

$$\begin{aligned} & \rightarrow c_\gamma y_e^{11i2} + \hbar \left(\frac{1}{16} c_\gamma \frac{1}{m_\Phi^2} (m_\Phi^2 y_e^{11i2} (3 g_2^2 (1 + 2 c_\gamma^2 + 2 s_\gamma^2) + g_1^2 (5 + 2 c_\gamma^2 + 2 s_\gamma^2)) + \right. \\ & \quad \overline{y_e}^{\text{pr}} (6 m_\Phi^2 y_e^{\text{pi}2} y_e^{11r} (1 + s_\gamma^2) + 8 m_H^2 s_\gamma^2 y_e^{\text{pr}} y_e^{11i2}) \Big) - \\ & \frac{1}{2} \sum_{\mathbf{p}} s_{2\gamma} s_\gamma g_1^2 \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) \text{LF}_{1,0} [m_{\mathbf{d}}^{\text{p}}] + \frac{3}{2} s_{2\gamma} s_\gamma \frac{1}{m_\Phi^4} \overline{y_d}^{\text{pr}} y_d^{\text{pr}} y_e^{11i2} \\ & \quad (m_H^2 + m_\Phi^2) \text{LF}_{1,0} [m_{\mathbf{d}}^{\text{r}}] - \frac{1}{2} \sum_{\mathbf{p}} s_{2\gamma} s_\gamma g_1^2 \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) \text{LF}_{1,0} [m_{\mathbf{e}}^{\text{p}}] + \\ & \frac{1}{2} s_{2\gamma} s_\gamma \frac{1}{m_\Phi^4} \overline{y_e}^{\text{pr}} y_e^{\text{pr}} y_e^{11i2} (m_H^2 + m_\Phi^2) \text{LF}_{1,0} [m_{\mathbf{e}}^{\text{r}}] + \\ & \frac{1}{2} s_{2\gamma} s_\gamma \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) (\overline{y_e}^{\text{pr}} y_e^{\text{pr}} + \sum_{\mathbf{p}} g_1^2) \text{LF}_{1,0} [m_{\mathbf{l}}^{\text{p}}] - \\ & \frac{1}{2} s_{2\gamma} s_\gamma \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) (-3 \overline{y_d}^{\text{pr}} y_d^{\text{pr}} + 3 \overline{y_u}^{\text{pr}} y_u^{\text{pr}} + \sum_{\mathbf{p}} g_1^2) \text{LF}_{1,0} [m_{\mathbf{q}}^{\text{p}}] + \\ & \sum_{\mathbf{p}} s_{2\gamma} s_\gamma g_1^2 \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) \text{LF}_{1,0} [m_{\mathbf{u}}^{\text{p}}] - \\ & \frac{3}{2} s_{2\gamma} s_\gamma \frac{1}{m_\Phi^4} y_e^{11i2} \overline{y_u}^{\text{pr}} y_u^{\text{pr}} (m_H^2 + m_\Phi^2) \text{LF}_{1,0} [m_{\mathbf{u}}^{\text{r}}] - \\ & \frac{3}{8} s_{4\gamma} s_\gamma \frac{1}{m_\Phi^4} y_e^{11i2} (g_1^2 + g_2^2) (m_H^2 + m_\Phi^2) \text{LF}_{1,0} [m_\Phi] - \frac{3}{4} c_\gamma s_\gamma^2 \overline{y_e}^{\text{pr}} y_e^{\text{pi}2} y_e^{11r} \text{LF}_{1,1} [m_\Phi] - \\ & c_\gamma g_1^2 y_e^{11i2} \text{LF}_{1,1,0} [m_1, m_{\mathbf{e}}^{i2}] + \frac{1}{2} c_\gamma g_1^2 y_e^{11i2} \text{LF}_{2,1,-1} [m_1, m_{\mathbf{e}}^{i2}] - \\ & \frac{1}{4} c_\gamma g_1^2 y_e^{11i2} \text{LF}_{1,1,0} [m_1, m_{\mathbf{l}}^{i1}] + \frac{1}{8} c_\gamma g_1^2 y_e^{11i2} \text{LF}_{2,1,-1} [m_1, m_{\mathbf{l}}^{i1}] + \\ & m_1 s_\gamma \tilde{\mu} g_1^2 \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) (c_\gamma^2 - s_\gamma^2) \text{LF}_{1,1,0} [m_1, \tilde{\mu}] - \frac{3}{4} c_\gamma g_2^2 y_e^{11i2} \text{LF}_{1,1,0} [m_2, m_{\mathbf{l}}^{i1}] + \\ & \frac{3}{8} c_\gamma g_2^2 y_e^{11i2} \text{LF}_{2,1,-1} [m_2, m_{\mathbf{l}}^{i1}] + 3 m_2 s_\gamma \tilde{\mu} g_2^2 \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) (c_\gamma^2 - s_\gamma^2) \text{LF}_{1,1,0} [m_2, \tilde{\mu}] + \\ & 3 s_\gamma \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) (s_\gamma \overline{a_d}^{\text{pr}} + \tilde{\mu} c_\gamma \overline{y_d}^{\text{pr}}) (c_\gamma a_d^{\text{pr}} - s_\gamma \tilde{\mu} y_d^{\text{pr}}) \text{LF}_{1,1,0} [m_{\mathbf{d}}^{\text{r}}, m_{\mathbf{q}}^{\text{p}}] + \\ & s_\gamma \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) (s_\gamma \overline{a_e}^{\text{pr}} + \tilde{\mu} c_\gamma \overline{y_e}^{\text{pr}}) (c_\gamma a_e^{\text{pr}} - s_\gamma \tilde{\mu} y_e^{\text{pr}}) \text{LF}_{1,1,0} [m_{\mathbf{e}}^{\text{r}}, m_{\mathbf{l}}^{\text{p}}] - \\ & \frac{1}{2} c_\gamma \overline{y_e}^{\text{pr}} y_e^{\text{pi}2} y_e^{11r} \text{LF}_{1,1,0} [m_{\mathbf{e}}^{\text{r}}, \tilde{\mu}] + \frac{1}{2} \frac{1}{m_\Phi^2} y_e^{11i2} \\ & (\overline{a_e}^{\text{pr}} (m_\Phi^2 c_\gamma^2 - 2 m_H^2 s_\gamma^2) - s_\gamma \tilde{\mu} c_\gamma \overline{y_e}^{\text{pr}} (2 m_H^2 + m_\Phi^2)) (c_\gamma a_e^{\text{pr}} - s_\gamma \tilde{\mu} y_e^{\text{pr}}) \text{LF}_{2,1,0} [m_{\mathbf{l}}^{\text{p}}, m_{\mathbf{e}}^{\text{r}}] - \\ & \frac{1}{2} \frac{1}{m_\Phi^2} y_e^{11i2} (\overline{a_e}^{\text{pr}} (m_\Phi^2 c_\gamma^2 - 2 m_H^2 s_\gamma^2) - s_\gamma \tilde{\mu} c_\gamma \overline{y_e}^{\text{pr}} (2 m_H^2 + m_\Phi^2)) (c_\gamma a_e^{\text{pr}} - s_\gamma \tilde{\mu} y_e^{\text{pr}}) \\ & \text{LF}_{3,1,-1} [m_{\mathbf{l}}^{\text{p}}, m_{\mathbf{e}}^{\text{r}}] - m_H^2 c_\gamma y_e^{11i2} (c_\gamma \overline{a_e}^{\text{pr}} - s_\gamma \tilde{\mu} \overline{y_e}^{\text{pr}}) (c_\gamma a_e^{\text{pr}} - s_\gamma \tilde{\mu} y_e^{\text{pr}}) \text{LF}_{3,1,0} [m_{\mathbf{l}}^{\text{p}}, m_{\mathbf{e}}^{\text{r}}] + \\ & 3 m_H^2 c_\gamma y_e^{11i2} (c_\gamma \overline{a_e}^{\text{pr}} - s_\gamma \tilde{\mu} \overline{y_e}^{\text{pr}}) (c_\gamma a_e^{\text{pr}} - s_\gamma \tilde{\mu} y_e^{\text{pr}}) \text{LF}_{4,1,-1} [m_{\mathbf{l}}^{\text{p}}, m_{\mathbf{e}}^{\text{r}}] - \\ & 2 m_H^2 c_\gamma y_e^{11i2} (c_\gamma \overline{a_e}^{\text{pr}} - s_\gamma \tilde{\mu} \overline{y_e}^{\text{pr}}) (c_\gamma a_e^{\text{pr}} - s_\gamma \tilde{\mu} y_e^{\text{pr}}) \text{LF}_{5,1,-2} [m_{\mathbf{l}}^{\text{p}}, m_{\mathbf{e}}^{\text{r}}] - \\ & c_\gamma \overline{y_e}^{\text{pr}} y_e^{\text{pi}2} y_e^{11r} \text{LF}_{1,1,0} [m_{\mathbf{l}}^{\text{p}}, \tilde{\mu}] + \frac{3}{2} \frac{1}{m_\Phi^2} y_e^{11i2} \\ & (\overline{a_d}^{\text{pr}} (m_\Phi^2 c_\gamma^2 - 2 m_H^2 s_\gamma^2) - s_\gamma \tilde{\mu} c_\gamma \overline{y_d}^{\text{pr}} (2 m_H^2 + m_\Phi^2)) (c_\gamma a_d^{\text{pr}} - s_\gamma \tilde{\mu} y_d^{\text{pr}}) \text{LF}_{2,1,0} [m_{\mathbf{q}}^{\text{p}}, m_{\mathbf{d}}^{\text{r}}] - \\ & \frac{3}{2} \frac{1}{m_\Phi^2} y_e^{11i2} (\overline{a_d}^{\text{pr}} (m_\Phi^2 c_\gamma^2 - 2 m_H^2 s_\gamma^2) - s_\gamma \tilde{\mu} c_\gamma \overline{y_d}^{\text{pr}} (2 m_H^2 + m_\Phi^2)) (c_\gamma a_d^{\text{pr}} - s_\gamma \tilde{\mu} y_d^{\text{pr}}) \\ & \text{LF}_{3,1,-1} [m_{\mathbf{q}}^{\text{p}}, m_{\mathbf{d}}^{\text{r}}] - 3 m_H^2 c_\gamma y_e^{11i2} (c_\gamma \overline{a_d}^{\text{pr}} - s_\gamma \tilde{\mu} \overline{y_d}^{\text{pr}}) (c_\gamma a_d^{\text{pr}} - s_\gamma \tilde{\mu} y_d^{\text{pr}}) \text{LF}_{3,1,0} [m_{\mathbf{q}}^{\text{p}}, m_{\mathbf{d}}^{\text{r}}] + \\ & 9 m_H^2 c_\gamma y_e^{11i2} (c_\gamma \overline{a_d}^{\text{pr}} - s_\gamma \tilde{\mu} \overline{y_d}^{\text{pr}}) (c_\gamma a_d^{\text{pr}} - s_\gamma \tilde{\mu} y_d^{\text{pr}}) \text{LF}_{4,1,-1} [m_{\mathbf{q}}^{\text{p}}, m_{\mathbf{d}}^{\text{r}}] - \\ & 6 m_H^2 c_\gamma y_e^{11i2} (c_\gamma \overline{a_d}^{\text{pr}} - s_\gamma \tilde{\mu} \overline{y_d}^{\text{pr}}) (c_\gamma a_d^{\text{pr}} - s_\gamma \tilde{\mu} y_d^{\text{pr}}) \text{LF}_{5,1,-2} [m_{\mathbf{q}}^{\text{p}}, m_{\mathbf{d}}^{\text{r}}] - \\ & 3 s_\gamma \frac{1}{m_\Phi^4} y_e^{11i2} (m_H^2 + m_\Phi^2) (s_\gamma \overline{a_u}^{\text{pr}} - \tilde{\mu} c_\gamma \overline{y_u}^{\text{pr}}) (c_\gamma a_u^{\text{pr}} + s_\gamma \tilde{\mu} y_u^{\text{pr}}) \text{LF}_{1,1,0} [m_{\mathbf{q}}^{\text{p}}, m_{\mathbf{u}}^{\text{r}}] + \\ & \frac{3}{2} \frac{1}{m_\Phi^2} y_e^{11i2} (s_\gamma \overline{a_u}^{\text{pr}} - \tilde{\mu} c_\gamma \overline{y_u}^{\text{pr}}) (s_\gamma c_\gamma a_u^{\text{pr}} (2 m_H^2 + m_\Phi^2) + \tilde{\mu} y_u^{\text{pr}} (-m_\Phi^2 c_\gamma^2 + 2 m_H^2 s_\gamma^2)) \\ & \text{LF}_{2,1,0} [m_{\mathbf{u}}^{\text{r}}, m_{\mathbf{q}}^{\text{p}}] - \frac{3}{2} \frac{1}{m_\Phi^2} y_e^{11i2} (s_\gamma \overline{a_u}^{\text{pr}} - \tilde{\mu} c_\gamma \overline{y_u}^{\text{pr}}) \\ & (s_\gamma c_\gamma a_u^{\text{pr}} (2 m_H^2 + m_\Phi^2) + \tilde{\mu} y_u^{\text{pr}} (-m_\Phi^2 c_\gamma^2 + 2 m_H^2 s_\gamma^2)) \text{LF}_{$$