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The Dicke Hamiltonian revisited

Abstract: The Dicke Hamiltonian is a paradigmatic model in quantum optics. Originally, it describes a system of N two-level atoms interacting with a single monochromatic electromagnetic radiation mode within a cavity. However, its algebraic simplicity makes it suitable to describe a general collective system of qubits interacting with a bosonic field within the quantum information framework. The model is well-known for its critical behavior i. e., the superradiant phase transition, both thermal and quantum, as well as its relation with chaos and entanglement. We revisit the model and its solutions. Then, we discuss the spectrum of the Hamiltonian to show its interesting properties.