The interation Hamiltonian is

$$\frac{\Omega\left(t\right)\,\left(\alpha^{\dagger}\otimes\sigma_{-}+\alpha\otimes\sigma_{+}\right)}{2}$$

The total Hamiltonian is

$$\omega_{c}\,\alpha^{\dagger}\cdot\alpha+\frac{\Omega\left(t\right)\,\left(\alpha^{\dagger}\otimes\sigma_{-}+\alpha\otimes\sigma_{+}\right)}{2}+\frac{\omega_{a}\,\sigma_{z}}{2}$$

Parameters:

$$\begin{aligned}\Omega_{0}&=1\text{ meV}\\t_{0}&=0\\\omega_{a}&=0.25\text{ Hz}\\\omega_{c}&=0.25\text{ Hz}\\t_{fin}&=1\\g&=1\\t_{p}&=0.5\end{aligned}$$

System equations:

$$\frac{d}{d\,t}\,\rho_{1,1}=-i\,\left(\frac{\rho_{4,1}\,\Omega\left(t\right)}{2}-\frac{\rho_{1,4}\,\Omega\left(t\right)}{2}\right)+2\,\rho_{3,3}\,g-\frac{3\,\rho_{1,1}\,g}{2}$$