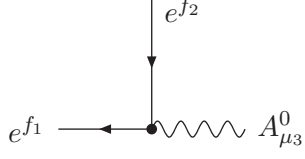
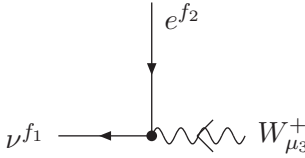
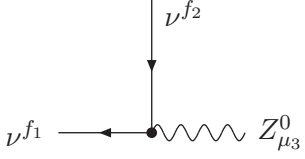


## A SMEFT interaction vertices

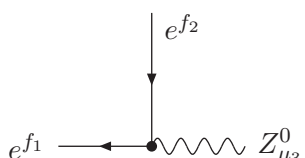
### A.1 Lepton–gauge vertices



$$+ \frac{i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} \delta_{f_1 f_2} \gamma^{\mu_3} - \frac{i\bar{g}^2 \bar{g}'^2 v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} \delta_{f_1 f_2} C^{\varphi W B} \gamma^{\mu_3}$$
  


$$- \frac{i\bar{g}}{\sqrt{2}} U_{f_2 f_1}^* \gamma^{\mu_3} P_L$$
  


$$+ \frac{1}{2} i \sqrt{\bar{g}^2 + \bar{g}'^2} \delta_{f_1 f_2} \gamma^{\mu_3} \gamma^5 + \frac{i\bar{g}\bar{g}' v^2}{2\sqrt{\bar{g}^2 + \bar{g}'^2}} \delta_{f_1 f_2} C^{\varphi W B} \gamma^{\mu_3} \gamma^5$$

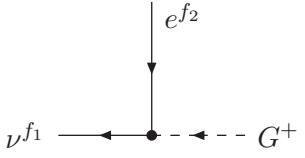
$$+ \frac{1}{2} i v^2 \sqrt{\bar{g}^2 + \bar{g}'^2} C_{g_1 g_2}^{\varphi l 1} (U_{g_2 f_2} U_{g_1 f_1}^* \gamma^{\mu_3} P_L - U_{g_2 f_1} U_{g_1 f_2}^* \gamma^{\mu_3} P_R)$$
  


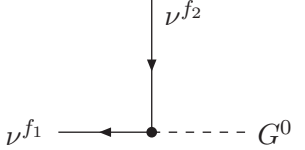
$$- \frac{i}{2\sqrt{\bar{g}^2 + \bar{g}'^2}} \delta_{f_1 f_2} \left( (\bar{g}'^2 - \bar{g}^2) \gamma^{\mu_3} P_L + 2\bar{g}'^2 \gamma^{\mu_3} P_R \right)$$

$$+ \frac{i\bar{g}\bar{g}' v^2}{2(\bar{g}^2 + \bar{g}'^2)^{3/2}} \delta_{f_1 f_2} C^{\varphi W B} \left( (\bar{g}'^2 - \bar{g}^2) \gamma^{\mu_3} P_L - 2\bar{g}^2 \gamma^{\mu_3} P_R \right)$$

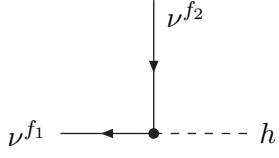
$$+ \frac{1}{2} i v^2 \sqrt{\bar{g}^2 + \bar{g}'^2} C_{f_1 f_2}^{\varphi l 1} \gamma^{\mu_3} P_L$$

### A.2 Lepton–Higgs–gauge vertices

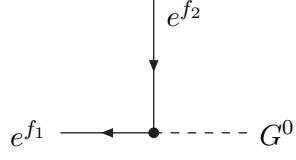


$$+ \frac{i\sqrt{2}}{v} U_{f_2 f_1}^* (m_{\nu_{f_1}} P_L - m_{l_{f_2}} P_R)$$
  


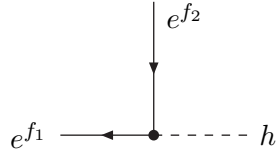
$$- \frac{2}{v} m_{\nu_{f_1}} \delta_{f_1 f_2} \gamma^5 - v C_{g_1 g_2}^{\varphi l 1} \left( U_{g_2 f_2} \not{p}_3 P_L U_{g_1 f_1}^* - U_{g_2 f_1} \not{p}_3 P_R U_{g_1 f_2}^* \right)$$



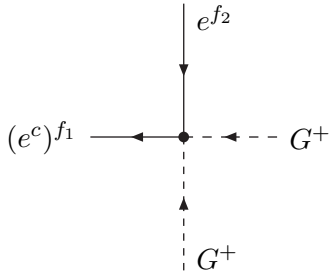
$$-\frac{2i}{v}m_{\nu_{f_1}}\delta_{f_1f_2}$$



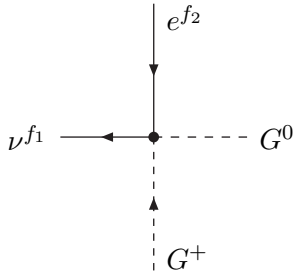
$$+\frac{1}{v}m_{l_{f_1}}\delta_{f_1f_2}\gamma^5-\frac{v}{4}m_{l_{f_1}}\delta_{f_1f_2}C^{\varphi D}\gamma^5-v\not{p}_3P_L C^{\varphi l1}_{f_1f_2}$$



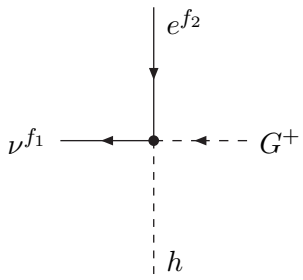
$$-\frac{i}{v}m_{l_{f_1}}\delta_{f_1f_2}+\frac{iv}{4}m_{l_{f_1}}\delta_{f_1f_2}C^{\varphi D}$$



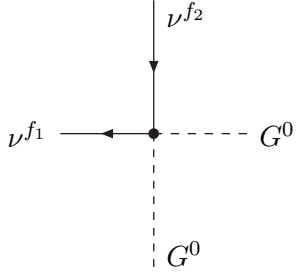
$$-\frac{4i}{v^2}m_{\nu_{g_1}}P_LU^*_{f_1g_1}U^*_{f_2g_1}$$



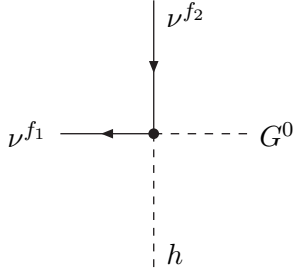
$$-\frac{\sqrt{2}}{v^2}m_{\nu_{f_1}}P_LU^*_{f_2f_1}$$



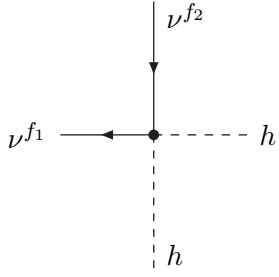
$$+\frac{i\sqrt{2}}{v^2}m_{\nu_{f_1}}P_LU^*_{f_2f_1}$$



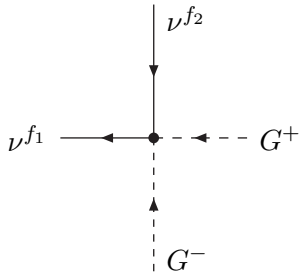
$$+\frac{2i}{v^2}m_{\nu_{f_1}}\delta_{f_1f_2}$$



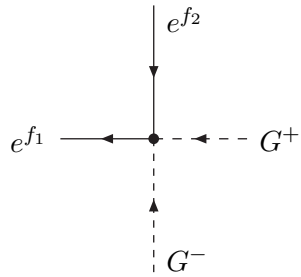
$$-\frac{2}{v^2}m_{\nu_{f_1}}\delta_{f_1f_2}\gamma^5 - C_{g_1g_2}^{\varphi l1} \left( U_{g_2f_2} \left( \not{p}_3 P_L - \not{p}_4 P_L \right) U_{g_1f_1}^* + U_{g_2f_1} \left( \not{p}_4 P_R - \not{p}_3 P_R \right) U_{g_1f_2}^* \right)$$



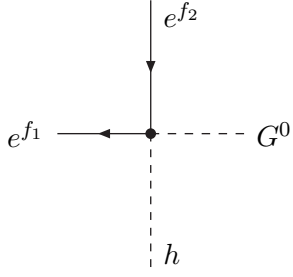
$$-\frac{2i}{v^2}m_{\nu_{f_1}}\delta_{f_1f_2}$$



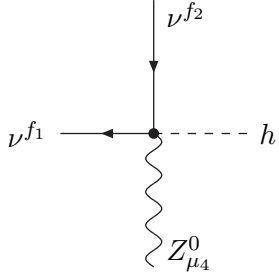
$$+iC_{g_1g_2}^{\varphi l1} \left( U_{g_2f_2} \left( \not{p}_3 P_L - \not{p}_4 P_L \right) U_{g_1f_1}^* + U_{g_2f_1} \left( \not{p}_4 P_R - \not{p}_3 P_R \right) U_{g_1f_2}^* \right)$$



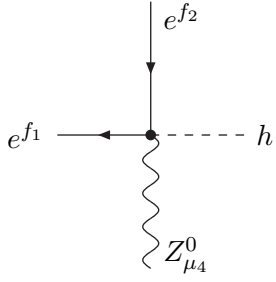
$$+i \left( \not{p}_3 P_L - \not{p}_4 P_L \right) C_{f_1f_2}^{\varphi l1}$$



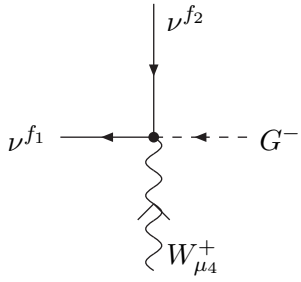
$$-\left(\not{p}_3 P_L - \not{p}_4 P_L\right) C_{f_1 f_2}^{\varphi l 1}$$



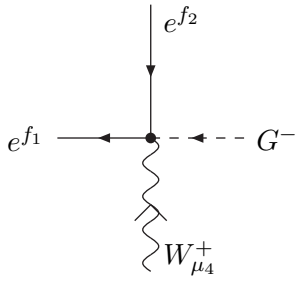
$$+iv\sqrt{\bar{g}^2 + \bar{g}'^2} C_{g_1 g_2}^{\varphi l 1} (U_{g_2 f_2} U_{g_1 f_1}^* \gamma^{\mu_4} P_L - U_{g_2 f_1} U_{g_1 f_2}^* \gamma^{\mu_4} P_R)$$



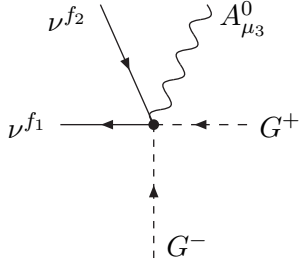
$$+iv\sqrt{\bar{g}^2 + \bar{g}'^2} C_{f_1 f_2}^{\varphi l 1} \gamma^{\mu_4} P_L$$



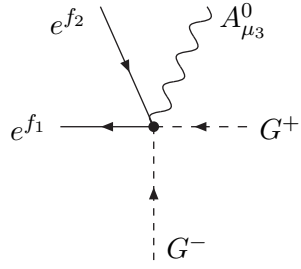
$$-i\bar{g}v C_{g_1 g_2}^{\varphi l 1} (U_{g_2 f_2} U_{g_1 f_1}^* \gamma^{\mu_4} P_L - U_{g_2 f_1} U_{g_1 f_2}^* \gamma^{\mu_4} P_R)$$



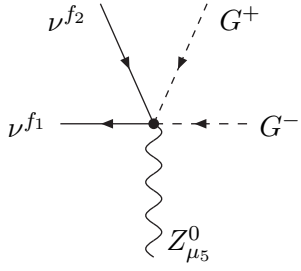
$$-i\bar{g}v C_{f_1 f_2}^{\varphi l 1} \gamma^{\mu_4} P_L$$



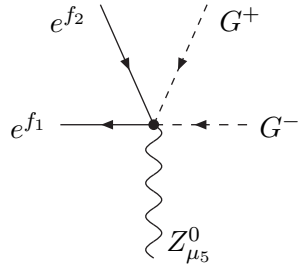
$$-\frac{2i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C_{g_1 g_2}^{\varphi l 1} (U_{g_2 f_2} U_{g_1 f_1}^* \gamma^{\mu_3} P_L - U_{g_2 f_1} U_{g_1 f_2}^* \gamma^{\mu_3} P_R)$$



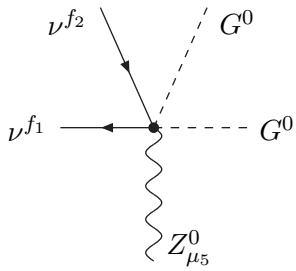
$$-\frac{2i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C_{f_1 f_2}^{\varphi l 1} \gamma^{\mu_3} P_L$$



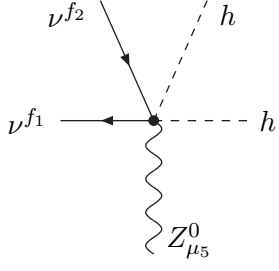
$$+\frac{i(\bar{g}'^2 - \bar{g}^2)}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C_{g_1 g_2}^{\varphi l 1} (U_{g_2 f_2} U_{g_1 f_1}^* \gamma^{\mu_5} P_L - U_{g_2 f_1} U_{g_1 f_2}^* \gamma^{\mu_5} P_R)$$



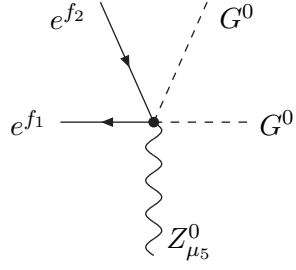
$$+\frac{i(\bar{g}'^2 - \bar{g}^2)}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C_{f_1 f_2}^{\varphi l 1} \gamma^{\mu_5} P_L$$



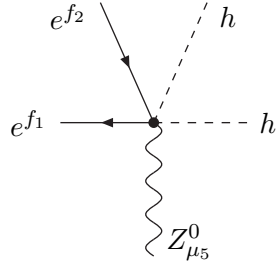
$$+i\sqrt{\bar{g}^2 + \bar{g}'^2} C_{g_1 g_2}^{\varphi l 1} (U_{g_2 f_2} U_{g_1 f_1}^* \gamma^{\mu_5} P_L - U_{g_2 f_1} U_{g_1 f_2}^* \gamma^{\mu_5} P_R)$$



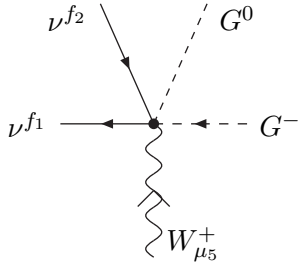
$$+i\sqrt{\bar{g}^2 + \bar{g}'^2} C_{g_1 g_2}^{\varphi l 1} (U_{g_2 f_2} U_{g_1 f_1}^* \gamma^{\mu_5} P_L - U_{g_2 f_1} U_{g_1 f_2}^* \gamma^{\mu_5} P_R)$$



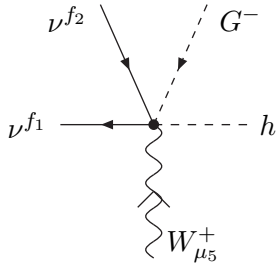
$$+i\sqrt{\bar{g}^2 + \bar{g}'^2} C_{f_1 f_2}^{\varphi l 1} \gamma^{\mu_5} P_L$$



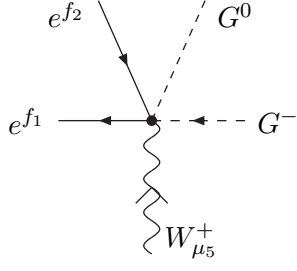
$$+i\sqrt{\bar{g}^2 + \bar{g}'^2} C_{f_1 f_2}^{\varphi l 1} \gamma^{\mu_5} P_L$$



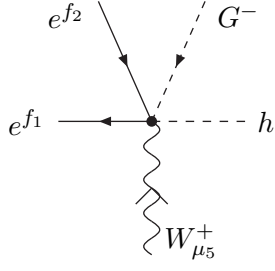
$$+\bar{g} C_{g_1 g_2}^{\varphi l 1} (U_{g_2 f_2} U_{g_1 f_1}^* \gamma^{\mu_5} P_L - U_{g_2 f_1} U_{g_1 f_2}^* \gamma^{\mu_5} P_R)$$



$$-i\bar{g} C_{g_1 g_2}^{\varphi l 1} (U_{g_2 f_2} U_{g_1 f_1}^* \gamma^{\mu_5} P_L - U_{g_2 f_1} U_{g_1 f_2}^* \gamma^{\mu_5} P_R)$$

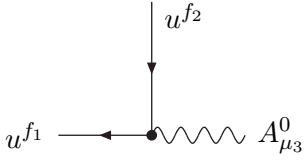


$$+\bar{g}C_{f_1f_2}^{\varphi l1}\gamma^{\mu_5}P_L$$

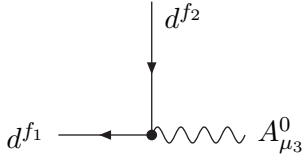


$$-i\bar{g}C_{f_1f_2}^{\varphi l1}\gamma^{\mu_5}P_L$$

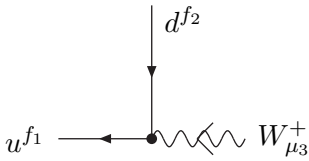
### A.3 Quark-gauge vertices



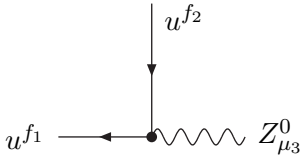
$$-\frac{2i\bar{g}\bar{g}'}{3\sqrt{\bar{g}^2+\bar{g}'^2}}\delta_{f_1f_2}\gamma^{\mu_3}+\frac{2i\bar{g}^2\bar{g}'^2v^2}{3(\bar{g}^2+\bar{g}'^2)^{3/2}}\delta_{f_1f_2}C^{\varphi WB}\gamma^{\mu_3}$$



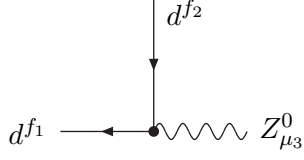
$$+\frac{i\bar{g}\bar{g}'}{3\sqrt{\bar{g}^2+\bar{g}'^2}}\delta_{f_1f_2}\gamma^{\mu_3}-\frac{i\bar{g}^2\bar{g}'^2v^2}{3(\bar{g}^2+\bar{g}'^2)^{3/2}}\delta_{f_1f_2}C^{\varphi WB}\gamma^{\mu_3}$$



$$-\frac{i\bar{g}}{\sqrt{2}}K_{f_1f_2}\gamma^{\mu_3}P_L$$

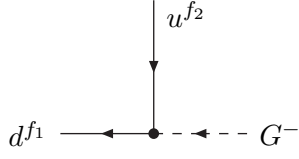


$$+\frac{i}{6\sqrt{\bar{g}^2+\bar{g}'^2}}\delta_{f_1f_2}\left(\left(\bar{g}'^2-3\bar{g}^2\right)\gamma^{\mu_3}P_L+4\bar{g}'^2\gamma^{\mu_3}P_R\right)\\ -\frac{i\bar{g}\bar{g}'v^2}{6(\bar{g}^2+\bar{g}'^2)^{3/2}}\delta_{f_1f_2}C^{\varphi WB}\left(\left(3\bar{g}'^2-\bar{g}^2\right)\gamma^{\mu_3}P_L-4\bar{g}^2\gamma^{\mu_3}P_R\right)$$

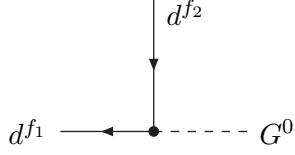


$$\begin{aligned}
& + \frac{i}{6\sqrt{\bar{g}^2 + \bar{g}'^2}} \delta_{f_1 f_2} \left( (3\bar{g}^2 + \bar{g}'^2) \gamma^{\mu_3} P_L - 2\bar{g}'^2 \gamma^{\mu_3} P_R \right) \\
& + \frac{i\bar{g}\bar{g}'v^2}{6(\bar{g}^2 + \bar{g}'^2)^{3/2}} \delta_{f_1 f_2} C^{\varphi WB} \left( (\bar{g}^2 + 3\bar{g}'^2) \gamma^{\mu_3} P_L - 2\bar{g}^2 \gamma^{\mu_3} P_R \right)
\end{aligned}$$

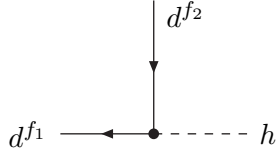
#### A.4 Quark-Higgs-gauge vertices



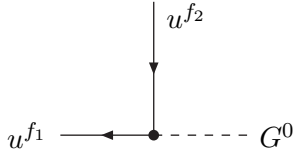
$$-\frac{i\sqrt{2}}{v} K_{f_2 f_1}^* \left( m_{d_{f_1}} P_L - m_{u_{f_2}} P_R \right)$$



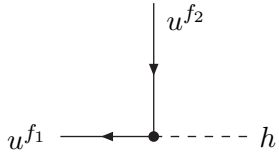
$$+\frac{1}{v} m_{d_{f_1}} \delta_{f_1 f_2} \gamma^5 - \frac{v}{4} m_{d_{f_1}} \delta_{f_1 f_2} C^{\varphi D} \gamma^5$$



$$-\frac{i}{v} m_{d_{f_1}} \delta_{f_1 f_2} + \frac{iv}{4} m_{d_{f_1}} \delta_{f_1 f_2} C^{\varphi D}$$



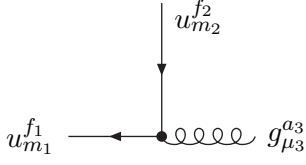
$$-\frac{1}{v} m_{u_{f_1}} \delta_{f_1 f_2} \gamma^5 + \frac{v}{4} m_{u_{f_1}} \delta_{f_1 f_2} C^{\varphi D} \gamma^5$$



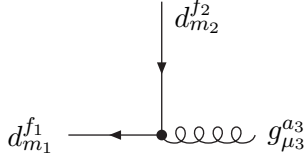
$$-\frac{i}{v} m_{u_{f_1}} \delta_{f_1 f_2} + \frac{iv}{4} m_{u_{f_1}} \delta_{f_1 f_2} C^{\varphi D}$$



## A.5 Quark-gluon vertices

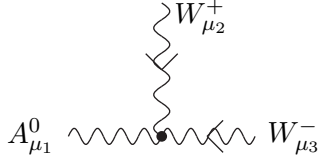


$$-i\bar{g}_s\delta_{f_1f_2}\mathcal{T}_{m_1m_2}^{a_3}\gamma^{\mu_3}$$

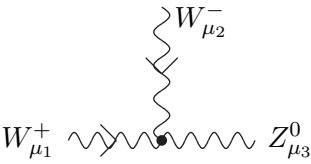


$$-i\bar{g}_s\delta_{f_1f_2}\mathcal{T}_{m_1m_2}^{a_3}\gamma^{\mu_3}$$

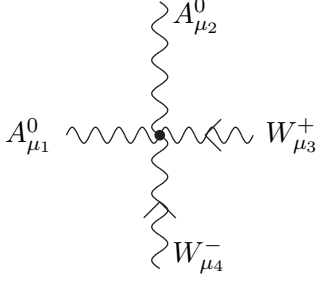
## A.6 Gauge self interaction vertices



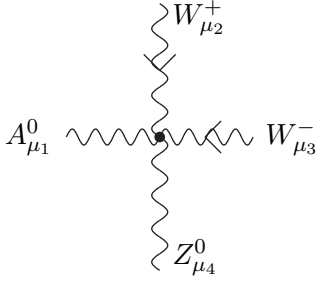
$$\begin{aligned} & + \frac{i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} (\eta_{\mu_1\mu_2}p_1^{\mu_3} - \eta_{\mu_1\mu_2}p_2^{\mu_3} - \eta_{\mu_1\mu_3}p_1^{\mu_2} + \eta_{\mu_1\mu_3}p_3^{\mu_2} + \eta_{\mu_2\mu_3}p_2^{\mu_1} \\ & - \eta_{\mu_2\mu_3}p_3^{\mu_1}) + \frac{i\bar{g}^2v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi WB} \left( \bar{g}^2\eta_{\mu_1\mu_2}p_1^{\mu_3} - \bar{g}^2\eta_{\mu_1\mu_3}p_1^{\mu_2} \right. \\ & + \bar{g}'^2\eta_{\mu_1\mu_2}p_2^{\mu_3} - \bar{g}'^2\eta_{\mu_1\mu_3}p_3^{\mu_2} - \bar{g}'^2\eta_{\mu_2\mu_3}p_2^{\mu_1} + \bar{g}'^2\eta_{\mu_2\mu_3}p_3^{\mu_1} \Big) \\ & - \frac{6i\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^W (p_1 \cdot p_2 \eta_{\mu_1\mu_3}p_3^{\mu_2} - p_1 \cdot p_2 \eta_{\mu_2\mu_3}p_3^{\mu_1} \\ & - p_1 \cdot p_3 \eta_{\mu_1\mu_2}p_2^{\mu_3} + p_1 \cdot p_3 \eta_{\mu_2\mu_3}p_2^{\mu_1} \\ & + p_1^{\mu_3} (p_2 \cdot p_3 \eta_{\mu_1\mu_2} - p_2^{\mu_1} p_3^{\mu_2}) + p_1^{\mu_2} (p_2^{\mu_3} p_3^{\mu_1} - p_2 \cdot p_3 \eta_{\mu_1\mu_3})) \end{aligned}$$



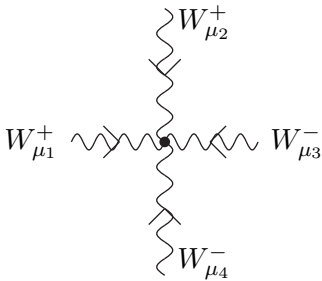
$$\begin{aligned} & + \frac{i\bar{g}^2}{\sqrt{\bar{g}^2 + \bar{g}'^2}} (\eta_{\mu_1\mu_2}p_1^{\mu_3} - \eta_{\mu_1\mu_2}p_2^{\mu_3} - \eta_{\mu_1\mu_3}p_1^{\mu_2} + \eta_{\mu_1\mu_3}p_3^{\mu_2} + \eta_{\mu_2\mu_3}p_2^{\mu_1} \\ & - \eta_{\mu_2\mu_3}p_3^{\mu_1}) + \frac{i\bar{g}\bar{g}'v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi WB} \left( \bar{g}^2\eta_{\mu_1\mu_3}(-p_3^{\mu_2}) + \bar{g}^2\eta_{\mu_2\mu_3}p_3^{\mu_1} \right. \\ & + \bar{g}'^2\eta_{\mu_1\mu_2}p_1^{\mu_3} - \bar{g}'^2\eta_{\mu_1\mu_2}p_2^{\mu_3} - \bar{g}'^2\eta_{\mu_1\mu_3}p_1^{\mu_2} + \bar{g}'^2\eta_{\mu_2\mu_3}p_2^{\mu_1} \Big) \\ & - \frac{6i\bar{g}}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^W (p_1 \cdot p_2 \eta_{\mu_1\mu_3}p_3^{\mu_2} - p_1 \cdot p_2 \eta_{\mu_2\mu_3}p_3^{\mu_1} \\ & - p_1 \cdot p_3 \eta_{\mu_1\mu_2}p_2^{\mu_3} + p_1 \cdot p_3 \eta_{\mu_2\mu_3}p_2^{\mu_1} \\ & + p_1^{\mu_3} (p_2 \cdot p_3 \eta_{\mu_1\mu_2} - p_2^{\mu_1} p_3^{\mu_2}) + p_1^{\mu_2} (p_2^{\mu_3} p_3^{\mu_1} - p_2 \cdot p_3 \eta_{\mu_1\mu_3})) \end{aligned}$$



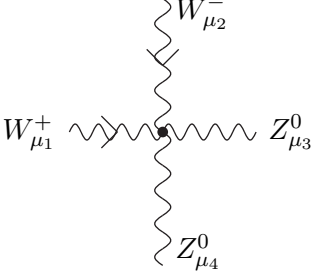
$$\begin{aligned}
& + \frac{i\bar{g}^2\bar{g}'^2}{\bar{g}^2 + \bar{g}'^2} (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} + \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} - 2\eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}) \\
& - \frac{2i\bar{g}^3\bar{g}'^3v^2}{(\bar{g}^2 + \bar{g}'^2)^2} (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} + \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} - 2\eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}) C^{\varphi WB} \\
& - \frac{6i\bar{g}\bar{g}'^2}{\bar{g}^2 + \bar{g}'^2} C^W (\eta_{\mu_1\mu_2}p_1^{\mu_4}p_4^{\mu_3} + \eta_{\mu_1\mu_2}p_2^{\mu_4}p_4^{\mu_3} + \eta_{\mu_1\mu_3}p_1^{\mu_4}p_3^{\mu_2} \\
& - \eta_{\mu_1\mu_3}p_2^{\mu_4}p_3^{\mu_2} - \eta_{\mu_1\mu_3}p_1^{\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_3}p_1^{\mu_4}p_4^{\mu_2} \\
& - \eta_{\mu_1\mu_4}p_1^{\mu_2}p_4^{\mu_3} - \eta_{\mu_2\mu_3}p_1^{\mu_4}p_3^{\mu_1} + \eta_{\mu_2\mu_3}p_2^{\mu_4}p_3^{\mu_1} \\
& - \eta_{\mu_2\mu_3}p_2^{\mu_1}p_3^{\mu_4} - \eta_{\mu_2\mu_3}p_2^{\mu_4}p_4^{\mu_1} - \eta_{\mu_2\mu_4}p_2^{\mu_1}p_4^{\mu_3} \\
& + p_1^{\mu_3}(\eta_{\mu_1\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_4}p_3^{\mu_2} + \eta_{\mu_1\mu_4}p_4^{\mu_2} - \eta_{\mu_2\mu_4}p_4^{\mu_1}) \\
& + p_2^{\mu_3}(\eta_{\mu_1\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_4}p_4^{\mu_2} + \eta_{\mu_2\mu_4}(p_4^{\mu_1} - p_3^{\mu_1})) \\
& + \eta_{\mu_3\mu_4}p_1^{\mu_2}p_3^{\mu_1} + \eta_{\mu_3\mu_4}p_2^{\mu_1}p_3^{\mu_2} + \eta_{\mu_3\mu_4}p_1^{\mu_2}p_4^{\mu_1} \\
& + \eta_{\mu_3\mu_4}p_2^{\mu_1}p_4^{\mu_2} - p_1 \cdot p_3\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} - p_1 \cdot p_4\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} \\
& - p_2 \cdot p_3\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} - p_2 \cdot p_4\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} + p_1 \cdot p_3\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} \\
& + p_1 \cdot p_4\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} + p_2 \cdot p_3\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} + p_2 \cdot p_4\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3})
\end{aligned}$$



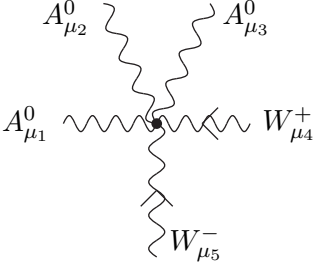
$$\begin{aligned}
& - \frac{i\bar{g}^3\bar{g}'}{\bar{g}^2 + \bar{g}'^2} (2\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} - \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} - \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}) \\
& - \frac{i\bar{g}^2\bar{g}'^2v^2(\bar{g}'^2 - \bar{g}^2)}{(\bar{g}^2 + \bar{g}'^2)^2} (2\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} - \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} \\
& - \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}) C^{\varphi WB} + \frac{6i\bar{g}^2\bar{g}'}{\bar{g}^2 + \bar{g}'^2} C^W (\eta_{\mu_1\mu_2}p_2^{\mu_4}p_4^{\mu_3} \\
& + \eta_{\mu_1\mu_3}p_1^{\mu_2}p_2^{\mu_4} - \eta_{\mu_1\mu_3}p_1^{\mu_2}p_3^{\mu_4} + \eta_{\mu_1\mu_3}p_3^{\mu_4}p_4^{\mu_2} - \eta_{\mu_1\mu_4}p_1^{\mu_2}p_2^{\mu_3} \\
& - \eta_{\mu_1\mu_4}p_2^{\mu_3}p_4^{\mu_2} - \eta_{\mu_1\mu_4}p_2^{\mu_2}p_3^{\mu_3} - \eta_{\mu_2\mu_3}p_2^{\mu_4}p_4^{\mu_1} - \eta_{\mu_2\mu_3}p_3^{\mu_4}p_4^{\mu_1} \\
& + p_1^{\mu_4}(\eta_{\mu_1\mu_2}p_2^{\mu_3} + \eta_{\mu_1\mu_3}p_3^{\mu_2} - \eta_{\mu_2\mu_3}(p_2^{\mu_1} + p_3^{\mu_1})) \\
& + \eta_{\mu_2\mu_4}p_2^{\mu_3}p_4^{\mu_1} - \eta_{\mu_2\mu_4}p_2^{\mu_1}p_4^{\mu_3} + \eta_{\mu_2\mu_4}p_3^{\mu_1}p_4^{\mu_3} \\
& + p_1^{\mu_3}(\eta_{\mu_1\mu_2}(-p_2^{\mu_4}) + \eta_{\mu_1\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_4}p_3^{\mu_2} + \eta_{\mu_2\mu_4}p_2^{\mu_1}) \\
& + \eta_{\mu_3\mu_4}p_1^{\mu_2}p_3^{\mu_1} + \eta_{\mu_3\mu_4}p_3^{\mu_2}p_4^{\mu_1} + \eta_{\mu_3\mu_4}p_2^{\mu_1}p_4^{\mu_2} \\
& - \eta_{\mu_3\mu_4}p_3^{\mu_1}p_4^{\mu_2} - p_1 \cdot p_3\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} - p_2 \cdot p_4\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} \\
& + p_1 \cdot p_2\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} - p_1 \cdot p_2\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} + p_1 \cdot p_3\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} \\
& + p_2 \cdot p_4\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} + p_3 \cdot p_4\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} - p_3 \cdot p_4\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4})
\end{aligned}$$



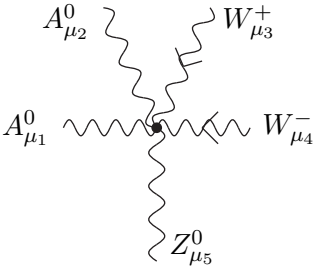
$$\begin{aligned}
& - i\bar{g}^2 (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} + \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} - 2\eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}) \\
& + 6i\bar{g}C^W (\eta_{\mu_1\mu_2}p_1^{\mu_4}p_4^{\mu_3} + \eta_{\mu_1\mu_2}p_2^{\mu_4}p_4^{\mu_3} + \eta_{\mu_1\mu_3}p_1^{\mu_4}p_3^{\mu_2} \\
& - \eta_{\mu_1\mu_3}p_2^{\mu_4}p_3^{\mu_2} - \eta_{\mu_1\mu_3}p_1^{\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_3}p_1^{\mu_4}p_4^{\mu_2} - \eta_{\mu_1\mu_4}p_1^{\mu_2}p_4^{\mu_3} \\
& - \eta_{\mu_2\mu_3}p_1^{\mu_4}p_3^{\mu_1} + \eta_{\mu_2\mu_3}p_2^{\mu_4}p_3^{\mu_1} - \eta_{\mu_2\mu_3}p_2^{\mu_1}p_3^{\mu_4} - \eta_{\mu_2\mu_3}p_2^{\mu_4}p_4^{\mu_1} \\
& - \eta_{\mu_2\mu_4}p_2^{\mu_1}p_4^{\mu_3} + p_1^{\mu_3}(\eta_{\mu_1\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_4}p_3^{\mu_2} + \eta_{\mu_1\mu_4}p_4^{\mu_2} - \eta_{\mu_2\mu_4}p_4^{\mu_1}) \\
& + p_2^{\mu_3}(\eta_{\mu_1\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_4}p_4^{\mu_2} + \eta_{\mu_2\mu_4}(p_4^{\mu_1} - p_3^{\mu_1})) \\
& + \eta_{\mu_3\mu_4}p_1^{\mu_2}p_3^{\mu_1} + \eta_{\mu_3\mu_4}p_2^{\mu_1}p_3^{\mu_2} + \eta_{\mu_3\mu_4}p_1^{\mu_2}p_4^{\mu_1} \\
& + \eta_{\mu_3\mu_4}p_2^{\mu_1}p_4^{\mu_2} - p_1 \cdot p_3\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} - p_1 \cdot p_4\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} \\
& - p_2 \cdot p_3\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} - p_2 \cdot p_4\eta_{\mu_3\mu_4}\eta_{\mu_1\mu_2} + p_1 \cdot p_3\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} \\
& + p_1 \cdot p_4\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} + p_2 \cdot p_3\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} + p_2 \cdot p_4\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3})
\end{aligned}$$



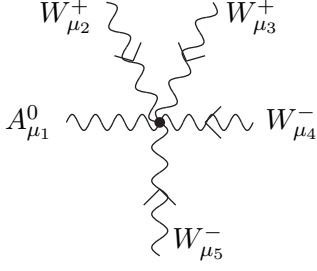
$$\begin{aligned}
& + \frac{i\bar{g}^4}{\bar{g}^2 + \bar{g}'^2} (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} + \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} - 2\eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}) \\
& + \frac{2i\bar{g}^3\bar{g}'^3v^2}{(\bar{g}^2 + \bar{g}'^2)^2} (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} + \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} - 2\eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}) C^{\varphi WB} \\
& - \frac{6i\bar{g}^3}{\bar{g}^2 + \bar{g}'^2} C^W (\eta_{\mu_1\mu_2}p_1^{\mu_4}p_4^{\mu_3} + \eta_{\mu_1\mu_2}p_2^{\mu_4}p_4^{\mu_3} + \eta_{\mu_1\mu_3}p_1^{\mu_4}p_3^{\mu_2} \\
& - \eta_{\mu_1\mu_3}p_2^{\mu_4}p_3^{\mu_2} - \eta_{\mu_1\mu_3}p_1^{\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_3}p_1^{\mu_4}p_4^{\mu_2} \\
& - \eta_{\mu_1\mu_4}p_1^{\mu_2}p_3^{\mu_3} - \eta_{\mu_2\mu_3}p_1^{\mu_4}p_3^{\mu_1} + \eta_{\mu_2\mu_3}p_2^{\mu_4}p_3^{\mu_1} \\
& - \eta_{\mu_2\mu_3}p_2^{\mu_1}p_3^{\mu_4} - \eta_{\mu_2\mu_3}p_2^{\mu_4}p_4^{\mu_1} - \eta_{\mu_2\mu_4}p_2^{\mu_1}p_4^{\mu_3} \\
& + p_1^{\mu_3}(\eta_{\mu_1\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_4}p_3^{\mu_2} + \eta_{\mu_1\mu_4}p_4^{\mu_2} - \eta_{\mu_2\mu_4}p_4^{\mu_1}) \\
& + p_2^{\mu_3}(\eta_{\mu_1\mu_2}p_3^{\mu_4} - \eta_{\mu_1\mu_4}p_4^{\mu_2} + \eta_{\mu_2\mu_4}(p_4^{\mu_1} - p_3^{\mu_1})) \\
& + \eta_{\mu_3\mu_4}p_1^{\mu_2}p_3^{\mu_1} + \eta_{\mu_3\mu_4}p_2^{\mu_1}p_3^{\mu_2} + \eta_{\mu_3\mu_4}p_1^{\mu_2}p_4^{\mu_1} \\
& + \eta_{\mu_3\mu_4}p_2^{\mu_1}p_4^{\mu_2} - p_1 \cdot p_3 \eta_{\mu_3\mu_4} \eta_{\mu_1\mu_2} - p_1 \cdot p_4 \eta_{\mu_3\mu_4} \eta_{\mu_1\mu_2} \\
& - p_2 \cdot p_3 \eta_{\mu_3\mu_4} \eta_{\mu_1\mu_2} - p_2 \cdot p_4 \eta_{\mu_3\mu_4} \eta_{\mu_1\mu_2} + p_1 \cdot p_3 \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} \\
& + p_1 \cdot p_4 \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} + p_2 \cdot p_3 \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} + p_2 \cdot p_4 \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3})
\end{aligned}$$



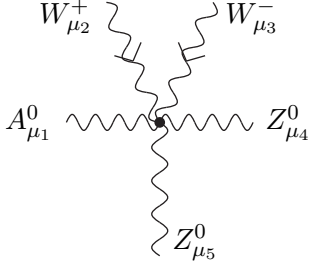
$$\begin{aligned}
& + \frac{6i\bar{g}^2\bar{g}'^3}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^W (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3}(-p_3^{\mu_5}) - 2\eta_{\mu_1\mu_5}\eta_{\mu_2\mu_3}p_1^{\mu_4} \\
& + \eta_{\mu_1\mu_5}\eta_{\mu_2\mu_3}p_2^{\mu_4} + \eta_{\mu_1\mu_5}\eta_{\mu_2\mu_3}p_3^{\mu_4} - \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4}p_3^{\mu_5} \\
& + \eta_{\mu_1\mu_5}\eta_{\mu_2\mu_4}p_1^{\mu_3} - \eta_{\mu_1\mu_5}\eta_{\mu_2\mu_4}p_2^{\mu_3} + \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_5}p_1^{\mu_4} \\
& - 2\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_5}p_2^{\mu_4} + \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_5}p_3^{\mu_4} - \eta_{\mu_1\mu_4}\eta_{\mu_2\mu_5}p_1^{\mu_3} \\
& + \eta_{\mu_1\mu_4}\eta_{\mu_2\mu_5}p_2^{\mu_3} + 2\eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}p_3^{\mu_5} + \eta_{\mu_1\mu_5}\eta_{\mu_3\mu_4}p_1^{\mu_2} \\
& - \eta_{\mu_1\mu_5}\eta_{\mu_3\mu_4}p_2^{\mu_2} + \eta_{\mu_2\mu_5}\eta_{\mu_3\mu_4}p_2^{\mu_1} - \eta_{\mu_2\mu_5}\eta_{\mu_3\mu_4}p_3^{\mu_1} \\
& + (2\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} - \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} - \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4})p_1^{\mu_5} \\
& - (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} - 2\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} + \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4})p_2^{\mu_5} + \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_5}p_1^{\mu_4} \\
& + \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_5}p_2^{\mu_4} - 2\eta_{\mu_1\mu_2}\eta_{\mu_3\mu_5}p_3^{\mu_4} - \eta_{\mu_1\mu_4}\eta_{\mu_3\mu_5}p_1^{\mu_2} \\
& + \eta_{\mu_1\mu_4}\eta_{\mu_3\mu_5}p_3^{\mu_2} - \eta_{\mu_2\mu_4}\eta_{\mu_3\mu_5}p_2^{\mu_1} + \eta_{\mu_2\mu_4}\eta_{\mu_3\mu_5}p_3^{\mu_1})
\end{aligned}$$



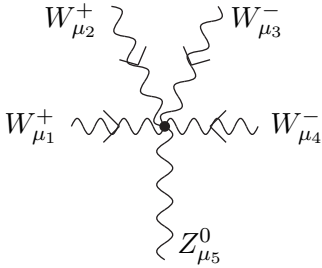
$$\begin{aligned}
& + \frac{6i\bar{g}^3\bar{g}'^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^W (\eta_{\mu_1\mu_5}\eta_{\mu_2\mu_3}(-p_1^{\mu_4}) + 2\eta_{\mu_1\mu_5}\eta_{\mu_2\mu_3}p_2^{\mu_4} \\
& - \eta_{\mu_1\mu_5}\eta_{\mu_2\mu_3}p_5^{\mu_4} - \eta_{\mu_4\mu_5}\eta_{\mu_2\mu_3}p_2^{\mu_1} + \eta_{\mu_4\mu_5}\eta_{\mu_2\mu_3}p_5^{\mu_1} \\
& + \eta_{\mu_1\mu_5}\eta_{\mu_2\mu_4}p_1^{\mu_3} - 2\eta_{\mu_1\mu_5}\eta_{\mu_2\mu_4}p_2^{\mu_3} + \eta_{\mu_1\mu_5}\eta_{\mu_2\mu_4}p_5^{\mu_3} \\
& + (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} - \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4})p_1^{\mu_5} + (\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} - \eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3})p_2^{\mu_5} \\
& + 2\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_5}p_1^{\mu_4} - \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_5}p_2^{\mu_4} - \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_5}p_5^{\mu_4} \\
& - 2\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_5}p_1^{\mu_3} + \eta_{\mu_1\mu_4}\eta_{\mu_2\mu_5}p_2^{\mu_3} + \eta_{\mu_1\mu_4}\eta_{\mu_2\mu_5}p_5^{\mu_3} \\
& - \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_5}p_1^{\mu_4} - \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_5}p_2^{\mu_4} + 2\eta_{\mu_1\mu_2}\eta_{\mu_3\mu_5}p_5^{\mu_4} \\
& + \eta_{\mu_1\mu_4}\eta_{\mu_3\mu_5}p_1^{\mu_2} - \eta_{\mu_1\mu_4}\eta_{\mu_3\mu_5}p_5^{\mu_2} + \eta_{\mu_2\mu_4}\eta_{\mu_3\mu_5}p_2^{\mu_1} \\
& - \eta_{\mu_2\mu_4}\eta_{\mu_3\mu_5}p_5^{\mu_1} + \eta_{\mu_1\mu_2}\eta_{\mu_4\mu_5}p_1^{\mu_3} + \eta_{\mu_1\mu_2}\eta_{\mu_4\mu_5}p_2^{\mu_3} \\
& - 2\eta_{\mu_1\mu_2}\eta_{\mu_4\mu_5}p_5^{\mu_3} - \eta_{\mu_1\mu_3}\eta_{\mu_4\mu_5}p_1^{\mu_2} + \eta_{\mu_1\mu_3}\eta_{\mu_4\mu_5}p_5^{\mu_2})
\end{aligned}$$



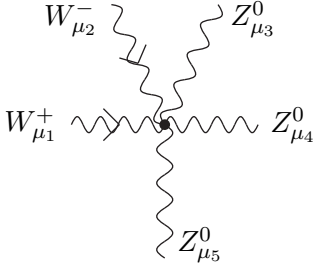
$$\begin{aligned}
& + \frac{6i\bar{g}^2\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^W (-2p_4^{\mu_5} \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} + p_2^{\mu_4} \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_3} \\
& + p_3^{\mu_4} \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_3} - 2p_5^{\mu_4} \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_3} - 2p_2^{\mu_1} \eta_{\mu_4\mu_5} \eta_{\mu_2\mu_3} \\
& - 2p_3^{\mu_1} \eta_{\mu_4\mu_5} \eta_{\mu_2\mu_3} + 2p_4^{\mu_1} \eta_{\mu_4\mu_5} \eta_{\mu_2\mu_3} + 2p_5^{\mu_1} \eta_{\mu_4\mu_5} \eta_{\mu_2\mu_3} \\
& + p_4^{\mu_5} \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} - p_2^{\mu_3} \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_4} + p_5^{\mu_3} \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_4} \\
& + p_3^{\mu_5} (\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4}) - p_3^{\mu_4} \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} \\
& + p_5^{\mu_4} \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} - p_2^{\mu_3} \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} + p_4^{\mu_3} \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} \\
& + p_4^{\mu_5} \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4} - p_3^{\mu_2} \eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} + p_5^{\mu_2} \eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} \\
& + p_2^{\mu_1} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} + p_3^{\mu_1} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} - p_4^{\mu_1} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} \\
& - p_5^{\mu_1} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} + p_2^{\mu_5} (\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} - \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4}) \\
& - p_2^{\mu_4} \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_5} + p_5^{\mu_4} \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_5} - p_3^{\mu_2} \eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} \\
& + p_4^{\mu_2} \eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} + p_2^{\mu_1} \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} + p_3^{\mu_1} \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} \\
& - p_4^{\mu_1} \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} - p_5^{\mu_1} \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} + 2p_2^{\mu_3} \eta_{\mu_1\mu_2} \eta_{\mu_4\mu_5} \\
& - p_4^{\mu_3} \eta_{\mu_1\mu_2} \eta_{\mu_4\mu_5} - p_5^{\mu_3} \eta_{\mu_1\mu_2} \eta_{\mu_4\mu_5} + 2p_3^{\mu_2} \eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5} \\
& - p_4^{\mu_2} \eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5} - p_5^{\mu_2} \eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5})
\end{aligned}$$



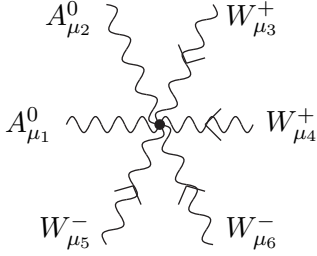
$$\begin{aligned}
& + \frac{6i\bar{g}^4\bar{g}'}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^W (\eta_{\mu_1\mu_5} \eta_{\mu_2\mu_4} (-p_1^{\mu_3}) + 2\eta_{\mu_1\mu_5} \eta_{\mu_2\mu_4} p_4^{\mu_3} \\
& - \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_4} p_5^{\mu_3} - \eta_{\mu_3\mu_5} \eta_{\mu_2\mu_4} p_4^{\mu_1} + \eta_{\mu_3\mu_5} \eta_{\mu_2\mu_4} p_5^{\mu_1} \\
& + \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} p_1^{\mu_4} - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} p_5^{\mu_4} - \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} p_1^{\mu_3} \\
& - \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} p_4^{\mu_3} + 2\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} p_5^{\mu_3} + \eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} p_1^{\mu_2} \\
& - 2\eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} p_4^{\mu_2} + \eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} p_5^{\mu_2} + \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} p_4^{\mu_1} \\
& - \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} p_5^{\mu_1} + (\eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} - \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4}) p_1^{\mu_5} \\
& + (\eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4} - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4}) p_4^{\mu_5} - \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_5} p_1^{\mu_4} + \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_5} p_5^{\mu_4} \\
& + \eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} p_1^{\mu_2} + \eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} p_4^{\mu_2} - 2\eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} p_5^{\mu_2} \\
& + 2\eta_{\mu_1\mu_2} \eta_{\mu_4\mu_5} p_1^{\mu_3} - \eta_{\mu_1\mu_2} \eta_{\mu_4\mu_5} p_4^{\mu_3} - \eta_{\mu_1\mu_2} \eta_{\mu_4\mu_5} p_5^{\mu_3} \\
& - 2\eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5} p_1^{\mu_2} + \eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5} p_4^{\mu_2} + \eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5} p_5^{\mu_2})
\end{aligned}$$



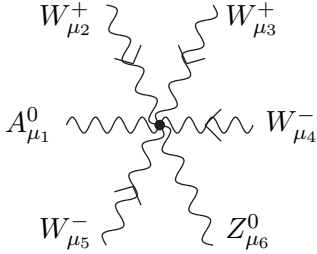
$$\begin{aligned}
& + \frac{6i\bar{g}^3}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^W (-p_3^{\mu_5} \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} - p_4^{\mu_5} \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} \\
& - p_1^{\mu_4} \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_3} + p_3^{\mu_4} \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_3} - p_2^{\mu_1} \eta_{\mu_4\mu_5} \eta_{\mu_2\mu_3} \\
& + p_4^{\mu_1} \eta_{\mu_4\mu_5} \eta_{\mu_2\mu_3} - p_3^{\mu_5} \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} - p_4^{\mu_5} \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} \\
& - p_1^{\mu_3} \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_4} + p_4^{\mu_3} \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_4} - p_2^{\mu_4} \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} \\
& + p_3^{\mu_4} \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} - p_2^{\mu_3} \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} + p_4^{\mu_3} \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} \\
& + 2p_3^{\mu_5} \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4} + 2p_4^{\mu_5} \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4} \\
& + 2p_1^{\mu_2} \eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} - p_3^{\mu_2} \eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} - p_4^{\mu_2} \eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} \\
& + 2p_2^{\mu_1} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} - p_3^{\mu_1} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} - p_4^{\mu_1} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} \\
& + p_1^{\mu_5} (\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} + \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} - 2\eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4}) \\
& + p_2^{\mu_5} (\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} + \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} - 2\eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4}) \\
& + p_1^{\mu_4} \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_5} + p_2^{\mu_4} \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_5} - 2p_3^{\mu_4} \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_5} \\
& - p_1^{\mu_2} \eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} + p_3^{\mu_2} \eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} - p_2^{\mu_1} \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} \\
& + p_3^{\mu_1} \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} + p_1^{\mu_3} \eta_{\mu_1\mu_2} \eta_{\mu_4\mu_5} + p_2^{\mu_3} \eta_{\mu_1\mu_2} \eta_{\mu_4\mu_5} \\
& - 2p_4^{\mu_3} \eta_{\mu_1\mu_2} \eta_{\mu_4\mu_5} - p_1^{\mu_2} \eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5} + p_4^{\mu_2} \eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5})
\end{aligned}$$



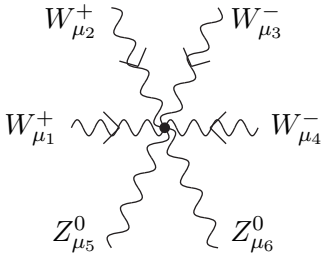
$$\begin{aligned}
& + \frac{6i\bar{g}^5}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^W (\eta_{\mu_1\mu_5} \eta_{\mu_2\mu_3} p_3^{\mu_4} - \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_3} p_5^{\mu_4} \\
& - 2\eta_{\mu_4\mu_5} \eta_{\mu_2\mu_3} p_3^{\mu_1} + \eta_{\mu_4\mu_5} \eta_{\mu_2\mu_3} p_4^{\mu_1} + \eta_{\mu_4\mu_5} \eta_{\mu_2\mu_3} p_5^{\mu_1} \\
& + \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_4} p_4^{\mu_3} - \eta_{\mu_1\mu_5} \eta_{\mu_2\mu_4} p_5^{\mu_3} + (\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4}) p_3^{\mu_5} \\
& + (\eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} - \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3}) p_4^{\mu_5} - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} p_3^{\mu_4} \\
& + \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} p_5^{\mu_4} - \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} p_4^{\mu_3} + \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} p_5^{\mu_3} \\
& - \eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} p_3^{\mu_2} - \eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} p_4^{\mu_2} + 2\eta_{\mu_1\mu_5} \eta_{\mu_3\mu_4} p_5^{\mu_2} \\
& + \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} p_3^{\mu_1} + \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} p_4^{\mu_1} - 2\eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} p_5^{\mu_1} \\
& - \eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} p_3^{\mu_2} + 2\eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} p_4^{\mu_2} - \eta_{\mu_1\mu_4} \eta_{\mu_3\mu_5} p_5^{\mu_2} \\
& + \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} p_3^{\mu_1} - 2\eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} p_4^{\mu_1} + \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} p_5^{\mu_1} \\
& + 2\eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5} p_3^{\mu_2} - \eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5} p_4^{\mu_2} - \eta_{\mu_1\mu_3} \eta_{\mu_4\mu_5} p_5^{\mu_2})
\end{aligned}$$



$$\begin{aligned}
& - \frac{12i\bar{g}^3\bar{g}'^2}{\bar{g}^2 + \bar{g}'^2} (-\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_6} \eta_{\mu_3\mu_5} + 2\eta_{\mu_1\mu_2} \eta_{\mu_4\mu_6} \eta_{\mu_3\mu_5} \\
& - \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_6} - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_6} \eta_{\mu_4\mu_5} + 2\eta_{\mu_1\mu_2} \eta_{\mu_3\mu_6} \eta_{\mu_4\mu_5} \\
& + \eta_{\mu_1\mu_6} (2\eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} - \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} - \eta_{\mu_2\mu_3} \eta_{\mu_4\mu_5}) \\
& - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} \eta_{\mu_4\mu_6} + \eta_{\mu_1\mu_5} (2\eta_{\mu_2\mu_6} \eta_{\mu_3\mu_4} - \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_6} - \eta_{\mu_2\mu_3} \eta_{\mu_4\mu_6}) \\
& + 2\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} \eta_{\mu_5\mu_6} + 2\eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} \eta_{\mu_5\mu_6} - 4\eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4} \eta_{\mu_5\mu_6}) C^W
\end{aligned}$$

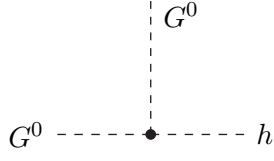


$$\begin{aligned}
& - \frac{12i\bar{g}^4\bar{g}'}{\bar{g}^2 + \bar{g}'^2} (-\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_6} \eta_{\mu_3\mu_5} - \eta_{\mu_1\mu_2} \eta_{\mu_4\mu_6} \eta_{\mu_3\mu_5} \\
& - \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_6} + 2\eta_{\mu_1\mu_3} \eta_{\mu_2\mu_6} \eta_{\mu_4\mu_5} + 2\eta_{\mu_1\mu_2} \eta_{\mu_3\mu_6} \eta_{\mu_4\mu_5} \\
& + 2\eta_{\mu_1\mu_6} (\eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} + \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} - 2\eta_{\mu_2\mu_3} \eta_{\mu_4\mu_5}) \\
& - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} \eta_{\mu_4\mu_6} - \eta_{\mu_1\mu_5} (\eta_{\mu_2\mu_6} \eta_{\mu_3\mu_4} + \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_6} - 2\eta_{\mu_2\mu_3} \eta_{\mu_4\mu_6}) \\
& + 2\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} \eta_{\mu_5\mu_6} - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} \eta_{\mu_5\mu_6} - \eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4} \eta_{\mu_5\mu_6}) C^W
\end{aligned}$$

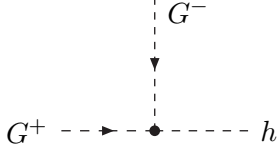


$$\begin{aligned}
& - \frac{12i\bar{g}^5}{\bar{g}^2 + \bar{g}'^2} (-\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_6} \eta_{\mu_3\mu_5} + 2\eta_{\mu_1\mu_2} \eta_{\mu_4\mu_6} \eta_{\mu_3\mu_5} \\
& - \eta_{\mu_1\mu_4} \eta_{\mu_2\mu_5} \eta_{\mu_3\mu_6} - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_6} \eta_{\mu_4\mu_5} + 2\eta_{\mu_1\mu_2} \eta_{\mu_3\mu_6} \eta_{\mu_4\mu_5} \\
& + \eta_{\mu_1\mu_6} (2\eta_{\mu_2\mu_5} \eta_{\mu_3\mu_4} - \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_5} - \eta_{\mu_2\mu_3} \eta_{\mu_4\mu_5}) \\
& - \eta_{\mu_1\mu_3} \eta_{\mu_2\mu_5} \eta_{\mu_4\mu_6} + \eta_{\mu_1\mu_5} (2\eta_{\mu_2\mu_6} \eta_{\mu_3\mu_4} - \eta_{\mu_2\mu_4} \eta_{\mu_3\mu_6} - \eta_{\mu_2\mu_3} \eta_{\mu_4\mu_6}) \\
& + 2\eta_{\mu_1\mu_4} \eta_{\mu_2\mu_3} \eta_{\mu_5\mu_6} + 2\eta_{\mu_1\mu_3} \eta_{\mu_2\mu_4} \eta_{\mu_5\mu_6} - 4\eta_{\mu_1\mu_2} \eta_{\mu_3\mu_4} \eta_{\mu_5\mu_6}) C^W
\end{aligned}$$

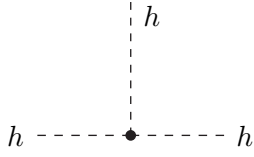
## A.7 Higgs–gauge vertices



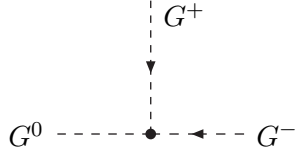
$$-i\lambda v + \frac{iv}{4}C^{\varphi D} (3\lambda v^2 - 4p_1 \cdot p_2)$$



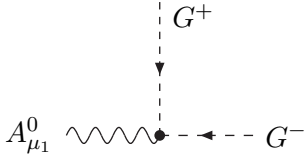
$$-i\lambda v + \frac{iv}{4}C^{\varphi D} (\lambda v^2 - 2(p_1 \cdot p_3 + p_2 \cdot p_3))$$



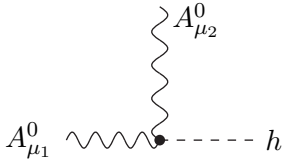
$$-3i\lambda v + \frac{iv}{4}C^{\varphi D} (9\lambda v^2 - 4(p_1 \cdot p_2 + p_1 \cdot p_3 + p_2 \cdot p_3))$$



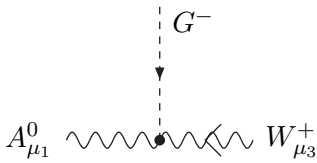
$$-\frac{v}{2}(p_1 \cdot p_2 - p_1 \cdot p_3)C^{\varphi D}$$



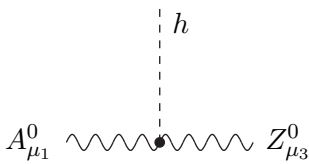
$$-\frac{i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}}(p_2^{\mu_1} - p_3^{\mu_1}) + \frac{i\bar{g}^2\bar{g}'^2v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}}C^{\varphi WB}(p_2^{\mu_1} - p_3^{\mu_1})$$



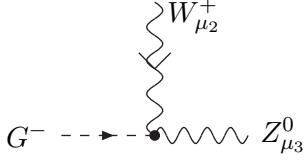
$$-\frac{4i\bar{g}\bar{g}'v}{\bar{g}^2 + \bar{g}'^2}C^{\varphi WB}(p_1^{\mu_2}p_2^{\mu_1} - p_1 \cdot p_2\eta_{\mu_1\mu_2})$$



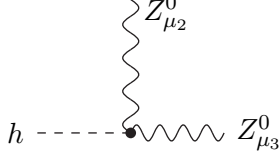
$$\begin{aligned} & + \frac{i\bar{g}^2\bar{g}'v}{2\sqrt{\bar{g}^2 + \bar{g}'^2}}\eta_{\mu_1\mu_3} \\ & - \frac{i\bar{g}v}{2(\bar{g}^2 + \bar{g}'^2)^{3/2}}C^{\varphi WB}\left(\eta_{\mu_1\mu_3}\left(\bar{g}'^2(4p_1 \cdot p_3 + \bar{g}^2v^2) + 4\bar{g}^2p_1 \cdot p_3\right)\right. \\ & \left. - 4(\bar{g}^2 + \bar{g}'^2)p_1^{\mu_3}p_3^{\mu_1}\right) \end{aligned}$$



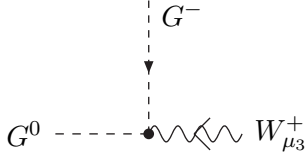
$$+\frac{2iv(\bar{g}'^2 - \bar{g}^2)}{\bar{g}^2 + \bar{g}'^2}C^{\varphi WB}(p_1^{\mu_3}p_3^{\mu_1} - p_1 \cdot p_3\eta_{\mu_1\mu_3})$$



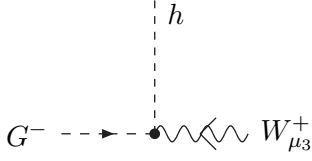
$$\begin{aligned}
& -\frac{i\bar{g}\bar{g}'^2v}{2\sqrt{\bar{g}^2+\bar{g}'^2}}\eta_{\mu_2\mu_3}-\frac{1}{4}i\bar{g}v^3\sqrt{\bar{g}^2+\bar{g}'^2}\eta_{\mu_2\mu_3}C^{\varphi D} \\
& -\frac{i\bar{g}'v}{2(\bar{g}^2+\bar{g}'^2)^{3/2}}C^{\varphi WB}\left(\eta_{\mu_2\mu_3}\left(-4\bar{g}^2p_2\cdot p_3-4\bar{g}'^2p_2\cdot p_3+\bar{g}^4v^2\right)\right. \\
& \left.+4\left(\bar{g}^2+\bar{g}'^2\right)p_2^{\mu_3}p_3^{\mu_2}\right)
\end{aligned}$$



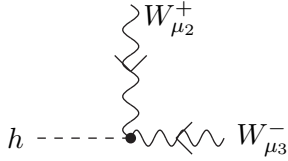
$$\begin{aligned}
& +\frac{iv}{2}\left(\bar{g}^2+\bar{g}'^2\right)\eta_{\mu_2\mu_3}+\frac{3iv^3}{8}\left(\bar{g}^2+\bar{g}'^2\right)\eta_{\mu_2\mu_3}C^{\varphi D} \\
& +\frac{i\bar{g}\bar{g}'v}{\bar{g}^2+\bar{g}'^2}C^{\varphi WB}\left(\eta_{\mu_2\mu_3}\left(-4p_2\cdot p_3+\bar{g}^2v^2+\bar{g}'^2v^2\right)+4p_2^{\mu_3}p_3^{\mu_2}\right)
\end{aligned}$$



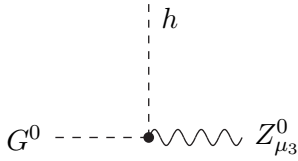
$$+\frac{\bar{g}}{2}(p_1^{\mu_3}-p_2^{\mu_3})+\frac{\bar{g}v^2}{8}C^{\varphi D}(3p_1^{\mu_3}+p_2^{\mu_3})$$



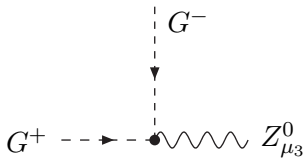
$$+\frac{i\bar{g}}{2}(p_1^{\mu_3}-p_2^{\mu_3})-\frac{1}{8}i\bar{g}v^2C^{\varphi D}(p_1^{\mu_3}-p_2^{\mu_3})$$



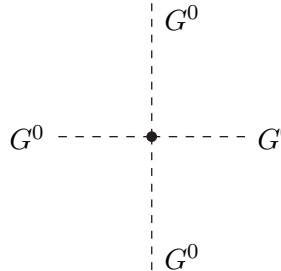
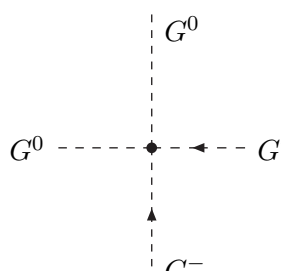
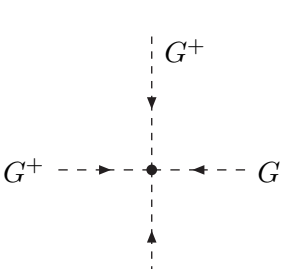
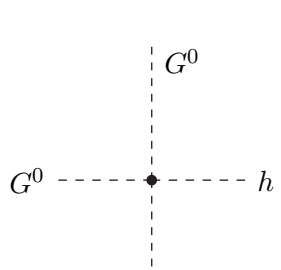
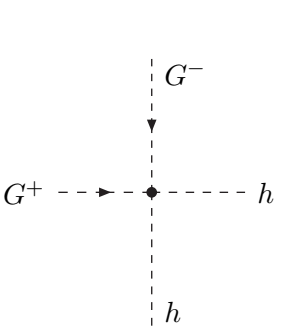
$$+\frac{1}{2}i\bar{g}^2v\eta_{\mu_2\mu_3}-\frac{1}{8}i\bar{g}^2v^3\eta_{\mu_2\mu_3}C^{\varphi D}$$



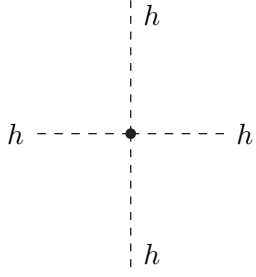
$$\begin{aligned}
& -\frac{1}{2}\sqrt{\bar{g}^2+\bar{g}'^2}(p_1^{\mu_3}-p_2^{\mu_3})-\frac{1}{2}v^2\sqrt{\bar{g}^2+\bar{g}'^2}C^{\varphi D}p_1^{\mu_3} \\
& -\frac{\bar{g}\bar{g}'v^2}{2\sqrt{\bar{g}^2+\bar{g}'^2}}C^{\varphi WB}(p_1^{\mu_3}-p_2^{\mu_3})
\end{aligned}$$



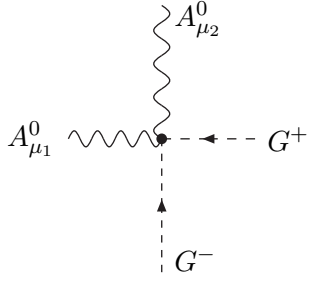
$$\begin{aligned}
& +\frac{i(\bar{g}'^2-\bar{g}^2)}{2\sqrt{\bar{g}^2+\bar{g}'^2}}(p_1^{\mu_3}-p_2^{\mu_3})+\frac{1}{4}iv^2\sqrt{\bar{g}^2+\bar{g}'^2}C^{\varphi D}(p_1^{\mu_3}-p_2^{\mu_3}) \\
& -\frac{i\bar{g}\bar{g}'v^2(\bar{g}'^2-\bar{g}^2)}{2(\bar{g}^2+\bar{g}'^2)^{3/2}}C^{\varphi WB}(p_1^{\mu_3}-p_2^{\mu_3})
\end{aligned}$$

 <p>A central vertex with four dashed lines extending outwards, labeled <math>G^0</math> at the top, bottom, left, and right.</p>	$-3i\lambda + iC^{\varphi D} (-p_1 \cdot p_2 - p_1 \cdot p_3 - p_1 \cdot p_4 - p_2 \cdot p_3 - p_2 \cdot p_4 - p_3 \cdot p_4 + 3\lambda v^2)$
 <p>A central vertex with four dashed lines. Top: <math>G^0</math>, Bottom: <math>G^-</math>, Left: <math>G^0</math>, Right: <math>G^+</math>. Arrows on the right and bottom lines point towards the vertex.</p>	$-i\lambda + \frac{i}{2}C^{\varphi D} (-p_1 \cdot p_3 - p_1 \cdot p_4 - p_2 \cdot p_3 - p_2 \cdot p_4 + \lambda v^2)$
 <p>A central vertex with four dashed lines. Top: <math>G^+</math>, Bottom: <math>G^-</math>, Left: <math>G^+</math>, Right: <math>G^-</math>. Arrows on all four lines point towards the vertex.</p>	$-2i\lambda - i(p_1 \cdot p_3 + p_1 \cdot p_4 + p_2 \cdot p_3 + p_2 \cdot p_4)C^{\varphi D}$
 <p>A central vertex with four dashed lines. Top: <math>G^0</math>, Bottom: <math>h</math>, Left: <math>G^0</math>, Right: <math>h</math>.</p>	$-i\lambda + iC^{\varphi D} (-p_1 \cdot p_2 - p_3 \cdot p_4 + \lambda v^2)$
 <p>A central vertex with four dashed lines. Top: <math>G^-</math>, Bottom: <math>h</math>, Left: <math>G^+</math>, Right: <math>h</math>. Arrows on the top and bottom lines point towards the vertex.</p>	$-i\lambda + \frac{i}{2}C^{\varphi D} (-p_1 \cdot p_3 - p_1 \cdot p_4 - p_2 \cdot p_3 - p_2 \cdot p_4 + \lambda v^2)$

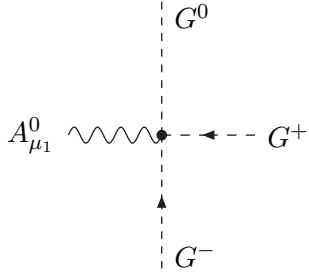




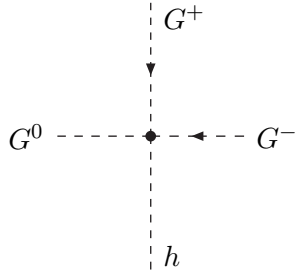
$$-3i\lambda + iC^{\varphi D} (-p_1 \cdot p_2 - p_1 \cdot p_3 - p_1 \cdot p_4 - p_2 \cdot p_3 - p_2 \cdot p_4 - p_3 \cdot p_4 + 3\lambda v^2)$$



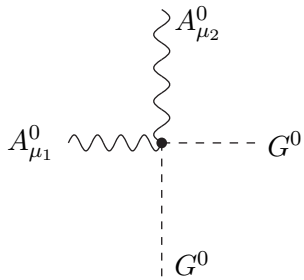
$$+\frac{2i\bar{g}^2\bar{g}'^2}{\bar{g}^2+\bar{g}'^2}\eta_{\mu_1\mu_2}-\frac{4i\bar{g}\bar{g}'}{(\bar{g}^2+\bar{g}'^2)^2}C^{\varphi WB}\left(\eta_{\mu_1\mu_2}\left(\bar{g}'^2(p_1\cdot p_2+\bar{g}^2v^2)+\bar{g}^2p_1\cdot p_2\right)-\left(\bar{g}^2+\bar{g}'^2\right)p_1^{\mu_2}p_2^{\mu_1}\right)$$



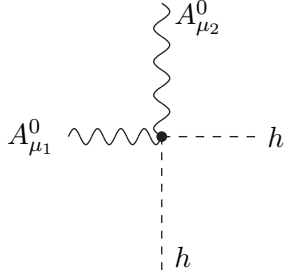
$$+\frac{\bar{g}\bar{g}'v}{\sqrt{\bar{g}^2+\bar{g}'^2}}C^{\varphi D}p_2^{\mu_1}$$



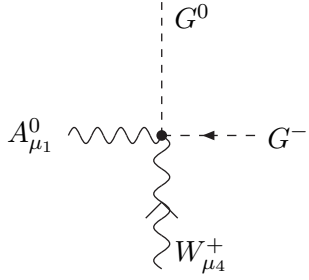
$$-\frac{1}{2}(p_1 \cdot p_2 - p_1 \cdot p_3 - p_2 \cdot p_4 + p_3 \cdot p_4)C^{\varphi D}$$



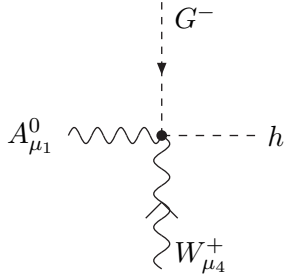
$$-\frac{4i\bar{g}\bar{g}'}{\bar{g}^2+\bar{g}'^2}C^{\varphi WB}(p_1^{\mu_2}p_2^{\mu_1}-p_1\cdot p_2\eta_{\mu_1\mu_2})$$



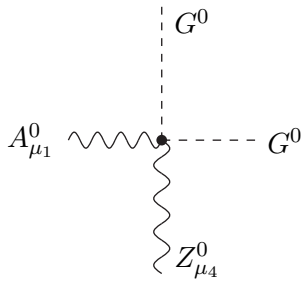
$$-\frac{4i\bar{g}\bar{g}'}{\bar{g}^2 + \bar{g}'^2} C^{\varphi WB} (p_1^{\mu_2} p_2^{\mu_1} - p_1 \cdot p_2 \eta_{\mu_1 \mu_2})$$



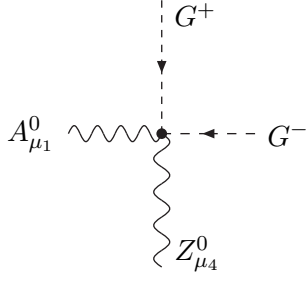
$$\begin{aligned} & -\frac{\bar{g}^2 \bar{g}'}{2\sqrt{\bar{g}^2 + \bar{g}'^2}} \eta_{\mu_1 \mu_4} + \frac{\bar{g}^2 \bar{g}' v^2}{8\sqrt{\bar{g}^2 + \bar{g}'^2}} \eta_{\mu_1 \mu_4} C^{\varphi D} \\ & - \frac{\bar{g}}{2(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi WB} \left( 4(\bar{g}^2 + \bar{g}'^2) p_1^{\mu_4} p_4^{\mu_1} \right. \\ & \left. - \eta_{\mu_1 \mu_4} (\bar{g}'^2 (4p_1 \cdot p_4 + \bar{g}^2 v^2) + 4\bar{g}^2 p_1 \cdot p_4) \right) \end{aligned}$$



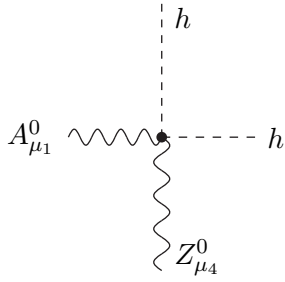
$$\begin{aligned} & + \frac{i\bar{g}^2 \bar{g}'}{2\sqrt{\bar{g}^2 + \bar{g}'^2}} \eta_{\mu_1 \mu_4} - \frac{i\bar{g}^2 \bar{g}' v^2}{8\sqrt{\bar{g}^2 + \bar{g}'^2}} \eta_{\mu_1 \mu_4} C^{\varphi D} \\ & + \frac{i\bar{g}}{2(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi WB} \left( 4(\bar{g}^2 + \bar{g}'^2) p_1^{\mu_4} p_4^{\mu_1} \right. \\ & \left. - \eta_{\mu_1 \mu_4} (\bar{g}'^2 (4p_1 \cdot p_4 + \bar{g}^2 v^2) + 4\bar{g}^2 p_1 \cdot p_4) \right) \end{aligned}$$



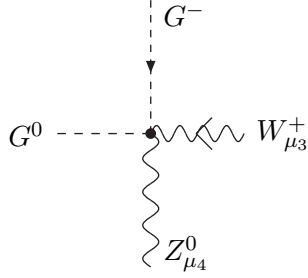
$$+\frac{2i(\bar{g}'^2 - \bar{g}^2)}{\bar{g}^2 + \bar{g}'^2} C^{\varphi WB} (p_1^{\mu_4} p_4^{\mu_1} - p_1 \cdot p_4 \eta_{\mu_1 \mu_4})$$



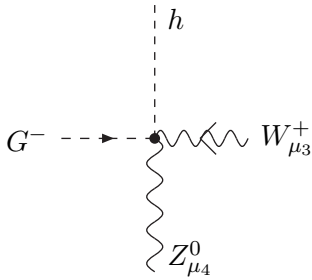
$$\begin{aligned}
& -\frac{i\bar{g}\bar{g}'\left(\bar{g}'^2-\bar{g}^2\right)}{\bar{g}^2+\bar{g}'^2}\eta_{\mu_1\mu_4}-\frac{1}{2}i\bar{g}\bar{g}'v^2\eta_{\mu_1\mu_4}C^{\varphi D} \\
& +\frac{2i\left(\bar{g}'^2-\bar{g}^2\right)}{\left(\bar{g}^2+\bar{g}'^2\right)^2}C^{\varphi WB}\left(\eta_{\mu_1\mu_4}\left(\bar{g}'^2\left(p_1\cdot p_4+\bar{g}^2v^2\right)+\bar{g}^2p_1\cdot p_4\right)\right. \\
& \left.-\left(\bar{g}^2+\bar{g}'^2\right)p_1^{\mu_4}p_4^{\mu_1}\right)
\end{aligned}$$



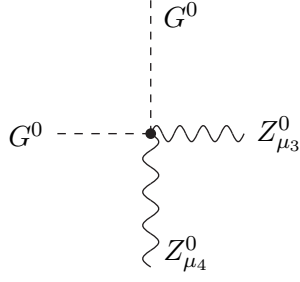
$$+\frac{2i\left(\bar{g}'^2-\bar{g}^2\right)}{\bar{g}^2+\bar{g}'^2}C^{\varphi WB}\left(p_1^{\mu_4}p_4^{\mu_1}-p_1\cdot p_4\eta_{\mu_1\mu_4}\right)$$



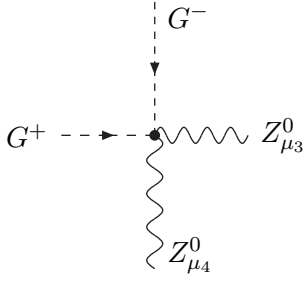
$$\begin{aligned}
& +\frac{\bar{g}\bar{g}'^2}{2\sqrt{\bar{g}^2+\bar{g}'^2}}\eta_{\mu_3\mu_4}+\frac{\bar{g}v^2}{8\sqrt{\bar{g}^2+\bar{g}'^2}}\left(2\bar{g}^2+\bar{g}'^2\right)\eta_{\mu_3\mu_4}C^{\varphi D} \\
& +\frac{\bar{g}'}{2\left(\bar{g}^2+\bar{g}'^2\right)^{3/2}}C^{\varphi WB}\left(\eta_{\mu_3\mu_4}\left(-4\bar{g}^2p_3\cdot p_4-4\bar{g}'^2p_3\cdot p_4+\bar{g}^4v^2\right)\right. \\
& \left.+4\left(\bar{g}^2+\bar{g}'^2\right)p_3^{\mu_4}p_4^{\mu_3}\right)
\end{aligned}$$



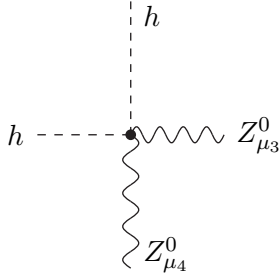
$$\begin{aligned}
& -\frac{i\bar{g}\bar{g}'^2}{2\sqrt{\bar{g}^2+\bar{g}'^2}}\eta_{\mu_3\mu_4}-\frac{i\bar{g}v^2}{8\sqrt{\bar{g}^2+\bar{g}'^2}}\left(6\bar{g}^2+5\bar{g}'^2\right)\eta_{\mu_3\mu_4}C^{\varphi D} \\
& -\frac{i\bar{g}'}{2\left(\bar{g}^2+\bar{g}'^2\right)^{3/2}}C^{\varphi WB}\left(\eta_{\mu_3\mu_4}\left(-4\bar{g}^2p_3\cdot p_4-4\bar{g}'^2p_3\cdot p_4+\bar{g}^4v^2\right)\right. \\
& \left.+4\left(\bar{g}^2+\bar{g}'^2\right)p_3^{\mu_4}p_4^{\mu_3}\right)
\end{aligned}$$



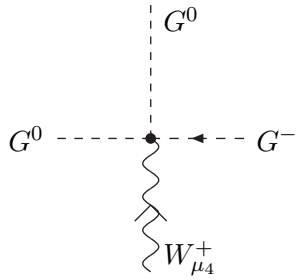
$$+\frac{i}{2}(\bar{g}^2 + \bar{g}'^2)\eta_{\mu_3\mu_4} + \frac{iv^2}{4}(\bar{g}^2 + \bar{g}'^2)\eta_{\mu_3\mu_4}C^{\varphi D} \\ + \frac{i\bar{g}\bar{g}'}{\bar{g}^2 + \bar{g}'^2}C^{\varphi WB}\left(\eta_{\mu_3\mu_4}\left(-4p_3 \cdot p_4 + \bar{g}^2 v^2 + \bar{g}'^2 v^2\right) + 4p_3^{\mu_4}p_4^{\mu_3}\right)$$



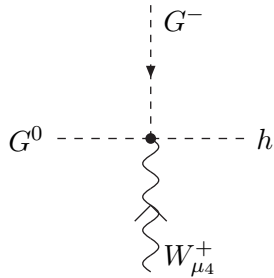
$$+\frac{i(\bar{g}'^2 - \bar{g}^2)^2}{2(\bar{g}^2 + \bar{g}'^2)}\eta_{\mu_3\mu_4} + \frac{1}{2}iv^2(\bar{g}'^2 - \bar{g}^2)\eta_{\mu_3\mu_4}C^{\varphi D} \\ - \frac{i\bar{g}\bar{g}'}{(\bar{g}^2 + \bar{g}'^2)^2}C^{\varphi WB}\left(\eta_{\mu_3\mu_4}\left(-2\bar{g}'^2(2p_3 \cdot p_4 + \bar{g}^2 v^2) \right. \right. \\ \left. \left. - 4\bar{g}^2 p_3 \cdot p_4 + \bar{g}^4 v^2 + \bar{g}'^4 v^2\right) + 4(\bar{g}^2 + \bar{g}'^2)p_3^{\mu_4}p_4^{\mu_3}\right)$$



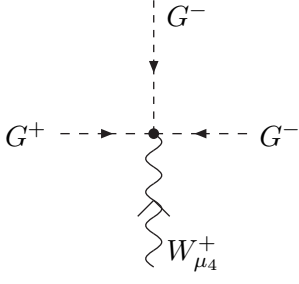
$$+\frac{i}{2}(\bar{g}^2 + \bar{g}'^2)\eta_{\mu_3\mu_4} + \frac{5iv^2}{4}(\bar{g}^2 + \bar{g}'^2)\eta_{\mu_3\mu_4}C^{\varphi D} \\ + \frac{i\bar{g}\bar{g}'}{\bar{g}^2 + \bar{g}'^2}C^{\varphi WB}\left(\eta_{\mu_3\mu_4}\left(-4p_3 \cdot p_4 + \bar{g}^2 v^2 + \bar{g}'^2 v^2\right) + 4p_3^{\mu_4}p_4^{\mu_3}\right)$$



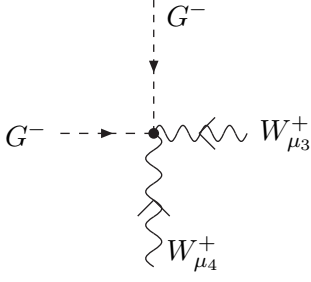
$$+\frac{i\bar{g}v}{2}C^{\varphi D}(p_1^{\mu_4} + p_2^{\mu_4})$$



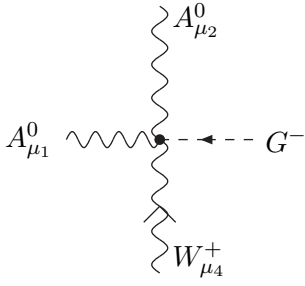
$$+\frac{\bar{g}v}{2}C^{\varphi D}(2p_1^{\mu_4} - p_3^{\mu_4})$$



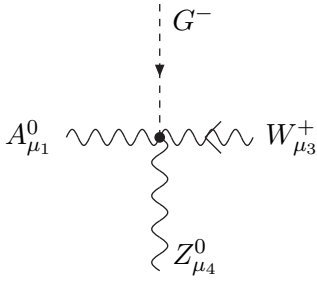
$$-\frac{1}{2}i\bar{g}vC^{\varphi D}(2p_1^{\mu_4}-p_2^{\mu_4}-p_3^{\mu_4})$$



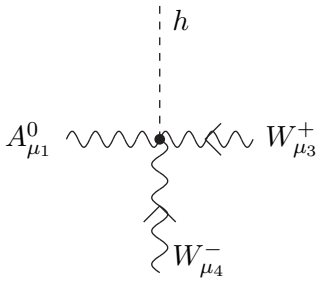
$$+i\bar{g}^2v^2\eta_{\mu_3\mu_4}C^{\varphi D}$$



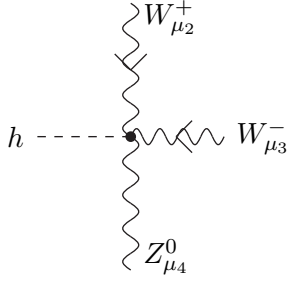
$$-\frac{2i\bar{g}^2\bar{g}'v}{\bar{g}^2+\bar{g}'^2}C^{\varphi WB}(\eta_{\mu_1\mu_2}p_1^{\mu_4}+\eta_{\mu_1\mu_2}p_2^{\mu_4}-\eta_{\mu_1\mu_4}p_1^{\mu_2}-\eta_{\mu_2\mu_4}p_2^{\mu_1})$$



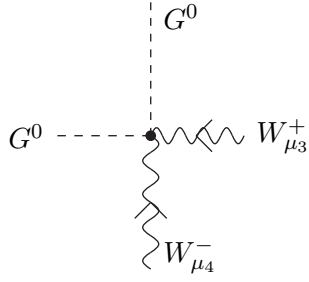
$$+\frac{2i\bar{g}v}{\bar{g}^2+\bar{g}'^2}C^{\varphi WB}\left(\bar{g}^2\eta_{\mu_1\mu_3}p_1^{\mu_4}-\bar{g}^2\eta_{\mu_1\mu_4}p_1^{\mu_3}+\bar{g}'^2(\eta_{\mu_1\mu_4}p_4^{\mu_3}-\eta_{\mu_3\mu_4}p_4^{\mu_1})\right)$$



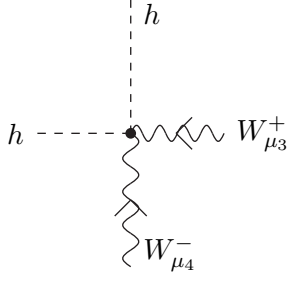
$$+\frac{2i\bar{g}^2v}{\sqrt{\bar{g}^2+\bar{g}'^2}}C^{\varphi WB}(\eta_{\mu_1\mu_3}p_1^{\mu_4}-\eta_{\mu_1\mu_4}p_1^{\mu_3})$$



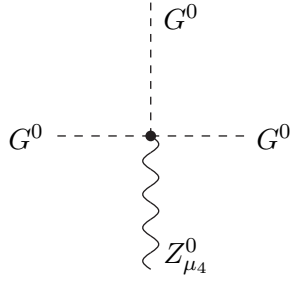
$$-\frac{2i\bar{g}\bar{g}'v}{\sqrt{\bar{g}^2+\bar{g}'^2}}C^{\varphi WB}(\eta_{\mu_2\mu_4}p_4^{\mu_3}-\eta_{\mu_3\mu_4}p_4^{\mu_2})$$



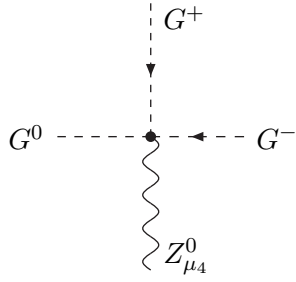
$$+\frac{i\bar{g}^2}{2}\eta_{\mu_3\mu_4}-\frac{1}{4}i\bar{g}^2v^2\eta_{\mu_3\mu_4}C^{\varphi D}$$



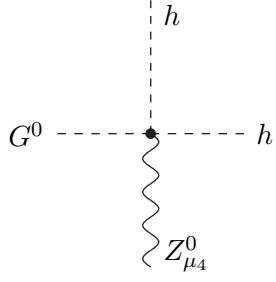
$$+\frac{i\bar{g}^2}{2}\eta_{\mu_3\mu_4}-\frac{1}{4}i\bar{g}^2v^2\eta_{\mu_3\mu_4}C^{\varphi D}$$



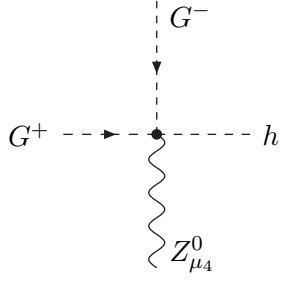
$$-\frac{1}{2}v\sqrt{\bar{g}^2+\bar{g}'^2}C^{\varphi D}(p_1^{\mu_4}+p_2^{\mu_4}+p_3^{\mu_4})$$



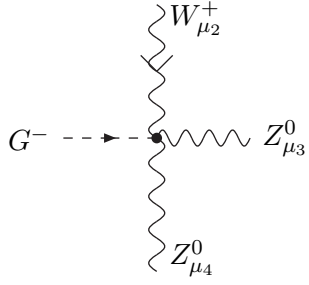
$$-\frac{v\left(\bar{g}'^2-\bar{g}^2\right)}{2\sqrt{\bar{g}^2+\bar{g}'^2}}C^{\varphi D}p_1^{\mu_4}$$



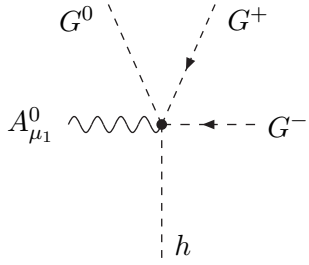
$$-\frac{1}{2}v\sqrt{\bar{g}^2 + \bar{g}'^2}C^{\varphi D}(3p_1^{\mu_4} - p_2^{\mu_4} - p_3^{\mu_4})$$



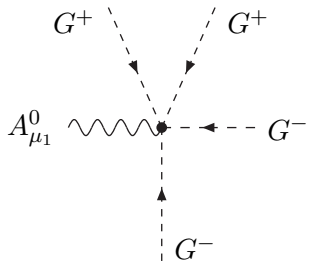
$$+\frac{1}{2}iv\sqrt{\bar{g}^2 + \bar{g}'^2}C^{\varphi D}(p_1^{\mu_4} - p_2^{\mu_4})$$



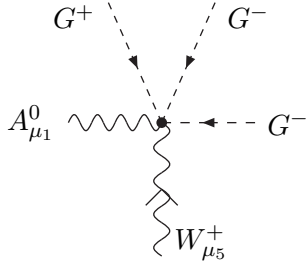
$$-\frac{2i\bar{g}^2\bar{g}'v}{\bar{g}^2 + \bar{g}'^2}C^{\varphi WB}(\eta_{\mu_2\mu_3}p_3^{\mu_4} + \eta_{\mu_2\mu_4}p_4^{\mu_3} - \eta_{\mu_3\mu_4}(p_3^{\mu_2} + p_4^{\mu_2}))$$



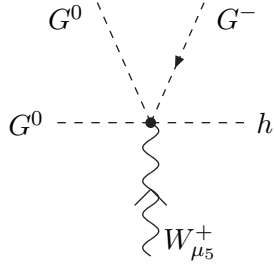
$$+\frac{\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}}C^{\varphi D}(p_2^{\mu_1} - p_5^{\mu_1})$$



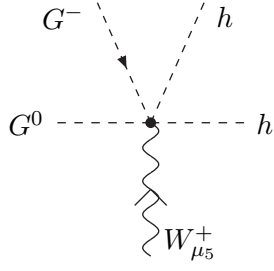
$$-\frac{2i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}}C^{\varphi D}(p_2^{\mu_1} + p_3^{\mu_1} - p_4^{\mu_1} - p_5^{\mu_1})$$



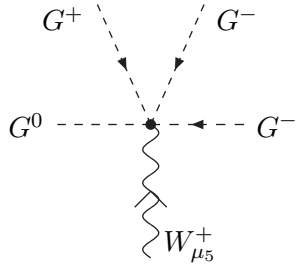
$$+ \frac{2i\bar{g}^2\bar{g}'v}{\sqrt{\bar{g}^2 + \bar{g}'^2}} \eta_{\mu_1\mu_5} C^{\varphi D}$$



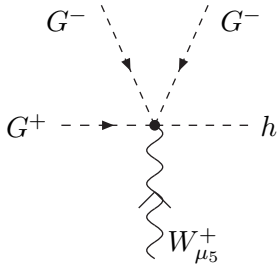
$$+ \frac{i\bar{g}}{2} C^{\varphi D} (p_1^{\mu_5} + p_2^{\mu_5} - 2p_4^{\mu_5})$$



$$+ \frac{\bar{g}}{2} C^{\varphi D} (2p_1^{\mu_5} - p_3^{\mu_5} - p_4^{\mu_5})$$

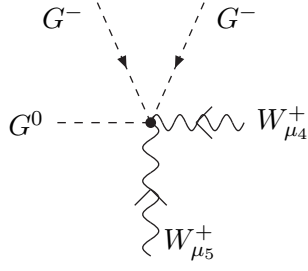


$$+ \frac{\bar{g}}{2} C^{\varphi D} (2p_2^{\mu_5} - p_3^{\mu_5} - p_4^{\mu_5})$$

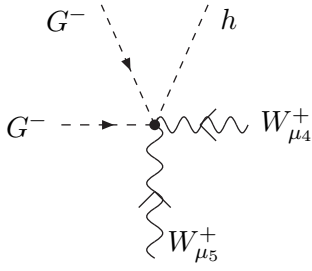


$$- \frac{i\bar{g}}{2} C^{\varphi D} (2p_1^{\mu_5} - p_2^{\mu_5} - p_3^{\mu_5})$$

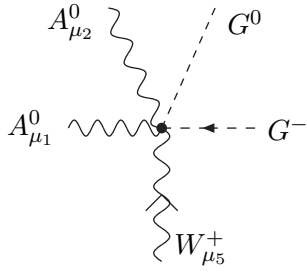




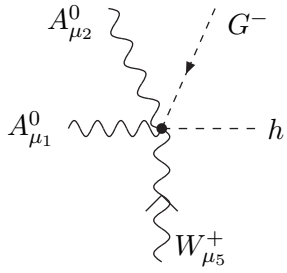
$$-2\bar{g}^2 v \eta_{\mu_4 \mu_5} C^{\varphi D}$$



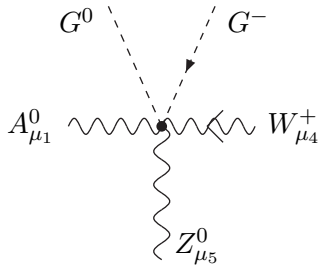
$$+2i\bar{g}^2 v \eta_{\mu_4 \mu_5} C^{\varphi D}$$



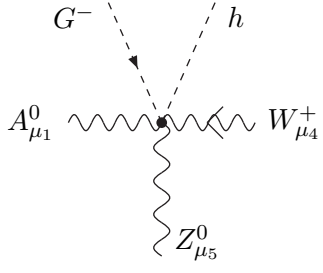
$$+\frac{2\bar{g}^2 \bar{g}'}{\bar{g}^2 + \bar{g}'^2} C^{\varphi WB} (\eta_{\mu_1 \mu_2} p_1^{\mu_5} + \eta_{\mu_1 \mu_2} p_2^{\mu_5} - \eta_{\mu_1 \mu_5} p_1^{\mu_2} - \eta_{\mu_2 \mu_5} p_2^{\mu_1})$$



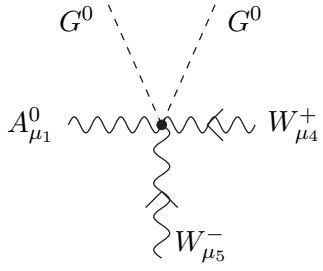
$$-\frac{2i\bar{g}^2 \bar{g}'}{\bar{g}^2 + \bar{g}'^2} C^{\varphi WB} (\eta_{\mu_1 \mu_2} p_1^{\mu_5} + \eta_{\mu_1 \mu_2} p_2^{\mu_5} - \eta_{\mu_1 \mu_5} p_1^{\mu_2} - \eta_{\mu_2 \mu_5} p_2^{\mu_1})$$



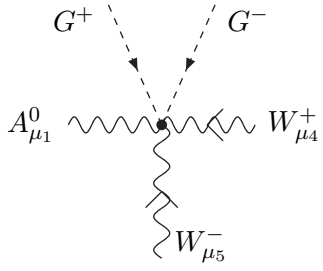
$$-\frac{2\bar{g}}{\bar{g}^2 + \bar{g}'^2} C^{\varphi WB} \left( \bar{g}^2 \eta_{\mu_1 \mu_4} p_1^{\mu_5} - \bar{g}^2 \eta_{\mu_1 \mu_5} p_1^{\mu_4} + \bar{g}'^2 (\eta_{\mu_1 \mu_5} p_5^{\mu_4} - \eta_{\mu_4 \mu_5} p_5^{\mu_1}) \right)$$



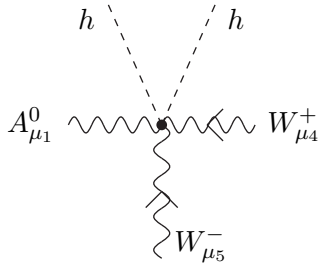
$$+ \frac{2i\bar{g}}{\bar{g}^2 + \bar{g}'^2} C^{\varphi WB} \left( \bar{g}^2 \eta_{\mu_1 \mu_4} p_1^{\mu_5} - \bar{g}^2 \eta_{\mu_1 \mu_5} p_1^{\mu_4} + \bar{g}'^2 (\eta_{\mu_1 \mu_5} p_5^{\mu_4} - \eta_{\mu_4 \mu_5} p_5^{\mu_1}) \right)$$



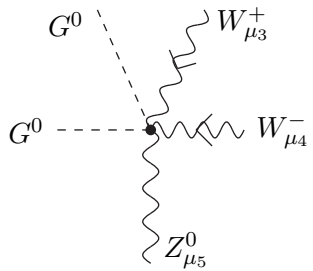
$$+ \frac{2i\bar{g}^2}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^{\varphi WB} (\eta_{\mu_1 \mu_4} p_1^{\mu_5} - \eta_{\mu_1 \mu_5} p_1^{\mu_4})$$



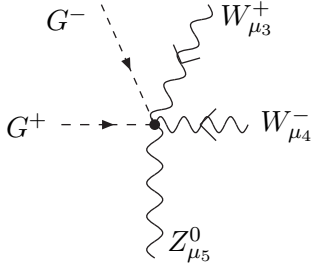
$$- \frac{2i\bar{g}^2}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^{\varphi WB} (\eta_{\mu_1 \mu_4} p_1^{\mu_5} - \eta_{\mu_1 \mu_5} p_1^{\mu_4})$$



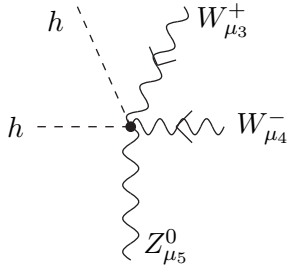
$$+ \frac{2i\bar{g}^2}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^{\varphi WB} (\eta_{\mu_1 \mu_4} p_1^{\mu_5} - \eta_{\mu_1 \mu_5} p_1^{\mu_4})$$



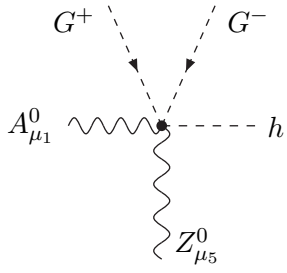
$$- \frac{2i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^{\varphi WB} (\eta_{\mu_3 \mu_5} p_5^{\mu_4} - \eta_{\mu_4 \mu_5} p_5^{\mu_3})$$



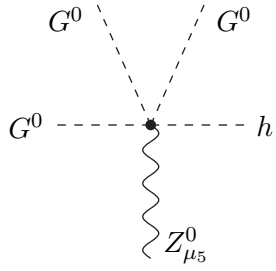
$$+ \frac{2i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^{\varphi WB} (\eta_{\mu_3\mu_5} p_5^{\mu_4} - \eta_{\mu_4\mu_5} p_5^{\mu_3})$$



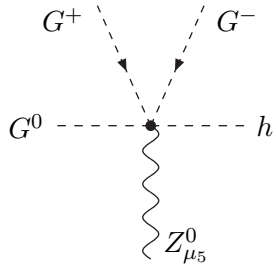
$$- \frac{2i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} C^{\varphi WB} (\eta_{\mu_3\mu_5} p_5^{\mu_4} - \eta_{\mu_4\mu_5} p_5^{\mu_3})$$



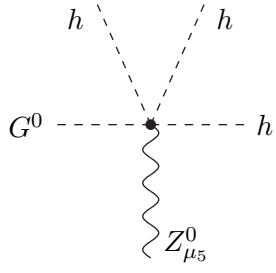
$$-i\bar{g}\bar{g}'v\eta_{\mu_1\mu_5} C^{\varphi D}$$



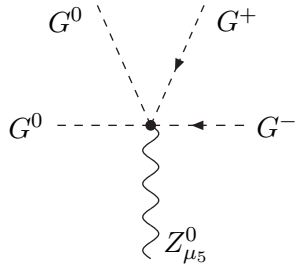
$$- \frac{1}{2} \sqrt{\bar{g}^2 + \bar{g}'^2} C^{\varphi D} (p_1^{\mu_5} + p_2^{\mu_5} + p_3^{\mu_5} - 3p_4^{\mu_5})$$



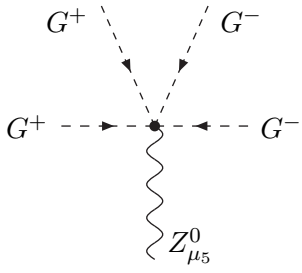
$$- \frac{\bar{g}'^2 - \bar{g}^2}{2\sqrt{\bar{g}^2 + \bar{g}'^2}} C^{\varphi D} (p_1^{\mu_5} - p_4^{\mu_5})$$



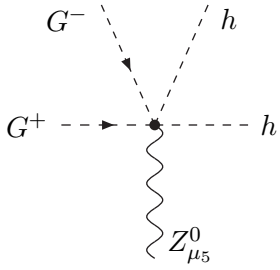
$$-\frac{1}{2}\sqrt{\bar{g}^2 + \bar{g}'^2}C^{\varphi D}(3p_1^{\mu_5} - p_2^{\mu_5} - p_3^{\mu_5} - p_4^{\mu_5})$$



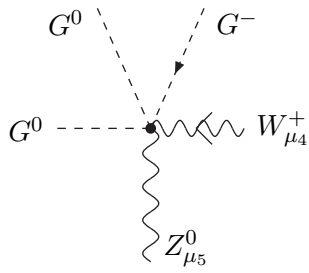
$$+\frac{1}{2}i\sqrt{\bar{g}^2 + \bar{g}'^2}C^{\varphi D}(p_3^{\mu_5} - p_4^{\mu_5})$$



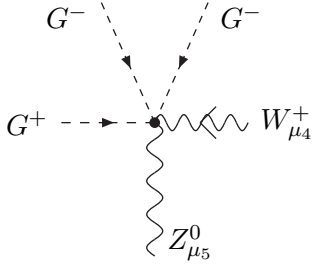
$$+\frac{i(\bar{g}'^2 - \bar{g}^2)}{\sqrt{\bar{g}^2 + \bar{g}'^2}}C^{\varphi D}(p_1^{\mu_5} + p_2^{\mu_5} - p_3^{\mu_5} - p_4^{\mu_5})$$



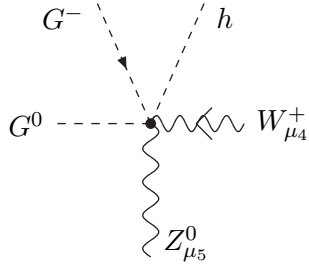
$$+\frac{1}{2}i\sqrt{\bar{g}^2 + \bar{g}'^2}C^{\varphi D}(p_1^{\mu_5} - p_2^{\mu_5})$$



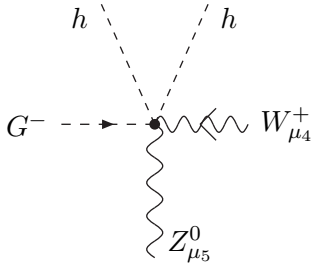
$$-\frac{1}{2}i\bar{g}v\sqrt{\bar{g}^2 + \bar{g}'^2}\eta_{\mu_4\mu_5}C^{\varphi D}$$



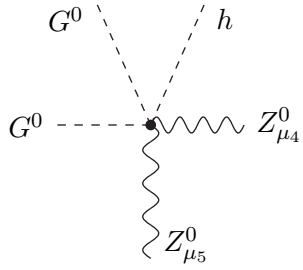
$$-\frac{i\bar{g}v\left(\bar{g}'^2-\bar{g}^2\right)}{\sqrt{\bar{g}^2+\bar{g}'^2}}\eta_{\mu_4\mu_5}C^{\varphi D}$$



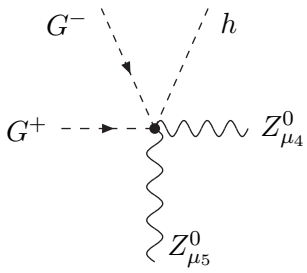
$$+\frac{1}{2}\bar{g}v\sqrt{\bar{g}^2+\bar{g}'^2}\eta_{\mu_4\mu_5}C^{\varphi D}$$



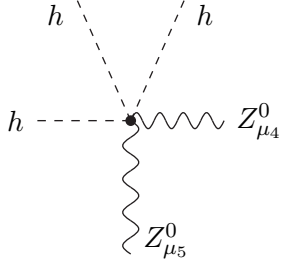
$$-\frac{3}{2}i\bar{g}v\sqrt{\bar{g}^2+\bar{g}'^2}\eta_{\mu_4\mu_5}C^{\varphi D}$$



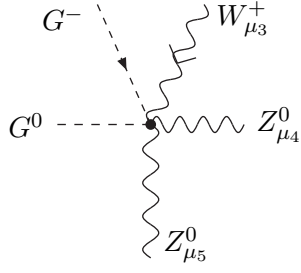
$$+iv\left(\bar{g}^2+\bar{g}'^2\right)\eta_{\mu_4\mu_5}C^{\varphi D}$$



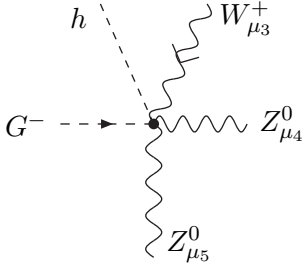
$$+iv\left(\bar{g}'^2-\bar{g}^2\right)\eta_{\mu_4\mu_5}C^{\varphi D}$$



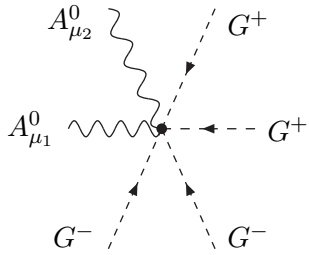
$$+3iv \left( \bar{g}^2 + \bar{g}'^2 \right) \eta_{\mu_4 \mu_5} C^{\varphi D}$$



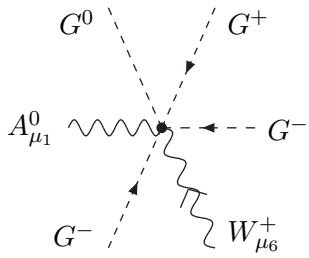
$$+\frac{2\bar{g}^2\bar{g}'}{\bar{g}^2+\bar{g}'^2}C^{\varphi WB}(\eta_{\mu_3\mu_4}p_4^{\mu_5}+\eta_{\mu_3\mu_5}p_5^{\mu_4}-\eta_{\mu_4\mu_5}(p_4^{\mu_3}+p_5^{\mu_3}))$$



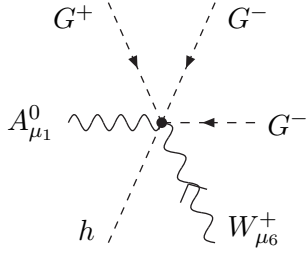
$$-\frac{2i\bar{g}^2\bar{g}'}{\bar{g}^2+\bar{g}'^2}C^{\varphi WB}(\eta_{\mu_3\mu_4}p_4^{\mu_5}+\eta_{\mu_3\mu_5}p_5^{\mu_4}-\eta_{\mu_4\mu_5}(p_4^{\mu_3}+p_5^{\mu_3}))$$



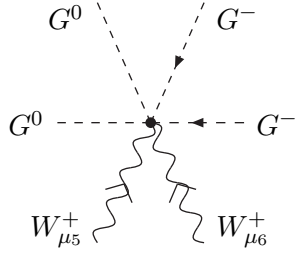
$$+\frac{8i\bar{g}^2\bar{g}'^2}{\bar{g}^2+\bar{g}'^2}\eta_{\mu_1\mu_2}C^{\varphi D}$$



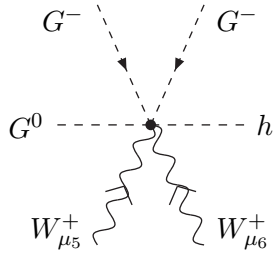
$$-\frac{2\bar{g}^2\bar{g}'}{\sqrt{\bar{g}^2+\bar{g}'^2}}\eta_{\mu_1\mu_6}C^{\varphi D}$$



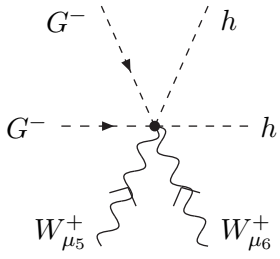
$$+ \frac{2i\bar{g}^2\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} \eta_{\mu_1\mu_6} C^{\varphi D}$$



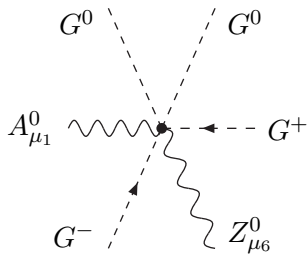
$$-2i\bar{g}^2 \eta_{\mu_5\mu_6} C^{\varphi D}$$



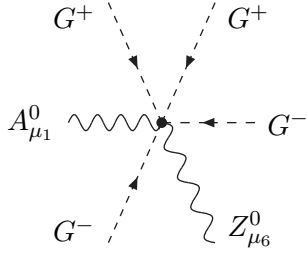
$$-2\bar{g}^2 \eta_{\mu_5\mu_6} C^{\varphi D}$$



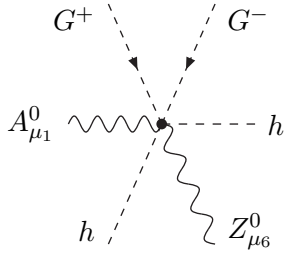
$$+2i\bar{g}^2 \eta_{\mu_5\mu_6} C^{\varphi D}$$



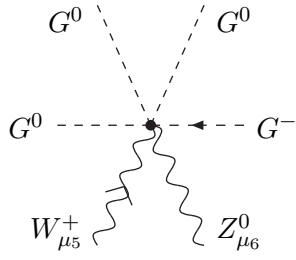
$$-i\bar{g}\bar{g}' \eta_{\mu_1\mu_6} C^{\varphi D}$$



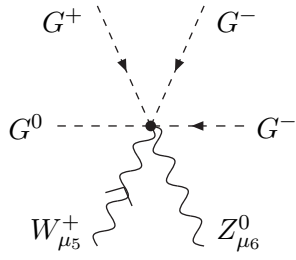
$$-\frac{4i\bar{g}\bar{g}'(\bar{g}'^2 - \bar{g}^2)}{\bar{g}^2 + \bar{g}'^2}\eta_{\mu_1\mu_6}C^{\varphi D}$$



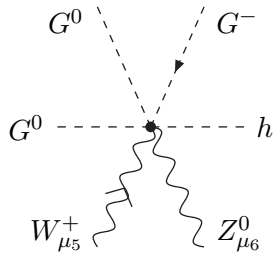
$$-i\bar{g}\bar{g}'\eta_{\mu_1\mu_6}C^{\varphi D}$$



$$+\frac{3}{2}\bar{g}\sqrt{\bar{g}^2 + \bar{g}'^2}\eta_{\mu_5\mu_6}C^{\varphi D}$$

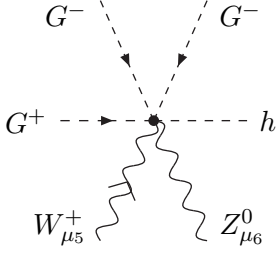


$$+\frac{\bar{g}(\bar{g}'^2 - \bar{g}^2)}{\sqrt{\bar{g}^2 + \bar{g}'^2}}\eta_{\mu_5\mu_6}C^{\varphi D}$$

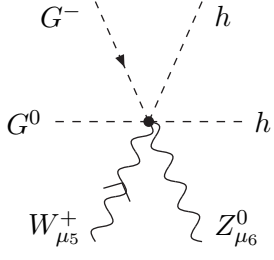


$$-\frac{1}{2}i\bar{g}\sqrt{\bar{g}^2 + \bar{g}'^2}\eta_{\mu_5\mu_6}C^{\varphi D}$$

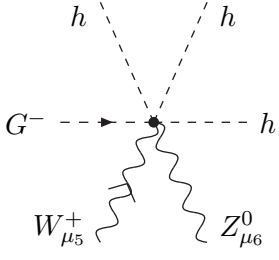




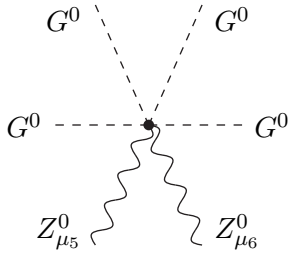
$$-\frac{i\bar{g}\left(\bar{g}'^2-\bar{g}^2\right)}{\sqrt{\bar{g}^2+\bar{g}'^2}}\eta_{\mu_5\mu_6}C^{\varphi D}$$



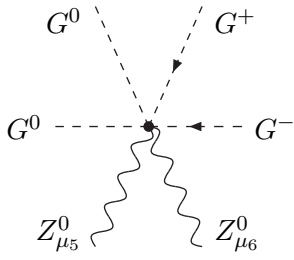
$$+\frac{1}{2}\bar{g}\sqrt{\bar{g}^2+\bar{g}'^2}\eta_{\mu_5\mu_6}C^{\varphi D}$$



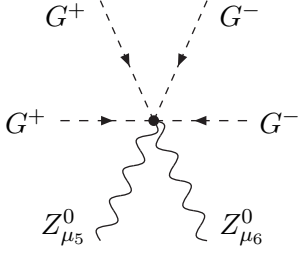
$$-\frac{3}{2}i\bar{g}\sqrt{\bar{g}^2+\bar{g}'^2}\eta_{\mu_5\mu_6}C^{\varphi D}$$



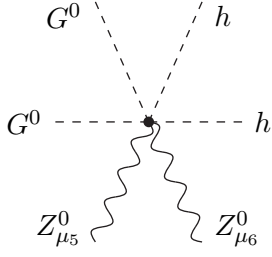
$$+3i\left(\bar{g}^2+\bar{g}'^2\right)\eta_{\mu_5\mu_6}C^{\varphi D}$$



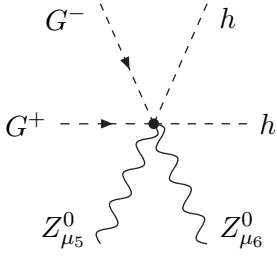
$$+i\left(\bar{g}'^2-\bar{g}^2\right)\eta_{\mu_5\mu_6}C^{\varphi D}$$



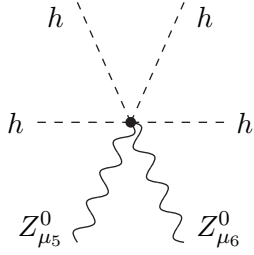
$$+ \frac{2i \left( \bar{g}'^2 - \bar{g}^2 \right)^2}{\bar{g}^2 + \bar{g}'^2} \eta_{\mu_5 \mu_6} C^{\varphi D}$$



$$+ i \left( \bar{g}^2 + \bar{g}'^2 \right) \eta_{\mu_5 \mu_6} C^{\varphi D}$$

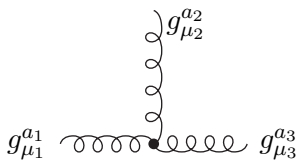


$$+ i \left( \bar{g}'^2 - \bar{g}^2 \right) \eta_{\mu_5 \mu_6} C^{\varphi D}$$

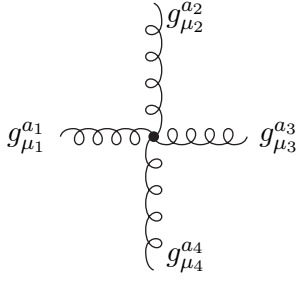


$$+ 3i \left( \bar{g}^2 + \bar{g}'^2 \right) \eta_{\mu_5 \mu_6} C^{\varphi D}$$

## A.8 Gluon self interaction vertices



$$- \bar{g}_s f_{a_1 a_2 a_3} \left( \eta_{\mu_1 \mu_2} p_1^{\mu_3} - \eta_{\mu_1 \mu_2} p_2^{\mu_3} - \eta_{\mu_1 \mu_3} p_1^{\mu_2} + \eta_{\mu_1 \mu_3} p_3^{\mu_2} + \eta_{\mu_2 \mu_3} p_2^{\mu_1} - \eta_{\mu_2 \mu_3} p_3^{\mu_1} \right)$$

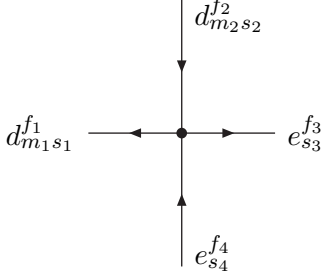


$$\begin{aligned}
& +i\bar{g}_s^2 \left( (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} - \eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4}) f_{a_1a_2b_1} f_{a_3a_4b_1} \right. \\
& \quad + (\eta_{\mu_1\mu_4}\eta_{\mu_2\mu_3} - \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}) f_{a_1a_3b_1} f_{a_2a_4b_1} \\
& \quad \left. + (\eta_{\mu_1\mu_3}\eta_{\mu_2\mu_4} - \eta_{\mu_1\mu_2}\eta_{\mu_3\mu_4}) f_{a_1a_4b_1} f_{a_2a_3b_1} \right)
\end{aligned}$$

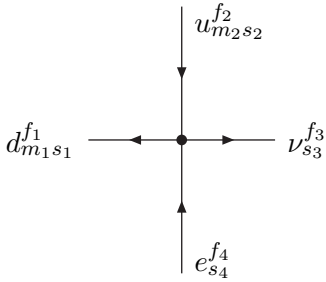
## A.9 Higgs–gluon vertices

## A.10 Four lepton vertices

## A.11 Two quark–two lepton vertices



$$+i \left( (P_L)_{s_3s_4} (P_R)_{s_1s_2} C_{f_4f_3f_2f_1}^{ledq*} + (P_L)_{s_1s_2} (P_R)_{s_3s_4} C_{f_3f_4f_1f_2}^{ledq} \right)$$

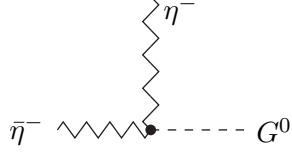


$$+i(P_L)_{s_1s_2} (P_R)_{s_3s_4} U_{g_1f_3}^* K_{f_2g_2}^* C_{g_1f_4f_1g_2}^{ledq}$$

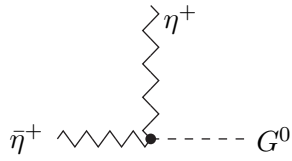
## A.12 Four quark vertices

## A.13 Baryon and lepton number violating four fermion vertices

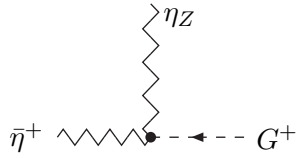
## A.14 Ghost vertices



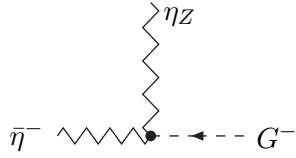
$$+\frac{1}{4}\bar{g}^2 v \xi_W + \frac{1}{16}\bar{g}^2 v^3 \xi_W C^{\varphi D}$$



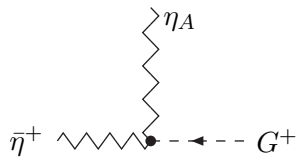
$$-\frac{1}{4}\bar{g}^2 v \xi_W - \frac{1}{16}\bar{g}^2 v^3 \xi_W C^{\varphi D}$$



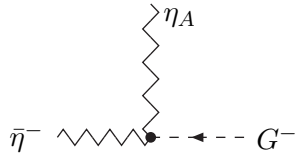
$$-\frac{i\bar{g}v\left(\bar{g}'^2 - \bar{g}^2\right)\xi_W}{4\sqrt{\bar{g}^2 + \bar{g}'^2}} + \frac{i\bar{g}^2\bar{g}'v^3\left(\bar{g}'^2 - \bar{g}^2\right)\xi_W}{4\left(\bar{g}^2 + \bar{g}'^2\right)^{3/2}} C^{\varphi WB}$$



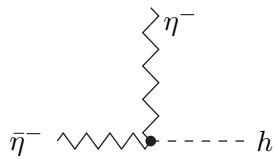
$$-\frac{i\bar{g}v\left(\bar{g}'^2 - \bar{g}^2\right)\xi_W}{4\sqrt{\bar{g}^2 + \bar{g}'^2}} + \frac{i\bar{g}^2\bar{g}'v^3\left(\bar{g}'^2 - \bar{g}^2\right)\xi_W}{4\left(\bar{g}^2 + \bar{g}'^2\right)^{3/2}} C^{\varphi WB}$$



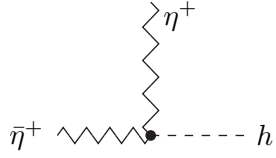
$$+\frac{i\bar{g}^2\bar{g}'v\xi_W}{2\sqrt{\bar{g}^2 + \bar{g}'^2}} - \frac{i\bar{g}^3\bar{g}'^2v^3\xi_W}{2\left(\bar{g}^2 + \bar{g}'^2\right)^{3/2}} C^{\varphi WB}$$



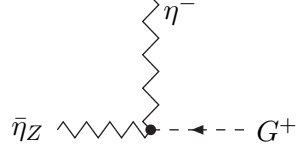
$$+\frac{i\bar{g}^2\bar{g}'v\xi_W}{2\sqrt{\bar{g}^2 + \bar{g}'^2}} - \frac{i\bar{g}^3\bar{g}'^2v^3\xi_W}{2\left(\bar{g}^2 + \bar{g}'^2\right)^{3/2}} C^{\varphi WB}$$



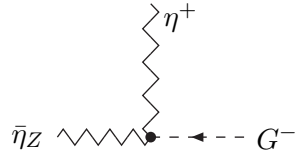
$$+\frac{1}{4}i\bar{g}^2 v \xi_W + \frac{1}{16}i\bar{g}^2 v^3 \xi_W C^{\varphi D}$$



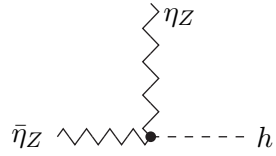
$$+\frac{1}{4}i\bar{g}^2v\xi_W+\frac{1}{16}i\bar{g}^2v^3\xi_W C^{\varphi D}$$



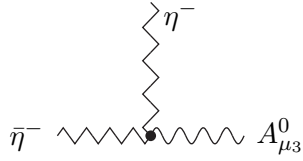
$$-\frac{1}{4}i\bar{g}v\sqrt{\bar{g}^2+\bar{g}'^2}\xi_Z+\frac{1}{8}i\bar{g}v^3\sqrt{\bar{g}^2+\bar{g}'^2}\xi_Z C^{\varphi D}-\frac{i\bar{g}^2\bar{g}'v^3\xi_Z}{4\sqrt{\bar{g}^2+\bar{g}'^2}}C^{\varphi WB}$$



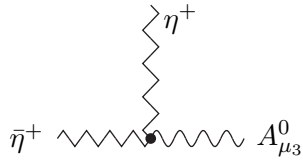
$$-\frac{1}{4}i\bar{g}v\sqrt{\bar{g}^2+\bar{g}'^2}\xi_Z+\frac{1}{8}i\bar{g}v^3\sqrt{\bar{g}^2+\bar{g}'^2}\xi_Z C^{\varphi D}-\frac{i\bar{g}^2\bar{g}'v^3\xi_Z}{4\sqrt{\bar{g}^2+\bar{g}'^2}}C^{\varphi WB}$$



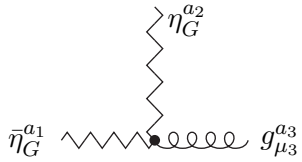
$$+\frac{1}{4}iv\xi_Z\left(\bar{g}^2+\bar{g}'^2\right)-\frac{1}{16}iv^3\xi_Z\left(\bar{g}^2+\bar{g}'^2\right)C^{\varphi D}+\frac{1}{2}i\bar{g}\bar{g}'v^3\xi_Z C^{\varphi WB}$$



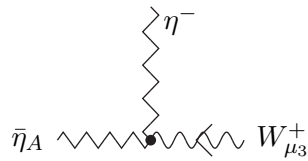
$$+\frac{i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2+\bar{g}'^2}}p_1^{\mu_3}-\frac{i\bar{g}^2\bar{g}'^2v^2}{(\bar{g}^2+\bar{g}'^2)^{3/2}}C^{\varphi WB}p_1^{\mu_3}$$



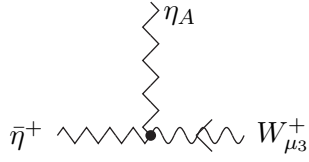
$$-\frac{i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2+\bar{g}'^2}}p_1^{\mu_3}+\frac{i\bar{g}^2\bar{g}'^2v^2}{(\bar{g}^2+\bar{g}'^2)^{3/2}}C^{\varphi WB}p_1^{\mu_3}$$



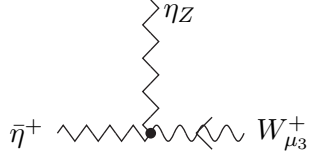
$$-\bar{g}_s f_{a_3 a_1 a_2} p_1^{\mu_3}$$



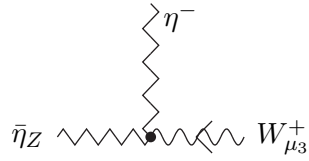
$$-\frac{i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2+\bar{g}'^2}}p_1^{\mu_3}-\frac{i\bar{g}^4v^2}{(\bar{g}^2+\bar{g}'^2)^{3/2}}C^{\varphi WB}p_1^{\mu_3}$$



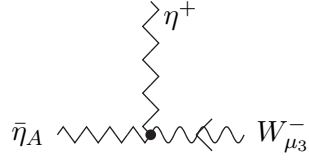
$$+ \frac{i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} p_1^{\mu_3} - \frac{i\bar{g}^2 \bar{g}'^2 v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi W B} p_1^{\mu_3}$$



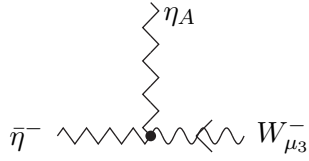
$$+ \frac{i\bar{g}^2}{\sqrt{\bar{g}^2 + \bar{g}'^2}} p_1^{\mu_3} + \frac{i\bar{g}\bar{g}'^3 v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi W B} p_1^{\mu_3}$$



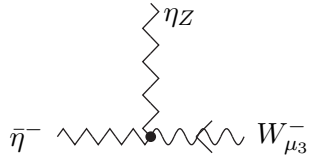
$$- \frac{i\bar{g}^2}{\sqrt{\bar{g}^2 + \bar{g}'^2}} p_1^{\mu_3} + \frac{i\bar{g}^3 \bar{g}' v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi W B} p_1^{\mu_3}$$



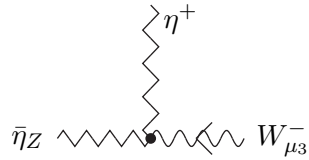
$$+ \frac{i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} p_1^{\mu_3} + \frac{i\bar{g}^4 v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi W B} p_1^{\mu_3}$$



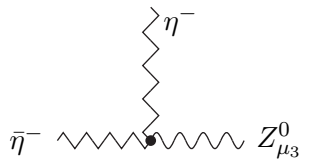
$$- \frac{i\bar{g}\bar{g}'}{\sqrt{\bar{g}^2 + \bar{g}'^2}} p_1^{\mu_3} + \frac{i\bar{g}^2 \bar{g}'^2 v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi W B} p_1^{\mu_3}$$



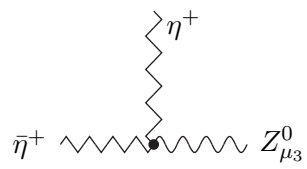
$$- \frac{i\bar{g}^2}{\sqrt{\bar{g}^2 + \bar{g}'^2}} p_1^{\mu_3} - \frac{i\bar{g}\bar{g}'^3 v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi W B} p_1^{\mu_3}$$



$$+ \frac{i\bar{g}^2}{\sqrt{\bar{g}^2 + \bar{g}'^2}} p_1^{\mu_3} - \frac{i\bar{g}^3 \bar{g}' v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi W B} p_1^{\mu_3}$$



$$+ \frac{i\bar{g}^2}{\sqrt{\bar{g}^2 + \bar{g}'^2}} p_1^{\mu_3} + \frac{i\bar{g}\bar{g}'^3 v^2}{(\bar{g}^2 + \bar{g}'^2)^{3/2}} C^{\varphi W B} p_1^{\mu_3}$$



$$-\frac{i\bar{g}^2}{\sqrt{\bar{g}^2+\bar{g}'^2}}p_1^{\mu_3}-\frac{i\bar{g}\bar{g}'^3v^2}{(\bar{g}^2+\bar{g}'^2)^{3/2}}C^{\varphi WB}p_1^{\mu_3}$$