

$$\begin{aligned} \text{HD} &\rightarrow \hbar \left( \frac{2}{27} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{3,0} [\mathbf{m}_{\mathbf{d}}^{\mathbf{P}}] - \frac{5}{36} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{4,-1} [\mathbf{m}_{\mathbf{d}}^{\mathbf{P}}] + \frac{8}{135} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2} [\mathbf{m}_{\mathbf{d}}^{\mathbf{P}}] + \right. \\ &\frac{2}{9} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{3,0} [\mathbf{m}_{\mathbf{e}}^{\mathbf{P}}] - \frac{5}{12} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{4,-1} [\mathbf{m}_{\mathbf{e}}^{\mathbf{P}}] + \frac{8}{45} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2} [\mathbf{m}_{\mathbf{e}}^{\mathbf{P}}] + \\ &\left( -c_{2\gamma} g_2^2 c_\gamma^2 \overline{y_e^{pr}} y_e^{pr} + \frac{1}{36} \sum_{\mathbf{p}} (4 g_1^4 + 9 g_2^4 c_{2\gamma}^2) \right) \text{LF}_{3,0} [\mathbf{m}_{\mathbf{l}}^{\mathbf{P}}] + \\ &\left( c_{2\gamma} g_2^2 c_\gamma^2 \overline{y_e^{pr}} y_e^{pr} - \frac{1}{24} \sum_{\mathbf{p}} (5 g_1^4 + 6 g_2^4 c_{2\gamma}^2) \right) \text{LF}_{4,-1} [\mathbf{m}_{\mathbf{l}}^{\mathbf{P}}] + \frac{4}{45} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2} [\mathbf{m}_{\mathbf{l}}^{\mathbf{P}}] + \\ &\left( \frac{1}{27} \sum_{\mathbf{p}} \mathbf{g}_1^4 + \frac{3}{4} c_{2\gamma} g_2^2 (-4 c_\gamma^2 \overline{y_d^{pr}} y_d^{pr} + 4 s_\gamma^2 \overline{y_u^{pr}} y_u^{pr} + \sum_{\mathbf{p}} c_{2\gamma} g_2^2) \right) \text{LF}_{3,0} [\mathbf{m}_{\mathbf{q}}^{\mathbf{P}}] + \\ &\left( 3 c_{2\gamma} g_2^2 (c_\gamma^2 \overline{y_d^{pr}} y_d^{pr} - s_\gamma^2 \overline{y_u^{pr}} y_u^{pr}) - \frac{1}{72} \sum_{\mathbf{p}} (5 g_1^4 + 54 g_2^4 c_{2\gamma}^2) \right) \text{LF}_{4,-1} [\mathbf{m}_{\mathbf{q}}^{\mathbf{P}}] + \\ &\frac{4}{135} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2} [\mathbf{m}_{\mathbf{q}}^{\mathbf{P}}] + \frac{8}{27} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{3,0} [\mathbf{m}_{\mathbf{u}}^{\mathbf{P}}] - \frac{5}{9} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{4,-1} [\mathbf{m}_{\mathbf{u}}^{\mathbf{P}}] + \frac{32}{135} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2} [\mathbf{m}_{\mathbf{u}}^{\mathbf{P}}] + \\ &\frac{1}{576} (g_1^4 (73 + 9 c_{4\gamma} (-2 + c_{4\gamma}) - 36 s_{2\gamma}^4) + 18 g_1^2 g_2^2 (-3 + c_{4\gamma} (2 + c_{4\gamma}) - 4 s_{2\gamma}^4) + \\ &9 g_2^4 ((3 + c_{4\gamma})^2 - 4 s_{2\gamma}^4)) \text{LF}_{3,0} [\mathbf{m}_{\Phi}] + \frac{1}{192} (-6 g_1^2 g_2^2 (-3 + c_{4\gamma} (2 + c_{4\gamma}) - 4 s_{2\gamma}^4) + \\ &3 g_2^4 (- (3 + c_{4\gamma})^2 + 4 s_{2\gamma}^4) + g_1^4 (-43 - 3 c_{4\gamma} (-2 + c_{4\gamma}) + 12 s_{2\gamma}^4)) \text{LF}_{4,-1} [\mathbf{m}_{\Phi}] + \\ &\frac{4}{45} g_1^4 \text{LF}_{5,-2} [\mathbf{m}_{\Phi}] + \frac{1}{9} g_1^4 \text{LF}_{3,0} [\tilde{\mu}] + \frac{1}{6} g_1^4 \text{LF}_{4,-1} [\tilde{\mu}] - \frac{8}{45} g_1^4 \text{LF}_{5,-2} [\tilde{\mu}] + \\ &\frac{1}{8} g_1^4 \text{LF}_{2,2,-1} [\mathbf{m}_1, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 + \frac{1}{4} g_1^4 m_1^2 \text{LF}_{2,2,0} [\mathbf{m}_1, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 + \\ &\frac{17}{8} g_2^4 \text{LF}_{2,2,-1} [\mathbf{m}_2, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 + \frac{1}{4} g_2^4 m_2^2 \text{LF}_{2,2,0} [\mathbf{m}_2, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 - \\ &4 g_2^4 \text{LF}_{3,2,-2} [\mathbf{m}_2, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 + 3 g_2^4 m_2^2 \text{LF}_{3,2,-1} [\mathbf{m}_2, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 + \\ &2 g_2^4 \text{LF}_{3,3,-3} [\mathbf{m}_2, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 - 2 g_2^4 m_2^2 \text{LF}_{3,3,-2} [\mathbf{m}_2, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 + \\ &2 g_2^4 \text{LF}_{4,2,-3} [\mathbf{m}_2, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 - 2 g_2^4 m_2^2 \text{LF}_{4,2,-2} [\mathbf{m}_2, \tilde{\mu}] (c_\gamma^2 - s_\gamma^2)^2 + \\ &\frac{2}{3} g_1^2 (c_\gamma \overline{a_d^{pr}} - s_\gamma \tilde{\mu} \overline{y_d^{pr}}) (c_\gamma a_d^{pr} - s_\gamma \tilde{\mu} y_d^{pr}) \text{LF}_{2,2,0} [\mathbf{m}_d^r, \mathbf{m}_q^{\mathbf{P}}] - \\ &\frac{1}{3} g_1^2 (c_\gamma \overline{a_d^{pr}} - s_\gamma \tilde{\mu} \overline{y_d^{pr}}) (c_\gamma a_d^{pr} - s_\gamma \tilde{\mu} y_d^{pr}) \text{LF}_{3,2,-1} [\mathbf{m}_d^r, \mathbf{m}_q^{\mathbf{P}}] + \\ &\frac{2}{3} g_1^2 (c_\gamma \overline{a_e^{pr}} - s_\gamma \tilde{\mu} \overline{y_e^{pr}}) (c_\gamma a_e^{pr} - s_\gamma \tilde{\mu} y_e^{pr}) \text{LF}_{2,2,0} [\mathbf{m}_e^r, \mathbf{m}_l^{\mathbf{P}}] - \\ &\frac{1}{3} g_1^2 (c_\gamma \overline{a_e^{pr}} - s_\gamma \tilde{\mu} \overline{y_e^{pr}}) (c_\gamma a_e^{pr} - s_\gamma \tilde{\mu} y_e^{pr}) \text{LF}_{3,2,-1} [\mathbf{m}_e^r, \mathbf{m}_l^{\mathbf{P}}] - \\ &\frac{2}{3} g_1^2 (c_\gamma \overline{a_e^{pr}} - s_\gamma \tilde{\mu} \overline{y_e^{pr}}) (c_\gamma a_e^{pr} - s_\gamma \tilde{\mu} y_e^{pr}) \text{LF}_{3,1,0} [\mathbf{m}_l^{\mathbf{P}}, \mathbf{m}_e^r] - \\ &\frac{2}{3} g_1^2 (c_\gamma \overline{a_e^{pr}} - s_\gamma \tilde{\mu} \overline{y_e^{pr}}) (c_\gamma a_e^{pr} - s_\gamma \tilde{\mu} y_e^{pr}) \text{LF}_{3,2,-1} [\mathbf{m}_l^{\mathbf{P}}, \mathbf{m}_e^r] + \\ &\frac{1}{2} (3 g_1^2 - c_{2\gamma} g_2^2) (c_\gamma \overline{a_e^{pr}} - s_\gamma \tilde{\mu} \overline{y_e^{pr}}) (c_\gamma a_e^{pr} - s_\gamma \tilde{\mu} y_e^{pr}) \text{LF}_{4,1,-1} [\mathbf{m}_l^{\mathbf{P}}, \mathbf{m}_e^r] - \\ &\frac{2}{3} g_1^2 (c_\gamma \overline{a_e^{pr}} - s_\gamma \tilde{\mu} \overline{y_e^{pr}}) (c_\gamma a_e^{pr} - s_\gamma \tilde{\mu} y_e^{pr}) \text{LF}_{5,1,-2} [\mathbf{m}_l^{\mathbf{P}}, \mathbf{m}_e^r] + \\ &c_\gamma^4 \overline{y_e^{pr}} \overline{y_e^{st}} y_e^{pt} y_e^{sr} \text{LF}_{2,1,0} [\mathbf{m}_l^{\mathbf{P}}, \mathbf{m}_l^{\mathbf{s}}] - c_\gamma^4 \overline{y_e^{pr}} \overline{y_e^{st}} y_e^{pt} y_e^{sr} \text{LF}_{3,1,-1} [\mathbf{m}_l^{\mathbf{P}}, \mathbf{m}_l^{\mathbf{s}}] - \\ &\frac{2}{3} g_1^2 (c_\gamma \overline{a_d^{pr}} - s_\gamma \tilde{\mu} \overline{y_d^{pr}}) (c_\gamma a_d^{pr} - s_\gamma \tilde{\mu} y_d^{pr}) \text{LF}_{3,1,0} [\mathbf{m}_q^{\mathbf{P}}, \mathbf{m}_d^r] - \\ &\frac{2}{3} g_1^2 (c_\gamma \overline{a_d^{pr}} - s_\gamma \tilde{\mu} \overline{y_d^{pr}}) (c_\gamma a_d^{pr} - s_\gamma \tilde{\mu} y_d^{pr}) \text{LF}_{3,2,-1} [\mathbf{m}_q^{\mathbf{P}}, \mathbf{m}_d^r] + \\ &\frac{1}{2} (5 g_1^2 - 3 c_{2\gamma} g_2^2) (c_\gamma \overline{a_d^{pr}} - s_\gamma \tilde{\mu} \overline{y_d^{pr}}) (c_\gamma a_d^{pr} - s_\gamma \tilde{\mu} y_d^{pr}) \text{LF}_{4,1,-1} [\mathbf{m}_q^{\mathbf{P}}, \mathbf{m}_d^r] - \\ &2 g_1^2 (c_\gamma \overline{a_d^{pr}} - s_\gamma \tilde{\mu} \overline{y_d^{pr}}) (c_\gamma a_d^{pr} - s_\gamma \tilde{\mu} y_d^{pr}) \text{LF}_{5,1,-2} [\mathbf{m}_q^{\mathbf{P}}, \mathbf{m}_d^r] + \\ &3 (c_\gamma^2 \overline{y_d^{pr}} y_d^{sr} (c_\gamma^2 \overline{y_d^{st}} y_d^{pt} - s_\gamma^2 \overline{y_u^{st}} y_u^{pt}) + s_\gamma^4 \overline{y_u^{pr}} \overline{y_u^{st}} y_u^{pt} y_u^{sr}) \text{LF}_{2,1,0} [\mathbf{m}_q^{\mathbf{S}}, \mathbf{m}_q^{\mathbf{s}}] - \\ &3 (c_\gamma^2 \overline{y_d^{pr}} y_d^{sr} (c_\gamma^2 \overline{y_d^{st}} y_d^{pt} - s_\gamma^2 \overline{y_u^{st}} y_u^{pt}) + s_\gamma^4 \overline{y_u^{pr}} \overline{y_u^{st}} y_u^{pt} y_u^{sr}) \text{LF}_{3,1,-1} [\mathbf{m}_q^{\mathbf{P}}, \mathbf{m}_q^{\mathbf{s}}] - \\ &\frac{1}{3} g_1^2 (s_\gamma \overline{a_u^{pr}} - \tilde{\mu} c_\gamma \overline{y_u^{pr}}) (s_\gamma a_u^{pr} - \tilde{\mu} c_\gamma y_u^{pr}) \text{LF}_{2,2,0} [\mathbf{m}_q^{\mathbf{P}}, \mathbf{m}_u^r] + \\ &3 c_{2\gamma} g_2^2 (s_\gamma \overline{a_u^{pr}} - \tilde{\mu} c_\gamma \overline{y_u^{pr}}) (s_\gamma a_u^{pr} - \tilde{\mu} c_\gamma y_u^{pr}) \text{LF}_{3,1,0} [\mathbf{m}_q^{\mathbf{P}}, \mathbf{m}_u^r] + \\ &\frac{1}{6} (g_1^2 - 9 c_{2\gamma$$