

$$\begin{aligned}
& \frac{\hbar}{\epsilon} - \frac{\hbar B^{\mu\nu 2}}{4} - \frac{1}{4} \frac{1}{g_Y^2} B^{\mu\nu 2} - \frac{1}{4} \frac{1}{g_S^2} G^{\mu\nu A 2} - \frac{1}{6} \frac{\hbar}{\epsilon} W^{\mu\nu I 2} - \frac{1}{4} \frac{1}{g_L^2} W^{\mu\nu I 2} - \\
& \frac{1}{6} \frac{\hbar}{\epsilon} B^{\mu\nu 2} \text{Log} \left[\frac{\overline{p}^2}{M_\phi^2} \right] - \frac{1}{6} \frac{\hbar}{\epsilon} W^{\mu\nu I 2} \text{Log} \left[\frac{\overline{p}^2}{M_\phi^2} \right] + D_\mu \overline{H}_i D_\mu H^i + C_H \overline{H}_i H^i + i \left(\overline{d}_a^r \cdot \gamma_\mu P_R \cdot D_\mu d^a r \right) + \\
& i \left(\overline{e}^r \cdot \gamma_\mu P_R \cdot D_\mu e^r \right) + i \left(\overline{l}_i^r \cdot \gamma_\mu P_L \cdot D_\mu l^i r \right) + i \left(\overline{q}_{a i}^r \cdot \gamma_\mu P_L \cdot D_\mu q^{a i} r \right) + i \left(\overline{u}_a^r \cdot \gamma_\mu P_R \cdot D_\mu u^a r \right) - \\
& \frac{1}{2} \lambda \overline{H}_i \overline{H}_j H^i H^j + \frac{\hbar}{\epsilon} \left(\lambda_{H_X}^{PR} \right)^2 \overline{H}_i \overline{H}_j H^i H^j + \hbar \left(\lambda_{H_X}^{PR} \right)^2 \text{LF}_{1,1,0} [M_X^P, M_X^r] \overline{H}_i \overline{H}_j H^i H^j - \\
& \overline{Y}_d^{PR} \overline{H}_i \left(\overline{d}_a^r \cdot P_L \cdot q^{a i p} \right) - \overline{Y}_e^{PR} \overline{H}_i \left(\overline{e}^r \cdot P_L \cdot l^{i p} \right) - \frac{1}{8} \hbar \overline{Y}_e^{sr} \overline{\lambda_{\psi\chi}}^{\text{pt}} \lambda_{\psi\chi}^{\text{st}} \overline{H}_i \left(\overline{e}^r \cdot P_L \cdot l^{i p} \right) + \\
& \frac{1}{4} \frac{\hbar}{\epsilon} \frac{1}{\overline{Y}_e^{sr}} \overline{\lambda_{\psi\chi}}^{\text{pt}} \lambda_{\psi\chi}^{\text{st}} \overline{H}_i \left(\overline{e}^r \cdot P_L \cdot l^{i p} \right) + \frac{1}{2} \hbar \overline{Y}_e^{sr} \overline{\lambda_{\psi\chi}}^{\text{pt}} \lambda_{\psi\chi}^{\text{st}} \text{LF}_{1,1,0} [M_\phi, M_X^r] \overline{H}_i \left(\overline{e}^r \cdot P_L \cdot l^{i p} \right) - \\
& \frac{1}{4} \hbar \overline{Y}_e^{sr} \overline{\lambda_{\psi\chi}}^{\text{pt}} \lambda_{\psi\chi}^{\text{st}} \text{LF}_{2,1,-1} [M_\phi, M_X^t] \overline{H}_i \left(\overline{e}^r \cdot P_L \cdot l^{i p} \right) - Y_e^{rP} H^i \left(\overline{l}_i^r \cdot P_R \cdot e^P \right) - \\
& \frac{1}{8} \hbar Y_e^{sP} \overline{\lambda_{\psi\chi}}^{\text{st}} \lambda_{\psi\chi}^{\text{rt}} H^i \left(\overline{l}_i^r \cdot P_R \cdot e^P \right) + \frac{1}{4} \frac{\hbar}{\epsilon} Y_e^{sP} \overline{\lambda_{\psi\chi}}^{\text{st}} \lambda_{\psi\chi}^{\text{rt}} H^i \left(\overline{l}_i^r \cdot P_R \cdot e^P \right) + \\
& \frac{1}{2} \hbar Y_e^{sP} \overline{\lambda_{\psi\chi}}^{\text{st}} \lambda_{\psi\chi}^{\text{rt}} \text{LF}_{1,1,0} [M_\phi, M_X^t] H^i \left(\overline{l}_i^r \cdot P_R \cdot e^P \right) - \\
& \frac{1}{4} \hbar Y_e^{sP} \overline{\lambda_{\psi\chi}}^{\text{st}} \lambda_{\psi\chi}^{\text{rt}} \text{LF}_{2,1,-1} [M_\phi, M_X^t] H^i \left(\overline{l}_i^r \cdot P_R \cdot e^P \right) - Y_d^{rP} H^i \left(\overline{q}_{a i}^r \cdot P_R \cdot d^{a p} \right) - \\
& Y_u^{rP} \overline{H}_i \left(\overline{q}_{a j}^r \cdot P_R \cdot u^{a p} \right) \epsilon^{j i} - \overline{Y}_u^{rP} \overline{H}_j \left(\overline{u}_a^r \cdot P_L \cdot q^{a i p} \right) \overline{\epsilon}_{i j} + \frac{1}{180} \frac{\hbar}{M_\phi^2} W^{\mu\nu K} W^{\mu\rho J} W^{\nu\rho I} F^{IJK} - \\
& \frac{1}{30} \frac{\hbar}{\epsilon} C_H^2 g_L^4 \frac{1}{M_\phi^2} \overline{H}_i \overline{H}_j H^i H^j - \frac{1}{30} \hbar C_H^2 g_Y^4 \frac{1}{M_\phi^2} \overline{H}_i \overline{H}_j H^i H^j + \\
& \frac{1}{30} \hbar \lambda g_L^4 \frac{1}{M_\phi^2} \overline{H}_i \overline{H}_j \overline{H}_K H^i H^j H^K + \frac{1}{30} \hbar \lambda g_Y^4 \frac{1}{M_\phi^2} \overline{H}_i \overline{H}_j \overline{H}_K H^i H^j H^K + \\
& 2 \hbar C_H^2 \left(\lambda_{H_X}^{PR} \right)^2 \text{LF}_{2,1,0} [M_X^P, M_X^r] \overline{H}_i \overline{H}_j H^i H^j - 2 \hbar \lambda \left(\lambda_{H_X}^{PR} \right)^2 \text{LF}_{2,1,0} [M_X^P, M_X^r] \overline{H}_i \overline{H}_j \overline{H}_K H^i H^j H^K - \\
& 2 \hbar C_H^2 \left(\lambda_{H_X}^{PR} \right)^2 \text{LF}_{3,1,-1} [M_X^P, M_X^r] \overline{H}_i \overline{H}_j H^i H^j + 2 \hbar \lambda \left(\lambda_{H_X}^{PR} \right)^2 \text{LF}_{3,1,-1} [M_X^P, M_X^r] \overline{H}_i \overline{H}_j \overline{H}_K H^i H^j H^K - \\
& \frac{4}{3} \hbar \lambda_{H_X}^{PR} \lambda_{H_X}^{PS} \lambda_{H_X}^{rs} \text{LF}_{1,1,1,0} [M_X^P, M_X^r, M_X^s] \overline{H}_i \overline{H}_j \overline{H}_K H^i H^j H^K - \\
& \frac{1}{10} \hbar g_L^4 \frac{1}{M_\phi^2} \overline{H}_i D_\mu \overline{H}_j H^i D_\mu H^j - \frac{1}{15} \hbar g_Y^4 \frac{1}{M_\phi^2} D_\mu \overline{H}_i \overline{H}_j H^i D_\mu H^j - \frac{1}{30} \hbar g_Y^4 \frac{1}{M_\phi^2} \overline{H}_i D_\mu \overline{H}_j H^i D_\mu H^j + \\
& 2 \hbar \left(\lambda_{H_X}^{PR} \right)^2 \text{LF}_{2,1,0} [M_X^P, M_X^r] \overline{H}_i D_\mu \overline{H}_j H^i D_\mu H^j - 2 \hbar \left(\lambda_{H_X}^{PR} \right)^2 \text{LF}_{3,1,-1} [M_X^P, M_X^r] \overline{H}_i D_\mu \overline{H}_j H^i D_\mu H^j + \\
& \frac{1}{60} \hbar g_L^4 \frac{1}{M_\phi^2} \overline{Y}_d^{rP} \overline{H}_i \overline{H}_j H^i \left(\overline{d}_a^r \cdot P_L \cdot q^{a j p} \right) + \frac{1}{60} \hbar g_Y^4 \frac{1}{M_\phi^2} \overline{Y}_d^{rP} \overline{H}_i \overline{H}_j H^i \left(\overline{d}_a^r \cdot P_L \cdot q^{a j p} \right) - \\
& \hbar \overline{Y}_d^{rP} \left(\lambda_{H_X}^{\text{st}} \right)^2 \text{LF}_{2,1,0} [M_X^s, M_X^t] \overline{H}_i \overline{H}_j H^i \left(\overline{d}_a^r \cdot P_L \cdot q^{a j p} \right) + \\
& \hbar \overline{Y}_d^{rP} \left(\lambda_{H_X}^{\text{st}} \right)^2 \text{LF}_{3,1,-1} [M_X^s, M_X^t] \overline{H}_i \overline{H}_j H^i \left(\overline{d}_a^r \cdot P_L \cdot q^{a j p} \right) + \\
& \frac{1}{60} \hbar g_L^4 \frac{1}{M_\phi^2} \overline{Y}_e^{rP} \overline{H}_i \overline{H}_j H^i \left(\overline{e}^r \cdot P_L \cdot l^{j p} \right) + \frac{1}{60} \hbar g_Y^4 \frac{1}{M_\phi^2} \overline{Y}_e^{rP} \overline{H}_i \overline{H}_j H^i \left(\overline{e}^r \cdot P_L \cdot l^{j p} \right) - \\
& \frac{1}{2} \hbar \overline{Y}_e^{ps} \overline{Y}_e^{\text{tr}} Y_e^{us} \overline{\lambda_{\psi\chi}}^{\text{uv}} \lambda_{\psi\chi}^{\text{tv}} \text{LF}_{2,1,0} [M_\phi, M_X^v] \overline{H}_i \overline{H}_j H^i \left(\overline{e}^r \cdot P_L \cdot l^{j p} \right) + \\
& \hbar \overline{Y}_e^{ps} \overline{Y}_e^{\text{tr}} Y_e^{us} \overline{\lambda_{\psi\chi}}^{\text{uv}} \lambda_{\psi\chi}^{\text{tv}} \text{LF}_{3,1,-1} [M_\phi, M_X^v] \overline{H}_i \overline{H}_j H^i \left(\overline{e}^r \cdot P_L \cdot l^{j p} \right) - \\
& \frac{1}{2} \hbar \overline{Y}_e^{ps} \overline{Y}_e^{\text{tr}} Y_e^{us} \overline{\lambda_{\psi\chi}}^{\text{uv}} \lambda_{\psi\chi}^{\text{tv}} \text{LF}_{4,1,-2} [M_\phi, M_X^v] \overline{H}_i \overline{H}_j H^i \left(\overline{e}^r \cdot P_L \cdot l^{j p} \right) - \\
& \hbar \overline{Y}_e^{rP} \left(\lambda_{H_X}^{\text{st}} \right)^2 \text{LF}_{2,1,0} [M_X^s, M_X^t] \overline{H}_i \overline{H}_j H^i \left(\overline{e}^r \cdot P_L \cdot l^{j p} \right) + \\
& \hbar \overline{Y}_e^{rP} \left(\lambda_{H_X}^{\text{st}} \right)^2 \text{LF}_{3,1,-1} [M_X^s, M_X^t] \overline{H}_i \overline{H}_j H^i \left(\overline{e}^r \cdot P_L \cdot l^{j p} \right) - \\
& \hbar \overline{Y}_e^{sr} \lambda_{H_X}^{\text{tu}} \overline{\lambda_{\psi\chi}}^{\text{pt}} \lambda_{\psi\chi}^{\text{su}} \text{LF}_{1,1,1,0} [M_\phi, M_X^t, M_X^u] \overline{H}_i \overline{H}_j H^i \left(\overline{e}^r \cdot P_L \cdot l^{j p} \right) + \\
& \frac{1}{2} \hbar \overline{Y}_e^{sr} \lambda_{H_X}^{\text{tu}} \overline{\lambda_{\psi\chi}}^{\text{pt}} \lambda_{\psi\chi}^{\text{su}} \text{LF}_{2,1,1,-1} [M_\phi, M_X^t, M_X^u] \overline{H}_i \overline{H}_j H^i \left(\overline{e}^r \cdot P_L \cdot l^{j p} \right) + \\
& \frac{1}{2} \hbar \overline{Y}_e^{sr} \lambda_{H_X}^{\text{tu}} \overline{\lambda_{\psi\chi}}^{\text{pt}} \lambda_{\psi\$$