

$$\begin{aligned} & \frac{\hbar}{\epsilon} \mathbf{B}^{\mu\nu 2} - \frac{1}{4} \frac{1}{\mathbf{g}_r^2} \mathbf{B}^{\mu\nu 2} - \frac{1}{6} \frac{1}{\epsilon} \mathbf{G}^{\mu\nu A 2} - \frac{1}{4} \frac{1}{\mathbf{g}_s^2} \mathbf{G}^{\mu\nu A 2} - \frac{1}{4} \frac{1}{\mathbf{g}_L^2} \mathbf{W}^{\mu\nu I 2} - \\ & \frac{1}{9} \hbar \mathbf{B}^{\mu\nu 2} \text{Log} \left[\frac{\overline{\mu}^2}{M_\phi^2} \right] - \frac{1}{6} \hbar \mathbf{G}^{\mu\nu A 2} \text{Log} \left[\frac{\overline{\mu}^2}{M_\phi^2} \right] + \mathbf{D}_\mu \overline{\mathbf{H}}_i \mathbf{D}_\mu \mathbf{H}^i + \mathbf{C}_{H^2} \overline{\mathbf{H}}_i \mathbf{H}^i + \mathbf{i} \left(\overline{\mathbf{d}}_a^r \cdot \gamma_\mu \mathbf{P}_R \cdot \mathbf{D}_\mu \mathbf{d}^{ar} \right) + \\ & \mathbf{i} \left(\overline{\mathbf{e}}^r \cdot \gamma_\mu \mathbf{P}_R \cdot \mathbf{D}_\mu \mathbf{e}^r \right) + \mathbf{i} \left(\overline{\mathbf{l}}_i^r \cdot \gamma_\mu \mathbf{P}_L \cdot \mathbf{D}_\mu \mathbf{l}^{ir} \right) + \mathbf{i} \left(\overline{\mathbf{q}}_{ai}^r \cdot \gamma_\mu \mathbf{P}_L \cdot \mathbf{D}_\mu \mathbf{q}^{air} \right) + \mathbf{i} \left(\overline{\mathbf{u}}_a^r \cdot \gamma_\mu \mathbf{P}_R \cdot \mathbf{D}_\mu \mathbf{u}^{ar} \right) - \\ & \frac{1}{2} \lambda \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}^i \mathbf{H}^j + \hbar \frac{1}{\epsilon} \left(\lambda_{H_X} \text{pr} \right)^2 \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}^i \mathbf{H}^j + \hbar \left(\lambda_{H_X} \text{pr} \right)^2 \mathbf{L}_{\mathbf{F}1,1,0} \left[\mathbf{M}_X^{\mathbf{P}}, \mathbf{M}_X^{\mathbf{r}} \right] \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}^i \mathbf{H}^j - \\ & \overline{\mathbf{Y}}_d^{\text{pr}} \overline{\mathbf{H}}_i \left(\overline{\mathbf{d}}_a^r \cdot \mathbf{P}_L \cdot \mathbf{q}^{aip} \right) - \frac{1}{8} \hbar \overline{\mathbf{Y}}_d^{\text{ps}} \overline{\lambda_{\psi\chi}}^{\text{st}} \lambda_{\psi\chi}^{\text{rt}} \overline{\mathbf{H}}_i \left(\overline{\mathbf{d}}_a^r \cdot \mathbf{P}_L \cdot \mathbf{q}^{aip} \right) + \\ & \frac{1}{4} \hbar \frac{1}{\epsilon} \overline{\mathbf{Y}}_d^{\text{ps}} \overline{\lambda_{\psi\chi}}^{\text{st}} \lambda_{\psi\chi}^{\text{rt}} \overline{\mathbf{H}}_i \left(\overline{\mathbf{d}}_a^r \cdot \mathbf{P}_L \cdot \mathbf{q}^{aip} \right) + \frac{1}{2} \hbar \overline{\mathbf{Y}}_d^{\text{ps}} \overline{\lambda_{\psi\chi}}^{\text{st}} \lambda_{\psi\chi}^{\text{rt}} \mathbf{L}_{\mathbf{F}1,1,0} \left[\mathbf{M}_\phi, \mathbf{M}_X^{\mathbf{t}} \right] \overline{\mathbf{H}}_i \left(\overline{\mathbf{d}}_a^r \cdot \mathbf{P}_L \cdot \mathbf{q}^{aip} \right) - \\ & \frac{1}{4} \hbar \overline{\mathbf{Y}}_d^{\text{ps}} \overline{\lambda_{\psi\chi}}^{\text{st}} \lambda_{\psi\chi}^{\text{rt}} \mathbf{L}_{\mathbf{F}2,1,-1} \left[\mathbf{M}_\phi, \mathbf{M}_X^{\mathbf{t}} \right] \overline{\mathbf{H}}_i \left(\overline{\mathbf{d}}_a^r \cdot \mathbf{P}_L \cdot \mathbf{q}^{aip} \right) - \overline{\mathbf{Y}}_e^{\text{pr}} \overline{\mathbf{H}}_i \left(\overline{\mathbf{e}}^r \cdot \mathbf{P}_L \cdot \mathbf{l}^{ip} \right) - \\ & \mathbf{Y}_e^{\text{rp}} \mathbf{H}^i \left(\overline{\mathbf{l}}_i^r \cdot \mathbf{P}_R \cdot \mathbf{e}^{\text{p}} \right) - \mathbf{Y}_d^{\text{rp}} \mathbf{H}^i \left(\overline{\mathbf{q}}_{ai}^r \cdot \mathbf{P}_R \cdot \mathbf{d}^{\text{ap}} \right) - \frac{1}{8} \hbar \mathbf{Y}_d^{\text{rt}} \overline{\lambda_{\psi\chi}}^{\text{ps}} \lambda_{\psi\chi}^{\text{ts}} \mathbf{H}^i \left(\overline{\mathbf{q}}_{ai}^r \cdot \mathbf{P}_R \cdot \mathbf{d}^{\text{ap}} \right) + \\ & \frac{1}{4} \hbar \frac{1}{\epsilon} \mathbf{Y}_d^{\text{rt}} \overline{\lambda_{\psi\chi}}^{\text{ps}} \lambda_{\psi\chi}^{\text{ts}} \mathbf{H}^i \left(\overline{\mathbf{q}}_{ai}^r \cdot \mathbf{P}_R \cdot \mathbf{d}^{\text{ap}} \right) + \frac{1}{2} \hbar \mathbf{Y}_d^{\text{rt}} \overline{\lambda_{\psi\chi}}^{\text{ps}} \lambda_{\psi\chi}^{\text{ts}} \mathbf{L}_{\mathbf{F}1,1,0} \left[\mathbf{M}_\phi, \mathbf{M}_X^{\mathbf{s}} \right] \mathbf{H}^i \left(\overline{\mathbf{q}}_{ai}^r \cdot \mathbf{P}_R \cdot \mathbf{d}^{\text{ap}} \right) - \\ & \frac{1}{4} \hbar \mathbf{Y}_d^{\text{rt}} \overline{\lambda_{\psi\chi}}^{\text{ps}} \lambda_{\psi\chi}^{\text{ts}} \mathbf{L}_{\mathbf{F}2,1,-1} \left[\mathbf{M}_\phi, \mathbf{M}_X^{\mathbf{s}} \right] \mathbf{H}^i \left(\overline{\mathbf{q}}_{ai}^r \cdot \mathbf{P}_R \cdot \mathbf{d}^{\text{ap}} \right) - \mathbf{Y}_u^{\text{rp}} \overline{\mathbf{H}}_i \left(\overline{\mathbf{q}}_{aj}^r \cdot \mathbf{P}_R \cdot \mathbf{u}^{\text{ap}} \right) \epsilon^{\text{ji}} - \\ & \overline{\mathbf{U}}_u^{\text{pr}} \mathbf{H}^j \left(\overline{\mathbf{u}}_a^r \cdot \mathbf{P}_L \cdot \mathbf{q}^{ajp} \right) \overline{\epsilon}_{ij} + \frac{1}{180} \hbar \frac{1}{M_\phi^2} \mathbf{G}^{\mu\nu\text{C}} \mathbf{G}^{\mu\rho\text{B}} \mathbf{G}^{\nu\rho\text{A}} \mathbf{f}^{\text{ABC}} - \frac{1}{45} \hbar \mathbf{C}_{H^2} \mathbf{g}_Y^4 \frac{1}{M_\phi^2} \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}^i \mathbf{H}^j + \\ & \frac{1}{45} \hbar \lambda \mathbf{g}_Y^4 \frac{1}{M_\phi^2} \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}_k \mathbf{H}^i \mathbf{H}^j \mathbf{H}^k + 2 \hbar \mathbf{C}_{H^2} \left(\lambda_{H_X} \text{pr} \right)^2 \mathbf{L}_{\mathbf{F}2,1,0} \left[\mathbf{M}_X^{\mathbf{P}}, \mathbf{M}_X^{\mathbf{r}} \right] \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}^i \mathbf{H}^j - \\ & 2 \hbar \lambda \left(\lambda_{H_X} \text{pr} \right)^2 \mathbf{L}_{\mathbf{F}2,1,0} \left[\mathbf{M}_X^{\mathbf{P}}, \mathbf{M}_X^{\mathbf{r}} \right] \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}_k \mathbf{H}^i \mathbf{H}^j \mathbf{H}^k - 2 \hbar \mathbf{C}_{H^2} \left(\lambda_{H_X} \text{pr} \right)^2 \mathbf{L}_{\mathbf{F}3,1,-1} \left[\mathbf{M}_X^{\mathbf{P}}, \mathbf{M}_X^{\mathbf{r}} \right] \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}^i \mathbf{H}^j + \\ & 2 \hbar \lambda \left(\lambda_{H_X} \text{pr} \right)^2 \mathbf{L}_{\mathbf{F}3,1,-1} \left[\mathbf{M}_X^{\mathbf{P}}, \mathbf{M}_X^{\mathbf{r}} \right] \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}_k \mathbf{H}^i \mathbf{H}^j \mathbf{H}^k - \\ & \frac{4}{3} \hbar \lambda_{H_X} \text{pr} \lambda_{H_X}^{\text{ps}} \lambda_{H_X}^{\text{rs}} \mathbf{L}_{\mathbf{F}1,1,1,0} \left[\mathbf{M}_X^{\mathbf{P}}, \mathbf{M}_X^{\mathbf{r}}, \mathbf{M}_X^{\mathbf{s}} \right] \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}_k \mathbf{H}^i \mathbf{H}^j \mathbf{H}^k - \frac{2}{45} \hbar \mathbf{g}_Y^4 \frac{1}{M_\phi^2} \mathbf{D}_\mu \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}^i \mathbf{D}_\mu \mathbf{H}^j - \\ & \frac{1}{45} \hbar \mathbf{g}_Y^4 \frac{1}{M_\phi^2} \overline{\mathbf{H}}_i \mathbf{D}_\mu \mathbf{H}_j \mathbf{H}^i \mathbf{D}_\mu \mathbf{H}^j + 2 \hbar \left(\lambda_{H_X} \text{pr} \right)^2 \mathbf{L}_{\mathbf{F}2,1,0} \left[\mathbf{M}_X^{\mathbf{P}}, \mathbf{M}_X^{\mathbf{r}} \right] \overline{\mathbf{H}}_i \mathbf{D}_\mu \mathbf{H}_j \mathbf{H}^i \mathbf{D}_\mu \mathbf{H}^j - \\ & 2 \hbar \left(\lambda_{H_X} \text{pr} \right)^2 \mathbf{L}_{\mathbf{F}3,1,-1} \left[\mathbf{M}_X^{\mathbf{P}}, \mathbf{M}_X^{\mathbf{r}} \right] \overline{\mathbf{H}}_i \mathbf{D}_\mu \mathbf{H}_j \mathbf{H}^i \mathbf{D}_\mu \mathbf{H}^j + \frac{1}{90} \hbar \mathbf{g}_Y^4 \frac{1}{M_\phi^2} \overline{\mathbf{Y}}_d^{\text{pr}} \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}^i \left(\overline{\mathbf{d}}_a^r \cdot \mathbf{P}_L \cdot \mathbf{q}^{ajp} \right) - \\ & \frac{1}{2} \hbar \overline{\mathbf{Y}}_d^{\text{ps}} \overline{\mathbf{Y}}_d^{\text{tr}} \mathbf{Y}_d^{\text{tv}} \overline{\lambda_{\psi\chi}}^{\text{su}} \lambda_{\psi\chi}^{\text{vu}} \mathbf{L}_{\mathbf{F}2,1,0} \left[\mathbf{M}_\phi, \mathbf{M}_X^{\mathbf{u}} \right] \overline{\mathbf{H}}_i \mathbf{H}_j \mathbf{H}^i \left(\overline{\mathbf{d}}_a^r \cdot \mathbf{P}_L \cdot \mathbf{q}^{ajp} \right) + \\ & \hbar \overline{\mathbf{Y}}_d^{\text{ps}} \overline{\mathbf{Y}}_d^{\text{tr}} \mathbf{Y}_d^{\text{tv}} \overline{\lambda_{\psi\chi}}^{\text{su}} \$$