

## SMbgf

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$$C_{56}(\bar{e}_{g1}, e_{g2}, H) = -\frac{ie\delta_{g1,g2}m_{e_{g1}}}{2M_W s_W} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$C_{59}(\bar{e}_{g1}, e_{g2}, G^0) = \frac{e\delta_{g1,g2}m_{e_{g1}}}{2M_W s_W} \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$C_{64}(\bar{\nu}_{g1}, e_{g2}, G^+) = -\frac{ie\delta_{g1,g2}m_{e_{g1}}}{\sqrt{2}M_W s_W} \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$C_{65}(\bar{e}_{g1}, \nu_{g2}, G^-) = -\frac{ie\delta_{g1,g2}m_{e_{g1}}}{\sqrt{2}M_W s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{403}(\bar{e}_{g1}, e_{g2}, \hat{H}) = -\frac{ie\delta_{g1,g2}m_{e_{g1}}}{2M_W s_W} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$C_{406}(\bar{e}_{g1}, e_{g2}, \hat{G}^0) = \frac{e\delta_{g1,g2}m_{e_{g1}}}{2M_W s_W} \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$C_{411}(\bar{\nu}_{g1}, e_{g2}, \hat{G}^+) = -\frac{ie\delta_{g1,g2}m_{e_{g1}}}{\sqrt{2}M_W s_W} \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

$$C_{412}(\bar{e}_{g1}, \nu_{g2}, \hat{G}^-) = -\frac{ie\delta_{g1,g2}m_{e_{g1}}}{\sqrt{2}M_W s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{57}(\bar{u}_{g1}, u_{g2}, H) = -\frac{ie\delta_{g1,g2}m_{u_{g1}}}{2M_W s_W} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$C_{58}(\bar{d}_{g1}, d_{g2}, H) = -\frac{ie\delta_{g1,g2}m_{d_{g1}}}{2M_W s_W} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$C_{60}(\bar{u}_{g1}, u_{g2}, G^0) = \frac{e\delta_{g1,g2}m_{u_{g1}}}{2M_W s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$C_{61}(\bar{d}_{g1}, d_{g2}, G^0) = \frac{e\delta_{g1,g2}m_{d_{g1}}}{2M_W s_W} \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$C_{62}(\bar{u}_{g1}, d_{g2}, G^+) = \frac{ie\text{CKM}_{g1,g2}}{\sqrt{2}M_W s_W} \begin{bmatrix} m_{u_{g1}} \\ -m_{d_{g2}} \end{bmatrix}$$

$$C_{63}(\bar{d}_{g1}, u_{g2}, G^-) = \frac{ie\text{CKM}_{g2,g1}^*}{\sqrt{2}M_W s_W} \begin{bmatrix} -m_{d_{g1}} \\ m_{u_{g2}} \end{bmatrix}$$

$$C_{404}(\bar{u}_{g1}, u_{g2}, \hat{H}) = -\frac{ie\delta_{g1,g2}m_{u_{g1}}}{2M_W s_W} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$C_{405}(\bar{d}_{g1}, d_{g2}, \hat{H}) = -\frac{ie\delta_{g1,g2}m_{d_{g1}}}{2M_W s_W} \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$_{407} C\left(\bar{u}_{g1}, u_{g2}, \hat{G}^0\right) = \frac{e\delta_{g1,g2}m_{u_{g1}}}{2M_W s_W} \left[ \begin{array}{c} 1 \\ -1 \end{array} \right]$$

$$_{408} C\left(\bar{d}_{g1}, d_{g2}, \hat{G}^0\right) = \frac{e\delta_{g1,g2}m_{d_{g1}}}{2M_W s_W} \left[ \begin{array}{c} -1 \\ 1 \end{array} \right]$$

$$_{409} C\left(\bar{u}_{g1}, d_{g2}, \hat{G}^+\right) = \frac{ie\text{CKM}_{g1,g2}}{\sqrt{2}M_W s_W} \left[ \begin{array}{c} m_{u_{g1}} \\ -m_{d_{g2}} \end{array} \right]$$

$$_{410} C\left(\bar{d}_{g1}, u_{g2}, \hat{G}^-\right) = \frac{ie\text{CKM}_{g2,g1}^*}{\sqrt{2}M_W s_W} \left[ \begin{array}{c} -m_{d_{g1}} \\ m_{u_{g2}} \end{array} \right]$$

**[FFV] 2 Leptons – Gauge Boson**

$$_{45} C\left(\bar{e}_{g1}, e_{g2}, \gamma\right) = ie\delta_{g1,g2} \left[ \begin{array}{c} 1 \\ 1 \end{array} \right]$$

$$_{48} C\left(\bar{\nu}_{g1}, \nu_{g2}, Z\right) = \frac{ie\delta_{g1,g2}}{2c_W s_W} \left[ \begin{array}{c} 1 \\ 0 \end{array} \right]$$

$$_{49} C\left(\bar{e}_{g1}, e_{g2}, Z\right) = \frac{ie\delta_{g1,g2}}{c_W} \left[ \begin{array}{c} -\frac{1}{s_W} \left(\frac{1}{2} - s_W^2\right) \\ s_W \end{array} \right]$$

$$_{52} C\left(\bar{\nu}_{g1}, e_{g2}, W^+\right) = \frac{ie\delta_{g1,g2}}{\sqrt{2}s_W} \left[ \begin{array}{c} 1 \\ 0 \end{array} \right]$$

$$_{53} C\left(\bar{e}_{g1}, \nu_{g2}, W^{-}\right)=\frac{i e \delta_{g 1, g 2}}{\sqrt{2} s_W}\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$_{392} C\left(\bar{e}_{g 1}, e_{g 2}, \hat{\gamma}\right)=i e \delta_{g 1, g 2}\left[\begin{array}{c} 1 \\ \hline 1 \end{array}\right]$$

$$_{395} C\left(\bar{\nu}_{g 1}, \nu_{g 2}, \hat{Z}\right)=\frac{i e \delta_{g 1, g 2}}{2 c_W s_W}\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$_{396} C\left(\bar{e}_{g 1}, e_{g 2}, \hat{Z}\right)=\frac{i e \delta_{g 1, g 2}}{c_W}\left[\begin{array}{c} \frac{1}{s_W}\left(\frac{1}{2}-c_W^2\right) \\ \hline s_W \end{array}\right]$$

$$_{399} C\left(\bar{\nu}_{g 1}, e_{g 2}, \hat{W}^{+}\right)=\frac{i e \delta_{g 1, g 2}}{\sqrt{2} s_W}\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

$$_{400} C\left(\bar{e}_{g 1}, \nu_{g 2}, \hat{W}^{-}\right)=\frac{i e \delta_{g 1, g 2}}{\sqrt{2} s_W}\left[\begin{array}{c} 1 \\ \hline 0 \end{array}\right]$$

**[FFV] 2 Quarks – Gauge Boson**

$$_{46} C\left(\bar{u}_{g 1}, u_{g 2}, \gamma\right)=-\frac{2}{3} i e \delta_{g 1, g 2}\left[\begin{array}{c} 1 \\ \hline 1 \end{array}\right]$$

$$_{47} C\left(\bar{d}_{g 1}, d_{g 2}, \gamma\right)=\frac{1}{3} i e \delta_{g 1, g 2}\left[\begin{array}{c} 1 \\ \hline 1 \end{array}\right]$$

$$C_{50}(\bar{u}_{g1}, u_{g2}, Z) = \frac{ie\delta_{g1,g2}}{c_W} \left[ \frac{\frac{1}{s_W} \left( \frac{1}{2} - \frac{2}{3}s_W^2 \right)}{-\frac{2s_W}{3}} \right]$$

$$C_{51}(\bar{d}_{g1}, d_{g2}, Z) = \frac{ie\delta_{g1,g2}}{c_W} \left[ \frac{-\frac{1}{s_W} \left( \frac{1}{2} - \frac{1}{3}s_W^2 \right)}{\frac{s_W}{3}} \right]$$

$$C_{54}(\bar{u}_{g1}, d_{g2}, W^+) = \frac{ie\text{CKM}_{g1,g2}}{\sqrt{2}s_W} \left[ \frac{1}{0} \right]$$

$$C_{55}(\bar{d}_{g1}, u_{g2}, W^-) = \frac{ie\text{CKM}_{g2,g1}^*}{\sqrt{2}s_W} \left[ \frac{1}{0} \right]$$

$$C_{393}(\bar{u}_{g1}, u_{g2}, \hat{\gamma}) = -\frac{2}{3}ie\delta_{g1,g2} \left[ \frac{1}{1} \right]$$

$$C_{394}(\bar{d}_{g1}, d_{g2}, \hat{\gamma}) = \frac{1}{3}ie\delta_{g1,g2} \left[ \frac{1}{1} \right]$$

$$C_{397}(\bar{u}_{g1}, u_{g2}, \hat{Z}) = -\frac{ie\delta_{g1,g2}}{c_W} \left[ \frac{\frac{1}{6s_W} (1 - 4c_W^2)}{\frac{2s_W}{3}} \right]$$

$$C_{398}(\bar{d}_{g1}, d_{g2}, \hat{Z}) = \frac{ie\delta_{g1,g2}}{c_W} \left[ \frac{-\frac{1}{6s_W} (1 + 2c_W^2)}{\frac{s_W}{3}} \right]$$

$$C_{401}(\bar{u}_{g1}, d_{g2}, \hat{W}^+) = \frac{ie\text{CKM}_{g1,g2}}{\sqrt{2}s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{402}(\bar{d}_{g1}, u_{g2}, \hat{W}^-) = \frac{ie\text{CKM}_{g2,g1}^*}{\sqrt{2}s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

[SSS] **3 Higgs**

$$C_{13}(H, H, H) = \begin{bmatrix} -\frac{3ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$C_{14}(H, G^0, G^0) = \begin{bmatrix} -\frac{ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$C_{15}(G^-, H, G^+) = \begin{bmatrix} -\frac{ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$C_{159}(\hat{H}, \hat{H}, \hat{H}) = \begin{bmatrix} -\frac{3ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$C_{160}(\hat{H}, \hat{H}, H) = \begin{bmatrix} -\frac{3ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$C_{161}(\hat{H}, \hat{G}^0, \hat{G}^0) = \begin{bmatrix} -\frac{ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$C_{162}(\hat{H}, \hat{G}^0, G^0) = \begin{bmatrix} -\frac{ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$C_{163}(H, \hat{G}^0, \hat{G}^0) = \begin{bmatrix} -\frac{ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$C_{164}(\hat{G}^-, \hat{H}, \hat{G}^+) = \begin{bmatrix} -\frac{ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$C_{165}(\hat{G}^-, \hat{H}, G^+) = \begin{bmatrix} -\frac{ieM_H^2}{2M_W s_W} \end{bmatrix}$$

$$_{166} C(\hat{G}^-, H, \hat{G}^+) = \left[ -\frac{ieM_H^2}{2M_W s_W} \right]$$

$$_{167} C(G^-, \hat{H}, \hat{G}^+) = \left[ -\frac{ieM_H^2}{2M_W s_W} \right]$$

$$_{429} C(\hat{H}, H, H) = \left[ -\frac{3ieM_H^2}{2M_W s_W} \right]$$

$$_{430} C(\hat{H}, G^0, G^0) = \left[ -ie \left( \frac{\xi_Q M_W}{s_W c_W^2} + \frac{M_H^2}{2M_W s_W} \right) \right]$$

$$_{431} C(H, \hat{G}^0, G^0) = \left[ ie \left( \frac{\xi_Q M_W}{s_W c_W^2} - \frac{M_H^2}{2M_W s_W} \right) \right]$$

$$_{432} C(\hat{H}, G^+, G^-) = \left[ -ie \left( \frac{\xi_Q M_W}{s_W} + \frac{M_H^2}{2M_W s_W} \right) \right]$$

$$_{433} C(H, \hat{G}^+, G^-) = \left[ ie \left( \frac{\xi_Q M_W}{2s_W} - \frac{M_H^2}{2M_W s_W} \right) \right]$$

$$_{434} C(H, G^+, \hat{G}^-) = \left[ ie \left( \frac{\xi_Q M_W}{2s_W} - \frac{M_H^2}{2M_W s_W} \right) \right]$$

$$_{435} C(G^0, \hat{G}^+, G^-) = \left[ \frac{e\xi_Q M_W s_W}{2c_W^2} \right]$$

$$_{436} C(G^0, G^+, \hat{G}^-) = \left[ -\frac{e\xi_Q M_W s_W}{2c_W^2} \right]$$

**[SSV] 2 Higgs – Gauge Boson**

$$_{32} C(G^0, H, Z) = \frac{e}{2c_W s_W} \left[ \frac{1}{-1} \right]$$

$$_{33} C(G^+, G^-, \gamma) = ie \left[ \frac{-1}{1} \right]$$



$$C_{34}(G^+, G^-, Z) = -\frac{ie}{2c_W s_W} (c_W^2 - s_W^2) \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$C_{35}(G^-, H, W^+) = \frac{ie}{2s_W} \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$C_{36}(G^+, H, W^-) = \frac{ie}{2s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$C_{37}(G^-, G^0, W^+) = \frac{e}{2s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$C_{38}(G^+, G^0, W^-) = \frac{e}{2s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$C_{328}(\hat{G}^0, \hat{H}, \hat{Z}) = \frac{e}{2c_W s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$C_{329}(\hat{G}^0, \hat{H}, Z) = \frac{e}{2c_W s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$C_{330}(\hat{G}^0, H, \hat{Z}) = \frac{e}{2c_W s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$C_{331}(G^0, \hat{H}, \hat{Z}) = \frac{e}{2c_W s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$_{332} C \left( G^0, H, \hat{Z} \right) = \frac{e}{2c_W s_W} \left[ \frac{1}{-1} \right]$$

$$_{333} C \left( \hat{G}^+, \hat{G}^-, \hat{\gamma} \right) = ie \left[ \frac{-1}{1} \right]$$

$$_{334} C \left( \hat{G}^+, \hat{G}^-, \gamma \right) = ie \left[ \frac{-1}{1} \right]$$

$$_{335} C \left( \hat{G}^+, G^-, \hat{\gamma} \right) = ie \left[ \frac{-1}{1} \right]$$

$$_{336} C \left( G^+, \hat{G}^-, \hat{\gamma} \right) = ie \left[ \frac{-1}{1} \right]$$

$$_{337} C \left( G^+, G^-, \hat{\gamma} \right) = ie \left[ \frac{-1}{1} \right]$$

$$_{338} C \left( \hat{G}^+, \hat{G}^-, \hat{Z} \right) = \frac{ie}{2c_W s_W} \left( c_W^2 - s_W^2 \right) \left[ \frac{1}{-1} \right]$$

$$_{339} C \left( \hat{G}^+, \hat{G}^-, Z \right) = \frac{ie}{2c_W s_W} \left( c_W^2 - s_W^2 \right) \left[ \frac{1}{-1} \right]$$

$$_{340} C \left( \hat{G}^+, G^-, \hat{Z} \right) = \frac{ie}{2c_W s_W} \left( c_W^2 - s_W^2 \right) \left[ \frac{1}{-1} \right]$$

$$_{341} C \left( G^+, \hat{G}^-, \hat{Z} \right) = \frac{ie}{2c_W s_W} \left( c_W^2 - s_W^2 \right) \left[ \frac{1}{-1} \right]$$

$$_{342} C \left( G^+, G^-, \hat{Z} \right) = \frac{ie}{2c_W s_W} \left( c_W^2 - s_W^2 \right) \left[ \frac{1}{-1} \right]$$

$$_{343} C \left( \hat{G}^-, \hat{H}, \hat{W}^+ \right) = \frac{ie}{2s_W} \left[ \frac{-1}{1} \right]$$

$$_{344} C \left( \hat{G}^-, \hat{H}, W^+ \right) = \frac{ie}{2s_W} \left[ \frac{-1}{1} \right]$$

$$_{345} C \left( \hat{G}^-, H, \hat{W}^+ \right) = \frac{ie}{2s_W} \left[ \frac{-1}{1} \right]$$

$$_{346} C \left( G^-, \hat{H}, \hat{W}^+ \right) = \frac{ie}{2s_W} \left[ \frac{-1}{1} \right]$$

$$_{347} C \left( G^-, H, \hat{W}^+ \right) = \frac{ie}{2s_W} \left[ \frac{-1}{1} \right]$$

$$_{348} C \left( \hat{G}^+, \hat{H}, \hat{W}^- \right) = \frac{ie}{2s_W} \left[ \frac{1}{-1} \right]$$

$$_{349} C \left( \hat{G}^+, \hat{H}, W^- \right) = \frac{ie}{2s_W} \left[ \frac{1}{-1} \right]$$

$$_{350} C\left(\hat{G}^+, H, \hat{W}^-\right)=\frac{i e}{2 s_W}\left[\frac{1}{-1}\right]$$

$$_{351} C\left(G^+, \hat{H}, \hat{W}^-\right)=\frac{i e}{2 s_W}\left[\frac{1}{-1}\right]$$

$$_{352} C\left(G^+, H, \hat{W}^-\right)=\frac{i e}{2 s_W}\left[\frac{1}{-1}\right]$$

$$_{353} C\left(\hat{G}^-, \hat{G}^0, \hat{W}^+\right)=\frac{e}{2 s_W}\left[\frac{1}{-1}\right]$$

$$_{354} C\left(\hat{G}^-, \hat{G}^0, W^+\right)=\frac{e}{2 s_W}\left[\frac{1}{-1}\right]$$

$$_{355} C\left(\hat{G}^-, G^0, \hat{W}^+\right)=\frac{e}{2 s_W}\left[\frac{1}{-1}\right]$$

$$_{356} C\left(G^-, \hat{G}^0, \hat{W}^+\right)=\frac{e}{2 s_W}\left[\frac{1}{-1}\right]$$

$$_{357} C\left(G^-, G^0, \hat{W}^+\right)=\frac{e}{2 s_W}\left[\frac{1}{-1}\right]$$

$$_{358} C\left(\hat{G}^+, \hat{G}^0, \hat{W}^-\right)=\frac{e}{2 s_W}\left[\frac{1}{-1}\right]$$

$$_{359} C\left(\hat{G}^+, \hat{G}^0, W^-\right) = \frac{e}{2s_W} \left[ \frac{1}{-1} \right]$$

$$_{360} C\left(\hat{G}^+, G^0, \hat{W}^-\right) = \frac{e}{2s_W} \left[ \frac{1}{-1} \right]$$

$$_{361} C\left(G^+, \hat{G}^0, \hat{W}^-\right) = \frac{e}{2s_W} \left[ \frac{1}{-1} \right]$$

$$_{362} C\left(G^+, G^0, \hat{W}^-\right) = \frac{e}{2s_W} \left[ \frac{1}{-1} \right]$$

$$_{437} C\left(\hat{G}^-, H, W^+\right) = -\frac{ie}{s_W} \left[ \frac{1}{0} \right]$$

$$_{438} C\left(\hat{G}^+, H, W^-\right) = \frac{ie}{s_W} \left[ \frac{1}{0} \right]$$

$$_{439} C\left(\hat{H}, G^-, W^+\right) = \frac{ie}{s_W} \left[ \frac{1}{0} \right]$$

$$_{440} C\left(\hat{H}, G^+, W^-\right) = -\frac{ie}{s_W} \left[ \frac{1}{0} \right]$$

$$_{441} C\left(\hat{G}^-, G^0, W^+\right) = \frac{e}{s_W} \left[ \frac{1}{0} \right]$$

$$C_{442}(\hat{G}^+, G^0, W^-) = \frac{e}{s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{443}(\hat{G}^0, G^-, W^+) = -\frac{e}{s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{444}(\hat{G}^0, G^+, W^-) = -\frac{e}{s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{445}(\hat{G}^-, G^+, Z) = -\frac{ie}{c_W s_W} (c_W^2 - s_W^2) \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{446}(\hat{G}^+, G^-, Z) = \frac{ie}{c_W s_W} (c_W^2 - s_W^2) \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{447}(\hat{G}^-, G^+, \gamma) = 2ie \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{448}(\hat{G}^+, G^-, \gamma) = -2ie \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{449}(\hat{G}^0, H, Z) = \frac{e}{c_W s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{450}(\hat{H}, G^0, Z) = -\frac{e}{c_W s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

[SUU] **Higgs – 2 Ghosts**

$$C_{78}(H, \bar{u}_Z, u_Z) = \left[ -\frac{ie\xi_Z M_Z}{2c_W s_W} \right]$$

$$C_{79}(H, \bar{u}_-, u_-) = \left[ -\frac{ie\xi_W M_W}{2s_W} \right]$$

$$C_{80}(H, \bar{u}_+, u_+) = \left[ -\frac{ie\xi_W M_W}{2s_W} \right]$$

$$C_{81}(G^0, \bar{u}_+, u_+) = \left[ \frac{e\xi_W M_W}{2s_W} \right]$$

$$C_{82}(G^0, \bar{u}_-, u_-) = \left[ -\frac{e\xi_W M_W}{2s_W} \right]$$

$$C_{83}(G^+, \bar{u}_Z, u_-) = \left[ \frac{ie\xi_Z M_Z}{2s_W} \right]$$

$$C_{84}(G^-, \bar{u}_Z, u_+) = \left[ \frac{ie\xi_Z M_Z}{2s_W} \right]$$

$$C_{85}(G^+, \bar{u}_+, u_Z) = \left[ -\frac{ie\xi_W M_W}{2c_W s_W} (c_W^2 - s_W^2) \right]$$

$$C_{86}(G^-, \bar{u}_-, u_Z) = \left[ -\frac{ie\xi_W M_W}{2c_W s_W} (c_W^2 - s_W^2) \right]$$

$$C_{87}(G^+, \bar{u}_+, u_\gamma) = \left[ ie\xi_W M_W \right]$$

$$C_{88}(G^-, \bar{u}_-, u_\gamma) = \left[ ie\xi_W M_W \right]$$

$$C_{474}(\hat{G}^+, \bar{u}_+, u_Z) = \left[ \frac{ie\xi_Q M_W s_W}{c_W} \right]$$

$$C_{475}(\hat{G}^-, \bar{u}_-, u_Z) = \left[ \frac{ie\xi_Q M_W s_W}{c_W} \right]$$

$$C_{476}(\hat{G}^+, \bar{u}_+, u_\gamma) = \left[ ie\xi_Q M_W \right]$$

$$C_{477}(\hat{G}^-, \bar{u}_-, u_\gamma) = \left[ ie\xi_Q M_W \right]$$

$$C_{478}(\hat{G}^+, \bar{u}_Z, u_-) = \left[ \frac{ie\xi_Q M_W s_W}{c_W} \right]$$

$$C_{479}(\hat{G}^-, \bar{u}_Z, u_+) = \left[ \frac{ie\xi_Q M_W s_W}{c_W} \right]$$

$$C_{480}(\hat{G}^+, \bar{u}_\gamma, u_-) = \left[ ie\xi_Q M_W \right]$$

$$C_{481}(\hat{G}^-, \bar{u}_\gamma, u_+) = \left[ ie\xi_Q M_W \right]$$

$$C_{482}(\hat{H}, \bar{u}_+, u_+) = \left[ -\frac{ie\xi_Q M_W}{s_W} \right]$$

$$C_{483}(\hat{H}, \bar{u}_-, u_-) = \left[ -\frac{ie\xi_Q M_W}{s_W} \right]$$

$$C_{484}(\hat{H}, \bar{u}_Z, u_Z) = \left[ -\frac{ie\xi_Q M_W}{s_W c_W^2} \right]$$

[SVV] **Higgs – 2 Gauge Bosons**

$$C_{39}(H, W^+, W^-) = \left[ \frac{ieM_W}{s_W} \right]$$

$$C_{40}(H, Z, Z) = \left[ \frac{ieM_W}{s_W c_W^2} \right]$$

$$C_{41}(G^+, W^-, Z) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$C_{42}(G^-, W^+, Z) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$C_{43}(G^+, W^-, \gamma) = \left[ -ieM_W \right]$$

$$C_{44}(G^-, W^+, \gamma) = \left[ -ieM_W \right]$$



$$_{363} C(\hat{H}, \hat{W}^+, \hat{W}^-) = \left[ \frac{ieM_W}{s_W} \right]$$

$$_{364} C(\hat{H}, \hat{W}^+, W^-) = \left[ \frac{ieM_W}{s_W} \right]$$

$$_{365} C(\hat{H}, W^+, \hat{W}^-) = \left[ \frac{ieM_W}{s_W} \right]$$

$$_{366} C(H, \hat{W}^+, \hat{W}^-) = \left[ \frac{ieM_W}{s_W} \right]$$

$$_{367} C(\hat{H}, W^+, W^-) = \left[ \frac{ieM_W}{s_W} \right]$$

$$_{368} C(\hat{H}, \hat{Z}, \hat{Z}) = \left[ \frac{ieM_W}{s_W c_W^2} \right]$$

$$_{369} C(\hat{H}, \hat{Z}, Z) = \left[ \frac{ieM_W}{s_W c_W^2} \right]$$

$$_{370} C(H, \hat{Z}, \hat{Z}) = \left[ \frac{ieM_W}{s_W c_W^2} \right]$$

$$_{371} C(\hat{H}, Z, Z) = \left[ \frac{ieM_W}{s_W c_W^2} \right]$$

$$_{372} C(\hat{G}^+, \hat{W}^-, \hat{Z}) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{373} C(\hat{G}^+, \hat{W}^-, Z) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{374} C(\hat{G}^+, W^-, \hat{Z}) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{375} C(G^+, \hat{W}^-, \hat{Z}) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{376} C(\hat{G}^+, W^-, Z) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{377} C(\hat{G}^-, \hat{W}^+, \hat{Z}) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{378} C(\hat{G}^-, \hat{W}^+, Z) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{379} C(\hat{G}^-, W^+, \hat{Z}) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{380} C(G^-, \hat{W}^+, \hat{Z}) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{381} C(\hat{G}^-, W^+, Z) = \left[ -\frac{ieM_W s_W}{c_W} \right]$$

$$_{382} C(\hat{G}^+, \hat{W}^-, \hat{\gamma}) = \left[ -ieM_W \right]$$

$$_{383} C(\hat{G}^+, \hat{W}^-, \gamma) = \left[ -ieM_W \right]$$

$$_{384} C(\hat{G}^+, W^-, \hat{\gamma}) = \left[ -ieM_W \right]$$

$$_{385} C(G^+, \hat{W}^-, \hat{\gamma}) = \left[ -ieM_W \right]$$

$$_{386} C(\hat{G}^+, W^-, \gamma) = \left[ -ieM_W \right]$$

$$_{387} C(\hat{G}^-, \hat{W}^+, \hat{\gamma}) = \left[ -ieM_W \right]$$

$$_{388} C(\hat{G}^-, \hat{W}^+, \gamma) = \left[ -ieM_W \right]$$

$$_{389} C(\hat{G}^-, W^+, \hat{\gamma}) = \left[ -ieM_W \right]$$

$$_{390} C(G^-, \hat{W}^+, \hat{\gamma}) = \left[ -ieM_W \right]$$

$$_{391} C(\hat{G}^-, W^+, \gamma) = \left[ -ieM_W \right]$$

$$_{451} C(H, \hat{W}^+, W^-) = \left[ \frac{ieM_W}{s_W} \right]$$

$$_{452} C(H, \hat{W}^-, W^+) = \left[ \frac{ieM_W}{s_W} \right]$$

$$_{453} C(H, \hat{Z}, Z) = \left[ \frac{ieM_W}{s_W c_W^2} \right]$$

$$_{454} C(G^+, \hat{Z}, W^-) = \left[ -\frac{ieM_W}{c_W s_W} \right]$$

$$_{455} C(G^-, \hat{Z}, W^+) = \left[ -\frac{ieM_W}{c_W s_W} \right]$$

$$_{456} C(G^+, \hat{W}^-, Z) = \left[ \frac{ieM_W}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{457} C(G^-, \hat{W}^+, Z) = \left[ \frac{ieM_W}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{458} C(G^+, \hat{W}^-, \gamma) = \left[ -2ieM_W \right]$$

$$_{459} C(G^-, \hat{W}^+, \gamma) = \left[ -2ieM_W \right]$$

$$_{460} C(G^0, \hat{W}^+, W^-) = \left[ \frac{eM_W}{s_W} \right]$$

$$_{461} C(G^0, \hat{W}^-, W^+) = \left[ -\frac{eM_W}{s_W} \right]$$

**[UVV] 2 Ghosts – Gauge Boson**

$$_{66} C(\bar{u}_-, u_-, \gamma) = -ie \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$_{67} C(\bar{u}_+, u_+, \gamma) = ie \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$_{68} C(\bar{u}_-, u_-, Z) = \frac{iec_W}{s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{69}(\bar{u}_+, u_+, Z) = -\frac{ie c_W}{s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{70}(\bar{u}_-, u_Z, W^-) = -\frac{ie c_W}{s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{71}(\bar{u}_Z, u_-, W^+) = -\frac{ie c_W}{s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{72}(\bar{u}_+, u_Z, W^+) = \frac{ie c_W}{s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{73}(\bar{u}_Z, u_+, W^-) = \frac{ie c_W}{s_W} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{74}(\bar{u}_-, u_\gamma, W^-) = ie \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{75}(\bar{u}_\gamma, u_-, W^+) = ie \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{76}(\bar{u}_+, u_\gamma, W^+) = -ie \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$C_{77}(\bar{u}_\gamma, u_+, W^-) = -ie \begin{bmatrix} 1 \\ 0 \end{bmatrix}$$

$$_{462} C(\bar{u}_+, u_Z, \hat{W}^+) = \frac{ie c_W}{s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$_{463} C(\bar{u}_-, u_Z, \hat{W}^-) = \frac{ie c_W}{s_W} \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$_{464} C(\bar{u}_+, u_\gamma, \hat{W}^+) = ie \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$_{465} C(\bar{u}_-, u_\gamma, \hat{W}^-) = ie \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$_{466} C(\bar{u}_Z, u_-, \hat{W}^+) = \frac{ie c_W}{s_W} \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$_{467} C(\bar{u}_Z, u_+, \hat{W}^-) = \frac{ie c_W}{s_W} \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$_{468} C(\bar{u}_\gamma, u_-, \hat{W}^+) = ie \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$_{469} C(\bar{u}_\gamma, u_+, \hat{W}^-) = ie \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$_{470} C(\bar{u}_+, u_+, \hat{\gamma}) = ie \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$_{471} C(\bar{u}_-, u_-, \hat{\gamma}) = ie \left[ \frac{-1}{1} \right]$$

$$_{472} C(\bar{u}_+, u_+, \hat{Z}) = \frac{iec_W}{s_W} \left[ \frac{-1}{1} \right]$$

$$_{473} C(\bar{u}_-, u_-, \hat{Z}) = \frac{iec_W}{s_W} \left[ \frac{1}{-1} \right]$$

**[VVV] 3 Gauge Bosons**

$$_5 C(\gamma, W^+, W^-) = -ie \left[ \frac{1}{0} \right]$$

$$_6 C(Z, W^+, W^-) = \frac{iec_W}{s_W} \left[ \frac{1}{0} \right]$$

$$C_{121}(\hat{\gamma}, \hat{W}^+, \hat{W}^-) = -ie \begin{bmatrix} 1 \\ \hline 0 \\ \hline 0 \\ \hline 0 \end{bmatrix}$$

$$C_{122}(\hat{\gamma}, \hat{W}^+, W^-) = -ie \begin{bmatrix} 1 \\ \hline 0 \\ \hline 0 \\ \hline 0 \end{bmatrix}$$

$$C_{123}(\hat{\gamma}, W^+, \hat{W}^-) = -ie \begin{bmatrix} 1 \\ \hline 0 \\ \hline 0 \\ \hline 0 \end{bmatrix}$$

$$C_{124}(\gamma, \hat{W}^+, \hat{W}^-) = -ie \begin{bmatrix} 1 \\ \hline 0 \\ \hline 0 \\ \hline 0 \end{bmatrix}$$

$$C_{125}(\hat{Z}, \hat{W}^+, \hat{W}^-) = \frac{iec_W}{s_W} \begin{bmatrix} 1 \\ \hline 0 \\ \hline 0 \\ \hline 0 \end{bmatrix}$$

$$C_{126}(\hat{Z}, \hat{W}^+, W^-) = \frac{iec_W}{s_W} \begin{bmatrix} 1 \\ \hline 0 \\ \hline 0 \\ \hline 0 \end{bmatrix}$$

$$C_{127}(\hat{Z}, W^+, \hat{W}^-) = \frac{iec_W}{s_W} \begin{bmatrix} 1 \\ \hline 0 \\ \hline 0 \\ \hline 0 \end{bmatrix}$$

$$C_{128}(Z, \hat{W}^+, \hat{W}^-) = \frac{iec_W}{s_W} \begin{bmatrix} 1 \\ \hline 0 \\ \hline 0 \\ \hline 0 \end{bmatrix}$$



$$C_{423}(\hat{\gamma}, W^+, W^-) = ie \begin{bmatrix} -1 \\ \hline -\frac{1}{\xi_Q} \\ \hline \frac{1}{\xi_Q} \\ \hline 0 \end{bmatrix}$$

$$C_{424}(\hat{W}^+, W^-, \gamma) = ie \begin{bmatrix} -1 \\ \hline -\frac{1}{\xi_Q} \\ \hline \frac{1}{\xi_Q} \\ \hline 0 \end{bmatrix}$$

$$C_{425}(\hat{W}^-, \gamma, W^+) = ie \begin{bmatrix} -1 \\ \hline -\frac{1}{\xi_Q} \\ \hline \frac{1}{\xi_Q} \\ \hline 0 \end{bmatrix}$$

$$C_{426}(\hat{Z}, W^+, W^-) = \frac{iec_W}{s_W} \begin{bmatrix} 1 \\ \hline \frac{1}{\xi_Q} \\ \hline -\frac{1}{\xi_Q} \\ \hline 0 \end{bmatrix}$$

$$C_{427}(\hat{W}^+, W^-, Z) = \frac{ie c_W}{s_W} \begin{bmatrix} 1 \\ \frac{1}{\xi_Q} \\ -\frac{1}{\xi_Q} \\ 0 \end{bmatrix}$$

$$C_{428}(\hat{W}^-, Z, W^+) = \frac{ie c_W}{s_W} \begin{bmatrix} 1 \\ \frac{1}{\xi_Q} \\ -\frac{1}{\xi_Q} \\ 0 \end{bmatrix}$$

[SSSS] **4 Higgs**

$$C_7(H, H, H, H) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_8(H, H, G^0, G^0) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_9(H, H, G^-, G^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{10}(G^0, G^0, G^0, G^0) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{11}(G^0, G^0, G^-, G^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{12}(G^-, G^-, G^+, G^+) = \left[ -\frac{ie^2 M_H^2}{2M_W^2 s_W^2} \right]$$

$$C_{129}(\hat{H}, \hat{H}, \hat{H}, \hat{H}) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{130}(\hat{H}, \hat{H}, \hat{H}, H) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{131}(\hat{H}, H, H, H) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{132}(\hat{H}, \hat{H}, \hat{G}^0, \hat{G}^0) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{133}(\hat{H}, \hat{H}, \hat{G}^0, G^0) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{134}(\hat{H}, H, \hat{G}^0, \hat{G}^0) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{135}(\hat{H}, H, G^0, G^0) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{136}(H, H, \hat{G}^0, G^0) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{137}(\hat{H}, \hat{H}, \hat{G}^-, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{138}(\hat{H}, \hat{H}, \hat{G}^-, G^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{139}(\hat{H}, \hat{H}, G^-, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{140}(\hat{H}, H, \hat{G}^-, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{141}(\hat{H}, H, G^-, G^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{142}(H, H, \hat{G}^-, G^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{143}(H, H, G^-, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{144}(\hat{G}^0, \hat{G}^0, \hat{G}^0, \hat{G}^0) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{145}(\hat{G}^0, \hat{G}^0, \hat{G}^0, G^0) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{146}(\hat{G}^0, G^0, G^0, G^0) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{147}(\hat{G}^0, \hat{G}^0, \hat{G}^-, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{148}(\hat{G}^0, \hat{G}^0, \hat{G}^-, G^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{149}(\hat{G}^0, \hat{G}^0, G^-, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{150}(\hat{G}^0, G^0, \hat{G}^-, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{151}(\hat{G}^0, G^0, G^-, G^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{152}(G^0, G^0, \hat{G}^-, G^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{153}(G^0, G^0, G^-, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{154}(\hat{G}^-, \hat{G}^-, \hat{G}^+, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{2M_W^2 s_W^2} \right]$$

$$C_{155}(\hat{G}^-, \hat{G}^-, \hat{G}^+, G^+) = \left[ -\frac{ie^2 M_H^2}{2M_W^2 s_W^2} \right]$$

$$C_{156}(\hat{G}^-, G^-, \hat{G}^+, \hat{G}^+) = \left[ -\frac{ie^2 M_H^2}{2M_W^2 s_W^2} \right]$$

$$_{157} C(\hat{G}^-, G^-, G^+, G^+) = \left[ -\frac{ie^2 M_H^2}{2M_W^2 s_W^2} \right]$$

$$_{158} C(G^-, G^-, \hat{G}^+, G^+) = \left[ -\frac{ie^2 M_H^2}{2M_W^2 s_W^2} \right]$$

$$_{502} C(H, H, \hat{G}^+, \hat{G}^-) = \left[ -ie^2 \left( \frac{\xi_Q}{2s_W^2} + \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$_{503} C(\hat{H}, \hat{H}, G^+, G^-) = \left[ -ie^2 \left( \frac{\xi_Q}{2s_W^2} + \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$_{504} C(G^0, G^0, \hat{G}^+, \hat{G}^-) = \left[ -ie^2 \left( \frac{\xi_Q}{2s_W^2} + \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$_{505} C(\hat{G}^0, \hat{G}^0, G^+, G^-) = \left[ -ie^2 \left( \frac{\xi_Q}{2s_W^2} + \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$_{506} C(\hat{H}, H, \hat{G}^+, G^-) = \left[ ie^2 \left( \frac{\xi_Q}{4s_W^2} - \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$_{507} C(\hat{H}, H, G^+, \hat{G}^-) = \left[ ie^2 \left( \frac{\xi_Q}{4s_W^2} - \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$_{508} C(\hat{G}^0, G^0, \hat{G}^+, G^-) = \left[ ie^2 \left( \frac{\xi_Q}{4s_W^2} - \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$_{509} C(\hat{G}^0, G^0, G^+, \hat{G}^-) = \left[ ie^2 \left( \frac{\xi_Q}{4s_W^2} - \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$_{510} C(\hat{H}, G^0, \hat{G}^+, G^-) = \left[ \frac{e^2 \xi_Q}{4c_W^2} \right]$$

$$_{511} C(H, \hat{G}^0, \hat{G}^+, G^-) = \left[ -\frac{e^2 \xi_Q}{4c_W^2} \right]$$

$$_{512} C(\hat{H}, G^0, G^+, \hat{G}^-) = \left[ -\frac{e^2 \xi_Q}{4c_W^2} \right]$$

$$_{513} C(H, \hat{G}^0, G^+, \hat{G}^-) = \left[ \frac{e^2 \xi_Q}{4c_W^2} \right]$$

$$C_{514}(H, H, \hat{G}^0, \hat{G}^0) = \left[ -ie^2 \left( \frac{\xi_Q}{2c_W^2 s_W^2} + \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$C_{515}(\hat{H}, \hat{H}, G^0, G^0) = \left[ -ie^2 \left( \frac{\xi_Q}{2c_W^2 s_W^2} + \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$C_{516}(\hat{H}, H, \hat{G}^0, G^0) = \left[ ie^2 \left( \frac{\xi_Q}{4c_W^2 s_W^2} - \frac{M_H^2}{4M_W^2 s_W^2} \right) \right]$$

$$C_{517}(\hat{G}^+, \hat{G}^+, G^-, G^-) = \left[ ie^2 \left( \frac{\xi_Q}{2c_W^2 s_W^2} - \frac{M_H^2}{2M_W^2 s_W^2} \right) \right]$$

$$C_{518}(\hat{G}^-, \hat{G}^-, G^+, G^+) = \left[ ie^2 \left( \frac{\xi_Q}{2c_W^2 s_W^2} - \frac{M_H^2}{2M_W^2 s_W^2} \right) \right]$$

$$C_{519}(\hat{G}^-, \hat{G}^+, G^-, G^+) = \left[ -ie^2 \left( \frac{\xi_Q}{4c_W^2 s_W^2} + \frac{M_H^2}{2M_W^2 s_W^2} \right) \right]$$

$$C_{520}(\hat{H}, \hat{H}, H, H) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

$$C_{521}(\hat{G}^0, \hat{G}^0, G^0, G^0) = \left[ -\frac{3ie^2 M_H^2}{4M_W^2 s_W^2} \right]$$

**[SSUU] 2 Higgs – 2 Ghosts**

$$C_{634}(\hat{G}^+, G^-, \bar{u}_+, u_+) = \left[ -\frac{ie^2 \xi_Q}{2s_W^2} \right]$$

$$C_{635}(G^+, \hat{G}^-, \bar{u}_-, u_-) = \left[ -\frac{ie^2 \xi_Q}{2s_W^2} \right]$$

$$C_{636}(\hat{H}, H, \bar{u}_+, u_+) = \left[ -\frac{ie^2 \xi_Q}{4s_W^2} \right]$$

$$C_{637}(\hat{H}, H, \bar{u}_-, u_-) = \left[ -\frac{ie^2 \xi_Q}{4s_W^2} \right]$$

$$C_{638}(\hat{G}^0, G^0, \bar{u}_+, u_+) = \left[ -\frac{ie^2 \xi_Q}{4s_W^2} \right]$$

$$_{639} C \left( \hat{G}^0, G^0, \bar{u}_-, u_- \right) = \left[ -\frac{\mathrm{i}e^2\xi_Q}{4s_W^2} \right]$$

$$_{640} C \left( \hat{H}, H, \bar{u}_Z, u_Z \right) = \left[ -\frac{\mathrm{i}e^2\xi_Q}{4c_W^2s_W^2} \right]$$

$$_{641} C \left( \hat{G}^0, G^0, \bar{u}_Z, u_Z \right) = \left[ -\frac{\mathrm{i}e^2\xi_Q}{4c_W^2s_W^2} \right]$$

$$_{642} C \left( \hat{H}, G^0, \bar{u}_+, u_+ \right) = \left[ \frac{e^2\xi_Q}{4s_W^2} \right]$$

$$_{643} C \left( \hat{H}, G^0, \bar{u}_-, u_- \right) = \left[ -\frac{e^2\xi_Q}{4s_W^2} \right]$$

$$_{644} C \left( H, \hat{G}^0, \bar{u}_+, u_+ \right) = \left[ -\frac{e^2\xi_Q}{4s_W^2} \right]$$

$$_{645} C \left( H, \hat{G}^0, \bar{u}_-, u_- \right) = \left[ \frac{e^2\xi_Q}{4s_W^2} \right]$$

$$_{646} C \left( \hat{G}^-, G^+, \bar{u}_Z, u_Z \right) = \left[ \frac{\mathrm{i}e^2\xi_Q}{4c_W^2s_W^2} \left( c_W^2 - s_W^2 \right)^2 \right]$$

$$_{647} C \left( G^-, \hat{G}^+, \bar{u}_Z, u_Z \right) = \left[ \frac{\mathrm{i}e^2\xi_Q}{4c_W^2s_W^2} \left( c_W^2 - s_W^2 \right)^2 \right]$$

$$_{648} C \left( G^-, \hat{G}^+, \bar{u}_Z, u_\gamma \right) = \left[ \frac{\mathrm{i}e^2\xi_Q}{2c_Ws_W} \left( c_W^2 - s_W^2 \right) \right]$$

$$_{649} C \left( \hat{G}^-, G^+, \bar{u}_Z, u_\gamma \right) = \left[ \frac{\mathrm{i}e^2\xi_Q}{2c_Ws_W} \left( c_W^2 - s_W^2 \right) \right]$$

$$_{650} C \left( G^-, \hat{G}^+, \bar{u}_\gamma, u_Z \right) = \left[ \frac{\mathrm{i}e^2\xi_Q}{2c_Ws_W} \left( c_W^2 - s_W^2 \right) \right]$$

$$_{651} C \left( \hat{G}^-, G^+, \bar{u}_\gamma, u_Z \right) = \left[ \frac{\mathrm{i}e^2\xi_Q}{2c_Ws_W} \left( c_W^2 - s_W^2 \right) \right]$$

$$_{652} C \left( G^-, \hat{G}^+, \bar{u}_\gamma, u_\gamma \right) = \left[ -\mathrm{i}e^2\xi_Q \right]$$

$$_{653} C(\hat{G}^-, G^+, \bar{u}_\gamma, u_\gamma) = \left[ -ie^2 \xi_Q \right]$$

$$_{654} C(\hat{G}^+, H, \bar{u}_+, u_Z) = \left[ \frac{ie^2 \xi_Q}{4c_W s_W^2} \right]$$

$$_{655} C(\hat{G}^-, H, \bar{u}_-, u_Z) = \left[ \frac{ie^2 \xi_Q}{4c_W s_W^2} \right]$$

$$_{656} C(G^+, \hat{H}, \bar{u}_Z, u_-) = \left[ \frac{ie^2 \xi_Q}{4c_W s_W^2} \right]$$

$$_{657} C(G^-, \hat{H}, \bar{u}_Z, u_+) = \left[ \frac{ie^2 \xi_Q}{4c_W s_W^2} \right]$$

$$_{658} C(G^+, \hat{H}, \bar{u}_+, u_Z) = \left[ -\frac{ie^2 \xi_Q}{4c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$_{659} C(G^-, \hat{H}, \bar{u}_-, u_Z) = \left[ -\frac{ie^2 \xi_Q}{4c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$_{660} C(\hat{G}^+, H, \bar{u}_Z, u_-) = \left[ -\frac{ie^2 \xi_Q}{4c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$_{661} C(\hat{G}^-, H, \bar{u}_Z, u_+) = \left[ \frac{ie^2 \xi_Q}{4c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$_{662} C(\hat{G}^+, H, \bar{u}_+, u_\gamma) = \left[ \frac{ie^2 \xi_Q}{2s_W} \right]$$

$$_{663} C(\hat{G}^-, H, \bar{u}_-, u_\gamma) = \left[ \frac{ie^2 \xi_Q}{2s_W} \right]$$

$$_{664} C(G^+, \hat{H}, \bar{u}_\gamma, u_-) = \left[ \frac{ie^2 \xi_Q}{2s_W} \right]$$

$$_{665} C(G^-, \hat{H}, \bar{u}_\gamma, u_+) = \left[ \frac{ie^2 \xi_Q}{2s_W} \right]$$

$$_{666} C(\hat{G}^+, G^0, \bar{u}_+, u_Z) = \left[ \frac{e^2 \xi_Q}{4c_W s_W^2} \right]$$



$$C_{667}(\hat{G}^-, G^0, \bar{u}_-, u_Z) = \left[ -\frac{e^2 \xi_Q}{4c_W s_W^2} \right]$$

$$C_{668}(G^+, \hat{G}^0, \bar{u}_Z, u_-) = \left[ \frac{e^2 \xi_Q}{4c_W s_W^2} \right]$$

$$C_{669}(G^-, \hat{G}^0, \bar{u}_Z, u_+) = \left[ -\frac{e^2 \xi_Q}{4c_W s_W^2} \right]$$

$$C_{670}(G^+, \hat{G}^0, \bar{u}_+, u_Z) = \left[ -\frac{e^2 \xi_Q}{4c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$C_{671}(G^-, \hat{G}^0, \bar{u}_-, u_Z) = \left[ \frac{e^2 \xi_Q}{4c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$C_{672}(\hat{G}^+, G^0, \bar{u}_Z, u_-) = \left[ -\frac{e^2 \xi_Q}{4c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$C_{673}(\hat{G}^-, G^0, \bar{u}_Z, u_+) = \left[ \frac{e^2 \xi_Q}{4c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$C_{674}(G^+, \hat{G}^0, \bar{u}_+, u_\gamma) = \left[ \frac{e^2 \xi_Q}{2s_W} \right]$$

$$C_{675}(G^-, \hat{G}^0, \bar{u}_-, u_\gamma) = \left[ -\frac{e^2 \xi_Q}{2s_W} \right]$$

$$C_{676}(\hat{G}^+, G^0, \bar{u}_\gamma, u_-) = \left[ \frac{e^2 \xi_Q}{2s_W} \right]$$

$$C_{677}(\hat{G}^-, G^0, \bar{u}_\gamma, u_+) = \left[ -\frac{e^2 \xi_Q}{2s_W} \right]$$

$$C_{678}(\hat{G}^+, \hat{G}^-, \bar{u}_+, u_+) = \left[ -\frac{ie^2 \xi_Q}{2s_W^2} \right]$$

$$C_{679}(\hat{G}^+, \hat{G}^-, \bar{u}_-, u_-) = \left[ -\frac{ie^2 \xi_Q}{2s_W^2} \right]$$

$$C_{680}(\hat{H}, \hat{H}, \bar{u}_+, u_+) = \left[ -\frac{ie^2 \xi_Q}{2s_W^2} \right]$$

$$_{681} C(\hat{H}, \hat{H}, \bar{u}_-, u_-) = \left[ -\frac{ie^2 \xi_Q}{2s_W^2} \right]$$

$$_{682} C(\hat{G}^0, \hat{G}^0, \bar{u}_+, u_+) = \left[ -\frac{ie^2 \xi_Q}{2s_W^2} \right]$$

$$_{683} C(\hat{G}^0, \hat{G}^0, \bar{u}_-, u_-) = \left[ -\frac{ie^2 \xi_Q}{2s_W^2} \right]$$

$$_{684} C(\hat{H}, \hat{H}, \bar{u}_Z, u_Z) = \left[ -\frac{ie^2 \xi_Q}{2c_W^2 s_W^2} \right]$$

$$_{685} C(\hat{G}^0, \hat{G}^0, \bar{u}_Z, u_Z) = \left[ -\frac{ie^2 \xi_Q}{2c_W^2 s_W^2} \right]$$

$$_{686} C(\hat{G}^-, \hat{G}^+, \bar{u}_Z, u_Z) = \left[ \frac{ie^2 \xi_Q}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{687} C(\hat{G}^-, \hat{G}^+, \bar{u}_Z, u_\gamma) = \left[ \frac{ie^2 \xi_Q}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{688} C(\hat{G}^-, \hat{G}^+, \bar{u}_\gamma, u_Z) = \left[ \frac{ie^2 \xi_Q}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{689} C(\hat{G}^-, \hat{G}^+, \bar{u}_\gamma, u_\gamma) = \left[ -2ie^2 \xi_Q \right]$$

$$_{690} C(\hat{G}^+, \hat{H}, \bar{u}_+, u_Z) = \left[ \frac{ie^2 \xi_Q}{2c_W} \right]$$

$$_{691} C(\hat{G}^-, \hat{H}, \bar{u}_-, u_Z) = \left[ \frac{ie^2 \xi_Q}{2c_W} \right]$$

$$_{692} C(\hat{G}^+, \hat{H}, \bar{u}_Z, u_-) = \left[ \frac{ie^2 \xi_Q}{2c_W} \right]$$

$$_{693} C(\hat{G}^-, \hat{H}, \bar{u}_Z, u_+) = \left[ \frac{ie^2 \xi_Q}{2c_W} \right]$$

$$_{694} C(\hat{G}^+, \hat{H}, \bar{u}_+, u_\gamma) = \left[ \frac{ie^2 \xi_Q}{2s_W} \right]$$

$$_{695} C(\hat{G}^-, \hat{H}, \bar{u}_-, u_\gamma) = \left[ \frac{ie^2 \xi_Q}{2s_W} \right]$$

$$_{696} C(\hat{G}^+, \hat{H}, \bar{u}_\gamma, u_-) = \left[ \frac{ie^2 \xi_Q}{2s_W} \right]$$

$$_{697} C(\hat{G}^-, \hat{H}, \bar{u}_\gamma, u_+) = \left[ \frac{ie^2 \xi_Q}{2s_W} \right]$$

$$_{698} C(\hat{G}^+, \hat{G}^0, \bar{u}_+, u_Z) = \left[ \frac{e^2 \xi_Q}{2c_W} \right]$$

$$_{699} C(\hat{G}^-, \hat{G}^0, \bar{u}_-, u_Z) = \left[ -\frac{e^2 \xi_Q}{2c_W} \right]$$

$$_{700} C(\hat{G}^+, \hat{G}^0, \bar{u}_Z, u_-) = \left[ \frac{e^2 \xi_Q}{2c_W} \right]$$

$$_{701} C(\hat{G}^-, \hat{G}^0, \bar{u}_Z, u_+) = \left[ -\frac{e^2 \xi_Q}{2c_W} \right]$$

$$_{702} C(\hat{G}^+, \hat{G}^0, \bar{u}_+, u_\gamma) = \left[ \frac{e^2 \xi_Q}{2s_W} \right]$$

$$_{703} C(\hat{G}^-, \hat{G}^0, \bar{u}_-, u_\gamma) = \left[ -\frac{e^2 \xi_Q}{2s_W} \right]$$

$$_{704} C(\hat{G}^+, \hat{G}^0, \bar{u}_\gamma, u_-) = \left[ \frac{e^2 \xi_Q}{2s_W} \right]$$

$$_{705} C(\hat{G}^-, \hat{G}^0, \bar{u}_\gamma, u_+) = \left[ -\frac{e^2 \xi_Q}{2s_W} \right]$$

**[SSVV] 2 Higgs – 2 Gauge Bosons**

$$_{16} C(H, H, W^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{17} C(G^0, G^0, W^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{18}(G^-, G^+, W^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{19}(G^-, G^+, Z, Z) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$C_{20}(G^-, G^+, \gamma, Z) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$C_{21}(G^-, G^+, \gamma, \gamma) = \left[ 2ie^2 \right]$$

$$C_{22}(H, H, Z, Z) = \left[ \frac{ie^2}{2c_W^2 s_W^2} \right]$$

$$C_{23}(G^0, G^0, Z, Z) = \left[ \frac{ie^2}{2c_W^2 s_W^2} \right]$$

$$C_{24}(H, G^+, W^-, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$C_{25}(H, G^-, W^+, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$C_{26}(H, G^-, W^+, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$C_{27}(H, G^+, W^-, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$C_{28}(G^-, G^0, Z, W^+) = \left[ \frac{e^2}{2c_W} \right]$$

$$C_{29}(G^+, G^0, Z, W^-) = \left[ -\frac{e^2}{2c_W} \right]$$

$$C_{30}(G^-, G^0, \gamma, W^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$C_{31}(G^+, G^0, \gamma, W^-) = \left[ -\frac{e^2}{2s_W} \right]$$

$$C_{168}(\hat{H}, \hat{H}, \hat{W}^-, \hat{W}^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{169}(\hat{H}, \hat{H}, \hat{W}^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{170}(\hat{H}, \hat{H}, W^-, \hat{W}^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{171}(\hat{H}, H, \hat{W}^-, \hat{W}^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{172}(\hat{H}, H, W^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{173}(H, H, \hat{W}^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{174}(H, H, W^-, \hat{W}^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{175}(H, H, \hat{W}^-, \hat{W}^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{176}(\hat{H}, \hat{H}, W^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{177}(\hat{G}^0, \hat{G}^0, \hat{W}^-, \hat{W}^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{178}(\hat{G}^0, \hat{G}^0, \hat{W}^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{179}(\hat{G}^0, \hat{G}^0, W^-, \hat{W}^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{180}(\hat{G}^0, G^0, \hat{W}^-, \hat{W}^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$C_{181}(\hat{G}^0, G^0, W^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{182} C \left( G^0, G^0, \hat{W}^-, W^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{183} C \left( G^0, G^0, W^-, \hat{W}^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{184} C \left( G^0, G^0, \hat{W}^-, \hat{W}^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{185} C \left( \hat{G}^0, \hat{G}^0, W^-, W^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{186} C \left( \hat{G}^-, \hat{G}^+, \hat{W}^-, \hat{W}^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{187} C \left( \hat{G}^-, \hat{G}^+, \hat{W}^-, W^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{188} C \left( \hat{G}^-, \hat{G}^+, W^-, \hat{W}^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{189} C \left( \hat{G}^-, G^+, \hat{W}^-, \hat{W}^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{190} C \left( G^-, \hat{G}^+, \hat{W}^-, \hat{W}^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{191} C \left( \hat{G}^-, G^+, W^-, W^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{192} C \left( G^-, \hat{G}^+, W^-, W^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{193} C \left( G^-, G^+, \hat{W}^-, W^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{194} C \left( G^-, G^+, W^-, \hat{W}^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{195} C \left( G^-, G^+, \hat{W}^-, \hat{W}^+ \right) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{196} C(\hat{G}^-, \hat{G}^+, W^-, W^+) = \left[ \frac{ie^2}{2s_W^2} \right]$$

$$_{197} C(\hat{G}^-, \hat{G}^+, \hat{Z}, \hat{Z}) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{198} C(\hat{G}^-, \hat{G}^+, \hat{Z}, Z) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{199} C(\hat{G}^-, G^+, \hat{Z}, \hat{Z}) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{200} C(G^-, \hat{G}^+, \hat{Z}, \hat{Z}) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{201} C(\hat{G}^-, G^+, Z, Z) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{202} C(G^-, \hat{G}^+, Z, Z) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{203} C(G^-, G^+, \hat{Z}, Z) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{204} C(G^-, G^+, \hat{Z}, \hat{Z}) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{205} C(\hat{G}^-, \hat{G}^+, Z, Z) = \left[ \frac{ie^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{206} C(\hat{G}^-, \hat{G}^+, \hat{\gamma}, \hat{Z}) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{207} C(\hat{G}^-, \hat{G}^+, \hat{\gamma}, Z) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{208} C(\hat{G}^-, \hat{G}^+, \gamma, \hat{Z}) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{209} C(\hat{G}^-, G^+, \hat{\gamma}, \hat{Z}) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{210} C(G^-, \hat{G}^+, \hat{\gamma}, \hat{Z}) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{211} C(\hat{G}^-, G^+, \gamma, Z) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{212} C(G^-, \hat{G}^+, \gamma, Z) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{213} C(G^-, G^+, \hat{\gamma}, Z) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{214} C(G^-, G^+, \gamma, \hat{Z}) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{215} C(G^-, G^+, \hat{\gamma}, \hat{Z}) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{216} C(\hat{G}^-, \hat{G}^+, \gamma, Z) = \left[ -\frac{ie^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{217} C(\hat{G}^-, \hat{G}^+, \hat{\gamma}, \hat{\gamma}) = \left[ 2ie^2 \right]$$

$$_{218} C(\hat{G}^-, \hat{G}^+, \hat{\gamma}, \gamma) = \left[ 2ie^2 \right]$$

$$_{219} C(\hat{G}^-, G^+, \hat{\gamma}, \hat{\gamma}) = \left[ 2ie^2 \right]$$

$$_{220} C(G^-, \hat{G}^+, \hat{\gamma}, \hat{\gamma}) = \left[ 2ie^2 \right]$$

$$_{221} C(\hat{G}^-, G^+, \gamma, \gamma) = \left[ 2ie^2 \right]$$

$$_{222} C(G^-, \hat{G}^+, \gamma, \gamma) = \left[ 2ie^2 \right]$$

$$_{223} C(G^-, G^+, \hat{\gamma}, \gamma) = \left[ 2ie^2 \right]$$

$$_{224} C(G^-, G^+, \hat{\gamma}, \hat{\gamma}) = \left[ 2ie^2 \right]$$

$$_{40} \quad _{225} C(\hat{G}^-, \hat{G}^+, \gamma, \gamma) = \left[ 2ie^2 \right]$$



$$_{226} C(\hat{H}, \hat{H}, \hat{Z}, \hat{Z}) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{227} C(\hat{H}, \hat{H}, \hat{Z}, Z) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{228} C(\hat{H}, H, \hat{Z}, \hat{Z}) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{229} C(\hat{H}, H, Z, Z) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{230} C(H, H, \hat{Z}, Z) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{231} C(H, H, \hat{Z}, \hat{Z}) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{232} C(\hat{H}, \hat{H}, Z, Z) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{233} C\left(\hat{G}^0, \hat{G}^0, \hat{Z}, \hat{Z}\right) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{234} C\left(\hat{G}^0, \hat{G}^0, \hat{Z}, Z\right) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{235} C\left(\hat{G}^0, G^0, \hat{Z}, \hat{Z}\right) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{236} C\left(\hat{G}^0, G^0, Z, Z\right) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{237} C\left(G^0, G^0, \hat{Z}, Z\right) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{238} C\left(G^0, G^0, \hat{Z}, \hat{Z}\right) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{239} C\left(\hat{G}^0, \hat{G}^0, Z, Z\right) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{240} C(\hat{H}, \hat{G}^+, \hat{W}^-, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{241} C(\hat{H}, \hat{G}^+, \hat{W}^-, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{242} C(\hat{H}, \hat{G}^+, W^-, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{243} C(\hat{H}, G^+, \hat{W}^-, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{244} C(H, \hat{G}^+, \hat{W}^-, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{245} C(\hat{H}, G^+, W^-, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{246} C(H, \hat{G}^+, W^-, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{247} C(H, G^+, \hat{W}^-, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{248} C(H, G^+, W^-, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{249} C(H, G^+, \hat{W}^-, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{250} C(\hat{H}, \hat{G}^+, W^-, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{251} C(\hat{H}, \hat{G}^-, \hat{W}^+, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{252} C(\hat{H}, \hat{G}^-, \hat{W}^+, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{253} C(\hat{H}, \hat{G}^-, W^+, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{254} C(\hat{H}, G^-, \hat{W}^+, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{255} C(H, \hat{G}^-, \hat{W}^+, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{256} C(\hat{H}, G^-, W^+, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{257} C(H, \hat{G}^-, W^+, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{258} C(H, G^-, \hat{W}^+, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{259} C(H, G^-, W^+, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{260} C(H, G^-, \hat{W}^+, \hat{Z}) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{261} C(\hat{H}, \hat{G}^-, W^+, Z) = \left[ -\frac{ie^2}{2c_W} \right]$$

$$_{262} C(\hat{H}, \hat{G}^-, \hat{W}^+, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{263} C(\hat{H}, \hat{G}^-, \hat{W}^+, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{264} C(\hat{H}, \hat{G}^-, W^+, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{265} C(\hat{H}, G^-, \hat{W}^+, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{266} C(H, \hat{G}^-, \hat{W}^+, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{267} C(\hat{H}, G^-, W^+, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{268} C(H, \hat{G}^-, W^+, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{269} C(H, G^-, \hat{W}^+, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{270} C(H, G^-, W^+, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{271} C(H, G^-, \hat{W}^+, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{272} C(\hat{H}, \hat{G}^-, W^+, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{273} C(\hat{H}, \hat{G}^+, \hat{W}^-, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{274} C(\hat{H}, \hat{G}^+, \hat{W}^-, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{275} C(\hat{H}, \hat{G}^+, W^-, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{276} C(\hat{H}, G^+, \hat{W}^-, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{277} C(H, \hat{G}^+, \hat{W}^-, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{278} C(\hat{H}, G^+, W^-, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{279} C(H, \hat{G}^+, W^-, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{280} C(H, G^+, \hat{W}^-, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{281} C(H, G^+, W^-, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{282} C(H, G^+, \hat{W}^-, \hat{\gamma}) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{283} C(\hat{H}, \hat{G}^+, W^-, \gamma) = \left[ -\frac{ie^2}{2s_W} \right]$$

$$_{284} C(\hat{G}^-, \hat{G}^0, \hat{Z}, \hat{W}^+) = \left[ \frac{e^2}{2c_W} \right]$$

$$_{285} C\left(\hat{G}^{-}, \hat{G}^0, \hat{Z}, W^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{286} C\left(\hat{G}^{-}, \hat{G}^0, Z, \hat{W}^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{287} C\left(\hat{G}^{-}, G^0, \hat{Z}, \hat{W}^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{288} C\left(G^{-}, \hat{G}^0, \hat{Z}, \hat{W}^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{289} C\left(\hat{G}^{-}, G^0, Z, W^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{290} C\left(G^{-}, \hat{G}^0, Z, W^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{291} C\left(G^{-}, G^0, \hat{Z}, W^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{292} C\left(G^{-}, G^0, Z, \hat{W}^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{293} C\left(G^{-}, G^0, \hat{Z}, \hat{W}^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{294} C\left(\hat{G}^{-}, \hat{G}^0, Z, W^{+}\right)=\left[\frac{e^2}{2 c_W}\right]$$

$$_{295} C\left(\hat{G}^{+}, \hat{G}^0, \hat{Z}, \hat{W}^{-}\right)=\left[-\frac{e^2}{2 c_W}\right]$$

$$_{296} C\left(\hat{G}^{+}, \hat{G}^0, \hat{Z}, W^{-}\right)=\left[-\frac{e^2}{2 c_W}\right]$$

$$_{297} C\left(\hat{G}^{+}, \hat{G}^0, Z, \hat{W}^{-}\right)=\left[-\frac{e^2}{2 c_W}\right]$$

$$_{298} C\left(\hat{G}^{+}, G^0, \hat{Z}, \hat{W}^{-}\right)=\left[-\frac{e^2}{2 c_W}\right]$$

$$_{299} C\left(G^{+}, \hat{G}^0, \hat{Z}, \hat{W}^{-}\right)=\left[-\frac{e^2}{2 c_W}\right]$$

$$C_{300}(\hat{G}^+, G^0, Z, W^-) = \left[ -\frac{e^2}{2c_W} \right]$$

$$C_{301}(G^+, \hat{G}^0, Z, W^-) = \left[ -\frac{e^2}{2c_W} \right]$$

$$C_{302}(G^+, G^0, \hat{Z}, W^-) = \left[ -\frac{e^2}{2c_W} \right]$$

$$C_{303}(G^+, G^0, Z, \hat{W}^-) = \left[ -\frac{e^2}{2c_W} \right]$$

$$C_{304}(G^+, G^0, \hat{Z}, \hat{W}^-) = \left[ -\frac{e^2}{2c_W} \right]$$

$$C_{305}(\hat{G}^+, \hat{G}^0, Z, W^-) = \left[ -\frac{e^2}{2c_W} \right]$$

$$C_{306}(\hat{G}^-, \hat{G}^0, \hat{\gamma}, \hat{W}^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$C_{307}(\hat{G}^-, \hat{G}^0, \hat{\gamma}, W^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$C_{308}(\hat{G}^-, \hat{G}^0, \gamma, \hat{W}^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$C_{309}(\hat{G}^-, G^0, \hat{\gamma}, \hat{W}^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$C_{310}(G^-, \hat{G}^0, \hat{\gamma}, \hat{W}^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$C_{311}(\hat{G}^-, G^0, \gamma, W^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$C_{312}(G^-, \hat{G}^0, \gamma, W^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$C_{313}(G^-, G^0, \hat{\gamma}, W^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$C_{314}(G^-, G^0, \gamma, \hat{W}^+) = \left[ \frac{e^2}{2s_W} \right]$$

$$_{315} C \left( G^-, G^0, \hat{\gamma}, \hat{W}^+ \right) = \left[ \frac{e^2}{2s_W} \right]$$

$$_{316} C \left( \hat{G}^-, \hat{G}^0, \gamma, W^+ \right) = \left[ \frac{e^2}{2s_W} \right]$$

$$_{317} C \left( \hat{G}^+, \hat{G}^0, \hat{\gamma}, \hat{W}^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{318} C \left( \hat{G}^+, \hat{G}^0, \hat{\gamma}, W^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{319} C \left( \hat{G}^+, \hat{G}^0, \gamma, \hat{W}^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{320} C \left( \hat{G}^+, G^0, \hat{\gamma}, \hat{W}^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{321} C \left( G^+, \hat{G}^0, \hat{\gamma}, \hat{W}^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{322} C \left( \hat{G}^+, G^0, \gamma, W^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{323} C \left( G^+, \hat{G}^0, \gamma, W^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{324} C \left( G^+, G^0, \hat{\gamma}, W^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{325} C \left( G^+, G^0, \gamma, \hat{W}^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{326} C \left( G^+, G^0, \hat{\gamma}, \hat{W}^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{327} C \left( \hat{G}^+, \hat{G}^0, \gamma, W^- \right) = \left[ -\frac{e^2}{2s_W} \right]$$

$$_{522} C \left( \hat{G}^+, G^-, \hat{\gamma}, \gamma \right) = \left[ 2ie^2 \right]$$

$$_{523} C \left( G^+, \hat{G}^-, \hat{\gamma}, \gamma \right) = \left[ 2ie^2 \right]$$

$$_{524} C(\hat{G}^+, G^-, \hat{\gamma}, Z) = \left[ -\frac{\mathrm{i}e^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{525} C(G^+, \hat{G}^-, \hat{\gamma}, Z) = \left[ -\frac{\mathrm{i}e^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{526} C(\hat{G}^+, G^-, \gamma, \hat{Z}) = \left[ -\frac{\mathrm{i}e^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{527} C(G^+, \hat{G}^-, \gamma, \hat{Z}) = \left[ -\frac{\mathrm{i}e^2}{c_W s_W} (c_W^2 - s_W^2) \right]$$

$$_{528} C(\hat{G}^+, G^-, \hat{Z}, Z) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{529} C(G^+, \hat{G}^-, \hat{Z}, Z) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} (c_W^2 - s_W^2)^2 \right]$$

$$_{530} C(\hat{H}, H, \hat{Z}, Z) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{531} C(\hat{G}^0, G^0, \hat{Z}, Z) = \left[ \frac{\mathrm{i}e^2}{2c_W^2 s_W^2} \right]$$

$$_{532} C(\hat{H}, H, \hat{W}^+, W^-) = \left[ \frac{\mathrm{i}e^2}{2s_W^2} \right]$$

$$_{533} C(\hat{H}, H, W^+, \hat{W}^-) = \left[ \frac{\mathrm{i}e^2}{2s_W^2} \right]$$

$$_{534} C(\hat{G}^0, G^0, \hat{W}^+, W^-) = \left[ \frac{\mathrm{i}e^2}{2s_W^2} \right]$$

$$_{535} C(\hat{G}^0, G^0, W^+, \hat{W}^-) = \left[ \frac{\mathrm{i}e^2}{2s_W^2} \right]$$

$$_{536} C(H, \hat{G}^-, \hat{\gamma}, W^+) = \left[ -\frac{\mathrm{i}e^2}{s_W} \right]$$

$$_{537} C(H, \hat{G}^+, \hat{\gamma}, W^-) = \left[ -\frac{\mathrm{i}e^2}{s_W} \right]$$



$$_{538} C(\hat{H}, G^-, \gamma, \hat{W}^+) = \left[ -\frac{ie^2}{s_W} \right]$$

$$_{539} C(\hat{H}, G^+, \gamma, \hat{W}^-) = \left[ -\frac{ie^2}{s_W} \right]$$

$$_{540} C(G^0, \hat{G}^-, \hat{\gamma}, W^+) = \left[ \frac{e^2}{s_W} \right]$$

$$_{541} C(G^0, \hat{G}^+, \hat{\gamma}, W^-) = \left[ -\frac{e^2}{s_W} \right]$$

$$_{542} C(\hat{G}^0, G^-, \gamma, \hat{W}^+) = \left[ \frac{e^2}{s_W} \right]$$

$$_{543} C(\hat{G}^0, G^+, \gamma, \hat{W}^-) = \left[ -\frac{e^2}{s_W} \right]$$

$$_{544} C(\hat{H}, G^-, \hat{Z}, W^+) = \left[ -\frac{ie^2}{2c_W s_W^2} \right]$$

$$_{545} C(\hat{H}, G^+, \hat{Z}, W^-) = \left[ -\frac{ie^2}{2c_W s_W^2} \right]$$

$$_{546} C(H, \hat{G}^-, Z, \hat{W}^+) = \left[ -\frac{ie^2}{2c_W s_W^2} \right]$$

$$_{547} C(H, \hat{G}^+, Z, \hat{W}^-) = \left[ -\frac{ie^2}{2c_W s_W^2} \right]$$

$$_{548} C(H, \hat{G}^-, \hat{Z}, W^+) = \left[ \frac{ie^2}{2c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$_{549} C(H, \hat{G}^+, \hat{Z}, W^-) = \left[ \frac{ie^2}{2c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$_{550} C(\hat{H}, G^-, Z, \hat{W}^+) = \left[ \frac{ie^2}{2c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$_{551} C(\hat{H}, G^+, Z, \hat{W}^-) = \left[ \frac{ie^2}{2c_W s_W^2} (c_W^2 - s_W^2) \right]$$

$$_{552} C\left(\hat{G}^0, G^-, \hat{Z}, W^+\right)=\left[\frac{e^2}{2 c_W s_W^2}\right]$$

$$_{553} C\left(\hat{G}^0, G^+, \hat{Z}, W^-\right)=\left[-\frac{e^2}{2 c_W s_W^2}\right]$$

$$_{554} C\left(G^0, \hat{G}^-, Z, \hat{W}^+\right)=\left[\frac{e^2}{2 c_W s_W^2}\right]$$

$$_{555} C\left(G^0, \hat{G}^+, Z, \hat{W}^-\right)=\left[-\frac{e^2}{2 c_W s_W^2}\right]$$

$$_{556} C\left(G^0, \hat{G}^-, \hat{Z}, W^+\right)=\left[-\frac{e^2}{2 c_W s_W^2}\left(c_W^2-s_W^2\right)\right]$$

$$_{557} C\left(G^0, \hat{G}^+, \hat{Z}, W^-\right)=\left[\frac{e^2}{2 c_W s_W^2}\left(c_W^2-s_W^2\right)\right]$$

$$_{558} C\left(\hat{G}^0, G^-, Z, \hat{W}^+\right)=\left[-\frac{e^2}{2 c_W s_W^2}\left(c_W^2-s_W^2\right)\right]$$

$$_{559} C\left(\hat{G}^0, G^+, Z, \hat{W}^-\right)=\left[\frac{e^2}{2 c_W s_W^2}\left(c_W^2-s_W^2\right)\right]$$

$$_{560} C\left(G^+, \hat{G}^-, \hat{W}^+, W^-\right)=\left[\frac{i e^2}{s_W^2}\right]$$

$$_{561} C\left(\hat{G}^+, G^-, W^+, \hat{W}^-\right)=\left[\frac{i e^2}{s_W^2}\right]$$

$$_{562} C\left(\hat{H}, G^0, \hat{W}^+, W^-\right)=\left[\frac{e^2}{2 s_W^2}\right]$$

$$_{563} C\left(\hat{H}, G^0, W^+, \hat{W}^-\right)=\left[-\frac{e^2}{2 s_W^2}\right]$$

$$_{564} C\left(H, \hat{G}^0, \hat{W}^+, W^-\right)=\left[-\frac{e^2}{2 s_W^2}\right]$$

$$_{565} C\left(H, \hat{G}^0, W^+, \hat{W}^-\right)=\left[\frac{e^2}{2 s_W^2}\right]$$

$$C_{566}(\bar{u}_+, u_+, \hat{\gamma}, \gamma) = \left[ ie^2 \right]$$

$$C_{567}(\bar{u}_-, u_-, \hat{\gamma}, \gamma) = \left[ ie^2 \right]$$

$$C_{568}(\bar{u}_+, u_+, \hat{\gamma}, Z) = \left[ -\frac{ie^2 c_W}{s_W} \right]$$

$$C_{569}(\bar{u}_-, u_-, \hat{\gamma}, Z) = \left[ -\frac{ie^2 c_W}{s_W} \right]$$

$$C_{570}(\bar{u}_+, u_+, \hat{Z}, \gamma) = \left[ -\frac{ie^2 c_W}{s_W} \right]$$

$$C_{571}(\bar{u}_-, u_-, \hat{Z}, \gamma) = \left[ -\frac{ie^2 c_W}{s_W} \right]$$

$$C_{572}(\bar{u}_+, u_+, \hat{Z}, Z) = \left[ \frac{ie^2 c_W^2}{s_W^2} \right]$$

$$C_{573}(\bar{u}_-, u_-, \hat{Z}, Z) = \left[ \frac{ie^2 c_W^2}{s_W^2} \right]$$

$$C_{574}(\bar{u}_+, u_\gamma, \hat{\gamma}, W^+) = \left[ -ie^2 \right]$$

$$C_{575}(\bar{u}_-, u_\gamma, \hat{\gamma}, W^-) = \left[ -ie^2 \right]$$

$$C_{576}(\bar{u}_+, u_\gamma, \hat{Z}, W^+) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{577}(\bar{u}_-, u_\gamma, \hat{Z}, W^-) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{578}(\bar{u}_+, u_Z, \hat{\gamma}, W^+) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{579}(\bar{u}_-, u_Z, \hat{\gamma}, W^-) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$_{580} C(\bar{u}_+, u_Z, \hat{Z}, W^+) = \left[ -\frac{\mathrm{i}e^2 c_W^2}{s_W^2} \right]$$

$$_{581} C(\bar{u}_-, u_Z, \hat{Z}, W^-) = \left[ -\frac{\mathrm{i}e^2 c_W^2}{s_W^2} \right]$$

$$_{582} C(\bar{u}_\gamma, u_-, \hat{W}^+, \gamma) = \left[ -\mathrm{i}e^2 \right]$$

$$_{583} C(\bar{u}_\gamma, u_+, \hat{W}^-, \gamma) = \left[ -\mathrm{i}e^2 \right]$$

$$_{584} C(\bar{u}_\gamma, u_-, \hat{W}^+, Z) = \left[ \frac{\mathrm{i}e^2 c_W}{s_W} \right]$$

$$_{585} C(\bar{u}_\gamma, u_+, \hat{W}^-, Z) = \left[ \frac{\mathrm{i}e^2 c_W}{s_W} \right]$$

$$_{586} C(\bar{u}_Z, u_-, \hat{W}^+, \gamma) = \left[ \frac{\mathrm{i}e^2 c_W}{s_W} \right]$$

$$_{587} C(\bar{u}_Z, u_+, \hat{W}^-, \gamma) = \left[ \frac{\mathrm{i}e^2 c_W}{s_W} \right]$$

$$_{588} C(\bar{u}_Z, u_-, \hat{W}^+, Z) = \left[ -\frac{\mathrm{i}e^2 c_W^2}{s_W^2} \right]$$

$$_{589} C(\bar{u}_Z, u_+, \hat{W}^-, Z) = \left[ -\frac{\mathrm{i}e^2 c_W^2}{s_W^2} \right]$$

$$_{590} C(\bar{u}_\gamma, u_\gamma, \hat{W}^+, W^-) = \left[ \mathrm{i}e^2 \right]$$

$$_{591} C(\bar{u}_\gamma, u_\gamma, \hat{W}^-, W^+) = \left[ \mathrm{i}e^2 \right]$$

$$_{592} C(\bar{u}_Z, u_\gamma, \hat{W}^+, W^-) = \left[ -\frac{\mathrm{i}e^2 c_W}{s_W} \right]$$

$$_{593} C(\bar{u}_Z, u_\gamma, \hat{W}^-, W^+) = \left[ -\frac{\mathrm{i}e^2 c_W}{s_W} \right]$$

$$_{594} C(\bar{u}_\gamma, u_Z, \hat{W}^+, W^-) = \left[ -\frac{\mathrm{i}e^2 c_W}{s_W} \right]$$

$$C_{595}(\bar{u}_\gamma, u_Z, \hat{W}^-, W^+) = \left[ -\frac{ie^2 c_W}{s_W} \right]$$

$$C_{596}(\bar{u}_Z, u_Z, \hat{W}^+, W^-) = \left[ \frac{ie^2 c_W^2}{s_W^2} \right]$$

$$C_{597}(\bar{u}_Z, u_Z, \hat{W}^-, W^+) = \left[ \frac{ie^2 c_W^2}{s_W^2} \right]$$

$$C_{598}(\bar{u}_+, u_+, \hat{W}^+, W^-) = \left[ \frac{ie^2}{s_W^2} \right]$$

$$C_{599}(\bar{u}_-, u_-, \hat{W}^-, W^+) = \left[ \frac{ie^2}{s_W^2} \right]$$

$$C_{600}(\bar{u}_+, u_-, \hat{W}^+, W^+) = \left[ -\frac{ie^2}{s_W^2} \right]$$

$$C_{601}(\bar{u}_-, u_+, \hat{W}^-, W^-) = \left[ -\frac{ie^2}{s_W^2} \right]$$

$$C_{602}(\bar{u}_+, u_+, \hat{\gamma}, \hat{\gamma}) = \left[ 2ie^2 \right]$$

$$C_{603}(\bar{u}_-, u_-, \hat{\gamma}, \hat{\gamma}) = \left[ 2ie^2 \right]$$

$$C_{604}(\bar{u}_+, u_+, \hat{\gamma}, \hat{Z}) = \left[ -\frac{2ie^2 c_W}{s_W} \right]$$

$$C_{605}(\bar{u}_-, u_-, \hat{\gamma}, \hat{Z}) = \left[ -\frac{2ie^2 c_W}{s_W} \right]$$

$$C_{606}(\bar{u}_+, u_+, \hat{Z}, \hat{\gamma}) = \left[ -\frac{2ie^2 c_W}{s_W} \right]$$

$$C_{607}(\bar{u}_-, u_-, \hat{Z}, \hat{\gamma}) = \left[ -\frac{2ie^2 c_W}{s_W} \right]$$

$$C_{608}(\bar{u}_+, u_+, \hat{Z}, \hat{Z}) = \left[ \frac{2ie^2 c_W^2}{s_W^2} \right]$$

$$C_{609}(\bar{u}_-, u_-, \hat{Z}, \hat{Z}) = \left[ \frac{2ie^2 c_W^2}{s_W^2} \right]$$

$$C_{610}(\bar{u}_+, u_\gamma, \hat{\gamma}, \hat{W}^+) = \left[ -ie^2 \right]$$

$$C_{611}(\bar{u}_-, u_\gamma, \hat{\gamma}, \hat{W}^-) = \left[ -ie^2 \right]$$

$$C_{612}(\bar{u}_+, u_\gamma, \hat{Z}, \hat{W}^+) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{613}(\bar{u}_-, u_\gamma, \hat{Z}, \hat{W}^-) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{614}(\bar{u}_+, u_Z, \hat{\gamma}, \hat{W}^+) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{615}(\bar{u}_-, u_Z, \hat{\gamma}, \hat{W}^-) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{616}(\bar{u}_+, u_Z, \hat{Z}, \hat{W}^+) = \left[ -\frac{ie^2 c_W^2}{s_W^2} \right]$$

$$C_{617}(\bar{u}_-, u_Z, \hat{Z}, \hat{W}^-) = \left[ -\frac{ie^2 c_W^2}{s_W^2} \right]$$

$$C_{618}(\bar{u}_\gamma, u_-, \hat{W}^+, \hat{\gamma}) = \left[ -ie^2 \right]$$

$$C_{619}(\bar{u}_\gamma, u_+, \hat{W}^-, \hat{\gamma}) = \left[ -ie^2 \right]$$

$$C_{620}(\bar{u}_\gamma, u_-, \hat{W}^+, \hat{Z}) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{621}(\bar{u}_\gamma, u_+, \hat{W}^-, \hat{Z}) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{622}(\bar{u}_Z, u_-, \hat{W}^+, \hat{\gamma}) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{623}(\bar{u}_Z, u_+, \hat{W}^-, \hat{\gamma}) = \left[ \frac{ie^2 c_W}{s_W} \right]$$

$$C_{624}(\bar{u}_Z, u_-, \hat{W}^+, \hat{Z}) = \left[ -\frac{ie^2 c_W^2}{s_W^2} \right]$$

$$C_{625}(\bar{u}_Z, u_+, \hat{W}^-, \hat{Z}) = \left[ -\frac{ie^2 c_W^2}{s_W^2} \right]$$

$$C_{626}(\bar{u}_\gamma, u_\gamma, \hat{W}^-, \hat{W}^+) = \left[ 2ie^2 \right]$$

$$C_{627}(\bar{u}_Z, u_\gamma, \hat{W}^-, \hat{W}^+) = \left[ -\frac{2ie^2 c_W}{s_W} \right]$$

$$C_{628}(\bar{u}_\gamma, u_Z, \hat{W}^-, \hat{W}^+) = \left[ -\frac{2ie^2 c_W}{s_W} \right]$$

$$C_{629}(\bar{u}_Z, u_Z, \hat{W}^-, \hat{W}^+) = \left[ \frac{2ie^2 c_W^2}{s_W^2} \right]$$

$$C_{630}(\bar{u}_+, u_+, \hat{W}^+, \hat{W}^-) = \left[ \frac{ie^2}{s_W^2} \right]$$

$$C_{631}(\bar{u}_-, u_-, \hat{W}^-, \hat{W}^+) = \left[ \frac{ie^2}{s_W^2} \right]$$

$$C_{632}(\bar{u}_+, u_-, \hat{W}^+, \hat{W}^+) = \left[ -\frac{2ie^2}{s_W^2} \right]$$

$$C_{633}(\bar{u}_-, u_+, \hat{W}^-, \hat{W}^-) = \left[ -\frac{2ie^2}{s_W^2} \right]$$

**[VVVV] 4 Gauge Bosons**

$$C_1(W^+, W^+, W^-, W^-) = \frac{ie^2}{s_W^2} \left[ \begin{array}{c} 2 \\ \hline -1 \\ \hline -1 \end{array} \right]$$

$$C_2(W^+, W^-, Z, Z) = \frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_3(W^+, W^-, \gamma, Z) = \frac{ie^2 c_W}{s_W} \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix}$$

$$C_4(W^+, W^-, \gamma, \gamma) = ie^2 \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{93}(\hat{W}^+, \hat{W}^+, \hat{W}^-, \hat{W}^-) = \frac{ie^2}{s_W^2} \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix}$$

$$C_{94}(\hat{W}^+, \hat{W}^+, \hat{W}^-, W^-) = \frac{ie^2}{s_W^2} \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix}$$



$$_{95} C(\hat{W}^+, W^+, \hat{W}^-, \hat{W}^-) = \frac{ie^2}{s_W^2} \begin{bmatrix} 2 \\ \hline -1 \\ \hline -1 \end{bmatrix}$$

$$_{96} C(\hat{W}^+, W^+, W^-, W^-) = \frac{ie^2}{s_W^2} \begin{bmatrix} 2 \\ \hline -1 \\ \hline -1 \end{bmatrix}$$

$$_{97} C(W^+, W^+, \hat{W}^-, W^-) = \frac{ie^2}{s_W^2} \begin{bmatrix} 2 \\ \hline -1 \\ \hline -1 \end{bmatrix}$$

$$_{98} C(\hat{W}^+, \hat{W}^-, \hat{Z}, \hat{Z}) = \frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} -2 \\ \hline 1 \\ \hline 1 \end{bmatrix}$$

$$_{99} C(\hat{W}^+, \hat{W}^-, \hat{Z}, Z) = \frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} -2 \\ \hline 1 \\ \hline 1 \end{bmatrix}$$

$$C_{100}(\hat{W}^+, W^-, \hat{Z}, \hat{Z}) = \frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{101}(W^+, \hat{W}^-, \hat{Z}, \hat{Z}) = \frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{102}(\hat{W}^+, W^-, Z, Z) = \frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{103}(W^+, \hat{W}^-, Z, Z) = \frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{104}(W^+, W^-, \hat{Z}, Z) = \frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$_{105} C\left(\hat{W}^{+}, \hat{W}^{-}, \hat{\gamma}, \hat{Z}\right)=\frac{\mathrm{i} e^2 c_W}{s_W}\left[\begin{array}{c} 2 \\ \hline -1 \\ \hline -1 \end{array}\right]$$

$$_{106} C\left(\hat{W}^{+}, \hat{W}^{-}, \hat{\gamma}, Z\right)=\frac{\mathrm{i} e^2 c_W}{s_W}\left[\begin{array}{c} 2 \\ \hline -1 \\ \hline -1 \end{array}\right]$$

$$_{107} C\left(\hat{W}^{+}, \hat{W}^{-}, \gamma, \hat{Z}\right)=\frac{\mathrm{i} e^2 c_W}{s_W}\left[\begin{array}{c} 2 \\ \hline -1 \\ \hline -1 \end{array}\right]$$

$$_{108} C\left(\hat{W}^{+}, W^{-}, \hat{\gamma}, \hat{Z}\right)=\frac{\mathrm{i} e^2 c_W}{s_W}\left[\begin{array}{c} 2 \\ \hline -1 \\ \hline -1 \end{array}\right]$$

$$_{109} C\left(W^{+}, \hat{W}^{-}, \hat{\gamma}, \hat{Z}\right)=\frac{\mathrm{i} e^2 c_W}{s_W}\left[\begin{array}{c} 2 \\ \hline -1 \\ \hline -1 \end{array}\right]$$

$$C_{110}(\hat{W}^+, W^-, \gamma, Z) = \frac{ie^2 c_W}{s_W} \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix}$$

$$C_{111}(W^+, \hat{W}^-, \gamma, Z) = \frac{ie^2 c_W}{s_W} \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix}$$

$$C_{112}(W^+, W^-, \hat{\gamma}, Z) = \frac{ie^2 c_W}{s_W} \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix}$$

$$C_{113}(W^+, W^-, \gamma, \hat{Z}) = \frac{ie^2 c_W}{s_W} \begin{bmatrix} 2 \\ -1 \\ -1 \end{bmatrix}$$

$$C_{114}(\hat{W}^+, \hat{W}^-, \hat{\gamma}, \hat{\gamma}) = ie^2 \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{115}(\hat{W}^+, \hat{W}^-, \hat{\gamma}, \gamma) = ie^2 \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{116}(\hat{W}^+, W^-, \hat{\gamma}, \gamma) = ie^2 \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{117}(W^+, \hat{W}^-, \hat{\gamma}, \gamma) = ie^2 \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{118}(\hat{W}^+, W^-, \gamma, \gamma) = ie^2 \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$C_{119}(W^+, \hat{W}^-, \gamma, \gamma) = ie^2 \begin{bmatrix} -2 \\ 1 \\ 1 \end{bmatrix}$$

$$_{120} C(W^+, W^-, \hat{\gamma}, \gamma) = ie^2 \begin{bmatrix} -2 \\ \hline 1 \\ \hline 1 \end{bmatrix}$$

$$_{485} C(\hat{\gamma}, \hat{\gamma}, W^+, W^-) = -ie^2 \begin{bmatrix} 2 \\ \hline -1 + \frac{1}{\xi_Q} \\ \hline -1 + \frac{1}{\xi_Q} \end{bmatrix}$$

$$_{486} C(\hat{W}^+, \hat{W}^-, \gamma, \gamma) = -ie^2 \begin{bmatrix} 2 \\ \hline -1 + \frac{1}{\xi_Q} \\ \hline -1 + \frac{1}{\xi_Q} \end{bmatrix}$$

$$_{487} C(\hat{Z}, \hat{Z}, W^+, W^-) = -\frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} 2 \\ \hline -1 + \frac{1}{\xi_Q} \\ \hline -1 + \frac{1}{\xi_Q} \end{bmatrix}$$

$$_{488} C(\hat{W}^+, \hat{W}^-, Z, Z) = -\frac{ie^2 c_W^2}{s_W^2} \begin{bmatrix} 2 \\ \hline -1 + \frac{1}{\xi_Q} \\ \hline -1 + \frac{1}{\xi_Q} \end{bmatrix}$$

$$_{489} C\left(\hat{\gamma}, \hat{Z}, W^+, W^-\right)=\frac{\mathrm{i} e^2 c_W}{s_W}\left[\begin{array}{c} 2 \\ \hline -1+\frac{1}{\xi_Q} \\ \hline -1+\frac{1}{\xi_Q} \end{array}\right]$$

$$_{490} C\left(\hat{W}^+, \hat{W}^-, \gamma, Z\right)=\frac{\mathrm{i} e^2 c_W}{s_W}\left[\begin{array}{c} 2 \\ \hline -1+\frac{1}{\xi_Q} \\ \hline -1+\frac{1}{\xi_Q} \end{array}\right]$$

$$_{491} C\left(\hat{W}^-, \hat{W}^-, W^+, W^+\right)=\frac{\mathrm{i} e^2}{s_W^2}\left[\begin{array}{c} 2 \\ \hline -1+\frac{1}{\xi_Q} \\ \hline -1+\frac{1}{\xi_Q} \end{array}\right]$$

$$_{492} C\left(\hat{W}^+, \hat{W}^+, W^-, W^-\right)=\frac{\mathrm{i} e^2}{s_W^2}\left[\begin{array}{c} 2 \\ \hline -1+\frac{1}{\xi_Q} \\ \hline -1+\frac{1}{\xi_Q} \end{array}\right]$$

$$_{493} C\left(\hat{W}^+, \hat{\gamma}, W^-, \gamma\right)=\mathrm{i} e^2\left[\begin{array}{c} 1 \\ \hline -2 \\ \hline 1+\frac{1}{\xi_Q} \end{array}\right]$$

$$_{494} C(\hat{W}^-, \hat{\gamma}, W^+, \gamma) = ie^2 \left[ \begin{array}{c} 1 \\ -2 \\ 1 + \frac{1}{\xi_Q} \end{array} \right]$$

$$_{495} C(\hat{W}^+, \hat{Z}, W^-, Z) = \frac{ie^2 c_W^2}{s_W^2} \left[ \begin{array}{c} 1 \\ -2 \\ 1 + \frac{1}{\xi_Q} \end{array} \right]$$

$$_{496} C(\hat{W}^-, \hat{Z}, W^+, Z) = \frac{ie^2 c_W^2}{s_W^2} \left[ \begin{array}{c} 1 \\ -2 \\ 1 + \frac{1}{\xi_Q} \end{array} \right]$$

$$_{497} C(\hat{W}^+, \hat{\gamma}, W^-, Z) = \frac{ie^2 c_W}{s_W} \left[ \begin{array}{c} -1 \\ 2 \\ -1 - \frac{1}{\xi_Q} \end{array} \right]$$

$$_{498} C(\hat{W}^-, \hat{\gamma}, W^+, Z) = \frac{ie^2 c_W}{s_W} \left[ \begin{array}{c} -1 \\ 2 \\ -1 - \frac{1}{\xi_Q} \end{array} \right]$$



$$_{499}C\left(\hat{W}^+,\hat{Z},W^-, \gamma\right)=\frac{\mathrm{i}e^2c_W}{s_W}\left[\begin{array}{c} -1 \\ \hline 2 \\ \hline -1-\frac{1}{\xi_Q} \end{array}\right]$$

$$_{500}C\left(\hat{W}^-,\hat{Z},W^+, \gamma\right)=\frac{\mathrm{i}e^2c_W}{s_W}\left[\begin{array}{c} -1 \\ \hline 2 \\ \hline -1-\frac{1}{\xi_Q} \end{array}\right]$$

$$_{501}C\left(\hat{W}^+,\hat{W}^-,W^+,W^-\right)=\frac{\mathrm{i}e^2}{s_W^2}\left[\begin{array}{c} -1 \\ \hline 2 \\ \hline -1-\frac{1}{\xi_Q} \end{array}\right]$$