Rotating wave approximation:

$$\varepsilon(t) = \Omega(t) \cdot \cos(\omega_d t) \qquad \omega_d = 4.5\ \text{GHz}$$

$$\cos(\omega_d t) = \frac{1}{2}\left(e^{i\omega_d t} + e^{-i\omega_d t}\right)$$

$$\tilde{\omega}_{12} = \omega_{12} - \omega_d$$

$$\begin{aligned}\hat{H} = {} & \tilde{\omega}_1 \hat{n}_1 - \frac{\alpha_1}{2}\left(\hat{n}_1 - \hat{n}_1^2\right) \\ & + \tilde{\omega}_2 \hat{n}_2 - \frac{\alpha_2}{2}\left(\hat{n}_2 - \hat{n}_2^2\right) \\ & + J\left(\hat{b}_1^+ \hat{b}_2 + \hat{b}_1 \hat{b}_2^+\right) \\ & + \frac{\Omega_{re}(t)}{2}\left[\hat{b}_1 + b_1^+ + \lambda \hat{b}_2 + \lambda b_2^+\right] \\ & + i\frac{\Omega_{im}(t)}{2}\left[b_1^+ - \hat{b}_1 + \lambda b_2^+ - \lambda b_2\right]\end{aligned}$$

2 controls!