Non-secular Lindblad Equation

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Introduction

Application to Floquet Topological system

Application to the Mollow triplet

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System operator $A(t)$, environment operator $B(t)$
coupling is $A(t) \cdot B(t)$
Environment is characterized by its correlation

$$\Gamma(\omega) = \int \langle B(t)B(0) \rangle_E e^{i\omega t} \, dt$$

System has eigenfrequencies $\nu_j$

$$A(t) = \sum_{j=-J,\ldots,J} A_j e^{-i\nu_j t}$$

To 2nd order in the coupling, the reduced density matrix satisfies

$$\frac{d \rho_S}{dt} = \sum_{j,k} \Gamma(\nu_j) e^{i(\nu_k - \nu_j)t} \left[ A_j \rho_S A_k^\dagger - A_k^\dagger A_j \rho_S \right] + h.c.$$  

The secular case, keeping only $k=j$ is the Lindblad equation, justified only if all $|\nu_k - \nu_j| \gg \Gamma$. 
Floquet Topological state

S. Vajna, B. Dora, G. Zarand, BH  

arXiv:1603.05348
Secular approximation

Non-secular case a sharp crossover.
Mollow triplet

A. Ulhaq et al., Nature Photonics (2012)

Bloch equations:
(1) Lab frame $\Omega \ll \Gamma$
(2) Relaxation in rotating frame $\Omega \gg \Gamma$
Crossover needs non-secular system.