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Adiabatic ground-state preparation in the Dicke model[1]
MICHAEL TOMKA, University of Southern California — The Dicke model is an important model in quantum optics. It describes the interaction of N two-level atoms with a single-mode radiation field through the dipole coupling. In the thermodynamic limit, when the number of two-level atoms goes to infinity, the model exhibits a transition to a superradiant phase at a critical coupling strength. We study the geometrical properties of the Dicke model's ground-state manifold. On the one hand, for a small number of two-level atoms we exploit the Riemannian quantum metric structure of the ground-state manifold to construct optimal protocols for the task of adiabatic ground-state preparation in a fixed amount of time, on the other hand, for the limit of a large number of atoms we use a time-dependent mean-field theory to describe the dynamics of the system and hence use a classical analogue of the metric to define geodesics for the adiabatic ground-state preparation.

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