The rich physics of quantum gases in time-modulated optical lattices

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Time: 4pm
Venue: Remote via Zoom
Host: Associate Professor David Wilkowski

Abstract

In this talk, I propose to focus on two different topics that we have recently investigated with our BEC experiment using phase or/and amplitude modulation of a 1D optical lattices:

1) In the low frequency regime, we have studied the kinetics of the quantum transition to staggered states for phase-modulated lattice. Our data once combined with numerics enables us to identify the regime under which quantum fluctuations act as the triggering mechanism for the phase transition [1].

2) In the second part, I will focus on a relatively strong and quasi-resonant amplitude modulation of the lattice to observe a quantum chaos transport mechanism called chaos-assisted tunneling. Under such a modulation, the classical phase space exhibits stable islands surrounded by a large chaotic sea. The chain of islands mimics an effective superlattice, with new controllable tunneling properties. The coupling between islands is indeed mediated by delocalized Floquet states that spread over the chaotic sea. As a result, the transport between the islands exhibit sharp resonances where the tunneling rate varies by orders of magnitude over a short range of parameters. We experimentally demonstrate and characterize these resonances for the first time in a quantum system. This opens the way to new kinds of quantum simulations with long-range transport [2].


Short Biography

David Guéry-Odelin is full professor at University Paul-Sabatier (Toulouse, France) since 2007. He got his PhD thesis in 1998 under the supervision of Jean Dalibard (LKB, ENS Paris), before doing post-doctoral studies in the group of prof. Sandro Stringari (Trento, Italy). He joined CNRS in 2007. David Guéry-Odelin has done remarkable work on quantum gas and pioneer work on shortcut to adiabaticity. For 2012 to 2016, he was the director of the physics centre at les Houches school. He was wrote with Claude Cohen-Tannoudji Advances in Atomic Physics: An Overview

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Registration

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