Ronnie Kosloff

Shortcuts to thermalization using the

time-dependent non-adiabatic Master equation.

For driven quantum system with a time dependent Hamiltonian we are able solve the dynamics for a wide range of time dependent protocols. These solutions share the stability obtained by protocols obeying the adiabatic theorem but are not limited to slow driving. The inertial theorem is an enabler in the study of quantum dynamics of driven systems. This allows studies of dynamical processes that go beyond the adiabatic assumption. We use this procedure to derive a Non Adiabatic Master Equation (NAME) solving the problem of the correct Master equation for a driven system. We present a procedure to accelerate the relaxation rate of an open quantum system towards its equilibrium state. The control protocol, termed Shortcut to Equilibration, is obtained by reverse engineering the non-adiabatic master equation. This is a non-unitary control task aimed at rapidly changing the entropy of the system. Such a protocol serves as a shortcut to an abrupt change in the Hamiltonian, followed by exponential decay. As an example, we study the thermalization of a

particle in an harmonic well, demonstrating that for short times there is a four orders of magnitude improvement in accuracy.