$$\Gamma(h\to\phi\phi) = \frac{1}{2!}\frac{|\mathcal{M}|^2 P_0}{8\pi m_h^2}$$

$$P_0 = \frac{1}{2}\sqrt{m_h^2 - 4m_\phi^2} = \frac{m_h}{2}\sqrt{1-\frac{4m_\phi^2}{m_h^2}}$$

$$\Rightarrow \Gamma(h\to\phi\phi) = \frac{1}{2!}\frac{|\mathcal{M}|^2}{8\pi m_h^2 2}\left(m_h^2 - 4m_\phi^2\right)^{1/2}$$

$$\mathcal{L}\to\lambda_{hs}\Phi^2|H|^2 \Rightarrow \lambda_{hs}\Phi^2\frac{1}{2}(v+h)^2$$

$$\Rightarrow |\mathcal{M}|^2 = (\lambda_{hs}v)^2$$

$$\Rightarrow \Gamma(h\to\phi\phi) = \frac{1}{4}\frac{\lambda_{hs}^2 V^2}{8\pi m_h}\sqrt{1-\frac{4m_\phi^2}{m_h^2}}$$

$$\mathrm{Definimos}: f(m_h, m_\phi, v) = \frac{1}{4}\frac{V^2}{8\pi m_h}\sqrt{1-\frac{4m_\phi^2}{m_h^2}}$$

$$\mathrm{Entonces}, \mathrm{BR}(h\to\phi\phi) = \frac{f\lambda_{h\phi}^2}{f\lambda_{h\phi}^2 + \Gamma_{\mathrm{SM}}} \Rightarrow \lambda^2 = \frac{\Gamma_{\mathrm{SM}}\mathrm{BR}}{f(1-\mathrm{BR})}$$

$$\Rightarrow \lambda^2 = \frac{\Gamma_{\mathrm{SM}}\mathrm{BR}(4)(8\pi m_h)}{(1-\mathrm{BR})V^2} \times \frac{1}{\left(1-\frac{4m_\phi^2}{m_h^2}\right)^{1/2}}$$

$$\Rightarrow \lambda = \left(\frac{\Gamma_{\mathrm{SM}}\mathrm{BR}(4)8\pi m_h}{(1-\mathrm{BR})V^2}\right)^{1/2}\frac{1}{\left(1-\frac{4m_\phi^2}{m_h^2}\right)^{1/4}}$$

$$\Rightarrow \lambda = 2\left(\frac{\Gamma_{\mathrm{SM}}\mathrm{BR}8\pi m_h}{(1-\mathrm{BR})V^2}\right)^{1/2}\frac{1}{\left(1-\frac{4m_\phi^2}{m_h^2}\right)^{1/4}}$$