$$
\begin{aligned}
M_H^2 \to\ & -C_{H^2} + \hbar \left(-\frac{1}{4} C_{H^2} \left({g_1}^2 + 3\, {g_2}^2 \right) - C_{H^2} \left(c_\gamma \overline{a_e}^{pr} - s_\gamma \tilde{\mu} \overline{y_e}^{pr} \right) \left(c_\gamma a_e{}^{pr} - s_\gamma \tilde{\mu}\, y_e{}^{pr} \right) LF_{2,1,0}\left[m_{\tilde{l}}{}^p, m_{\tilde{e}}{}^r \right] + \right. \\
& C_{H^2} \left(c_\gamma \overline{a_e}^{pr} - s_\gamma \tilde{\mu} \overline{y_e}^{pr} \right) \left(c_\gamma a_e{}^{pr} - s_\gamma \tilde{\mu}\, y_e{}^{pr} \right) LF_{3,1,-1}\left[m_{\tilde{l}}{}^p, m_{\tilde{e}}{}^r \right] - \\
& {C_{H^2}}^2 \left(c_\gamma \overline{a_e}^{pr} - s_\gamma \tilde{\mu} \overline{y_e}^{pr} \right) \left(c_\gamma a_e{}^{pr} - s_\gamma \tilde{\mu}\, y_e{}^{pr} \right) LF_{3,1,0}\left[m_{\tilde{l}}{}^p, m_{\tilde{e}}{}^r \right] + \\
& 3\, {C_{H^2}}^2 \left(c_\gamma \overline{a_e}^{pr} - s_\gamma \tilde{\mu} \overline{y_e}^{pr} \right) \left(c_\gamma a_e{}^{pr} - s_\gamma \tilde{\mu}\, y_e{}^{pr} \right) LF_{4,1,-1}\left[m_{\tilde{l}}{}^p, m_{\tilde{e}}{}^r \right] - \\
& 2\, {C_{H^2}}^2 \left(c_\gamma \overline{a_e}^{pr} - s_\gamma \tilde{\mu} \overline{y_e}^{pr} \right) \left(c_\gamma a_e{}^{pr} - s_\gamma \tilde{\mu}\, y_e{}^{pr} \right) LF_{5,1,-2}\left[m_{\tilde{l}}{}^p, m_{\tilde{e}}{}^r \right] - \\
& 3\, C_{H^2} \left(c_\gamma \overline{a_d}^{pr} - s_\gamma \tilde{\mu} \overline{y_d}^{pr} \right) \left(c_\gamma a_d{}^{pr} - s_\gamma \tilde{\mu}\, y_d{}^{pr} \right) LF_{2,1,0}\left[m_{\tilde{q}}{}^p, m_{\tilde{d}}{}^r \right] + \\
& 3\, C_{H^2} \left(c_\gamma \overline{a_d}^{pr} - s_\gamma \tilde{\mu} \overline{y_d}^{pr} \right) \left(c_\gamma a_d{}^{pr} - s_\gamma \tilde{\mu}\, y_d{}^{pr} \right) LF_{3,1,-1}\left[m_{\tilde{q}}{}^p, m_{\tilde{d}}{}^r \right] - \\
& 3\, {C_{H^2}}^2 \left(c_\gamma \overline{a_d}^{pr} - s_\gamma \tilde{\mu} \overline{y_d}^{pr} \right) \left(c_\gamma a_d{}^{pr} - s_\gamma \tilde{\mu}\, y_d{}^{pr} \right) LF_{3,1,0}\left[m_{\tilde{q}}{}^p, m_{\tilde{d}}{}^r \right] + \\
& 9\, {C_{H^2}}^2 \left(c_\gamma \overline{a_d}^{pr} - s_\gamma \tilde{\mu} \overline{y_d}^{pr} \right) \left(c_\gamma a_d{}^{pr} - s_\gamma \tilde{\mu}\, y_d{}^{pr} \right) LF_{4,1,-1}\left[m_{\tilde{q}}{}^p, m_{\tilde{d}}{}^r \right] - \\
& 6\, {C_{H^2}}^2 \left(c_\gamma \overline{a_d}^{pr} - s_\gamma \tilde{\mu} \overline{y_d}^{pr} \right) \left(c_\gamma a_d{}^{pr} - s_\gamma \tilde{\mu}\, y_d{}^{pr} \right) LF_{5,1,-2}\left[m_{\tilde{q}}{}^p, m_{\tilde{d}}{}^r \right] - \\
& 3\, C_{H^2} \left(s_\gamma \overline{a_u}^{pr} - \tilde{\mu}\, c_\gamma \overline{y_u}^{pr} \right) \left(s_\gamma a_u{}^{pr} - \tilde{\mu}\, c_\gamma y_u{}^{pr} \right) LF_{2,1,0}\left[m_{\tilde{u}}{}^r, m_{\tilde{q}}{}^p \right] + \\
& 3\, C_{H^2} \left(s_\gamma \overline{a_u}^{pr} - \tilde{\mu}\, c_\gamma \overline{y_u}^{pr} \right) \left(s_\gamma a_u{}^{pr} - \tilde{\mu}\, c_\gamma y_u{}^{pr} \right) LF_{3,1,-1}\left[m_{\tilde{u}}{}^r, m_{\tilde{q}}{}^p \right] - \\
& 3\, {C_{H^2}}^2 \left(s_\gamma \overline{a_u}^{pr} - \tilde{\mu}\, c_\gamma \overline{y_u}^{pr} \right) \left(s_\gamma a_u{}^{pr} - \tilde{\mu}\, c_\gamma y_u{}^{pr} \right) LF_{3,1,0}\left[m_{\tilde{u}}{}^r, m_{\tilde{q}}{}^p \right] + \\
& 9\, {C_{H^2}}^2 \left(s_\gamma \overline{a_u}^{pr} - \tilde{\mu}\, c_\gamma \overline{y_u}^{pr} \right) \left(s_\gamma a_u{}^{pr} - \tilde{\mu}\, c_\gamma y_u{}^{pr} \right) LF_{4,1,-1}\left[m_{\tilde{u}}{}^r, m_{\tilde{q}}{}^p \right] - \\
& 6\, {C_{H^2}}^2 \left(s_\gamma \overline{a_u}^{pr} - \tilde{\mu}\, c_\gamma \overline{y_u}^{pr} \right) \left(s_\gamma a_u{}^{pr} - \tilde{\mu}\, c_\gamma y_u{}^{pr} \right) LF_{5,1,-2}\left[m_{\tilde{u}}{}^r, m_{\tilde{q}}{}^p \right] + \\
& \frac{3}{2} C_{H^2}\, {g_1}^2\, LF_{2,1,-1}[\tilde{\mu}, m_1] + 2\, m_1\, s_\gamma\, C_{H^2}\, \tilde{\mu}\, c_\gamma\, {g_1}^2\, LF_{2,1,0}[\tilde{\mu}, m_1] - C_{H^2}\, {g_1}^2\, LF_{3,1,-2}[\tilde{\mu}, m_1] + \\
& 2\, C_{H^2}\, {g_1}^2 \left(C_{H^2} - m_1\, s_\gamma\, \tilde{\mu}\, c_\gamma \right) LF_{3,1,-1}[\tilde{\mu}, m_1] + 2\, m_1\, s_\gamma\, \tilde{\mu}\, c_\gamma\, {g_1}^2\, {C_{H^2}}^2\, LF_{3,1,0}[\tilde{\mu}, m_1] - \\
& 4\, {g_1}^2\, {C_{H^2}}^2\, LF_{4,1,-2}[\tilde{\mu}, m_1] - 6\, m_1\, s_\gamma\, \tilde{\mu}\, c_\gamma\, {g_1}^2\, {C_{H^2}}^2\, LF_{4,1,-1}[\tilde{\mu}, m_1] + \\
& 2\, {g_1}^2\, {C_{H^2}}^2\, LF_{5,1,-3}[\tilde{\mu}, m_1] + 4\, m_1\, s_\gamma\, \tilde{\mu}\, c_\gamma\, {g_1}^2\, {C_{H^2}}^2\, LF_{5,1,-2}[\tilde{\mu}, m_1] + \\
& \frac{9}{2} C_{H^2}\, {g_2}^2\, LF_{2,1,-1}[\tilde{\mu}, m_2] + 6\, m_2\, s_\gamma\, C_{H^2}\, \tilde{\mu}\, c_\gamma\, {g_2}^2\, LF_{2,1,0}[\tilde{\mu}, m_2] - 3\, C_{H^2}\, {g_2}^2\, LF_{3,1,-2}[\tilde{\mu}, m_2] + \\
& 6\, C_{H^2}\, {g_2}^2 \left(C_{H^2} - m_2\, s_\gamma\, \tilde{\mu}\, c_\gamma \right) LF_{3,1,-1}[\tilde{\mu}, m_2] + 6\, m_2\, s_\gamma\, \tilde{\mu}\, c_\gamma\, {g_2}^2\, {C_{H^2}}^2\, LF_{3,1,0}[\tilde{\mu}, m_2] - \\
& 12\, {g_2}^2\, {C_{H^2}}^2\, LF_{4,1,-2}[\tilde{\mu}, m_2] - 18\, m_2\, s_\gamma\, \tilde{\mu}\, c_\gamma\, {g_2}^2\, {C_{H^2}}^2\, LF_{4,1,-1}[\tilde{\mu}, m_2] + \\
& \left. 6\, {g_2}^2\, {C_{H^2}}^2\, LF_{5,1,-3}[\tilde{\mu}, m_2] + 12\, m_2\, s_\gamma\, \tilde{\mu}\, c_\gamma\, {g_2}^2\, {C_{H^2}}^2\, LF_{5,1,-2}[\tilde{\mu}, m_2] \right)
\end{aligned}
$$