Sine-Gordon Model

Small Density Fluc ations

A convenient variable is $\varphi = \phi_2 - \phi$

Integrate out fluctuations in numb $Z_{\text{eff}} \propto \int d\phi e^{i\mathcal{L}_{\text{eff}}}$

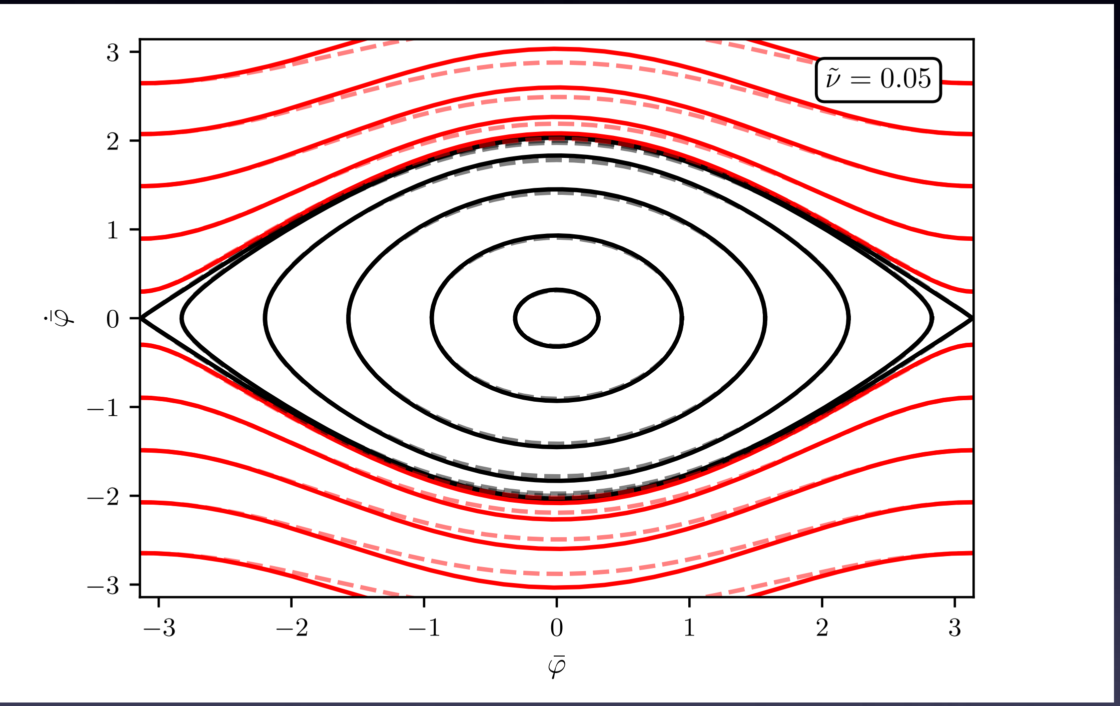
Relative phas by sine-Gordon model

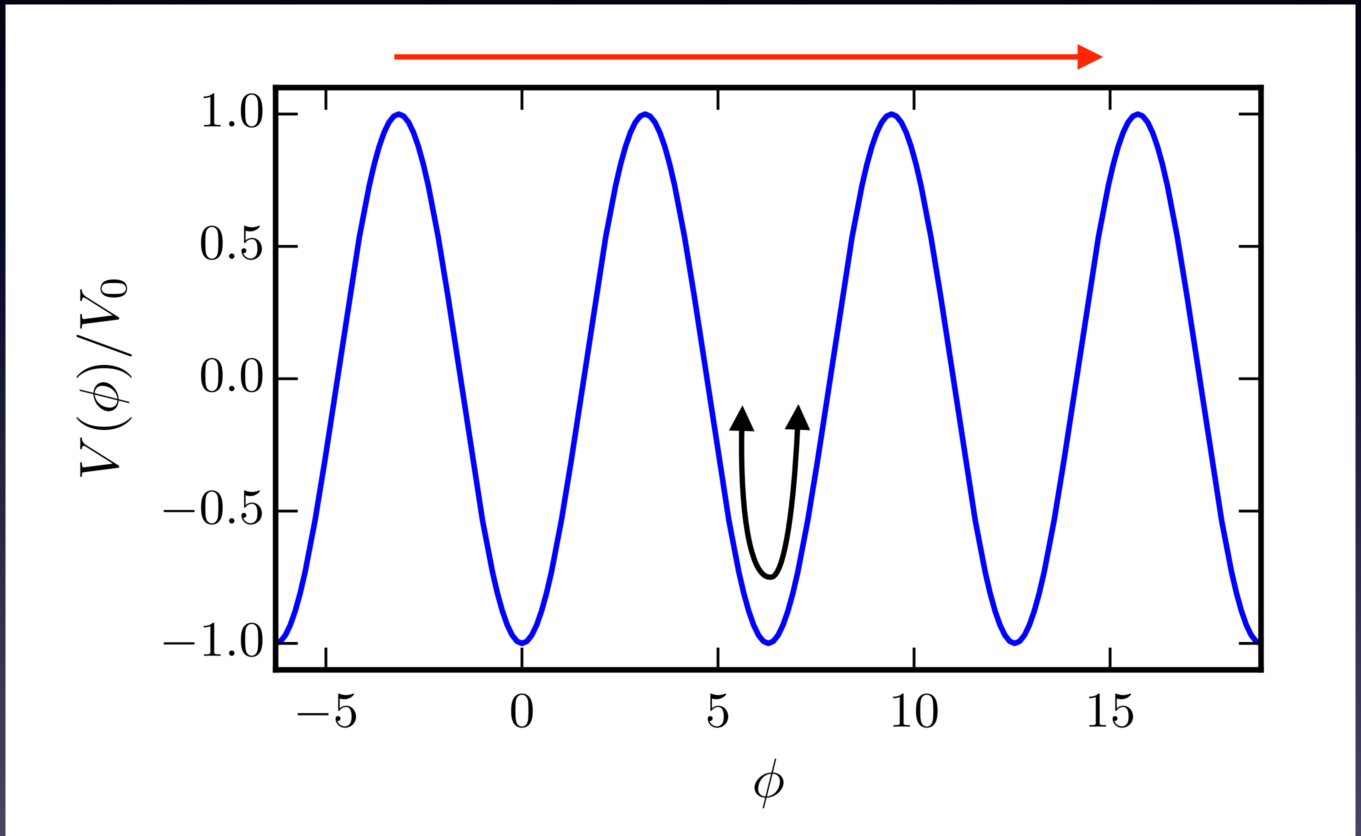
$$\mathscr{L}_{\text{eff}} \quad \frac{\;\; \varphi)^2}{2} + \nu \Lambda \cos \varphi + \ldots$$

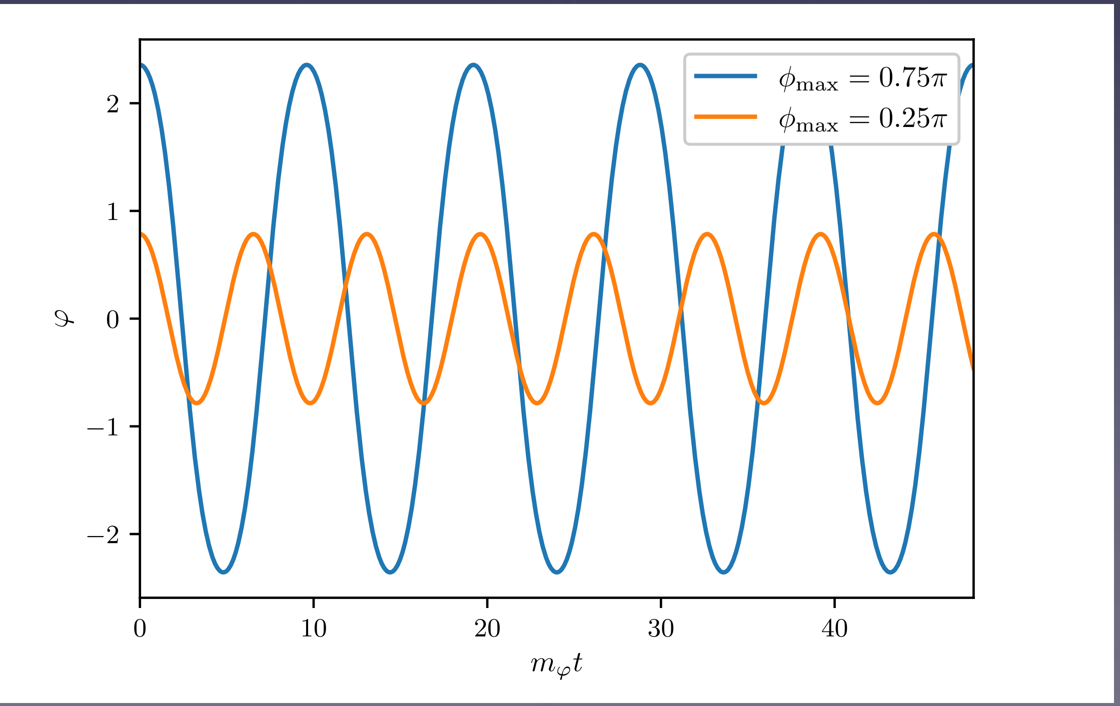
$$c_s^2 \approx \frac{g}{m} \qquad m_\varphi \approx \sqrt{\tilde{\nu}} \frac{2g\bar{n}}{\hbar} \qquad L_\varphi = \frac{c_s}{m_\varphi} \sim \frac{L_{\text{heal}}}{\sqrt{\tilde{\nu}}}$$

Sine-Gordon Model

Homogeneous Background Evolution







Two periodic motion types
Black - single minimum
Red - scan minima