

$$\begin{aligned} & \hbar \left(-\frac{1}{216} s_Y c_Y \frac{1}{m_s^2} (18 Y_d^{i3i4} Y_u^{i1i2} (g_1^2 + 16 g_3^2) + 9 \overline{Y_d}^{pr} (Y_u^{pi2} (-2 s_Y^2 Y_d^{i3i4} Y_d^{i3r} + 3 Y_d^{i1r} Y_d^{i3i4} \right. \\ & \quad (1 + 2 c_Y^2 + 5 s_Y^2)) + 9 Y_u^{i1i2} (Y_d^{pi4} Y_d^{i3r} (1 + s_Y^2) + 4 s_Y^2 Y_d^{pr} Y_d^{i3i4})) + 27 \overline{Y_u}^{pr} \\ & \quad (3 Y_d^{i3i4} (Y_u^{pi2} Y_u^{i1r} (1 + c_Y^2) + 4 c_Y^2 Y_u^{pr} Y_u^{i1i2}) + Y_d^{pi4} Y_u^{i1i2} Y_u^{i3r} (1 + 5 c_Y^2 + 2 s_Y^2)) + \\ & \quad 2 Y_u^{i3i2} (Y_d^{i1i4} (5 g_1^2 + 27 g_2^2 - 192 g_3^2) - 9 c_Y^2 Y_d^{pi4} \overline{Y_u}^{pr} Y_u^{i1r})) - \\ & \quad \frac{1}{2} \sum_p g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (s_{2Y} c_Y^2 + s_Y c_{2Y} c_Y - s_{2Y} s_Y^2) LF_{1,0}[m_d^p] + \\ & \quad \frac{3}{2} \frac{1}{m_{\phi^2}} \overline{Y_d}^{pr} Y_d^{pr} Y_d^{i3i4} Y_u^{i1i2} (s_{2Y} c_Y^2 - s_{2Y} s_Y^2 - 2 c_Y s_Y^3) LF_{1,0}[m_d^r] - \\ & \quad \frac{1}{2} \sum_p g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (s_{2Y} c_Y^2 + s_Y c_{2Y} c_Y - s_{2Y} s_Y^2) LF_{1,0}[m_e^p] + \\ & \quad \frac{1}{2} \frac{1}{m_{\phi^2}} Y_d^{i3i4} \overline{Y_e}^{pr} Y_e^{pr} Y_u^{i1i2} (s_{2Y} c_Y^2 - s_{2Y} s_Y^2 - 2 c_Y s_Y^3) LF_{1,0}[m_e^r] + \frac{1}{2} \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} \\ & \quad (\overline{Y_e}^{pr} Y_e^{pr} (s_{2Y} c_Y^2 - s_{2Y} s_Y^2 - 2 c_Y s_Y^3) + \sum_p g_1^2 (s_{2Y} c_Y^2 + s_Y c_{2Y} c_Y - s_{2Y} s_Y^2)) LF_{1,0}[m_l^p] + \\ & \quad \frac{1}{2} \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (3 \overline{Y_d}^{pr} Y_d^{pr} (s_{2Y} c_Y^2 - s_{2Y} s_Y^2 - 2 c_Y s_Y^3) - \\ & \quad 3 \overline{Y_u}^{pr} Y_u^{pr} (s_{2Y} c_Y^2 + 2 s_Y c_Y^3 - s_{2Y} s_Y^2) - \sum_p g_1^2 (s_{2Y} c_Y^2 + s_Y c_{2Y} c_Y - s_{2Y} s_Y^2)) LF_{1,0}[m_q^p] + \\ & \quad \sum_p g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (s_{2Y} c_Y^2 + s_Y c_{2Y} c_Y - s_{2Y} s_Y^2) LF_{1,0}[m_u^p] - \\ & \quad \frac{3}{2} \frac{1}{m_{\phi^2}} Y_d^{i3i4} \overline{Y_u}^{pr} Y_u^{pr} Y_u^{i1i2} (s_{2Y} c_Y^2 + 2 s_Y c_Y^3 - s_{2Y} s_Y^2) LF_{1,0}[m_u^r] + \\ & \quad \frac{1}{8} \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (-3 s_{4Y} c_Y^2 (g_1^2 + g_2^2) + \\ & \quad 2 s_Y c_Y (g_1^2 (1 - 3 c_{2Y}^2) - 3 g_2^2 (-1 + c_{2Y}^2)) + 3 s_{4Y} s_Y^2 (g_1^2 + g_2^2)) LF_{1,0}[m_{\phi}] + \\ & \quad \frac{1}{4} s_Y c_Y \frac{1}{m_{\phi^2}} (-2 Y_d^{i3i4} Y_u^{i1i2} (g_1^2 + 3 g_2^2) + 3 s_Y^2 \overline{Y_d}^{pr} (-Y_d^{i1r} Y_d^{i3i4} Y_u^{pi2} + Y_d^{pi4} Y_d^{i3r} Y_u^{i1i2}) + \\ & \quad 3 c_Y^2 \overline{Y_u}^{pr} (Y_d^{i3i4} Y_u^{pi2} Y_u^{i1r} - Y_d^{pi4} Y_u^{i1i2} Y_u^{i3r})) LF_{1,1}[m_{\phi}] + \frac{1}{54} s_Y c_Y \\ & \quad (-27 c_Y^2 \overline{Y_d}^{pr} Y_d^{i1r} Y_d^{i3i4} Y_u^{pi2} + 3 Y_u^{i1i2} (Y_d^{i3i4} (7 g_1^2 + 27 g_2^2) - 9 s_Y^2 Y_d^{pi4} \overline{Y_u}^{pr} Y_u^{i3r}) + \\ & \quad Y_d^{i1i4} Y_u^{i3i2} (-5 g_1^2 - 27 g_2^2 + 192 g_3^2)) LF_{1,2}[m_{\phi}] + \\ & \quad \frac{1}{9} s_Y c_Y g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_1, m_d^{i4}] - \frac{1}{18} s_Y c_Y g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_1, m_d^{i4}] + \\ & \quad \frac{1}{36} s_Y c_Y g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_1, m_q^{i1}] - \\ & \quad \frac{1}{72} s_Y c_Y g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_1, m_q^{i1}] + \\ & \quad \frac{1}{36} s_Y c_Y g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_1, m_q^{i3}] - \\ & \quad \frac{1}{72} s_Y c_Y g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_1, m_q^{i3}] + \\ & \quad \frac{4}{9} s_Y c_Y g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_1, m_u^{i2}] - \\ & \quad \frac{2}{9} s_Y c_Y g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_1, m_u^{i2}] + s_Y c_Y g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,-1}[m_1, \tilde{\mu}] + \\ & \quad m_1 \tilde{\mu} g_1^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (c_Y^4 - 4 s_Y^2 c_Y^2 + s_Y^4) LF_{1,1,0}[m_1, \tilde{\mu}] + \\ & \quad \frac{3}{4} s_Y c_Y g_2^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_2, m_q^{i1}] - \\ & \quad \frac{3}{8} s_Y c_Y g_2^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_2, m_q^{i1}] + \frac{3}{4} s_Y c_Y g_2^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_2, m_q^{i3}] - \\ & \quad \frac{3}{8} s_Y c_Y g_2^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_2, m_q^{i3}] + 3 s_Y c_Y g_2^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,-1}[m_2, \tilde{\mu}] + \\ & \quad 3 m_2 \tilde{\mu} g_2^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (c_Y^4 - 4 s_Y^2 c_Y^2 + s_Y^4) LF_{1,1,0}[m_2, \tilde{\mu}] + \\ & \quad \frac{4}{3} s_Y c_Y g_3^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_3, m_d^{i4}] - \frac{2}{3} s_Y c_Y g_3^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_3, m_d^{i4}] + \\ & \quad \frac{4}{3} s_Y c_Y g_3^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_3, m_q^{i1}] - \frac{2}{3} s_Y c_Y g_3^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_3, m_q^{i1}] + \\ & \quad \frac{4}{3} s_Y c_Y g_3^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_3, m_q^{i3}] - \frac{2}{3} s_Y c_Y g_3^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_3, m_q^{i3}] + \\ & \quad \frac{4}{3} s_Y c_Y g_3^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{1,1,0}[m_3, m_u^{i2}] - \frac{2}{3} s_Y c_Y g_3^2 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} LF_{2,1,-1}[m_3, m_u^{i2}] + \\ & \quad 3 \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (s_Y \tilde{\mu} c_Y \overline{Y_d}^{pr} (-3 s_Y c_Y a_d^{pr} + \tilde{\mu} Y_d^{pr} (-2 c_Y^2 + s_Y^2)) + \\ & \quad \overline{a_d}^{pr} (s_Y c_Y a_d^{pr} (c_Y^2 - 2 s_Y^2) + \tilde{\mu} Y_d^{pr} (c_Y^4 - s_Y^2 c_Y^2 + s_Y^4))) LF_{1,1,0}[m_d^r, m_q^p] + \\ & \quad \frac{1}{2} s_Y c_Y \frac{1}{m_{\phi^2}} \overline{Y_d}^{pr} (Y_d^{i1r} Y_d^{i3i4} Y_u^{pi2} + Y_d^{pi4} Y_d^{i3r} Y_u^{i1i2}) LF_{1,1,0}[m_d^r, \tilde{\mu}] + \\ & \quad \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (s_Y \tilde{\mu} c_Y \overline{Y_e}^{pr} (-3 s_Y c_Y a_e^{pr} + \tilde{\mu} Y_e^{pr} (-2 c_Y^2 + s_Y^2)) + \\ & \quad \overline{a_e}^{pr} (s_Y c_Y a_e^{pr} (c_Y^2 - 2 s_Y^2) + \tilde{\mu} Y_e^{pr} (c_Y^4 - s_Y^2 c_Y^2 + s_Y^4))) LF_{1,1,0}[m_e^r, m_l^p] + \\ & \quad \frac{1}{m_{\phi^2}} Y_d^{i3i4} Y_u^{i1i2} (s_Y \tilde{\mu} c_Y \overline{Y_e}^{pr} (2 s_Y c_Y a_e^{pr} + \tilde{\mu} Y_e^{pr} (c_Y^2 - s_Y^2)) + \\ & \quad \overline{a_e}^{pr} (s_Y c_Y a_e^{pr} (-c_Y^2 + s_Y^2) - \tilde{\mu} Y_e^{pr} ($$