FVMSSM

[FFS] Chargino – Lepton – Higgs

$$\underset{267}{C}\left(\tilde{\chi}^-_{c1}, \bar{e}_{g2}, \tilde{\nu}_{g3}\right) = \frac{ie\delta_{g2,g3}}{s_W}\begin{bmatrix} \frac{m_{e_{g3}} U^*_{c1,2}}{\sqrt{2} c_\beta M_W} \\ \hline -V_{c1,1} \end{bmatrix}$$

$$\underset{268}{C}\left(\tilde{\chi}^+_{c1}, \overline{\nu}_{g2}, \tilde{e}^{s3}_{g3}\right) = \frac{ie\delta_{g2,g3}}{2s_W}\left(\frac{\sqrt{2} m_{e_{g2}} U_{c1,2} U^{\tilde{e}_{g2}*}_{s3,2}}{c_\beta M_W} - 2U_{c1,1} U^{\tilde{e}_{g2}*}_{s3,1}\right)\begin{bmatrix} 0 \\ \hline 1 \end{bmatrix}$$

$$\underset{271}{C}\left(e_{g1}, \tilde{\chi}^+_{c2}, \tilde{\nu}^\dagger_{g3}\right) = \frac{ie\delta_{g1,g3}}{s_W}\begin{bmatrix} -V^*_{c2,1} \\ \hline \frac{m_{e_{g3}} U_{c2,2}}{\sqrt{2} c_\beta M_W} \end{bmatrix}$$

$$\underset{272}{C}\left(\nu_{g1}, \tilde{\chi}^-_{c2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \frac{ie\delta_{g1,g3}}{2s_W}\left(\frac{\sqrt{2} m_{e_{g1}} U^*_{c2,2} U^{\tilde{e}_{g1}}_{s3,2}}{c_\beta M_W} - 2U^*_{c2,1} U^{\tilde{e}_{g1}}_{s3,1}\right)\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

[FFS] Chargino – Neutralino – Higgs

$$\underset{253}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^+_{c2}, H^-\right) = -\frac{ie}{s_W}\begin{bmatrix} c_\beta\left(\frac{V^*_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z^*_{n1,1}}{c_W} + Z^*_{n1,2}\right) + V^*_{c2,1} Z^*_{n1,4}\right) \\ \hline -s_\beta\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2}\right) - U_{c2,1} Z_{n1,3}\right) \end{bmatrix}$$

$$\underset{254}{C}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^+_{c2}, G^-\right) = -\frac{ie}{s_W}\begin{bmatrix} s_\beta\left(\frac{V^*_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z^*_{n1,1}}{c_W} + Z^*_{n1,2}\right) + V^*_{c2,1} Z^*_{n1,4}\right) \\ \hline c_\beta\left(\frac{U_{c2,2}}{\sqrt{2}}\left(\frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2}\right) - U_{c2,1} Z_{n1,3}\right) \end{bmatrix}$$

$$\underset{255}{C}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^0_{n2}, H^+\right) = -\frac{ie}{s_W}\begin{bmatrix} -s_\beta\left(\frac{U^*_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z^*_{n2,1}}{c_W} + Z^*_{n2,2}\right) - U^*_{c1,1} Z^*_{n2,3}\right) \\ \hline c_\beta\left(\frac{V_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2}\right) + V_{c1,1} Z_{n2,4}\right) \end{bmatrix}$$

$$\underset{256}{C}\left(\tilde{\chi}^{-}_{c1}, \tilde{\chi}^{0}_{n2}, G^{+}\right) = -\frac{ie}{s_W}\begin{bmatrix} c_\beta\left(\frac{U^*_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z^*_{n2,1}}{c_W} + Z^*_{n2,2}\right) - U^*_{c1,1} Z^*_{n2,3}\right) \\ \hline s_\beta\left(\frac{V_{c1,2}}{\sqrt{2}}\left(\frac{s_W Z_{n2,1}}{c_W} + Z_{n2,2}\right) + V_{c1,1} Z_{n2,4}\right) \end{bmatrix}$$

[FFS] Chargino – Quark – Higgs

$$\underset{265}{C}\left(\tilde{\chi}^{-}_{c1}, \bar{d}_{g2}, \tilde{u}_{a3}\right) = \frac{ie}{M_W s_W}\begin{bmatrix} \frac{m_{d_{g2}} U^*_{c1,2}}{\sqrt{2}c_\beta}\left(\sum_{j1=1}^{3} CKM^*_{j1,g2} R^{\tilde{u}*}_{a3,j1}\right) \\ \hline -\frac{1}{2s_\beta}\left(\sum_{j1=1}^{3} CKM^*_{j1,g2}\left(2M_W s_\beta V_{c1,1} R^{\tilde{u}*}_{a3,j1} - \sqrt{2} m_{u_{j1}} V_{c1,2} R^{\tilde{u}*}_{a3,3+j1}\right)\right) \end{bmatrix}$$

$$\underset{266}{C}\left(\tilde{\chi}^{+}_{c1}, \bar{u}_{g2}, \tilde{d}_{a3}\right) = \frac{ie}{M_W s_W}\begin{bmatrix} \frac{m_{u_{g2}} V^*_{c1,2}}{\sqrt{2}s_\beta}\left(\sum_{j2=1}^{3} CKM_{g2,j2} R^{\tilde{d}*}_{a3,j2}\right) \\ \hline -\frac{1}{2c_\beta}\left(\sum_{j2=1}^{3} CKM_{g2,j2}\left(2c_\beta M_W U_{c1,1} R^{\tilde{d}*}_{a3,j2} - \sqrt{2} m_{d_{j2}} U_{c1,2} R^{\tilde{d}*}_{a3,3+j2}\right)\right) \end{bmatrix}$$

$$\underset{269}{C}\left(d_{g1}, \tilde{\chi}^{+}_{c2}, \tilde{u}^{\dagger}_{a3}\right) = \frac{ie}{M_W s_W}\begin{bmatrix} -\frac{1}{2s_\beta}\left(\sum_{j1=1}^{3} CKM_{j1,g1}\left(2M_W s_\beta R^{\tilde{u}}_{a3,j1} V^*_{c2,1} - \sqrt{2} m_{u_{j1}} R^{\tilde{u}}_{a3,3+j1} V^*_{c2,2}\right)\right) \\ \hline \frac{m_{d_{g1}} U_{c2,2}}{\sqrt{2}c_\beta}\left(\sum_{j1=1}^{3} CKM_{j1,g1} R^{\tilde{u}}_{a3,j1}\right) \end{bmatrix}$$

$$\underset{270}{C}\left(u_{g1}, \tilde{\chi}^{-}_{c2}, \tilde{d}^{\dagger}_{a3}\right) = \frac{ie}{M_W s_W}\begin{bmatrix} -\frac{1}{2c_\beta}\left(\sum_{j2=1}^{3} CKM^*_{g1,j2}\left(2c_\beta M_W R^{\tilde{d}}_{a3,j2} U^*_{c2,1} - \sqrt{2} m_{d_{j2}} R^{\tilde{d}}_{a3,3+j2} U^*_{c2,2}\right)\right) \\ \hline \frac{m_{u_{g1}} V_{c2,2}}{\sqrt{2}s_\beta}\left(\sum_{j2=1}^{3} CKM^*_{g1,j2} R^{\tilde{d}}_{a3,j2}\right) \end{bmatrix}$$

[FFS] Gluino – Quark – Higgs

$$\underset{392}{C}\left(\tilde{g}, \bar{u}_{g2}, \tilde{u}_{a3}\right) = \sqrt{2} i g_s T^{g1}_{c2,c3}\begin{bmatrix} \mathcal{R}^*_{Gl} R^{\tilde{u}*}_{a3,3+g2} \\ \hline -\mathcal{R}_{Gl} R^{\tilde{u}*}_{a3,g2} \end{bmatrix}$$

$$\underset{393}{C}\left(\tilde{g}, \overline{d}_{g2}, \tilde{d}_{a3}\right) = \sqrt{2} i g_s T^{g1}_{c2,c3} \begin{bmatrix} \mathcal{R}^*_{Gl} R^{\tilde{d}*}_{a3,3+g2} \\ \hline -\mathcal{R}_{Gl} R^{\tilde{d}*}_{a3,g2} \end{bmatrix}$$

$$\underset{394}{C}\left(\tilde{g}, u_{g2}, \tilde{u}^{\dagger}_{a3}\right) = \sqrt{2} i g_s T^{g1}_{c3,c2} \begin{bmatrix} -\mathcal{R}^*_{Gl} R^{\tilde{u}}_{a3,g2} \\ \hline \mathcal{R}_{Gl} R^{\tilde{u}}_{a3,3+g2} \end{bmatrix}$$

$$\underset{395}{C}\left(\tilde{g}, d_{g2}, \tilde{d}^{\dagger}_{a3}\right) = \sqrt{2} i g_s T^{g1}_{c3,c2} \begin{bmatrix} -\mathcal{R}^*_{Gl} R^{\tilde{d}}_{a3,g2} \\ \hline \mathcal{R}_{Gl} R^{\tilde{d}}_{a3,3+g2} \end{bmatrix}$$

[FFS] Lepton – Neutralino – Higgs

$$\underset{257}{C}\left(\tilde{\chi}^0_{n1}, \overline{\nu}_{g2}, \tilde{\nu}_{g3}\right) = \frac{i e \delta_{g2,g3}}{\sqrt{2} c_W s_W} \left(s_W Z_{n1,1} - c_W Z_{n1,2}\right) \begin{bmatrix} 0 \\ \hline 1 \end{bmatrix}$$

$$\underset{258}{C}\left(\tilde{\chi}^0_{n1}, \overline{e}_{g2}, \tilde{e}^{s3}_{g3}\right) = \frac{i e \delta_{g2,g3}}{\sqrt{2} c_W c_\beta M_W s_W} \begin{bmatrix} -2 c_\beta M_W s_W U^{\tilde{e}_{g2}*}_{s3,2} Z^*_{n1,1} - c_W m_{e_{g2}} U^{\tilde{e}_{g2}*}_{s3,1} Z^*_{n1,3} \\ \hline c_\beta M_W \left(s_W Z_{n1,1} + c_W Z_{n1,2}\right) U^{\tilde{e}_{g2}*}_{s3,1} - c_W m_{e_{g2}} Z_{n1,3} U^{\tilde{e}_{g2}*}_{s3,2} \end{bmatrix}$$

$$\underset{261}{C}\left(\nu_{g1}, \tilde{\chi}^0_{n2}, \tilde{\nu}^{\dagger}_{g3}\right) = \frac{i e \delta_{g1,g3}}{\sqrt{2} c_W s_W} \left(s_W Z^*_{n2,1} - c_W Z^*_{n2,2}\right) \begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{262}{C}\left(e_{g1}, \tilde{\chi}^0_{n2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \frac{i e \delta_{g1,g3}}{\sqrt{2} c_W c_\beta M_W s_W} \begin{bmatrix} c_\beta M_W s_W U^{\tilde{e}_{g1}}_{s3,1} Z^*_{n2,1} + c_W \left(c_\beta M_W U^{\tilde{e}_{g1}}_{s3,1} Z^*_{n2,2} - m_{e_{g1}} U^{\tilde{e}_{g1}}_{s3,2} Z^*_{n2,3}\right) \\ \hline -c_W m_{e_{g1}} Z_{n2,3} U^{\tilde{e}_{g1}}_{s3,1} - 2 c_\beta M_W s_W Z_{n2,1} U^{\tilde{e}_{g1}}_{s3,2} \end{bmatrix}$$

[FFS] Neutralino – Quark – Higgs

$$C_{259}\left(\tilde{\chi}^0_{n1}, \bar{u}_{g2}, \tilde{u}_{a3}\right) = \frac{ie}{3\sqrt{2}c_W M_W s_W s_\beta}\begin{bmatrix} 4M_W s_W s_\beta R^{\tilde{u}*}_{a3,3+g2} Z^*_{n1,1} - 3c_W m_{u_{g2}} R^{\tilde{u}*}_{a3,g2} Z^*_{n1,4} \\ -M_W s_\beta \left(s_W Z_{n1,1} + 3c_W Z_{n1,2}\right) R^{\tilde{u}*}_{a3,g2} - 3c_W m_{u_{g2}} Z_{n1,4} R^{\tilde{u}*}_{a3,3+g2} \end{bmatrix}$$

$$C_{260}\left(\tilde{\chi}^0_{n1}, \bar{d}_{g2}, \tilde{d}_{a3}\right) = \frac{ie}{3\sqrt{2}c_W c_\beta M_W s_W}\begin{bmatrix} -2c_\beta M_W s_W R^{\tilde{d}*}_{a3,3+g2} Z^*_{n1,1} - 3c_W m_{d_{g2}} R^{\tilde{d}*}_{a3,g2} Z^*_{n1,3} \\ -c_\beta M_W \left(s_W Z_{n1,1} - 3c_W Z_{n1,2}\right) R^{\tilde{d}*}_{a3,g2} - 3c_W m_{d_{g2}} Z_{n1,3} R^{\tilde{d}*}_{a3,3+g2} \end{bmatrix}$$

$$C_{263}\left(u_{g1}, \tilde{\chi}^0_{n2}, \tilde{u}^\dagger_{a3}\right) = -\frac{ie}{3\sqrt{2}c_W M_W s_W s_\beta}\begin{bmatrix} M_W s_W s_\beta R^{\tilde{u}}_{a3,g1} Z^*_{n2,1} + 3c_W \left(M_W s_\beta R^{\tilde{u}}_{a3,g1} Z^*_{n2,2} + m_{u_{g1}} R^{\tilde{u}}_{a3,3+g1} Z^*_{n2,4}\right) \\ 3c_W m_{u_{g1}} Z_{n2,4} R^{\tilde{u}}_{a3,g1} - 4M_W s_W s_\beta Z_{n2,1} R^{\tilde{u}}_{a3,3+g1} \end{bmatrix}$$

$$C_{264}\left(d_{g1}, \tilde{\chi}^0_{n2}, \tilde{d}^\dagger_{a3}\right) = -\frac{ie}{3\sqrt{2}c_W c_\beta M_W s_W}\begin{bmatrix} c_\beta M_W s_W R^{\tilde{d}}_{a3,g1} Z^*_{n2,1} - 3c_W \left(c_\beta M_W R^{\tilde{d}}_{a3,g1} Z^*_{n2,2} - m_{d_{g1}} R^{\tilde{d}}_{a3,3+g1} Z^*_{n2,3}\right) \\ 3c_W m_{d_{g1}} Z_{n2,3} R^{\tilde{d}}_{a3,g1} + 2c_\beta M_W s_W Z_{n2,1} R^{\tilde{d}}_{a3,3+g1} \end{bmatrix}$$

[FFS] 2 Charginos – Higgs

$$C_{249}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^+_{c2}, h^0\right) = \frac{ie}{\sqrt{2}s_W}\begin{bmatrix} s_\alpha U^*_{c1,2} V^*_{c2,1} - c_\alpha U^*_{c1,1} V^*_{c2,2} \\ s_\alpha U_{c2,2} V_{c1,1} - c_\alpha U_{c2,1} V_{c1,2} \end{bmatrix}$$

$$C_{250}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^+_{c2}, H^0\right) = -\frac{ie}{\sqrt{2}s_W}\begin{bmatrix} c_\alpha U^*_{c1,2} V^*_{c2,1} + s_\alpha U^*_{c1,1} V^*_{c2,2} \\ c_\alpha U_{c2,2} V_{c1,1} + s_\alpha U_{c2,1} V_{c1,2} \end{bmatrix}$$

$$C_{251}\left(\tilde{\chi}^-_{c1}, \tilde{\chi}^+_{c2}, A^0\right) = \frac{e}{\sqrt{2}s_W}\begin{bmatrix} -s_\beta U^*_{c1,2} V^*_{c2,1} - c_\beta U^*_{c1,1} V^*_{c2,2} \\ s_\beta U_{c2,2} V_{c1,1} + c_\beta U_{c2,1} V_{c1,2} \end{bmatrix}$$

$$\underset{252}{C}\left(\tilde{\chi}_{c1}^{-}, \tilde{\chi}_{c2}^{+}, G^{0}\right) = \frac{e}{\sqrt{2}s_W}\begin{bmatrix} c_\beta U_{c1,2}^{*} V_{c2,1}^{*} - s_\beta U_{c1,1}^{*} V_{c2,2}^{*} \\ \hline -c_\beta U_{c2,2} V_{c1,1} + s_\beta U_{c2,1} V_{c1,2} \end{bmatrix}$$

[FFS] 2 Leptons – Higgs

$$\underset{181}{C}\left(e_{g1}, \bar{e}_{g2}, h^{0}\right) = \frac{ie\delta_{g1,g2} m_{e_{g1}} s_\alpha}{2c_\beta M_W s_W}\begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$\underset{184}{C}\left(e_{g1}, \bar{e}_{g2}, G^{0}\right) = \frac{e\delta_{g1,g2} m_{e_{g1}}}{2M_W s_W}\begin{bmatrix} -1 \\ \hline 1 \end{bmatrix}$$

$$\underset{194}{C}\left(e_{g1}, \bar{e}_{g2}, H^{0}\right) = -\frac{ie\delta_{g1,g2} c_\alpha m_{e_{g1}}}{2c_\beta M_W s_W}\begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$\underset{197}{C}\left(e_{g1}, \bar{e}_{g2}, A^{0}\right) = \frac{e\delta_{g1,g2} m_{e_{g1}} t_\beta}{2M_W s_W}\begin{bmatrix} 1 \\ \hline -1 \end{bmatrix}$$

$$\underset{200}{C}\left(\nu_{g1}, \bar{e}_{g2}, G^{-}\right) = -\frac{ie\delta_{g1,g2} m_{e_{g2}}}{\sqrt{2}M_W s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{201}{C}\left(e_{g1}, \bar{\nu}_{g2}, G^{+}\right) = -\frac{ie\delta_{g1,g2} m_{e_{g1}}}{\sqrt{2}M_W s_W}\begin{bmatrix} 0 \\ \hline 1 \end{bmatrix}$$

$$\underset{204}{C}\left(\nu_{g1}, \bar{e}_{g2}, H^{-}\right) = \frac{ie\delta_{g1,g2} m_{e_{g2}} t_\beta}{\sqrt{2}M_W s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{205}{C}\left(e_{g1},\overline{\nu}_{g2},H^{+}\right)=\frac{ie\delta_{g1,g2}m_{e_{g1}}t_{\beta}}{\sqrt{2}M_{W}s_{W}}\begin{bmatrix}0\\\hline 1\end{bmatrix}$$

[FFS] 2 Neutralinos – Higgs

$$\underset{245}{C}\left(\tilde{\chi}^{0}_{n1},\tilde{\chi}^{0}_{n2},h^{0}\right)=\frac{ie}{2c_{W}s_{W}}\begin{bmatrix}-\left(s_{\alpha}Z^{*}_{n1,3}+c_{\alpha}Z^{*}_{n1,4}\right)\left(s_{W}Z^{*}_{n2,1}-c_{W}Z^{*}_{n2,2}\right)-s_{\alpha}\left(s_{W}Z^{*}_{n1,1}-c_{W}Z^{*}_{n1,2}\right)Z^{*}_{n2,3}-\\ c_{\alpha}\left(s_{W}Z^{*}_{n1,1}-c_{W}Z^{*}_{n1,2}\right)Z^{*}_{n2,4}\\\hline -\left(s_{\alpha}Z_{n1,3}+c_{\alpha}Z_{n1,4}\right)\left(s_{W}Z_{n2,1}-c_{W}Z_{n2,2}\right)-\left(s_{W}s_{\alpha}Z_{n1,1}-c_{W}s_{\alpha}Z_{n1,2}\right)Z_{n2,3}-\\ \left(c_{\alpha}s_{W}Z_{n1,1}-c_{W}c_{\alpha}Z_{n1,2}\right)Z_{n2,4}\end{bmatrix}$$

$$\underset{246}{C}\left(\tilde{\chi}^{0}_{n1},\tilde{\chi}^{0}_{n2},H^{0}\right)=\frac{ie}{2c_{W}s_{W}}\begin{bmatrix}\left(c_{\alpha}Z^{*}_{n1,3}-s_{\alpha}Z^{*}_{n1,4}\right)\left(s_{W}Z^{*}_{n2,1}-c_{W}Z^{*}_{n2,2}\right)+c_{\alpha}\left(s_{W}Z^{*}_{n1,1}-c_{W}Z^{*}_{n1,2}\right)Z^{*}_{n2,3}-\\ \left(s_{W}s_{\alpha}Z^{*}_{n1,1}-c_{W}s_{\alpha}Z^{*}_{n1,2}\right)Z^{*}_{n2,4}\\\hline \left(c_{\alpha}Z_{n1,3}-s_{\alpha}Z_{n1,4}\right)\left(s_{W}Z_{n2,1}-c_{W}Z_{n2,2}\right)+c_{\alpha}\left(s_{W}Z_{n1,1}-c_{W}Z_{n1,2}\right)Z_{n2,3}-\\ \left(s_{W}s_{\alpha}Z_{n1,1}-c_{W}s_{\alpha}Z_{n1,2}\right)Z_{n2,4}\end{bmatrix}$$

$$\underset{247}{C}\left(\tilde{\chi}^{0}_{n1},\tilde{\chi}^{0}_{n2},A^{0}\right)=\frac{e}{2c_{W}s_{W}}\begin{bmatrix}\left(s_{\beta}Z^{*}_{n1,3}-c_{\beta}Z^{*}_{n1,4}\right)\left(s_{W}Z^{*}_{n2,1}-c_{W}Z^{*}_{n2,2}\right)+s_{\beta}\left(s_{W}Z^{*}_{n1,1}-c_{W}Z^{*}_{n1,2}\right)Z^{*}_{n2,3}-\\ \left(c_{\beta}s_{W}Z^{*}_{n1,1}-c_{W}c_{\beta}Z^{*}_{n1,2}\right)Z^{*}_{n2,4}\\\hline -\left(s_{\beta}Z_{n1,3}-c_{\beta}Z_{n1,4}\right)\left(s_{W}Z_{n2,1}-c_{W}Z_{n2,2}\right)-s_{\beta}\left(s_{W}Z_{n1,1}-c_{W}Z_{n1,2}\right)Z_{n2,3}+\\ \left(c_{\beta}s_{W}Z_{n1,1}-c_{W}c_{\beta}Z_{n1,2}\right)Z_{n2,4}\end{bmatrix}$$

$$\underset{248}{C}\left(\tilde{\chi}^{0}_{n1},\tilde{\chi}^{0}_{n2},G^{0}\right)=\frac{e}{2c_{W}s_{W}}\begin{bmatrix}-\left(c_{\beta}Z^{*}_{n1,3}+s_{\beta}Z^{*}_{n1,4}\right)\left(s_{W}Z^{*}_{n2,1}-c_{W}Z^{*}_{n2,2}\right)-c_{\beta}\left(s_{W}Z^{*}_{n1,1}-c_{W}Z^{*}_{n1,2}\right)Z^{*}_{n2,3}-\\ s_{\beta}\left(s_{W}Z^{*}_{n1,1}-c_{W}Z^{*}_{n1,2}\right)Z^{*}_{n2,4}\\\hline \left(c_{\beta}Z_{n1,3}+s_{\beta}Z_{n1,4}\right)\left(s_{W}Z_{n2,1}-c_{W}Z_{n2,2}\right)+c_{\beta}\left(s_{W}Z_{n1,1}-c_{W}Z_{n1,2}\right)Z_{n2,3}+\\ s_{\beta}\left(s_{W}Z_{n1,1}-c_{W}Z_{n1,2}\right)Z_{n2,4}\end{bmatrix}$$

[FFS] 2 Quarks – Higgs

$$C_{182}\left(u_{g1}, \overline{u}_{g2}, h^0\right) = -\frac{\mathrm{i}e\delta_{g1,g2}c_\alpha m_{u_{g1}}}{2M_W s_W s_\beta}\begin{bmatrix}1\\\hline 1\end{bmatrix}$$

$$C_{183}\left(d_{g1}, \overline{d}_{g2}, h^0\right) = \frac{\mathrm{i}e\delta_{g1,g2}m_{d_{g1}}s_\alpha}{2c_\beta M_W s_W}\begin{bmatrix}1\\\hline 1\end{bmatrix}$$

$$C_{185}\left(u_{g1}, \overline{u}_{g2}, G^0\right) = \frac{e\delta_{g1,g2}m_{u_{g1}}}{2M_W s_W}\begin{bmatrix}1\\\hline -1\end{bmatrix}$$

$$C_{186}\left(d_{g1}, \overline{d}_{g2}, G^0\right) = \frac{e\delta_{g1,g2}m_{d_{g1}}}{2M_W s_W}\begin{bmatrix}-1\\\hline 1\end{bmatrix}$$

$$C_{195}\left(u_{g1}, \overline{u}_{g2}, H^0\right) = -\frac{\mathrm{i}e\delta_{g1,g2}m_{u_{g1}}s_\alpha}{2M_W s_W s_\beta}\begin{bmatrix}1\\\hline 1\end{bmatrix}$$

$$C_{196}\left(d_{g1}, \overline{d}_{g2}, H^0\right) = -\frac{\mathrm{i}e\delta_{g1,g2}c_\alpha m_{d_{g1}}}{2c_\beta M_W s_W}\begin{bmatrix}1\\\hline 1\end{bmatrix}$$

$$C_{198}\left(u_{g1}, \overline{u}_{g2}, A^0\right) = \frac{e\delta_{g1,g2}m_{u_{g1}}}{2M_W s_W t_\beta}\begin{bmatrix}1\\\hline -1\end{bmatrix}$$

$$C_{199}\left(d_{g1}, \overline{d}_{g2}, A^0\right) = \frac{e\delta_{g1,g2}m_{d_{g1}}t_\beta}{2M_W s_W}\begin{bmatrix}1\\\hline -1\end{bmatrix}$$

$$\underset{206}{C}\left(u_{g1}, \bar{d}_{g2}, G^{-}\right) = \frac{ie\mathrm{CKM}^{*}_{g1,g2}}{\sqrt{2}M_{W}s_{W}} \begin{bmatrix} -m_{d_{g2}} \\ \hline m_{u_{g1}} \end{bmatrix}$$

$$\underset{207}{C}\left(d_{g1}, \bar{u}_{g2}, G^{+}\right) = \frac{ie\mathrm{CKM}_{g2,g1}}{\sqrt{2}M_{W}s_{W}} \begin{bmatrix} m_{u_{g2}} \\ \hline -m_{d_{g1}} \end{bmatrix}$$

$$\underset{210}{C}\left(u_{g1}, \bar{d}_{g2}, H^{-}\right) = \frac{ie\mathrm{CKM}^{*}_{g1,g2}}{\sqrt{2}M_{W}s_{W}} \begin{bmatrix} m_{d_{g2}} t_{\beta} \\ \hline \frac{m_{u_{g1}}}{t_{\beta}} \end{bmatrix}$$

$$\underset{211}{C}\left(d_{g1}, \bar{u}_{g2}, H^{+}\right) = \frac{ie\mathrm{CKM}_{g2,g1}}{\sqrt{2}M_{W}s_{W}} \begin{bmatrix} \frac{m_{u_{g2}}}{t_{\beta}} \\ \hline m_{d_{g1}} t_{\beta} \end{bmatrix}$$

[FFV] Chargino – Neutralino – Gauge Boson

$$\underset{274}{C}\left(\tilde{\chi}^{0}_{n1}, \tilde{\chi}^{+}_{c2}, W^{-}\right) = \frac{ie}{s_{W}} \begin{bmatrix} -\frac{Z_{n1,4}V^{*}_{c2,2}}{\sqrt{2}} + Z_{n1,2}V^{*}_{c2,1} \\ \hline \frac{U_{c2,2}Z^{*}_{n1,3}}{\sqrt{2}} + U_{c2,1}Z^{*}_{n1,2} \end{bmatrix}$$

$$\underset{275}{C}\left(\tilde{\chi}^{-}_{c1}, \tilde{\chi}^{0}_{n2}, W^{+}\right) = \frac{ie}{s_{W}} \begin{bmatrix} -\frac{V_{c1,2}Z^{*}_{n2,4}}{\sqrt{2}} + V_{c1,1}Z^{*}_{n2,2} \\ \hline \frac{Z_{n2,3}U^{*}_{c1,2}}{\sqrt{2}} + Z_{n2,2}U^{*}_{c1,1} \end{bmatrix}$$

[FFV] 2 Charginos – Gauge Boson

$$\underset{276}{C}\left(\tilde{\chi}^{+}_{c1}, \tilde{\chi}^{-}_{c2}, \gamma\right) = ie \begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$\underset{277}{C}\left(\tilde{\chi}_{c1}^{+},\tilde{\chi}_{c2}^{-},Z\right) = -\frac{ie}{c_W s_W}\begin{bmatrix} -\left(\frac{1}{2}U_{c1,2}U_{c2,2}^{*}\right) + s_W^2 - U_{c1,1}U_{c2,2}^{*} \\ \hline -\left(\frac{1}{2}V_{c2,2}V_{c1,2}^{*}\right) + s_W^2 - V_{c2,1}V_{c1,1}^{*} \end{bmatrix}$$

[FFV] 2 Gluinos – Gauge Boson

$$\underset{389}{C}\left(\tilde{g},\tilde{g},g\right) = -g_s f^{g1,g2,g3}\begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

[FFV] 2 Leptons – Gauge Boson

$$\underset{187}{C}\left(\bar{e}_{g1},e_{g2},\gamma\right) = ie\delta_{g1,g2}\begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$\underset{190}{C}\left(\bar{\nu}_{g1},\nu_{g2},Z\right) = -\frac{ie\delta_{g1,g2}}{2c_W s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{191}{C}\left(\bar{e}_{g1},e_{g2},Z\right) = -\frac{ie\delta_{g1,g2}}{c_W}\begin{bmatrix} -\frac{1}{s_W}\left(\frac{1}{2}-s_W^2\right) \\ \hline s_W \end{bmatrix}$$

$$\underset{202}{C}\left(\bar{e}_{g1},\nu_{g2},W^{-}\right) = -\frac{ie\delta_{g1,g2}}{\sqrt{2}s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$\underset{203}{C}\left(\bar{\nu}_{g1},e_{g2},W^{+}\right) = -\frac{ie\delta_{g1,g2}}{\sqrt{2}s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

[FFV] 2 Neutralinos – Gauge Boson

$$C_{273}\left(\tilde{\chi}^0_{n1}, \tilde{\chi}^0_{n2}, Z\right) = \frac{ie}{2c_W s_W}\begin{bmatrix} -Z_{n1,3}Z^*_{n2,3} + Z_{n1,4}Z^*_{n2,4} \\ \hline Z_{n2,3}Z^*_{n1,3} - Z_{n2,4}Z^*_{n1,4} \end{bmatrix}$$

[FFV] 2 Quarks – Gauge Boson

$$C_{188}\left(\overline{u}_{g1}, u_{g2}, \gamma\right) = -\frac{2}{3}ie\delta_{g1,g2}\begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$C_{189}\left(\overline{d}_{g1}, d_{g2}, \gamma\right) = \frac{1}{3}ie\delta_{g1,g2}\begin{bmatrix} 1 \\ \hline 1 \end{bmatrix}$$

$$C_{192}\left(\overline{u}_{g1}, u_{g2}, Z\right) = \frac{ie\delta_{g1,g2}}{c_W}\begin{bmatrix} -\frac{1}{6s_W}\left(3 - 4s^2_W\right) \\ \hline \frac{2s_W}{3} \end{bmatrix}$$

$$C_{193}\left(\overline{d}_{g1}, d_{g2}, Z\right) = -\frac{ie\delta_{g1,g2}}{c_W}\begin{bmatrix} -\frac{1}{6s_W}\left(3 - 2s^2_W\right) \\ \hline \frac{s_W}{3} \end{bmatrix}$$

$$C_{208}\left(\overline{d}_{g1}, u_{g2}, W^-\right) = -\frac{ieCKM^*_{g2,g1}}{\sqrt{2}s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$C_{209}\left(\overline{u}_{g1}, d_{g2}, W^+\right) = -\frac{ieCKM_{g1,g2}}{\sqrt{2}s_W}\begin{bmatrix} 1 \\ \hline 0 \end{bmatrix}$$

$$C_{387}\left(\overline{u}_{g1}, u_{g2}, g\right) = -\mathrm{i}g_s\delta_{g1,g2}T^{g3}_{c1,c2}\begin{bmatrix}1\\\hline 1\end{bmatrix}$$

$$C_{388}\left(\overline{d}_{g1}, d_{g2}, g\right) = -\mathrm{i}g_s\delta_{g1,g2}T^{g3}_{c1,c2}\begin{bmatrix}1\\\hline 1\end{bmatrix}$$

[SSS] 3 Higgs

$$C_{43}\left(h^0, h^0, h^0\right) = \left[-\frac{3\mathrm{i}ec_{2\alpha}M_W s_{\alpha+\beta}}{2s_W c_W^2}\right]$$

$$C_{44}\left(h^0, h^0, H^0\right) = \left[\frac{\mathrm{i}eM_W}{2s_W c_W^2}\left(c_{2\alpha}c_{\alpha+\beta} - 2s_{2\alpha}s_{\alpha+\beta}\right)\right]$$

$$C_{45}\left(h^0, H^0, H^0\right) = \left[\frac{\mathrm{i}eM_W}{2s_W c_W^2}\left(2c_{\alpha+\beta}s_{2\alpha} + c_{2\alpha}s_{\alpha+\beta}\right)\right]$$

$$C_{46}\left(H^0, H^0, H^0\right) = \left[-\frac{3\mathrm{i}ec_{2\alpha}c_{\alpha+\beta}M_W}{2s_W c_W^2}\right]$$

$$C_{47}\left(h^0, A^0, A^0\right) = \left[-\frac{\mathrm{i}ec_{2\beta}M_W s_{\alpha+\beta}}{2s_W c_W^2}\right]$$

$$C_{48}\left(h^0, A^0, G^0\right) = \left[-\frac{\mathrm{i}eM_W s_{2\beta}s_{\alpha+\beta}}{2s_W c_W^2}\right]$$

$$C_{49}\left(h^0, G^0, G^0\right) = \left[\frac{\mathrm{i}ec_{2\beta}M_W s_{\alpha+\beta}}{2s_W c_W^2}\right]$$

$$C_{50}\left(H^0, A^0, A^0\right) = \left[\frac{\mathrm{i}ec_{2\beta}c_{\alpha+\beta}M_W}{2s_W c_W^2}\right]$$

$$C_{51}\left(H^0, A^0, G^0\right) = \left[\frac{\mathrm{i}ec_{\alpha+\beta}M_W s_{2\beta}}{2s_W c_W^2}\right]$$

$$C_{52}\left(H^0, G^0, G^0\right) = \left[-\frac{\mathrm{i}ec_{2\beta}c_{\alpha+\beta}M_W}{2s_W c_W^2}\right]$$

$$C_{53}\left(h^0, H^-, H^+\right) = \left[-\frac{\mathrm{i}eM_{\mathrm{W}}}{s_{\mathrm{W}}}\left(\frac{c_{2\beta}s_{\alpha+\beta}}{2c_{\mathrm{W}}^2} + s_{\beta-\alpha}\right) \right]$$

$$C_{54}\left(h^0, H^-, G^+\right) = \left[-\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c_{\mathrm{W}}^2} - c_{\beta-\alpha}\right) \right]$$

$$C_{55}\left(h^0, G^-, H^+\right) = \left[-\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}}\left(\frac{s_{2\beta}s_{\alpha+\beta}}{c_{\mathrm{W}}^2} - c_{\beta-\alpha}\right) \right]$$

$$C_{56}\left(h^0, G^-, G^+\right) = \left[\frac{\mathrm{i}ec_{2\beta}M_{\mathrm{W}}s_{\alpha+\beta}}{2s_{\mathrm{W}}c_{\mathrm{W}}^2} \right]$$

$$C_{57}\left(H^0, H^-, H^+\right) = \left[\frac{\mathrm{i}eM_{\mathrm{W}}}{s_{\mathrm{W}}}\left(\frac{c_{2\beta}c_{\alpha+\beta}}{2c_{\mathrm{W}}^2} - c_{\beta-\alpha}\right) \right]$$

$$C_{58}\left(H^0, H^-, G^+\right) = \left[\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c_{\mathrm{W}}^2} - s_{\beta-\alpha}\right) \right]$$

$$C_{59}\left(H^0, G^-, H^+\right) = \left[\frac{\mathrm{i}eM_{\mathrm{W}}}{2s_{\mathrm{W}}}\left(\frac{c_{\alpha+\beta}s_{2\beta}}{c_{\mathrm{W}}^2} - s_{\beta-\alpha}\right) \right]$$

$$C_{60}\left(H^0, G^-, G^+\right) = \left[-\frac{\mathrm{i}ec_{2\beta}c_{\alpha+\beta}M_{\mathrm{W}}}{2s_{\mathrm{W}}c_{\mathrm{W}}^2} \right]$$

$$C_{61}\left(A^0, H^-, G^+\right) = \left[-\frac{eM_{\mathrm{W}}}{2s_{\mathrm{W}}} \right]$$

$$C_{62}\left(A^0, G^-, H^+\right) = \left[\frac{eM_{\mathrm{W}}}{2s_{\mathrm{W}}} \right]$$

$$C_{212}\left(A^0, \tilde{e}_{\mathrm{g2}}^{\mathrm{s2}}, \tilde{e}_{\mathrm{g3}}^{\mathrm{s3},\dagger}\right) = \left[-\frac{e\delta_{\mathrm{g2,g3}}m_{e_{\mathrm{g2}}}}{2M_{\mathrm{W}}s_{\mathrm{W}}}\left(\left(\mu + t_\beta A_{\mathrm{g2,g2}}^{e*}\right)U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g2}}*}U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g2}}} - \left(\mu^* + t_\beta A_{\mathrm{g2,g2}}^{e}\right)U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g2}}*}U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g2}}}\right) \right]$$

$$C_{213}\left(G^0, \tilde{e}_{\mathrm{g2}}^{\mathrm{s2}}, \tilde{e}_{\mathrm{g3}}^{\mathrm{s3},\dagger}\right) = \left[-\frac{e\delta_{\mathrm{g2,g3}}m_{e_{\mathrm{g2}}}}{2M_{\mathrm{W}}s_{\mathrm{W}}}\left(\left(\mu t_\beta - A_{\mathrm{g2,g2}}^{e*}\right)U_{\mathrm{s2,2}}^{\tilde{e}_{\mathrm{g2}}*}U_{\mathrm{s3,1}}^{\tilde{e}_{\mathrm{g2}}} - \left(t_\beta\mu^* - A_{\mathrm{g2,g2}}^{e}\right)U_{\mathrm{s2,1}}^{\tilde{e}_{\mathrm{g2}}*}U_{\mathrm{s3,2}}^{\tilde{e}_{\mathrm{g2}}}\right) \right]$$

$$C_{214}\left(A^0, \tilde{u}_{\mathrm{a2}}, \tilde{u}_{\mathrm{a3}}^{\dagger}\right) = \left[-\frac{e}{2M_{\mathrm{W}}s_{\mathrm{W}}t_\beta}\left(\sum_{\mathrm{j1,j2=1}}^{3} \begin{array}{l} \left(\mu\delta_{\mathrm{j1,j2}}m_{u_{\mathrm{j1}}}t_\beta + m_{u_{\mathrm{j2}}}A_{\mathrm{j2,j1}}^{u*}\right)R_{\mathrm{a2,3+j1}}^{\tilde{u}*}R_{\mathrm{a3,j2}}^{\tilde{u}} - \\ \left(\delta_{\mathrm{j1,j2}}m_{u_{\mathrm{j1}}}t_\beta\mu^* + m_{u_{\mathrm{j1}}}A_{\mathrm{j1,j2}}^{u}\right)R_{\mathrm{a2,j1}}^{\tilde{u}*}R_{\mathrm{a3,3+j2}}^{\tilde{u}} \end{array}\right) \right]$$

$$C_{215}\left(G^0, \tilde{u}_{\mathrm{a2}}, \tilde{u}_{\mathrm{a3}}^{\dagger}\right) = \left[\frac{e}{2M_{\mathrm{W}}s_{\mathrm{W}}t_\beta}\left(\sum_{\mathrm{j1,j2=1}}^{3} \begin{array}{l} \left(\mu\delta_{\mathrm{j1,j2}}m_{u_{\mathrm{j1}}} - m_{u_{\mathrm{j2}}}t_\beta A_{\mathrm{j2,j1}}^{u*}\right)R_{\mathrm{a2,3+j1}}^{\tilde{u}*}R_{\mathrm{a3,j2}}^{\tilde{u}} - \\ \left(\delta_{\mathrm{j1,j2}}m_{u_{\mathrm{j1}}}\mu^* - m_{u_{\mathrm{j1}}}t_\beta A_{\mathrm{j1,j2}}^{u}\right)R_{\mathrm{a2,j1}}^{\tilde{u}*}R_{\mathrm{a3,3+j2}}^{\tilde{u}} \end{array}\right) \right]$$

$$\underset{216}{C}\left(A^0, \tilde{d}_{a2}, \tilde{d}^{\dagger}_{a3}\right) = \left[-\frac{e}{2M_W s_W} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} \left(\mu \delta_{j1,j2} m_{d_{j1}} + m_{d_{j2}} t_\beta A^{d*}_{j2,j1}\right) R^{\tilde{d}*}_{a2,3+j1} R^{\tilde{d}}_{a3,j2} - \\ \left(\delta_{j1,j2} m_{d_{j1}} \mu^* + m_{d_{j1}} t_\beta A^{d}_{j1,j2}\right) R^{\tilde{d}*}_{a2,j1} R^{\tilde{d}}_{a3,3+j2} \end{array} \right) \right]$$

$$\underset{217}{C}\left(G^0, \tilde{d}_{a2}, \tilde{d}^{\dagger}_{a3}\right) = \left[-\frac{e}{2M_W s_W} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} \left(\mu \delta_{j1,j2} m_{d_{j1}} t_\beta - m_{d_{j2}} A^{d*}_{j2,j1}\right) R^{\tilde{d}*}_{a2,3+j1} R^{\tilde{d}}_{a3,j2} - \\ \left(\delta_{j1,j2} m_{d_{j1}} t_\beta \mu^* - m_{d_{j1}} A^{d}_{j1,j2}\right) R^{\tilde{d}*}_{a2,j1} R^{\tilde{d}}_{a3,3+j2} \end{array} \right) \right]$$

$$\underset{218}{C}\left(h^0, \tilde{\nu}_{g2}, \tilde{\nu}^{\dagger}_{g3}\right) = \left[\frac{ie\delta_{g2,g3} M_Z s_{\alpha+\beta}}{2c_W s_W} \right]$$

$$\underset{219}{C}\left(H^0, \tilde{\nu}_{g2}, \tilde{\nu}^{\dagger}_{g3}\right) = \left[-\frac{ie\delta_{g2,g3} c_{\alpha+\beta} M_Z}{2c_W s_W} \right]$$

$$\underset{220}{C}\left(h^0, \tilde{e}^{s2}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[\frac{ie\delta_{g2,g3}}{2c_W c_\beta M_W s_W} \left(\begin{array}{l} U^{\tilde{e}_{g2}*}_{s2,1} \left(\left(2c_W s_\alpha m^2_{e_{g2}} - c_\beta M_W M_Z s_{\alpha+\beta}\left(1 - 2s^2_W\right)\right) U^{\tilde{e}_{g2}}_{s3,1} + c_W m_{e_{g2}} \left(c_\alpha \mu^* + s_\alpha A^{e}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2}\right) + \\ U^{\tilde{e}_{g2}*}_{s2,2} \left(c_W m_{e_{g2}} \left(\mu c_\alpha + s_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} + 2c_W s_\alpha m^2_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,2} - 2c_\beta M_W M_Z s_{\alpha+\beta} s^2_W U^{\tilde{e}_{g2}}_{s3,2}\right) \end{array} \right) \right]$$

$$\underset{221}{C}\left(H^0, \tilde{e}^{s2}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[-\frac{ie\delta_{g2,g3}}{2c_W c_\beta M_W s_W} \left(\begin{array}{l} U^{\tilde{e}_{g2}*}_{s2,1} \left(\left(2c_W c_\alpha m^2_{e_{g2}} - c_{\alpha+\beta} c_\beta M_W M_Z \left(1 - 2s^2_W\right)\right) U^{\tilde{e}_{g2}}_{s3,1} - c_W m_{e_{g2}} \left(s_\alpha \mu^* - c_\alpha A^{e}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2}\right) - \\ U^{\tilde{e}_{g2}*}_{s2,2} \left(c_W m_{e_{g2}} \left(\mu s_\alpha - c_\alpha A^{e*}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,1} - 2c_W c_\alpha m^2_{e_{g2}} U^{\tilde{e}_{g2}}_{s3,2} + 2c_{\alpha+\beta} c_\beta M_W M_Z s^2_W U^{\tilde{e}_{g2}}_{s3,2}\right) \end{array} \right) \right]$$

$$\underset{222}{C}\left(h^0, \tilde{u}_{a2}, \tilde{u}^{\dagger}_{a3}\right) = \left[-\frac{ie}{6c_W M_W s_W s_\beta} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} \left(\begin{array}{l} \delta_{j1,j2} R^{\tilde{u}}_{a3,j2} \left(6c_W c_\alpha m^2_{u_{j1}} - M_W M_Z s_{\alpha+\beta} s_\beta \left(3 - 4s^2_W\right)\right) + \\ 3c_W \left(\delta_{j1,j2} m_{u_{j1}} s_\alpha \mu^* + c_\alpha m_{u_{j1}} A^{u}_{j1,j2}\right) R^{\tilde{u}}_{a3,3+j2} \end{array} \right) R^{\tilde{u}*}_{a2,j1} + \\ \left(\begin{array}{l} 3c_W \left(\mu \delta_{j1,j2} m_{u_{j1}} s_\alpha + c_\alpha m_{u_{j2}} A^{u*}_{j2,j1}\right) R^{\tilde{u}}_{a3,j2} + \\ 6\delta_{j1,j2} c_W c_\alpha m^2_{u_{j1}} R^{\tilde{u}}_{a3,3+j2} - 4\delta_{j1,j2} M_W M_Z s_{\alpha+\beta} s_\beta R^{\tilde{u}}_{a3,3+j2} s^2_W \end{array} \right) R^{\tilde{u}*}_{a2,3+j1} \end{array} \right) \right]$$

$$\underset{223}{C}\left(H^0, \tilde{u}_{a2}, \tilde{u}^{\dagger}_{a3}\right) = \left[-\frac{ie}{6c_W M_W s_W s_\beta} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} \left(\begin{array}{l} \delta_{j1,j2} R^{\tilde{u}}_{a3,j2} \left(6c_W s_\alpha m^2_{u_{j1}} + c_{\alpha+\beta} M_W M_Z s_\beta \left(3 - 4s^2_W\right)\right) - \\ 3c_W \left(\delta_{j1,j2} c_\alpha m_{u_{j1}} \mu^* - m_{u_{j1}} s_\alpha A^{u}_{j1,j2}\right) R^{\tilde{u}}_{a3,3+j2} \end{array} \right) R^{\tilde{u}*}_{a2,j1} - \\ \left(\begin{array}{l} 3c_W \left(\mu \delta_{j1,j2} c_\alpha m_{u_{j1}} - m_{u_{j2}} s_\alpha A^{u*}_{j2,j1}\right) R^{\tilde{u}}_{a3,j2} - \\ 6\delta_{j1,j2} c_W s_\alpha m^2_{u_{j1}} R^{\tilde{u}}_{a3,3+j2} + 4\delta_{j1,j2} c_{\alpha+\beta} M_W M_Z s_\beta R^{\tilde{u}}_{a3,3+j2} s^2_W \end{array} \right) R^{\tilde{u}*}_{a2,3+j1} \end{array} \right) \right]$$

$$\underset{224}{C}\left(h^0, \tilde{d}_{a2}, \tilde{d}^{\dagger}_{a3}\right) = \left[\frac{ie}{6c_W c_\beta M_W s_W} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} \left(\begin{array}{l} \delta_{j1,j2} R^{\tilde{d}}_{a3,j2} \left(6c_W s_\alpha m^2_{d_{j1}} - c_\beta M_W M_Z s_{\alpha+\beta} \left(3 - 2s^2_W\right)\right) + \\ 3c_W \left(\delta_{j1,j2} c_\alpha m_{d_{j1}} \mu^* + m_{d_{j1}} s_\alpha A^{d}_{j1,j2}\right) R^{\tilde{d}}_{a3,3+j2} \end{array} \right) R^{\tilde{d}*}_{a2,j1} + \\ \left(\begin{array}{l} 3c_W \left(\mu \delta_{j1,j2} c_\alpha m_{d_{j1}} + m_{d_{j2}} s_\alpha A^{d*}_{j2,j1}\right) R^{\tilde{d}}_{a3,j2} + \\ 6\delta_{j1,j2} c_W s_\alpha m^2_{d_{j1}} R^{\tilde{d}}_{a3,3+j2} - 2\delta_{j1,j2} c_\beta M_W M_Z s_{\alpha+\beta} R^{\tilde{d}}_{a3,3+j2} s^2_W \end{array} \right) R^{\tilde{d}*}_{a2,3+j1} \end{array} \right) \right]$$

$$\underset{225}{C}\left(H^0,\tilde{d}_{a2},\tilde{d}^{\dagger}_{a3}\right) = \left[-\frac{ie}{6c_W c_\beta M_W s_W} \left(\sum_{j1,j2=1}^{3} \begin{pmatrix} \delta_{j1,j2} R^{\tilde{d}}_{a3,j2} \left(6c_W c_\alpha m^2_{d_{j1}} - c_{\alpha+\beta} c_\beta M_W M_Z \left(3 - 2s^2_W\right)\right) - \\ 3c_W \left(\delta_{j1,j2} m_{d_{j1}} s_\alpha \mu^* - c_\alpha m_{d_{j1}} A^d_{j1,j2}\right) R^{\tilde{d}}_{a3,3+j2} \end{pmatrix} R^{\tilde{d}*}_{a2,j1} - \right.$$
$$\left. \begin{pmatrix} 3c_W \left(\mu \delta_{j1,j2} m_{d_{j1}} s_\alpha - c_\alpha m_{d_{j2}} A^{d*}_{j2,j1}\right) R^{\tilde{d}}_{a3,j2} - \\ 6\delta_{j1,j2} c_W c_\alpha m^2_{d_{j1}} R^{\tilde{d}}_{a3,3+j2} - 2\delta_{j1,j2} c_{\alpha+\beta} c_\beta M_W M_Z R^{\tilde{d}}_{a3,3+j2} s^2_W \end{pmatrix} R^{\tilde{d}*}_{a2,3+j1} \right) \right]$$

$$\underset{226}{C}\left(H^+,\tilde{d}_{a2},\tilde{u}^{\dagger}_{a3}\right) = \left[\frac{ie}{\sqrt{2} M_W s_W t_\beta} \left(\sum_{j1,j2=1}^{3} \begin{pmatrix} t_\beta \left(\mu \mathrm{CKM}_{j1,j2} m_{d_{j2}} + \left(\sum_{gn=1}^{3} \mathrm{CKM}_{j1,gn} m_{d_{gn}} A^{d*}_{gn,j2}\right) t_\beta\right) R^{\tilde{u}}_{a3,j1} + \\ \mathrm{CKM}_{j1,j2} m_{d_{j2}} m_{u_{j1}} R^{\tilde{u}}_{a3,3+j1} \left(1 + t^2_\beta\right) \end{pmatrix} R^{\tilde{d}*}_{a2,3+j2} + \right.$$
$$\left. \begin{pmatrix} \mathrm{CKM}_{j1,j2} \left(m^2_{u_{j1}} + t_\beta \left(t_\beta m^2_{d_{j2}} - s_{2\beta} M^2_W\right)\right) R^{\tilde{u}}_{a3,j1} + \\ \left(\sum_{gn=1}^{3} \mathrm{CKM}_{gn,j2} m_{u_{gn}} A^u_{gn,j1} + \mathrm{CKM}_{j1,j2} m_{u_{j1}} t_\beta \mu^*\right) R^{\tilde{u}}_{a3,3+j1} \end{pmatrix} R^{\tilde{d}*}_{a2,j2} \right) \right]$$

$$\underset{227}{C}\left(H^-,\tilde{u}_{a2},\tilde{d}^{\dagger}_{a3}\right) = \left[\frac{ie}{\sqrt{2} M_W s_W t_\beta} \left(\sum_{j1,j2=1}^{3} \begin{pmatrix} \left(\sum_{gn=1}^{3} m_{u_{gn}} \mathrm{CKM}^*_{gn,j2} A^{u*}_{gn,j1} + \mu m_{u_{j1}} t_\beta \mathrm{CKM}^*_{j1,j2}\right) R^{\tilde{d}}_{a3,j2} + \\ m_{d_{j2}} m_{u_{j1}} \mathrm{CKM}^*_{j1,j2} R^{\tilde{d}}_{a3,3+j2} \left(1 + t^2_\beta\right) \end{pmatrix} R^{\tilde{u}*}_{a2,3+j1} + \right.$$
$$\left. \begin{pmatrix} \mathrm{CKM}^*_{j1,j2} \left(m^2_{u_{j1}} + t_\beta \left(t_\beta m^2_{d_{j2}} - s_{2\beta} M^2_W\right)\right) R^{\tilde{d}}_{a3,j2} + \\ t_\beta \left(\left(\sum_{gn=1}^{3} m_{d_{gn}} \mathrm{CKM}^*_{j1,gn} A^d_{gn,j2}\right) t_\beta + m_{d_{j2}} \mu^* \mathrm{CKM}^*_{j1,j2}\right) R^{\tilde{d}}_{a3,3+j2} \end{pmatrix} R^{\tilde{u}*}_{a2,j1} \right) \right]$$

$$\underset{228}{C}\left(H^+,\tilde{e}^{s2}_{g2},\tilde{\nu}^{\dagger}_{g3}\right) = \left[\frac{ie\delta_{g2,g3}}{\sqrt{2} M_W s_W} \left(\left(t_\beta m^2_{e_{g3}} - s_{2\beta} M^2_W\right) U^{\tilde{e}_{g3}*}_{s2,1} + m_{e_{g3}} \left(\mu + t_\beta A^{e*}_{g3,g3}\right) U^{\tilde{e}_{g3}*}_{s2,2} \right) \right]$$

$$\underset{229}{C}\left(H^-,\tilde{\nu}_{g2},\tilde{e}^{s3,\dagger}_{g3}\right) = \left[\frac{ie\delta_{g2,g3}}{\sqrt{2} M_W s_W} \left(\left(t_\beta m^2_{e_{g2}} - s_{2\beta} M^2_W\right) U^{\tilde{e}_{g2}}_{s3,1} + m_{e_{g2}} \left(\mu^* + t_\beta A^e_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2} \right) \right]$$

$$\underset{230}{C}\left(G^+,\tilde{d}_{a2},\tilde{u}^{\dagger}_{a3}\right) = \left[-\frac{ie}{\sqrt{2} M_W s_W t_\beta} \left(\sum_{j1,j2=1}^{3} \begin{pmatrix} \mathrm{CKM}_{j1,j2} t_\beta \left(m^2_{d_{j2}} - m^2_{u_{j1}} - c_{2\beta} M^2_W\right) R^{\tilde{u}}_{a3,j1} - \\ \left(\left(\sum_{gn=1}^{3} \mathrm{CKM}_{gn,j2} m_{u_{gn}} A^u_{gn,j1}\right) t_\beta - \mathrm{CKM}_{j1,j2} m_{u_{j1}} \mu^*\right) R^{\tilde{u}}_{a3,3+j1} \end{pmatrix} R^{\tilde{d}*}_{a2,j2} - \right.$$
$$\left. t_\beta \left(-\left(\sum_{gn=1}^{3} \mathrm{CKM}_{j1,gn} m_{d_{gn}} A^{d*}_{gn,j2}\right) + \mu \mathrm{CKM}_{j1,j2} m_{d_{j2}} t_\beta\right) R^{\tilde{d}*}_{a2,3+j2} R^{\tilde{u}}_{a3,j1} \right) \right]$$

$$\underset{231}{C}\left(G^-, \tilde{u}_{a2}, \tilde{d}^{\dagger}_{a3}\right) = \left[-\frac{ie}{\sqrt{2}M_W s_W t_\beta} \left(\sum_{j1,j2=1}^{3} \begin{pmatrix} \mathrm{CKM}^*_{j1,j2}\left(m^2_{d_{j2}} - m^2_{u_{j1}} - c_{2\beta}M_W^2\right) R^{\tilde{d}}_{a3,j2} + \\ \left(\sum_{gn=1}^{3} m_{d_{gn}} \mathrm{CKM}^*_{j1,gn} A^d_{gn,j2} - m_{d_{j2}} t_\beta \mu^* \mathrm{CKM}^*_{j1,j2}\right) R^{\tilde{d}}_{a3,3+j2} \end{pmatrix} t_\beta R^{\tilde{u}*}_{a2,j1} - \right. \right.$$
$$\left. \left. \left(\left(\sum_{gn=1}^{3} m_{u_{gn}} \mathrm{CKM}^*_{gn,j2} A^{u*}_{gn,j1} \right) t_\beta - \mu m_{u_{j1}} \mathrm{CKM}^*_{j1,j2} \right) R^{\tilde{u}*}_{a2,3+j1} R^{\tilde{d}}_{a3,j2} \right) \right]$$

$$\underset{232}{C}\left(G^+, \tilde{e}^{s2}_{g2}, \tilde{\nu}^{\dagger}_{g3}\right) = \left[-\frac{ie\delta_{g2,g3}}{\sqrt{2}M_W s_W} \left(\left(m^2_{e_{g3}} - c_{2\beta}M_W^2\right) U^{\tilde{e}_{g3}*}_{s2,1} - m_{e_{g3}} \left(\mu t_\beta - A^{e*}_{g3,g3}\right) U^{\tilde{e}_{g3}*}_{s2,2} \right) \right]$$

$$\underset{233}{C}\left(G^-, \tilde{\nu}_{g2}, \tilde{e}^{s3,\dagger}_{g3}\right) = \left[-\frac{ie\delta_{g2,g3}}{\sqrt{2}M_W s_W} \left(\left(m^2_{e_{g2}} - c_{2\beta}M_W^2\right) U^{\tilde{e}_{g2}}_{s3,1} - m_{e_{g2}} \left(t_\beta \mu^* - A^{e}_{g2,g2}\right) U^{\tilde{e}_{g2}}_{s3,2} \right) \right]$$

[SSV] 2 Higgs – Gauge Boson

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

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

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

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

$$\underset{63}{C}\left(h^0, A^0, Z\right) = \left[\frac{ec_{\beta-\alpha}}{2c_W s_W} \right]$$

$$\underset{64}{C}\left(h^0, G^0, Z\right) = \left[\frac{es_{\beta-\alpha}}{2c_W s_W} \right]$$

$$\underset{65}{C}\left(H^0, A^0, Z\right) = \left[-\frac{es_{\beta-\alpha}}{2c_W s_W} \right]$$

$$\underset{66}{C}\left(H^0, G^0, Z\right) = \left[\frac{ec_{\beta-\alpha}}{2c_W s_W} \right]$$

$$\underset{67}{C}\left(H^-, H^+, \gamma\right) = \left[ie \right]$$

$$C_{68}\left(H^-, H^+, Z\right) = \left[\frac{ie}{2c_W s_W}\left(c_W^2 - s_W^2\right) \right]$$

$$C_{69}\left(h^0, H^-, W^+\right) = \left[-\frac{iec_{\beta-\alpha}}{2s_W} \right]$$

$$C_{70}\left(h^0, G^-, W^+\right) = \left[-\frac{ies_{\beta-\alpha}}{2s_W} \right]$$

$$C_{71}\left(H^0, H^-, W^+\right) = \left[\frac{ies_{\beta-\alpha}}{2s_W} \right]$$

$$C_{72}\left(H^0, G^-, W^+\right) = \left[-\frac{iec_{\beta-\alpha}}{2s_W} \right]$$

$$C_{73}\left(h^0, H^+, W^-\right) = \left[\frac{iec_{\beta-\alpha}}{2s_W} \right]$$

$$C_{74}\left(h^0, G^+, W^-\right) = \left[\frac{ies_{\beta-\alpha}}{2s_W} \right]$$

$$C_{75}\left(H^0, H^+, W^-\right) = \left[-\frac{ies_{\beta-\alpha}}{2s_W} \right]$$

$$C_{76}\left(H^0, G^+, W^-\right) = \left[\frac{iec_{\beta-\alpha}}{2s_W} \right]$$

$$C_{77}\left(A^0, H^-, W^+\right) = \left[\frac{e}{2s_W} \right]$$

$$C_{78}\left(A^0, H^+, W^-\right) = \left[\frac{e}{2s_W} \right]$$

$$C_{234}\left(\tilde{\nu}_{g1}, \tilde{\nu}_{g2}^\dagger, Z\right) = \left[-\frac{ie\delta_{g1,g2}}{2c_W s_W} \right]$$

$$C_{235}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, \gamma\right) = \left[ie\delta_{g1,g2}\delta_{s1,s2} \right]$$

$$C_{236}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, Z\right) = \left[\frac{ie\delta_{g1,g2}}{2c_W s_W}\left(\left(1 - 2s_W^2\right) U_{s1,1}^{\tilde{e}_{g1}*} U_{s2,1}^{\tilde{e}_{g1}} - 2s_W^2 U_{s1,2}^{\tilde{e}_{g1}*} U_{s2,2}^{\tilde{e}_{g1}}\right) \right]$$

$$C_{237}\left(\tilde{u}_{a1}, \tilde{u}_{a2}^\dagger, \gamma\right) = \left[-\frac{2}{3} ie\delta_{a1,a2} \right]$$

$$\underset{238}{C}\left(\tilde{u}_{a1}, \tilde{u}^{\dagger}_{a2}, Z\right) = \left[-\frac{ie}{6 c_W s_W} \left(\sum_{j2=1}^{3} \left(R^{\tilde{u}*}_{a1,j2} R^{\tilde{u}}_{a2,j2} \left(3 - 4 s_W^2\right) - 4 R^{\tilde{u}*}_{a1,3+j2} R^{\tilde{u}}_{a2,3+j2} s_W^2 \right) \right) \right]$$

$$\underset{239}{C}\left(\tilde{d}_{a1}, \tilde{d}^{\dagger}_{a2}, \gamma\right) = \left[\frac{1}{3} ie \delta_{a1,a2} \right]$$

$$\underset{240}{C}\left(\tilde{d}_{a1}, \tilde{d}^{\dagger}_{a2}, Z\right) = \left[\frac{ie}{6 c_W s_W} \left(\sum_{j2=1}^{3} \left(R^{\tilde{d}*}_{a1,j2} R^{\tilde{d}}_{a2,j2} \left(3 - 2 s_W^2\right) - 2 R^{\tilde{d}*}_{a1,3+j2} R^{\tilde{d}}_{a2,3+j2} s_W^2 \right) \right) \right]$$

$$\underset{241}{C}\left(\tilde{u}_{a1}, \tilde{d}^{\dagger}_{a2}, W^{-}\right) = \left[-\frac{ie}{\sqrt{2} s_W} \left(\sum_{j1=1}^{3} \left(\sum_{j2=1}^{3} \mathrm{CKM}^{*}_{j1,j2} R^{\tilde{d}}_{a2,j2} \right) R^{\tilde{u}*}_{a1,j1} \right) \right]$$

$$\underset{242}{C}\left(\tilde{d}_{a1}, \tilde{u}^{\dagger}_{a2}, W^{+}\right) = \left[-\frac{ie}{\sqrt{2} s_W} \left(\sum_{j2=1}^{3} \left(\sum_{j1=1}^{3} \mathrm{CKM}_{j1,j2} R^{\tilde{u}}_{a2,j1} \right) R^{\tilde{d}*}_{a1,j2} \right) \right]$$

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

$$\underset{244}{C}\left(\tilde{e}^{s1}_{g1}, \tilde{\nu}^{\dagger}_{g2}, W^{+}\right) = \left[-\frac{ie \delta_{g1,g2} U^{\tilde{e}_{g2}*}_{s1,1}}{\sqrt{2} s_W} \right]$$

$$\underset{390}{C}\left(\tilde{u}_{a1}, \tilde{u}^{\dagger}_{a2}, g\right) = \left[-i g_s \delta_{a1,a2} T^{g3}_{c2,c1} \right]$$

$$\underset{391}{C}\left(\tilde{d}_{a1}, \tilde{d}^{\dagger}_{a2}, g\right) = \left[-i g_s \delta_{a1,a2} T^{g3}_{c2,c1} \right]$$

[SUU] Higgs – 2 Ghosts

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

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

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

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

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

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

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

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

$$C_{83}\left(h^0, u_Z, \overline{u}_Z\right) = \left[-\frac{ie\xi_Z M_W s_{\beta-\alpha}}{2s_W c_W^2} \right]$$

$$C_{84}\left(H^0, u_Z, \overline{u}_Z\right) = \left[-\frac{ie\xi_Z c_{\beta-\alpha} M_W}{2s_W c_W^2} \right]$$

$$C_{85}\left(h^0, u_-, \overline{u}_-\right) = \left[-\frac{ie\xi_W M_W s_{\beta-\alpha}}{2s_W} \right]$$

$$C_{86}\left(H^0, u_-, \overline{u}_-\right) = \left[-\frac{ie\xi_W c_{\beta-\alpha} M_W}{2s_W} \right]$$

$$C_{87}\left(h^0, u_+, \overline{u}_+\right) = \left[-\frac{ie\xi_W M_W s_{\beta-\alpha}}{2s_W} \right]$$

$$C_{88}\left(H^0, u_+, \overline{u}_+\right) = \left[-\frac{ie\xi_W c_{\beta-\alpha} M_W}{2s_W} \right]$$

[SVV] Higgs – 2 Gauge Bosons

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

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

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

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

$$C_{79}\left(h^0, Z, Z\right) = \left[\frac{ieM_W s_{\beta-\alpha}}{s_W c_W^2}\right]$$

$$C_{80}\left(H^0, Z, Z\right) = \left[\frac{iec_{\beta-\alpha}M_W}{s_W c_W^2}\right]$$

$$C_{81}\left(h^0, W^-, W^+\right) = \left[\frac{ieM_W s_{\beta-\alpha}}{s_W}\right]$$

$$C_{82}\left(H^0, W^-, W^+\right) = \left[\frac{iec_{\beta-\alpha}M_W}{s_W}\right]$$

[UUV] 2 Ghosts – Gauge Boson

$$C_{19}\left(\overline{u}_-, u_-, \gamma\right) = -ie\begin{bmatrix}1\\ \hline 0\end{bmatrix}$$

$$C_{20}\left(\overline{u}_+, u_+, \gamma\right) = ie\begin{bmatrix}1\\ \hline 0\end{bmatrix}$$

$$C_{21}\left(\overline{u}_-, u_-, Z\right) = -\frac{iec_W}{s_W}\begin{bmatrix}1\\ \hline 0\end{bmatrix}$$

$$C_{22}\left(\overline{u}_+, u_+, Z\right) = \frac{iec_W}{s_W}\begin{bmatrix}1\\ \hline 0\end{bmatrix}$$

$$C_{23}\left(\overline{u}_-, u_\gamma, W^-\right) = ie\begin{bmatrix}1\\ \hline 0\end{bmatrix}$$

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

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

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

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

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

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

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

$$C_{386}\left(\overline{u}_g, u_g, g\right) = g_\mathrm{s} f^{\mathrm{g1,g2,g3}} \left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

[VVV] 3 Gauge Bosons

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

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

$$C(g,g,g) = \left[\; g_s f^{g1,g2,g3} \;\right]$$

[SSSS] 4 Higgs

$$C\left(h^0,h^0,h^0,h^0\right) = \left[\; -\frac{3ie^2c_{2\alpha}^2}{4c_W^2s_W^2} \;\right]$$

$$C\left(h^0,h^0,h^0,H^0\right) = \left[\; -\frac{3ie^2c_{2\alpha}s_{2\alpha}}{4c_W^2s_W^2} \;\right]$$

$$C\left(h^0,h^0,H^0,H^0\right) = \left[\; \frac{ie^2}{4c_W^2s_W^2}\left(1-3s_{2\alpha}^2\right) \;\right]$$

$$C\left(h^0,H^0,H^0,H^0\right) = \left[\; \frac{3ie^2c_{2\alpha}s_{2\alpha}}{4c_W^2s_W^2} \;\right]$$

$$C\left(H^0,H^0,H^0,H^0\right) = \left[\; -\frac{3ie^2c_{2\alpha}^2}{4c_W^2s_W^2} \;\right]$$

$$C\left(h^0,h^0,A^0,A^0\right) = \left[\; -\frac{ie^2c_{2\alpha}c_{2\beta}}{4c_W^2s_W^2} \;\right]$$

$$C\left(h^0,h^0,A^0,G^0\right) = \left[\; -\frac{ie^2c_{2\alpha}s_{2\beta}}{4c_W^2s_W^2} \;\right]$$

$$C\left(h^0,h^0,G^0,G^0\right) = \left[\; \frac{ie^2c_{2\alpha}c_{2\beta}}{4c_W^2s_W^2} \;\right]$$

$$C\left(h^0,H^0,A^0,A^0\right) = \left[\; -\frac{ie^2c_{2\beta}s_{2\alpha}}{4c_W^2s_W^2} \;\right]$$

$$C\left(h^0,H^0,A^0,G^0\right) = \left[\; -\frac{ie^2s_{2\alpha}s_{2\beta}}{4c_W^2s_W^2} \;\right]$$

$$C\left(h^0,H^0,G^0,G^0\right) = \left[\; \frac{ie^2c_{2\beta}s_{2\alpha}}{4c_W^2s_W^2} \;\right]$$

$$C\left(H^0,H^0,A^0,A^0\right) = \left[\; \frac{ie^2c_{2\alpha}c_{2\beta}}{4c_W^2s_W^2} \;\right]$$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$C_{115}\left(h^0, A^0, H^-, G^+\right) = \left[-\frac{e^2 s_{\beta-\alpha}}{4 s_W^2} \right]$$

$$C_{116}\left(h^0, A^0, G^-, H^+\right) = \left[\frac{e^2 s_{\beta-\alpha}}{4 s_W^2} \right]$$

$$C_{117}\left(h^0, G^0, H^-, G^+\right) = \left[\frac{e^2 c_{\beta-\alpha}}{4 s_W^2} \right]$$

$$C_{118}\left(h^0, G^0, G^-, H^+\right) = \left[-\frac{e^2 c_{\beta-\alpha}}{4 s_W^2} \right]$$

$$C_{119}\left(H^0, A^0, H^-, G^+\right) = \left[-\frac{e^2 c_{\beta-\alpha}}{4 s_W^2} \right]$$

$$C_{120}\left(H^0, A^0, G^-, H^+\right) = \left[\frac{e^2 c_{\beta-\alpha}}{4 s_W^2} \right]$$

$$C_{121}\left(H^0, G^0, H^-, G^+\right) = \left[-\frac{e^2 s_{\beta-\alpha}}{4 s_W^2} \right]$$

$$C_{122}\left(H^0, G^0, G^-, H^+\right) = \left[\frac{e^2 s_{\beta-\alpha}}{4 s_W^2} \right]$$

$$C_{123}\left(A^0, A^0, A^0, A^0\right) = \left[-\frac{3\mathrm{i} e^2 c_{2\beta}^2}{4 c_W^2 s_W^2} \right]$$

$$C_{124}\left(A^0, A^0, A^0, G^0\right) = \left[-\frac{3\mathrm{i} e^2 c_{2\beta} s_{2\beta}}{4 c_W^2 s_W^2} \right]$$

$$C_{125}\left(A^0, A^0, G^0, G^0\right) = \left[\frac{\mathrm{i} e^2}{4 c_W^2 s_W^2} \left(1 - 3 s_{2\beta}^2\right) \right]$$

$$C_{126}\left(A^0, G^0, G^0, G^0\right) = \left[\frac{3\mathrm{i} e^2 c_{2\beta} s_{2\beta}}{4 c_W^2 s_W^2} \right]$$

$$C_{127}\left(G^0, G^0, G^0, G^0\right) = \left[-\frac{3\mathrm{i} e^2 c_{2\beta}^2}{4 c_W^2 s_W^2} \right]$$

$$C_{128}\left(A^0, A^0, H^-, H^+\right) = \left[-\frac{ie^2 c_{2\beta}^2}{4 c_W^2 s_W^2} \right]$$

$$C_{129}\left(A^0, A^0, H^-, G^+\right) = \left[-\frac{ie^2 c_{2\beta} s_{2\beta}}{4 c_W^2 s_W^2} \right]$$

$$C_{130}\left(A^0, A^0, G^-, H^+\right) = \left[-\frac{ie^2 c_{2\beta} s_{2\beta}}{4 c_W^2 s_W^2} \right]$$

$$C_{131}\left(A^0, A^0, G^-, G^+\right) = \left[-\frac{ie^2}{4 s_W^2} \left(1 - \frac{c_{2\beta}^2 s_W^2}{c_W^2} + s_{2\beta}^2 \right) \right]$$

$$C_{132}\left(A^0, G^0, H^-, H^+\right) = \left[-\frac{ie^2 c_{2\beta} s_{2\beta}}{4 c_W^2 s_W^2} \right]$$

$$C_{133}\left(A^0, G^0, H^-, G^+\right) = \left[-\frac{ie^2}{4 s_W^2} \left(\frac{s_W^2 s_{2\beta}^2}{c_W^2} - c_{2\beta}^2 \right) \right]$$

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

$$C_{135}\left(A^0, G^0, G^-, G^+\right) = \left[\frac{ie^2 c_{2\beta} s_{2\beta}}{4 c_W^2 s_W^2} \right]$$

$$C_{136}\left(G^0, G^0, H^-, H^+\right) = \left[-\frac{ie^2}{4 s_W^2} \left(1 - \frac{c_{2\beta}^2 s_W^2}{c_W^2} + s_{2\beta}^2 \right) \right]$$

$$C_{137}\left(G^0, G^0, H^-, G^+\right) = \left[\frac{ie^2 c_{2\beta} s_{2\beta}}{4 c_W^2 s_W^2} \right]$$

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

$$C_{139}\left(G^0, G^0, G^-, G^+\right) = \left[-\frac{ie^2 c_{2\beta}^2}{4 c_W^2 s_W^2} \right]$$

$$C_{140}\left(H^-, H^-, H^+, H^+\right) = \left[-\frac{ie^2 c_{2\beta}^2}{2 c_W^2 s_W^2} \right]$$

$$C_{141}\left(H^-,H^-,H^+,G^+\right) = \left[-\frac{ie^2 c_{2\beta} s_{2\beta}}{2c_W^2 s_W^2} \right]$$

$$C_{142}\left(H^-,H^-,G^+,G^+\right) = \left[-\frac{ie^2 s_{2\beta}^2}{2c_W^2 s_W^2} \right]$$

$$C_{143}\left(H^-,G^-,H^+,H^+\right) = \left[-\frac{ie^2 c_{2\beta} s_{2\beta}}{2c_W^2 s_W^2} \right]$$

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

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

$$C_{146}\left(G^-,G^-,H^+,H^+\right) = \left[-\frac{ie^2 s_{2\beta}^2}{2c_W^2 s_W^2} \right]$$

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

$$C_{148}\left(G^-,G^-,G^+,G^+\right) = \left[-\frac{ie^2 c_{2\beta}^2}{2c_W^2 s_W^2} \right]$$

$$C_{278}\left(h^0,h^0,\tilde{\nu}_{g3},\tilde{\nu}_{g4}^\dagger\right) = \left[\frac{ie^2 \delta_{g3,g4} c_{2\alpha}}{4c_W^2 s_W^2} \right]$$

$$C_{279}\left(h^0,h^0,\tilde{e}_{g3}^{s3},\tilde{e}_{g4}^{s4,\dagger}\right) = \left[-\frac{ie^2 \delta_{g3,g4}}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(c_{2\alpha}c_\beta^2 M_W^2\left(1-2s_W^2\right) + 2c_W^2 m_{e_{g4}}^2 s_\alpha^2\right) U_{s3,1}^{\tilde{e}_{g4}*} U_{s4,1}^{\tilde{e}_{g4}} + 2\left(c_{2\alpha}c_\beta^2 M_W^2 s_W^2 + c_W^2 m_{e_{g4}}^2 s_\alpha^2\right) U_{s3,2}^{\tilde{e}_{g4}*} U_{s4,2}^{\tilde{e}_{g4}}\right) \right]$$

$$C_{280}\left(h^0,h^0,\tilde{u}_{a3},\tilde{u}_{a4}^\dagger\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2 s_\beta^2}\left(\sum_{j1=1}^{3} \begin{array}{l} R_{a3,j1}^{\tilde{u}*} R_{a4,j1}^{\tilde{u}}\left(6c_W^2 c_\alpha^2 m_{u_{j1}}^2 - c_{2\alpha} M_W^2\left(3-4s_W^2\right) s_\beta^2\right) + \\ 2R_{a3,3+j1}^{\tilde{u}*} R_{a4,3+j1}^{\tilde{u}}\left(3c_W^2 c_\alpha^2 m_{u_{j1}}^2 - 2c_{2\alpha} M_W^2 s_W^2 s_\beta^2\right) \end{array}\right) \right]$$

$$C_{281}\left(h^0,h^0,\tilde{d}_{a3},\tilde{d}_{a4}^\dagger\right) = \left[-\frac{ie^2}{12c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\sum_{j1=1}^{3} \begin{array}{l} R_{a3,j1}^{\tilde{d}*} R_{a4,j1}^{\tilde{d}}\left(c_{2\alpha}c_\beta^2 M_W^2\left(3-2s_W^2\right) + 6c_W^2 m_{d_{j1}}^2 s_\alpha^2\right) + \\ 2R_{a3,3+j1}^{\tilde{d}*} R_{a4,3+j1}^{\tilde{d}}\left(c_{2\alpha}c_\beta^2 M_W^2 s_W^2 + 3c_W^2 m_{d_{j1}}^2 s_\alpha^2\right) \end{array}\right) \right]$$

$$C_{282}\left(H^0,H^0,\tilde{\nu}_{g3},\tilde{\nu}_{g4}^\dagger\right) = \left[-\frac{ie^2 \delta_{g3,g4} c_{2\alpha}}{4c_W^2 s_W^2} \right]$$

$$\underset{283}{C}\left(H^0, H^0, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\left(2c_W^2 c_\alpha^2 m^2_{e_{g4}} - c_{2\alpha}c_\beta^2 M_W^2\left(1-2s_W^2\right)\right)U^{\tilde{e}_{g4}*}_{s3,1}U^{\tilde{e}_{g4}}_{s4,1} + 2\left(c_W^2 c_\alpha^2 m^2_{e_{g4}} - c_{2\alpha}c_\beta^2 M_W^2 s_W^2\right)U^{\tilde{e}_{g4}*}_{s3,2}U^{\tilde{e}_{g4}}_{s4,2}\right)\right]$$

$$\underset{284}{C}\left(H^0, H^0, \tilde{u}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2 s_\beta^2}\left(\sum_{j1=1}^{3}\begin{array}{l} R^{\tilde{u}*}_{a3,j1}R^{\tilde{u}}_{a4,j1}\left(6c_W^2 m^2_{u_{j1}}s_\alpha^2 + c_{2\alpha}M_W^2\left(3-4s_W^2\right)s_\beta^2\right) + \\ 2R^{\tilde{u}*}_{a3,3+j1}R^{\tilde{u}}_{a4,3+j1}\left(3c_W^2 m^2_{u_{j1}}s_\alpha^2 + 2c_{2\alpha}M_W^2 s_W^2 s_\beta^2\right)\end{array}\right)\right]$$

$$\underset{285}{C}\left(H^0, H^0, \tilde{d}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[-\frac{ie^2}{12c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\sum_{j1=1}^{3}\begin{array}{l} R^{\tilde{d}*}_{a3,j1}R^{\tilde{d}}_{a4,j1}\left(6c_W^2 c_\alpha^2 m^2_{d_{j1}} - c_{2\alpha}c_\beta^2 M_W^2\left(3-2s_W^2\right)\right) + \\ 2R^{\tilde{d}*}_{a3,3+j1}R^{\tilde{d}}_{a4,3+j1}\left(3c_W^2 c_\alpha^2 m^2_{d_{j1}} - c_{2\alpha}c_\beta^2 M_W^2 s_W^2\right)\end{array}\right)\right]$$

$$\underset{286}{C}\left(A^0, A^0, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}c_{2\beta}}{4c_W^2 s_W^2}\right]$$

$$\underset{287}{C}\left(A^0, A^0, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{4c_W^2 M_W^2 s_W^2}\left(\left(c_{2\beta}M_W^2\left(1-2s_W^2\right) + 2c_W^2 m^2_{e_{g4}}t_\beta^2\right)U^{\tilde{e}_{g4}*}_{s3,1}U^{\tilde{e}_{g4}}_{s4,1} + 2\left(c_{2\beta}M_W^2 s_W^2 + c_W^2 m^2_{e_{g4}}t_\beta^2\right)U^{\tilde{e}_{g4}*}_{s3,2}U^{\tilde{e}_{g4}}_{s4,2}\right)\right]$$

$$\underset{288}{C}\left(A^0, A^0, \tilde{u}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2 t_\beta^2}\left(\sum_{j1=1}^{3}\begin{array}{l} R^{\tilde{u}*}_{a3,j1}R^{\tilde{u}}_{a4,j1}\left(6c_W^2 m^2_{u_{j1}} - c_{2\beta}M_W^2\left(3-4s_W^2\right)t_\beta^2\right) + \\ 2R^{\tilde{u}*}_{a3,3+j1}R^{\tilde{u}}_{a4,3+j1}\left(3c_W^2 m^2_{u_{j1}} - 2c_{2\beta}M_W^2 s_W^2 t_\beta^2\right)\end{array}\right)\right]$$

$$\underset{289}{C}\left(A^0, A^0, \tilde{d}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2}\left(\sum_{j1=1}^{3}\begin{array}{l} R^{\tilde{d}*}_{a3,j1}R^{\tilde{d}}_{a4,j1}\left(c_{2\beta}M_W^2\left(3-2s_W^2\right) + 6c_W^2 m^2_{d_{j1}}t_\beta^2\right) + \\ 2R^{\tilde{d}*}_{a3,3+j1}R^{\tilde{d}}_{a4,3+j1}\left(c_{2\beta}M_W^2 s_W^2 + 3c_W^2 m^2_{d_{j1}}t_\beta^2\right)\end{array}\right)\right]$$

$$\underset{290}{C}\left(G^0, G^0, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}c_{2\beta}}{4c_W^2 s_W^2}\right]$$

$$\underset{291}{C}\left(G^0, G^0, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{4c_W^2 M_W^2 s_W^2}\left(\left(2c_W^2 m^2_{e_{g4}} - c_{2\beta}M_W^2\left(1-2s_W^2\right)\right)U^{\tilde{e}_{g4}*}_{s3,1}U^{\tilde{e}_{g4}}_{s4,1} + 2\left(c_W^2 m^2_{e_{g4}} - c_{2\beta}M_W^2 s_W^2\right)U^{\tilde{e}_{g4}*}_{s3,2}U^{\tilde{e}_{g4}}_{s4,2}\right)\right]$$

$$\underset{292}{C}\left(G^0, G^0, \tilde{u}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2}\left(\sum_{j1=1}^{3}\begin{array}{l} R^{\tilde{u}*}_{a3,j1}R^{\tilde{u}}_{a4,j1}\left(6c_W^2 m^2_{u_{j1}} + c_{2\beta}M_W^2\left(3-4s_W^2\right)\right) + \\ 2R^{\tilde{u}*}_{a3,3+j1}R^{\tilde{u}}_{a4,3+j1}\left(3c_W^2 m^2_{u_{j1}} + 2c_{2\beta}M_W^2 s_W^2\right)\end{array}\right)\right]$$

$$\underset{293}{C}\left(G^0, G^0, \tilde{d}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[-\frac{ie^2}{12c_W^2 M_W^2 s_W^2}\left(\sum_{j1=1}^{3}\begin{array}{l} R^{\tilde{d}*}_{a3,j1}R^{\tilde{d}}_{a4,j1}\left(6c_W^2 m^2_{d_{j1}} - c_{2\beta}M_W^2\left(3-2s_W^2\right)\right) + \\ 2R^{\tilde{d}*}_{a3,3+j1}R^{\tilde{d}}_{a4,3+j1}\left(3c_W^2 m^2_{d_{j1}} - c_{2\beta}M_W^2 s_W^2\right)\end{array}\right)\right]$$

$$C\left(h^0, H^0, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2 \delta_{g3,g4} s_{2\alpha}}{4 c_W^2 s_W^2} \right]$$

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

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

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

$$C\left(h^0, H^0, \tilde{u}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{ie^2 s_{2\alpha}}{12 c_W^2 M_W^2 s_W^2 s_\beta^2} \left(\sum_{j1=1}^{3} \left(R^{\tilde{u}*}_{a3,j1} R^{\tilde{u}}_{a4,j1} \left(3 c_W^2 m_{u_{j1}}^2 - M_W^2 \left(3 - 4 s_W^2\right) s_\beta^2 \right) + R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{u}}_{a4,3+j1} \left(3 c_W^2 m_{u_{j1}}^2 - 4 M_W^2 s_W^2 s_\beta^2 \right) \right) \right) \right]$$

$$C\left(h^0, H^0, \tilde{d}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[\frac{ie^2 s_{2\alpha}}{12 c_W^2 c_\beta^2 M_W^2 s_W^2} \left(\sum_{j1=1}^{3} \left(R^{\tilde{d}*}_{a3,j1} R^{\tilde{d}}_{a4,j1} \left(3 c_W^2 m_{d_{j1}}^2 - c_\beta^2 M_W^2 \left(3 - 2 s_W^2\right) \right) + R^{\tilde{d}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j1} \left(3 c_W^2 m_{d_{j1}}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) \right) \right) \right]$$

$$C\left(A^0, G^0, \tilde{u}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{ie^2 s_{2\beta}}{12 c_W^2 M_W^2 s_W^2 s_\beta^2} \left(\sum_{j1=1}^{3} \left(R^{\tilde{u}*}_{a3,j1} R^{\tilde{u}}_{a4,j1} \left(3 c_W^2 m_{u_{j1}}^2 - M_W^2 \left(3 - 4 s_W^2\right) s_\beta^2 \right) + R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{u}}_{a4,3+j1} \left(3 c_W^2 m_{u_{j1}}^2 - 4 M_W^2 s_W^2 s_\beta^2 \right) \right) \right) \right]$$

$$C\left(A^0, G^0, \tilde{d}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[\frac{ie^2 s_{2\beta}}{12 c_W^2 c_\beta^2 M_W^2 s_W^2} \left(\sum_{j1=1}^{3} \left(R^{\tilde{d}*}_{a3,j1} R^{\tilde{d}}_{a4,j1} \left(3 c_W^2 m_{d_{j1}}^2 - c_\beta^2 M_W^2 \left(3 - 2 s_W^2\right) \right) + R^{\tilde{d}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j1} \left(3 c_W^2 m_{d_{j1}}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) \right) \right) \right]$$

$$C\left(h^0, H^-, \tilde{u}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[\frac{ie^2}{2\sqrt{2} s_{2\beta} M_W^2 s_W^2 s_\beta^2} \left(\sum_{j1,j2=1}^{3} \left(\begin{array}{l} s_{2\beta} R^{\tilde{u}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} \left(c_\alpha c_\beta m_{u_{j1}}^2 - s_\beta \left(c_{\alpha+\beta} s_\beta M_W^2 + s_\alpha m_{d_{j2}}^2 t_\beta^2 \right) \right) + \\ 2 m_{d_{j2}} m_{u_{j1}} s_{\beta-\alpha} R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2} s_\beta^2 \end{array} \right) \mathrm{CKM}^*_{j1,j2} \right) \right]$$

$$C\left(h^0, H^+, \tilde{d}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[\frac{ie^2}{2\sqrt{2} s_{2\beta} M_W^2 s_W^2 s_\beta^2} \left(\sum_{j1,j2=1}^{3} \left(\begin{array}{l} s_{2\beta} R^{\tilde{d}*}_{a3,j2} R^{\tilde{u}}_{a4,j1} \left(c_\alpha c_\beta m_{u_{j1}}^2 - s_\beta \left(c_{\alpha+\beta} s_\beta M_W^2 + s_\alpha m_{d_{j2}}^2 t_\beta^2 \right) \right) + \\ 2 m_{d_{j2}} m_{u_{j1}} s_{\beta-\alpha} R^{\tilde{d}*}_{a3,3+j2} R^{\tilde{u}}_{a4,3+j1} s_\beta^2 \end{array} \right) \mathrm{CKM}_{j1,j2} \right) \right]$$

$$C\left(h^0, G^-, \tilde{u}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[\frac{ie^2}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \left(\begin{array}{l} s_{2\beta} \left(s_\alpha s_\beta m_{d_{j2}}^2 + c_\alpha c_\beta m_{u_{j1}}^2 - c_\beta s_{\alpha+\beta} s_\beta M_W^2 \right) R^{\tilde{u}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} - \\ 2 c_\beta c_{\beta-\alpha} m_{d_{j2}} m_{u_{j1}} s_\beta R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2} \end{array} \right) \mathrm{CKM}^*_{j1,j2} \right) \right]$$

$$C\left(h^0, G^+, \tilde{d}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[\frac{ie^2}{2\sqrt{2} c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \left(\begin{array}{l} s_{2\beta} \left(s_\alpha s_\beta m_{d_{j2}}^2 + c_\alpha c_\beta m_{u_{j1}}^2 - c_\beta s_{\alpha+\beta} s_\beta M_W^2 \right) R^{\tilde{d}*}_{a3,j2} R^{\tilde{u}}_{a4,j1} - \\ 2 c_\beta c_{\beta-\alpha} m_{d_{j2}} m_{u_{j1}} s_\beta R^{\tilde{d}*}_{a3,3+j2} R^{\tilde{u}}_{a4,3+j1} \end{array} \right) \mathrm{CKM}_{j1,j2} \right) \right]$$

$$C\left(A^0, H^-, \tilde{u}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[-\frac{e^2}{2\sqrt{2}s_W^2}\left(\sum_{j1=1}^{3}\left(\sum_{j2=1}^{3}\left(\frac{m^2_{u_{j1}}}{M_W^2 t_\beta^2} - \frac{m^2_{d_{j2}} t_\beta^2}{M_W^2} - c_{2\beta}\right)\mathrm{CKM}^*_{j1,j2} R^{\tilde{d}}_{a4,j2}\right) R^{\tilde{u}*}_{a3,j1}\right)\right]$$

$$C\left(A^0, H^+, \tilde{d}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[\frac{e^2}{2\sqrt{2}s_W^2}\left(\sum_{j2=1}^{3}\left(\sum_{j1=1}^{3}\mathrm{CKM}_{j1,j2}\left(\frac{m^2_{u_{j1}}}{M_W^2 t_\beta^2} - \frac{m^2_{d_{j2}} t_\beta^2}{M_W^2} - c_{2\beta}\right) R^{\tilde{u}}_{a4,j1}\right) R^{\tilde{d}*}_{a3,j2}\right)\right]$$

$$C\left(A^0, G^-, \tilde{u}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[-\frac{e^2}{2\sqrt{2}s_{2\beta}t_\beta M_W^2 s_W^2}\left(\sum_{j1,j2=1}^{3}\mathrm{CKM}^*_{j1,j2}\left(s_{2\beta}\left(m^2_{u_{j1}} + t_\beta\left(t_\beta m^2_{d_{j2}} - s_{2\beta}M_W^2\right)\right) R^{\tilde{u}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} + 2m_{d_{j2}} m_{u_{j1}} t_\beta R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2}\right)\right)\right]$$

$$C\left(A^0, G^+, \tilde{d}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[\frac{e^2}{2\sqrt{2}s_{2\beta}t_\beta M_W^2 s_W^2}\left(\sum_{j1,j2=1}^{3}\mathrm{CKM}_{j1,j2}\left(s_{2\beta}\left(m^2_{u_{j1}} + t_\beta\left(t_\beta m^2_{d_{j2}} - s_{2\beta}M_W^2\right)\right) R^{\tilde{d}*}_{a3,j2} R^{\tilde{u}}_{a4,j1} + 2m_{d_{j2}} m_{u_{j1}} t_\beta R^{\tilde{d}*}_{a3,3+j2} R^{\tilde{u}}_{a4,3+j1}\right)\right)\right]$$

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

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

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

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

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

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

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

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

$$\underset{318}{C}\left(H^0, H^-, \tilde{u}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[\frac{ie^2}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2} \left(\sum_{j1,j2=1}^{3} \left(\begin{array}{l} s_{2\beta} R^{\tilde{u}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} \left(c_\beta s_\alpha m^2_{u_{j1}} - s_\beta \left(s_{\alpha+\beta} s_\beta M_W^2 - c_\alpha m^2_{d_{j2}} t_\beta^2 \right) \right) + \\ 2 c_{\beta-\alpha} m_{d_{j2}} m_{u_{j1}} R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2} s_\beta^2 \end{array} \right) CKM^*_{j1,j2} \right) \right]$$

$$\underset{319}{C}\left(H^0, H^+, \tilde{d}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[\frac{ie^2}{2\sqrt{2}s_{2\beta}M_W^2 s_W^2 s_\beta^2} \left(\sum_{j1,j2=1}^{3} \left(\begin{array}{l} s_{2\beta} R^{\tilde{d}*}_{a3,j2} R^{\tilde{u}}_{a4,j1} \left(c_\beta s_\alpha m^2_{u_{j1}} - s_\beta \left(s_{\alpha+\beta} s_\beta M_W^2 - c_\alpha m^2_{d_{j2}} t_\beta^2 \right) \right) + \\ 2 c_{\beta-\alpha} m_{d_{j2}} m_{u_{j1}} R^{\tilde{d}*}_{a3,3+j2} R^{\tilde{u}}_{a4,3+j1} s_\beta^2 \end{array} \right) CKM_{j1,j2} \right) \right]$$

$$\underset{320}{C}\left(H^0, G^-, \tilde{u}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[-\frac{ie^2}{2\sqrt{2}c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \left(\begin{array}{l} s_{2\beta} \left(c_\alpha s_\beta m^2_{d_{j2}} - c_\beta s_\alpha m^2_{u_{j1}} - c_{\alpha+\beta} c_\beta s_\beta M_W^2 \right) R^{\tilde{u}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} - \\ 2 c_\beta m_{d_{j2}} m_{u_{j1}} s_\beta s_{\beta-\alpha} R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2} \end{array} \right) CKM^*_{j1,j2} \right) \right]$$

$$\underset{321}{C}\left(H^0, G^+, \tilde{d}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{ie^2}{2\sqrt{2}c_\beta s_{2\beta} s_\beta M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \left(\begin{array}{l} s_{2\beta} \left(c_\alpha s_\beta m^2_{d_{j2}} - c_\beta s_\alpha m^2_{u_{j1}} - c_{\alpha+\beta} c_\beta s_\beta M_W^2 \right) R^{\tilde{d}*}_{a3,j2} R^{\tilde{u}}_{a4,j1} - \\ 2 c_\beta m_{d_{j2}} m_{u_{j1}} s_\beta s_{\beta-\alpha} R^{\tilde{d}*}_{a3,3+j2} R^{\tilde{u}}_{a4,3+j1} \end{array} \right) CKM_{j1,j2} \right) \right]$$

$$\underset{322}{C}\left(G^0, H^-, \tilde{u}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[-\frac{e^2}{2\sqrt{2}s_{2\beta}t_\beta M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} CKM^*_{j1,j2} \left(s_{2\beta} \left(m^2_{u_{j1}} + t_\beta \left(t_\beta m^2_{d_{j2}} - s_{2\beta} M_W^2 \right) \right) R^{\tilde{u}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} - 2 m_{d_{j2}} m_{u_{j1}} t_\beta R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2} \right) \right) \right]$$

$$\underset{323}{C}\left(G^0, H^+, \tilde{d}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[\frac{e^2}{2\sqrt{2}s_{2\beta}t_\beta M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} CKM_{j1,j2} \left(s_{2\beta} \left(m^2_{u_{j1}} + t_\beta \left(t_\beta m^2_{d_{j2}} - s_{2\beta} M_W^2 \right) \right) R^{\tilde{d}*}_{a3,j2} R^{\tilde{u}}_{a4,j1} - 2 m_{d_{j2}} m_{u_{j1}} t_\beta R^{\tilde{d}*}_{a3,3+j2} R^{\tilde{u}}_{a4,3+j1} \right) \right) \right]$$

$$\underset{324}{C}\left(G^0, G^-, \tilde{u}_{a3}, \tilde{d}^{\dagger}_{a4}\right) = \left[\frac{e^2}{2\sqrt{2}M_W^2 s_W^2} \left(\sum_{j1=1}^{3} \left(\sum_{j2=1}^{3} CKM^*_{j1,j2} \left(m^2_{d_{j2}} - m^2_{u_{j1}} - c_{2\beta} M_W^2 \right) R^{\tilde{d}}_{a4,j2} \right) R^{\tilde{u}*}_{a3,j1} \right) \right]$$

$$\underset{325}{C}\left(G^0, G^+, \tilde{d}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{e^2}{2\sqrt{2}M_W^2 s_W^2} \left(\sum_{j2=1}^{3} \left(\sum_{j1=1}^{3} CKM_{j1,j2} \left(m^2_{d_{j2}} - m^2_{u_{j1}} - c_{2\beta} M_W^2 \right) R^{\tilde{u}}_{a4,j1} \right) R^{\tilde{d}*}_{a3,j2} \right) \right]$$

$$\underset{326}{C}\left(H^0, H^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2}s_W^2} \left(\frac{c_\alpha t_\beta m^2_{e_{g3}}}{c_\beta M_W^2} - s_{\alpha+\beta} \right) \right]$$

$$\underset{327}{C}\left(H^0, H^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2 \delta_{g3,g4} U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s_W^2} \left(\frac{c_\alpha t_\beta m^2_{e_{g4}}}{c_\beta M_W^2} - s_{\alpha+\beta} \right) \right]$$

$$\underset{328}{C}\left(H^0, G^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2 \delta_{g3,g4} U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2}s_W^2} \left(\frac{c_\alpha m^2_{e_{g3}}}{c_\beta M_W^2} - c_{\alpha+\beta} \right) \right]$$

$$C\left(H^0, G^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s_W^2}\left(\frac{c_\alpha m^2_{e_{g4}}}{c_\beta M_W^2} - c_{\alpha+\beta}\right)\right] \quad (329)$$

$$C\left(G^0, H^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{e^2\delta_{g3,g4}U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2}s_W^2}\left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - s_{2\beta}\right)\right] \quad (330)$$

$$C\left(G^0, H^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{e^2\delta_{g3,g4}U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s_W^2}\left(\frac{t_\beta m^2_{e_{g4}}}{M_W^2} - s_{2\beta}\right)\right] \quad (331)$$

$$C\left(G^0, G^-, \tilde{\nu}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{e^2\delta_{g3,g4}U^{\tilde{e}_{g3}}_{s4,1}}{2\sqrt{2}s_W^2}\left(\frac{m^2_{e_{g3}}}{M_W^2} - c_{2\beta}\right)\right] \quad (332)$$

$$C\left(G^0, G^+, \tilde{e}^{s3}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{e^2\delta_{g3,g4}U^{\tilde{e}_{g4}*}_{s3,1}}{2\sqrt{2}s_W^2}\left(\frac{m^2_{e_{g4}}}{M_W^2} - c_{2\beta}\right)\right] \quad (333)$$

$$C\left(H^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(\frac{m^2_{e_{g3}}t_\beta^2}{M_W^2} + \left(\frac{1}{2}c_{2\beta}\right)\left(2 - \frac{1}{c_W^2}\right)\right)\right] \quad (334)$$

$$C\left(H^-, G^+, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - \left(\frac{1}{2}s_{2\beta}\right)\left(2 - \frac{1}{c_W^2}\right)\right)\right] \quad (335)$$

$$C\left(G^-, H^+, \tilde{\nu}_{g3}, \tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - \left(\frac{1}{2}s_{2\beta}\right)\left(2 - \frac{1}{c_W^2}\right)\right)\right] \quad (336)$$

$$C\left(H^-, H^+, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{4c_W^2M_W^2s_W^2}\left(c_{2\beta}M_W^2U^{\tilde{e}_{g3}*}_{s3,1}U^{\tilde{e}_{g3}}_{s4,1} - 2\left(c_{2\beta}M_W^2s_W^2 + c_W^2m^2_{e_{g3}}t_\beta^2\right)U^{\tilde{e}_{g3}*}_{s3,2}U^{\tilde{e}_{g3}}_{s4,2}\right)\right] \quad (337)$$

$$C\left(H^-, G^+, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(s_{2\beta}\left(1 - \frac{1}{c_W^2}\left(\frac{1}{2} - s_W^2\right)\right)U^{\tilde{e}_{g3}*}_{s3,1}U^{\tilde{e}_{g3}}_{s4,1} + \left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - \frac{s_{2\beta}s_W^2}{c_W^2}\right)U^{\tilde{e}_{g3}*}_{s3,2}U^{\tilde{e}_{g3}}_{s4,2}\right)\right] \quad (338)$$

$$C\left(G^-, H^+, \tilde{e}^{s3}_{g3}, \tilde{e}^{s4,\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{2s_W^2}\left(s_{2\beta}\left(1 - \frac{1}{c_W^2}\left(\frac{1}{2} - s_W^2\right)\right)U^{\tilde{e}_{g3}*}_{s3,1}U^{\tilde{e}_{g3}}_{s4,1} + \left(\frac{t_\beta m^2_{e_{g3}}}{M_W^2} - \frac{s_{2\beta}s_W^2}{c_W^2}\right)U^{\tilde{e}_{g3}*}_{s3,2}U^{\tilde{e}_{g3}}_{s4,2}\right)\right] \quad (339)$$

$$C\left(H^-, H^+, \tilde{u}_{a3}, \tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{ie^2}{12c_W^2M_W^2s_W^2t_\beta^2}\left(\sum_{j1,j2=1}^{3} \begin{array}{l} R^{\tilde{u}*}_{a3,j1}R^{\tilde{u}}_{a4,j2}t_\beta^2\left(\delta_{j1,j2}c_{2\beta}\left(1 + 2c_W^2\right)M_W^2 + 6\left(\sum_{gn=1}^{3}\mathrm{CKM}_{j2,gn}\mathrm{CKM}^*_{j1,gn}m^2_{d_{gn}}\right)c_W^2t_\beta^2\right) + \\ 2\delta_{j1,j2}R^{\tilde{u}*}_{a3,3+j1}R^{\tilde{u}}_{a4,3+j2}\left(3c_W^2m^2_{u_{j1}} - 2c_{2\beta}M_W^2s_W^2t_\beta^2\right) \end{array}\right)\right] \quad (340)$$

$$C\left(H^-, G^+, \tilde{u}_{a3}, \tilde{u}^\dagger_{a4}\right) = \left[\frac{ie^2}{12 t_\beta c_W^2 M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} t_\beta \left(6 \left(\sum_{gn=1}^{3} CKM_{j2,gn} CKM^*_{j1,gn} m^2_{d_{gn}} \right) t_\beta c_W^2 - \delta_{j1,j2} s_{2\beta} \left(1 + 2c_W^2\right) M_W^2 \right) R^{\tilde{u}*}_{a3,j1} R^{\tilde{u}}_{a4,j2} - \\ 2\delta_{j1,j2} R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{u}}_{a4,3+j2} \left(3c_W^2 m^2_{u_{j1}} - 2 s_{2\beta} t_\beta M_W^2 s_W^2 \right) \end{array} \right) \right]$$

$$C\left(G^-, H^+, \tilde{u}_{a3}, \tilde{u}^\dagger_{a4}\right) = \left[\frac{ie^2}{12 t_\beta c_W^2 M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} t_\beta \left(6 \left(\sum_{gn=1}^{3} CKM_{j2,gn} CKM^*_{j1,gn} m^2_{d_{gn}} \right) t_\beta c_W^2 - \delta_{j1,j2} s_{2\beta} \left(1 + 2c_W^2\right) M_W^2 \right) R^{\tilde{u}*}_{a3,j1} R^{\tilde{u}}_{a4,j2} - \\ 2\delta_{j1,j2} R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{u}}_{a4,3+j2} \left(3c_W^2 m^2_{u_{j1}} - 2 s_{2\beta} t_\beta M_W^2 s_W^2 \right) \end{array} \right) \right]$$

$$C\left(H^-, H^+, \tilde{d}_{a3}, \tilde{d}^\dagger_{a4}\right) = \left[-\frac{ie^2}{12 c_W^2 M_W^2 s_W^2 t_\beta^2} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} R^{\tilde{d}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} \left(6 \left(\sum_{gn=1}^{3} CKM_{gn,j1} CKM^*_{gn,j2} m^2_{u_{gn}} \right) c_W^2 + \delta_{j1,j2} c_{2\beta} \left(1 - 4c_W^2\right) M_W^2 t_\beta^2 \right) + \\ 2\delta_{j1,j2} R^{\tilde{d}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2} t_\beta^2 \left(c_{2\beta} M_W^2 s_W^2 + 3c_W^2 m^2_{d_{j1}} t_\beta^2 \right) \end{array} \right) \right]$$

$$C\left(H^-, G^+, \tilde{d}_{a3}, \tilde{d}^\dagger_{a4}\right) = \left[-\frac{ie^2}{12 t_\beta c_W^2 M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} \left(6 \left(\sum_{gn=1}^{3} CKM_{gn,j1} CKM^*_{gn,j2} m^2_{u_{gn}} \right) c_W^2 + \delta_{j1,j2} s_{2\beta} t_\beta \left(1 - 4c_W^2\right) M_W^2 \right) R^{\tilde{d}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} - \\ 2\delta_{j1,j2} t_\beta R^{\tilde{d}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2} \left(3t_\beta c_W^2 m^2_{d_{j1}} - s_{2\beta} M_W^2 s_W^2 \right) \end{array} \right) \right]$$

$$C\left(G^-, H^+, \tilde{d}_{a3}, \tilde{d}^\dagger_{a4}\right) = \left[-\frac{ie^2}{12 t_\beta c_W^2 M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} \left(6 \left(\sum_{gn=1}^{3} CKM_{gn,j1} CKM^*_{gn,j2} m^2_{u_{gn}} \right) c_W^2 + \delta_{j1,j2} s_{2\beta} t_\beta \left(1 - 4c_W^2\right) M_W^2 \right) R^{\tilde{d}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} - \\ 2\delta_{j1,j2} t_\beta R^{\tilde{d}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2} \left(3t_\beta c_W^2 m^2_{d_{j1}} - s_{2\beta} M_W^2 s_W^2 \right) \end{array} \right) \right]$$

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

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

$$C\left(G^-, G^+, \tilde{u}_{a3}, \tilde{u}^\dagger_{a4}\right) = \left[-\frac{ie^2}{12 c_W^2 M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} \left(6 \left(\sum_{gn=1}^{3} CKM_{j2,gn} CKM^*_{j1,gn} m^2_{d_{gn}} \right) c_W^2 - \delta_{j1,j2} c_{2\beta} \left(1 + 2c_W^2\right) M_W^2 \right) R^{\tilde{u}*}_{a3,j1} R^{\tilde{u}}_{a4,j2} + \\ 2\delta_{j1,j2} R^{\tilde{u}*}_{a3,3+j1} R^{\tilde{u}}_{a4,3+j2} \left(3c_W^2 m^2_{u_{j1}} + 2c_{2\beta} M_W^2 s_W^2 \right) \end{array} \right) \right]$$

$$C\left(G^-, G^+, \tilde{d}_{a3}, \tilde{d}^\dagger_{a4}\right) = \left[-\frac{ie^2}{12 c_W^2 M_W^2 s_W^2} \left(\sum_{j1,j2=1}^{3} \begin{array}{l} \left(6 \left(\sum_{gn=1}^{3} CKM_{gn,j1} CKM^*_{gn,j2} m^2_{u_{gn}} \right) c_W^2 - \delta_{j1,j2} c_{2\beta} \left(1 - 4c_W^2\right) M_W^2 \right) R^{\tilde{d}*}_{a3,j1} R^{\tilde{d}}_{a4,j2} + \\ 2\delta_{j1,j2} R^{\tilde{d}*}_{a3,3+j1} R^{\tilde{d}}_{a4,3+j2} \left(3c_W^2 m^2_{d_{j1}} - c_{2\beta} M_W^2 s_W^2 \right) \end{array} \right) \right]$$

$$\underset{372}{C}\left(\tilde{d}_{a1},\tilde{d}^{\dagger}_{a2},\tilde{d}_{a3},\tilde{d}^{\dagger}_{a4}\right) = \left[-\sum_{j1,j2,j3,j4=1}^{3} \left(\begin{array}{l} \frac{ie^2}{36c_W^2 c_\beta^2 M_W^2 s_W^2} \left(\begin{array}{l} 2\left(\begin{array}{l} \left(\begin{array}{l} 2\left(\begin{array}{l} c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,3+j2} R^{\tilde{d}}_{a4,j4} s_W^2 + \\ 9 m_{d_{j1}} m_{d_{j2}} c_W^2 R^{\tilde{d}}_{a2,j2} R^{\tilde{d}}_{a4,3+j4} \end{array} \right) R^{\tilde{d}*}_{a3,3+j3} + \\ \left(1+8c_W^2\right) c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,j2} R^{\tilde{d}*}_{a3,j3} R^{\tilde{d}}_{a4,j4} \end{array} \right) R^{\tilde{d}*}_{a1,j1} + \\ 2\left(\begin{array}{l} \left(\begin{array}{l} 9 m_{d_{j1}} m_{d_{j2}} c_W^2 R^{\tilde{d}}_{a2,3+j2} R^{\tilde{d}}_{a4,j4} + \\ c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,j2} R^{\tilde{d}}_{a4,3+j4} s_W^2 \end{array} \right) R^{\tilde{d}*}_{a3,j3} + \\ 2 c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,3+j2} R^{\tilde{d}*}_{a3,3+j3} R^{\tilde{d}}_{a4,3+j4} s_W^2 \end{array} \right) R^{\tilde{d}*}_{a1,3+j1} \end{array} \right) + \\ i g_s^2 \left(T^x_{c2,c3} T^x_{c4,c1}\right) \left(R^{\tilde{d}}_{a2,j2} R^{\tilde{d}*}_{a3,j3} - R^{\tilde{d}}_{a2,3+j2} R^{\tilde{d}*}_{a3,3+j3} \right) \left(R^{\tilde{d}*}_{a1,j1} R^{\tilde{d}}_{a4,j4} - R^{\tilde{d}*}_{a1,3+j1} R^{\tilde{d}}_{a4,3+j4} \right) \end{array} \right) \delta_{j1,j4}\delta_{j2,j3} + \\ \left(\begin{array}{l} \frac{ie^2}{36c_W^2 c_\beta^2 M_W^2 s_W^2} \left(\begin{array}{l} 2\left(\begin{array}{l} \left(\begin{array}{l} 2\left(\begin{array}{l} c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,3+j2} R^{\tilde{d}}_{a4,j4} s_W^2 + \\ 9 m_{d_{j1}} m_{d_{j3}} c_W^2 R^{\tilde{d}}_{a2,j2} R^{\tilde{d}}_{a4,3+j4} \end{array} \right) R^{\tilde{d}*}_{a3,j3} + \\ 2 c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,3+j2} R^{\tilde{d}*}_{a3,3+j3} R^{\tilde{d}}_{a4,3+j4} s_W^2 \end{array} \right) R^{\tilde{d}*}_{a1,3+j1} + \\ \left(\begin{array}{l} 2\left(\begin{array}{l} 9 m_{d_{j1}} m_{d_{j3}} c_W^2 R^{\tilde{d}}_{a2,3+j2} R^{\tilde{d}}_{a4,j4} + \\ c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,j2} R^{\tilde{d}}_{a4,3+j4} s_W^2 \end{array} \right) R^{\tilde{d}*}_{a3,3+j3} + \\ \left(1+8c_W^2\right) c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,j2} R^{\tilde{d}*}_{a3,j3} R^{\tilde{d}}_{a4,j4} \end{array} \right) R^{\tilde{d}*}_{a1,j1} \end{array} \right) + \\ i g_s^2 \left(T^x_{c2,c1} T^x_{c4,c3}\right) \left(R^{\tilde{d}*}_{a1,j1} R^{\tilde{d}}_{a2,j2} - R^{\tilde{d}*}_{a1,3+j1} R^{\tilde{d}}_{a2,3+j2} \right) \left(R^{\tilde{d}*}_{a3,j3} R^{\tilde{d}}_{a4,j4} - R^{\tilde{d}*}_{a3,3+j3} R^{\tilde{d}}_{a4,3+j4} \right) \end{array} \right) \delta_{j1,j2}\delta_{j3,j4} \end{array} \right) \right]$$

$$\underset{373}{C}\left(\tilde{d}_{a1},\tilde{d}^{\dagger}_{a2},\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g3,g4}}{12c_W^2 c_\beta^2 M_W^2 s_W^2} \left(\sum_{j2=1}^{3} \begin{array}{l} \left(\begin{array}{l} c_\beta^2 M_W^2 R^{\tilde{d}*}_{a1,j2} R^{\tilde{d}}_{a2,j2} \left(3c_W^2 - s_W^2\right) U^{\tilde{e}_{g3}}_{s4,1} - \\ 2 R^{\tilde{d}*}_{a1,3+j2} \left(c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,3+j2} s_W^2 U^{\tilde{e}_{g3}}_{s4,1} - 3 m_{d_{j2}} m_{e_{g3}} c_W^2 R^{\tilde{d}}_{a2,j2} U^{\tilde{e}_{g3}}_{s4,2} \right) \end{array} \right) U^{\tilde{e}_{g3}*}_{s3,1} + \\ 2 \left(\begin{array}{l} 2 c_\beta^2 M_W^2 R^{\tilde{d}*}_{a1,3+j2} R^{\tilde{d}}_{a2,3+j2} s_W^2 U^{\tilde{e}_{g3}}_{s4,2} + \\ R^{\tilde{d}*}_{a1,j2} \left(3 m_{d_{j2}} m_{e_{g3}} c_W^2 R^{\tilde{d}}_{a2,3+j2} U^{\tilde{e}_{g3}}_{s4,1} + c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,j2} s_W^2 U^{\tilde{e}_{g3}}_{s4,2} \right) \end{array} \right) U^{\tilde{e}_{g3}*}_{s3,2} \end{array} \right) \right]$$

$$\underset{374}{C}\left(\tilde{d}_{a1},\tilde{d}^{\dagger}_{a2},\tilde{\nu}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2\delta_{g3,g4}}{12c_W^2 s_W^2} \left(\sum_{j2=1}^{3} \left(\left(1+2c_W^2\right) R^{\tilde{d}*}_{a1,j2} R^{\tilde{d}}_{a2,j2} + 2 R^{\tilde{d}*}_{a1,3+j2} R^{\tilde{d}}_{a2,3+j2} s_W^2 \right) \right) \right]$$

$$\underset{375}{C}\left(\tilde{d}_{a1},\tilde{d}^{\dagger}_{a2},\tilde{u}_{a3},\tilde{u}^{\dagger}_{a4}\right) = \left[\sum_{j1,j2,j3,j4=1}^{3} \left(\begin{array}{l} \frac{ie^2}{36c_W^2 s_W^2} \left(\begin{array}{l} 4\left(R^{\tilde{d}*}_{a1,j1} R^{\tilde{d}}_{a2,j2} + 2 R^{\tilde{d}*}_{a1,3+j1} R^{\tilde{d}}_{a2,3+j2} \right) R^{\tilde{u}*}_{a3,3+j3} R^{\tilde{u}}_{a4,3+j4} s_W^2 + \\ R^{\tilde{u}*}_{a3,j3} R^{\tilde{u}}_{a4,j4} \left(R^{\tilde{d}*}_{a1,j1} R^{\tilde{d}}_{a2,j2} \left(9c_W^2 - s_W^2\right) - 2 R^{\tilde{d}*}_{a1,3+j1} R^{\tilde{d}}_{a2,3+j2} s_W^2 \right) \end{array} \right) - \\ i g_s^2 \left(T^x_{c2,c1} T^x_{c4,c3}\right) \left(R^{\tilde{d}*}_{a1,j1} R^{\tilde{d}}_{a2,j2} - R^{\tilde{d}*}_{a1,3+j1} R^{\tilde{d}}_{a2,3+j2} \right) \left(R^{\tilde{u}*}_{a3,j3} R^{\tilde{u}}_{a4,j4} - R^{\tilde{u}*}_{a3,3+j3} R^{\tilde{u}}_{a4,3+j4} \right) \end{array} \right) \delta_{j1,j2}\delta_{j3,j4} - \\ \frac{ie^2 CKM_{j4,j1} CKM^*_{j3,j2}}{2c_\beta^2 M_W^2 s_W^2 s_\beta^2} \left(\begin{array}{l} m_{u_{j3}} m_{u_{j4}} c_\beta^2 R^{\tilde{d}*}_{a1,j1} R^{\tilde{d}}_{a2,j2} R^{\tilde{u}*}_{a3,3+j3} R^{\tilde{u}}_{a4,3+j4} + \\ \left(c_\beta^2 M_W^2 R^{\tilde{d}*}_{a1,j1} R^{\tilde{d}}_{a2,j2} + m_{d_{j1}} m_{d_{j2}} R^{\tilde{d}*}_{a1,3+j1} R^{\tilde{d}}_{a2,3+j2} \right) R^{\tilde{u}*}_{a3,j3} R^{\tilde{u}}_{a4,j4} s_\beta^2 \end{array} \right) \end{array} \right) \right]$$

$$\underset{376}{C}\left(\tilde{d}_{a1},\tilde{e}^{s2,\dagger}_{g2},\tilde{\nu}_{g3},\tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{ie^2\delta_{g2,g3}}{2c_\beta^2 M_W^2 s_W^2}\left(\sum_{j1=1}^{3}\left(\sum_{j4=1}^{3}CKM_{j4,j1}R^{\tilde{u}}_{a4,j4}\right)\left(c_\beta^2 M_W^2 R^{\tilde{d}*}_{a1,j1}U^{\tilde{e}_{g2}}_{s2,1} + m_{d_{j1}}m_{e_{g2}}R^{\tilde{d}*}_{a1,3+j1}U^{\tilde{e}_{g2}}_{s2,2}\right)\right)\right]$$

$$\underset{377}{C}\left(\tilde{e}^{s1}_{g1},\tilde{d}^{\dagger}_{a2},\tilde{u}_{a3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2\delta_{g1,g4}}{2c_\beta^2 M_W^2 s_W^2}\left(\sum_{j2=1}^{3}\left(\sum_{j3=1}^{3}CKM^{*}_{j3,j2}R^{\tilde{u}*}_{a3,j3}\right)\left(c_\beta^2 M_W^2 R^{\tilde{d}}_{a2,j2}U^{\tilde{e}_{g1}*}_{s1,1} + m_{d_{j2}}m_{e_{g1}}R^{\tilde{d}}_{a2,3+j2}U^{\tilde{e}_{g1}*}_{s1,2}\right)\right)\right]$$

$$\underset{378}{C}\left(\tilde{e}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{e}^{s3}_{g3},\tilde{e}^{s4,\dagger}_{g4}\right) = \left[-\frac{ie^2}{4c_W^2 c_\beta^2 M_W^2 s_W^2}\left(\begin{array}{l}\left(\begin{array}{l}\left(\begin{array}{l}c_\beta^2 M_W^2 U^{\tilde{e}_{g1}}_{s2,1}U^{\tilde{e}_{g3}*}_{s3,1}U^{\tilde{e}_{g3}}_{s4,1} + \\ 2U^{\tilde{e}_{g3}*}_{s3,2}\left(m_{e_{g1}}m_{e_{g3}}c_W^2 U^{\tilde{e}_{g1}}_{s2,2}U^{\tilde{e}_{g3}}_{s4,1} - c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g1}}_{s2,1}U^{\tilde{e}_{g3}}_{s4,2}\right)\end{array}\right)\delta_{g1,g2}\delta_{g3,g4} + \\ \delta_{g1,g4}\delta_{g2,g3}c_\beta^2 M_W^2 U^{\tilde{e}_{g2}}_{s2,1}U^{\tilde{e}_{g2}*}_{s3,1}U^{\tilde{e}_{g1}}_{s4,1} - \\ 2\delta_{g1,g4}\delta_{g2,g3}U^{\tilde{e}_{g2}*}_{s3,2}\left(c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g2}}_{s2,2}U^{\tilde{e}_{g1}}_{s4,1} - m_{e_{g1}}m_{e_{g2}}c_W^2 U^{\tilde{e}_{g2}}_{s2,1}U^{\tilde{e}_{g1}}_{s4,2}\right)\end{array}\right)U^{\tilde{e}_{g1}*}_{s1,1} + \\ 2\left(\begin{array}{l}\left(\begin{array}{l}2c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g1}}_{s2,2}U^{\tilde{e}_{g3}*}_{s3,2}U^{\tilde{e}_{g3}}_{s4,2} - \\ U^{\tilde{e}_{g3}*}_{s3,1}\left(c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g1}}_{s2,2}U^{\tilde{e}_{g3}}_{s4,1} - m_{e_{g1}}m_{e_{g3}}c_W^2 U^{\tilde{e}_{g1}}_{s2,1}U^{\tilde{e}_{g3}}_{s4,2}\right)\end{array}\right)\delta_{g1,g2}\delta_{g3,g4} + \\ 2\delta_{g1,g4}\delta_{g2,g3}c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g2}}_{s2,2}U^{\tilde{e}_{g2}*}_{s3,2}U^{\tilde{e}_{g1}}_{s4,2} + \\ \delta_{g1,g4}\delta_{g2,g3}U^{\tilde{e}_{g2}*}_{s3,1}\left(m_{e_{g1}}m_{e_{g2}}c_W^2 U^{\tilde{e}_{g2}}_{s2,2}U^{\tilde{e}_{g1}}_{s4,1} - c_\beta^2 M_W^2 s_W^2 U^{\tilde{e}_{g2}}_{s2,1}U^{\tilde{e}_{g1}}_{s4,2}\right)\end{array}\right)U^{\tilde{e}_{g1}*}_{s1,2}\end{array}\right)\right]$$

$$\underset{379}{C}\left(\tilde{e}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{\nu}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[\frac{ie^2}{4s_W^2}\left(\begin{array}{l}\frac{\delta_{g1,g2}\delta_{g3,g4}}{c_W^2}\left(\left(c_W^2 - s_W^2\right)U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g1}}_{s2,1} + 2s_W^2 U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g1}}_{s2,2}\right) - \\ \frac{2\delta_{g1,g4}\delta_{g2,g3}}{c_\beta^2 M_W^2}\left(c_\beta^2 M_W^2 U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g2}}_{s2,1} + m_{e_{g1}}m_{e_{g2}}U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g2}}_{s2,2}\right)\end{array}\right)\right]$$

$$\underset{380}{C}\left(\tilde{e}^{s1}_{g1},\tilde{e}^{s2,\dagger}_{g2},\tilde{u}_{a3},\tilde{u}^{\dagger}_{a4}\right) = \left[\frac{ie^2\delta_{g1,g2}}{12c_W^2 s_W^2}\left(\sum_{j4=1}^{3}\begin{array}{l}\left(\left(1+2c_W^2\right)R^{\tilde{u}*}_{a3,j4}R^{\tilde{u}}_{a4,j4} - 4R^{\tilde{u}*}_{a3,3+j4}R^{\tilde{u}}_{a4,3+j4}s_W^2\right)U^{\tilde{e}_{g1}*}_{s1,1}U^{\tilde{e}_{g1}}_{s2,1} - \\ 2\left(R^{\tilde{u}*}_{a3,j4}R^{\tilde{u}}_{a4,j4} - 4R^{\tilde{u}*}_{a3,3+j4}R^{\tilde{u}}_{a4,3+j4}\right)s_W^2 U^{\tilde{e}_{g1}*}_{s1,2}U^{\tilde{e}_{g1}}_{s2,2}\end{array}\right)\right]$$

$$\underset{381}{C}\left(\tilde{\nu}_{g1},\tilde{\nu}^{\dagger}_{g2},\tilde{\nu}_{g3},\tilde{\nu}^{\dagger}_{g4}\right) = \left[-\frac{ie^2}{4c_W^2 s_W^2}\left(\delta_{g1,g4}\delta_{g2,g3} + \delta_{g1,g2}\delta_{g3,g4}\right)\right]$$

$$\underset{382}{C}\left(\tilde{\nu}_{g1},\tilde{\nu}^{\dagger}_{g2},\tilde{u}_{a3},\tilde{u}^{\dagger}_{a4}\right) = \left[-\frac{ie^2\delta_{g1,g2}}{12c_W^2 s_W^2}\left(\sum_{j4=1}^{3}\left(R^{\tilde{u}*}_{a3,j4}R^{\tilde{u}}_{a4,j4}\left(3c_W^2 - s_W^2\right) + 4R^{\tilde{u}*}_{a3,3+j4}R^{\tilde{u}}_{a4,3+j4}s_W^2\right)\right)\right]$$

$$\underset{383}{C}\left(\tilde{u}_{a1},\tilde{u}^{\dagger}_{a2},\tilde{u}_{a3},\tilde{u}^{\dagger}_{a4}\right) = \left[\sum_{j1,j2,j3,j4=1}^{3}\left(\begin{array}{c}\frac{ie^2}{36c_W^2M_W^2s_W^2s_\beta^2}\left(\begin{array}{c}\left(\begin{array}{c}2\left(\begin{array}{c}2M_W^2R^{\tilde{u}}_{a2,3+j2}R^{\tilde{u}}_{a4,j4}s_W^2s_\beta^2-\\9m_{u_{j1}}m_{u_{j2}}c_W^2R^{\tilde{u}}_{a2,j2}R^{\tilde{u}}_{a4,3+j4}\end{array}\right)R^{\tilde{u}*}_{a3,3+j3}-\\\left(1+8c_W^2\right)M_W^2R^{\tilde{u}}_{a2,j2}R^{\tilde{u}*}_{a3,j3}R^{\tilde{u}}_{a4,j4}s_\beta^2\end{array}\right)R^{\tilde{u}*}_{a1,j1}-\\2\left(\begin{array}{c}\left(\begin{array}{c}9m_{u_{j1}}m_{u_{j2}}c_W^2R^{\tilde{u}}_{a2,3+j2}R^{\tilde{u}}_{a4,j4}-\\2M_W^2R^{\tilde{u}}_{a2,j2}R^{\tilde{u}}_{a4,3+j4}s_W^2s_\beta^2\end{array}\right)R^{\tilde{u}*}_{a3,j3}+\\8M_W^2R^{\tilde{u}}_{a2,3+j2}R^{\tilde{u}*}_{a3,3+j3}R^{\tilde{u}}_{a4,3+j4}s_W^2s_\beta^2\end{array}\right)R^{\tilde{u}*}_{a1,3+j1}\\ ig_s^2\left(T^x_{c2,c3}T^x_{c4,c1}\right)\left(R^{\tilde{u}}_{a2,j2}R^{\tilde{u}*}_{a3,j3}-R^{\tilde{u}}_{a2,3+j2}R^{\tilde{u}*}_{a3,3+j3}\right)\left(R^{\tilde{u}*}_{a1,j1}R^{\tilde{u}}_{a4,j4}-R^{\tilde{u}*}_{a1,3+j1}R^{\tilde{u}}_{a4,3+j4}\right)\end{array}\right)-\delta_{j1,j4}\delta_{j2,j3}+\\\left(\begin{array}{c}\frac{ie^2}{36c_W^2M_W^2s_W^2s_\beta^2}\left(\begin{array}{c}2\left(\begin{array}{c}2M_W^2R^{\tilde{u}}_{a2,3+j2}R^{\tilde{u}}_{a4,j4}s_W^2s_\beta^2-\\9m_{u_{j1}}m_{u_{j3}}c_W^2R^{\tilde{u}}_{a2,j2}R^{\tilde{u}}_{a4,3+j4}\end{array}\right)R^{\tilde{u}*}_{a3,j3}-\\8M_W^2R^{\tilde{u}}_{a2,3+j2}R^{\tilde{u}*}_{a3,3+j3}R^{\tilde{u}}_{a4,3+j4}s_W^2s_\beta^2\end{array}\right)R^{\tilde{u}*}_{a1,3+j1}-\\\left(\begin{array}{c}2\left(\begin{array}{c}9m_{u_{j1}}m_{u_{j3}}c_W^2R^{\tilde{u}}_{a2,3+j2}R^{\tilde{u}}_{a4,j4}-\\2M_W^2R^{\tilde{u}}_{a2,j2}R^{\tilde{u}}_{a4,3+j4}s_W^2s_\beta^2\end{array}\right)R^{\tilde{u}*}_{a3,3+j3}+\\\left(1+8c_W^2\right)M_W^2R^{\tilde{u}}_{a2,j2}R^{\tilde{u}*}_{a3,j3}R^{\tilde{u}}_{a4,j4}s_\beta^2\end{array}\right)R^{\tilde{u}*}_{a1,j1}\\ ig_s^2\left(T^x_{c2,c1}T^x_{c4,c3}\right)\left(R^{\tilde{u}*}_{a1,j1}R^{\tilde{u}}_{a2,j2}-R^{\tilde{u}*}_{a1,3+j1}R^{\tilde{u}}_{a2,3+j2}\right)\left(R^{\tilde{u}*}_{a3,j3}R^{\tilde{u}}_{a4,j4}-R^{\tilde{u}*}_{a3,3+j3}R^{\tilde{u}}_{a4,3+j4}\right)\end{array}\right)-\delta_{j1,j2}\delta_{j3,j4}\end{array}\right)\right]$$

[SSVV] 2 Higgs – 2 Gauge Bosons

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

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

$$\underset{33}{C}\left(G^0,G^0,Z,Z\right) = \left[\frac{ie^2}{2c_W^2s_W^2}\right]$$

$$\underset{34}{C}\left(G^0,G^0,W^-,W^+\right) = \left[\frac{ie^2}{2s_W^2}\right]$$

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

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

$$C_{37}\left(G^-, G^+, Z, Z\right) = \left[\ \frac{\mathrm{i}e^2}{2c_\mathrm{W}^2 s_\mathrm{W}^2}\left(c_\mathrm{W}^2 - s_\mathrm{W}^2\right)^2\ \right]$$

$$C_{38}\left(G^-, G^+, W^-, W^+\right) = \left[\ \frac{\mathrm{i}e^2}{2s_\mathrm{W}^2}\ \right]$$

$$C_{149}\left(h^0, H^-, \gamma, W^+\right) = \left[\ \frac{\mathrm{i}e^2 c_{\beta-\alpha}}{2s_\mathrm{W}}\ \right]$$

$$C_{150}\left(h^0, H^-, Z, W^+\right) = \left[\ -\frac{\mathrm{i}e^2 c_{\beta-\alpha}}{2c_\mathrm{W}}\ \right]$$

$$C_{151}\left(h^0, G^-, \gamma, W^+\right) = \left[\ \frac{\mathrm{i}e^2 s_{\beta-\alpha}}{2s_\mathrm{W}}\ \right]$$

$$C_{152}\left(h^0, G^-, Z, W^+\right) = \left[\ -\frac{\mathrm{i}e^2 s_{\beta-\alpha}}{2c_\mathrm{W}}\ \right]$$

$$C_{153}\left(h^0, H^+, \gamma, W^-\right) = \left[\ \frac{\mathrm{i}e^2 c_{\beta-\alpha}}{2s_\mathrm{W}}\ \right]$$

$$C_{154}\left(h^0, H^+, Z, W^-\right) = \left[\ -\frac{\mathrm{i}e^2 c_{\beta-\alpha}}{2c_\mathrm{W}}\ \right]$$

$$C_{155}\left(h^0, G^+, \gamma, W^-\right) = \left[\ \frac{\mathrm{i}e^2 s_{\beta-\alpha}}{2s_\mathrm{W}}\ \right]$$

$$C_{156}\left(h^0, G^+, Z, W^-\right) = \left[\ -\frac{\mathrm{i}e^2 s_{\beta-\alpha}}{2c_\mathrm{W}}\ \right]$$

$$C_{157}\left(H^0, H^0, Z, Z\right) = \left[\ \frac{\mathrm{i}e^2}{2c_\mathrm{W}^2 s_\mathrm{W}^2}\ \right]$$

$$C_{158}\left(H^0, H^0, W^-, W^+\right) = \left[\ \frac{\mathrm{i}e^2}{2s_\mathrm{W}^2}\ \right]$$

$$C_{159}\left(H^0, H^-, \gamma, W^+\right) = \left[\ -\frac{\mathrm{i}e^2 s_{\beta-\alpha}}{2s_\mathrm{W}}\ \right]$$

$$C_{160}\left(H^0, H^-, Z, W^+\right) = \left[\ \frac{\mathrm{i}e^2 s_{\beta-\alpha}}{2c_\mathrm{W}}\ \right]$$

$$C_{161}\left(H^0, G^-, \gamma, W^+\right) = \left[\frac{\mathrm{i}e^2 c_{\beta-\alpha}}{2 s_W} \right]$$

$$C_{162}\left(H^0, G^-, Z, W^+\right) = \left[-\frac{\mathrm{i}e^2 c_{\beta-\alpha}}{2 c_W} \right]$$

$$C_{163}\left(H^0, H^+, \gamma, W^-\right) = \left[-\frac{\mathrm{i}e^2 s_{\beta-\alpha}}{2 s_W} \right]$$

$$C_{164}\left(H^0, H^+, Z, W^-\right) = \left[\frac{\mathrm{i}e^2 s_{\beta-\alpha}}{2 c_W} \right]$$

$$C_{165}\left(H^0, G^+, \gamma, W^-\right) = \left[\frac{\mathrm{i}e^2 c_{\beta-\alpha}}{2 s_W} \right]$$

$$C_{166}\left(H^0, G^+, Z, W^-\right) = \left[-\frac{\mathrm{i}e^2 c_{\beta-\alpha}}{2 c_W} \right]$$

$$C_{167}\left(A^0, A^0, Z, Z\right) = \left[\frac{\mathrm{i}e^2}{2 c_W^2 s_W^2} \right]$$

$$C_{168}\left(A^0, A^0, W^-, W^+\right) = \left[\frac{\mathrm{i}e^2}{2 s_W^2} \right]$$

$$C_{169}\left(A^0, H^-, \gamma, W^+\right) = \left[-\frac{e^2}{2 s_W} \right]$$

$$C_{170}\left(A^0, H^-, Z, W^+\right) = \left[\frac{e^2}{2 c_W} \right]$$

$$C_{171}\left(A^0, H^+, \gamma, W^-\right) = \left[\frac{e^2}{2 s_W} \right]$$

$$C_{172}\left(A^0, H^+, Z, W^-\right) = \left[-\frac{e^2}{2 c_W} \right]$$

$$C_{173}\left(G^0, G^-, \gamma, W^+\right) = \left[-\frac{e^2}{2 s_W} \right]$$

$$C_{174}\left(G^0, G^-, Z, W^+\right) = \left[\frac{e^2}{2 c_W} \right]$$

$$\underset{175}{C}\left(G^0, G^+, \gamma, W^-\right) = \left[\ \frac{e^2}{2 s_W}\ \right]$$

$$\underset{176}{C}\left(G^0, G^+, Z, W^-\right) = \left[\ -\frac{e^2}{2 c_W}\ \right]$$

$$\underset{177}{C}\left(H^-, H^+, \gamma, \gamma\right) = \left[\ 2 i e^2\ \right]$$

$$\underset{178}{C}\left(H^-, H^+, \gamma, Z\right) = \left[\ \frac{i e^2}{c_W s_W}\left(c_W^2 - s_W^2\right)\ \right]$$

$$\underset{179}{C}\left(H^-, H^+, Z, Z\right) = \left[\ \frac{i e^2}{2 c_W^2 s_W^2}\left(c_W^2 - s_W^2\right)^2\ \right]$$

$$\underset{180}{C}\left(H^-, H^+, W^-, W^+\right) = \left[\ \frac{i e^2}{2 s_W^2}\ \right]$$

$$\underset{350}{C}\left(\tilde{\nu}_{g1}, \tilde{\nu}_{g2}^{\dagger}, Z, Z\right) = \left[\ \frac{i e^2 \delta_{g1,g2}}{2 c_W^2 s_W^2}\ \right]$$

$$\underset{351}{C}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, \gamma, \gamma\right) = \left[\ 2 i e^2 \delta_{g1,g2} \delta_{s1,s2}\ \right]$$

$$\underset{352}{C}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, \gamma, Z\right) = \left[\ \frac{i e^2 \delta_{g1,g2}}{c_W s_W}\left(\left(1 - 2 s_W^2\right) U_{s1,1}^{\tilde{e}_{g1}*} U_{s2,1}^{\tilde{e}_{g1}} - 2 s_W^2 U_{s1,2}^{\tilde{e}_{g1}*} U_{s2,2}^{\tilde{e}_{g1}}\right)\ \right]$$

$$\underset{353}{C}\left(\tilde{e}_{g1}^{s1}, \tilde{e}_{g2}^{s2,\dagger}, Z, Z\right) = \left[\ \frac{i e^2 \delta_{g1,g2}}{2 c_W^2 s_W^2}\left(\left(1 - 2 s_W^2\right)^2 U_{s1,1}^{\tilde{e}_{g1}*} U_{s2,1}^{\tilde{e}_{g1}} + 4 s_W^4 U_{s1,2}^{\tilde{e}_{g1}*} U_{s2,2}^{\tilde{e}_{g1}}\right)\ \right]$$

$$\underset{354}{C}\left(\tilde{u}_{a1}, \tilde{u}_{a2}^{\dagger}, \gamma, \gamma\right) = \left[\ \frac{8}{9} i e^2 \delta_{a1,a2}\ \right]$$

$$\underset{355}{C}\left(\tilde{u}_{a1}, \tilde{u}_{a2}^{\dagger}, \gamma, Z\right) = \left[\ \frac{2 i e^2}{9 c_W s_W}\left(\sum_{j2=1}^{3}\left(R_{a1,j2}^{\tilde{u}*} R_{a2,j2}^{\tilde{u}}\left(3 - 4 s_W^2\right) - 4 R_{a1,3+j2}^{\tilde{u}*} R_{a2,3+j2}^{\tilde{u}} s_W^2\right)\right)\ \right]$$

$$\underset{356}{C}\left(\tilde{u}_{a1}, \tilde{u}_{a2}^{\dagger}, Z, Z\right) = \left[\ \frac{i e^2}{18 c_W^2 s_W^2}\left(\sum_{j2=1}^{3}\left(R_{a1,j2}^{\tilde{u}*} R_{a2,j2}^{\tilde{u}}\left(3 - 4 s_W^2\right)^2 + 16 R_{a1,3+j2}^{\tilde{u}*} R_{a2,3+j2}^{\tilde{u}} s_W^4\right)\right)\ \right]$$

$$\underset{357}{C}\left(\tilde{d}_{a1}, \tilde{d}_{a2}^{\dagger}, \gamma, \gamma\right) = \left[\ \frac{2}{9} i e^2 \delta_{a1,a2}\ \right]$$

$$C\left(\tilde{d}_{a1}, \tilde{d}^{\dagger}_{a2}, \gamma, Z\right) = \left[\frac{ie^2}{9 c_W s_W} \left(\sum_{j2=1}^{3} \left(R^{\tilde{d}*}_{a1,j2} R^{\tilde{d}}_{a2,j2} \left(3 - 2 s_W^2\right) - 2 R^{\tilde{d}*}_{a1,3+j2} R^{\tilde{d}}_{a2,3+j2} s_W^2 \right) \right) \right]$$

$$C\left(\tilde{d}_{a1}, \tilde{d}^{\dagger}_{a2}, Z, Z\right) = \left[\frac{ie^2}{18 c_W^2 s_W^2} \left(\sum_{j2=1}^{3} \left(R^{\tilde{d}*}_{a1,j2} R^{\tilde{d}}_{a2,j2} \left(3 - 2 s_W^2\right)^2 + 4 R^{\tilde{d}*}_{a1,3+j2} R^{\tilde{d}}_{a2,3+j2} s_W^4 \right) \right) \right]$$

$$C\left(\tilde{u}_{a1}, \tilde{d}^{\dagger}_{a2}, \gamma, W^-\right) = \left[\frac{ie^2}{3\sqrt{2} s_W} \left(\sum_{j1=1}^{3} \left(\sum_{j2=1}^{3} \mathrm{CKM}^{*}_{j1,j2} R^{\tilde{d}}_{a2,j2} \right) R^{\tilde{u}*}_{a1,j1} \right) \right]$$

$$C\left(\tilde{d}_{a1}, \tilde{u}^{\dagger}_{a2}, \gamma, W^+\right) = \left[\frac{ie^2}{3\sqrt{2} s_W} \left(\sum_{j2=1}^{3} \left(\sum_{j1=1}^{3} \mathrm{CKM}_{j1,j2} R^{\tilde{u}}_{a2,j1} \right) R^{\tilde{d}*}_{a1,j2} \right) \right]$$

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

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

$$C\left(\tilde{u}_{a1}, \tilde{d}^{\dagger}_{a2}, Z, W^-\right) = \left[-\frac{ie^2}{3\sqrt{2} c_W} \left(\sum_{j1=1}^{3} \left(\sum_{j2=1}^{3} \mathrm{CKM}^{*}_{j1,j2} R^{\tilde{d}}_{a2,j2} \right) R^{\tilde{u}*}_{a1,j1} \right) \right]$$

$$C\left(\tilde{d}_{a1}, \tilde{u}^{\dagger}_{a2}, Z, W^+\right) = \left[-\frac{ie^2}{3\sqrt{2} c_W} \left(\sum_{j2=1}^{3} \left(\sum_{j1=1}^{3} \mathrm{CKM}_{j1,j2} R^{\tilde{u}}_{a2,j1} \right) R^{\tilde{d}*}_{a1,j2} \right) \right]$$

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

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

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

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

$$\underset{370}{C}\left(\tilde{u}_{a1}, \tilde{u}^{\dagger}_{a2}, W^{-}, W^{+}\right) = \left[\frac{i e^2}{2 s_W^2} \left(\sum_{j2=1}^{3} R^{\tilde{u}*}_{a1,j2} R^{\tilde{u}}_{a2,j2} \right) \right]$$

$$\underset{371}{C}\left(\tilde{d}_{a1}, \tilde{d}^{\dagger}_{a2}, W^{-}, W^{+}\right) = \left[\frac{i e^2}{2 s_W^2} \left(\sum_{j2=1}^{3} R^{\tilde{d}*}_{a1,j2} R^{\tilde{d}}_{a2,j2} \right) \right]$$

$$\underset{396}{C}\left(\tilde{u}_{a1}, \tilde{u}^{\dagger}_{a2}, g, g\right) = \left[i g_s^2 \delta_{a1,a2} \left((T^{g3} T^{g4})_{c2,c1} + (T^{g4} T^{g3})_{c2,c1} \right) \right]$$

$$\underset{397}{C}\left(\tilde{d}_{a1}, \tilde{d}^{\dagger}_{a2}, g, g\right) = \left[i g_s^2 \delta_{a1,a2} \left((T^{g3} T^{g4})_{c2,c1} + (T^{g4} T^{g3})_{c2,c1} \right) \right]$$

$$\underset{398}{C}\left(\tilde{u}_{a1}, \tilde{u}^{\dagger}_{a2}, g, \gamma\right) = \left[\frac{4}{3} i e g_s \delta_{a1,a2} T^{g3}_{c2,c1} \right]$$

$$\underset{399}{C}\left(\tilde{d}_{a1}, \tilde{d}^{\dagger}_{a2}, g, \gamma\right) = \left[-\frac{2}{3} i e g_s \delta_{a1,a2} T^{g3}_{c2,c1} \right]$$

$$\underset{400}{C}\left(\tilde{u}_{a1}, \tilde{u}^{\dagger}_{a2}, g, Z\right) = \left[\frac{2 i e g_s T^{g3}_{c2,c1}}{c_W s_W} \left(\sum_{j2=1}^{3} \left(\frac{1}{2} R^{\tilde{u}*}_{a1,j2} R^{\tilde{u}}_{a2,j2} - \frac{2}{3} \delta_{a1,a2} \delta_{j2,1} s_W^2 \right) \right) \right]$$

$$\underset{401}{C}\left(\tilde{d}_{a1}, \tilde{d}^{\dagger}_{a2}, g, Z\right) = \left[-\frac{2 i e g_s T^{g3}_{c2,c1}}{c_W s_W} \left(\sum_{j2=1}^{3} \left(\frac{1}{2} R^{\tilde{d}*}_{a1,j2} R^{\tilde{d}}_{a2,j2} - \frac{1}{3} \delta_{a1,a2} \delta_{j2,1} s_W^2 \right) \right) \right]$$

$$\underset{402}{C}\left(\tilde{u}_{a1}, \tilde{d}^{\dagger}_{a2}, g, W^{-}\right) = \left[\frac{\sqrt{2} i e g_s T^{g3}_{c2,c1}}{s_W} \left(\sum_{j1=1}^{3} \left(\sum_{j2=1}^{3} \mathrm{CKM}^{*}_{j1,j2} R^{\tilde{d}}_{a2,j2} \right) R^{\tilde{u}*}_{a1,j1} \right) \right]$$

$$\underset{403}{C}\left(\tilde{d}_{a1}, \tilde{u}^{\dagger}_{a2}, g, W^{+}\right) = \left[\frac{\sqrt{2} i e g_s T^{g3}_{c2,c1}}{s_W} \left(\sum_{j2=1}^{3} \left(\sum_{j1=1}^{3} \mathrm{CKM}_{j1,j2} R^{\tilde{u}}_{a2,j1} \right) R^{\tilde{d}*}_{a1,j2} \right) \right]$$

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$$\underset{39}{C}\left(\gamma, \gamma, W^{-}, W^{+}\right) = i e^2 \begin{bmatrix} -2 \\ \hline 1 \\ \hline 1 \end{bmatrix}$$

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

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

$$\underset{42}{C}\left(W^-, W^-, W^+, W^+\right) = \frac{\mathrm{i}e^2}{s_\mathrm{W}^2} \begin{bmatrix} 2 \\ \hline -1 \\ \hline -1 \end{bmatrix}$$

$$\underset{384}{C}(g, g, g, g) = -\mathrm{i}g_\mathrm{s}^2 \begin{bmatrix} f^{\mathrm{g1,g3,x}} f^{\mathrm{x,g2,g4}} - f^{\mathrm{g1,g4,x}} f^{\mathrm{x,g3,g2}} \\ \hline f^{\mathrm{g1,g2,x}} f^{\mathrm{x,g3,g4}} + f^{\mathrm{g1,g4,x}} f^{\mathrm{x,g3,g2}} \\ \hline -\left(f^{\mathrm{g1,g2,x}} f^{\mathrm{x,g3,g4}}\right) - f^{\mathrm{g1,g3,x}} f^{\mathrm{x,g2,g4}} \end{bmatrix}$$