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Mod-01 Lec-41 The Jaynes-Cummings model

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Quantum Optics 8: Jaynes-Cummings model, quantum Rabi oscillations, collapses and revivals.

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It was further found that the analytic solution for the quantum Rabi model can be given in terms of confluent Heun functions [4243, ], with the well-known Judd isolated exact solutions [44] appearing naturally as truncations of the infinite series defining the confluent Heun

## The quantum Rabi model: solution and dynamics

It was further found that the analytic solution for the quantum Rabi model can be given in terms of confluent Heun functions [42, 43], with the well-known Judd isolated exact solutions appearing naturally as truncations of the infinite series defining the confluent Heun functions. Braak's analytic solution of the quantum Rabi model heralded an ongoing

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wave of solutions for the full eigenspectrum of various known generalisations of the quantum Rabi model.

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2. Eigenvalue problem and analytic solutions The quantum Rabi model is described by the hamiltonian  $(\hbar = 1) H_R = \omega z + g(a^\dagger + a) \sigma_x$ , (1) where  $a$  and  $a^\dagger$  are the destruction and creation operators for a single bosonic mode of frequency  $\omega$ ,  $\sigma_x$  and  $\sigma_z$  are Pauli matrices for a two-level system with level splitting  $2g$ ,

## **The quantum Rabi model: solution and dynamics**

The analytic solutions for various generalisations of the quantum Rabi model are also discussed. Results are also reviewed on the level statistics and the dynamics of the quantum Rabi model. The article concludes with an introductory overview of several experimental realisations of the quantum Rabi model.

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The analytic solutions for various generalisations of the quantum Rabi model are also discussed. Results are also reviewed on the level statistics and the dynamics of the quantum Rabi model. The article concludes with an introductory overview of several experimental realisations of the quantum Rabi model.

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The quantum Rabi model: solution and dynamics. This article presents a review of recent developments on various aspects

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of the quantum Rabi model. Particular emphasis is given on the exact analytic solution obtained in terms of confluent Heun functions. The analytic solutions for various generalisations of the quantum Rabi model are also discussed.

## [1609.00434] The quantum Rabi model: solution and dynamics

According to the criterion proposed by Braak, the quantum Rabi model is quantum integrable because the eigenstates can be uniquely identified by using two quantum numbers ( $p$  and  $n$ ), equal to the...

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A generalization of the quantum Rabi model: exact solution and spectral structure 5 by an effective Hamiltonian  $H = H_{\text{Rabi}} + \lambda \sigma_x$  (3) =  $\lambda \sigma_x + g \sigma_x (a + a^\dagger) + \omega a^\dagger a$ ; (4) where an additional term,  $\lambda \sigma_x$ , appears compared to the original quantum Rabi Hamiltonian  $H_{\text{Rabi}}$ .

## A generalization of the quantum Rabi model: exact solution ...

As before, the Rabi problem is solved by assuming the electric field  $E$  is oscillatory with constant magnitude  $E_0 = E_0 \cos(\omega t)$ . In this case, the solution can be found by applying two successive rotations to the matrix equation above, of the form

## Rabi problem - Wikipedia

The Jaynes–Cummings model is a theoretical model in quantum optics. It describes the system of a two-level atom interacting with a quantized mode of an optical cavity, with or

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without the presence of light. It was originally developed to study the interaction of atoms with the quantized electromagnetic field in order to investigate the phenomena of spontaneous emission and absorption of photons in a cavity. The Jaynes–Cummings model is of great interest to atomic physics, quantum optics ...

## Jaynes–Cummings model - Wikipedia

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## The quantum Rabi model: solution and dynamics - CORE

The fourteen lowest levels in the spectrum of the quantum Rabi model ( $\gamma = 0$ ) for  $g \in [0, 1.6]$  ( $\gamma = 0.4$ ). Red (blue) levels correspond to the positive (negative) parity sector. The plot is composed...

## A generalization of the quantum Rabi model: Exact solution ...

Abstract and Figures The quantum Rabi model is the simplest and most important theoretical description of light–matter interaction for all experimentally accessible coupling regimes. It can be...

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Simulation of the coherent excitation of molecules by laser radiation is carried out. It is based on simple models, i.e., quantum systems with  $N + 1$  energy level. The exact solution of differential equations describing the process in terms of the simplest semi-classical Rabi model is obtained without integration of differential equations but using discrete mathematics with Fourier transform ...

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## **Fourier Spectra of Quantum Systems E?cited by Laser ...**

The quantum Rabi model (QRM), which represents the simplest interaction between a two-level atom (qubit) and a light field (cavity), continues to inspire exciting developments in many fields ranging from quantum optics, quantum information science, and condensed matter physics [ 1 ]. The Hamiltonian is given by

## **Quantum Rabi–Stark model: solutions and exotic energy**

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to the quantum Rabi model, the so-called rotating wave approximation (RWA), leading to a model which can be solved exactly by elementary means and which now bears the name quantum Jaynes–Cummings model. The quantum Rabi model, on the other hand, although still describing the interaction between

## **Journal of Physics A: Mathematical and Theoretical PAPER ...**

Citation Xie, Q, Zhong, H, Batchelor, M et al 2017, 'The quantum Rabi model: Solution and dynamics', Journal of Physics A: Mathematical and Theoretical, vol. 50, no ...

## **The quantum Rabi model: Sol... - Researchers - ANU**

Braak's analytical solutions for the quantum Rabi model are obtained in the Bargmann space of analytical functions, where the system is described by two coupled first-order ordinary differential equations [ 40 – 45 ]. Braak showed that the parity symmetry plays a key role in the integrability of the Rabi model.

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