MSSM, HMix

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

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

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

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

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

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

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

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

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

[FFS] **Chargino – Quark – Squark**

$$\underset{123}{C}\left(\tilde{\chi}_{c1}^{-}, \overline{d}_{g2}, \tilde{u}_{g3}^{s3}\right) = \frac{ie\mathrm{CKM}_{g3,g2}^{*}}{M_{W}s_{W}}\left[\frac{\dfrac{m_{d_{g2}}U_{c1,2}^{*}U_{s3,1}^{\tilde{u}_{g3}*}}{\sqrt{2}c_{\beta}}}{-\dfrac{1}{2s_{\beta}}\left(2M_{W}s_{\beta}V_{c1,1}U_{s3,1}^{\tilde{u}_{g3}*} - \sqrt{2}m_{u_{g3}}V_{c1,2}U_{s3,2}^{\tilde{u}_{g3}*}\right)}\right]$$

$$\underset{124}{C}\left(\tilde{\chi}_{c1}^{+}, \overline{u}_{g2}, \tilde{d}_{g3}^{s3}\right) = \frac{ie\mathrm{CKM}_{g2,g3}}{M_{W}s_{W}}\left[\frac{\dfrac{m_{u_{g2}}U_{s3,1}^{\tilde{d}_{g3}*}V_{c1,2}^{*}}{\sqrt{2}s_{\beta}}}{-\dfrac{1}{2c_{\beta}}\left(2c_{\beta}M_{W}U_{c1,1}U_{s3,1}^{\tilde{d}_{g3}*} - \sqrt{2}m_{d_{g3}}U_{c1,2}U_{s3,2}^{\tilde{d}_{g3}*}\right)}\right]$$

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

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

[FFS] **Lepton – Neutralino – Slepton**

$$\underset{115}{C}\left(\tilde{\chi}_{n1}^{0}, \overline{\nu}_{g2}, \tilde{\nu}_{g3}\right) = \frac{ie\delta_{g2,g3}}{\sqrt{2}c_{W}s_{W}}\left(s_{W}Z_{n1,1} - c_{W}Z_{n1,2}\right)\left[\frac{0}{1}\right]$$

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

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

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

[FFS] **Neutralino – Quark – Squark**

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

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

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

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

$$C_{110}\left(\tilde{\chi}_{c1}^-, \tilde{\chi}_{c2}^+, G^0\right) = \frac{e}{\sqrt{2}s_W}\left[\begin{array}{c} c_\beta U_{c1,2}^* V_{c2,1}^* - s_\beta U_{c1,1}^* V_{c2,2}^* \\ \\ \hline \\ -c_\beta U_{c2,2}V_{c1,1} + s_\beta U_{c2,1}V_{c1,2} \end{array}\right]$$

$$C_{206}\left(\tilde{\chi}_{c1}^-, \tilde{\chi}_{c2}^+, H_{h3}\right) = \left[\begin{array}{c} \dfrac{ieU_{h3,1}^H}{\sqrt{2}s_W}\left(s_\alpha U_{c1,2}^* V_{c2,1}^* - c_\alpha U_{c1,1}^* V_{c2,2}^*\right) - \\ \dfrac{eU_{h3,3}^H}{\sqrt{2}s_W}\left(s_\beta U_{c1,2}^* V_{c2,1}^* + c_\beta U_{c1,1}^* V_{c2,2}^*\right) - \\ \dfrac{ieU_{h3,2}^H}{\sqrt{2}s_W}\left(c_\alpha U_{c1,2}^* V_{c2,1}^* + s_\alpha U_{c1,1}^* V_{c2,2}^*\right) \\ \hline \\ \dfrac{ieU_{h3,1}^H}{\sqrt{2}s_W}\left(s_\alpha U_{c2,2}V_{c1,1} - c_\alpha U_{c2,1}V_{c1,2}\right) + \\ \dfrac{eU_{h3,3}^H}{\sqrt{2}s_W}\left(s_\beta U_{c2,2}V_{c1,1} + c_\beta U_{c2,1}V_{c1,2}\right) - \\ \dfrac{ieU_{h3,2}^H}{\sqrt{2}s_W}\left(c_\alpha U_{c2,2}V_{c1,1} + s_\alpha U_{c2,1}V_{c1,2}\right) \end{array}\right]$$

$$C_{207}\left(\tilde{\chi}_{c1}^-, \tilde{\chi}_{c2}^+, \hat{H}_{h3}\right) = \left[\begin{array}{c} \dfrac{ieZ_{h3,1}^H}{\sqrt{2}s_W}\left(s_\alpha U_{c1,2}^* V_{c2,1}^* - c_\alpha U_{c1,1}^* V_{c2,2}^*\right) - \\ \dfrac{ieZ_{h3,2}^H}{\sqrt{2}s_W}\left(c_\alpha U_{c1,2}^* V_{c2,1}^* + s_\alpha U_{c1,1}^* V_{c2,2}^*\right) - \\ \dfrac{eZ_{h3,3}^H}{\sqrt{2}s_W}\left(s_\beta U_{c1,2}^* V_{c2,1}^* + c_\beta U_{c1,1}^* V_{c2,2}^*\right) \\ \hline \\ \dfrac{ieZ_{h3,1}^H}{\sqrt{2}s_W}\left(s_\alpha U_{c2,2}V_{c1,1} - c_\alpha U_{c2,1}V_{c1,2}\right) - \\ \dfrac{ieZ_{h3,2}^H}{\sqrt{2}s_W}\left(c_\alpha U_{c2,2}V_{c1,1} + s_\alpha U_{c2,1}V_{c1,2}\right) + \\ \dfrac{eZ_{h3,3}^H}{\sqrt{2}s_W}\left(s_\beta U_{c2,2}V_{c1,1} + c_\beta U_{c2,1}V_{c1,2}\right) \end{array}\right]$$

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

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

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

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

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

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

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

$$\underset{109}{C}\left(\tilde{\chi}_{n1}^0, \tilde{\chi}_{n2}^0, G^0\right) = \frac{e}{2c_W s_W}\left[\frac{-\left(c_\beta Z_{n1,3}^* + s_\beta Z_{n1,4}^*\right)\left(s_W Z_{n2,1}^* - c_W Z_{n2,2}^*\right) - c_\beta\left(s_W Z_{n1,1}^* - c_W Z_{n1,2}^*\right) Z_{n2,3}^* - s_\beta\left(s_W Z_{n1,1}^* - c_W Z_{n1,2}^*\right) Z_{n2,4}^*}{\left(c_\beta Z_{n1,3} + s_\beta Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + c_\beta\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,3} + s_\beta\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,4}}\right]$$

$$\underset{204}{C}\left(\tilde{\chi}_{n1}^0, \tilde{\chi}_{n2}^0, H_{h3}\right) = \left[\frac{\boxed{1}}{\boxed{2}}\right]$$

$$\boxed{2} = \begin{aligned} &-\frac{ieU_{h3,1}^H}{2c_W s_W}\left(\left(s_\alpha Z_{n1,3} + c_\alpha Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W s_\alpha Z_{n1,1} - c_W s_\alpha Z_{n1,2}\right) Z_{n2,3} + \left(c_\alpha s_W Z_{n1,1} - c_W c_\alpha Z_{n1,2}\right) Z_{n2,4}\right) - \\ &\frac{eU_{h3,3}^H}{2c_W s_W}\left(\left(s_\beta Z_{n1,3} - c_\beta Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + s_\beta\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,3} - \left(c_\beta s_W Z_{n1,1} - c_W c_\beta Z_{n1,2}\right) Z_{n2,4}\right) + \\ &\frac{ieU_{h3,2}^H}{2c_W s_W}\left(\left(c_\alpha Z_{n1,3} - s_\alpha Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + c_\alpha\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,3} - \left(s_W s_\alpha Z_{n1,1} - c_W s_\alpha Z_{n1,2}\right) Z_{n2,4}\right) \end{aligned}$$

$$\boxed{1} = \begin{aligned} &-\frac{ieU_{h3,1}^H}{2c_W s_W}\left(\left(s_\alpha Z_{n1,3}^* + c_\alpha Z_{n1,4}^*\right)\left(s_W Z_{n2,1}^* - c_W Z_{n2,2}^*\right) + s_\alpha\left(s_W Z_{n1,1}^* - c_W Z_{n1,2}^*\right) Z_{n2,3}^* + c_\alpha\left(s_W Z_{n1,1}^* - c_W Z_{n1,2}^*\right) Z_{n2,4}^*\right) + \\ &\frac{eU_{h3,3}^H}{2c_W s_W}\left(\left(s_\beta Z_{n1,3}^* - c_\beta Z_{n1,4}^*\right)\left(s_W Z_{n2,1}^* - c_W Z_{n2,2}^*\right) + s_\beta\left(s_W Z_{n1,1}^* - c_W Z_{n1,2}^*\right) Z_{n2,3}^* - \left(c_\beta s_W Z_{n1,1}^* - c_W c_\beta Z_{n1,2}^*\right) Z_{n2,4}^*\right) + \\ &\frac{ieU_{h3,2}^H}{2c_W s_W}\left(\left(c_\alpha Z_{n1,3}^* - s_\alpha Z_{n1,4}^*\right)\left(s_W Z_{n2,1}^* - c_W Z_{n2,2}^*\right) + c_\alpha\left(s_W Z_{n1,1}^* - c_W Z_{n1,2}^*\right) Z_{n2,3}^* - \left(s_W s_\alpha Z_{n1,1}^* - c_W s_\alpha Z_{n1,2}^*\right) Z_{n2,4}^*\right) \end{aligned}$$

$$\underset{205}{C}\left(\tilde{\chi}_{n1}^0, \tilde{\chi}_{n2}^0, \hat{H}_{h3}\right) = \left[\frac{\boxed{1}}{\boxed{2}}\right]$$

$$\boxed{2} = \begin{aligned} &-\frac{ieZ_{h3,1}^H}{2c_W s_W}\left(\left(s_\alpha Z_{n1,3} + c_\alpha Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + \left(s_W s_\alpha Z_{n1,1} - c_W s_\alpha Z_{n1,2}\right) Z_{n2,3} + \left(c_\alpha s_W Z_{n1,1} - c_W c_\alpha Z_{n1,2}\right) Z_{n2,4}\right) - \\ &\frac{eZ_{h3,3}^H}{2c_W s_W}\left(\left(s_\beta Z_{n1,3} - c_\beta Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + s_\beta\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,3} - \left(c_\beta s_W Z_{n1,1} - c_W c_\beta Z_{n1,2}\right) Z_{n2,4}\right) + \\ &\frac{ieZ_{h3,2}^H}{2c_W s_W}\left(\left(c_\alpha Z_{n1,3} - s_\alpha Z_{n1,4}\right)\left(s_W Z_{n2,1} - c_W Z_{n2,2}\right) + c_\alpha\left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) Z_{n2,3} - \left(s_W s_\alpha Z_{n1,1} - c_W s_\alpha Z_{n1,2}\right) Z_{n2,4}\right) \end{aligned}$$

$$1 = \begin{aligned} &-\frac{ieZ^H_{h3,1}}{2c_Ws_W}\left(\left(s_\alpha Z^*_{n1,3} + c_\alpha Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + s_\alpha\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,3} + c_\alpha\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,4}\right) + \\ &\frac{eZ^H_{h3,3}}{2c_Ws_W}\left(\left(s_\beta Z^*_{n1,3} - c_\beta Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + s_\beta\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,3} - \left(c_\beta s_W Z^*_{n1,1} - c_W c_\beta Z^*_{n1,2}\right) Z^*_{n2,4}\right) + \\ &\frac{ieZ^H_{h3,2}}{2c_Ws_W}\left(\left(c_\alpha Z^*_{n1,3} - s_\alpha Z^*_{n1,4}\right)\left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) + c_\alpha\left(s_W Z^*_{n1,1} - c_W Z^*_{n1,2}\right) Z^*_{n2,3} - \left(s_W s_\alpha Z^*_{n1,1} - c_W s_\alpha Z^*_{n1,2}\right) Z^*_{n2,4}\right) \end{aligned}$$

[FFS] **2 Quarks – Higgs**

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

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

$$\underset{81}{C}\left(u_{g1}, \bar{d}_{g2}, G^-\right) = \frac{ie\text{CKM}^*_{g1,g2}}{\sqrt{2}M_W s_W}\left[\begin{array}{c} -m_{d_{g2}} \\ \hline m_{u_{g1}} \end{array}\right]$$

$$\underset{82}{C}\left(d_{g1}, \bar{u}_{g2}, G^+\right) = \frac{ie\text{CKM}_{g2,g1}}{\sqrt{2}M_W s_W}\left[\begin{array}{c} m_{u_{g2}} \\ \hline -m_{d_{g1}} \end{array}\right]$$

$$\underset{85}{C}\left(u_{g1}, \bar{d}_{g2}, H^-\right) = \frac{ie\text{CKM}^*_{g1,g2}}{\sqrt{2}M_W s_W}\left[\begin{array}{c} m_{d_{g2}} t_\beta \\ \hline \dfrac{m_{u_{g1}}}{t_\beta} \end{array}\right]$$

$$\underset{86}{C}\left(d_{g1}, \bar{u}_{g2}, H^+\right) = \frac{ie\text{CKM}_{g2,g1}}{\sqrt{2}M_W s_W}\left[\begin{array}{c} \dfrac{m_{u_{g2}}}{t_\beta} \\ \hline m_{d_{g1}} t_\beta \end{array}\right]$$

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$$\underset{200}{C}\left(u_{g1}, \overline{u}_{g2}, H_{h3}\right) = \begin{bmatrix} -\dfrac{ie\delta_{g1,g2}c_\alpha m_{u_{g1}}U^{H}_{h3,1}}{2M_{W}s_{W}s_\beta} - \dfrac{ie\delta_{g1,g2}m_{u_{g1}}s_\alpha U^{H}_{h3,2}}{2M_{W}s_{W}s_\beta} + \dfrac{e\delta_{g1,g2}m_{u_{g1}}U^{H}_{h3,3}}{2M_{W}s_{W}t_\beta} \\[3mm] -\dfrac{ie\delta_{g1,g2}c_\alpha m_{u_{g1}}U^{H}_{h3,1}}{2M_{W}s_{W}s_\beta} - \dfrac{ie\delta_{g1,g2}m_{u_{g1}}s_\alpha U^{H}_{h3,2}}{2M_{W}s_{W}s_\beta} - \dfrac{e\delta_{g1,g2}m_{u_{g1}}U^{H}_{h3,3}}{2M_{W}s_{W}t_\beta} \end{bmatrix}$$

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

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

$$\underset{203}{C}\left(d_{g1}, \overline{d}_{g2}, \hat{H}_{h3}\right) = \begin{bmatrix} \dfrac{ie\delta_{g1,g2}m_{d_{g1}}s_\alpha Z^{H}_{h3,1}}{2c_\beta M_{W}s_{W}} - \dfrac{ie\delta_{g1,g2}c_\alpha m_{d_{g1}}Z^{H}_{h3,2}}{2c_\beta M_{W}s_{W}} + \dfrac{e\delta_{g1,g2}m_{d_{g1}}t_\beta Z^{H}_{h3,3}}{2M_{W}s_{W}} \\[3mm] \dfrac{ie\delta_{g1,g2}m_{d_{g1}}s_\alpha Z^{H}_{h3,1}}{2c_\beta M_{W}s_{W}} - \dfrac{ie\delta_{g1,g2}c_\alpha m_{d_{g1}}Z^{H}_{h3,2}}{2c_\beta M_{W}s_{W}} - \dfrac{e\delta_{g1,g2}m_{d_{g1}}t_\beta Z^{H}_{h3,3}}{2M_{W}s_{W}} \end{bmatrix}$$

[FFV] **Chargino – Neutralino – Gauge Boson**

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

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

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

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

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

$$\underset{71}{C}\left(\overline{\nu}_{g1}, \nu_{g2}, Z\right) = -\frac{ie\delta_{g1,g2}}{2c_W s_W} \begin{bmatrix} 1 \\ \underline{} \\ 0 \end{bmatrix}$$

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

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

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

$$\underset{131}{C}\left(\tilde{\chi}_{n1}^{0}, \tilde{\chi}_{n2}^{0}, Z\right) = \frac{ie}{2c_{W}s_{W}} \begin{bmatrix} -Z_{n1,3}Z_{n2,3}^{*} + Z_{n1,4}Z_{n2,4}^{*} \\ \\ Z_{n2,3}Z_{n1,3}^{*} - Z_{n2,4}Z_{n1,4}^{*} \end{bmatrix}$$

[FFV] **2 Quarks – Gauge Boson**

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

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

$$\underset{73}{C}\left(\overline{u}_{g1}, u_{g2}, Z\right) = \frac{ie\delta_{g1,g2}}{c_{W}} \begin{bmatrix} -\frac{1}{6s_{W}}\left(3 - 4s_{W}^{2}\right) \\ \hline \frac{2s_{W}}{3} \end{bmatrix}$$

$$\underset{74}{C}\left(\overline{d}_{g1}, d_{g2}, Z\right) = -\frac{ie\delta_{g1,g2}}{c_{W}} \begin{bmatrix} -\frac{1}{6s_{W}}\left(3 - 2s_{W}^{2}\right) \\ \hline \frac{s_{W}}{3} \end{bmatrix}$$

$$\underset{83}{C}\left(\overline{d}_{g1}, u_{g2}, W^{-}\right) = -\frac{ie\text{CKM}_{g2,g1}^{*}}{\sqrt{2}s_{W}} \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{84}{C}\left(\overline{u}_{g1}, d_{g2}, W^{+}\right) = -\frac{ie\text{CKM}_{g1,g2}}{\sqrt{2}s_{W}} \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

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

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

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

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

$$\underset{216}{C}\left(H_{h1}, H^-, G^+\right) = \left[\ -\frac{eM_W U^H_{h1,3}}{2s_W} - \frac{ieM_W U^H_{h1,1}}{2s_W}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c^2_W} - c_{\beta-\alpha}\right) + \frac{ieM_W U^H_{h1,2}}{2s_W}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c^2_W} - s_{\beta-\alpha}\right)\ \right]$$

$$\underset{217}{C}\left(\hat{H}_{h1}, H^-, G^+\right) = \left[\ -\frac{eM_W Z^H_{h1,3}}{2s_W} - \frac{ieM_W Z^H_{h1,1}}{2s_W}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c^2_W} - c_{\beta-\alpha}\right) + \frac{ieM_W Z^H_{h1,2}}{2s_W}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c^2_W} - s_{\beta-\alpha}\right)\ \right]$$

$$\underset{222}{C}\left(H_{h1}, G^-, H^+\right) = \left[\ \frac{eM_W U^H_{h1,3}}{2s_W} - \frac{ieM_W U^H_{h1,1}}{2s_W}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c^2_W} - c_{\beta-\alpha}\right) + \frac{ieM_W U^H_{h1,2}}{2s_W}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c^2_W} - s_{\beta-\alpha}\right)\ \right]$$

$$\underset{223}{C}\left(\hat{H}_{h1}, G^-, H^+\right) = \left[\ \frac{eM_W Z^H_{h1,3}}{2s_W} - \frac{ieM_W Z^H_{h1,1}}{2s_W}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c^2_W} - c_{\beta-\alpha}\right) + \frac{ieM_W Z^H_{h1,2}}{2s_W}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c^2_W} - s_{\beta-\alpha}\right)\ \right]$$

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

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

$$\underset{228}{C}\left(H_{h1}, H_{h2}, G^0\right) = \left[\ -\frac{ieM_W s_{2\beta}s_{\alpha+\beta}}{2s_W c^2_W}\left(U^H_{h1,3}U^H_{h2,1} + U^H_{h1,1}U^H_{h2,3}\right) + \frac{iec_{\alpha+\beta}M_W s_{2\beta}}{2s_W c^2_W}\left(U^H_{h1,3}U^H_{h2,2} + U^H_{h1,2}U^H_{h2,3}\right)\ \right]$$

$$\underset{229}{C}\left(\hat{H}_{h1}, H_{h2}, G^0\right) = \left[\ -\frac{ieM_W s_{2\beta}s_{\alpha+\beta}}{2s_W c^2_W}\left(U^H_{h2,3}Z^H_{h1,1} + U^H_{h2,1}Z^H_{h1,3}\right) + \frac{iec_{\alpha+\beta}M_W s_{2\beta}}{2s_W c^2_W}\left(U^H_{h2,3}Z^H_{h1,2} + U^H_{h2,2}Z^H_{h1,3}\right)\ \right]$$

$$\mathop{C}_{230}\left(\hat{H}_{\text{h1}}, \hat{H}_{\text{h2}}, G^0\right) = \left[-\frac{ieM_{\text{W}}s_{2\beta}s_{\alpha+\beta}}{2s_{\text{W}}c_{\text{W}}^2}\left(Z^{\text{H}}_{\text{h1,3}}Z^{\text{H}}_{\text{h2,1}} + Z^{\text{H}}_{\text{h1,1}}Z^{\text{H}}_{\text{h2,3}}\right) + \frac{iec_{\alpha+\beta}M_{\text{W}}s_{2\beta}}{2s_{\text{W}}c_{\text{W}}^2}\left(Z^{\text{H}}_{\text{h1,3}}Z^{\text{H}}_{\text{h2,2}} + Z^{\text{H}}_{\text{h1,2}}Z^{\text{H}}_{\text{h2,3}}\right) \right]$$

$$\mathop{C}_{231}\left(H_{\text{h1}}, H_{\text{h2}}, H_{\text{h3}}\right) = \left[\; \boxed{1} \; \right]$$

$$
\boxed{1} =
\begin{aligned}
&-\frac{3iec_{2\alpha}M_{\text{W}}s_{\alpha+\beta}U^{\text{H}}_{\text{h1,1}}U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,1}}}{2s_{\text{W}}c_{\text{W}}^2} - \frac{3iec_{2\alpha}c_{\alpha+\beta}M_{\text{W}}U^{\text{H}}_{\text{h1,2}}U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,2}}}{2s_{\text{W}}c_{\text{W}}^2} + \\
&\frac{ieM_{\text{W}}}{2s_{\text{W}}c_{\text{W}}^2}\left(c_{2\alpha}c_{\alpha+\beta} - 2s_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\text{H}}_{\text{h1,2}}U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,1}} + U^{\text{H}}_{\text{h1,1}}U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,1}} + U^{\text{H}}_{\text{h1,1}}U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,2}}\right) + \\
&\frac{ieM_{\text{W}}}{2s_{\text{W}}c_{\text{W}}^2}\left(2c_{\alpha+\beta}s_{2\alpha} + c_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\text{H}}_{\text{h1,2}}U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,1}} + U^{\text{H}}_{\text{h1,2}}U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,2}} + U^{\text{H}}_{\text{h1,1}}U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,2}}\right) - \\
&\frac{iec_{2\beta}M_{\text{W}}s_{\alpha+\beta}}{2s_{\text{W}}c_{\text{W}}^2}\left(U^{\text{H}}_{\text{h1,3}}U^{\text{H}}_{\text{h2,3}}U^{\text{H}}_{\text{h3,1}} + U^{\text{H}}_{\text{h1,3}}U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,3}} + U^{\text{H}}_{\text{h1,1}}U^{\text{H}}_{\text{h2,3}}U^{\text{H}}_{\text{h3,3}}\right) + \\
&\frac{iec_{2\beta}c_{\alpha+\beta}M_{\text{W}}}{2s_{\text{W}}c_{\text{W}}^2}\left(U^{\text{H}}_{\text{h1,3}}U^{\text{H}}_{\text{h2,3}}U^{\text{H}}_{\text{h3,2}} + U^{\text{H}}_{\text{h1,3}}U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,3}} + U^{\text{H}}_{\text{h1,2}}U^{\text{H}}_{\text{h2,3}}U^{\text{H}}_{\text{h3,3}}\right)
\end{aligned}
$$

$$\mathop{C}_{232}\left(\hat{H}_{\text{h1}}, H_{\text{h2}}, H_{\text{h3}}\right) = \left[\; \boxed{1} \; \right]$$

$$
\boxed{1} =
\begin{aligned}
&-\frac{3iec_{2\alpha}M_{\text{W}}s_{\alpha+\beta}U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,1}}}{2s_{\text{W}}c_{\text{W}}^2} - \frac{3iec_{2\alpha}c_{\alpha+\beta}M_{\text{W}}U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,2}}}{2s_{\text{W}}c_{\text{W}}^2} + \\
&\frac{ieM_{\text{W}}}{2s_{\text{W}}c_{\text{W}}^2}\left(c_{2\alpha}c_{\alpha+\beta} - 2s_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,1}} + U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,1}} + U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,2}}\right) + \\
&\frac{ieM_{\text{W}}}{2s_{\text{W}}c_{\text{W}}^2}\left(2c_{\alpha+\beta}s_{2\alpha} + c_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,1}} + U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,2}} + U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,2}}\right) - \\
&\frac{iec_{2\beta}M_{\text{W}}s_{\alpha+\beta}}{2s_{\text{W}}c_{\text{W}}^2}\left(U^{\text{H}}_{\text{h2,3}}U^{\text{H}}_{\text{h3,3}}Z^{\text{H}}_{\text{h1,1}} + U^{\text{H}}_{\text{h2,3}}U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,3}} + U^{\text{H}}_{\text{h2,1}}U^{\text{H}}_{\text{h3,3}}Z^{\text{H}}_{\text{h1,3}}\right) + \\
&\frac{iec_{2\beta}c_{\alpha+\beta}M_{\text{W}}}{2s_{\text{W}}c_{\text{W}}^2}\left(U^{\text{H}}_{\text{h2,3}}U^{\text{H}}_{\text{h3,3}}Z^{\text{H}}_{\text{h1,2}} + U^{\text{H}}_{\text{h2,3}}U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,3}} + U^{\text{H}}_{\text{h2,2}}U^{\text{H}}_{\text{h3,3}}Z^{\text{H}}_{\text{h1,3}}\right)
\end{aligned}
$$

$$\mathop{C}_{233}\left(\hat{H}_{\text{h1}}, \hat{H}_{\text{h2}}, H_{\text{h3}}\right) = \left[\; \boxed{1} \; \right]$$

$$
\boxed{1} =
\begin{aligned}
&-\frac{3iec_{2\alpha}M_{\text{W}}s_{\alpha+\beta}U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,1}}Z^{\text{H}}_{\text{h2,1}}}{2s_{\text{W}}c_{\text{W}}^2} - \frac{3iec_{2\alpha}c_{\alpha+\beta}M_{\text{W}}U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,2}}Z^{\text{H}}_{\text{h2,2}}}{2s_{\text{W}}c_{\text{W}}^2} + \\
&\frac{ieM_{\text{W}}}{2s_{\text{W}}c_{\text{W}}^2}\left(c_{2\alpha}c_{\alpha+\beta} - 2s_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,1}}Z^{\text{H}}_{\text{h2,1}} + U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,2}}Z^{\text{H}}_{\text{h2,1}} + U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,1}}Z^{\text{H}}_{\text{h2,2}}\right) + \\
&\frac{ieM_{\text{W}}}{2s_{\text{W}}c_{\text{W}}^2}\left(2c_{\alpha+\beta}s_{2\alpha} + c_{2\alpha}s_{\alpha+\beta}\right)\left(U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,2}}Z^{\text{H}}_{\text{h2,1}} + U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,1}}Z^{\text{H}}_{\text{h2,2}} + U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,2}}Z^{\text{H}}_{\text{h2,2}}\right) - \\
&\frac{iec_{2\beta}M_{\text{W}}s_{\alpha+\beta}}{2s_{\text{W}}c_{\text{W}}^2}\left(U^{\text{H}}_{\text{h3,3}}Z^{\text{H}}_{\text{h1,3}}Z^{\text{H}}_{\text{h2,1}} + U^{\text{H}}_{\text{h3,3}}Z^{\text{H}}_{\text{h1,1}}Z^{\text{H}}_{\text{h2,3}} + U^{\text{H}}_{\text{h3,1}}Z^{\text{H}}_{\text{h1,3}}Z^{\text{H}}_{\text{h2,3}}\right) + \\
&\frac{iec_{2\beta}c_{\alpha+\beta}M_{\text{W}}}{2s_{\text{W}}c_{\text{W}}^2}\left(U^{\text{H}}_{\text{h3,3}}Z^{\text{H}}_{\text{h1,3}}Z^{\text{H}}_{\text{h2,2}} + U^{\text{H}}_{\text{h3,3}}Z^{\text{H}}_{\text{h1,2}}Z^{\text{H}}_{\text{h2,3}} + U^{\text{H}}_{\text{h3,2}}Z^{\text{H}}_{\text{h1,3}}Z^{\text{H}}_{\text{h2,3}}\right)
\end{aligned}
$$

$$\underset{234}{C}\left(\hat{H}_{\text{h1}}, \hat{H}_{\text{h2}}, \hat{H}_{\text{h3}}\right) = \left[\ \boxed{1}\ \right]$$

$$
\begin{aligned}
\boxed{1} = \quad & -\frac{3iec_{2\alpha}M_\text{W}s_{\alpha+\beta}Z^\text{H}_{\text{h1},1}Z^\text{H}_{\text{h2},1}Z^\text{H}_{\text{h3},1}}{2s_\text{W}c_\text{W}^2} - \frac{3iec_{2\alpha}c_{\alpha+\beta}M_\text{W}Z^\text{H}_{\text{h1},2}Z^\text{H}_{\text{h2},2}Z^\text{H}_{\text{h3},2}}{2s_\text{W}c_\text{W}^2} + \\
& \frac{ieM_\text{W}}{2s_\text{W}c_\text{W}^2}\left(c_{2\alpha}c_{\alpha+\beta} - 2s_{2\alpha}s_{\alpha+\beta}\right)\left(Z^\text{H}_{\text{h1},2}Z^\text{H}_{\text{h2},1}Z^\text{H}_{\text{h3},1} + Z^\text{H}_{\text{h1},1}Z^\text{H}_{\text{h2},2}Z^\text{H}_{\text{h3},1} + Z^\text{H}_{\text{h1},1}Z^\text{H}_{\text{h2},1}Z^\text{H}_{\text{h3},2}\right) + \\
& \frac{ieM_\text{W}}{2s_\text{W}c_\text{W}^2}\left(2c_{\alpha+\beta}s_{2\alpha} + c_{2\alpha}s_{\alpha+\beta}\right)\left(Z^\text{H}_{\text{h1},2}Z^\text{H}_{\text{h2},2}Z^\text{H}_{\text{h3},1} + Z^\text{H}_{\text{h1},2}Z^\text{H}_{\text{h2},1}Z^\text{H}_{\text{h3},2} + Z^\text{H}_{\text{h1},1}Z^\text{H}_{\text{h2},2}Z^\text{H}_{\text{h3},2}\right) - \\
& \frac{iec_{2\beta}M_\text{W}s_{\alpha+\beta}}{2s_\text{W}c_\text{W}^2}\left(Z^\text{H}_{\text{h1},3}Z^\text{H}_{\text{h2},3}Z^\text{H}_{\text{h3},1} + Z^\text{H}_{\text{h1},3}Z^\text{H}_{\text{h2},1}Z^\text{H}_{\text{h3},3} + Z^\text{H}_{\text{h1},1}Z^\text{H}_{\text{h2},3}Z^\text{H}_{\text{h3},3}\right) + \\
& \frac{iec_{2\beta}c_{\alpha+\beta}M_\text{W}}{2s_\text{W}c_\text{W}^2}\left(Z^\text{H}_{\text{h1},3}Z^\text{H}_{\text{h2},3}Z^\text{H}_{\text{h3},2} + Z^\text{H}_{\text{h1},3}Z^\text{H}_{\text{h2},2}Z^\text{H}_{\text{h3},3} + Z^\text{H}_{\text{h1},2}Z^\text{H}_{\text{h2},3}Z^\text{H}_{\text{h3},3}\right)
\end{aligned}
$$

[SSS] **Higgs – 2 Sleptons**

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

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

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

$$\underset{96}{C}\left(G^+, \tilde{e}^{\text{s2}}_{\text{g2}}, \tilde{\nu}^{\dagger}_{\text{g3}}\right) = \left[\ -\frac{ie\delta_{\text{g2,g3}}}{\sqrt{2}M_\text{W}s_\text{W}}\left(\left(m_{e_{\text{g3}}}^2 - c_{2\beta}M_\text{W}^2\right)U^{\tilde{e}\text{g3}*}_{\text{s2},1} - m_{e_{\text{g3}}}\left(\mu t_\beta - A^{e*}_{\text{g3,g3}}\right)U^{\tilde{e}\text{g3}*}_{\text{s2},2}\right)\ \right]$$

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

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

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

$$\underset{240}{C}\left(H_{\text{h1}}, \tilde{e}^{\text{s2}}_{\text{g2}}, \tilde{e}^{\text{s3},\dagger}_{\text{g3}}\right) = \left[\ \boxed{3}\ \right]$$

$$\boxed{3} = \frac{ie(\boxed{2})\delta_{g2,g3}U^{H}_{h1,1}}{2c_{W}c_{\beta}M_{W}s_{W}} + \frac{ie(\boxed{1})\delta_{g2,g3}U^{H}_{h1,2}}{2c_{W}c_{\beta}M_{W}s_{W}} - \frac{e\delta_{g2,g3}m_{e_{g2}}U^{H}_{h1,3}}{2M_{W}s_{W}}\left(\left(\mu + t_{\beta}A^{e*}_{g2,g2}\right)U^{\tilde{e}g2*}_{s2,2}U^{\tilde{e}g2}_{s3,1} - \left(\mu^* + t_{\beta}A^{e}_{g2,g2}\right)U^{\tilde{e}g2*}_{s2,1}U^{\tilde{e}g2}_{s3,2}\right)$$

$$\boxed{2} = U^{\tilde{e}g2*}_{s2,1}\left(\left(2c_{W}s_{\alpha}m^2_{e_{g2}} - c_{\beta}M_{W}M_{Z}s_{\alpha+\beta}\left(1-2s^2_{W}\right)\right)U^{\tilde{e}g2}_{s3,1} + c_{W}m_{e_{g2}}\left(c_{\alpha}\mu^* + s_{\alpha}A^{e}_{g2,g2}\right)U^{\tilde{e}g2}_{s3,2}\right) + U^{\tilde{e}g2*}_{s2,2}\left(c_{W}m_{e_{g2}}\left(\mu c_{\alpha} + s_{\alpha}A^{e*}_{g2,g2}\right)U^{\tilde{e}g2}_{s3,1} + 2c_{W}s_{\alpha}m^2_{e_{g2}}U^{\tilde{e}g2}_{s3,2} - 2c_{\beta}M_{W}M_{Z}s_{\alpha+\beta}s^2_{W}U^{\tilde{e}g2}_{s3,2}\right)$$

$$\boxed{1} = U^{\tilde{e}g2*}_{s2,2}\left(c_{W}m_{e_{g2}}\left(\mu s_{\alpha} - c_{\alpha}A^{e*}_{g2,g2}\right)U^{\tilde{e}g2}_{s3,1} - 2c_{W}c_{\alpha}m^2_{e_{g2}}U^{\tilde{e}g2}_{s3,2} + 2c_{\alpha+\beta}c_{\beta}M_{W}M_{Z}s^2_{W}U^{\tilde{e}g2}_{s3,2}\right) - U^{\tilde{e}g2*}_{s2,1}\left(\left(2c_{W}c_{\alpha}m^2_{e_{g2}} - c_{\alpha+\beta}c_{\beta}M_{W}M_{Z}\left(1-2s^2_{W}\right)\right)U^{\tilde{e}g2}_{s3,1} - c_{W}m_{e_{g2}}\left(s_{\alpha}\mu^* - c_{\alpha}A^{e}_{g2,g2}\right)U^{\tilde{e}g2}_{s3,2}\right)$$

$$\underset{241}{C}\left(\hat{H}_{h1}, \tilde{e}^{s2}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[\quad\boxed{3}\quad\right]$$

$$\boxed{3} = \frac{ie(\boxed{1})\delta_{g2,g3}Z^{H}_{h1,1}}{2c_{W}c_{\beta}M_{W}s_{W}} + \frac{ie(\boxed{2})\delta_{g2,g3}Z^{H}_{h1,2}}{2c_{W}c_{\beta}M_{W}s_{W}} - \frac{e\delta_{g2,g3}m_{e_{g2}}Z^{H}_{h1,3}}{2M_{W}s_{W}}\left(\left(\mu + t_{\beta}A^{e*}_{g2,g2}\right)U^{\tilde{e}g2*}_{s2,2}U^{\tilde{e}g2}_{s3,1} - \left(\mu^* + t_{\beta}A^{e}_{g2,g2}\right)U^{\tilde{e}g2*}_{s2,1}U^{\tilde{e}g2}_{s3,2}\right)$$

$$\boxed{2} = U^{\tilde{e}g2*}_{s2,2}\left(c_{W}m_{e_{g2}}\left(\mu s_{\alpha} - c_{\alpha}A^{e*}_{g2,g2}\right)U^{\tilde{e}g2}_{s3,1} - 2c_{W}c_{\alpha}m^2_{e_{g2}}U^{\tilde{e}g2}_{s3,2} + 2c_{\alpha+\beta}c_{\beta}M_{W}M_{Z}s^2_{W}U^{\tilde{e}g2}_{s3,2}\right) - U^{\tilde{e}g2*}_{s2,1}\left(\left(2c_{W}c_{\alpha}m^2_{e_{g2}} - c_{\alpha+\beta}c_{\beta}M_{W}M_{Z}\left(1-2s^2_{W}\right)\right)U^{\tilde{e}g2}_{s3,1} - c_{W}m_{e_{g2}}\left(s_{\alpha}\mu^* - c_{\alpha}A^{e}_{g2,g2}\right)U^{\tilde{e}g2}_{s3,2}\right)$$

$$\boxed{1} = U^{\tilde{e}g2*}_{s2,1}\left(\left(2c_{W}s_{\alpha}m^2_{e_{g2}} - c_{\beta}M_{W}M_{Z}s_{\alpha+\beta}\left(1-2s^2_{W}\right)\right)U^{\tilde{e}g2}_{s3,1} + c_{W}m_{e_{g2}}\left(c_{\alpha}\mu^* + s_{\alpha}A^{e}_{g2,g2}\right)U^{\tilde{e}g2}_{s3,2}\right) + U^{\tilde{e}g2*}_{s2,2}\left(c_{W}m_{e_{g2}}\left(\mu c_{\alpha} + s_{\alpha}A^{e*}_{g2,g2}\right)U^{\tilde{e}g2}_{s3,1} + 2c_{W}s_{\alpha}m^2_{e_{g2}}U^{\tilde{e}g2}_{s3,2} - 2c_{\beta}M_{W}M_{Z}s_{\alpha+\beta}s^2_{W}U^{\tilde{e}g2}_{s3,2}\right)$$

[SSS] **Higgs – 2 Squarks**

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

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

$$\underset{90}{C}\left(H^+, \tilde{d}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[\frac{ie\text{CKM}_{g3,g2}}{\sqrt{2}M_{W}s_{W}t_{\beta}}\left(\begin{array}{l}U^{\tilde{d}g2*}_{s2,1}\left(\left(m^2_{u_{g3}} + t_{\beta}\left(t_{\beta}m^2_{d_{g2}} - s_{2\beta}M^2_{W}\right)\right)U^{\tilde{u}g3}_{s3,1} + m_{u_{g3}}\left(t_{\beta}\mu^* + A^{u}_{g3,g3}\right)U^{\tilde{u}g3}_{s3,2}\right) + \\ m_{d_{g2}}U^{\tilde{d}g2*}_{s2,2}\left(t_{\beta}\left(\mu + t_{\beta}A^{d*}_{g2,g2}\right)U^{\tilde{u}g3}_{s3,1} + m_{u_{g3}}\left(1 + t^2_{\beta}\right)U^{\tilde{u}g3}_{s3,2}\right)\end{array}\right)\right]$$

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

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

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

$$\underset{242}{C}\left(H_{h1}, \tilde{u}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[\;\boxed{3}\;\right]$$

$$\boxed{3} = -\frac{ie(\boxed{2})\delta_{g2,g3}U^H_{h1,1}}{6c_W M_W s_W s_\beta} - \frac{ie(\boxed{1})\delta_{g2,g3}U^H_{h1,2}}{6c_W M_W s_W s_\beta} - \frac{e\delta_{g2,g3}m_{u_{g2}}U^H_{h1,3}}{2M_W s_W t_\beta}\left(\left(\mu t_\beta + A^{u*}_{g2,g2}\right)U^{\tilde{u}_{g2}*}_{s2,2}U^{\tilde{u}_{g2}}_{s3,1} - \left(t_\beta\mu^* + A^u_{g2,g2}\right)U^{\tilde{u}_{g2}*}_{s2,1}U^{\tilde{u}_{g2}}_{s3,2}\right)$$

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

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

$$\underset{243}{C}\left(\hat{H}_{h1}, \tilde{u}^{s2}_{g2}, \tilde{u}^{s3,\dagger}_{g3}\right) = \left[\;\boxed{3}\;\right]$$

$$\boxed{3} = -\frac{ie(\boxed{1})\delta_{g2,g3}Z^H_{h1,1}}{6c_W M_W s_W s_\beta} - \frac{ie(\boxed{2})\delta_{g2,g3}Z^H_{h1,2}}{6c_W M_W s_W s_\beta} - \frac{e\delta_{g2,g3}m_{u_{g2}}Z^H_{h1,3}}{2M_W s_W t_\beta}\left(\left(\mu t_\beta + A^{u*}_{g2,g2}\right)U^{\tilde{u}_{g2}*}_{s2,2}U^{\tilde{u}_{g2}}_{s3,1} - \left(t_\beta\mu^* + A^u_{g2,g2}\right)U^{\tilde{u}_{g2}*}_{s2,1}U^{\tilde{u}_{g2}}_{s3,2}\right)$$

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

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

$$\underset{244}{C}\left(H_{h1}, \tilde{d}_{g2}^{s2}, \tilde{d}_{g3}^{s3,\dagger}\right) = \left[\; \boxed{3} \;\right]$$

$$\boxed{3} = \frac{ie(\boxed{2})\delta_{g2,g3}U_{h1,1}^{H}}{6c_{W}c_{\beta}M_{W}s_{W}} - \frac{ie(\boxed{1})\delta_{g2,g3}U_{h1,2}^{H}}{6c_{W}c_{\beta}M_{W}s_{W}} -$$
$$\frac{e\delta_{g2,g3}m_{d_{g2}}U_{h1,3}^{H}}{2M_{W}s_{W}}\left(\left(\mu + t_{\beta}A_{g2,g2}^{d*}\right)U_{s2,2}^{\tilde{d}_{g2}*}U_{s3,1}^{\tilde{d}_{g2}} - \left(\mu^{*} + t_{\beta}A_{g2,g2}^{d}\right)U_{s2,1}^{\tilde{d}_{g2}*}U_{s3,2}^{\tilde{d}_{g2}}\right)$$

$$\boxed{2} = U_{s2,1}^{\tilde{d}_{g2}*}\left(\left(6c_{W}s_{\alpha}m_{d_{g2}}^{2} - c_{\beta}M_{W}M_{Z}s_{\alpha+\beta}\left(3 - 2s_{W}^{2}\right)\right)U_{s3,1}^{\tilde{d}_{g2}} + 3c_{W}m_{d_{g2}}\left(c_{\alpha}\mu^{*} + s_{\alpha}A_{g2,g2}^{d}\right)U_{s3,2}^{\tilde{d}_{g2}}\right) +$$
$$U_{s2,2}^{\tilde{d}_{g2}*}\left(3c_{W}m_{d_{g2}}\left(\mu c_{\alpha} + s_{\alpha}A_{g2,g2}^{d*}\right)U_{s3,1}^{\tilde{d}_{g2}} + 6c_{W}s_{\alpha}m_{d_{g2}}^{2}U_{s3,2}^{\tilde{d}_{g2}} - 2c_{\beta}M_{W}M_{Z}s_{\alpha+\beta}s_{W}^{2}U_{s3,2}^{\tilde{d}_{g2}}\right)$$

$$\boxed{1} = -U_{s2,2}^{\tilde{d}_{g2}*}\left(3c_{W}m_{d_{g2}}\left(\mu s_{\alpha} - c_{\alpha}A_{g2,g2}^{d*}\right)U_{s3,1}^{\tilde{d}_{g2}} - 6c_{W}c_{\alpha}m_{d_{g2}}^{2}U_{s3,2}^{\tilde{d}_{g2}} + 2c_{\alpha+\beta}c_{\beta}M_{W}M_{Z}s_{W}^{2}U_{s3,2}^{\tilde{d}_{g2}}\right) +$$
$$U_{s2,1}^{\tilde{d}_{g2}*}\left(\left(6c_{W}c_{\alpha}m_{d_{g2}}^{2} - c_{\alpha+\beta}c_{\beta}M_{W}M_{Z}\left(3 - 2s_{W}^{2}\right)\right)U_{s3,1}^{\tilde{d}_{g2}} - 3c_{W}m_{d_{g2}}\left(s_{\alpha}\mu^{*} - c_{\alpha}A_{g2,g2}^{d}\right)U_{s3,2}^{\tilde{d}_{g2}}\right)$$

$$\underset{245}{C}\left(\hat{H}_{h1}, \tilde{d}_{g2}^{s2}, \tilde{d}_{g3}^{s3,\dagger}\right) = \left[\; \boxed{3} \;\right]$$

$$\boxed{3} = \frac{ie(\boxed{1})\delta_{g2,g3}Z_{h1,1}^{H}}{6c_{W}c_{\beta}M_{W}s_{W}} - \frac{ie(\boxed{2})\delta_{g2,g3}Z_{h1,2}^{H}}{6c_{W}c_{\beta}M_{W}s_{W}} -$$
$$\frac{e\delta_{g2,g3}m_{d_{g2}}Z_{h1,3}^{H}}{2M_{W}s_{W}}\left(\left(\mu + t_{\beta}A_{g2,g2}^{d*}\right)U_{s2,2}^{\tilde{d}_{g2}*}U_{s3,1}^{\tilde{d}_{g2}} - \left(\mu^{*} + t_{\beta}A_{g2,g2}^{d}\right)U_{s2,1}^{\tilde{d}_{g2}*}U_{s3,2}^{\tilde{d}_{g2}}\right)$$

$$\boxed{2} = -U_{s2,2}^{\tilde{d}_{g2}*}\left(3c_{W}m_{d_{g2}}\left(\mu s_{\alpha} - c_{\alpha}A_{g2,g2}^{d*}\right)U_{s3,1}^{\tilde{d}_{g2}} - 6c_{W}c_{\alpha}m_{d_{g2}}^{2}U_{s3,2}^{\tilde{d}_{g2}} + 2c_{\alpha+\beta}c_{\beta}M_{W}M_{Z}s_{W}^{2}U_{s3,2}^{\tilde{d}_{g2}}\right) +$$
$$U_{s2,1}^{\tilde{d}_{g2}*}\left(\left(6c_{W}c_{\alpha}m_{d_{g2}}^{2} - c_{\alpha+\beta}c_{\beta}M_{W}M_{Z}\left(3 - 2s_{W}^{2}\right)\right)U_{s3,1}^{\tilde{d}_{g2}} - 3c_{W}m_{d_{g2}}\left(s_{\alpha}\mu^{*} - c_{\alpha}A_{g2,g2}^{d}\right)U_{s3,2}^{\tilde{d}_{g2}}\right)$$

$$\boxed{1} = U_{s2,1}^{\tilde{d}_{g2}*}\left(\left(6c_{W}s_{\alpha}m_{d_{g2}}^{2} - c_{\beta}M_{W}M_{Z}s_{\alpha+\beta}\left(3 - 2s_{W}^{2}\right)\right)U_{s3,1}^{\tilde{d}_{g2}} + 3c_{W}m_{d_{g2}}\left(c_{\alpha}\mu^{*} + s_{\alpha}A_{g2,g2}^{d}\right)U_{s3,2}^{\tilde{d}_{g2}}\right) +$$
$$U_{s2,2}^{\tilde{d}_{g2}*}\left(3c_{W}m_{d_{g2}}\left(\mu c_{\alpha} + s_{\alpha}A_{g2,g2}^{d*}\right)U_{s3,1}^{\tilde{d}_{g2}} + 6c_{W}s_{\alpha}m_{d_{g2}}^{2}U_{s3,2}^{\tilde{d}_{g2}} - 2c_{\beta}M_{W}M_{Z}s_{\alpha+\beta}s_{W}^{2}U_{s3,2}^{\tilde{d}_{g2}}\right)$$

[SSV] **2 Higgs – Gauge Boson**

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

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

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

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

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

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

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

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

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

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

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

$$\underset{219}{C}\left(\hat{H}_{h1}, H^-, W^+\right) = \left[\ -\frac{iec_{\beta-\alpha}Z_{h1,1}^H}{2s_W} + \frac{ies_{\beta-\alpha}Z_{h1,2}^H}{2s_W} + \frac{eZ_{h1,3}^H}{2s_W}\ \right]$$

$$\underset{220}{C}\left(H_{h1}, G^+, W^-\right) = \left[\ \frac{ies_{\beta-\alpha}U_{h1,1}^H}{2s_W} + \frac{iec_{\beta-\alpha}U_{h1,2}^H}{2s_W}\ \right]$$

$$\underset{221}{C}\left(\hat{H}_{h1}, G^+, W^-\right) = \left[\ \frac{ies_{\beta-\alpha}Z_{h1,1}^H}{2s_W} + \frac{iec_{\beta-\alpha}Z_{h1,2}^H}{2s_W}\ \right]$$

$$\underset{226}{C}\left(H_{h1}, G^-, W^+\right) = \left[\ -\frac{ies_{\beta-\alpha}U_{h1,1}^H}{2s_W} - \frac{iec_{\beta-\alpha}U_{h1,2}^H}{2s_W}\ \right]$$

$$\underset{227}{C}\left(\hat{H}_{h1}, G^-, W^+\right) = \left[\ -\frac{ies_{\beta-\alpha}Z_{h1,1}^H}{2s_W} - \frac{iec_{\beta-\alpha}Z_{h1,2}^H}{2s_W}\ \right]$$

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

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

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

[SSV] **2 Sleptons – Gauge Boson**

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

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

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

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

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

[SSV] **2 Squarks – Gauge Boson**

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

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

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

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

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

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

[SUU] **Higgs – 2 Ghosts**

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

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

$$\underset{13}{C}\left(G^-, u_\gamma, \overline{u}_-\right) = \left[\; -ie\xi_W M_W \;\right]$$

$$\underset{14}{C}\left(G^+, u_\gamma, \overline{u}_+\right) = \left[\; -ie\xi_W M_W \;\right]$$

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

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

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

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

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

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

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

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

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

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

[SVV] **Higgs – 2 Gauge Bosons**

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

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

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

$$\underset{8}{C}\left(G^+, Z, W^-\right) = \left[\; -\frac{ieM_W s_W}{c_W} \;\right]$$

$$\underset{252}{C}\left(H_{h1}, Z, Z\right) = \left[\; \frac{ieM_W s_{\beta-\alpha} U^H_{h1,1}}{s_W c^2_W} + \frac{iec_{\beta-\alpha} M_W U^H_{h1,2}}{s_W c^2_W} \;\right]$$

$$\underset{253}{C}\left(\hat{H}_{h1}, Z, Z\right) = \left[\; \frac{ieM_W s_{\beta-\alpha} Z^H_{h1,1}}{s_W c^2_W} + \frac{iec_{\beta-\alpha} M_W Z^H_{h1,2}}{s_W c^2_W} \;\right]$$

$$\underset{254}{C}\left(H_{h1}, W^-, W^+\right) = \left[\; \frac{ieM_W s_{\beta-\alpha} U^H_{h1,1}}{s_W} + \frac{iec_{\beta-\alpha} M_W U^H_{h1,2}}{s_W} \;\right]$$

$$\underset{255}{C}\left(\hat{H}_{h1}, W^-, W^+\right) = \left[\; \frac{ieM_W s_{\beta-\alpha} Z^H_{h1,1}}{s_W} + \frac{iec_{\beta-\alpha} M_W Z^H_{h1,2}}{s_W} \;\right]$$

$$\boxed{[\text{UUV}] \quad \textbf{2 Ghosts} - \textbf{Gauge Boson}}$$

$$\underset{19}{C}\left(\overline{u}_-, u_-, \gamma\right) = -\mathrm{i}e \begin{bmatrix} 1 \\ \rule{1.5em}{0.4pt} \\ 0 \end{bmatrix}$$

$$\underset{20}{C}\left(\overline{u}_+, u_+, \gamma\right) = \mathrm{i}e \begin{bmatrix} 1 \\ \rule{1.5em}{0.4pt} \\ 0 \end{bmatrix}$$

$$\underset{21}{C}\left(\overline{u}_-, u_-, Z\right) = -\frac{\mathrm{i}e c_W}{s_W} \begin{bmatrix} 1 \\ \rule{1.5em}{0.4pt} \\ 0 \end{bmatrix}$$

$$\underset{22}{C}\left(\overline{u}_+, u_+, Z\right) = \frac{\mathrm{i}e c_W}{s_W} \begin{bmatrix} 1 \\ \rule{1.5em}{0.4pt} \\ 0 \end{bmatrix}$$

$$\underset{23}{C}\left(\overline{u}_-, u_\gamma, W^-\right) = \mathrm{i}e \begin{bmatrix} 1 \\ \rule{1.5em}{0.4pt} \\ 0 \end{bmatrix}$$

$$\underset{24}{C}\left(\overline{u}_+, u_\gamma, W^+\right) = -\mathrm{i}e \begin{bmatrix} 1 \\ \rule{1.5em}{0.4pt} \\ 0 \end{bmatrix}$$

$$\underset{25}{C}\left(\overline{u}_\gamma, u_+, W^-\right) = -\mathrm{i}e \begin{bmatrix} 1 \\ \rule{1.5em}{0.4pt} \\ 0 \end{bmatrix}$$

$$\underset{26}{C}\left(\overline{u}_\gamma, u_-, W^+\right) = \mathrm{i}e \begin{bmatrix} 1 \\ \rule{1.5em}{0.4pt} \\ 0 \end{bmatrix}$$

$$\underset{27}{C}\left(\overline{u}_-, u_Z, W^-\right) = \frac{iec_W}{s_W} \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{28}{C}\left(\overline{u}_+, u_Z, W^+\right) = -\frac{iec_W}{s_W} \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{29}{C}\left(\overline{u}_Z, u_+, W^-\right) = -\frac{iec_W}{s_W} \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{30}{C}\left(\overline{u}_Z, u_-, W^+\right) = \frac{iec_W}{s_W} \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

[VVV] **3 Gauge Bosons**

$$\underset{9}{C}\left(\gamma, W^+, W^-\right) = \begin{bmatrix} -ie \end{bmatrix}$$

$$\underset{10}{C}\left(Z, W^+, W^-\right) = \begin{bmatrix} -\dfrac{iec_W}{s_W} \end{bmatrix}$$

[SSSS] **4 Higgs**

$$\underset{43}{C}\left(G^0, G^0, G^0, G^0\right) = \begin{bmatrix} -\dfrac{3ie^2 c_{2\beta}^2}{4c_W^2 s_W^2} \end{bmatrix}$$

$$\underset{44}{C}\left(G^0, G^0, H^-, H^+\right) = \begin{bmatrix} -\dfrac{ie^2}{4s_W^2}\left(1 - \dfrac{c_{2\beta}^2 s_W^2}{c_W^2} + s_{2\beta}^2\right) \end{bmatrix}$$

$$\underset{45}{C}\left(G^0, G^0, H^-, G^+\right) = \begin{bmatrix} \dfrac{ie^2 c_{2\beta} s_{2\beta}}{4c_W^2 s_W^2} \end{bmatrix}$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$\underset{260}{C}\left(H_{\text{h1}}, G^0, H^-, G^+\right) = \left[\frac{e^2 c_{\beta-\alpha} U^{\text{H}}_{\text{h1},1}}{4 s_{\text{W}}^2} - \frac{e^2 s_{\beta-\alpha} U^{\text{H}}_{\text{h1},2}}{4 s_{\text{W}}^2} - \frac{ie^2 U^{\text{H}}_{\text{h1},3}}{4 s_{\text{W}}^2}\left(\frac{s_{\text{W}}^2 s_{2\beta}^2}{c_{\text{W}}^2} - c_{2\beta}^2 \right) \right]$$

$$\underset{261}{C}\left(\hat{H}_{\text{h1}}, G^0, H^-, G^+\right) = \left[\frac{e^2 c_{\beta-\alpha} Z^{\text{H}}_{\text{h1},1}}{4 s_{\text{W}}^2} - \frac{e^2 s_{\beta-\alpha} Z^{\text{H}}_{\text{h1},2}}{4 s_{\text{W}}^2} - \frac{ie^2 Z^{\text{H}}_{\text{h1},3}}{4 s_{\text{W}}^2}\left(\frac{s_{\text{W}}^2 s_{2\beta}^2}{c_{\text{W}}^2} - c_{2\beta}^2 \right) \right]$$

$$\underset{262}{C}\left(H_{\text{h1}}, G^0, G^-, H^+\right) = \left[-\frac{e^2 c_{\beta-\alpha} U^{\text{H}}_{\text{h1},1}}{4 s_{\text{W}}^2} + \frac{e^2 s_{\beta-\alpha} U^{\text{H}}_{\text{h1},2}}{4 s_{\text{W}}^2} - \frac{ie^2 U^{\text{H}}_{\text{h1},3}}{4 s_{\text{W}}^2}\left(\frac{s_{\text{W}}^2 s_{2\beta}^2}{c_{\text{W}}^2} - c_{2\beta}^2 \right) \right]$$

$$\underset{263}{C}\left(\hat{H}_{\text{h1}}, G^0, G^-, H^+\right) = \left[-\frac{e^2 c_{\beta-\alpha} Z^{\text{H}}_{\text{h1},1}}{4 s_{\text{W}}^2} + \frac{e^2 s_{\beta-\alpha} Z^{\text{H}}_{\text{h1},2}}{4 s_{\text{W}}^2} - \frac{ie^2 Z^{\text{H}}_{\text{h1},3}}{4 s_{\text{W}}^2}\left(\frac{s_{\text{W}}^2 s_{2\beta}^2}{c_{\text{W}}^2} - c_{2\beta}^2 \right) \right]$$

$$\underset{264}{C}\left(H_{\text{h1}}, G^0, G^-, G^+\right) = \left[\frac{ie^2 c_{2\beta} s_{2\beta} U^{\text{H}}_{\text{h1},3}}{4 c_{\text{W}}^2 s_{\text{W}}^2} \right]$$

$$\underset{265}{C}\left(\hat{H}_{\text{h1}}, G^0, G^-, G^+\right) = \left[\frac{ie^2 c_{2\beta} s_{2\beta} Z^{\text{H}}_{\text{h1},3}}{4 c_{\text{W}}^2 s_{\text{W}}^2} \right]$$

$$\underset{306}{C}\left(H_{\text{h1}}, H_{\text{h2}}, G^0, G^0\right) = \left[\begin{array}{l} \dfrac{ie^2 c_{2\alpha} c_{2\beta} U^{\text{H}}_{\text{h1},1} U^{\text{H}}_{\text{h2},1}}{4 c_{\text{W}}^2 s_{\text{W}}^2} - \dfrac{ie^2 c_{2\alpha} c_{2\beta} U^{\text{H}}_{\text{h1},2} U^{\text{H}}_{\text{h2},2}}{4 c_{\text{W}}^2 s_{\text{W}}^2} + \dfrac{ie^2 c_{2\beta} s_{2\alpha}}{4 c_{\text{W}}^2 s_{\text{W}}^2}\left(U^{\text{H}}_{\text{h1},2} U^{\text{H}}_{\text{h2},1} + U^{\text{H}}_{\text{h1},1} U^{\text{H}}_{\text{h2},2} \right) + \\[2mm] \dfrac{ie^2 U^{\text{H}}_{\text{h1},3} U^{\text{H}}_{\text{h2},3}}{4 c_{\text{W}}^2 s_{\text{W}}^2}\left(1 - 3 s_{2\beta}^2 \right) \end{array} \right]$$

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

$$\underset{308}{C}\left(\hat{H}_{\text{h1}}, \hat{H}_{\text{h2}}, G^0, G^0\right) = \left[\begin{array}{l} \dfrac{ie^2 c_{2\alpha} c_{2\beta} Z^{\text{H}}_{\text{h1},1} Z^{\text{H}}_{\text{h2},1}}{4 c_{\text{W}}^2 s_{\text{W}}^2} - \dfrac{ie^2 c_{2\alpha} c_{2\beta} Z^{\text{H}}_{\text{h1},2} Z^{\text{H}}_{\text{h2},2}}{4 c_{\text{W}}^2 s_{\text{W}}^2} + \dfrac{ie^2 c_{2\beta} s_{2\alpha}}{4 c_{\text{W}}^2 s_{\text{W}}^2}\left(Z^{\text{H}}_{\text{h1},2} Z^{\text{H}}_{\text{h2},1} + Z^{\text{H}}_{\text{h1},1} Z^{\text{H}}_{\text{h2},2} \right) + \\[2mm] \dfrac{ie^2 Z^{\text{H}}_{\text{h1},3} Z^{\text{H}}_{\text{h2},3}}{4 c_{\text{W}}^2 s_{\text{W}}^2}\left(1 - 3 s_{2\beta}^2 \right) \end{array} \right]$$

$$\underset{309}{C}\left(H_{\text{h}1}, H_{\text{h}2}, H^-, H^+\right) = \left[\; \boxed{1} \;\right]$$

$$\boxed{1} = \begin{aligned}&-\frac{ie^2 c_{2\beta}^2 U_{\text{h}1,3}^{\text{H}} U_{\text{h}2,3}^{\text{H}}}{4 c_{\text{W}}^2 s_{\text{W}}^2} - \frac{ie^2 U_{\text{h}1,1}^{\text{H}} U_{\text{h}2,1}^{\text{H}}}{4 s_{\text{W}}^2}\left(\frac{c_{2\alpha} c_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} - s_{2\alpha} s_{2\beta} + 1\right) - \frac{ie^2 U_{\text{h}1,2}^{\text{H}} U_{\text{h}2,2}^{\text{H}}}{4 s_{\text{W}}^2}\left(-\frac{c_{2\alpha} c_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} + s_{2\alpha} s_{2\beta} + 1\right) - \\ &\frac{ie^2}{4 s_{\text{W}}^2}\left(\frac{c_{2\beta} s_{2\alpha} s_{\text{W}}^2}{c_{\text{W}}^2} + c_{2\alpha} s_{2\beta}\right)\left(U_{\text{h}1,2}^{\text{H}} U_{\text{h}2,1}^{\text{H}} + U_{\text{h}1,1}^{\text{H}} U_{\text{h}2,2}^{\text{H}}\right)\end{aligned}$$

$$\underset{310}{C}\left(\hat{H}_{\text{h}1}, H_{\text{h}2}, H^-, H^+\right) = \left[\; \boxed{1} \;\right]$$

$$\boxed{1} = \begin{aligned}&-\frac{ie^2 c_{2\beta}^2 U_{\text{h}2,3}^{\text{H}} Z_{\text{h}1,3}^{\text{H}}}{4 c_{\text{W}}^2 s_{\text{W}}^2} - \frac{ie^2 U_{\text{h}2,1}^{\text{H}} Z_{\text{h}1,1}^{\text{H}}}{4 s_{\text{W}}^2}\left(\frac{c_{2\alpha} c_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} - s_{2\alpha} s_{2\beta} + 1\right) - \frac{ie^2 U_{\text{h}2,2}^{\text{H}} Z_{\text{h}1,2}^{\text{H}}}{4 s_{\text{W}}^2}\left(-\frac{c_{2\alpha} c_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} + s_{2\alpha} s_{2\beta} + 1\right) - \\ &\frac{ie^2}{4 s_{\text{W}}^2}\left(\frac{c_{2\beta} s_{2\alpha} s_{\text{W}}^2}{c_{\text{W}}^2} + c_{2\alpha} s_{2\beta}\right)\left(U_{\text{h}2,2}^{\text{H}} Z_{\text{h}1,1}^{\text{H}} + U_{\text{h}2,1}^{\text{H}} Z_{\text{h}1,2}^{\text{H}}\right)\end{aligned}$$

$$\underset{311}{C}\left(\hat{H}_{\text{h}1}, \hat{H}_{\text{h}2}, H^-, H^+\right) = \left[\; \boxed{1} \;\right]$$

$$\boxed{1} = \begin{aligned}&-\frac{ie^2 c_{2\beta}^2 Z_{\text{h}1,3}^{\text{H}} Z_{\text{h}2,3}^{\text{H}}}{4 c_{\text{W}}^2 s_{\text{W}}^2} - \frac{ie^2 Z_{\text{h}1,1}^{\text{H}} Z_{\text{h}2,1}^{\text{H}}}{4 s_{\text{W}}^2}\left(\frac{c_{2\alpha} c_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} - s_{2\alpha} s_{2\beta} + 1\right) - \frac{ie^2 Z_{\text{h}1,2}^{\text{H}} Z_{\text{h}2,2}^{\text{H}}}{4 s_{\text{W}}^2}\left(-\frac{c_{2\alpha} c_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} + s_{2\alpha} s_{2\beta} + 1\right) - \\ &\frac{ie^2}{4 s_{\text{W}}^2}\left(\frac{c_{2\beta} s_{2\alpha} s_{\text{W}}^2}{c_{\text{W}}^2} + c_{2\alpha} s_{2\beta}\right)\left(Z_{\text{h}1,2}^{\text{H}} Z_{\text{h}2,1}^{\text{H}} + Z_{\text{h}1,1}^{\text{H}} Z_{\text{h}2,2}^{\text{H}}\right)\end{aligned}$$

$$\underset{312}{C}\left(H_{\text{h}1}, H_{\text{h}2}, H^-, G^+\right) = \left[\; \boxed{1} \;\right]$$

$$\boxed{1} = \begin{aligned}&-\frac{ie^2 c_{2\beta} s_{2\beta} U_{\text{h}1,3}^{\text{H}} U_{\text{h}2,3}^{\text{H}}}{4 c_{\text{W}}^2 s_{\text{W}}^2} - \frac{ie^2 U_{\text{h}1,1}^{\text{H}} U_{\text{h}2,1}^{\text{H}}}{4 s_{\text{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} + c_{2\beta} s_{2\alpha}\right) + \frac{ie^2 U_{\text{h}1,2}^{\text{H}} U_{\text{h}2,2}^{\text{H}}}{4 s_{\text{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} + c_{2\beta} s_{2\alpha}\right) - \\ &\frac{ie^2}{4 s_{\text{W}}^2}\left(\frac{s_{2\alpha} s_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} - c_{2\alpha} c_{2\beta}\right)\left(U_{\text{h}1,2}^{\text{H}} U_{\text{h}2,1}^{\text{H}} + U_{\text{h}1,1}^{\text{H}} U_{\text{h}2,2}^{\text{H}}\right) + \frac{e^2 s_{\beta-\alpha}}{4 s_{\text{W}}^2}\left(U_{\text{h}1,3}^{\text{H}} U_{\text{h}2,1}^{\text{H}} + U_{\text{h}1,1}^{\text{H}} U_{\text{h}2,3}^{\text{H}}\right) - \\ &\frac{e^2 c_{\beta-\alpha}}{4 s_{\text{W}}^2}\left(U_{\text{h}1,3}^{\text{H}} U_{\text{h}2,2}^{\text{H}} + U_{\text{h}1,2}^{\text{H}} U_{\text{h}2,3}^{\text{H}}\right)\end{aligned}$$

$$\underset{313}{C}\left(\hat{H}_{\text{h}1}, H_{\text{h}2}, H^-, G^+\right) = \left[\; \boxed{1} \;\right]$$

$$\boxed{1} = \begin{aligned}&-\frac{ie^2 c_{2\beta} s_{2\beta} U_{\text{h}2,3}^{\text{H}} Z_{\text{h}1,3}^{\text{H}}}{4 c_{\text{W}}^2 s_{\text{W}}^2} - \frac{ie^2 U_{\text{h}2,1}^{\text{H}} Z_{\text{h}1,1}^{\text{H}}}{4 s_{\text{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} + c_{2\beta} s_{2\alpha}\right) + \frac{ie^2 U_{\text{h}2,2}^{\text{H}} Z_{\text{h}1,2}^{\text{H}}}{4 s_{\text{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} + c_{2\beta} s_{2\alpha}\right) - \\ &\frac{ie^2}{4 s_{\text{W}}^2}\left(\frac{s_{2\alpha} s_{2\beta} s_{\text{W}}^2}{c_{\text{W}}^2} - c_{2\alpha} c_{2\beta}\right)\left(U_{\text{h}2,2}^{\text{H}} Z_{\text{h}1,1}^{\text{H}} + U_{\text{h}2,1}^{\text{H}} Z_{\text{h}1,2}^{\text{H}}\right) + \frac{e^2 s_{\beta-\alpha}}{4 s_{\text{W}}^2}\left(U_{\text{h}2,3}^{\text{H}} Z_{\text{h}1,1}^{\text{H}} + U_{\text{h}2,1}^{\text{H}} Z_{\text{h}1,3}^{\text{H}}\right) - \\ &\frac{e^2 c_{\beta-\alpha}}{4 s_{\text{W}}^2}\left(U_{\text{h}2,3}^{\text{H}} Z_{\text{h}1,2}^{\text{H}} + U_{\text{h}2,2}^{\text{H}} Z_{\text{h}1,3}^{\text{H}}\right)\end{aligned}$$

$$\underset{314}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, H^-, G^+\right) = \boxed{1}$$

$$
\boxed{1} =
\begin{aligned}
&-\frac{ie^2 c_{2\beta} s_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{4s_{\mathrm{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} + c_{2\beta} s_{2\alpha}\right) + \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{4s_{\mathrm{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} + c_{2\beta} s_{2\alpha}\right) - \\
&\frac{ie^2}{4s_{\mathrm{W}}^2}\left(\frac{s_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} - c_{2\alpha} c_{2\beta}\right)\left(Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},2}\right) + \frac{e^2 s_{\beta-\alpha}}{4s_{\mathrm{W}}^2}\left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},3}\right) - \\
&\frac{e^2 c_{\beta-\alpha}}{4s_{\mathrm{W}}^2}\left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},2} + Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},3}\right)
\end{aligned}
$$

$$\underset{315}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, G^-, H^+\right) = \boxed{1}$$

$$
\boxed{1} =
\begin{aligned}
&-\frac{ie^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1}}{4s_{\mathrm{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} + c_{2\beta} s_{2\alpha}\right) + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2}}{4s_{\mathrm{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} + c_{2\beta} s_{2\alpha}\right) - \\
&\frac{ie^2}{4s_{\mathrm{W}}^2}\left(\frac{s_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} - c_{2\alpha} c_{2\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2}\right) - \frac{e^2 s_{\beta-\alpha}}{4s_{\mathrm{W}}^2}\left(U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},3}\right) + \\
&\frac{e^2 c_{\beta-\alpha}}{4s_{\mathrm{W}}^2}\left(U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},2} + U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},3}\right)
\end{aligned}
$$

$$\underset{316}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, G^-, H^+\right) = \boxed{1}$$

$$
\boxed{1} =
\begin{aligned}
&-\frac{ie^2 c_{2\beta} s_{2\beta} U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{4s_{\mathrm{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} + c_{2\beta} s_{2\alpha}\right) + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},2}}{4s_{\mathrm{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} + c_{2\beta} s_{2\alpha}\right) - \\
&\frac{ie^2}{4s_{\mathrm{W}}^2}\left(\frac{s_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} - c_{2\alpha} c_{2\beta}\right)\left(U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},2}\right) - \frac{e^2 s_{\beta-\alpha}}{4s_{\mathrm{W}}^2}\left(U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},3}\right) + \\
&\frac{e^2 c_{\beta-\alpha}}{4s_{\mathrm{W}}^2}\left(U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},2} + U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},3}\right)
\end{aligned}
$$

$$\underset{317}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, G^-, H^+\right) = \boxed{1}$$

$$
\boxed{1} =
\begin{aligned}
&-\frac{ie^2 c_{2\beta} s_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{4s_{\mathrm{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} + c_{2\beta} s_{2\alpha}\right) + \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{4s_{\mathrm{W}}^2}\left(\frac{c_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} + c_{2\beta} s_{2\alpha}\right) - \\
&\frac{ie^2}{4s_{\mathrm{W}}^2}\left(\frac{s_{2\alpha} s_{2\beta} s_{\mathrm{W}}^2}{c_{\mathrm{W}}^2} - c_{2\alpha} c_{2\beta}\right)\left(Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},2}\right) - \frac{e^2 s_{\beta-\alpha}}{4s_{\mathrm{W}}^2}\left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},3}\right) + \\
&\frac{e^2 c_{\beta-\alpha}}{4s_{\mathrm{W}}^2}\left(Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},2} + Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},3}\right)
\end{aligned}
$$

$$\underset{318}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, G^-, G^+\right) = \boxed{1}$$

$$
\boxed{1} = \begin{aligned} &-\frac{ie^2 U^{\mathrm{H}}_{h1,2} U^{\mathrm{H}}_{h2,2}}{4s^2_{\mathrm{W}}}\left(\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - s_{2\alpha}s_{2\beta} + 1\right) - \frac{ie^2 U^{\mathrm{H}}_{h1,1} U^{\mathrm{H}}_{h2,1}}{4s^2_{\mathrm{W}}}\left(-\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s_{2\alpha}s_{2\beta} + 1\right) - \frac{ie^2 U^{\mathrm{H}}_{h1,3} U^{\mathrm{H}}_{h2,3}}{4s^2_{\mathrm{W}}}\left(-\frac{c^2_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s^2_{2\beta} + 1\right) + \\ &\frac{ie^2}{4s^2_{\mathrm{W}}}\left(\frac{c_{2\beta}s_{2\alpha}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\alpha}s_{2\beta}\right)\left(U^{\mathrm{H}}_{h1,2} U^{\mathrm{H}}_{h2,1} + U^{\mathrm{H}}_{h1,1} U^{\mathrm{H}}_{h2,2}\right) \end{aligned}
$$

$$
\underset{319}{\mathrm{C}}\left(\hat{H}_{h1}, H_{h2}, G^-, G^+\right) = \left[\ \boxed{1}\ \right]
$$

$$
\boxed{1} = \begin{aligned} &-\frac{ie^2 U^{\mathrm{H}}_{h2,2} Z^{\mathrm{H}}_{h1,2}}{4s^2_{\mathrm{W}}}\left(\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - s_{2\alpha}s_{2\beta} + 1\right) - \frac{ie^2 U^{\mathrm{H}}_{h2,1} Z^{\mathrm{H}}_{h1,1}}{4s^2_{\mathrm{W}}}\left(-\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s_{2\alpha}s_{2\beta} + 1\right) - \frac{ie^2 U^{\mathrm{H}}_{h2,3} Z^{\mathrm{H}}_{h1,3}}{4s^2_{\mathrm{W}}}\left(-\frac{c^2_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s^2_{2\beta} + 1\right) + \\ &\frac{ie^2}{4s^2_{\mathrm{W}}}\left(\frac{c_{2\beta}s_{2\alpha}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\alpha}s_{2\beta}\right)\left(U^{\mathrm{H}}_{h2,2} Z^{\mathrm{H}}_{h1,1} + U^{\mathrm{H}}_{h2,1} Z^{\mathrm{H}}_{h1,2}\right) \end{aligned}
$$

$$
\underset{320}{\mathrm{C}}\left(\hat{H}_{h1}, \hat{H}_{h2}, G^-, G^+\right) = \left[\ \boxed{1}\ \right]
$$

$$
\boxed{1} = \begin{aligned} &-\frac{ie^2 Z^{\mathrm{H}}_{h1,2} Z^{\mathrm{H}}_{h2,2}}{4s^2_{\mathrm{W}}}\left(\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} - s_{2\alpha}s_{2\beta} + 1\right) - \frac{ie^2 Z^{\mathrm{H}}_{h1,1} Z^{\mathrm{H}}_{h2,1}}{4s^2_{\mathrm{W}}}\left(-\frac{c_{2\alpha}c_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s_{2\alpha}s_{2\beta} + 1\right) - \frac{ie^2 Z^{\mathrm{H}}_{h1,3} Z^{\mathrm{H}}_{h2,3}}{4s^2_{\mathrm{W}}}\left(-\frac{c^2_{2\beta}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + s^2_{2\beta} + 1\right) + \\ &\frac{ie^2}{4s^2_{\mathrm{W}}}\left(\frac{c_{2\beta}s_{2\alpha}s^2_{\mathrm{W}}}{c^2_{\mathrm{W}}} + c_{2\alpha}s_{2\beta}\right)\left(Z^{\mathrm{H}}_{h1,2} Z^{\mathrm{H}}_{h2,1} + Z^{\mathrm{H}}_{h1,1} Z^{\mathrm{H}}_{h2,2}\right) \end{aligned}
$$

$$
\underset{321}{\mathrm{C}}\left(H_{h1}, H_{h2}, H_{h3}, G^0\right) = \left[\ \boxed{1}\ \right]
$$

$$
\boxed{1} = \begin{aligned} &-\frac{3ie^2 c_{2\beta}s_{2\beta} U^{\mathrm{H}}_{h1,3} U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,3}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} - \frac{ie^2 c_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h1,3} U^{\mathrm{H}}_{h2,1} U^{\mathrm{H}}_{h3,1} + U^{\mathrm{H}}_{h1,1} U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,1} + U^{\mathrm{H}}_{h1,1} U^{\mathrm{H}}_{h2,1} U^{\mathrm{H}}_{h3,3}\right) - \\ &\frac{ie^2 s_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h1,3} U^{\mathrm{H}}_{h2,2} U^{\mathrm{H}}_{h3,1} + U^{\mathrm{H}}_{h1,2} U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,1} + U^{\mathrm{H}}_{h1,3} U^{\mathrm{H}}_{h2,1} U^{\mathrm{H}}_{h3,2} + U^{\mathrm{H}}_{h1,1} U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,2} + U^{\mathrm{H}}_{h1,2} U^{\mathrm{H}}_{h2,1} U^{\mathrm{H}}_{h3,3} + U^{\mathrm{H}}_{h1,1} U^{\mathrm{H}}_{h2,2} U^{\mathrm{H}}_{h3,3}\right) + \\ &\frac{ie^2 c_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h1,3} U^{\mathrm{H}}_{h2,2} U^{\mathrm{H}}_{h3,2} + U^{\mathrm{H}}_{h1,2} U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,2} + U^{\mathrm{H}}_{h1,2} U^{\mathrm{H}}_{h2,2} U^{\mathrm{H}}_{h3,3}\right) \end{aligned}
$$

$$
\underset{322}{\mathrm{C}}\left(\hat{H}_{h1}, H_{h2}, H_{h3}, G^0\right) = \left[\ \boxed{1}\ \right]
$$

$$
\boxed{1} = \begin{aligned} &-\frac{3ie^2 c_{2\beta}s_{2\beta} U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,3} Z^{\mathrm{H}}_{h1,3}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} - \frac{ie^2 c_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,1} Z^{\mathrm{H}}_{h1,1} + U^{\mathrm{H}}_{h2,1} U^{\mathrm{H}}_{h3,3} Z^{\mathrm{H}}_{h1,1} + U^{\mathrm{H}}_{h2,1} U^{\mathrm{H}}_{h3,1} Z^{\mathrm{H}}_{h1,3}\right) - \\ &\frac{ie^2 s_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,2} Z^{\mathrm{H}}_{h1,1} + U^{\mathrm{H}}_{h2,2} U^{\mathrm{H}}_{h3,3} Z^{\mathrm{H}}_{h1,1} + U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,1} Z^{\mathrm{H}}_{h1,2} + U^{\mathrm{H}}_{h2,1} U^{\mathrm{H}}_{h3,3} Z^{\mathrm{H}}_{h1,2} + U^{\mathrm{H}}_{h2,2} U^{\mathrm{H}}_{h3,1} Z^{\mathrm{H}}_{h1,3} + U^{\mathrm{H}}_{h2,1} U^{\mathrm{H}}_{h3,2} Z^{\mathrm{H}}_{h1,3}\right) + \\ &\frac{ie^2 c_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h2,3} U^{\mathrm{H}}_{h3,2} Z^{\mathrm{H}}_{h1,2} + U^{\mathrm{H}}_{h2,2} U^{\mathrm{H}}_{h3,3} Z^{\mathrm{H}}_{h1,2} + U^{\mathrm{H}}_{h2,2} U^{\mathrm{H}}_{h3,2} Z^{\mathrm{H}}_{h1,3}\right) \end{aligned}
$$

28 $\quad\underset{323}{\mathrm{C}}\left(\hat{H}_{h1}, \hat{H}_{h2}, H_{h3}, G^0\right) = \left[\ \boxed{1}\ \right]$

$$\boxed{1} = \frac{-\frac{3ie^2 c_{2\beta}s_{2\beta}U^{\mathrm{H}}_{h3,3}Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,3}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} - \frac{ie^2 c_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h3,3}Z^{\mathrm{H}}_{h1,1}Z^{\mathrm{H}}_{h2,1} + U^{\mathrm{H}}_{h3,1}Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,1} + U^{\mathrm{H}}_{h3,1}Z^{\mathrm{H}}_{h1,1}Z^{\mathrm{H}}_{h2,3}\right) -}{}$$

$$1 = \frac{ie^2 s_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h3,3}Z^{\mathrm{H}}_{h1,2}Z^{\mathrm{H}}_{h2,1} + U^{\mathrm{H}}_{h3,2}Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,1} + U^{\mathrm{H}}_{h3,3}Z^{\mathrm{H}}_{h1,1}Z^{\mathrm{H}}_{h2,2} + U^{\mathrm{H}}_{h3,1}Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,2} + U^{\mathrm{H}}_{h3,2}Z^{\mathrm{H}}_{h1,1}Z^{\mathrm{H}}_{h2,3} + U^{\mathrm{H}}_{h3,1}Z^{\mathrm{H}}_{h1,2}Z^{\mathrm{H}}_{h2,3}\right) +$$

$$\frac{ie^2 c_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h3,3}Z^{\mathrm{H}}_{h1,2}Z^{\mathrm{H}}_{h2,2} + U^{\mathrm{H}}_{h3,2}Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,2} + U^{\mathrm{H}}_{h3,2}Z^{\mathrm{H}}_{h1,2}Z^{\mathrm{H}}_{h2,3}\right)$$

$$\underset{324}{\mathrm{C}}\left(\hat{H}_{h1}, \hat{H}_{h2}, \hat{H}_{h3}, G^0\right) = \left[\ \boxed{1}\ \right]$$

$$\boxed{1} = \frac{-\frac{3ie^2 c_{2\beta}s_{2\beta}Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,3}Z^{\mathrm{H}}_{h3,3}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} - \frac{ie^2 c_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,1}Z^{\mathrm{H}}_{h3,1} + Z^{\mathrm{H}}_{h1,1}Z^{\mathrm{H}}_{h2,3}Z^{\mathrm{H}}_{h3,1} + Z^{\mathrm{H}}_{h1,1}Z^{\mathrm{H}}_{h2,1}Z^{\mathrm{H}}_{h3,3}\right) -}{}$$

$$1 = \frac{ie^2 s_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,2}Z^{\mathrm{H}}_{h3,1} + Z^{\mathrm{H}}_{h1,2}Z^{\mathrm{H}}_{h2,3}Z^{\mathrm{H}}_{h3,1} + Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,1}Z^{\mathrm{H}}_{h3,2} + Z^{\mathrm{H}}_{h1,1}Z^{\mathrm{H}}_{h2,3}Z^{\mathrm{H}}_{h3,2} + Z^{\mathrm{H}}_{h1,2}Z^{\mathrm{H}}_{h2,1}Z^{\mathrm{H}}_{h3,3} + Z^{\mathrm{H}}_{h1,1}Z^{\mathrm{H}}_{h2,2}Z^{\mathrm{H}}_{h3,3}\right) +$$

$$\frac{ie^2 c_{2\alpha}s_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(Z^{\mathrm{H}}_{h1,3}Z^{\mathrm{H}}_{h2,2}Z^{\mathrm{H}}_{h3,2} + Z^{\mathrm{H}}_{h1,2}Z^{\mathrm{H}}_{h2,3}Z^{\mathrm{H}}_{h3,2} + Z^{\mathrm{H}}_{h1,2}Z^{\mathrm{H}}_{h2,2}Z^{\mathrm{H}}_{h3,3}\right)$$

$$\underset{325}{\mathrm{C}}\left(H_{h1}, H_{h2}, H_{h3}, H_{h4}\right) = \left[\ \boxed{2}\ \right]$$

$$\boxed{2} = -\frac{ie^2(\boxed{1})c_{2\beta}s_{2\alpha}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} - \frac{3ie^2 c^2_{2\alpha}U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,1}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} - \frac{3ie^2 c^2_{2\alpha}U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,2}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} -$$

$$\frac{3ie^2 c_{2\alpha}s_{2\alpha}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,2}\right) +$$

$$\frac{ie^2}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\begin{pmatrix} U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,1} + \\ U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,2} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,2} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,2} \end{pmatrix}\left(1 - 3s^2_{2\alpha}\right) +$$

$$2 = \frac{3ie^2 c_{2\alpha}s_{2\alpha}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\left(U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,2} + U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,2} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,2}\right) -$$

$$\frac{3ie^2 c^2_{2\beta}U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,3}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}} -$$

$$\frac{ie^2 c_{2\alpha}c_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\begin{pmatrix} U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,1} + \\ U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,3} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,3} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,3} \end{pmatrix} +$$

$$\frac{ie^2 c_{2\alpha}c_{2\beta}}{4c^2_{\mathrm{W}}s^2_{\mathrm{W}}}\begin{pmatrix} U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,2} + U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,2} + U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,2} + \\ U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,3} + U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,3} + U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,3} \end{pmatrix}$$

$$\boxed{1} = U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,1} + U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,2} + U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,2} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,2} +$$

$$U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,3} + U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,1}U^{\mathrm{H}}_{h4,3} + U^{\mathrm{H}}_{h1,3}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,3} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,3}U^{\mathrm{H}}_{h3,2}U^{\mathrm{H}}_{h4,3} + U^{\mathrm{H}}_{h1,2}U^{\mathrm{H}}_{h2,1}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,3} + U^{\mathrm{H}}_{h1,1}U^{\mathrm{H}}_{h2,2}U^{\mathrm{H}}_{h3,3}U^{\mathrm{H}}_{h4,3}$$

$$C_{326}\left(\hat{H}_{\text{h1}}, H_{\text{h2}}, H_{\text{h3}}, H_{\text{h4}}\right) = \boxed{\;2\;}$$

$$
\boxed{2} = \begin{aligned}
&-\frac{ie^2(\boxed{1})c_{2\beta}s_{2\alpha}}{4c_{\text{W}}^2 s_{\text{W}}^2} - \frac{3ie^2 c_{2\alpha}^2 U_{\text{h2,1}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}}}{4c_{\text{W}}^2 s_{\text{W}}^2} - \frac{3ie^2 c_{2\alpha}^2 U_{\text{h2,2}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}}}{4c_{\text{W}}^2 s_{\text{W}}^2} - \\[4pt]
&\frac{3ie^2 c_{2\alpha}s_{2\alpha}}{4c_{\text{W}}^2 s_{\text{W}}^2}\left(U_{\text{h2,2}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}}\right) + \\[4pt]
&\frac{ie^2}{4c_{\text{W}}^2 s_{\text{W}}^2}\left(\begin{array}{l} U_{\text{h2,2}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,2}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + \\ U_{\text{h2,2}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} \end{array}\right)\left(1 - 3s_{2\alpha}^2\right) + \\[4pt]
&\frac{3ie^2 c_{2\alpha}s_{2\alpha}}{4c_{\text{W}}^2 s_{\text{W}}^2}\left(U_{\text{h2,2}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,2}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + U_{\text{h2,2}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}}\right) - \\[4pt]
&\frac{3ie^2 c_{2\beta}^2 U_{\text{h2,3}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}}}{4c_{\text{W}}^2 s_{\text{W}}^2} - \\[4pt]
&\frac{ie^2 c_{2\alpha}c_{2\beta}}{4c_{\text{W}}^2 s_{\text{W}}^2}\left(\begin{array}{l} U_{\text{h2,3}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,3}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + \\ U_{\text{h2,3}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} \end{array}\right) + \\[4pt]
&\frac{ie^2 c_{2\alpha}c_{2\beta}}{4c_{\text{W}}^2 s_{\text{W}}^2}\left(\begin{array}{l} U_{\text{h2,3}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + U_{\text{h2,3}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + U_{\text{h2,2}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + \\ U_{\text{h2,3}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} + U_{\text{h2,2}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} + U_{\text{h2,2}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} \end{array}\right)
\end{aligned}
$$

$$
\boxed{1} = \begin{aligned}
&U_{\text{h2,3}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,3}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,2}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,1}}^{\text{H}} + U_{\text{h2,3}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + U_{\text{h2,3}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,2}}^{\text{H}} + \\[4pt]
&U_{\text{h2,3}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} + U_{\text{h2,2}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,1}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} + U_{\text{h2,3}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,3}}^{\text{H}} U_{\text{h4,2}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} + U_{\text{h2,2}}^{\text{H}} U_{\text{h3,1}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}} + U_{\text{h2,1}}^{\text{H}} U_{\text{h3,2}}^{\text{H}} U_{\text{h4,3}}^{\text{H}} Z_{\text{h1,3}}^{\text{H}}
\end{aligned}
$$

$$C_{327}\left(\hat{H}_{\text{h1}}, \hat{H}_{\text{h2}}, H_{\text{h3}}, H_{\text{h4}}\right) = \boxed{\;2\;}$$

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$$-\frac{ie^2(\boxed{1})c_{2\beta}s_{2\alpha}}{4c_W^2 s_W^2} - \frac{3ie^2 c_{2\alpha}^2 U_{h3,1}^H U_{h4,1}^H Z_{h1,1}^H Z_{h2,1}^H}{4c_W^2 s_W^2} - \frac{3ie^2 c_{2\alpha}^2 U_{h3,2}^H U_{h4,2}^H Z_{h1,2}^H Z_{h2,2}^H}{4c_W^2 s_W^2} -$$

$$\frac{3ie^2 c_{2\alpha} s_{2\alpha}}{4c_W^2 s_W^2}\left(U_{h3,2}^H U_{h4,1}^H Z_{h1,1}^H Z_{h2,1}^H + U_{h3,1}^H U_{h4,2}^H Z_{h1,1}^H Z_{h2,1}^H + U_{h3,1}^H U_{h4,1}^H Z_{h1,2}^H Z_{h2,1}^H + U_{h3,1}^H U_{h4,1}^H Z_{h1,1}^H Z_{h2,2}^H\right) +$$

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

$$\boxed{2} = \frac{3ie^2 c_{2\alpha} s_{2\alpha}}{4c_W^2 s_W^2}\left(U_{h3,2}^H U_{h4,2}^H Z_{h1,2}^H Z_{h2,1}^H + U_{h3,2}^H U_{h4,2}^H Z_{h1,1}^H Z_{h2,2}^H + U_{h3,2}^H U_{h4,1}^H Z_{h1,2}^H Z_{h2,2}^H + U_{h3,1}^H U_{h4,2}^H Z_{h1,2}^H Z_{h2,2}^H\right) -$$

$$\frac{3ie^2 c_{2\beta}^2 U_{h3,3}^H U_{h4,3}^H Z_{h1,3}^H Z_{h2,3}^H}{4c_W^2 s_W^2} -$$

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

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

$$\boxed{1} = U_{h3,3}^H U_{h4,3}^H Z_{h1,2}^H Z_{h2,1}^H + U_{h3,3}^H U_{h4,2}^H Z_{h1,3}^H Z_{h2,1}^H + U_{h3,2}^H U_{h4,3}^H Z_{h1,3}^H Z_{h2,1}^H + U_{h3,3}^H U_{h4,3}^H Z_{h1,1}^H Z_{h2,2}^H + U_{h3,3}^H U_{h4,1}^H Z_{h1,3}^H Z_{h2,2}^H + U_{h3,1}^H U_{h4,3}^H Z_{h1,3}^H Z_{h2,2}^H +$$
$$U_{h3,3}^H U_{h4,2}^H Z_{h1,1}^H Z_{h2,3}^H + U_{h3,2}^H U_{h4,3}^H Z_{h1,1}^H Z_{h2,3}^H + U_{h3,3}^H U_{h4,1}^H Z_{h1,2}^H Z_{h2,3}^H + U_{h3,1}^H U_{h4,3}^H Z_{h1,2}^H Z_{h2,3}^H + U_{h3,2}^H U_{h4,1}^H Z_{h1,3}^H Z_{h2,3}^H + U_{h3,1}^H U_{h4,2}^H Z_{h1,3}^H Z_{h2,3}^H$$

$$C_{328}\left(\hat{H}_{h1}, \hat{H}_{h2}, \hat{H}_{h3}, H_{h4}\right) = \left[\ \boxed{2}\ \right]$$

$$
\boxed{2} = -\frac{ie^2(\boxed{1})c_{2\beta}s_{2\alpha}}{4c_W^2 s_W^2} - \frac{3ie^2 c_{2\alpha}^2 U_{h4,1}^H Z_{h1,1}^H Z_{h2,1}^H Z_{h3,1}^H}{4c_W^2 s_W^2} - \frac{3ie^2 c_{2\alpha}^2 U_{h4,2}^H Z_{h1,2}^H Z_{h2,2}^H Z_{h3,2}^H}{4c_W^2 s_W^2} -
$$

$$
\frac{3ie^2 c_{2\alpha}s_{2\alpha}}{4c_W^2 s_W^2}\left(U_{h4,2}^H Z_{h1,1}^H Z_{h2,1}^H Z_{h3,1}^H + U_{h4,1}^H Z_{h1,2}^H Z_{h2,1}^H Z_{h3,1}^H + U_{h4,1}^H Z_{h1,1}^H Z_{h2,2}^H Z_{h3,1}^H + U_{h4,1}^H Z_{h1,1}^H Z_{h2,1}^H Z_{h3,2}^H \right) +
$$

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

$$
\frac{3ie^2 c_{2\alpha}s_{2\alpha}}{4c_W^2 s_W^2}\left(U_{h4,2}^H Z_{h1,2}^H Z_{h2,2}^H Z_{h3,1}^H + U_{h4,2}^H Z_{h1,2}^H Z_{h2,1}^H Z_{h3,2}^H + U_{h4,2}^H Z_{h1,1}^H Z_{h2,2}^H Z_{h3,2}^H + U_{h4,1}^H Z_{h1,2}^H Z_{h2,2}^H Z_{h3,2}^H \right) -
$$

$$
\frac{3ie^2 c_{2\beta}^2 U_{h4,3}^H Z_{h1,3}^H Z_{h2,3}^H Z_{h3,3}^H}{4c_W^2 s_W^2} -
$$

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

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

$$
\boxed{1} = U_{h4,3}^H Z_{h1,3}^H Z_{h2,2}^H Z_{h3,1}^H + U_{h4,3}^H Z_{h1,2}^H Z_{h2,3}^H Z_{h3,1}^H + U_{h4,2}^H Z_{h1,3}^H Z_{h2,3}^H Z_{h3,1}^H + U_{h4,3}^H Z_{h1,3}^H Z_{h2,1}^H Z_{h3,2}^H + U_{h4,3}^H Z_{h1,1}^H Z_{h2,3}^H Z_{h3,2}^H + U_{h4,1}^H Z_{h1,3}^H Z_{h2,3}^H Z_{h3,2}^H +
$$
$$
U_{h4,3}^H Z_{h1,2}^H Z_{h2,1}^H Z_{h3,3}^H + U_{h4,2}^H Z_{h1,3}^H Z_{h2,1}^H Z_{h3,3}^H + U_{h4,3}^H Z_{h1,1}^H Z_{h2,2}^H Z_{h3,3}^H + U_{h4,1}^H Z_{h1,3}^H Z_{h2,2}^H Z_{h3,3}^H + U_{h4,2}^H Z_{h1,1}^H Z_{h2,3}^H Z_{h3,3}^H + U_{h4,1}^H Z_{h1,2}^H Z_{h2,3}^H Z_{h3,3}^H
$$

$$
C_{329}\left(\hat{H}_{h1}, \hat{H}_{h2}, \hat{H}_{h3}, \hat{H}_{h4}\right) = \left[\ \boxed{2}\ \right]
$$

$$-\frac{ie^2(\boxed{1})c_{2\beta}s_{2\alpha}}{4c_W^2 s_W^2} - \frac{3ie^2 c_{2\alpha}^2 Z_{h1,1}^H Z_{h2,1}^H Z_{h3,1}^H Z_{h4,1}^H}{4c_W^2 s_W^2} - \frac{3ie^2 c_{2\alpha}^2 Z_{h1,2}^H Z_{h2,2}^H Z_{h3,2}^H Z_{h4,2}^H}{4c_W^2 s_W^2} -$$

$$\frac{3ie^2 c_{2\alpha}s_{2\alpha}}{4c_W^2 s_W^2}\left(Z_{h1,2}^H Z_{h2,1}^H Z_{h3,1}^H Z_{h4,1}^H + Z_{h1,1}^H Z_{h2,2}^H Z_{h3,1}^H Z_{h4,1}^H + Z_{h1,1}^H Z_{h2,1}^H Z_{h3,2}^H Z_{h4,1}^H + Z_{h1,1}^H Z_{h2,1}^H Z_{h3,1}^H Z_{h4,2}^H\right) +$$

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

$$\boxed{2} = \frac{3ie^2 c_{2\alpha}s_{2\alpha}}{4c_W^2 s_W^2}\left(Z_{h1,2}^H Z_{h2,2}^H Z_{h3,2}^H Z_{h4,1}^H + Z_{h1,2}^H Z_{h2,2}^H Z_{h3,1}^H Z_{h4,2}^H + Z_{h1,2}^H Z_{h2,1}^H Z_{h3,2}^H Z_{h4,2}^H + Z_{h1,1}^H Z_{h2,2}^H Z_{h3,2}^H Z_{h4,2}^H\right) -$$

$$\frac{3ie^2 c_{2\beta}^2 Z_{h1,3}^H Z_{h2,3}^H Z_{h3,3}^H Z_{h4,3}^H}{4c_W^2 s_W^2} -$$

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

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

$$\boxed{1} = Z_{h1,3}^H Z_{h2,3}^H Z_{h3,2}^H Z_{h4,1}^H + Z_{h1,3}^H Z_{h2,2}^H Z_{h3,3}^H Z_{h4,1}^H + Z_{h1,2}^H Z_{h2,3}^H Z_{h3,3}^H Z_{h4,1}^H + Z_{h1,3}^H Z_{h2,3}^H Z_{h3,1}^H Z_{h4,2}^H + Z_{h1,3}^H Z_{h2,1}^H Z_{h3,3}^H Z_{h4,2}^H + Z_{h1,1}^H Z_{h2,3}^H Z_{h3,3}^H Z_{h4,2}^H +$$
$$Z_{h1,3}^H Z_{h2,2}^H Z_{h3,1}^H Z_{h4,3}^H + Z_{h1,2}^H Z_{h2,3}^H Z_{h3,1}^H Z_{h4,3}^H + Z_{h1,3}^H Z_{h2,1}^H Z_{h3,2}^H Z_{h4,3}^H + Z_{h1,1}^H Z_{h2,3}^H Z_{h3,2}^H Z_{h4,3}^H + Z_{h1,2}^H Z_{h2,1}^H Z_{h3,3}^H Z_{h4,3}^H + Z_{h1,1}^H Z_{h2,2}^H Z_{h3,3}^H Z_{h4,3}^H$$

[SSSS] 4 Sleptons

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

$$\boxed{2} = \delta_{g1,g4}\delta_{g2,g3}c_\beta^2 M_W^2 U_{s2,1}^{\tilde{e}g2} U_{s3,1}^{\tilde{e}g2*} U_{s4,1}^{\tilde{e}g1} - 2\delta_{g1,g4}\delta_{g2,g3}U_{s3,2}^{\tilde{e}g2*}\left(c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{e}g2} U_{s4,1}^{\tilde{e}g1} - m_{eg1}m_{eg2}c_W^2 U_{s2,1}^{\tilde{e}g2} U_{s4,2}^{\tilde{e}g1}\right) +$$
$$\delta_{g1,g2}\delta_{g3,g4}\left(c_\beta^2 M_W^2 U_{s2,1}^{\tilde{e}g1} U_{s3,1}^{\tilde{e}g3*} U_{s4,1}^{\tilde{e}g3} + 2U_{s3,2}^{\tilde{e}g3*}\left(m_{eg1}m_{eg3}c_W^2 U_{s2,2}^{\tilde{e}g1} U_{s4,1}^{\tilde{e}g3} - c_\beta^2 M_W^2 s_W^2 U_{s2,1}^{\tilde{e}g1} U_{s4,2}^{\tilde{e}g3}\right)\right)$$

$$\boxed{1} = 2\delta_{g1,g4}\delta_{g2,g3}c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{e}g2} U_{s3,2}^{\tilde{e}g2*} U_{s4,2}^{\tilde{e}g1} + \delta_{g1,g4}\delta_{g2,g3}U_{s3,1}^{\tilde{e}g2*}\left(m_{eg1}m_{eg2}c_W^2 U_{s2,2}^{\tilde{e}g2} U_{s4,1}^{\tilde{e}g1} - c_\beta^2 M_W^2 s_W^2 U_{s2,1}^{\tilde{e}g2} U_{s4,2}^{\tilde{e}g1}\right) +$$
$$\delta_{g1,g2}\delta_{g3,g4}\left(2c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{e}g1} U_{s3,2}^{\tilde{e}g3*} U_{s4,2}^{\tilde{e}g3} - U_{s3,1}^{\tilde{e}g3*}\left(c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{e}g1} U_{s4,1}^{\tilde{e}g3} - m_{eg1}m_{eg3}c_W^2 U_{s2,1}^{\tilde{e}g1} U_{s4,2}^{\tilde{e}g3}\right)\right)$$

$$\underset{193}{C}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, \tilde{v}_{g3}, \tilde{v}_{g4}^\dagger\right) = \left[\frac{ie^2}{4s_W^2}\left(\begin{array}{l} \dfrac{\delta_{g1,g2}\delta_{g3,g4}}{c_W^2}\left(\left(c_W^2 - s_W^2\right)U_{s1,1}^{\tilde{e}g1*} U_{s2,1}^{\tilde{e}g1} + 2s_W^2 U_{s1,2}^{\tilde{e}g1*} U_{s2,2}^{\tilde{e}g1}\right) - \\ \dfrac{2\delta_{g1,g4}\delta_{g2,g3}}{c_\beta^2 M_W^2}\left(c_\beta^2 M_W^2 U_{s1,1}^{\tilde{e}g1*} U_{s2,1}^{\tilde{e}g2} + m_{eg1}m_{eg2}U_{s1,2}^{\tilde{e}g1*} U_{s2,2}^{\tilde{e}g2}\right) \end{array}\right)\right]$$

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

[SSSS] 4 Squarks

$$\underset{186}{C}\left(\tilde{d}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[\;\boxed{3}\;\right]$$

$$\boxed{3} =
\begin{aligned}
&-\delta_{g1,g2}\delta_{g3,g4}\left(\frac{ie^2(\boxed{1})}{36c_W^2 c_\beta^2 M_W^2 s_W^2} + i\left(T_{c2,c1}^x T_{c4,c3}^x\right)g_s^2\left(U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g1}} - U_{s1,2}^{\tilde{d}_{g1}*}U_{s2,2}^{\tilde{d}_{g1}}\right)\left(U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{d}_{g3}} - U_{s3,2}^{\tilde{d}_{g3}*}U_{s4,2}^{\tilde{d}_{g3}}\right)\right) - \\
&\delta_{g1,g4}\delta_{g2,g3}\left(\frac{ie^2(\boxed{2})}{36c_W^2 c_\beta^2 M_W^2 s_W^2} + i\left(T_{c2,c3}^x T_{c4,c1}^x\right)g_s^2\left(U_{s2,1}^{\tilde{d}_{g2}}U_{s3,1}^{\tilde{d}_{g2}*} - U_{s2,2}^{\tilde{d}_{g2}}U_{s3,2}^{\tilde{d}_{g2}*}\right)\left(U_{s1,1}^{\tilde{d}_{g1}*}U_{s4,1}^{\tilde{d}_{g1}} - U_{s1,2}^{\tilde{d}_{g1}*}U_{s4,2}^{\tilde{d}_{g1}}\right)\right)
\end{aligned}$$

$$\boxed{2} =
\begin{aligned}
&U_{s1,1}^{\tilde{d}_{g1}*}\left(\left(8c_W^2+1\right)c_\beta^2 M_W^2 U_{s2,1}^{\tilde{d}_{g2}}U_{s3,1}^{\tilde{d}_{g2}*}U_{s4,1}^{\tilde{d}_{g1}} + 2U_{s3,2}^{\tilde{d}_{g2}*}\left(c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d}_{g2}}U_{s4,1}^{\tilde{d}_{g1}} + 9m_{d_{g1}}m_{d_{g2}}c_W^2 U_{s2,1}^{\tilde{d}_{g2}}U_{s4,2}^{\tilde{d}_{g1}}\right)\right) + \\
&2U_{s1,2}^{\tilde{d}_{g1}*}\left(2c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d}_{g2}}U_{s3,2}^{\tilde{d}_{g2}*}U_{s4,2}^{\tilde{d}_{g1}} + U_{s3,1}^{\tilde{d}_{g2}*}\left(9m_{d_{g1}}m_{d_{g2}}c_W^2 U_{s2,2}^{\tilde{d}_{g2}}U_{s4,1}^{\tilde{d}_{g1}} + c_\beta^2 M_W^2 s_W^2 U_{s2,1}^{\tilde{d}_{g2}}U_{s4,2}^{\tilde{d}_{g1}}\right)\right)
\end{aligned}$$

$$\boxed{1} =
\begin{aligned}
&2U_{s1,2}^{\tilde{d}_{g1}*}\left(2c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d}_{g1}}U_{s3,2}^{\tilde{d}_{g3}*}U_{s4,2}^{\tilde{d}_{g3}} + U_{s3,1}^{\tilde{d}_{g3}*}\left(c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d}_{g1}}U_{s4,1}^{\tilde{d}_{g3}} + 9m_{d_{g1}}m_{d_{g3}}c_W^2 U_{s2,1}^{\tilde{d}_{g1}}U_{s4,2}^{\tilde{d}_{g3}}\right)\right) + \\
&U_{s1,1}^{\tilde{d}_{g1}*}\left(\left(8c_W^2+1\right)c_\beta^2 M_W^2 U_{s2,1}^{\tilde{d}_{g1}}U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{d}_{g3}} + 2U_{s3,2}^{\tilde{d}_{g3}*}\left(9m_{d_{g1}}m_{d_{g3}}c_W^2 U_{s2,2}^{\tilde{d}_{g1}}U_{s4,1}^{\tilde{d}_{g3}} + c_\beta^2 M_W^2 s_W^2 U_{s2,1}^{\tilde{d}_{g1}}U_{s4,2}^{\tilde{d}_{g3}}\right)\right)
\end{aligned}$$

$$\underset{189}{C}\left(\tilde{d}_{g1}^{s1}, \tilde{d}_{g2}^{s2,\dagger}, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\; -\frac{ie^2 CKM_{g4,g1}CKM_{g3,g2}^*}{2c_\beta^2 M_W^2 s_W^2 s_\beta^2}\left(\begin{aligned}&s_\beta^2\left(c_\beta^2 M_W^2 U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g2}} + m_{d_{g1}}m_{d_{g2}}U_{s1,2}^{\tilde{d}_{g1}*}U_{s2,2}^{\tilde{d}_{g2}}\right)U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{u}_{g4}} + \\ &m_{u_{g3}}m_{u_{g4}}c_\beta^2 U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g2}}U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{u}_{g4}}\end{aligned}\right) + (\boxed{1})\delta_{g1,g2}\delta_{g3,g4}\;\right]$$

$$\boxed{1} =
\begin{aligned}
&-i\left(T_{c2,c1}^x T_{c4,c3}^x\right)g_s^2\left(U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g1}} - U_{s1,2}^{\tilde{d}_{g1}*}U_{s2,2}^{\tilde{d}_{g1}}\right)\left(U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{u}_{g3}} - U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{u}_{g3}}\right) + \\
&\frac{ie^2}{36c_W^2 s_W^2}\left(\begin{aligned}&\left(\left(9c_W^2 - s_W^2\right)U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g1}} - 2s_W^2 U_{s1,2}^{\tilde{d}_{g1}*}U_{s2,2}^{\tilde{d}_{g1}}\right)U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{u}_{g3}} + \\ &4s_W^2\left(U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g1}} + 2U_{s1,2}^{\tilde{d}_{g1}*}U_{s2,2}^{\tilde{d}_{g1}}\right)U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{u}_{g3}}\end{aligned}\right)
\end{aligned}$$

$$\underset{197}{C}\left(\tilde{u}_{g1}^{s1}, \tilde{u}_{g2}^{s2,\dagger}, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\;\boxed{3}\;\right]$$

$$\boxed{3} =
\begin{aligned}
&-\delta_{g1,g2}\delta_{g3,g4}\left(\frac{ie^2(\boxed{1})}{36c_W^2 M_W^2 s_W^2 s_\beta^2} + i\left(T_{c2,c1}^x T_{c4,c3}^x\right)g_s^2\left(U_{s1,1}^{\tilde{u}_{g1}*}U_{s2,1}^{\tilde{u}_{g1}} - U_{s1,2}^{\tilde{u}_{g1}*}U_{s2,2}^{\tilde{u}_{g1}}\right)\left(U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{u}_{g3}} - U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{u}_{g3}}\right)\right) - \\
&\delta_{g1,g4}\delta_{g2,g3}\left(\frac{ie^2(\boxed{2})}{36c_W^2 M_W^2 s_W^2 s_\beta^2} + i\left(T_{c2,c3}^x T_{c4,c1}^x\right)g_s^2\left(U_{s2,1}^{\tilde{u}_{g2}}U_{s3,1}^{\tilde{u}_{g2}*} - U_{s2,2}^{\tilde{u}_{g2}}U_{s3,2}^{\tilde{u}_{g2}*}\right)\left(U_{s1,1}^{\tilde{u}_{g1}*}U_{s4,1}^{\tilde{u}_{g1}} - U_{s1,2}^{\tilde{u}_{g1}*}U_{s4,1}^{\tilde{u}_{g1}}\right)\right)
\end{aligned}$$

$$\boxed{2} = U_{s1,1}^{\tilde{u}_{g1}*}\left(\left(8c_W^2+1\right)M_W^2s_\beta^2 U_{s2,1}^{\tilde{u}_{g2}}U_{s3,1}^{\tilde{u}_{g2}*}U_{s4,1}^{\tilde{u}_{g1}} - 2U_{s3,2}^{\tilde{u}_{g2}*}\left(2M_W^2s_\beta^2 U_{s2,2}^{\tilde{u}_{g2}}U_{s4,1}^{\tilde{u}_{g1}} - 9m_{u_{g1}}m_{u_{g2}}c_W^2 U_{s2,1}^{\tilde{u}_{g2}}U_{s4,2}^{\tilde{u}_{g1}}\right)\right) +$$
$$2U_{s1,2}^{\tilde{u}_{g1}*}\left(8M_W^2s_W^2s_\beta^2 U_{s2,2}^{\tilde{u}_{g2}}U_{s3,2}^{\tilde{u}_{g2}*}U_{s4,2}^{\tilde{u}_{g1}} + U_{s3,1}^{\tilde{u}_{g2}*}\left(9m_{u_{g1}}m_{u_{g2}}c_W^2 U_{s2,2}^{\tilde{u}_{g2}}U_{s4,1}^{\tilde{u}_{g1}} - 2M_W^2s_W^2s_\beta^2 U_{s2,1}^{\tilde{u}_{g2}}U_{s4,2}^{\tilde{u}_{g1}}\right)\right)$$

$$\boxed{1} = 2U_{s1,2}^{\tilde{u}_{g1}*}\left(8M_W^2s_W^2s_\beta^2 U_{s2,2}^{\tilde{u}_{g1}}U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{u}_{g3}} - U_{s3,1}^{\tilde{u}_{g3}*}\left(2M_W^2s_W^2s_\beta^2 U_{s2,2}^{\tilde{u}_{g1}}U_{s4,1}^{\tilde{u}_{g3}} - 9m_{u_{g1}}m_{u_{g3}}c_W^2 U_{s2,1}^{\tilde{u}_{g1}}U_{s4,2}^{\tilde{u}_{g3}}\right)\right) +$$
$$U_{s1,1}^{\tilde{u}_{g1}*}\left(\left(8c_W^2+1\right)M_W^2s_\beta^2 U_{s2,1}^{\tilde{u}_{g1}}U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{u}_{g3}} + 2U_{s3,2}^{\tilde{u}_{g3}*}\left(9m_{u_{g1}}m_{u_{g3}}c_W^2 U_{s2,2}^{\tilde{u}_{g1}}U_{s4,1}^{\tilde{u}_{g3}} - 2M_W^2s_W^2s_\beta^2 U_{s2,1}^{\tilde{u}_{g1}}U_{s4,2}^{\tilde{u}_{g3}}\right)\right)$$

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

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

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

$$\underset{145}{C}\left(G^0, H^+, \tilde{e}_{g3}^{s3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\; \frac{e^2\delta_{g3,g4}U_{s3,1}^{\tilde{e}_{g4}*}}{2\sqrt{2}s_W^2}\left(\frac{t_\beta m_{e_{g4}}^2}{M_W^2} - s_{2\beta}\right) \;\right]$$

$$\underset{146}{C}\left(G^0, G^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\; \frac{e^2\delta_{g3,g4}U_{s4,1}^{\tilde{e}_{g3}}}{2\sqrt{2}s_W^2}\left(\frac{m_{e_{g3}}^2}{M_W^2} - c_{2\beta}\right) \;\right]$$

$$\underset{147}{C}\left(G^0, G^+, \tilde{e}_{g3}^{s3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\; -\frac{e^2\delta_{g3,g4}U_{s3,1}^{\tilde{e}_{g4}*}}{2\sqrt{2}s_W^2}\left(\frac{m_{e_{g4}}^2}{M_W^2} - c_{2\beta}\right) \;\right]$$

$$\underset{148}{C}\left(H^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\; -\frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(\frac{m_{e_{g3}}^2 t_\beta^2}{M_W^2} + \left(\frac{1}{2}c_{2\beta}\right)\left(2-\frac{1}{c_W^2}\right)\right) \;\right]$$

$$\underset{149}{C}\left(H^-, G^+, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\; \frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(\frac{t_\beta m_{e_{g3}}^2}{M_W^2} - \left(\frac{1}{2}s_{2\beta}\right)\left(2-\frac{1}{c_W^2}\right)\right) \;\right]$$

$$\underset{150}{C}\left(G^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}_{g4}^\dagger\right) = \left[\; \frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(\frac{t_\beta m_{e_{g3}}^2}{M_W^2} - \left(\frac{1}{2}s_{2\beta}\right)\left(2-\frac{1}{c_W^2}\right)\right) \;\right]$$

$$\underset{151}{C}\left(H^-,H^+,\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{4c_W^2 M_W^2 s_W^2}\left(c_{2\beta}M_W^2 U^{\tilde{e}_{g3}*}_{s3,1}U^{\tilde{e}_{g3}}_{s4,1} - 2\left(c_{2\beta}M_W^2 s_W^2 + c_W^2 m_{e_{g3}}^2 t_\beta^2\right)U^{\tilde{e}_{g3}*}_{s3,2}U^{\tilde{e}_{g3}}_{s4,2}\right)\right]$$

$$\underset{152}{C}\left(H^-,G^+,\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(s_{2\beta}\left(1-\frac{1}{c_W^2}\left(\frac{1}{2}-s_W^2\right)\right)U^{\tilde{e}_{g3}*}_{s3,1}U^{\tilde{e}_{g3}}_{s4,1} + \left(\frac{t_\beta m_{e_{g3}}^2}{M_W^2}-\frac{s_{2\beta}s_W^2}{c_W^2}\right)U^{\tilde{e}_{g3}*}_{s3,2}U^{\tilde{e}_{g3}}_{s4,2}\right)\right]$$

$$\underset{153}{C}\left(G^-,H^+,\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(s_{2\beta}\left(1-\frac{1}{c_W^2}\left(\frac{1}{2}-s_W^2\right)\right)U^{\tilde{e}_{g3}*}_{s3,1}U^{\tilde{e}_{g3}}_{s4,1} + \left(\frac{t_\beta m_{e_{g3}}^2}{M_W^2}-\frac{s_{2\beta}s_W^2}{c_W^2}\right)U^{\tilde{e}_{g3}*}_{s3,2}U^{\tilde{e}_{g3}}_{s4,2}\right)\right]$$

$$\underset{160}{C}\left(G^-,G^+,\tilde{\nu}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{4c_W^2 M_W^2 s_W^2}\left(2c_W^2 m_{e_{g3}}^2 + c_{2\beta}\left(1-2c_W^2\right)M_W^2\right)\right]$$

$$\underset{161}{C}\left(G^-,G^+,\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(c_{2\beta}\left(1-\frac{1}{c_W^2}\left(\frac{1}{2}-s_W^2\right)\right)U^{\tilde{e}_{g3}*}_{s3,1}U^{\tilde{e}_{g3}}_{s4,1} + \left(\frac{m_{e_{g3}}^2}{M_W^2}-\frac{c_{2\beta}s_W^2}{c_W^2}\right)U^{\tilde{e}_{g3}*}_{s3,2}U^{\tilde{e}_{g3}}_{s4,2}\right)\right]$$

$$\underset{266}{C}\left(H_{h1},G^0,\tilde{\nu}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}s_{2\beta}U^H_{h1,3}}{4c_W^2 s_W^2}\right]$$

$$\underset{267}{C}\left(\hat{H}_{h1},G^0,\tilde{\nu}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}s_{2\beta}Z^H_{h1,3}}{4c_W^2 s_W^2}\right]$$

$$\underset{268}{C}\left(H_{h1},G^0,\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}s_{2\beta}U^H_{h1,3}}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(c_W^2 m_{e_{g4}}^2 - c_\beta^2 M_W^2\left(1-2s_W^2\right)\right)U^{\tilde{e}_{g4}*}_{s3,1}U^{\tilde{e}_{g4}}_{s4,1} + \left(c_W^2 m_{e_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right)U^{\tilde{e}_{g4}*}_{s3,2}U^{\tilde{e}_{g4}}_{s4,2}\right)\right]$$

$$\underset{269}{C}\left(\hat{H}_{h1},G^0,\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}s_{2\beta}Z^H_{h1,3}}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(c_W^2 m_{e_{g4}}^2 - c_\beta^2 M_W^2\left(1-2s_W^2\right)\right)U^{\tilde{e}_{g4}*}_{s3,1}U^{\tilde{e}_{g4}}_{s4,1} + \left(c_W^2 m_{e_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right)U^{\tilde{e}_{g4}*}_{s3,2}U^{\tilde{e}_{g4}}_{s4,2}\right)\right]$$

$$\underset{274}{C}\left(H_{h1},H^+,\tilde{e}^{s3}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[\;\boxed{1}\;\right]$$

$$\boxed{1} = \frac{ie^2\delta_{g3,g4}U^H_{h1,2}U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s_W^2}\left(\frac{c_\alpha t_\beta m_{e_{g4}}^2}{c_\beta M_W^2}-s_{\alpha+\beta}\right) - \frac{ie^2\delta_{g3,g4}U^H_{h1,1}U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s_W^2}\left(\frac{s_\alpha t_\beta m_{e_{g4}}^2}{c_\beta M_W^2}+c_{\alpha+\beta}\right) -$$
$$\frac{e^2\delta_{g3,g4}U^H_{h1,3}U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s_W^2}\left(\frac{m_{e_{g4}}^2 t_\beta^2}{M_W^2}+c_{2\beta}\right)$$

$$\underset{275}{C}\left(\hat{H}_{h1},H^+,\tilde{e}^{s3}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[\;\boxed{1}\;\right]$$

$$1 = \frac{ie^2 \delta_{g3,g4} U_{s3,1}^{\tilde{e}_{g4}*} Z_{h1,2}^H}{2\sqrt{2}s_W^2} \left(\frac{c_\alpha t_\beta m_{e_{g4}}^2}{c_\beta M_W^2} - s_{\alpha+\beta} \right) - \frac{ie^2 \delta_{g3,g4} U_{s3,1}^{\tilde{e}_{g4}*} Z_{h1,1}^H}{2\sqrt{2}s_W^2} \left(\frac{s_\alpha t_\beta m_{e_{g4}}^2}{c_\beta M_W^2} + c_{\alpha+\beta} \right) - \frac{e^2 \delta_{g3,g4} U_{s3,1}^{\tilde{e}_{g4}*} Z_{h1,3}^H}{2\sqrt{2}s_W^2} \left(\frac{m_{e_{g4}}^2 t_\beta^2}{M_W^2} + c_{2\beta} \right)$$

$$\underset{282}{C}\left(H_{h1}, H^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger} \right) = \boxed{1}$$

$$1 = \frac{ie^2 \delta_{g3,g4} U_{h1,2}^H U_{s4,1}^{\tilde{e}_{g3}}}{2\sqrt{2}s_W^2} \left(\frac{c_\alpha t_\beta m_{e_{g3}}^2}{c_\beta M_W^2} - s_{\alpha+\beta} \right) - \frac{ie^2 \delta_{g3,g4} U_{h1,1}^H U_{s4,1}^{\tilde{e}_{g3}}}{2\sqrt{2}s_W^2} \left(\frac{s_\alpha t_\beta m_{e_{g3}}^2}{c_\beta M_W^2} + c_{\alpha+\beta} \right) + \frac{e^2 \delta_{g3,g4} U_{h1,3}^H U_{s4,1}^{\tilde{e}_{g3}}}{2\sqrt{2}s_W^2} \left(\frac{m_{e_{g3}}^2 t_\beta^2}{M_W^2} + c_{2\beta} \right)$$

$$\underset{283}{C}\left(\hat{H}_{h1}, H^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger} \right) = \boxed{1}$$

$$1 = \frac{ie^2 \delta_{g3,g4} U_{s4,1}^{\tilde{e}_{g3}} Z_{h1,2}^H}{2\sqrt{2}s_W^2} \left(\frac{c_\alpha t_\beta m_{e_{g3}}^2}{c_\beta M_W^2} - s_{\alpha+\beta} \right) - \frac{ie^2 \delta_{g3,g4} U_{s4,1}^{\tilde{e}_{g3}} Z_{h1,1}^H}{2\sqrt{2}s_W^2} \left(\frac{s_\alpha t_\beta m_{e_{g3}}^2}{c_\beta M_W^2} + c_{\alpha+\beta} \right) + \frac{e^2 \delta_{g3,g4} U_{s4,1}^{\tilde{e}_{g3}} Z_{h1,3}^H}{2\sqrt{2}s_W^2} \left(\frac{m_{e_{g3}}^2 t_\beta^2}{M_W^2} + c_{2\beta} \right)$$

$$\underset{290}{C}\left(H_{h1}, G^+, \tilde{e}_{g3}^{s3}, \tilde{\nu}_{g4}^{\dagger} \right) = \boxed{1}$$

$$1 = \frac{ie^2 \delta_{g3,g4} U_{h1,1}^H U_{s3,1}^{\tilde{e}_{g4}*}}{2\sqrt{2}s_W^2} \left(\frac{s_\alpha m_{e_{g4}}^2}{c_\beta M_W^2} - s_{\alpha+\beta} \right) - \frac{ie^2 \delta_{g3,g4} U_{h1,2}^H U_{s3,1}^{\tilde{e}_{g4}*}}{2\sqrt{2}s_W^2} \left(\frac{c_\alpha m_{e_{g4}}^2}{c_\beta M_W^2} - c_{\alpha+\beta} \right) + \frac{e^2 \delta_{g3,g4} U_{h1,3}^H U_{s3,1}^{\tilde{e}_{g4}*}}{2\sqrt{2}s_W^2} \left(\frac{t_\beta m_{e_{g4}}^2}{M_W^2} - s_{2\beta} \right)$$

$$\underset{291}{C}\left(\hat{H}_{h1}, G^+, \tilde{e}_{g3}^{s3}, \tilde{\nu}_{g4}^{\dagger} \right) = \boxed{1}$$

$$1 = \frac{ie^2 \delta_{g3,g4} U_{s3,1}^{\tilde{e}_{g4}*} Z_{h1,1}^H}{2\sqrt{2}s_W^2} \left(\frac{s_\alpha m_{e_{g4}}^2}{c_\beta M_W^2} - s_{\alpha+\beta} \right) - \frac{ie^2 \delta_{g3,g4} U_{s3,1}^{\tilde{e}_{g4}*} Z_{h1,2}^H}{2\sqrt{2}s_W^2} \left(\frac{c_\alpha m_{e_{g4}}^2}{c_\beta M_W^2} - c_{\alpha+\beta} \right) + \frac{e^2 \delta_{g3,g4} U_{s3,1}^{\tilde{e}_{g4}*} Z_{h1,3}^H}{2\sqrt{2}s_W^2} \left(\frac{t_\beta m_{e_{g4}}^2}{M_W^2} - s_{2\beta} \right)$$

$$\underset{298}{C}\left(H_{h1}, G^-, \tilde{\nu}_{g3}, \tilde{e}_{g4}^{s4,\dagger} \right) = \boxed{1}$$

$$\boxed{1} = \frac{ie^2 \delta_{g3,g4} U^{\mathrm{H}}_{\mathrm{h1},1} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2}s_{\mathrm{W}}^2} \left(\frac{s_\alpha m_{e_{g3}}^2}{c_\beta M_{\mathrm{W}}^2} - s_{\alpha+\beta} \right) - \frac{ie^2 \delta_{g3,g4} U^{\mathrm{H}}_{\mathrm{h1},2} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2}s_{\mathrm{W}}^2} \left(\frac{c_\alpha m_{e_{g3}}^2}{c_\beta M_{\mathrm{W}}^2} - c_{\alpha+\beta} \right) -$$
$$\frac{e^2 \delta_{g3,g4} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2}s_{\mathrm{W}}^2} \left(\frac{t_\beta m_{e_{g3}}^2}{M_{\mathrm{W}}^2} - s_{2\beta} \right)$$

$\underset{299}{\mathrm{C}} \left(\hat{H}_{\mathrm{h1}}, G^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4} \right) = \left[\boxed{1} \right]$

$$\boxed{1} = \frac{ie^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{2\sqrt{2}s_{\mathrm{W}}^2} \left(\frac{s_\alpha m_{e_{g3}}^2}{c_\beta M_{\mathrm{W}}^2} - s_{\alpha+\beta} \right) - \frac{ie^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1} Z^{\mathrm{H}}_{\mathrm{h1},2}}{2\sqrt{2}s_{\mathrm{W}}^2} \left(\frac{c_\alpha m_{e_{g3}}^2}{c_\beta M_{\mathrm{W}}^2} - c_{\alpha+\beta} \right) -$$
$$\frac{e^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1} Z^{\mathrm{H}}_{\mathrm{h1},3}}{2\sqrt{2}s_{\mathrm{W}}^2} \left(\frac{t_\beta m_{e_{g3}}^2}{M_{\mathrm{W}}^2} - s_{2\beta} \right)$$

$\underset{330}{\mathrm{C}} \left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4} \right) = \left[\boxed{1} \right]$

$$\boxed{1} = \frac{ie^2 \delta_{g3,g4} c_{2\alpha} U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \frac{ie^2 \delta_{g3,g4} c_{2\alpha} U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \frac{ie^2 \delta_{g3,g4} s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},1} + U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},2} \right) +$$
$$\frac{ie^2 \delta_{g3,g4} c_{2\beta} U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2}$$

$\underset{331}{\mathrm{C}} \left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4} \right) = \left[\boxed{1} \right]$

$$\boxed{1} = \frac{ie^2 \delta_{g3,g4} c_{2\alpha} U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \frac{ie^2 \delta_{g3,g4} c_{2\alpha} U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},2}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \frac{ie^2 \delta_{g3,g4} s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},1} + U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},2} \right) +$$
$$\frac{ie^2 \delta_{g3,g4} c_{2\beta} U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2}$$

$\underset{332}{\mathrm{C}} \left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4} \right) = \left[\boxed{1} \right]$

$$\boxed{1} = \frac{ie^2 \delta_{g3,g4} c_{2\alpha} Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} - \frac{ie^2 \delta_{g3,g4} c_{2\alpha} Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \frac{ie^2 \delta_{g3,g4} s_{2\alpha}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \left(Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},1} + Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},2} \right) +$$
$$\frac{ie^2 \delta_{g3,g4} c_{2\beta} Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{4c_{\mathrm{W}}^2 s_{\mathrm{W}}^2}$$

$\underset{333}{\mathrm{C}} \left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4} \right) = \left[\boxed{1} \right]$

$$1 = \frac{ie^2\delta_{g3,g4}s_{2\alpha}}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(U_{h1,2}^H U_{h2,1}^H + U_{h1,1}^H U_{h2,2}^H\right)\left(\left(c_W^2 m_{e_{g4}}^2 - c_\beta^2 M_W^2\left(1-2s_W^2\right)\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + \left(c_W^2 m_{e_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right) -$$

$$\frac{ie^2\delta_{g3,g4}U_{h1,2}^H U_{h2,2}^H}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(2c_W^2 c_\alpha^2 m_{e_{g4}}^2 - c_{2\alpha}c_\beta^2 M_W^2\left(1-2s_W^2\right)\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_W^2 c_\alpha^2 m_{e_{g4}}^2 - c_{2\alpha}c_\beta^2 M_W^2 s_W^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right) -$$

$$\frac{ie^2\delta_{g3,g4}U_{h1,1}^H U_{h2,1}^H}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(c_{2\alpha}c_\beta^2 M_W^2\left(1-2s_W^2\right) + 2c_W^2 m_{e_{g4}}^2 s_\alpha^2\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_{2\alpha}c_\beta^2 M_W^2 s_W^2 + c_W^2 m_{e_{g4}}^2 s_\alpha^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right) -$$

$$\frac{ie^2\delta_{g3,g4}U_{h1,3}^H U_{h2,3}^H}{4c_W^2 M_W^2 s_W^2}\left(\left(c_{2\beta}M_W^2\left(1-2s_W^2\right) + 2c_W^2 m_{e_{g4}}^2 t_\beta^2\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_{2\beta}M_W^2 s_W^2 + c_W^2 m_{e_{g4}}^2 t_\beta^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right)$$

$$\underset{334}{C}\left(\hat{H}_{h1}, H_{h2}, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\; \boxed{1} \;\right]$$

$$1 = -\frac{ie^2\delta_{g3,g4}U_{h2,1}^H Z_{h1,1}^H}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(c_{2\alpha}c_\beta^2 M_W^2\left(1-2s_W^2\right) + 2c_W^2 m_{e_{g4}}^2 s_\alpha^2\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_{2\alpha}c_\beta^2 M_W^2 s_W^2 + c_W^2 m_{e_{g4}}^2 s_\alpha^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right) -$$

$$\frac{ie^2\delta_{g3,g4}U_{h2,2}^H Z_{h1,2}^H}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(2c_W^2 c_\alpha^2 m_{e_{g4}}^2 - c_{2\alpha}c_\beta^2 M_W^2\left(1-2s_W^2\right)\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_W^2 c_\alpha^2 m_{e_{g4}}^2 - c_{2\alpha}c_\beta^2 M_W^2 s_W^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right) +$$

$$\frac{ie^2\delta_{g3,g4}s_{2\alpha}}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(c_W^2 m_{e_{g4}}^2 - c_\beta^2 M_W^2\left(1-2s_W^2\right)\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + \left(c_W^2 m_{e_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right)\left(U_{h2,2}^H Z_{h1,1}^H + U_{h2,1}^H Z_{h1,2}^H\right) -$$

$$\frac{ie^2\delta_{g3,g4}U_{h2,3}^H Z_{h1,3}^H}{4c_W^2 M_W^2 s_W^2}\left(\left(c_{2\beta}M_W^2\left(1-2s_W^2\right) + 2c_W^2 m_{e_{g4}}^2 t_\beta^2\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_{2\beta}M_W^2 s_W^2 + c_W^2 m_{e_{g4}}^2 t_\beta^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right)$$

$$\underset{335}{C}\left(\hat{H}_{h1}, \hat{H}_{h2}, \tilde{e}_{g3}^{s3}, \tilde{e}_{g4}^{s4,\dagger}\right) = \left[\; \boxed{1} \;\right]$$

$$1 = -\frac{ie^2\delta_{g3,g4}Z_{h1,1}^H Z_{h2,1}^H}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(c_{2\alpha}c_\beta^2 M_W^2\left(1-2s_W^2\right) + 2c_W^2 m_{e_{g4}}^2 s_\alpha^2\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_{2\alpha}c_\beta^2 M_W^2 s_W^2 + c_W^2 m_{e_{g4}}^2 s_\alpha^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right) -$$

$$\frac{ie^2\delta_{g3,g4}Z_{h1,2}^H Z_{h2,2}^H}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(2c_W^2 c_\alpha^2 m_{e_{g4}}^2 - c_{2\alpha}c_\beta^2 M_W^2\left(1-2s_W^2\right)\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_W^2 c_\alpha^2 m_{e_{g4}}^2 - c_{2\alpha}c_\beta^2 M_W^2 s_W^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right) +$$

$$\frac{ie^2\delta_{g3,g4}s_{2\alpha}}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(c_W^2 m_{e_{g4}}^2 - c_\beta^2 M_W^2\left(1-2s_W^2\right)\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + \left(c_W^2 m_{e_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right)\left(Z_{h1,2}^H Z_{h2,1}^H + Z_{h1,1}^H Z_{h2,2}^H\right) -$$

$$\frac{ie^2\delta_{g3,g4}Z_{h1,3}^H Z_{h2,3}^H}{4c_W^2 M_W^2 s_W^2}\left(\left(c_{2\beta}M_W^2\left(1-2s_W^2\right) + 2c_W^2 m_{e_{g4}}^2 t_\beta^2\right)U_{s3,1}^{\tilde{e}_{g4}*}U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_{2\beta}M_W^2 s_W^2 + c_W^2 m_{e_{g4}}^2 t_\beta^2\right)U_{s3,2}^{\tilde{e}_{g4}*}U_{s4,2}^{\tilde{e}_{g4}}\right)$$

[SSSS] **2 Higgs – 2 Squarks**

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

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

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

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

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

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

$$\underset{154}{C}\left(H^-, H^+, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2 t_\beta^2}\left(\begin{array}{c} t_\beta^2\left(\delta_{g3,g4}c_{2\beta}\left(1 + 2c_W^2\right)M_W^2 + 6\left(\sum_{gn=1}^{3}\mathrm{CKM}_{g4,gn}\mathrm{CKM}_{g3,gn}^* m_{d_{gn}}^2\right)c_W^2 t_\beta^2\right)U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{u}_{g4}} + \\ 2\delta_{g3,g4}\left(3c_W^2 m_{u_{g3}}^2 - 2c_{2\beta}M_W^2 s_W^2 t_\beta^2\right)U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{u}_{g4}} \end{array}\right) \right]$$

$$\underset{155}{C}\left(H^-, G^+, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\frac{ie^2}{12t_\beta c_W^2 M_W^2 s_W^2}\left(\begin{array}{c} t_\beta\left(6\left(\sum_{gn=1}^{3}\mathrm{CKM}_{g4,gn}\mathrm{CKM}_{g3,gn}^* m_{d_{gn}}^2\right)t_\beta c_W^2 - \delta_{g3,g4}s_{2\beta}\left(1 + 2c_W^2\right)M_W^2\right)U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{u}_{g4}} - \\ 2\delta_{g3,g4}\left(3c_W^2 m_{u_{g3}}^2 - 2s_{2\beta}t_\beta M_W^2 s_W^2\right)U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{u}_{g4}} \end{array}\right) \right]$$

$$\underset{156}{C}\left(G^-, H^+, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\frac{ie^2}{12t_\beta c_W^2 M_W^2 s_W^2}\left(\begin{array}{c} t_\beta\left(6\left(\sum_{gn=1}^{3}\mathrm{CKM}_{g4,gn}\mathrm{CKM}_{g3,gn}^* m_{d_{gn}}^2\right)t_\beta c_W^2 - \delta_{g3,g4}s_{2\beta}\left(1 + 2c_W^2\right)M_W^2\right)U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{u}_{g4}} - \\ 2\delta_{g3,g4}\left(3c_W^2 m_{u_{g3}}^2 - 2s_{2\beta}t_\beta M_W^2 s_W^2\right)U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{u}_{g4}} \end{array}\right) \right]$$

$$\underset{157}{C}\left(H^-, H^+, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2 t_\beta^2}\left(\begin{array}{c} \left(6\left(\sum_{gn=1}^{3}\mathrm{CKM}_{gn,g3}\mathrm{CKM}_{gn,g4}^* m_{u_{gn}}^2\right)c_W^2 + \delta_{g3,g4}c_{2\beta}\left(1 - 4c_W^2\right)M_W^2 t_\beta^2\right)U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{d}_{g4}} + \\ 2\delta_{g3,g4}t_\beta^2\left(c_{2\beta}M_W^2 s_W^2 + 3c_W^2 m_{d_{g3}}^2 t_\beta^2\right)U_{s3,2}^{\tilde{d}_{g3}*}U_{s4,2}^{\tilde{d}_{g4}} \end{array}\right) \right]$$

$$\underset{158}{C}\left(H^-, G^+, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2}{12t_\beta c_W^2 M_W^2 s_W^2}\left(\begin{array}{c} \left(6\left(\sum_{gn=1}^{3}\mathrm{CKM}_{gn,g3}\mathrm{CKM}_{gn,g4}^* m_{u_{gn}}^2\right)c_W^2 + \delta_{g3,g4}s_{2\beta}t_\beta\left(1 - 4c_W^2\right)M_W^2\right)U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{d}_{g4}} - \\ 2\delta_{g3,g4}t_\beta\left(3t_\beta c_W^2 m_{d_{g3}}^2 - s_{2\beta}M_W^2 s_W^2\right)U_{s3,2}^{\tilde{d}_{g3}*}U_{s4,2}^{\tilde{d}_{g4}} \end{array}\right) \right]$$

$$\underset{159}{C}\left(G^-, H^+, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2}{12t_\beta c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(6\left(\sum_{gn=1}^3 \mathrm{CKM}_{gn,g3}\mathrm{CKM}_{gn,g4}^* m_{u_{gn}}^2\right)c_W^2 + \delta_{g3,g4}s_{2\beta}t_\beta\left(1-4c_W^2\right)M_W^2\right)U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{d}_{g4}} - \\ 2\delta_{g3,g4}t_\beta\left(3t_\beta c_W^2 m_{d_{g3}}^2 - s_{2\beta}M_W^2 s_W^2\right)U_{s3,2}^{\tilde{d}_{g3}*}U_{s4,2}^{\tilde{d}_{g4}} \end{array} \right) \right]$$

$$\underset{162}{C}\left(G^-, G^+, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(6\left(\sum_{gn=1}^3 \mathrm{CKM}_{g4,gn}\mathrm{CKM}_{g3,gn}^* m_{d_{gn}}^2\right)c_W^2 - \delta_{g3,g4}c_{2\beta}\left(1+2c_W^2\right)M_W^2\right)U_{s3,1}^{\tilde{u}_{g3}*}U_{s4,1}^{\tilde{u}_{g4}} + \\ 2\delta_{g3,g4}\left(3c_W^2 m_{u_{g3}}^2 + 2c_{2\beta}M_W^2 s_W^2\right)U_{s3,2}^{\tilde{u}_{g3}*}U_{s4,2}^{\tilde{u}_{g4}} \end{array} \right) \right]$$

$$\underset{163}{C}\left(G^-, G^+, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2} \left(\begin{array}{l} \left(6\left(\sum_{gn=1}^3 \mathrm{CKM}_{gn,g3}\mathrm{CKM}_{gn,g4}^* m_{u_{gn}}^2\right)c_W^2 - \delta_{g3,g4}c_{2\beta}\left(1-4c_W^2\right)M_W^2\right)U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{d}_{g4}} + \\ 2\delta_{g3,g4}\left(3c_W^2 m_{d_{g3}}^2 - c_{2\beta}M_W^2 s_W^2\right)U_{s3,2}^{\tilde{d}_{g3}*}U_{s4,2}^{\tilde{d}_{g4}} \end{array} \right) \right]$$

$$\underset{270}{C}\left(H_{h1}, G^0, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2\delta_{g3,g4}s_{2\beta}U_{h1,3}^H}{12c_W^2 M_W^2 s_W^2 s_\beta^2}\left(\left(3c_W^2 m_{u_{g4}}^2 - M_W^2\left(3-4s_W^2\right)s_\beta^2\right)U_{s3,1}^{\tilde{u}_{g4}*}U_{s4,1}^{\tilde{u}_{g4}} + \left(3c_W^2 m_{u_{g4}}^2 - 4M_W^2 s_W^2 s_\beta^2\right)U_{s3,2}^{\tilde{u}_{g4}*}U_{s4,2}^{\tilde{u}_{g4}}\right) \right]$$

$$\underset{271}{C}\left(\hat{H}_{h1}, G^0, \tilde{u}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2\delta_{g3,g4}s_{2\beta}Z_{h1,3}^H}{12c_W^2 M_W^2 s_W^2 s_\beta^2}\left(\left(3c_W^2 m_{u_{g4}}^2 - M_W^2\left(3-4s_W^2\right)s_\beta^2\right)U_{s3,1}^{\tilde{u}_{g4}*}U_{s4,1}^{\tilde{u}_{g4}} + \left(3c_W^2 m_{u_{g4}}^2 - 4M_W^2 s_W^2 s_\beta^2\right)U_{s3,2}^{\tilde{u}_{g4}*}U_{s4,2}^{\tilde{u}_{g4}}\right) \right]$$

$$\underset{272}{C}\left(H_{h1}, G^0, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[\frac{ie^2\delta_{g3,g4}s_{2\beta}U_{h1,3}^H}{12c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(3c_W^2 m_{d_{g4}}^2 - c_\beta^2 M_W^2\left(3-2s_W^2\right)\right)U_{s3,1}^{\tilde{d}_{g4}*}U_{s4,1}^{\tilde{d}_{g4}} + \left(3c_W^2 m_{d_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right)U_{s3,2}^{\tilde{d}_{g4}*}U_{s4,2}^{\tilde{d}_{g4}}\right) \right]$$

$$\underset{273}{C}\left(\hat{H}_{h1}, G^0, \tilde{d}_{g3}^{s3}, \tilde{d}_{g4}^{s4,\dagger}\right) = \left[\frac{ie^2\delta_{g3,g4}s_{2\beta}Z_{h1,3}^H}{12c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(3c_W^2 m_{d_{g4}}^2 - c_\beta^2 M_W^2\left(3-2s_W^2\right)\right)U_{s3,1}^{\tilde{d}_{g4}*}U_{s4,1}^{\tilde{d}_{g4}} + \left(3c_W^2 m_{d_{g4}}^2 - 2c_\beta^2 M_W^2 s_W^2\right)U_{s3,2}^{\tilde{d}_{g4}*}U_{s4,2}^{\tilde{d}_{g4}}\right) \right]$$

$$\underset{276}{C}\left(H_{h1}, H^+, \tilde{d}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\boxed{1} \right]$$

$$\boxed{1} = \begin{aligned} &\frac{e^2\mathrm{CKM}_{g4,g3}U_{h1,3}^H U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{u}_{g4}}}{2\sqrt{2}s_W^2}\left(\frac{m_{u_{g4}}^2}{M_W^2 t_\beta^2} - \frac{m_{d_{g3}}^2 t_\beta^2}{M_W^2} - c_{2\beta}\right) + \\ &\frac{ie^2\mathrm{CKM}_{g4,g3}U_{h1,2}^H}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2}\left(s_{2\beta}\left(c_\beta s_\alpha m_{u_{g4}}^2 - s_\beta\left(s_{\alpha+\beta}s_\beta M_W^2 - c_\alpha m_{d_{g3}}^2 t_\beta^2\right)\right)U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{u}_{g4}} + 2c_{\beta-\alpha}m_{d_{g3}}m_{u_{g4}}s_\beta^2 U_{s3,2}^{\tilde{d}_{g3}*}U_{s4,2}^{\tilde{u}_{g4}}\right) + \\ &\frac{ie^2\mathrm{CKM}_{g4,g3}U_{h1,1}^H}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2}\left(s_{2\beta}\left(c_\alpha c_\beta m_{u_{g4}}^2 - s_\beta\left(c_{\alpha+\beta}s_\beta M_W^2 + s_\alpha m_{d_{g3}}^2 t_\beta^2\right)\right)U_{s3,1}^{\tilde{d}_{g3}*}U_{s4,1}^{\tilde{u}_{g4}} + 2m_{d_{g3}}m_{u_{g4}}s_{\beta-\alpha}s_\beta^2 U_{s3,2}^{\tilde{d}_{g3}*}U_{s4,2}^{\tilde{u}_{g4}}\right) \end{aligned}$$

$$\underset{277}{C}\left(\hat{H}_{h1}, H^+, \tilde{d}_{g3}^{s3}, \tilde{u}_{g4}^{s4,\dagger}\right) = \left[\boxed{1} \right]$$

$$
\boxed{1} = \begin{aligned}
&\frac{ie^2 \mathrm{CKM}_{g4,g3} Z^{\mathrm{H}}_{h1,1}}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2}\left(s_{2\beta}\left(c_\alpha c_\beta m_{u_{g4}}^2 - s_\beta\left(c_{\alpha+\beta}s_\beta M_W^2 + s_\alpha m_{d_{g3}}^2 t_\beta^2\right)\right)U^{\tilde d_{g3}*}_{s3,1}U^{\tilde u_{g4}}_{s4,1} + 2m_{d_{g3}}m_{u_{g4}}s_{\beta-\alpha}s_\beta^2 U^{\tilde d_{g3}*}_{s3,2}U^{\tilde u_{g4}}_{s4,2}\right) + \\
&\frac{ie^2 \mathrm{CKM}_{g4,g3} Z^{\mathrm{H}}_{h1,2}}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2}\left(s_{2\beta}\left(c_\beta s_\alpha m_{u_{g4}}^2 - s_\beta\left(s_{\alpha+\beta}s_\beta M_W^2 - c_\alpha m_{d_{g3}}^2 t_\beta^2\right)\right)U^{\tilde d_{g3}*}_{s3,1}U^{\tilde u_{g4}}_{s4,1} + 2c_{\beta-\alpha}m_{d_{g3}}m_{u_{g4}}s_\beta^2 U^{\tilde d_{g3}*}_{s3,2}U^{\tilde u_{g4}}_{s4,2}\right) + \\
&\frac{e^2 \mathrm{CKM}_{g4,g3} U^{\tilde d_{g3}*}_{s3,1}U^{\tilde u_{g4}}_{s4,1} Z^{\mathrm{H}}_{h1,3}}{2\sqrt{2}s_W^2}\left(\frac{m_{u_{g4}}^2}{M_W^2 t_\beta^2} - \frac{m_{d_{g3}}^2 t_\beta^2}{M_W^2} - c_{2\beta}\right)
\end{aligned}
$$

$$
\underset{284}{C}\left(H_{h1}, H^-, \tilde u^{s3}_{g3}, \tilde d^{s4,\dagger}_{g4}\right) = \left[\ \boxed{1}\ \right]
$$

$$
\boxed{1} = \begin{aligned}
&-\frac{e^2 \mathrm{CKM}^*_{g3,g4} U^{\mathrm{H}}_{h1,3} U^{\tilde u_{g3}*}_{s3,1}U^{\tilde d_{g4}}_{s4,1}}{2\sqrt{2}s_W^2}\left(\frac{m_{u_{g3}}^2}{M_W^2 t_\beta^2} - \frac{m_{d_{g4}}^2 t_\beta^2}{M_W^2} - c_{2\beta}\right) + \\
&\frac{ie^2 \mathrm{CKM}^*_{g3,g4} U^{\mathrm{H}}_{h1,2}}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2}\left(s_{2\beta}\left(c_\beta s_\alpha m_{u_{g3}}^2 - s_\beta\left(s_{\alpha+\beta}s_\beta M_W^2 - c_\alpha m_{d_{g4}}^2 t_\beta^2\right)\right)U^{\tilde u_{g3}*}_{s3,1}U^{\tilde d_{g4}}_{s4,1} + 2c_{\beta-\alpha}m_{d_{g4}}m_{u_{g3}}s_\beta^2 U^{\tilde u_{g3}*}_{s3,2}U^{\tilde d_{g4}}_{s4,2}\right) + \\
&\frac{ie^2 \mathrm{CKM}^*_{g3,g4} U^{\mathrm{H}}_{h1,1}}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2}\left(s_{2\beta}\left(c_\alpha c_\beta m_{u_{g3}}^2 - s_\beta\left(c_{\alpha+\beta}s_\beta M_W^2 + s_\alpha m_{d_{g4}}^2 t_\beta^2\right)\right)U^{\tilde u_{g3}*}_{s3,1}U^{\tilde d_{g4}}_{s4,1} + 2m_{d_{g4}}m_{u_{g3}}s_{\beta-\alpha}s_\beta^2 U^{\tilde u_{g3}*}_{s3,2}U^{\tilde d_{g4}}_{s4,2}\right)
\end{aligned}
$$

$$
\underset{285}{C}\left(\hat H_{h1}, H^-, \tilde u^{s3}_{g3}, \tilde d^{s4,\dagger}_{g4}\right) = \left[\ \boxed{1}\ \right]
$$

$$
\boxed{1} = \begin{aligned}
&\frac{ie^2 \mathrm{CKM}^*_{g3,g4} Z^{\mathrm{H}}_{h1,1}}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2}\left(s_{2\beta}\left(c_\alpha c_\beta m_{u_{g3}}^2 - s_\beta\left(c_{\alpha+\beta}s_\beta M_W^2 + s_\alpha m_{d_{g4}}^2 t_\beta^2\right)\right)U^{\tilde u_{g3}*}_{s3,1}U^{\tilde d_{g4}}_{s4,1} + 2m_{d_{g4}}m_{u_{g3}}s_{\beta-\alpha}s_\beta^2 U^{\tilde u_{g3}*}_{s3,2}U^{\tilde d_{g4}}_{s4,2}\right) + \\
&\frac{ie^2 \mathrm{CKM}^*_{g3,g4} Z^{\mathrm{H}}_{h1,2}}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2}\left(s_{2\beta}\left(c_\beta s_\alpha m_{u_{g3}}^2 - s_\beta\left(s_{\alpha+\beta}s_\beta M_W^2 - c_\alpha m_{d_{g4}}^2 t_\beta^2\right)\right)U^{\tilde u_{g3}*}_{s3,1}U^{\tilde d_{g4}}_{s4,1} + 2c_{\beta-\alpha}m_{d_{g4}}m_{u_{g3}}s_\beta^2 U^{\tilde u_{g3}*}_{s3,2}U^{\tilde d_{g4}}_{s4,2}\right) - \\
&\frac{e^2 \mathrm{CKM}^*_{g3,g4} U^{\tilde u_{g3}*}_{s3,1}U^{\tilde d_{g4}}_{s4,1} Z^{\mathrm{H}}_{h1,3}}{2\sqrt{2}s_W^2}\left(\frac{m_{u_{g3}}^2}{M_W^2 t_\beta^2} - \frac{m_{d_{g4}}^2 t_\beta^2}{M_W^2} - c_{2\beta}\right)
\end{aligned}
$$

$$
\underset{292}{C}\left(H_{h1}, G^+, \tilde d^{s3}_{g3}, \tilde u^{s4,\dagger}_{g4}\right) = \left[\ \boxed{1}\ \right]
$$

$$
\boxed{1} = \begin{aligned}
&\frac{ie^2 \mathrm{CKM}_{g4,g3} U^{\mathrm{H}}_{h1,1}}{2\sqrt{2}c_\beta s_{2\beta}s_\beta M_W^2 s_W^2}\left(s_{2\beta}\left(s_\alpha s_\beta m_{d_{g3}}^2 + c_\alpha c_\beta m_{u_{g4}}^2 - c_\beta s_{\alpha+\beta}s_\beta M_W^2\right)U^{\tilde d_{g3}*}_{s3,1}U^{\tilde u_{g4}}_{s4,1} - 2c_\beta c_{\beta-\alpha}m_{d_{g3}}m_{u_{g4}}s_\beta U^{\tilde d_{g3}*}_{s3,2}U^{\tilde u_{g4}}_{s4,2}\right) - \\
&\frac{ie^2 \mathrm{CKM}_{g4,g3} U^{\mathrm{H}}_{h1,2}}{2\sqrt{2}c_\beta s_{2\beta}s_\beta M_W^2 s_W^2}\left(s_{2\beta}\left(c_\alpha s_\beta m_{d_{g3}}^2 - c_\beta s_\alpha m_{u_{g4}}^2 - c_{\alpha+\beta}c_\beta s_\beta M_W^2\right)U^{\tilde d_{g3}*}_{s3,1}U^{\tilde u_{g4}}_{s4,1} - 2c_\beta m_{d_{g3}}m_{u_{g4}}s_\beta s_{\beta-\alpha}U^{\tilde d_{g3}*}_{s3,2}U^{\tilde u_{g4}}_{s4,2}\right) + \\
&\frac{e^2 \mathrm{CKM}_{g4,g3} U^{\mathrm{H}}_{h1,3}}{2\sqrt{2}s_{2\beta}t_\beta M_W^2 s_W^2}\left(s_{2\beta}\left(m_{u_{g4}}^2 + t_\beta\left(t_\beta m_{d_{g3}}^2 - s_{2\beta}M_W^2\right)\right)U^{\tilde d_{g3}*}_{s3,1}U^{\tilde u_{g4}}_{s4,1} + 2m_{d_{g3}}m_{u_{g4}}t_\beta U^{\tilde d_{g3}*}_{s3,2}U^{\tilde u_{g4}}_{s4,2}\right)
\end{aligned}
$$

42 $\underset{293}{C}\left(\hat H_{h1}, G^+, \tilde d^{s3}_{g3}, \tilde u^{s4,\dagger}_{g4}\right) = \left[\ \boxed{1}\ \right]$

$$
\boxed{1} =
\begin{aligned}
&\frac{ie^2 \mathrm{CKM}_{g4,g3} Z^{\mathrm{H}}_{h1,1}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(s_{2\beta} \left(s_\alpha s_\beta m_{d_{g3}}^2 + c_\alpha c_\beta m_{u_{g4}}^2 - c_\beta s_{\alpha+\beta} s_\beta M_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} - 2 c_\beta c_{\beta-\alpha} m_{d_{g3}} m_{u_{g4}} s_\beta U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \right) - \\
&\frac{ie^2 \mathrm{CKM}_{g4,g3} Z^{\mathrm{H}}_{h1,2}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(s_{2\beta} \left(c_\alpha s_\beta m_{d_{g3}}^2 - c_\beta s_\alpha m_{u_{g4}}^2 - c_{\alpha+\beta} c_\beta s_\beta M_W^2 \right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} - 2 c_\beta m_{d_{g3}} m_{u_{g4}} s_\beta s_{\beta-\alpha} U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \right) + \\
&\frac{e^2 \mathrm{CKM}_{g4,g3} Z^{\mathrm{H}}_{h1,3}}{2\sqrt{2} s_{2\beta} t_\beta M_W^2 s_W^2} \left(s_{2\beta} \left(m_{u_{g4}}^2 + t_\beta \left(t_\beta m_{d_{g3}}^2 - s_{2\beta} M_W^2 \right) \right) U^{\tilde{d}_{g3}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + 2 m_{d_{g3}} m_{u_{g4}} t_\beta U^{\tilde{d}_{g3}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \right)
\end{aligned}
$$

$$
\underset{300}{C}\left(H_{h1}, G^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4} \right) = \left[\; \boxed{1} \; \right]
$$

$$
\boxed{1} =
\begin{aligned}
&\frac{ie^2 \mathrm{CKM}^*_{g3,g4} U^{\mathrm{H}}_{h1,1}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(s_{2\beta} \left(s_\alpha s_\beta m_{d_{g4}}^2 + c_\alpha c_\beta m_{u_{g3}}^2 - c_\beta s_{\alpha+\beta} s_\beta M_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} - 2 c_\beta c_{\beta-\alpha} m_{d_{g4}} m_{u_{g3}} s_\beta U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \right) - \\
&\frac{ie^2 \mathrm{CKM}^*_{g3,g4} U^{\mathrm{H}}_{h1,2}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(s_{2\beta} \left(c_\alpha s_\beta m_{d_{g4}}^2 - c_\beta s_\alpha m_{u_{g3}}^2 - c_{\alpha+\beta} c_\beta s_\beta M_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} - 2 c_\beta m_{d_{g4}} m_{u_{g3}} s_\beta s_{\beta-\alpha} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \right) - \\
&\frac{e^2 \mathrm{CKM}^*_{g3,g4} U^{\mathrm{H}}_{h1,3}}{2\sqrt{2} s_{2\beta} t_\beta M_W^2 s_W^2} \left(s_{2\beta} \left(m_{u_{g3}}^2 + t_\beta \left(t_\beta m_{d_{g4}}^2 - s_{2\beta} M_W^2 \right) \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} + 2 m_{d_{g4}} m_{u_{g3}} t_\beta U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \right)
\end{aligned}
$$

$$
\underset{301}{C}\left(\hat{H}_{h1}, G^-, \tilde{u}^{s3}_{g3}, \tilde{d}^{s4,\dagger}_{g4} \right) = \left[\; \boxed{1} \; \right]
$$

$$
\boxed{1} =
\begin{aligned}
&\frac{ie^2 \mathrm{CKM}^*_{g3,g4} Z^{\mathrm{H}}_{h1,1}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(s_{2\beta} \left(s_\alpha s_\beta m_{d_{g4}}^2 + c_\alpha c_\beta m_{u_{g3}}^2 - c_\beta s_{\alpha+\beta} s_\beta M_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} - 2 c_\beta c_{\beta-\alpha} m_{d_{g4}} m_{u_{g3}} s_\beta U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \right) - \\
&\frac{ie^2 \mathrm{CKM}^*_{g3,g4} Z^{\mathrm{H}}_{h1,2}}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(s_{2\beta} \left(c_\alpha s_\beta m_{d_{g4}}^2 - c_\beta s_\alpha m_{u_{g3}}^2 - c_{\alpha+\beta} c_\beta s_\beta M_W^2 \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} - 2 c_\beta m_{d_{g4}} m_{u_{g3}} s_\beta s_{\beta-\alpha} U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \right) - \\
&\frac{e^2 \mathrm{CKM}^*_{g3,g4} Z^{\mathrm{H}}_{h1,3}}{2\sqrt{2} s_{2\beta} t_\beta M_W^2 s_W^2} \left(s_{2\beta} \left(m_{u_{g3}}^2 + t_\beta \left(t_\beta m_{d_{g4}}^2 - s_{2\beta} M_W^2 \right) \right) U^{\tilde{u}_{g3}*}_{s3,1} U^{\tilde{d}_{g4}}_{s4,1} + 2 m_{d_{g4}} m_{u_{g3}} t_\beta U^{\tilde{u}_{g3}*}_{s3,2} U^{\tilde{d}_{g4}}_{s4,2} \right)
\end{aligned}
$$

$$
\underset{336}{C}\left(H_{h1}, H_{h2}, \tilde{u}^{s3}_{g3}, \tilde{u}^{s4,\dagger}_{g4} \right) = \left[\; \boxed{1} \; \right]
$$

$$
\boxed{1} =
\begin{aligned}
&-\frac{ie^2 \delta_{g3,g4} s_{2\alpha}}{12 c_W^2 M_W^2 s_W^2 s_\beta^2} \left(U^{\mathrm{H}}_{h1,2} U^{\mathrm{H}}_{h2,1} + U^{\mathrm{H}}_{h1,1} U^{\mathrm{H}}_{h2,2} \right) \left(\left(3 c_W^2 m_{u_{g4}}^2 - M_W^2 \left(3 - 4 s_W^2 \right) s_\beta^2 \right) U^{\tilde{u}_{g4}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + \left(3 c_W^2 m_{u_{g4}}^2 - 4 M_W^2 s_W^2 s_\beta^2 \right) U^{\tilde{u}_{g4}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \right) - \\
&\frac{ie^2 \delta_{g3,g4} U^{\mathrm{H}}_{h1,1} U^{\mathrm{H}}_{h2,1}}{12 c_W^2 M_W^2 s_W^2 s_\beta^2} \left(\left(6 c_W^2 c_\alpha^2 m_{u_{g4}}^2 - c_{2\alpha} M_W^2 \left(3 - 4 s_W^2 \right) s_\beta^2 \right) U^{\tilde{u}_{g4}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + 2 \left(3 c_W^2 c_\alpha^2 m_{u_{g4}}^2 - 2 c_{2\alpha} M_W^2 s_W^2 s_\beta^2 \right) U^{\tilde{u}_{g4}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \right) - \\
&\frac{ie^2 \delta_{g3,g4} U^{\mathrm{H}}_{h1,2} U^{\mathrm{H}}_{h2,2}}{12 c_W^2 M_W^2 s_W^2 s_\beta^2} \left(\left(6 c_W^2 m_{u_{g4}}^2 s_\alpha^2 + c_{2\alpha} M_W^2 \left(3 - 4 s_W^2 \right) s_\beta^2 \right) U^{\tilde{u}_{g4}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + 2 \left(3 c_W^2 m_{u_{g4}}^2 s_\alpha^2 + 2 c_{2\alpha} M_W^2 s_W^2 s_\beta^2 \right) U^{\tilde{u}_{g4}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \right) - \\
&\frac{ie^2 \delta_{g3,g4} U^{\mathrm{H}}_{h1,3} U^{\mathrm{H}}_{h2,3}}{12 c_W^2 M_W^2 s_W^2 t_\beta^2} \left(\left(6 c_W^2 m_{u_{g4}}^2 - c_{2\beta} M_W^2 \left(3 - 4 s_W^2 \right) t_\beta^2 \right) U^{\tilde{u}_{g4}*}_{s3,1} U^{\tilde{u}_{g4}}_{s4,1} + 2 \left(3 c_W^2 m_{u_{g4}}^2 - 2 c_{2\beta} M_W^2 s_W^2 t_\beta^2 \right) U^{\tilde{u}_{g4}*}_{s3,2} U^{\tilde{u}_{g4}}_{s4,2} \right)
\end{aligned}
$$

$$\underset{337}{\mathrm{C}}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{u}_{\mathrm{g3}}^{\mathrm{s3}}, \tilde{u}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[\ \boxed{1}\ \right]$$

$$
\begin{aligned}
\boxed{1} =\ & -\frac{ie^2\delta_{\mathrm{g3,g4}}U^{\mathrm{H}}_{\mathrm{h2,1}}Z^{\mathrm{H}}_{\mathrm{h1,1}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_{\beta}^2}\left(\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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} + 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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right) - \\
& \frac{ie^2\delta_{\mathrm{g3,g4}}U^{\mathrm{H}}_{\mathrm{h2,2}}Z^{\mathrm{H}}_{\mathrm{h1,2}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_{\beta}^2}\left(\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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} + 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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right) - \\
& \frac{ie^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_{\beta}^2}\left(\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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} + \left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2 - 4M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_{\beta}^2\right)U^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}}\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{ie^2\delta_{\mathrm{g3,g4}}U^{\mathrm{H}}_{\mathrm{h2,3}}Z^{\mathrm{H}}_{\mathrm{h1,3}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_{\beta}^2}\left(\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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} + 2\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2 - 2c_{2\beta}M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_{\beta}^2\right)U^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right)
\end{aligned}
$$

$$\underset{338}{\mathrm{C}}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, \tilde{u}_{\mathrm{g3}}^{\mathrm{s3}}, \tilde{u}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[\ \boxed{1}\ \right]$$

$$
\begin{aligned}
\boxed{1} =\ & -\frac{ie^2\delta_{\mathrm{g3,g4}}Z^{\mathrm{H}}_{\mathrm{h1,1}}Z^{\mathrm{H}}_{\mathrm{h2,1}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_{\beta}^2}\left(\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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} + 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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right) - \\
& \frac{ie^2\delta_{\mathrm{g3,g4}}Z^{\mathrm{H}}_{\mathrm{h1,2}}Z^{\mathrm{H}}_{\mathrm{h2,2}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_{\beta}^2}\left(\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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} + 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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right) - \\
& \frac{ie^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_{\beta}^2}\left(\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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} + \left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2 - 4M_{\mathrm{W}}^2s_{\mathrm{W}}^2s_{\beta}^2\right)U^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}}\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{ie^2\delta_{\mathrm{g3,g4}}Z^{\mathrm{H}}_{\mathrm{h1,3}}Z^{\mathrm{H}}_{\mathrm{h2,3}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_{\beta}^2}\left(\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^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,1}} + 2\left(3c_{\mathrm{W}}^2m_{u_{\mathrm{g4}}}^2 - 2c_{2\beta}M_{\mathrm{W}}^2s_{\mathrm{W}}^2t_{\beta}^2\right)U^{\tilde{u}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{u}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right)
\end{aligned}
$$

$$\underset{339}{\mathrm{C}}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{d}_{\mathrm{g3}}^{\mathrm{s3}}, \tilde{d}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[\ \boxed{1}\ \right]$$

$$
\begin{aligned}
\boxed{1} =\ & \frac{ie^2\delta_{\mathrm{g3,g4}}s_{2\alpha}}{12c_{\mathrm{W}}^2c_{\beta}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\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)\left(\left(3c_{\mathrm{W}}^2m_{d_{\mathrm{g4}}}^2 - c_{\beta}^2M_{\mathrm{W}}^2\left(3-2s_{\mathrm{W}}^2\right)\right)U^{\tilde{d}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} + \left(3c_{\mathrm{W}}^2m_{d_{\mathrm{g4}}}^2 - 2c_{\beta}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2\right)U^{\tilde{d}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right) - \\
& \frac{ie^2\delta_{\mathrm{g3,g4}}U^{\mathrm{H}}_{\mathrm{h1,2}}U^{\mathrm{H}}_{\mathrm{h2,2}}}{12c_{\mathrm{W}}^2c_{\beta}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\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^{\tilde{d}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} + 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^{\tilde{d}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right) - \\
& \frac{ie^2\delta_{\mathrm{g3,g4}}U^{\mathrm{H}}_{\mathrm{h1,1}}U^{\mathrm{H}}_{\mathrm{h2,1}}}{12c_{\mathrm{W}}^2c_{\beta}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\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^{\tilde{d}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} + 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^{\tilde{d}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right) - \\
& \frac{ie^2\delta_{\mathrm{g3,g4}}U^{\mathrm{H}}_{\mathrm{h1,3}}U^{\mathrm{H}}_{\mathrm{h2,3}}}{12c_{\mathrm{W}}^2M_{\mathrm{W}}^2s_{\mathrm{W}}^2}\left(\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^{\tilde{d}_{\mathrm{g4}}*}_{\mathrm{s3,1}}U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,1}} + 2\left(c_{2\beta}M_{\mathrm{W}}^2s_{\mathrm{W}}^2 + 3c_{\mathrm{W}}^2m_{d_{\mathrm{g4}}}^2t_{\beta}^2\right)U^{\tilde{d}_{\mathrm{g4}}*}_{\mathrm{s3,2}}U^{\tilde{d}_{\mathrm{g4}}}_{\mathrm{s4,2}}\right)
\end{aligned}
$$

$$\underset{340}{\mathrm{C}}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, \tilde{d}_{\mathrm{g3}}^{\mathrm{s3}}, \tilde{d}_{\mathrm{g4}}^{\mathrm{s4},\dagger}\right) = \left[\ \boxed{1}\ \right]$$

$$\boxed{1} = -\frac{ie^2\delta_{g3,g4}U^H_{h2,1}Z^H_{h1,1}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\left(c_{2\alpha}c_\beta^2M_W^2\left(3-2s_W^2\right)+6c_W^2m_{d_{g4}}^2s_\alpha^2\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1}+2\left(c_{2\alpha}c_\beta^2M_W^2s_W^2+3c_W^2m_{d_{g4}}^2s_\alpha^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\right)-$$

$$\frac{ie^2\delta_{g3,g4}U^H_{h2,2}Z^H_{h1,2}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\left(6c_W^2c_\alpha^2m_{d_{g4}}^2-c_{2\alpha}c_\beta^2M_W^2\left(3-2s_W^2\right)\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1}+2\left(3c_W^2c_\alpha^2m_{d_{g4}}^2-c_{2\alpha}c_\beta^2M_W^2s_W^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\right)+$$

$$\frac{ie^2\delta_{g3,g4}s_{2\alpha}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\left(3c_W^2m_{d_{g4}}^2-c_\beta^2M_W^2\left(3-2s_W^2\right)\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1}+\left(3c_W^2m_{d_{g4}}^2-2c_\beta^2M_W^2s_W^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\right)\left(U^H_{h2,2}Z^H_{h1,1}+U^H_{h2,1}Z^H_{h1,2}\right)-$$

$$\frac{ie^2\delta_{g3,g4}U^H_{h2,3}Z^H_{h1,3}}{12c_W^2M_W^2s_W^2}\left(\left(c_{2\beta}M_W^2\left(3-2s_W^2\right)+6c_W^2m_{d_{g4}}^2t_\beta^2\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1}+2\left(c_{2\beta}M_W^2s_W^2+3c_W^2m_{d_{g4}}^2t_\beta^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\right)$$

$$\underset{341}{C}\left(\hat{H}_{h1},\hat{H}_{h2},\tilde{d}^{s3}_{g3},\tilde{d}^{s4,\dagger}_{g4}\right)=\left[\quad\boxed{1}\quad\right]$$

$$\boxed{1} = -\frac{ie^2\delta_{g3,g4}Z^H_{h1,1}Z^H_{h2,1}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\left(c_{2\alpha}c_\beta^2M_W^2\left(3-2s_W^2\right)+6c_W^2m_{d_{g4}}^2s_\alpha^2\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1}+2\left(c_{2\alpha}c_\beta^2M_W^2s_W^2+3c_W^2m_{d_{g4}}^2s_\alpha^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\right)-$$

$$\frac{ie^2\delta_{g3,g4}Z^H_{h1,2}Z^H_{h2,2}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\left(6c_W^2c_\alpha^2m_{d_{g4}}^2-c_{2\alpha}c_\beta^2M_W^2\left(3-2s_W^2\right)\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1}+2\left(3c_W^2c_\alpha^2m_{d_{g4}}^2-c_{2\alpha}c_\beta^2M_W^2s_W^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\right)+$$

$$\frac{ie^2\delta_{g3,g4}s_{2\alpha}}{12c_W^2c_\beta^2M_W^2s_W^2}\left(\left(3c_W^2m_{d_{g4}}^2-c_\beta^2M_W^2\left(3-2s_W^2\right)\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1}+\left(3c_W^2m_{d_{g4}}^2-2c_\beta^2M_W^2s_W^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\right)\left(Z^H_{h1,2}Z^H_{h2,1}+Z^H_{h1,1}Z^H_{h2,2}\right)-$$

$$\frac{ie^2\delta_{g3,g4}Z^H_{h1,3}Z^H_{h2,3}}{12c_W^2M_W^2s_W^2}\left(\left(c_{2\beta}M_W^2\left(3-2s_W^2\right)+6c_W^2m_{d_{g4}}^2t_\beta^2\right)U^{\tilde{d}_{g4}*}_{s3,1}U^{\tilde{d}_{g4}}_{s4,1}+2\left(c_{2\beta}M_W^2s_W^2+3c_W^2m_{d_{g4}}^2t_\beta^2\right)U^{\tilde{d}_{g4}*}_{s3,2}U^{\tilde{d}_{g4}}_{s4,2}\right)$$

[SSSS] **2 Sleptons – 2 Squarks**

$$\underset{187}{C}\left(\tilde{d}^{s1}_{g1},\tilde{d}^{s2,\dagger}_{g2},\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right)=\left[-\frac{ie^2(\boxed{1})\delta_{g1,g2}\delta_{g3,g4}}{12c_W^2c_\beta^2M_W^2s_W^2}\right]$$

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

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

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

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

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

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

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

[SSVV] **2 Higgs – 2 Gauge Bosons**

$$
\underset{31}{C}\left(G^0, G^0, Z, Z\right) = \left[\frac{ie^2}{2c_W^2 s_W^2} \right]
$$

$$
\underset{32}{C}\left(G^0, G^0, W^-, W^+\right) = \left[\frac{ie^2}{2s_W^2} \right]
$$

$$
\underset{33}{C}\left(G^-, G^+, \gamma, \gamma\right) = \left[2ie^2 \right]
$$

$$
\underset{34}{C}\left(G^-, G^+, \gamma, Z\right) = \left[\frac{ie^2}{c_W s_W} \left(c_W^2 - s_W^2\right) \right]
$$

$$
\underset{35}{C}\left(G^-, G^+, Z, Z\right) = \left[\frac{ie^2}{2c_W^2 s_W^2} \left(c_W^2 - s_W^2\right)^2 \right]
$$

$$
\underset{36}{C}\left(G^-, G^+, W^-, W^+\right) = \left[\frac{ie^2}{2s_W^2} \right]
$$

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

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

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

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

$$C_{61}(H^-, H^+, \gamma, \gamma) = \left[\ 2ie^2 \ \right]$$

$$C_{62}(H^-, H^+, \gamma, Z) = \left[\ \frac{ie^2}{c_W s_W}\left(c_W^2 - s_W^2\right) \ \right]$$

$$C_{63}(H^-, H^+, Z, Z) = \left[\ \frac{ie^2}{2c_W^2 s_W^2}\left(c_W^2 - s_W^2\right)^2 \ \right]$$

$$C_{64}(H^-, H^+, W^-, W^+) = \left[\ \frac{ie^2}{2s_W^2} \ \right]$$

$$C_{278}(H_{h1}, H^+, \gamma, W^-) = \left[\ \frac{ie^2 c_{\beta-\alpha} U_{h1,1}^H}{2s_W} - \frac{ie^2 s_{\beta-\alpha} U_{h1,2}^H}{2s_W} + \frac{e^2 U_{h1,3}^H}{2s_W} \ \right]$$

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

$$C_{280}(H_{h1}, H^+, Z, W^-) = \left[\ -\frac{ie^2 c_{\beta-\alpha} U_{h1,1}^H}{2c_W} + \frac{ie^2 s_{\beta-\alpha} U_{h1,2}^H}{2c_W} - \frac{e^2 U_{h1,3}^H}{2c_W} \ \right]$$

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

$$C_{286}(H_{h1}, H^-, \gamma, W^+) = \left[\ \frac{ie^2 c_{\beta-\alpha} U_{h1,1}^H}{2s_W} - \frac{ie^2 s_{\beta-\alpha} U_{h1,2}^H}{2s_W} - \frac{e^2 U_{h1,3}^H}{2s_W} \ \right]$$

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

$$C_{288}(H_{h1}, H^-, Z, W^+) = \left[\ -\frac{ie^2 c_{\beta-\alpha} U_{h1,1}^H}{2c_W} + \frac{ie^2 s_{\beta-\alpha} U_{h1,2}^H}{2c_W} + \frac{e^2 U_{h1,3}^H}{2c_W} \ \right]$$

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

$$C_{294}(H_{h1}, G^+, \gamma, W^-) = \left[\ \frac{ie^2 s_{\beta-\alpha} U_{h1,1}^H}{2s_W} + \frac{ie^2 c_{\beta-\alpha} U_{h1,2}^H}{2s_W} \ \right]$$

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

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

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

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

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

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

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

$$\underset{342}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, Z, Z\right) = \left[\; \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1}}{2c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2}}{2c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3}}{2c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \;\right]$$

$$\underset{343}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, Z, Z\right) = \left[\; \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{2c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},2}}{2c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{2c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \;\right]$$

$$\underset{344}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, Z, Z\right) = \left[\; \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{2c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{2c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} + \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{2c_{\mathrm{W}}^2 s_{\mathrm{W}}^2} \;\right]$$

$$\underset{345}{C}\left(H_{\mathrm{h1}}, H_{\mathrm{h2}}, W^{-}, W^{+}\right) = \left[\; \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h1},1} U^{\mathrm{H}}_{\mathrm{h2},1}}{2s_{\mathrm{W}}^2} + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h1},2} U^{\mathrm{H}}_{\mathrm{h2},2}}{2s_{\mathrm{W}}^2} + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h1},3} U^{\mathrm{H}}_{\mathrm{h2},3}}{2s_{\mathrm{W}}^2} \;\right]$$

$$\underset{346}{C}\left(\hat{H}_{\mathrm{h1}}, H_{\mathrm{h2}}, W^{-}, W^{+}\right) = \left[\; \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h2},1} Z^{\mathrm{H}}_{\mathrm{h1},1}}{2s_{\mathrm{W}}^2} + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h2},2} Z^{\mathrm{H}}_{\mathrm{h1},2}}{2s_{\mathrm{W}}^2} + \frac{ie^2 U^{\mathrm{H}}_{\mathrm{h2},3} Z^{\mathrm{H}}_{\mathrm{h1},3}}{2s_{\mathrm{W}}^2} \;\right]$$

$$\underset{347}{C}\left(\hat{H}_{\mathrm{h1}}, \hat{H}_{\mathrm{h2}}, W^{-}, W^{+}\right) = \left[\; \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},1} Z^{\mathrm{H}}_{\mathrm{h2},1}}{2s_{\mathrm{W}}^2} + \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},2} Z^{\mathrm{H}}_{\mathrm{h2},2}}{2s_{\mathrm{W}}^2} + \frac{ie^2 Z^{\mathrm{H}}_{\mathrm{h1},3} Z^{\mathrm{H}}_{\mathrm{h2},3}}{2s_{\mathrm{W}}^2} \;\right]$$

[SSVV] 2 Sleptons – 2 Gauge Bosons

$$\underset{164}{C}\left(\tilde{\nu}_{g1}, \tilde{\nu}_{g2}^{\dagger}, Z, Z\right) = \left[\ \frac{ie^2 \delta_{g1,g2}}{2c_W^2 s_W^2}\ \right]$$

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

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

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

$$\underset{176}{C}\left(\tilde{\nu}_{g1}, \tilde{e}_{g2}^{s2,\dagger}, \gamma, W^-\right) = \left[\ -\frac{ie^2 \delta_{g1,g2} U_{s2,1}^{\tilde{e}_{g1}}}{\sqrt{2}s_W}\ \right]$$

$$\underset{177}{C}\left(\tilde{e}_{g1}^{s1}, \tilde{\nu}_{g2}^{\dagger}, \gamma, W^+\right) = \left[\ -\frac{ie^2 \delta_{g1,g2} U_{s1,1}^{\tilde{e}_{g2}*}}{\sqrt{2}s_W}\ \right]$$

$$\underset{180}{C}\left(\tilde{\nu}_{g1}, \tilde{e}_{g2}^{s2,\dagger}, Z, W^-\right) = \left[\ \frac{ie^2 \delta_{g1,g2} U_{s2,1}^{\tilde{e}_{g1}}}{\sqrt{2}c_W}\ \right]$$

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

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

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

[SSVV] 2 Squarks – 2 Gauge Bosons

$$\underset{168}{C}\left(\tilde{u}_{g1}^{s1}, \tilde{u}_{g2}^{s2,\dagger}, \gamma, \gamma\right) = \left[\ \frac{8}{9}ie^2 \delta_{g1,g2}\delta_{s1,s2}\ \right]$$

$$\underset{169}{C}\left(\tilde{u}_{g1}^{s1}, \tilde{u}_{g2}^{s2,\dagger}, \gamma, Z\right) = \left[\ \frac{2ie^2 \delta_{g1,g2}}{9c_W s_W}\left(\left(3 - 4s_W^2\right) U_{s1,1}^{\tilde{u}_{g1}*} U_{s2,1}^{\tilde{u}_{g1}} - 4s_W^2 U_{s1,2}^{\tilde{u}_{g1}*} U_{s2,2}^{\tilde{u}_{g1}}\right)\ \right]$$

$$\underset{170}{C}\left(\tilde{u}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},Z,Z\right)=\left[\ \frac{ie^2\delta_{g1,g2}}{18c_W^2s_W^2}\left(\left(3-4s_W^2\right)^2U_{s1,1}^{\tilde{u}_{g1}*}U_{s2,1}^{\tilde{u}_{g1}}+16s_W^4U_{s1,2}^{\tilde{u}_{g1}*}U_{s2,2}^{\tilde{u}_{g1}}\right)\ \right]$$

$$\underset{171}{C}\left(\tilde{d}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},\gamma,\gamma\right)=\left[\ \frac{2}{9}ie^2\delta_{g1,g2}\delta_{s1,s2}\ \right]$$

$$\underset{172}{C}\left(\tilde{d}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},\gamma,Z\right)=\left[\ \frac{ie^2\delta_{g1,g2}}{9c_Ws_W}\left(\left(3-2s_W^2\right)U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g1}}-2s_W^2U_{s1,2}^{\tilde{d}_{g1}*}U_{s2,2}^{\tilde{d}_{g1}}\right)\ \right]$$

$$\underset{173}{C}\left(\tilde{d}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},Z,Z\right)=\left[\ \frac{ie^2\delta_{g1,g2}}{18c_W^2s_W^2}\left(\left(3-2s_W^2\right)^2U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{d}_{g1}}+4s_W^4U_{s1,2}^{\tilde{d}_{g1}*}U_{s2,2}^{\tilde{d}_{g1}}\right)\ \right]$$

$$\underset{174}{C}\left(\tilde{u}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},\gamma,W^-\right)=\left[\ \frac{ie^2\text{CKM}_{g1,g2}^*U_{s1,1}^{\tilde{u}_{g1}*}U_{s2,1}^{\tilde{d}_{g2}}}{3\sqrt{2}s_W}\ \right]$$

$$\underset{175}{C}\left(\tilde{d}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},\gamma,W^+\right)=\left[\ \frac{ie^2\text{CKM}_{g2,g1}U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{u}_{g2}}}{3\sqrt{2}s_W}\ \right]$$

$$\underset{178}{C}\left(\tilde{u}_{g1}^{s1},\tilde{d}_{g2}^{s2,\dagger},Z,W^-\right)=\left[\ -\frac{ie^2\text{CKM}_{g1,g2}^*U_{s1,1}^{\tilde{u}_{g1}*}U_{s2,1}^{\tilde{d}_{g2}}}{3\sqrt{2}c_W}\ \right]$$

$$\underset{179}{C}\left(\tilde{d}_{g1}^{s1},\tilde{u}_{g2}^{s2,\dagger},Z,W^+\right)=\left[\ -\frac{ie^2\text{CKM}_{g2,g1}U_{s1,1}^{\tilde{d}_{g1}*}U_{s2,1}^{\tilde{u}_{g2}}}{3\sqrt{2}c_W}\ \right]$$

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

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

[VVVV] **4 Gauge Bosons**

$$\underset{37}{C}\left(\gamma,\gamma,W^-,W^+\right)=ie^2\begin{bmatrix}-2\\\hline 1\\\hline 1\end{bmatrix}$$

$$\underset{38}{C}\left(\gamma, Z, W^-, W^+\right) = \frac{ie^2 c_W}{s_W} \begin{bmatrix} \dfrac{-2}{1} \\[4pt] \dfrac{1}{1} \end{bmatrix}$$

$$\underset{39}{C}\left(Z, Z, W^-, W^+\right) = \frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} \dfrac{-2}{1} \\[4pt] \dfrac{1}{1} \end{bmatrix}$$

$$\underset{40}{C}\left(W^-, W^-, W^+, W^+\right) = \frac{ie^2}{s_W^2} \begin{bmatrix} \dfrac{2}{-1} \\[4pt] \dfrac{-1}{} \end{bmatrix}$$