\beta Z^*_{3,4}\right)\left(s_WZ^*_{n2,1}-c_WZ^*_{n2,2}\right)+\\ \left(s_WZ^*_{3,1}-c_WZ^*_{3,2}\right)\left(c_\beta Z^*_{n2,3}+s_\beta Z^*_{n2,4}\right)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,3}+\\
\left(\begin{array}{l}\left(c_\beta Z^*_{4,3}+s_\beta Z^*_{4,4}\right)\left(s_WZ^*_{n2,1}-c_WZ^*_{n2,2}\right)+\\ \left(s_WZ^*_{4,1}-c_WZ^*_{4,2}\right)\left(c_\beta Z^*_{n2,3}+s_\beta Z^*_{n2,4}\right)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,R}_{n1,4}-\\
\left(\begin{array}{l}\left(s_\beta Z^*_{n1,3}-c_\beta Z^*_{n1,4}\right)\left(s_WZ^*_{n2,1}-c_WZ^*_{n2,2}\right)+\\ \left(s_WZ^*_{n1,1}-c_WZ^*_{n1,2}\right)\left(s_\beta Z^*_{n2,3}-c_\beta Z^*_{n2,4}\right)\end{array}\right)\left(\delta Z_{AG}\right)+\\
\left(\begin{array}{l}\left(c_\beta Z^*_{n1,3}+s_\beta Z^*_{n1,4}\right)\left(s_WZ^*_{n2,1}-c_WZ^*_{n2,2}\right)+\\ \left(s_WZ^*_{n1,1}-c_WZ^*_{n1,2}\right)\left(c_\beta Z^*_{n2,3}+s_\beta Z^*_{n2,4}\right)\end{array}\right)\left(\delta Z_{GG}\right)
\end{array}\right)s_Wc_W^2
\end{array}
$$

$$
\begin{array}{l}
2\left(\begin{array}{l}\left(c_\beta Z_{n1,3}+s_\beta Z_{n1,4}\right)\left(\left(\delta s_W-\left(\delta Z_e\right)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)+\\ \left(c_\beta Z_{n2,3}+s_\beta Z_{n2,4}\right)\left(\left(\delta s_W-\left(\delta Z_e\right)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)\end{array}\right)+\\
\left(\begin{array}{l}\left(\begin{array}{l}\left(c_\beta Z_{1,3}+s_\beta Z_{1,4}\right)\left(s_WZ_{n1,1}-c_WZ_{n1,2}\right)+\\ \left(s_WZ_{1,1}-c_WZ_{1,2}\right)\left(c_\beta Z_{n1,3}+s_\beta Z_{n1,4}\right)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{1,n2}+\\
\left(\begin{array}{l}\left(c_\beta Z_{2,3}+s_\beta Z_{2,4}\right)\left(s_WZ_{n1,1}-c_WZ_{n1,2}\right)+\\ \left(s_WZ_{2,1}-c_WZ_{2,2}\right)\left(c_\beta Z_{n1,3}+s_\beta Z_{n1,4}\right)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{2,n2}+\\
\left(\begin{array}{l}\left(c_\beta Z_{3,3}+s_\beta Z_{3,4}\right)\left(s_WZ_{n1,1}-c_WZ_{n1,2}\right)+\\ \left(s_WZ_{3,1}-c_WZ_{3,2}\right)\left(c_\beta Z_{n1,3}+s_\beta Z_{n1,4}\right)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{3,n2}+\\
\left(\begin{array}{l}\left(c_\beta Z_{4,3}+s_\beta Z_{4,4}\right)\left(s_WZ_{n1,1}-c_WZ_{n1,2}\right)+\\ \left(s_WZ_{4,1}-c_WZ_{4,2}\right)\left(c_\beta Z_{n1,3}+s_\beta Z_{n1,4}\right)\end{array}\right)\delta Z^{\tilde{\chi}^0,R}_{4,n2}+\\
\left(\begin{array}{l}\left(c_\beta Z_{1,3}+s_\beta Z_{1,4}\right)\left(s_WZ_{n2,1}-c_WZ_{n2,2}\right)+\\ \left(s_WZ_{1,1}-c_WZ_{1,2}\right)\left(c_\beta Z_{n2,3}+s_\beta Z_{n2,4}\right)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,1}+\\
\left(\begin{array}{l}\left(c_\beta Z_{2,3}+s_\beta Z_{2,4}\right)\left(s_WZ_{n2,1}-c_WZ_{n2,2}\right)+\\ \left(s_WZ_{2,1}-c_WZ_{2,2}\right)\left(c_\beta Z_{n2,3}+s_\beta Z_{n2,4}\right)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,2}+\\
\left(\begin{array}{l}\left(c_\beta Z_{3,3}+s_\beta Z_{3,4}\right)\left(s_WZ_{n2,1}-c_WZ_{n2,2}\right)+\\ \left(s_WZ_{3,1}-c_WZ_{3,2}\right)\left(c_\beta Z_{n2,3}+s_\beta Z_{n2,4}\right)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,3}+\\
\left(\begin{array}{l}\left(c_\beta Z_{4,3}+s_\beta Z_{4,4}\right)\left(s_WZ_{n2,1}-c_WZ_{n2,2}\right)+\\ \left(s_WZ_{4,1}-c_WZ_{4,2}\right)\left(c_\beta Z_{n2,3}+s_\beta Z_{n2,4}\right)\end{array}\right)\delta \overline{Z}^{\tilde{\chi}^0,L}_{n1,4}+\\
\left(\begin{array}{l}\left(s_\beta Z_{n1,3}-c_\beta Z_{n1,4}\right)\left(s_WZ_{n2,1}-c_WZ_{n2,2}\right)+\\ \left(s_WZ_{n1,1}-c_WZ_{n1,2}\right)\left(s_\beta Z_{n2,3}-c_\beta Z_{n2,4}\right)\end{array}\right)\left(\delta Z_{AG}\right)+\\
\left(\begin{array}{l}\left(c_\beta Z_{n1,3}+s_\beta Z_{n1,4}\right)\left(s_WZ_{n2,1}-c_WZ_{n2,2}\right)+\\ \left(s_WZ_{n1,1}-c_WZ_{n1,2}\right)\left(c_\beta Z_{n2,3}+s_\beta Z_{n2,4}\right)\end{array}\right)\left(\delta Z_{GG}\right)
\end{array}\right)s_Wc_W^2
\end{array}
$$

$$\underset{184}{C}\left(u_{g1},\overline{u}_{g2},h^0\right) = -\frac{ie\delta_{g1,g2}}{4M_W^3 s_W^2 s_\beta^2}\left[\begin{array}{l} 2c_\alpha s_W s_\beta \delta m_{g1}^{u_g} M_W^2 - \\ \left(\begin{array}{l} c_\alpha\left(2\left(\left(\delta s_\beta\right)s_W+\left(\delta s_W\right)s_\beta\right)M_W^2+s_W s_\beta\left(\delta M_W^2-\left(2\left(\delta Z_e\right)+\delta Z_{hh}+\delta\overline{Z}_{g2,g2}^{u,R}+\delta Z_{g1,g1}^{u,L}\right)M_W^2\right)\right)- \\ \left(\delta Z_{hH}\right)s_W s_\alpha s_\beta M_W^2 \end{array}\right) m_{u_{g1}} \\ \hline 2c_\alpha s_W s_\beta \delta m_{g1}^{u_g} M_W^2 - \\ \left(\begin{array}{l} c_\alpha\left(2\left(\left(\delta s_\beta\right)s_W+\left(\delta s_W\right)s_\beta\right)M_W^2+s_W s_\beta\left(\delta M_W^2-\left(2\left(\delta Z_e\right)+\delta Z_{hh}+\delta\overline{Z}_{g2,g2}^{u,L}+\delta Z_{g1,g1}^{u,R}\right)M_W^2\right)\right)- \\ \left(\delta Z_{hH}\right)s_W s_\alpha s_\beta M_W^2 \end{array}\right) m_{u_{g1}} \end{array}\right]$$

$$\underset{185}{C}\left(d_{g1},\overline{d}_{g2},h^0\right) = \frac{ie\delta_{g1,g2}}{4c_\beta^2 M_W^3 s_W^2}\left[\begin{array}{l} 2c_\beta s_W s_\alpha \delta m_{g1}^{d_g} M_W^2 - \\ \left(\begin{array}{l} s_\alpha\left(2\left(\delta c_\beta\right)s_W M_W^2+c_\beta\left(s_W\delta M_W^2+2\left(\delta s_W-\left(\delta Z_e\right)s_W\right)M_W^2\right)\right)+ \\ c_\beta s_W\left(\left(\delta Z_{hH}\right)c_\alpha-s_\alpha\left(\delta Z_{hh}+\delta\overline{Z}_{g2,g2}^{d,R}+\delta Z_{g1,g1}^{d,L}\right)\right)M_W^2 \end{array}\right) m_{d_{g1}} \\ \hline 2c_\beta s_W s_\alpha \delta m_{g1}^{d_g} M_W^2 - \\ \left(\begin{array}{l} s_\alpha\left(2\left(\delta c_\beta\right)s_W M_W^2+c_\beta\left(s_W\delta M_W^2+2\left(\delta s_W-\left(\delta Z_e\right)s_W\right)M_W^2\right)\right)+ \\ c_\beta s_W\left(\left(\delta Z_{hH}\right)c_\alpha-s_\alpha\left(\delta Z_{hh}+\delta\overline{Z}_{g2,g2}^{d,L}+\delta Z_{g1,g1}^{d,R}\right)\right)M_W^2 \end{array}\right) m_{d_{g1}} \end{array}\right]$$

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

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

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

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

$$\underset{204}{C}\left(u_{g1},\overline{u}_{g2},H^0\right)=-\frac{ie\delta_{g1,g2}}{4M_W^3 s_W^2 s_\beta^2}\left[\begin{array}{l}2s_W s_\alpha s_\beta \delta m_{g1}^{u_g} M_W^2 - \\ \left(\begin{array}{l} s_\alpha\left(2\left(\delta s_W\right)s_\beta M_W^2 + s_W\left(s_\beta\delta M_W^2+2\left(\delta s_\beta-\left(\delta Z_e\right)s_\beta\right)M_W^2\right)\right) - \\ s_W s_\beta\left(\left(\delta Z_{hH}\right)c_\alpha + s_\alpha\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{u,R}+\delta Z_{g1,g1}^{u,L}\right)\right)M_W^2 \end{array}\right) m_{u_{g1}} \\ \hline 2s_W s_\alpha s_\beta \delta m_{g1}^{u_g} M_W^2 - \\ \left(\begin{array}{l} s_\alpha\left(2\left(\delta s_W\right)s_\beta M_W^2 + s_W\left(s_\beta\delta M_W^2+2\left(\delta s_\beta-\left(\delta Z_e\right)s_\beta\right)M_W^2\right)\right) - \\ s_W s_\beta\left(\left(\delta Z_{hH}\right)c_\alpha + s_\alpha\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{u,L}+\delta Z_{g1,g1}^{u,R}\right)\right)M_W^2 \end{array}\right) m_{u_{g1}}\end{array}\right]$$

$$\underset{205}{C}\left(d_{g1},\bar{d}_{g2},H^{0}\right)=-\frac{ie\delta_{g1,g2}}{4c_{\beta}^{2}M_{W}^{3}s_{W}^{2}}\left[\frac{\begin{array}{l}2c_{\alpha}c_{\beta}s_{W}\delta m_{g1}^{d_{g}}M_{W}^{2}-\\\left(\begin{array}{l}2\left(\delta c_{\beta}\right)c_{\alpha}s_{W}M_{W}^{2}+\\\left(\begin{array}{l}c_{\alpha}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)M_{W}^{2}\right)+\\s_{W}\left(\left(\delta Z_{hH}\right)s_{\alpha}-c_{\alpha}\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{d,R}+\delta Z_{g1,g1}^{d,L}\right)\right)M_{W}^{2}\end{array}\right)c_{\beta}\end{array}\right)m_{d_{g1}}\end{array}}{\begin{array}{l}2c_{\alpha}c_{\beta}s_{W}\delta m_{g1}^{d_{g}}M_{W}^{2}-\\\left(\begin{array}{l}2\left(\delta c_{\beta}\right)c_{\alpha}s_{W}M_{W}^{2}+\\\left(\begin{array}{l}c_{\alpha}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)M_{W}^{2}\right)+\\s_{W}\left(\left(\delta Z_{hH}\right)s_{\alpha}-c_{\alpha}\left(\delta Z_{HH}+\delta\overline{Z}_{g2,g2}^{d,L}+\delta Z_{g1,g1}^{d,R}\right)\right)M_{W}^{2}\end{array}\right)c_{\beta}\end{array}\right)m_{d_{g1}}\end{array}}\right]$$

$$\underset{208}{C}\left(u_{g1},\bar{d}_{g2},H^{-}\right)=\frac{ie}{\sqrt{2}M_{W}^{3}s_{W}^{2}}\left[\frac{\frac{1}{2c_{\beta}^{2}}\left(\begin{array}{l}m_{d_{g2}}s_{W}s_{2\beta}\delta CKM_{g1,g2}^{*}M_{W}^{2}+\\\left(\begin{array}{l}s_{W}s_{2\beta}\delta m_{g2}^{d_{g}}M_{W}^{2}-\\\left(\begin{array}{l}\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)s_{2\beta}M_{W}^{2}+\\\left(\begin{array}{l}s_{\beta}\left(c_{\beta}\delta M_{W}^{2}+2\left(\delta c_{\beta}\right)M_{W}^{2}\right)+\\c_{\beta}\left(\left(\delta Z_{G^{-}H^{-}}\right)c_{\beta}-s_{\beta}\left(\delta Z_{H^{-}H^{-}}+\delta\overline{Z}_{g2,g2}^{d,R}+\delta Z_{g1,g1}^{u,L}\right)\right)M_{W}^{2}\end{array}\right)s_{W}\end{array}\right)m_{d_{g2}}\end{array}\right)CKM_{g1,g2}^{*}}{\frac{1}{4s_{\beta}^{2}}\left(\begin{array}{l}2m_{u_{g1}}s_{W}s_{2\beta}\delta CKM_{g1,g2}^{*}M_{W}^{2}+\\\left(\begin{array}{l}2s_{W}s_{2\beta}\delta m_{g1}^{u_{g}}M_{W}^{2}-\\\left(\begin{array}{l}s_{2\beta}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)M_{W}^{2}\right)+\\s_{W}M_{W}^{2}\left(4\left(\delta s_{\beta}\right)c_{\beta}-s_{2\beta}\left(\delta Z_{H^{-}H^{-}}+\delta\overline{Z}_{g2,g2}^{d,L}+\delta Z_{g1,g1}^{u,R}\right)-2\left(\delta Z_{G^{-}H^{-}}\right)s_{\beta}^{2}\right)\end{array}\right)m_{u_{g1}}\end{array}\right)CKM_{g1,g2}^{*}\end{array}}\right]$$

$$\underset{209}{C}\left(u_{g1},\bar{d}_{g2},G^{-}\right)=\frac{ie}{2\sqrt{2}M_{W}^{3}s_{W}^{2}}\left[\frac{-\frac{1}{c_{\beta}}\left(\begin{array}{l}2c_{\beta}m_{d_{g2}}s_{W}\delta CKM_{g1,g2}^{*}M_{W}^{2}+\\\left(\begin{array}{l}2c_{\beta}s_{W}\delta m_{g2}^{d_{g}}M_{W}^{2}-\\\left(\begin{array}{l}c_{\beta}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}\right)M_{W}^{2}\right)+\\s_{W}\left(2\left(\delta c_{\beta}\right)+\left(\delta Z_{H^{-}G^{-}}\right)s_{\beta}-c_{\beta}\left(2\left(\delta Z_{e}\right)+\delta Z_{G^{-}G^{-}}+\delta\overline{Z}_{g2,g2}^{d,R}+\delta Z_{g1,g1}^{u,L}\right)\right)M_{W}^{2}\end{array}\right)m_{d_{g2}}\end{array}\right)CKM_{g1,g2}^{*}\end{array}}{\frac{1}{s_{\beta}}\left(\begin{array}{l}2m_{u_{g1}}s_{W}s_{\beta}\delta CKM_{g1,g2}^{*}M_{W}^{2}+\\\left(\begin{array}{l}2s_{W}s_{\beta}\delta m_{g1}^{u_{g}}M_{W}^{2}-\\\left(\begin{array}{l}s_{W}\left(s_{\beta}\delta M_{W}^{2}+2\left(\delta s_{\beta}-\left(\delta Z_{e}\right)s_{\beta}\right)M_{W}^{2}\right)+\\\left(2\left(\delta s_{W}\right)s_{\beta}-s_{W}\left(\left(\delta Z_{H^{-}G^{-}}\right)c_{\beta}+s_{\beta}\left(\delta Z_{G^{-}G^{-}}+\delta\overline{Z}_{g2,g2}^{d,L}+\delta Z_{g1,g1}^{u,R}\right)\right)\right)M_{W}^{2}\end{array}\right)m_{u_{g1}}\end{array}\right)CKM_{g1,g2}^{*}\end{array}}\right]$$

$$\underset{210}{C}\left(d_{g1},\overline{u}_{g2},H^{+}\right)=\frac{ie}{4\sqrt{2}M_{W}^{3}s_{W}^{2}}\left[\begin{array}{c}\frac{1}{s_{\beta}^{2}}\left(\begin{array}{l}2CKM_{g2,g1}s_{W}s_{2\beta}\delta m_{g2}^{u_{g}}M_{W}^{2}+\\\left(\begin{array}{l}2\left(\delta CKM_{g2,g1}\right)s_{W}s_{2\beta}M_{W}^{2}-\\\left(\begin{array}{l}s_{2\beta}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)M_{W}^{2}\right)+\\s_{W}M_{W}^{2}\left(4\left(\delta s_{\beta}\right)c_{\beta}-s_{2\beta}\left(\delta\overline{Z}_{H^{-}H^{-}}+\delta\overline{Z}_{g2,g2}^{u,R}+\delta Z_{g1,g1}^{d,L}\right)-2\left(\delta Z_{H^{-}G^{-}}\right)s_{\beta}^{2}\right)\end{array}\right)CKM_{g2,g1}\end{array}\right)m_{u_{g2}}\end{array}\right)\\\hline\frac{1}{c_{\beta}^{2}}\left(\begin{array}{l}2CKM_{g2,g1}s_{W}s_{2\beta}\delta m_{g1}^{d_{g}}M_{W}^{2}+\\\left(\begin{array}{l}2\left(\delta CKM_{g2,g1}\right)s_{W}s_{2\beta}M_{W}^{2}-\\\left(\begin{array}{l}s_{2\beta}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)M_{W}^{2}\right)+\\s_{W}\left(4\left(\delta c_{\beta}\right)s_{\beta}-s_{2\beta}\left(\delta\overline{Z}_{H^{-}H^{-}}+\delta\overline{Z}_{g2,g2}^{u,L}+\delta Z_{g1,g1}^{d,R}\right)+2\left(\delta Z_{H^{-}G^{-}}\right)c_{\beta}^{2}\right)M_{W}^{2}\end{array}\right)CKM_{g2,g1}\end{array}\right)m_{d_{g1}}\end{array}\right)\end{array}\right]$$

$$\underset{211}{C}\left(d_{g1},\overline{u}_{g2},G^{+}\right)=\frac{ie}{2\sqrt{2}M_{W}^{3}s_{W}^{2}}\left[\begin{array}{c}\frac{1}{s_{\beta}}\left(\begin{array}{l}2CKM_{g2,g1}s_{W}s_{\beta}\delta m_{g2}^{u_{g}}M_{W}^{2}+\\\left(\begin{array}{l}2\left(\delta CKM_{g2,g1}\right)s_{W}s_{\beta}M_{W}^{2}-\\\left(\begin{array}{l}s_{W}\left(s_{\beta}\delta M_{W}^{2}+2\left(\delta s_{\beta}-\left(\delta Z_{e}\right)s_{\beta}\right)M_{W}^{2}\right)+\\\left(2\left(\delta s_{W}\right)s_{\beta}-s_{W}\left(\left(\delta Z_{G^{-}H^{-}}\right)c_{\beta}+s_{\beta}\left(\delta Z_{G^{-}G^{-}}+\delta\overline{Z}_{g2,g2}^{u,R}+\delta Z_{g1,g1}^{d,L}\right)\right)\right)M_{W}^{2}\end{array}\right)CKM_{g2,g1}\end{array}\right)m_{u_{g2}}\end{array}\right)\\\hline-\frac{1}{c_{\beta}}\left(\begin{array}{l}2\left(\delta CKM_{g2,g1}\right)c_{\beta}m_{d_{g1}}s_{W}M_{W}^{2}+\\\left(\begin{array}{l}2c_{\beta}s_{W}\delta m_{g1}^{d_{g}}M_{W}^{2}-\\\left(\begin{array}{l}c_{\beta}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}\right)M_{W}^{2}\right)+\\s_{W}\left(2\left(\delta c_{\beta}\right)+\left(\delta Z_{G^{-}H^{-}}\right)s_{\beta}-c_{\beta}\left(2\left(\delta Z_{e}\right)+\delta Z_{G^{-}G^{-}}+\delta\overline{Z}_{g2,g2}^{u,L}+\delta Z_{g1,g1}^{d,R}\right)\right)M_{W}^{2}\end{array}\right)m_{d_{g1}}\end{array}\right)CKM_{g2,g1}\end{array}\right)\end{array}\right]$$

[FFV] Chargino – Neutralino – Gauge Boson

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

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

$$\underset{277}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^0_{n2}, W^+\right) = \frac{ie}{4s_W^2}$$

$$\begin{bmatrix}
-2\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta\overline{Z}_W\right)s_W\right) V_{c1,1} - s_W\left(V_{1,1}\delta Z^{\tilde{\chi}^-,R}_{1,c1} + V_{2,1}\delta Z^{\tilde{\chi}^-,R}_{2,c1}\right)\right) Z^*_{n2,2} + \\
\sqrt{2}\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta\overline{Z}_W\right)s_W\right) V_{c1,2} - s_W\left(V_{1,2}\delta Z^{\tilde{\chi}^-,R}_{1,c1} + V_{2,2}\delta Z^{\tilde{\chi}^-,R}_{2,c1}\right)\right) Z^*_{n2,4} + \\
\begin{pmatrix} 2V_{c1,1}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n2} Z^*_{1,2} + \delta Z^{\tilde{\chi}^0,L}_{2,n2} Z^*_{2,2} + \delta Z^{\tilde{\chi}^0,L}_{3,n2} Z^*_{3,2} + \delta Z^{\tilde{\chi}^0,L}_{4,n2} Z^*_{4,2}\right) - \\ \sqrt{2}V_{c1,2}\left(\delta Z^{\tilde{\chi}^0,L}_{1,n2} Z^*_{1,4} + \delta Z^{\tilde{\chi}^0,L}_{2,n2} Z^*_{2,4} + \delta Z^{\tilde{\chi}^0,L}_{3,n2} Z^*_{3,4} + \delta Z^{\tilde{\chi}^0,L}_{4,n2} Z^*_{4,4}\right) \end{pmatrix} s_W \\
\hline
2\begin{pmatrix} s_W\left(Z_{1,2}\delta Z^{\tilde{\chi}^0,R}_{1,n2} + Z_{2,2}\delta Z^{\tilde{\chi}^0,R}_{2,n2} + Z_{3,2}\delta Z^{\tilde{\chi}^0,R}_{3,n2} + Z_{4,2}\delta Z^{\tilde{\chi}^0,R}_{4,n2}\right) - \\ \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta\overline{Z}_W\right)s_W\right) Z_{n2,2} \end{pmatrix} U^*_{c1,1} + \\
\sqrt{2}\begin{pmatrix} s_W\left(Z_{1,3}\delta Z^{\tilde{\chi}^0,R}_{1,n2} + Z_{2,3}\delta Z^{\tilde{\chi}^0,R}_{2,n2} + Z_{3,3}\delta Z^{\tilde{\chi}^0,R}_{3,n2} + Z_{4,3}\delta Z^{\tilde{\chi}^0,R}_{4,n2}\right) - \\ \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta\overline{Z}_W\right)s_W\right) Z_{n2,3} \end{pmatrix} U^*_{c1,2} + \\
\begin{pmatrix} 2Z_{n2,2}\left(\delta Z^{\tilde{\chi}^-,L}_{1,c1} U^*_{1,1} + \delta Z^{\tilde{\chi}^-,L}_{2,c1} U^*_{2,1}\right) + \\ \sqrt{2}Z_{n2,3}\left(\delta Z^{\tilde{\chi}^-,L}_{1,c1} U^*_{1,2} + \delta Z^{\tilde{\chi}^-,L}_{2,c1} U^*_{2,2}\right) \end{pmatrix} s_W
\end{bmatrix}$$

[FFV] 2 Charginos – Gauge Boson

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

$$\underset{279}{C}\left(\tilde{\chi}^+_{c1},\tilde{\chi}^-_{c2},Z\right) = \frac{ie}{4c^3_W s^2_W}\left[\begin{array}{l} -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)+ \\ \left(\begin{array}{l} 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}- \\ \left(\begin{array}{l} \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{array}\right)c^2_W \end{array}\right)s_W- \\ \left(\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(\begin{array}{l} 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)- \\ \left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)U_{c1,1} \end{array}\right)U^*_{c2,1} \end{array}\right)c^2_W \\ \hline \begin{array}{l} -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\right)+ \\ 2s_W V_{c2,1}\left(c^2_W\left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c1,1}V^*_{1,1}+\delta\overline{Z}^{\tilde{\chi}^-,R}_{c1,2}V^*_{2,1}\right)+2\left(\delta s_W\right)s_W V^*_{c1,1}\right)- \\ \left(\begin{array}{l} \left(\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 s_W\right)s^2_W\right)V^*_{c1,2}- \\ s_W c^2_W\left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c1,1}V^*_{1,2}+\delta\overline{Z}^{\tilde{\chi}^-,R}_{c1,2}V^*_{2,2}\right) \end{array}\right)V_{c2,2}- \\ \left(\begin{array}{l} 2\left(\delta\overline{Z}^{\tilde{\chi}^-,R}_{c1,1}+\delta\overline{Z}^{\tilde{\chi}^-,R}_{c1,2}\right)s^3_W+ \\ 2\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)V_{c2,1}V^*_{c1,1}+ \\ \left(\begin{array}{l} \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{array}\right)s_W \end{array}\right)c^2_W \end{array} \end{array}\right]$$

[FFV] 2 Gluinos – Gauge Boson

$$C_{461}(\tilde{g},\tilde{g},g) = -\frac{1}{2}g_s f^{g1,g2,g3}\begin{bmatrix} \delta Z_{gg} + 2\left(\delta Z_{g_s} + \delta Z^{L}_{\tilde{g}}\right) \\ \hline \delta Z_{gg} + 2\left(\delta Z_{g_s} + \delta Z^{R}_{\tilde{g}}\right) \end{bmatrix}$$

[FFV] 2 Leptons – Gauge Boson

$$C_{196}(\bar{e}_{g1}, e_{g2}, \gamma) = ie\delta_{g1,g2}\begin{bmatrix} \frac{1}{4}\left(4\left(\delta Z_e\right) + 2\left(\delta Z_{\gamma\gamma}\right) + 2\left(\delta\overline{Z}^{e,L}_{g1,g1} + \delta Z^{e,L}_{g1,g1}\right) + \frac{1}{c_W s_W}\left(\delta Z_{Z\gamma} - 2\left(\delta Z_{Z\gamma}\right)s_W^2\right)\right) \\ \hline -\frac{1}{2c_W}\left(\left(\delta Z_{Z\gamma}\right)s_W - c_W\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma} + \delta\overline{Z}^{e,R}_{g1,g1} + \delta Z^{e,R}_{g1,g1}\right)\right) \end{bmatrix}$$

$$C_{199}(\bar{\nu}_{g1}, \nu_{g2}, Z) = \frac{ie\delta_{g1,g2}}{4c_W^3 s_W^2}\left(\left(2\left(\delta s_W\right) - s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta\overline{Z}^{\nu,L}_{g1,g1} + \delta Z^{\nu,L}_{g1,g1}\right)\right)c_W^2 - 2\left(\delta s_W\right)s_W^2\right)\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$C_{200}(\bar{e}_{g1}, e_{g2}, Z) = -\frac{ie\delta_{g1,g2}}{c_W^3}\begin{bmatrix} \frac{1}{4s_W^2}\left(\left(2\left(\delta s_W\right) + s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta\overline{Z}^{e,L}_{g1,g1} + \delta Z^{e,L}_{g1,g1}\right)\left(1 - 2c_W^2\right)\right)c_W^2 + 2\left(\delta s_W - \left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2\right) \\ \hline \frac{1}{2}\left(2\left(\delta s_W\right) - \left(\left(\delta Z_{\gamma Z}\right)c_W - s_W\left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta\overline{Z}^{e,R}_{g1,g1} + \delta Z^{e,R}_{g1,g1}\right)\right)c_W^2\right) \end{bmatrix}$$

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

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

$$C_{455}(\bar{\nu}_{g1}, \nu_{g2}, \gamma) = -\frac{ie\delta_{g1,g2}\left(\delta Z_{Z\gamma}\right)}{4c_W s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

[FFV] 2 Neutralinos – Gauge Boson

$$\underset{275}{C}\left(\tilde{\chi}^0_{n1},\tilde{\chi}^0_{n2},Z\right)=\frac{ie}{4c_W^3s_W^2}\left[\begin{array}{l}-\left(\begin{array}{l}2\left(\delta s_W\right)Z_{n1,3}s_W^2-\\\left(\begin{array}{l}\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)Z_{n1,3}-\\\left(\begin{array}{l}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}\end{array}\right)s_W\end{array}\right)c_W^2\end{array}\right)Z^*_{n2,3}-\\\left(\begin{array}{l}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{array}\right)s_Wc_W^2+\\\left(\begin{array}{l}2\left(\delta s_W\right)Z_{n1,4}s_W^2-\\\left(\begin{array}{l}\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)Z_{n1,4}-\\\left(\begin{array}{l}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}\end{array}\right)s_W\end{array}\right)c_W^2\end{array}\right)Z^*_{n2,4}\\\hline\left(\begin{array}{l}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-\\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)\end{array}\right)Z^*_{n1,3}-\\\left(\begin{array}{l}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-\\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)\end{array}\right)Z^*_{n1,4}+\\\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_Wc_W^2\end{array}\right]$$

$$\underset{414}{C}\left(\tilde{\chi}^0_{n1},\tilde{\chi}^0_{n2},\gamma\right)=\frac{ie\left(\delta Z_{Z\gamma}\right)}{4c_Ws_W}\left[\begin{array}{l}-Z_{n1,3}Z^*_{n2,3}+Z_{n1,4}Z^*_{n2,4}\\\hline Z_{n2,3}Z^*_{n1,3}-Z_{n2,4}Z^*_{n1,4}\end{array}\right]$$

[FFV] 2 Quarks – Gauge Boson

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

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

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

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

$$\underset{212}{C}\left(\overline{d}_{g1},u_{g2},W^-\right)=\frac{ie}{2\sqrt{2}s_W^2}\left(\begin{array}{l}\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_W\right)s_W\right)\mathrm{CKM}^*_{g2,g1}-\\\left(\begin{array}{l}2\delta\mathrm{CKM}^*_{g2,g1}+\mathrm{CKM}^*_{g2,1}\delta\overline{Z}^{d,L}_{g1,1}+\mathrm{CKM}^*_{g2,2}\delta\overline{Z}^{d,L}_{g1,2}+\mathrm{CKM}^*_{g2,3}\delta\overline{Z}^{d,L}_{g1,3}+\\\mathrm{CKM}^*_{1,g1}\delta Z^{u,L}_{1,g2}+\mathrm{CKM}^*_{2,g1}\delta Z^{u,L}_{2,g2}+\mathrm{CKM}^*_{3,g1}\delta Z^{u,L}_{3,g2}\end{array}\right)s_W\end{array}\right)\left[\begin{array}{c}1\\\hline0\end{array}\right]$$

$$\underset{213}{C}\left(\overline{u}_{g1},d_{g2},W^+\right)=\frac{ie}{2\sqrt{2}s_W^2}\left(\begin{array}{l}\mathrm{CKM}_{g1,g2}\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_W\right)s_W\right)-\\\left(\begin{array}{l}2\left(\delta\mathrm{CKM}_{g1,g2}\right)+\mathrm{CKM}_{1,g2}\delta\overline{Z}^{u,L}_{g1,1}+\mathrm{CKM}_{2,g2}\delta\overline{Z}^{u,L}_{g1,2}+\mathrm{CKM}_{3,g2}\delta\overline{Z}^{u,L}_{g1,3}+\\\mathrm{CKM}_{g1,1}\delta Z^{d,L}_{1,g2}+\mathrm{CKM}_{g1,2}\delta Z^{d,L}_{2,g2}+\mathrm{CKM}_{g1,3}\delta Z^{d,L}_{3,g2}\end{array}\right)s_W\end{array}\right)\left[\begin{array}{c}1\\\hline0\end{array}\right]$$

$$\underset{459}{C}\left(\overline{u}_{g1},u_{g2},g\right)=-\frac{1}{2}ig_s\delta_{g1,g2}T^{g3}_{c1,c2}\left[\frac{2\left(\delta Z_{g_s}\right)+\delta Z_{gg}+\delta\overline{Z}^{u,L}_{g1,g1}+\delta Z^{u,L}_{g2,g2}}{2\left(\delta Z_{g_s}\right)+\delta Z_{gg}+\delta\overline{Z}^{u,R}_{g1,g1}+\delta Z^{u,R}_{g2,g2}}\right]$$

$$\underset{460}{C}\left(\overline{d}_{g1},d_{g2},g\right)=-\frac{1}{2}ig_s\delta_{g1,g2}T^{g3}_{c1,c2}\left[\frac{2\left(\delta Z_{g_s}\right)+\delta Z_{gg}+\delta\overline{Z}^{d,L}_{g1,g1}+\delta Z^{d,L}_{g2,g2}}{2\left(\delta Z_{g_s}\right)+\delta Z_{gg}+\delta\overline{Z}^{d,R}_{g1,g1}+\delta Z^{d,R}_{g2,g2}}\right]$$

[SSS] 3 Higgs

$$\underset{43}{C}\left(h^0,h^0,h^0\right) = \left[\frac{3ie}{4M_W c_W^4 s_W^2}\left(\begin{array}{l}(\delta Z_{hH})\, s_W \left(c_{2\alpha}c_{\alpha+\beta} - 2s_{2\alpha}s_{\alpha+\beta}\right) c_W^2 M_W^2 - \\ \left(\begin{array}{l}4\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 s_W^2 - \\ \left(\begin{array}{l}2\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 - \\ s_W\left(s_{\alpha+\beta}\delta M_W^2 + \left(2\left(\delta Z_e\right) + 3\left(\delta Z_{hh}\right)\right) s_{\alpha+\beta} + 2\left(\delta t_\beta\right) c_{\alpha+\beta} c_\beta^2\right) M_W^2\end{array}\right) c_W^2\end{array}\right) c_{2\alpha}\end{array}\right)\right]$$

$$\underset{44}{C}\left(h^0,h^0,H^0\right) = \left[-\frac{ie}{4M_W c_W^4 s_W^2}\left(\begin{array}{l}2\left(\begin{array}{l}4\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 s_W^2 - \\ \left(\begin{array}{l}2\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 - \\ \left(\begin{array}{l}s_{\alpha+\beta}\delta M_W^2 - \\ \left(\begin{array}{l}2c_{\alpha+\beta}\left(\delta Z_{hH} - \left(\delta t_\beta\right) c_\beta^2\right) - \\ \left(2\left(\delta Z_e + \delta Z_{hh}\right) + \delta Z_{HH}\right) s_{\alpha+\beta}\end{array}\right) M_W^2\end{array}\right) s_W\end{array}\right) c_W^2\end{array}\right) s_{2\alpha} + \\ \left(\begin{array}{l}s_W s_{\alpha+\beta} c_W^2\left(\delta Z_{hH} + 2\left(\delta t_\beta\right) c_\beta^2\right) M_W^2 + \\ c_{\alpha+\beta}\left(c_W^2\left(2\left(\delta s_W\right) M_W^2 - s_W\left(\delta M_W^2 + \left(2\left(\delta Z_e + \delta Z_{hh}\right) + \delta Z_{HH}\right) M_W^2\right)\right) - 4\left(\delta s_W\right) M_W^2 s_W^2\right)\end{array}\right) c_{2\alpha}\end{array}\right)\right]$$

$$\underset{45}{C}\left(h^0,H^0,H^0\right) = \left[\frac{ie}{4M_W c_W^4 s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}8\left(\delta s_W\right) s_{2\alpha} M_W^2 s_W^2 - \\ \left(\begin{array}{l}4\left(\delta s_W\right) s_{2\alpha} M_W^2 - \\ \left(\begin{array}{l}2s_{2\alpha}\delta M_W^2 - \\ \left(\begin{array}{l}c_{2\alpha}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right) c_\beta^2\right) - \\ \left(4\left(\delta Z_e\right) + 2\left(\delta Z_{hh}\right) + 4\left(\delta Z_{HH}\right)\right) s_{2\alpha}\end{array}\right) M_W^2\end{array}\right) s_W\end{array}\right) c_W^2\end{array}\right) c_{\alpha+\beta} - \\ \left(\begin{array}{l}4 s_W s_{2\alpha} c_W^2\left(\delta Z_{hH} + \left(\delta t_\beta\right) c_\beta^2\right) M_W^2 - \\ c_{2\alpha}\left(c_W^2\left(s_W\delta M_W^2 - \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{hh} + 2\left(\delta Z_{HH}\right)\right) s_W\right) M_W^2\right) + 4\left(\delta s_W\right) M_W^2 s_W^2\right)\end{array}\right) s_{\alpha+\beta}\end{array}\right)\right]$$

$$\underset{46}{C}\left(H^0,H^0,H^0\right) = \left[\frac{3ie}{4M_W c_W^4 s_W^2}\left(\begin{array}{l}2\left(\delta Z_{hH}\right) c_{\alpha+\beta} s_W s_{2\alpha} c_W^2 M_W^2 + \\ \left(\begin{array}{l}s_W s_{\alpha+\beta} c_W^2\left(\delta Z_{hH} + 2\left(\delta t_\beta\right) c_\beta^2\right) M_W^2 - \\ c_{\alpha+\beta}\left(c_W^2\left(s_W\delta M_W^2 - \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + 3\left(\delta Z_{HH}\right)\right) s_W\right) M_W^2\right) + 4\left(\delta s_W\right) M_W^2 s_W^2\right)\end{array}\right) c_{2\alpha}\end{array}\right)\right]$$

$$
\underset{47}{C}\left(h^0, A^0, A^0\right) = \left[-\frac{ie}{4 M_W c_W^4 s_W^2} \left(\begin{array}{l} 2\left(\delta Z_{AG}\right) s_W s_{2\beta} s_{\alpha+\beta} c_W^2 M_W^2 + \\ \left(\begin{array}{l} 4\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 s_W^2 - \\ \left(\begin{array}{l} 2\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 - \\ \left(\begin{array}{l} s_{\alpha+\beta} \delta M_W^2 - \\ \left(\begin{array}{l} c_{\alpha+\beta}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right) c_\beta^2\right) - \\ \left(2\left(\delta Z_e\right) + 2\left(\delta Z_{AA}\right) + \delta Z_{hh}\right) s_{\alpha+\beta} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_W^2 \end{array} \right) c_{2\beta} \end{array} \right) \right]
$$

$$
\underset{48}{C}\left(h^0, G^0, G^0\right) = \left[-\frac{ie}{4 M_W c_W^4 s_W^2} \left(\begin{array}{l} 2\left(\delta Z_{AG}\right) s_W s_{2\beta} s_{\alpha+\beta} c_W^2 M_W^2 - \\ \left(\begin{array}{l} 4\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 s_W^2 - \\ \left(\begin{array}{l} 2\left(\delta s_W\right) s_{\alpha+\beta} M_W^2 - \\ \left(\begin{array}{l} s_{\alpha+\beta} \delta M_W^2 - \\ \left(\begin{array}{l} c_{\alpha+\beta}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right) c_\beta^2\right) - \\ \left(2\left(\delta Z_e\right) + 2\left(\delta Z_{GG}\right) + \delta Z_{hh}\right) s_{\alpha+\beta} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_W^2 \end{array} \right) c_{2\beta} \end{array} \right) \right]
$$

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

$$
\underset{50}{C}\left(H^0, A^0, A^0\right) = \left[\frac{ie}{4 M_W c_W^4 s_W^2} \left(\begin{array}{l} 2\left(\delta Z_{AG}\right) c_{\alpha+\beta} s_W s_{2\beta} c_W^2 M_W^2 - \\ \left(\begin{array}{l} s_W s_{\alpha+\beta} c_W^2 \left(\delta Z_{hH} + 2\left(\delta t_\beta\right) c_\beta^2\right) M_W^2 + \\ c_{\alpha+\beta}\left(c_W^2\left(2\left(\delta s_W\right) M_W^2 - s_W\left(\delta M_W^2 + \left(2\left(\delta Z_e\right) + 2\left(\delta Z_{AA}\right) + \delta Z_{HH}\right) M_W^2\right)\right) - 4\left(\delta s_W\right) M_W^2 s_W^2\right) \end{array} \right) c_{2\beta} \end{array} \right) \right]
$$

$$
\underset{51}{C}\left(H^0, G^0, G^0\right) = \left[\frac{ie}{4 M_W c_W^4 s_W^2} \left(\begin{array}{l} 2\left(\delta Z_{AG}\right) c_{\alpha+\beta} s_W s_{2\beta} c_W^2 M_W^2 + \\ \left(\begin{array}{l} s_W s_{\alpha+\beta} c_W^2 \left(\delta Z_{hH} + 2\left(\delta t_\beta\right) c_\beta^2\right) M_W^2 + \\ c_{\alpha+\beta}\left(c_W^2\left(2\left(\delta s_W\right) M_W^2 - s_W\left(\delta M_W^2 + \left(2\left(\delta Z_e\right) + 2\left(\delta Z_{GG}\right) + \delta Z_{HH}\right) M_W^2\right)\right) - 4\left(\delta s_W\right) M_W^2 s_W^2\right) \end{array} \right) c_{2\beta} \end{array} \right) \right]
$$

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

$$
\underset{53}{C}\left(h^0,H^-,H^+\right) = \left[\frac{ie}{4M_W c_W^4 s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}c_\alpha s_\beta c_W^2\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\delta M_W^2 + \left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh} + \delta Z_{H^-H^-}\right)M_W^2\right)\right) - \\ s_W\left(4\left(\delta s_W\right)s_W s_{\alpha+\beta} + \left(\delta Z_{hH}\right)s_\alpha s_\beta c_W^2 - \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)c_{\alpha+\beta}c_W^4\right)M_W^2\end{array}\right)c_{2\beta} - \\ \left(\begin{array}{l}\left(\begin{array}{l}2\left(\delta s_W\right)s_\alpha M_W^2 - \\ s_W\left(s_\alpha\delta M_W^2 - \left(\left(\delta Z_{hH}\right)c_\alpha - \left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh} + \delta Z_{H^-H^-}\right)s_\alpha\right)M_W^2\right)\end{array}\right)c_\beta\left(1 - 2c_\beta^2 s_W^2 + 2c_W^2 s_\beta^2\right) + \\ 2\left(\begin{array}{l}\left(\delta s_\beta\right)s_W M_W^2\left(1 - 2s_W^2 s_\beta^2\right) - \\ \left(\begin{array}{l}2\left(\delta s_W\right)s_\beta M_W^2 - \\ \left(\begin{array}{l}s_\beta\delta M_W^2 + \\ \left(\begin{array}{l}\left(\delta c_\beta\right)s_{2\beta} + \\ \left(2\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh} + \delta Z_{H^-H^-}\right)s_\beta\end{array}\right)M_W^2\end{array}\right)s_W\end{array}\right)c_W^2\end{array}\right)c_\alpha - \\ \left(\begin{array}{l}s_\alpha\left(2\left(\left(\delta s_\beta\right)s_{2\beta} - \left(\delta Z_{hH}\right)s_\beta\right)c_W^2 + \left(\delta c_\beta\right)\left(2 - 4c_\beta^2 s_W^2\right)\right) - \\ \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)s_{2\beta}s_{\alpha+\beta}s_W^2\end{array}\right)s_W M_W^2\end{array}\right)c_W^2\end{array}\right)\right]
$$

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

$$
\underset{55}{C}\left(h^0,H^-,G^+\right) = \left[\frac{ie}{4M_W c_W^4 s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}s_W s_{\alpha+\beta}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right)c_\beta^2\right)M_W^2 - \\ c_{\alpha+\beta}\left(2\left(\delta s_W\right)M_W^2 - s_W\left(\delta M_W^2 + \left(2\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)M_W^2\right)\right)\end{array}\right)c_{2\beta}c_W^4 - \\ \left(\begin{array}{l}2M_W^2\left(\left(\delta Z_{G^-H^-}\right)s_{\beta-\alpha}c_W^4 + 2\left(\delta s_W\right)s_{2\beta}s_{\alpha+\beta}s_W^3\right) + \\ \left(\begin{array}{l}2\left(\delta s_W\right)s_{\alpha+\beta}M_W^2 + \\ \left(\begin{array}{l}s_{\alpha+\beta}\delta M_W^2 - \\ \left(\begin{array}{l}c_{\alpha+\beta}\left(\delta Z_{hH} - 2\left(\delta t_\beta\right)c_\beta^2\right) - \\ \left(2\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)s_{\alpha+\beta}\end{array}\right)M_W^2\end{array}\right)s_W\end{array}\right)s_W s_{2\beta}c_W^2\end{array}\right)s_W\end{array}\right)\right]
$$

$$\underset{56}{C}\left(h^0,G^-,H^+\right) = \left[\frac{ie}{4M_W c_W^4 s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}s_W s_{\alpha+\beta}\left(\delta Z_{hH}-2\left(\delta t_\beta\right)c_\beta^2\right)M_W^2- \\ c_{\alpha+\beta}\left(2\left(\delta s_W\right)M_W^2-s_W\left(\delta M_W^2+\left(2\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{hh}+\delta Z_{G^-G^-}\right)M_W^2\right)\right)\end{array}\right)c_{2\beta}c_W^4- \\ \left(\begin{array}{l}M_W^2\left(4\left(\delta s_W\right)s_{2\beta}s_{\alpha+\beta}s_W^3+\left(\delta Z_{H^-G^-}\right)c_W^4\left(c_{\alpha+\beta}s_{2\beta}-2s_\alpha c_\beta^3+2c_\alpha s_\beta^3\right)\right)+ \\ \left(\begin{array}{l}2\left(\delta s_W\right)s_{\alpha+\beta}M_W^2+ \\ \left(\begin{array}{l}s_{\alpha+\beta}\delta M_W^2- \\ \left(\begin{array}{l}c_{\alpha+\beta}\left(\delta Z_{hH}-2\left(\delta t_\beta\right)c_\beta^2\right)- \\ \left(2\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{hh}+\delta Z_{G^-G^-}\right)s_{\alpha+\beta}\end{array}\right)M_W^2\end{array}\right)s_W\end{array}\right)s_W s_{2\beta}c_W^2\end{array}\right)s_W\end{array}\right)\right]$$

$$\underset{57}{C}\left(H^0,H^-,H^+\right) = \left[\frac{ie}{4M_W c_W^4 s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}s_\alpha s_\beta c_W^2\left(2\left(\delta s_W\right)M_W^2-s_W\left(\delta M_W^2+\left(2\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{HH}+\delta Z_{H^-H^-}\right)M_W^2\right)\right)+ \\ M_W^2\left(\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_W s_{\alpha+\beta}c_W^4+4\left(\delta s_W\right)c_{\alpha+\beta}s_W^2\right)\end{array}\right)c_{2\beta}+ \\ \left(\begin{array}{l}2\left(\begin{array}{l}2\left(\delta s_W\right)s_\beta M_W^2- \\ \left(\begin{array}{l}\left(\delta c_\beta\right)s_{2\beta}M_W^2+ \\ \left(\begin{array}{l}\delta M_W^2+ \\ \left(\begin{array}{l}2\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}- \\ \frac{1}{2}\left(\delta Z_{hH}\right)s_{2\beta}-\delta Z_{HH}+ \\ \delta Z_{H^-H^-}\end{array}\right)M_W^2\end{array}\right)s_\beta\end{array}\right)s_W\end{array}\right)s_\alpha c_W^2- \\ \left(\begin{array}{l}s_W M_W^2\left(2\left(\delta s_\beta\right)s_{2\beta}c_W^2+\left(\delta Z_{hH}\right)s_\beta\left(c_{2\beta}+2c_W^2\right)+\left(\delta c_\beta\right)\left(2-4c_\beta^2 s_W^2\right)\right)- \\ c_\beta\left(2\left(\delta s_W\right)M_W^2-s_W\left(\delta M_W^2+\left(2\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{HH}+\delta Z_{H^-H^-}\right)M_W^2\right)\right)\left(1-2c_\beta^2 s_W^2+2c_W^2 s_\beta^2\right)\end{array}\right)c_\alpha+ \\ \left(\begin{array}{l}s_\alpha\left(\left(\delta Z_{hH}\right)\left(c_\beta-2c_\beta^3 s_W^2\right)-\left(\delta s_\beta\right)\left(2-4s_W^2 s_\beta^2\right)\right)+ \\ \left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)c_{\alpha+\beta}s_{2\beta}s_W^2\end{array}\right)s_W M_W^2\end{array}\right)\end{array}\right)\right]$$

$$\underset{58}{C}\left(H^0,G^-,G^+\right) = \left[-\frac{ie}{4M_W c_W^4 s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}\left(\delta s_\beta\right)s_\alpha\left(2-4c_\beta^2 s_W^2\right)+\left(\delta c_\beta\right)c_\alpha\left(2-4s_W^2 s_\beta^2\right)- \\ s_{2\beta}\left(2\left(\left(\delta s_\beta\right)c_\alpha+\left(\delta c_\beta\right)s_\alpha\right)c_W^2+\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)c_{\alpha+\beta}s_W^2\right)\end{array}\right)s_W c_W^2 M_W^2- \\ \left(\begin{array}{l}M_W^2\left(\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_W s_{\alpha+\beta}c_W^4-4\left(\delta s_W\right)c_{\alpha+\beta}s_W^2\right)+ \\ \left(\begin{array}{l}\left(\delta Z_{hH}\right)s_W s_{\alpha+\beta}M_W^2+ \\ c_\alpha c_\beta\left(2\left(\delta s_W\right)M_W^2-s_W\left(\delta M_W^2+\left(2\left(\delta Z_e\right)+\delta Z_{HH}+2\left(\delta Z_{G^-G^-}\right)\right)M_W^2\right)\right)+ \\ s_\alpha s_\beta\left(s_W\delta M_W^2-\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_{HH}+2\left(\delta Z_{G^-G^-}\right)\right)s_W\right)M_W^2\right)\end{array}\right)c_W^2\end{array}\right)c_{2\beta}\end{array}\right)\right]$$

$$
\underset{59}{C}\left(H^0,H^-,G^+\right) = \left[-\frac{\mathrm{i}e}{4M_{\mathrm{W}}c_{\mathrm{W}}^4 s_{\mathrm{W}}^2} \left(\begin{array}{l} \left(\begin{array}{l} 2\left(\delta s_{\mathrm{W}}\right) s_{\alpha+\beta} M_{\mathrm{W}}^2 - \\ \left(\begin{array}{l} s_{\alpha+\beta}\delta M_{\mathrm{W}}^2 + \\ \left(\left(2\left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{HH}} + \delta Z_{\mathrm{G^-G^-}} + \delta Z_{\mathrm{H^-H^-}}\right) s_{\alpha+\beta} + c_{\alpha+\beta}\left(\delta Z_{\mathrm{hH}} + 2\left(\delta t_\beta\right) c_\beta^2\right)\right) M_{\mathrm{W}}^2 \end{array} \right) s_{\mathrm{W}} \end{array} \right) c_{2\beta} c_{\mathrm{W}}^4 - \\ \left(\begin{array}{l} c_{\alpha+\beta} s_{\mathrm{W}} s_{2\beta} \left(c_{\mathrm{W}}^2 \left(s_{\mathrm{W}}\delta M_{\mathrm{W}}^2 + \left(2\left(\delta s_{\mathrm{W}}\right) + \left(2\left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{HH}} + \delta Z_{\mathrm{G^-G^-}} + \delta Z_{\mathrm{H^-H^-}}\right) s_{\mathrm{W}}\right) M_{\mathrm{W}}^2\right) + 4\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 s_{\mathrm{W}}^2\right) - \\ \left(\begin{array}{l} s_{2\beta} s_{\alpha+\beta} \left(\delta Z_{\mathrm{hH}} + 2\left(\delta t_\beta\right) c_\beta^2\right) s_{\mathrm{W}}^2 + \\ \left(\delta Z_{\mathrm{G^-H^-}}\right) c_{\mathrm{W}}^2 \left(s_{2\beta}\left(2 c_\beta s_\alpha - s_{\alpha+\beta}\right) + 2\left(c_\alpha\left(s_{2\beta} s_\beta + c_\beta^3\right) + s_\alpha s_\beta^3\right)\right) \end{array} \right) c_{\mathrm{W}}^2 M_{\mathrm{W}}^2 \end{array} \right) s \end{array} \right)
$$

$$
\underset{60}{C}\left(H^0,G^-,H^+\right) = \left[-\frac{\mathrm{i}e}{4M_{\mathrm{W}}c_{\mathrm{W}}^4 s_{\mathrm{W}}^2} \left(\begin{array}{l} \left(\begin{array}{l} 2\left(\delta s_{\mathrm{W}}\right) s_{\alpha+\beta} M_{\mathrm{W}}^2 - \\ \left(\begin{array}{l} s_{\alpha+\beta}\delta M_{\mathrm{W}}^2 + \\ \left(\left(2\left(\delta Z_{\mathrm{e}}\right) + \delta\overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{HH}} + \delta Z_{\mathrm{G^-G^-}}\right) s_{\alpha+\beta} + c_{\alpha+\beta}\left(\delta Z_{\mathrm{hH}} + 2\left(\delta t_\beta\right) c_\beta^2\right)\right) M_{\mathrm{W}}^2 \end{array} \right) s_{\mathrm{W}} \end{array} \right) c_{2\beta} c_{\mathrm{W}}^4 + \\ \left(\begin{array}{l} c_{\mathrm{W}}^2 M_{\mathrm{W}}^2 \left(s_{2\beta} s_{\alpha+\beta} \left(\delta Z_{\mathrm{hH}} + 2\left(\delta t_\beta\right) c_\beta^2\right) s_{\mathrm{W}}^2 + \left(\delta Z_{\mathrm{H^-G^-}}\right) c_{\mathrm{W}}^2 \left(s_{2\beta} s_{\alpha+\beta} + 2 c_\alpha c_\beta^3 + 2 s_\alpha s_\beta^3\right)\right) - \\ c_{\alpha+\beta} s_{\mathrm{W}} s_{2\beta} \left(c_{\mathrm{W}}^2 \left(s_{\mathrm{W}}\delta M_{\mathrm{W}}^2 + \left(2\left(\delta s_{\mathrm{W}}\right) + \left(2\left(\delta Z_{\mathrm{e}}\right) + \delta\overline{Z}_{\mathrm{H^-H^-}} + \delta Z_{\mathrm{HH}} + \delta Z_{\mathrm{G^-G^-}}\right) s_{\mathrm{W}}\right) M_{\mathrm{W}}^2\right) + 4\left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 s_{\mathrm{W}}^2\right) \end{array} \right) s_{\mathrm{W}} \end{array} \right)
$$

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

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

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

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

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

$$
\underset{215}{C}\left(G^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(\left(\left(\left(\left(\begin{array}{l} 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)c_\beta\delta m^{e_g}_{g2} + \\ \left(\left(\left(\begin{array}{l}\left(\begin{array}{l}\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}\end{array}\right)\left(\mu s_\beta - c_\beta A^{e*}_{g2,g2}\right) + \\ 2(\delta\mu)s_\beta U^{\tilde{e}_{g2}}_{s3,1}\end{array}\right)U^{\tilde{e}_{g2}*}_{s2,2} - \\ \left(\begin{array}{l}\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}\end{array}\right)\left(s_\beta\mu^* - c_\beta A^{e}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,1} + \\ \left(\begin{array}{l}\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}\end{array}\right)\delta Z^{\tilde{e}_{g2}}_{1,s2} + \\ \left(\begin{array}{l}\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}\end{array}\right)\delta Z^{\tilde{e}_{g2}}_{2,s2} + \\ \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)(\delta Z_{AG})\end{array}\right)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)m_{e_{g2}}\right)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}}\end{array}\right)M_W^2 - \\ m_{e_{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(\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}\right)\end{array}\right)\right]
$$

$$\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(\left(\left(\left(\left(\begin{array}{l} 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} + \\ \left(\left(\begin{array}{l} \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} \end{array} \right) \delta Z^{\tilde{u}_{g2}}_{1,s2} + \\ \left(\begin{array}{l} \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} \end{array} \right) \delta Z^{\tilde{u}_{g2}}_{2,s2} - \\ \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) (\delta Z_{AG}) \end{array} \right) m_{u_{g2}} \\ \left(\left(\begin{array}{l} \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} \end{array} \right) \left(\mu s_\beta + c_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} - \\ \left(\begin{array}{l} \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} \end{array} \right) \left(s_\beta \mu^* + c_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} \end{array} \right) s_\beta + \\ \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} \end{array} \right) s_\beta + \\ 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((\delta s_\beta) s_W + (\delta s_W) s_\beta \right) \end{array} \right) m_{u_{g2}} \\ m_{u_{g2}} s_W s_\beta \left(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z_{AA}\right) M_W^2 \right) \left(\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} \right) \end{array} \right) s_W - \\ M_W^2 - \end{array} \right) \right]$$

$$
\underset{217}{C}\left(G^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(\left(\left(\left(\begin{array}{l} 2\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) \delta m^{u_g}_{g2} + \\ \left(\begin{array}{l} \left(\begin{array}{l} \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} \end{array} \right) \left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} - \\ \left(\begin{array}{l} \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} \end{array} \right) \left(c_\beta \mu^* - s_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right) m_{u_{g2}} \end{array} \right) s_\beta + \\ \left(\begin{array}{l} \left(\begin{array}{l} \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} \end{array} \right) \left(\mu c_\beta - s_\beta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} - \\ \left(\begin{array}{l} \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} \end{array} \right) \left(c_\beta \mu^* - s_\beta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} \end{array} \right) s_\beta + \\ \left(\begin{array}{l} \left((\delta\mu) s_{2\beta} - 2\delta \mathrm{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 \mathrm{A}^{u}_{g2,g2} s_\beta^2\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \end{array} \right) m_{u_{g2}} \end{array} \right) s_W - \\ 2\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((\delta s_\beta) s_W + (\delta s_W) s_\beta \right) \end{array} \right) M_W^2 - \\ \left(\begin{array}{l} \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 Z_{AG}) M_W^2 + \\ \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) \left(\delta M_W^2 - (2(\delta Z_e) + \delta Z_{GG}) M_W^2 \right) \end{array} \right) m_{u_{g2}} s_W s_\beta \end{array} \right) \right]
$$

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

$$\underset{219}{C}\left(G^0, \tilde{d}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left[-\frac{e\delta_{g2,g3}}{4c_\beta^2 M_W^3 s_W^2} \left(\left(\left(2\left(\begin{array}{c} \left(\mu s_\beta - c_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(s_\beta \mu^* - c_\beta A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) c_\beta \delta m^{d_g}_{g2} + \right. \right. \right. \right.$$

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

$$\left. \left. \left. \left. \left. \begin{array}{c} 2(\delta\mu) s_\beta U^{\tilde{d}_{g2}}_{s3,1} \end{array} \right) U^{\tilde{d}_{g2}*}_{s2,2} - \right. \right. \right. \right.$$

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

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

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

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

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

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

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

$$\underset{220}{C}\left(h^0, \tilde{\nu}_{g2}, \tilde{\nu}^\dagger_{g3}\right) = \left[-\frac{ie\delta_{g2,g3}}{4M_Z c_W^3 s_W^2} \left(\begin{array}{c} c_W^2 \left(2\left(\delta s_W\right) s_{\alpha+\beta} M_Z^2 - s_W \left(s_{\alpha+\beta}\delta M_Z^2 + 2\left(\left(\delta Z_e\right) s_{\alpha+\beta} + \left(\delta t_\beta\right) c_{\alpha+\beta} c_\beta^2\right) M_Z^2\right)\right) + \\ M_Z^2 \left(s_W \left(\left(\delta Z_{hH}\right) c_{\alpha+\beta} - s_{\alpha+\beta}\left(\delta Z_{hh} + \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right)\right) c_W^2 - 2\left(\delta s_W\right) s_{\alpha+\beta} s_W^2\right) \end{array} \right) \right]$$

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

$$
\underset{222}{C}\left(h^{0},\tilde{e}^{s2}_{g2},\tilde{e}^{s3,\dagger}_{g3}\right) = \left[\left(\frac{1}{4}\mathrm{i}e\delta_{g2,g3}\right) \left(\frac{1}{c_\beta M_W} \left(\frac{1}{s_W} \left(\frac{1}{c_W} \left(\left(\left(c_W m_{e_{g2}} \left(\mu c_\alpha + s_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{1,1} - \left(2c_\beta M_W M_Z s_{\alpha+\beta} s_W^2 - 2c_W s_\alpha m^2_{e_{g2}} \right) U^{\tilde{e}_{g2}}_{1,2} \right) U^{\tilde{e}_{g2}*}_{s2,2} + \left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(1-2c_W^2\right) + 2c_W s_\alpha m^2_{e_{g2}} \right) U^{\tilde{e}_{g2}}_{1,1} + c_W m_{e_{g2}} \left(c_\alpha \mu^* + s_\alpha A^{e}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{1,2} \right) U^{\tilde{e}_{g2}*}_{s2,1} \right) \delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3} + \left(\left(c_W m_{e_{g2}} \left(\mu c_\alpha + s_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{2,1} - \left(2c_\beta M_W M_Z s_{\alpha+\beta} s_W^2 - 2c_W s_\alpha m^2_{e_{g2}} \right) U^{\tilde{e}_{g2}}_{2,2} \right) U^{\tilde{e}_{g2}*}_{s2,2} + \left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(1-2c_W^2\right) + 2c_W s_\alpha m^2_{e_{g2}} \right) U^{\tilde{e}_{g2}}_{2,1} + c_W m_{e_{g2}} \left(c_\alpha \mu^* + s_\alpha A^{e}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{2,2} \right) U^{\tilde{e}_{g2}*}_{s2,1} \right) \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3} \right) + 2 \left(\left((\delta\mu) c_\alpha + s_\alpha \delta \mathrm{A}^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}*}_{s2,2} U^{\tilde{e}_{g2}}_{s3,1} + \left(c_\alpha \delta\mu^* + s_\alpha \delta \mathrm{A}^{e}_{g2,g2}\right) U^{\tilde{e}_{g2}*}_{s2,1} U^{\tilde{e}_{g2}}_{s3,2} \right) m_{e_{g2}} \right) - \frac{2\left(\delta s_W\right)}{c_W s_W^2} \left(\left(c_W m_{e_{g2}} \left(\mu c_\alpha + s_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} + 2\left(c_W s_\alpha m^2_{e_{g2}} + c_\beta M_W M_Z s_{\alpha+\beta} s_W^2 \right) U^{\tilde{e}_{g2}}_{s3,2} \right) U^{\tilde{e}_{g2}*}_{s2,2} - \left(\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(3-2c_W^2\right) - 2c_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}*}_{s2,1} \right) \right) + \left(\left(2 \left(\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}*}_{s2,2} + \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) U^{\tilde{e}_{g2}*}_{s2,1} \right) \delta m^{e_g}_{g2} + \left(\left(\left(c_W m_{e_{g2}} \left(\mu s_\alpha - c_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} - 2\left(c_W c_\alpha m^2_{e_{g2}} - c_{\alpha+\beta} c_\beta M_W M_Z s_W^2 \right) U^{\tilde{e}_{g2}}_{s3,2} \right) U^{\tilde{e}_{g2}*}_{s2,2} - \left(\left(c_{\alpha+\beta} c_\beta M_W M_Z \left(1-2c_W^2\right) + 2c_W c_\alpha m^2_{e_{g2}} \right) U^{\tilde{e}_{g2}}_{s3,1} - c_W m_{e_{g2}} \left(s_\alpha \mu^* - c_\alpha A^{e}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2} \right) U^{\tilde{e}_{g2}*}_{s2,1} \right) \left(\delta Z_{hH}\right) + \left(\left(c_W m_{e_{g2}} \left(\mu c_\alpha + s_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} - \cdots
$$

55

$$
\underset{223}{C}\left(H^0, \tilde{e}^{s2}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \frac{ie\delta_{g2,g3}}{4s^2_W}
$$

$$
\left(
\begin{array}{l}
\frac{1}{c_W c_\beta M_W}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\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^{e*}_{g2,g2}
\end{array}
\right) m_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,1} + \\
2\left(2\left(\delta s_W\right) c_\alpha + \left(\delta Z_{hH}\right) s_W s_\alpha\right) m^2_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) c_W + \\
2 c_\beta M_W M_Z \left(2\left(\delta s_W\right) c_{\alpha+\beta} - \left(\delta Z_{hH}\right) s_W s_{\alpha+\beta}\right) s^2_W U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{s2,2} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
c_\beta M_W M_Z \left(\left(\delta Z_{hH}\right) s_W s_{\alpha+\beta}\left(1 - 2c^2_W\right) - 2\left(\delta s_W\right) c_{\alpha+\beta}\left(3 - 2c^2_W\right)\right) + \\
2 c_W \left(2\left(\delta s_W\right) c_\alpha + \left(\delta Z_{hH}\right) s_W s_\alpha\right) m^2_{e_{g2}}
\end{array}
\right) U^{\tilde{e}_{g2}}_{s3,1} + \\
\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^e_{g2,g2}
\end{array}
\right) c_W m_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{s2,1}
\end{array}
\right) + \\
\left(
\begin{array}{l}
\frac{1}{c_\beta M_W}
\left(
\begin{array}{l}
2\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(\mu s_\alpha - c_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} - \\
4 c_\alpha m_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{s2,2} - \\
\left(
\begin{array}{l}
4 c_\alpha m_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,1} - \\
\left(s_\alpha \mu^* - c_\alpha A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{s2,1}
\end{array}
\right) \delta m^{e_g}_{g2} + \\
\frac{1}{c_W}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
c_W m_{e_{g2}} \left(\mu s_\alpha - c_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} - \\
2\left(c_W c_\alpha m^2_{e_{g2}} - c_{\alpha+\beta} c_\beta M_W M_Z s^2_W\right) U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{1,2} - \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
c_{\alpha+\beta} c_\beta M_W M_Z \left(1 - 2c^2_W\right) + \\
2 c_W c_\alpha m^2_{e_{g2}}
\end{array}
\right) U^{\tilde{e}_{g2}}_{s3,1} - \\
c_W m_{e_{g2}} \left(s_\alpha \mu^* - c_\alpha A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{1,1}
\end{array}
\right) \delta Z^{\tilde{e}_{g2}}_{1,s2} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
c_W m_{e_{g2}} \left(\mu s_\alpha - c_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} - \\
2\left(c_W c_\alpha m^2_{e_{g2}} - c_{\alpha+\beta} c_\beta M_W M_Z s^2_W\right) U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{2,2} - \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
c_{\alpha+\beta} c_\beta M_W M_Z \left(1 - 2c^2_W\right) + \\
2 c_W c_\alpha m^2_{e_{g2}}
\end{array}
\right) U^{\tilde{e}_{g2}}_{s3,1} - \\
c_W m_{e_{g2}} \left(s_\alpha \mu^* - c_\alpha A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{2,1}
\end{array}
\right) \delta Z^{\tilde{e}_{g2}}_{2,s2} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
c_W m_{e_{g2}} \left(\mu s_\alpha - c_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} - \\
2\left(c_W c_\alpha m^2_{e_{g2}} - c_{\alpha+\beta} c_\beta M_W M_Z s^2_W\right) U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{s2,2} - \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
c_{\alpha+\beta} c_\beta M_W M_Z \left(1 - 2c^2_W\right) + \\
2 c_W c_\alpha m^2_{e_{g2}}
\end{array}
\right) U^{\tilde{e}_{g2}}_{s3,1} - \\
c_W m_{e_{g2}} \left(s_\alpha \mu^* - c_\alpha A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{e}_{g2}*}_{s2,1}
\end{array}
\right) \left(2\left(\delta Z_e\right) + \delta Z_{HH}\right)
\end{array}
\right) + \\
\left(
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\left(
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\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\mu s_\alpha - \\
\end{array}
\right) m_{e_{g2}} U^{\tilde{e}_{g2}}_{1,1} - \\
\end{array}
\right) \\
\end{array}
\right) \\
\end{array}
\right) s_W
\end{array}
\right)
\end{array}
\right)
$$

$$
\underset{224}{C}\left(h^0, \tilde{u}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = -\left(\frac{1}{12} i e \delta_{g2,g3}\right)
$$

$$
\frac{1}{M_W s_\beta}
$$

$$
\frac{1}{s_W}
$$

$$
\frac{1}{c_W}
$$

$$
\begin{pmatrix}
3c_W m_{u_{g2}} \left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{1,1} - \\
\left(
\begin{array}{l}
4 M_W M_Z s_{\alpha+\beta} s_\beta s^2_W - \\
6 c_W c_\alpha m^2_{u_{g2}}
\end{array}
\right) U^{\tilde{u}_{g2}}_{1,2}
\end{pmatrix} U^{\tilde{u}_{g2}*}_{s2,2} +
$$

$$
\begin{pmatrix}
\left(
\begin{array}{l}
M_W M_Z s_{\alpha+\beta} s_\beta \left(1 - 4 c^2_W\right) + \\
6 c_W c_\alpha m^2_{u_{g2}}
\end{array}
\right) U^{\tilde{u}_{g2}}_{1,1} + \\
3 c_W m_{u_{g2}} \left(s_\alpha \mu^* + c_\alpha A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{1,2}
\end{pmatrix} U^{\tilde{u}_{g2}*}_{s2,1}
$$

$$
\delta \overline{Z}^{\tilde{u}_{g3}}_{1,s3} +
$$

$$
\begin{pmatrix}
3c_W m_{u_{g2}} \left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{2,1} - \\
\left(
\begin{array}{l}
4 M_W M_Z s_{\alpha+\beta} s_\beta s^2_W - \\
6 c_W c_\alpha m^2_{u_{g2}}
\end{array}
\right) U^{\tilde{u}_{g2}}_{2,2}
\end{pmatrix} U^{\tilde{u}_{g2}*}_{s2,2} +
$$

$$
\begin{pmatrix}
\left(
\begin{array}{l}
M_W M_Z s_{\alpha+\beta} s_\beta \left(1 - 4 c^2_W\right) + \\
6 c_W c_\alpha m^2_{u_{g2}}
\end{array}
\right) U^{\tilde{u}_{g2}}_{2,1} + \\
3 c_W m_{u_{g2}} \left(s_\alpha \mu^* + c_\alpha A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{2,2}
\end{pmatrix} U^{\tilde{u}_{g2}*}_{s2,1}
$$

$$
\delta \overline{Z}^{\tilde{u}_{g3}}_{2,s3}
$$

$$
+
$$

$$
6 \begin{pmatrix}
\left((\delta\mu) s_\alpha + c_\alpha \delta A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} + \\
\left(s_\alpha \delta\mu^* + c_\alpha \delta A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2}
\end{pmatrix} m_{u_{g2}}
$$

$$
+
$$

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

$$
\begin{pmatrix}
\left(
\begin{array}{l}
6 c_W \left(2 (\delta s_W) c_\alpha - (\delta Z_{hH}) s_W s_\alpha\right) m^2_{u_{g2}} - \\
\left(
\begin{array}{l}
2 (\delta s_W) s_{\alpha+\beta} \left(7 - 4 c^2_W\right) - \\
(\delta Z_{hH}) c_{\alpha+\beta} s_W \left(1 - 4 c^2_W\right)
\end{array}
\right) M_W M_Z s_\beta
\end{array}
\right) U^{\tilde{u}_{g2}}_{s3,1} + \\
3 \left(
\begin{array}{l}
\left((\delta Z_{hH}) c_\alpha s_W + 2 (\delta s_W) s_\alpha\right) \mu^* + \\
\left(2 (\delta s_W) c_\alpha - (\delta Z_{hH}) s_W s_\alpha\right) A^{u}_{g2,g2}
\end{array}
\right) c_W m_{u_{g2}} U^{\tilde{u}_{g2}}_{s3,2}
\end{pmatrix} U^{\tilde{u}_{g2}*}_{s2,1}
$$

$$
-
$$

$$
\begin{pmatrix}
6 \begin{pmatrix}
\left(
\begin{array}{l}
\left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} + \\
4 c_\alpha m_{u_{g2}} U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,2} + \\
\left(
\begin{array}{l}
4 c_\alpha m_{u_{g2}} U^{\tilde{u}_{g2}}_{s3,1} + \\
\left(s_\alpha \mu^* + c_\alpha A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,1}
\end{pmatrix} \delta m^{u_g}_{g2} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
3 c_W m_{u_{g2}} \left(\mu s_\alpha + c_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} - \\
\left(
\begin{array}{l}
4 M_W M_Z s_{\alpha+\beta} s_\beta s^2_W - \\
6 c_W c_\alpha m^2_{u_{g2}}
\end{array}
\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,2} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
M_W M_Z s_{\alpha+\beta} s_\beta \left(1 - 4 c^2_W\right) + \\
6 c_W c_\alpha m^2_{u_{g2}}
\end{array}
\right) U^{\tilde{u}_{g2}}_{s3,1} + \\
3 c_W m_{u_{g2}} \left(s_\alpha \mu^* + c_\alpha A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,1}
\end{array}
\right) \delta \overline{Z}^{\tilde{u}_{g2}}_{s3,s3}
\end{pmatrix}
$$

$$
\underset{225}{C}\left(H^0, \tilde{u}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = -\frac{ie\delta_{g2,g3}}{12 s_W^2}
$$

$$
\left[
\frac{1}{c_W M_W s_\beta}
\left(
2\left(
\begin{array}{l}
\left(
\begin{array}{l}
3 c_W m_{u_{g2}} \left(\mu c_\alpha - s_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} - \\
\left(6 c_W s_\alpha m^2_{u_{g2}} - 4 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,2} - \\
\left(
\begin{array}{l}
\left(c_{\alpha+\beta} M_W M_Z s_\beta \left(7 - 4 c_W^2\right) + 6 c_W s_\alpha m^2_{u_{g2}}\right) U^{\tilde{u}_{g2}}_{s3,1} - \\
3 c_W m_{u_{g2}} \left(c_\alpha \mu^* - s_\alpha A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,1}
\end{array}
\right) (\delta s_W) - \right.
$$

$$
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
3 c_W m_{u_{g2}} \left(\mu c_\alpha - s_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} - \\
2\left(3 c_W s_\alpha m^2_{u_{g2}} + 2 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{1,2} + \\
\left(
\begin{array}{l}
\left(c_{\alpha+\beta} M_W M_Z s_\beta \left(1 - 4 c_W^2\right) - 6 c_W s_\alpha m^2_{u_{g2}}\right) U^{\tilde{u}_{g2}}_{s3,1} + \\
3 c_W m_{u_{g2}} \left(c_\alpha \mu^* - s_\alpha A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{1,1}
\end{array}
\right) \delta Z^{\tilde{u}_{g2}}_{1,s2} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
3 c_W m_{u_{g2}} \left(\mu c_\alpha - s_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} - \\
2\left(3 c_W s_\alpha m^2_{u_{g2}} + 2 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{2,2} + \\
\left(
\begin{array}{l}
\left(c_{\alpha+\beta} M_W M_Z s_\beta \left(1 - 4 c_W^2\right) - 6 c_W s_\alpha m^2_{u_{g2}}\right) U^{\tilde{u}_{g2}}_{s3,1} + \\
3 c_W m_{u_{g2}} \left(c_\alpha \mu^* - s_\alpha A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{2,1}
\end{array}
\right) \delta Z^{\tilde{u}_{g2}}_{2,s2} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
3 c_W m_{u_{g2}} \left(\mu c_\alpha - s_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} - \\
2\left(3 c_W s_\alpha m^2_{u_{g2}} + 2 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,2} + \\
\left(
\begin{array}{l}
\left(c_{\alpha+\beta} M_W M_Z s_\beta \left(1 - 4 c_W^2\right) - 6 c_W s_\alpha m^2_{u_{g2}}\right) U^{\tilde{u}_{g2}}_{s3,1} + \\
3 c_W m_{u_{g2}} \left(c_\alpha \mu^* - s_\alpha A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,1}
\end{array}
\right) (2(\delta Z_e) + \delta Z_{HH})
\end{array}
\right) s_W
\right) -
$$

$$
\frac{1}{M_W s_\beta}
\left(
6\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(\mu c_\alpha - s_\alpha A^{u*}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,1} - \\
4 m_{u_{g2}} s_\alpha U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,2} - \\
\left(
\begin{array}{l}
4 m_{u_{g2}} s_\alpha U^{\tilde{u}_{g2}}_{s3,1} - \\
\left(c_\alpha \mu^* - s_\alpha A^{u}_{g2,g2}\right) U^{\tilde{u}_{g2}}_{s3,2}
\end{array}
\right) U^{\tilde{u}_{g2}*}_{s2,1}
\end{array}
\right) \delta m^{u_g}_{g2} - \right.
$$

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

$$
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
3\left(\begin{array}{l}\mu c_\alpha - \\ s_\alpha A^{u*}_{g2,g2}\end{array}\right) m_{u_{g2}} U^{\tilde{u}_{g2}}_{1,1} - \\
6 s_\alpha m^2_{u_{g2}} U^{\tilde{u}_{g2}}_{1,2} \\
4 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2 U^{\tilde{u}_{g2}}_{1,2}
\end{array}
\right) c_W - \\
\left(
\begin{array}{l}
\left(\begin{array}{l}\mu c_\alpha - \\ s_\alpha A^{u*}_{g2,g2}\end{array}\right) m_{u_{g2}} U^{\tilde{u}_{g2}}_{1,1} \\
2 s_\alpha m^2_{u_{g2}} U^{\tilde{u}_{g2}}_{1,2}
\end{array}
\right) s_W
\end{array}
\right) \delta \overline{Z}^{\tilde{u}_{g3}}_{1,s3} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
3\left(\begin{array}{l}\mu c_\alpha - \\ s_\alpha A^{u*}_{g2,g2}\end{array}\right) m_{u_{g2}} U^{\tilde{u}_{g2}}_{2,1} - \\
6 s_\alpha m^2_{u_{g2}} U^{\tilde{u}_{g2}}_{2,2} \\
4 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2 U^{\tilde{u}_{g2}}_{2,2}
\end{array}
\right) c_W - \\
\left(
\begin{array}{l}
\left(\begin{array}{l}\mu c_\alpha - \\ s_\alpha A^{u*}_{g2,g2}\end{array}\right) m_{u_{g2}} U^{\tilde{u}_{g2}}_{2,1} \\
2 s_\alpha m^2_{u_{g2}} U^{\tilde{u}_{g2}}_{2,2}
\end{array}
\right) s_W
\end{array}
\right) \delta \overline{Z}^{\tilde{u}_{g3}}_{2,s3} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
3\left(\begin{array}{l}\mu c_\alpha - \\ s_\alpha A^{u*}_{g2,g2}\end{array}\right) m_{u_{g2}} U^{\tilde{u}_{g2}}_{s2,1} - \\
6 s_\alpha m^2_{u_{g2}} U^{\tilde{u}_{g2}}_{s2,2} \\
4 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2 U^{\tilde{u}_{g2}}_{s2,2}
\end{array}
\right) c_W - \\
\left(
\begin{array}{l}
\left(\begin{array}{l}\mu c_\alpha - \\ s_\alpha A^{u*}_{g2,g2}\end{array}\right) m_{u_{g2}} U^{\tilde{u}_{g2}}_{s2,1} \\
2 s_\alpha m^2_{u_{g2}} U^{\tilde{u}_{g2}}_{s2,2}
\end{array}
\right) s_W
\end{array}
\right) \delta \overline{Z}^{\tilde{u}_{g3}}_{s2,s3} + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
3\left(\begin{array}{l}\mu c_\alpha - \\ s_\alpha A^{u*}_{g2,g2}\end{array}\right) m_{u_{g2}} U^{\tilde{u}_{g2}}_{s1,1} - \\
6 s_\alpha m^2_{u_{g2}} U^{\tilde{u}_{g2}}_{s1,2} \\
4 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2 U^{\tilde{u}_{g2}}_{s1,2}
\end{array}
\right) c_W - \\
\left(
\begin{array}{l}
\left(\begin{array}{l}\mu c_\alpha - \\ s_\alpha A^{u*}_{g2,g2}\end{array}\right) m_{u_{g2}} U^{\tilde{u}_{g2}}_{s1,1} \\
2 s_\alpha m^2_{u_{g2}} U^{\tilde{u}_{g2}}_{s1,2}
\end{array}
\right) s_W
\end{array}
\right) \delta \overline{Z}^{\tilde{u}_{g3}}_{s1,s3}
\end{array}
\right)
$$

$$
\underset{226}{C}\left(h^0, \tilde{d}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left(\frac{1}{12} i e \delta_{g2,g3}\right)
\left(\begin{array}{l}
\frac{1}{c_\beta M_W}\left(\begin{array}{l}
\frac{1}{s_W}\left(\begin{array}{l}
\frac{1}{c_W}\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\begin{array}{l}
3 c_W m_{d_{g2}}\left(\mu c_\alpha + s_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{1,1} - \\
\left(\begin{array}{l} 2 c_\beta M_W M_Z s_{\alpha+\beta} s^2_W - \\ 6 c_W s_\alpha m^2_{d_{g2}} \end{array}\right) U^{\tilde{d}_{g2}}_{1,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,2} - \\
\left(\begin{array}{l}
\left(\begin{array}{l} c_\beta M_W M_Z s_{\alpha+\beta}\left(1 + 2 c^2_W\right) - \\ 6 c_W s_\alpha m^2_{d_{g2}} \end{array}\right) U^{\tilde{d}_{g2}}_{1,1} - \\
3 c_W m_{d_{g2}}\left(c_\alpha \mu^* + s_\alpha A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{1,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,1}
\end{array}\right) \delta \overline{Z}^{\tilde{d}_{g3}}_{1,s3} + \\
\left(\begin{array}{l}
\left(\begin{array}{l}
3 c_W m_{d_{g2}}\left(\mu c_\alpha + s_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{2,1} - \\
\left(\begin{array}{l} 2 c_\beta M_W M_Z s_{\alpha+\beta} s^2_W - \\ 6 c_W s_\alpha m^2_{d_{g2}} \end{array}\right) U^{\tilde{d}_{g2}}_{2,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,2} - \\
\left(\begin{array}{l}
\left(\begin{array}{l} c_\beta M_W M_Z s_{\alpha+\beta}\left(1 + 2 c^2_W\right) - \\ 6 c_W s_\alpha m^2_{d_{g2}} \end{array}\right) U^{\tilde{d}_{g2}}_{2,1} - \\
3 c_W m_{d_{g2}}\left(c_\alpha \mu^* + s_\alpha A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{2,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,1}
\end{array}\right) \delta \overline{Z}^{\tilde{d}_{g3}}_{2,s3}
\end{array}\right) + \\
6\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) m_{d_{g2}}
\end{array}\right) - \\
\frac{2\left(\delta s_W\right)}{c_W s^2_W}\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\begin{array}{l}
3 m_{d_{g2}}\left(\mu c_\alpha + s_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,1} + \\
6 s_\alpha m^2_{d_{g2}} U^{\tilde{d}_{g2}}_{s3,2}
\end{array}\right) c_W + \\
2 c_\beta M_W M_Z s_{\alpha+\beta} s^2_W U^{\tilde{d}_{g2}}_{s3,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,2} - \\
\left(\begin{array}{l}
\left(c_\beta M_W M_Z s_{\alpha+\beta}\left(5 - 2 c^2_W\right) - 6 c_W s_\alpha m^2_{d_{g2}}\right) U^{\tilde{d}_{g2}}_{s3,1} - \\
3 c_W m_{d_{g2}}\left(c_\alpha \mu^* + s_\alpha A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,1}
\end{array}\right)
\end{array}\right) + \\
\left(\begin{array}{l}
6\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\mu c_\alpha + s_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,1} + \\
4 m_{d_{g2}} s_\alpha U^{\tilde{d}_{g2}}_{s3,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,2} + \\
\left(\begin{array}{l}
4 m_{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}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,1}
\end{array}\right) \delta m^{d_g}_{g2} + \\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\begin{array}{l}
3 c_W m_{d_{g2}}\left(\mu s_\alpha - c_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,1} - \\
2\left(3 c_W c_\alpha m^2_{d_{g2}} - c_{\alpha+\beta} c_\beta M_W M_Z s^2_W\right) U^{\tilde{d}_{g2}}_{s3,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,2} + \\
\left(\begin{array}{l}
\left(\begin{array}{l} c_{\alpha+\beta} c_\beta M_W M_Z\left(1 + 2 c^2_W\right) - \\ 6 c_W c_\alpha m^2_{d_{g2}} \end{array}\right) U^{\tilde{d}_{g2}}_{s3,1} + \\
3 c_W m_{d_{g2}}\left(s_\alpha \mu^* - c_\alpha A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,1}
\end{array}\right) (\delta Z_{hH}) + \\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\begin{array}{l}
3 c_W m_{d_{g2}}\left(\mu c_\alpha + s_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{1,1} - \\
\left(\begin{array}{l} 2 c_\beta M_W M_Z s_{\alpha+\beta} s^2_W - \\ 6 c_W s_\alpha m^2_{d_{g2}} \end{array}\right) U^{\tilde{d}_{g2}}_{1,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,2} - \\
\left(\begin{array}{l}
\left(\begin{array}{l} c_\beta M_W M_Z s_{\alpha+\beta}\left(1 + 2 c^2_W\right) - \\ 6 c_W s_\alpha m^2_{d_{g2}} \end{array}\right) U^{\tilde{d}_{g2}}_{1,1} - \\
3 c_W m_{d_{g2}}\left(c_\alpha \mu^* + s_\alpha A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{1,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,1}
\end{array}\right) \delta \overline{Z}^{\tilde{d}_{g3}}_{1,s3} + \\
\left(\begin{array}{l}
\left(\begin{array}{l}
3 c_W m_{d_{g2}}\left(\mu c_\alpha + s_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{2,1} - \\
\left(\begin{array}{l} 2 c_\beta M_W M_Z s_{\alpha+\beta} s^2_W - \\ 6 c_W s_\alpha m^2_{d_{g2}} \end{array}\right) U^{\tilde{d}_{g2}}_{2,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,2} - \\
\left(\begin{array}{l}
\left(\begin{array}{l} c_\beta M_W M_Z s_{\alpha+\beta}\left(1 + 2 c^2_W\right) - \\ 6 c_W s_\alpha m^2_{d_{g2}} \end{array}\right) U^{\tilde{d}_{g2}}_{2,1} - \\
3 c_W m_{d_{g2}}\left(c_\alpha \mu^* + s_\alpha A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{2,2}
\end{array}\right) U^{\tilde{d}_{g2}*}_{s2,1}
\end{array}\right) \delta \overline{Z}^{\tilde{d}_{g3}}_{2,s3}
\end{array}\right)
\end{array}\right)
$$

$$
\underset{227}{C}\left(H^0, \tilde{d}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \Bigg[\left(\frac{1}{12} \mathrm{i} e \delta_{g2,g3}\right) \Bigg(\frac{1}{c_W c_\beta M_W} \Bigg(\frac{1}{s_W^2} \Bigg(\Bigg(\Bigg(3 \Big(\mu \left((\delta Z_{hH}) c_\alpha s_W - 2 (\delta s_W) s_\alpha \right) + \left(2 (\delta s_W) c_\alpha + (\delta Z_{hH}) s_W s_\alpha\right) A^{d*}_{g2,g2} \Big) m_{d_{g2}} U^{\tilde{d}_{g2}}_{s3,1} + 6 \left(2 (\delta s_W) c_\alpha + (\delta Z_{hH}) s_W s_\alpha\right) m^2_{d_{g2}} U^{\tilde{d}_{g2}}_{s3,2} \Bigg) c_W + 2 c_\beta M_W M_Z \left(2 (\delta s_W) c_{\alpha+\beta} - (\delta Z_{hH}) s_W s_{\alpha+\beta}\right) s_W^2 U^{\tilde{d}_{g2}}_{s3,2} \Bigg) U^{\tilde{d}_{g2}*}_{s2,2} + \Bigg(\Bigg(6 c_W \left(2 (\delta s_W) c_\alpha + (\delta Z_{hH}) s_W s_\alpha\right) m^2_{d_{g2}} - \Big(2 (\delta s_W) c_{\alpha+\beta} \left(5 - 2 c_W^2\right) + (\delta Z_{hH}) s_W s_{\alpha+\beta} \left(1 + 2 c_W^2\right) \Big) c_\beta M_W M_Z \Bigg) U^{\tilde{d}_{g2}}_{s3,1} + 3 \Big(\left((\delta Z_{hH}) c_\alpha s_W - 2 (\delta s_W) s_\alpha \right) \mu^* + \left(2 (\delta s_W) c_\alpha + (\delta Z_{hH}) s_W s_\alpha\right) A^{d}_{g2,g2} \Big) c_W m_{d_{g2}} U^{\tilde{d}_{g2}}_{s3,2} \Bigg) U^{\tilde{d}_{g2}*}_{s2,1} \Bigg) + \frac{1}{s_W} \Bigg(\Bigg(\Bigg(\Big(3 m_{d_{g2}} \left(\mu s_\alpha - c_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{1,1} - 6 c_\alpha m^2_{d_{g2}} U^{\tilde{d}_{g2}}_{1,2} \Big) c_W + 2 c_{\alpha+\beta} c_\beta M_W M_Z s_W^2 U^{\tilde{d}_{g2}}_{1,2} \Bigg) \delta \overline{Z}^{\tilde{d}_{g3}}_{1,s3} + \Bigg(\Big(3 m_{d_{g2}} \left(\mu s_\alpha - c_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{2,1} - 6 c_\alpha m^2_{d_{g2}} U^{\tilde{d}_{g2}}_{2,2} \Big) c_W + 2 c_{\alpha+\beta} c_\beta M_W M_Z s_W^2 U^{\tilde{d}_{g2}}_{2,2} \Bigg) \delta \overline{Z}^{\tilde{d}_{g3}}_{2,s3} + 6 c_W m_{d_{g2}} \left((\delta\mu) s_\alpha - c_\alpha \delta A^{d*}_{g2,g2} \right) U^{\tilde{d}_{g2}}_{s3,1} \Bigg) U^{\tilde{d}_{g2}*}_{s2,2} + \Bigg(\Bigg(\Big(c_{\alpha+\beta} c_\beta M_W M_Z \left(1 + 2 c_W^2\right) - 6 c_W c_\alpha m^2_{d_{g2}} \Big) U^{\tilde{d}_{g2}}_{1,1} + 3 c_W m_{d_{g2}} \left(s_\alpha \mu^* - c_\alpha A^{d}_{g2,g2} \right) U^{\tilde{d}_{g2}}_{1,2} \Bigg) \delta \overline{Z}^{\tilde{d}_{g3}}_{1,s3} + \Bigg(\Big(c_{\alpha+\beta} c_\beta M_W M_Z \left(1 + 2 c_W^2\right) - 6 c_W c_\alpha m^2_{d_{g2}} \Big) U^{\tilde{d}_{g2}}_{2,1} + 3 c_W m_{d_{g2}} \left(s_\alpha \mu^* - c_\alpha A^{d}_{g2,g2} \right) U^{\tilde{d}_{g2}}_{2,2} \Bigg) \delta \overline{Z}^{\tilde{d}_{g3}}_{2,s3} + 6 c_W m_{d_{g2}} \left(s_\alpha \delta\mu^* - c_\alpha \delta A^{d}_{g2,g2} \right) U^{\tilde{d}_{g2}}_{s3,2} \Bigg) U^{\tilde{d}_{g2}*}_{s2,1} \Bigg) \Bigg) + \Bigg(\Bigg(6 \Bigg(\Big(\left(\mu s_\alpha - c_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,1} - 4 c_\alpha m_{d_{g2}} U^{\tilde{d}_{g2}}_{s3,2} \Big) U^{\tilde{d}_{g2}*}_{s2,2} - \Big(4 c_\alpha m_{d_{g2}} U^{\tilde{d}_{g2}}_{s3,1} - \left(s_\alpha \mu^* - c_\alpha A^{d}_{g2,g2} \right) U^{\tilde{d}_{g2}}_{s3,2} \Big) U^{\tilde{d}_{g2}*}_{s2,1} \Bigg) \delta m^{d_g}_{g2} + \Bigg(\Bigg(\Bigg(3 c_W m_{d_{g2}} \left(\mu s_\alpha - c_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,1} - 2 \left(3 c_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} \Bigg) U^{\tilde{d}_{g2}*}_{1,2} + \Bigg(\Big(c_{\alpha+\beta} c_\beta M_W M_Z \left(1 + 2 c_W^2\right) - \cdots \Big) U^{\tilde{d}_{g2}}_{s3,1} + \cdots \Bigg) \cdots \Bigg) \delta Z^{\tilde{d}_{g2}}_{1,s2} + \cdots
$$

$$
\underset{228}{C}\left(H^{+},\tilde{d}_{g2}^{s2},\tilde{u}_{g3}^{s3,\dagger}\right) = -\frac{ie}{2\sqrt{2}M_{W}s_{W}^{2}}\left(\begin{array}{l}
\left(\begin{array}{l}
2\left(\begin{array}{l}
\frac{\delta s_{\beta}}{s_{\beta}^{2}}\left(\begin{array}{l}
\left(\begin{array}{l}
c_{\beta}\left(m_{u_{g3}}^{2}+M_{W}^{2}s_{\beta}^{2}\right)U_{s3,1}^{\tilde{u}_{g3}}+\\
m_{u_{g3}}\left(s_{\beta}\mu^{*}+c_{\beta}A_{g3,g3}^{u}\right)U_{s3,2}^{\tilde{u}_{g3}}
\end{array}\right)U_{s2,1}^{\tilde{d}_{g2}*}+\\
c_{\beta}m_{d_{g2}}m_{u_{g3}}U_{s2,2}^{\tilde{d}_{g2}*}U_{s3,2}^{\tilde{u}_{g3}}
\end{array}\right)+\\
\frac{\delta c_{\beta}}{c_{\beta}^{2}}\left(\begin{array}{l}
s_{\beta}\left(m_{d_{g2}}^{2}+c_{\beta}^{2}M_{W}^{2}\right)U_{s2,1}^{\tilde{d}_{g2}*}U_{s3,1}^{\tilde{u}_{g3}}+\\
m_{d_{g2}}U_{s2,2}^{\tilde{d}_{g2}*}\left(\left(\mu c_{\beta}+s_{\beta}A_{g2,g2}^{d*}\right)U_{s3,1}^{\tilde{u}_{g3}}+m_{u_{g3}}s_{\beta}U_{s3,2}^{\tilde{u}_{g3}}\right)
\end{array}\right)
\end{array}\right)+\\
\frac{1}{s_{2\beta}}\left(\begin{array}{l}
2\left(\begin{array}{l}
\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^{*}+2A_{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)-\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\begin{array}{l}
s_{\beta}\left(\mu c_{\beta}+s_{\beta}A_{g2,g2}^{d*}\right)U_{1,1}^{\tilde{u}_{g3}}+\\
m_{u_{g3}}U_{1,2}^{\tilde{u}_{g3}}
\end{array}\right)m_{d_{g2}}U_{s2,2}^{\tilde{d}_{g2}*}-\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\frac{1}{2}M_{W}^{2}s_{2\beta}^{2}-\\
c_{\beta}^{2}m_{u_{g3}}^{2}+m_{d_{g2}}^{2}s_{\beta}^{2}
\end{array}\right)U_{1,1}^{\tilde{u}_{g3}}-\\
c_{\beta}m_{u_{g3}}\left(s_{\beta}\mu^{*}+c_{\beta}A_{g3,g3}^{u}\right)U_{1,2}^{\tilde{u}_{g3}}
\end{array}\right)U_{s2,1}^{\tilde{d}_{g2}*}
\end{array}\right)\delta\overline{Z}_{1,s3}^{\tilde{u}_{g3}}+\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\begin{array}{l}
s_{\beta}\left(\mu c_{\beta}+s_{\beta}A_{g2,g2}^{d*}\right)U_{2,1}^{\tilde{u}_{g3}}+\\
m_{u_{g3}}U_{2,2}^{\tilde{u}_{g3}}
\end{array}\right)m_{d_{g2}}U_{s2,2}^{\tilde{d}_{g2}*}-\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\frac{1}{2}M_{W}^{2}s_{2\beta}^{2}-\\
c_{\beta}^{2}m_{u_{g3}}^{2}+m_{d_{g2}}^{2}s_{\beta}^{2}
\end{array}\right)U_{2,1}^{\tilde{u}_{g3}}-\\
c_{\beta}m_{u_{g3}}\left(s_{\beta}\mu^{*}+c_{\beta}A_{g3,g3}^{u}\right)U_{2,2}^{\tilde{u}_{g3}}
\end{array}\right)U_{s2,1}^{\tilde{d}_{g2}*}
\end{array}\right)\delta\overline{Z}_{2,s3}^{\tilde{u}_{g3}}+\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\mu s_{2\beta}+2A_{g2,g2}^{d*}s_{\beta}^{2}\right)U_{s3,1}^{\tilde{u}_{g3}}+\\
2m_{u_{g3}}U_{s3,2}^{\tilde{u}_{g3}}
\end{array}\right)\delta m_{g2}^{d_{g}}+\\
\left(\begin{array}{l}
\left((\delta\mu)s_{2\beta}+2\delta A_{g2,g2}^{d*}s_{\beta}^{2}\right)U_{s3,1}^{\tilde{u}_{g3}}+\\
2\delta m_{g3}^{u_{g}}U_{s3,2}^{\tilde{u}_{g3}}
\end{array}\right)m_{d_{g2}}
\end{array}\right)U_{s2,2}^{\tilde{d}_{g2}*}-\\
\left(\begin{array}{l}
\left(\begin{array}{l}
s_{\beta}\left(m_{d_{g2}}^{2}-m_{u_{g3}}^{2}-c_{2\beta}M_{W}^{2}\right)U_{s3,1}^{\tilde{u}_{g3}}+\\
m_{u_{g3}}\left(c_{\beta}\mu^{*}-s_{\beta}A_{g3,g3}^{u}\right)U_{s3,2}^{\tilde{u}_{g3}}
\end{array}\right)c_{\beta}U_{s2,1}^{\tilde{d}_{g2}*}-\\
m_{d_{g2}}s_{\beta}\left(\mu s_{\beta}-c_{\beta}A_{g2,g2}^{d*}\right)U_{s2,2}^{\tilde{d}_{g2}*}U_{s3,1}^{\tilde{u}_{g3}}
\end{array}\right)(\delta Z_{H^{-}G^{-}})+\\
\left(\begin{array}{l}
\left(\begin{array}{l}
4m_{u_{g3}}c_{\beta}^{2}U_{s3,1}^{\tilde{u}_{g3}}+\\
\left(s_{2\beta}\mu^{*}+2A_{g3,g3}^{u}c_{\beta}^{2}\right)U_{s3,2}^{\tilde{u}_{g3}}
\end{array}\right)\delta m_{g3}^{u_{g}}+\\
4m_{d_{g2}}\delta m_{g2}^{d_{g}}s_{\beta}^{2}U_{s3,1}^{\tilde{u}_{g3}}+\\
m_{u_{g3}}\left(s_{2\beta}\delta\mu^{*}+2\delta A_{g3,g3}^{u}c_{\beta}^{2}\right)U_{s3,2}^{\tilde{u}_{g3}}
\end{array}\right)U_{s2,1}^{\tilde{d}_{g2}*}
\end{array}\right)
\end{array}\right)
\end{array}\right)\mathrm{CKM}_{g3,g2}s_{W}+
$$

$$
\underset{229}{C}\left(H^-,\tilde{u}^{s2}_{g2},\tilde{d}^{s3,\dagger}_{g3}\right) = \frac{ie}{2\sqrt{2}M_W s^2_W}\left(\begin{array}{l}
\frac{2}{s_{2\beta}}\left(\begin{array}{l}
\frac{s_W}{2}\left(\begin{array}{l}
\left(\begin{array}{l}\left(\mu s_{2\beta}+2A^{u*}_{g2,g2}c^2_\beta\right)U^{\tilde{d}_{g3}}_{s3,1}+\\ 2m_{d_{g3}}U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)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(\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^*+2A^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{array}\right)+\\
\left(\begin{array}{l}\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^*+2A^d_{g3,g3}s^2_\beta\right)\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}-\\
m_{u_{g2}}U^{\tilde{u}_{g2}*}_{s2,2}\left(c_\beta\left(\mu s_\beta+c_\beta A^{u*}_{g2,g2}\right)U^{\tilde{d}_{g3}}_{s3,1}+m_{d_{g3}}U^{\tilde{d}_{g3}}_{s3,2}\right)
\end{array}\right)\left(2\left(\delta s_W\right)-2\left(\delta Z_e\right)s_W\right)
\end{array}\right)\mathrm{CKM}^*_{g2,g3}-\\
\left(\begin{array}{l}\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^*+2A^d_{g3,g3}s^2_\beta\right)\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}-\\
m_{u_{g2}}U^{\tilde{u}_{g2}*}_{s2,2}\left(c_\beta\left(\mu s_\beta+c_\beta A^{u*}_{g2,g2}\right)U^{\tilde{d}_{g3}}_{s3,1}+m_{d_{g3}}U^{\tilde{d}_{g3}}_{s3,2}\right)
\end{array}\right)\left(\left(\delta Z_{H^-H^-}\right)\mathrm{CKM}^*_{g2,g3}+2\delta\mathrm{CKM}^*_{g2,g3}\right)+\\
\frac{\mathrm{CKM}^*_{g2,g3}}{2M^2_W}\left(\begin{array}{l}
\left(\begin{array}{l}\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(2\delta M^2_W c^2_\beta-\left(\delta Z_{G^-H^-}\right)s_{2\beta}M^2_W\right)\end{array}\right)U^{\tilde{d}_{g3}}_{s3,1}+\\ 2m_{d_{g3}}\delta M^2_W U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)m_{u_{g2}}U^{\tilde{u}_{g2}*}_{s2,2}+\\
\left(\begin{array}{l}\left(\begin{array}{l}\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)+\\ \left(\begin{array}{l}M^2_W s^2_{2\beta}+\\ 2\left(c^2_\beta m^2_{u_{g2}}+m^2_{d_{g3}}s^2_\beta\right)\end{array}\right)\delta M^2_W\end{array}\right)U^{\tilde{d}_{g3}}_{s3,1}+\\
\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(s_{2\beta}\delta M^2_W-2\left(\delta Z_{G^-H^-}\right)M^2_W s^2_\beta\right)\end{array}\right)m_{d_{g3}}U^{\tilde{d}_{g3}}_{s3,2}
\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}
\end{array}\right)s_W
\end{array}\right)\\
\frac{2}{s^2_{2\beta}}\left(\begin{array}{l}
2\left(\begin{array}{l}\left(\begin{array}{l}\left(\delta s_\beta\right)c_\beta\left(\mu s_{2\beta}+2A^{u*}_{g2,g2}c^2_\beta\right)U^{\tilde{d}_{g3}}_{s3,1}+\\ 2m_{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)m_{u_{g2}}U^{\tilde{u}_{g2}*}_{s2,2}+\\
\left(\begin{array}{l}\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}+\\ 2\left(\delta c_\beta\right)m_{d_{g3}}s_\beta\left(s_{2\beta}\mu^*+2A^d_{g3,g3}s^2_\beta\right)U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}
\end{array}\right)-\\
\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\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)s_\beta+\\ c^2_\beta m^2_{u_{g2}}U^{\tilde{d}_{g3}}_{1,1}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}+\\
\left(\begin{array}{l}\left(\begin{array}{l}\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_\beta-\\ s_\beta m^2_{u_{g2}}U^{\tilde{d}_{g3}}_{1,1}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,2}
\end{array}\right)\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3}+\\
\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\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)s_\beta+\\ c^2_\beta m^2_{u_{g2}}U^{\tilde{d}_{g3}}_{1,1}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}+\\
\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\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_\beta-\\ s_\beta m^2_{u_{g2}}U^{\tilde{d}_{g3}}_{1,1}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,2}
\end{array}\right)\delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3}
\end{array}\right)
\end{array}\right)
$$

$$
\underset{230}{C}\left(H^{+},\tilde{e}_{g2}^{s2},\tilde{\nu}_{g3}^{\dagger}\right) = \left[\frac{\mathrm{i}e\delta_{g2,g3}}{2\sqrt{2}c_{\beta}^{2}M_{W}^{3}s_{W}^{2}}\left(\begin{array}{l}
\left(\begin{array}{l}
2c_{\beta}s_{W}\delta m_{g3}^{e_{g}}\left(\mu c_{\beta}+s_{\beta}A_{g3,g3}^{e*}\right)M_{W}^{2}+ \\
\left(\begin{array}{l}
\left(\begin{array}{l}
c_{\beta}\left(2(\delta\mu)s_{W}M_{W}^{2}-\mu\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}\right)M_{W}^{2}\right)\right)+ \\
\left(\begin{array}{l}
2s_{\beta}\delta A_{g3,g3}^{e*}- \\
\mu\left(\begin{array}{l}
2\left(\delta c_{\beta}\right)- \\
c_{\beta}\left(2\left(\delta Z_{e}\right)+\delta\overline{Z}_{H^{-}H^{-}}+\delta\overline{Z}_{1,1}^{\tilde{\nu}}\right)- \\
\left(\delta Z_{H^{-}G^{-}}\right)s_{\beta}
\end{array}\right)
\end{array}\right)s_{W}M_{W}^{2}
\end{array}\right)c_{\beta}- \\
\left(\begin{array}{l}
\left(\frac{1}{2}s_{2\beta}\right)\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\overline{Z}_{1,1}^{\tilde{\nu}}\right)M_{W}^{2}\right)\right)+ \\
s_{W}\left(2\left(\delta c_{\beta}\right)s_{\beta}+\left(\delta Z_{H^{-}G^{-}}\right)c_{\beta}^{2}\right)M_{W}^{2}
\end{array}\right)A_{g3,g3}^{e*}
\end{array}\right)m_{e_{g3}}
\end{array}\right)U_{s2,2}^{\tilde{e}_{g3}*}+ \\
\left(\begin{array}{l}
m_{e_{g3}}\left(\mu c_{\beta}+s_{\beta}A_{g3,g3}^{e*}\right)\left(\delta Z_{1,s2}^{\tilde{e}_{g2}}U_{1,2}^{\tilde{e}_{g3}*}+\delta Z_{2,s2}^{\tilde{e}_{g2}}U_{2,2}^{\tilde{e}_{g3}*}\right)+ \\
\left(s_{\beta}m_{e_{g3}}^{2}-c_{\beta}s_{2\beta}M_{W}^{2}\right)\left(\delta Z_{1,s2}^{\tilde{e}_{g2}}U_{1,1}^{\tilde{e}_{g3}*}+\delta Z_{2,s2}^{\tilde{e}_{g2}}U_{2,1}^{\tilde{e}_{g3}*}\right)
\end{array}\right)c_{\beta}s_{W}M_{W}^{2}- \\
\left(\begin{array}{l}
2c_{\beta}^{3}\left(s_{W}s_{\beta}\delta M_{W}^{2}M_{W}^{2}+\left(\left(\delta s_{\beta}\right)s_{W}-2\left(\delta s_{W}\right)s_{\beta}\right)M_{W}^{4}\right)+ \\
m_{e_{g3}}s_{2\beta}\left(\left(\delta s_{W}\right)m_{e_{g3}}-2s_{W}\delta m_{g3}^{e_{g}}\right)M_{W}^{2}- \\
\left(\begin{array}{l}
c_{\beta}\left(\left(\delta Z_{H^{-}G^{-}}\right)c_{2\beta}c_{\beta}-\left(\delta c_{\beta}+\left(2\left(\delta Z_{e}\right)+\delta\overline{Z}_{H^{-}H^{-}}\right)c_{\beta}\right)s_{2\beta}\right)M_{W}^{4}+ \\
\frac{1}{2}\left(\begin{array}{l}
s_{2\beta}\delta\overline{Z}_{1,1}^{\tilde{\nu}}M_{W}^{2}\left(m_{e_{g3}}^{2}-2c_{\beta}^{2}M_{W}^{2}\right)- \\
\left(\begin{array}{l}
s_{2\beta}\delta M_{W}^{2}+ \\
\left(\begin{array}{l}
4\left(\delta c_{\beta}\right)s_{\beta}- \\
\left(2\left(\delta Z_{e}\right)+\delta\overline{Z}_{H^{-}H^{-}}\right)s_{2\beta}+ \\
2\left(\delta Z_{H^{-}G^{-}}\right)c_{\beta}^{2}
\end{array}\right)M_{W}^{2}
\end{array}\right)m_{e_{g3}}^{2}
\end{array}\right)s_{W}
\end{array}\right)U_{s2,1}^{\tilde{e}_{g3}*}
\end{array}\right)
\end{array}\right)
$$

$$\underset{231}{C}\left(H^{-},\tilde{\nu}_{g2},\tilde{e}^{s3,\dagger}_{g3}\right) = \left[\frac{ie\delta_{g2,g3}}{2\sqrt{2}c_\beta^2 M_W^3 s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\left(s_\beta m_{e_{g2}}^2 - c_\beta s_{2\beta} M_W^2\right) U_{1,1}^{\tilde{e}_{g2}} + \\ m_{e_{g2}}\left(c_\beta \mu^* + s_\beta A_{g2,g2}^e\right) U_{1,2}^{\tilde{e}_{g2}}\end{array}\right)\delta\overline{Z}_{1,s3}^{\tilde{e}_{g3}} + \\ \left(\begin{array}{l}\left(s_\beta m_{e_{g2}}^2 - c_\beta s_{2\beta} M_W^2\right) U_{2,1}^{\tilde{e}_{g2}} + \\ m_{e_{g2}}\left(c_\beta \mu^* + s_\beta A_{g2,g2}^e\right) U_{2,2}^{\tilde{e}_{g2}}\end{array}\right)\delta\overline{Z}_{2,s3}^{\tilde{e}_{g3}}\end{array}\right)c_\beta + \\ \delta m_{g2}^{e_g}\left(s_{2\beta} A_{g2,g2}^e + 2\mu^* c_\beta^2\right) U_{s3,2}^{\tilde{e}_{g2}}\end{array}\right)M_W^2 + \\ \left(\frac{1}{2} m_{e_{g2}}^2 U_{s3,1}^{\tilde{e}_{g2}}\right)\left(\begin{array}{l}\left(\left(2\left(\delta Z_e\right) + \delta Z_{H^-H^-}\right)s_{2\beta} - 4\left(\delta c_\beta\right)s_\beta - 2\left(\delta Z_{G^-H^-}\right)c_\beta^2\right)M_W^2 - \\ s_{2\beta}\left(\delta M_W^2 - \delta Z_{1,1}^{\tilde{\nu}} M_W^2\right)\end{array}\right)\end{array}\right)s_W - \\ \left(\begin{array}{l}2c_\beta^3\left(s_W s_\beta \delta M_W^2 M_W^2 + \left(\left(\delta s_\beta\right)s_W - 2\left(\delta s_W\right)s_\beta\right)M_W^4\right) + \\ \left(\frac{1}{4} s_W M_W^4\right)\left(4s_{2\beta}\left(\left(\delta c_\beta\right)c_\beta + \left(2\left(\delta Z_e\right) + \delta Z_{H^-H^-} + \delta Z_{1,1}^{\tilde{\nu}}\right)c_\beta^2\right) - \left(\delta Z_{G^-H^-}\right)\left(4c_\beta^4 - s_{2\beta}^2\right)\right) + \\ m_{e_{g2}} s_{2\beta}\left(\left(\delta s_W\right)m_{e_{g2}} - 2s_W \delta m_{g2}^{e_g}\right)M_W^2\end{array}\right)U_{s3,1}^{\tilde{e}_{g2}} - \\ \left(\begin{array}{l}A_{g2,g2}^e\left(\left(\delta s_W - \left(\delta Z_e\right)s_W\right)s_{2\beta} M_W^2 + s_W s_\beta\left(c_\beta \delta M_W^2 + 2\left(\delta c_\beta\right)M_W^2\right)\right) + \\ c_\beta^2\left(s_W \mu^* \delta M_W^2 + \left(2\left(\delta s_W\right)\mu^* - 2s_W \delta\mu^*\right)M_W^2\right) - \\ \left(\frac{1}{2} s_W M_W^2\right)\left(\begin{array}{l}2s_{2\beta}\delta A_{g2,g2}^e + \\ A_{g2,g2}^e\left(s_{2\beta}\left(\delta Z_{H^-H^-} + \delta Z_{1,1}^{\tilde{\nu}}\right) - 2\left(\delta Z_{G^-H^-}\right)c_\beta^2\right) - \\ \mu^*\left(4\left(\delta c_\beta\right)c_\beta - \left(\delta Z_{G^-H^-}\right)s_{2\beta} - 2\left(2\left(\delta Z_e\right) + \delta Z_{H^-H^-} + \delta Z_{1,1}^{\tilde{\nu}}\right)c_\beta^2\right)\end{array}\right)\end{array}\right)m_{e_{g2}} U_{s3,2}^{\tilde{e}_{g2}}\end{array}\right)\right]$$

$$
\underset{232}{C}\left(G^{+},\tilde{d}^{s2}_{g2},\tilde{u}^{s3,\dagger}_{g3}\right) = -\frac{ie}{2\sqrt{2}M_{W}s^{2}_{W}}\left(\begin{array}{l}
\frac{2}{s_{2\beta}}\left(\begin{array}{l}
\left(\begin{array}{l}
\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}-\\
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}
\end{array}\right)\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(\begin{array}{l}
\left(\begin{array}{l}
\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}
\end{array}\right)m_{d_{g2}}U^{\tilde{d}_{g2}*}_{s2,2}+\\
\left(\begin{array}{l}
\left(\begin{array}{l}
s_{2\beta}M^{2}_{W}\left(c_{2\beta}\delta M^{2}_{W}-\left(\delta Z_{G^{-}H^{-}}\right)s_{2\beta}M^{2}_{W}\right)-\\
m^{2}_{u_{g3}}\left(s_{2\beta}\delta M^{2}_{W}-2\left(\delta Z_{G^{-}H^{-}}\right)c^{2}_{\beta}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{array}\right)U^{\tilde{u}_{g3}}_{s3,1}-\\
\left(\begin{array}{l}
A^{u}_{g3,g3}\left(s_{2\beta}\delta M^{2}_{W}-2\left(\delta Z_{G^{-}H^{-}}\right)c^{2}_{\beta}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{array}\right)m_{u_{g3}}U^{\tilde{u}_{g3}}_{s3,2}
\end{array}\right)U^{\tilde{d}_{g2}*}_{s2,1}
\end{array}\right)s_{W}\\
\left(\begin{array}{l}
\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}-\\
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}
\end{array}\right)\mathrm{CKM}_{g3,g2}\left(2\left(\delta s_{W}\right)-2\left(\delta Z_{e}\right)s_{W}\right)
\end{array}\right)\\
-\left(\begin{array}{l}
2\left(\begin{array}{l}
\frac{U^{\tilde{d}_{g2}*}_{s2,1}}{s_{\beta}}\left(\begin{array}{l}
\left(\begin{array}{l}
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}
\end{array}\right)\delta m^{u_{g}}_{g3}-\\
m_{u_{g3}}\left(c_{\beta}\delta\mu^{*}-s_{\beta}\delta A^{u}_{g3,g3}\right)U^{\tilde{u}_{g3}}_{s3,2}
\end{array}\right)-\\
\frac{U^{\tilde{u}_{g3}}_{s3,1}}{c_{\beta}}\left(\begin{array}{l}
2c_{\beta}m_{d_{g2}}\delta m^{d_{g}}_{g2}U^{\tilde{d}_{g2}*}_{s2,1}-\\
\left(\begin{array}{l}
\delta m^{d_{g}}_{g2}\left(\mu s_{\beta}-c_{\beta}A^{d*}_{g2,g2}\right)+\\
m_{d_{g2}}\left((\delta\mu)s_{\beta}-c_{\beta}\delta A^{d*}_{g2,g2}\right)
\end{array}\right)U^{\tilde{d}_{g2}*}_{s2,2}
\end{array}\right)
\end{array}\right)-\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\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}-\\
\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)
\end{array}\right)\delta\overline{Z}^{\tilde{u}_{g3}}_{1,s3}-\\
\left(\begin{array}{l}
\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}-\\
m_{d_{g2}}U^{\tilde{u}_{g3}}_{2,1}U^{\tilde{d}_{g2}*}_{s2,2}\left(\mu s_{\beta}-c_{\beta}A^{d*}_{g2,g2}\right)
\end{array}\right)\delta\overline{Z}^{\tilde{u}_{g3}}_{2,s3}-\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(m^{2}_{d_{g2}}-m^{2}_{u_{g3}}-c_{2\beta}M^{2}_{W}\right)U^{\tilde{u}_{g3}}_{3,1}+\\
\frac{m_{u_{g3}}U^{\tilde{u}_{g3}}_{3,2}}{s_{\beta}}\left(c_{\beta}\mu^{*}-s_{\beta}A^{u}_{g3,g3}\right)
\end{array}\right)U^{\tilde{d}_{g2}*}_{s2,1}-\\
\frac{m_{d_{g2}}U^{\tilde{u}_{g3}}_{3,1}U^{\tilde{d}_{g2}*}_{s2,2}}{c_{\beta}}\left(\mu s_{\beta}-c_{\beta}A^{d*}_{g2,g2}\right)
\end{array}\right)\delta\overline{Z}^{\tilde{u}_{g3}}_{3,s3}-\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(m^{2}_{d_{g2}}-m^{2}_{u_{g3}}-c_{2\beta}M^{2}_{W}\right)U^{\tilde{u}_{g3}}_{4,1}+\\
\frac{m_{u_{g3}}U^{\tilde{u}_{g3}}_{4,2}}{s_{\beta}}\left(c_{\beta}\mu^{*}-s_{\beta}A^{u}_{g3,g3}\right)
\end{array}\right)U^{\tilde{d}_{g2}*}_{s2,1}-\\
\frac{m_{d_{g2}}U^{\tilde{u}_{g3}}_{4,1}U^{\tilde{d}_{g2}*}_{s2,2}}{c_{\beta}}\left(\mu s_{\beta}-c_{\beta}A^{d*}_{g2,g2}\right)
\end{array}\right)\delta\overline{Z}^{\tilde{u}_{g3}}_{4,s3}-\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(m^{2}_{d_{g2}}-m^{2}_{u_{g3}}-c_{2\beta}M^{2}_{W}\right)U^{\tilde{u}_{g3}}_{5,1}+\\
\frac{m_{u_{g3}}U^{\tilde{u}_{g3}}_{5,2}}{s_{\beta}}\left(c_{\beta}\mu^{*}-s_{\beta}A^{u}_{g3,g3}\right)
\end{array}\right)U^{\tilde{d}_{g2}*}_{s2,1}-\\
\frac{m_{d_{g2}}U^{\tilde{u}_{g3}}_{5,1}U^{\tilde{d}_{g2}*}_{s2,2}}{c_{\beta}}\left(\mu s_{\beta}-c_{\beta}A^{d*}_{g2,g2}\right)
\end{array}\right)\delta\overline{Z}^{\tilde{u}_{g3}}_{5,s3}-\\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(m^{2}_{d_{g2}}-m^{2}_{u_{g3}}-c_{2\beta}M^{2}_{W}\right)U^{\tilde{u}_{g3}}_{6,1}+\\
\frac{m_{u_{g3}}U^{\tilde{u}_{g3}}_{6,2}}{s_{\beta}}\left(c_{\beta}\mu^{*}-s_{\beta}A^{u}_{g3,g3}\right)
\end{array}\right)U^{\tilde{d}_{g2}*}_{s2,1}-\\
\frac{m_{d_{g2}}U^{\tilde{u}_{g3}}_{6,1}U^{\tilde{d}_{g2}*}_{s2,2}}{c_{\beta}}\left(\mu s_{\beta}-c_{\beta}A^{d*}_{g2,g2}\right)
\end{array}\right)\delta\overline{Z}^{\tilde{u}_{g3}}_{6,s3}
\end{array}\right)\mathrm{CKM}_{g3,g2}s_{W}
$$

$$
\underset{233}{C}\left(G^{-},\tilde{u}^{s2}_{g2},\tilde{d}^{s3,\dagger}_{g3}\right) = \frac{ie}{2\sqrt{2}M_W s_W^2}\left(\begin{array}{l}
\frac{1}{s_{2\beta}}\left(\begin{array}{l}\left(\begin{array}{l}s_{2\beta}\left(m^2_{d_{g3}}-m^2_{u_{g2}}-c_{2\beta}M_W^2\right)U^{\tilde{d}_{g3}}_{s3,1}+\\ m_{d_{g3}}\left(s_{2\beta}A^{d}_{g3,g3}-2\mu^* s_\beta^2\right)U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}-\\ m_{u_{g2}}\left(s_{2\beta}A^{u*}_{g2,g2}-2\mu c_\beta^2\right)U^{\tilde{u}_{g2}*}_{s2,2}U^{\tilde{d}_{g3}}_{s3,1}\end{array}\right)\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}-2s_W\delta\mathrm{CK}\right.\\
\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\left(m^2_{d_{g3}}-m^2_{u_{g2}}-c_{2\beta}M_W^2\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}+\\ \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)\end{array}\right)\delta\overline{Z}^{\tilde{d}_{g3}}_{1,s3}+\\
\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}\left(m^2_{d_{g3}}-m^2_{u_{g2}}-c_{2\beta}M_W^2\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}+\\ \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)\end{array}\right)\delta\overline{Z}^{\tilde{d}_{g3}}_{2,s3}-\\
\frac{2\left(\delta c_\beta\right)}{c_\beta^2}\left(\begin{array}{l}\left(\begin{array}{l}c_\beta\left(m^2_{d_{g3}}+c_\beta^2M_W^2\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)U^{\tilde{u}_{g2}*}_{s2,1}+\\ c_\beta m_{d_{g3}}m_{u_{g2}}U^{\tilde{u}_{g2}*}_{s2,2}U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)+\\
\frac{\delta Z_{H^-G^-}}{s_{2\beta}}\left(\begin{array}{l}\left(\begin{array}{l}\left(M_W^2s_{2\beta}^2-2\left(c_\beta^2m^2_{u_{g2}}+m^2_{d_{g3}}s_\beta^2\right)\right)U^{\tilde{d}_{g3}}_{s3,1}-\\ m_{d_{g3}}\left(s_{2\beta}\mu^*+2A^{d}_{g3,g3}s_\beta^2\right)U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}-\\ m_{u_{g2}}U^{\tilde{u}_{g2}*}_{s2,2}\left(\left(\mu s_{2\beta}+2A^{u*}_{g2,g2}c_\beta^2\right)U^{\tilde{d}_{g3}}_{s3,1}+2m_{d_{g3}}U^{\tilde{d}_{g3}}_{s3,2}\right)\end{array}\right)+\\
\frac{1}{s_\beta}\left(\begin{array}{l}\frac{1}{c_\beta}\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}c_\beta\left(m^2_{d_{g3}}-m^2_{u_{g2}}-c_{2\beta}M_W^2\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}+\\ 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}\end{array}\right)\delta Z^{\tilde{u}_{g2}}_{1,s2}+\\
\left(\begin{array}{l}\left(\begin{array}{l}c_\beta\left(m^2_{d_{g3}}-m^2_{u_{g2}}-c_{2\beta}M_W^2\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}\end{array}\right)\delta Z^{\tilde{u}_{g2}}_{2,s2}-\\
\frac{\delta M_W^2}{M_W^2}\left(\begin{array}{l}\left(\begin{array}{l}c_\beta\left(m^2_{d_{g3}}-m^2_{u_{g2}}+c_{2\beta}M_W^2\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}+\\ 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}\end{array}\right)\end{array}\right)-\\
\left(\begin{array}{l}2m_{u_{g2}}s_\beta\delta m^{u_g}_{g2}U^{\tilde{u}_{g2}*}_{s2,1}-\\ \left(\begin{array}{l}\left(\begin{array}{l}\left(m^2_{d_{g3}}-m^2_{u_{g2}}-c_{2\beta}M_W^2\right)U^{\tilde{d}_{g3}}_{s3,1}-\\ m_{d_{g3}}\left(s_{2\beta}A^{d}_{g3,g3}-2\mu^*s_\beta^2\right)U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)\delta Z^{\tilde{u}_{g2}}_{1,s2}+\\ m_{u_{g2}}\left(s_{2\beta}A^{u*}_{g2,g2}-2\mu c_\beta^2\right)U^{\tilde{u}_{g2}*}_{1,2}U^{\tilde{d}_{g3}}_{s3,1}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}+\\ \left(\begin{array}{l}\left(\begin{array}{l}\left(m^2_{d_{g3}}-m^2_{u_{g2}}-c_{2\beta}M_W^2\right)U^{\tilde{d}_{g3}}_{s3,1}-\\ m_{d_{g3}}\left(s_{2\beta}A^{d}_{g3,g3}-2\mu^*s_\beta^2\right)U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)\delta Z^{\tilde{u}_{g2}}_{2,s2}+\\ m_{u_{g2}}\left(s_{2\beta}A^{u*}_{g2,g2}-2\mu c_\beta^2\right)U^{\tilde{u}_{g2}*}_{2,2}U^{\tilde{d}_{g3}}_{s3,1}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}+\\ \left(\begin{array}{l}\left(\begin{array}{l}\left(m^2_{d_{g3}}-m^2_{u_{g2}}-c_{2\beta}M_W^2\right)U^{\tilde{d}_{g3}}_{s3,1}-\\ m_{d_{g3}}\left(s_{2\beta}A^{d}_{g3,g3}-2\mu^*s_\beta^2\right)U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)\delta Z^{\tilde{u}_{g2}}_{s2,s2}+\\ m_{u_{g2}}\left(s_{2\beta}A^{u*}_{g2,g2}-2\mu c_\beta^2\right)U^{\tilde{u}_{g2}*}_{s2,2}U^{\tilde{d}_{g3}}_{s3,1}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1}\end{array}\right)\end{array}\right)\end{array}\right)s_W\mathrm{CKM}^*_{g2,g3}
$$

$$
\underset{234}{C}\left(G^{+},\tilde{e}_{g2}^{s2},\tilde{\nu}_{g3}^{\dagger}\right) = \left[\frac{ie\delta_{g2,g3}}{2\sqrt{2}c_{\beta}^{2}M_{W}^{3}s_{W}^{2}}\left(\begin{array}{l}
\left(\begin{array}{l}
s_{W}\delta m_{g3}^{e_{g}}\left(\mu s_{2\beta}-2A_{g3,g3}^{e*}c_{\beta}^{2}\right)M_{W}^{2}- \\
\left(\begin{array}{l}
\left(\mu\left(\delta s_{W}\right)-\left(\delta\mu+\mu\left(\delta Z_{e}\right)\right)s_{W}\right)s_{2\beta}M_{W}^{2}+ \\
\left(\begin{array}{l}
\mu s_{\beta}\left(c_{\beta}\delta M_{W}^{2}+2\left(\delta c_{\beta}\right)M_{W}^{2}\right)- \\
\left(\frac{1}{2}M_{W}^{2}\right)\left(\begin{array}{l}
\left(2\mu\left(\delta Z_{G^{-}H^{-}}\right)-4\delta A_{g3,g3}^{e*}\right)c_{\beta}^{2}+ \\
\mu s_{2\beta}\left(\delta Z_{G^{-}G^{-}}+\delta\overline{Z}_{1,1}^{\tilde{\nu}}\right)
\end{array}\right)
\end{array}\right)s_{W}- \\
\left(\begin{array}{l}
s_{W}\left(2\left(\delta c_{\beta}\right)+\left(\delta Z_{G^{-}H^{-}}\right)s_{\beta}-c_{\beta}\delta\overline{Z}_{1,1}^{\tilde{\nu}}\right)M_{W}^{2}+ \\
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_{G^{-}G^{-}}\right)M_{W}^{2}\right)\right)
\end{array}\right)c_{\beta}A_{g3,g3}^{e*}
\end{array}\right)m_{e_{g3}}
\end{array}\right)U_{s2,2}^{\tilde{e}_{g3}*}+ \\
\left(\begin{array}{l}
\left(\begin{array}{l}
m_{e_{g3}}\left(\mu s_{\beta}-c_{\beta}A_{g3,g3}^{e*}\right)\left(\delta Z_{1,s2}^{\tilde{e}_{g2}}U_{1,2}^{\tilde{e}_{g3}*}+\delta Z_{2,s2}^{\tilde{e}_{g2}}U_{2,2}^{\tilde{e}_{g3}*}\right)- \\
c_{\beta}\left(m_{e_{g3}}^{2}-c_{2\beta}M_{W}^{2}\right)\left(\delta Z_{1,s2}^{\tilde{e}_{g2}}U_{1,1}^{\tilde{e}_{g3}*}+\delta Z_{2,s2}^{\tilde{e}_{g2}}U_{2,1}^{\tilde{e}_{g3}*}\right)
\end{array}\right)s_{W}M_{W}^{2}+ \\
\left(\begin{array}{l}
c_{\beta}m_{e_{g3}}^{2}\left(s_{W}\delta M_{W}^{2}+2\left(\delta s_{W}\right)M_{W}^{2}\right)+\left(\delta s_{W}\right)\left(s_{2\beta}s_{\beta}-2c_{\beta}^{3}\right)M_{W}^{4}+ \\
\left(\begin{array}{l}
\left(2\left(\delta c_{\beta}\right)-\left(2\left(\delta Z_{e}\right)+\delta Z_{G^{-}G^{-}}\right)c_{\beta}+\left(\delta Z_{G^{-}H^{-}}\right)s_{\beta}\right)m_{e_{g3}}^{2}- \\
c_{\beta}\delta\overline{Z}_{1,1}^{\tilde{\nu}}\left(m_{e_{g3}}^{2}-c_{2\beta}M_{W}^{2}\right)- \\
\frac{1}{2}\left(\begin{array}{l}
\left(s_{2\beta}s_{\beta}-2c_{\beta}^{3}\right)\left(\delta M_{W}^{2}+2\left(\delta Z_{e}\right)M_{W}^{2}\right)+ \\
8c_{\beta}m_{e_{g3}}\delta m_{g3}^{e_{g}}- \\
\left(\begin{array}{l}
4\left(\delta c_{\beta}\right)c_{\beta}^{2}- \\
2\left(\begin{array}{l}
\left(\delta s_{\beta}\right)s_{2\beta}+ \\
\left(\begin{array}{l}
\left(\delta Z_{G^{-}H^{-}}\right)s_{2\beta}- \\
\left(\delta Z_{G^{-}G^{-}}\right)c_{2\beta}
\end{array}\right)c_{\beta}
\end{array}\right)
\end{array}\right)M_{W}^{2}
\end{array}\right)s_{W}M_{W}^{2}
\end{array}\right)U_{s2,1}^{\tilde{e}_{g3}*}
\end{array}\right)c_{\beta}
\end{array}\right)
\end{array}\right)\right]
$$

$$\underset{235}{C}\left(G^-,\tilde{\nu}_{g2},\tilde{e}^{s3,\dagger}_{g3}\right) = \Bigg[-\frac{ie\delta_{g2,g3}}{2\sqrt{2}c_\beta^2 M_W^3 s_W^2} \Bigg(\Bigg(\Bigg(\Bigg(\Big(c_\beta \left(m_{e_{g2}}^2 - 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} \Big) \delta\overline{Z}^{\tilde{e}_{g3}}_{1,s3} + \Big(c_\beta \left(m_{e_{g2}}^2 - 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} \Big) \delta\overline{Z}^{\tilde{e}_{g3}}_{2,s3} - \left(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 Z^{\tilde{\nu}}_{1,1}\right)\right) m_{e_{g2}}^2 U^{\tilde{e}_{g2}}_{s3,1} \Bigg) 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} \Bigg) s_W - 2\left(\delta s_W\right) m_{e_{g2}} A^e_{g2,g2} c_\beta^2 U^{\tilde{e}_{g2}}_{s3,2} \Bigg) M_W^2 - \Bigg(c_\beta^2 m_{e_{g2}}^2 \left(s_W \delta M_W^2 + 2\left(\delta s_W\right)M_W^2\right) - \left(\frac{1}{2}\left(\delta s_W\right)M_W^4\right)\left(4c_\beta^4 - s_{2\beta}^2\right) - \left(\frac{1}{4}s_W M_W^2\right) \Big(\left(4s_{2\beta}\left(\left(\delta s_\beta\right)c_\beta + \left(\delta Z_{H^-G^-}\right)c_\beta^2\right) - 8\left(\delta c_\beta\right)c_\beta^3\right) M_W^2 - \left(\delta M_W^2 + \left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-} + \delta Z^{\tilde{\nu}}_{1,1}\right)M_W^2\right)\left(4c_\beta^4 - s_{2\beta}^2\right) + 16 m_{e_{g2}} \delta m^{e_g}_{g2} c_\beta^2 \Big) \Bigg) U^{\tilde{e}_{g2}}_{s3,1} + \Bigg(\mu^*\left(\left(\delta s_W - \left(\delta Z_e\right)s_W\right)s_{2\beta}M_W^2 + s_W s_\beta\left(c_\beta \delta M_W^2 + 2\left(\delta c_\beta\right)M_W^2\right)\right) - \Big(s_{2\beta}\delta\mu^* M_W^2 + \Big(A^e_{g2,g2}\left(2\left(\delta c_\beta\right)M_W^2 + c_\beta\left(\delta M_W^2 - 2\left(\delta Z_e\right)M_W^2\right)\right) - \Big(2c_\beta \delta A^e_{g2,g2} - \left(\delta Z_{H^-G^-}\right)\left(c_\beta \mu^* + s_\beta A^e_{g2,g2}\right) - \left(\delta Z_{G^-G^-} + \delta Z^{\tilde{\nu}}_{1,1}\right)\left(s_\beta \mu^* - c_\beta A^e_{g2,g2}\right) \Big) M_W^2 \Big) c_\beta \Big) s_W \Bigg) m_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,2} \Bigg) \Bigg]$$

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

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

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

$$C_{4}\left(G^{0},G^{+},W^{-}\right) = \left[-\frac{e}{4s_{W}^{2}}\left(2\left(\delta s_{W}\right) - \left(2\left(\delta Z_{e}\right) + \delta Z_{W} + \delta Z_{GG} + \delta Z_{G^{-}G^{-}}\right)s_{W}\right)\right]$$

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

$$C_{66}\left(h^{0},G^{0},Z\right) = \left[-\frac{e}{4c_{W}^{3}s_{W}^{2}}\left(\left(2\left(\delta s_{W}\right)s_{\beta-\alpha} - s_{W}\left(\left(\delta Z_{AG} + \delta Z_{hH}\right)c_{\beta-\alpha} + \left(2\left(\delta Z_{e}\right) + \delta Z_{ZZ} + \delta Z_{GG} + \delta Z_{hh}\right)s_{\beta-\alpha}\right)\right)c_{W}^{2} - 2\left(\delta s_{W}\right)s_{\beta-\alpha}s_{W}^{2}\right)\right]$$

$$C_{67}\left(H^{0},A^{0},Z\right) = \left[\frac{e}{4c_{W}^{3}s_{W}^{2}}\left(\left(2\left(\delta s_{W}\right)s_{\beta-\alpha} + s_{W}\left(\left(\delta Z_{AG} + \delta Z_{hH}\right)c_{\beta-\alpha} - \left(2\left(\delta Z_{e}\right) + \delta Z_{ZZ} + \delta Z_{AA} + \delta Z_{HH}\right)s_{\beta-\alpha}\right)\right)c_{W}^{2} - 2\left(\delta s_{W}\right)s_{\beta-\alpha}s_{W}^{2}\right)\right]$$

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

$$C_{69}\left(H^{-},H^{+},\gamma\right) = \left[\left(\frac{1}{4}ie\right)\left(4\left(\delta Z_{e}\right) + \left(\frac{c_{W}}{s_{W}} - \frac{s_{W}}{c_{W}}\right)\left(\delta Z_{Z\gamma}\right) + 2\left(\delta Z_{\gamma\gamma}\right) + 2\left(\delta\overline{Z}_{H^{-}H^{-}} + \delta Z_{H^{-}H^{-}}\right)\right)\right]$$

$$C_{70}\left(H^{-},H^{+},Z\right) = \left[-\frac{ie}{4c_{W}^{3}s_{W}^{2}}\left(\begin{array}{l}\left(2\left(\delta s_{W}\right) - \left(2\left(\delta Z_{e}\right) + \delta\overline{Z}_{H^{-}H^{-}} + \delta Z_{ZZ} + \delta Z_{H^{-}H^{-}}\right)s_{W}\right)c_{W}^{4} + 2\left(\delta s_{W}\right)s_{W}^{4} + \\ \left(\left(4\left(\delta s_{W}\right) + \left(2\left(\delta Z_{e}\right) + \delta\overline{Z}_{H^{-}H^{-}} + \delta Z_{ZZ} + \delta Z_{H^{-}H^{-}}\right)s_{W}\right)c_{W}^{2} - 2\left(\delta Z_{\gamma Z}\right)c_{W}^{3}\right)s_{W}^{2}\end{array}\right)\right]$$

$$C_{71}\left(h^{0},H^{-},W^{+}\right) = \left[\frac{ie}{4s_{W}^{2}}\left(c_{\beta-\alpha}\left(2\left(\delta s_{W}\right) - \left(2\left(\delta Z_{e}\right) + \delta\overline{Z}_{W} + \delta Z_{hh} + \delta Z_{H^{-}H^{-}}\right)s_{W}\right) + \left(\delta Z_{hH} - \delta Z_{G^{-}H^{-}}\right)s_{W}s_{\beta-\alpha}\right)\right]$$

$$C_{72}\left(h^{0},G^{-},W^{+}\right) = \left[\frac{ie}{4s_{W}^{2}}\left(2\left(\delta s_{W}\right)s_{\beta-\alpha} - s_{W}\left(\left(\delta Z_{hH} + \delta Z_{H^{-}G^{-}}\right)c_{\beta-\alpha} + \left(2\left(\delta Z_{e}\right) + \delta\overline{Z}_{W} + \delta Z_{hh} + \delta Z_{G^{-}G^{-}}\right)s_{\beta-\alpha}\right)\right)\right]$$

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

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

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

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

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

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

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

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

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

$$C_{237}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, \gamma\right) = \left[\begin{array}{l} \frac{ie\delta_{g1,g2}}{4c_W s_W}\left(\begin{array}{l} 2\left(\begin{array}{l} \delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}} + \delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}} + \delta_{s2,1}\delta Z_{1,s1}^{\tilde{e}_{g1}} + \\ \delta_{s1,s2}\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) + \delta_{s2,2}\delta Z_{2,s1}^{\tilde{e}_{g1}} \end{array}\right)c_W s_W + \\ \left(\delta Z_{Z\gamma}\right)\left(\left(1 - 2s_W^2\right)U_{s1,1}^{\tilde{e}_{g1}*}U_{s2,1}^{\tilde{e}_{g1}} - 2s_W^2 U_{s1,2}^{\tilde{e}_{g1}*}U_{s2,2}^{\tilde{e}_{g1}}\right) \end{array}\right) \end{array}\right]$$

$$C_{238}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, Z\right) = \left[\begin{array}{l} \frac{ie\delta_{g1,g2}}{4c_W^3 s_W^2}\left(\begin{array}{l} 2\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right)c_W^3 s_W^2 - \\ \left(\begin{array}{l} 2\left(\begin{array}{l} s_W c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,2}^{\tilde{e}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,2}^{\tilde{e}_{g1}}\right) + \\ \left(\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 + 2\left(\delta s_W\right)s_W^2\right)U_{s2,2}^{\tilde{e}_{g1}} \end{array}\right)s_W U_{s1,2}^{\tilde{e}_{g1}*} + \\ \left(\begin{array}{l} \left(1 - 2c_W^2\right)\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,1}^{\tilde{e}_{g1}*} + \delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,1}^{\tilde{e}_{g1}*}\right)U_{s2,1}^{\tilde{e}_{g1}} + \\ 2s_W^2\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,2}^{\tilde{e}_{g1}*} + \delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,2}^{\tilde{e}_{g1}*}\right)U_{s2,2}^{\tilde{e}_{g1}} \end{array}\right)c_W^2 \end{array}\right)s_W - \\ \left(\begin{array}{l} s_W\left(1 - 2c_W^2\right)c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,1}^{\tilde{e}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,1}^{\tilde{e}_{g1}}\right) + \\ \left(\left(\left(\delta s_W\right)\left(6 - 4c_W^2\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\left(1 - 2c_W^2\right)\right)c_W^2 - \left(\delta s_W\right)\left(2s_W^2 - 4s_W^4\right)\right)U_{s2,1}^{\tilde{e}_{g1}} \end{array}\right)U_{s1,1}^{\tilde{e}_{g1}*} \end{array}\right)\end{array}\right]$$

$$C_{239}\left(\tilde{u}_{g1}^{s1}, \tilde{u}_{g2}^{s2,\dagger}, \gamma\right) = \left[\begin{array}{l} -\frac{ie\delta_{g1,g2}}{12c_W s_W}\left(\begin{array}{l} 4\left(\begin{array}{l} \delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}} + \delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}} + \delta_{s2,1}\delta Z_{1,s1}^{\tilde{u}_{g1}} + \\ \delta_{s1,s2}\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma}\right) + \delta_{s2,2}\delta Z_{2,s1}^{\tilde{u}_{g1}} \end{array}\right)c_W s_W + \\ \left(\delta Z_{Z\gamma}\right)\left(\left(3 - 4s_W^2\right)U_{s1,1}^{\tilde{u}_{g1}*}U_{s2,1}^{\tilde{u}_{g1}} - 4s_W^2 U_{s1,2}^{\tilde{u}_{g1}*}U_{s2,2}^{\tilde{u}_{g1}}\right) \end{array}\right) \end{array}\right]$$

$$\underset{240}{C}\left(\tilde{u}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},Z\right)=\left[-\frac{ie\delta_{g1,g2}}{12c_W^3s_W^2}\left(\begin{array}{l}4\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right)c_W^3s_W^2-\\ \left(\begin{array}{l}4\left(\begin{array}{l}s_Wc_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}U_{1,2}^{\tilde{u}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}U_{2,2}^{\tilde{u}_{g1}}\right)+\\ \left(\left(2\left(\delta s_W\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)c_W^2+2\left(\delta s_W\right)s_W^2\right)U_{s2,2}^{\tilde{u}_{g1}}\end{array}\right)s_WU_{s1,2}^{\tilde{u}_{g1}*}+\\ \left(\begin{array}{l}\left(1-4c_W^2\right)\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,1}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,1}^{\tilde{u}_{g1}*}\right)U_{s2,1}^{\tilde{u}_{g1}}+\\ 4s_W^2\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,2}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,2}^{\tilde{u}_{g1}*}\right)U_{s2,2}^{\tilde{u}_{g1}}\end{array}\right)c_W^2\end{array}\right)s_W-\\ \left(\begin{array}{l}s_W\left(1-4c_W^2\right)c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}U_{1,1}^{\tilde{u}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}U_{2,1}^{\tilde{u}_{g1}}\right)+\\ \left(\left(\left(\delta s_W\right)\left(14-8c_W^2\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\left(1-4c_W^2\right)\right)c_W^2+2\left(\delta s_W\right)\left(1-4c_W^2\right)s_W^2\right)U_{s2,1}^{\tilde{u}_{g1}}\end{array}\right)U_{s1,1}^{\tilde{u}_{g1}*}\end{array}\right)\right]$$

$$\underset{241}{C}\left(\tilde{d}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},\gamma\right)=\left[\frac{ie\delta_{g1,g2}}{12c_Ws_W}\left(\begin{array}{l}2\left(\begin{array}{l}\delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}+\delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}+\delta_{s2,1}\delta Z_{1,s1}^{\tilde{d}_{g1}}+\\ \delta_{s1,s2}\left(2\left(\delta Z_e\right)+\delta Z_{\gamma\gamma}\right)+\delta_{s2,2}\delta Z_{2,s1}^{\tilde{d}_{g1}}\end{array}\right)c_Ws_W+\\ \left(\delta Z_{Z\gamma}\right)\left(\left(3-2s_W^2\right)U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g1}}-2s_W^2U_{s1,2}^{\tilde{d}_{g1}*}U_{s2,2}^{\tilde{d}_{g1}}\right)\end{array}\right)\right]$$

$$\underset{242}{C}\left(\tilde{d}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},Z\right)=\left[\frac{ie\delta_{g1,g2}}{12c_W^3s_W^2}\left(\begin{array}{l}2\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right)c_W^3s_W^2-\\ \left(\begin{array}{l}2\left(\begin{array}{l}s_Wc_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}U_{1,2}^{\tilde{d}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}U_{2,2}^{\tilde{d}_{g1}}\right)+\\ \left(\left(2\left(\delta s_W\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)c_W^2+2\left(\delta s_W\right)s_W^2\right)U_{s2,2}^{\tilde{d}_{g1}}\end{array}\right)s_WU_{s1,2}^{\tilde{d}_{g1}*}-\\ \left(\begin{array}{l}\left(1+2c_W^2\right)\left(\delta Z_{1,s1}^{\tilde{d}_{g1}}U_{1,1}^{\tilde{d}_{g1}*}+\delta Z_{2,s1}^{\tilde{d}_{g1}}U_{2,1}^{\tilde{d}_{g1}*}\right)U_{s2,1}^{\tilde{d}_{g1}}-\\ 2s_W^2\left(\delta Z_{1,s1}^{\tilde{d}_{g1}}U_{1,2}^{\tilde{d}_{g1}*}+\delta Z_{2,s1}^{\tilde{d}_{g1}}U_{2,2}^{\tilde{d}_{g1}*}\right)U_{s2,2}^{\tilde{d}_{g1}}\end{array}\right)c_W^2\end{array}\right)s_W+\\ \left(\begin{array}{l}s_Wc_W^2\left(1+2c_W^2\right)\left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}U_{1,1}^{\tilde{d}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}U_{2,1}^{\tilde{d}_{g1}}\right)+\\ \left(\begin{array}{l}2\left(\left(2\left(\delta s_W\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)c_W^4+\left(\delta s_W\right)s_W^2\right)+\\ c_W^2\left(\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W-2\left(\delta s_W\right)\left(5-2s_W^2\right)\right)\end{array}\right)U_{s2,1}^{\tilde{d}_{g1}}\end{array}\right)U_{s1,1}^{\tilde{d}_{g1}*}\end{array}\right)\right]$$

$$\underset{243}{C}\left(\tilde{u}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},W^-\right)=\left[-\frac{ie}{2\sqrt{2}s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}s_W\left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}U_{1,1}^{\tilde{d}_{g2}}+\delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}U_{2,1}^{\tilde{d}_{g2}}\right)-\\ \left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_W\right)s_W\right)U_{s2,1}^{\tilde{d}_{g2}}\end{array}\right)U_{s1,1}^{\tilde{u}_{g1}*}+\\ s_W\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,1}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,1}^{\tilde{u}_{g1}*}\right)U_{s2,1}^{\tilde{d}_{g2}}\end{array}\right)\mathrm{CKM}_{g1,g2}^*+\\ 2s_W\delta\mathrm{CKM}_{g1,g2}^*U_{s1,1}^{\tilde{u}_{g1}*}U_{s2,1}^{\tilde{d}_{g2}}\end{array}\right)\right]$$

$$\underset{244}{C}\left(\tilde{d}_{g1}^{s1}, \tilde{u}_{g2}^{s2,\dagger}, W^{+}\right) = \left[-\frac{ie}{2\sqrt{2}s_W^2} \left(\left(\begin{array}{l} s_W \left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}} U_{1,1}^{\tilde{u}_{g2}} + \delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}} U_{2,1}^{\tilde{u}_{g2}} \right) - \\ \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta\overline{Z}_W\right) s_W\right) U_{s2,1}^{\tilde{u}_{g2}} \end{array} \right) U_{s1,1}^{\tilde{d}_{g1}*} + \right.$$
$$\left. \left(\begin{array}{l} s_W \left(\delta Z_{1,s1}^{\tilde{d}_{g1}} U_{1,1}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}} U_{2,1}^{\tilde{d}_{g1}*} \right) U_{s2,1}^{\tilde{u}_{g2}} \\ 2\left(\delta \mathrm{CKM}_{g2,g1}\right) s_W U_{s1,1}^{\tilde{d}_{g1}*} U_{s2,1}^{\tilde{u}_{g2}} \end{array} \right) \mathrm{CKM}_{g2,g1} + \right]$$

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

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

$$\underset{421}{C}\left(h^0, A^0, \gamma\right) = \left[\frac{e\left(\delta Z_{Z\gamma}\right) c_{\beta-\alpha}}{4 c_W s_W} \right]$$

$$\underset{422}{C}\left(h^0, G^0, \gamma\right) = \left[\frac{e\left(\delta Z_{Z\gamma}\right) s_{\beta-\alpha}}{4 c_W s_W} \right]$$

$$\underset{423}{C}\left(H^0, A^0, \gamma\right) = \left[-\frac{e\left(\delta Z_{Z\gamma}\right) s_{\beta-\alpha}}{4 c_W s_W} \right]$$

$$\underset{424}{C}\left(H^0, G^0, \gamma\right) = \left[\frac{e\left(\delta Z_{Z\gamma}\right) c_{\beta-\alpha}}{4 c_W s_W} \right]$$

$$\underset{425}{C}\left(H^-, G^+, \gamma\right) = \left[ie\left(\delta Z_{G^-H^-}\right) \right]$$

$$\underset{426}{C}\left(G^-, H^+, \gamma\right) = \left[ie\left(\delta Z_{H^-G^-}\right) \right]$$

$$\underset{427}{C}\left(H^-, G^+, Z\right) = \left[-\frac{ie\left(\delta Z_{G^-H^-}\right)}{2 c_W s_W} \left(1 - 2c_W^2\right) \right]$$

$$\underset{428}{C}\left(G^-, H^+, Z\right) = \left[-\frac{ie\left(\delta Z_{H^-G^-}\right)}{2 c_W s_W} \left(1 - 2c_W^2\right) \right]$$

$$\underset{429}{C}\left(A^0, G^-, W^+\right) = \left[\frac{e}{4 s_W} \left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) \right]$$

$$C_{430}\left(A^0, G^+, W^-\right) = \left[\frac{e}{4 s_W} \left(\delta Z_{AG} + \delta Z_{G^- H^-}\right) \right]$$

$$C_{431}\left(G^0, H^-, W^+\right) = \left[\frac{e}{4 s_W} \left(\delta Z_{AG} + \delta Z_{G^- H^-}\right) \right]$$

$$C_{432}\left(G^0, H^+, W^-\right) = \left[\frac{e}{4 s_W} \left(\delta Z_{AG} + \delta Z_{H^- G^-}\right) \right]$$

$$C_{433}\left(\tilde{\nu}_{g1}, \tilde{\nu}^{\dagger}_{g2}, \gamma\right) = \left[-\frac{i e \delta_{g1,g2} \left(\delta Z_{Z\gamma}\right)}{4 c_W s_W} \right]$$

$$C_{462}\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, g\right) = \left[-\left(\frac{1}{2} i g_s \delta_{g1,g2} T^{g3}_{c2,c1}\right) \left(\begin{array}{l} \delta_{s1,1} \delta \overline{Z}^{\tilde{u}_{g2}}_{1,s2} + \delta_{s1,2} \delta \overline{Z}^{\tilde{u}_{g2}}_{2,s2} + \delta_{s2,1} \delta Z^{\tilde{u}_{g1}}_{1,s1} + \delta_{s2,2} \delta Z^{\tilde{u}_{g1}}_{2,s1} + \\ \delta_{s1,s2} \left(2 \left(\delta Z_{g_s}\right) + \delta Z_{gg}\right) \end{array} \right) \right]$$

$$C_{463}\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, g\right) = \left[-\left(\frac{1}{2} i g_s \delta_{g1,g2} T^{g3}_{c2,c1}\right) \left(\begin{array}{l} \delta_{s1,1} \delta \overline{Z}^{\tilde{d}_{g2}}_{1,s2} + \delta_{s1,2} \delta \overline{Z}^{\tilde{d}_{g2}}_{2,s2} + \delta_{s2,1} \delta Z^{\tilde{d}_{g1}}_{1,s1} + \delta_{s2,2} \delta Z^{\tilde{d}_{g1}}_{2,s1} + \\ \delta_{s1,s2} \left(2 \left(\delta Z_{g_s}\right) + \delta Z_{gg}\right) \end{array} \right) \right]$$

[SVV] Higgs – 2 Gauge Bosons

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

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

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

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

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

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

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

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

$$\underset{415}{C}\left(h^0, Z, \gamma\right) = \left[\frac{ie\left(\delta Z_{Z\gamma}\right) M_W s_{\beta-\alpha}}{2 s_W c_W^2} \right]$$

$$\underset{416}{C}\left(H^0, Z, \gamma\right) = \left[\frac{ie\left(\delta Z_{Z\gamma}\right) c_{\beta-\alpha} M_W}{2 s_W c_W^2} \right]$$

$$\underset{417}{C}\left(H^-, \gamma, W^+\right) = \left[\left(\frac{1}{2} ie M_W\right)\left(\delta Z_{G^-H^-} + 2\left(\delta s_\beta\right) c_\beta - 2\left(\delta c_\beta\right) s_\beta\right) \right]$$

$$\underset{418}{C}\left(H^+, \gamma, W^-\right) = \left[\left(\frac{1}{2} ie M_W\right)\left(\delta Z_{H^-G^-} + 2\left(\delta s_\beta\right) c_\beta - 2\left(\delta c_\beta\right) s_\beta\right) \right]$$

$$\underset{419}{C}\left(H^-, Z, W^+\right) = \left[-\frac{ie M_W s_W}{2 c_W}\left(\delta Z_{G^-H^-} + 2\left(\delta s_\beta\right) c_\beta - 2\left(\delta c_\beta\right) s_\beta\right) \right]$$

$$\underset{420}{C}\left(H^+, Z, W^-\right) = \left[-\frac{ie M_W s_W}{2 c_W}\left(\delta Z_{H^-G^-} + 2\left(\delta s_\beta\right) c_\beta - 2\left(\delta c_\beta\right) s_\beta\right) \right]$$

[UUV] 2 Ghosts – Gauge Boson

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

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

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

$$\underset{22}{C}\left(\overline{u}_{+},u_{+},Z\right)=-\frac{\mathrm{i}e}{2c_{\mathrm{W}}s_{\mathrm{W}}^{2}}\left(2\left(\delta s_{\mathrm{W}}\right)-c_{\mathrm{W}}s_{\mathrm{W}}\left(\left(2\left(\delta Z_{\mathrm{e}}+\delta U_{\mathrm{W}}\right)-\delta Z_{\mathrm{W}}+\delta Z_{\mathrm{ZZ}}\right)c_{\mathrm{W}}+\left(\delta Z_{\gamma\mathrm{Z}}\right)s_{\mathrm{W}}\right)\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$\underset{23}{C}\left(\overline{u}_{-},u_{\gamma},W^{-}\right)=\mathrm{i}e\left(\frac{\left(\delta U_{\mathrm{Z}\gamma}\right)c_{\mathrm{W}}}{s_{\mathrm{W}}}+\delta Z_{\mathrm{e}}+\delta U_{\gamma\gamma}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$\underset{24}{C}\left(\overline{u}_{+},u_{\gamma},W^{+}\right)=-\mathrm{i}e\left(\frac{\left(\delta U_{\mathrm{Z}\gamma}\right)c_{\mathrm{W}}}{s_{\mathrm{W}}}+\delta Z_{\mathrm{e}}+\delta U_{\gamma\gamma}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$\underset{25}{C}\left(\overline{u}_{\gamma},u_{+},W^{-}\right)=\left(\frac{1}{2}\mathrm{i}e\right)\left(\frac{\left(\delta Z_{\gamma\mathrm{Z}}\right)c_{\mathrm{W}}}{s_{\mathrm{W}}}-2\left(\delta Z_{\mathrm{e}}\right)-2\left(\delta U_{\mathrm{W}}\right)-\delta Z_{\mathrm{W}}+\delta Z_{\gamma\gamma}\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$\underset{26}{C}\left(\overline{u}_{\gamma},u_{-},W^{+}\right)=\mathrm{i}e\left(\delta U_{\mathrm{W}}-\frac{1}{2}\left(\frac{\left(\delta Z_{\gamma\mathrm{Z}}\right)c_{\mathrm{W}}}{s_{\mathrm{W}}}-2\left(\delta Z_{\mathrm{e}}\right)-\delta Z_{\mathrm{W}}+\delta Z_{\gamma\gamma}\right)\right)\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

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

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

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

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

[VVV] 3 Gauge Bosons

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

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

$$C_{457}(g, g, g) = \left[\left(\frac{1}{2} g_{s} f^{g1,g2,g3}\right)\left(2\left(\delta Z_{g_{s}}\right) + 3\left(\delta Z_{gg}\right)\right) \right]$$

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

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

$$C_{93}\left(h^{0}, h^{0}, H^{0}, H^{0}\right) = \left[-\frac{i e^{2}}{4 c_{W}^{4} s_{W}^{3}}\left(\left(2\left(\delta s_{W}\right) - \left(2\left(\delta Z_{e}\right) + \delta Z_{hh} + \delta Z_{HH}\right) s_{W}\right) c_{W}^{2} - 2\left(\delta s_{W}\right) s_{W}^{2}\right)\left(1 - 3 s_{2\alpha}^{2}\right) \right]$$

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

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

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

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

$$C_{98}\left(h^{0}, h^{0}, A^{0}, G^{0}\right) = \left[-\frac{i e^{2} s_{2\beta}}{8 c_{W}^{4} s_{W}^{3}}\left(2\left(\delta Z_{hH}\right) s_{W} s_{2\alpha} c_{W}^{2} - c_{2\alpha}\left(\left(4\left(\delta s_{W}\right) - \left(4\left(\delta Z_{e}\right) + \delta Z_{AA} + \delta Z_{GG} + 2\left(\delta Z_{hh}\right)\right) s_{W}\right) c_{W}^{2} - 4\left(\delta s_{W}\right) s_{W}^{2}\right)\right) \right]$$

$$C_{99}\left(h^{0}, H^{0}, A^{0}, A^{0}\right) = \left[-\frac{i e^{2} s_{2\alpha}}{8 c_{W}^{4} s_{W}^{3}}\left(2\left(\delta Z_{AG}\right) s_{W} s_{2\beta} c_{W}^{2} - c_{2\beta}\left(\left(4\left(\delta s_{W}\right) - \left(4\left(\delta Z_{e}\right) + 2\left(\delta Z_{AA}\right) + \delta Z_{hh} + \delta Z_{HH}\right) s_{W}\right) c_{W}^{2} - 4\left(\delta s_{W}\right) s_{W}^{2}\right)\right) \right]$$

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

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

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

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

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

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

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

$$\underset{107}{C}\left(h^0,h^0,H^-,G^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} c_{2\beta}\left(4\left(\delta s_W\right)s_{2\alpha} + s_W\left(2\left(\delta Z_{hH}\right)c_{2\alpha} - \left(4\left(\delta Z_e\right) + 2\left(\delta Z_{hh}\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)s_{2\alpha}\right)\right)c_W^4 - \\ \left(\begin{array}{l} 2\left(\delta Z_{G^-H^-}\right)c_W^4 + \\ s_{2\beta}\left(2\left(\delta Z_{hH}\right)s_{2\alpha}c_W^2 + c_{2\alpha}\left(4\left(\delta s_W\right)s_W + \left(4\left(\delta Z_e\right) + 2\left(\delta Z_{hh}\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right)c_W^2\right)\right)s_W^2 \end{array}\right)s_W \end{array}\right)\right]$$

$$\underset{108}{C}\left(h^0,h^0,G^-,H^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} c_{2\beta}\left(4\left(\delta s_W\right)s_{2\alpha}+s_W\left(2\left(\delta Z_{hH}\right)c_{2\alpha}-\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+2\left(\delta Z_{hh}\right)+\delta Z_{G^-G^-}\right)s_{2\alpha}\right)\right)c_W^4- \\ \left(\begin{array}{l} 2\left(\delta Z_{H^-G^-}\right)c_W^4+ \\ s_{2\beta}\left(2\left(\delta Z_{hH}\right)s_{2\alpha}c_W^2+c_{2\alpha}\left(4\left(\delta s_W\right)s_W+\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+2\left(\delta Z_{hh}\right)+\delta Z_{G^-G^-}\right)c_W^2\right)\right)s_W^2 \end{array}\right)s_W \end{array}\right)\right]$$

$$\underset{109}{C}\left(h^0,H^0,H^-,H^+\right) = \left[-\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} c_{2\beta}s_{2\alpha}\left(4\left(\delta s_W\right)s_W+\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{hh}+\delta Z_{HH}+\delta Z_{H^-H^-}\right)c_W^2\right)s_W^3+ \\ s_W c_W^2\left(2\left(\delta Z_{hH}\right)c_W^2+\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_{2\alpha}s_{2\beta}s_W^2\right)- \\ c_{2\alpha}\left(4\left(\delta s_W\right)s_{2\beta}+s_W\left(\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)c_{2\beta}-\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{hh}+\delta Z_{HH}+\delta Z_{H^-H^-}\right)s_{2\beta}\right)\right)c_W^4 \end{array}\right)\right]$$

$$\underset{110}{C}\left(h^0,H^0,G^-,G^+\right) = \left[-\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} s_W c_W^2\left(2\left(\delta Z_{hH}\right)c_W^2+\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_{2\alpha}s_{2\beta}s_W^2\right)- \\ c_{2\beta}s_{2\alpha}\left(4\left(\delta s_W\right)s_W+\left(4\left(\delta Z_e\right)+\delta Z_{hh}+\delta Z_{HH}+2\left(\delta Z_{G^-G^-}\right)\right)c_W^2\right)s_W^3+ \\ c_{2\alpha}\left(4\left(\delta s_W\right)s_{2\beta}-s_W\left(\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)c_{2\beta}+\left(4\left(\delta Z_e\right)+\delta Z_{hh}+\delta Z_{HH}+2\left(\delta Z_{G^-G^-}\right)\right)s_{2\beta}\right)\right)c_W^4 \end{array}\right)\right]$$

$$\underset{111}{C}\left(h^0,H^0,H^-,G^+\right) = \left[-\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} s_{2\alpha}s_{2\beta}\left(4\left(\delta s_W\right)s_W+\left(4\left(\delta Z_e\right)+\delta Z_{hh}+\delta Z_{HH}+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}\right)c_W^2\right)s_W^3+ \\ c_{2\alpha}c_{2\beta}\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta Z_{hh}+\delta Z_{HH}+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}\right)s_W\right)c_W^4 \end{array}\right)\right]$$

$$\underset{112}{C}\left(h^0,H^0,G^-,H^+\right) = \left[-\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} s_{2\alpha}s_{2\beta}\left(4\left(\delta s_W\right)s_W+\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{hh}+\delta Z_{HH}+\delta Z_{G^-G^-}\right)c_W^2\right)s_W^3+ \\ c_{2\alpha}c_{2\beta}\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{hh}+\delta Z_{HH}+\delta Z_{G^-G^-}\right)s_W\right)c_W^4 \end{array}\right)\right]$$

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

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

$$\underset{115}{C}\left(H^0,H^0,H^-,G^+\right) = \left[-\frac{ie^2}{8c_W^4 s_W^3} \left(\begin{array}{l} s_{2\beta}\left(2\left(\delta Z_{hH}\right) s_{2\alpha}c_W^2 - c_{2\alpha}\left(4\left(\delta s_W\right) s_W + \left(4\left(\delta Z_e\right) + 2\left(\delta Z_{HH}\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right) c_W^2\right)\right) s_W^3 + \\ \left(\begin{array}{l} 2\left(\delta Z_{G^-H^-}\right) s_W + \\ c_{2\beta}\left(4\left(\delta s_W\right) s_{2\alpha} - s_W\left(2\left(\delta Z_{hH}\right) c_{2\alpha} + \left(4\left(\delta Z_e\right) + 2\left(\delta Z_{HH}\right) + \delta Z_{G^-G^-} + \delta Z_{H^-H^-}\right) s_{2\alpha}\right)\right) \end{array} \right) c_W^4 \end{array} \right) \right]$$

$$\underset{116}{C}\left(H^0,H^0,G^-,H^+\right) = \left[-\frac{ie^2}{8c_W^4 s_W^3} \left(\begin{array}{l} s_{2\beta}\left(2\left(\delta Z_{hH}\right) s_{2\alpha}c_W^2 - c_{2\alpha}\left(4\left(\delta s_W\right) s_W + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{HH}\right) + \delta Z_{G^-G^-}\right) c_W^2\right)\right) s_W^3 + \\ \left(\begin{array}{l} 2\left(\delta Z_{H^-G^-}\right) s_W + \\ c_{2\beta}\left(4\left(\delta s_W\right) s_{2\alpha} - s_W\left(2\left(\delta Z_{hH}\right) c_{2\alpha} + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{HH}\right) + \delta Z_{G^-G^-}\right) s_{2\alpha}\right)\right) \end{array} \right) c_W^4 \end{array} \right) \right]$$

$$\underset{117}{C}\left(h^0,A^0,H^-,G^+\right) = \left[-\frac{e^2}{8s_W^3} \left(\begin{array}{l} c_\beta\left(4\left(\delta s_W\right) s_\alpha - s_W\left(\left(\delta Z_{AG} - \delta Z_{hH}\right) c_\alpha + \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_\alpha\right)\right) - \\ \left(c_\alpha\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_W\right) + \left(\delta Z_{AG} - \delta Z_{hH}\right) s_W s_\alpha\right) s_\beta + \\ \left(\delta Z_{G^-G^-}\right) s_W s_{\beta-\alpha} \end{array} \right) \right]$$

$$\underset{118}{C}\left(h^0,A^0,G^-,H^+\right) = \left[-\frac{e^2}{8s_W^3} \left(\begin{array}{l} s_W\left(\left(\delta Z_{AG} - \delta Z_{hH}\right) s_\alpha s_\beta - \left(\delta\overline{Z}_{H^-H^-}\right) s_{\beta-\alpha}\right) + \\ c_\alpha\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_W\right) s_\beta - \\ c_\beta\left(4\left(\delta s_W\right) s_\alpha - s_W\left(\left(\delta Z_{AG} - \delta Z_{hH}\right) c_\alpha + \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_\alpha\right)\right) \end{array} \right) \right]$$

$$\underset{119}{C}\left(h^0,G^0,H^-,G^+\right) = \left[-\frac{e^2}{8s_W^3} \left(\begin{array}{l} \left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\alpha s_W + 4\left(\delta s_W\right) s_\alpha\right) s_\beta + \\ c_\alpha c_\beta\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_W\right) - \\ s_W\left(\left(\delta Z_{G^-G^-}\right) c_{\beta-\alpha} + s_\alpha\left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\beta + \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_\beta\right)\right) \end{array} \right) \right]$$

$$\underset{120}{C}\left(h^0,G^0,G^-,H^+\right) = \left[\frac{e^2}{8s_W^3} \left(\begin{array}{l} \left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\alpha s_W + 4\left(\delta s_W\right) s_\alpha\right) s_\beta + \\ c_\alpha c_\beta\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_W\right) - \\ s_W\left(\left(\delta\overline{Z}_{H^-H^-}\right) c_{\beta-\alpha} + s_\alpha\left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\beta + \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_\beta\right)\right) \end{array} \right) \right]$$

$$
\underset{121}{C}\left(H^0, A^0, H^-, G^+\right) = \left[\frac{e^2}{8 s_W^3} \left(\begin{array}{l} 4\left(\delta s_W\right) s_\alpha s_\beta + \\ c_\alpha \left(c_\beta \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_W\right) - \left(\delta Z_{AG} + \delta Z_{hH}\right) s_W s_\beta\right) - \\ s_W \left(\left(\delta Z_{G^-G^-}\right) c_{\beta-\alpha} - s_\alpha \left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\beta - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_\beta\right)\right) \end{array} \right) \right]
$$

$$
\underset{122}{C}\left(H^0, A^0, G^-, H^+\right) = \left[-\frac{e^2}{8 s_W^3} \left(\begin{array}{l} 4\left(\delta s_W\right) s_\alpha s_\beta - \\ s_W \left(\left(\delta \overline{Z}_{H^-H^-}\right) c_{\beta-\alpha} - s_\alpha \left(\left(\delta Z_{AG} + \delta Z_{hH}\right) c_\beta - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_\beta\right)\right) + \\ c_\alpha \left(c_\beta \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_W\right) - \left(\delta Z_{AG} + \delta Z_{hH}\right) s_W s_\beta\right) \end{array} \right) \right]
$$

$$
\underset{123}{C}\left(H^0, G^0, H^-, G^+\right) = \left[\frac{e^2}{8 s_W^3} \left(\begin{array}{l} c_\alpha \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_W\right) s_\beta - \\ c_\beta \left(4\left(\delta s_W\right) s_\alpha + s_W \left(\left(\delta Z_{AG} - \delta Z_{hH}\right) c_\alpha - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_\alpha\right)\right) - \\ s_W \left(\left(\delta Z_{AG} - \delta Z_{hH}\right) s_\alpha s_\beta + \left(\delta Z_{G^-G^-}\right) s_{\beta-\alpha}\right) \end{array} \right) \right]
$$

$$
\underset{124}{C}\left(H^0, G^0, G^-, H^+\right) = \left[\frac{e^2}{8 s_W^3} \left(\begin{array}{l} s_W \left(\left(\delta Z_{AG} - \delta Z_{hH}\right) s_\alpha s_\beta + \left(\delta \overline{Z}_{H^-H^-}\right) s_{\beta-\alpha}\right) - \\ c_\alpha \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_W\right) s_\beta + \\ c_\beta \left(4\left(\delta s_W\right) s_\alpha + s_W \left(\left(\delta Z_{AG} - \delta Z_{hH}\right) c_\alpha - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_\alpha\right)\right) \end{array} \right) \right]
$$

$$
\underset{125}{C}\left(A^0,A^0,A^0,A^0\right) = \left[\frac{3ie^2}{64c_W^4 s_W^3}\left(\begin{array}{l}
(\delta s_W)\, s_W^2\left(9s_{2\beta}^6 - 32s_\beta^{12} - 2s_{2\beta}^4\left(8 - 4c_{2\beta} - s_\beta^4\right) + 16s_{2\beta}^2\left(2 - 3s_\beta^4\right)s_\beta^4\right) + \\
32c_\beta^{12}\left(\left(\delta s_W - (\delta Z_e + \delta Z_{AA})\, s_W\right)c_W^2 - (\delta s_W)\, s_W^2\right) - \\
2c_\beta^2\left(\left(\delta Z_{AG}\right)s_W s_{2\beta} c_W^2\left(14 - 3s_{2\beta}^2\right) - 4c_{2\beta}\left(\left(\delta s_W - (\delta Z_e + \delta Z_{AA})\, s_W\right)c_W^2 - (\delta s_W)\, s_W^2\right)\left(4 - s_{2\beta}^2\right)\right)s_{2\beta}^2 - \\
\left(\begin{array}{l}
4c_\beta^6\left(8c_{2\beta}s_{2\beta}\left(\left(\delta s_W - (\delta Z_e + \delta Z_{AA})\, s_W\right)c_W^2 - (\delta s_W)\, s_W^2\right) - (\delta Z_{AG})\, s_W c_W^2\left(4 + 5s_{2\beta}^2\right)\right) + \\
2\left(\begin{array}{l}
s_{2\beta}\left(\left(\delta s_W - (\delta Z_e + \delta Z_{AA})\, s_W\right)c_W^2 - (\delta s_W)\, s_W^2\right)\left(16 - 24c_{2\beta}^2 - 11s_{2\beta}^2\right) + \\
8\left(\delta Z_{AG}\right)c_{2\beta}s_W c_W^2\left(1 + 3s_{2\beta}^2\right)
\end{array}\right)c_\beta^4
\end{array}\right)s_{2\beta} + \\
\left(\begin{array}{l}
(\delta s_W - (\delta Z_e + \delta Z_{AA})\, s_W)\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}^2 s_\beta^8\right) - \\
\left(\begin{array}{l}
16\left(c_\beta^{10} + c_{2\beta}c_\beta^8\right) + \\
2\left(\begin{array}{l}
s_{2\beta}^2 s_\beta^2\left(3s_{2\beta}^2 - 2\left(7 - s_\beta^2 - 6s_\beta^4\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)
\end{array}\right)
\end{array}\right)(\delta Z_{AG})\, s_W s_{2\beta} - \\
\left(\begin{array}{l}
128\left(\delta c_\beta\right)c_\beta^{11} - 32\left(\delta s_\beta\right)c_{2\beta}s_{2\beta}c_\beta^7 + \\
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 - \\
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) - \\
\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 + \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 + \\
128\left(\delta s_\beta\right)s_\beta^{11} + 144\left(\delta s_\beta\right)s_{2\beta}^2 s_\beta^7 + 96\left(\delta c_\beta\right)s_{2\beta}s_\beta^9 - \\
\left(\begin{array}{l}
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) - \\
8\left(\begin{array}{l}
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)
\end{array}\right)c_\beta^3
\end{array}\right)s_{2\beta}
\end{array}\right)s_W
\end{array}\right)
\end{array}\right)\right]
$$

$$
\underset{126}{C}\left(A^0,A^0,A^0,G^0\right) = \frac{3ie^2}{16c_W^4 s_W^3}\left(\begin{array}{l}
\left(\begin{array}{l}
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)- \\
\left(\begin{array}{l}
2\left(\delta c_\beta\right)\left(8c_\beta^7+2c_\beta^3\left(2+9s_{2\beta}^2\right)-s_{2\beta}s_\beta\left(6-11s_{2\beta}^2-12s_\beta^4\right)\right)- \\
\left(\delta Z_{AG}\right)s_{2\beta}\left(1+c_\beta^2\right)\left(4c_\beta^2-4c_\beta^4-s_{2\beta}^2\right)
\end{array}\right)s_W c_W^2- \\
\left(\begin{array}{l}
4\left(\delta s_W\right)s_W^2\left(1+22s_\beta^4\right)- \\
\left(\begin{array}{l}
\left(\delta s_W\right)\left(4+88s_\beta^4\right)- \\
\left(\begin{array}{l}
176\left(\delta s_\beta\right)s_\beta^3+\left(\delta Z_e\right)\left(4+88s_\beta^4\right)+ \\
\left(3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)\left(1+22s_\beta^4\right)
\end{array}\right)s_W
\end{array}\right)c_W^2
\end{array}\right)c_\beta^4+ \\
\left(\begin{array}{l}
\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)+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(\begin{array}{l}
4\left(\delta s_W\right)s_\beta s_W^2\left(1+3s_{2\beta}^2+s_\beta^4\right)- \\
\left(\begin{array}{l}
4\left(\delta s_W\right)\left(s_\beta+3s_\beta s_{2\beta}^2+s_\beta^5\right)- \\
\left(\begin{array}{l}
4\left(\delta s_\beta\right)\left(2+9s_{2\beta}^2+4s_\beta^4\right)+ \\
\left(4\left(\delta Z_e\right)+3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)s_\beta\left(1+3s_{2\beta}^2+s_\beta^4\right)
\end{array}\right)s_W
\end{array}\right)c_W^2
\end{array}\right)s_\beta^2
\end{array}\right)s_\beta
\end{array}\right)c_{2\beta}s_{2\beta}+ \\
2\left(\begin{array}{l}
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)- \\
\left(\frac{1}{2}s_{2\beta}s_\beta^5\right)\left(\begin{array}{l}
2\left(\delta s_\beta\right)s_W c_W^2\left(3-7s_\beta^4\right)- \\
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(1+s_\beta^2\right)
\end{array}\right)+ \\
\left(\frac{1}{8}s_\beta s_{2\beta}^3\right)\left(\begin{array}{l}
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)- \\
\left(\begin{array}{l}
\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)
\end{array}\right)s_W
\end{array}\right)c_W^2
\end{array}\right)+ \\
\left(\begin{array}{l}
4\left(\delta s_W\right)s_\beta s_W^2\left(1+6s_\beta^4\right)- \\
\left(\begin{array}{l}
4\left(\delta s_W\right)\left(s_\beta+6s_\beta^5\right)- \\
\left(\begin{array}{l}
\left(\delta s_\beta\right)\left(2+44s_\beta^4\right)+ \\
\left(4\left(\delta Z_e\right)+3\left(\delta Z_{AA}\right)+\delta Z_{GG}\right)s_\beta\left(1+6s_\beta^4\right)
\end{array}\right)s_W
\end{array}\right)c_W^2
\end{array}\right)c_\beta^7- \\
\left(\frac{1}{32}s_W c_W^2\right)\left(\begin{array}{l}
4\left(\begin{array}{l}
56c_\beta^9+c_\beta\left(38-13s_{2\beta}^2\right)s_{2\beta}^2-2c_\beta^5\left(12+37s_{2\beta}^2\right)+ \\
2s_{2\beta}s_\beta^3\left(11s_{2\beta}^2-2\left(9-s_\beta^2-4s_\beta^4\right)\right)
\end{array}\right)\left(\delta c_\beta\right)s_{2\beta}+ \\
\left(\begin{array}{l}
32c_\beta^{12}-32c_\beta^8+39s_{2\beta}^6-s_{2\beta}^4\left(44-94s_\beta^4\right)-
\end{array}\right)+
\end{array}\right)
\end{array}\right)
\end{array}\right)
$$

$$\underset{127}{C}\left(A^0, A^0, G^0, G^0\right) = \left[-\frac{\mathrm{i}e^2}{32 c_{\mathrm{W}}^4 s_{\mathrm{W}}^3} \left(\begin{array}{l} 2\left(\delta s_{\mathrm{W}}\right) s_{\mathrm{W}}^2 \left(12 s_{2\beta}^6 - 3 s_{2\beta}^4 \left(5 - 2c_{2\beta} - 8 s_\beta^4\right) + 16 s_{2\beta}^2 s_\beta^4 - 8 s_\beta^8\right) + \\ \left(\left(2\left(\delta s_{\mathrm{W}}\right) - \left(2\left(\delta \mathrm{Z_e}\right) + \delta Z_{\mathrm{AA}} + \delta Z_{\mathrm{GG}}\right) s_{\mathrm{W}}\right) c_{\mathrm{W}}^2 - 2\left(\delta s_{\mathrm{W}}\right) s_{\mathrm{W}}^2\right) \left(8 c_\beta^8 - s_{2\beta}^2 \left(c_{2\beta} \left(24 c_\beta^6 - 6 c_\beta^2 \left(4 - s_{2\beta}^2\right)\right) + 8 c_\beta^4 \left(2 + 3 s_{2\beta}^2\right)\right.\right. \\ \left(\begin{array}{l} 2\left(\delta s_{\mathrm{W}}\right) \left(3\left(5 - 2c_{2\beta} - 4 s_{2\beta}^2\right) s_{2\beta}^4 - 8 s_{2\beta}^2 \left(2 + 3 s_{2\beta}^2\right) s_\beta^4 + 8 s_\beta^8\right) - \\ \left(\begin{array}{l} 48\left(\delta s_\beta\right) s_{2\beta} c_\beta^9 + \\ 6 c_\beta \left(2\left(\delta s_\beta\right) s_{2\beta} \left(5 - 8 s_{2\beta}^2\right) + \left(\delta c_\beta\right) c_{2\beta} \left(12 - 5 s_{2\beta}^2\right)\right) s_{2\beta}^2 + \\ 12 s_{2\beta} c_\beta^3 \left(\left(\delta s_\beta\right) c_{2\beta} \left(4 - 3 s_{2\beta}^2\right) - \left(\delta c_\beta\right) s_{2\beta} \left(4 + 13 s_{2\beta}^2\right)\right) - \\ s_\beta \left(72\left(\delta s_\beta\right) c_{2\beta} s_{2\beta}^2 - 12\left(\delta c_\beta\right)\left(5 - c_{2\beta}\right) s_{2\beta}^3 - 30\left(\delta s_\beta\right) c_{2\beta} s_{2\beta}^4 + 96\left(\delta c_\beta\right) s_{2\beta}^5\right) - \\ \left(48\left(\delta s_\beta\right) s_{2\beta}^2 - 24\left(\delta c_\beta\right) c_{2\beta} s_{2\beta}^3 + 156\left(\delta s_\beta\right) s_{2\beta}^4\right) s_\beta^3 - \\ \left(32\left(\delta c_\beta\right) s_{2\beta} - 168\left(\delta s_\beta\right) c_{2\beta} s_{2\beta}^2 + 72\left(\delta c_\beta\right) s_{2\beta}^3\right) s_\beta^5 - \left(\delta s_\beta\right)\left(32 - 24 s_{2\beta}^2\right) s_\beta^7 + \\ 48\left(\delta c_\beta\right) s_{2\beta} s_\beta^9 + \\ \left(2\left(\delta \mathrm{Z_e}\right) + \delta Z_{\mathrm{AA}} + \delta Z_{\mathrm{GG}}\right)\left(3\left(5 - 2c_{2\beta}\right) s_{2\beta}^4 - 12 s_{2\beta}^6 - \left(16 s_{2\beta}^2 + 24 s_{2\beta}^4\right) s_\beta^4 + 8 s_\beta^8\right) - \\ 8\left(\begin{array}{l} c_\beta^7 \left(6\left(\delta s_\beta\right) c_{2\beta} s_{2\beta} - \left(\delta c_\beta\right)\left(4 - 3 s_{2\beta}^2\right)\right) + \\ s_{2\beta} c_\beta^5 \left(21\left(\delta c_\beta\right) c_{2\beta} s_{2\beta} + \left(\delta s_\beta\right)\left(4 + 9 s_{2\beta}^2\right)\right) \end{array} \right) \end{array} \right) s_{\mathrm{W}} \end{array} \right) c_{\mathrm{W}}^2 \right) \right]$$

$$
\underset{128}{C}\left(A^0,G^0,G^0,G^0\right) = \Bigg[-\frac{3ie^2}{16c_W^4 s_W^3} \Bigg(\Bigg(c_\beta^8\left((4(\delta s_W) - (4(\delta Z_e)+\delta Z_{AA}+3(\delta Z_{GG}))s_W)c_W^2 - 4(\delta s_W)s_W^2\right) - \left(\begin{array}{l} 2(\delta c_\beta)\left(8c_\beta^7 + 2c_\beta^3\left(2+9s_{2\beta}^2\right) - s_{2\beta}s_\beta\left(6-11s_{2\beta}^2-12s_\beta^4\right)\right) + \\ (\delta Z_{AG})s_{2\beta}\left(1+c_\beta^2\right)\left(4c_\beta^2-4c_\beta^4-s_{2\beta}^2\right) \end{array}\right) s_W c_W^2 - \left(\begin{array}{l} 4(\delta s_W)s_W^2\left(1+22s_\beta^4\right) - \\ \left(\begin{array}{l} (\delta s_W)\left(4+88s_\beta^4\right) - \\ \left(\begin{array}{l} 176(\delta s_\beta)s_\beta^3 + (\delta Z_e)\left(4+88s_\beta^4\right) + \\ (\delta Z_{AA}+3(\delta Z_{GG}))\left(1+22s_\beta^4\right) \end{array}\right) s_W \end{array}\right) c_W^2 \end{array}\right) c_\beta^4 + \left(\begin{array}{l} (\delta s_\beta)s_W c_W^2\left(24c_\beta^2-48c_\beta^6\right) - \\ s_{2\beta}\left(3c_\beta-6c_\beta^5\right)\left((4(\delta s_W)-(4(\delta Z_e)+\delta Z_{AA}+3(\delta Z_{GG}))s_W)c_W^2 - 4(\delta s_W)s_W^2\right) - \\ \left(\begin{array}{l} 4(\delta s_W)s_\beta s_W^2\left(1+3s_{2\beta}^2+s_\beta^4\right) - \\ \left(\begin{array}{l} 4(\delta s_W)\left(s_\beta+3s_\beta s_{2\beta}^2+s_\beta^5\right) - \\ \left(\begin{array}{l} 4(\delta s_\beta)\left(2+9s_{2\beta}^2+4s_\beta^4\right) + \\ (4(\delta Z_e)+\delta Z_{AA}+3(\delta Z_{GG}))s_\beta\left(1+3s_{2\beta}^2+s_\beta^4\right) \end{array}\right) s_W \end{array}\right) c_W^2 \end{array}\right) s_\beta^2 \end{array}\right) s_\beta \Bigg) c_{2\beta}s_{2\beta} +
$$

$$
2 \Bigg(c_\beta^{11}\left((4(\delta s_W)s_\beta - s_W(2(\delta s_\beta)+(4(\delta Z_e)+\delta Z_{AA}+3(\delta Z_{GG}))s_\beta))c_W^2 - 4(\delta s_W)s_\beta s_W^2\right) - \left(\frac{1}{2}s_{2\beta}s_\beta^5\right)\left(\begin{array}{l} 2(\delta s_\beta)s_W c_W^2\left(3-7s_\beta^4\right) - \\ s_\beta c_\beta^2\left((4(\delta s_W)-(4(\delta Z_e)+\delta Z_{AA}+3(\delta Z_{GG}))s_W)c_W^2 - 4(\delta s_W)s_W^2\right)\left(1+s_\beta^2\right) \end{array}\right) + \left(\frac{1}{8}s_\beta s_{2\beta}^3\right)\left(\begin{array}{l} 4(\delta s_W)s_\beta s_W^2\left(7-5s_\beta^4\right) - \\ \left(\begin{array}{l} 4(\delta s_W)s_\beta\left(7-5s_\beta^4\right) - \\ \left(\begin{array}{l} (\delta s_\beta)\left(38-74s_\beta^4\right) + \\ (4(\delta Z_e)+\delta Z_{AA}+3(\delta Z_{GG}))s_\beta\left(7-5s_\beta^4\right) \end{array}\right) s_W \end{array}\right) c_W^2 \end{array}\right) + \left(\begin{array}{l} 4(\delta s_W)s_\beta s_W^2\left(1+6s_\beta^4\right) - \\ \left(\begin{array}{l} 4(\delta s_W)\left(s_\beta+6s_\beta^5\right) - \\ \left(\begin{array}{l} (\delta s_\beta)\left(2+44s_\beta^4\right) + \\ (4(\delta Z_e)+\delta Z_{AA}+3(\delta Z_{GG}))s_\beta\left(1+6s_\beta^4\right) \end{array}\right) s_W \end{array}\right) c_W^2 \end{array}\right) c_\beta^7 - \left(\frac{1}{32}s_W c_W^2\right)\left(\begin{array}{l} 4\left(\begin{array}{l} 56c_\beta^9 + c_\beta\left(38-13s_{2\beta}^2\right)s_{2\beta}^2 - 2c_\beta^5\left(12+37s_{2\beta}^2\right) + \\ 2s_{2\beta}s_\beta^3\left(11s_{2\beta}^2 - 2\left(9-s_\beta^2-4s_\beta^4\right)\right) \end{array}\right)(\delta c_\beta)s_{2\beta} - \\ \Bigg(32c_\beta^{12} - 32c_\beta^8 + 39s_{2\beta}^6 - s_{2\beta}^4\left(44-94s_\beta^4\right) - \end{array}\right. +
$$

$$
\underset{129}{C}\left(G^0,G^0,G^0,G^0\right) = \left[\frac{3ie^2}{64c_W^4 s_W^3}\left(\begin{array}{l}
(\delta s_W)\, s_W^2\left(9s_{2\beta}^6 - 32s_\beta^{12} - 2s_{2\beta}^4\left(8 - 4c_{2\beta} - s_\beta^4\right) + 16s_{2\beta}^2\left(2 - 3s_\beta^4\right)s_\beta^4\right) + \\
32c_\beta^{12}\left((\delta s_W - (\delta Z_e + \delta Z_{GG})\, s_W)\, c_W^2 - (\delta s_W)\, s_W^2\right) + \\
c_\beta^2\left(2\,(\delta Z_{AG})\, s_W s_{2\beta} c_W^2\left(14 - 3s_{2\beta}^2\right) + 8c_{2\beta}\left((\delta s_W - (\delta Z_e + \delta Z_{GG})\, s_W)\, c_W^2 - (\delta s_W)\, s_W^2\right)\left(4 - s_{2\beta}^2\right)\right)s_{2\beta}^2 - \\
\left(\begin{array}{l}
(\delta s_W)\left(9s_{2\beta}^6 - 32s_\beta^{12} - 2s_{2\beta}^4\left(8 - 4c_{2\beta} - s_\beta^4\right) + 16s_{2\beta}^2\left(2 - 3s_\beta^4\right)s_\beta^4\right) + \\
\left(\begin{array}{l}
128\,(\delta c_\beta)\, c_\beta^{11} + \\
2c_\beta\left((\delta s_\beta)\, s_{2\beta}\left(16 - 15s_{2\beta}^2\right) + 2\,(\delta c_\beta)\, c_{2\beta}\left(12 - 5s_{2\beta}^2\right)\right)s_{2\beta}^2 - \\
(\delta Z_e)\left(9s_{2\beta}^6 - 32s_\beta^{12} - 2s_{2\beta}^4\left(8 - 4c_{2\beta} - s_\beta^4\right) + 16s_{2\beta}^2\left(2 - 3s_\beta^4\right)s_\beta^4\right) - \\
16\,(\delta Z_{AG})\, s_{2\beta}\left(c_\beta^{10} + c_{2\beta}c_\beta^8\right) - \\
(\delta Z_{GG})\left(9s_{2\beta}^6 - 32s_\beta^{12} - 2s_{2\beta}^4\left(8 - s_\beta^4\right) + 16s_{2\beta}^2\left(2 - 3s_\beta^4\right)s_\beta^4\right) - \\
\left(\begin{array}{l}
32\,(\delta s_\beta)\, c_{2\beta}c_\beta^7 + 16c_\beta^5\left(7\,(\delta c_\beta)\, c_{2\beta}s_{2\beta} - (\delta s_\beta)\left(4 - s_{2\beta}^2\right)\right) - \\
8\left(\begin{array}{l}
18\,(\delta c_\beta)\, s_{2\beta}c_{2\beta}^2 + (\delta s_\beta)\, c_{2\beta}\left(4 - 3s_{2\beta}^2\right) - \\
6\,(\delta c_\beta)\, s_{2\beta}\left(1 - s_{2\beta}^2\right)
\end{array}\right)c_\beta^3
\end{array}\right)s_{2\beta} - \\
2\left(\begin{array}{l}
(\delta c_\beta)\, s_{2\beta}\left(21s_{2\beta}^4 + 16s_\beta^4 - 16s_{2\beta}^2\left(1 + s_\beta^4\right) - 48s_\beta^8\right) + \\
\left(\begin{array}{l}
4\,(\delta s_\beta)\, s_\beta\left(3s_{2\beta}^4 + s_{2\beta}^2\left(6 - 18s_\beta^4\right) - 16s_\beta^8\right) + \\
(\delta Z_{AG})\, s_{2\beta}^3\left(3s_{2\beta}^2 - 2\left(7 - s_\beta^2 - 6s_\beta^4\right)\right)
\end{array}\right)s_\beta
\end{array}\right)s_\beta - \\
2\left(\begin{array}{l}
(\delta Z_{AG})\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) + \\
4\,(\delta Z_{GG})\, s_{2\beta}^3 + \\
\left(\begin{array}{l}
4\,(\delta c_\beta)\, s_{2\beta}^2\left(1 - 2s_\beta^2\right) + \\
2\,(\delta s_\beta)\, s_{2\beta}\left(12 - 5s_{2\beta}^2 - 28s_\beta^4\right)
\end{array}\right)s_\beta
\end{array}\right)c_{2\beta}s_{2\beta}
\end{array}\right)s_W
\end{array}\right)c_W^2 - \\
\left(\begin{array}{l}
4c_\beta^6\left(8c_{2\beta}s_{2\beta}\left((\delta s_W - (\delta Z_e + \delta Z_{GG})\, s_W)\, c_W^2 - (\delta s_W)\, s_W^2\right) + (\delta Z_{AG})\, s_W c_W^2\left(4 + 5s_{2\beta}^2\right)\right) - \\
2\left(\begin{array}{l}
(\delta s_W)\, s_{2\beta}s_W^2\left(16 - 24c_{2\beta}^2 - 11s_{2\beta}^2\right) + \\
\left(\begin{array}{l}
(\delta Z_{AG})\, c_{2\beta}s_W\left(8 + 24s_{2\beta}^2\right) - \\
(\delta s_W - (\delta Z_e + \delta Z_{GG})\, s_W)\left(8s_{2\beta}\left(2 - 3c_{2\beta}^2\right) - 11s_{2\beta}^3\right)
\end{array}\right)c_W^2
\end{array}\right)c_\beta^4
\end{array}\right)s_{2\beta}
\end{array}\right)
\end{array}\right)\right]
$$

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

$$
\underset{131}{C}\left(A^0,A^0,H^-,G^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} 2s_W c_W^2\left(\left(\delta Z_{AG}-\delta Z_{G^-H^-}\right)c_W^2-\left(\delta Z_{AG}\right)s_{2\beta}^2\right)+ \\ c_{2\beta}s_{2\beta}\left(\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+2\left(\delta Z_{AA}\right)+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)\end{array}\right)\right]
$$

$$
\underset{132}{C}\left(A^0,A^0,G^-,H^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} 2s_W c_W^2\left(\left(\delta Z_{AG}-\delta Z_{H^-G^-}\right)c_W^2-\left(\delta Z_{AG}\right)s_{2\beta}^2\right)+ \\ c_{2\beta}s_{2\beta}\left(\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+2\left(\delta Z_{AA}\right)+\delta Z_{G^-G^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)\end{array}\right)\right]
$$

$$
\underset{133}{C}\left(A^0,A^0,G^-,G^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} c_{2\beta}s_W\left(\left(2\left(\delta Z_{AG}\right)-\delta Z_{G^-H^-}-\delta Z_{H^-G^-}\right)s_{2\beta}+2c_{2\beta}\left(2\left(\delta Z_e\right)+\delta Z_{AA}+\delta Z_{G^-G^-}+8\left(\delta c_\beta\right)c_\beta+8\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2+ \\ 4\left(\left(\delta s_W\right)c_{2\beta}^2 s_W^4-c_W^4\left(s_W\left(2\left(\delta Z_e\right)+\delta Z_{AA}+\delta Z_{G^-G^-}+6\left(\delta c_\beta\right)c_\beta+6\left(\delta s_\beta\right)s_\beta\right)-\left(\delta s_W\right)\left(1+s_{2\beta}^2\right)\right)\right)\end{array}\right)\right]
$$

$$
\underset{134}{C}\left(A^0,G^0,H^-,H^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} c_{2\beta}s_{2\beta}\left(\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{H^-H^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)- \\ s_W c_W^2\left(\left(2\left(\delta Z_{AG}\right)-\delta Z_{G^-H^-}-\delta Z_{H^-G^-}\right)c_W^2+\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_{2\beta}^2\right)\end{array}\right)\right]
$$

$$
\underset{135}{C}\left(A^0,G^0,H^-,G^+\right) = \left[\frac{ie^2}{32c_W^4 s_W^3}\left(\begin{array}{l} c_W^4\left(4s_W\left(4\left(\delta Z_e\right)+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta c_{2\beta}^2\right)-\left(\delta s_W\right)\left(16-8\left(s_{2\beta}^2+s_{2\beta}^4\right)+\right.\right. \\ \left(\begin{array}{l}\left(\delta s_W\right)s_W^2\left(s_W^2\left(24-8s_{2\beta}^2+s_{2\beta}^4\right)-8\left(c_\beta^8+s_\beta^8\right)\right)- \\ 4\left(\begin{array}{l}\left(\delta s_W\right)\left(2-4s_W^2\right)\left(c_\beta^8+s_\beta^8\right)- \\ s_W\left(4\left(\delta Z_e\right)+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta s_W^2\right)\end{array}\right)c_W^2\end{array}\right)s_{2\beta}^2\end{array}\right)\right]
$$

$$
\underset{136}{C}\left(A^0,G^0,G^-,H^+\right) = \left[\frac{ie^2}{32c_W^4 s_W^3}\left(\begin{array}{l} c_W^4\left(4s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{G^-G^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta c_{2\beta}^2\right)-\left(\delta s_W\right)\left(16-8\left(s_{2\beta}^2+s_{2\beta}^4\right)+\right.\right. \\ \left(\begin{array}{l}\left(\delta s_W\right)s_W^2\left(s_W^2\left(24-8s_{2\beta}^2+s_{2\beta}^4\right)-8\left(c_\beta^8+s_\beta^8\right)\right)- \\ 4\left(\begin{array}{l}\left(\delta s_W\right)\left(2-4s_W^2\right)\left(c_\beta^8+s_\beta^8\right)- \\ s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+\delta Z_{AA}+\delta Z_{GG}+\delta Z_{G^-G^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta s_W^2\right)\end{array}\right)c_W^2\end{array}\right)s_{2\beta}^2\end{array}\right)\right]
$$

$$
\underset{137}{C}\left(A^0,G^0,G^-,G^+\right) = \left[-\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} s_W c_W^2\left(\left(2\left(\delta Z_{AG}\right)-\delta Z_{G^-H^-}-\delta Z_{H^-G^-}\right)c_W^2+\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_{2\beta}^2\right)+ \\ c_{2\beta}s_{2\beta}\left(\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta Z_{AA}+\delta Z_{GG}+2\left(\delta Z_{G^-G^-}\right)+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)\end{array}\right)\right]
$$

$$
\underset{138}{C}\left(G^0,G^0,H^-,H^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} 4\left(\delta s_W\right)c_{2\beta}^2 s_W^4- \\ c_W^4\left(2s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+2\left(\delta Z_{GG}\right)+\delta Z_{H^-H^-}+12\left(\delta c_\beta\right)c_\beta+12\left(\delta s_\beta\right)s_\beta\right)-4\left(\delta s_W\right)\left(1+s_{2\beta}^2\right)\right)+ \\ \left(\begin{array}{l} c_{2\beta}\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+2\left(\delta Z_{GG}\right)+\delta Z_{H^-H^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta\right)- \\ \left(2\left(\delta Z_{AG}\right)-\delta Z_{G^-H^-}-\delta Z_{H^-G^-}\right)s_{2\beta}\end{array}\right)c_{2\beta}s_W c_W^2\end{array}\right)\right]
$$

$$C_{139}\left(G^0,G^0,H^-,G^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} s_W\left(2\left(\delta Z_{AG}\right)\left(c_W-s_{2\beta}\right)\left(c_W+s_{2\beta}\right)c_W^2-2\left(\delta Z_{G^-H^-}\right)c_W^4\right)- \\ c_{2\beta}s_{2\beta}\left(\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+2\left(\delta Z_{GG}\right)+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)\end{array}\right)\right]$$

$$C_{140}\left(G^0,G^0,G^-,H^+\right) = \left[\frac{ie^2}{8c_W^4 s_W^3}\left(\begin{array}{l} s_W\left(2\left(\delta Z_{AG}\right)\left(c_W-s_{2\beta}\right)\left(c_W+s_{2\beta}\right)c_W^2-2\left(\delta Z_{H^-G^-}\right)c_W^4\right)- \\ c_{2\beta}s_{2\beta}\left(\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_{H^-H^-}+2\left(\delta Z_{GG}\right)+\delta Z_{G^-G^-}+16\left(\delta c_\beta\right)c_\beta+16\left(\delta s_\beta\right)s_\beta\right)\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)\end{array}\right)\right]$$

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

$$C_{142}\left(H^-,H^-,H^+,H^+\right) = \left[\frac{ie^2c_{2\beta}}{2c_W^4 s_W^3}\left(\begin{array}{l} c_\beta^2\left(\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_{H^-H^-}\right)s_W\right)c_W^2-2\left(\delta s_W\right)s_W^2\right)+2\left(\delta s_W\right)s_W^2s_\beta^2- \\ c_W^2\left(s_W\left(\left(\delta\overline{Z}_{H^-H^-}\right)c_{2\beta}+\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_{2\beta}\right)+\left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_{H^-H^-}\right)s_W\right)s_\beta^2\right)\end{array}\right)\right]$$

$$C_{143}\left(H^-,H^-,H^+,G^+\right) = \left[-\frac{ie^2}{4c_W^4 s_W^3}\left(\begin{array}{l} \left(\frac{1}{2}s_W c_W^2\right)\left(2s_{2\beta}\left(\left(\delta\overline{Z}_{H^-H^-}\right)c_{2\beta}+\left(\delta Z_{H^-G^-}\right)s_{2\beta}\right)+\left(\delta Z_{G^-H^-}\right)\left(2c_{2\beta}^2-2c_\beta^4+3s_{2\beta}^2-2s_\beta^4\right)\right)- \\ c_{2\beta}s_{2\beta}\left(\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta Z_{G^-G^-}+2\left(\delta Z_{H^-H^-}\right)\right)s_W\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)\end{array}\right)\right]$$

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

$$C_{145}\left(H^-,G^-,H^+,H^+\right) = \left[\frac{ie^2s_{2\beta}}{4c_W^4 s_W^3}\left(\begin{array}{l} c_\beta^2\left(\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}\right)s_W\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)+4\left(\delta s_W\right)s_W^2s_\beta^2- \\ c_W^2\left(s_W\left(2\left(\delta\overline{Z}_{H^-H^-}\right)c_{2\beta}+\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_{2\beta}\right)+\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}\right)s_W\right)s_\beta^2\right)\end{array}\right)\right]$$

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

$$C_{147}\left(H^-,G^-,G^+,G^+\right) = \left[-\frac{ie^2s_{2\beta}}{4c_W^4 s_W^3}\left(\begin{array}{l} c_\beta^2\left(\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}\right)s_W\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)+4\left(\delta s_W\right)s_W^2s_\beta^2- \\ c_W^2\left(s_W\left(2\left(\delta Z_{G^-G^-}\right)c_{2\beta}-\left(\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\right)s_{2\beta}\right)+\left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta Z_{G^-G^-}+\delta Z_{H^-H^-}\right)s_W\right)s_\beta^2\right)\end{array}\right)\right]$$

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

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

$$\underset{150}{C}\left(G^-, G^-, G^+, G^+\right) = \left[\frac{\mathrm{i}e^2 c_{2\beta}}{2 c_W^4 s_W^3} \left(\begin{array}{l} c_\beta^2 \left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) s_W\right) c_W^2 - 2\left(\delta s_W\right) s_W^2 \right) + 2\left(\delta s_W\right) s_W^2 s_\beta^2 - \\ c_W^2 \left(s_W \left(\delta Z_{G^-G^-} - \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_{2\beta} \right) + \left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + 3\left(\delta Z_{G^-G^-}\right)\right) s_W\right) s_\beta^2 \right) \end{array} \right) \right]$$

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

$$
\underset{281}{C}\left(h^0, h^0, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\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} \left(\begin{array}{l} 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 - 2 c_W^2 m_{e_{g4}}^2 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 \left(\begin{array}{l} \left(\begin{array}{l} 4 c_\beta s_W \delta m^{e_g}_{g4} M_W^2 s_\alpha^2 - \\ \left(\begin{array}{l} 4 \left(\delta c_\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 + \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_{2\alpha} M_W^2 + \\ 2 \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2 \left(\delta Z_e\right) + \\ \delta Z_{hh} \end{array} \right) M_W^2 \end{array} \right) s_\alpha^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) m_{e_{g4}} \end{array} \right) m_{e_{g4}} c_W^4 - \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_W s_{2\alpha} \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 \end{array} \right) U^{\tilde{e}_{g4}}_{s4,1} \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,1} - \\ 2 \left(\begin{array}{l} 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_{e_{g4}}^2 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) + \\ \left(\begin{array}{l} 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 + \\ \left(\begin{array}{l} 4 c_\beta s_W \delta m^{e_g}_{g4} M_W^2 s_\alpha^2 - \\ \left(\begin{array}{l} 4 \left(\delta c_\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 + \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_{2\alpha} M_W^2 + \\ 2 \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2 \left(\delta Z_e\right) + \\ \delta Z_{hh} \end{array} \right) M_W^2 \end{array} \right) s_\alpha^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) m_{e_{g4}} \end{array} \right) m_{e_{g4}} c_W^4 \end{array} \right) U^{\tilde{e}_{g4}}_{s4,2} \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,2} + \\ \left(\begin{array}{l} \left(c_{2\alpha}\left(1-2c_W^2\right) c_\beta^2 M_W^2 - 2 c_W^2 m_{e_{g4}}^2 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_{e_{g4}}^2 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} \right) c_\beta s_W c_W^2 M_W^2 \end{array} \right) \right]
$$

$$
\underset{282}{C}\left(h^0, h^0, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\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}
\left(\begin{array}{l}
s_W s_\beta c_W^2 M_W^2 \left(6 c_W^2 c_\alpha^2 m^2_{u_{g4}} + c_{2\alpha}\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) + \\
2 \left(\begin{array}{l}
3 \left(\begin{array}{l}
4 s_W s_\beta \delta m^{u_g}_{g4} c_\alpha^2 M_W^2 + \\
\left(\begin{array}{l}
\left(\delta Z_{hH}\right) s_W s_{2\alpha} s_\beta M_W^2 - \\
2 \left(\begin{array}{l}
2\left(\delta s_\beta\right) s_W M_W^2 + \\
2 \left(\begin{array}{l}
2\left(\delta s_W\right) M_W^2 + \\
\left(\begin{array}{l}
\delta M_W^2 - \\
\left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{hh} \end{array} \right) M_W^2
\end{array} \right) s_W
\end{array} \right) s_\beta
\end{array} \right) c_\alpha^2
\end{array} \right) m_{u_{g4}}
\end{array} \right) m_{u_{g4}} c_W^4 + \\
\left(\begin{array}{l}
\left(\delta Z_{hH}\right) s_W s_{2\alpha} \left(1 - 4c_W^2\right) c_W^2 + \\
\left(\begin{array}{l}
2\left(\delta s_W\right)\left(1 - 4c_W^2\right) s_W^2 + \\
\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
\end{array} \right) c_{2\alpha}
\end{array} \right) M_W^4 s_\beta^3
\end{array} \right) U^{\tilde{u}_{g4}}_{s4,1}
\end{array} \right) U^{\tilde{u}_{g4}*}_{s3,1} + \\
\left(\begin{array}{l}
s_W s_\beta c_W^2 M_W^2 \left(3 c_W^2 c_\alpha^2 m^2_{u_{g4}} - 2 c_{2\alpha} 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) - \\
2 \left(\begin{array}{l}
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 - \\
3 \left(\begin{array}{l}
4 s_W s_\beta \delta m^{u_g}_{g4} c_\alpha^2 M_W^2 + \\
\left(\begin{array}{l}
\left(\delta Z_{hH}\right) s_W s_{2\alpha} s_\beta M_W^2 - \\
2 \left(\begin{array}{l}
2\left(\delta s_\beta\right) s_W M_W^2 + \\
2 \left(\begin{array}{l}
2\left(\delta s_W\right) M_W^2 + \\
\left(\begin{array}{l}
\delta M_W^2 - \\
\left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{hh} \end{array} \right) M_W^2
\end{array} \right) s_W
\end{array} \right) s_\beta
\end{array} \right) c_\alpha^2
\end{array} \right) m_{u_{g4}}
\end{array} \right) m_{u_{g4}} c_W^4
\end{array} \right) U^{\tilde{u}_{g4}}_{s4,2}
\end{array} \right) U^{\tilde{u}_{g4}*}_{s3,2} + \\
\left(\begin{array}{l}
\left(6 c_W^2 c_\alpha^2 m^2_{u_{g4}} + c_{2\alpha}\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} + \\
2 \left(3 c_W^2 c_\alpha^2 m^2_{u_{g4}} - 2 c_{2\alpha} 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_W s_\beta c_W^2 M_W^2
\end{array} \right) \right]
$$

$$
\underset{283}{C}\left(h^0,h^0,\tilde{d}^{s3}_{g3},\tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{24 c_W^4 c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} \left(\begin{array}{l} 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 + 6 c_W^2 m^2_{d_{g4}} s_\alpha^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(\begin{array}{l} 3 \left(\begin{array}{l} 4 c_\beta s_W \delta m^{d_g}_{g4} M_W^2 s_\alpha^2 - \\ \left(\begin{array}{l} 4 \left(\delta c_\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 + \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_{2\alpha} M_W^2 + \\ 2 \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{hh} \end{array} \right) M_W^2 \end{array} \right) s_\alpha^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) m_{d_{g4}} \end{array} \right) m_{d_{g4}} c_W^4 + \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_W s_{2\alpha} c_W^2 \left(1+2c_W^2\right) + \\ \left(\begin{array}{l} 2\left(\delta s_W\right)\left(1+2c_W^2\right) s_W^2 - \\ c_W^2 \left(6\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) \end{array} \right) c_{2\alpha} \end{array} \right) c_\beta^3 M_W^4 \end{array} \right) U^{\tilde{d}_{g4}}_{s4,1} \end{array} \right) U^{\tilde{d}_{g4}*}_{s3,1} + \\ 2 \left(\begin{array}{l} 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^2_{d_{g4}} s_\alpha^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(\begin{array}{l} 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 + \\ 3 \left(\begin{array}{l} 4 c_\beta s_W \delta m^{d_g}_{g4} M_W^2 s_\alpha^2 - \\ \left(\begin{array}{l} 4 \left(\delta c_\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 + \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_{2\alpha} M_W^2 + \\ 2 \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{hh} \end{array} \right) M_W^2 \end{array} \right) s_\alpha^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) m_{d_{g4}} \end{array} \right) m_{d_{g4}} c_W^4 \end{array} \right) U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) U^{\tilde{d}_{g4}*}_{s3,2} + \\ \left(\begin{array}{l} \left(c_{2\alpha}\left(1+2c_W^2\right) c_\beta^2 M_W^2 + 6 c_W^2 m^2_{d_{g4}} s_\alpha^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\alpha} c_\beta^2 M_W^2 s_W^2 + 3 c_W^2 m^2_{d_{g4}} s_\alpha^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} \right) c_\beta s_W c_W^2 M_W^2 \end{array} \right) \right]
$$

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

$$
\underset{285}{C}\left(H^0, H^0, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\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} \left(\begin{array}{l} c_\beta s_W c_W^2 M_W^2 \left(2 c_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) + \\ 2 \left(\begin{array}{l} \left(\begin{array}{l} 4 c_\beta s_W \delta m^{e_g}_{g4} c_\alpha^2 M_W^2 - \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) c_\beta s_W s_{2\alpha} M_W^2 + \\ 2 \left(\begin{array}{l} 2\left(\delta c_\beta\right) s_W M_W^2 + \\ 2 \left(\begin{array}{l} 2\left(\delta s_W\right) M_W^2 + \\ \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{HH} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) c_\alpha^2 \end{array} \right) m_{e_{g4}} \end{array} \right) m_{e_{g4}} c_W^4 - \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_W s_{2\alpha} \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 \end{array} \right) U^{\tilde{e}_{g4}}_{s4,1} \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,1} + \\ 2 \left(\begin{array}{l} 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 \left(\begin{array}{l} \left(\begin{array}{l} 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 + \\ \left(\begin{array}{l} 4 c_\beta s_W \delta m^{e_g}_{g4} c_\alpha^2 M_W^2 - \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) c_\beta s_W s_{2\alpha} M_W^2 + \\ 2 \left(\begin{array}{l} 2\left(\delta c_\beta\right) s_W M_W^2 + \\ 2 \left(\begin{array}{l} 2\left(\delta s_W\right) M_W^2 + \\ \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{HH} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) c_\alpha^2 \end{array} \right) m_{e_{g4}} \end{array} \right) m_{e_{g4}} c_W^4 \end{array} \right) U^{\tilde{e}_{g4}}_{s4,2} \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,2} + \\ \left(\begin{array}{l} \left(2 c_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} \right) c_\beta s_W c_W^2 M_W^2 \end{array} \right) \right]
$$

$$\underset{286}{C}\left(H^0,H^0,\tilde{u}_{g3}^{s3},\tilde{u}_{g4}^{s4,\dagger}\right)=\left[-\frac{ie^2\delta_{g3,g4}}{24c_W^4M_W^4s_W^3s_\beta^3}\left(\begin{array}{l}\left(\begin{array}{l}s_Ws_\beta c_W^2M_W^2\left(6c_W^2m_{u_{g4}}^2s_\alpha^2-c_{2\alpha}\left(1-4c_W^2\right)M_W^2s_\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\left(\begin{array}{l}3\left(\begin{array}{l}4s_Ws_\beta\delta m_{g4}^{u_g}M_W^2s_\alpha^2-\\4\left(\left(\delta s_\beta\right)s_W+\left(\delta s_W\right)s_\beta\right)M_W^2s_\alpha^2+\\\left(\begin{array}{l}2\delta M_W^2s_\alpha^2-\\\left(\begin{array}{l}\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\end{array}\right)M_W^2\end{array}\right)s_Ws_\beta\end{array}\right)m_{u_{g4}}\end{array}\right)m_{u_{g4}}c_W^4+\\\left(\begin{array}{l}\left(\delta Z_{hH}\right)s_Ws_{2\alpha}\left(1-4c_W^2\right)c_W^2-\\\left(\begin{array}{l}2\left(\delta s_W\right)\left(1-4c_W^2\right)s_W^2+\\\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\end{array}\right)c_{2\alpha}\end{array}\right)M_W^4s_\beta^3\end{array}\right)U_{s4,1}^{\tilde{u}_{g4}}\end{array}\right)U_{s3,1}^{\tilde{u}_{g4}*}+\\2\left(\begin{array}{l}s_Ws_\beta c_W^2M_W^2\left(3c_W^2m_{u_{g4}}^2s_\alpha^2+2c_{2\alpha}M_W^2s_W^2s_\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(\begin{array}{l}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^4s_W^3s_\beta^3-\\3\left(\begin{array}{l}4s_Ws_\beta\delta m_{g4}^{u_g}M_W^2s_\alpha^2-\\4\left(\delta s_\beta\right)s_WM_W^2s_\alpha^2+\\\left(\begin{array}{l}4\left(\delta s_W\right)M_W^2s_\alpha^2+\\\left(\begin{array}{l}2\delta M_W^2s_\alpha^2-\\\left(\begin{array}{l}\left(\delta Z_{hH}\right)s_{2\alpha}+\\\left(\begin{array}{l}4\left(\delta Z_e\right)+\\2\left(\delta Z_{HH}\right)\end{array}\right)s_\alpha^2\end{array}\right)M_W^2\end{array}\right)s_W\end{array}\right)s_\beta\end{array}\right)m_{u_{g4}}\end{array}\right)m_{u_{g4}}c_W^4\end{array}\right)U_{s4,2}^{\tilde{u}_{g4}}\end{array}\right)U_{s3,2}^{\tilde{u}_{g4}*}+\\\left(\begin{array}{l}\left(6c_W^2m_{u_{g4}}^2s_\alpha^2-c_{2\alpha}\left(1-4c_W^2\right)M_W^2s_\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^2m_{u_{g4}}^2s_\alpha^2+2c_{2\alpha}M_W^2s_W^2s_\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)s_Ws_\beta c_W^2M_W^2\end{array}\right)\right]$$

$$
\underset{287}{C}\left(H^0, H^0, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{24 c_W^4 c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} c_\beta s_W c_W^2 M_W^2 \left(6 c_W^2 c_\alpha^2 m^2_{d_{g4}} - c_{2\alpha}\left(1+2c_W^2\right) c_\beta^2 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(\begin{array}{l} 3\left(\begin{array}{l} 4 c_\beta s_W \delta m^{d_g}_{g4} c_\alpha^2 M_W^2 - \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) c_\beta s_W s_{2\alpha} M_W^2 + \\ 2\left(\delta c_\beta\right) s_W M_W^2 + \\ 2\left(\begin{array}{l} 2\left(\delta s_W\right) M_W^2 + \\ \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{HH} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) c_\alpha^2 \end{array} \right) m_{d_{g4}} \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_W s_{2\alpha} c_W^2 \left(1+2c_W^2\right) - \\ \left(\begin{array}{l} 2\left(\delta s_W\right)\left(1+2c_W^2\right) s_W^2 - \\ c_W^2\left(6\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) \end{array} \right) c_{2\alpha} \end{array} \right) c_\beta^3 M_W^4 \end{array} \right) m_{d_{g4}} c_W^4 + \\ 2\left(\begin{array}{l} c_\beta s_W c_W^2 M_W^2 \left(3 c_W^2 c_\alpha^2 m^2_{d_{g4}} - c_{2\alpha} 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) + \\ 2\left(\begin{array}{l} 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 + \\ 3\left(\begin{array}{l} 4 c_\beta s_W \delta m^{d_g}_{g4} c_\alpha^2 M_W^2 - \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) c_\beta s_W s_{2\alpha} M_W^2 + \\ 2\left(\delta c_\beta\right) s_W M_W^2 + \\ 2\left(\begin{array}{l} 2\left(\delta s_W\right) M_W^2 + \\ \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{HH} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) c_\alpha^2 \end{array} \right) m_{d_{g4}} \end{array} \right) m_{d_{g4}} c_W^4 \end{array} \right) U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) U^{\tilde{d}_{g4}*}_{s3,2} + \\ \left(\begin{array}{l} \left(6 c_W^2 c_\alpha^2 m^2_{d_{g4}} - c_{2\alpha}\left(1+2c_W^2\right) c_\beta^2 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(3 c_W^2 c_\alpha^2 m^2_{d_{g4}} - c_{2\alpha} c_\beta^2 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} \right) c_\beta s_W c_W^2 M_W^2 \end{array} \right) U^{\tilde{d}_{g4}}_{s4,1} \end{array} \right) U^{\tilde{d}_{g4}*}_{s3,1} + \\ \left(\begin{array}{l} c_\beta s_W c_W^2 M_W^2 \left(6 c_W^2 c_\alpha^2 m^2_{d_{g4}} - c_{2\alpha}\left(1+2c_W^2\right) c_\beta^2 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(\begin{array}{l} 3\left(\begin{array}{l} 4 c_\beta s_W \delta m^{d_g}_{g4} c_\alpha^2 M_W^2 - \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) c_\beta s_W s_{2\alpha} M_W^2 + \\ 2\left(\delta c_\beta\right) s_W M_W^2 + \\ 2\left(\begin{array}{l} 2\left(\delta s_W\right) M_W^2 + \\ \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{HH} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) c_\alpha^2 \end{array} \right) m_{d_{g4}} \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) s_W s_{2\alpha} c_W^2 \left(1+2c_W^2\right) - \\ \left(\begin{array}{l} 2\left(\delta s_W\right)\left(1+2c_W^2\right) s_W^2 - \\ c_W^2\left(6\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) \end{array} \right) c_{2\alpha} \end{array} \right) c_\beta^3 M_W^4 \end{array} \right) m_{d_{g4}} c_W^4 + \\ 2\left(\begin{array}{l} c_\beta s_W c_W^2 M_W^2 \left(3 c_W^2 c_\alpha^2 m^2_{d_{g4}} - c_{2\alpha} 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) + \\ 2\left(\begin{array}{l} 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 + \\ 3\left(\begin{array}{l} 4 c_\beta s_W \delta m^{d_g}_{g4} c_\alpha^2 M_W^2 - \\ \left(\begin{array}{l} \left(\delta Z_{hH}\right) c_\beta s_W s_{2\alpha} M_W^2 + \\ 2\left(\delta c_\beta\right) s_W M_W^2 + \\ 2\left(\begin{array}{l} 2\left(\delta s_W\right) M_W^2 + \\ \left(\begin{array}{l} \delta M_W^2 - \\ \left(\begin{array}{l} 2\left(\delta Z_e\right) + \\ \delta Z_{HH} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) c_\alpha^2 \end{array} \right) m_{d_{g4}} \end{array} \right) m_{d_{g4}} c_W^4 \end{array} \right) U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) U^{\tilde{d}_{g4}*}_{s3,2} + \\ \left(\begin{array}{l} \left(6 c_W^2 c_\alpha^2 m^2_{d_{g4}} - c_{2\alpha}\left(1+2c_W^2\right) c_\beta^2 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(3 c_W^2 c_\alpha^2 m^2_{d_{g4}} - c_{2\alpha} c_\beta^2 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} \right) c_\beta s_W c_W^2 M_W^2 \end{array} \right) \right]
$$

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

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

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

$$\underset{291}{C}\left(A^0, A^0, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{8c_W^4 c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} 2\left(\begin{array}{l} 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) + \\ 2\left(\begin{array}{l} 2\left(\begin{array}{l} s_W s_{2\beta}\delta m_{g4}^{e_g} M_W^2 - \\ \left(\frac{1}{2}s_{2\beta}\right)\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_{AA}\right) 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}} \end{array} \right) m_{e_{g4}} s_\beta c_W^4 - \\ 2\left(\begin{array}{l} \left(\delta Z_{AG}\right) s_W s_{2\beta}\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_{AA}\right) s_W\left(1-2c_W^2\right)\right) c_W^2 \end{array} \right) c_{2\beta} \end{array} \right) c_\beta^3 M_W^4 \end{array} \right) U_{s4,1}^{\tilde{e}_{g4}} \\ 2\left(\begin{array}{l} 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\left(\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 + \\ 2\left(\begin{array}{l} \left(\begin{array}{l} s_W s_{2\beta}\delta m_{g4}^{e_g} M_W^2 - \\ \left(\frac{1}{2}s_{2\beta}\right)\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_{AA}\right) 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}} \end{array} \right) m_{e_{g4}} s_\beta c_W^4 \end{array} \right) U_{s4,2}^{\tilde{e}_{g4}} \end{array} \right) \\ \left(\begin{array}{l} \left(c_{2\beta}\left(1-2c_W^2\right) c_\beta^2 M_W^2 - 2c_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{array} \right) c_\beta s_W c_W^2 M_W^2 \end{array} \right) \right]$$

$$
\underset{292}{C}\left(G^0, G^0, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\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} \left(\begin{array}{l} c_\beta s_W c_W^2 M_W^2 \left(2 c_W^2 m^2_{e_{g4}} + c_{2\beta}\left(1-2c_W^2\right) 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) - \\ 2\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(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) M_W^2\right)\right) \end{array} \right) c_W^4 m^2_{e_{g4}} - \\ 2\left(\begin{array}{l} 4 m_{e_{g4}} s_W \delta m^{e_g}_{g4} c_W^4 M_W^2 - \\ \left(\begin{array}{l} \left(\delta Z_{AG}\right) s_W s_{2\beta}\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(\begin{array}{l} 2\left(\delta s_W\right) + \\ \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_W\left(1-2c_W^2\right) \end{array} \right) c_W^2 \end{array} \right) c_{2\beta} \end{array} \right) M_W^4 \end{array} \right) c_\beta \end{array} \right) U^{\tilde{e}_{g4}}_{s4,1} \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,1} + \\ \left(\begin{array}{l} c_\beta s_W c_W^2 M_W^2 \left(c_W^2 m^2_{e_{g4}} - c_{2\beta} 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\left(\begin{array}{l} \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(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) M_W^2\right)\right) \end{array} \right) c_W^4 m^2_{e_{g4}} - \\ 2\left(\begin{array}{l} 2 m_{e_{g4}} s_W \delta m^{e_g}_{g4} c_W^4 M_W^2 + \\ \left(\begin{array}{l} \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) \end{array} \right) M_W^4 s_W^3 \end{array} \right) c_\beta \end{array} \right) U^{\tilde{e}_{g4}}_{s4,2} \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,2} + \\ \left(\begin{array}{l} \left(2 c_W^2 m^2_{e_{g4}} + c_{2\beta}\left(1-2c_W^2\right) 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 m^2_{e_{g4}} - c_{2\beta} 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} \right) c_\beta s_W c_W^2 M_W^2 \end{array} \right) \right]
$$

$$
\underset{293}{C}\left(A^0, G^0, \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(\left(\begin{array}{l} s_W s_{2\beta} 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) + \\ \left(\begin{array}{l} \left(\begin{array}{l} 4\left(\left(\delta s_W - \left(\delta Z_e\right) 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 - 2c_W^2\right) c_W^2 \end{array} \right) s_{2\beta} c_\beta^2 M_W^4 + \\ \left(\begin{array}{l} 4 s_W s_{2\beta} \delta m_{g4}^{e_g} M_W^2 - \\ \left(\begin{array}{l} 4\left(\delta s_W\right) s_{2\beta} M_W^2 + \\ \left(\begin{array}{l} 2 s_{2\beta} \delta M_W^2 + \\ \left(\begin{array}{l} 8\left(\delta c_\beta\right) s_\beta + \\ 2\left(\delta Z_{AG}\right) - \\ \left(\begin{array}{l} 4\left(\delta Z_e\right) + \\ \delta Z_{AA} + \\ \delta Z_{GG} \end{array} \right) s_{2\beta} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) m_{e_{g4}} \end{array} \right) m_{e_{g4}} c_W^4 \end{array} \right) U_{s4,1}^{\tilde{e}_{g4}} \end{array} \right) U_{s3,1}^{\tilde{e}_{g4}*} + \\ \left(\begin{array}{l} s_W s_{2\beta} 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(\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 - \\ \left(\begin{array}{l} 4 s_W s_{2\beta} \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(\delta M_W^2 - 2\left(\delta Z_e\right) M_W^2\right)\right) + \\ \left(\begin{array}{l} 2\left(\delta Z_{AG}\right) + 8\left(\delta c_\beta\right) s_\beta - \\ \left(\delta Z_{AA} + \delta Z_{GG}\right) s_{2\beta} \end{array} \right) s_W M_W^2 \end{array} \right) m_{e_{g4}} \end{array} \right) m_{e_{g4}} c_W^4 \end{array} \right) U_{s4,2}^{\tilde{e}_{g4}} \end{array} \right) U_{s3,2}^{\tilde{e}_{g4}*} + \\ \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 - 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) s_W s_{2\beta} c_W^2 M_W^2 \end{array} \right) \right]
$$

$$\underset{294}{C}\left(A^{0},A^{0},\tilde{u}^{s3}_{g3},\tilde{u}^{s4,\dagger}_{g4}\right)= \Bigg[-\frac{ie^{2}\delta_{g3,g4}}{24c_{W}^{4}M_{W}^{4}s_{W}^{3}s_{\beta}^{3}} \Bigg(\Bigg($$

$$s_{W}s_{\beta}c_{W}^{2}M_{W}^{2}\left(6c_{W}^{2}c_{\beta}^{2}m_{u_{g4}}^{2}+c_{2\beta}\left(1-4c_{W}^{2}\right)M_{W}^{2}s_{\beta}^{2}\right)\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4}U^{\tilde{u}_{g4}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4}U^{\tilde{u}_{g4}}_{2,1}\right)+$$

$$2\Bigg(6\Bigg(s_{W}s_{2\beta}\delta m^{u_{g}}_{g4}M_{W}^{2}+\Bigg((\delta Z_{AG})\,s_{W}M_{W}^{2}s_{\beta}^{2}-\Bigg(2\,(\delta s_{\beta})\,s_{W}M_{W}^{2}+\Bigg(2\,(\delta s_{W})\,M_{W}^{2}+\left(\delta M_{W}^{2}-\left(2\,(\delta Z_{e})+\delta Z_{AA}\right)M_{W}^{2}\right)s_{W}\Bigg)s_{\beta}\Bigg)c_{\beta}\Bigg)m_{u_{g4}}\Bigg)c_{\beta}m_{u_{g4}}c_{W}^{4}+$$

$$\Bigg((\delta Z_{AG})\,s_{W}s_{2\beta}\left(1-4c_{W}^{2}\right)c_{W}^{2}-\left(2\,(\delta s_{W})\left(1-4c_{W}^{2}\right)s_{W}^{2}+\left(6\,(\delta s_{W})+\left(2\,(\delta Z_{e})+\delta Z_{AA}\right)s_{W}\left(1-4c_{W}^{2}\right)\right)c_{W}^{2}\right)s_{\beta}^{2}-$$

$$\left((\delta s_{W})\left(6s_{W}^{2}-8s_{W}^{4}\right)-\left(6\,(\delta s_{W})+\left(2\,(\delta Z_{e})+\delta Z_{AA}\right)s_{W}\left(1-4c_{W}^{2}\right)\right)c_{W}^{2}\right)c_{\beta}^{2}\Bigg)M_{W}^{4}s_{\beta}^{3}\Bigg)U^{\tilde{u}_{g4}}_{s4,1}\Bigg)U^{\tilde{u}_{g4}*}_{s3,1}+$$

$$2\Bigg(s_{W}s_{\beta}c_{W}^{2}M_{W}^{2}\left(3c_{W}^{2}c_{\beta}^{2}m_{u_{g4}}^{2}-2c_{2\beta}M_{W}^{2}s_{W}^{2}s_{\beta}^{2}\right)\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4}U^{\tilde{u}_{g4}}_{1,2}+\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4}U^{\tilde{u}_{g4}}_{2,2}\right)+$$

$$2\Bigg(3\Bigg(s_{W}s_{2\beta}\delta m^{u_{g}}_{g4}M_{W}^{2}-\left(\frac{1}{2}m_{u_{g4}}\right)\Bigg(2\,(\delta s_{W})\,s_{2\beta}M_{W}^{2}+\Bigg(s_{2\beta}\delta M_{W}^{2}+\Bigg(4\,(\delta s_{\beta})\,c_{\beta}-\left(2\,(\delta Z_{e})+\delta Z_{AA}\right)s_{2\beta}-2\,(\delta Z_{AG})\,s_{\beta}^{2}\Bigg)M_{W}^{2}\Bigg)s_{W}\Bigg)\Bigg)c_{\beta}m_{u_{g4}}c_{W}^{4}-$$

$$2\Bigg(\left(2\,(\delta s_{W})\,s_{W}+\left(2\,(\delta Z_{e})+\delta Z_{AA}\right)c_{W}^{2}\right)c_{\beta}^{2}-2\,(\delta s_{W})\,s_{W}s_{\beta}^{2}+c_{W}^{2}\left((\delta Z_{AG})\,s_{2\beta}-\left(2\,(\delta Z_{e})+\delta Z_{AA}\right)s_{\beta}^{2}\right)\Bigg)M_{W}^{4}s_{W}^{3}s_{\beta}^{3}\Bigg)U^{\tilde{u}_{g4}}_{s4,2}\Bigg)U^{\tilde{u}_{g4}*}_{s3,2}+$$

$$\Bigg(\left(6c_{W}^{2}c_{\beta}^{2}m_{u_{g4}}^{2}+c_{2\beta}\left(1-4c_{W}^{2}\right)M_{W}^{2}s_{\beta}^{2}\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g4}*}_{1,1}+\delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g4}*}_{2,1}\right)U^{\tilde{u}_{g4}}_{s4,1}+$$

$$2\left(3c_{W}^{2}c_{\beta}^{2}m_{u_{g4}}^{2}-2c_{2\beta}M_{W}^{2}s_{W}^{2}s_{\beta}^{2}\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g4}*}_{1,2}+\delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g4}*}_{2,2}\right)U^{\tilde{u}_{g4}}_{s4,2}\Bigg)s_{W}s_{\beta}c_{W}^{2}M_{W}^{2}$$

$$\underset{295}{C}\left(G^0, G^0, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{24 s_\beta c_W^4 M_W^4 s_W^3} \right.$$
$$\left(\left(s_W s_\beta c_W^2 M_W^2 \left(6 c_W^2 m^2_{u_{g4}} - c_{2\beta}\left(1 - 4c_W^2\right) M_W^2\right) \left(\delta \overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,1} + \delta \overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,1}\right) - \right.\right.$$
$$\left(6 \left(\begin{array}{l} 2\left(\delta s_W\right) s_\beta M_W^2 + \\ s_W \left(s_\beta \delta M_W^2 + \left(2\left(\delta s_\beta\right) - \left(\delta Z_{AG}\right) c_\beta - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_\beta\right) M_W^2 \right) \end{array} \right) c_W^4 m^2_{u_{g4}} - \right.$$
$$\left. 2 \left(\begin{array}{l} 12 m_{u_{g4}} s_W \delta m^{u_g}_{g4} c_W^4 M_W^2 + \\ \left(\begin{array}{l} \left(\delta Z_{AG}\right) s_W s_{2\beta} \left(1 - 4c_W^2\right) c_W^2 - \\ \left(\begin{array}{l} 2\left(\delta s_W\right)\left(1 - 4c_W^2\right) s_W^2 + \\ \left(\begin{array}{l} 6\left(\delta s_W\right) + \\ \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_W \left(1 - 4c_W^2\right) \end{array} \right) c_W^2 \end{array} \right) c_\beta^2 - \\ \left(\begin{array}{l} \left(\delta s_W\right)\left(6 s_W^2 - 8 s_W^4\right) - \\ \left(\begin{array}{l} 6\left(\delta s_W\right) + \\ \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_W \left(1 - 4c_W^2\right) \end{array} \right) c_W^2 \end{array} \right) s_\beta^2 \end{array} \right) M_W^4 \end{array} \right) s_\beta \right) U^{\tilde{u}_{g4}}_{s4,1} \left. \right) U^{\tilde{u}_{g4}*}_{s3,1} +$$
$$2 \left(\left(s_W s_\beta c_W^2 M_W^2 \left(3 c_W^2 m^2_{u_{g4}} + 2 c_{2\beta} M_W^2 s_W^2\right) \left(\delta \overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,2} + \delta \overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,2}\right) - \right.\right.$$
$$\left(3 \left(\begin{array}{l} 2\left(\delta s_W\right) s_\beta M_W^2 + \\ s_W \left(s_\beta \delta M_W^2 + \left(2\left(\delta s_\beta\right) - \left(\delta Z_{AG}\right) c_\beta - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_\beta\right) M_W^2 \right) \end{array} \right) c_W^4 m^2_{u_{g4}} - \right.$$
$$\left. 2 \left(\begin{array}{l} 6 m_{u_{g4}} s_W \delta m^{u_g}_{g4} c_W^4 M_W^2 - \\ 2 \left(\begin{array}{l} \left(\delta Z_{AG}\right) s_{2\beta} c_W^2 - \\ c_{2\beta} \left(2\left(\delta s_W\right) s_W + \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) c_W^2\right) \end{array} \right) M_W^4 s_W^3 \end{array} \right) s_\beta \right) U^{\tilde{u}_{g4}}_{s4,2} \left. \right) U^{\tilde{u}_{g4}*}_{s3,2}$$
$$\left. \left(\begin{array}{l} \left(6 c_W^2 m^2_{u_{g4}} - c_{2\beta}\left(1 - 4c_W^2\right) M_W^2\right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g4}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g4}*}_{2,1}\right) U^{\tilde{u}_{g4}}_{s4,1} + \\ 2\left(3 c_W^2 m^2_{u_{g4}} + 2 c_{2\beta} M_W^2 s_W^2\right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g4}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g4}*}_{2,2}\right) U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) s_W s_\beta c_W^2 M_W^2 \right)$$

$$\underset{296}{C}\left(A^0, G^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^2} \left(\begin{array}{l} \left(\begin{array}{l} s_W s_{2\beta} c_W^2 M_W^2 \left(3 c_W^2 m_{u_{g4}}^2 + \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) - \\ \left(\begin{array}{l} 6 \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(\begin{array}{l} 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} \end{array} \right) M_W^2 \end{array} \right) \end{array} \right) c_W^4 m_{u_{g4}}^2 - \\ \left(\begin{array}{l} 24 m_{u_{g4}} s_W s_\beta \delta m_{g4}^{u_g} 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 - \\ \left(\begin{array}{l} 4 \left(\delta s_W\right) \left(3 - 4 s_W^2\right) + \\ \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) s_W \end{array} \right) c_W^2 \end{array} \right) M_W^4 s_\beta^3 \end{array} \right) c_\beta \end{array} \right) U_{s4,1}^{\tilde{u}_{g4}} \end{array} \right) U_{s3,1}^{\tilde{u}_{g4}*} + \\ \left(\begin{array}{l} s_W s_{2\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) - \\ 2 \left(\begin{array}{l} \left(\frac{3}{2} c_W^4 m_{u_{g4}}^2\right) \left(\begin{array}{l} 4 \left(\delta s_W\right) s_{2\beta} M_W^2 + \\ \left(\begin{array}{l} 2 s_{2\beta} \delta M_W^2 - \\ \left(\begin{array}{l} 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} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) + \\ \left(\begin{array}{l} 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_{g4}^{u_g} c_W^4 M_W^2 \end{array} \right) c_\beta \end{array} \right) U_{s4,2}^{\tilde{u}_{g4}} \end{array} \right) U_{s3,2}^{\tilde{u}_{g4}*} + \\ \left(\begin{array}{l} \left(3 c_W^2 m_{u_{g4}}^2 + \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}} + \\ \left(3 c_W^2 m_{u_{g4}}^2 - 4 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} \right) s_W s_{2\beta} c_W^2 M_W^2 \end{array} \right) \right]$$

$$\underset{297}{C}\left(A^0, A^0, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{24 c_W^4 c_\beta^3 M_W^4 s_W^3} \right.$$
$$\left(\begin{array}{l}
\left(\begin{array}{l}
s_W c_W^2 M_W^2 \left(3 s_{2\beta} s_\beta c_W^2 m^2_{d_{g4}} + c_{2\beta}\left(1+2c_W^2\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(\begin{array}{l}
6\left(\begin{array}{l}
s_W s_{2\beta} \delta m^{d_g}_{g4} M_W^2 - \\
\left(\frac{1}{2} s_{2\beta}\right)\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_{AA}\right) 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}} \end{array} \right) m_{d_{g4}} s_\beta c_W^4 + \\
2\left(\begin{array}{l}
\left(\delta Z_{AG}\right) s_W s_{2\beta} c_W^2\left(1+2c_W^2\right) + \\
\left(\begin{array}{l}
2\left(\delta s_W\right)\left(1+2c_W^2\right) s_W^2 - \\
c_W^2\left(6\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{AA}\right) s_W\left(1+2c_W^2\right)\right)
\end{array} \right) c_\beta^2 - \\
\left(\begin{array}{l}
\left(\delta s_W\right)\left(6 s_W^2 - 4 s_W^4\right) - \\
c_W^2\left(6\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{AA}\right) s_W\left(1+2c_W^2\right)\right)
\end{array} \right) s_\beta^2
\end{array} \right) c_\beta^3 M_W^4
\end{array} \right) U^{\tilde{d}_{g4}}_{s4,} \\
2\left(\begin{array}{l}
c_\beta s_W c_W^2 M_W^2\left(c_{2\beta} c_\beta^2 M_W^2 s_W^2 + 3 c_W^2 m^2_{d_{g4}} s_\beta^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) + \\
2\left(\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 + \\
3\left(\begin{array}{l}
s_W s_{2\beta} \delta m^{d_g}_{g4} M_W^2 - \\
\left(\frac{1}{2} s_{2\beta}\right)\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_{AA}\right) 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}} \end{array} \right) m_{d_{g4}} s_\beta c_W^4
\end{array} \right) U^{\tilde{d}_{g4}}_{s4,} \\
\left(\begin{array}{l}
\left(c_{2\beta}\left(1+2c_W^2\right) c_\beta^2 M_W^2 + 6 c_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 + 3 c_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} \right) c_\beta s_W c_W^2 M_W^2
\end{array} \right)$$

$$\underset{298}{C}\left(G^0, G^0, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{24 c_\beta c_W^4 M_W^4 s_W^3} \left(\left(\begin{array}{l} c_\beta s_W c_W^2 M_W^2 \left(6 c_W^2 m^2_{d_{g4}} - c_{2\beta}\left(1+2c_W^2\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(\begin{array}{l} 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(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) M_W^2\right)\right) \end{array} \right) c_W^4 m^2_{d_{g4}} - \\ 2\left(\begin{array}{l} 12 m_{d_{g4}} s_W \delta m^{d_g}_{g4} c_W^4 M_W^2 + \\ \left(\begin{array}{l} \left(\delta Z_{AG}\right) s_W s_{2\beta} c_W^2\left(1+2c_W^2\right) - \\ \left(\begin{array}{l} 2\left(\delta s_W\right)\left(1+2c_W^2\right) s_W^2 - \\ \left(\begin{array}{l} 6\left(\delta s_W\right) - \\ \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_W\left(1+2c_W^2\right) \end{array} \right) c_W^2 \end{array} \right) c_\beta^2 + \\ \left(\begin{array}{l} \left(\delta s_W\right)\left(6 s_W^2 - 4 s_W^4\right) - \\ \left(\begin{array}{l} 6\left(\delta s_W\right) - \\ \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) s_W\left(1+2c_W^2\right) \end{array} \right) c_W^2 \end{array} \right) s_\beta^2 \end{array} \right) M_W^4 \end{array} \right) c_\beta \end{array} \right) U^{\tilde{d}_{g4}}_{s4,1} \end{array} \right) U^{\tilde{d}_{g4}*}_{s3,1} + \\ 2\left(\begin{array}{l} c_\beta s_W c_W^2 M_W^2\left(3 c_W^2 m^2_{d_{g4}} - c_{2\beta} 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) - \\ 2\left(\begin{array}{l} 3\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(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z_{GG}\right) M_W^2\right)\right) \end{array} \right) c_W^4 m^2_{d_{g4}} - \\ 2\left(\begin{array}{l} 6 m_{d_{g4}} s_W \delta m^{d_g}_{g4} c_W^4 M_W^2 + \\ \left(\begin{array}{l} \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) \end{array} \right) M_W^4 s_W^3 \end{array} \right) c_\beta \end{array} \right) U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) U^{\tilde{d}_{g4}*}_{s3,2} + \\ \left(\begin{array}{l} \left(6 c_W^2 m^2_{d_{g4}} - c_{2\beta}\left(1+2c_W^2\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(3 c_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} \right) c_\beta s_W c_W^2 M_W^2 \end{array} \right) \right) \right]$$

$$\underset{299}{C}\left(A^0, G^0, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{24 c_W^4 c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} \left(\begin{array}{l} s_W s_{2\beta} c_W^2 M_W^2 \left(3 c_W^2 m_{\tilde{d}_{g4}}^2 - \left(1 + 2 c_W^2\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(\begin{array}{l} 6 \left(\begin{array}{l} s_W \left(\delta Z_{AG} + 4 \left(\delta c_\beta\right) s_\beta\right) M_W^2 + \\ \left(\frac{1}{2} s_{2\beta}\right) \left(4 \left(\delta s_W\right) M_W^2 + s_W \left(2 \delta M_W^2 - \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) M_W^2\right)\right) \end{array} \right) c_W^4 m_{\tilde{d}_{g4}}^2 - \\ \left(\begin{array}{l} 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 \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 - \\ \left(\begin{array}{l} 4 \left(\delta s_W\right) \left(3 - 2 s_W^2\right) - \\ \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) s_W \end{array} \right) c_W^2 \end{array} \right) c_\beta^3 M_W^4 \end{array} \right) s_\beta \end{array} \right) U_{s4,1}^{\tilde{d}_{g4}} \end{array} \right) U_{s3,1}^{\tilde{d}_{g4}} \\ \left(\begin{array}{l} s_W s_{2\beta} c_W^2 M_W^2 \left(3 c_W^2 m_{\tilde{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) - \\ 2 \left(\begin{array}{l} 3 \left(\begin{array}{l} s_W \left(\delta Z_{AG} + 4 \left(\delta c_\beta\right) s_\beta\right) M_W^2 + \\ \left(\frac{1}{2} s_{2\beta}\right) \left(4 \left(\delta s_W\right) M_W^2 + s_W \left(2 \delta M_W^2 - \left(4 \left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{GG}\right) M_W^2\right)\right) \end{array} \right) c_W^4 m_{\tilde{d}_{g4}}^2 + \\ \left(\begin{array}{l} 2 \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^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 \end{array} \right) s_\beta \end{array} \right) U_{s4,2}^{\tilde{d}_{g4}} \end{array} \right) U_{s...}^{\tilde{d}} \\ \left(\begin{array}{l} \left(3 c_W^2 m_{\tilde{d}_{g4}}^2 - \left(1 + 2 c_W^2\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_{\tilde{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) s_W s_{2\beta} c_W^2 M_W^2 \end{array} \right) \right]$$

$$\underset{300}{C}\left(h^0, H^0, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[-\frac{i e^2 \delta_{g3,g4} s_{2\alpha}}{8 c_W^4 s_W^3} \left(\left(4 \left(\delta s_W - \left(\delta Z_e\right) s_W\right) - s_W \left(\delta Z_{hh} + \delta Z_{HH} + \delta \overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right) c_W^2 - 4 \left(\delta s_W\right) s_W^2 \right) \right]$$

$$
\underset{301}{C}\left(h^0, H^0, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\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} \left(\begin{array}{l} c_\beta s_W s_{2\alpha} c_W^2 M_W^2 \left(c_W^2 m^2_{e_{g4}} + \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) + \\ \left(\begin{array}{l} \left(\begin{array}{l} 4\left(\delta s_W\right)\left(1 - 2c_W^2\right) s_W^2 + \\ \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 - 2c_W^2\right)\right) c_W^2 \end{array} \right) s_{2\alpha} c_\beta^3 M_W^4 + \\ \left(\begin{array}{l} 4 c_\beta s_W s_{2\alpha} \delta m^{e_g}_{g4} M_W^2 - \\ \left(\begin{array}{l} 4\left(\delta c_\beta\right) s_W s_{2\alpha} M_W^2 + \\ \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 + \\ \left(\begin{array}{l} 2\left(\delta Z_{hH}\right)\left(c_\alpha^2 + s_\alpha^2\right) - \\ \left(\begin{array}{l} 4\left(\delta Z_e\right) + \\ \delta Z_{hh} + \\ \delta Z_{HH} \end{array} \right) s_{2\alpha} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) m_{e_{g4}} \end{array} \right) m_{e_{g4}} c_W^4 \end{array} \right) U^{\tilde{e}_{g4}}_{s4,1} \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,1} + \\ \left(\begin{array}{l} c_\beta s_W s_{2\alpha} c_W^2 M_W^2 \left(c_W^2 m^2_{e_{g4}} - 2 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) - \\ \left(\begin{array}{l} 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 - \\ \left(\begin{array}{l} 4 c_\beta s_W s_{2\alpha} \delta m^{e_g}_{g4} M_W^2 - \\ \left(\begin{array}{l} 4\left(\delta c_\beta\right) s_W s_{2\alpha} M_W^2 + \\ \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 + \\ \left(\begin{array}{l} 2\left(\delta Z_{hH}\right)\left(c_\alpha^2 + s_\alpha^2\right) - \\ \left(\begin{array}{l} 4\left(\delta Z_e\right) + \\ \delta Z_{hh} + \\ \delta Z_{HH} \end{array} \right) s_{2\alpha} \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) c_\beta \end{array} \right) m_{e_{g4}} \end{array} \right) m_{e_{g4}} c_W^4 \end{array} \right) U^{\tilde{e}_{g4}}_{s4,2} \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,2} + \\ \left(\begin{array}{l} \left(c_W^2 m^2_{e_{g4}} + \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} + \\ \left(c_W^2 m^2_{e_{g4}} - 2 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} \right) c_\beta s_W s_{2\alpha} c_W^2 M_W^2 \end{array} \right) \end{array} \right) \right]
$$

$$
\underset{302}{C}\left(h^0, H^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(\left(\begin{array}{l} s_W s_{2\alpha} s_\beta c_W^2 M_W^2 \left(3 c_W^2 m_{u_{g4}}^2 + \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) + \\ \left(\left(\begin{array}{l} 4 \left(\delta s_W\right) \left(1 - 4 c_W^2\right) s_W^2 + \\ \left(12 \left(\delta s_W\right) + \left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH}\right) s_W \left(1 - 4 c_W^2\right)\right) c_W^2 \end{array} \right) s_{2\alpha} M_W^4 s_\beta^3 + \\ 3 \left(\left(\begin{array}{l} 4 s_W s_{2\alpha} s_\beta \delta m_{g4}^{u_g} M_W^2 - \\ \left(\begin{array}{l} 4 \left(\delta s_W\right) s_{2\alpha} s_\beta M_W^2 + \\ \left(\begin{array}{l} 4 \left(\delta s_\beta\right) s_{2\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 s_{2\alpha} \delta M_W^2 - \\ \left(\begin{array}{l} 2 \left(\delta Z_{hH}\right) \left(c_\alpha^2 + s_\alpha^2\right) + \\ \left(\begin{array}{l} 4 \left(\delta Z_e\right) + \\ \delta Z_{hh} + \\ \delta Z_{HH} \end{array} \right) s_{2\alpha} \end{array} \right) M_W^2 \end{array} \right) s_\beta \end{array} \right) s_W \end{array} \right) m_{u_{g4}} \end{array} \right) m_{u_{g4}} c_W^4 \end{array} \right) U_{s4,1}^{\tilde{u}_{g4}} \end{array} \right) U_{s3,1}^{\tilde{u}_{g4}*} + \\ \left(\begin{array}{l} s_W s_{2\alpha} 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(\begin{array}{l} 4 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) M_W^4 s_W^3 s_\beta^3 - \\ 3 \left(\left(\begin{array}{l} 4 s_W s_{2\alpha} s_\beta \delta m_{g4}^{u_g} M_W^2 - \\ \left(\begin{array}{l} 4 \left(\delta s_W\right) s_{2\alpha} s_\beta M_W^2 + \\ \left(\begin{array}{l} 4 \left(\delta s_\beta\right) s_{2\alpha} M_W^2 + \\ \left(\begin{array}{l} 2 s_{2\alpha} \delta M_W^2 - \\ \left(\begin{array}{l} 2 \left(\delta Z_{hH}\right) \left(c_\alpha^2 + s_\alpha^2\right) + \\ \left(\begin{array}{l} 4 \left(\delta Z_e\right) + \\ \delta Z_{hh} + \\ \delta Z_{HH} \end{array} \right) s_{2\alpha} \end{array} \right) M_W^2 \end{array} \right) s_\beta \end{array} \right) s_W \end{array} \right) m_{u_{g4}} \end{array} \right) m_{u_{g4}} c_W^4 \end{array} \right) U_{s4,2}^{\tilde{u}_{g4}} \end{array} \right) U_{s3,2}^{\tilde{u}_{g4}*} + \\ \left(\begin{array}{l} \left(3 c_W^2 m_{u_{g4}}^2 + \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}} + \\ \left(3 c_W^2 m_{u_{g4}}^2 - 4 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} \right) s_W s_{2\alpha} s_\beta c_W^2 M_W^2 \end{array} \right) \right]
$$

$$\underset{303}{C}\left(h^0, H^0, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{24 c_W^4 c_\beta^3 M_W^4 s_W^3}\right.$$
$$\left(\begin{array}{l}
c_\beta s_W s_{2\alpha} c_W^2 M_W^2 \left(3 c_W^2 m^2_{\tilde{d}_{g4}} - \left(1+2c_W^2\right) c_\beta^2 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) - \\
\left(\begin{array}{l}
\left(\begin{array}{l}
4\left(\delta s_W\right)\left(1+2c_W^2\right) s_W^2 - \\
c_W^2\left(12\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{HH}\right) s_W \left(1+2c_W^2\right)\right)
\end{array}\right) s_{2\alpha} c_\beta^3 M_W^4 - \\
3\left(\begin{array}{l}
4 c_\beta s_W s_{2\alpha} \delta m^{\tilde{d}_g}_{g4} M_W^2 - \\
\left(\begin{array}{l}
4\left(\delta c_\beta\right) s_W s_{2\alpha} M_W^2 + \\
\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 + \\
\left(\begin{array}{l}
2\left(\delta Z_{hH}\right)\left(c_\alpha^2 + s_\alpha^2\right) - \\
\left(\begin{array}{l}
4\left(\delta Z_e\right) + \\
\delta Z_{hh} + \\
\delta Z_{HH}
\end{array}\right) s_{2\alpha}
\end{array}\right) M_W^2
\end{array}\right) s_W
\end{array}\right) c_\beta
\end{array}\right) m_{\tilde{d}_{g4}}
\end{array}\right) m_{\tilde{d}_{g4}} c_W^4
\end{array}\right) U^{\tilde{d}_{g4}}_{s4,1}
\end{array}\right) U^{\tilde{d}_{g4}*}_{s3,1} + \\
c_\beta s_W s_{2\alpha} c_W^2 M_W^2 \left(3 c_W^2 m^2_{\tilde{d}_{g4}} - 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) - \\
\left(\begin{array}{l}
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 - \\
3\left(\begin{array}{l}
4 c_\beta s_W s_{2\alpha} \delta m^{\tilde{d}_g}_{g4} M_W^2 - \\
\left(\begin{array}{l}
4\left(\delta c_\beta\right) s_W s_{2\alpha} M_W^2 + \\
\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 + \\
\left(\begin{array}{l}
2\left(\delta Z_{hH}\right)\left(c_\alpha^2 + s_\alpha^2\right) - \\
\left(\begin{array}{l}
4\left(\delta Z_e\right) + \\
\delta Z_{hh} + \\
\delta Z_{HH}
\end{array}\right) s_{2\alpha}
\end{array}\right) M_W^2
\end{array}\right) s_W
\end{array}\right) c_\beta
\end{array}\right) m_{\tilde{d}_{g4}}
\end{array}\right) m_{\tilde{d}_{g4}} c_W^4
\end{array}\right) U^{\tilde{d}_{g4}}_{s4,2}
\end{array}\right) U^{\tilde{d}_{g4}*}_{s3,2} + \\
\left(\begin{array}{l}
\left(3 c_W^2 m^2_{\tilde{d}_{g4}} - \left(1+2c_W^2\right) c_\beta^2 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} + \\
\left(3 c_W^2 m^2_{\tilde{d}_{g4}} - 2 c_\beta^2 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}\right) c_\beta s_W s_{2\alpha} c_W^2 M_W^2
\end{array}\right)\left.\right]$$

$$
\underset{304}{C}\left(h^0, H^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \Bigg[\frac{\sqrt{2} i e^2}{M_W^4 s_W^3 s_{2\beta}^3} \Bigg(\Bigg(\left(\frac{1}{2} s_{2\beta}\right) \Bigg(\Bigg(
\left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} s_W s_{2\beta} s_{\beta-\alpha} M_W^2\right)\left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,2}\right) +
$$

$$
\Bigg(m_{u_{g3}} s_W s_{2\beta} s_{\beta-\alpha} \delta m^{d_g}_{g4} M_W^2 + \Bigg(s_W s_{2\beta} s_{\beta-\alpha} \delta m^{u_g}_{g3} M_W^2 - \Bigg(2\left(\delta c_\beta\right) s_W s_\beta s_{\beta-\alpha} M_W^2 + \Bigg(4\left(\delta s_W\right) s_\beta s_{\beta-\alpha} M_W^2 + \Bigg(2\left(\delta s_\beta\right) s_{\beta-\alpha} M_W^2 +
$$

$$
\Bigg(2 s_{\beta-\alpha} \delta M_W^2 - \Bigg(\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right) c_{\beta-\alpha} + \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_{\beta-\alpha} \Bigg) M_W^2 \Bigg) s_\beta \Bigg) s_W \Bigg) c_\beta \Bigg) m_{u_{g3}} \Bigg) m_{d_{g4}} \Bigg) U^{\tilde{d}_{g4}}_{s4,2} \Bigg) U \ldots
$$

$$
\Bigg(\left(c_\alpha c_\beta^3 m_{u_{g3}}^2 - \left(s_\alpha s_\beta m_{d_{g4}}^2 + c_{\alpha+\beta} c_\beta^2 M_W^2\right) s_\beta^2\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1}\right) U^{\tilde{d}_{g4}}_{s4,1} +
$$

$$
\left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} s_{2\beta} s_{\beta-\alpha} U^{\tilde{d}_{g4}}_{s4,2}\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,2}\right) \Bigg) s_W M_W^2
$$

$$
\Bigg(\left(\frac{1}{8} s_W s_{2\beta} M_W^2\right)\left(4 c_\alpha c_\beta^3 m_{u_{g3}}^2 - c_{\alpha+\beta} M_W^2 s_{2\beta}^2 - 4 s_\alpha m_{d_{g4}}^2 s_\beta^3\right)\left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1}\right) +
$$

$$
\Bigg(\Bigg(\left(\frac{1}{2} m_{u_{g3}}^2\right) \Bigg(2 c_\alpha m_{u_{g3}} s_W s_{2\beta} \delta m^{u_g}_{g3} M_W^2 + \Bigg(\left(\delta Z_{hH}\right) s_W s_{2\beta} s_\alpha M_W^2 - \Bigg(4\left(\delta s_W\right) s_{2\beta} M_W^2 + \Bigg(2 s_{2\beta} \delta M_W^2 +
$$

$$
\Bigg(8\left(\delta s_\beta\right) c_\beta - 2\left(\delta Z_{G^-H^-}\right) s_\beta^2 - \left(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_{2\beta} \Bigg) M_W^2 \Bigg) s_W \Bigg) c_\alpha \Bigg) \Bigg) c_\beta^3 -
$$

$$
\Bigg(2 m_{d_{g4}} s_W s_{2\beta} s_\alpha \delta m^{d_g}_{g4} M_W^2 + \Bigg(\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) s_W s_{\alpha+\beta} - \Bigg(4\left(\delta s_W\right) - \Bigg(4\left(\delta Z_e\right) + \ldots \Bigg) c_\beta^3 M_W^4 - \ldots \Bigg) U^{\tilde{d}_{g4}}_{s4,1} \Bigg) U^{\tilde{u}_{g3}*}_{s3,1}
$$

$$
\underset{305}{C}\left(h^0, G^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \Bigg[-\frac{\sqrt{2}\mathrm{i}e^2 c_\beta}{M_W^4 s_W^3 s_{2\beta}^3} \Bigg(\Bigg(\Bigg(\Bigg(\left(\frac{1}{2} c_{\beta-\alpha} m_{d_{g4}} m_{u_{g3}} s_W s_{2\beta} M_W^2\right) \left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,2}\right) + \Bigg(c_{\beta-\alpha} m_{u_{g3}} s_W s_{2\beta} \delta m^{d_g}_{g4} M_W^2 + \Bigg(c_{\beta-\alpha} s_W s_{2\beta} \delta m^{u_g}_{g3} M_W^2 - \left(\frac{1}{2} m_{u_{g3}}\right) \Bigg(\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right) s_W s_{2\beta} s_{\beta-\alpha} M_W^2 + \Bigg(4\left(\delta s_W\right) s_{2\beta} M_W^2 + \Bigg(2 s_{2\beta} \delta M_W^2 + \Bigg(4 \Big(\left(\delta s_\beta\right) c_\beta + \left(\delta c_\beta\right) s_\beta \Big) - \Big(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-} \Big) s_{2\beta} \Bigg) M_W^2 \Bigg) s_W \Bigg) c_{\beta-\alpha} \Bigg) \Bigg) m_{d_{g4}} \Bigg) U^{\tilde{d}_{g4}}_{s4,2} \Bigg) U^{\tilde{u}_{g3}*}_{s3,2} -
$$

$$
\left(\frac{1}{2} s_W s_{2\beta} M_W^2\right) \Bigg(\left(s_\alpha s_\beta m_{d_{g4}}^2 + c_\beta \left(c_\alpha m_{u_{g3}}^2 - s_{\alpha+\beta} s_\beta M_W^2\right)\right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1}\right) U^{\tilde{d}_{g4}}_{s4,1} - c_{\beta-\alpha} m_{d_{g4}} m_{u_{g3}} \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,2}\right) U^{\tilde{d}_{g4}}_{s4,2} \Bigg) \Bigg)
$$

$$
\Bigg(c_\beta s_W M_W^2 \left(s_\alpha s_\beta m_{d_{g4}}^2 + c_\beta \left(c_\alpha m_{u_{g3}}^2 - s_{\alpha+\beta} s_\beta M_W^2\right)\right) s_\beta^2 \left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1}\right) + \Bigg(\left(\frac{1}{2} c_\beta m_{u_{g3}} s_{2\beta}\right) \Bigg(4 c_\alpha s_W s_\beta \delta m^{u_g}_{g3} M_W^2 + \Bigg(\left(\delta Z_{hH}\right) s_W s_\alpha s_\beta M_W^2 - \Bigg(4\left(\delta s_W\right) s_\beta M_W^2 + \Bigg(2 s_\beta \delta M_W^2 + \Bigg(4\left(\delta s_\beta\right) - \left(\delta Z_{H^-G^-}\right) c_\beta - \Big(4\left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-} \Big) s_\beta \Bigg) M_W^2 \Bigg) s_W \Bigg) c_\alpha \Bigg) m_{u_{g3}} \Bigg) +
$$

$$
\Bigg(4 c_\beta m_{d_{g4}} s_W s_\alpha \delta m^{d_g}_{g4} M_W^2 + \Bigg(4\left(\delta s_W\right) s_{\alpha+\beta} + \Bigg(\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) c_{\alpha+\beta} - \Bigg(4\left(\delta Z_e\right) + \delta Z_{hh} + \cdots \Bigg) s_{\alpha+\beta} \Bigg) s_W \Bigg) c_\beta^2 M_W^4 - \cdots \quad U^{\tilde{d}_{g4}}_{s4,1} \quad U^{\tilde{u}_{g3}*}_{s3,1}
$$

$$
\underset{306}{C}\left(h^0, H^+, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \Bigg[\frac{\sqrt{2} i e^2}{M_W^4 s_W^3 s_{2\beta}^3} \Bigg(\Bigg(\left(\frac{1}{2} s_{2\beta}\right) \Bigg(\Bigg(\left(\frac{1}{2} m_{d_{g3}} m_{u_{g4}} s_W s_{2\beta} s_{\beta-\alpha} M_W^2\right) \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,2}\right) + \Bigg(m_{u_{g4}} s_W s_{2\beta} s_{\beta-\alpha} \delta m^{d_g}_{g3} M_W^2 + \Bigg(s_W s_{2\beta} s_{\beta-\alpha} \delta m^{u_g}_{g4} M_W^2 - \Bigg(2\left(\delta c_\beta\right) s_W s_\beta s_{\beta-\alpha} M_W^2 + \Bigg(4\left(\delta s_W\right) s_\beta s_{\beta-\alpha} M_W^2 + \Bigg(2\left(\delta s_\beta\right) s_{\beta-\alpha} M_W^2 + \Bigg(2 s_{\beta-\alpha} \delta M_W^2 - \Bigg(\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) c_{\beta-\alpha} + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh}\right) s_{\beta-\alpha} \Bigg) M_W^2 \Bigg) s_\beta \Bigg) s_W \Bigg) c_\beta \Bigg) m_{u_{g4}} \Bigg) m_{d_{g3}} \Bigg) U^{\tilde{u}_{g4}}_{s4,2} \Bigg) U
$$

$$
\Bigg(\left(c_\alpha c_\beta^3 m_{u_{g4}}^2 - \left(s_\alpha s_\beta m_{d_{g3}}^2 + c_{\alpha+\beta} c_\beta^2 M_W^2\right) s_\beta^2\right) \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1}\right) U^{\tilde{u}_{g4}}_{s4,1} + \left(\frac{1}{2} m_{d_{g3}} m_{u_{g4}} s_{2\beta} s_{\beta-\alpha} U^{\tilde{u}_{g4}}_{s4,2}\right) \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,2}\right) \Bigg) s_W M_W^2 \Bigg)
$$

$$
\Bigg(\left(\frac{1}{8} s_W s_{2\beta} M_W^2\right) \left(4 c_\alpha c_\beta^3 m_{u_{g4}}^2 - c_{\alpha+\beta} M_W^2 s_{2\beta}^2 - 4 s_\alpha m_{d_{g3}}^2 s_\beta^3\right) \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,1}\right) + \Bigg(\Bigg(\Bigg(2 c_\alpha m_{u_{g4}} s_W s_{2\beta} \delta m^{u_g}_{g4} M_W^2 + \left(\frac{1}{2} m_{u_{g4}}^2\right) \Bigg(\left(\delta Z_{hH}\right) s_W s_{2\beta} s_\alpha M_W^2 - \Bigg(4\left(\delta s_W\right) s_{2\beta} M_W^2 + \Bigg(2 s_{2\beta} \delta M_W^2 + \Bigg(8\left(\delta s_\beta\right) c_\beta - 2\left(\delta Z_{H^-G^-}\right) s_\beta^2 - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{hh}\right) s_{2\beta} \Bigg) M_W^2 \Bigg) s_W \Bigg) c_\alpha \Bigg) \Bigg) c_\beta^3 -
$$

$$
\Bigg(2 m_{d_{g3}} s_W s_{2\beta} s_\alpha \delta m^{d_g}_{g3} M_W^2 + \Bigg(\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right) s_W s_{\alpha+\beta} - \Bigg(4\left(\delta s_W\right) - \Bigg(4\left(\delta Z_e\right) + \ldots \Bigg) \Bigg) c_\beta^3 M_W^4 - \ldots \Bigg) U^{\tilde{u}_{g4}}_{s4,1} \Bigg) U^{\tilde{d}_{g3}*}_{s3,1}
$$

$$
\underset{307}{C}\left(h^0, G^+, \tilde{d}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = -\frac{\sqrt{2}\mathrm{i}e^2 c_\beta}{M_W^4 s_W^3 s_{2\beta}^3}
$$

$$
\left(\left(\left(\left(\left(\frac{1}{2}c_{\beta-\alpha}m_{d_{g3}}m_{u_{g4}}s_W s_{2\beta}M_W^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,2}^{\tilde{u}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,2}^{\tilde{u}_{g4}}\right) + \right.\right.\right.\right.
$$

$$
\left.\left.\left.\left(c_{\beta-\alpha}m_{u_{g4}}s_W s_{2\beta}\delta m_{g3}^{d_g}M_W^2 + \right.\right.\right.\right.
$$

$$
\left.\left.\left.\left(c_{\beta-\alpha}s_W s_{2\beta}\delta m_{g4}^{u_g}M_W^2 - \right.\right.\right.\right.
$$

$$
\left.\left.\left.\left(\frac{1}{2}m_{u_{g4}}\right)\left(\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right)s_W s_{2\beta}s_{\beta-\alpha}M_W^2 + \right.\right.\right.\right.
$$

$$
\left.\left.\left.\left.\left(4\left(\delta s_W\right)s_{2\beta}M_W^2 + \right.\right.\right.\right.\right.
$$

$$
\left.\left.\left.\left.\left(2s_{2\beta}\delta M_W^2 + \right.\right.\right.\right.\right.
$$

$$
\left.\left.\left.\left.\left(4\left(\begin{array}{l}(\delta s_\beta)c_\beta + \\ (\delta c_\beta)s_\beta\end{array}\right) - \right.\right.\right.\right.\right.
$$

$$
\left.\left.\left.\left.\left.\left(\begin{array}{l}4\left(\delta Z_e\right) + \\ \delta Z_{hh} + \\ \delta Z_{G^-G^-}\end{array}\right)s_{2\beta}\right)M_W^2\right)s_W\right)c_{\beta-\alpha}\right)m_{d_{g3}}\right)U_{s4,2}^{\tilde{u}_{g4}}\right)U_{s3,2}^{\tilde{d}_{g3}*} - \right.
$$

$$
\left.\left(\frac{1}{2}s_W s_{2\beta}M_W^2\right)\left(\begin{array}{l}\left(s_\alpha s_\beta m_{d_{g3}}^2 + c_\beta\left(c_\alpha m_{u_{g4}}^2 - s_{\alpha+\beta}s_\beta M_W^2\right)\right)\left(\delta Z_{1,s3}^{\tilde{d}_{g3}}U_{1,1}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}}U_{2,1}^{\tilde{d}_{g3}*}\right)U_{s4,1}^{\tilde{u}_{g4}} - \\ c_{\beta-\alpha}m_{d_{g3}}m_{u_{g4}}\left(\delta Z_{1,s3}^{\tilde{d}_{g3}}U_{1,2}^{\tilde{d}_{g3}*} + \delta Z_{2,s3}^{\tilde{d}_{g3}}U_{2,2}^{\tilde{d}_{g3}*}\right)U_{s4,2}^{\tilde{u}_{g4}}\end{array}\right)\right)
$$

$$
\left(\begin{array}{l}c_\beta s_W M_W^2\left(s_\alpha s_\beta m_{d_{g3}}^2 + c_\beta\left(c_\alpha m_{u_{g4}}^2 - s_{\alpha+\beta}s_\beta M_W^2\right)\right)s_\beta^2\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,1}^{\tilde{u}_{g4}} + \delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,1}^{\tilde{u}_{g4}}\right) + \\ \left(\frac{1}{2}c_\beta m_{u_{g4}}s_{2\beta}\right)\left(\begin{array}{l}4c_\alpha s_W s_\beta\delta m_{g4}^{u_g}M_W^2 + \\ \left(\left(\delta Z_{hH}\right)s_W s_\alpha s_\beta M_W^2 - \right. \\ \left.\left(4\left(\delta s_W\right)s_\beta M_W^2 + \right.\right. \\ \left.\left.\left(2s_\beta\delta M_W^2 + \right.\right.\right. \\ \left.\left.\left.\left(\begin{array}{l}4\left(\delta s_\beta\right) - \\ \left(\delta Z_{G^-H^-}\right)c_\beta - \\ \left(\begin{array}{l}4\left(\delta Z_e\right) + \\ \delta Z_{hh} + \\ \delta Z_{G^-G^-}\end{array}\right)s_\beta\end{array}\right)M_W^2\right)s_W\right)c_\alpha\right)m_{u_{g4}}\end{array}\right) + \\ \left(\begin{array}{l}4c_\beta m_{d_{g3}}s_W s_\alpha\delta m_{g3}^{d_g}M_W^2 + \\ \left(\begin{array}{l}4\left(\delta s_W\right)s_{\alpha+\beta} + \\ \left(\begin{array}{l}\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right)c_{\alpha+\beta} - \\ \left(\begin{array}{l}4\left(\delta Z_e\right) + \\ \delta Z_{hh} + \end{array}\right)s_{\alpha+\beta}\end{array}\right)s_W\end{array}\right)c_\beta^2 M_W^4 - \end{array}\right)U_{s4,1}^{\tilde{u}_{g4}}\end{array}\right)U_{s3,1}^{\tilde{d}_{g3}*}\right)
$$

$$\underset{308}{C}\left(A^0, H^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{\sqrt{2}e^2}{M_W^4 s_W^3 s_{2\beta}^3} \left(\left(\left(\left(\frac{1}{8} s_W s_{2\beta} M_W^2\right) \left(4 c_\beta^4 m_{u_{g3}}^2 - c_{2\beta} M_W^2 s_{2\beta}^2 - 4 m_{d_{g4}}^2 s_\beta^4\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) + \left(\left(2 m_{u_{g3}} s_W s_{2\beta} \delta m^{u_g}_{g3} M_W^2 + \left(\left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) s_W M_W^2 s_\beta^2 - \left(4\left(\delta s_W\right) s_\beta M_W^2 + \left(4\left(\delta s_\beta\right) M_W^2 + \left(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^-H^-} \right) M_W^2 \right) s_\beta \right) s_W \right) c_\beta \right) m_{u_{g3}}^2 \right) c_\beta^4 - \left(\left(\left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) s_W s_{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) c_{2\beta} \right) c_\beta^3 M_W^4 + \left(2 m_{d_{g4}} s_W s_{2\beta} \delta m^{d_g}_{g4} M_W^2 - \left(\left(\frac{1}{2} s_{2\beta}\right) \left(4\left(\delta s_W\right) M_W^2 + \left(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^-H^-} \right) M_W^2 \right) s_W \right) + \left(4\left(\delta c_\beta\right) s_\beta + \left(\delta Z_{AG} + \delta Z_{G^-H^-} \right) c_\beta^2 \right) s_W M_W^2 \right) m_{d_{g4}}^2 \right) s_\beta \right) s_\beta^3 \right) U^{\tilde{d}_{g4}}_{s4,1} \right) U^{\tilde{u}_{g3}*}_{s3,1} - \left(\frac{1}{2} s_W s_{2\beta} M_W^2\right) \left(\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^{\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} + \left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} s_{2\beta} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2}\right) \left(\delta Z_{AG} - \delta Z_{G^-H^-}\right) \right) \right) \mathrm{CKM} \right.$$

$$\left. s_W s_{2\beta} \delta \mathrm{CKM}^*_{g3,g4} M_W^2 \left(\frac{1}{4} c_{2\beta} M_W^2 s_{2\beta}^2 - c_\beta^4 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^4\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} \right.$$

$$\underset{309}{C}\left(G^0, G^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[\frac{e^2}{2\sqrt{2} s_{2\beta} M_W^4 s_W^3} \left(\left(\left(\left(\left(\frac{1}{2} s_W s_{2\beta} M_W^2 \right) \left(m^2_{d_{g4}} - m^2_{u_{g3}} - c_{2\beta} M_W^2 \right) \left(\delta \overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta \overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1} \right) - \right. \right. \right. \right. \right. \right.$$
$$\left. \left. \left. \left. \left(\left(s_{2\beta} \delta M_W^2 + \left(\frac{1}{2} M_W^2 \right) \left(\begin{array}{l} 8 \left(\delta c_\beta\right) s_\beta + \\ 2 \left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) s_\beta^2 - \\ \left(4 \left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right) s_{2\beta} \end{array} \right) \right) s_W m^2_{d_{g4}} - \right. \right. \right. \right.$$
$$\left. \left. \left. \left(\frac{1}{2} s_{2\beta} M_W^4 \right) \left(\begin{array}{l} \left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) s_W s_{2\beta} + \\ \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right) s_W\right) \left(c_\beta^2 - s_\beta^2\right) \end{array} \right) - \right. \right. \right.$$
$$\left. \left. \left(\left(\begin{array}{l} 4 \left(\delta s_W\right) s_\beta M_W^2 + \\ \left(\begin{array}{l} 2 s_\beta \delta M_W^2 + \\ \left(\begin{array}{l} 4 \left(\delta s_\beta\right) - \\ \left(\begin{array}{l} \delta Z_{AG} + \\ \delta Z_{H^-G^-} \end{array} \right) c_\beta - \\ \left(\begin{array}{l} 4 \left(\delta Z_e\right) + \\ \delta Z_{GG} + \\ \delta Z_{G^-G^-} \end{array} \right) s_\beta \end{array} \right) M_W^2 \end{array} \right) s_W \end{array} \right) m^2_{u_{g3}} - \right. \right.$$
$$\left. \left. \left(\begin{array}{l} 4 m_{u_{g3}} s_W \delta m^{u_g}_{g3} + \\ 4 m_{d_{g4}} \left(\left(\delta s_W\right) m_{d_{g4}} - s_W \delta m^{d_g}_{g4} \right) \end{array} \right) s_\beta M_W^2 \right) c_\beta \right) U^{\tilde{d}_{g4}}_{s4,1} \right) U^{\tilde{u}_{g3}*}_{s3,1} + \right.$$
$$\left. \left(\left(\frac{1}{2} s_{2\beta} U^{\tilde{d}_{g4}}_{s4,1} \right) \left(m^2_{d_{g4}} - m^2_{u_{g3}} - c_{2\beta} M_W^2 \right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1} \right) - \right. \right.$$
$$\left. \left. \left(\delta Z_{AG} - \delta Z_{H^-G^-} \right) m_{d_{g4}} m_{u_{g3}} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \right) s_W M_W^2 \right)$$
$$\left. s_W s_{2\beta} \delta \mathrm{CKM}^*_{g3,g4} M_W^2 \left(m^2_{d_{g4}} - m^2_{u_{g3}} - c_{2\beta} M_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} \right) \Bigg] \mathrm{CK}$$

$$
\underset{310}{C}\left(A^0, G^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \Bigg[\frac{e^2}{\sqrt{2} M_W^4 s_W^3 s_{2\beta}^2} \Bigg(\Bigg(\Bigg(\left(\frac{1}{4} s_W s_{2\beta} M_W^2\right) \left(M_W^2 s_{2\beta}^2 - 2\left(c_\beta^2 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^2\right)\right) \left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1}\right) -
$$

$$
\Bigg(\Bigg(2 m_{u_{g3}} s_W s_{2\beta} \delta m^{u_g}_{g3} M_W^2 + \Bigg(s_W M_W^2 \left(\left(\delta Z_{H^-G^-}\right) c_\beta^2 + \left(\delta Z_{AG}\right) s_\beta^2 \right) - \Bigg(4\left(\delta s_W\right) s_\beta M_W^2 + \Bigg(4\left(\delta s_\beta\right) M_W^2 + \Bigg(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-} \right) M_W^2 \Bigg) s_\beta \Bigg) s_W \Bigg) c_\beta \Bigg) m_{u_{g3}}^2 \Bigg) c_\beta^2 +
$$

$$
\Bigg(2 m_{d_{g4}} s_W s_{2\beta} \delta m^{d_g}_{g4} M_W^2 + \Bigg(4\left(\delta s_W\right) s_{2\beta} + \Bigg(\left(\delta Z_{AG} - \delta Z_{H^-G^-}\right) c_{2\beta} - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-} \right) s_{2\beta} \Bigg) s_W \Bigg) c_\beta^2 M_W^4 -
$$

$$
\Bigg(\left(\frac{1}{2} s_{2\beta}\right) \Bigg(4\left(\delta s_W\right) M_W^2 + \Bigg(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-} \right) M_W^2 \Bigg) s_W \Bigg) + \left(4\left(\delta c_\beta\right) s_\beta + \left(\delta Z_{AG}\right) c_\beta^2 + \left(\delta Z_{H^-G^-}\right) s_\beta^2 \right) s_W M_W^2 \Bigg) m_{d_{g4}}^2 \Bigg) s_\beta^2 \Bigg) U^{\tilde{d}_{g4}}_{s4,1} \Bigg) U^{\tilde{u}_{g3}*}_{s3,1} -
$$

$$
\Bigg(\left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} U^{\tilde{u}_{g3}*}_{s3,2}\right) \left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,2}\right) - \left(\frac{1}{4} U^{\tilde{d}_{g4}}_{s4,1}\right) \left(M_W^2 s_{2\beta}^2 - 2\left(c_\beta^2 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^2\right)\right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1}\right) \Bigg) s_W s_{2\beta} M_W^2 +
$$

$$
\Bigg(\Bigg(\left(s_{2\beta} \delta M_W^2 + \left(2\left(\delta c_\beta\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right) c_\beta\right) s_\beta M_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,2} - \left(\frac{1}{2} s_{2\beta} M_W^2\right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,2}\right) \Bigg) m_{d_{g4}} m_{u_{g3}} s_W - \ldots \Bigg) U^{\tilde{d}_{g4}}_{s4,2} \ldots \; \mathrm{CK}\ldots
$$

$$
\Bigg(m_{\ldots} s_W s_{\ldots} \delta m^{d_g}_{\ldots} - \ldots
$$

$$
\underset{311}{C}\left(G^0, H^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \Bigg[\frac{e^2}{\sqrt{2} M_W^4 s_W^3 s_{2\beta}^2} \Bigg(\Bigg(\Bigg(\Bigg(\left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} U^{\tilde{u}_{g3}*}_{s3,2}\right) \left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,2}\right) - \left(\frac{1}{2} U^{\tilde{d}_{g4}}_{s4,1}\right) \left(c_\beta^2 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^2\right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1}\right) \Bigg) s_{2\beta} M_W^2 + \left(\frac{1}{4} M_W^4 s_{2\beta}^3 U^{\tilde{d}_{g4}}_{s4,1}\right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1}\right) \Bigg) s_W +
$$

$$
\Bigg(\left(\frac{1}{4} s_W s_{2\beta} M_W^2\right) \left(M_W^2 s_{2\beta}^2 - 2\left(c_\beta^2 m_{u_{g3}}^2 + m_{d_{g4}}^2 s_\beta^2\right)\right) \left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1}\right) - \Bigg(\Bigg(2 m_{u_{g3}} s_W s_{2\beta} \delta m^{u_g}_{g3} M_W^2 + \Bigg(s_W M_W^2 \left((\delta Z_{AG}) c_\beta^2 + (\delta Z_{G^-H^-}) s_\beta^2\right) - \Bigg(4(\delta s_W) s_\beta M_W^2 + \Bigg(4(\delta s_\beta) M_W^2 + \Bigg(2\delta M_W^2 - \left(4(\delta Z_e) + \delta Z_{GG} + \delta Z_{H^-H^-}\right) M_W^2 \Bigg) s_\beta \Bigg) s_W \Bigg) c_\beta \Bigg) m_{u_{g3}}^2 \Bigg) c_\beta^2 +
$$

$$
\Bigg(2 m_{d_{g4}} s_W s_{2\beta} \delta m^{d_g}_{g4} M_W^2 + \Bigg(4(\delta s_W) s_{2\beta} - \Bigg((\delta Z_{AG} - \delta Z_{G^-H^-}) c_{2\beta} + \left(4(\delta Z_e) + \delta Z_{GG} + \delta Z_{H^-H^-}\right) s_{2\beta} \Bigg) s_W \Bigg) c_\beta^2 M_W^4 - \Bigg(\left(\frac{1}{2} s_{2\beta}\right) \Bigg(4(\delta s_W) M_W^2 + \Bigg(2\delta M_W^2 - \left(4(\delta Z_e) + \delta Z_{GG} + \delta Z_{H^-H^-}\right) M_W^2 \Bigg) s_W \Bigg) + \left(4(\delta c_\beta) s_\beta + (\delta Z_{AG}) s_\beta^2 + (\delta Z_{G^-H^-}) c_\beta^2\right) s_W M_W^2 \Bigg) m_{d_{g4}}^2 \Bigg) s_\beta^2 \Bigg) U^{\tilde{d}_{g4}}_{s4,1} \Bigg) U^{\tilde{u}_{g3}*}_{s3,1} - \text{CK}
$$

$$
\Bigg(\Bigg(\left(s_{2\beta} \delta M_W^2 + \left(2(\delta c_\beta) - \left(4(\delta Z_e) + \delta Z_{GG} + \delta Z_{H^-H^-}\right) c_\beta\right) s_\beta M_W^2\right) U^{\tilde{u}_{g3}*}_{s3,2} - \left(\frac{1}{} \right) \left(\delta Z^{\tilde{u}_{g3}} U^{\tilde{u}_{g3}*} + \delta Z^{\tilde{u}_{g3}} U^{\tilde{u}_{g3}*}\right) \Bigg) m_{d_{g4}} m_{u_{g3}} s_W -
$$

$$
\underset{312}{C}\left(A^0, H^+, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \Bigg[\frac{\sqrt{2}e^2}{M_W^4 s_W^3 s_{2\beta}^3} \Bigg(\Bigg(\Bigg(\left(\frac{1}{8} s_W s_{2\beta} M_W^2\right) \left(4c_\beta^4 m_{u_{g4}}^2 - c_{2\beta} M_W^2 s_{2\beta}^2 - 4 m_{d_{g3}}^2 s_\beta^4\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) + \Bigg(\Bigg(2 m_{u_{g4}} s_W s_{2\beta} \delta m^{u_g}_{g4} M_W^2 + \Bigg(\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) s_W M_W^2 s_\beta^2 - \Bigg(4\left(\delta s_W\right) s_\beta M_W^2 + \Bigg(4\left(\delta s_\beta\right) M_W^2 + \Bigg(2\delta M_W^2 - \Bigg(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{AA} \Bigg) M_W^2 \Bigg) s_\beta \Bigg) s_W \Bigg) c_\beta \Bigg) m_{u_{g4}}^2 \Bigg) c_\beta^4 - \Bigg(\Bigg(\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) s_W s_{2\beta} - \Bigg(4\left(\delta s_W\right) - \Bigg(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{AA} \Bigg) s_W \Bigg) c_{2\beta} \Bigg) c_\beta^3 M_W^4 + \Bigg(2 m_{d_{g3}} s_W s_{2\beta} \delta m^{d_g}_{g3} M_W^2 - \Bigg(\left(\frac{1}{2} s_{2\beta}\right) \Bigg(4\left(\delta s_W\right) M_W^2 + \Bigg(2\delta M_W^2 - \Bigg(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{AA} \Bigg) M_W^2 \Bigg) s_W \Bigg) + \Bigg(4\left(\delta c_\beta\right) s_\beta + \Bigg(\delta Z_{AG} + \delta Z_{H^-G^-} \Bigg) c_\beta^2 \Bigg) s_W M_W^2 \Bigg) m_{d_{g3}}^2 \Bigg) s_\beta \Bigg) s_\beta^3 \Bigg) U^{\tilde{u}_{g4}}_{s4,1} \Bigg) U^{\tilde{d}_{g3}*}_{s3,1} - \left(\frac{1}{2} s_W s_{2\beta} M_W^2\right) \Bigg(\left(\frac{1}{4} c_{2\beta} M_W^2 s_{2\beta}^2 - c_\beta^4 m_{u_{g4}}^2 + m_{d_{g3}}^2 s_\beta^4\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} + \left(\frac{1}{2} m_{d_{g3}} m_{u_{g4}} s_{2\beta} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2}\right) \left(\delta Z_{AG} - \delta Z_{H^-G^-}\right) \Bigg) \Bigg) \mathrm{CKM}_{g\ldots}
$$

$$
\left(\delta \mathrm{CKM}_{g4,g3}\right) s_W s_{2\beta} M_W^2 \left(\frac{1}{4} c_{2\beta} M_W^2 s_{2\beta}^2 - c_\beta^4 m_{u_{g4}}^2 + m_{d_{g3}}^2 s_\beta^4\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1}
$$

$$
\underset{313}{C}\left(G^{0},G^{+},\tilde{d}^{\mathrm{s3}}_{\mathrm{g3}},\tilde{u}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \Bigg[-\frac{e^{2}}{2\sqrt{2}s_{2\beta}M_{\mathrm{W}}^{4}s_{\mathrm{W}}^{3}} \Bigg(\Bigg(\Bigg(\left(\frac{1}{2}s_{\mathrm{W}}s_{2\beta}M_{\mathrm{W}}^{2}\right)\left(m_{d_{\mathrm{g3}}}^{2}-m_{u_{\mathrm{g4}}}^{2}-c_{2\beta}M_{\mathrm{W}}^{2}\right)\left(\delta\overline{Z}^{\tilde{u}_{\mathrm{g4}}}_{1,\mathrm{s4}}U^{\tilde{u}_{\mathrm{g4}}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{\mathrm{g4}}}_{2,\mathrm{s4}}U^{\tilde{u}_{\mathrm{g4}}}_{2,1}\right) - \Bigg(\Bigg(s_{2\beta}\delta M_{\mathrm{W}}^{2} + \left(\frac{1}{2}M_{\mathrm{W}}^{2}\right)\Bigg(8\left(\delta c_{\beta}\right)s_{\beta} + 2\left(\delta Z_{\mathrm{AG}}+\delta Z_{\mathrm{G^{-}H^{-}}}\right)s_{\beta}^{2} - \left(4\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\mathrm{GG}}+\delta Z_{\mathrm{G^{-}G^{-}}}\right)s_{2\beta} \Bigg) \Bigg) s_{\mathrm{W}}m_{d_{\mathrm{g3}}}^{2} - \left(\frac{1}{2}s_{2\beta}M_{\mathrm{W}}^{4}\right)\Bigg(\left(\delta Z_{\mathrm{AG}}+\delta Z_{\mathrm{G^{-}H^{-}}}\right)s_{\mathrm{W}}s_{2\beta} + \left(4\left(\delta s_{\mathrm{W}}\right)-\left(4\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\mathrm{GG}}+\delta Z_{\mathrm{G^{-}G^{-}}}\right)s_{\mathrm{W}}\right)\left(c_{\beta}^{2}-s_{\beta}^{2}\right) \Bigg) - \Bigg(\Bigg(\Bigg(4\left(\delta s_{\mathrm{W}}\right)s_{\beta}M_{\mathrm{W}}^{2} + \Bigg(2s_{\beta}\delta M_{\mathrm{W}}^{2} + \Bigg(4\left(\delta s_{\beta}\right) - \Bigg(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{G^{-}H^{-}}} \Bigg) c_{\beta} - \Bigg(4\left(\delta Z_{\mathrm{e}}\right) + \delta Z_{\mathrm{GG}} + \delta Z_{\mathrm{G^{-}G^{-}}} \Bigg) s_{\beta} \Bigg) M_{\mathrm{W}}^{2} \Bigg) s_{\mathrm{W}} \Bigg) m_{u_{\mathrm{g4}}}^{2} - \Bigg(4m_{u_{\mathrm{g4}}}s_{\mathrm{W}}\delta m^{u_{\mathrm{g}}}_{\mathrm{g4}} + 4m_{d_{\mathrm{g3}}}\left(\left(\delta s_{\mathrm{W}}\right)m_{d_{\mathrm{g3}}}-s_{\mathrm{W}}\delta m^{d_{\mathrm{g}}}_{\mathrm{g3}}\right) \Bigg) s_{\beta}M_{\mathrm{W}}^{2} \Bigg) c_{\beta} \Bigg) U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},1} \Bigg) U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3},1} + \Bigg(\left(\frac{1}{2}s_{2\beta}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},1}\right)\left(m_{d_{\mathrm{g3}}}^{2}-m_{u_{\mathrm{g4}}}^{2}-c_{2\beta}M_{\mathrm{W}}^{2}\right)\left(\delta Z^{\tilde{d}_{\mathrm{g3}}}_{1,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{1,1}+\delta Z^{\tilde{d}_{\mathrm{g3}}}_{2,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{2,1}\right) - \left(\delta Z_{\mathrm{AG}}-\delta Z_{\mathrm{G^{-}H^{-}}}\right)m_{d_{\mathrm{g3}}}m_{u_{\mathrm{g4}}}U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3},2}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},2} \Bigg) s_{\mathrm{W}}M_{\mathrm{W}}^{2} \Bigg) \mathrm{C}
$$

$$
\left(\delta\mathrm{CKM}_{\mathrm{g4,g3}}\right)s_{\mathrm{W}}s_{2\beta}M_{\mathrm{W}}^{2}\left(m_{d_{\mathrm{g3}}}^{2}-m_{u_{\mathrm{g4}}}^{2}-c_{2\beta}M_{\mathrm{W}}^{2}\right)U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3},1}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4},1}
$$

$$
\underset{314}{C}\left(A^0, G^+, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \Bigg[-\frac{e^2}{\sqrt{2} M_W^4 s_W^3 s_{2\beta}^2} \Bigg(\Bigg(\Bigg(\left(\frac{1}{4} s_W s_{2\beta} 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) -
\\
\Bigg(\Bigg(2 m_{u_{g4}} s_W s_{2\beta} \delta m^{u_g}_{g4} M_W^2 + \Bigg(s_W M_W^2 \left(\left(\delta Z_{G^-H^-}\right) c_\beta^2 + \left(\delta Z_{AG}\right) s_\beta^2\right) - \Bigg(4\left(\delta s_W\right) s_\beta M_W^2 + \Bigg(4\left(\delta s_\beta\right) M_W^2 + \Bigg(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right) M_W^2 \Bigg) s_\beta \Bigg) s_W \Bigg) c_\beta \Bigg) m_{u_{g4}}^2 \Bigg) c_\beta^2 +
\\
\Bigg(2 m_{d_{g3}} s_W s_{2\beta} \delta m^{d_g}_{g3} M_W^2 + \Bigg(4\left(\delta s_W\right) s_{2\beta} + \Bigg(\left(\delta Z_{AG} - \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} \Bigg) s_W \Bigg) c_\beta^2 M_W^4 -
\\
\Bigg(\left(\frac{1}{2} s_{2\beta}\right) \Bigg(4\left(\delta s_W\right) M_W^2 + \Bigg(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right) M_W^2 \Bigg) s_W \Bigg) + \left(4\left(\delta c_\beta\right) s_\beta + \left(\delta Z_{AG}\right) c_\beta^2 + \left(\delta Z_{G^-H^-}\right) s_\beta^2\right) s_W M_W^2 \Bigg) m_{d_{g3}}^2 \Bigg) s_\beta^2 \Bigg) U^{\tilde{u}_{g4}}_{s4,1} \Bigg) U^{\tilde{d}_{g3}*}_{s3,1} -
\\
\Bigg(\Bigg(\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}{4} U^{\tilde{u}_{g4}}_{s4,1}\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^{\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) \Bigg) s_W s_{2\beta} M_W^2 +
\\
\Bigg(\Bigg(\left(s_{2\beta} \delta M_W^2 + \left(2\left(\delta c_\beta\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\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) \Bigg) m_{d_{g3}} m_{u_{g4}} s_W -
\\
\Bigg(m_{\ldots} s_W s_\beta \delta m^{d_g} - \ldots \Bigg) \ldots \Bigg) U^{\tilde{u}_{g4}}_{s4,2} \ldots
$$

$$
\underset{315}{C}\left(G^{0},H^{+},\tilde{d}^{s3}_{g3},\tilde{u}^{s4,\dagger}_{g4}\right) = \Bigg[-\frac{e^{2}}{\sqrt{2}M_{W}^{4}s_{W}^{3}s_{2\beta}^{2}} \Bigg(\Bigg(\Bigg(\bigg(\left(\frac{1}{2}m_{d_{g3}}m_{u_{g4}}U^{\tilde{d}_{g3}*}_{s3,2}\right)\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4}U^{\tilde{u}_{g4}}_{1,2}+\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4}U^{\tilde{u}_{g4}}_{2,2}\right) -
$$

$$
\left(\frac{1}{2}U^{\tilde{u}_{g4}}_{s4,1}\right)\left(c_{\beta}^{2}m_{u_{g4}}^{2}+m_{d_{g3}}^{2}s_{\beta}^{2}\right)\left(\delta Z^{\tilde{d}_{g3}}_{1,s3}U^{\tilde{d}_{g3}*}_{1,1}+\delta Z^{\tilde{d}_{g3}}_{2,s3}U^{\tilde{d}_{g3}*}_{2,1}\right) \bigg) s_{2\beta}M_{W}^{2} +
$$

$$
\left(\frac{1}{4}M_{W}^{4}s_{2\beta}^{3}U^{\tilde{u}_{g4}}_{s4,1}\right)\left(\delta Z^{\tilde{d}_{g3}}_{1,s3}U^{\tilde{d}_{g3}*}_{1,1}+\delta Z^{\tilde{d}_{g3}}_{2,s3}U^{\tilde{d}_{g3}*}_{2,1}\right) \Bigg) s_{W} +
$$

$$
\Bigg(\left(\frac{1}{4}s_{W}s_{2\beta}M_{W}^{2}\right)\left(M_{W}^{2}s_{2\beta}^{2}-2\left(c_{\beta}^{2}m_{u_{g4}}^{2}+m_{d_{g3}}^{2}s_{\beta}^{2}\right)\right)\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4}U^{\tilde{u}_{g4}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4}U^{\tilde{u}_{g4}}_{2,1}\right) -
$$

$$
\Bigg(\bigg(2m_{u_{g4}}s_{W}s_{2\beta}\delta m^{u_{g}}_{g4}M_{W}^{2} + \Big(s_{W}M_{W}^{2}\left(\left(\delta Z_{AG}\right)c_{\beta}^{2}+\left(\delta Z_{H^{-}G^{-}}\right)s_{\beta}^{2}\right) - \Big(4\left(\delta s_{W}\right)s_{\beta}M_{W}^{2} + \Big(4\left(\delta s_{\beta}\right)M_{W}^{2} + \Big(2\delta M_{W}^{2} - \left(4\left(\delta Z_{e}\right) + \delta\overline{Z}_{H^{-}H^{-}} + \delta Z_{GG} \right) M_{W}^{2} \Big) s_{\beta} \Big) s_{W} \Big) c_{\beta} \Big) m_{u_{g4}}^{2} \bigg) c_{\beta}^{2} +
$$

$$
\bigg(2m_{d_{g3}}s_{W}s_{2\beta}\delta m^{d_{g}}_{g3}M_{W}^{2} + \Big(4\left(\delta s_{W}\right)s_{2\beta} - \Big(\left(\delta Z_{AG}-\delta Z_{H^{-}G^{-}}\right)c_{2\beta} + \left(4\left(\delta Z_{e}\right) + \delta\overline{Z}_{H^{-}H^{-}} + \delta Z_{GG} \right) s_{2\beta} \Big) s_{W} \Big) c_{\beta}^{2}M_{W}^{4} -
$$

$$
\Big(\left(\frac{1}{2}s_{2\beta}\right)\Big(4\left(\delta s_{W}\right)M_{W}^{2} + \Big(2\delta M_{W}^{2} - \left(4\left(\delta Z_{e}\right) + \delta\overline{Z}_{H^{-}H^{-}} + \delta Z_{GG} \right) M_{W}^{2} \Big) s_{W} \Big) + \left(4\left(\delta c_{\beta}\right)s_{\beta} + \left(\delta Z_{AG}\right)s_{\beta}^{2} + \left(\delta Z_{H^{-}G^{-}}\right)c_{\beta}^{2} \right) s_{W}M_{W}^{2} \Big) m_{d_{g3}}^{2} \bigg) s_{\beta}^{2} \Bigg) U^{\tilde{u}_{g4}}_{s4,1} \Bigg) U^{\tilde{d}_{g3}*}_{s3,1} -
$$

$$
\Bigg(\bigg(\left(s_{2\beta}\delta M_{W}^{2} + \left(2\left(\delta c_{\beta}\right) - \left(4\left(\delta Z_{e}\right) + \delta\overline{Z}_{H^{-}H^{-}} + \delta Z_{GG}\right)c_{\beta}\right)s_{\beta}M_{W}^{2}\right)U^{\tilde{d}_{g3}*}_{s3,2} - \bigg) m_{d_{g3}}m_{u_{g4}}s_{W} -
$$

$$
\left(\frac{1}{2} \ldots M^{2}\right)\left(\delta Z^{\tilde{d}_{g3}}_{\ldots}U^{\tilde{d}_{g3}*}_{\ldots} + \delta Z^{\tilde{d}_{g3}}_{\ldots}U^{\tilde{d}_{g3}*}_{\ldots}\right)
$$

$$
\underset{316}{C}\left(h^0, H^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} c_\beta s_W M_W^2 \left(s_\alpha s_\beta m^2_{e_{g3}} + c_{\alpha+\beta} c_\beta^2 M_W^2\right) \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,1} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,1}\right) + \\ \left(\begin{array}{l} m_{e_{g3}} s_{2\beta} s_\alpha \left(2 s_W \delta m^{e_g}_{g3} M_W^2 - m_{e_{g3}} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right)\right) + \\ \left(\frac{1}{2} s_W M_W^2\right) \left(\begin{array}{l} \delta Z^{\tilde{\nu}}_{1,1} \left(s_{2\beta} s_\alpha m^2_{e_{g3}} + 2 c_{\alpha+\beta} c_\beta^3 M_W^2\right) - \\ \left(\begin{array}{l} s_{2\beta} \left(\left(\delta Z_{hH}\right) c_\alpha - \left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_\alpha\right) + \\ s_\alpha \left(8 \left(\delta c_\beta\right) s_\beta + 2 \left(\delta Z_{G^-H^-}\right) c_\beta^2\right) \end{array} \right) m^2_{e_{g3}} \end{array} \right) - \\ \left(\frac{1}{2} c_\beta^2 M_W^4\right) \left(\begin{array}{l} 2 c_\alpha \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_W\right) c_\beta^2 + \\ s_W s_\alpha \left(\left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_{2\beta} - 2 \left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) c_\beta^2\right) - \\ s_{2\beta} \left(\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) c_\alpha s_W + 4 \left(\delta s_W\right) s_\alpha\right) \end{array} \right) \end{array} \right) U^{\tilde{e}_{g3}}_{s4,1} \end{array} \right) \right]
$$

$$
\underset{317}{C}\left(h^0, G^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} c_\beta s_W M_W^2 \left(s_\alpha m^2_{e_{g3}} - c_\beta s_{\alpha+\beta} M_W^2\right) \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,1} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,1}\right) + \\ \left(\begin{array}{l} \left(\begin{array}{l} 2 m_{e_{g3}} s_\alpha \left(2 s_W \delta m^{e_g}_{g3} M_W^2 - m_{e_{g3}} \left(s_W \delta M_W^2 + 2 \left(\delta s_W\right) M_W^2\right)\right) + \\ \left(\frac{1}{2} M_W^4\right) \left(\begin{array}{l} \left(\begin{array}{l} 8 \left(\delta s_W\right) s_\alpha + \\ 2 \left(\begin{array}{l} \left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) c_\alpha - \\ \left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_\alpha \end{array} \right) s_W \end{array} \right) c_\beta^2 - \\ \left(\begin{array}{l} \left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) s_W s_\alpha - \\ c_\alpha \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_W\right) \end{array} \right) s_{2\beta} \end{array} \right) \end{array} \right) c_\beta + \\ \left(\begin{array}{l} c_\beta \delta Z^{\tilde{\nu}}_{1,1} \left(s_\alpha m^2_{e_{g3}} - c_\beta s_{\alpha+\beta} M_W^2\right) - \\ \left(\begin{array}{l} s_\alpha \left(4 \left(\delta c_\beta\right) + \left(\delta Z_{H^-G^-}\right) s_\beta\right) + \\ c_\beta \left(\left(\delta Z_{hH}\right) c_\alpha - \left(4 \left(\delta Z_e\right) + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_\alpha\right) \end{array} \right) m^2_{e_{g3}} \end{array} \right) s_W M_W^2 \end{array} \right) U^{\tilde{e}_{g3}}_{s4,1} \end{array} \right) \right]
$$

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

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

$$
\underset{320}{C}\left(A^0, H^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} c_\beta s_W M_W^2 \left(c_{2\beta} c_\beta^2 M_W^2 + m_{e_{g3}}^2 s_\beta^2\right) \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,1} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,1}\right) - \\ \left(\frac{1}{4} U^{\tilde{e}_{g3}}_{s4,1}\right) \left(\begin{array}{l} s_W m_{e_{g3}}^2 M_W^2 \left(2\left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) c_\beta s_{2\beta} + 16\left(\delta c_\beta\right) s_\beta^2\right) - \\ 2 \left(\begin{array}{l} 4 s_W \delta m^{e_g}_{g3} M_W^2 - \\ \left(\begin{array}{l} s_W \left(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^-H^-}\right) M_W^2\right) + \\ \left(4\left(\delta s_W\right) - s_W \delta Z^{\tilde{\nu}}_{1,1}\right) M_W^2 \end{array} \right) m_{e_{g3}} \end{array} \right) m_{e_{g3}} s_{2\beta} s_\beta + \\ \left(\begin{array}{l} \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{H^-H^-}\right) s_W\right) \left(4 c_\beta^5 - c_\beta s_{2\beta}^2\right) - \\ 4 s_W \left(\left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) s_{2\beta} + c_{2\beta} \delta Z^{\tilde{\nu}}_{1,1}\right) c_\beta^3 \end{array} \right) M_W^4 \end{array} \right) \end{array} \right) \right]
$$

$$\underset{321}{C}\left(G^0, G^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{e^2\delta_{g3,g4}}{4\sqrt{2}c_\beta M_W^4 s_W^3}\left(\begin{array}{l} c_\beta s_W M_W^2\left(m^2_{e_{g3}} - c_{2\beta}M_W^2\right)\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g3}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,1}\right) + \\ \left(\begin{array}{l} 2c_\beta m_{e_{g3}}\left(2s_W\delta m^{e_g}_{g3}M_W^2 - m_{e_{g3}}\left(s_W\delta M_W^2 + 2\left(\delta s_W\right)M_W^2\right)\right) + \\ \left(\frac{1}{2}M_W^4\right)\left(\begin{array}{l}\left(8\left(\delta s_W\right) - 2\left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right)s_W\right)c_\beta^3 + \\ \left(\begin{array}{l} 2\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right)c_\beta s_W - \\ \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right)s_W\right)s_\beta \end{array}\right)s_{2\beta}\end{array}\right) - \\ \left(\begin{array}{l}\left(4\left(\delta c_\beta\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right)c_\beta + \left(\delta Z_{AG} + \delta Z_{H^-G^-}\right)s_\beta\right)m^2_{e_{g3}} - \\ c_\beta\delta Z^{\tilde{\nu}}_{1,1}\left(m^2_{e_{g3}} - c_{2\beta}M_W^2\right)\end{array}\right)s_W M_W^2 \end{array}\right)U^{\tilde{e}_{g3}}_{s4,1}\end{array}\right)\right]$$

$$\underset{322}{C}\left(A^0, G^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{e^2\delta_{g3,g4}}{4\sqrt{2}c_\beta^2 M_W^4 s_W^3}\left(\begin{array}{l}\left(\frac{1}{2}s_W s_{2\beta}M_W^2\right)\left(m^2_{e_{g3}} - 2c_\beta^2 M_W^2\right)\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g3}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,1}\right) - \\ \left(\begin{array}{l} 2m_{e_{g3}}s_{2\beta}\left(\left(\delta s_W\right)m_{e_{g3}} - s_W\delta m^{e_g}_{g3}\right)M_W^2 - \\ \left(\frac{1}{4}M_W^4\right)\left(\begin{array}{l}\left(\delta Z_{AG} - \delta Z_{H^-G^-}\right)s_W\left(4c_\beta^4 - s_{2\beta}^2\right) + \\ 4\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right)s_W\right)s_{2\beta}c_\beta^2\end{array}\right) - \\ \left(\begin{array}{l}\left(\frac{1}{2}s_{2\beta}\delta Z^{\tilde{\nu}}_{1,1}M_W^2\right)\left(m^2_{e_{g3}} - 2c_\beta^2 M_W^2\right) - \\ \left(\begin{array}{l} s_{2\beta}\delta M_W^2 + \\ \left(\frac{1}{2}M_W^2\right)\left(\begin{array}{l} 8\left(\delta c_\beta\right)s_\beta + 2\left(\left(\delta Z_{AG}\right)c_\beta^2 + \left(\delta Z_{H^-G^-}\right)s_\beta^2\right) - \\ \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right)s_{2\beta}\end{array}\right)\end{array}\right)m^2_{e_{g3}}\end{array}\right)s_W\end{array}\right)U^{\tilde{e}_{g3}}_{s4,1}\end{array}\right)\right]$$

$$\underset{323}{C}\left(G^0, H^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{e^2\delta_{g3,g4}}{4\sqrt{2}c_\beta^2 M_W^4 s_W^3}\left(\begin{array}{l}\left(\frac{1}{2}s_W s_{2\beta}M_W^2\right)\left(m^2_{e_{g3}} - 2c_\beta^2 M_W^2\right)\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g3}}_{1,1} + \delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,1}\right) + \\ \left(\begin{array}{l} m_{e_{g3}}s_{2\beta}\left(2s_W\delta m^{e_g}_{g3}M_W^2 - m_{e_{g3}}\left(s_W\delta M_W^2 + 2\left(\delta s_W\right)M_W^2\right)\right) + \\ \left(\frac{1}{4}M_W^4\right)\left(\begin{array}{l} 4\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{H^-H^-}\right)s_W\right)s_{2\beta}c_\beta^2 - \\ \left(\delta Z_{AG} - \delta Z_{G^-H^-}\right)s_W\left(4c_\beta^4 - s_{2\beta}^2\right)\end{array}\right) + \\ \left(\frac{1}{2}s_W M_W^2\right)\left(\begin{array}{l} s_{2\beta}\delta Z^{\tilde{\nu}}_{1,1}\left(m^2_{e_{g3}} - 2c_\beta^2 M_W^2\right) - \\ \left(\begin{array}{l} 8\left(\delta c_\beta\right)s_\beta + 2\left(\delta Z_{AG}\right)s_\beta^2 - \\ \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{H^-H^-}\right)s_{2\beta} - 2\left(\delta Z_{G^-H^-}\right)c_\beta^2\end{array}\right)m^2_{e_{g3}}\end{array}\right)\end{array}\right)U^{\tilde{e}_{g3}}_{s4,1}\end{array}\right)\right]$$

$$
\underset{324}{C}\left(A^0, H^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{e^2 \delta_{g3,g4}}{16\sqrt{2} c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} 2 s_W M_W^2 \left(s_{2\beta} s_\beta m_{e_{g4}}^2 + 2 c_{2\beta} c_\beta^3 M_W^2\right) \left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g4}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g4}*}_{2,1}\right) - \\ \left(\begin{array}{l} s_W m_{e_{g4}}^2 M_W^2 \left(2\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) c_\beta s_{2\beta} + 16 \left(\delta c_\beta\right) s_\beta^2\right) - \\ 2 \left(\begin{array}{l} 4 s_W \delta m^{e_g}_{g4} M_W^2 - \\ \left(\begin{array}{l} \left(4\left(\delta s_W\right) - s_W \delta \overline{Z}^{\tilde{\nu}}_{1,1}\right) M_W^2 + \\ s_W \left(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta \overline{Z}_{H^-H^-} + \delta Z_{AA}\right) M_W^2\right) \end{array} \right) m_{e_{g4}} \end{array} \right) m_{e_{g4}} s_{2\beta} s_\beta + \\ \left(\begin{array}{l} \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{AA}\right) s_W\right) \left(4 c_\beta^5 - c_\beta s_{2\beta}^2\right) - \\ 4 s_W \left(\left(\delta Z_{AG} + \delta Z_{H^-G^-}\right) s_{2\beta} + c_{2\beta} \left(\delta \overline{Z}_{H^-H^-} + \delta \overline{Z}^{\tilde{\nu}}_{1,1}\right)\right) c_\beta^3 \end{array} \right) M_W^4 \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,1} \end{array} \right) \right]
$$

$$
\underset{325}{C}\left(G^0, G^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta M_W^4 s_W^3} \left(\begin{array}{l} c_\beta s_W M_W^2 \left(m_{e_{g4}}^2 - c_{2\beta} M_W^2\right) \left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g4}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g4}*}_{2,1}\right) + \\ \left(\begin{array}{l} 2 c_\beta m_{e_{g4}} \left(2 s_W \delta m^{e_g}_{g4} M_W^2 - m_{e_{g4}} \left(s_W \delta M_W^2 + 2\left(\delta s_W\right) M_W^2\right)\right) - \\ \left(\begin{array}{l} \left(4\left(\delta c_\beta\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG} + \delta Z_{G^-G^-}\right) c_\beta + \left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) s_\beta\right) m_{e_{g4}}^2 - \\ c_\beta \delta \overline{Z}^{\tilde{\nu}}_{1,1} \left(m_{e_{g4}}^2 - c_{2\beta} M_W^2\right) \end{array} \right) s_W M_W^2 + \\ \left(\frac{1}{2} M_W^4\right) \left(\begin{array}{l} \left(8\left(\delta s_W\right) - 2\left(4\left(\delta Z_e\right) + \delta Z_{GG}\right) s_W\right) c_\beta^3 - \\ \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{GG}\right) s_W\right) s_{2\beta} s_\beta - \\ 2 c_\beta s_W \left(\left(\delta Z_{G^-G^-}\right) c_{2\beta} - \left(\delta Z_{AG} + \delta Z_{G^-H^-}\right) s_{2\beta}\right) \end{array} \right) \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,1} \end{array} \right) \right]
$$

$$
\underset{326}{C}\left(A^0, G^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} \left(\frac{1}{2} s_W s_{2\beta} M_W^2\right) \left(m_{e_{g4}}^2 - 2 c_\beta^2 M_W^2\right) \left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g4}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g4}*}_{2,1}\right) - \\ \left(\begin{array}{l} 2 m_{e_{g4}} s_{2\beta} \left(\left(\delta s_W\right) m_{e_{g4}} - s_W \delta m^{e_g}_{g4}\right) M_W^2 - \\ \left(\frac{1}{4} M_W^4\right) \left(\begin{array}{l} \left(\delta Z_{AG}\right) s_W \left(4 c_\beta^4 - s_{2\beta}^2\right) + \\ 4\left(4\left(\delta s_W\right) s_{2\beta} - s_W \left(\left(\delta Z_{G^-H^-}\right) c_{2\beta} + \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right) s_{2\beta}\right)\right) c_\beta^2 \end{array} \right) - \\ \left(\begin{array}{l} \left(\frac{1}{2} s_{2\beta} \delta \overline{Z}^{\tilde{\nu}}_{1,1} M_W^2\right) \left(m_{e_{g4}}^2 - 2 c_\beta^2 M_W^2\right) - \\ \left(\begin{array}{l} s_{2\beta} \delta M_W^2 + \\ \left(\frac{1}{2} M_W^2\right) \left(\begin{array}{l} 8\left(\delta c_\beta\right) s_\beta + 2\left(\left(\delta Z_{AG}\right) c_\beta^2 + \left(\delta Z_{G^-H^-}\right) s_\beta^2\right) - \\ \left(4\left(\delta Z_e\right) + \delta Z_{AA} + \delta Z_{G^-G^-}\right) s_{2\beta} \end{array} \right) \end{array} \right) m_{e_{g4}}^2 \end{array} \right) s_W \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,1} \end{array} \right) \right]
$$

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

$$
\underset{328}{C}\left(H^0, H^-, \tilde{u}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \frac{\sqrt{2}ie^2}{M_W^4 s_W^3 s_{2\beta}^3}
\left[
\left(\frac{1}{2}s_{2\beta}\right)\left(\left(\left(\left(\frac{1}{2}c_{\beta-\alpha}m_{d_{g4}}m_{u_{g3}}s_W s_{2\beta}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) + \right.\right.\right.\right.
\left.\left.\left.\left.
\left(\begin{array}{l} c_{\beta-\alpha}m_{u_{g3}}s_W s_{2\beta}\delta m_{g4}^{d_g}M_W^2 + \\ \left(\frac{1}{2}m_{d_{g4}}\right)\left(\begin{array}{l} 2c_{\beta-\alpha}s_W s_{2\beta}\delta m_{g3}^{u_g}M_W^2 + \\ \left(\begin{array}{l} \left(\delta Z_{hH} + \delta Z_{G^-H^-}\right)s_W s_{2\beta}s_{\beta-\alpha}M_W^2 - \\ \left(\begin{array}{l} 4\left(\delta s_W\right)s_{2\beta}M_W^2 + \\ \left(\begin{array}{l} 2s_{2\beta}\delta M_W^2 + \\ \left(\begin{array}{l} 4\left(\begin{array}{l}\left(\delta s_\beta\right)c_\beta + \\ \left(\delta c_\beta\right)s_\beta\end{array}\right) - \\ \left(\begin{array}{l}4\left(\delta Z_e\right) + \\ \delta Z_{HH} + \\ \delta Z_{H^-H^-}\end{array}\right)s_{2\beta}\end{array}\right)M_W^2\end{array}\right)s_W\end{array}\right)c_{\beta-\alpha}\end{array}\right)m_{u_{g3}}\end{array}\right)\end{array}\right)U_{s4,2}^{\tilde{d}_{g4}}\right)U_{s}^{\tilde{u}}
\right.
\left.
\left(\begin{array}{l}\left(\frac{1}{4}U_{s4,1}^{\tilde{d}_{g4}}\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 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) - \\ \left(\frac{1}{2}c_{\beta-\alpha}m_{d_{g4}}m_{u_{g3}}s_{2\beta}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)\end{array}\right)s_W M_W^2\right)
\left(\begin{array}{l}\left(\frac{1}{8}s_W s_{2\beta}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}_{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(\begin{array}{l}
2m_{u_{g3}}s_W s_{2\beta}s_\alpha\delta m_{g3}^{u_g}M_W^2 + \\
\left(\begin{array}{l}\left(\delta Z_{G^-H^-}\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 + \\ \left(\begin{array}{l}2s_\alpha\delta M_W^2 - \\ \left(\begin{array}{l}\left(\delta Z_{hH}\right)c_\alpha + \\ \left(\begin{array}{l}4\left(\delta Z_e\right) + \\ \delta Z_{HH} + \\ \delta Z_{H^-H^-}\end{array}\right)s_\alpha\end{array}\right)M_W^2\end{array}\right)s_\beta\end{array}\right)s_W\end{array}\right)c_\beta\end{array}\right)m_{u_{g3}}^2\end{array}\right)c_\beta^3 + \\
\left(\begin{array}{l}
2c_\alpha m_{d_{g4}}s_W s_{2\beta}\delta m_{g4}^{d_g}M_W^2 + \\
\left(\begin{array}{l}4\left(\delta s_W\right)s_{\alpha+\beta} - \\ \left(\begin{array}{l}\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right)c_{\alpha+\beta} + \\ \left(\begin{array}{l}4\left(\delta Z_e\right) + \\ \delta Z_{HH} + \\ \delta Z_{H^-H^-}\end{array}\right)s_{\alpha+\beta}\end{array}\right)s_W\end{array}\right)c_\beta^3 M_W^4 -
\end{array}\right)U_{s4,1}^{\tilde{d}_{g4}}\right)U_{s3,1}^{\tilde{u}_{g3}*}
\right]
$$

$$
\underset{329}{C}\left(H^0, G^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \Bigg[\frac{\sqrt{2}\mathrm{i}e^2}{M_W^4 s_W^3 s_{2\beta}^3} \Bigg(\Bigg(\left(\frac{1}{2} s_{2\beta}\right) \Bigg(\Bigg(\left(\frac{1}{2} m_{d_{g4}} m_{u_{g3}} s_W s_{2\beta} s_{\beta-\alpha} M_W^2\right) \left(\delta \overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,2} + \delta \overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,2}\right) + \Bigg(m_{u_{g3}} s_W s_{2\beta} s_{\beta-\alpha} \delta m^{d_g}_{g4} M_W^2 + \Bigg(s_W s_{2\beta} s_{\beta-\alpha} \delta m^{u_g}_{g3} M_W^2 - \Bigg(2\left(\delta c_\beta\right) s_W s_\beta s_{\beta-\alpha} M_W^2 + \Bigg(4\left(\delta s_W\right) s_\beta s_{\beta-\alpha} M_W^2 + \Bigg(2\left(\delta s_\beta\right) s_{\beta-\alpha} M_W^2 + \Bigg(2 s_{\beta-\alpha} \delta M_W^2 + \Bigg(\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) c_{\beta-\alpha} - \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_{\beta-\alpha} \Bigg) M_W^2 \Bigg) s_\beta \Bigg) s_W \Bigg) c_\beta \Bigg) m_{u_{g3}} \Bigg) m_{d_{g4}} \Bigg) U^{\tilde{d}_{g4}}_{s4,2} \Bigg) U
$$

$$
\left(\frac{1}{2} s_W s_{2\beta} M_W^2\right) \Bigg(\left(c_\alpha s_\beta m^2_{d_{g4}} - c_\beta \left(s_\alpha m^2_{u_{g3}} + c_{\alpha+\beta} s_\beta M_W^2\right)\right) \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,1} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,1}\right) U^{\tilde{d}_{g4}}_{s4,1} - m_{d_{g4}} m_{u_{g3}} s_{\beta-\alpha} \left(\delta Z^{\tilde{u}_{g3}}_{1,s3} U^{\tilde{u}_{g3}*}_{1,2} + \delta Z^{\tilde{u}_{g3}}_{2,s3} U^{\tilde{u}_{g3}*}_{2,2}\right) U^{\tilde{d}_{g4}}_{s4,2} \Bigg) \Bigg)
$$

$$
\Bigg(\left(\frac{1}{8} s_W M_W^2 s^2_{2\beta}\right) \left(2 c_\alpha s_\beta m^2_{d_{g4}} - 2 c_\beta s_\alpha m^2_{u_{g3}} - c_{\alpha+\beta} s_{2\beta} M_W^2\right) \left(\delta \overline{Z}^{\tilde{d}_{g4}}_{1,s4} U^{\tilde{d}_{g4}}_{1,1} + \delta \overline{Z}^{\tilde{d}_{g4}}_{2,s4} U^{\tilde{d}_{g4}}_{2,1}\right) - \Bigg(\left(\frac{1}{2} m_{u_{g3}} c_\beta^2\right) \Bigg(4 s_W s_\alpha s_\beta \delta m^{u_g}_{g3} M_W^2 - \Bigg(4\left(\delta s_W\right) s_\alpha s_\beta M_W^2 + \Bigg(s_\alpha \left(2 s_\beta \delta M_W^2 + 4\left(\delta s_\beta\right) M_W^2\right) - \Bigg(\left(\delta Z_{H^-G^-}\right) c_\beta s_\alpha + \Bigg(\left(\delta Z_{hH}\right) c_\alpha + \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_\alpha \Bigg) s_\beta \Bigg) M_W^2 \Bigg) s_W \Bigg) m_{u_{g3}} \Bigg) -
$$

$$
\left(\frac{1}{2} m^2_{d_{g4}}\right) \Bigg(2 c_\alpha c_\beta m_{d_{g4}} s_W \delta m^{d_g}_{g4} M_W^2 - \Bigg(\left(\delta Z_{hH}\right) c_\beta s_W s_\alpha M_W^2 + \Bigg(s_W \left(4\left(\delta c_\beta\right) + \left(\delta Z_{H^-G^-}\right) s_\beta\right) M_W^2 + \Bigg(4\left(\delta s_W\right) M_W^2 + \Bigg(2\delta M_W^2 - \cdots \Bigg) \Bigg) c \cdots \Bigg) + \cdots \Bigg) s_{2\beta} U^{\tilde{d}_{g4}}_{s4,1} \Bigg) U^{\tilde{u}_{g3}*}_{s3,1}
$$

$$
\underset{330}{C}\left(H^0, H^+, \tilde{d}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \frac{\sqrt{2}ie^2}{M_W^4 s_W^3 s_{2\beta}^3}
$$

$$
\underset{331}{C}\left(H^0, G^+, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \Bigg[\frac{\sqrt{2}\mathrm{i}e^2}{M_W^4 s_W^3 s_{2\beta}^3} \Bigg(\Bigg(\left(\frac{1}{2}s_{2\beta}\right) \Bigg(\Bigg(\left(\frac{1}{2}m_{d_{g3}} m_{u_{g4}} s_W s_{2\beta} s_{\beta-\alpha} M_W^2\right) \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,2} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,2}\right) + \Big(m_{u_{g4}} s_W s_{2\beta} s_{\beta-\alpha} \delta m^{d_g}_{g3} M_W^2 + \Big(s_W s_{2\beta} s_{\beta-\alpha} \delta m^{u_g}_{g4} M_W^2 - \Big(2\left(\delta c_\beta\right) s_W s_\beta s_{\beta-\alpha} M_W^2 + \Big(4\left(\delta s_W\right) s_\beta s_{\beta-\alpha} M_W^2 + \Big(2\left(\delta s_\beta\right) s_{\beta-\alpha} M_W^2 + \Big(2 s_{\beta-\alpha} \delta M_W^2 + \Big(\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right) c_{\beta-\alpha} - \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_{\beta-\alpha} \Big) M_W^2 \Big) s_\beta \Big) s_W \Big) c_\beta \Big) m_{u_{g4}} \Big) m_{d_{g3}} \Big) U^{\tilde{u}_{g4}}_{s4,2} \Bigg) U
$$

$$
+ \left(\frac{1}{2}s_W s_{2\beta} M_W^2\right) \Bigg(\left(c_\alpha s_\beta m^2_{d_{g3}} - c_\beta \left(s_\alpha m^2_{u_{g4}} + c_{\alpha+\beta} s_\beta M_W^2\right)\right) \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,1} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,1}\right) U^{\tilde{u}_{g4}}_{s4,1} - m_{d_{g3}} m_{u_{g4}} s_{\beta-\alpha} \left(\delta Z^{\tilde{d}_{g3}}_{1,s3} U^{\tilde{d}_{g3}*}_{1,2} + \delta Z^{\tilde{d}_{g3}}_{2,s3} U^{\tilde{d}_{g3}*}_{2,2}\right) U^{\tilde{u}_{g4}}_{s4,2} \Bigg) \Bigg)
$$

$$
\Bigg(\left(\frac{1}{8}s_W M_W^2 s_{2\beta}^2\right) \left(2c_\alpha s_\beta m^2_{d_{g3}} - 2c_\beta s_\alpha m^2_{u_{g4}} - c_{\alpha+\beta} s_{2\beta} M_W^2\right) \left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4} U^{\tilde{u}_{g4}}_{1,1} + \delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4} U^{\tilde{u}_{g4}}_{2,1}\right) - \Bigg(\left(\frac{1}{2}m_{u_{g4}} c_\beta^2\right) \Big(4 s_W s_\alpha s_\beta \delta m^{u_g}_{g4} M_W^2 - \Big(4\left(\delta s_W\right) s_\alpha s_\beta M_W^2 + \Big(s_\alpha \left(2 s_\beta \delta M_W^2 + 4\left(\delta s_\beta\right) M_W^2\right) - \Big(\left(\delta Z_{G^-H^-}\right) c_\beta s_\alpha + \Big(\left(\delta Z_{hH}\right) c_\alpha + \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_\alpha \Big) s_\beta \Big) M_W^2 \Big) s_W \Big) m_{u_{g4}} \Big) -
$$

$$
\Big(2c_\alpha c_\beta m_{d_{g3}} s_W \delta m^{d_g}_{g3} M_W^2 - \Big(\left(\delta Z_{hH}\right) c_\beta s_W s_\alpha M_W^2 + \Big(s_W \left(4\left(\delta c_\beta\right) + \left(\delta Z_{G^-H^-}\right) s_\beta\right) M_W^2 + \Big(4\left(\delta s_W\right) M_W^2 + \Big(2\delta M_W^2 - \ldots
$$

$$
\left(\frac{1}{2}m^2 \ldots\right) \ldots + \ldots \Bigg) s_{2\beta} U^{\tilde{u}_{g4}}_{s4,1} \Bigg) U^{\tilde{d}_{g3}*}_{s3,1}
$$

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

$$
\underset{333}{C}\left(H^0, G^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{4\sqrt{2} c_\beta^2 M_W^4 s_W^3}\left(\begin{array}{l} c_\beta s_W M_W^2 \left(c_\alpha m_{e_{g3}}^2 - c_{\alpha+\beta} c_\beta M_W^2\right)\left(\delta\overline{Z}_{1,s4}^{\tilde{e}_{g4}} U_{1,1}^{\tilde{e}_{g3}} + \delta\overline{Z}_{2,s4}^{\tilde{e}_{g4}} U_{2,1}^{\tilde{e}_{g3}}\right) - \\ \left(\begin{array}{l} \left(\frac{1}{2} c_\beta M_W^4\right)\left(\begin{array}{l} s_{2\beta}\left(4\left(\delta s_W\right) s_\alpha - s_W\left(\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right) c_\alpha + \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_\alpha\right)\right) - \\ 2\left(c_\alpha\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_W\right) + \left(\delta Z_{hH} + \delta Z_{H^-G^-}\right) s_W s_\alpha\right) c_\beta^2 \end{array}\right) - \\ \left(\begin{array}{l} 4 c_\beta m_{e_{g3}} s_W \delta m_{g3}^{e_g} M_W^2 - \\ 2 m_{e_{g3}}^2\left(2\left(\delta c_\beta\right) s_W M_W^2 + c_\beta\left(s_W \delta M_W^2 + \left(2\left(\delta s_W\right) - 2\left(\delta Z_e\right) s_W\right) M_W^2\right)\right) \end{array}\right) c_\alpha - \\ \left(\begin{array}{l} \left(c_\beta\left(\left(\delta Z_{HH} + \delta Z_{G^-G^-}\right) c_\alpha - \left(\delta Z_{hH}\right) s_\alpha\right) - \left(\delta Z_{H^-G^-}\right) c_\alpha s_\beta\right) m_{e_{g3}}^2 + \\ c_\beta \delta Z_{1,1}^{\tilde{\nu}}\left(c_\alpha m_{e_{g3}}^2 - c_{\alpha+\beta} c_\beta M_W^2\right) \end{array}\right) s_W M_W^2 \end{array}\right) U_{s} \end{array}\right)
$$

$$
\underset{334}{C}\left(H^0, H^+, \tilde{e}_{g3}^{s3}, \tilde{\nu}_{g4}^{\dagger}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{8\sqrt{2} c_\beta^3 M_W^4 s_W^3}\left(\begin{array}{l} s_W M_W^2 \left(c_\alpha s_{2\beta} m_{e_{g4}}^2 - 2 s_{\alpha+\beta} c_\beta^3 M_W^2\right)\left(\delta Z_{1,s3}^{\tilde{e}_{g3}} U_{1,1}^{\tilde{e}_{g4}*} + \delta Z_{2,s3}^{\tilde{e}_{g3}} U_{2,1}^{\tilde{e}_{g4}*}\right) - \\ \left(\begin{array}{l} c_\alpha s_W\left(8\left(\delta c_\beta\right) s_\beta + 2\left(\delta Z_{H^-G^-}\right) c_\beta^2\right) m_{e_{g4}}^2 M_W^2 - \\ \left(\begin{array}{l} 4 c_\alpha s_W \delta m_{g4}^{e_g} M_W^2 - \\ \left(\begin{array}{l} s_W\left(\left(\delta Z_{hH}\right) s_\alpha - c_\alpha \delta\overline{Z}_{1,1}^{\tilde{\nu}}\right) M_W^2 + \\ c_\alpha\left(4\left(\delta s_W\right) M_W^2 + s_W\left(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{HH}\right) M_W^2\right)\right) \end{array}\right) m_{e_{g4}} \end{array}\right) m_{e_{g4}} s_{2\beta} - \\ \left(\begin{array}{l} 2\left(4\left(\delta s_W\right) s_\alpha - s_W\left(\left(\delta Z_{hH}\right) c_\alpha + \left(4\left(\delta Z_e\right) + \delta Z_{HH}\right) s_\alpha\right)\right) c_\beta^4 + \\ s_{2\beta}\left(c_\alpha\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{HH}\right) s_W\right) + \left(\delta Z_{hH}\right) s_W s_\alpha\right) c_\beta^2 + \\ 2 s_W\left(\left(\delta Z_{H^-G^-}\right) c_{\alpha+\beta} - s_{\alpha+\beta}\left(\delta\overline{Z}_{H^-H^-} + \delta\overline{Z}_{1,1}^{\tilde{\nu}}\right)\right) c_\beta^3 \end{array}\right) M_W^4 \end{array}\right) U_{s3,1}^{\tilde{e}_{g4}*} \end{array}\right)\right]
$$

$$\underset{335}{C}\left(H^0, G^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{8\sqrt{2} c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} 2 c_\beta s_W M_W^2 \left(c_\alpha m^2_{e_{g4}} - c_{\alpha+\beta} c_\beta M_W^2\right) \left(\delta Z^{\tilde{e}_{g3}}_{1,s3} U^{\tilde{e}_{g4}*}_{1,1} + \delta Z^{\tilde{e}_{g3}}_{2,s3} U^{\tilde{e}_{g4}*}_{2,1}\right) - \\ \left(\begin{array}{l} c_\alpha s_W \left(8\left(\delta c_\beta\right) + 2\left(\delta Z_{G^-H^-}\right) s_\beta\right) m^2_{e_{g4}} M_W^2 - \\ 2 \left(\begin{array}{l} 4 c_\alpha s_W \delta m^{e_g}_{g4} M_W^2 - \\ \left(\begin{array}{l} s_W \left(\left(\delta Z_{hH}\right) s_\alpha - c_\alpha \delta \overline{Z}^{\tilde{\nu}}_{1,1}\right) M_W^2 + \\ c_\alpha \left(4\left(\delta s_W\right) M_W^2 + s_W \left(2\delta M_W^2 - \left(4\left(\delta Z_e\right) + \delta Z_{HH} + \delta Z_{G^-G^-}\right) M_W^2\right)\right) \end{array} \right) m_{e_{g4}} \end{array} \right) c_\beta m_{e_{g4}} + \\ \left(\begin{array}{l} c_\beta s_{2\beta} \left(4\left(\delta s_W\right) s_\alpha - s_W \left(\left(\delta Z_{hH}\right) c_\alpha + \left(4\left(\delta Z_e\right) + \delta Z_{HH}\right) s_\alpha\right)\right) - \\ 2 \left(\begin{array}{l} \left(c_\alpha \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{HH}\right) s_W\right) + \left(\delta Z_{hH}\right) s_W s_\alpha\right) c_\beta^3 + \\ s_W \left(\left(\delta Z_{G^-H^-}\right) s_{\alpha+\beta} - c_{\alpha+\beta} \left(\delta Z_{G^-G^-} + \delta \overline{Z}^{\tilde{\nu}}_{1,1}\right)\right) c_\beta^2 \end{array} \right) \end{array} \right) M_W^4 \end{array} \right) U^{\tilde{e}_{g4}*}_{s3,1} \end{array} \right)$$

$$\underset{336}{C}\left(H^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{32 c_W^4 c_\beta^3 M_W^4 s_W^3} \left(\begin{array}{l} \left(\begin{array}{l} 4 \left(\left(\delta \overline{Z}_{H^-H^-}\right) c_{2\beta} s_W \left(1 - 2c_W^2\right) c_W^2 c_\beta^2 - \left(\left(\delta s_W - \left(\delta Z_e\right) s_W\right) \left(c_W^2 - 2c_W^4\right) - \left(\delta s_W\right) s_W^2 \right) \left(4c_\beta^4 - s_{2\beta}^2\right) \right) + \\ \left(\begin{array}{l} \left(\delta Z_{H^-H^-}\right) \left(4c_\beta^4 - s_{2\beta}^2\right) + \\ 4 \left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_{2\beta} + c_{2\beta} \left(\delta \overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right) \right) c_\beta^2 \end{array} \right) s_W \left(1 - 2c_W^2\right) c_W^2 \end{array} \right) c_\beta M \\ \left(\begin{array}{l} 16 m_{e_{g3}} s_W s_{2\beta} s_\beta \delta m^{e_g}_{g3} M_W^2 - \\ 4 \left(\begin{array}{l} s_W M_W^2 \left(\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) c_\beta s_{2\beta} + 8\left(\delta c_\beta\right) s_\beta^2 \right) + \\ \left(\begin{array}{l} \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta \overline{Z}_{H^-H^-}\right) s_W\right) M_W^2 + \\ s_W \left(2\delta M_W^2 - \left(\delta Z_{H^-H^-} + \delta \overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right) M_W^2\right) \end{array} \right) s_{2\beta} s_\beta \end{array} \right) m^2_{e_{g3}} \end{array} \right) c_W^4 \end{array} \right)$$

$$\underset{337}{C}\left(G^-, G^+, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{16 c_\beta c_W^4 M_W^4 s_W^3} \left(\begin{array}{l} 4 \left(s_{2\beta} s_\beta - 2c_\beta^3\right) M_W^4 \left(\left(\delta s_W - \left(\delta Z_e\right) s_W\right) \left(c_W^2 - 2c_W^4\right) - \left(\delta s_W\right) s_W^2 \right) - \\ \left(\begin{array}{l} 4 \left(\begin{array}{l} c_\beta \left(2 s_W \delta M_W^2 + 4\left(\delta s_W - \left(\delta Z_e\right) s_W\right) M_W^2\right) + \\ \left(\begin{array}{l} 4\left(\delta c_\beta\right) + \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_\beta - \\ c_\beta \left(2\left(\delta Z_{G^-G^-}\right) + \delta \overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right) \end{array} \right) s_W M_W^2 \end{array} \right) c_W^2 m^2_{e_{g3}} - \\ \left(\begin{array}{l} 16 c_\beta m_{e_{g3}} \delta m^{e_g}_{g3} c_W^2 M_W^2 + \\ \left(\begin{array}{l} 2\left(\delta Z_{G^-G^-}\right) c_\beta^3 - \\ s_{2\beta} \left(2\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) c_\beta + \left(\delta Z_{G^-G^-}\right) s_\beta\right) + \\ 2 c_{2\beta} c_\beta \left(\delta Z_{G^-G^-} + \delta \overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right) \end{array} \right) \left(1 - 2c_W^2\right) M_W^4 \end{array} \right) s_W \end{array} \right) c_W^2 \end{array} \right) \right]$$

$$\underset{338}{C}\left(H^-, G^+, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{8 c_W^4 c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} \left(\begin{array}{l} s_{2\beta}\left(2 s_W \delta M_W^2 + 4\left(\delta s_W - \left(\delta Z_e\right) s_W\right) M_W^2\right) + \\ s_W\left(2\left(\delta Z_{G^-H^-}\right) + 8\left(\delta c_\beta\right) s_\beta - s_{2\beta}\left(\delta Z_{G^-G^-} + \delta Z_{H^-H^-} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right) M_W^2 \end{array} \right) c_W^4 m_{e_{g3}}^2 - \\ \left(\begin{array}{l} 4 m_{e_{g3}} s_W \delta m_{g3}^{e_g} c_W^4 M_W^2 - \\ \left(\begin{array}{l} 4\left(\left(\delta s_W - \left(\delta Z_e\right) s_W\right)\left(c_W^2 - 2 c_W^4\right) - \left(\delta s_W\right) s_W^2\right) - \\ s_W\left(\delta Z_{G^-G^-} + \delta Z_{H^-H^-} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\left(1 - 2 c_W^2\right) c_W^2 \end{array} \right) c_\beta^2 M_W^4 \end{array} \right) s_{2\beta} \end{array} \right) \right]$$

$$\underset{339}{C}\left(G^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{8 c_W^4 c_\beta^2 M_W^4 s_W^3} \left(\begin{array}{l} \left(\begin{array}{l} s_{2\beta}\left(2 s_W \delta M_W^2 + 4\left(\delta s_W\right) M_W^2\right) + \\ s_W\left(2\left(\delta Z_{H^-G^-}\right) + 8\left(\delta c_\beta\right) s_\beta - s_{2\beta}\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{G^-G^-} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\right) M_W^2 \end{array} \right) c_W^4 m_{e_{g3}}^2 - \\ \left(\begin{array}{l} 4 m_{e_{g3}} s_W \delta m_{g3}^{e_g} c_W^4 M_W^2 + \\ \left(\begin{array}{l} \left(8\left(\delta s_W\right) - 2\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-}\right) s_W\right) c_W^4 + 4\left(\delta s_W\right) s_W^2 - \\ \left(\begin{array}{l} 4\left(\delta s_W\right) - \\ \left(\begin{array}{l} 4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \\ \left(\delta Z_{G^-G^-} + \delta\overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}}\right)\left(1 - 2 c_W^2\right) \end{array} \right) s_W \end{array} \right) c_W^2 \end{array} \right) c_\beta^2 M_W^4 \end{array} \right) s_{2\beta} \end{array} \right) \right]$$

$$
\underset{340}{C}\left(H^-,H^+,\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right)=\Bigg[\frac{\mathrm{i}e^2\delta_{g3,g4}}{8c_W^4c_\beta^3M_W^4s_W^3}\Bigg(\Bigg(\Bigg(c_{2\beta}s_Wc_W^2c_\beta^2\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g3}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,1}\right)+\Bigg((\delta s_W)\left(4c_\beta^8s_W^2-4c_W^2c_\beta^2\left(1-2c_W^2s_\beta^2+2c_{2\beta}s_W^2s_\beta^4\right)\right)-\Bigg(4(\delta s_W)s_Ws_\beta^6-c_{2\beta}\left(\left(4(\delta Z_e)+\delta\overline{Z}_{H^-H^-}+\delta Z_{H^-H^-}\right)c_W^2+(\delta s_W)s_Ws_{2\beta}^2\right)-\Bigg(8(\delta c_\beta)c_\beta+(\delta s_\beta)\left(8s_\beta-16s_\beta^3\right)-\Bigg(8(\delta c_\beta)s_\beta-2(\delta s_W)s_Ws_{2\beta}\left(1+2s_\beta^2\right)-\delta Z_{G^-H^-}+\delta Z_{H^-G^-}\Bigg)s_{2\beta}\Bigg)c_W^2\Bigg)s_Wc_\beta^2\Bigg)U^{\tilde{e}_{g3}}_{s4,1}\Bigg)M_W^2U^{\tilde{e}_{g3}*}_{s3,1}+\Bigg(c_{2\beta}c_\beta^2M_W^2\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g3}*}_{1,1}+\delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g3}*}_{2,1}\right)U^{\tilde{e}_{g3}}_{s4,1}-2\left(c_{2\beta}c_\beta^2M_W^2s_W^2+c_W^2m_{e_{g3}}^2s_\beta^2\right)\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g3}*}_{1,2}+\delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g3}*}_{2,2}\right)U^{\tilde{e}_{g3}}_{s4,2}\Bigg)s_Wc_W^2\Bigg)c_\beta M_W^2
$$

$$
2\Bigg(\Bigg(c_\beta s_Wc_W^2M_W^2\left(c_{2\beta}c_\beta^2M_W^2s_W^2+c_W^2m_{e_{g3}}^2s_\beta^2\right)\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g3}}_{1,2}+\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,2}\right)-\Bigg(\Bigg((\delta Z_{G^-H^-}+\delta Z_{H^-G^-})s_Wc_\beta^2M_W^2+\Bigg(4(\delta c_\beta)s_WM_W^2+\Bigg(2s_W\delta M_W^2+\Bigg(4(\delta s_W)-\Bigg(4(\delta Z_e)+\delta\overline{Z}_{H^-H^-}+\delta Z_{H^-H^-}\Bigg)s_W\Bigg)M_W^2\Bigg)c_\beta\Bigg)s_\beta\Bigg)s_\beta c_W^4m_{e_{g3}}^2-\Bigg(4m_{e_{g3}}\delta m^{e_g}_{g3}c_W^4s_\beta^2+\Bigg(c_{2\beta}\left(4(\delta s_W)s_W+\left(4(\delta Z_e)+\delta\overline{Z}_{H^-H^-}+\delta Z_{H^-H^-}\right)c_W^2\right)+(\delta Z_{G^-H^-}+\delta Z_{H^-G^-})s_{2\beta}c_W^2\Bigg)c_\beta^2M_W^2s_W^2\Bigg)c_\beta s_WM_W^2\Bigg)U^{\tilde{e}_{g3}}_{s4,2}\Bigg)U^{\tilde{e}_{g3}*}_{s3,2}
$$

$$
\underset{341}{C}\left(G^{-},G^{+},\tilde{e}_{g3}^{s3},\tilde{e}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{8c_\beta c_W^4 M_W^4 s_W^3} \left(\left(\left(\begin{array}{l} 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) + \\ \left(\begin{array}{l} 4\left(\delta c_\beta\right) c_{2\beta} s_W c_W^2 c_\beta^2 + \\ 2s_{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) + \\ \left(\begin{array}{l} 4\left(\delta s_W\right) s_W^2 - \\ \left(\begin{array}{l} 4\left(\delta s_W\right) + \\ \left(\begin{array}{l} \left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_{2\beta} - \\ 2\left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) c_{2\beta} \end{array} \right) s_W \end{array} \right) c_W^2 \end{array} \right) c_\beta \end{array} \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} 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} \right) M_W^2 + \\ 2\left(\begin{array}{l} 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(\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) - \\ \left(\begin{array}{l} \left(\begin{array}{l} 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(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) M_W^2\right)\right) \end{array} \right) c_W^4 m_{e_{g3}}^2 - \\ \left(\begin{array}{l} 4 m_{e_{g3}} s_W \delta m_{g3}^{e_g} c_W^4 M_W^2 + \\ \left(\begin{array}{l} \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) \end{array} \right) M_W^4 s_W^3 \end{array} \right) c_\beta \end{array} \right) U_{s4,2}^{\tilde{e}_{g3}} \end{array} \right) U_{s3,2}^{\tilde{e}_{g3}*} \end{array} \right) \right) \right]
$$

$$\underset{342}{C}\left(H^-, G^+, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{8 c_W^4 c_\beta^2 M_W^4 s_W^3} \left(2 \left(\left(\left(\frac{1}{2} s_W s_{2\beta} c_W^2 M_W^2 \right) \left(c_W^2 m^2_{e_{g3}} - 2 c_\beta^2 M_W^2 s_W^2 \right) \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,2} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,2} \right) - \right. \right. \right. \right.$$

$$\left. \left. \left. \left(\left(\begin{array}{l} s_W \left(\delta Z_{G^- H^-} + 4 \left(\delta c_\beta \right) s_\beta \right) M_W^2 + \\ \left(\frac{1}{2} s_{2\beta} \right) \left(\begin{array}{l} 2 s_W \delta M_W^2 + \\ \left(\begin{array}{l} 4 \left(\delta s_W \right) - \\ \left(\begin{array}{l} 4 \left(\delta Z_e \right) + \\ \delta Z_{H^- H^-} + \end{array} \right) s_W \\ \delta Z_{G^- G^-} \end{array} \right) M_W^2 \end{array} \right) \end{array} \right) c_W^4 m^2_{e_{g3}} + \right. \right. \right. \right.$$

$$\left. \left. \left. \left(\frac{1}{2} s_W s_{2\beta} M_W^2 \right) \left(\begin{array}{l} 2 \left(4 \left(\delta s_W \right) s_W + \left(4 \left(\delta Z_e \right) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-} \right) c_W^2 \right) c_\beta^2 M_W^2 s_W^2 - \\ 4 m_{e_{g3}} \delta m^{e_g}_{g3} c_W^4 \end{array} \right) \right) U^{\tilde{e}_{g3}}_{s4,2} \right) U^{\tilde{e}_{g3}}_{s3,2}$$

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

$$\left(\begin{array}{l} 2 s_W s_\beta c_W^2 \left(\delta \overline{Z}^{\tilde{e}_{g4}}_{1,s4} U^{\tilde{e}_{g3}}_{1,1} + \delta \overline{Z}^{\tilde{e}_{g4}}_{2,s4} U^{\tilde{e}_{g3}}_{2,1} \right) + \\ \left(\frac{1}{2} U^{\tilde{e}_{g3}}_{s4,1} \right) \left(\begin{array}{l} s_\beta \left(16 \left(\delta s_W \right) s_W^2 - 16 c_W^4 \left(\delta s_W - 3 \left(\delta s_\beta \right) s_W s_\beta^3 \right) \right) + \\ \left(\begin{array}{l} 4 \left(\delta c_\beta \right) s_{2\beta} \left(3 + s_\beta^2 \right) + \\ \left(\delta s_\beta \right) \left(5 s_{2\beta}^2 + 4 s_\beta^2 - 4 \left(5 - 12 s_W^2 \right) s_\beta^4 \right) + \\ 4 \left(4 \left(\delta Z_e \right) + \delta Z_{G^- G^-} + \delta Z_{H^- H^-} - 4 \left(\delta s_W \right) s_W \right) s_\beta \end{array} \right) s_W c_W^2 \end{array} \right) \end{array} \right) c_\beta^3 M_W^4 U^{\tilde{e}_{g3}*}_{s3,1} \right]$$

$$
\underset{343}{C}\left(G^{-},H^{+},\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right)=\Bigg[\frac{\mathrm{i}e^{2}\delta_{g3,g4}}{8c_{W}^{4}c_{\beta}^{2}M_{W}^{4}s_{W}^{3}}\Bigg(2\Bigg(\Bigg(\left(\frac{1}{2}s_{W}s_{2\beta}c_{W}^{2}M_{W}^{2}\right)\left(c_{W}^{2}m_{e_{g3}}^{2}-2c_{\beta}^{2}M_{W}^{2}s_{W}^{2}\right)\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g3}}_{1,2}+\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,2}\right)-\Bigg(\Bigg(s_{W}\left(\delta Z_{H^{-}G^{-}}+4\left(\delta c_{\beta}\right)s_{\beta}\right)M_{W}^{2}+\left(\frac{1}{2}s_{2\beta}\right)\Bigg(2s_{W}\delta M_{W}^{2}+\Bigg(4\left(\delta s_{W}\right)-\left(4\left(\delta Z_{e}\right)+\delta\overline{Z}_{H^{-}H^{-}}+\delta Z_{G^{-}G^{-}}\right)s_{W}\Bigg)M_{W}^{2}\Bigg)\Bigg)c_{W}^{4}m_{e_{g3}}^{2}+\left(\frac{1}{2}s_{W}s_{2\beta}M_{W}^{2}\right)\Bigg(2\left(4\left(\delta s_{W}\right)s_{W}+\left(4\left(\delta Z_{e}\right)+\delta\overline{Z}_{H^{-}H^{-}}+\delta Z_{G^{-}G^{-}}\right)c_{W}^{2}\right)c_{\beta}^{2}M_{W}^{2}s_{W}^{2}-4m_{e_{g3}}\delta m^{e_{g}}_{g3}c_{W}^{4}\Bigg)\Bigg)U^{\tilde{e}_{g3}}_{s4,2}\Bigg)U^{\tilde{e}_{g3}}_{s3,}
$$

$$
\left(\frac{1}{2}s_{W}s_{2\beta}c_{W}^{2}M_{W}^{2}\right)\Bigg(c_{\beta}^{2}M_{W}^{2}\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g3}*}_{1,1}+\delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g3}*}_{2,1}\right)U^{\tilde{e}_{g3}}_{s4,1}+\left(c_{W}^{2}m_{e_{g3}}^{2}-2c_{\beta}^{2}M_{W}^{2}s_{W}^{2}\right)\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g3}*}_{1,2}+\delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g3}*}_{2,2}\right)U^{\tilde{e}_{g3}}_{s4,2}\Bigg)\Bigg)
$$

$$
\Bigg(2s_{W}s_{\beta}c_{W}^{2}\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g3}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,1}\right)+\left(\frac{1}{2}U^{\tilde{e}_{g3}}_{s4,1}\right)\Bigg(s_{\beta}\left(16\left(\delta s_{W}\right)s_{W}^{2}-16c_{W}^{4}\left(\delta s_{W}-3\left(\delta s_{\beta}\right)s_{W}s_{\beta}^{3}\right)\right)+\Bigg(4\left(\delta c_{\beta}\right)s_{2\beta}\left(3+s_{\beta}^{2}\right)+\left(\delta s_{\beta}\right)\left(5s_{2\beta}^{2}+4s_{\beta}^{2}-4\left(5-12s_{W}^{2}\right)s_{\beta}^{4}\right)+4\left(4\left(\delta Z_{e}\right)+\delta\overline{Z}_{H^{-}H^{-}}+\delta Z_{G^{-}G^{-}}-4\left(\delta s_{W}\right)s_{W}\right)s_{\beta}\Bigg)s_{W}c_{W}^{2}\Bigg)\Bigg)c_{\beta}^{3}M_{W}^{4}U^{\tilde{e}_{g3}*}_{s3,1}
$$

$$\underset{344}{C}\left(H^-, H^+, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = -\frac{\mathrm{i}e^2}{3c_W^4 M_W^4 s_W^3 s_{2\beta}^3}$$

$$\left(\begin{array}{l}
\left(\begin{array}{l}
2\left(\begin{array}{l}
s_W s_\beta c_W^2 M_W^2 \left(3c_W^2 c_\beta^2 m_{u_{g3}}^2 - 2c_{2\beta} 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(\begin{array}{l}
3\left(\begin{array}{l}
2 s_W s_{2\beta} \delta m_{g3}^{u_g} M_W^2 + \\
\left(\begin{array}{l}
\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_W M_W^2 s_\beta^2 - \\
\left(\begin{array}{l}
4\left(\delta s_W\right) s_\beta M_W^2 + \\
\left(\begin{array}{l}
4\left(\delta s_\beta\right) M_W^2 + \\
\left(\begin{array}{l}
2\delta M_W^2 - \\
\left(\begin{array}{l}
4\left(\delta Z_e\right) + \\
\delta\overline{Z}_{H^-H^-} + \\
\delta Z_{H^-H^-}
\end{array}\right) M_W^2
\end{array}\right) s_\beta
\end{array}\right) s_W
\end{array}\right) c_\beta
\end{array}\right) m_{u_{g3}}
\end{array}\right) c_\beta m_{u_{g3}} c_W^4 - \\
2\left(\begin{array}{l}
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) + \\
\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_{2\beta} c_W^2
\end{array}\right) M_W^4 s_W^3 s_\beta^3
\end{array}\right) U_{s4,2}^{\tilde{u}_{g4}}
\end{array}\right) \delta_{g3,g4} c_\beta^2 \\
\left(\begin{array}{l}
\left(\begin{array}{l}
\delta_{g3,g4} c_{2\beta}\left(1 + 2c_W^2\right) c_\beta^2 M_W^2 + \\
6\left(\begin{array}{l}
\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
\end{array}\right) c_W^2 s_\beta^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(6c_W^2 c_\beta^4 m_{u_{g3}}^2 - c_{2\beta} M_W^2 s_W^2 s_{2\beta}^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}\right) \\
\left(\begin{array}{l}
\left(\begin{array}{l}
\delta_{g3,g4} c_{2\beta}\left(1 + 2c_W^2\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) s_W c_W^2 M_W^2 \left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}\right. \\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_W s_{2\beta} c_W^2 \left(1 + 2c_W^2\right) + \\
\left(\begin{array}{l}
4\left(\delta s_W\right) s_W^2 - \\
\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 - \\
\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) c_{2\beta}
\end{array}\right) \delta_{g3,g4} c_\beta^3 M_W^4 - \\
\left(\begin{array}{l}
\left(\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 - \\
\left(\begin{array}{l}
2\left(\delta\mathrm{CKM}_{g4,3}\right) c_\beta \mathrm{CKM}_{g3,3}^* M_W^2 + \\
\left(\begin{array}{l}
2 c_\beta \delta\mathrm{CKM}_{g3,3}^* M_W^2 - \\
\left(\begin{array}{l}
4\left(\delta c_\beta\right) M_W^2 + \\
\left(\begin{array}{l}
2\delta M_W^2 - \\
\left(\begin{array}{l}
4\left(\delta Z_e\right) + \\
\delta\overline{Z}_{H^-H^-} +
\end{array}\right) M_W^2
\end{array}\right) c_\beta
\end{array}\right)\mathrm{CKM}_{g3,3}^*
\end{array}\right)\mathrm{CKM}_{g4,3}
\end{array}\right) s_\beta
\end{array}\right) s_W m_{d_3}^2 -
\end{array}\right.
\end{array}\right)
\end{array}\right)
\end{array}\right)
\end{array}\right)
\end{array}\right)$$

$$
\underset{345}{C}\left(G^-, G^+, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = -\frac{\mathrm{i}e^2}{12 s_{2\beta} c_W^4 M_W^4 s_W^3}
\left\{
\begin{array}{l}
2\left(
\begin{array}{l}
s_W s_\beta c_W^2 M_W^2 \left(3 c_W^2 m_{u_{g3}}^2 + 2 c_{2\beta} M_W^2 s_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(
\begin{array}{l}
3\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(
\begin{array}{l}
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
\end{array}
\right) M_W^2
\end{array}
\right) s_W
\end{array}
\right) c_W^4 m_{u_{g3}}^2 - \\
\left(
\begin{array}{l}
12 m_{u_{g3}} s_W \delta m_{g3}^{u_g} c_W^4 M_W^2 - \\
2\left(
\begin{array}{l}
\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)
\end{array}
\right) M_W^4 s_W^3
\end{array}
\right) s_\beta
\end{array}
\right) U_{s4,2}^{\tilde{u}_{g4}}
\end{array}
\right) \delta_{g3,g4} U_{s3,2}^{\tilde{u}_{g3}*} - \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\delta_{g3,g4} c_{2\beta}\left(1 + 2 c_W^2\right) M_W^2 - \\
6\left(
\begin{array}{l}
CKM_{g4,1} CKM_{g3,1}^* m_{d_1}^2 + CKM_{g4,2} CKM_{g3,2}^* m_{d_2}^2 + \\
CKM_{g4,3} CKM_{g3,3}^* m_{d_3}^2
\end{array}
\right) c_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(3 c_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}
\right) \\
\left(
\begin{array}{l}
\delta_{g3,g4} c_{2\beta}\left(1 + 2 c_W^2\right) M_W^2 - \\
6 c_W^2\left(CKM_{g4,1} CKM_{g3,1}^* m_{d_1}^2 + CKM_{g4,2} CKM_{g3,2}^* m_{d_2}^2 + CKM_{g4,3} CKM_{g3,3}^* m_{d_3}^2\right)
\end{array}
\right) c_\beta s_W c_W^2 M_W^2 \left(\delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} U_{1}^{i}\right. \\
2\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(\frac{1}{2} s_W s_{2\beta} c_W^2\right)\left(\delta Z_{G^- H^-} + \delta Z_{H^- G^-}\right)\left(1 + 2 c_W^2\right) - \\
\left(
\begin{array}{l}
2\left(\delta s_W\right) s_W^2 - \\
\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 - \\
\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) c_{2\beta}
\end{array}
\right) \delta_{g3,g4} c_\beta M_W^4 + \\
\left(
\begin{array}{l}
2 c_\beta m_{d_1} s_W \delta CKM_{g3,1}^* M_W^2 + \\
\left(
\begin{array}{l}
4 c_\beta s_W \delta m_1^{d_g} M_W^2 - \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
4\left(\delta c_\beta\right) + \\
\left(
\begin{array}{l}
\delta Z_{H^- G^-} + \\
\delta Z_{G^- H^-}
\end{array}
\right) s_\beta
\end{array}
\right) s_W M_W^2 + \\
\left(
\begin{array}{l}
4\left(\delta s_W\right) M_W^2 + \\
2\left(
\begin{array}{l}
\delta M_W^2 - \\
\left(
\begin{array}{l}
2\left(\delta Z_e\right) + \\
\delta Z_{G^- G^-}
\end{array}
\right) M_W^2
\end{array}
\right) s_W
\end{array}
\right) c_\beta
\end{array}
\right) m_{d_1}
\end{array}
\right) CKM_{g3,1}^*
\end{array}
\right) CKM_{g4,1} m_{d_1} + \\
2
\end{array}
\right.
\end{array}
\right.
\right\}
$$

$$
\underset{346}{C}\left(H^-,G^+,\tilde{u}^{s3}_{g3},\tilde{u}^{s4,\dagger}_{g4}\right) = -\frac{ie^2}{3c_W^4M_W^4s_W^3s_{2\beta}^2}\Bigg(\Bigg(\left(\frac{1}{2}\delta_{g3,g4}c_\beta U^{\tilde{u}_{g3}*}_{s3,2}\right)\Bigg(s_Ws_{2\beta}c_W^2M_W^2\left(3c_W^2m_{u_{g3}}^2-4M_W^2s_W^2s_\beta^2\right)\left(\delta\overline{Z}^{\tilde{u}_{g4}}_{1,s4}U^{\tilde{u}_{g4}}_{1,2}+\delta\overline{Z}^{\tilde{u}_{g4}}_{2,s4}U^{\tilde{u}_{g4}}_{2,2}\right) - \left(3\left(4(\delta s_W)s_{2\beta}M_W^2+\left(2s_{2\beta}\delta M_W^2+\left(8(\delta s_\beta)c_\beta - 2(\delta Z_{G^-H^-}) - \left(4(\delta Z_e)+\delta Z_{H^-H^-}+\delta Z_{G^-G^-}\right)s_{2\beta}\right)M_W^2\right)s_W\right)c_W^4m_{u_{g3}}^2 + \left(4\left(4(\delta s_W)s_W+(4(\delta Z_e)+\delta Z_{G^-G^-}+\delta Z_{H^-H^-})c_W^2\right)M_W^4s_W^3s_\beta^2 - 12m_{u_{g3}}s_W\delta m^{u_g}_{g3}c_W^4M_W^2\right)s_{2\beta}\right)U^{\tilde{u}_{g4}}_{s4,2}
$$

$$
\left(\left(\delta_{g3,g4}\left(1+2c_W^2\right)c_\beta^2M_W^2 - 3\left(CKM_{g4,1}CKM^*_{g3,1}m_{d_1}^2+CKM_{g4,2}CKM^*_{g3,2}m_{d_2}^2+CKM_{g4,3}CKM^*_{g3,3}m_{d_3}^2\right)c_W^2\right)s_\beta^2\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,1}+\delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,1}\right)U^{\tilde{u}_{g4}}_{s4,1} + \delta_{g3,g4}\left(3c_W^2c_\beta^2m_{u_{g3}}^2-M_W^2s_W^2s_{2\beta}^2\right)\left(\delta Z^{\tilde{u}_{g3}}_{1,s3}U^{\tilde{u}_{g3}*}_{1,2}+\delta Z^{\tilde{u}_{g3}}_{2,s3}U^{\tilde{u}_{g3}*}_{2,2}\right)U^{\tilde{u}_{g4}}_{s4,2}\right)\Bigg)
$$

$$
\Bigg(\left(\frac{1}{2}s_Ws_{2\beta}c_W^2M_W^2\right)\left(\delta_{g3,g4}\left(1+2c_W^2\right)c_\beta^2M_W^2 - 3c_W^2\left(CKM_{g4,1}CKM^*_{g3,1}m_{d_1}^2+CKM_{g4,2}CKM^*_{g3,2}m_{d_2}^2+CKM_{g4,3}CKM^*_{g3,3}m_{d_3}^2\right)\right)\left(\delta\overline{Z}\ldots\right.
$$

$$
\Bigg(\left(\frac{1}{2}\delta_{g3,g4}s_{2\beta}c_\beta^2M_W^4\right)\left((8(\delta s_W)-2(4(\delta Z_e)+\delta Z_{G^-G^-}+\delta Z_{H^-H^-})s_W)c_W^4-4(\delta s_W)s_W^2+(4(\delta s_W)-(4(\delta Z_e)+\delta Z_{G^-G^-}+\delta Z_{H^-H^-})s_W)c_W^2\right) +
$$

$$
\Bigg(\Bigg((\delta CKM_{g4,3})s_{2\beta}CKM^*_{g3,3}M_W^2 + \left(\frac{1}{2}CKM_{g4,3}\right)\left(2s_{2\beta}\delta CKM^*_{g3,3}M_W^2 - \left(2s_{2\beta}\delta M_W^2+\left(8(\delta c_\beta)s_\beta+2(\delta Z_{G^-H^-}) - \left(4(\delta Z_e)+\delta Z_{H^-H^-}+\delta Z_{G^-G^-}\right)s_{2\beta}\right)M_W^2\right)CKM^*_{g3,3}\right)\Bigg)s_Wm_{d_3}^2 +
$$

$$
\Bigg(m_{d_1}s_Ws_{2\beta}\delta CKM^*_{g3,1}M_W^2 + \Bigg(2s_Ws_{2\beta}\delta m^{d_g}_1M_W^2 - \ldots
$$

$$
\underset{347}{C}\left(G^{-},H^{+},\tilde{u}_{g3}^{s3},\tilde{u}_{g4}^{s4,\dagger}\right) = -\frac{ie^{2}}{3c_{W}^{4}M_{W}^{4}s_{W}^{3}s_{2\beta}^{2}}
$$

$$\underset{348}{C}\left(H^-, H^+, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = -\frac{ie^2}{3c_W^4 M_W^4 s_W^3 s_{2\beta}^3}$$

$$\left(\begin{array}{l}
\left(\begin{array}{l}
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_{d_{g3}}^2 s_\beta^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) + \\
2\left(\begin{array}{l}
\left(\begin{array}{l}
3\left(\begin{array}{l}
2 s_W s_{2\beta} \delta m^{d_g}_{g3} M_W^2 - \\
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 + \\
\left(\frac{1}{2} s_{2\beta}\right) \left(\begin{array}{l}
4\left(\delta s_W\right) M_W^2 + \\
\left(\begin{array}{l}
2\delta M_W^2 - \\
\left(\begin{array}{l}
4\left(\delta Z_e\right) + \\
\delta\overline{Z}_{H^-H^-} +
\end{array}\right) M_W^2 \\
\delta Z_{H^-H^-}
\end{array}\right) s_W
\end{array}\right)
\end{array}\right) m_{d_{g3}}
\end{array}\right) m_{d_{g3}} s_\beta c_W^4 + \\
\left(\begin{array}{l}
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) + \\
\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_{2\beta} c_W^2
\end{array}\right) c_\beta^3 M_W^4 s_W^3
\end{array}\right) U^{\tilde{d}_{g4}}_{s4,2}
\end{array}\right) \delta_{g3,g4} s_\beta^2 \\
\left(\begin{array}{l}
\left(\begin{array}{l}
\delta_{g3,g4} c_{2\beta}\left(1 - 4c_W^2\right) M_W^2 s_\beta^2 + \\
6\left(\begin{array}{l}
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}
\end{array}\right) c_W^2 c_\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,} \\
\left(\frac{1}{2}\delta_{g3,g4} U^{\tilde{d}_{g4}}_{s4,2}\right) \left(c_{2\beta} M_W^2 s_W^2 s_{2\beta}^2 + 12 c_W^2 m^2_{d_{g3}} s_\beta^4\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) \\
\left(\begin{array}{l}
\left(\begin{array}{l}
\delta_{g3,g4} c_{2\beta}\left(1 - 4c_W^2\right) M_W^2 s_\beta^2 + \\
6 c_W^2 c_\beta^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)
\end{array}\right) s_W s_\beta c_W^2 M_W^2 \left(\delta\overline{Z}^{\tilde{d}_{g4}}_{1,s4}\right. \\
\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right) s_W s_{2\beta}\left(1 - 4c_W^2\right) c_W^2 - \\
\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_{H^-H^-}\right) s_W\right) c_W^2 - \\
4\left(\begin{array}{l}
\left(\delta s_W\right) s_W^2 + \\
\left(\begin{array}{l}
4\left(\delta s_W\right) - \\
\left(\begin{array}{l}
4\left(\delta Z_e\right) + \\
\delta\overline{Z}_{H^-H^-} +
\end{array}\right) s_W
\end{array}\right) c_W^4
\end{array}\right)
\end{array}\right) c_{2\beta}
\end{array}\right) \delta_{g3,g4} M_W^4 s_\beta^3 + \\
\left(\begin{array}{l}
\left(\begin{array}{l}
m_{u_1} s_W s_{2\beta} \delta CKM^*_{1,g4} M_W^2 + \\
\left(\begin{array}{l}
2 s_W s_{2\beta} \delta m_1^{u_g} M_W^2 - \\
\left(\begin{array}{l}
4\left(\delta s_W\right) s_{2\beta} M_W^2 + \\
\left(\begin{array}{l}
2 s_{2\beta} \delta M_W^2 + \\
\left(\begin{array}{l}
8\left(\delta s_\beta\right) c_\beta - \\
\end{array}\right.
\end{array}\right.
\end{array}\right.
\end{array}\right.
\end{array}\right.
\end{array}\right.
\end{array}\right.
\end{array}\right.
\end{array}\right.$$

$$
\underset{349}{C}\left(G^{-},G^{+},\tilde{d}_{g3}^{s3},\tilde{d}_{g4}^{s4,\dagger}\right) = -\frac{ie^2}{12 s_{2\beta} c_W^4 M_W^4 s_W^3}
\left(
\begin{array}{l}
\left(
\begin{array}{l}
2\left(
\begin{array}{l}
c_\beta s_W c_W^2 M_W^2 \left(3c_W^2 m_{d_{g3}}^2 - c_{2\beta} 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(
\begin{array}{l}
3\left(
\begin{array}{l}
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(\delta M_W^2 - \left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) M_W^2\right)\right)
\end{array}
\right) c_W^4 m_{d_{g3}}^2 - \\
\left(
\begin{array}{l}
12 m_{d_{g3}} s_W \delta m_{g3}^{d_g} c_W^4 M_W^2 + \\
\left(
\begin{array}{l}
\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)
\end{array}
\right) M_W^4 s_W^3
\end{array}
\right) c_\beta
\end{array}
\right) U_{s4,2}^{\tilde{d}_{g4}}
\end{array}
\right) \delta_{g3,g4} U_{s
\\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\delta_{g3,g4} c_{2\beta}\left(1 - 4c_W^2\right) M_W^2 - \\
6\left(
\begin{array}{l}
CKM_{1,g3} CKM_{1,g4}^* m_{u_1}^2 + CKM_{2,g3} CKM_{2,g4}^* m_{u_2}^2 + \\
CKM_{3,g3} CKM_{3,g4}^* m_{u_3}^2
\end{array}
\right) c_W^2
\end{array}
\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{d}_{g4}} - \\
2\delta_{g3,g4}\left(3c_W^2 m_{d_{g3}}^2 - c_{2\beta} M_W^2 s_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) U_{s4,2}^{\tilde{d}_{g4}}
\end{array}
\right)
\\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
\delta_{g3,g4} c_{2\beta}\left(1 - 4c_W^2\right) M_W^2 - \\
6c_W^2\left(CKM_{1,g3} CKM_{1,g4}^* m_{u_1}^2 + CKM_{2,g3} CKM_{2,g4}^* m_{u_2}^2 + CKM_{3,g3} CKM_{3,g4}^* m_{u_3}^2\right)
\end{array}
\right) s_W s_\beta c_W^2 M_W^2 \left(\delta\overline{Z}_{1,s4}^{\tilde{d}_{g4}} U
\\
2\left(
\begin{array}{l}
\left(
\begin{array}{l}
\left(\frac{1}{2} s_W s_{2\beta} c_W^2\right)\left(\delta Z_{G^-H^-} + \delta Z_{H^-G^-}\right)\left(1 - 4c_W^2\right) - \\
\left(
\begin{array}{l}
2\left(\delta s_W\right) s_W^2 + \\
\left(8\left(\delta s_W\right) - 4\left(2\left(\delta Z_e\right) + \delta Z_{G^-G^-}\right) s_W\right) c_W^4 - \\
\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) c_{2\beta}
\end{array}
\right) \delta_{g3,g4} s_\beta M_W^4 + \\
\left(
\begin{array}{l}
\left(
\begin{array}{l}
2 m_{u_1} s_W s_\beta \delta CKM_{1,g4}^* M_W^2 + \\
\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(
\begin{array}{l}
4\left(\delta s_\beta\right) - \\
2\left(
\begin{array}{l}
2\left(\delta Z_e\right) + \\
\delta Z_{G^-G^-}
\end{array}
\right) s_\beta -
\end{array}
\right) M_W^2
\end{array}
\right) s_W
\end{array}
\right) m_{u_1}
\end{array}
\right) CKM_{1,g4}^*
\end{array}
\right) CKM_{1,g3} m_{u_1} - \\
2\left(
\begin{array}{l}
4 CKM_{3,g3} m_{u_3} CKM_{3,g4}^*\left(m_{u_3}\left(\left(\delta s_\beta\right) s_W + \left(\delta s_W\right) s_\beta\right) - s_W s_\beta \delta m_3^{u_g}\right) - \\
\left(
\begin{array}{l}
4\left(
\begin{array}{l}
s_W s_\beta \delta m_2^{u_g} - \\
m_{u_2}\left(\left(\delta s_\beta\right) s_W + \left(\delta s_W\right) s_\beta\right)
\end{array}
\right) m_{u_2} +
\end{array}
\right)
\end{array}
\right) M_W^2 +
\end{array}
\right)
\end{array}
\right)
\end{array}
\right)
\end{array}
\right)
\end{array}
\right)
\end{array}
\right)
$$

$$
\underset{350}{C}\left(H^{-},G^{+},\tilde{d}^{\mathrm{s3}}_{\mathrm{g3}},\tilde{d}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \frac{\mathrm{i}e^{2}}{3c_{\mathrm{W}}^{4}M_{\mathrm{W}}^{4}s_{\mathrm{W}}^{3}s_{2\beta}^{2}} \Bigg(\Bigg(\Bigg(\left(\frac{1}{2}s_{\mathrm{W}}s_{2\beta}c_{\mathrm{W}}^{2}M_{\mathrm{W}}^{2}\right)\left(3c_{\mathrm{W}}^{2}m_{d_{\mathrm{g3}}}^{2}-2c_{\beta}^{2}M_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}\right)\left(\delta\overline{Z}^{\tilde{d}_{\mathrm{g4}}}_{1,\mathrm{s4}}U^{\tilde{d}_{\mathrm{g4}}}_{1,2}+\delta\overline{Z}^{\tilde{d}_{\mathrm{g4}}}_{2,\mathrm{s4}}U^{\tilde{d}_{\mathrm{g4}}}_{2,2}\right) - \Bigg(3\Bigg(s_{\mathrm{W}}\left(\delta Z_{\mathrm{G^{-}H^{-}}}+4\left(\delta c_{\beta}\right)s_{\beta}\right)M_{\mathrm{W}}^{2} + \left(\frac{1}{2}s_{2\beta}\right)\Bigg(4\left(\delta s_{\mathrm{W}}\right)M_{\mathrm{W}}^{2} + \Bigg(2\delta M_{\mathrm{W}}^{2} - \Bigg(4\left(\delta \mathrm{Z_{e}}\right) + \delta Z_{\mathrm{H^{-}H^{-}}} + \delta Z_{\mathrm{G^{-}G^{-}}}\Bigg)M_{\mathrm{W}}^{2}\Bigg)s_{\mathrm{W}}\Bigg)\Bigg)c_{\mathrm{W}}^{4}m_{d_{\mathrm{g3}}}^{2} + \Bigg(2\left(4\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}+\left(4\left(\delta \mathrm{Z_{e}}\right)+\delta Z_{\mathrm{G^{-}G^{-}}}+\delta Z_{\mathrm{H^{-}H^{-}}}\right)c_{\mathrm{W}}^{2}\right)c_{\beta}^{3}M_{\mathrm{W}}^{4}s_{\mathrm{W}}^{3} - 12c_{\beta}m_{d_{\mathrm{g3}}}s_{\mathrm{W}}\delta m^{d_{\mathrm{g}}}_{\mathrm{g3}}c_{\mathrm{W}}^{4}M_{\mathrm{W}}^{2}\Bigg)s_{\beta}\Bigg)U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4},2}\Bigg)\delta_{\mathrm{g3,g4}}s_{\beta}U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3},2} -
$$

$$
\Bigg(\Bigg(\delta_{\mathrm{g3,g4}}\left(1-4c_{\mathrm{W}}^{2}\right)M_{\mathrm{W}}^{2}s_{\beta}^{2} + 3\Bigg(\mathrm{CKM}_{1,\mathrm{g3}}\mathrm{CKM}^{*}_{1,\mathrm{g4}}m_{u_{1}}^{2}+\mathrm{CKM}_{2,\mathrm{g3}}\mathrm{CKM}^{*}_{2,\mathrm{g4}}m_{u_{2}}^{2}+\mathrm{CKM}_{3,\mathrm{g3}}\mathrm{CKM}^{*}_{3,\mathrm{g4}}m_{u_{3}}^{2}\Bigg)c_{\mathrm{W}}^{2}\Bigg)c_{\beta}^{2}\left(\delta Z^{\tilde{d}_{\mathrm{g3}}}_{1,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{1,1}+\delta Z^{\tilde{d}_{\mathrm{g3}}}_{2,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{2,1}\right)U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4},1} - \delta_{\mathrm{g3,g4}}\left(3c_{\mathrm{W}}^{2}m_{d_{\mathrm{g3}}}^{2}-2c_{\beta}^{2}M_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}\right)s_{\beta}^{2}\left(\delta Z^{\tilde{d}_{\mathrm{g3}}}_{1,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{1,2}+\delta Z^{\tilde{d}_{\mathrm{g3}}}_{2,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{2,2}\right)U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4},2}\Bigg)
$$

$$
\Bigg(\left(\frac{1}{2}s_{\mathrm{W}}s_{2\beta}c_{\mathrm{W}}^{2}M_{\mathrm{W}}^{2}\right)\Bigg(\delta_{\mathrm{g3,g4}}\left(1-4c_{\mathrm{W}}^{2}\right)M_{\mathrm{W}}^{2}s_{\beta}^{2} + 3c_{\mathrm{W}}^{2}\left(\mathrm{CKM}_{1,\mathrm{g3}}\mathrm{CKM}^{*}_{1,\mathrm{g4}}m_{u_{1}}^{2}+\mathrm{CKM}_{2,\mathrm{g3}}\mathrm{CKM}^{*}_{2,\mathrm{g4}}m_{u_{2}}^{2}+\mathrm{CKM}_{3,\mathrm{g3}}\mathrm{CKM}^{*}_{3,\mathrm{g4}}m_{u_{3}}^{2}\right)\Bigg)\Bigg(\delta\overline{Z}^{\tilde{d}_{\mathrm{g4}}}_{1,\mathrm{s}\ldots}
$$

$$
\Bigg(\left(\frac{1}{2}\delta_{\mathrm{g3,g4}}s_{2\beta}M_{\mathrm{W}}^{4}s_{\beta}^{2}\right)\Bigg(\left(4\left(\delta s_{\mathrm{W}}\right)-\left(4\left(\delta \mathrm{Z_{e}}\right)+\delta Z_{\mathrm{G^{-}G^{-}}}+\delta Z_{\mathrm{H^{-}H^{-}}}\right)s_{\mathrm{W}}\right)c_{\mathrm{W}}^{2} - 4\left(\left(4\left(\delta s_{\mathrm{W}}\right)-\left(4\left(\delta \mathrm{Z_{e}}\right)+\delta Z_{\mathrm{G^{-}G^{-}}}+\delta Z_{\mathrm{H^{-}H^{-}}}\right)s_{\mathrm{W}}\right)c_{\mathrm{W}}^{4}+\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}^{2}\right)\Bigg) -
$$

$$
\Bigg(\Bigg(\Bigg(m_{u_{1}}s_{\mathrm{W}}s_{2\beta}\delta\mathrm{CKM}^{*}_{1,\mathrm{g4}}M_{\mathrm{W}}^{2} + \Bigg(2s_{\mathrm{W}}s_{2\beta}\delta m^{u_{\mathrm{g}}}_{1}M_{\mathrm{W}}^{2} - \Bigg(2\left(\delta s_{\mathrm{W}}\right)s_{2\beta}M_{\mathrm{W}}^{2} + \frac{s_{\mathrm{W}}}{2}\Bigg(2s_{2\beta}\delta M_{\mathrm{W}}^{2} + \Bigg(8\left(\delta s_{\beta}\right)c_{\beta} - 2\left(\delta Z_{\mathrm{G^{-}H^{-}}}\right) - \Bigg(4\left(\delta \mathrm{Z_{e}}\right) + \delta Z_{\mathrm{H^{-}H^{-}}} + \delta Z_{\mathrm{G^{-}G^{-}}}\Bigg)s_{2\beta}\Bigg)M_{\mathrm{W}}^{2}\Bigg)\Bigg)m_{u_{1}}\Bigg)\mathrm{CKM}^{*}_{1,\mathrm{g4}}\Bigg)\mathrm{CKM}_{1,\mathrm{g3}}m_{u_{1}} +
$$

$$
\Bigg(\left(\delta\mathrm{CKM}_{1,\mathrm{g3}}\right)s_{2\beta}\mathrm{CKM}^{*}_{1,\mathrm{g4}}m_{u_{1}}^{2}M_{\mathrm{W}}^{2} + \Bigg(\left(\delta\mathrm{CKM}_{3,\mathrm{g3}}\right)s_{2\beta}\mathrm{CKM}^{*}_{3,\mathrm{g4}}M_{\mathrm{W}}^{2} + \ldots
$$

$$
\underset{351}{C}\left(G^{-},H^{+},\tilde{d}^{\mathrm{s3}}_{\mathrm{g3}},\tilde{d}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \Bigg[\frac{\mathrm{i}e^{2}}{3c_{\mathrm{W}}^{4}M_{\mathrm{W}}^{4}s_{\mathrm{W}}^{3}s_{2\beta}^{2}} \Bigg(\Bigg(\Bigg(\left(\frac{1}{2}s_{\mathrm{W}}s_{2\beta}c_{\mathrm{W}}^{2}M_{\mathrm{W}}^{2}\right)\left(3c_{\mathrm{W}}^{2}m_{d_{\mathrm{g3}}}^{2}-2c_{\beta}^{2}M_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}\right)\left(\delta\overline{Z}^{\tilde{d}_{\mathrm{g4}}}_{1,\mathrm{s4}}U^{\tilde{d}_{\mathrm{g4}}}_{1,2}+\delta\overline{Z}^{\tilde{d}_{\mathrm{g4}}}_{2,\mathrm{s4}}U^{\tilde{d}_{\mathrm{g4}}}_{2,2}\right) - \Bigg(3\Bigg(s_{\mathrm{W}}\left(\delta Z_{\mathrm{H^{-}G^{-}}}+4\left(\delta c_{\beta}\right)s_{\beta}\right)M_{\mathrm{W}}^{2} + \left(\frac{1}{2}s_{2\beta}\right)\Bigg(4\left(\delta s_{\mathrm{W}}\right)M_{\mathrm{W}}^{2} + \Bigg(2\delta M_{\mathrm{W}}^{2} - \Bigg(4\left(\delta \mathrm{Z_{e}}\right) + \delta\overline{\mathrm{Z}}_{\mathrm{H^{-}H^{-}}} + \delta \mathrm{Z}_{\mathrm{G^{-}G^{-}}} \Bigg) M_{\mathrm{W}}^{2} \Bigg) s_{\mathrm{W}} \Bigg) \Bigg) c_{\mathrm{W}}^{4}m_{d_{\mathrm{g3}}}^{2} + \Bigg(2\left(4\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}+\left(4\left(\delta \mathrm{Z_{e}}\right)+\delta\overline{\mathrm{Z}}_{\mathrm{H^{-}H^{-}}}+\delta \mathrm{Z}_{\mathrm{G^{-}G^{-}}}\right)c_{\mathrm{W}}^{2}\right)c_{\beta}^{3}M_{\mathrm{W}}^{4}s_{\mathrm{W}}^{3} - 12c_{\beta}m_{d_{\mathrm{g3}}}s_{\mathrm{W}}\delta m^{d_{\mathrm{g}}}_{\mathrm{g3}}c_{\mathrm{W}}^{4}M_{\mathrm{W}}^{2} \Bigg) s_{\beta} \Bigg) U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4},2} \Bigg) \delta_{\mathrm{g3,g4}}s_{\beta}U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3},2} - \Bigg(\Bigg(\delta_{\mathrm{g3,g4}}\left(1-4c_{\mathrm{W}}^{2}\right)M_{\mathrm{W}}^{2}s_{\beta}^{2} + 3\Bigg(\mathrm{CKM}_{1,\mathrm{g3}}\mathrm{CKM}^{*}_{1,\mathrm{g4}}m_{u_{1}}^{2} + \mathrm{CKM}_{2,\mathrm{g3}}\mathrm{CKM}^{*}_{2,\mathrm{g4}}m_{u_{2}}^{2} + \mathrm{CKM}_{3,\mathrm{g3}}\mathrm{CKM}^{*}_{3,\mathrm{g4}}m_{u_{3}}^{2} \Bigg) c_{\mathrm{W}}^{2} \Bigg) c_{\beta}^{2}\left(\delta Z^{\tilde{d}_{\mathrm{g3}}}_{1,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{1,1}+\delta Z^{\tilde{d}_{\mathrm{g3}}}_{2,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{2,1}\right)U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4},1} - \delta_{\mathrm{g3,g4}}\left(3c_{\mathrm{W}}^{2}m_{d_{\mathrm{g3}}}^{2}-2c_{\beta}^{2}M_{\mathrm{W}}^{2}s_{\mathrm{W}}^{2}\right)s_{\beta}^{2}\left(\delta Z^{\tilde{d}_{\mathrm{g3}}}_{1,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{1,2}+\delta Z^{\tilde{d}_{\mathrm{g3}}}_{2,\mathrm{s3}}U^{\tilde{d}_{\mathrm{g3}}*}_{2,2}\right)U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4},2} \Bigg) \cdots
$$

$$
\cdots \Bigg(\left(\frac{1}{2}s_{\mathrm{W}}s_{2\beta}c_{\mathrm{W}}^{2}M_{\mathrm{W}}^{2}\right)\Bigg(\delta_{\mathrm{g3,g4}}\left(1-4c_{\mathrm{W}}^{2}\right)M_{\mathrm{W}}^{2}s_{\beta}^{2} + 3c_{\mathrm{W}}^{2}\left(\mathrm{CKM}_{1,\mathrm{g3}}\mathrm{CKM}^{*}_{1,\mathrm{g4}}m_{u_{1}}^{2}+\mathrm{CKM}_{2,\mathrm{g3}}\mathrm{CKM}^{*}_{2,\mathrm{g4}}m_{u_{2}}^{2}+\mathrm{CKM}_{3,\mathrm{g3}}\mathrm{CKM}^{*}_{3,\mathrm{g4}}m_{u_{3}}^{2}\right) \Bigg) \left(\delta\overline{Z}^{\tilde{d}_{\mathrm{g4}}}_{1,\mathrm{s}\cdots} \cdots\right.
$$

$$
\Bigg(\left(\frac{1}{2}\delta_{\mathrm{g3,g4}}s_{2\beta}M_{\mathrm{W}}^{4}s_{\beta}^{2}\right)\Bigg(\left(4\left(\delta s_{\mathrm{W}}\right)-\left(4\left(\delta \mathrm{Z_{e}}\right)+\delta\overline{\mathrm{Z}}_{\mathrm{H^{-}H^{-}}}+\delta \mathrm{Z}_{\mathrm{G^{-}G^{-}}}\right)s_{\mathrm{W}}\right)c_{\mathrm{W}}^{2} - 4\left(\left(4\left(\delta s_{\mathrm{W}}\right)-\left(4\left(\delta \mathrm{Z_{e}}\right)+\delta\overline{\mathrm{Z}}_{\mathrm{H^{-}H^{-}}}+\delta \mathrm{Z}_{\mathrm{G^{-}G^{-}}}\right)s_{\mathrm{W}}\right)c_{\mathrm{W}}^{4}+\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}^{2}\right) \Bigg) - \Bigg(\Bigg(m_{u_{1}}s_{\mathrm{W}}s_{2\beta}\delta\mathrm{CKM}^{*}_{1,\mathrm{g4}}M_{\mathrm{W}}^{2} + \Bigg(2s_{\mathrm{W}}s_{2\beta}\delta m^{u_{\mathrm{g}}}_{1}M_{\mathrm{W}}^{2} - \Bigg(2\left(\delta s_{\mathrm{W}}\right)s_{2\beta}M_{\mathrm{W}}^{2} + \frac{s_{\mathrm{W}}}{2}\Bigg(2s_{2\beta}\delta M_{\mathrm{W}}^{2} + \Bigg(8\left(\delta s_{\beta}\right)c_{\beta} - 2\left(\delta Z_{\mathrm{H^{-}G^{-}}}\right) - \Bigg(4\left(\delta \mathrm{Z_{e}}\right) + \delta\overline{\mathrm{Z}}_{\mathrm{H^{-}H^{-}}} + \delta \mathrm{Z}_{\mathrm{G^{-}G^{-}}} \Bigg) s_{2\beta} \Bigg) M_{\mathrm{W}}^{2} \Bigg) \Bigg) m_{u_{1}} \Bigg) \mathrm{CKM}^{*}_{1,\mathrm{g4}} \Bigg) \mathrm{CKM}_{1,\mathrm{g3}}m_{u_{1}} + \Bigg(\left(\delta\mathrm{CKM}_{1,\mathrm{g3}}\right)s_{2\beta}\mathrm{CKM}^{*}_{1,\mathrm{g4}}m_{u_{1}}^{2}M_{\mathrm{W}}^{2} + \Bigg(\left(\delta\mathrm{CKM}_{3,\mathrm{g3}}\right)s_{2\beta}\mathrm{CKM}^{*}_{3,\mathrm{g4}}M_{\mathrm{W}}^{2} + \cdots
$$

$$
\Bigg[e^2 \Bigg(\frac{4}{c_W^4 c_\beta^3 M_W^4 s_W^3} \Bigg(\Bigg(18 \Bigg(\left(U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{d}_{g2}*}_{s3,2} U^{\tilde{d}_{g1}}_{s4,2} + U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{d}_{g2}*}_{s3,1} U^{\tilde{d}_{g1}}_{s4,1} \right) \delta_{g1,g4} \delta_{g2,g3} m_{d_{g2}} + \left(U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g3}}_{s4,1} + U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g3}}_{s4,2} \right) \delta_{g1,g2} \delta_{g3,g4} m_{d_{g3}} \Bigg) (\delta c_\beta)\, m_{d_{g1}} s_W M_W^2 -
$$

$$
9 \Bigg(\left(\delta_{g1,g4} \delta_{g2,g3} m_{d_{g2}} U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{d}_{g2}*}_{s3,2} U^{\tilde{d}_{g1}}_{s4,2} + \delta_{g1,g2} \delta_{g3,g4} m_{d_{g3}} U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g3}}_{s4,1} \right) U^{\tilde{d}_{g1}*}_{s1,1} + \left(\delta_{g1,g4} \delta_{g2,g3} m_{d_{g2}} U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{d}_{g2}*}_{s3,1} U^{\tilde{d}_{g1}}_{s4,1} + \delta_{g1,g2} \delta_{g3,g4} m_{d_{g3}} U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g3}}_{s4,2} \right) U^{\tilde{d}_{g1}*}_{s1,2} \Bigg) c_\beta \Big(s_W \delta m^{d_g}_{g1} M_W^2 - m_{d_{g1}} \Big(2\, (\delta s_W)\, M_W^2 + s_W \Big(
$$

$$
\Bigg(\Bigg(\left(\left((\delta s_W - (\delta Z_e)\, s_W) \left(c_W^2 + 8 c_W^4 \right) - (\delta s_W)\, s_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g3}}_{s4,1} - 2 \left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2 \right) s_W^3 U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g3}}_{s4,2} \right) \delta_{g1,g2} \delta_{g3,g4} U^{\tilde{d}_{g1}}_{s2,1} + \left(\left((\delta s_W - (\delta Z_e)\, s_W) \left(c_W^2 + 8 c_W^4 \right) - (\delta s_W)\, s_W^2 \right) U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{d}_{g2}*}_{s3,1} - 2 \left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2 \right) s_W^3 U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{d}_{g2}*}_{s3,2} \right) \delta_{g1,g4} \delta_{g2,g3} U^{\tilde{d}_{g1}}_{s4,1} \Bigg) U^{\tilde{d}_{g1}*}_{s1,1} -
$$

$$
2 \Bigg(\left(U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g3}}_{s4,1} + 2 U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g3}}_{s4,2} \right) \delta_{g1,g2} \delta_{g3,g4} U^{\tilde{d}_{g1}}_{s2,2} + \left(U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{d}_{g2}*}_{s3,1} + 2 U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{d}_{g2}*}_{s3,2} \right) \delta_{g1,g4} \delta_{g2,g3} U^{\tilde{d}_{g1}}_{s4,2} \Bigg) \left((\delta s_W)\, s_W + (\delta Z_e)\, c_W^2 \right) s_W^3 U^{\tilde{d}_{g1}*}_{s1,2} \Bigg) \Bigg) \Bigg) +
$$

$$
\frac{36 m_{d_{g1}}}{c_\beta^2 M_W^2 s_W^2} \Bigg(\left(U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{d}_{g2}*}_{s3,2} U^{\tilde{d}_{g1}}_{s4,2} + U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{d}_{g2}*}_{s3,1} U^{\tilde{d}_{g1}}_{s4,1} \right) \delta_{g1,g4} \delta_{g2,g3} \delta m^{d_g}_{g2} + \left(U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g3}}_{s4,1} + U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g3}}_{s4,2} \right) \delta_{g1,g2} \delta_{g3,g4} \delta m^{d_g}_{g3} \Bigg) \Bigg)
$$

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

$$
36 g_s^2 \left(T^x_{c2,c3} T^x_{c4,c1} \right) \left(U^{\tilde{d}_{g1}}_{1,1} U^{\tilde{d}_{g1}*}_{s1,1} - U^{\tilde{d}_{g1}}_{1,2} U^{\tilde{d}_{g1}*}_{s1,2} \right) \left(U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{d}_{g2}*}_{s3,1} - U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{d}_{g2}*}_{s3,2} \right) \Bigg) \delta_{g1,g4} \delta_{g2,g3} + \Bigg(\Bigg(\Bigg(\left(\left(1 + 8 c_W^2 \right) U^{\tilde{d}_{g3}}_{1,1} U^{\tilde{d}_{g3}*}_{s3,1} + \dots \right) c_\beta^2 M_W^2 U^{\tilde{d}_{g1}}_{s2,1} + \dots \Bigg) \Bigg) \Bigg) \delta \overline{Z}^{\tilde{d}_{g4}}_{1,s4} -
$$

$$
\underset{375}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right)=\Bigg[-\frac{ie^2\delta_{g1,g2}\delta_{g3,g4}}{24c_W^4c_\beta^3M_W^4s_W^3}\Bigg(2\Bigg(\Bigg(\Bigg(\left(c_\beta^2M_W^2s_W^2U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{e}_{g3}}_{s4,2}+3m_{d_{g1}}m_{e_{g3}}c_W^2U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{e}_{g3}}_{s4,1}\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)+2c_\beta^2M_W^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}U^{\tilde{e}_{g3}}_{s4,2}\Bigg)c_W^2+2\Bigg(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)U^{\tilde{e}_{g3}}_{s4,2}+\left(\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)c_W^2+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)U^{\tilde{d}_{g1}}_{s2,2}\Bigg)c_\beta^2M_W^2s_W^2U^{\tilde{d}_{g1}*}_{s1,2}\Bigg)c_\beta s_WM_W^2+\Bigg(\left(c_W^2c_\beta^3M_W^4s_W^3U^{\tilde{d}_{g1}}_{1,1}U^{\tilde{e}_{g3}}_{s4,2}+3c_\beta m_{d_{g1}}m_{e_{g3}}s_Wc_W^4M_W^2U^{\tilde{d}_{g1}}_{1,2}U^{\tilde{e}_{g3}}_{s4,1}\right)\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}+\left(c_W^2c_\beta^3M_W^4s_W^3U^{\tilde{d}_{g1}}_{2,1}U^{\tilde{e}_{g3}}_{s4,2}+3c_\beta m_{d_{g1}}m_{e_{g3}}s_Wc_W^4M_W^2U^{\tilde{d}_{g1}}_{2,2}U^{\tilde{e}_{g3}}_{s4,1}\right)\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}+\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)c_\beta^3M_W^4s_W^3U^{\tilde{d}_{g1}}_{s2,1}+\Bigg(\Bigg(\left(3\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)m_{d_{g1}}m_{e_{g3}}+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}\right)s_WM_W^2-6m_{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)c_\beta-12\left(\delta c_\beta-\left(\delta Z_e\right)c_\beta\right)m_{d_{g1}}m_{e_{g3}}s_WM_W^2U^{\tilde{e}_{g3}}_{s4,1}\Bigg)c_W^4U^{\tilde{d}_{g1}}_{s2,2}\Bigg)U^{\tilde{d}_{g1}*}_{s1,1}\Bigg)U^{\tilde{e}_{g3}*}_{s3,2}-
$$

$$
\Bigg(\Bigg(\left(1-4c_W^2\right)c_\beta^2M_W^2U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{e}_{g3}}_{s4,1}+2U^{\tilde{d}_{g1}*}_{s1,2}\left(c_\beta^2M_W^2s_W^2U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{e}_{g3}}_{s4,1}-3m_{d_{g1}}m_{e_{g3}}c_W^2U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{e}_{g3}}_{s4,2}\right)\Bigg)\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g3}*}_{1,1}+\delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g3}*}_{2,1}\right)-2\Bigg(3m_{d_{g1}}m_{e_{g3}}c_W^2U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{e}_{g3}}_{s4,1}+c_\beta^2M_W^2s_W^2\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1}+2U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)U^{\tilde{e}_{g3}}_{s4,2}\Bigg)\left(\delta Z^{\tilde{e}_{g3}}_{1,s3}U^{\tilde{e}_{g3}*}_{1,2}+\delta Z^{\tilde{e}_{g3}}_{2,s3}U^{\tilde{e}_{g3}*}_{2,2}\right)\Bigg)c_\beta s_Wc_W^2M_W^2 \ldots
$$

$$
\Bigg(\Bigg(s_W\left(1-4c_W^2\right)c_W^2\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g1}}_{2,1}\right)U^{\tilde{e}_{g3}}_{s4,1}+\left(s_W\left(1-4c_W^2\right)c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g4}}_{1,s4}U^{\tilde{e}_{g3}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g4}}_{2,s4}U^{\tilde{e}_{g3}}_{2,1}\right)+4\left(3\left(\delta s_W-\left(\delta Z_e\right)s_W\right)c_W^4+\left(\delta Z_e\right)c_W^2s_W^3+\left(\delta s_W\right)s_W^4\right)U^{\tilde{e}_{g3}}_{s4,1}\right)U^{\tilde{d}_{g1}}_{s2,1}\Bigg)c_\beta^3M_W^4U^{\tilde{d}_{g1}*}_{s1,1}+\Bigg(\left(1-4c_W^2\right)c_\beta^2M_W^2\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,1}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,1}\right)U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{e}_{g3}}_{s4,1}+2\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,2}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,2}\right)\left(c_\beta^2M_W^2s_W^2U^{\tilde{d}_{g1}}_{s2,2}U^{\tilde{e}_{g3}}_{s4,1}-3m_{d_{g1}}m_{e_{g3}}c_W^2U^{\tilde{d}_{g1}}_{s2,1}U^{\tilde{e}_{g3}}_{s4,2}\right)\Bigg)c_\beta s_Wc_W^2M_W^2-\ldots
$$

$$\underset{376}{C}\left(\tilde{d}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^{\dagger}\right) = \left[\frac{i e^2 \delta_{g1,g2} \delta_{g3,g4}}{24 c_W^4 s_W^3} \left(\begin{array}{l} \left(\begin{array}{l} 2 \left(\begin{array}{l} c_W^2 \left(\delta \overline{Z}_{1,s2}^{\tilde{d}_{g2}} U_{1,2}^{\tilde{d}_{g1}} + \delta \overline{Z}_{2,s2}^{\tilde{d}_{g2}} U_{2,2}^{\tilde{d}_{g1}} \right) + \\ \left(\left(\delta \overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}} \right) c_W^2 + 4 \left(\left(\delta s_W \right) s_W + \left(\delta Z_e \right) c_W^2 \right) \right) U_{s2,2}^{\tilde{d}_{g1}} \end{array} \right) s_W^2 U_{s1,2}^{\tilde{d}_{g1}*} + \\ \left(\begin{array}{l} \left(1 + 2 c_W^2 \right) \left(\delta Z_{1,s1}^{\tilde{d}_{g1}} U_{1,1}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}} U_{2,1}^{\tilde{d}_{g1}*} \right) U_{s2,1}^{\tilde{d}_{g1}} + \\ 2 s_W^2 \left(\delta Z_{1,s1}^{\tilde{d}_{g1}} U_{1,2}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}} U_{2,2}^{\tilde{d}_{g1}*} \right) U_{s2,2}^{\tilde{d}_{g1}} \end{array} \right) c_W^2 \end{array} \right) s_W + \\ \left(\begin{array}{l} s_W c_W^2 \left(1 + 2 c_W^2 \right) \left(\delta \overline{Z}_{1,s2}^{\tilde{d}_{g2}} U_{1,1}^{\tilde{d}_{g1}} + \delta \overline{Z}_{2,s2}^{\tilde{d}_{g2}} U_{2,1}^{\tilde{d}_{g1}} \right) - \\ \left(\begin{array}{l} \left(4 \left(\delta s_W \right) - 4 \left(\delta Z_e \right) s_W \right) \left(c_W^2 + 2 c_W^4 \right) - 4 \left(\delta s_W \right) s_W^2 - \\ s_W \left(\delta \overline{Z}_{1,1}^{\tilde{\nu}} + \delta Z_{1,1}^{\tilde{\nu}} \right) c_W^2 \left(1 + 2 c_W^2 \right) \end{array} \right) U_{s2,1}^{\tilde{d}_{g1}} \end{array} \right) U_{s1,1}^{\tilde{d}_{g1}*} \end{array} \right) \right]$$

$$
\begin{aligned}
& e^2 \Bigg(\frac{\mathrm{i}}{M_{\mathrm{W}}^4 s_{\mathrm{W}}^3 s_{2\beta}^3} \Bigg(\Bigg(\Bigg(\begin{pmatrix} \delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}} \left(\delta s_{\mathrm{W}}\right) U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g1}}} U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g3}}} - \\ \left(\begin{pmatrix} \mathrm{CKM}_{\mathrm{g4,g1}} \left(2 \left(\delta s_{\mathrm{W}}\right) \mathrm{CKM}_{\mathrm{g3,g2}}^{*} - s_{\mathrm{W}} \delta \mathrm{CKM}_{\mathrm{g3,g2}}^{*} \right) - \\ \left(\delta \mathrm{CKM}_{\mathrm{g4,g1}}\right) s_{\mathrm{W}} \mathrm{CKM}_{\mathrm{g3,g2}}^{*} \end{pmatrix} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g2}}} U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}} \right) \end{pmatrix} M_{\mathrm{W}}^4 s_{2\beta}^3 U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} + \\ 4 \Bigg(\begin{pmatrix} \left(\delta \mathrm{CKM}_{\mathrm{g4,g1}}\right) m_{d_{\mathrm{g1}}} m_{d_{\mathrm{g2}}} s_{\mathrm{W}} s_{2\beta} \mathrm{CKM}_{\mathrm{g3,g2}}^{*} M_{\mathrm{W}}^2 + \\ \Bigg(\begin{pmatrix} m_{d_{\mathrm{g1}}} m_{d_{\mathrm{g2}}} s_{\mathrm{W}} s_{2\beta} \delta \mathrm{CKM}_{\mathrm{g3,g2}}^{*} M_{\mathrm{W}}^2 + \\ \Bigg(\begin{pmatrix} m_{d_{\mathrm{g1}}} s_{\mathrm{W}} s_{2\beta} \delta m_{\mathrm{g2}}^{d_{\mathrm{g}}} M_{\mathrm{W}}^2 + \\ \Bigg(\begin{pmatrix} s_{\mathrm{W}} s_{2\beta} \delta m_{\mathrm{g1}}^{d_{\mathrm{g}}} M_{\mathrm{W}}^2 - \\ \Bigg(\begin{pmatrix} 4 \left(\delta c_{\beta}\right) s_{\mathrm{W}} s_{\beta} M_{\mathrm{W}}^2 + \\ \left(\begin{pmatrix} 2 \left(\delta s_{\mathrm{W}}\right) M_{\mathrm{W}}^2 + \\ s_{\mathrm{W}} \delta M_{\mathrm{W}}^2 \end{pmatrix} s_{2\beta} \right) m_{d_{\mathrm{g1}}} \end{pmatrix} \Bigg) m_{d_{\mathrm{g2}}} \end{pmatrix} \Bigg) \mathrm{CKM}_{\mathrm{g3,g2}}^{*} \end{pmatrix} \Bigg) \mathrm{CKM}_{\mathrm{g4,g1}} \end{pmatrix} \Bigg) s_{\beta}^2 U_{\mathrm{s1,2}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{d}_{\mathrm{g2}}} \\ 4 \Bigg(\begin{pmatrix} \left(\delta \mathrm{CKM}_{\mathrm{g4,g1}}\right) m_{u_{\mathrm{g3}}} m_{u_{\mathrm{g4}}} s_{\mathrm{W}} s_{2\beta} \mathrm{CKM}_{\mathrm{g3,g2}}^{*} M_{\mathrm{W}}^2 + \\ \Bigg(\begin{pmatrix} m_{u_{\mathrm{g3}}} m_{u_{\mathrm{g4}}} s_{\mathrm{W}} s_{2\beta} \delta \mathrm{CKM}_{\mathrm{g3,g2}}^{*} M_{\mathrm{W}}^2 + \\ \Bigg(\begin{pmatrix} m_{u_{\mathrm{g3}}} s_{\mathrm{W}} s_{2\beta} \delta m_{\mathrm{g4}}^{u_{\mathrm{g}}} M_{\mathrm{W}}^2 + \\ \Bigg(\begin{pmatrix} s_{\mathrm{W}} s_{2\beta} \delta m_{\mathrm{g3}}^{u_{\mathrm{g}}} M_{\mathrm{W}}^2 - \\ \Bigg(\begin{pmatrix} s_{\mathrm{W}} s_{2\beta} \delta M_{\mathrm{W}}^2 + \\ \left(\begin{pmatrix} 2 \left(\delta s_{\mathrm{W}}\right) s_{2\beta} + \\ 4 \left(\delta s_{\beta}\right) c_{\beta} s_{\mathrm{W}} \end{pmatrix} M_{\mathrm{W}}^2 \right) m_{u_{\mathrm{g3}}} \end{pmatrix} \Bigg) m_{u_{\mathrm{g4}}} \end{pmatrix} \Bigg) \mathrm{CKM}_{\mathrm{g3,g2}}^{*} \end{pmatrix} \Bigg) \mathrm{CKM}_{\mathrm{g4,g1}} \end{pmatrix} \Bigg) c_{\beta}^2 U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g2}}} U_{\mathrm{s3}} \\ \frac{\mathrm{i} \left(\delta Z_{\mathrm{e}}\right)}{9 s_{\mathrm{W}}^2} \Bigg(\begin{pmatrix} \frac{\delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}}}{c_{\mathrm{W}}^2} \begin{pmatrix} \begin{pmatrix} \left(1 - 10 c_{\mathrm{W}}^2\right) U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g1}}} + \\ 2 s_{\mathrm{W}}^2 U_{\mathrm{s1,2}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{d}_{\mathrm{g1}}} \end{pmatrix} U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g3}}*} U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g3}}} - \\ 4 s_{\mathrm{W}}^2 \left(U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g1}}} + 2 U_{\mathrm{s1,2}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{d}_{\mathrm{g1}}} \right) U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g3}}*} U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g3}}} \end{pmatrix} + \\ \frac{18 \mathrm{CKM}_{\mathrm{g4,g1}} \mathrm{CKM}_{\mathrm{g3,g2}}^{*}}{M_{\mathrm{W}}^2 s_{2\beta}^2} \begin{pmatrix} \begin{pmatrix} M_{\mathrm{W}}^2 s_{2\beta}^2 U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g2}}} + \\ 4 m_{d_{\mathrm{g1}}} m_{d_{\mathrm{g2}}} s_{\beta}^2 U_{\mathrm{s1,2}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{d}_{\mathrm{g2}}} \end{pmatrix} U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g3}}*} U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}} + \\ 4 m_{u_{\mathrm{g3}}} m_{u_{\mathrm{g4}}} c_{\beta}^2 U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g2}}} U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g3}}*} U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}} \end{pmatrix} \end{pmatrix} \Bigg) \\ \Bigg(\begin{pmatrix} \frac{\mathrm{i} e^2}{36 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \begin{pmatrix} \begin{pmatrix} \left(1 - 10 c_{\mathrm{W}}^2\right) U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g1}}} + \\ 2 s_{\mathrm{W}}^2 U_{\mathrm{s1,2}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{d}_{\mathrm{g1}}} \end{pmatrix} U_{1,1}^{\tilde{u}_{\mathrm{g3}}} U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g3}}*} - \\ 4 s_{\mathrm{W}}^2 U_{1,2}^{\tilde{u}_{\mathrm{g3}}} \left(U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g1}}} + 2 U_{\mathrm{s1,2}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{d}_{\mathrm{g1}}} \right) U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g3}}*} \end{pmatrix} + \\ \mathrm{i} g_{\mathrm{s}}^2 \left(T_{\mathrm{c2,c1}}^{\mathrm{x}} T_{\mathrm{c4,c3}}^{\mathrm{x}} \right) \left(U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g1}}} - U_{\mathrm{s1,2}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,2}}^{\tilde{d}_{\mathrm{g1}}} \right) \left(U_{1,1}^{\tilde{u}_{\mathrm{g3}}} U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g3}}*} - U_{1,2}^{\tilde{u}_{\mathrm{g3}}} U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g3}}*} \right) \end{pmatrix} \delta_{\mathrm{g1,g2}} \delta_{\mathrm{g3,g4}} + \\ 2 \mathrm{i} e^2 \mathrm{CKM}_{\mathrm{g4,g1}} \mathrm{CKM}_{\mathrm{g3,g2}}^{*} \Bigg(\begin{pmatrix} m_{u_{\mathrm{g3}}} m_{u_{\mathrm{g4}}} c_{\beta}^2 U_{1,2}^{\tilde{u}_{\mathrm{g4}}} U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*} U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g2}}} U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g3}}*} + \\ \end{pmatrix} \end{aligned}
$$

$$
\underset{378}{C}\left(\tilde{d}_{g1}^{s1},\tilde{e}_{g2}^{s2,\dagger},\tilde{\nu}_{g3},\tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{i e^2 \delta_{g2,g3}}{4 c_\beta^3 M_W^4 s_W^3} \left(\left(\left(\begin{array}{l} 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} \end{array} \right) c_\beta^3 M_W^4 U^{\tilde{d}_{g1}*}_{s1,1} + \right. \right. \right. \\ \left(\begin{array}{l} c_\beta m_{d_{g1}} m_{e_{g2}} s_W M_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} + \\ \left(\begin{array}{l} c_\beta m_{d_{g1}} m_{e_{g2}} s_W M_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(\begin{array}{l} 2 c_\beta m_{e_{g2}} s_W \delta m^{d_g}_{g1} M_W^2 + \\ \left(\begin{array}{l} 2 c_\beta s_W \delta m^{e_g}_{g2} M_W^2 - \\ \left(\begin{array}{l} c_\beta \left(2 s_W \delta M_W^2 + 4 \left(\delta s_W\right) M_W^2 \right) + \\ \left(\begin{array}{l} 4\left(\delta c_\beta\right) - \\ \left(\begin{array}{l} 4\left(\delta Z_e\right) + \\ \delta Z^{\tilde{\nu}}_{1,1} \end{array} \right) c_\beta \end{array} \right) s_W M_W^2 \end{array} \right) m_{e_{g2}} \end{array} \right) m_{d_{g1}} \end{array} \right) U^{\tilde{e}_{g2}}_{s2,2} \end{array} \right) U^{\tilde{u}_{g4}}_{s4,1} \end{array} \right) U^{\tilde{d}_{g1}*}_{s1,2} + \\ \left(\begin{array}{l} 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{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} \end{array} \right) c_\beta s_W M_W^2 U^{\tilde{u}_{g4}}_{s4,1} \\ 2\left(\delta \mathrm{CKM}_{g4,g1}\right) c_\beta s_W M_W^2 \left(c_\beta^2 M_W^2 U^{\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) \mathrm{CKM}_{g4,g1} + \right)
$$

$$
\underset{379}{C}\left(\tilde{e}^{\mathrm{s1}}_{\mathrm{g1}},\tilde{d}^{\mathrm{s2},\dagger}_{\mathrm{g2}},\tilde{u}^{\mathrm{s3}}_{\mathrm{g3}},\tilde{\nu}^{\dagger}_{\mathrm{g4}}\right)=\Bigg[-\frac{\mathrm{i}e^{2}\delta_{\mathrm{g1,g4}}}{4c_{\beta}^{3}M_{\mathrm{W}}^{4}s_{\mathrm{W}}^{3}}\Bigg(\Bigg(\Bigg(\Bigg(s_{\mathrm{W}}\left(\delta\overline{Z}^{\tilde{d}_{\mathrm{g2}}}_{1,\mathrm{s2}}U^{\tilde{d}_{\mathrm{g2}}}_{1,1}+\delta\overline{Z}^{\tilde{d}_{\mathrm{g2}}}_{2,\mathrm{s2}}U^{\tilde{d}_{\mathrm{g2}}}_{2,1}\right)-\left(4\left(\delta s_{\mathrm{W}}\right)-s_{\mathrm{W}}\left(4\left(\delta Z_{\mathrm{e}}\right)+\delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},1}\Bigg)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},1}+s_{\mathrm{W}}\left(\delta Z^{\tilde{u}_{\mathrm{g3}}}_{1,\mathrm{s3}}U^{\tilde{u}_{\mathrm{g3}}*}_{1,1}+\delta Z^{\tilde{u}_{\mathrm{g3}}}_{2,\mathrm{s3}}U^{\tilde{u}_{\mathrm{g3}}*}_{2,1}\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},1}\Bigg)c_{\beta}^{3}M_{\mathrm{W}}^{4}U^{\tilde{e}_{\mathrm{g1}}*}_{\mathrm{s1},1}+\Bigg(\Bigg(c_{\beta}m_{d_{\mathrm{g2}}}m_{e_{\mathrm{g1}}}s_{\mathrm{W}}M_{\mathrm{W}}^{2}\left(\delta\overline{Z}^{\tilde{d}_{\mathrm{g2}}}_{1,\mathrm{s2}}U^{\tilde{d}_{\mathrm{g2}}}_{1,2}+\delta\overline{Z}^{\tilde{d}_{\mathrm{g2}}}_{2,\mathrm{s2}}U^{\tilde{d}_{\mathrm{g2}}}_{2,2}\right)+\Bigg(2c_{\beta}m_{e_{\mathrm{g1}}}s_{\mathrm{W}}\delta m^{d_{\mathrm{g}}}_{\mathrm{g2}}M_{\mathrm{W}}^{2}+\Bigg(2c_{\beta}s_{\mathrm{W}}\delta m^{e_{\mathrm{g}}}_{\mathrm{g1}}M_{\mathrm{W}}^{2}-\Bigg(c_{\beta}\left(2s_{\mathrm{W}}\delta M_{\mathrm{W}}^{2}+4\left(\delta s_{\mathrm{W}}\right)M_{\mathrm{W}}^{2}\right)+\Bigg(4\left(\delta c_{\beta}\right)-\left(4\left(\delta Z_{\mathrm{e}}\right)+\delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)c_{\beta}\Bigg)s_{\mathrm{W}}M_{\mathrm{W}}^{2}\Bigg)m_{e_{\mathrm{g1}}}\Bigg)m_{d_{\mathrm{g2}}}\Bigg)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},2}\Bigg)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},1}+c_{\beta}m_{d_{\mathrm{g2}}}m_{e_{\mathrm{g1}}}s_{\mathrm{W}}M_{\mathrm{W}}^{2}\left(\delta Z^{\tilde{u}_{\mathrm{g3}}}_{1,\mathrm{s3}}U^{\tilde{u}_{\mathrm{g3}}*}_{1,1}+\delta Z^{\tilde{u}_{\mathrm{g3}}}_{2,\mathrm{s3}}U^{\tilde{u}_{\mathrm{g3}}*}_{2,1}\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},2}\Bigg)U^{\tilde{e}_{\mathrm{g1}}*}_{\mathrm{s1},2}+\Bigg(c_{\beta}^{2}M_{\mathrm{W}}^{2}\left(\delta Z^{\tilde{e}_{\mathrm{g1}}}_{1,\mathrm{s1}}U^{\tilde{e}_{\mathrm{g1}}*}_{1,1}+\delta Z^{\tilde{e}_{\mathrm{g1}}}_{2,\mathrm{s1}}U^{\tilde{e}_{\mathrm{g1}}*}_{2,1}\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},1}+m_{d_{\mathrm{g2}}}m_{e_{\mathrm{g1}}}\left(\delta Z^{\tilde{e}_{\mathrm{g1}}}_{1,\mathrm{s1}}U^{\tilde{e}_{\mathrm{g1}}*}_{1,2}+\delta Z^{\tilde{e}_{\mathrm{g1}}}_{2,\mathrm{s1}}U^{\tilde{e}_{\mathrm{g1}}*}_{2,2}\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},2}\Bigg)c_{\beta}s_{\mathrm{W}}M_{\mathrm{W}}^{2}U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},1}\Bigg)\mathrm{CKM}^{*}_{\mathrm{g3,g2}}+2c_{\beta}s_{\mathrm{W}}\delta\mathrm{CKM}^{*}_{\mathrm{g3,g2}}M_{\mathrm{W}}^{2}\left(c_{\beta}^{2}M_{\mathrm{W}}^{2}U^{\tilde{e}_{\mathrm{g1}}*}_{\mathrm{s1},1}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},1}+m_{d_{\mathrm{g2}}}m_{e_{\mathrm{g1}}}U^{\tilde{e}_{\mathrm{g1}}*}_{\mathrm{s1},2}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s2},2}\right)U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3},1}
$$

$$
\left(\left(\left(\left(\begin{array}{l} 2m_{e_{g1}}m_{e_{g2}}c_{W}^{2}U_{s2,1}^{\tilde{e}_{g2}}U_{s3,2}^{\tilde{e}_{g2}*}U_{s4,2}^{\tilde{e}_{g1}}+ \\ c_{\beta}^{2}M_{W}^{2}\left(U_{s2,1}^{\tilde{e}_{g2}}U_{s3,1}^{\tilde{e}_{g2}*}-2s_{W}^{2}U_{s2,2}^{\tilde{e}_{g2}}U_{s3,2}^{\tilde{e}_{g2}*}\right)U_{s4,1}^{\tilde{e}_{g1}} \end{array}\right)\delta_{g1,g4}\delta_{g2,g3}+ \left(\begin{array}{l} 2m_{e_{g1}}m_{e_{g3}}c_{W}^{2}U_{s2,2}^{\tilde{e}_{g1}}U_{s3,2}^{\tilde{e}_{g3}*}U_{s4,1}^{\tilde{e}_{g3}}+ \\ c_{\beta}^{2}M_{W}^{2}U_{s2,1}^{\tilde{e}_{g1}}\left(U_{s3,1}^{\tilde{e}_{g3}*}U_{s4,1}^{\tilde{e}_{g3}}-2s_{W}^{2}U_{s3,2}^{\tilde{e}_{g3}*}U_{s4,2}^{\tilde{e}_{g3}}\right) \end{array}\right)\delta_{g1,g2}\delta_{g3,g4}\right)\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,1}^{\tilde{e}_{g1}*}+\delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,1}^{\tilde{e}_{g1}*}\right)+\right.\right.\right.
$$

$$
2\left(\begin{array}{l} \left(\begin{array}{l} 2\delta_{g1,g4}\delta_{g2,g3}U_{s2,2}^{\tilde{e}_{g2}}U_{s3,2}^{\tilde{e}_{g2}*}U_{s4,2}^{\tilde{e}_{g1}}- \\ \delta_{g1,g2}\delta_{g3,g4}U_{s2,2}^{\tilde{e}_{g1}}\left(U_{s3,1}^{\tilde{e}_{g3}*}U_{s4,1}^{\tilde{e}_{g3}}-2U_{s3,2}^{\tilde{e}_{g3}*}U_{s4,2}^{\tilde{e}_{g3}}\right) \end{array}\right)c_{\beta}^{2}M_{W}^{2}s_{W}^{2}+ \\ \delta_{g1,g4}\delta_{g2,g3}U_{s3,1}^{\tilde{e}_{g2}*}\left(m_{e_{g1}}m_{e_{g2}}c_{W}^{2}U_{s2,2}^{\tilde{e}_{g2}}U_{s4,1}^{\tilde{e}_{g1}}-c_{\beta}^{2}M_{W}^{2}s_{W}^{2}U_{s2,1}^{\tilde{e}_{g2}}U_{s4,2}^{\tilde{e}_{g1}}\right)+ \\ \delta_{g1,g2}\delta_{g3,g4}m_{e_{g1}}m_{e_{g3}}c_{W}^{2}U_{s2,1}^{\tilde{e}_{g1}}U_{s3,1}^{\tilde{e}_{g3}*}U_{s4,2}^{\tilde{e}_{g3}} \end{array}\right)\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,2}^{\tilde{e}_{g1}*}+\delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,2}^{\tilde{e}_{g1}*}\right)\Bigg)c_{\beta}s_{W}
$$

$$
\left(\left(\left(\left(\left(\begin{array}{l} \delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,1}^{\tilde{e}_{g2}}+ \\ \delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,1}^{\tilde{e}_{g2}} \end{array}\right)s_{W}c_{W}^{2}U_{s4,1}^{\tilde{e}_{g1}}+ \left(\begin{array}{l} \left(\begin{array}{l} \delta\overline{Z}_{1,s4}^{\tilde{e}_{g4}}U_{1,1}^{\tilde{e}_{g1}}+ \\ \delta\overline{Z}_{2,s4}^{\tilde{e}_{g4}}U_{2,1}^{\tilde{e}_{g1}} \end{array}\right)s_{W}c_{W}^{2}- \\ 4\left(\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)c_{W}^{2}-\left(\delta s_{W}\right)s_{W}^{2}\right)U_{s4,1}^{\tilde{e}_{g1}} \end{array}\right)U_{s2,1}^{\tilde{e}_{g2}}\right)U_{s3,1}^{\tilde{e}_{g2}*}-\right.\right.\right.\right.
$$

$$
\left.2c_{W}^{2}s_{W}^{3}\left(\delta Z_{1,s3}^{\tilde{e}_{g3}}U_{1,2}^{\tilde{e}_{g2}*}+\delta Z_{2,s3}^{\tilde{e}_{g3}}U_{2,2}^{\tilde{e}_{g2}*}\right)U_{s2,2}^{\tilde{e}_{g2}}U_{s4,1}^{\tilde{e}_{g1}}\right)c_{\beta}^{3}M_{W}^{4}+
$$

$$
2\left(\begin{array}{l} \left(\begin{array}{l} c_{\beta}m_{e_{g1}}m_{e_{g2}}s_{W}c_{W}^{4}M_{W}^{2}U_{1,1}^{\tilde{e}_{g2}}U_{s4,2}^{\tilde{e}_{g1}}- \\ c_{W}^{2}c_{\beta}^{3}M_{W}^{4}s_{W}^{3}U_{1,2}^{\tilde{e}_{g2}}U_{s4,1}^{\tilde{e}_{g1}} \end{array}\right)\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}+ \\ \left(\begin{array}{l} c_{\beta}m_{e_{g1}}m_{e_{g2}}s_{W}c_{W}^{4}M_{W}^{2}U_{2,1}^{\tilde{e}_{g2}}U_{s4,2}^{\tilde{e}_{g1}}- \\ c_{W}^{2}c_{\beta}^{3}M_{W}^{4}s_{W}^{3}U_{2,2}^{\tilde{e}_{g2}}U_{s4,1}^{\tilde{e}_{g1}} \end{array}\right)\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}+ \\ \left(\left(\left(\begin{array}{l} \delta\overline{Z}_{1,s4}^{\tilde{e}_{g4}}U_{1,2}^{\tilde{e}_{g1}}+ \\ \delta\overline{Z}_{2,s4}^{\tilde{e}_{g4}}U_{2,2}^{\tilde{e}_{g1}} \end{array}\right)m_{e_{g1}}m_{e_{g2}}s_{W}M_{W}^{2}+ 2\left(\begin{array}{l} m_{e_{g1}}s_{W}\delta m_{g2}^{e_{g}}M_{W}^{2}+ \\ \left(\begin{array}{l} s_{W}\delta m_{g1}^{e_{g}}M_{W}^{2}- \\ \left(\begin{array}{l} 2\left(\delta s_{W}\right)M_{W}^{2}+ \\ s_{W}\delta M_{W}^{2} \end{array}\right)m_{e_{g1}} \end{array}\right)m_{e_{g2}} \end{array}\right)U_{s4,2}^{\tilde{e}_{g1}}\right)c_{\beta}- \right. \\ \left. 4\left(\delta c_{\beta}-\left(\delta Z_{e}\right)c_{\beta}\right)m_{e_{g1}}m_{e_{g2}}s_{W}M_{W}^{2}U_{s4,2}^{\tilde{e}_{g1}}\right)c_{W}^{4}U_{s2,1}^{\tilde{e}_{g2}}- \\ \left(\begin{array}{l} \left(\begin{array}{l} \delta\overline{Z}_{1,s4}^{\tilde{e}_{g4}}U_{1,1}^{\tilde{e}_{g1}}+ \\ \delta\overline{Z}_{2,s4}^{\tilde{e}_{g4}}U_{2,1}^{\tilde{e}_{g1}} \end{array}\right)c_{W}^{2}+ \\ 4\left(\left(\delta s_{W}\right)s_{W}+\left(\delta Z_{e}\right)c_{W}^{2}\right)U_{s4,1}^{\tilde{e}_{g1}} \end{array}\right)c_{\beta}^{3}M_{W}^{4}s_{W}^{3}U_{s2,2}^{\tilde{e}_{g2}} \end{array}\right)U_{s3,2}^{\tilde{e}_{g2}*}+ \Bigg)\delta_{g1,g4}\delta_{g2,g3}
$$

$$
\left(c_{W}^{2}c_{\beta}^{3}M_{W}^{4}\left(\delta Z_{1,s3}^{\tilde{e}_{g3}}U_{1,2}^{\tilde{e}_{g2}*}+\delta Z_{2,s3}^{\tilde{e}_{g3}}U_{2,2}^{\tilde{e}_{g2}*}\right)U_{s4,1}^{\tilde{e}_{g1}}+\right.
$$

$$
\underset{381}{C}\left(\tilde{e}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{\nu}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2}{8s_W^3} \left(\begin{array}{l}
4\left(\begin{array}{l} \frac{\delta_{g1,g2}\delta_{g3,g4}s_W^4}{c_W^4}\left(U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g1}}_{s2,1} - 2U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g1}}_{s2,2}\right) + \\ U^{\tilde{e}_{g1}*}_{s1,1}\left(\delta_{g1,g2}\delta_{g3,g4}U^{\tilde{e}_{g1}}_{s2,1} - 2\delta_{g1,g4}\delta_{g2,g3}U^{\tilde{e}_{g2}}_{s2,1}\right) - \\ \frac{2\delta_{g1,g4}\delta_{g2,g3}m_{e_{g1}}m_{e_{g2}}U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g2}}_{s2,2}}{c_\beta^2 M_W^2} \end{array} \right)(\delta s_W) + \\
\left(\begin{array}{l} \frac{1}{c_W^2 c_\beta^3 M_W^4}\left(\begin{array}{l} \left(\begin{array}{l} \left(\begin{array}{l} \left(\begin{array}{l} \delta_{g1,g2}\delta_{g3,g4}\left(1-2c_W^2\right)U^{\tilde{e}_{g1}}_{1,1} + \\ 2\delta_{g1,g4}\delta_{g2,g3}c_W^2 U^{\tilde{e}_{g2}}_{1,1} \end{array} \right)\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2} + \\ \left(\begin{array}{l} \delta_{g1,g2}\delta_{g3,g4}\left(1-2c_W^2\right)U^{\tilde{e}_{g1}}_{2,1} + \\ 2\delta_{g1,g4}\delta_{g2,g3}c_W^2 U^{\tilde{e}_{g2}}_{2,1} \end{array} \right)\delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2} \end{array} \right)U^{\tilde{e}_{g1}*}_{s1,1} - \\ 2\delta_{g1,g2}\delta_{g3,g4}s_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}_{g1}*}_{s1,2} \end{array} \right)c_\beta^3 M_W^4 + \\ \left(\begin{array}{l} 2\left(\begin{array}{l} \left(\begin{array}{l} \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} \end{array} \right)m_{e_{g1}}m_{e_{g2}}M_W^2 + \\ 2\left(\begin{array}{l} m_{e_{g1}}\delta m^{e_g}_{g2}M_W^2 - \\ m_{e_{g2}}\left(m_{e_{g1}}\delta M_W^2 - \delta m^{e_g}_{g1}M_W^2\right) \end{array} \right)U^{\tilde{e}_{g2}}_{s2,2} \end{array} \right)c_\beta - \\ 8\left(\delta c_\beta\right)m_{e_{g1}}m_{e_{g2}}M_W^2 U^{\tilde{e}_{g2}}_{s2,2} \end{array} \right) + \\ \delta_{g1,g4}\delta_{g2,g3}c_W^2 U^{\tilde{e}_{g1}*}_{s1,2} \end{array} \right) \\
\left(\begin{array}{l} \frac{\delta_{g1,g2}\delta_{g3,g4}}{c_W^2}\left(\left(1-2c_W^2\right)U^{\tilde{e}_{g1}*}_{1,1}U^{\tilde{e}_{g1}}_{s2,1} - 2s_W^2 U^{\tilde{e}_{g1}*}_{1,2}U^{\tilde{e}_{g1}}_{s2,2}\right) + \\ 2\delta_{g1,g4}\delta_{g2,g3}\left(\frac{m_{e_{g1}}m_{e_{g2}}U^{\tilde{e}_{g1}*}_{1,2}U^{\tilde{e}_{g2}}_{s2,2}}{c_\beta^2 M_W^2} + U^{\tilde{e}_{g1}*}_{1,1}U^{\tilde{e}_{g2}}_{s2,1}\right) \end{array} \right)\delta Z^{\tilde{e}_{g1}}_{1,s1} + \\
\left(\begin{array}{l} \frac{\delta_{g1,g2}\delta_{g3,g4}}{c_W^2}\left(\left(1-2c_W^2\right)U^{\tilde{e}_{g1}*}_{2,1}U^{\tilde{e}_{g1}}_{s2,1} - 2s_W^2 U^{\tilde{e}_{g1}*}_{2,2}U^{\tilde{e}_{g1}}_{s2,2}\right) + \\ 2\delta_{g1,g4}\delta_{g2,g3}\left(\frac{m_{e_{g1}}m_{e_{g2}}U^{\tilde{e}_{g1}*}_{2,2}U^{\tilde{e}_{g2}}_{s2,2}}{c_\beta^2 M_W^2} + U^{\tilde{e}_{g1}*}_{2,1}U^{\tilde{e}_{g2}}_{s2,1}\right) \end{array} \right)\delta Z^{\tilde{e}_{g1}}_{2,s1} + \\
\left(\begin{array}{l} \frac{\delta_{g1,g2}\delta_{g3,g4}}{c_W^2}\left(\left(1-2c_W^2\right)U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g1}}_{s2,1} - 2s_W^2 U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g1}}_{s2,2}\right) + \\ 2\delta_{g1,g4}\delta_{g2,g3}\left(\frac{m_{e_{g1}}m_{e_{g2}}U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g2}}_{s2,2}}{c_\beta^2 M_W^2} + U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g2}}_{s2,1}\right) \end{array} \right)\left(4\left(\delta Z_e\right) + \delta\overline{Z}^{\tilde{\nu}}_{1,1} + \delta Z^{\tilde{\nu}}_{1,1}\right)
\end{array} \right) s_W \right) \right]
$$

$$\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(\left(\left(\left(\begin{array}{l} 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} + \\ \left(\left(\begin{array}{l} \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} \end{array} \right) c_W^2 + \\ 4\left((\delta s_W) s_W + (\delta Z_e) c_W^2 \right) U^{\tilde{e}_{g1}}_{s2,1} \end{array} \right) 4 \left(\begin{array}{l} \left(\begin{array}{l} \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} \end{array} \right) c_W^2 + \\ 4\left((\delta s_W) s_W + (\delta Z_e) c_W^2 \right) U^{\tilde{e}_{g1}}_{s2,1} \end{array} \right) U^{\tilde{u}_{g3}}_{s4,2} \right) s_W^2 U^{\tilde{u}_{g3}*}_{s3,2} - \\ \left(\begin{array}{l} \left(1+2c_W^2\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{array} \right) c_W^2 U^{\tilde{e}_{g1}}_{s2,1} \end{array} \right) s_W - \\ \left(\begin{array}{l} s_W c_W^2 \left(1+2c_W^2\right) \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}}_{s2,1} + \\ \left(\begin{array}{l} s_W c_W^2 \left(1+2c_W^2\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((\delta s_W - (\delta Z_e) s_W) \left(c_W^2 + 2c_W^4\right) - (\delta s_W) s_W^2 \right) U^{\tilde{e}_{g1}}_{s2,1} \end{array} \right) U^{\tilde{u}_{g3}}_{s4,1} \end{array} \right) U^{\tilde{u}_{g3}*}_{s3,1} \end{array} \right) U^{\tilde{e}_{g1}*}_{s1,1} + \\ \left(\begin{array}{l} 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) - \\ \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(1+2c_W^2\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) \end{array} \right) c_W^2 + \\ \left(\begin{array}{l} 2 \left(\begin{array}{l} 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} + \\ \left(\left(\begin{array}{l} \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} \end{array} \right) c_W^2 + \\ 4\left((\delta s_W) s_W + (\delta Z_e) c_W^2 \right) U^{\tilde{e}_{g1}}_{s2,2} \end{array} \right) U^{\tilde{u}_{g3}}_{s4,1} \end{array} \right) U^{\tilde{u}_{g3}*}_{s3,1} - \\ 4 \left(\begin{array}{l} 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} + \\ \left(\left(\begin{array}{l} \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} \end{array} \right) c_W^2 + \\ 4\left((\delta s_W) s_W + (\delta Z_e) c_W^2 \right) U^{\tilde{e}_{g1}}_{s2,2} \end{array} \right) U^{\tilde{u}_{g3}}_{s4,2} \end{array} \right) U^{\tilde{u}_{g3}*}_{s3,2} + \\ \left(\begin{array}{l} \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{array} \right) c_W^2 U^{\tilde{e}_{g1}}_{s2,2} \end{array} \right) s_W^2 U^{\tilde{e}_{g1}*}_{s1,2} \end{array} \right) s_W \end{array} \right) \right]$$

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

$$\underset{384}{C}\left(\tilde{\nu}_{g1},\tilde{\nu}_{g2}^{\dagger},\tilde{u}_{g3}^{s3},\tilde{u}_{g4}^{s4,\dagger}\right)=\left[-\frac{ie^{2}\delta_{g1,g2}\delta_{g3,g4}}{24c_{W}^{4}s_{W}^{3}}\left(\begin{array}{l}\left(\begin{array}{l}4\left(\begin{array}{l}c_{W}^{2}\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,2}^{\tilde{u}_{g3}}+\delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,2}^{\tilde{u}_{g3}}\right)+\\\left(\left(\delta\overline{Z}_{1,1}^{\tilde{\nu}}+\delta Z_{1,1}^{\tilde{\nu}}\right)c_{W}^{2}+4\left(\left(\delta s_{W}\right)s_{W}+\left(\delta Z_{e}\right)c_{W}^{2}\right)\right)U_{s4,2}^{\tilde{u}_{g3}}\end{array}\right)s_{W}^{2}U_{s3,2}^{\tilde{u}_{g3}*}-\\\left(\begin{array}{l}\left(1-4c_{W}^{2}\right)\left(\delta Z_{1,s3}^{\tilde{u}_{g3}}U_{1,1}^{\tilde{u}_{g3}*}+\delta Z_{2,s3}^{\tilde{u}_{g3}}U_{2,1}^{\tilde{u}_{g3}*}\right)U_{s4,1}^{\tilde{u}_{g3}}-\\4s_{W}^{2}\left(\delta Z_{1,s3}^{\tilde{u}_{g3}}U_{1,2}^{\tilde{u}_{g3}*}+\delta Z_{2,s3}^{\tilde{u}_{g3}}U_{2,2}^{\tilde{u}_{g3}*}\right)U_{s4,2}^{\tilde{u}_{g3}}\end{array}\right)c_{W}^{2}\end{array}\right)s_{W}-\\\left(\begin{array}{l}s_{W}\left(1-4c_{W}^{2}\right)c_{W}^{2}\left(\delta\overline{Z}_{1,s4}^{\tilde{u}_{g4}}U_{1,1}^{\tilde{u}_{g3}}+\delta\overline{Z}_{2,s4}^{\tilde{u}_{g4}}U_{2,1}^{\tilde{u}_{g3}}\right)-\\\left(\left(\delta\overline{Z}_{1,1}^{\tilde{\nu}}+\delta Z_{1,1}^{\tilde{\nu}}\right)\left(3s_{W}c_{W}^{4}-c_{W}^{2}s_{W}^{3}\right)-4\left(3\left(\delta s_{W}-\left(\delta Z_{e}\right)s_{W}\right)c_{W}^{4}+\left(\delta Z_{e}\right)c_{W}^{2}s_{W}^{3}+\left(\delta s_{W}\right)s_{W}^{4}\right)\right)U_{s4,1}^{\tilde{u}_{g3}}\end{array}\right)U_{s3,1}^{\tilde{u}_{g3}*}\end{array}\right)\right]$$

$$
e^2 \Bigg(\frac{4}{c_W^4 M_W^4 s_W^3 s_\beta^3} \Bigg(\Bigg(18 \left(\begin{pmatrix} U_{s1,1}^{\tilde{u}_{g1}*} U_{s2,1}^{\tilde{u}_{g2}} U_{s3,2}^{\tilde{u}_{g2}*} U_{s4,2}^{\tilde{u}_{g1}} + \\ U_{s1,2}^{\tilde{u}_{g1}*} U_{s2,2}^{\tilde{u}_{g2}} U_{s3,1}^{\tilde{u}_{g2}*} U_{s4,1}^{\tilde{u}_{g1}} \end{pmatrix} \delta_{g1,g4} \delta_{g2,g3} m_{u_{g2}} + \begin{pmatrix} U_{s1,1}^{\tilde{u}_{g1}*} U_{s2,2}^{\tilde{u}_{g1}} U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{u}_{g3}} + \\ U_{s1,2}^{\tilde{u}_{g1}*} U_{s2,1}^{\tilde{u}_{g1}} U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{u}_{g3}} \end{pmatrix} \delta_{g1,g2} \delta_{g3,g4} m_{u_{g3}} \right) (\delta s_\beta) m_{u_{g1}} s_W M_W^2 -
$$

$$
9 \left(\begin{pmatrix} \delta_{g1,g4} \delta_{g2,g3} m_{u_{g2}} U_{s2,1}^{\tilde{u}_{g2}} U_{s3,2}^{\tilde{u}_{g2}*} U_{s4,2}^{\tilde{u}_{g1}} + \\ \delta_{g1,g2} \delta_{g3,g4} m_{u_{g3}} U_{s2,2}^{\tilde{u}_{g1}} U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{u}_{g3}} \end{pmatrix} U_{s1,1}^{\tilde{u}_{g1}*} + \begin{pmatrix} \delta_{g1,g4} \delta_{g2,g3} m_{u_{g2}} U_{s2,2}^{\tilde{u}_{g2}} U_{s3,1}^{\tilde{u}_{g2}*} U_{s4,1}^{\tilde{u}_{g1}} + \\ \delta_{g1,g2} \delta_{g3,g4} m_{u_{g3}} U_{s2,1}^{\tilde{u}_{g1}} U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{u}_{g3}} \end{pmatrix} U_{s1,2}^{\tilde{u}_{g1}*} \right) s_\beta \left(s_W \delta m_{g1}^{u_g} M_W^2 - m_{u_{g1}} \left(2 (\delta s_W) M_W^2 + s_W \right.\right.
$$

$$
\Bigg(\left(\begin{pmatrix} \left((\delta s_W - (\delta Z_e) s_W) \left(c_W^2 + 8 c_W^4 \right) - (\delta s_W) s_W^2 \right) U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{u}_{g3}} + \\ 4 \left((\delta s_W) s_W + (\delta Z_e) c_W^2 \right) s_W^3 U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{u}_{g3}} \end{pmatrix} \delta_{g1,g2} \delta_{g3,g4} U_{s2,1}^{\tilde{u}_{g1}} + \begin{pmatrix} \left((\delta s_W - (\delta Z_e) s_W) \left(c_W^2 + 8 c_W^4 \right) - (\delta s_W) s_W^2 \right) U_{s2,1}^{\tilde{u}_{g2}} U_{s3,1}^{\tilde{u}_{g2}*} + \\ 4 \left((\delta s_W) s_W + (\delta Z_e) c_W^2 \right) s_W^3 U_{s2,2}^{\tilde{u}_{g2}} U_{s3,2}^{\tilde{u}_{g2}*} \end{pmatrix} \delta_{g1,g4} \delta_{g2,g3} U_{s4,1}^{\tilde{u}_{g1}} \right) U_{s1,1}^{\tilde{u}_{g1}*} +
$$

$$
4 \left(\begin{pmatrix} U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{u}_{g3}} - \\ 4 U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{u}_{g3}} \end{pmatrix} \delta_{g1,g2} \delta_{g3,g4} U_{s2,2}^{\tilde{u}_{g1}} + \begin{pmatrix} U_{s2,1}^{\tilde{u}_{g2}} U_{s3,1}^{\tilde{u}_{g2}*} - \\ 4 U_{s2,2}^{\tilde{u}_{g2}} U_{s3,2}^{\tilde{u}_{g2}*} \end{pmatrix} \delta_{g1,g4} \delta_{g2,g3} U_{s4,2}^{\tilde{u}_{g1}} \right) \left((\delta s_W) s_W + (\delta Z_e) c_W^2 \right) s_W^3 U_{s1,2}^{\tilde{u}_{g1}*} \Bigg) \Bigg) +
$$

$$
\frac{36 m_{u_{g1}}}{M_W^2 s_W^2 s_\beta^2} \left(\begin{pmatrix} U_{s1,1}^{\tilde{u}_{g1}*} U_{s2,1}^{\tilde{u}_{g2}} U_{s3,2}^{\tilde{u}_{g2}*} U_{s4,2}^{\tilde{u}_{g1}} + \\ U_{s1,2}^{\tilde{u}_{g1}*} U_{s2,2}^{\tilde{u}_{g2}} U_{s3,1}^{\tilde{u}_{g2}*} U_{s4,1}^{\tilde{u}_{g1}} \end{pmatrix} \delta_{g1,g4} \delta_{g2,g3} \delta m_{g2}^{u_g} + \begin{pmatrix} U_{s1,1}^{\tilde{u}_{g1}*} U_{s2,2}^{\tilde{u}_{g1}} U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{u}_{g3}} + \\ U_{s1,2}^{\tilde{u}_{g1}*} U_{s2,1}^{\tilde{u}_{g1}} U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{u}_{g3}} \end{pmatrix} \delta_{g1,g2} \delta_{g3,g4} \delta m_{g3}^{u_g} \right) \Bigg)
$$

$$
\Bigg(\Bigg(\frac{e^2}{c_W^2 M_W^2 s_W^2 s_\beta^2} \Bigg(\left(\begin{pmatrix} \left(1 + 8 c_W^2 \right) U_{s2,1}^{\tilde{u}_{g2}} U_{s3,1}^{\tilde{u}_{g2}*} - \\ 4 s_W^2 U_{s2,2}^{\tilde{u}_{g2}} U_{s3,2}^{\tilde{u}_{g2}*} \end{pmatrix} M_W^2 s_\beta^2 U_{1,1}^{\tilde{u}_{g1}} + \atop 18 m_{u_{g1}} m_{u_{g2}} c_W^2 U_{1,2}^{\tilde{u}_{g1}} U_{s2,1}^{\tilde{u}_{g2}} U_{s3,2}^{\tilde{u}_{g2}*} \right) U_{s1,1}^{\tilde{u}_{g1}*} - 2 \left(2 \begin{pmatrix} U_{s2,1}^{\tilde{u}_{g2}} U_{s3,1}^{\tilde{u}_{g2}*} - \\ 4 U_{s2,2}^{\tilde{u}_{g2}} U_{s3,2}^{\tilde{u}_{g2}*} \end{pmatrix} M_W^2 s_W^2 s_\beta^2 U_{1,2}^{\tilde{u}_{g1}} - \atop 9 m_{u_{g1}} m_{u_{g2}} c_W^2 U_{1,1}^{\tilde{u}_{g1}} U_{s2,2}^{\tilde{u}_{g2}} U_{s3,1}^{\tilde{u}_{g2}*} \right) U_{s1,2}^{\tilde{u}_{g1}*} \Bigg) +
$$

$$
36 g_s^2 \left(T_{c2,c3}^{x} T_{c4,c1}^{x} \right) \left(U_{1,1}^{\tilde{u}_{g1}} U_{s1,1}^{\tilde{u}_{g1}*} - U_{1,2}^{\tilde{u}_{g1}} U_{s1,2}^{\tilde{u}_{g1}*} \right) \left(U_{s2,1}^{\tilde{u}_{g2}} U_{s3,1}^{\tilde{u}_{g2}*} - U_{s2,2}^{\tilde{u}_{g2}} U_{s3,2}^{\tilde{u}_{g2}*} \right) \Bigg) \delta_{g1,g4} \delta_{g2,g3} +
$$

$$
\Bigg(\Bigg(\left(\begin{pmatrix} \left(1 + 8 c_W^2 \right) U_{1,1}^{\tilde{u}_{g3}} U_{s3,1}^{\tilde{u}_{g3}*} - \\ \ldots \end{pmatrix} M_W^2 s_\beta^2 U_{s2,1}^{\tilde{u}_{g1}} + \ldots \right) U^{\tilde{u}_{g1}*} \ldots \Bigg) \ldots \Bigg) \ldots \delta \overline{Z}_{1,s4}^{\tilde{u}_{g4}} -
$$

[SSVV] 2 Higgs – 2 Gauge Bosons

$$C_{31}\left(h^0,h^0,Z,Z\right) = \left[-\frac{ie^2}{2c_W^4 s_W^3}\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{hh}\right) s_W\right) c_W^2 - 2\left(\delta s_W\right) s_W^2\right) \right]$$

$$C_{32}\left(h^0,h^0,W^-,W^+\right) = \left[-\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_W + 2\left(\delta Z_{hh}\right)\right) s_W\right) \right]$$

$$C_{33}\left(G^0,G^0,Z,Z\right) = \left[-\frac{ie^2}{2c_W^4 s_W^3}\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{GG}\right) s_W\right) c_W^2 - 2\left(\delta s_W\right) s_W^2\right) \right]$$

$$C_{34}\left(G^0,G^0,W^-,W^+\right) = \left[-\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_W + 2\left(\delta Z_{GG}\right)\right) s_W\right) \right]$$

$$C_{35}\left(G^-,G^+,\gamma,\gamma\right) = \left[\frac{ie^2}{c_W s_W}\left(2\left(2\left(\delta Z_e\right) + \delta Z_{\gamma\gamma} + \delta Z_{G^-G^-}\right) c_W s_W + \left(\delta Z_{Z\gamma}\right)\left(c_W^2 - s_W^2\right)\right) \right]$$

$$C_{36}\left(G^-,G^+,\gamma,Z\right) = \left[-\frac{ie^2}{4c_W^3 s_W^2}\left(\begin{array}{l} 2\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma} + 2\left(\delta Z_{G^-G^-}\right)\right) s_W\right) c_W^4 + 4\left(\delta s_W\right) s_W^4 - \left(\delta Z_{Z\gamma}\right)\left(c_W^5 + c_W s_W^4\right) + \\ \left(2\left(4\left(\delta s_W\right) + \left(4\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma} + 2\left(\delta Z_{G^-G^-}\right)\right) s_W\right) c_W^2 + 2\left(\delta Z_{Z\gamma} - 2\left(\delta Z_{\gamma Z}\right)\right) c_W^3\right) s_W^2 \end{array} \right) \right]$$

$$C_{37}\left(G^-,G^+,Z,Z\right) = \left[\frac{ie^2}{2c_W^4 s_W^3}\left(1 - 2c_W^2\right)\left(\left(2\left(\delta s_W\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{G^-G^-}\right) s_W\right) c_W^4 + \left(\left(4\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{G^-G^-}\right) s_W\right) c_W^2 - 2\left(\delta Z_{\gamma Z}\right) c_W^3\right) s \right.$$

$$C_{38}\left(G^-,G^+,W^-,W^+\right) = \left[-\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_W + 2\left(\delta Z_{G^-G^-}\right)\right) s_W\right) \right]$$

$$C_{151}\left(h^0,H^-,\gamma,W^+\right) = \left[-\frac{ie^2}{4c_W s_W^2}\left(\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right) c_W s_W s_{\beta-\alpha} + c_{\beta-\alpha}\left(c_W\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{\gamma\gamma} + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_W\right) + \left(\delta Z_{Z\gamma}\right) s_W^2\right)\right) \right]$$

$$C_{152}\left(h^0,G^-,\gamma,W^+\right) = \left[-\frac{ie^2}{4c_W s_W^2}\left(c_W\left(2\left(\delta s_W\right) s_{\beta-\alpha} - s_W\left(\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right) c_{\beta-\alpha} + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{\gamma\gamma} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_{\beta-\alpha}\right)\right) + \left(\delta Z_{Z\gamma}\right) s_{\beta-\alpha} s_W^2\right) \right]$$

$$C_{153}\left(h^0,H^-,Z,W^+\right) = \left[\frac{ie^2}{4s_W c_W^3}\left(\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right) s_W s_{\beta-\alpha} c_W^2 - c_{\beta-\alpha}\left(\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{ZZ} + \delta Z_{hh} + \delta Z_{H^-H^-}\right) s_W c_W^2 - \left(\delta Z_{\gamma Z}\right) c_W^3 + 2\left(\delta s_W\right) s_W^2\right)\right) \right]$$

$$C_{154}\left(h^0,G^-,Z,W^+\right) = \left[-\frac{ie^2}{4s_W c_W^3}\left(s_W\left(\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right) c_{\beta-\alpha} + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{ZZ} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_{\beta-\alpha}\right) c_W^2 - s_{\beta-\alpha}\left(\left(\delta Z_{\gamma Z}\right) c_W^3 - 2\left(\delta s_W\right) s_W^2\right)\right) \right]$$

$$C_{155}\left(h^0,H^+,\gamma,W^-\right) = \left[-\frac{ie^2}{4c_W s_W^2}\left(\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) c_W s_W s_{\beta-\alpha} + c_{\beta-\alpha}\left(c_W\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{\gamma\gamma} + \delta Z_{hh}\right) s_W\right) + \left(\delta Z_{Z\gamma}\right) s_W^2\right)\right) \right]$$

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

$$C\left(h^0, H^+, Z, W^-\right) = \left[\frac{ie^2}{4 s_W c_W^3} \left(\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) s_W s_{\beta-\alpha} c_W^2 - c_{\beta-\alpha} \left(\left(4 \left(\delta Z_e\right) + \delta \overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{ZZ} + \delta Z_{hh}\right) s_W c_W^2 - \left(\delta Z_{\gamma Z}\right) c_W^3 + 2 \left(\delta s_W\right) s_W^2 \right) \right) \right]$$

$$C\left(h^0, G^+, Z, W^-\right) = \left[-\frac{ie^2}{4 s_W c_W^3} \left(s_W \left(\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) c_{\beta-\alpha} + \left(4 \left(\delta Z_e\right) + \delta Z_W + \delta Z_{ZZ} + \delta Z_{hh} + \delta Z_{G^-G^-}\right) s_{\beta-\alpha}\right) c_W^2 - s_{\beta-\alpha} \left(\left(\delta Z_{\gamma Z}\right) c_W^3 - 2 \left(\delta s_W\right) s_W^2 \right) \right) \right]$$

$$C\left(H^0, H^0, Z, Z\right) = \left[-\frac{ie^2}{2 c_W^4 s_W^3} \left(\left(2 \left(\delta s_W\right) - \left(2 \left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{HH}\right) s_W\right) c_W^2 - 2 \left(\delta s_W\right) s_W^2 \right) \right]$$

$$C\left(H^0, H^0, W^-, W^+\right) = \left[-\frac{ie^2}{4 s_W^3} \left(4 \left(\delta s_W\right) - \left(4 \left(\delta Z_e\right) + \delta \overline{Z}_W + \delta Z_W + 2 \left(\delta Z_{HH}\right)\right) s_W\right) \right]$$

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

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

$$C\left(H^0, H^-, Z, W^+\right) = \left[-\frac{ie^2}{4 s_W c_W^3} \left(s_W \left(\left(\delta Z_{hH} + \delta Z_{G^-H^-}\right) c_{\beta-\alpha} - \left(4 \left(\delta Z_e\right) + \delta \overline{Z}_W + \delta Z_{ZZ} + \delta Z_{HH} + \delta Z_{H^-H^-}\right) s_{\beta-\alpha}\right) c_W^2 + s_{\beta-\alpha} \left(\left(\delta Z_{\gamma Z}\right) c_W^3 - 2 \left(\delta s_W\right) s_W^2 \right) \right) \right]$$

$$C\left(H^0, G^-, Z, W^+\right) = \left[-\frac{ie^2}{4 s_W c_W^3} \left(\left(\delta Z_{hH} - \delta Z_{H^-G^-}\right) s_W s_{\beta-\alpha} c_W^2 + c_{\beta-\alpha} \left(\left(4 \left(\delta Z_e\right) + \delta \overline{Z}_W + \delta Z_{ZZ} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_W c_W^2 - \left(\delta Z_{\gamma Z}\right) c_W^3 + 2 \left(\delta s_W\right) s_W^2 \right) \right) \right]$$

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

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

$$C\left(H^0, H^+, Z, W^-\right) = \left[-\frac{ie^2}{4 s_W c_W^3} \left(s_W \left(\left(\delta Z_{hH} + \delta Z_{H^-G^-}\right) c_{\beta-\alpha} - \left(4 \left(\delta Z_e\right) + \delta \overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{ZZ} + \delta Z_{HH}\right) s_{\beta-\alpha}\right) c_W^2 + s_{\beta-\alpha} \left(\left(\delta Z_{\gamma Z}\right) c_W^3 - 2 \left(\delta s_W\right) s_W^2 \right) \right) \right]$$

$$C\left(H^0, G^+, Z, W^-\right) = \left[-\frac{ie^2}{4 s_W c_W^3} \left(\left(\delta Z_{hH} - \delta Z_{G^-H^-}\right) s_W s_{\beta-\alpha} c_W^2 + c_{\beta-\alpha} \left(\left(4 \left(\delta Z_e\right) + \delta Z_W + \delta Z_{ZZ} + \delta Z_{HH} + \delta Z_{G^-G^-}\right) s_W c_W^2 - \left(\delta Z_{\gamma Z}\right) c_W^3 + 2 \left(\delta s_W\right) s_W^2 \right) \right) \right]$$

$$C\left(A^0, A^0, Z, Z\right) = \left[-\frac{ie^2}{2 c_W^4 s_W^3} \left(\left(2 \left(\delta s_W\right) - \left(2 \left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{AA}\right) s_W\right) c_W^2 - 2 \left(\delta s_W\right) s_W^2 \right) \right]$$

$$\underset{170}{C}\left(A^0,A^0,W^-,W^+\right) = \left[-\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_W + 2\left(\delta Z_{AA}\right)\right)s_W\right)\right]$$

$$\underset{171}{C}\left(A^0,H^-,\gamma,W^+\right) = \left[\frac{e^2}{4c_W s_W^2}\left(c_W\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{\gamma\gamma} + \delta Z_{AA} + \delta Z_{H^-H^-}\right)s_W\right) + \left(\delta Z_{Z\gamma}\right)s_W^2\right)\right]$$

$$\underset{172}{C}\left(A^0,H^-,Z,W^+\right) = \left[\frac{e^2}{4s_W c_W^3}\left(\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{ZZ} + \delta Z_{AA} + \delta Z_{H^-H^-}\right)s_W c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$\underset{173}{C}\left(A^0,H^+,\gamma,W^-\right) = \left[-\frac{e^2}{4c_W s_W^2}\left(c_W\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{\gamma\gamma} + \delta Z_{AA}\right)s_W\right) + \left(\delta Z_{Z\gamma}\right)s_W^2\right)\right]$$

$$\underset{174}{C}\left(A^0,H^+,Z,W^-\right) = \left[-\frac{e^2}{4s_W c_W^3}\left(\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{ZZ} + \delta Z_{AA}\right)s_W c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$\underset{175}{C}\left(G^0,G^-,\gamma,W^+\right) = \left[\frac{e^2}{4c_W s_W^2}\left(c_W\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{\gamma\gamma} + \delta Z_{GG} + \delta Z_{G^-G^-}\right)s_W\right) + \left(\delta Z_{Z\gamma}\right)s_W^2\right)\right]$$

$$\underset{176}{C}\left(G^0,G^-,Z,W^+\right) = \left[\frac{e^2}{4s_W c_W^3}\left(\left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta Z_{ZZ} + \delta Z_{GG} + \delta Z_{G^-G^-}\right)s_W c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$\underset{177}{C}\left(G^0,G^+,\gamma,W^-\right) = \left[-\frac{e^2}{4c_W s_W^2}\left(c_W\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_W + \delta Z_{\gamma\gamma} + \delta Z_{GG} + \delta Z_{G^-G^-}\right)s_W\right) + \left(\delta Z_{Z\gamma}\right)s_W^2\right)\right]$$

$$\underset{178}{C}\left(G^0,G^+,Z,W^-\right) = \left[-\frac{e^2}{4s_W c_W^3}\left(\left(4\left(\delta Z_e\right) + \delta Z_W + \delta Z_{ZZ} + \delta Z_{GG} + \delta Z_{G^-G^-}\right)s_W c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)\right]$$

$$\underset{179}{C}\left(H^-,H^+,\gamma,\gamma\right) = \left[\frac{ie^2}{c_W s_W}\left(\left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{\gamma\gamma}\right) + \delta Z_{H^-H^-}\right)c_W s_W + \left(\delta Z_{Z\gamma}\right)\left(c_W^2 - s_W^2\right)\right)\right]$$

$$\underset{180}{C}\left(H^-,H^+,\gamma,Z\right) = \left[-\frac{ie^2}{4c_W^3 s_W^2}\left(\begin{array}{l} 2\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{ZZ} + \delta Z_{\gamma\gamma} + \delta Z_{H^-H^-}\right)s_W\right)c_W^4 + 4\left(\delta s_W\right)s_W^4 - \left(\delta Z_{Z\gamma}\right)\left(c_W^5 + c_W s_W^4\right) + \\ \left(2\left(4\left(\delta s_W\right) + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + \delta Z_{ZZ} + \delta Z_{\gamma\gamma} + \delta Z_{H^-H^-}\right)s_W\right)c_W^2 + 2\left(\delta Z_{Z\gamma} - 2\left(\delta Z_{\gamma Z}\right)\right)c_W^3\right)s_W^2 \end{array}\right)\right]$$

$$\underset{181}{C}\left(H^-,H^+,Z,Z\right) = \left[\frac{ie^2}{4c_W^4 s_W^3}\left(\begin{array}{l} \left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{ZZ}\right) + \delta Z_{H^-H^-}\right)s_W\right)c_W^4 + 4\left(\delta s_W\right)s_W^4 + \\ \left(\left(8\left(\delta s_W\right) + \left(4\left(\delta Z_e\right) + \delta\overline{Z}_{H^-H^-} + 2\left(\delta Z_{ZZ}\right) + \delta Z_{H^-H^-}\right)s_W\right)c_W^2 - 4\left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2 \end{array}\right)\left(1 - 2c_W^2\right)\right]$$

$$\underset{182}{C}\left(H^-,H^+,W^-,W^+\right) = \left[-\frac{ie^2}{4s_W^3}\left(4\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta\overline{Z}_W + \delta\overline{Z}_{H^-H^-} + \delta Z_W + \delta Z_{H^-H^-}\right)s_W\right)\right]$$

$$\underset{352}{C}\left(\tilde{\nu}_{g1},\tilde{\nu}_{g2}^{\dagger},Z,Z\right)=\left[\begin{array}{c}-\frac{ie^2\delta_{g1,g2}}{4c_W^4s_W^3}\left(\left(4\left(\delta s_W\right)-s_W\left(2\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)+\delta\overline{Z}_{1,1}^{\tilde{\nu}}+\delta Z_{1,1}^{\tilde{\nu}}\right)\right)c_W^2-4\left(\delta s_W\right)s_W^2\right)\end{array}\right]$$

$$\underset{353}{C}\left(\tilde{e}_{g1}^{s1},\tilde{e}_{g2}^{s2,\dagger},\gamma,\gamma\right)=\left[\begin{array}{c}\frac{ie^2\delta_{g1,g2}}{c_Ws_W}\left(\begin{array}{c}\left(\begin{array}{c}\delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}+\delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}+\delta_{s2,1}\delta Z_{1,s1}^{\tilde{e}_{g1}}+\\2\delta_{s1,s2}\left(2\left(\delta Z_e\right)+\delta Z_{\gamma\gamma}\right)+\delta_{s2,2}\delta Z_{2,s1}^{\tilde{e}_{g1}}\end{array}\right)c_Ws_W+\\\left(\delta Z_{Z\gamma}\right)\left(\left(1-2s_W^2\right)U_{s1,1}^{\tilde{e}_{g1}*}U_{s2,1}^{\tilde{e}_{g1}}-2s_W^2U_{s1,2}^{\tilde{e}_{g1}*}U_{s2,2}^{\tilde{e}_{g1}}\right)\end{array}\right)\end{array}\right]$$

$$\underset{354}{C}\left(\tilde{e}_{g1}^{s1},\tilde{e}_{g2}^{s2,\dagger},\gamma,Z\right)=\left[\begin{array}{c}\frac{ie^2\delta_{g1,g2}}{4c_W^3s_W^2}\left(\begin{array}{c}4\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right)c_W^3s_W^2-\\2\left(\begin{array}{c}2\left(\begin{array}{c}s_Wc_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,2}^{\tilde{e}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,2}^{\tilde{e}_{g1}}\right)+\\\left(\left(2\left(\delta s_W\right)+\left(4\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}\right)s_W\right)c_W^2+\left(2\left(\delta s_W\right)-\left(\delta Z_{Z\gamma}\right)c_W\right)s_W^2\right)U_{s2,2}^{\tilde{e}_{g1}}\end{array}\right)s_WU_{s1,2}^{\tilde{e}_{g1}*}+\\\left(\begin{array}{c}\left(1-2c_W^2\right)\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,1}^{\tilde{e}_{g1}*}+\delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,1}^{\tilde{e}_{g1}*}\right)U_{s2,1}^{\tilde{e}_{g1}}+\\2s_W^2\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,2}^{\tilde{e}_{g1}*}+\delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,2}^{\tilde{e}_{g1}*}\right)U_{s2,2}^{\tilde{e}_{g1}}\end{array}\right)c_W^2\end{array}\right)s_W-\\\left(\begin{array}{c}2s_W\left(1-2c_W^2\right)c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,1}^{\tilde{e}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,1}^{\tilde{e}_{g1}}\right)-\\\left(\begin{array}{c}\left(\delta Z_{Z\gamma}\right)c_W\left(1-2c_W^2\right)^2-\\2\left(\left(\delta s_W\right)\left(6-4c_W^2\right)+\left(4\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}\right)s_W\left(1-2c_W^2\right)\right)c_W^2-\left(\delta s_W\right)\left(4s_W^2-8s_W^4\right)\end{array}\right)U_{s2,1}^{\tilde{e}_{g1}}\end{array}\right)U_{s1,1}^{\tilde{e}_{g1}*}\end{array}\right)\end{array}\right]$$

$$\underset{355}{C}\left(\tilde{e}_{g1}^{s1},\tilde{e}_{g2}^{s2,\dagger},Z,Z\right)=\left[\begin{array}{c}\frac{ie^2\delta_{g1,g2}}{4c_W^4s_W^3}\left(\begin{array}{c}\left(\begin{array}{c}4\left(\begin{array}{c}s_Wc_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,2}^{\tilde{e}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,2}^{\tilde{e}_{g1}}\right)+\\2\left(\left(2\left(\delta s_W\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)c_W^2-\left(\delta Z_{\gamma Z}\right)c_W^3+2\left(\delta s_W\right)s_W^2\right)U_{s2,2}^{\tilde{e}_{g1}}\end{array}\right)s_W^3U_{s1,2}^{\tilde{e}_{g1}*}+\\\left(\begin{array}{c}\left(1-2c_W^2\right)^2\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,1}^{\tilde{e}_{g1}*}+\delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,1}^{\tilde{e}_{g1}*}\right)U_{s2,1}^{\tilde{e}_{g1}}+\\4s_W^4\left(\delta Z_{1,s1}^{\tilde{e}_{g1}}U_{1,2}^{\tilde{e}_{g1}*}+\delta Z_{2,s1}^{\tilde{e}_{g1}}U_{2,2}^{\tilde{e}_{g1}*}\right)U_{s2,2}^{\tilde{e}_{g1}}\end{array}\right)c_W^2\end{array}\right)s_W+\\\left(\begin{array}{c}s_W\left(1-2c_W^2\right)c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{e}_{g2}}U_{1,1}^{\tilde{e}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{e}_{g2}}U_{2,1}^{\tilde{e}_{g1}}\right)-\\2\left(\begin{array}{c}2\left(\delta s_W+\left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2-4\left(\delta s_W\right)s_W^4-\\\left(\left(\delta s_W\right)\left(6-4c_W^2\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\left(1-2c_W^2\right)\right)c_W^2\end{array}\right)U_{s2,1}^{\tilde{e}_{g1}}\end{array}\right)\left(1-2c_W^2\right)U_{s1,1}^{\tilde{e}_{g1}*}\end{array}\right)\end{array}\right]$$

$$\underset{356}{C}\left(\tilde{u}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},\gamma,\gamma\right)=\left[\begin{array}{c}\frac{2ie^2\delta_{g1,g2}}{9c_Ws_W}\left(\begin{array}{c}2\left(\begin{array}{c}\delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}+\delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}+\delta_{s2,1}\delta Z_{1,s1}^{\tilde{u}_{g1}}+\\\delta_{s1,s2}\left(4\left(\delta Z_e\right)+2\left(\delta Z_{\gamma\gamma}\right)\right)+\delta_{s2,2}\delta Z_{2,s1}^{\tilde{u}_{g1}}\end{array}\right)c_Ws_W+\\\left(\delta Z_{Z\gamma}\right)\left(\left(3-4s_W^2\right)U_{s1,1}^{\tilde{u}_{g1}*}U_{s2,1}^{\tilde{u}_{g1}}-4s_W^2U_{s1,2}^{\tilde{u}_{g1}*}U_{s2,2}^{\tilde{u}_{g1}}\right)\end{array}\right)\end{array}\right]$$

$$
\underset{357}{C}\left(\tilde{u}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},\gamma,Z\right) = \left[\frac{ie^2\delta_{g1,g2}}{36c_W^3s_W^2}\left(\begin{array}{l} 16\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right)c_W^3s_W^2 - \\ 4\left(\begin{array}{l} 4\left(\begin{array}{l} s_Wc_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}U_{1,2}^{\tilde{u}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}U_{2,2}^{\tilde{u}_{g1}}\right)+ \\ \left(\left(2\left(\delta s_W\right)+\left(4\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}\right)s_W\right)c_W^2+\left(2\left(\delta s_W\right)-\left(\delta Z_{\gamma Z}\right)c_W\right)s_W^2\right)U_{s2,2}^{\tilde{u}_{g1}} \end{array}\right)s_WU_{s1,2}^{\tilde{u}_{g1}*}+ \\ \left(\begin{array}{l} \left(1-4c_W^2\right)\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,1}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,1}^{\tilde{u}_{g1}*}\right)U_{s2,1}^{\tilde{u}_{g1}}+ \\ 4s_W^2\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,2}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,2}^{\tilde{u}_{g1}*}\right)U_{s2,2}^{\tilde{u}_{g1}} \end{array}\right)c_W^2 \end{array}\right)s_W- \\ \left(\begin{array}{l} 4s_W\left(1-4c_W^2\right)c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}U_{1,1}^{\tilde{u}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}U_{2,1}^{\tilde{u}_{g1}}\right)- \\ \left(\begin{array}{l} \left(\delta Z_{\gamma Z}\right)c_W\left(1-4c_W^2\right)^2-8\left(\delta s_W\right)\left(1-4c_W^2\right)s_W^2- \\ 4\left(\left(\delta s_W\right)\left(14-8c_W^2\right)+\left(4\left(\delta Z_e\right)+\delta Z_{ZZ}+\delta Z_{\gamma\gamma}\right)s_W\left(1-4c_W^2\right)\right)c_W^2 \end{array}\right)U_{s2,1}^{\tilde{u}_{g1}} \end{array}\right)U_{s1,1}^{\tilde{u}_{g1}*} \end{array}\right)\right]
$$

$$
\underset{358}{C}\left(\tilde{u}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},Z,Z\right) = \left[\frac{ie^2\delta_{g1,g2}}{36c_W^4s_W^3}\left(\begin{array}{l} \left(\begin{array}{l} \left(\begin{array}{l} 16\left(\begin{array}{l} s_Wc_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}U_{1,2}^{\tilde{u}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}U_{2,2}^{\tilde{u}_{g1}}\right)+ \\ 2\left(\left(2\left(\delta s_W\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\right)c_W^2-\left(\delta Z_{\gamma Z}\right)c_W^3+2\left(\delta s_W\right)s_W^2\right)U_{s2,2}^{\tilde{u}_{g1}} \end{array}\right)s_W^3U_{s1,2}^{\tilde{u}_{g1}*}+ \\ \left(\begin{array}{l} \left(1-4c_W^2\right)^2\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,1}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,1}^{\tilde{u}_{g1}*}\right)U_{s2,1}^{\tilde{u}_{g1}}+ \\ 16s_W^4\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,2}^{\tilde{u}_{g1}*}+\delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,2}^{\tilde{u}_{g1}*}\right)U_{s2,2}^{\tilde{u}_{g1}} \end{array}\right)c_W^2 \end{array}\right)s_W+ \\ \left(\begin{array}{l} s_W\left(1-4c_W^2\right)c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{u}_{g2}}U_{1,1}^{\tilde{u}_{g1}}+\delta\overline{Z}_{2,s2}^{\tilde{u}_{g2}}U_{2,1}^{\tilde{u}_{g1}}\right)- \\ 2\left(\begin{array}{l} \left(6\left(\delta s_W\right)+4\left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2-8\left(\delta s_W\right)s_W^4- \\ \left(\left(\delta s_W\right)\left(14-8c_W^2\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}\right)s_W\left(1-4c_W^2\right)\right)c_W^2 \end{array}\right)U_{s2,1}^{\tilde{u}_{g1}} \end{array}\right)\left(1-4c_W^2\right)U_{s1,1}^{\tilde{u}_{g1}*} \end{array}\right)\right]
$$

$$
\underset{359}{C}\left(\tilde{d}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},\gamma,\gamma\right) = \left[\frac{ie^2\delta_{g1,g2}}{9c_Ws_W}\left(\begin{array}{l} \left(\begin{array}{l} \delta_{s1,1}\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}+\delta_{s1,2}\delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}+\delta_{s2,1}\delta Z_{1,s1}^{\tilde{d}_{g1}}+ \\ 2\delta_{s1,s2}\left(2\left(\delta Z_e\right)+\delta Z_{\gamma\gamma}\right)+\delta_{s2,2}\delta Z_{2,s1}^{\tilde{d}_{g1}} \end{array}\right)c_Ws_W+ \\ \left(\delta Z_{\gamma Z}\right)\left(\left(3-2s_W^2\right)U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g1}}-2s_W^2U_{s1,2}^{\tilde{d}_{g1}*}U_{s2,2}^{\tilde{d}_{g1}}\right) \end{array}\right)\right]
$$

$$
\underset{360}{C}\left(\tilde{d}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},\gamma,Z\right) = \left[\frac{ie^2\delta_{g1,g2}}{36c_W^3 s_W^2}\left(\begin{array}{l}
4\delta_{s1,s2}\left(\delta Z_{\gamma Z}\right)c_W^3 s_W^2 - \\
2\left(\begin{array}{l}
2\left(\begin{array}{l}
s_W c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}U_{1,2}^{\tilde{d}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}U_{2,2}^{\tilde{d}_{g1}}\right) + \\
\left(\left(2\left(\delta s_W\right) + \left(4\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma}\right)s_W\right)c_W^2 + \left(2\left(\delta s_W\right) - \left(\delta Z_{\gamma Z}\right)c_W\right)s_W^2\right)U_{s2,2}^{\tilde{d}_{g1}}
\end{array}\right)s_W U_{s1,2}^{\tilde{d}_{g1}*} - \\
\left(\begin{array}{l}
\left(1+2c_W^2\right)\left(\delta Z_{1,s1}^{\tilde{d}_{g1}}U_{1,1}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}}U_{2,1}^{\tilde{d}_{g1}*}\right)U_{s2,1}^{\tilde{d}_{g1}} - \\
2s_W^2\left(\delta Z_{1,s1}^{\tilde{d}_{g1}}U_{1,2}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}}U_{2,2}^{\tilde{d}_{g1}*}\right)U_{s2,2}^{\tilde{d}_{g1}}
\end{array}\right)c_W^2
\end{array}\right)s_W + \\
\left(\begin{array}{l}
2s_W c_W^2\left(1+2c_W^2\right)\left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}U_{1,1}^{\tilde{d}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}U_{2,1}^{\tilde{d}_{g1}}\right) + \\
\left(\begin{array}{l}
\left(\delta Z_{\gamma Z}\right)c_W\left(1+2c_W^2\right)^2 + 4\left(\delta s_W\right)\left(1+2c_W^2\right)s_W^2 - \\
2c_W^2\left(\left(\delta s_W\right)\left(10-4c_W^2\right) - \left(4\left(\delta Z_e\right) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma}\right)s_W\left(1+2c_W^2\right)\right)
\end{array}\right)U_{s2,1}^{\tilde{d}_{g1}}
\end{array}\right)U_{s1,1}^{\tilde{d}_{g1}*}
\end{array}\right)\right]
$$

$$
\underset{361}{C}\left(\tilde{d}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},Z,Z\right) = \left[\frac{ie^2\delta_{g1,g2}}{36c_W^4 s_W^3}\left(\begin{array}{l}
\left(\begin{array}{l}
4\left(\begin{array}{l}
s_W c_W^2\left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}U_{1,2}^{\tilde{d}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}U_{2,2}^{\tilde{d}_{g1}}\right) + \\
2\left(\left(2\left(\delta s_W\right) + \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\right)c_W^2 - \left(\delta Z_{\gamma Z}\right)c_W^3 + 2\left(\delta s_W\right)s_W^2\right)U_{s2,2}^{\tilde{d}_{g1}}
\end{array}\right)s_W^3 U_{s1,2}^{\tilde{d}_{g1}*} + \\
\left(\begin{array}{l}
\left(1+2c_W^2\right)^2\left(\delta Z_{1,s1}^{\tilde{d}_{g1}}U_{1,1}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}}U_{2,1}^{\tilde{d}_{g1}*}\right)U_{s2,1}^{\tilde{d}_{g1}} + \\
4s_W^4\left(\delta Z_{1,s1}^{\tilde{d}_{g1}}U_{1,2}^{\tilde{d}_{g1}*} + \delta Z_{2,s1}^{\tilde{d}_{g1}}U_{2,2}^{\tilde{d}_{g1}*}\right)U_{s2,2}^{\tilde{d}_{g1}}
\end{array}\right)c_W^2
\end{array}\right)s_W + \\
\left(\begin{array}{l}
s_W c_W^2\left(1+2c_W^2\right)\left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}U_{1,1}^{\tilde{d}_{g1}} + \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}U_{2,1}^{\tilde{d}_{g1}}\right) + \\
2\left(\begin{array}{l}
2\left(3\left(\delta s_W\right) + \left(\delta Z_{\gamma Z}\right)c_W^3\right)s_W^2 - 4\left(\delta s_W\right)s_W^4 - \\
c_W^2\left(\left(\delta s_W\right)\left(10-4c_W^2\right) - \left(2\left(\delta Z_e\right) + \delta Z_{ZZ}\right)s_W\left(1+2c_W^2\right)\right)
\end{array}\right)U_{s2,1}^{\tilde{d}_{g1}}
\end{array}\right)\left(1+2c_W^2\right)U_{s1,1}^{\tilde{d}_{g1}*}
\end{array}\right)\right]
$$

$$
\underset{362}{C}\left(\tilde{u}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},\gamma,W^-\right) = \left[\frac{ie^2}{6\sqrt{2}c_W s_W^2}\left(\begin{array}{l}
\left(\begin{array}{l}
\left(\begin{array}{l}
c_W s_W\left(\delta\overline{Z}_{1,s2}^{\tilde{d}_{g2}}U_{1,1}^{\tilde{d}_{g2}} + \delta\overline{Z}_{2,s2}^{\tilde{d}_{g2}}U_{2,1}^{\tilde{d}_{g2}}\right) - \\
\left(c_W\left(2\left(\delta s_W\right) - \left(4\left(\delta Z_e\right) + \delta Z_W + \delta Z_{\gamma\gamma}\right)s_W\right) + \left(\delta Z_{\gamma Z}\right)s_W^2\right)U_{s2,1}^{\tilde{d}_{g2}}
\end{array}\right)U_{s1,1}^{\tilde{u}_{g1}*} + \\
c_W s_W\left(\delta Z_{1,s1}^{\tilde{u}_{g1}}U_{1,1}^{\tilde{u}_{g1}*} + \delta Z_{2,s1}^{\tilde{u}_{g1}}U_{2,1}^{\tilde{u}_{g1}*}\right)U_{s2,1}^{\tilde{d}_{g2}}
\end{array}\right)\mathrm{CKM}_{g1,g2}^* + \\
2c_W s_W\delta\mathrm{CKM}_{g1,g2}^* U_{s1,1}^{\tilde{u}_{g1}*}U_{s2,1}^{\tilde{d}_{g2}}
\end{array}\right)\right]
$$

$$C\left(\tilde{d}^{s1}_{g1},\tilde{u}^{s2,\dagger}_{g2},\gamma,W^{+}\right) = \left[\frac{ie^2}{6\sqrt{2}c_W s_W^2}\left(\left(\begin{array}{l}\left(\begin{array}{l}c_W s_W\left(\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}U^{\tilde{u}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}U^{\tilde{u}_{g2}}_{2,1}\right)-\\ \left(c_W\left(2\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{\gamma\gamma}\right)s_W\right)+\left(\delta Z_{Z\gamma}\right)s_W^2\right)U^{\tilde{u}_{g2}}_{s2,1}\end{array}\right)U^{\tilde{d}_{g1}*}_{s1,1}+\\ c_W s_W\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,1}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,1}\right)U^{\tilde{u}_{g2}}_{s2,1}\end{array}\right)\mathrm{CKM}_{g2,g1}+\\ 2\left(\delta\mathrm{CKM}_{g2,g1}\right)c_W s_W U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{u}_{g2}}_{s2,1}\end{array}\right)\right]$$

$$C\left(\tilde{\nu}_{g1},\tilde{e}^{s2,\dagger}_{g2},\gamma,W^{-}\right) = \left[-\frac{ie^2\delta_{g1,g2}}{2\sqrt{2}c_W s_W^2}\left(\begin{array}{l}c_W s_W\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g1}}_{2,1}\right)-\\ \left(c_W\left(2\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta Z_W+\delta Z_{\gamma\gamma}+\delta Z^{\tilde{\nu}}_{1,1}\right)\right)+\left(\delta Z_{Z\gamma}\right)s_W^2\right)U^{\tilde{e}_{g1}}_{s2,1}\end{array}\right)\right]$$

$$C\left(\tilde{e}^{s1}_{g1},\tilde{\nu}^{\dagger}_{g2},\gamma,W^{+}\right) = \left[\frac{ie^2\delta_{g1,g2}}{2\sqrt{2}c_W s_W^2}\left(\begin{array}{l}\left(c_W\left(2\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{\gamma\gamma}+\delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)\right)+\left(\delta Z_{Z\gamma}\right)s_W^2\right)U^{\tilde{e}_{g2}*}_{s1,1}-\\ c_W s_W\left(\delta Z^{\tilde{e}_{g1}}_{1,s1}U^{\tilde{e}_{g2}*}_{1,1}+\delta Z^{\tilde{e}_{g1}}_{2,s1}U^{\tilde{e}_{g2}*}_{2,1}\right)\end{array}\right)\right]$$

$$C\left(\tilde{u}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},Z,W^{-}\right) = \left[-\frac{ie^2}{6\sqrt{2}s_W c_W^3}\left(\left(\begin{array}{l}\left(\begin{array}{l}s_W c_W^2\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g2}}_{2,1}\right)+\\ \left(\left(4\left(\delta Z_e\right)+\delta Z_W+\delta Z_{ZZ}\right)s_W c_W^2-\left(\delta Z_{\gamma Z}\right)c_W^3+2\left(\delta s_W\right)s_W^2\right)U^{\tilde{d}_{g2}}_{s2,1}\end{array}\right)U^{\tilde{u}_{g1}*}_{s1,1}+\\ s_W c_W^2\left(\delta Z^{\tilde{u}_{g1}}_{1,s1}U^{\tilde{u}_{g1}*}_{1,1}+\delta Z^{\tilde{u}_{g1}}_{2,s1}U^{\tilde{u}_{g1}*}_{2,1}\right)U^{\tilde{d}_{g2}}_{s2,1}\end{array}\right)\mathrm{CKM}^{*}_{g1,g2}+\\ 2s_W\delta\mathrm{CKM}^{*}_{g1,g2}c_W^2U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1}\end{array}\right)\right]$$

$$C\left(\tilde{d}^{s1}_{g1},\tilde{u}^{s2,\dagger}_{g2},Z,W^{+}\right) = \left[-\frac{ie^2}{6\sqrt{2}s_W c_W^3}\left(\left(\begin{array}{l}\left(\begin{array}{l}s_W c_W^2\left(\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}U^{\tilde{u}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}U^{\tilde{u}_{g2}}_{2,1}\right)+\\ \left(\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{ZZ}\right)s_W c_W^2-\left(\delta Z_{\gamma Z}\right)c_W^3+2\left(\delta s_W\right)s_W^2\right)U^{\tilde{u}_{g2}}_{s2,1}\end{array}\right)U^{\tilde{d}_{g1}*}_{s1,1}+\\ s_W c_W^2\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,1}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,1}\right)U^{\tilde{u}_{g2}}_{s2,1}\end{array}\right)\mathrm{CKM}_{g2,g1}+\\ 2\left(\delta\mathrm{CKM}_{g2,g1}\right)s_W c_W^2U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{u}_{g2}}_{s2,1}\end{array}\right)\right]$$

$$C\left(\tilde{\nu}_{g1},\tilde{e}^{s2,\dagger}_{g2},Z,W^{-}\right) = \left[\frac{ie^2\delta_{g1,g2}}{2\sqrt{2}s_W c_W^3}\left(\begin{array}{l}s_W c_W^2\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g1}}_{2,1}\right)+\\ \left(s_W\left(4\left(\delta Z_e\right)+\delta Z_W+\delta Z_{ZZ}+\delta Z^{\tilde{\nu}}_{1,1}\right)c_W^2-\left(\delta Z_{\gamma Z}\right)c_W^3+2\left(\delta s_W\right)s_W^2\right)U^{\tilde{e}_{g1}}_{s2,1}\end{array}\right)\right]$$

$$C\left(\tilde{e}^{s1}_{g1},\tilde{\nu}^{\dagger}_{g2},Z,W^{+}\right) = \left[\frac{ie^2\delta_{g1,g2}}{2\sqrt{2}s_W c_W^3}\left(\begin{array}{l}\left(s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_{ZZ}+\delta\overline{Z}^{\tilde{\nu}}_{1,1}\right)c_W^2-\left(\delta Z_{\gamma Z}\right)c_W^3+2\left(\delta s_W\right)s_W^2\right)U^{\tilde{e}_{g2}*}_{s1,1}+\\ s_W c_W^2\left(\delta Z^{\tilde{e}_{g1}}_{1,s1}U^{\tilde{e}_{g2}*}_{1,1}+\delta Z^{\tilde{e}_{g1}}_{2,s1}U^{\tilde{e}_{g2}*}_{2,1}\right)\end{array}\right)\right]$$

$$C\left(\tilde{\nu}_{g1},\tilde{\nu}^{\dagger}_{g2},W^{-},W^{+}\right) = \left[-\frac{ie^2\delta_{g1,g2}}{4s_W^3}\left(4\left(\delta s_W\right)-s_W\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_W+\delta\overline{Z}^{\tilde{\nu}}_{1,1}+\delta Z^{\tilde{\nu}}_{1,1}\right)\right)\right]$$

$$C_{371}\left(\tilde{e}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},W^-,W^+\right) = \left[\begin{array}{c} \frac{ie^2\delta_{g1,g2}}{4s_W^3}\left(\begin{array}{c}\left(\begin{array}{c} s_W\left(\delta\overline{Z}^{\tilde{e}_{g2}}_{1,s2}U^{\tilde{e}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{e}_{g2}}_{2,s2}U^{\tilde{e}_{g1}}_{2,1}\right)- \\ \left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_W\right)s_W\right)U^{\tilde{e}_{g1}}_{s2,1}\end{array}\right)U^{\tilde{e}_{g1}*}_{s1,1}+ \\ s_W\left(\delta Z^{\tilde{e}_{g1}}_{1,s1}U^{\tilde{e}_{g1}*}_{1,1}+\delta Z^{\tilde{e}_{g1}}_{2,s1}U^{\tilde{e}_{g1}*}_{2,1}\right)U^{\tilde{e}_{g1}}_{s2,1}\end{array}\right)\end{array}\right]$$

$$C_{372}\left(\tilde{u}^{s1}_{g1},\tilde{u}^{s2,\dagger}_{g2},W^-,W^+\right) = \left[\begin{array}{c} \frac{ie^2\delta_{g1,g2}}{4s_W^3}\left(\begin{array}{c}\left(\begin{array}{c} s_W\left(\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}U^{\tilde{u}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}U^{\tilde{u}_{g1}}_{2,1}\right)- \\ \left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_W\right)s_W\right)U^{\tilde{u}_{g1}}_{s2,1}\end{array}\right)U^{\tilde{u}_{g1}*}_{s1,1}+ \\ s_W\left(\delta Z^{\tilde{u}_{g1}}_{1,s1}U^{\tilde{u}_{g1}*}_{1,1}+\delta Z^{\tilde{u}_{g1}}_{2,s1}U^{\tilde{u}_{g1}*}_{2,1}\right)U^{\tilde{u}_{g1}}_{s2,1}\end{array}\right)\end{array}\right]$$

$$C_{373}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},W^-,W^+\right) = \left[\begin{array}{c} \frac{ie^2\delta_{g1,g2}}{4s_W^3}\left(\begin{array}{c}\left(\begin{array}{c} s_W\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g1}}_{2,1}\right)- \\ \left(4\left(\delta s_W\right)-\left(4\left(\delta Z_e\right)+\delta\overline{Z}_W+\delta Z_W\right)s_W\right)U^{\tilde{d}_{g1}}_{s2,1}\end{array}\right)U^{\tilde{d}_{g1}*}_{s1,1}+ \\ s_W\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,1}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,1}\right)U^{\tilde{d}_{g1}}_{s2,1}\end{array}\right)\end{array}\right]$$

$$C_{386}\left(G^0,H^-,\gamma,W^+\right) = \left[-\frac{e^2}{4s_W}\left(\delta Z_{AG}+\delta Z_{G^-H^-}\right)\right]$$

$$C_{387}\left(G^0,H^+,\gamma,W^-\right) = \left[\frac{e^2}{4s_W}\left(\delta Z_{AG}+\delta Z_{H^-G^-}\right)\right]$$

$$C_{388}\left(G^0,H^-,Z,W^+\right) = \left[\frac{e^2}{4c_W}\left(\delta Z_{AG}+\delta Z_{G^-H^-}\right)\right]$$

$$C_{389}\left(G^0,H^+,Z,W^-\right) = \left[-\frac{e^2}{4c_W}\left(\delta Z_{AG}+\delta Z_{H^-G^-}\right)\right]$$

$$C_{390}\left(A^0,G^-,\gamma,W^+\right) = \left[-\frac{e^2}{4s_W}\left(\delta Z_{AG}+\delta Z_{H^-G^-}\right)\right]$$

$$C_{391}\left(A^0,G^+,\gamma,W^-\right) = \left[\frac{e^2}{4s_W}\left(\delta Z_{AG}+\delta Z_{G^-H^-}\right)\right]$$

$$C_{392}\left(A^0,G^-,Z,W^+\right) = \left[\frac{e^2}{4c_W}\left(\delta Z_{AG}+\delta Z_{H^-G^-}\right)\right]$$

$$C_{393}\left(A^0,G^+,Z,W^-\right) = \left[-\frac{e^2}{4c_W}\left(\delta Z_{AG}+\delta Z_{G^-H^-}\right)\right]$$

$$C_{394}\left(H^0,h^0,Z,Z\right) = \left[\frac{ie^2\left(\delta Z_{hH}\right)}{2c_W^2s_W^2}\right]$$

$$C\left(G^0, A^0, Z, Z\right) = \left[\frac{\mathrm{i}e^2 \left(\delta Z_{\mathrm{AG}}\right)}{2 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \right]$$

$$C\left(H^0, h^0, W^-, W^+\right) = \left[\frac{\mathrm{i}e^2 \left(\delta Z_{\mathrm{hH}}\right)}{2 s_{\mathrm{W}}^2} \right]$$

$$C\left(G^0, A^0, W^-, W^+\right) = \left[\frac{\mathrm{i}e^2 \left(\delta Z_{\mathrm{AG}}\right)}{2 s_{\mathrm{W}}^2} \right]$$

$$C\left(H^-, G^0, W^+, \gamma\right) = \left[-\frac{e^2}{4 s_{\mathrm{W}}} \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{G^-H^-}}\right) \right]$$

$$C\left(H^+, G^0, W^-, \gamma\right) = \left[\frac{e^2}{4 s_{\mathrm{W}}} \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{H^-G^-}}\right) \right]$$

$$C\left(H^-, G^0, W^+, Z\right) = \left[\frac{e^2}{4 c_{\mathrm{W}}} \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{G^-H^-}}\right) \right]$$

$$C\left(H^+, G^0, W^-, Z\right) = \left[-\frac{e^2}{4 c_{\mathrm{W}}} \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{H^-G^-}}\right) \right]$$

$$C\left(G^-, A^0, W^+, \gamma\right) = \left[-\frac{e^2}{4 s_{\mathrm{W}}} \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{H^-G^-}}\right) \right]$$

$$C\left(G^+, A^0, W^-, \gamma\right) = \left[\frac{e^2}{4 s_{\mathrm{W}}} \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{G^-H^-}}\right) \right]$$

$$C\left(G^-, A^0, W^+, Z\right) = \left[\frac{e^2}{4 c_{\mathrm{W}}} \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{H^-G^-}}\right) \right]$$

$$C\left(G^+, A^0, W^-, Z\right) = \left[-\frac{e^2}{4 c_{\mathrm{W}}} \left(\delta Z_{\mathrm{AG}} + \delta Z_{\mathrm{G^-H^-}}\right) \right]$$

$$C\left(G^-, H^+, \gamma, \gamma\right) = \left[2\mathrm{i}e^2 \left(\delta Z_{\mathrm{H^-G^-}}\right) \right]$$

$$C\left(H^-, G^+, \gamma, \gamma\right) = \left[2\mathrm{i}e^2 \left(\delta Z_{\mathrm{G^-H^-}}\right) \right]$$

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

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

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

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

$$C\left(G^-,H^+,W^-,W^+\right) = \left[\ \frac{\mathrm{i}e^2\left(\delta Z_{\mathrm{H^-G^-}}\right)}{2s_{\mathrm{W}}^2}\ \right]$$

$$C\left(H^-,G^+,W^+,W^-\right) = \left[\ \frac{\mathrm{i}e^2\left(\delta Z_{\mathrm{G^-H^-}}\right)}{2s_{\mathrm{W}}^2}\ \right]$$

$$C\left(\tilde{u}_{\mathrm{g1}}^{\mathrm{s1}},\tilde{u}_{\mathrm{g2}}^{\mathrm{s2},\dagger},g,g\right) = \left[\ \left(\frac{1}{2}\mathrm{i}g_{\mathrm{s}}^2\delta_{\mathrm{g1,g2}}\right)\left(\begin{array}{l}\delta_{\mathrm{s1,1}}\delta\overline{Z}_{\mathrm{1,s2}}^{\tilde{u}_{\mathrm{g2}}}+\delta_{\mathrm{s1,2}}\delta\overline{Z}_{\mathrm{2,s2}}^{\tilde{u}_{\mathrm{g2}}}+\delta_{\mathrm{s2,1}}\delta Z_{\mathrm{1,s1}}^{\tilde{u}_{\mathrm{g1}}}+\delta_{\mathrm{s2,2}}\delta Z_{\mathrm{2,s1}}^{\tilde{u}_{\mathrm{g1}}}+\\ 2\delta_{\mathrm{s1,s2}}\left(2\left(\delta Z_{g_{\mathrm{s}}}\right)+\delta Z_{gg}\right)\end{array}\right)\left(\left(T^{\mathrm{g3}}T^{\mathrm{g4}}\right)_{\mathrm{c2,c1}}+\left(T^{\mathrm{g4}}T^{\mathrm{g3}}\right)_{\mathrm{c2,c1}}\right)\ \right]$$

$$C\left(\tilde{d}_{\mathrm{g1}}^{\mathrm{s1}},\tilde{d}_{\mathrm{g2}}^{\mathrm{s2},\dagger},g,g\right) = \left[\ \left(\frac{1}{2}\mathrm{i}g_{\mathrm{s}}^2\delta_{\mathrm{g1,g2}}\right)\left(\begin{array}{l}\delta_{\mathrm{s1,1}}\delta\overline{Z}_{\mathrm{1,s2}}^{\tilde{d}_{\mathrm{g2}}}+\delta_{\mathrm{s1,2}}\delta\overline{Z}_{\mathrm{2,s2}}^{\tilde{d}_{\mathrm{g2}}}+\delta_{\mathrm{s2,1}}\delta Z_{\mathrm{1,s1}}^{\tilde{d}_{\mathrm{g1}}}+\delta_{\mathrm{s2,2}}\delta Z_{\mathrm{2,s1}}^{\tilde{d}_{\mathrm{g1}}}+\\ 2\delta_{\mathrm{s1,s2}}\left(2\left(\delta Z_{g_{\mathrm{s}}}\right)+\delta Z_{gg}\right)\end{array}\right)\left(\left(T^{\mathrm{g3}}T^{\mathrm{g4}}\right)_{\mathrm{c2,c1}}+\left(T^{\mathrm{g4}}T^{\mathrm{g3}}\right)_{\mathrm{c2,c1}}\right)\ \right]$$

$$C\left(\tilde{u}_{\mathrm{g1}}^{\mathrm{s1}},\tilde{u}_{\mathrm{g2}}^{\mathrm{s2},\dagger},g,\gamma\right) = \left[\ \frac{\mathrm{i}eg_{\mathrm{s}}\delta_{\mathrm{g1,g2}}T_{\mathrm{c2,c1}}^{\mathrm{g3}}}{6c_{\mathrm{W}}s_{\mathrm{W}}}\left(\begin{array}{l}4\left(\begin{array}{l}\delta_{\mathrm{s1,1}}\delta\overline{Z}_{\mathrm{1,s2}}^{\tilde{u}_{\mathrm{g2}}}+\delta_{\mathrm{s1,2}}\delta\overline{Z}_{\mathrm{2,s2}}^{\tilde{u}_{\mathrm{g2}}}+\delta_{\mathrm{s2,1}}\delta Z_{\mathrm{1,s1}}^{\tilde{u}_{\mathrm{g1}}}+\\ \delta_{\mathrm{s1,s2}}\left(2\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\gamma\gamma}+2\left(\delta Z_{g_{\mathrm{s}}}\right)+\delta Z_{gg}\right)+\delta_{\mathrm{s2,2}}\delta Z_{\mathrm{2,s1}}^{\tilde{u}_{\mathrm{g1}}}\end{array}\right)c_{\mathrm{W}}s_{\mathrm{W}}-\\ \left(\delta Z_{\mathrm{Z}\gamma}\right)\left(4\delta_{\mathrm{s1,s2}}s_{\mathrm{W}}^2-3U_{\mathrm{s1,1}}^{\tilde{u}_{\mathrm{g1}}*}U_{\mathrm{s2,1}}^{\tilde{u}_{\mathrm{g1}}}\right)\end{array}\right)\ \right]$$

$$C\left(\tilde{d}_{\mathrm{g1}}^{\mathrm{s1}},\tilde{d}_{\mathrm{g2}}^{\mathrm{s2},\dagger},g,\gamma\right) = \left[\ -\frac{\mathrm{i}eg_{\mathrm{s}}\delta_{\mathrm{g1,g2}}T_{\mathrm{c2,c1}}^{\mathrm{g3}}}{6c_{\mathrm{W}}s_{\mathrm{W}}}\left(\begin{array}{l}2\left(\begin{array}{l}\delta_{\mathrm{s1,1}}\delta\overline{Z}_{\mathrm{1,s2}}^{\tilde{d}_{\mathrm{g2}}}+\delta_{\mathrm{s1,2}}\delta\overline{Z}_{\mathrm{2,s2}}^{\tilde{d}_{\mathrm{g2}}}+\delta_{\mathrm{s2,1}}\delta Z_{\mathrm{1,s1}}^{\tilde{d}_{\mathrm{g1}}}+\\ \delta_{\mathrm{s1,s2}}\left(2\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\gamma\gamma}+2\left(\delta Z_{g_{\mathrm{s}}}\right)+\delta Z_{gg}\right)+\delta_{\mathrm{s2,2}}\delta Z_{\mathrm{2,s1}}^{\tilde{d}_{\mathrm{g1}}}\end{array}\right)c_{\mathrm{W}}s_{\mathrm{W}}-\\ \left(\delta Z_{\mathrm{Z}\gamma}\right)\left(2\delta_{\mathrm{s1,s2}}s_{\mathrm{W}}^2-3U_{\mathrm{s1,1}}^{\tilde{d}_{\mathrm{g1}}*}U_{\mathrm{s2,1}}^{\tilde{d}_{\mathrm{g1}}}\right)\end{array}\right)\ \right]$$

$$C\left(\tilde{u}_{\mathrm{g1}}^{\mathrm{s1}},\tilde{u}_{\mathrm{g2}}^{\mathrm{s2},\dagger},g,Z\right) = \left[\ -\frac{\mathrm{i}eg_{\mathrm{s}}\delta_{\mathrm{g1,g2}}T_{\mathrm{c2,c1}}^{\mathrm{g3}}}{6c_{\mathrm{W}}^3 s_{\mathrm{W}}^2}\left(\begin{array}{l}\delta_{\mathrm{s1,s2}}s_{\mathrm{W}}^2\left(4\left(2\left(\delta s_{\mathrm{W}}\right)+\left(2\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\mathrm{ZZ}}+2\left(\delta Z_{g_{\mathrm{s}}}\right)+\delta Z_{gg}\right)s_{\mathrm{W}}\right)c_{\mathrm{W}}^2-4\left(\delta Z_{\gamma\mathrm{Z}}\right)c_{\mathrm{W}}^3+8\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}^2\right)+\\ \left(\begin{array}{l}4\left(\delta_{\mathrm{s1,1}}\delta\overline{Z}_{\mathrm{1,s2}}^{\tilde{u}_{\mathrm{g2}}}+\delta_{\mathrm{s1,2}}\delta\overline{Z}_{\mathrm{2,s2}}^{\tilde{u}_{\mathrm{g2}}}\right)s_{\mathrm{W}}^3+\\ \left(\begin{array}{l}\delta Z_{\mathrm{1,s1}}^{\tilde{u}_{\mathrm{g1}}}\left(4\delta_{\mathrm{s2,1}}s_{\mathrm{W}}^2-3U_{\mathrm{1,1}}^{\tilde{u}_{\mathrm{g1}}*}U_{\mathrm{s2,1}}^{\tilde{u}_{\mathrm{g1}}}\right)+\\ \delta Z_{\mathrm{2,s1}}^{\tilde{u}_{\mathrm{g1}}}\left(4\delta_{\mathrm{s2,2}}s_{\mathrm{W}}^2-3U_{\mathrm{2,1}}^{\tilde{u}_{\mathrm{g1}}*}U_{\mathrm{s2,1}}^{\tilde{u}_{\mathrm{g1}}}\right)\end{array}\right)s_{\mathrm{W}}\end{array}\right)c_{\mathrm{W}}^2-\\ \left(\begin{array}{l}\left(\begin{array}{l}3s_{\mathrm{W}}\left(\delta\overline{Z}_{\mathrm{1,s2}}^{\tilde{u}_{\mathrm{g2}}}U_{\mathrm{1,1}}^{\tilde{u}_{\mathrm{g1}}}+\delta\overline{Z}_{\mathrm{2,s2}}^{\tilde{u}_{\mathrm{g2}}}U_{\mathrm{2,1}}^{\tilde{u}_{\mathrm{g1}}}\right)-\\ \left(6\left(\delta s_{\mathrm{W}}\right)-3\left(2\left(\delta Z_{\mathrm{e}}\right)+\delta Z_{\mathrm{ZZ}}+2\left(\delta Z_{g_{\mathrm{s}}}\right)+\delta Z_{gg}\right)s_{\mathrm{W}}\right)U_{\mathrm{s2,1}}^{\tilde{u}_{\mathrm{g1}}}\end{array}\right)c_{\mathrm{W}}^2+\\ 6\left(\delta s_{\mathrm{W}}\right)s_{\mathrm{W}}^2U_{\mathrm{s2,1}}^{\tilde{u}_{\mathrm{g1}}}\end{array}\right)U_{\mathrm{s1,1}}^{\tilde{u}_{\mathrm{g1}}*}\end{array}\right)\ \right]$$

$$\underset{473}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},g,Z\right) = \left[\frac{ie g_s \delta_{g1,g2} T^{g3}_{c2,c1}}{6 c_W^3 s_W^2}\left(\begin{array}{l} \delta_{s1,s2} s_W^2 \left(2\left(2\left(\delta s_W\right)+\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+2\left(\delta Z_{g_s}\right)+\delta Z_{gg}\right)s_W\right)c_W^2-2\left(\delta Z_{\gamma Z}\right)c_W^3+4\left(\delta s_W\right)s_W^2\right)+ \\ \left(\begin{array}{l} 2\left(\delta_{s1,1}\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}+\delta_{s1,2}\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}\right)s_W^3+ \\ \left(\begin{array}{l} \delta Z^{\tilde{d}_{g1}}_{1,s1}\left(2\delta_{s2,1}s_W^2-3U^{\tilde{d}_{g1}*}_{1,1}U^{\tilde{d}_{g1}}_{s2,1}\right)+ \\ \delta Z^{\tilde{d}_{g1}}_{2,s1}\left(2\delta_{s2,2}s_W^2-3U^{\tilde{d}_{g1}*}_{2,1}U^{\tilde{d}_{g1}}_{s2,1}\right) \end{array}\right)s_W \end{array}\right)c_W^2- \\ \left(\begin{array}{l} \left(\begin{array}{l} 3s_W\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g1}}_{1,1}+\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g1}}_{2,1}\right)- \\ \left(6\left(\delta s_W\right)-3\left(2\left(\delta Z_e\right)+\delta Z_{ZZ}+2\left(\delta Z_{g_s}\right)+\delta Z_{gg}\right)s_W\right)U^{\tilde{d}_{g1}}_{s2,1} \end{array}\right)c_W^2+ \\ 6\left(\delta s_W\right)s_W^2 U^{\tilde{d}_{g1}}_{s2,1} \end{array}\right)U^{\tilde{d}_{g1}*}_{s1,1} \end{array}\right)\right]$$

$$\underset{474}{C}\left(\tilde{u}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},g,W^-\right) = \left[\frac{ie g_s T^{g3}_{c2,c1}}{\sqrt{2}s_W^2}\left(\begin{array}{l} \left(\begin{array}{l} \left(\begin{array}{l} s_W\left(\delta\overline{Z}^{\tilde{d}_{g2}}_{1,s2}U^{\tilde{d}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{d}_{g2}}_{2,s2}U^{\tilde{d}_{g2}}_{2,1}\right)- \\ \left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta Z_W+2\left(\delta Z_{g_s}\right)+\delta Z_{gg}\right)s_W\right)U^{\tilde{d}_{g2}}_{s2,1} \end{array}\right)U^{\tilde{u}_{g1}*}_{s1,1}+ \\ s_W\left(\delta Z^{\tilde{u}_{g1}}_{1,s1}U^{\tilde{u}_{g1}*}_{1,1}+\delta Z^{\tilde{u}_{g1}}_{2,s1}U^{\tilde{u}_{g1}*}_{2,1}\right)U^{\tilde{d}_{g2}}_{s2,1} \end{array}\right)\mathrm{CKM}^*_{g1,g2}+ \\ 2s_W\delta\mathrm{CKM}^*_{g1,g2}U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1} \end{array}\right)\right]$$

$$\underset{475}{C}\left(\tilde{d}^{s1}_{g1},\tilde{u}^{s2,\dagger}_{g2},g,W^+\right) = \left[\frac{ie g_s T^{g3}_{c2,c1}}{\sqrt{2}s_W^2}\left(\begin{array}{l} \left(\begin{array}{l} \left(\begin{array}{l} s_W\left(\delta\overline{Z}^{\tilde{u}_{g2}}_{1,s2}U^{\tilde{u}_{g2}}_{1,1}+\delta\overline{Z}^{\tilde{u}_{g2}}_{2,s2}U^{\tilde{u}_{g2}}_{2,1}\right)- \\ \left(2\left(\delta s_W\right)-\left(2\left(\delta Z_e\right)+\delta\overline{Z}_W+2\left(\delta Z_{g_s}\right)+\delta Z_{gg}\right)s_W\right)U^{\tilde{u}_{g2}}_{s2,1} \end{array}\right)U^{\tilde{d}_{g1}*}_{s1,1}+ \\ s_W\left(\delta Z^{\tilde{d}_{g1}}_{1,s1}U^{\tilde{d}_{g1}*}_{1,1}+\delta Z^{\tilde{d}_{g1}}_{2,s1}U^{\tilde{d}_{g1}*}_{2,1}\right)U^{\tilde{u}_{g2}}_{s2,1} \end{array}\right)\mathrm{CKM}_{g2,g1}+ \\ 2\left(\delta\mathrm{CKM}_{g2,g1}\right)s_W U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{u}_{g2}}_{s2,1} \end{array}\right)\right]$$

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$$\underset{39}{C}\left(\gamma,\gamma,W^-,W^+\right) = \frac{ie^2}{s_W}\left(\left(\delta Z_{Z\gamma}\right)c_W+\left(2\left(\delta Z_e\right)+\delta Z_W+\delta Z_{\gamma\gamma}\right)s_W\right)\left[\begin{array}{c} -2 \\ \hline 1 \\ \hline 1 \end{array}\right]$$

$$\underset{40}{C}\left(\gamma, Z, W^-, W^+\right) = \frac{\mathrm{i}e^2}{c_\mathrm{W} s_\mathrm{W}^2}\left(2\left(\delta s_\mathrm{W}\right) - c_\mathrm{W}\left(\left(4\left(\delta Z_\mathrm{e}\right) + 2\left(\delta Z_\mathrm{W}\right) + \delta Z_{ZZ} + \delta Z_{\gamma\gamma}\right) c_\mathrm{W} s_\mathrm{W} + \left(\delta Z_{Z\gamma}\right) c_\mathrm{W}^2 + \left(\delta Z_{\gamma Z}\right) s_\mathrm{W}^2\right)\right) \begin{bmatrix} 1 \\ -\frac{1}{2} \\ -\frac{1}{2} \end{bmatrix}$$

$$\underset{41}{C}\left(Z, Z, W^-, W^+\right) = \frac{\mathrm{i}e^2}{s_\mathrm{W}^3}\left(2\left(\delta s_\mathrm{W}\right) - c_\mathrm{W} s_\mathrm{W}\left(\left(2\left(\delta Z_\mathrm{e}\right) + \delta Z_\mathrm{W} + \delta Z_{ZZ}\right) c_\mathrm{W} + \left(\delta Z_{\gamma Z}\right) s_\mathrm{W}\right)\right) \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix}$$

$$\underset{42}{C}\left(W^-, W^-, W^+, W^+\right) = \frac{\mathrm{i}e^2}{s_\mathrm{W}^3}\left(\delta s_\mathrm{W} - \left(\delta Z_\mathrm{e} + \delta Z_\mathrm{W}\right) s_\mathrm{W}\right) \begin{bmatrix} -4 \\ 2 \\ 2 \end{bmatrix}$$

$$\underset{456}{C}(g, g, g, g) = 2\mathrm{i}g_\mathrm{s}^2\left(\delta Z_{g_\mathrm{s}} + \delta Z_{gg}\right) \begin{bmatrix} -\left(f^{g1,g3,x} f^{x,g2,g4}\right) + f^{g1,g4,x} f^{x,g3,g2} \\ -\left(f^{g1,g2,x} f^{x,g3,g4}\right) - f^{g1,g4,x} f^{x,g3,g2} \\ f^{g1,g2,x} f^{x,g3,g4} + f^{g1,g3,x} f^{x,g2,g4} \end{bmatrix}$$