MSSM, HMix

[FFS] Chargino – Lepton – Higgs

$$\underset{125}{C}\left(\tilde{\chi}^-_{c1}, \bar{e}_{g2}, \tilde{\nu}_{g3}\right) = \frac{ie\delta_{g2,g3}}{s_W}\begin{bmatrix} \frac{m_{e_{g3}} U^*_{c1,2}}{\sqrt{2} c_\beta M_W} \\ \hline -V_{c1,1} \end{bmatrix}$$

$$\underset{126}{C}\left(\tilde{\chi}^+_{c1}, \overline{\nu}_{g2}, \tilde{e}^{s3}_{g3}\right) = \frac{ie\delta_{g2,g3}}{2s_W}\left(\frac{\sqrt{2} m_{e_{g2}} U_{c1,2} U^{\tilde{e}_{g2}*}_{s3,2}}{c_\beta M_W} - 2U_{c1,1} U^{\tilde{e}_{g2}*}_{s3,1}\right)\begin{bmatrix} 0 \\ \hline 1 \end{bmatrix}$$

$$\underset{129}{C}\left(e_{g1}, \tilde{\chi}^+_{c2}, \tilde{\nu}^\dagger_{g3}\right) = \frac{ie\delta_{g1,g3}}{s_W}\begin{bmatrix} -V^*_{c2,1} \\ \hline \frac{m_{e_{g3}} U_{c2,2}}{\sqrt{2} c_\beta M_W} \end{bmatrix}$$

$$\underset{130}{C}\left(\nu_{g1}, \tilde{\chi}^-_{c2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \frac{ie\delta_{g1,g3}}{2s_W}\left(\frac{\sqrt{2} m_{e_{g1}} U^*_{c2,2} U^{\tilde{e}_{g1}}_{s3,2}}{c_\beta M_W} - 2U^*_{c2,1} U^{\tilde{e}_{g1}}_{s3,1}\right)\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

[FFS] Chargino – Neutralino – Higgs

$$\underset{111}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^+_{c2}, H^-\right) = -\frac{ie}{s_W}\begin{bmatrix} c_\beta\left(\frac{V^*_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z^*_{n1,1}}{c_W} + Z^*_{n1,2}\right) + V^*_{c2,1} Z^*_{n1,4}\right) \\ \hline -s_\beta\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2}\right) - U_{c2,1} Z_{n1,3}\right) \end{bmatrix}$$

$$\underset{112}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^+_{c2}, G^-\right) = -\frac{ie}{s_W}\begin{bmatrix} s_\beta\left(\frac{V^*_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z^*_{n1,1}}{c_W} + Z^*_{n1,2}\right) + V^*_{c2,1} Z^*_{n1,4}\right) \\ \hline c_\beta\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2}\right) - U_{c2,1} Z_{n1,3}\right) \end{bmatrix}$$

$$\underset{113}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^0_{n2}, H^+\right) = -\frac{ie}{s_W}\begin{bmatrix} -s_\beta\left(\frac{U^*_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z^*_{n2,1}}{c_W} + Z^*_{n2,2}\right) - U^*_{c1,1} Z^*_{n2,3}\right) \\ \hline c_\beta\left(\frac{V_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2}\right) + V_{c1,1} Z_{n2,4}\right) \end{bmatrix}$$

$$\underset{114}{C}\left(\tilde{\chi}_{c1}^{-}, \tilde{\chi}_{n2}^{0}, G^{+}\right) = -\frac{ie}{s_W}\begin{bmatrix} c_\beta\left(\frac{U_{c1,2}^{*}}{\sqrt{2}}\left(\frac{s_W Z_{n2,1}^{*}}{c_W} + Z_{n2,2}^{*}\right) - U_{c1,1}^{*} Z_{n2,3}^{*}\right) \\ s_\beta\left(\frac{V_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2}\right) + V_{c1,1} Z_{n2,4}\right) \end{bmatrix}$$

[FFS] Chargino – Quark – Higgs

$$\underset{123}{C}\left(\tilde{\chi}_{c1}^{-}, \bar{d}_{g2}, \tilde{u}_{g3}^{s3}\right) = \frac{ie\mathrm{CKM}_{g3,g2}^{*}}{M_W s_W}\begin{bmatrix} \frac{m_{d_{g2}} U_{c1,2}^{*} U_{s3,1}^{\tilde{u}_{g3}*}}{\sqrt{2}c_\beta} \\ -\frac{1}{2s_\beta}\left(2M_W s_\beta V_{c1,1} U_{s3,1}^{\tilde{u}_{g3}*} - \sqrt{2} m_{u_{g3}} V_{c1,2} U_{s3,2}^{\tilde{u}_{g3}*}\right) \end{bmatrix}$$

$$\underset{124}{C}\left(\tilde{\chi}_{c1}^{+}, \bar{u}_{g2}, \tilde{d}_{g3}^{s3}\right) = \frac{ie\mathrm{CKM}_{g2,g3}}{M_W s_W}\begin{bmatrix} \frac{m_{u_{g2}} U_{s3,1}^{\tilde{d}_{g3}*} V_{c1,2}^{*}}{\sqrt{2}s_\beta} \\ -\frac{1}{2c_\beta}\left(2c_\beta M_W U_{c1,1} U_{s3,1}^{\tilde{d}_{g3}*} - \sqrt{2} m_{d_{g3}} U_{c1,2} U_{s3,2}^{\tilde{d}_{g3}*}\right) \end{bmatrix}$$

$$\underset{127}{C}\left(d_{g1}, \tilde{\chi}_{c2}^{+}, \tilde{u}_{g3}^{s3,\dagger}\right) = \frac{ie\mathrm{CKM}_{g3,g1}}{M_W s_W}\begin{bmatrix} -\frac{1}{2s_\beta}\left(2M_W s_\beta U_{s3,1}^{\tilde{u}_{g3}} V_{c2,1}^{*} - \sqrt{2} m_{u_{g3}} U_{s3,2}^{\tilde{u}_{g3}} V_{c2,2}^{*}\right) \\ \frac{m_{d_{g1}} U_{c2,2} U_{s3,1}^{\tilde{u}_{g3}}}{\sqrt{2}c_\beta} \end{bmatrix}$$

$$\underset{128}{C}\left(u_{g1}, \tilde{\chi}_{c2}^{-}, \tilde{d}_{g3}^{s3,\dagger}\right) = \frac{ie\mathrm{CKM}_{g1,g3}^{*}}{M_W s_W}\begin{bmatrix} -\frac{1}{2c_\beta}\left(2c_\beta M_W U_{c2,1}^{*} U_{s3,1}^{\tilde{d}_{g3}} - \sqrt{2} m_{d_{g3}} U_{c2,2}^{*} U_{s3,2}^{\tilde{d}_{g3}}\right) \\ \frac{m_{u_{g1}} V_{c2,2} U_{s3,1}^{\tilde{d}_{g3}}}{\sqrt{2}s_\beta} \end{bmatrix}$$

[FFS] Lepton – Neutralino – Higgs

$$\underset{115}{C}\left(\tilde{\chi}_{n1}^{0}, \bar{\nu}_{g2}, \tilde{\nu}_{g3}\right) = \frac{ie\delta_{g2,g3}}{\sqrt{2}c_W s_W}\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right)\begin{bmatrix} 0 \\ \hline 1 \end{bmatrix}$$

$$\underset{116}{C}\left(\tilde{\chi}^0_{n1}, \bar{e}_{g2}, \tilde{e}^{s3}_{g3}\right) = \frac{ie\delta_{g2,g3}}{\sqrt{2}c_W c_\beta M_W s_W} \begin{bmatrix} -2c_\beta M_W s_W U^{\tilde{e}_{g2}*}_{s3,2} Z^*_{n1,1} - c_W m_{e_{g2}} U^{\tilde{e}_{g2}*}_{s3,1} Z^*_{n1,3} \\ \hline c_\beta M_W \left(s_W Z_{n1,1} + c_W Z_{n1,2}\right) U^{\tilde{e}_{g2}*}_{s3,1} - c_W m_{e_{g2}} Z_{n1,3} U^{\tilde{e}_{g2}*}_{s3,2} \end{bmatrix}$$

$$\underset{119}{C}\left(\nu_{g1}, \tilde{\chi}^0_{n2}, \tilde{\nu}^\dagger_{g3}\right) = \frac{ie\delta_{g1,g3}}{\sqrt{2}c_W s_W} \left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{120}{C}\left(e_{g1}, \tilde{\chi}^0_{n2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \frac{ie\delta_{g1,g3}}{\sqrt{2}c_W c_\beta M_W s_W} \begin{bmatrix} c_\beta M_W s_W U^{\tilde{e}_{g1}}_{s3,1} Z^*_{n2,1} + c_W \left(c_\beta M_W U^{\tilde{e}_{g1}}_{s3,1} Z^*_{n2,2} - m_{e_{g1}} U^{\tilde{e}_{g1}}_{s3,2} Z^*_{n2,3}\right) \\ \hline -c_W m_{e_{g1}} Z_{n2,3} U^{\tilde{e}_{g1}}_{s3,1} - 2c_\beta M_W s_W Z_{n2,1} U^{\tilde{e}_{g1}}_{s3,2} \end{bmatrix}$$

[FFS] Neutralino – Quark – Higgs

$$\underset{117}{C}\left(\tilde{\chi}^0_{n1}, \bar{u}_{g2}, \tilde{u}^{s3}_{g3}\right) = \frac{ie\delta_{g2,g3}}{3\sqrt{2}c_W M_W s_W s_\beta} \begin{bmatrix} 4M_W s_W s_\beta U^{\tilde{u}_{g2}*}_{s3,2} Z^*_{n1,1} - 3c_W m_{u_{g2}} U^{\tilde{u}_{g2}*}_{s3,1} Z^*_{n1,4} \\ \hline -M_W s_\beta \left(s_W Z_{n1,1} + 3c_W Z_{n1,2}\right) U^{\tilde{u}_{g2}*}_{s3,1} - 3c_W m_{u_{g2}} Z_{n1,4} U^{\tilde{u}_{g2}*}_{s3,2} \end{bmatrix}$$

$$\underset{118}{C}\left(\tilde{\chi}^0_{n1}, \bar{d}_{g2}, \tilde{d}^{s3}_{g3}\right) = \frac{ie\delta_{g2,g3}}{3\sqrt{2}c_W c_\beta M_W s_W} \begin{bmatrix} -2c_\beta M_W s_W U^{\tilde{d}_{g2}*}_{s3,2} Z^*_{n1,1} - 3c_W m_{d_{g2}} U^{\tilde{d}_{g2}*}_{s3,1} Z^*_{n1,3} \\ \hline -c_\beta M_W \left(s_W Z_{n1,1} - 3c_W Z_{n1,2}\right) U^{\tilde{d}_{g2}*}_{s3,1} - 3c_W m_{d_{g2}} Z_{n1,3} U^{\tilde{d}_{g2}*}_{s3,2} \end{bmatrix}$$

$$\underset{121}{C}\left(u_{g1}, \tilde{\chi}^0_{n2}, \tilde{u}^{s3,\dagger}_{g3}\right) = -\frac{ie\delta_{g1,g3}}{3\sqrt{2}c_W M_W s_W s_\beta} \begin{bmatrix} M_W s_W s_\beta U^{\tilde{u}_{g1}}_{s3,1} Z^*_{n2,1} + 3c_W \left(M_W s_\beta U^{\tilde{u}_{g1}}_{s3,1} Z^*_{n2,2} + m_{u_{g1}} U^{\tilde{u}_{g1}}_{s3,2} Z^*_{n2,4}\right) \\ \hline 3c_W m_{u_{g1}} Z_{n2,4} U^{\tilde{u}_{g1}}_{s3,1} - 4M_W s_W s_\beta Z_{n2,1} U^{\tilde{u}_{g1}}_{s3,2} \end{bmatrix}$$

$$\underset{122}{C}\left(d_{g1}, \tilde{\chi}^0_{n2}, \tilde{d}^{s3,\dagger}_{g3}\right) = -\frac{ie\delta_{g1,g3}}{3\sqrt{2}c_W c_\beta M_W s_W} \begin{bmatrix} c_\beta M_W s_W U^{\tilde{d}_{g1}}_{s3,1} Z^*_{n2,1} - 3c_W \left(c_\beta M_W U^{\tilde{d}_{g1}}_{s3,1} Z^*_{n2,2} - m_{d_{g1}} U^{\tilde{d}_{g1}}_{s3,2} Z^*_{n2,3}\right) \\ \hline 3c_W m_{d_{g1}} Z_{n2,3} U^{\tilde{d}_{g1}}_{s3,1} + 2c_\beta M_W s_W Z_{n2,1} U^{\tilde{d}_{g1}}_{s3,2} \end{bmatrix}$$

[FFS] 2 Charginos – Higgs

$$\underset{110}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^+_{c2}, G^0\right) = \frac{e}{\sqrt{2}s_W}\begin{bmatrix} c_\beta U^*_{c1,2}V^*_{c2,1} - s_\beta U^*_{c1,1}V^*_{c2,2} \\ \hline -c_\beta U_{c2,2}V_{c1,1} + s_\beta U_{c2,1}V_{c1,2} \end{bmatrix}$$

$$\underset{206}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^+_{c2}, H_{h3}\right) = \begin{bmatrix} \frac{ieU^H_{h3,1}}{\sqrt{2}s_W}\left(s_\alpha U^*_{c1,2}V^*_{c2,1} - c_\alpha U^*_{c1,1}V^*_{c2,2}\right) - \\ \frac{ieU^H_{h3,2}}{\sqrt{2}s_W}\left(c_\alpha U^*_{c1,2}V^*_{c2,1} + s_\alpha U^*_{c1,1}V^*_{c2,2}\right) - \\ \frac{eU^H_{h3,3}}{\sqrt{2}s_W}\left(s_\beta U^*_{c1,2}V^*_{c2,1} + c_\beta U^*_{c1,1}V^*_{c2,2}\right) \\ \hline \frac{ieU^H_{h3,1}}{\sqrt{2}s_W}\left(s_\alpha U_{c2,2}V_{c1,1} - c_\alpha U_{c2,1}V_{c1,2}\right) + \\ \frac{eU^H_{h3,3}}{\sqrt{2}s_W}\left(s_\beta U_{c2,2}V_{c1,1} + c_\beta U_{c2,1}V_{c1,2}\right) - \\ \frac{ieU^H_{h3,2}}{\sqrt{2}s_W}\left(c_\alpha U_{c2,2}V_{c1,1} + s_\alpha U_{c2,1}V_{c1,2}\right) \end{bmatrix}$$

$$\underset{207}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^+_{c2}, \hat{H}_{h3}\right) = \begin{bmatrix} \frac{ieZ^H_{h3,1}}{\sqrt{2}s_W}\left(s_\alpha U^*_{c1,2}V^*_{c2,1} - c_\alpha U^*_{c1,1}V^*_{c2,2}\right) - \\ \frac{ieZ^H_{h3,2}}{\sqrt{2}s_W}\left(c_\alpha U^*_{c1,2}V^*_{c2,1} + s_\alpha U^*_{c1,1}V^*_{c2,2}\right) - \\ \frac{eZ^H_{h3,3}}{\sqrt{2}s_W}\left(s_\beta U^*_{c1,2}V^*_{c2,1} + c_\beta U^*_{c1,1}V^*_{c2,2}\right) \\ \hline \frac{ieZ^H_{h3,1}}{\sqrt{2}s_W}\left(s_\alpha U_{c2,2}V_{c1,1} - c_\alpha U_{c2,1}V_{c1,2}\right) - \\ \frac{ieZ^H_{h3,2}}{\sqrt{2}s_W}\left(c_\alpha U_{c2,2}V_{c1,1} + s_\alpha U_{c2,1}V_{c1,2}\right) + \\ \frac{eZ^H_{h3,3}}{\sqrt{2}s_W}\left(s_\beta U_{c2,2}V_{c1,1} + c_\beta U_{c2,1}V_{c1,2}\right) \end{bmatrix}$$

[FFS] 2 Leptons – Higgs

$$\underset{65}{C}\left(e_{g1},\bar{e}_{g2},G^{0}\right)=\frac{e\delta_{g1,g2}m_{e_{g1}}}{2M_{W}s_{W}}\begin{bmatrix}-1\\\hline 1\end{bmatrix}$$

$$\underset{75}{C}\left(\nu_{g1},\bar{e}_{g2},G^{-}\right)=-\frac{ie\delta_{g1,g2}m_{e_{g2}}}{\sqrt{2}M_{W}s_{W}}\begin{bmatrix}1\\\hline 0\end{bmatrix}$$

$$\underset{76}{C}\left(e_{g1},\bar{\nu}_{g2},G^{+}\right)=-\frac{ie\delta_{g1,g2}m_{e_{g1}}}{\sqrt{2}M_{W}s_{W}}\begin{bmatrix}0\\\hline 1\end{bmatrix}$$

$$\underset{79}{C}\left(\nu_{g1},\bar{e}_{g2},H^{-}\right)=\frac{ie\delta_{g1,g2}m_{e_{g2}}t_{\beta}}{\sqrt{2}M_{W}s_{W}}\begin{bmatrix}1\\\hline 0\end{bmatrix}$$

$$\underset{80}{C}\left(e_{g1},\bar{\nu}_{g2},H^{+}\right)=\frac{ie\delta_{g1,g2}m_{e_{g1}}t_{\beta}}{\sqrt{2}M_{W}s_{W}}\begin{bmatrix}0\\\hline 1\end{bmatrix}$$

$$\underset{198}{C}\left(e_{g1},\bar{e}_{g2},H_{h3}\right)=\begin{bmatrix}\frac{ie\delta_{g1,g2}m_{e_{g1}}s_{\alpha}U^{H}_{h3,1}}{2c_{\beta}M_{W}s_{W}}-\\\frac{ie\delta_{g1,g2}c_{\alpha}m_{e_{g1}}U^{H}_{h3,2}}{2c_{\beta}M_{W}s_{W}}+\\\frac{e\delta_{g1,g2}m_{e_{g1}}t_{\beta}U^{H}_{h3,3}}{2M_{W}s_{W}}\\\hline\frac{ie\delta_{g1,g2}m_{e_{g1}}s_{\alpha}U^{H}_{h3,1}}{2c_{\beta}M_{W}s_{W}}-\\\frac{ie\delta_{g1,g2}c_{\alpha}m_{e_{g1}}U^{H}_{h3,2}}{2c_{\beta}M_{W}s_{W}}-\\\frac{e\delta_{g1,g2}m_{e_{g1}}t_{\beta}U^{H}_{h3,3}}{2M_{W}s_{W}}\end{bmatrix}$$

$$\underset{199}{C}\left(e_{\mathrm{g1}}, \bar{e}_{\mathrm{g2}}, \hat{H}_{\mathrm{h3}}\right) = \begin{bmatrix} \frac{\mathrm{i}e\delta_{\mathrm{g1,g2}} m_{e_{\mathrm{g1}}} s_\alpha Z^{\mathrm{H}}_{\mathrm{h3,1}}}{2c_\beta M_{\mathrm{W}} s_{\mathrm{W}}} - \\ \frac{\mathrm{i}e\delta_{\mathrm{g1,g2}} c_\alpha m_{e_{\mathrm{g1}}} Z^{\mathrm{H}}_{\mathrm{h3,2}}}{2c_\beta M_{\mathrm{W}} s_{\mathrm{W}}} + \\ \frac{e\delta_{\mathrm{g1,g2}} m_{e_{\mathrm{g1}}} t_\beta Z^{\mathrm{H}}_{\mathrm{h3,3}}}{2M_{\mathrm{W}} s_{\mathrm{W}}} \\ \hline \frac{\mathrm{i}e\delta_{\mathrm{g1,g2}} m_{e_{\mathrm{g1}}} s_\alpha Z^{\mathrm{H}}_{\mathrm{h3,1}}}{2c_\beta M_{\mathrm{W}} s_{\mathrm{W}}} - \\ \frac{\mathrm{i}e\delta_{\mathrm{g1,g2}} c_\alpha m_{e_{\mathrm{g1}}} Z^{\mathrm{H}}_{\mathrm{h3,2}}}{2c_\beta M_{\mathrm{W}} s_{\mathrm{W}}} - \\ \frac{e\delta_{\mathrm{g1,g2}} m_{e_{\mathrm{g1}}} t_\beta Z^{\mathrm{H}}_{\mathrm{h3,3}}}{2M_{\mathrm{W}} s_{\mathrm{W}}} \end{bmatrix}$$

[FFS] 2 Neutralinos – Higgs

$$\underset{109}{C}\left(\tilde{\chi}^0_{\mathrm{n1}}, \tilde{\chi}^0_{\mathrm{n2}}, G^0\right) = \frac{e}{2c_{\mathrm{W}} s_{\mathrm{W}}} \begin{bmatrix} -\left(c_\beta Z^*_{\mathrm{n1,3}} + s_\beta Z^*_{\mathrm{n1,4}}\right)\left(s_{\mathrm{W}} Z^*_{\mathrm{n2,1}} - c_{\mathrm{W}} Z^*_{\mathrm{n2,2}}\right) - \\ c_\beta\left(s_{\mathrm{W}} Z^*_{\mathrm{n1,1}} - c_{\mathrm{W}} Z^*_{\mathrm{n1,2}}\right) Z^*_{\mathrm{n2,3}} + s_\beta\left(s_{\mathrm{W}} Z^*_{\mathrm{n1,1}} - c_{\mathrm{W}} Z^*_{\mathrm{n1,2}}\right) Z^*_{\mathrm{n2,4}} \\ \hline \left(c_\beta Z_{\mathrm{n1,3}} + s_\beta Z_{\mathrm{n1,4}}\right)\left(s_{\mathrm{W}} Z_{\mathrm{n2,1}} - c_{\mathrm{W}} Z_{\mathrm{n2,2}}\right) + \\ c_\beta\left(s_{\mathrm{W}} Z_{\mathrm{n1,1}} - c_{\mathrm{W}} Z_{\mathrm{n1,2}}\right) Z_{\mathrm{n2,3}} + s_\beta\left(s_{\mathrm{W}} Z_{\mathrm{n1,1}} - c_{\mathrm{W}} Z_{\mathrm{n1,2}}\right) Z_{\mathrm{n2,4}} \end{bmatrix}$$

$$\underset{204}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^0_{n2}, H_{h3}\right) = \left[\begin{array}{l}
-\frac{ieU^H_{h3,1}}{2c_W s_W}\left(\begin{array}{l}\left(s_\alpha Z^*_{n1,3} + c_\alpha Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \\ s_\alpha\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,3} + \\ c_\alpha\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,4}\end{array}\right) + \\
\frac{eU^H_{h3,3}}{2c_W s_W}\left(\begin{array}{l}\left(s_\beta Z^*_{n1,3} - c_\beta Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \\ s_\beta\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,3} - \\ \left(c_\beta s_W Z^*_{n1,1} - c_W c_\beta Z^*_{n1,2}\right) Z^*_{n2,4}\end{array}\right) + \\
\frac{ieU^H_{h3,2}}{2c_W s_W}\left(\begin{array}{l}\left(c_\alpha Z^*_{n1,3} - s_\alpha Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \\ c_\alpha\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,3} - \\ \left(s_W s_\alpha Z^*_{n1,1} - c_W s_\alpha Z^*_{n1,2}\right) Z^*_{n2,4}\end{array}\right) \\
\hline
-\frac{ieU^H_{h3,1}}{2c_W s_W}\left(\begin{array}{l}\left(s_\alpha Z_{n1,3} + c_\alpha Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \\ \left(s_W s_\alpha Z_{n1,1} - c_W s_\alpha Z_{n1,2}\right) Z_{n2,3} + \\ \left(c_\alpha s_W Z_{n1,1} - c_W c_\alpha Z_{n1,2}\right) Z_{n2,4}\end{array}\right) - \\
\frac{eU^H_{h3,3}}{2c_W s_W}\left(\begin{array}{l}\left(s_\beta Z_{n1,3} - c_\beta Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \\ s_\beta\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,3} - \\ \left(c_\beta s_W Z_{n1,1} - c_W c_\beta Z_{n1,2}\right) Z_{n2,4}\end{array}\right) + \\
\frac{ieU^H_{h3,2}}{2c_W s_W}\left(\begin{array}{l}\left(c_\alpha Z_{n1,3} - s_\alpha Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \\ c_\alpha\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,3} - \\ \left(s_W s_\alpha Z_{n1,1} - c_W s_\alpha Z_{n1,2}\right) Z_{n2,4}\end{array}\right)
\end{array}\right]$$

$$\underset{205}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^0_{n2}, \hat{H}_{h3}\right) = \left[\begin{array}{l} -\frac{ieZ^H_{h3,1}}{2c_W s_W}\left(\begin{array}{l}\left(s_\alpha Z^*_{n1,3} + c_\alpha Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \\ s_\alpha\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,3} + \\ c_\alpha\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,4}\end{array}\right) + \\ \frac{eZ^H_{h3,3}}{2c_W s_W}\left(\begin{array}{l}\left(s_\beta Z^*_{n1,3} - c_\beta Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \\ s_\beta\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,3} - \\ \left(c_\beta s_W Z^*_{n1,1} - c_W c_\beta Z^*_{n1,2}\right) Z^*_{n2,4}\end{array}\right) + \\ \frac{ieZ^H_{h3,2}}{2c_W s_W}\left(\begin{array}{l}\left(c_\alpha Z^*_{n1,3} - s_\alpha Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + \\ c_\alpha\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,3} - \\ \left(s_W s_\alpha Z^*_{n1,1} - c_W s_\alpha Z^*_{n1,2}\right) Z^*_{n2,4}\end{array}\right) \\ \hline -\frac{ieZ^H_{h3,1}}{2c_W s_W}\left(\begin{array}{l}\left(s_\alpha Z_{n1,3} + c_\alpha Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \\ \left(s_W s_\alpha Z_{n1,1} - c_W s_\alpha Z_{n1,2}\right) Z_{n2,3} + \\ \left(c_\alpha s_W Z_{n1,1} - c_W c_\alpha Z_{n1,2}\right) Z_{n2,4}\end{array}\right) - \\ \frac{eZ^H_{h3,3}}{2c_W s_W}\left(\begin{array}{l}\left(s_\beta Z_{n1,3} - c_\beta Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \\ s_\beta\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,3} - \\ \left(c_\beta s_W Z_{n1,1} - c_W c_\beta Z_{n1,2}\right) Z_{n2,4}\end{array}\right) + \\ \frac{ieZ^H_{h3,2}}{2c_W s_W}\left(\begin{array}{l}\left(c_\alpha Z_{n1,3} - s_\alpha Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \\ c_\alpha\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,3} - \\ \left(s_W s_\alpha Z_{n1,1} - c_W s_\alpha Z_{n1,2}\right) Z_{n2,4}\end{array}\right) \end{array}\right]$$

[FFS] 2 Quarks – Higgs

$$\underset{66}{C}\left(u_{g1}, \overline{u}_{g2}, G^0\right) = \frac{e\delta_{g1,g2} m_{u_{g1}}}{2M_W s_W}\left[\begin{array}{c} 1 \\ \hline -1 \end{array}\right]$$

$$\underset{67}{C}\left(d_{g1}, \overline{d}_{g2}, G^0\right) = \frac{e\delta_{g1,g2} m_{d_{g1}}}{2M_W s_W}\left[\begin{array}{c} -1 \\ \hline 1 \end{array}\right]$$

$$C_{81}\left(u_{g1}, \overline{d}_{g2}, G^{-}\right) = \frac{\mathrm{i}e\mathrm{CKM}^{*}_{g1,g2}}{\sqrt{2}M_{W}s_{W}}\begin{bmatrix} -m_{d_{g2}} \\ \hline m_{u_{g1}} \end{bmatrix}$$

$$C_{82}\left(d_{g1}, \overline{u}_{g2}, G^{+}\right) = \frac{\mathrm{i}e\mathrm{CKM}_{g2,g1}}{\sqrt{2}M_{W}s_{W}}\begin{bmatrix} m_{u_{g2}} \\ \hline -m_{d_{g1}} \end{bmatrix}$$

$$C_{85}\left(u_{g1}, \overline{d}_{g2}, H^{-}\right) = \frac{\mathrm{i}e\mathrm{CKM}^{*}_{g1,g2}}{\sqrt{2}M_{W}s_{W}}\begin{bmatrix} m_{d_{g2}}t_{\beta} \\ \hline \frac{m_{u_{g1}}}{t_{\beta}} \end{bmatrix}$$

$$C_{86}\left(d_{g1}, \overline{u}_{g2}, H^{+}\right) = \frac{\mathrm{i}e\mathrm{CKM}_{g2,g1}}{\sqrt{2}M_{W}s_{W}}\begin{bmatrix} \frac{m_{u_{g2}}}{t_{\beta}} \\ \hline m_{d_{g1}}t_{\beta} \end{bmatrix}$$

$$C_{200}\left(u_{g1}, \overline{u}_{g2}, H_{h3}\right) = \begin{bmatrix} -\frac{\mathrm{i}e\delta_{g1,g2}c_{\alpha}m_{u_{g1}}U^{H}_{h3,1}}{2M_{W}s_{W}s_{\beta}} - \frac{\mathrm{i}e\delta_{g1,g2}m_{u_{g1}}s_{\alpha}U^{H}_{h3,2}}{2M_{W}s_{W}s_{\beta}} + \frac{e\delta_{g1,g2}m_{u_{g1}}U^{H}_{h3,3}}{2M_{W}s_{W}t_{\beta}} \\ \hline -\frac{\mathrm{i}e\delta_{g1,g2}c_{\alpha}m_{u_{g1}}U^{H}_{h3,1}}{2M_{W}s_{W}s_{\beta}} - \frac{\mathrm{i}e\delta_{g1,g2}m_{u_{g1}}s_{\alpha}U^{H}_{h3,2}}{2M_{W}s_{W}s_{\beta}} - \frac{e\delta_{g1,g2}m_{u_{g1}}U^{H}_{h3,3}}{2M_{W}s_{W}t_{\beta}} \end{bmatrix}$$

$$\underset{201}{C}\left(u_{g1},\overline{u}_{g2},\hat{H}_{h3}\right) = \begin{bmatrix} -\frac{ie\delta_{g1,g2}c_\alpha m_{u_{g1}} Z^{H}_{h3,1}}{2M_W s_W s_\beta} - \frac{ie\delta_{g1,g2} m_{u_{g1}} s_\alpha Z^{H}_{h3,2}}{2M_W s_W s_\beta} + \frac{e\delta_{g1,g2} m_{u_{g1}} Z^{H}_{h3,3}}{2M_W s_W t_\beta} \\ -\frac{ie\delta_{g1,g2}c_\alpha m_{u_{g1}} Z^{H}_{h3,1}}{2M_W s_W s_\beta} - \frac{ie\delta_{g1,g2} m_{u_{g1}} s_\alpha Z^{H}_{h3,2}}{2M_W s_W s_\beta} - \frac{e\delta_{g1,g2} m_{u_{g1}} Z^{H}_{h3,3}}{2M_W s_W t_\beta} \end{bmatrix}$$

$$\underset{202}{C}\left(d_{g1},\overline{d}_{g2},H_{h3}\right) = \begin{bmatrix} \frac{ie\delta_{g1,g2} m_{d_{g1}} s_\alpha U^{H}_{h3,1}}{2c_\beta M_W s_W} - \frac{ie\delta_{g1,g2}c_\alpha m_{d_{g1}} U^{H}_{h3,2}}{2c_\beta M_W s_W} + \frac{e\delta_{g1,g2} m_{d_{g1}} t_\beta U^{H}_{h3,3}}{2M_W s_W} \\ \frac{ie\delta_{g1,g2} m_{d_{g1}} s_\alpha U^{H}_{h3,1}}{2c_\beta M_W s_W} - \frac{ie\delta_{g1,g2}c_\alpha m_{d_{g1}} U^{H}_{h3,2}}{2c_\beta M_W s_W} - \frac{e\delta_{g1,g2} m_{d_{g1}} t_\beta U^{H}_{h3,3}}{2M_W s_W} \end{bmatrix}$$

$$\underset{203}{C}\left(d_{g1}, \bar{d}_{g2}, \hat{H}_{h3}\right) = \begin{bmatrix} \frac{ie\delta_{g1,g2} m_{d_{g1}} s_\alpha Z^H_{h3,1}}{2 c_\beta M_W s_W} - \frac{ie\delta_{g1,g2} c_\alpha m_{d_{g1}} Z^H_{h3,2}}{2 c_\beta M_W s_W} + \frac{e\delta_{g1,g2} m_{d_{g1}} t_\beta Z^H_{h3,3}}{2 M_W s_W} \\ \hline \frac{ie\delta_{g1,g2} m_{d_{g1}} s_\alpha Z^H_{h3,1}}{2 c_\beta M_W s_W} - \frac{ie\delta_{g1,g2} c_\alpha m_{d_{g1}} Z^H_{h3,2}}{2 c_\beta M_W s_W} - \frac{e\delta_{g1,g2} m_{d_{g1}} t_\beta Z^H_{h3,3}}{2 M_W s_W} \end{bmatrix}$$

[FFV] Chargino – Neutralino – Gauge Boson

$$\underset{132}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^+_{c2}, W^-\right) = \frac{ie}{s_W} \begin{bmatrix} -\frac{Z_{n1,4} V^*_{c2,2}}{\sqrt{2}} + Z_{n1,2} V^*_{c2,1} \\ \hline \frac{U_{c2,2} Z^*_{n1,3}}{\sqrt{2}} + U_{c2,1} Z^*_{n1,2} \end{bmatrix}$$

$$\underset{133}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^0_{n2}, W^+\right) = \frac{ie}{s_W} \begin{bmatrix} -\frac{V_{c1,2} Z^*_{n2,4}}{\sqrt{2}} + V_{c1,1} Z^*_{n2,2} \\ \hline \frac{Z_{n2,3} U^*_{c1,2}}{\sqrt{2}} + Z_{n2,2} U^*_{c1,1} \end{bmatrix}$$

[FFV] 2 Charginos – Gauge Boson

$$\underset{134}{C}\left(\tilde{\chi}^+_{c1}, \tilde{\chi}^-_{c2}, \gamma\right) = ie \begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$\underset{135}{C}\left(\tilde{\chi}^+_{c1}, \tilde{\chi}^-_{c2}, Z\right) = -\frac{ie}{c_W s_W} \begin{bmatrix} -\left(\frac{1}{2} U_{c1,2} U^*_{c2,2}\right) + s^2_W - U_{c1,1} U^*_{c2,1} \\ \hline -\left(\frac{1}{2} V_{c2,2} V^*_{c1,2}\right) + s^2_W - V_{c2,1} V^*_{c1,1} \end{bmatrix}$$

[FFV] 2 Leptons – Gauge Boson

$$\underset{68}{C}\left(\bar{e}_{g1}, e_{g2}, \gamma\right) = \mathrm{i}e\delta_{g1,g2}\begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$\underset{71}{C}\left(\bar{\nu}_{g1}, \nu_{g2}, Z\right) = -\frac{\mathrm{i}e\delta_{g1,g2}}{2c_W s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{72}{C}\left(\bar{e}_{g1}, e_{g2}, Z\right) = -\frac{\mathrm{i}e\delta_{g1,g2}}{c_W}\begin{bmatrix} -\frac{1}{s_W}\left(\frac{1}{2} - s_W^2\right) \\ \hline s_W \end{bmatrix}$$

$$\underset{77}{C}\left(\bar{e}_{g1}, \nu_{g2}, W^-\right) = -\frac{\mathrm{i}e\delta_{g1,g2}}{\sqrt{2}s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{78}{C}\left(\bar{\nu}_{g1}, e_{g2}, W^+\right) = -\frac{\mathrm{i}e\delta_{g1,g2}}{\sqrt{2}s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

[FFV] 2 Neutralinos – Gauge Boson

$$\underset{131}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^0_{n2}, Z\right) = \frac{\mathrm{i}e}{2c_W s_W}\begin{bmatrix} -Z_{n1,3}Z^*_{n2,3} + Z_{n1,4}Z^*_{n2,4} \\ \hline Z_{n2,3}Z^*_{n1,3} - Z_{n2,4}Z^*_{n1,4} \end{bmatrix}$$

[FFV] 2 Quarks – Gauge Boson

$$\underset{69}{C}\left(\bar{u}_{g1}, u_{g2}, \gamma\right) = -\frac{2}{3}\mathrm{i}e\delta_{g1,g2}\begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$C_{70}\left(\overline{d}_{g1}, d_{g2}, \gamma\right) = \frac{1}{3} i e \delta_{g1,g2} \begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$C_{73}\left(\overline{u}_{g1}, u_{g2}, Z\right) = \frac{i e \delta_{g1,g2}}{c_W} \begin{bmatrix} -\frac{1}{6 s_W}\left(3 - 4 s_W^2\right) \\ \hline \frac{2 s_W}{3} \end{bmatrix}$$

$$C_{74}\left(\overline{d}_{g1}, d_{g2}, Z\right) = -\frac{i e \delta_{g1,g2}}{c_W} \begin{bmatrix} -\frac{1}{6 s_W}\left(3 - 2 s_W^2\right) \\ \hline \frac{s_W}{3} \end{bmatrix}$$

$$C_{83}\left(\overline{d}_{g1}, u_{g2}, W^-\right) = -\frac{i e \mathrm{CKM}^*_{g2,g1}}{\sqrt{2} s_W} \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$C_{84}\left(\overline{u}_{g1}, d_{g2}, W^+\right) = -\frac{i e \mathrm{CKM}_{g1,g2}}{\sqrt{2} s_W} \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

[SSS] 3 Higgs

$$C_{87}\left(G^0, \tilde{e}^{s2}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[-\frac{e \delta_{g2,g3} m_{e_{g2}}}{2 M_W s_W} \left(\left(\mu t_\beta - A^{e*}_{g2,g2} \right) U^{\tilde{e}_{g2}*}_{s2,2} U^{\tilde{e}_{g2}}_{s3,1} - \left(t_\beta \mu^* - A^{e}_{g2,g2} \right) U^{\tilde{e}_{g2}*}_{s2,1} U^{\tilde{e}_{g2}}_{s3,2} \right) \right]$$

$$C_{88}\left(G^0, \tilde{u}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[\frac{e \delta_{g2,g3} m_{u_{g2}}}{2 M_W s_W t_\beta} \left(\left(\mu - t_\beta A^{u*}_{g2,g2} \right) U^{\tilde{u}_{g2}*}_{s2,2} U^{\tilde{u}_{g2}}_{s3,1} - \left(\mu^* - t_\beta A^{u}_{g2,g2} \right) U^{\tilde{u}_{g2}*}_{s2,1} U^{\tilde{u}_{g2}}_{s3,2} \right) \right]$$

$$C_{89}\left(G^0, \tilde{d}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left[-\frac{e \delta_{g2,g3} m_{d_{g2}}}{2 M_W s_W} \left(\left(\mu t_\beta - A^{d*}_{g2,g2} \right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \left(t_\beta \mu^* - A^{d}_{g2,g2} \right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \right) \right]$$

$$C_{90}\left(H^+, \tilde{d}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[\frac{i e \mathrm{CKM}_{g3,g2}}{\sqrt{2} M_W s_W t_\beta} \begin{pmatrix} \left(\left(m^2_{u_{g3}} + t_\beta \left(t_\beta m^2_{d_{g2}} - s_{2\beta} M_W^2 \right) \right) U^{\tilde{u}_{g3}}_{s3,1} + \\ m_{u_{g3}} \left(t_\beta \mu^* + A^{u}_{g3,g3} \right) U^{\tilde{u}_{g3}}_{s3,2} \end{pmatrix} U^{\tilde{d}_{g2}*}_{s2,1} + \\ m_{d_{g2}} U^{\tilde{d}_{g2}*}_{s2,2} \left(t_\beta \left(\mu + t_\beta A^{d*}_{g2,g2} \right) U^{\tilde{u}_{g3}}_{s3,1} + m_{u_{g3}} \left(1 + t_\beta^2 \right) U^{\tilde{u}_{g3}}_{s3,2} \right) \end{pmatrix} \right]$$

$$\underset{91}{C}\left(H^-, \tilde{u}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left[\begin{array}{l} \frac{ie\mathrm{CKM}^*_{g2,g3}}{\sqrt{2}M_W s_W t_\beta}\left(\begin{array}{l}\left(\begin{array}{l}\left(m^2_{u_{g2}} + t_\beta\left(t_\beta m^2_{d_{g3}} - s_{2\beta}M^2_W\right)\right)U^{\tilde{d}_{g3}}_{s3,1} + \\ m_{d_{g3}}t_\beta\left(\mu^* + t_\beta A^d_{g3,g3}\right)U^{\tilde{d}_{g3}}_{s3,2}\end{array}\right)U^{\tilde{u}_{g2}*}_{s2,1} + \\ m_{u_{g2}}U^{\tilde{u}_{g2}*}_{s2,2}\left(\left(\mu t_\beta + A^{u*}_{g2,g2}\right)U^{\tilde{d}_{g3}}_{s3,1} + m_{d_{g3}}\left(1+t^2_\beta\right)U^{\tilde{d}_{g3}}_{s3,2}\right)\end{array}\right)\end{array}\right]$$

$$\underset{92}{C}\left(H^+, \tilde{e}^{s2}_{g2}, \tilde{\nu}^\dagger_{g3}\right) = \left[\frac{ie\delta_{g2,g3}}{\sqrt{2}M_W s_W}\left(\left(t_\beta m^2_{e_{g3}} - s_{2\beta}M^2_W\right)U^{\tilde{e}_{g3}*}_{s2,1} + m_{e_{g3}}\left(\mu + t_\beta A^{e*}_{g3,g3}\right)U^{\tilde{e}_{g3}*}_{s2,2}\right)\right]$$

$$\underset{93}{C}\left(H^-, \tilde{\nu}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[\frac{ie\delta_{g2,g3}}{\sqrt{2}M_W s_W}\left(\left(t_\beta m^2_{e_{g2}} - s_{2\beta}M^2_W\right)U^{\tilde{e}_{g2}}_{s3,1} + m_{e_{g2}}\left(\mu^* + t_\beta A^e_{g2,g2}\right)U^{\tilde{e}_{g2}}_{s3,2}\right)\right]$$

$$\underset{94}{C}\left(G^+, \tilde{d}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[\begin{array}{l}\frac{ie\mathrm{CKM}_{g3,g2}}{\sqrt{2}M_W s_W t_\beta}\left(\begin{array}{l}m_{d_{g2}}t_\beta\left(\mu t_\beta - A^{d*}_{g2,g2}\right)U^{\tilde{d}_{g2}*}_{s2,2}U^{\tilde{u}_{g3}}_{s3,1} - \\ U^{\tilde{d}_{g2}*}_{s2,1}\left(t_\beta\left(m^2_{d_{g2}} - m^2_{u_{g3}} - c_{2\beta}M^2_W\right)U^{\tilde{u}_{g3}}_{s3,1} + m_{u_{g3}}\left(\mu^* - t_\beta A^u_{g3,g3}\right)U^{\tilde{u}_{g3}}_{s3,2}\right)\end{array}\right)\end{array}\right]$$

$$\underset{95}{C}\left(G^-, \tilde{u}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left[-\frac{ie\mathrm{CKM}^*_{g2,g3}}{\sqrt{2}M_W s_W t_\beta}\left(\begin{array}{l}m_{u_{g2}}\left(\mu - t_\beta A^{u*}_{g2,g2}\right)U^{\tilde{u}_{g2}*}_{s2,2}U^{\tilde{d}_{g3}}_{s3,1} + \\ t_\beta U^{\tilde{u}_{g2}*}_{s2,1}\left(\left(m^2_{\tilde{d}_{g3}} - m^2_{u_{g2}} - c_{2\beta}M^2_W\right)U^{\tilde{d}_{g3}}_{s3,1} - m_{d_{g3}}\left(t_\beta\mu^* - A^d_{g3,g3}\right)U^{\tilde{d}_{g3}}_{s3,2}\right)\end{array}\right)\right]$$

$$\underset{96}{C}\left(G^+, \tilde{e}^{s2}_{g2}, \tilde{\nu}^\dagger_{g3}\right) = \left[-\frac{ie\delta_{g2,g3}}{\sqrt{2}M_W s_W}\left(\left(m^2_{e_{g3}} - c_{2\beta}M^2_W\right)U^{\tilde{e}_{g3}*}_{s2,1} - m_{e_{g3}}\left(\mu t_\beta - A^{e*}_{g3,g3}\right)U^{\tilde{e}_{g3}*}_{s2,2}\right)\right]$$

$$\underset{97}{C}\left(G^-, \tilde{\nu}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[-\frac{ie\delta_{g2,g3}}{\sqrt{2}M_W s_W}\left(\left(m^2_{e_{g2}} - c_{2\beta}M^2_W\right)U^{\tilde{e}_{g2}}_{s3,1} - m_{e_{g2}}\left(t_\beta\mu^* - A^e_{g2,g2}\right)U^{\tilde{e}_{g2}}_{s3,2}\right)\right]$$

$$\underset{208}{C}\left(H_{h1}, G^0, G^0\right) = \left[\frac{iec_{2\beta}M_W s_{\alpha+\beta}U^H_{h1,1}}{2s_W c^2_W} - \frac{iec_{2\beta}c_{\alpha+\beta}M_W U^H_{h1,2}}{2s_W c^2_W}\right]$$

$$\underset{209}{C}\left(\hat{H}_{h1}, G^0, G^0\right) = \left[\frac{iec_{2\beta}M_W s_{\alpha+\beta}Z^H_{h1,1}}{2s_W c^2_W} - \frac{iec_{2\beta}c_{\alpha+\beta}M_W Z^H_{h1,2}}{2s_W c^2_W}\right]$$

$$\underset{214}{C}\left(H_{h1}, H^-, H^+\right) = \left[\begin{array}{l}-\frac{ieM_W U^H_{h1,1}}{s_W}\left(\frac{c_{2\beta}s_{\alpha+\beta}}{2c^2_W} + s_{\beta-\alpha}\right) + \\ \frac{ieM_W U^H_{h1,2}}{s_W}\left(\frac{c_{2\beta}c_{\alpha+\beta}}{2c^2_W} - c_{\beta-\alpha}\right)\end{array}\right]$$

$$\underset{215}{C}\left(\hat{H}_{h1}, H^-, H^+\right) = \left[\begin{array}{l}-\frac{ieM_W Z^H_{h1,1}}{s_W}\left(\frac{c_{2\beta}s_{\alpha+\beta}}{2c^2_W} + s_{\beta-\alpha}\right) + \\ \frac{ieM_W Z^H_{h1,2}}{s_W}\left(\frac{c_{2\beta}c_{\alpha+\beta}}{2c^2_W} - c_{\beta-\alpha}\right)\end{array}\right]$$

$$C_{216}\left(H_{h1}, H^-, G^+\right) = \left[\begin{array}{l} -\frac{ieM_W U^H_{h1,1}}{2s_W}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c_W^2} - c_{\beta-\alpha}\right) - \\ \frac{eM_W U^H_{h1,3}}{2s_W} - \frac{ieM_W U^H_{h1,2}}{2s_W}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c_W^2} - s_{\beta-\alpha}\right) \end{array}\right]$$

$$C_{217}\left(\hat{H}_{h1}, H^-, G^+\right) = \left[\begin{array}{l} -\frac{ieM_W Z^H_{h1,1}}{2s_W}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c_W^2} - c_{\beta-\alpha}\right) - \\ \frac{eM_W Z^H_{h1,3}}{2s_W} - \frac{ieM_W Z^H_{h1,2}}{2s_W}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c_W^2} - s_{\beta-\alpha}\right) \end{array}\right]$$

$$C_{222}\left(H_{h1}, G^-, H^+\right) = \left[\begin{array}{l} -\frac{ieM_W U^H_{h1,1}}{2s_W}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c_W^2} - c_{\beta-\alpha}\right) + \\ \frac{eM_W U^H_{h1,3}}{2s_W} + \frac{ieM_W U^H_{h1,2}}{2s_W}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c_W^2} - s_{\beta-\alpha}\right) \end{array}\right]$$

$$C_{223}\left(\hat{H}_{h1}, G^-, H^+\right) = \left[\begin{array}{l} -\frac{ieM_W Z^H_{h1,1}}{2s_W}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c_W^2} - c_{\beta-\alpha}\right) + \\ \frac{eM_W Z^H_{h1,3}}{2s_W} + \frac{ieM_W Z^H_{h1,2}}{2s_W}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c_W^2} - s_{\beta-\alpha}\right) \end{array}\right]$$

$$C_{224}\left(H_{h1}, G^-, G^+\right) = \left[\frac{iec_{2\beta}M_W s_{\alpha+\beta}U^H_{h1,1}}{2s_W c_W^2} - \frac{iec_{2\beta}c_{\alpha+\beta}M_W U^H_{h1,2}}{2s_W c_W^2}\right]$$

$$C_{225}\left(\hat{H}_{h1}, G^-, G^+\right) = \left[\frac{iec_{2\beta}M_W s_{\alpha+\beta}Z^H_{h1,1}}{2s_W c_W^2} - \frac{iec_{2\beta}c_{\alpha+\beta}M_W Z^H_{h1,2}}{2s_W c_W^2}\right]$$

$$C_{228}\left(H_{h1}, H_{h2}, G^0\right) = \left[\begin{array}{l} -\frac{ieM_W s_{2\beta}s_{\alpha+\beta}}{2s_W c_W^2}\left(U^H_{h1,3}U^H_{h2,1} + U^H_{h1,1}U^H_{h2,3}\right) + \\ \frac{iec_{\alpha+\beta}M_W s_{2\beta}}{2s_W c_W^2}\left(U^H_{h1,3}U^H_{h2,2} + U^H_{h1,2}U^H_{h2,3}\right) \end{array}\right]$$

$$C_{229}\left(\hat{H}_{h1}, H_{h2}, G^0\right) = \left[\begin{array}{l} -\frac{ieM_W s_{2\beta}s_{\alpha+\beta}}{2s_W c_W^2}\left(U^H_{h2,3}Z^H_{h1,1} + U^H_{h2,1}Z^H_{h1,3}\right) + \\ \frac{iec_{\alpha+\beta}M_W s_{2\beta}}{2s_W c_W^2}\left(U^H_{h2,3}Z^H_{h1,2} + U^H_{h2,2}Z^H_{h1,3}\right) \end{array}\right]$$

$$C_{230}\left(\hat{H}_{h1}, \hat{H}_{h2}, G^0\right) = \left[\begin{array}{l} -\frac{ieM_W s_{2\beta}s_{\alpha+\beta}}{2s_W c_W^2}\left(Z^H_{h1,3}Z^H_{h2,1} + Z^H_{h1,1}Z^H_{h2,3}\right) + \\ \frac{iec_{\alpha+\beta}M_W s_{2\beta}}{2s_W c_W^2}\left(Z^H_{h1,3}Z^H_{h2,2} + Z^H_{h1,2}Z^H_{h2,3}\right) \end{array}\right]$$

$$
\underset{231}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, H_{\mathrm{h3}}\right) = \left[\begin{array}{l}
-\frac{3\mathrm{i}ec_{2\alpha}M_{\mathrm{W}}s_{\alpha+\beta}U^{\mathrm{H}}_{\mathrm{h1},1}U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},1}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}} - \\
\frac{3\mathrm{i}ec_{2\alpha}c_{\alpha+\beta}M_{\mathrm{W}}U^{\mathrm{H}}_{\mathrm{h1},2}U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},2}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}} + \\
\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(c_{2\alpha}c_{\alpha+\beta}-2s_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h1},2}U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},1}+U^{\mathrm{H}}_{\mathrm{h1},1}U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},1}+U^{\mathrm{H}}_{\mathrm{h1},1}U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},2}\right) + \\
\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(2c_{\alpha+\beta}s_{2\alpha}+c_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h1},2}U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},1}+U^{\mathrm{H}}_{\mathrm{h1},2}U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},2}+U^{\mathrm{H}}_{\mathrm{h1},1}U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},2}\right) - \\
\frac{\mathrm{i}ec_{2\beta}M_{\mathrm{W}}s_{\alpha+\beta}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h1},3}U^{\mathrm{H}}_{\mathrm{h2},3}U^{\mathrm{H}}_{\mathrm{h3},1}+U^{\mathrm{H}}_{\mathrm{h1},3}U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},3}+U^{\mathrm{H}}_{\mathrm{h1},1}U^{\mathrm{H}}_{\mathrm{h2},3}U^{\mathrm{H}}_{\mathrm{h3},3}\right) + \\
\frac{\mathrm{i}ec_{2\beta}c_{\alpha+\beta}M_{\mathrm{W}}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h1},3}U^{\mathrm{H}}_{\mathrm{h2},3}U^{\mathrm{H}}_{\mathrm{h3},2}+U^{\mathrm{H}}_{\mathrm{h1},3}U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},3}+U^{\mathrm{H}}_{\mathrm{h1},2}U^{\mathrm{H}}_{\mathrm{h2},3}U^{\mathrm{H}}_{\mathrm{h3},3}\right)
\end{array}\right]
$$

$$
\underset{232}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, H_{\mathrm{h3}}\right) = \left[\begin{array}{l}
-\frac{3\mathrm{i}ec_{2\alpha}M_{\mathrm{W}}s_{\alpha+\beta}U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},1}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}} - \\
\frac{3\mathrm{i}ec_{2\alpha}c_{\alpha+\beta}M_{\mathrm{W}}U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},2}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}} + \\
\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(c_{2\alpha}c_{\alpha+\beta}-2s_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},1}+U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},1}+U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},2}\right) + \\
\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(2c_{\alpha+\beta}s_{2\alpha}+c_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},1}+U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},2}+U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},2}\right) - \\
\frac{\mathrm{i}ec_{2\beta}M_{\mathrm{W}}s_{\alpha+\beta}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h2},3}U^{\mathrm{H}}_{\mathrm{h3},3}Z^{\mathrm{H}}_{\mathrm{h1},1}+U^{\mathrm{H}}_{\mathrm{h2},3}U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},3}+U^{\mathrm{H}}_{\mathrm{h2},1}U^{\mathrm{H}}_{\mathrm{h3},3}Z^{\mathrm{H}}_{\mathrm{h1},3}\right) + \\
\frac{\mathrm{i}ec_{2\beta}c_{\alpha+\beta}M_{\mathrm{W}}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h2},3}U^{\mathrm{H}}_{\mathrm{h3},3}Z^{\mathrm{H}}_{\mathrm{h1},2}+U^{\mathrm{H}}_{\mathrm{h2},3}U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},3}+U^{\mathrm{H}}_{\mathrm{h2},2}U^{\mathrm{H}}_{\mathrm{h3},3}Z^{\mathrm{H}}_{\mathrm{h1},3}\right)
\end{array}\right]
$$

$$
\underset{233}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, H_{\mathrm{h3}}\right) = \left[\begin{array}{l}
-\frac{3\mathrm{i}ec_{2\alpha}M_{\mathrm{W}}s_{\alpha+\beta}U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},1}Z^{\mathrm{H}}_{\mathrm{h2},1}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}} - \\
\frac{3\mathrm{i}ec_{2\alpha}c_{\alpha+\beta}M_{\mathrm{W}}U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},2}Z^{\mathrm{H}}_{\mathrm{h2},2}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}} + \\
\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(c_{2\alpha}c_{\alpha+\beta}-2s_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},1}Z^{\mathrm{H}}_{\mathrm{h2},1}+U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},2}Z^{\mathrm{H}}_{\mathrm{h2},1}+U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},1}Z^{\mathrm{H}}_{\mathrm{h2},2}\right) + \\
\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(2c_{\alpha+\beta}s_{2\alpha}+c_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},2}Z^{\mathrm{H}}_{\mathrm{h2},1}+U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},1}Z^{\mathrm{H}}_{\mathrm{h2},2}+U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},2}Z^{\mathrm{H}}_{\mathrm{h2},2}\right) - \\
\frac{\mathrm{i}ec_{2\beta}M_{\mathrm{W}}s_{\alpha+\beta}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h3},3}Z^{\mathrm{H}}_{\mathrm{h1},3}Z^{\mathrm{H}}_{\mathrm{h2},1}+U^{\mathrm{H}}_{\mathrm{h3},3}Z^{\mathrm{H}}_{\mathrm{h1},1}Z^{\mathrm{H}}_{\mathrm{h2},3}+U^{\mathrm{H}}_{\mathrm{h3},1}Z^{\mathrm{H}}_{\mathrm{h1},3}Z^{\mathrm{H}}_{\mathrm{h2},3}\right) + \\
\frac{\mathrm{i}ec_{2\beta}c_{\alpha+\beta}M_{\mathrm{W}}}{2s_{\mathrm{W}}c^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h3},3}Z^{\mathrm{H}}_{\mathrm{h1},3}Z^{\mathrm{H}}_{\mathrm{h2},2}+U^{\mathrm{H}}_{\mathrm{h3},3}Z^{\mathrm{H}}_{\mathrm{h1},2}Z^{\mathrm{H}}_{\mathrm{h2},3}+U^{\mathrm{H}}_{\mathrm{h3},2}Z^{\mathrm{H}}_{\mathrm{h1},3}Z^{\mathrm{H}}_{\mathrm{h2},3}\right)
\end{array}\right]
$$

$$
\underset{234}{C}\left(\hat{H}_{h1},\hat{H}_{h2},\hat{H}_{h3}\right) = \left[\begin{array}{l}
-\frac{3iec_{2\alpha}M_W s_{\alpha+\beta}Z^H_{h1,1}Z^H_{h2,1}Z^H_{h3,1}}{2s_W c_W^2} - \\
\frac{3iec_{2\alpha}c_{\alpha+\beta}M_W Z^H_{h1,2}Z^H_{h2,2}Z^H_{h3,2}}{2s_W c_W^2} + \\
\frac{ieM_W}{2s_W c_W^2}\left(c_{2\alpha}c_{\alpha+\beta}-2s_{2\alpha}s_{\alpha+\beta}\right)\left(Z^H_{h1,2}Z^H_{h2,1}Z^H_{h3,1}+Z^H_{h1,1}Z^H_{h2,2}Z^H_{h3,1}+Z^H_{h1,1}Z^H_{h2,1}Z^H_{h3,2}\right) + \\
\frac{ieM_W}{2s_W c_W^2}\left(2c_{\alpha+\beta}s_{2\alpha}+c_{2\alpha}s_{\alpha+\beta}\right)\left(Z^H_{h1,2}Z^H_{h2,2}Z^H_{h3,1}+Z^H_{h1,2}Z^H_{h2,1}Z^H_{h3,2}+Z^H_{h1,1}Z^H_{h2,2}Z^H_{h3,2}\right) - \\
\frac{iec_{2\beta}M_W s_{\alpha+\beta}}{2s_W c_W^2}\left(Z^H_{h1,3}Z^H_{h2,3}Z^H_{h3,1}+Z^H_{h1,3}Z^H_{h2,1}Z^H_{h3,3}+Z^H_{h1,1}Z^H_{h2,3}Z^H_{h3,3}\right) + \\
\frac{iec_{2\beta}c_{\alpha+\beta}M_W}{2s_W c_W^2}\left(Z^H_{h1,3}Z^H_{h2,3}Z^H_{h3,2}+Z^H_{h1,3}Z^H_{h2,2}Z^H_{h3,3}+Z^H_{h1,2}Z^H_{h2,3}Z^H_{h3,3}\right)
\end{array}\right]
$$

$$
\underset{238}{C}\left(H_{h1},\tilde{\nu}_{g2},\tilde{\nu}^{\dagger}_{g3}\right) = \left[\frac{ie\delta_{g2,g3}M_Z s_{\alpha+\beta}U^H_{h1,1}}{2c_W s_W} - \frac{ie\delta_{g2,g3}c_{\alpha+\beta}M_Z U^H_{h1,2}}{2c_W s_W}\right]
$$

$$
\underset{239}{C}\left(\hat{H}_{h1},\tilde{\nu}_{g2},\tilde{\nu}^{\dagger}_{g3}\right) = \left[\frac{ie\delta_{g2,g3}M_Z s_{\alpha+\beta}Z^H_{h1,1}}{2c_W s_W} - \frac{ie\delta_{g2,g3}c_{\alpha+\beta}M_Z Z^H_{h1,2}}{2c_W s_W}\right]
$$

$$
\underset{240}{C}\left(H_{h1},\tilde{e}^{s2}_{g2},\tilde{e}^{s3,\dagger}_{g3}\right) = \left[\begin{array}{l}
\frac{ie\delta_{g2,g3}U^H_{h1,2}}{2c_W c_\beta M_W s_W}\left(\begin{array}{l}
\left(\begin{array}{l} c_W m_{e_{g2}}\left(\mu s_\alpha - c_\alpha A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}}_{s3,1} - \\ 2c_W c_\alpha m^2_{e_{g2}}U^{\tilde{e}_{g2}}_{s3,2} - 2c_{\alpha+\beta}c_\beta M_W M_Z s^2_W U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)U^{\tilde{e}_{g2}*}_{s2,2} - \\
\left(\begin{array}{l}\left(2c_W c_\alpha m^2_{e_{g2}} - c_{\alpha+\beta}c_\beta M_W M_Z\left(1-2s^2_W\right)\right)U^{\tilde{e}_{g2}}_{s3,1} - \\ c_W m_{e_{g2}}\left(s_\alpha\mu^* - c_\alpha A^e_{g2,g2}\right)U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)U^{\tilde{e}_{g2}*}_{s2,1}
\end{array}\right) + \\
\frac{ie\delta_{g2,g3}U^H_{h1,1}}{2c_W c_\beta M_W s_W}\left(\begin{array}{l}
\left(\begin{array}{l} c_W m_{e_{g2}}\left(\mu c_\alpha + s_\alpha A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}}_{s3,1} + \\ 2c_W s_\alpha m^2_{e_{g2}}U^{\tilde{e}_{g2}}_{s3,2} - 2c_\beta M_W M_Z s_{\alpha+\beta}s^2_W U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)U^{\tilde{e}_{g2}*}_{s2,2} + \\
\left(\begin{array}{l}\left(2c_W s_\alpha m^2_{e_{g2}} - c_\beta M_W M_Z s_{\alpha+\beta}\left(1-2s^2_W\right)\right)U^{\tilde{e}_{g2}}_{s3,1} + \\ c_W m_{e_{g2}}\left(c_\alpha\mu^* + s_\alpha A^e_{g2,g2}\right)U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)U^{\tilde{e}_{g2}*}_{s2,1}
\end{array}\right) - \\
\frac{e\delta_{g2,g3}m_{e_{g2}}U^H_{h1,3}}{2M_W s_W}\left(\begin{array}{l}\left(\mu + t_\beta A^{e*}_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,2}U^{\tilde{e}_{g2}}_{s3,1} - \\ \left(\mu^* + t_\beta A^e_{g2,g2}\right)U^{\tilde{e}_{g2}*}_{s2,1}U^{\tilde{e}_{g2}}_{s3,2}\end{array}\right)
\end{array}\right]
$$

$$
\underset{241}{C}\left(\hat{H}_{\mathrm{h1}}, \tilde{e}^{\mathrm{s2}}_{\mathrm{g2}}, \tilde{e}^{\mathrm{s3},\dagger}_{\mathrm{g3}}\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e\delta_{\mathrm{g2,g3}} Z^{\mathrm{H}}_{\mathrm{h1,2}}}{2c_{\mathrm{W}} c_\beta M_{\mathrm{W}} s_{\mathrm{W}}} \left(\begin{array}{l}
\left(\begin{array}{l} c_{\mathrm{W}} m_{e_{\mathrm{g2}}} \left(\mu s_\alpha - c_\alpha A^{e*}_{\mathrm{g2,g2}}\right) U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},1} - \\ 2c_{\mathrm{W}} c_\alpha m^2_{e_{\mathrm{g2}}} U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},2} - 2c_{\alpha+\beta} c_\beta M_{\mathrm{W}} M_{\mathrm{Z}} s^2_{\mathrm{W}} U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},2} \end{array}\right) U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{s2},2} - \\
\left(\begin{array}{l} \left(2c_{\mathrm{W}} c_\alpha m^2_{e_{\mathrm{g2}}} - c_{\alpha+\beta} c_\beta M_{\mathrm{W}} M_{\mathrm{Z}} \left(1 - 2s^2_{\mathrm{W}}\right)\right) U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},1} - \\ c_{\mathrm{W}} m_{e_{\mathrm{g2}}} \left(s_\alpha \mu^* - c_\alpha A^{e}_{\mathrm{g2,g2}}\right) U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},2} \end{array}\right) U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{s2},1}
\end{array}\right) + \\
\frac{\mathrm{i}e\delta_{\mathrm{g2,g3}} Z^{\mathrm{H}}_{\mathrm{h1,1}}}{2c_{\mathrm{W}} c_\beta M_{\mathrm{W}} s_{\mathrm{W}}} \left(\begin{array}{l}
\left(\begin{array}{l} c_{\mathrm{W}} m_{e_{\mathrm{g2}}} \left(\mu c_\alpha + s_\alpha A^{e*}_{\mathrm{g2,g2}}\right) U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},1} + \\ 2c_{\mathrm{W}} s_\alpha m^2_{e_{\mathrm{g2}}} U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},2} - 2c_\beta M_{\mathrm{W}} M_{\mathrm{Z}} s_{\alpha+\beta} s^2_{\mathrm{W}} U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},2} \end{array}\right) U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{s2},2} + \\
\left(\begin{array}{l} \left(2c_{\mathrm{W}} s_\alpha m^2_{e_{\mathrm{g2}}} - c_\beta M_{\mathrm{W}} M_{\mathrm{Z}} s_{\alpha+\beta} \left(1 - 2s^2_{\mathrm{W}}\right)\right) U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},1} + \\ c_{\mathrm{W}} m_{e_{\mathrm{g2}}} \left(c_\alpha \mu^* + s_\alpha A^{e}_{\mathrm{g2,g2}}\right) U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},2} \end{array}\right) U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{s2},1}
\end{array}\right) - \\
\frac{e\delta_{\mathrm{g2,g3}} m_{e_{\mathrm{g2}}} Z^{\mathrm{H}}_{\mathrm{h1,3}}}{2M_{\mathrm{W}} s_{\mathrm{W}}} \left(\begin{array}{l}
\left(\mu + t_\beta A^{e*}_{\mathrm{g2,g2}}\right) U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{s2},2} U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},1} - \\
\left(\mu^* + t_\beta A^{e}_{\mathrm{g2,g2}}\right) U^{\tilde{e}_{\mathrm{g2}}*}_{\mathrm{s2},1} U^{\tilde{e}_{\mathrm{g2}}}_{\mathrm{s3},2}
\end{array}\right)
\end{array}\right]
$$

$$
\underset{242}{C}\left(H_{\mathrm{h1}}, \tilde{u}^{\mathrm{s2}}_{\mathrm{g2}}, \tilde{u}^{\mathrm{s3},\dagger}_{\mathrm{g3}}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e\delta_{\mathrm{g2,g3}} U^{\mathrm{H}}_{\mathrm{h1,1}}}{6c_{\mathrm{W}} M_{\mathrm{W}} s_{\mathrm{W}} s_\beta} \left(\begin{array}{l}
\left(\begin{array}{l} 3c_{\mathrm{W}} m_{u_{\mathrm{g2}}} \left(\mu s_\alpha + c_\alpha A^{u*}_{\mathrm{g2,g2}}\right) U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},1} + \\ 6c_{\mathrm{W}} c_\alpha m^2_{u_{\mathrm{g2}}} U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},2} - 4M_{\mathrm{W}} M_{\mathrm{Z}} s_{\alpha+\beta} s_\beta s^2_{\mathrm{W}} U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},2} \end{array}\right) U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2},2} + \\
\left(\begin{array}{l} \left(6c_{\mathrm{W}} c_\alpha m^2_{u_{\mathrm{g2}}} - M_{\mathrm{W}} M_{\mathrm{Z}} s_{\alpha+\beta} s_\beta \left(3 - 4s^2_{\mathrm{W}}\right)\right) U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},1} + \\ 3c_{\mathrm{W}} m_{u_{\mathrm{g2}}} \left(s_\alpha \mu^* + c_\alpha A^{u}_{\mathrm{g2,g2}}\right) U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},2} \end{array}\right) U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2},1}
\end{array}\right) + \\
\frac{\mathrm{i}e\delta_{\mathrm{g2,g3}} U^{\mathrm{H}}_{\mathrm{h1,2}}}{6c_{\mathrm{W}} M_{\mathrm{W}} s_{\mathrm{W}} s_\beta} \left(\begin{array}{l}
\left(\begin{array}{l} 3c_{\mathrm{W}} m_{u_{\mathrm{g2}}} \left(\mu c_\alpha - s_\alpha A^{u*}_{\mathrm{g2,g2}}\right) U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},1} - \\ 6c_{\mathrm{W}} s_\alpha m^2_{u_{\mathrm{g2}}} U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},2} + 4c_{\alpha+\beta} M_{\mathrm{W}} M_{\mathrm{Z}} s_\beta s^2_{\mathrm{W}} U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},2} \end{array}\right) U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2},2} - \\
\left(\begin{array}{l} \left(6c_{\mathrm{W}} s_\alpha m^2_{u_{\mathrm{g2}}} + c_{\alpha+\beta} M_{\mathrm{W}} M_{\mathrm{Z}} s_\beta \left(3 - 4s^2_{\mathrm{W}}\right)\right) U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},1} - \\ 3c_{\mathrm{W}} m_{u_{\mathrm{g2}}} \left(c_\alpha \mu^* - s_\alpha A^{u}_{\mathrm{g2,g2}}\right) U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},2} \end{array}\right) U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2},1}
\end{array}\right) - \\
\frac{e\delta_{\mathrm{g2,g3}} m_{u_{\mathrm{g2}}} U^{\mathrm{H}}_{\mathrm{h1,3}}}{2M_{\mathrm{W}} s_{\mathrm{W}} t_\beta} \left(\begin{array}{l}
\left(\mu t_\beta + A^{u*}_{\mathrm{g2,g2}}\right) U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2},2} U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},1} - \\
\left(t_\beta \mu^* + A^{u}_{\mathrm{g2,g2}}\right) U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2},1} U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3},2}
\end{array}\right)
\end{array}\right]
$$

$$\underset{243}{C}\left(\hat{H}_{\mathrm{h1}}, \tilde{u}^{\mathrm{s2}}_{\mathrm{g2}}, \tilde{u}^{\mathrm{s3},\dagger}_{\mathrm{g3}}\right) = \left[\begin{array}{l}
-\dfrac{\mathrm{i}e\delta_{\mathrm{g2,g3}}Z^{\mathrm{H}}_{\mathrm{h1,1}}}{6c_{\mathrm{W}}M_{\mathrm{W}}s_{\mathrm{W}}s_{\beta}}\left(\begin{array}{l}\left(\begin{array}{l}3c_{\mathrm{W}}m_{u_{\mathrm{g2}}}\left(\mu s_{\alpha}+c_{\alpha}A^{u*}_{\mathrm{g2,g2}}\right)U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,1}}+\\ 6c_{\mathrm{W}}c_{\alpha}m^{2}_{u_{\mathrm{g2}}}U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,2}}-4M_{\mathrm{W}}M_{\mathrm{Z}}s_{\alpha+\beta}s_{\beta}s^{2}_{\mathrm{W}}U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2,2}}+\\ \left(\begin{array}{l}\left(6c_{\mathrm{W}}c_{\alpha}m^{2}_{u_{\mathrm{g2}}}-M_{\mathrm{W}}M_{\mathrm{Z}}s_{\alpha+\beta}s_{\beta}\left(3-4s^{2}_{\mathrm{W}}\right)\right)U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,1}}+\\ 3c_{\mathrm{W}}m_{u_{\mathrm{g2}}}\left(s_{\alpha}\mu^{*}+c_{\alpha}A^{u}_{\mathrm{g2,g2}}\right)U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2,1}}\end{array}\right)+\\
\dfrac{\mathrm{i}e\delta_{\mathrm{g2,g3}}Z^{\mathrm{H}}_{\mathrm{h1,2}}}{6c_{\mathrm{W}}M_{\mathrm{W}}s_{\mathrm{W}}s_{\beta}}\left(\begin{array}{l}\left(\begin{array}{l}3c_{\mathrm{W}}m_{u_{\mathrm{g2}}}\left(\mu c_{\alpha}-s_{\alpha}A^{u*}_{\mathrm{g2,g2}}\right)U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,1}}-\\ 6c_{\mathrm{W}}s_{\alpha}m^{2}_{u_{\mathrm{g2}}}U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,2}}+4c_{\alpha+\beta}M_{\mathrm{W}}M_{\mathrm{Z}}s_{\beta}s^{2}_{\mathrm{W}}U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2,2}}-\\ \left(\begin{array}{l}\left(6c_{\mathrm{W}}s_{\alpha}m^{2}_{u_{\mathrm{g2}}}+c_{\alpha+\beta}M_{\mathrm{W}}M_{\mathrm{Z}}s_{\beta}\left(3-4s^{2}_{\mathrm{W}}\right)\right)U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,1}}-\\ 3c_{\mathrm{W}}m_{u_{\mathrm{g2}}}\left(c_{\alpha}\mu^{*}-s_{\alpha}A^{u}_{\mathrm{g2,g2}}\right)U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2,1}}\end{array}\right)-\\
\dfrac{e\delta_{\mathrm{g2,g3}}m_{u_{\mathrm{g2}}}Z^{\mathrm{H}}_{\mathrm{h1,3}}}{2M_{\mathrm{W}}s_{\mathrm{W}}t_{\beta}}\left(\begin{array}{l}\left(\mu t_{\beta}+A^{u*}_{\mathrm{g2,g2}}\right)U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2,2}}U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,1}}-\\ \left(t_{\beta}\mu^{*}+A^{u}_{\mathrm{g2,g2}}\right)U^{\tilde{u}_{\mathrm{g2}}*}_{\mathrm{s2,1}}U^{\tilde{u}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)
\end{array}\right]$$

$$\underset{244}{C}\left(H_{\mathrm{h1}}, \tilde{d}^{\mathrm{s2}}_{\mathrm{g2}}, \tilde{d}^{\mathrm{s3},\dagger}_{\mathrm{g3}}\right) = \left[\begin{array}{l}
\dfrac{\mathrm{i}e\delta_{\mathrm{g2,g3}}U^{\mathrm{H}}_{\mathrm{h1,2}}}{6c_{\mathrm{W}}c_{\beta}M_{\mathrm{W}}s_{\mathrm{W}}}\left(\begin{array}{l}\left(\begin{array}{l}3c_{\mathrm{W}}m_{d_{\mathrm{g2}}}\left(\mu s_{\alpha}-c_{\alpha}A^{d*}_{\mathrm{g2,g2}}\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,1}}-\\ 6c_{\mathrm{W}}c_{\alpha}m^{2}_{d_{\mathrm{g2}}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,2}}-2c_{\alpha+\beta}c_{\beta}M_{\mathrm{W}}M_{\mathrm{Z}}s^{2}_{\mathrm{W}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)U^{\tilde{d}_{\mathrm{g2}}*}_{\mathrm{s2,2}}-\\ \left(\begin{array}{l}\left(6c_{\mathrm{W}}c_{\alpha}m^{2}_{d_{\mathrm{g2}}}-c_{\alpha+\beta}c_{\beta}M_{\mathrm{W}}M_{\mathrm{Z}}\left(3-2s^{2}_{\mathrm{W}}\right)\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,1}}-\\ 3c_{\mathrm{W}}m_{d_{\mathrm{g2}}}\left(s_{\alpha}\mu^{*}-c_{\alpha}A^{d}_{\mathrm{g2,g2}}\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)U^{\tilde{d}_{\mathrm{g2}}*}_{\mathrm{s2,1}}\end{array}\right)+\\
\dfrac{\mathrm{i}e\delta_{\mathrm{g2,g3}}U^{\mathrm{H}}_{\mathrm{h1,1}}}{6c_{\mathrm{W}}c_{\beta}M_{\mathrm{W}}s_{\mathrm{W}}}\left(\begin{array}{l}\left(\begin{array}{l}3c_{\mathrm{W}}m_{d_{\mathrm{g2}}}\left(\mu c_{\alpha}+s_{\alpha}A^{d*}_{\mathrm{g2,g2}}\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,1}}+\\ 6c_{\mathrm{W}}s_{\alpha}m^{2}_{d_{\mathrm{g2}}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,2}}-2c_{\beta}M_{\mathrm{W}}M_{\mathrm{Z}}s_{\alpha+\beta}s^{2}_{\mathrm{W}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)U^{\tilde{d}_{\mathrm{g2}}*}_{\mathrm{s2,2}}+\\ \left(\begin{array}{l}\left(6c_{\mathrm{W}}s_{\alpha}m^{2}_{d_{\mathrm{g2}}}-c_{\beta}M_{\mathrm{W}}M_{\mathrm{Z}}s_{\alpha+\beta}\left(3-2s^{2}_{\mathrm{W}}\right)\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,1}}+\\ 3c_{\mathrm{W}}m_{d_{\mathrm{g2}}}\left(c_{\alpha}\mu^{*}+s_{\alpha}A^{d}_{\mathrm{g2,g2}}\right)U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)U^{\tilde{d}_{\mathrm{g2}}*}_{\mathrm{s2,1}}\end{array}\right)-\\
\dfrac{e\delta_{\mathrm{g2,g3}}m_{d_{\mathrm{g2}}}U^{\mathrm{H}}_{\mathrm{h1,3}}}{2M_{\mathrm{W}}s_{\mathrm{W}}}\left(\begin{array}{l}\left(\mu+t_{\beta}A^{d*}_{\mathrm{g2,g2}}\right)U^{\tilde{d}_{\mathrm{g2}}*}_{\mathrm{s2,2}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,1}}-\\ \left(\mu^{*}+t_{\beta}A^{d}_{\mathrm{g2,g2}}\right)U^{\tilde{d}_{\mathrm{g2}}*}_{\mathrm{s2,1}}U^{\tilde{d}_{\mathrm{g2}}}_{\mathrm{s3,2}}\end{array}\right)
\end{array}\right]$$

$$\underset{245}{C}\left(\hat{H}_{h1}, \tilde{d}^{s2}_{g2}, \tilde{d}^{s3,\dagger}_{g3}\right) = \left[\begin{array}{l} \frac{ie\delta_{g2,g3}Z^{H}_{h1,2}}{6c_W c_\beta M_W s_W} \left(\begin{array}{l} \left(\begin{array}{l} 3c_W m_{d_{g2}} \left(\mu s_\alpha - c_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,1} - \\ 6c_W c_\alpha m^2_{d_{g2}} U^{\tilde{d}_{g2}}_{s3,2} - 2c_{\alpha+\beta} c_\beta M_W M_Z s^2_W U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) U^{\tilde{d}_{g2}*}_{s2,2} - \\ \left(\begin{array}{l} \left(6c_W c_\alpha m^2_{d_{g2}} - c_{\alpha+\beta} c_\beta M_W M_Z \left(3 - 2s^2_W\right)\right) U^{\tilde{d}_{g2}}_{s3,1} - \\ 3c_W m_{d_{g2}} \left(s_\alpha \mu^* - c_\alpha A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) U^{\tilde{d}_{g2}*}_{s2,1} \end{array} \right) + \\ \frac{ie\delta_{g2,g3}Z^{H}_{h1,1}}{6c_W c_\beta M_W s_W} \left(\begin{array}{l} \left(\begin{array}{l} 3c_W m_{d_{g2}} \left(\mu c_\alpha + s_\alpha A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,1} + \\ 6c_W s_\alpha m^2_{d_{g2}} U^{\tilde{d}_{g2}}_{s3,2} - 2c_\beta M_W M_Z s_{\alpha+\beta} s^2_W U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) U^{\tilde{d}_{g2}*}_{s2,2} + \\ \left(\begin{array}{l} \left(6c_W s_\alpha m^2_{d_{g2}} - c_\beta M_W M_Z s_{\alpha+\beta} \left(3 - 2s^2_W\right)\right) U^{\tilde{d}_{g2}}_{s3,1} + \\ 3c_W m_{d_{g2}} \left(c_\alpha \mu^* + s_\alpha A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) U^{\tilde{d}_{g2}*}_{s2,1} \end{array} \right) - \\ \frac{e\delta_{g2,g3} m_{d_{g2}} Z^{H}_{h1,3}}{2M_W s_W} \left(\begin{array}{l} \left(\mu + t_\beta A^{d*}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,2} U^{\tilde{d}_{g2}}_{s3,1} - \\ \left(\mu^* + t_\beta A^{d}_{g2,g2}\right) U^{\tilde{d}_{g2}*}_{s2,1} U^{\tilde{d}_{g2}}_{s3,2} \end{array} \right) \end{array} \right]$$

[SSV] 2 Higgs – Gauge Boson

$$\underset{1}{C}\left(G^-, G^+, \gamma\right) = \left[ie \right]$$

$$\underset{2}{C}\left(G^-, G^+, Z\right) = \left[\frac{ie}{2c_W s_W}\left(c^2_W - s^2_W\right) \right]$$

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

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

$$\underset{41}{C}\left(H^-, H^+, \gamma\right) = \left[ie \right]$$

$$\underset{42}{C}\left(H^-, H^+, Z\right) = \left[\frac{ie}{2c_W s_W}\left(c^2_W - s^2_W\right) \right]$$

$$\underset{98}{C}\left(\tilde{\nu}_{g1}, \tilde{\nu}^\dagger_{g2}, Z\right) = \left[-\frac{ie\delta_{g1,g2}}{2c_W s_W} \right]$$

$$\underset{99}{C}\left(\tilde{e}^{s1}_{g1}, \tilde{e}^{s2,\dagger}_{g2}, \gamma\right) = \left[ie\delta_{g1,g2}\delta_{s1,s2} \right]$$

$$\underset{100}{C}\left(\tilde{e}^{s1}_{g1}, \tilde{e}^{s2,\dagger}_{g2}, Z\right) = \left[\frac{ie\delta_{g1,g2}}{2c_W s_W}\left(\left(1-2s_W^2\right)U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g1}}_{s2,1} - 2s_W^2 U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g1}}_{s2,2}\right)\right]$$

$$\underset{101}{C}\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, \gamma\right) = \left[-\frac{2}{3}ie\delta_{g1,g2}\delta_{s1,s2}\right]$$

$$\underset{102}{C}\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, Z\right) = \left[-\frac{ie\delta_{g1,g2}}{6c_W s_W}\left(\left(3-4s_W^2\right)U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{u}_{g1}}_{s2,1} - 4s_W^2 U^{\tilde{u}_{g1}*}_{s1,2}U^{\tilde{u}_{g1}}_{s2,2}\right)\right]$$

$$\underset{103}{C}\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, \gamma\right) = \left[\frac{1}{3}ie\delta_{g1,g2}\delta_{s1,s2}\right]$$

$$\underset{104}{C}\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, Z\right) = \left[\frac{ie\delta_{g1,g2}}{6c_W s_W}\left(\left(3-2s_W^2\right)U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1} - 2s_W^2 U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\right]$$

$$\underset{105}{C}\left(\tilde{u}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, W^-\right) = \left[-\frac{ie\mathrm{CKM}^*_{g1,g2}U^{\tilde{u}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1}}{\sqrt{2}s_W}\right]$$

$$\underset{106}{C}\left(\tilde{d}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, W^+\right) = \left[-\frac{ie\mathrm{CKM}_{g2,g1}U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{u}_{g2}}_{s2,1}}{\sqrt{2}s_W}\right]$$

$$\underset{107}{C}\left(\tilde{\nu}_{g1}, \tilde{e}^{s2,\dagger}_{g2}, W^-\right) = \left[-\frac{ie\delta_{g1,g2}U^{\tilde{e}_{g1}}_{s2,1}}{\sqrt{2}s_W}\right]$$

$$\underset{108}{C}\left(\tilde{e}^{s1}_{g1}, \tilde{\nu}^{\dagger}_{g2}, W^+\right) = \left[-\frac{ie\delta_{g1,g2}U^{\tilde{e}_{g2}*}_{s1,1}}{\sqrt{2}s_W}\right]$$

$$\underset{210}{C}\left(H_{h1}, G^0, Z\right) = \left[\frac{es_{\beta-\alpha}U^H_{h1,1}}{2c_W s_W} + \frac{ec_{\beta-\alpha}U^H_{h1,2}}{2c_W s_W}\right]$$

$$\underset{211}{C}\left(\hat{H}_{h1}, G^0, Z\right) = \left[\frac{es_{\beta-\alpha}Z^H_{h1,1}}{2c_W s_W} + \frac{ec_{\beta-\alpha}Z^H_{h1,2}}{2c_W s_W}\right]$$

$$\underset{212}{C}\left(H_{h1}, H^+, W^-\right) = \left[\frac{iec_{\beta-\alpha}U^H_{h1,1}}{2s_W} - \frac{ies_{\beta-\alpha}U^H_{h1,2}}{2s_W} + \frac{eU^H_{h1,3}}{2s_W}\right]$$

$$\underset{213}{C}\left(\hat{H}_{h1}, H^+, W^-\right) = \left[\frac{iec_{\beta-\alpha}Z^H_{h1,1}}{2s_W} - \frac{ies_{\beta-\alpha}Z^H_{h1,2}}{2s_W} + \frac{eZ^H_{h1,3}}{2s_W}\right]$$

$$\underset{218}{C}\left(H_{h1}, H^-, W^+\right) = \left[-\frac{iec_{\beta-\alpha}U^H_{h1,1}}{2s_W} + \frac{ies_{\beta-\alpha}U^H_{h1,2}}{2s_W} + \frac{eU^H_{h1,3}}{2s_W}\right]$$

$$C_{219}\left(\hat{H}_{h1}, H^-, W^+\right) = \left[-\frac{\mathrm{i}ec_{\beta-\alpha}Z^H_{h1,1}}{2s_W} + \frac{\mathrm{i}es_{\beta-\alpha}Z^H_{h1,2}}{2s_W} + \frac{eZ^H_{h1,3}}{2s_W} \right]$$

$$C_{220}\left(H_{h1}, G^+, W^-\right) = \left[\frac{\mathrm{i}es_{\beta-\alpha}U^H_{h1,1}}{2s_W} + \frac{\mathrm{i}ec_{\beta-\alpha}U^H_{h1,2}}{2s_W} \right]$$

$$C_{221}\left(\hat{H}_{h1}, G^+, W^-\right) = \left[\frac{\mathrm{i}es_{\beta-\alpha}Z^H_{h1,1}}{2s_W} + \frac{\mathrm{i}ec_{\beta-\alpha}Z^H_{h1,2}}{2s_W} \right]$$

$$C_{226}\left(H_{h1}, G^-, W^+\right) = \left[-\frac{\mathrm{i}es_{\beta-\alpha}U^H_{h1,1}}{2s_W} - \frac{\mathrm{i}ec_{\beta-\alpha}U^H_{h1,2}}{2s_W} \right]$$

$$C_{227}\left(\hat{H}_{h1}, G^-, W^+\right) = \left[-\frac{\mathrm{i}es_{\beta-\alpha}Z^H_{h1,1}}{2s_W} - \frac{\mathrm{i}ec_{\beta-\alpha}Z^H_{h1,2}}{2s_W} \right]$$

$$C_{235}\left(H_{h1}, H_{h2}, Z\right) = \left[\begin{array}{l} -\frac{ec_{\beta-\alpha}}{2c_W s_W}\left(U^H_{h1,3}U^H_{h2,1} - U^H_{h1,1}U^H_{h2,3}\right) + \\ \frac{es_{\beta-\alpha}}{2c_W s_W}\left(U^H_{h1,3}U^H_{h2,2} - U^H_{h1,2}U^H_{h2,3}\right) \end{array} \right]$$

$$C_{236}\left(\hat{H}_{h1}, H_{h2}, Z\right) = \left[\begin{array}{l} \frac{ec_{\beta-\alpha}}{2c_W s_W}\left(U^H_{h2,3}Z^H_{h1,1} - U^H_{h2,1}Z^H_{h1,3}\right) - \\ \frac{es_{\beta-\alpha}}{2c_W s_W}\left(U^H_{h2,3}Z^H_{h1,2} - U^H_{h2,2}Z^H_{h1,3}\right) \end{array} \right]$$

$$C_{237}\left(\hat{H}_{h1}, \hat{H}_{h2}, Z\right) = \left[\begin{array}{l} -\frac{ec_{\beta-\alpha}}{2c_W s_W}\left(Z^H_{h1,3}Z^H_{h2,1} - Z^H_{h1,1}Z^H_{h2,3}\right) + \\ \frac{es_{\beta-\alpha}}{2c_W s_W}\left(Z^H_{h1,3}Z^H_{h2,2} - Z^H_{h1,2}Z^H_{h2,3}\right) \end{array} \right]$$

[SUU] Higgs – 2 Ghosts

$$C_{11}\left(G^0, u_-, \overline{u}_-\right) = \left[-\frac{e\xi_W M_W}{2s_W} \right]$$

$$C_{12}\left(G^0, u_+, \overline{u}_+\right) = \left[\frac{e\xi_W M_W}{2s_W} \right]$$

$$C_{13}\left(G^-, u_\gamma, \overline{u}_-\right) = \left[-\mathrm{i}e\xi_W M_W \right]$$

$$C_{14}\left(G^+, u_\gamma, \overline{u}_+\right) = \left[-\mathrm{i}e\xi_W M_W \right]$$

$$\underset{15}{C}\left(G^-, u_Z, \overline{u}_-\right) = \left[-\frac{ie\xi_W M_W}{2c_W s_W}\left(c_W^2 - s_W^2\right) \right]$$

$$\underset{16}{C}\left(G^+, u_Z, \overline{u}_+\right) = \left[-\frac{ie\xi_W M_W}{2c_W s_W}\left(c_W^2 - s_W^2\right) \right]$$

$$\underset{17}{C}\left(G^-, u_+, \overline{u}_Z\right) = \left[\frac{ie\xi_Z M_W}{2c_W s_W} \right]$$

$$\underset{18}{C}\left(G^+, u_-, \overline{u}_Z\right) = \left[\frac{ie\xi_Z M_W}{2c_W s_W} \right]$$

$$\underset{246}{C}\left(H_{h1}, u_Z, \overline{u}_Z\right) = \left[-\frac{ie\xi_Z M_W s_{\beta-\alpha} U^H_{h1,1}}{2s_W c_W^2} - \frac{ie\xi_Z c_{\beta-\alpha} M_W U^H_{h1,2}}{2s_W c_W^2} \right]$$

$$\underset{247}{C}\left(\hat{H}_{h1}, u_Z, \overline{u}_Z\right) = \left[-\frac{ie\xi_Z M_W s_{\beta-\alpha} Z^H_{h1,1}}{2s_W c_W^2} - \frac{ie\xi_Z c_{\beta-\alpha} M_W Z^H_{h1,2}}{2s_W c_W^2} \right]$$

$$\underset{248}{C}\left(H_{h1}, u_-, \overline{u}_-\right) = \left[-\frac{ie\xi_W M_W s_{\beta-\alpha} U^H_{h1,1}}{2s_W} - \frac{ie\xi_W c_{\beta-\alpha} M_W U^H_{h1,2}}{2s_W} \right]$$

$$\underset{249}{C}\left(\hat{H}_{h1}, u_-, \overline{u}_-\right) = \left[-\frac{ie\xi_W M_W s_{\beta-\alpha} Z^H_{h1,1}}{2s_W} - \frac{ie\xi_W c_{\beta-\alpha} M_W Z^H_{h1,2}}{2s_W} \right]$$

$$\underset{250}{C}\left(H_{h1}, u_+, \overline{u}_+\right) = \left[-\frac{ie\xi_W M_W s_{\beta-\alpha} U^H_{h1,1}}{2s_W} - \frac{ie\xi_W c_{\beta-\alpha} M_W U^H_{h1,2}}{2s_W} \right]$$

$$\underset{251}{C}\left(\hat{H}_{h1}, u_+, \overline{u}_+\right) = \left[-\frac{ie\xi_W M_W s_{\beta-\alpha} Z^H_{h1,1}}{2s_W} - \frac{ie\xi_W c_{\beta-\alpha} M_W Z^H_{h1,2}}{2s_W} \right]$$

[SVV] Higgs – 2 Gauge Bosons

$$\underset{5}{C}\left(G^-, \gamma, W^+\right) = \left[ieM_W \right]$$

$$\underset{6}{C}\left(G^+, \gamma, W^-\right) = \left[ieM_W \right]$$

$$\underset{7}{C}\left(G^-, Z, W^+\right) = \left[-\frac{ieM_W s_W}{c_W} \right]$$

$$C_{8}\left(G^{+},Z,W^{-}\right) = \left[-\frac{\mathrm{i}eM_{\mathrm{W}}s_{\mathrm{W}}}{c_{\mathrm{W}}} \right]$$

$$C_{252}\left(H_{\mathrm{h1}},Z,Z\right) = \left[\frac{\mathrm{i}eM_{\mathrm{W}}s_{\beta-\alpha}U^{\mathrm{H}}_{\mathrm{h1},1}}{s_{\mathrm{W}}c^{2}_{\mathrm{W}}} + \frac{\mathrm{i}ec_{\beta-\alpha}M_{\mathrm{W}}U^{\mathrm{H}}_{\mathrm{h1},2}}{s_{\mathrm{W}}c^{2}_{\mathrm{W}}} \right]$$

$$C_{253}\left(\hat{H}_{\mathrm{h1}},Z,Z\right) = \left[\frac{\mathrm{i}eM_{\mathrm{W}}s_{\beta-\alpha}Z^{\mathrm{H}}_{\mathrm{h1},1}}{s_{\mathrm{W}}c^{2}_{\mathrm{W}}} + \frac{\mathrm{i}ec_{\beta-\alpha}M_{\mathrm{W}}Z^{\mathrm{H}}_{\mathrm{h1},2}}{s_{\mathrm{W}}c^{2}_{\mathrm{W}}} \right]$$

$$C_{254}\left(H_{\mathrm{h1}},W^{-},W^{+}\right) = \left[\frac{\mathrm{i}eM_{\mathrm{W}}s_{\beta-\alpha}U^{\mathrm{H}}_{\mathrm{h1},1}}{s_{\mathrm{W}}} + \frac{\mathrm{i}ec_{\beta-\alpha}M_{\mathrm{W}}U^{\mathrm{H}}_{\mathrm{h1},2}}{s_{\mathrm{W}}} \right]$$

$$C_{255}\left(\hat{H}_{\mathrm{h1}},W^{-},W^{+}\right) = \left[\frac{\mathrm{i}eM_{\mathrm{W}}s_{\beta-\alpha}Z^{\mathrm{H}}_{\mathrm{h1},1}}{s_{\mathrm{W}}} + \frac{\mathrm{i}ec_{\beta-\alpha}M_{\mathrm{W}}Z^{\mathrm{H}}_{\mathrm{h1},2}}{s_{\mathrm{W}}} \right]$$

[UUV] 2 Ghosts – Gauge Boson

$$C_{19}\left(\overline{u}_{-},u_{-},\gamma\right) = -\mathrm{i}e \left[\begin{array}{c} 1 \\ \hline 0 \end{array} \right]$$

$$C_{20}\left(\overline{u}_{+},u_{+},\gamma\right) = \mathrm{i}e \left[\begin{array}{c} 1 \\ \hline 0 \end{array} \right]$$

$$C_{21}\left(\overline{u}_{-},u_{-},Z\right) = -\frac{\mathrm{i}ec_{\mathrm{W}}}{s_{\mathrm{W}}} \left[\begin{array}{c} 1 \\ \hline 0 \end{array} \right]$$

$$C_{22}\left(\overline{u}_{+},u_{+},Z\right) = \frac{\mathrm{i}ec_{\mathrm{W}}}{s_{\mathrm{W}}} \left[\begin{array}{c} 1 \\ \hline 0 \end{array} \right]$$

$$C_{23}\left(\overline{u}_{-},u_{\gamma},W^{-}\right) = \mathrm{i}e \left[\begin{array}{c} 1 \\ \hline 0 \end{array} \right]$$

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

$$C_{25}\left(\overline{u}_\gamma, u_+, W^-\right) = -ie\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{26}\left(\overline{u}_\gamma, u_-, W^+\right) = ie\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{27}\left(\overline{u}_-, u_Z, W^-\right) = \frac{iec_W}{s_W}\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{28}\left(\overline{u}_+, u_Z, W^+\right) = -\frac{iec_W}{s_W}\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{29}\left(\overline{u}_Z, u_+, W^-\right) = -\frac{iec_W}{s_W}\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

$$C_{30}\left(\overline{u}_Z, u_-, W^+\right) = \frac{iec_W}{s_W}\left[\begin{array}{c}1\\\hline 0\end{array}\right]$$

[VVV] 3 Gauge Bosons

$$C_{9}\left(\gamma, W^+, W^-\right) = \left[\begin{array}{c} -ie \end{array}\right]$$

$$C_{10}\left(Z, W^+, W^-\right) = \left[\begin{array}{c} -\frac{iec_W}{s_W} \end{array}\right]$$

[SSSS] 4 Higgs

$$C_{43}\left(G^0, G^0, G^0, G^0\right) = \left[-\frac{3ie^2 c_{2\beta}^2}{4c_W^2 s_W^2} \right]$$

$$C_{44}\left(G^0, G^0, H^-, H^+\right) = \left[-\frac{ie^2}{4s_W^2}\left(1 - \frac{c_{2\beta}^2 s_W^2}{c_W^2} + s_{2\beta}^2\right) \right]$$

$$C_{45}\left(G^0, G^0, H^-, G^+\right) = \left[\frac{ie^2 c_{2\beta} s_{2\beta}}{4c_W^2 s_W^2} \right]$$

$$C_{46}\left(G^0, G^0, G^-, H^+\right) = \left[\frac{ie^2 c_{2\beta} s_{2\beta}}{4c_W^2 s_W^2} \right]$$

$$C_{47}\left(G^0, G^0, G^-, G^+\right) = \left[-\frac{ie^2 c_{2\beta}^2}{4c_W^2 s_W^2} \right]$$

$$C_{48}\left(H^-, H^-, H^+, H^+\right) = \left[-\frac{ie^2 c_{2\beta}^2}{2c_W^2 s_W^2} \right]$$

$$C_{49}\left(H^-, H^-, H^+, G^+\right) = \left[-\frac{ie^2 c_{2\beta} s_{2\beta}}{2c_W^2 s_W^2} \right]$$

$$C_{50}\left(H^-, H^-, G^+, G^+\right) = \left[-\frac{ie^2 s_{2\beta}^2}{2c_W^2 s_W^2} \right]$$

$$C_{51}\left(H^-, G^-, H^+, H^+\right) = \left[-\frac{ie^2 c_{2\beta} s_{2\beta}}{2c_W^2 s_W^2} \right]$$

$$C_{52}\left(H^-, G^-, H^+, G^+\right) = \left[\frac{ie^2}{4c_W^2 s_W^2}\left(c_{2\beta}^2 - s_{2\beta}^2\right) \right]$$

$$C_{53}\left(H^-, G^-, G^+, G^+\right) = \left[\frac{ie^2 c_{2\beta} s_{2\beta}}{2c_W^2 s_W^2} \right]$$

$$C_{54}\left(G^-, G^-, H^+, H^+\right) = \left[-\frac{ie^2 s_{2\beta}^2}{2c_W^2 s_W^2} \right]$$

$$\underset{55}{C}\left(G^-, G^-, H^+, G^+\right) = \left[\frac{\mathrm{i}e^2 c_{2\beta} s_{2\beta}}{2 c_W^2 s_W^2} \right]$$

$$\underset{56}{C}\left(G^-, G^-, G^+, G^+\right) = \left[-\frac{\mathrm{i}e^2 c_{2\beta}^2}{2 c_W^2 s_W^2} \right]$$

$$\underset{136}{C}\left(G^0, G^0, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^{\dagger}\right) = \left[-\frac{\mathrm{i}e^2 \delta_{g3,g4} c_{2\beta}}{4 c_W^2 s_W^2} \right]$$

$$\underset{137}{C}\left(G^0, G^0, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[-\frac{\mathrm{i}e^2 \delta_{g3,g4}}{4 c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(2 c_W^2 m_{e_{g4}}^2 - c_{2\beta} M_W^2 \left(1 - 2 s_W^2\right)\right) U_{s3,1}^{\tilde{e}_{g4}*} U_{s4,1}^{\tilde{e}_{g4}} + \\ 2 \left(c_W^2 m_{e_{g4}}^2 - c_{2\beta} M_W^2 s_W^2\right) U_{s3,2}^{\tilde{e}_{g4}*} U_{s4,2}^{\tilde{e}_{g4}} \end{array} \right) \right]$$

$$\underset{138}{C}\left(G^0, G^0, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{\mathrm{i}e^2 \delta_{g3,g4}}{12 c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(6 c_W^2 m_{u_{g4}}^2 + c_{2\beta} M_W^2 \left(3 - 4 s_W^2\right)\right) U_{s3,1}^{\tilde{u}_{g4}*} U_{s4,1}^{\tilde{u}_{g4}} + \\ 2 \left(3 c_W^2 m_{u_{g4}}^2 + 2 c_{2\beta} M_W^2 s_W^2\right) U_{s3,2}^{\tilde{u}_{g4}*} U_{s4,2}^{\tilde{u}_{g4}} \end{array} \right) \right]$$

$$\underset{139}{C}\left(G^0, G^0, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{\mathrm{i}e^2 \delta_{g3,g4}}{12 c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(6 c_W^2 m_{d_{g4}}^2 - c_{2\beta} M_W^2 \left(3 - 2 s_W^2\right)\right) U_{s3,1}^{\tilde{d}_{g4}*} U_{s4,1}^{\tilde{d}_{g4}} + \\ 2 \left(3 c_W^2 m_{d_{g4}}^2 - c_{2\beta} M_W^2 s_W^2\right) U_{s3,2}^{\tilde{d}_{g4}*} U_{s4,2}^{\tilde{d}_{g4}} \end{array} \right) \right]$$

$$\underset{140}{C}\left(G^0, H^-, \tilde{u}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{e^2 \mathrm{CKM}_{g3,g4}^*}{2\sqrt{2} s_{2\beta} t_\beta M_W^2 s_W^2} \left(\begin{array}{l} s_{2\beta} \left(m_{u_{g3}}^2 + t_\beta \left(t_\beta m_{d_{g4}}^2 - s_{2\beta} M_W^2\right)\right) U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{d}_{g4}} - \\ 2 m_{d_{g4}} m_{u_{g3}} t_\beta U_{s3,2}^{\tilde{u}_{g3}*} U_{s4,2}^{\tilde{d}_{g4}} \end{array} \right) \right]$$

$$\underset{141}{C}\left(G^0, H^+, \tilde{d}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\frac{e^2 \mathrm{CKM}_{g4,g3}}{2\sqrt{2} s_{2\beta} t_\beta M_W^2 s_W^2} \left(\begin{array}{l} s_{2\beta} \left(m_{u_{g4}}^2 + t_\beta \left(t_\beta m_{d_{g3}}^2 - s_{2\beta} M_W^2\right)\right) U_{s3,1}^{\tilde{d}_{g3}*} U_{s4,1}^{\tilde{u}_{g4}} - \\ 2 m_{d_{g3}} m_{u_{g4}} t_\beta U_{s3,2}^{\tilde{d}_{g3}*} U_{s4,2}^{\tilde{u}_{g4}} \end{array} \right) \right]$$

$$\underset{142}{C}\left(G^0, G^-, \tilde{u}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[\frac{e^2 \mathrm{CKM}_{g3,g4}^* U_{s3,1}^{\tilde{u}_{g3}*} U_{s4,1}^{\tilde{d}_{g4}}}{2\sqrt{2} M_W^2 s_W^2} \left(m_{d_{g4}}^2 - m_{u_{g3}}^2 - c_{2\beta} M_W^2\right) \right]$$

$$\underset{143}{C}\left(G^0, G^+, \tilde{d}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{e^2 \mathrm{CKM}_{g4,g3} U_{s3,1}^{\tilde{d}_{g3}*} U_{s4,1}^{\tilde{u}_{g4}}}{2\sqrt{2} M_W^2 s_W^2} \left(m_{d_{g3}}^2 - m_{u_{g4}}^2 - c_{2\beta} M_W^2\right) \right]$$

$$\underset{144}{C}\left(G^0, H^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[-\frac{e^2 \delta_{g3,g4} U_{s4,1}^{\tilde{e}_{g3}}}{2\sqrt{2} s_W^2} \left(\frac{t_\beta m_{e_{g3}}^2}{M_W^2} - s_{2\beta}\right) \right]$$

$$C\left(G^0, H^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{e^2 \delta_{g3,g4} U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2} s_W^2} \left(\frac{t_\beta m^2_{e_{g4}}}{M_W^2} - s_{2\beta} \right) \right]$$

$$C\left(G^0, G^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{e^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2} s_W^2} \left(\frac{m^2_{e_{g3}}}{M_W^2} - c_{2\beta} \right) \right]$$

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

$$C\left(H^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g3,g4}}{2 s_W^2} \left(\frac{m^2_{e_{g3}} t_\beta^2}{M_W^2} + \left(\frac{1}{2} c_{2\beta} \right) \left(2 - \frac{1}{c_W^2} \right) \right) \right]$$

$$C\left(H^-, G^+, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{2 s_W^2} \left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - \left(\frac{1}{2} s_{2\beta} \right) \left(2 - \frac{1}{c_W^2} \right) \right) \right]$$

$$C\left(G^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{2 s_W^2} \left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - \left(\frac{1}{2} s_{2\beta} \right) \left(2 - \frac{1}{c_W^2} \right) \right) \right]$$

$$C\left(H^-, H^+, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{4 c_W^2 M_W^2 s_W^2} \left(c_{2\beta} M_W^2 U^{\tilde{e}_{g3}*}_{s3,1} U^{\tilde{e}_{g3}}_{s4,1} - 2 \left(c_{2\beta} M_W^2 s_W^2 + c_W^2 m^2_{e_{g3}} t_\beta^2 \right) U^{\tilde{e}_{g3}*}_{s3,2} U^{\tilde{e}_{g3}}_{s4,2} \right) \right]$$

$$C\left(H^-, G^+, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{2 s_W^2} \left(\begin{array}{l} s_{2\beta} \left(1 - \frac{1}{c_W^2} \left(\frac{1}{2} - s_W^2 \right) \right) U^{\tilde{e}_{g3}*}_{s3,1} U^{\tilde{e}_{g3}}_{s4,1} + \\ \left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - \frac{s_{2\beta} s_W^2}{c_W^2} \right) U^{\tilde{e}_{g3}*}_{s3,2} U^{\tilde{e}_{g3}}_{s4,2} \end{array} \right) \right]$$

$$C\left(G^-, H^+, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g3,g4}}{2 s_W^2} \left(\begin{array}{l} s_{2\beta} \left(1 - \frac{1}{c_W^2} \left(\frac{1}{2} - s_W^2 \right) \right) U^{\tilde{e}_{g3}*}_{s3,1} U^{\tilde{e}_{g3}}_{s4,1} + \\ \left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - \frac{s_{2\beta} s_W^2}{c_W^2} \right) U^{\tilde{e}_{g3}*}_{s3,2} U^{\tilde{e}_{g3}}_{s4,2} \end{array} \right) \right]$$

$$C\left(H^-, H^+, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{i e^2}{12 c_W^2 M_W^2 s_W^2 t_\beta^2} \left(\begin{array}{l} t_\beta^2 \left(\delta_{g3,g4} c_{2\beta} \left(1 + 2 c_W^2 \right) M_W^2 + 6 \left(\sum_{gn=1}^{3} CKM_{g4,gn} CKM^*_{g3,gn} m^2_{d_{gn}} \right) c_W^2 t_\beta^2 \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ 2 \delta_{g3,g4} \left(3 c_W^2 m^2_{u_{g3}} - 2 c_{2\beta} M_W^2 s_W^2 t_\beta^2 \right) U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$C\left(H^-, G^+, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2}{12 t_\beta c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} t_\beta \left(6 \left(\sum_{gn=1}^{3} CKM_{g4,gn} CKM^*_{g3,gn} m^2_{d_{gn}} \right) t_\beta c_W^2 - \delta_{g3,g4} s_{2\beta} \left(1 + 2c_W^2\right) M_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} - \\ 2\delta_{g3,g4} \left(3 c_W^2 m^2_{u_{g3}} - 2 s_{2\beta} t_\beta M_W^2 s_W^2\right) U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$C\left(G^-, H^+, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2}{12 t_\beta c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} t_\beta \left(6 \left(\sum_{gn=1}^{3} CKM_{g4,gn} CKM^*_{g3,gn} m^2_{d_{gn}} \right) t_\beta c_W^2 - \delta_{g3,g4} s_{2\beta} \left(1 + 2c_W^2\right) M_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} - \\ 2\delta_{g3,g4} \left(3 c_W^2 m^2_{u_{g3}} - 2 s_{2\beta} t_\beta M_W^2 s_W^2\right) U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$C\left(H^-, H^+, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2}{12 c_W^2 M_W^2 s_W^2 t_\beta^2} \left(\begin{array}{l} \left(6 \left(\sum_{gn=1}^{3} CKM_{gn,g3} CKM^*_{gn,g4} m^2_{u_{gn}} \right) c_W^2 + \delta_{g3,g4} c_{2\beta} \left(1 - 4c_W^2\right) M_W^2 t_\beta^2 \right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} + \\ 2\delta_{g3,g4} t_\beta^2 \left(c_{2\beta} M_W^2 s_W^2 + 3 c_W^2 m^2_{d_{g3}} t_\beta^2 \right) U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$C\left(H^-, G^+, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2}{12 t_\beta c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(6 \left(\sum_{gn=1}^{3} CKM_{gn,g3} CKM^*_{gn,g4} m^2_{u_{gn}} \right) c_W^2 + \delta_{g3,g4} s_{2\beta} t_\beta \left(1 - 4c_W^2\right) M_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} - \\ 2\delta_{g3,g4} t_\beta \left(3 t_\beta c_W^2 m^2_{d_{g3}} - s_{2\beta} M_W^2 s_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$C\left(G^-, H^+, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2}{12 t_\beta c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(6 \left(\sum_{gn=1}^{3} CKM_{gn,g3} CKM^*_{gn,g4} m^2_{u_{gn}} \right) c_W^2 + \delta_{g3,g4} s_{2\beta} t_\beta \left(1 - 4c_W^2\right) M_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} - \\ 2\delta_{g3,g4} t_\beta \left(3 t_\beta c_W^2 m^2_{d_{g3}} - s_{2\beta} M_W^2 s_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) \right]$$

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

$$C\left(G^-, G^+, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2 \delta_{g3,g4}}{2 s_W^2} \left(\begin{array}{l} c_{2\beta} \left(1 - \frac{1}{c_W^2} \left(\frac{1}{2} - s_W^2 \right) \right) U^{\tilde{e}_{g3}*}_{s3,1} U^{\tilde{e}_{g3}}_{s4,1} + \\ \left(\frac{m^2_{e_{g3}}}{M_W^2} - \frac{c_{2\beta} s_W^2}{c_W^2} \right) U^{\tilde{e}_{g3}*}_{s3,2} U^{\tilde{e}_{g3}}_{s4,2} \end{array} \right) \right]$$

$$C\left(G^-, G^+, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2}{12 c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(6 \left(\sum_{gn=1}^{3} CKM_{g4,gn} CKM^*_{g3,gn} m^2_{d_{gn}} \right) c_W^2 - \delta_{g3,g4} c_{2\beta} \left(1 + 2c_W^2\right) M_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ 2\delta_{g3,g4} \left(3 c_W^2 m^2_{u_{g3}} + 2 c_{2\beta} M_W^2 s_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$C\left(G^-, G^+, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2}{12 c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(6 \left(\sum_{gn=1}^{3} CKM_{gn,g3} CKM^*_{gn,g4} m^2_{u_{gn}} \right) c_W^2 - \delta_{g3,g4} c_{2\beta} \left(1 - 4c_W^2\right) M_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} + \\ 2\delta_{g3,g4} \left(3 c_W^2 m^2_{d_{g3}} - c_{2\beta} M_W^2 s_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$
\underset{186}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{d}^{s3}_{g3},\tilde{d}^{s4,\dagger}_{g4}\right) = \left[-\left(\frac{i e^2}{36 c_W^2 c_\beta^2 M_W^2 s_W^2} \left(\begin{array}{c} 2\left(\begin{array}{c} \left(\begin{array}{c} c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{d}_{g1}}_{s4,2} + \\ 9 m_{d_{g1}} m_{d_{g2}} c_W^2 U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{d}_{g1}}_{s4,1} \end{array} \right) U^{\tilde{d}_{g2}*}_{s3,1} + \\ 2 c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{d}_{g2}*}_{s3,2} U^{\tilde{d}_{g1}}_{s4,2} \end{array} \right) U^{\tilde{d}_{g1}*}_{s1,2} + \\ \left(\begin{array}{c} 2\left(\begin{array}{c} 9 m_{d_{g1}} m_{d_{g2}} c_W^2 U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{d}_{g1}}_{s4,2} + \\ c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g2}}_{s2,2} U^{\tilde{d}_{g1}}_{s4,1} \end{array} \right) U^{\tilde{d}_{g2}*}_{s3,2} + \\ \left(1 + 8 c_W^2\right) c_\beta^2 M_W^2 U^{\tilde{d}_{g2}}_{s2,1} U^{\tilde{d}_{g2}*}_{s3,1} U^{\tilde{d}_{g1}}_{s4,1} \end{array} \right) U^{\tilde{d}_{g1}*}_{s1,1} \end{array} \right) + \right. \\ i g_s^2 \left(T^x_{c2,c3} T^x_{c4,c1}\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) \left(U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s4,1} - U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s4,2} \right) \delta_{g1,g4} \delta_{g2,g3} - \\ \left(\frac{i e^2}{36 c_W^2 c_\beta^2 M_W^2 s_W^2} \left(\begin{array}{c} 2\left(\begin{array}{c} \left(\begin{array}{c} c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{d}_{g3}}_{s4,1} + \\ 9 m_{d_{g1}} m_{d_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{d}_{g3}}_{s4,2} \end{array} \right) U^{\tilde{d}_{g3}*}_{s3,1} + \\ 2 c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g3}}_{s4,2} \end{array} \right) U^{\tilde{d}_{g1}*}_{s1,2} + \\ \left(\begin{array}{c} 2\left(\begin{array}{c} 9 m_{d_{g1}} m_{d_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{d}_{g3}}_{s4,1} + \\ c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{d}_{g3}}_{s4,2} \end{array} \right) U^{\tilde{d}_{g3}*}_{s3,2} + \\ \left(1 + 8 c_W^2\right) c_\beta^2 M_W^2 U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g3}}_{s4,1} \end{array} \right) U^{\tilde{d}_{g1}*}_{s1,1} \end{array} \right) + \\ i g_s^2 \left(T^x_{c2,c1} T^x_{c4,c3}\right) \left(U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,1} - U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s2,2} \right) \left(U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{d}_{g3}}_{s4,1} - U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{d}_{g3}}_{s4,2} \right) \delta_{g1,g2} \delta_{g3,g4} \end{array} \right]
$$

$$
\underset{187}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{i e^2 \delta_{g1,g2} \delta_{g3,g4}}{12 c_W^2 c_\beta^2 M_W^2 s_W^2} \left(\begin{array}{c} \left(\begin{array}{c} c_\beta^2 M_W^2 \left(3 c_W^2 - s_W^2\right) U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{e}_{g3}}_{s4,1} - \\ 2 U^{\tilde{d}_{g1}*}_{s1,2} \left(c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{e}_{g3}}_{s4,1} - 3 m_{d_{g1}} m_{e_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{e}_{g3}}_{s4,2} \right) \end{array} \right) U^{\tilde{e}_{g3}*}_{s3,1} + \\ 2 \left(\begin{array}{c} 2 c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{e}_{g3}}_{s4,2} + \\ U^{\tilde{d}_{g1}*}_{s1,1} \left(3 m_{d_{g1}} m_{e_{g3}} c_W^2 U^{\tilde{d}_{g1}}_{s2,2} U^{\tilde{e}_{g3}}_{s4,1} + c_\beta^2 M_W^2 s_W^2 U^{\tilde{d}_{g1}}_{s2,1} U^{\tilde{e}_{g3}}_{s4,2} \right) \end{array} \right) U^{\tilde{e}_{g3}*}_{s3,2} \end{array} \right) \right]
$$

$$
\underset{188}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{\nu}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{i e^2 \delta_{g1,g2} \delta_{g3,g4}}{12 c_W^2 s_W^2} \left(\left(1 + 2 c_W^2\right) U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,1} + 2 s_W^2 U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s2,2} \right) \right]
$$

$$\underset{189}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{u}^{s3}_{g3},\tilde{u}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} \left(\begin{array}{l} \frac{ie^2}{36c_W^2 s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}\left(9c_W^2-s_W^2\right)U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1}-\\ 2s_W^2 U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\end{array}\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}+\\ 4s_W^2\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1}+2U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\end{array}\right)-\\ ig_s^2\left(T^x_{c2,c1}T^x_{c4,c3}\right)\left(U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g1}}_{s2,1}-U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g1}}_{s2,2}\right)\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}-U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\end{array}\right)\delta_{g1,g2}\delta_{g3,g4}-\\ \frac{ie^2 CKM_{g4,g1}CKM^*_{g3,g2}}{2c_\beta^2 M_W^2 s_W^2 s_\beta^2}\left(\begin{array}{l} m_{u_{g3}}m_{u_{g4}}c_\beta^2 U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1}U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g4}}_{s4,2}+\\ s_\beta^2\left(c_\beta^2 M_W^2 U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1}+m_{d_{g1}}m_{d_{g2}}U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{d}_{g2}}_{s2,2}\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g4}}_{s4,1}\end{array}\right)\end{array}\right]$$

$$\underset{190}{C}\left(\tilde{d}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{\nu}_{g3},\tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2 CKM_{g4,g1}\delta_{g2,g3}U^{\tilde{u}_{g4}}_{s4,1}}{2c_\beta^2 M_W^2 s_W^2}\left(c_\beta^2 M_W^2 U^{\tilde{d}_{g1}*}_{s1,1}U^{\tilde{e}_{g2}}_{s2,1}+m_{d_{g1}}m_{e_{g2}}U^{\tilde{d}_{g1}*}_{s1,2}U^{\tilde{e}_{g2}}_{s2,2}\right)\right]$$

$$\underset{191}{C}\left(\tilde{e}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{u}^{s3}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g1,g4}CKM^*_{g3,g2}U^{\tilde{u}_{g3}*}_{s3,1}}{2c_\beta^2 M_W^2 s_W^2}\left(c_\beta^2 M_W^2 U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{d}_{g2}}_{s2,1}+m_{d_{g2}}m_{e_{g1}}U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{d}_{g2}}_{s2,2}\right)\right]$$

$$\underset{192}{C}\left(\tilde{e}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l}\frac{ie^2}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\begin{array}{l} 2\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g1}}_{s2,2}U^{\tilde{e}_{g3}}_{s4,1}-\\ m_{e_{g1}}m_{e_{g3}}c_W^2 U^{\tilde{e}_{g1}}_{s2,1}U^{\tilde{e}_{g3}}_{s4,2}\end{array}\right)U^{\tilde{e}_{g3}*}_{s3,1}-\\ 2c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g1}}_{s2,2}U^{\tilde{e}_{g3}*}_{s3,2}U^{\tilde{e}_{g3}}_{s4,2}\end{array}\right)\delta_{g1,g2}\delta_{g3,g4}-\\ 2\delta_{g1,g4}\delta_{g2,g3}c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g2}}_{s2,2}U^{\tilde{e}_{g2}*}_{s3,2}U^{\tilde{e}_{g1}}_{s4,2}-\\ \delta_{g1,g4}\delta_{g2,g3}U^{\tilde{e}_{g2}*}_{s3,1}\left(m_{e_{g1}}m_{e_{g2}}c_W^2 U^{\tilde{e}_{g2}}_{s2,2}U^{\tilde{e}_{g1}}_{s4,1}-c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g2}}_{s2,1}U^{\tilde{e}_{g1}}_{s4,2}\right)\end{array}\right)U^{\tilde{e}_{g1}*}_{s1,2}-\\ \left(\begin{array}{l}\left(\begin{array}{l}2\left(\begin{array}{l}m_{e_{g1}}m_{e_{g3}}c_W^2 U^{\tilde{e}_{g1}}_{s2,2}U^{\tilde{e}_{g3}}_{s4,1}-\\ c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g1}}_{s2,1}U^{\tilde{e}_{g3}}_{s4,2}\end{array}\right)U^{\tilde{e}_{g3}*}_{s3,2}+\\ c_\beta^2 M_W^2 U^{\tilde{e}_{g1}}_{s2,1}U^{\tilde{e}_{g3}*}_{s3,1}U^{\tilde{e}_{g3}}_{s4,1}\end{array}\right)\delta_{g1,g2}\delta_{g3,g4}+\\ \delta_{g1,g4}\delta_{g2,g3}c_\beta^2 M_W^2 U^{\tilde{e}_{g2}}_{s2,1}U^{\tilde{e}_{g2}*}_{s3,1}U^{\tilde{e}_{g1}}_{s4,1}-\\ 2\delta_{g1,g4}\delta_{g2,g3}U^{\tilde{e}_{g2}*}_{s3,2}\left(c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g2}}_{s2,2}U^{\tilde{e}_{g1}}_{s4,1}-m_{e_{g1}}m_{e_{g2}}c_W^2 U^{\tilde{e}_{g2}}_{s2,1}U^{\tilde{e}_{g1}}_{s4,2}\right)\end{array}\right)U^{\tilde{e}_{g1}*}_{s1,1}\end{array}\right)\end{array}\right]$$

$$\underset{193}{C}\left(\tilde{e}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{\nu}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2}{4s_W^2}\left(\begin{array}{l}\frac{\delta_{g1,g2}\delta_{g3,g4}}{c_W^2}\left(\left(c_W^2-s_W^2\right)U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g1}}_{s2,1}+2s_W^2 U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g1}}_{s2,2}\right)-\\ \frac{2\delta_{g1,g4}\delta_{g2,g3}}{c_\beta^2 M_W^2}\left(c_\beta^2 M_W^2 U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g2}}_{s2,1}+m_{e_{g1}}m_{e_{g2}}U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g2}}_{s2,2}\right)\end{array}\right)\right]$$

$$\underset{194}{C}\left(\tilde{e}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{u}^{s3}_{g3},\tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g1,g2}\delta_{g3,g4}}{12c_W^2 s_W^2}\left(\begin{array}{l}2s_W^2 U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g1}}_{s2,2}\left(U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}-4U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)-\\ U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g1}}_{s2,1}\left(\left(1+2c_W^2\right)U^{\tilde{u}_{g3}*}_{s3,1}U^{\tilde{u}_{g3}}_{s4,1}-4s_W^2 U^{\tilde{u}_{g3}*}_{s3,2}U^{\tilde{u}_{g3}}_{s4,2}\right)\end{array}\right)\right]$$

$$\underset{195}{C}\left(\tilde{\nu}_{g1}, \tilde{\nu}^{\dagger}_{g2}, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2}{4c_W^2 s_W^2}\left(\delta_{g1,g4}\delta_{g2,g3} + \delta_{g1,g2}\delta_{g3,g4}\right) \right]$$

$$\underset{196}{C}\left(\tilde{\nu}_{g1}, \tilde{\nu}^{\dagger}_{g2}, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g1,g2}\delta_{g3,g4}}{12c_W^2 s_W^2}\left(\left(3c_W^2 - s_W^2\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} + 4s_W^2 U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2}\right) \right]$$

$$\underset{197}{C}\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} \left(\begin{array}{l} \frac{ie^2}{36c_W^2 M_W^2 s_W^2 s_\beta^2} \left(\begin{array}{l} 2\left(\begin{array}{l} \left(\begin{array}{l} 2M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g2}}_{s2,1} U^{\tilde{u}_{g1}}_{s4,2} - \\ 9m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g2}}_{s2,2} U^{\tilde{u}_{g1}}_{s4,1} \end{array} \right) U^{\tilde{u}_{g2}*}_{s3,1} - \\ 8M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g2}}_{s2,2} U^{\tilde{u}_{g2}*}_{s3,2} U^{\tilde{u}_{g1}}_{s4,2} \end{array} \right) U^{\tilde{u}_{g1}*}_{s1,2} - \\ \left(\begin{array}{l} 2\left(\begin{array}{l} 9m_{u_{g1}} m_{u_{g2}} c_W^2 U^{\tilde{u}_{g2}}_{s2,1} U^{\tilde{u}_{g1}}_{s4,2} - \\ 2M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g2}}_{s2,2} U^{\tilde{u}_{g1}}_{s4,1} \end{array} \right) U^{\tilde{u}_{g2}*}_{s3,2} + \\ \left(1 + 8c_W^2\right) M_W^2 s_\beta^2 U^{\tilde{u}_{g2}}_{s2,1} U^{\tilde{u}_{g2}*}_{s3,1} U^{\tilde{u}_{g1}}_{s4,1} \end{array} \right) U^{\tilde{u}_{g1}*}_{s1,1} \end{array} \right) - \\ ig_s^2 \left(T^x_{c2,c3} T^x_{c4,c1}\right) \left(U^{\tilde{u}_{g2}}_{s2,1} U^{\tilde{u}_{g2}*}_{s3,1} - U^{\tilde{u}_{g2}}_{s2,2} U^{\tilde{u}_{g2}*}_{s3,2}\right) \left(U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{u}_{g1}}_{s4,1} - U^{\tilde{u}_{g1}*}_{s1,2} U^{\tilde{u}_{g1}}_{s4,2}\right) \end{array} \right) \delta_{g1,g4}\delta_{g2,g3} + \\ \left(\begin{array}{l} \frac{ie^2}{36c_W^2 M_W^2 s_W^2 s_\beta^2} \left(\begin{array}{l} 2\left(\begin{array}{l} \left(\begin{array}{l} 2M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,2} U^{\tilde{u}_{g3}}_{s4,1} - \\ 9m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g1}}_{s2,1} U^{\tilde{u}_{g3}}_{s4,2} \end{array} \right) U^{\tilde{u}_{g3}*}_{s3,1} - \\ 8M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,2} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2} \end{array} \right) U^{\tilde{u}_{g1}*}_{s1,2} - \\ \left(\begin{array}{l} 2\left(\begin{array}{l} 9m_{u_{g1}} m_{u_{g3}} c_W^2 U^{\tilde{u}_{g1}}_{s2,2} U^{\tilde{u}_{g3}}_{s4,1} - \\ 2M_W^2 s_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,1} U^{\tilde{u}_{g3}}_{s4,2} \end{array} \right) U^{\tilde{u}_{g3}*}_{s3,2} + \\ \left(1 + 8c_W^2\right) M_W^2 s_\beta^2 U^{\tilde{u}_{g1}}_{s2,1} U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} \end{array} \right) U^{\tilde{u}_{g1}*}_{s1,1} \end{array} \right) - \\ ig_s^2 \left(T^x_{c2,c1} T^x_{c4,c3}\right) \left(U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{u}_{g1}}_{s2,1} - U^{\tilde{u}_{g1}*}_{s1,2} U^{\tilde{u}_{g1}}_{s2,2}\right) \left(U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{u}_{g3}}_{s4,1} - U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{u}_{g3}}_{s4,2}\right) \end{array} \right) \delta_{g1,g2}\delta_{g3,g4} \end{array} \right]$$

$$\underset{256}{C}\left(H_{h1}, G^0, G^0, G^0\right) = \left[\frac{3ie^2 c_{2\beta} s_{2\beta} U^H_{h1,3}}{4c_W^2 s_W^2} \right]$$

$$\underset{257}{C}\left(\hat{H}_{h1}, G^0, G^0, G^0\right) = \left[\frac{3ie^2 c_{2\beta} s_{2\beta} Z^H_{h1,3}}{4c_W^2 s_W^2} \right]$$

$$\underset{258}{C}\left(H_{h1}, G^0, H^-, H^+\right) = \left[-\frac{ie^2 c_{2\beta} s_{2\beta} U^H_{h1,3}}{4c_W^2 s_W^2} \right]$$

$$\underset{259}{C}\left(\hat{H}_{h1}, G^0, H^-, H^+\right) = \left[-\frac{ie^2 c_{2\beta} s_{2\beta} Z^H_{h1,3}}{4c_W^2 s_W^2} \right]$$

$$
\underset{260}{C}\left(H_{\mathrm{h1}}, G^0, H^-, G^+\right) = \left[\begin{array}{l} \frac{e^2 c_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},1}}{4 s^2_{\mathrm{W}}} - \frac{e^2 s_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},2}}{4 s^2_{\mathrm{W}}} - \\ \frac{\mathrm{i} e^2 U^{\mathrm{H}}_{\mathrm{h1},3}}{4 s^2_{\mathrm{W}}} \left(\frac{s^2_{\mathrm{W}} s^2_{2\beta}}{c^2_{\mathrm{W}}} - c^2_{2\beta}\right) \end{array}\right]
$$

$$
\underset{261}{C}\left(\hat{H}_{\mathrm{h1}}, G^0, H^-, G^+\right) = \left[\begin{array}{l} \frac{e^2 c_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},1}}{4 s^2_{\mathrm{W}}} - \frac{e^2 s_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},2}}{4 s^2_{\mathrm{W}}} - \\ \frac{\mathrm{i} e^2 Z^{\mathrm{H}}_{\mathrm{h1},3}}{4 s^2_{\mathrm{W}}} \left(\frac{s^2_{\mathrm{W}} s^2_{2\beta}}{c^2_{\mathrm{W}}} - c^2_{2\beta}\right) \end{array}\right]
$$

$$
\underset{262}{C}\left(H_{\mathrm{h1}}, G^0, G^-, H^+\right) = \left[\begin{array}{l} -\frac{e^2 c_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},1}}{4 s^2_{\mathrm{W}}} + \frac{e^2 s_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},2}}{4 s^2_{\mathrm{W}}} - \\ \frac{\mathrm{i} e^2 U^{\mathrm{H}}_{\mathrm{h1},3}}{4 s^2_{\mathrm{W}}} \left(\frac{s^2_{\mathrm{W}} s^2_{2\beta}}{c^2_{\mathrm{W}}} - c^2_{2\beta}\right) \end{array}\right]
$$

$$
\underset{263}{C}\left(\hat{H}_{\mathrm{h1}}, G^0, G^-, H^+\right) = \left[\begin{array}{l} -\frac{e^2 c_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},1}}{4 s^2_{\mathrm{W}}} + \frac{e^2 s_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},2}}{4 s^2_{\mathrm{W}}} - \\ \frac{\mathrm{i} e^2 Z^{\mathrm{H}}_{\mathrm{h1},3}}{4 s^2_{\mathrm{W}}} \left(\frac{s^2_{\mathrm{W}} s^2_{2\beta}}{c^2_{\mathrm{W}}} - c^2_{2\beta}\right) \end{array}\right]
$$

$$
\underset{264}{C}\left(H_{\mathrm{h1}}, G^0, G^-, G^+\right) = \left[\begin{array}{l} \frac{\mathrm{i} e^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h1},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} \end{array}\right]
$$

$$
\underset{265}{C}\left(\hat{H}_{\mathrm{h1}}, G^0, G^-, G^+\right) = \left[\begin{array}{l} \frac{\mathrm{i} e^2 c_{2\beta} s_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} \end{array}\right]
$$

$$
\underset{266}{C}\left(H_{\mathrm{h1}}, G^0, \tilde{\nu}_{\mathrm{g3}}, \tilde{\nu}^{\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l} \frac{\mathrm{i} e^2 \delta_{\mathrm{g3},\mathrm{g4}} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h1},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} \end{array}\right]
$$

$$
\underset{267}{C}\left(\hat{H}_{\mathrm{h1}}, G^0, \tilde{\nu}_{\mathrm{g3}}, \tilde{\nu}^{\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l} \frac{\mathrm{i} e^2 \delta_{\mathrm{g3},\mathrm{g4}} s_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} \end{array}\right]
$$

$$
\underset{268}{C}\left(H_{\mathrm{h1}}, G^0, \tilde{e}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{e}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l} \frac{\mathrm{i} e^2 \delta_{\mathrm{g3},\mathrm{g4}} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h1},3}}{4 c^2_{\mathrm{W}} c^2_{\beta} M^2_{\mathrm{W}} s^2_{\mathrm{W}}} \left(\begin{array}{l} \left(c^2_{\mathrm{W}} m^2_{\tilde{e}_{\mathrm{g4}}} - c^2_{\beta} M^2_{\mathrm{W}} \left(1 - 2 s^2_{\mathrm{W}}\right)\right) U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3},1} U^{\tilde{e}_{\mathrm{g4}}}_{\mathrm{s4},1} + \\ \left(c^2_{\mathrm{W}} m^2_{\tilde{e}_{\mathrm{g4}}} - 2 c^2_{\beta} M^2_{\mathrm{W}} s^2_{\mathrm{W}}\right) U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3},2} U^{\tilde{e}_{\mathrm{g4}}}_{\mathrm{s4},2} \end{array} \right) \end{array}\right]
$$

$$
\underset{269}{C}\left(\hat{H}_{\mathrm{h1}}, G^0, \tilde{e}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{e}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l} \frac{\mathrm{i} e^2 \delta_{\mathrm{g3},\mathrm{g4}} s_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4 c^2_{\mathrm{W}} c^2_{\beta} M^2_{\mathrm{W}} s^2_{\mathrm{W}}} \left(\begin{array}{l} \left(c^2_{\mathrm{W}} m^2_{\tilde{e}_{\mathrm{g4}}} - c^2_{\beta} M^2_{\mathrm{W}} \left(1 - 2 s^2_{\mathrm{W}}\right)\right) U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3},1} U^{\tilde{e}_{\mathrm{g4}}}_{\mathrm{s4},1} + \\ \left(c^2_{\mathrm{W}} m^2_{\tilde{e}_{\mathrm{g4}}} - 2 c^2_{\beta} M^2_{\mathrm{W}} s^2_{\mathrm{W}}\right) U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3},2} U^{\tilde{e}_{\mathrm{g4}}}_{\mathrm{s4},2} \end{array} \right) \end{array}\right]
$$

$$\underset{270}{C}\left(H_{h1}, G^0, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}s_{2\beta}U^{H}_{h1,3}}{12c^2_W M^2_W s^2_W s^2_\beta} \left(\begin{array}{l} \left(3c^2_W m^2_{u_{g4}} - M^2_W\left(3-4s^2_W\right)s^2_\beta\right) U^{\tilde{u}_{g4}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ \left(3c^2_W m^2_{u_{g4}} - 4M^2_W s^2_W s^2_\beta\right) U^{\tilde{u}_{g4}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$\underset{271}{C}\left(\hat{H}_{h1}, G^0, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}s_{2\beta}Z^{H}_{h1,3}}{12c^2_W M^2_W s^2_W s^2_\beta} \left(\begin{array}{l} \left(3c^2_W m^2_{u_{g4}} - M^2_W\left(3-4s^2_W\right)s^2_\beta\right) U^{\tilde{u}_{g4}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ \left(3c^2_W m^2_{u_{g4}} - 4M^2_W s^2_W s^2_\beta\right) U^{\tilde{u}_{g4}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$\underset{272}{C}\left(H_{h1}, G^0, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}s_{2\beta}U^{H}_{h1,3}}{12c^2_W c^2_\beta M^2_W s^2_W} \left(\begin{array}{l} \left(3c^2_W m^2_{d_{g4}} - c^2_\beta M^2_W\left(3-2s^2_W\right)\right) U^{\tilde{d}_{g4}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} + \\ \left(3c^2_W m^2_{d_{g4}} - 2c^2_\beta M^2_W s^2_W\right) U^{\tilde{d}_{g4}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$\underset{273}{C}\left(\hat{H}_{h1}, G^0, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}s_{2\beta}Z^{H}_{h1,3}}{12c^2_W c^2_\beta M^2_W s^2_W} \left(\begin{array}{l} \left(3c^2_W m^2_{d_{g4}} - c^2_\beta M^2_W\left(3-2s^2_W\right)\right) U^{\tilde{d}_{g4}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} + \\ \left(3c^2_W m^2_{d_{g4}} - 2c^2_\beta M^2_W s^2_W\right) U^{\tilde{d}_{g4}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) \right]$$

$$\underset{274}{C}\left(H_{h1}, H^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\begin{array}{l} -\frac{ie^2\delta_{g3,g4}U^{H}_{h1,1}U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s^2_W}\left(\frac{s_\alpha t_\beta m^2_{e_{g4}}}{c_\beta M^2_W} + c_{\alpha+\beta}\right) + \\ \frac{ie^2\delta_{g3,g4}U^{H}_{h1,2}U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s^2_W}\left(\frac{c_\alpha t_\beta m^2_{e_{g4}}}{c_\beta M^2_W} - s_{\alpha+\beta}\right) - \\ \frac{e^2\delta_{g3,g4}U^{H}_{h1,3}U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s^2_W}\left(\frac{m^2_{e_{g4}}t^2_\beta}{M^2_W} + c_{2\beta}\right) \end{array} \right]$$

$$\underset{275}{C}\left(\hat{H}_{h1}, H^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\begin{array}{l} -\frac{ie^2\delta_{g3,g4}U^{\tilde{e}_{g4}*}_{s3,1}Z^{H}_{h1,1}}{2\sqrt{2}s^2_W}\left(\frac{s_\alpha t_\beta m^2_{e_{g4}}}{c_\beta M^2_W} + c_{\alpha+\beta}\right) + \\ \frac{ie^2\delta_{g3,g4}U^{\tilde{e}_{g4}*}_{s3,1}Z^{H}_{h1,2}}{2\sqrt{2}s^2_W}\left(\frac{c_\alpha t_\beta m^2_{e_{g4}}}{c_\beta M^2_W} - s_{\alpha+\beta}\right) - \\ \frac{e^2\delta_{g3,g4}U^{\tilde{e}_{g4}*}_{s3,1}Z^{H}_{h1,3}}{2\sqrt{2}s^2_W}\left(\frac{m^2_{e_{g4}}t^2_\beta}{M^2_W} + c_{2\beta}\right) \end{array} \right]$$

$$\underset{276}{C}\left(H_{h1}, H^+, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} \frac{ie^2\mathrm{CKM}_{g4,g3}U^{H}_{h1,2}}{2\sqrt{2}s_{2\beta}M^2_W s^2_W s^2_\beta}\left(\begin{array}{l} s_{2\beta}\left(c_\beta s_\alpha m^2_{u_{g4}} - s_\beta\left(s_{\alpha+\beta}s_\beta M^2_W - c_\alpha m^2_{d_{g3}}t^2_\beta\right)\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ 2c_{\beta-\alpha}m_{d_{g3}}m_{u_{g4}}s^2_\beta U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) + \\ \frac{ie^2\mathrm{CKM}_{g4,g3}U^{H}_{h1,1}}{2\sqrt{2}s_{2\beta}M^2_W s^2_W s^2_\beta}\left(\begin{array}{l} s_{2\beta}\left(c_\alpha c_\beta m^2_{u_{g4}} - s_\beta\left(c_{\alpha+\beta}s_\beta M^2_W + s_\alpha m^2_{d_{g3}}t^2_\beta\right)\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ 2m_{d_{g3}}m_{u_{g4}}s_{\beta-\alpha}s^2_\beta U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) + \\ \frac{e^2\mathrm{CKM}_{g4,g3}U^{H}_{h1,3}U^{\tilde{d}_{g3}*}_{s3,1}U^{\tilde{u}_{g4}}_{s4,1}}{2\sqrt{2}s^2_W}\left(\frac{m^2_{u_{g4}}}{M^2_W t^2_\beta} - \frac{m^2_{d_{g3}}t^2_\beta}{M^2_W} - c_{2\beta}\right) \end{array} \right]$$

$$\underset{277}{C}\left(\hat{H}_{h1}, H^{+}, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} \frac{ie^2 CKM_{g4,g3} Z^{H}_{h1,2}}{2\sqrt{2} s_{2\beta} M_W^2 s_W^2 s_\beta^2} \left(\begin{array}{l} s_{2\beta}\left(c_\beta s_\alpha m^2_{u_{g4}} - s_\beta\left(s_{\alpha+\beta} s_\beta M_W^2 - c_\alpha m^2_{d_{g3}} t_\beta^2\right)\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ 2 c_{\beta-\alpha} m_{d_{g3}} m_{u_{g4}} s_\beta^2 U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) + \\ \frac{ie^2 CKM_{g4,g3} Z^{H}_{h1,1}}{2\sqrt{2} s_{2\beta} M_W^2 s_W^2 s_\beta^2} \left(\begin{array}{l} s_{2\beta}\left(c_\alpha c_\beta m^2_{u_{g4}} - s_\beta\left(c_{\alpha+\beta} s_\beta M_W^2 + s_\alpha m^2_{d_{g3}} t_\beta^2\right)\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ 2 m_{d_{g3}} m_{u_{g4}} s_{\beta-\alpha} s_\beta^2 U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) + \\ \frac{e^2 CKM_{g4,g3} U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} Z^{H}_{h1,3}}{2\sqrt{2} s_W^2} \left(\frac{m^2_{u_{g4}}}{M_W^2 t_\beta^2} - \frac{m^2_{d_{g3}} t_\beta^2}{M_W^2} - c_{2\beta} \right) \end{array} \right]$$

$$\underset{282}{C}\left(H_{h1}, H^{-}, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} -\frac{ie^2 \delta_{g3,g4} U^{H}_{h1,1} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2} s_W^2} \left(\frac{s_\alpha t_\beta m^2_{e_{g3}}}{c_\beta M_W^2} + c_{\alpha+\beta} \right) + \\ \frac{ie^2 \delta_{g3,g4} U^{H}_{h1,2} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2} s_W^2} \left(\frac{c_\alpha t_\beta m^2_{e_{g3}}}{c_\beta M_W^2} - s_{\alpha+\beta} \right) + \\ \frac{e^2 \delta_{g3,g4} U^{H}_{h1,3} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2} s_W^2} \left(\frac{m^2_{e_{g3}} t_\beta^2}{M_W^2} + c_{2\beta} \right) \end{array} \right]$$

$$\underset{283}{C}\left(\hat{H}_{h1}, H^{-}, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} -\frac{ie^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1} Z^{H}_{h1,1}}{2\sqrt{2} s_W^2} \left(\frac{s_\alpha t_\beta m^2_{e_{g3}}}{c_\beta M_W^2} + c_{\alpha+\beta} \right) + \\ \frac{ie^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1} Z^{H}_{h1,2}}{2\sqrt{2} s_W^2} \left(\frac{c_\alpha t_\beta m^2_{e_{g3}}}{c_\beta M_W^2} - s_{\alpha+\beta} \right) + \\ \frac{e^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1} Z^{H}_{h1,3}}{2\sqrt{2} s_W^2} \left(\frac{m^2_{e_{g3}} t_\beta^2}{M_W^2} + c_{2\beta} \right) \end{array} \right]$$

$$\underset{284}{C}\left(H_{h1}, H^{-}, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} \frac{ie^2 CKM^{*}_{g3,g4} U^{H}_{h1,2}}{2\sqrt{2} s_{2\beta} M_W^2 s_W^2 s_\beta^2} \left(\begin{array}{l} s_{2\beta}\left(c_\beta s_\alpha m^2_{u_{g3}} - s_\beta\left(s_{\alpha+\beta} s_\beta M_W^2 - c_\alpha m^2_{d_{g4}} t_\beta^2\right)\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} + \\ 2 c_{\beta-\alpha} m_{d_{g4}} m_{u_{g3}} s_\beta^2 U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) + \\ \frac{ie^2 CKM^{*}_{g3,g4} U^{H}_{h1,1}}{2\sqrt{2} s_{2\beta} M_W^2 s_W^2 s_\beta^2} \left(\begin{array}{l} s_{2\beta}\left(c_\alpha c_\beta m^2_{u_{g3}} - s_\beta\left(c_{\alpha+\beta} s_\beta M_W^2 + s_\alpha m^2_{d_{g4}} t_\beta^2\right)\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} + \\ 2 m_{d_{g4}} m_{u_{g3}} s_{\beta-\alpha} s_\beta^2 U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) - \\ \frac{e^2 CKM^{*}_{g3,g4} U^{H}_{h1,3} U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1}}{2\sqrt{2} s_W^2} \left(\frac{m^2_{u_{g3}}}{M_W^2 t_\beta^2} - \frac{m^2_{d_{g4}} t_\beta^2}{M_W^2} - c_{2\beta} \right) \end{array} \right]$$

$$
\underset{285}{C}\left(\hat{H}_{\mathrm{h1}}, H^{-}, \tilde{u}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{d}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e^2 \mathrm{CKM}^{*}_{\mathrm{g3,g4}} Z^{\mathrm{H}}_{\mathrm{h1,2}}}{2\sqrt{2} s_{2\beta} M^2_{\mathrm{W}} s^2_{\mathrm{W}} s^2_{\beta}} \left(\begin{array}{l} s_{2\beta}\left(c_{\beta} s_{\alpha} m^2_{u_{\mathrm{g3}}} - s_{\beta}\left(s_{\alpha+\beta} s_{\beta} M^2_{\mathrm{W}} - c_{\alpha} m^2_{d_{\mathrm{g4}}} t^2_{\beta}\right)\right) U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} + \\ 2 c_{\beta-\alpha} m_{d_{\mathrm{g4}}} m_{u_{\mathrm{g3}}} s^2_{\beta} U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,2}} \end{array}\right) + \\
\frac{\mathrm{i}e^2 \mathrm{CKM}^{*}_{\mathrm{g3,g4}} Z^{\mathrm{H}}_{\mathrm{h1,1}}}{2\sqrt{2} s_{2\beta} M^2_{\mathrm{W}} s^2_{\mathrm{W}} s^2_{\beta}} \left(\begin{array}{l} s_{2\beta}\left(c_{\alpha} c_{\beta} m^2_{u_{\mathrm{g3}}} - s_{\beta}\left(c_{\alpha+\beta} s_{\beta} M^2_{\mathrm{W}} + s_{\alpha} m^2_{d_{\mathrm{g4}}} t^2_{\beta}\right)\right) U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} + \\ 2 m_{d_{\mathrm{g4}}} m_{u_{\mathrm{g3}}} s_{\beta-\alpha} s^2_{\beta} U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,2}} \end{array}\right) - \\
\frac{e^2 \mathrm{CKM}^{*}_{\mathrm{g3,g4}} U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} Z^{\mathrm{H}}_{\mathrm{h1,3}}}{2\sqrt{2} s^2_{\mathrm{W}}} \left(\frac{m^2_{u_{\mathrm{g3}}}}{M^2_{\mathrm{W}} t^2_{\beta}} - \frac{m^2_{d_{\mathrm{g4}}} t^2_{\beta}}{M^2_{\mathrm{W}}} - c_{2\beta}\right)
\end{array}\right]
$$

$$
\underset{290}{C}\left(H_{\mathrm{h1}}, G^{+}, \tilde{e}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{\nu}^{\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e^2 \delta_{\mathrm{g3,g4}} U^{\mathrm{H}}_{\mathrm{h1,1}} U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3,1}}}{2\sqrt{2} s^2_{\mathrm{W}}} \left(\frac{s_{\alpha} m^2_{e_{\mathrm{g4}}}}{c_{\beta} M^2_{\mathrm{W}}} - s_{\alpha+\beta}\right) - \\
\frac{\mathrm{i}e^2 \delta_{\mathrm{g3,g4}} U^{\mathrm{H}}_{\mathrm{h1,2}} U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3,1}}}{2\sqrt{2} s^2_{\mathrm{W}}} \left(\frac{c_{\alpha} m^2_{e_{\mathrm{g4}}}}{c_{\beta} M^2_{\mathrm{W}}} - c_{\alpha+\beta}\right) + \\
\frac{e^2 \delta_{\mathrm{g3,g4}} U^{\mathrm{H}}_{\mathrm{h1,3}} U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3,1}}}{2\sqrt{2} s^2_{\mathrm{W}}} \left(\frac{t_{\beta} m^2_{e_{\mathrm{g4}}}}{M^2_{\mathrm{W}}} - s_{2\beta}\right)
\end{array}\right]
$$

$$
\underset{291}{C}\left(\hat{H}_{\mathrm{h1}}, G^{+}, \tilde{e}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{\nu}^{\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e^2 \delta_{\mathrm{g3,g4}} U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3,1}} Z^{\mathrm{H}}_{\mathrm{h1,1}}}{2\sqrt{2} s^2_{\mathrm{W}}} \left(\frac{s_{\alpha} m^2_{e_{\mathrm{g4}}}}{c_{\beta} M^2_{\mathrm{W}}} - s_{\alpha+\beta}\right) - \\
\frac{\mathrm{i}e^2 \delta_{\mathrm{g3,g4}} U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3,1}} Z^{\mathrm{H}}_{\mathrm{h1,2}}}{2\sqrt{2} s^2_{\mathrm{W}}} \left(\frac{c_{\alpha} m^2_{e_{\mathrm{g4}}}}{c_{\beta} M^2_{\mathrm{W}}} - c_{\alpha+\beta}\right) + \\
\frac{e^2 \delta_{\mathrm{g3,g4}} U^{\tilde{e}_{\mathrm{g4}}*}_{\mathrm{s3,1}} Z^{\mathrm{H}}_{\mathrm{h1,3}}}{2\sqrt{2} s^2_{\mathrm{W}}} \left(\frac{t_{\beta} m^2_{e_{\mathrm{g4}}}}{M^2_{\mathrm{W}}} - s_{2\beta}\right)
\end{array}\right]
$$

$$
\underset{292}{C}\left(H_{\mathrm{h1}}, G^{+}, \tilde{d}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{u}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2 \mathrm{CKM}_{\mathrm{g4,g3}} U^{\mathrm{H}}_{\mathrm{h1,2}}}{2\sqrt{2} c_{\beta} s_{2\beta} s_{\beta} M^2_{\mathrm{W}} s^2_{\mathrm{W}}} \left(\begin{array}{l} s_{2\beta}\left(c_{\alpha} s_{\beta} m^2_{d_{\mathrm{g3}}} - c_{\beta} s_{\alpha} m^2_{u_{\mathrm{g4}}} - c_{\alpha+\beta} c_{\beta} s_{\beta} M^2_{\mathrm{W}}\right) U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3,1}} U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} - \\ 2 c_{\beta} m_{d_{\mathrm{g3}}} m_{u_{\mathrm{g4}}} s_{\beta} s_{\beta-\alpha} U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3,2}} U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}} \end{array}\right) + \\
\frac{\mathrm{i}e^2 \mathrm{CKM}_{\mathrm{g4,g3}} U^{\mathrm{H}}_{\mathrm{h1,1}}}{2\sqrt{2} c_{\beta} s_{2\beta} s_{\beta} M^2_{\mathrm{W}} s^2_{\mathrm{W}}} \left(\begin{array}{l} s_{2\beta}\left(s_{\alpha} s_{\beta} m^2_{d_{\mathrm{g3}}} + c_{\alpha} c_{\beta} m^2_{u_{\mathrm{g4}}} - c_{\beta} s_{\alpha+\beta} s_{\beta} M^2_{\mathrm{W}}\right) U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3,1}} U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} - \\ 2 c_{\beta} c_{\beta-\alpha} m_{d_{\mathrm{g3}}} m_{u_{\mathrm{g4}}} s_{\beta} U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3,2}} U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}} \end{array}\right) + \\
\frac{e^2 \mathrm{CKM}_{\mathrm{g4,g3}} U^{\mathrm{H}}_{\mathrm{h1,3}}}{2\sqrt{2} s_{2\beta} t_{\beta} M^2_{\mathrm{W}} s^2_{\mathrm{W}}} \left(\begin{array}{l} s_{2\beta}\left(m^2_{u_{\mathrm{g4}}} + t_{\beta}\left(t_{\beta} m^2_{d_{\mathrm{g3}}} - s_{2\beta} M^2_{\mathrm{W}}\right)\right) U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3,1}} U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} + \\ 2 m_{d_{\mathrm{g3}}} m_{u_{\mathrm{g4}}} t_{\beta} U^{\tilde{d}_{\mathrm{g3}}*}_{\mathrm{s3,2}} U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}} \end{array}\right)
\end{array}\right]
$$

$$
\underset{293}{C}\left(\hat{H}_{h1}, G^{+}, \tilde{d}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4}\right) = \left[
\begin{array}{l}
-\frac{ie^2 CKM_{g4,g3} Z^{H}_{h1,2}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(\begin{array}{l} s_{2\beta}\left(c_\alpha s_\beta m^2_{d_{g3}} - c_\beta s_\alpha m^2_{u_{g4}} - c_{\alpha+\beta} c_\beta s_\beta M_W^2\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} - \\ 2 c_\beta m_{d_{g3}} m_{u_{g4}} s_\beta s_{\beta-\alpha} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) + \\
\frac{ie^2 CKM_{g4,g3} Z^{H}_{h1,1}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(\begin{array}{l} s_{2\beta}\left(s_\alpha s_\beta m^2_{d_{g3}} + c_\alpha c_\beta m^2_{u_{g4}} - c_\beta s_{\alpha+\beta} s_\beta M_W^2\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} - \\ 2 c_\beta c_{\beta-\alpha} m_{d_{g3}} m_{u_{g4}} s_\beta U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right) + \\
\frac{e^2 CKM_{g4,g3} Z^{H}_{h1,3}}{2\sqrt{2} s_{2\beta} t_\beta M_W^2 s_W^2} \left(\begin{array}{l} s_{2\beta}\left(m^2_{u_{g4}} + t_\beta\left(t_\beta m^2_{d_{g3}} - s_{2\beta} M_W^2\right)\right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \\ 2 m_{d_{g3}} m_{u_{g4}} t_\beta U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \end{array} \right)
\end{array}
\right]
$$

$$
\underset{298}{C}\left(H_{h1}, G^{-}, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[
\begin{array}{l}
\frac{ie^2 \delta_{g3,g4} U^{H}_{h1,1} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2} s_W^2} \left(\frac{s_\alpha m^2_{e_{g3}}}{c_\beta M_W^2} - s_{\alpha+\beta} \right) - \\
\frac{ie^2 \delta_{g3,g4} U^{H}_{h1,2} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2} s_W^2} \left(\frac{c_\alpha m^2_{e_{g3}}}{c_\beta M_W^2} - c_{\alpha+\beta} \right) - \\
\frac{e^2 \delta_{g3,g4} U^{H}_{h1,3} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2} s_W^2} \left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - s_{2\beta} \right)
\end{array}
\right]
$$

$$
\underset{299}{C}\left(\hat{H}_{h1}, G^{-}, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[
\begin{array}{l}
\frac{ie^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1} Z^{H}_{h1,1}}{2\sqrt{2} s_W^2} \left(\frac{s_\alpha m^2_{e_{g3}}}{c_\beta M_W^2} - s_{\alpha+\beta} \right) - \\
\frac{ie^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1} Z^{H}_{h1,2}}{2\sqrt{2} s_W^2} \left(\frac{c_\alpha m^2_{e_{g3}}}{c_\beta M_W^2} - c_{\alpha+\beta} \right) - \\
\frac{e^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1} Z^{H}_{h1,3}}{2\sqrt{2} s_W^2} \left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - s_{2\beta} \right)
\end{array}
\right]
$$

$$
\underset{300}{C}\left(H_{h1}, G^{-}, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[
\begin{array}{l}
-\frac{ie^2 CKM^{*}_{g3,g4} U^{H}_{h1,2}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(\begin{array}{l} s_{2\beta}\left(c_\alpha s_\beta m^2_{d_{g4}} - c_\beta s_\alpha m^2_{u_{g3}} - c_{\alpha+\beta} c_\beta s_\beta M_W^2\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} - \\ 2 c_\beta m_{d_{g4}} m_{u_{g3}} s_\beta s_{\beta-\alpha} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) + \\
\frac{ie^2 CKM^{*}_{g3,g4} U^{H}_{h1,1}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(\begin{array}{l} s_{2\beta}\left(s_\alpha s_\beta m^2_{d_{g4}} + c_\alpha c_\beta m^2_{u_{g3}} - c_\beta s_{\alpha+\beta} s_\beta M_W^2\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} - \\ 2 c_\beta c_{\beta-\alpha} m_{d_{g4}} m_{u_{g3}} s_\beta U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right) - \\
\frac{e^2 CKM^{*}_{g3,g4} U^{H}_{h1,3}}{2\sqrt{2} s_{2\beta} t_\beta M_W^2 s_W^2} \left(\begin{array}{l} s_{2\beta}\left(m^2_{u_{g3}} + t_\beta\left(t_\beta m^2_{d_{g4}} - s_{2\beta} M_W^2\right)\right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} + \\ 2 m_{d_{g4}} m_{u_{g3}} t_\beta U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \end{array} \right)
\end{array}
\right]
$$

$$
\underset{301}{C}\left(\hat{H}_{\mathrm{h1}}, G^{-}, \tilde{u}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{d}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2 \mathrm{CKM}^{*}_{\mathrm{g3,g4}} Z^{\mathrm{H}}_{\mathrm{h1,2}}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M^2_{\mathrm{W}} s^2_{\mathrm{W}}} \left(\begin{array}{l} s_{2\beta}\left(c_\alpha s_\beta m^2_{d_{\mathrm{g4}}} - c_\beta s_\alpha m^2_{u_{\mathrm{g3}}} - c_{\alpha+\beta} c_\beta s_\beta M^2_{\mathrm{W}}\right) U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} - \\ 2 c_\beta m_{d_{\mathrm{g4}}} m_{u_{\mathrm{g3}}} s_\beta s_{\beta-\alpha} U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,2}} \end{array}\right) + \\
\frac{\mathrm{i}e^2 \mathrm{CKM}^{*}_{\mathrm{g3,g4}} Z^{\mathrm{H}}_{\mathrm{h1,1}}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M^2_{\mathrm{W}} s^2_{\mathrm{W}}} \left(\begin{array}{l} s_{2\beta}\left(s_\alpha s_\beta m^2_{d_{\mathrm{g4}}} + c_\alpha c_\beta m^2_{u_{\mathrm{g3}}} - c_\beta s_{\alpha+\beta} s_\beta M^2_{\mathrm{W}}\right) U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} - \\ 2 c_\beta c_{\beta-\alpha} m_{d_{\mathrm{g4}}} m_{u_{\mathrm{g3}}} s_\beta U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,2}} \end{array}\right) - \\
\frac{e^2 \mathrm{CKM}^{*}_{\mathrm{g3,g4}} Z^{\mathrm{H}}_{\mathrm{h1,3}}}{2\sqrt{2} s_{2\beta} t_\beta M^2_{\mathrm{W}} s^2_{\mathrm{W}}} \left(\begin{array}{l} s_{2\beta}\left(m^2_{u_{\mathrm{g3}}} + t_\beta\left(t_\beta m^2_{d_{\mathrm{g4}}} - s_{2\beta} M^2_{\mathrm{W}}\right)\right) U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,1}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} + \\ 2 m_{d_{\mathrm{g4}}} m_{u_{\mathrm{g3}}} t_\beta U^{\tilde{u}_{\mathrm{g3}}*}_{\mathrm{s3,2}} U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,2}} \end{array}\right)
\end{array}\right]
$$

$$
\underset{306}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, G^0, G^0\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta} U^{\mathrm{H}}_{\mathrm{h1,1}} U^{\mathrm{H}}_{\mathrm{h2,1}}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} - \\
\frac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta} U^{\mathrm{H}}_{\mathrm{h1,2}} U^{\mathrm{H}}_{\mathrm{h2,2}}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \\
\frac{\mathrm{i}e^2 c_{2\beta} s_{2\alpha}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h1,2}} U^{\mathrm{H}}_{\mathrm{h2,1}} + U^{\mathrm{H}}_{\mathrm{h1,1}} U^{\mathrm{H}}_{\mathrm{h2,2}}\right) + \\
\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1,3}} U^{\mathrm{H}}_{\mathrm{h2,3}}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}}\left(1 - 3 s^2_{2\beta}\right)
\end{array}\right]
$$

$$
\underset{307}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, G^0, G^0\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta} U^{\mathrm{H}}_{\mathrm{h2,1}} Z^{\mathrm{H}}_{\mathrm{h1,1}}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} - \\
\frac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta} U^{\mathrm{H}}_{\mathrm{h2,2}} Z^{\mathrm{H}}_{\mathrm{h1,2}}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \\
\frac{\mathrm{i}e^2 c_{2\beta} s_{2\alpha}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h2,2}} Z^{\mathrm{H}}_{\mathrm{h1,1}} + U^{\mathrm{H}}_{\mathrm{h2,1}} Z^{\mathrm{H}}_{\mathrm{h1,2}}\right) + \\
\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2,3}} Z^{\mathrm{H}}_{\mathrm{h1,3}}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}}\left(1 - 3 s^2_{2\beta}\right)
\end{array}\right]
$$

$$
\underset{308}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, G^0, G^0\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1,1}} Z^{\mathrm{H}}_{\mathrm{h2,1}}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} - \\
\frac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1,2}} Z^{\mathrm{H}}_{\mathrm{h2,2}}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \\
\frac{\mathrm{i}e^2 c_{2\beta} s_{2\alpha}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}}\left(Z^{\mathrm{H}}_{\mathrm{h1,2}} Z^{\mathrm{H}}_{\mathrm{h2,1}} + Z^{\mathrm{H}}_{\mathrm{h1,1}} Z^{\mathrm{H}}_{\mathrm{h2,2}}\right) + \\
\frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1,3}} Z^{\mathrm{H}}_{\mathrm{h2,3}}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}}\left(1 - 3 s^2_{2\beta}\right)
\end{array}\right]
$$

$$C_{309}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, H^-, H^+\right) = \left[\begin{array}{l} -\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1}}{4s^2_{\mathrm{W}}}\left(1+\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}}-s_{2\alpha}s_{2\beta}\right)- \\ \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2}}{4s^2_{\mathrm{W}}}\left(1-\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}}+s_{2\alpha}s_{2\beta}\right)- \\ \frac{\mathrm{i}e^2}{4s^2_{\mathrm{W}}}\left(\frac{c_{2\beta}s_{2\alpha}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}}+c_{2\alpha}s_{2\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h1},2}U^{\mathrm{H}}_{\mathrm{h2},1}+U^{\mathrm{H}}_{\mathrm{h1},1}U^{\mathrm{H}}_{\mathrm{h2},2}\right)- \\ \frac{\mathrm{i}e^2 c^2_{2\beta} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} \end{array}\right]$$

$$C_{310}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, H^-, H^+\right) = \left[\begin{array}{l} -\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{4s^2_{\mathrm{W}}}\left(1+\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}}-s_{2\alpha}s_{2\beta}\right)- \\ \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},2}}{4s^2_{\mathrm{W}}}\left(1-\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}}+s_{2\alpha}s_{2\beta}\right)- \\ \frac{\mathrm{i}e^2}{4s^2_{\mathrm{W}}}\left(\frac{c_{2\beta}s_{2\alpha}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}}+c_{2\alpha}s_{2\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h2},2}Z^{\mathrm{H}}_{\mathrm{h1},1}+U^{\mathrm{H}}_{\mathrm{h2},1}Z^{\mathrm{H}}_{\mathrm{h1},2}\right)- \\ \frac{\mathrm{i}e^2 c^2_{2\beta} U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} \end{array}\right]$$

$$C_{311}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, H^-, H^+\right) = \left[\begin{array}{l} -\frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{4s^2_{\mathrm{W}}}\left(1+\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}}-s_{2\alpha}s_{2\beta}\right)- \\ \frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{4s^2_{\mathrm{W}}}\left(1-\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}}+s_{2\alpha}s_{2\beta}\right)- \\ \frac{\mathrm{i}e^2}{4s^2_{\mathrm{W}}}\left(\frac{c_{2\beta}s_{2\alpha}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}}+c_{2\alpha}s_{2\beta}\right)\left(Z^{\mathrm{H}}_{\mathrm{h1},2}Z^{\mathrm{H}}_{\mathrm{h2},1}+Z^{\mathrm{H}}_{\mathrm{h1},1}Z^{\mathrm{H}}_{\mathrm{h2},2}\right)- \\ \frac{\mathrm{i}e^2 c^2_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} \end{array}\right]$$

$$
\underset{312}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, H^{-}, G^{+}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) + \\
\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) - \\
\frac{\mathrm{i}e^2}{4 s^2_{\mathrm{W}}} \left(\frac{s_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - c_{2\alpha} c_{2\beta}\right) \left(U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2}\right) - \\
\frac{\mathrm{i}e^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} - \\
\frac{e^2 s_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},3}\right) - \\
\frac{e^2 c_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},2} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},3}\right)
\end{array}\right]
$$

$$
\underset{313}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, H^{-}, G^{+}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) + \\
\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},2}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) - \\
\frac{\mathrm{i}e^2}{4 s^2_{\mathrm{W}}} \left(\frac{s_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - c_{2\alpha} c_{2\beta}\right) \left(U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},2}\right) - \\
\frac{\mathrm{i}e^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} - \\
\frac{e^2 s_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},3}\right) - \\
\frac{e^2 c_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},2} + U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},3}\right)
\end{array}\right]
$$

$$
\underset{314}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, H^{-}, G^{+}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) + \\
\frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) - \\
\frac{\mathrm{i}e^2}{4 s^2_{\mathrm{W}}} \left(\frac{s_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - c_{2\alpha} c_{2\beta}\right) \left(Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},2}\right) - \\
\frac{\mathrm{i}e^2 c_{2\beta} s_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} - \\
\frac{e^2 s_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},3}\right) - \\
\frac{e^2 c_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},2} + Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},3}\right)
\end{array}\right]
$$

$$
\underset{315}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, G^{-}, H^{+}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) + \\
\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) - \\
\frac{\mathrm{i}e^2}{4 s^2_{\mathrm{W}}} \left(\frac{s_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - c_{2\alpha} c_{2\beta}\right) \left(U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2}\right) - \\
\frac{\mathrm{i}e^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \\
\frac{e^2 s_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},3}\right) + \\
\frac{e^2 c_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},2} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},3}\right)
\end{array}\right]
$$

$$
\underset{316}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, G^{-}, H^{+}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) + \\
\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},2}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) - \\
\frac{\mathrm{i}e^2}{4 s^2_{\mathrm{W}}} \left(\frac{s_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - c_{2\alpha} c_{2\beta}\right) \left(U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},2}\right) - \\
\frac{\mathrm{i}e^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \\
\frac{e^2 s_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},3}\right) + \\
\frac{e^2 c_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},2} + U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},3}\right)
\end{array}\right]
$$

$$
\underset{317}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, G^{-}, H^{+}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) + \\
\frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{4 s^2_{\mathrm{W}}} \left(\frac{c_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\beta} s_{2\alpha}\right) - \\
\frac{\mathrm{i}e^2}{4 s^2_{\mathrm{W}}} \left(\frac{s_{2\alpha} s_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - c_{2\alpha} c_{2\beta}\right) \left(Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},2}\right) - \\
\frac{\mathrm{i}e^2 c_{2\beta} s_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \\
\frac{e^2 s_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},3}\right) + \\
\frac{e^2 c_{\beta-\alpha}}{4 s^2_{\mathrm{W}}} \left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},2} + Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},3}\right)
\end{array}\right]
$$

$$
\underset{318}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, G^{-}, G^{+}\right) = \left[\begin{array}{l} -\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1}}{4 s^2_{\mathrm{W}}}\left(1 - \frac{c_{2\alpha} c_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s_{2\alpha} s_{2\beta}\right) - \\ \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2}}{4 s^2_{\mathrm{W}}}\left(1 + \frac{c_{2\alpha} c_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - s_{2\alpha} s_{2\beta}\right) + \\ \frac{\mathrm{i}e^2}{4 s^2_{\mathrm{W}}}\left(\frac{c_{2\beta} s_{2\alpha} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\alpha} s_{2\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2}\right) - \\ \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3}}{4 s^2_{\mathrm{W}}}\left(1 - \frac{c^2_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s^2_{2\beta}\right) \end{array}\right]
$$

$$
\underset{319}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, G^{-}, G^{+}\right) = \left[\begin{array}{l} -\frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{4 s^2_{\mathrm{W}}}\left(1 - \frac{c_{2\alpha} c_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s_{2\alpha} s_{2\beta}\right) - \\ \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},2}}{4 s^2_{\mathrm{W}}}\left(1 + \frac{c_{2\alpha} c_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - s_{2\alpha} s_{2\beta}\right) + \\ \frac{\mathrm{i}e^2}{4 s^2_{\mathrm{W}}}\left(\frac{c_{2\beta} s_{2\alpha} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\alpha} s_{2\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},2}\right) - \\ \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4 s^2_{\mathrm{W}}}\left(1 - \frac{c^2_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s^2_{2\beta}\right) \end{array}\right]
$$

$$
\underset{320}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, G^{-}, G^{+}\right) = \left[\begin{array}{l} -\frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{4 s^2_{\mathrm{W}}}\left(1 - \frac{c_{2\alpha} c_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s_{2\alpha} s_{2\beta}\right) - \\ \frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{4 s^2_{\mathrm{W}}}\left(1 + \frac{c_{2\alpha} c_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - s_{2\alpha} s_{2\beta}\right) + \\ \frac{\mathrm{i}e^2}{4 s^2_{\mathrm{W}}}\left(\frac{c_{2\beta} s_{2\alpha} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\alpha} s_{2\beta}\right)\left(Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},2}\right) - \\ \frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{4 s^2_{\mathrm{W}}}\left(1 - \frac{c^2_{2\beta} s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s^2_{2\beta}\right) \end{array}\right]
$$

$$
\underset{321}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, H_{\mathrm{h3}}, G^{0}\right) = \left[\begin{array}{l} -\frac{3\mathrm{i}e^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},3}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} - \\ \frac{\mathrm{i}e^2 c_{2\alpha} s_{2\beta}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},3}\right) + \\ \frac{\mathrm{i}e^2 c_{2\alpha} s_{2\beta}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},2} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},2} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},3}\right) - \\ \frac{\mathrm{i}e^2 s_{2\alpha} s_{2\beta}}{4 c^2_{\mathrm{W}} s^2_{\mathrm{W}}}\left(\begin{array}{l} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},1} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},1} + \\ U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},2} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},2} + \\ U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},3} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},3} \end{array}\right) \end{array}\right]
$$

$$\underset{322}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, H_{\mathrm{h3}}, G^0\right) = \left[\begin{array}{l} -\dfrac{3\mathrm{i}e^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\ \dfrac{\mathrm{i}e^2 c_{2\alpha} s_{2\beta}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},1} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},1} Z^{\mathrm{H}}_{\mathrm{h1},3}\right) + \\ \dfrac{\mathrm{i}e^2 c_{2\alpha} s_{2\beta}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},2} Z^{\mathrm{H}}_{\mathrm{h1},2} + U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},2} + U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},2} Z^{\mathrm{H}}_{\mathrm{h1},3}\right) - \\ \dfrac{\mathrm{i}e^2 s_{2\alpha} s_{2\beta}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},2} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},1} + \\ U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},1} Z^{\mathrm{H}}_{\mathrm{h1},2} + U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},2} + \\ U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},1} Z^{\mathrm{H}}_{\mathrm{h1},3} + U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},2} Z^{\mathrm{H}}_{\mathrm{h1},3} \end{array}\right) \end{array}\right]$$

$$\underset{323}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, H_{\mathrm{h3}}, G^0\right) = \left[\begin{array}{l} -\dfrac{3\mathrm{i}e^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\ \dfrac{\mathrm{i}e^2 c_{2\alpha} s_{2\beta}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h3},1} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h3},1} Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},3}\right) + \\ \dfrac{\mathrm{i}e^2 c_{2\alpha} s_{2\beta}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2} + U^{\mathrm{H}}_{\mathrm{h3},2} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},2} + U^{\mathrm{H}}_{\mathrm{h3},2} Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},3}\right) - \\ \dfrac{\mathrm{i}e^2 s_{2\alpha} s_{2\beta}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h3},2} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},1} + \\ U^{\mathrm{H}}_{\mathrm{h3},3} Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},2} + U^{\mathrm{H}}_{\mathrm{h3},1} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},2} + \\ U^{\mathrm{H}}_{\mathrm{h3},2} Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},3} + U^{\mathrm{H}}_{\mathrm{h3},1} Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},3} \end{array}\right) \end{array}\right]$$

$$\underset{324}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, \hat{H}_{\mathrm{h3}}, G^0\right) = \left[\begin{array}{l} -\dfrac{3\mathrm{i}e^2 c_{2\beta} s_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h3},3}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\ \dfrac{\mathrm{i}e^2 c_{2\alpha} s_{2\beta}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h3},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h3},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h3},3}\right) + \\ \dfrac{\mathrm{i}e^2 c_{2\alpha} s_{2\beta}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h3},2} + Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h3},2} + Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h3},3}\right) - \\ \dfrac{\mathrm{i}e^2 s_{2\alpha} s_{2\beta}}{4 c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h3},1} + Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h3},1} + \\ Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h3},2} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h3},2} + \\ Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h3},3} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h3},3} \end{array}\right) \end{array}\right]$$

$$
\underset{325}{C}(H_{\mathrm{h1}}, H_{\mathrm{h2}}, H_{\mathrm{h3}}, H_{\mathrm{h4}}) = \left[\begin{array}{l}
-\dfrac{3\mathrm{i}e^2 c_{2\alpha}^2 U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},1}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\
\dfrac{3\mathrm{i}e^2 c_{2\alpha}^2 U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},2}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\
\dfrac{3\mathrm{i}e^2 c_{2\beta}^2 U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},3}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\
\dfrac{3\mathrm{i}e^2 c_{2\alpha} s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},1} + \\ U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},2} \end{array} \right) + \\
\dfrac{3\mathrm{i}e^2 c_{2\alpha} s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},1} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},2} + \\ U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},2} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},2} \end{array} \right) + \\
\dfrac{\mathrm{i}e^2}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},1} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},1} + \\ U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},1} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},2} + \\ U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},2} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},2} \end{array} \right) \left(1 - 3s_{2\alpha}^2\right) - \\
\dfrac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},1} + U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},1} + \\ U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},1} + U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},3} + \\ U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},3} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},3} \end{array} \right) + \\
\dfrac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},2} + U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},2} + \\ U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},2} + U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},3} + \\ U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},3} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},3} \end{array} \right) - \\
\dfrac{\mathrm{i}e^2 c_{2\beta} s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},1} + U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},1} + \\ U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},1} + U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},2} + \\ U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},2} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},2} + \\ U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},3} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},1} U^{\mathrm{H}}_{\mathrm{h4},3} + \\ U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},3} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},3} U^{\mathrm{H}}_{\mathrm{h3},2} U^{\mathrm{H}}_{\mathrm{h4},3} + \\ U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},3} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2} U^{\mathrm{H}}_{\mathrm{h3},3} U^{\mathrm{H}}_{\mathrm{h4},3} \end{array} \right)
\end{array}\right]
$$

$$
\underset{326}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, H_{\mathrm{h3}}, H_{\mathrm{h4}}\right) = \left[\begin{array}{l}
-\dfrac{3\mathrm{i}e^2 c_{2\alpha}^2 U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\
\dfrac{3\mathrm{i}e^2 c_{2\alpha}^2 U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\
\dfrac{3\mathrm{i}e^2 c_{2\beta}^2 U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\
\dfrac{3\mathrm{i}e^2 c_{2\alpha} s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + \\ U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} \end{array} \right) + \\
\dfrac{3\mathrm{i}e^2 c_{2\alpha} s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + \\ U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} \end{array} \right) + \\
\dfrac{\mathrm{i}e^2}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + \\ U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + \\ U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} \end{array} \right) \left(1 - 3s_{2\alpha}^2\right) - \\
\dfrac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + \\ U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} + \\ U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} + U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} \end{array} \right) + \\
\dfrac{\mathrm{i}e^2 c_{2\alpha} c_{2\beta}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + \\ U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} + \\ U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} + U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} \end{array} \right) - \\
\dfrac{\mathrm{i}e^2 c_{2\beta} s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(\begin{array}{l} U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + \\ U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},1}^{\mathrm{H}} + U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + \\ U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},2}^{\mathrm{H}} + \\ U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} + U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},1}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} + \\ U_{\mathrm{h2},3}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} + U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},3}^{\mathrm{H}} U_{\mathrm{h4},2}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} + \\ U_{\mathrm{h2},2}^{\mathrm{H}} U_{\mathrm{h3},1}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} + U_{\mathrm{h2},1}^{\mathrm{H}} U_{\mathrm{h3},2}^{\mathrm{H}} U_{\mathrm{h4},3}^{\mathrm{H}} Z_{\mathrm{h1},3}^{\mathrm{H}} \end{array} \right)
\end{array}\right]
$$

$$\underset{327}{C}\left(\hat{H}_{\mathrm{h1}},\hat{H}_{\mathrm{h2}},H_{\mathrm{h3}},H_{\mathrm{h4}}\right)=\left[\begin{array}{l}
-\frac{3\mathrm{i}e^2c_{2\alpha}^2U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}- \\
\frac{3\mathrm{i}e^2c_{2\alpha}^2U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}- \\
\frac{3\mathrm{i}e^2c_{2\beta}^2U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}- \\
\frac{3\mathrm{i}e^2c_{2\alpha}s_{2\alpha}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+\\U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}\end{array}\right)+ \\
\frac{3\mathrm{i}e^2c_{2\alpha}s_{2\alpha}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+\\U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}\end{array}\right)+ \\
\frac{\mathrm{i}e^2}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+\\U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+\\U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}\end{array}\right)\left(1-3s_{2\alpha}^2\right)- \\
\frac{\mathrm{i}e^2c_{2\alpha}c_{2\beta}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+\\U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}+\\U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}+U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}\end{array}\right)+ \\
\frac{\mathrm{i}e^2c_{2\alpha}c_{2\beta}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+\\U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}+\\U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}+U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}\end{array}\right)- \\
\frac{\mathrm{i}e^2c_{2\beta}s_{2\alpha}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+\\U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}+U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+\\U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}+\\U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}+U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}+\\U_{\mathrm{h3},3}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}+U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}+\\U_{\mathrm{h3},2}^{\mathrm{H}}U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}+U_{\mathrm{h3},1}^{\mathrm{H}}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}\end{array}\right)
\end{array}\right]$$

$$\underset{328}{C}\left(\hat{H}_{\mathrm{h1}},\hat{H}_{\mathrm{h2}},\hat{H}_{\mathrm{h3}},H_{\mathrm{h4}}\right)=\left[\begin{array}{l}
-\frac{3\mathrm{i}e^2c_{2\alpha}^2U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}- \\
\frac{3\mathrm{i}e^2c_{2\alpha}^2U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}- \\
\frac{3\mathrm{i}e^2c_{2\beta}^2U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}- \\
\frac{3\mathrm{i}e^2c_{2\alpha}s_{2\alpha}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+\\U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}\end{array}\right)+ \\
\frac{3\mathrm{i}e^2c_{2\alpha}s_{2\alpha}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+\\U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}\end{array}\right)+ \\
\frac{\mathrm{i}e^2}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+\\U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+\\U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}\end{array}\right)\left(1-3s_{2\alpha}^2\right)- \\
\frac{\mathrm{i}e^2c_{2\alpha}c_{2\beta}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+\\U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}+\\U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}+U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}\end{array}\right)+ \\
\frac{\mathrm{i}e^2c_{2\alpha}c_{2\beta}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+\\U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}+\\U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}+U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}\end{array}\right)- \\
\frac{\mathrm{i}e^2c_{2\beta}s_{2\alpha}}{4c_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+\\U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},1}^{\mathrm{H}}+U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+\\U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},2}^{\mathrm{H}}+\\U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}+U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},1}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}+\\U_{\mathrm{h4},3}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}+U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},3}^{\mathrm{H}}Z_{\mathrm{h2},2}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}+\\U_{\mathrm{h4},2}^{\mathrm{H}}Z_{\mathrm{h1},1}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}+U_{\mathrm{h4},1}^{\mathrm{H}}Z_{\mathrm{h1},2}^{\mathrm{H}}Z_{\mathrm{h2},3}^{\mathrm{H}}Z_{\mathrm{h3},3}^{\mathrm{H}}\end{array}\right)
\end{array}\right]$$

$$\underset{329}{C}\left(\hat{H}_{h1},\hat{H}_{h2},\hat{H}_{h3},\hat{H}_{h4}\right)=$$

$$\left[\begin{array}{l}
-\frac{3ie^2c_{2\alpha}^2Z_{h1,1}^HZ_{h2,1}^HZ_{h3,1}^HZ_{h4,1}^H}{4c_W^2s_W^2}- \\
\frac{3ie^2c_{2\alpha}^2Z_{h1,2}^HZ_{h2,2}^HZ_{h3,2}^HZ_{h4,2}^H}{4c_W^2s_W^2}- \\
\frac{3ie^2c_{2\beta}^2Z_{h1,3}^HZ_{h2,3}^HZ_{h3,3}^HZ_{h4,3}^H}{4c_W^2s_W^2}- \\
\frac{3ie^2c_{2\alpha}s_{2\alpha}}{4c_W^2s_W^2}\left(\begin{array}{l}Z_{h1,2}^HZ_{h2,1}^HZ_{h3,1}^HZ_{h4,1}^H+Z_{h1,1}^HZ_{h2,2}^HZ_{h3,1}^HZ_{h4,1}^H+\\Z_{h1,1}^HZ_{h2,1}^HZ_{h3,2}^HZ_{h4,1}^H+Z_{h1,1}^HZ_{h2,1}^HZ_{h3,1}^HZ_{h4,2}^H\end{array}\right)+ \\
\frac{3ie^2c_{2\alpha}s_{2\alpha}}{4c_W^2s_W^2}\left(\begin{array}{l}Z_{h1,2}^HZ_{h2,2}^HZ_{h3,2}^HZ_{h4,1}^H+Z_{h1,2}^HZ_{h2,2}^HZ_{h3,1}^HZ_{h4,2}^H+\\Z_{h1,2}^HZ_{h2,1}^HZ_{h3,2}^HZ_{h4,2}^H+Z_{h1,1}^HZ_{h2,2}^HZ_{h3,2}^HZ_{h4,2}^H\end{array}\right)+ \\
\frac{ie^2}{4c_W^2s_W^2}\left(\begin{array}{l}Z_{h1,2}^HZ_{h2,2}^HZ_{h3,1}^HZ_{h4,1}^H+Z_{h1,2}^HZ_{h2,1}^HZ_{h3,2}^HZ_{h4,1}^H+\\Z_{h1,1}^HZ_{h2,2}^HZ_{h3,2}^HZ_{h4,1}^H+Z_{h1,2}^HZ_{h2,1}^HZ_{h3,1}^HZ_{h4,2}^H+\\Z_{h1,1}^HZ_{h2,2}^HZ_{h3,1}^HZ_{h4,2}^H+Z_{h1,1}^HZ_{h2,1}^HZ_{h3,2}^HZ_{h4,2}^H\end{array}\right)\left(1-3s_{2\alpha}^2\right)- \\
\frac{ie^2c_{2\alpha}c_{2\beta}}{4c_W^2s_W^2}\left(\begin{array}{l}Z_{h1,3}^HZ_{h2,3}^HZ_{h3,1}^HZ_{h4,1}^H+Z_{h1,3}^HZ_{h2,1}^HZ_{h3,3}^HZ_{h4,1}^H+\\Z_{h1,1}^HZ_{h2,3}^HZ_{h3,3}^HZ_{h4,1}^H+Z_{h1,3}^HZ_{h2,1}^HZ_{h3,1}^HZ_{h4,3}^H+\\Z_{h1,1}^HZ_{h2,3}^HZ_{h3,1}^HZ_{h4,3}^H+Z_{h1,1}^HZ_{h2,1}^HZ_{h3,3}^HZ_{h4,3}^H\end{array}\right)+ \\
\frac{ie^2c_{2\alpha}c_{2\beta}}{4c_W^2s_W^2}\left(\begin{array}{l}Z_{h1,3}^HZ_{h2,3}^HZ_{h3,2}^HZ_{h4,2}^H+Z_{h1,3}^HZ_{h2,2}^HZ_{h3,3}^HZ_{h4,2}^H+\\Z_{h1,2}^HZ_{h2,3}^HZ_{h3,3}^HZ_{h4,2}^H+Z_{h1,3}^HZ_{h2,2}^HZ_{h3,2}^HZ_{h4,3}^H+\\Z_{h1,2}^HZ_{h2,3}^HZ_{h3,2}^HZ_{h4,3}^H+Z_{h1,2}^HZ_{h2,2}^HZ_{h3,3}^HZ_{h4,3}^H\end{array}\right)- \\
\frac{ie^2c_{2\beta}s_{2\alpha}}{4c_W^2s_W^2}\left(\begin{array}{l}Z_{h1,3}^HZ_{h2,3}^HZ_{h3,2}^HZ_{h4,1}^H+Z_{h1,3}^HZ_{h2,2}^HZ_{h3,3}^HZ_{h4,1}^H+\\Z_{h1,2}^HZ_{h2,3}^HZ_{h3,3}^HZ_{h4,1}^H+Z_{h1,3}^HZ_{h2,3}^HZ_{h3,1}^HZ_{h4,2}^H+\\Z_{h1,3}^HZ_{h2,1}^HZ_{h3,3}^HZ_{h4,2}^H+Z_{h1,1}^HZ_{h2,3}^HZ_{h3,3}^HZ_{h4,2}^H+\\Z_{h1,3}^HZ_{h2,2}^HZ_{h3,1}^HZ_{h4,3}^H+Z_{h1,2}^HZ_{h2,3}^HZ_{h3,1}^HZ_{h4,3}^H+\\Z_{h1,3}^HZ_{h2,1}^HZ_{h3,2}^HZ_{h4,3}^H+Z_{h1,1}^HZ_{h2,3}^HZ_{h3,2}^HZ_{h4,3}^H+\\Z_{h1,2}^HZ_{h2,1}^HZ_{h3,3}^HZ_{h4,3}^H+Z_{h1,1}^HZ_{h2,2}^HZ_{h3,3}^HZ_{h4,3}^H\end{array}\right)
\end{array}\right]$$

$$
\underset{330}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{\nu}_{\mathrm{g3}}, \tilde{\nu}_{\mathrm{g4}}^{\dagger}\right) = \left[\begin{array}{l} \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}c_{2\alpha}U_{\mathrm{h1,1}}^{\mathrm{H}}U_{\mathrm{h2,1}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}c_{2\alpha}U_{\mathrm{h1,2}}^{\mathrm{H}}U_{\mathrm{h2,2}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2}\left(U_{\mathrm{h1,2}}^{\mathrm{H}}U_{\mathrm{h2,1}}^{\mathrm{H}} + U_{\mathrm{h1,1}}^{\mathrm{H}}U_{\mathrm{h2,2}}^{\mathrm{H}}\right) + \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}c_{2\beta}U_{\mathrm{h1,3}}^{\mathrm{H}}U_{\mathrm{h2,3}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \end{array}\right]
$$

$$
\underset{331}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{\nu}_{\mathrm{g3}}, \tilde{\nu}_{\mathrm{g4}}^{\dagger}\right) = \left[\begin{array}{l} \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}c_{2\alpha}U_{\mathrm{h2,1}}^{\mathrm{H}}Z_{\mathrm{h1,1}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}c_{2\alpha}U_{\mathrm{h2,2}}^{\mathrm{H}}Z_{\mathrm{h1,2}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2}\left(U_{\mathrm{h2,2}}^{\mathrm{H}}Z_{\mathrm{h1,1}}^{\mathrm{H}} + U_{\mathrm{h2,1}}^{\mathrm{H}}Z_{\mathrm{h1,2}}^{\mathrm{H}}\right) + \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}c_{2\beta}U_{\mathrm{h2,3}}^{\mathrm{H}}Z_{\mathrm{h1,3}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \end{array}\right]
$$

$$
\underset{332}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, \tilde{\nu}_{\mathrm{g3}}, \tilde{\nu}_{\mathrm{g4}}^{\dagger}\right) = \left[\begin{array}{l} \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}c_{2\alpha}Z_{\mathrm{h1,1}}^{\mathrm{H}}Z_{\mathrm{h2,1}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}c_{2\alpha}Z_{\mathrm{h1,2}}^{\mathrm{H}}Z_{\mathrm{h2,2}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2}\left(Z_{\mathrm{h1,2}}^{\mathrm{H}}Z_{\mathrm{h2,1}}^{\mathrm{H}} + Z_{\mathrm{h1,1}}^{\mathrm{H}}Z_{\mathrm{h2,2}}^{\mathrm{H}}\right) + \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}c_{2\beta}Z_{\mathrm{h1,3}}^{\mathrm{H}}Z_{\mathrm{h2,3}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \end{array}\right]
$$

$$
\underset{333}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{e}_{\mathrm{g3}}^{\mathrm{s3}}, \tilde{e}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[\begin{array}{l} \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{4c_{\mathrm{W}}^2 c_{\beta}^2 M_{\mathrm{W}}^2 s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{\mathrm{W}}^2 m_{e_{\mathrm{g4}}}^2 - c_{\beta}^2 M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}} + \\ \left(c_{\mathrm{W}}^2 m_{e_{\mathrm{g4}}}^2 - 2c_{\beta}^2 M_{\mathrm{W}}^2 s_{\mathrm{W}}^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right)\left(U_{\mathrm{h1,2}}^{\mathrm{H}}U_{\mathrm{h2,1}}^{\mathrm{H}} + U_{\mathrm{h1,1}}^{\mathrm{H}}U_{\mathrm{h2,2}}^{\mathrm{H}}\right) - \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h1,2}}^{\mathrm{H}}U_{\mathrm{h2,2}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 c_{\beta}^2 M_{\mathrm{W}}^2 s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(2c_{\mathrm{W}}^2 c_{\alpha}^2 m_{e_{\mathrm{g4}}}^2 - c_{2\alpha}c_{\beta}^2 M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}} + \\ 2\left(c_{\mathrm{W}}^2 c_{\alpha}^2 m_{e_{\mathrm{g4}}}^2 - c_{2\alpha}c_{\beta}^2 M_{\mathrm{W}}^2 s_{\mathrm{W}}^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right) - \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h1,1}}^{\mathrm{H}}U_{\mathrm{h2,1}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 c_{\beta}^2 M_{\mathrm{W}}^2 s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{2\alpha}c_{\beta}^2 M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right) + 2c_{\mathrm{W}}^2 m_{e_{\mathrm{g4}}}^2 s_{\alpha}^2\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}} + \\ 2\left(c_{2\alpha}c_{\beta}^2 M_{\mathrm{W}}^2 s_{\mathrm{W}}^2 + c_{\mathrm{W}}^2 m_{e_{\mathrm{g4}}}^2 s_{\alpha}^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right) - \\ \frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h1,3}}^{\mathrm{H}}U_{\mathrm{h2,3}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2 M_{\mathrm{W}}^2 s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{2\beta}M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right) + 2c_{\mathrm{W}}^2 m_{e_{\mathrm{g4}}}^2 t_{\beta}^2\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}} + \\ 2\left(c_{2\beta}M_{\mathrm{W}}^2 s_{\mathrm{W}}^2 + c_{\mathrm{W}}^2 m_{e_{\mathrm{g4}}}^2 t_{\beta}^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right) \end{array}\right]
$$

$$
\underset{334}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{e}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{e}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{4c_{\mathrm{W}}^2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2-c_\beta^2M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}}+\\ \left(c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2-2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right)\left(U_{\mathrm{h2,2}}^{\mathrm{H}}Z_{\mathrm{h1,1}}^{\mathrm{H}}+U_{\mathrm{h2,1}}^{\mathrm{H}}Z_{\mathrm{h1,2}}^{\mathrm{H}}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h2,2}}^{\mathrm{H}}Z_{\mathrm{h1,2}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(2c_{\mathrm{W}}^2c_\alpha^2m_{e_{\mathrm{g4}}}^2-c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}}+\\ 2\left(c_{\mathrm{W}}^2c_\alpha^2m_{e_{\mathrm{g4}}}^2-c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h2,1}}^{\mathrm{H}}Z_{\mathrm{h1,1}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)+2c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2s_\alpha^2\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}}+\\ 2\left(c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2+c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2s_\alpha^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h2,3}}^{\mathrm{H}}Z_{\mathrm{h1,3}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{2\beta}M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)+2c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2t_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}}+\\ 2\left(c_{2\beta}M_{\mathrm{W}}^2s_{\mathrm{W}}^2+c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2t_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right)
\end{array}\right]
$$

$$
\underset{335}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, \tilde{e}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{e}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{4c_{\mathrm{W}}^2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2-c_\beta^2M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}}+\\ \left(c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2-2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right)\left(Z_{\mathrm{h1,2}}^{\mathrm{H}}Z_{\mathrm{h2,1}}^{\mathrm{H}}+Z_{\mathrm{h1,1}}^{\mathrm{H}}Z_{\mathrm{h2,2}}^{\mathrm{H}}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}Z_{\mathrm{h1,2}}^{\mathrm{H}}Z_{\mathrm{h2,2}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(2c_{\mathrm{W}}^2c_\alpha^2m_{e_{\mathrm{g4}}}^2-c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}}+\\ 2\left(c_{\mathrm{W}}^2c_\alpha^2m_{e_{\mathrm{g4}}}^2-c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}Z_{\mathrm{h1,1}}^{\mathrm{H}}Z_{\mathrm{h2,1}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)+2c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2s_\alpha^2\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}}+\\ 2\left(c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2+c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2s_\alpha^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}Z_{\mathrm{h1,3}}^{\mathrm{H}}Z_{\mathrm{h2,3}}^{\mathrm{H}}}{4c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{2\beta}M_{\mathrm{W}}^2\left(1-2s_{\mathrm{W}}^2\right)+2c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2t_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{e}_{\mathrm{g4}}}+\\ 2\left(c_{2\beta}M_{\mathrm{W}}^2s_{\mathrm{W}}^2+c_{\mathrm{W}}^2m_{e_{\mathrm{g4}}}^2t_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{e}_{\mathrm{g4}}}\end{array}\right)
\end{array}\right]
$$

$$
\underset{336}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{u}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{u}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2}\left(\begin{array}{l}\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)s_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ \left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-4M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)\left(U_{\mathrm{h1,2}}^{\mathrm{H}}U_{\mathrm{h2,1}}^{\mathrm{H}}+U_{\mathrm{h1,1}}^{\mathrm{H}}U_{\mathrm{h2,2}}^{\mathrm{H}}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h1,3}}^{\mathrm{H}}U_{\mathrm{h2,3}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_\beta^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-c_{2\beta}M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)t_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-2c_{2\beta}M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h1,1}}^{\mathrm{H}}U_{\mathrm{h2,1}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2c_\alpha^2m_{u_{\mathrm{g4}}}^2-c_{2\alpha}M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)s_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2c_\alpha^2m_{u_{\mathrm{g4}}}^2-2c_{2\alpha}M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h1,2}}^{\mathrm{H}}U_{\mathrm{h2,2}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2s_\alpha^2+c_{2\alpha}M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)s_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2s_\alpha^2+2c_{2\alpha}M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)
\end{array}\right]
$$

$$
\underset{337}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{u}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{u}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2}\left(\begin{array}{l}\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)s_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ \left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-4M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)\left(U_{\mathrm{h2,2}}^{\mathrm{H}}Z_{\mathrm{h1,1}}^{\mathrm{H}}+U_{\mathrm{h2,1}}^{\mathrm{H}}Z_{\mathrm{h1,2}}^{\mathrm{H}}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h2,3}}^{\mathrm{H}}Z_{\mathrm{h1,3}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_\beta^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-c_{2\beta}M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)t_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-2c_{2\beta}M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h2,1}}^{\mathrm{H}}Z_{\mathrm{h1,1}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2c_\alpha^2m_{u_{\mathrm{g4}}}^2-c_{2\alpha}M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)s_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2c_\alpha^2m_{u_{\mathrm{g4}}}^2-2c_{2\alpha}M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h2,2}}^{\mathrm{H}}Z_{\mathrm{h1,2}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2s_\alpha^2+c_{2\alpha}M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)s_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2s_\alpha^2+2c_{2\alpha}M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)
\end{array}\right]
$$

$$
\underset{338}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, \tilde{u}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{u}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
-\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2}\left(\begin{array}{l}\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)s_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ \left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-4M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)\left(Z_{\mathrm{h1,2}}^{\mathrm{H}}Z_{\mathrm{h2,1}}^{\mathrm{H}}+Z_{\mathrm{h1,1}}^{\mathrm{H}}Z_{\mathrm{h2,2}}^{\mathrm{H}}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}Z_{\mathrm{h1,3}}^{\mathrm{H}}Z_{\mathrm{h2,3}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_\beta^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-c_{2\beta}M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)t_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2-2c_{2\beta}M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}Z_{\mathrm{h1,1}}^{\mathrm{H}}Z_{\mathrm{h2,1}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2c_\alpha^2m_{u_{\mathrm{g4}}}^2-c_{2\alpha}M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)s_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2c_\alpha^2m_{u_{\mathrm{g4}}}^2-2c_{2\alpha}M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}Z_{\mathrm{h1,2}}^{\mathrm{H}}Z_{\mathrm{h2,2}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2s_\alpha^2+c_{2\alpha}M_{\mathrm{W}}^2\left(3-4s_{\mathrm{W}}^2\right)s_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{u}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2s_\alpha^2+2c_{2\alpha}M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{u}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{u}_{\mathrm{g4}}}\end{array}\right)
\end{array}\right]
$$

$$
\underset{339}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{d}^{\mathrm{s3}}_{\mathrm{g3}}, \tilde{d}^{\mathrm{s4},\dagger}_{\mathrm{g4}}\right) = \left[\begin{array}{l}
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{12c_{\mathrm{W}}^2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(3c_{\mathrm{W}}^2m_{d_{\mathrm{g4}}}^2-c_\beta^2M_{\mathrm{W}}^2\left(3-2s_{\mathrm{W}}^2\right)\right)U_{\mathrm{s3,1}}^{\tilde{d}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{d}_{\mathrm{g4}}}+\\ \left(3c_{\mathrm{W}}^2m_{d_{\mathrm{g4}}}^2-2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2\right)U_{\mathrm{s3,2}}^{\tilde{d}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{d}_{\mathrm{g4}}}\end{array}\right)\left(U_{\mathrm{h1,2}}^{\mathrm{H}}U_{\mathrm{h2,1}}^{\mathrm{H}}+U_{\mathrm{h1,1}}^{\mathrm{H}}U_{\mathrm{h2,2}}^{\mathrm{H}}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h1,2}}^{\mathrm{H}}U_{\mathrm{h2,2}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(6c_{\mathrm{W}}^2c_\alpha^2m_{d_{\mathrm{g4}}}^2-c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2\left(3-2s_{\mathrm{W}}^2\right)\right)U_{\mathrm{s3,1}}^{\tilde{d}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{d}_{\mathrm{g4}}}+\\ 2\left(3c_{\mathrm{W}}^2c_\alpha^2m_{d_{\mathrm{g4}}}^2-c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2\right)U_{\mathrm{s3,2}}^{\tilde{d}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{d}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h1,1}}^{\mathrm{H}}U_{\mathrm{h2,1}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2\left(3-2s_{\mathrm{W}}^2\right)+6c_{\mathrm{W}}^2m_{d_{\mathrm{g4}}}^2s_\alpha^2\right)U_{\mathrm{s3,1}}^{\tilde{d}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{d}_{\mathrm{g4}}}+\\ 2\left(c_{2\alpha}c_\beta^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2+3c_{\mathrm{W}}^2m_{d_{\mathrm{g4}}}^2s_\alpha^2\right)U_{\mathrm{s3,2}}^{\tilde{d}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{d}_{\mathrm{g4}}}\end{array}\right)-\\
\frac{\mathrm{i}e^2\delta_{\mathrm{g3,g4}}U_{\mathrm{h1,3}}^{\mathrm{H}}U_{\mathrm{h2,3}}^{\mathrm{H}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\begin{array}{l}\left(c_{2\beta}M_{\mathrm{W}}^2\left(3-2s_{\mathrm{W}}^2\right)+6c_{\mathrm{W}}^2m_{d_{\mathrm{g4}}}^2t_\beta^2\right)U_{\mathrm{s3,1}}^{\tilde{d}_{\mathrm{g4}}*}U_{\mathrm{s4,1}}^{\tilde{d}_{\mathrm{g4}}}+\\ 2\left(c_{2\beta}M_{\mathrm{W}}^2s_{\mathrm{W}}^2+3c_{\mathrm{W}}^2m_{d_{\mathrm{g4}}}^2t_\beta^2\right)U_{\mathrm{s3,2}}^{\tilde{d}_{\mathrm{g4}}*}U_{\mathrm{s4,2}}^{\tilde{d}_{\mathrm{g4}}}\end{array}\right)
\end{array}\right]
$$

$$C_{340}\left(\hat{H}_{h1}, H_{h2}, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} \frac{ie^2\delta_{g3,g4}s_{2\alpha}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\begin{array}{l}\left(3c_W^2m_{d_{g4}}^2 - c_\beta^2M_W^2\left(3-2s_W^2\right)\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1} + \\ \left(3c_W^2m_{d_{g4}}^2 - 2c_\beta^2M_W^2s_W^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\end{array}\right)\left(U^H_{h2,2}Z^H_{h1,1} + U^H_{h2,1}Z^H_{h1,2}\right) - \\ \frac{ie^2\delta_{g3,g4}U^H_{h2,2}Z^H_{h1,2}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\begin{array}{l}\left(6c_W^2c_\alpha^2m_{d_{g4}}^2 - c_{2\alpha}c_\beta^2M_W^2\left(3-2s_W^2\right)\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1} + \\ 2\left(3c_W^2c_\alpha^2m_{d_{g4}}^2 - c_{2\alpha}c_\beta^2M_W^2s_W^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\end{array}\right) - \\ \frac{ie^2\delta_{g3,g4}U^H_{h2,1}Z^H_{h1,1}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\begin{array}{l}\left(c_{2\alpha}c_\beta^2M_W^2\left(3-2s_W^2\right) + 6c_W^2m_{d_{g4}}^2s_\alpha^2\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1} + \\ 2\left(c_{2\alpha}c_\beta^2M_W^2s_W^2 + 3c_W^2m_{d_{g4}}^2s_\alpha^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\end{array}\right) - \\ \frac{ie^2\delta_{g3,g4}U^H_{h2,3}Z^H_{h1,3}}{12c_W^2M_W^2s_W^2}\left(\begin{array}{l}\left(c_{2\beta}M_W^2\left(3-2s_W^2\right) + 6c_W^2m_{d_{g4}}^2t_\beta^2\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1} + \\ 2\left(c_{2\beta}M_W^2s_W^2 + 3c_W^2m_{d_{g4}}^2t_\beta^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\end{array}\right) \end{array}\right]$$

$$C_{341}\left(\hat{H}_{h1}, \hat{H}_{h2}, \tilde{d}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4}\right) = \left[\begin{array}{l} \frac{ie^2\delta_{g3,g4}s_{2\alpha}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\begin{array}{l}\left(3c_W^2m_{d_{g4}}^2 - c_\beta^2M_W^2\left(3-2s_W^2\right)\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1} + \\ \left(3c_W^2m_{d_{g4}}^2 - 2c_\beta^2M_W^2s_W^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\end{array}\right)\left(Z^H_{h1,2}Z^H_{h2,1} + Z^H_{h1,1}Z^H_{h2,2}\right) - \\ \frac{ie^2\delta_{g3,g4}Z^H_{h1,2}Z^H_{h2,2}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\begin{array}{l}\left(6c_W^2c_\alpha^2m_{d_{g4}}^2 - c_{2\alpha}c_\beta^2M_W^2\left(3-2s_W^2\right)\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1} + \\ 2\left(3c_W^2c_\alpha^2m_{d_{g4}}^2 - c_{2\alpha}c_\beta^2M_W^2s_W^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\end{array}\right) - \\ \frac{ie^2\delta_{g3,g4}Z^H_{h1,1}Z^H_{h2,1}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\begin{array}{l}\left(c_{2\alpha}c_\beta^2M_W^2\left(3-2s_W^2\right) + 6c_W^2m_{d_{g4}}^2s_\alpha^2\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1} + \\ 2\left(c_{2\alpha}c_\beta^2M_W^2s_W^2 + 3c_W^2m_{d_{g4}}^2s_\alpha^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\end{array}\right) - \\ \frac{ie^2\delta_{g3,g4}Z^H_{h1,3}Z^H_{h2,3}}{12c_W^2M_W^2s_W^2}\left(\begin{array}{l}\left(c_{2\beta}M_W^2\left(3-2s_W^2\right) + 6c_W^2m_{d_{g4}}^2t_\beta^2\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1} + \\ 2\left(c_{2\beta}M_W^2s_W^2 + 3c_W^2m_{d_{g4}}^2t_\beta^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\end{array}\right) \end{array}\right]$$

[SSVV] 2 Higgs – 2 Gauge Bosons

$$C_{31}\left(G^0, G^0, Z, Z\right) = \left[\begin{array}{l} \frac{ie^2}{2c_W^2s_W^2} \end{array}\right]$$

$$C_{32}\left(G^0, G^0, W^-, W^+\right) = \left[\begin{array}{l} \frac{ie^2}{2s_W^2} \end{array}\right]$$

$$C_{33}\left(G^-, G^+, \gamma, \gamma\right) = \left[\begin{array}{l} 2ie^2 \end{array}\right]$$

$$C_{34}\left(G^-, G^+, \gamma, Z\right) = \left[\begin{array}{l} \frac{ie^2}{c_Ws_W}\left(c_W^2 - s_W^2\right) \end{array}\right]$$

$$\underset{35}{C}\left(G^-, G^+, Z, Z\right) = \left[\ \frac{\mathrm{i}e^2}{2c_\mathrm{W}^2 s_\mathrm{W}^2}\left(c_\mathrm{W}^2 - s_\mathrm{W}^2\right)^2\ \right]$$

$$\underset{36}{C}\left(G^-, G^+, W^-, W^+\right) = \left[\ \frac{\mathrm{i}e^2}{2s_\mathrm{W}^2}\ \right]$$

$$\underset{57}{C}\left(G^0, G^-, \gamma, W^+\right) = \left[\ -\frac{e^2}{2s_\mathrm{W}}\ \right]$$

$$\underset{58}{C}\left(G^0, G^-, Z, W^+\right) = \left[\ \frac{e^2}{2c_\mathrm{W}}\ \right]$$

$$\underset{59}{C}\left(G^0, G^+, \gamma, W^-\right) = \left[\ \frac{e^2}{2s_\mathrm{W}}\ \right]$$

$$\underset{60}{C}\left(G^0, G^+, Z, W^-\right) = \left[\ -\frac{e^2}{2c_\mathrm{W}}\ \right]$$

$$\underset{61}{C}\left(H^-, H^+, \gamma, \gamma\right) = \left[\ 2\mathrm{i}e^2\ \right]$$

$$\underset{62}{C}\left(H^-, H^+, \gamma, Z\right) = \left[\ \frac{\mathrm{i}e^2}{c_\mathrm{W} s_\mathrm{W}}\left(c_\mathrm{W}^2 - s_\mathrm{W}^2\right)\ \right]$$

$$\underset{63}{C}\left(H^-, H^+, Z, Z\right) = \left[\ \frac{\mathrm{i}e^2}{2c_\mathrm{W}^2 s_\mathrm{W}^2}\left(c_\mathrm{W}^2 - s_\mathrm{W}^2\right)^2\ \right]$$

$$\underset{64}{C}\left(H^-, H^+, W^-, W^+\right) = \left[\ \frac{\mathrm{i}e^2}{2s_\mathrm{W}^2}\ \right]$$

$$\underset{164}{C}\left(\tilde{\nu}_{\mathrm{g1}}, \tilde{\nu}_{\mathrm{g2}}^\dagger, Z, Z\right) = \left[\ \frac{\mathrm{i}e^2\delta_{\mathrm{g1,g2}}}{2c_\mathrm{W}^2 s_\mathrm{W}^2}\ \right]$$

$$\underset{165}{C}\left(\tilde{e}_{\mathrm{g1}}^{\mathrm{s1}}, \tilde{e}_{\mathrm{g2}}^{\mathrm{s2},\dagger}, \gamma, \gamma\right) = \left[\ 2\mathrm{i}e^2\delta_{\mathrm{g1,g2}}\delta_{\mathrm{s1,s2}}\ \right]$$

$$\underset{166}{C}\left(\tilde{e}_{\mathrm{g1}}^{\mathrm{s1}}, \tilde{e}_{\mathrm{g2}}^{\mathrm{s2},\dagger}, \gamma, Z\right) = \left[\ \frac{\mathrm{i}e^2\delta_{\mathrm{g1,g2}}}{c_\mathrm{W} s_\mathrm{W}}\left(\left(1 - 2s_\mathrm{W}^2\right)U_{\mathrm{s1,1}}^{\tilde{e}_{\mathrm{g1}}*}U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g1}}} - 2s_\mathrm{W}^2 U_{\mathrm{s1,2}}^{\tilde{e}_{\mathrm{g1}}*}U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g1}}}\right)\ \right]$$

$$\underset{167}{C}\left(\tilde{e}_{\mathrm{g1}}^{\mathrm{s1}}, \tilde{e}_{\mathrm{g2}}^{\mathrm{s2},\dagger}, Z, Z\right) = \left[\ \frac{\mathrm{i}e^2\delta_{\mathrm{g1,g2}}}{2c_\mathrm{W}^2 s_\mathrm{W}^2}\left(\left(1 - 2s_\mathrm{W}^2\right)^2 U_{\mathrm{s1,1}}^{\tilde{e}_{\mathrm{g1}}*}U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g1}}} + 4s_\mathrm{W}^4 U_{\mathrm{s1,2}}^{\tilde{e}_{\mathrm{g1}}*}U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g1}}}\right)\ \right]$$

$$C\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, \gamma, \gamma\right) = \left[\frac{8}{9} i e^2 \delta_{g1,g2} \delta_{s1,s2} \right]$$

$$C\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, \gamma, Z\right) = \left[\frac{2 i e^2 \delta_{g1,g2}}{9 c_W s_W} \left(\left(3 - 4 s_W^2\right) U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{u}_{g1}}_{s2,1} - 4 s_W^2 U^{\tilde{u}_{g1}*}_{s1,2} U^{\tilde{u}_{g1}}_{s2,2} \right) \right]$$

$$C\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, Z, Z\right) = \left[\frac{i e^2 \delta_{g1,g2}}{18 c_W^2 s_W^2} \left(\left(3 - 4 s_W^2\right)^2 U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{u}_{g1}}_{s2,1} + 16 s_W^4 U^{\tilde{u}_{g1}*}_{s1,2} U^{\tilde{u}_{g1}}_{s2,2} \right) \right]$$

$$C\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, \gamma, \gamma\right) = \left[\frac{2}{9} i e^2 \delta_{g1,g2} \delta_{s1,s2} \right]$$

$$C\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, \gamma, Z\right) = \left[\frac{i e^2 \delta_{g1,g2}}{9 c_W s_W} \left(\left(3 - 2 s_W^2\right) U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,1} - 2 s_W^2 U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s2,2} \right) \right]$$

$$C\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, Z, Z\right) = \left[\frac{i e^2 \delta_{g1,g2}}{18 c_W^2 s_W^2} \left(\left(3 - 2 s_W^2\right)^2 U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,1} + 4 s_W^4 U^{\tilde{d}_{g1}*}_{s1,2} U^{\tilde{d}_{g1}}_{s2,2} \right) \right]$$

$$C\left(\tilde{u}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, \gamma, W^-\right) = \left[\frac{i e^2 \mathrm{CKM}^*_{g1,g2} U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{d}_{g2}}_{s2,1}}{3\sqrt{2} s_W} \right]$$

$$C\left(\tilde{d}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, \gamma, W^+\right) = \left[\frac{i e^2 \mathrm{CKM}_{g2,g1} U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{u}_{g2}}_{s2,1}}{3\sqrt{2} s_W} \right]$$

$$C\left(\tilde{\nu}_{g1}, \tilde{e}^{s2,\dagger}_{g2}, \gamma, W^-\right) = \left[-\frac{i e^2 \delta_{g1,g2} U^{\tilde{e}_{g1}}_{s2,1}}{\sqrt{2} s_W} \right]$$

$$C\left(\tilde{e}^{s1}_{g1}, \tilde{\nu}^{\dagger}_{g2}, \gamma, W^+\right) = \left[-\frac{i e^2 \delta_{g1,g2} U^{\tilde{e}_{g2}*}_{s1,1}}{\sqrt{2} s_W} \right]$$

$$C\left(\tilde{u}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, Z, W^-\right) = \left[-\frac{i e^2 \mathrm{CKM}^*_{g1,g2} U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{d}_{g2}}_{s2,1}}{3\sqrt{2} c_W} \right]$$

$$C\left(\tilde{d}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, Z, W^+\right) = \left[-\frac{i e^2 \mathrm{CKM}_{g2,g1} U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{u}_{g2}}_{s2,1}}{3\sqrt{2} c_W} \right]$$

$$C\left(\tilde{\nu}_{g1}, \tilde{e}^{s2,\dagger}_{g2}, Z, W^-\right) = \left[\frac{i e^2 \delta_{g1,g2} U^{\tilde{e}_{g1}}_{s2,1}}{\sqrt{2} c_W} \right]$$

$$\underset{181}{C}\left(\tilde{e}^{s1}_{g1}, \tilde{\nu}^{\dagger}_{g2}, Z, W^{+}\right) = \left[\frac{\mathrm{i}e^2 \delta_{g1,g2} U^{\tilde{e}_{g2}*}_{s1,1}}{\sqrt{2} c_W} \right]$$

$$\underset{182}{C}\left(\tilde{\nu}_{g1}, \tilde{\nu}^{\dagger}_{g2}, W^{-}, W^{+}\right) = \left[\frac{\mathrm{i}e^2 \delta_{g1,g2}}{2 s_W^2} \right]$$

$$\underset{183}{C}\left(\tilde{e}^{s1}_{g1}, \tilde{e}^{s2,\dagger}_{g2}, W^{-}, W^{+}\right) = \left[\frac{\mathrm{i}e^2 \delta_{g1,g2} U^{\tilde{e}_{g1}*}_{s1,1} U^{\tilde{e}_{g1}}_{s2,1}}{2 s_W^2} \right]$$

$$\underset{184}{C}\left(\tilde{u}^{s1}_{g1}, \tilde{u}^{s2,\dagger}_{g2}, W^{-}, W^{+}\right) = \left[\frac{\mathrm{i}e^2 \delta_{g1,g2} U^{\tilde{u}_{g1}*}_{s1,1} U^{\tilde{u}_{g1}}_{s2,1}}{2 s_W^2} \right]$$

$$\underset{185}{C}\left(\tilde{d}^{s1}_{g1}, \tilde{d}^{s2,\dagger}_{g2}, W^{-}, W^{+}\right) = \left[\frac{\mathrm{i}e^2 \delta_{g1,g2} U^{\tilde{d}_{g1}*}_{s1,1} U^{\tilde{d}_{g1}}_{s2,1}}{2 s_W^2} \right]$$

$$\underset{278}{C}\left(H_{h1}, H^{+}, \gamma, W^{-}\right) = \left[\frac{\mathrm{i}e^2 c_{\beta-\alpha} U^{H}_{h1,1}}{2 s_W} - \frac{\mathrm{i}e^2 s_{\beta-\alpha} U^{H}_{h1,2}}{2 s_W} + \frac{e^2 U^{H}_{h1,3}}{2 s_W} \right]$$

$$\underset{279}{C}\left(\hat{H}_{h1}, H^{+}, \gamma, W^{-}\right) = \left[\frac{\mathrm{i}e^2 c_{\beta-\alpha} Z^{H}_{h1,1}}{2 s_W} - \frac{\mathrm{i}e^2 s_{\beta-\alpha} Z^{H}_{h1,2}}{2 s_W} + \frac{e^2 Z^{H}_{h1,3}}{2 s_W} \right]$$

$$\underset{280}{C}\left(H_{h1}, H^{+}, Z, W^{-}\right) = \left[-\frac{\mathrm{i}e^2 c_{\beta-\alpha} U^{H}_{h1,1}}{2 c_W} + \frac{\mathrm{i}e^2 s_{\beta-\alpha} U^{H}_{h1,2}}{2 c_W} - \frac{e^2 U^{H}_{h1,3}}{2 c_W} \right]$$

$$\underset{281}{C}\left(\hat{H}_{h1}, H^{+}, Z, W^{-}\right) = \left[-\frac{\mathrm{i}e^2 c_{\beta-\alpha} Z^{H}_{h1,1}}{2 c_W} + \frac{\mathrm{i}e^2 s_{\beta-\alpha} Z^{H}_{h1,2}}{2 c_W} - \frac{e^2 Z^{H}_{h1,3}}{2 c_W} \right]$$

$$\underset{286}{C}\left(H_{h1}, H^{-}, \gamma, W^{+}\right) = \left[\frac{\mathrm{i}e^2 c_{\beta-\alpha} U^{H}_{h1,1}}{2 s_W} - \frac{\mathrm{i}e^2 s_{\beta-\alpha} U^{H}_{h1,2}}{2 s_W} - \frac{e^2 U^{H}_{h1,3}}{2 s_W} \right]$$

$$\underset{287}{C}\left(\hat{H}_{h1}, H^{-}, \gamma, W^{+}\right) = \left[\frac{\mathrm{i}e^2 c_{\beta-\alpha} Z^{H}_{h1,1}}{2 s_W} - \frac{\mathrm{i}e^2 s_{\beta-\alpha} Z^{H}_{h1,2}}{2 s_W} - \frac{e^2 Z^{H}_{h1,3}}{2 s_W} \right]$$

$$\underset{288}{C}\left(H_{h1}, H^{-}, Z, W^{+}\right) = \left[-\frac{\mathrm{i}e^2 c_{\beta-\alpha} U^{H}_{h1,1}}{2 c_W} + \frac{\mathrm{i}e^2 s_{\beta-\alpha} U^{H}_{h1,2}}{2 c_W} + \frac{e^2 U^{H}_{h1,3}}{2 c_W} \right]$$

$$\underset{289}{C}\left(\hat{H}_{h1}, H^{-}, Z, W^{+}\right) = \left[-\frac{\mathrm{i}e^2 c_{\beta-\alpha} Z^{H}_{h1,1}}{2 c_W} + \frac{\mathrm{i}e^2 s_{\beta-\alpha} Z^{H}_{h1,2}}{2 c_W} + \frac{e^2 Z^{H}_{h1,3}}{2 c_W} \right]$$

$$C_{294}\left(H_{\mathrm{h1}}, G^{+}, \gamma, W^{-}\right) = \left[\frac{\mathrm{i}e^2 s_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},1}}{2 s_{\mathrm{W}}} + \frac{\mathrm{i}e^2 c_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},2}}{2 s_{\mathrm{W}}} \right]$$

$$C_{295}\left(\hat{H}_{\mathrm{h1}}, G^{+}, \gamma, W^{-}\right) = \left[\frac{\mathrm{i}e^2 s_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},1}}{2 s_{\mathrm{W}}} + \frac{\mathrm{i}e^2 c_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},2}}{2 s_{\mathrm{W}}} \right]$$

$$C_{296}\left(H_{\mathrm{h1}}, G^{+}, Z, W^{-}\right) = \left[-\frac{\mathrm{i}e^2 s_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},1}}{2 c_{\mathrm{W}}} - \frac{\mathrm{i}e^2 c_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},2}}{2 c_{\mathrm{W}}} \right]$$

$$C_{297}\left(\hat{H}_{\mathrm{h1}}, G^{+}, Z, W^{-}\right) = \left[-\frac{\mathrm{i}e^2 s_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},1}}{2 c_{\mathrm{W}}} - \frac{\mathrm{i}e^2 c_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},2}}{2 c_{\mathrm{W}}} \right]$$

$$C_{302}\left(H_{\mathrm{h1}}, G^{-}, \gamma, W^{+}\right) = \left[\frac{\mathrm{i}e^2 s_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},1}}{2 s_{\mathrm{W}}} + \frac{\mathrm{i}e^2 c_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},2}}{2 s_{\mathrm{W}}} \right]$$

$$C_{303}\left(\hat{H}_{\mathrm{h1}}, G^{-}, \gamma, W^{+}\right) = \left[\frac{\mathrm{i}e^2 s_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},1}}{2 s_{\mathrm{W}}} + \frac{\mathrm{i}e^2 c_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},2}}{2 s_{\mathrm{W}}} \right]$$

$$C_{304}\left(H_{\mathrm{h1}}, G^{-}, Z, W^{+}\right) = \left[-\frac{\mathrm{i}e^2 s_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},1}}{2 c_{\mathrm{W}}} - \frac{\mathrm{i}e^2 c_{\beta-\alpha} U^{\mathrm{H}}_{\mathrm{h1},2}}{2 c_{\mathrm{W}}} \right]$$

$$C_{305}\left(\hat{H}_{\mathrm{h1}}, G^{-}, Z, W^{+}\right) = \left[-\frac{\mathrm{i}e^2 s_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},1}}{2 c_{\mathrm{W}}} - \frac{\mathrm{i}e^2 c_{\beta-\alpha} Z^{\mathrm{H}}_{\mathrm{h1},2}}{2 c_{\mathrm{W}}} \right]$$

$$C_{342}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, Z, Z\right) = \left[\begin{array}{l} \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1}}{2 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2}}{2 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \\ \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3}}{2 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} \end{array} \right]$$

$$C_{343}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, Z, Z\right) = \left[\begin{array}{l} \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{2 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},2}}{2 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \\ \frac{\mathrm{i}e^2 U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{2 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} \end{array} \right]$$

$$C_{344}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, Z, Z\right) = \left[\begin{array}{l} \frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{2 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{2 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} + \\ \frac{\mathrm{i}e^2 Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{2 c^2_{\mathrm{W}} s^2_{\mathrm{W}}} \end{array} \right]$$

$$C_{345}\left(H_{h1}, H_{h2}, W^-, W^+\right) = \left[\begin{array}{c} \frac{ie^2 U^H_{h1,1} U^H_{h2,1}}{2s_W^2} + \frac{ie^2 U^H_{h1,2} U^H_{h2,2}}{2s_W^2} + \\ \frac{ie^2 U^H_{h1,3} U^H_{h2,3}}{2s_W^2} \end{array}\right]$$

$$C_{346}\left(\hat{H}_{h1}, H_{h2}, W^-, W^+\right) = \left[\begin{array}{c} \frac{ie^2 U^H_{h2,1} Z^H_{h1,1}}{2s_W^2} + \frac{ie^2 U^H_{h2,2} Z^H_{h1,2}}{2s_W^2} + \\ \frac{ie^2 U^H_{h2,3} Z^H_{h1,3}}{2s_W^2} \end{array}\right]$$

$$C_{347}\left(\hat{H}_{h1}, \hat{H}_{h2}, W^-, W^+\right) = \left[\begin{array}{c} \frac{ie^2 Z^H_{h1,1} Z^H_{h2,1}}{2s_W^2} + \frac{ie^2 Z^H_{h1,2} Z^H_{h2,2}}{2s_W^2} + \\ \frac{ie^2 Z^H_{h1,3} Z^H_{h2,3}}{2s_W^2} \end{array}\right]$$

[VVVV] 4 Gauge Bosons

$$C_{37}\left(\gamma, \gamma, W^-, W^+\right) = ie^2 \left[\begin{array}{c} -2 \\ \hline 1 \\ \hline 1 \end{array}\right]$$

$$C_{38}\left(\gamma, Z, W^-, W^+\right) = \frac{ie^2 c_W}{s_W} \left[\begin{array}{c} -2 \\ \hline 1 \\ \hline 1 \end{array}\right]$$

$$C_{39}\left(Z, Z, W^-, W^+\right) = \frac{ie^2 c_W^2}{s_W^2} \left[\begin{array}{c} -2 \\ \hline 1 \\ \hline 1 \end{array}\right]$$

$$\underset{40}{C}\left(W^-,W^-,W^+,W^+\right) = \frac{\mathrm{i}e^2}{s_{\mathrm{W}}^2}\begin{bmatrix} 2 \\ \hline -1 \\ \hline -1 \end{bmatrix}$$