

Quantum Algorithms as a Multiphoton Raman Excitation of a Quasicontinuum Edge

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Short Biography

Dr Aikaterini Mandilara is a quantum physicist working on problems related to quantum information, and quantum computing for the last twenty years. She earned her PhD in the USA in 2005, and her undergraduate studies were within the Physics Department of the University of Athens. She held research positions in Bruxelles, dissecting the concept of positivity in Wigner functions and in Paris laboring in various aspects of entanglement in atomic physics. For the period 2014-2021, she held an Assistant Professorship position in the Physics department of Nazarbayev University where she developed her own group and research directions. Her current research in the group of Prof Syvridis, is focused on quantum key distribution.

Abstract

A first indication of the underlying relation between level-band problems and quantum computing was given with the introduction of the adiabatic quantum computation model in 2001. In this model the solution to a classical problem is mapped into the ground state of the spectrum of a many-body Hamiltonian and the role of the quantum algorithm is to prescribe the adiabatic procedure for reaching the latter. Soon it became evident that for the most interesting combinatorial problems the required, for the success of the adiabatic procedure, gap between the ground state and the rest of the spectrum, is not guaranteed. Recently a new class of algorithmic procedures appeared, the QAOA class, with the aim to offer approximate solutions to such optimization problems and which work even in the absence of a gap. These approximate methods having also the advantage of requiring less physical resources, have attracted the interest of the community during the last years. In short, the generic prescription for reaching the edge of the spectrum is to adjust the application times of fixed control signals in accordance with classically processed feedback from the quantum system. In this talk, after an extensive introduction to quantum computational models and algorithms, I will present an approximate algorithmic procedure for populating the edge of the spectrum of an ensemble of Rydberg atoms. This procedure exploits previous and new theoretical knowledge on dynamics of level-band systems and experimental spectroscopic methods.