

$$\begin{aligned} \text{HD} \rightarrow & \hbar \left( \frac{2}{27} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{3,0}[\mathbf{m}_d^{\text{P}}] - \frac{5}{36} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{4,-1}[\mathbf{m}_d^{\text{P}}] + \frac{8}{135} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2}[\mathbf{m}_d^{\text{P}}] + \right. \\ & \frac{2}{9} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{3,0}[\mathbf{m}_e^{\text{P}}] - \frac{12}{52} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{4,-1}[\mathbf{m}_e^{\text{P}}] + \frac{8}{45} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2}[\mathbf{m}_e^{\text{P}}] + \\ & \left. \left( -\mathbf{c}_{2\gamma} \mathbf{g}_2^2 \mathbf{c}_\gamma^2 \overline{\mathbf{y}}^{\text{pr}} \mathbf{y}_e^{\text{pr}} + \frac{1}{36} \sum_{\mathbf{p}} \left( 4 \mathbf{g}_1^4 + 9 \mathbf{g}_2^4 \mathbf{c}_{2\gamma}^2 \right) \right) \text{LF}_{3,0}[\mathbf{m}_l^{\text{P}}] + \right. \\ & \left( \mathbf{c}_{2\gamma} \mathbf{g}_2^2 \mathbf{c}_\gamma^2 \overline{\mathbf{y}}^{\text{pr}} \mathbf{y}_e^{\text{pr}} - \frac{1}{24} \sum_{\mathbf{p}} \left( 5 \mathbf{g}_1^4 + 6 \mathbf{g}_2^4 \mathbf{c}_{2\gamma}^2 \right) \right) \text{LF}_{4,-1}[\mathbf{m}_l^{\text{P}}] + \frac{4}{45} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2}[\mathbf{m}_l^{\text{P}}] + \\ & \left( \frac{1}{27} \sum_{\mathbf{p}} \mathbf{g}_1^4 + \frac{3}{4} \mathbf{c}_{2\gamma} \mathbf{g}_2^2 \left( -4 \mathbf{c}_\gamma^2 \overline{\mathbf{y}}^{\text{pr}} \mathbf{y}_d^{\text{pr}} + 4 \mathbf{s}_\gamma^2 \overline{\mathbf{y}}^{\text{pr}} \mathbf{y}_u^{\text{pr}} + \sum_{\mathbf{p}} \mathbf{c}_{2\gamma} \mathbf{g}_2^2 \right) \right) \text{LF}_{3,0}[\mathbf{m}_q^{\text{P}}] + \\ & \left( 3 \mathbf{c}_{2\gamma} \mathbf{g}_2^2 \left( \mathbf{c}_\gamma^2 \overline{\mathbf{y}}^{\text{pr}} \mathbf{y}_d^{\text{pr}} - \mathbf{s}_\gamma^2 \overline{\mathbf{y}}^{\text{pr}} \mathbf{y}_u^{\text{pr}} \right) - \frac{1}{72} \sum_{\mathbf{p}} \left( 5 \mathbf{g}_1^4 + 54 \mathbf{g}_2^4 \mathbf{c}_{2\gamma}^2 \right) \right) \text{LF}_{4,-1}[\mathbf{m}_q^{\text{P}}] + \\ & \frac{4}{135} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2}[\mathbf{m}_q^{\text{P}}] + \frac{8}{27} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{3,0}[\mathbf{m}_u^{\text{P}}] - \frac{5}{9} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{4,-1}[\mathbf{m}_u^{\text{P}}] + \frac{32}{135} \sum_{\mathbf{p}} \mathbf{g}_1^4 \text{LF}_{5,-2}[\mathbf{m}_u^{\text{P}}] + \\ & \frac{1}{576} \left( \mathbf{g}_1^4 \left( 73 + 9 \mathbf{c}_{4\gamma} \left( -2 + \mathbf{c}_{4\gamma} \right) - 36 \mathbf{s}_{2\gamma}^4 \right) + 18 \mathbf{g}_1^2 \mathbf{g}_2^2 \left( -3 + \mathbf{c}_{4\gamma} \left( 2 + \mathbf{c}_{4\gamma} \right) - 4 \mathbf{s}_{2\gamma}^4 \right) + \right. \\ & 9 \mathbf{g}_2^4 \left( \left( 3 + \mathbf{c}_{4\gamma} \right)^2 - 4 \mathbf{s}_{2\gamma}^4 \right) \left. \right) \text{LF}_{3,0}[\mathbf{m}_\boxplus] + \frac{1}{192} \left( -6 \mathbf{g}_1^2 \mathbf{g}_2^2 \left( -3 + \mathbf{c}_{4\gamma} \left( 2 + \mathbf{c}_{4\gamma} \right) - 4 \mathbf{s}_{2\gamma}^4 \right) + \right. \\ & 3 \mathbf{g}_2^4 \left( -\left( 3 + \mathbf{c}_{4\gamma} \right)^2 + 4 \mathbf{s}_{2\gamma}^4 \right) + \mathbf{g}_1^4 \left( -43 - 3 \mathbf{c}_{4\gamma} \left( -2 + \mathbf{c}_{4\gamma} \right) + 12 \mathbf{s}_{2\gamma}^4 \right) \left. \right) \text{LF}_{4,-1}[\mathbf{m}_\boxplus] + \\ & \frac{4}{45} \mathbf{g}_1^4 \text{LF}_{5,-2}[\mathbf{m}_\boxplus] + \frac{1}{9} \mathbf{g}_1^4 \text{LF}_{3,0}[\tilde{\mu}] + \frac{1}{6} \mathbf{g}_1^4 \text{LF}_{4,-1}[\tilde{\mu}] - \frac{8}{45} \mathbf{g}_1^4 \text{LF}_{5,-2}[\tilde{\mu}] + \\ & \frac{1}{8} \mathbf{g}_1^4 \text{LF}_{2,2,-1}[\mathbf{m}_1, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 + \frac{1}{4} \mathbf{g}_1^4 \mathbf{m}_1^2 \text{LF}_{2,2,0}[\mathbf{m}_1, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 + \\ & \frac{17}{8} \mathbf{g}_2^4 \text{LF}_{2,2,-1}[\mathbf{m}_2, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 + \frac{1}{4} \mathbf{g}_2^4 \mathbf{m}_2^2 \text{LF}_{2,2,0}[\mathbf{m}_2, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 - \\ & 4 \mathbf{g}_2^4 \text{LF}_{3,2,-2}[\mathbf{m}_2, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 + 3 \mathbf{g}_2^4 \mathbf{m}_2^2 \text{LF}_{3,2,-1}[\mathbf{m}_2, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 + \\ & 2 \mathbf{g}_2^4 \text{LF}_{3,3,-3}[\mathbf{m}_2, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 - 2 \mathbf{g}_2^4 \mathbf{m}_2^2 \text{LF}_{3,3,-2}[\mathbf{m}_2, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 + \\ & 2 \mathbf{g}_2^4 \text{LF}_{4,2,-3}[\mathbf{m}_2, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 - 2 \mathbf{g}_2^4 \mathbf{m}_2^2 \text{LF}_{4,2,-2}[\mathbf{m}_2, \tilde{\mu}] \left( \mathbf{c}_\gamma^2 - \mathbf{s}_\gamma^2 \right)^2 + \\ & \frac{2}{3} \mathbf{g}_1^2 \left( \mathbf{c}_\gamma \overline{\mathbf{a}}_d^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \overline{\mathbf{y}}_d^{\text{pr}} \right) \left( \mathbf{c}_\gamma \mathbf{a}_d^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \mathbf{y}_d^{\text{pr}} \right) \text{LF}_{2,2,0}[\mathbf{m}_d^{\text{r}}, \mathbf{m}_q^{\text{p}}] - \\ & \frac{1}{3} \mathbf{g}_1^2 \left( \mathbf{c}_\gamma \overline{\mathbf{a}}_d^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \overline{\mathbf{y}}_d^{\text{pr}} \right) \left( \mathbf{c}_\gamma \mathbf{a}_d^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \mathbf{y}_d^{\text{pr}} \right) \text{LF}_{3,2,-1}[\mathbf{m}_d^{\text{r}}, \mathbf{m}_q^{\text{p}}] + \\ & \frac{2}{3} \mathbf{g}_1^2 \left( \mathbf{c}_\gamma \overline{\mathbf{a}}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \overline{\mathbf{y}}_e^{\text{pr}} \right) \left( \mathbf{c}_\gamma \mathbf{a}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \mathbf{y}_e^{\text{pr}} \right) \text{LF}_{2,2,0}[\mathbf{m}_e^{\text{r}}, \mathbf{m}_l^{\text{p}}] - \\ & \frac{1}{3} \mathbf{g}_1^2 \left( \mathbf{c}_\gamma \overline{\mathbf{a}}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \overline{\mathbf{y}}_e^{\text{pr}} \right) \left( \mathbf{c}_\gamma \mathbf{a}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \mathbf{y}_e^{\text{pr}} \right) \text{LF}_{3,2,-1}[\mathbf{m}_e^{\text{r}}, \mathbf{m}_l^{\text{p}}] - \\ & \frac{2}{3} \mathbf{g}_1^2 \left( \mathbf{c}_\gamma \overline{\mathbf{a}}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \overline{\mathbf{y}}_e^{\text{pr}} \right) \left( \mathbf{c}_\gamma \mathbf{a}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \mathbf{y}_e^{\text{pr}} \right) \text{LF}_{3,1,0}[\mathbf{m}_l^{\text{p}}, \mathbf{m}_e^{\text{r}}] - \\ & \frac{2}{3} \mathbf{g}_1^2 \left( \mathbf{c}_\gamma \overline{\mathbf{a}}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \overline{\mathbf{y}}_e^{\text{pr}} \right) \left( \mathbf{c}_\gamma \mathbf{a}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \mathbf{y}_e^{\text{pr}} \right) \text{LF}_{3,2,-1}[\mathbf{m}_l^{\text{p}}, \mathbf{m}_e^{\text{r}}] + \\ & \frac{1}{2} \left( 3 \mathbf{g}_1^2 - \mathbf{c}_{2\gamma} \mathbf{g}_2^2 \right) \left( \mathbf{c}_\gamma \overline{\mathbf{a}}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \overline{\mathbf{y}}_e^{\text{pr}} \right) \left( \mathbf{c}_\gamma \mathbf{a}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \mathbf{y}_e^{\text{pr}} \right) \text{LF}_{4,1,-1}[\mathbf{m}_l^{\text{p}}, \mathbf{m}_e^{\text{r}}] - \\ & \frac{2}{3} \mathbf{g}_1^2 \left( \mathbf{c}_\gamma \overline{\mathbf{a}}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \overline{\mathbf{y}}_e^{\text{pr}} \right) \left( \mathbf{c}_\gamma \mathbf{a}_e^{\text{pr}} - \mathbf{s}_\gamma \tilde{\mu} \mathbf{y}_e^{\text{pr}} \right) \text{LF}_{5,1,-2}[\mathbf{m}_l^{\text{p}}, \mathbf{m}_e^{\text{r}}] + \\ & \mathbf{c}_\gamma^4 \overline{\mathbf{y}}_e^{\text{pr}} \$$