北京大学量子材料科学中心

International Center for Quantum Materials, PKU

ICQM Special Seminar

Transport without charge: quantized conductance in neutral matter

Prof. Tilman Esslinger

ETH Zurich

Time: 4: 00 pm, June. 12, 2019 (Wednesday)

时间：2019年6月12日 （周三）下午4:00

Venue: Room W563, Physics building, Peking University

地点：北京大学物理楼，西563会议室

Abstract

We study fundamental concepts of particle and heat transport in a model system using ultracold atoms. It consists of a narrow channel connecting two macroscopic reservoirs of fermionic lithium atoms. For non-interacting atoms, we observe quantized conductance and the system finds an ideal description in the Landauer-Büttiker formalism, which views conduction as the transport of carriers from one terminal to another. For increasing attractive interactions, the particle conductance is unexpectedly enhanced even before the gas is expected to turn into a superfluid, showing plateau-like features at non-universal values. Inspired by the fountain effect in superfluid helium, we studied heat and particle transport in a unitary Fermi gas. After heating one of the reservoirs, we observed a particle current flowing from cold to hot and found the system, after an initial response, in a non-equilibrium steady state with finite temperature and chemical potential differences across the channel.

About the speaker

Professor Tilman Esslinger is a renowned experimentalist in ultracold atoms, leads the quantum optics group at ETH Zurich, and served the Chair of Department of Physics. One of the most famous achievements in his group is the experimental realization in 2014 of the topological Haldane model on honeycomb lattice, as proposed by Duncan Haldane (2016 Nobel laureate). Besides, his group has led the first experimental realization of a Fermi-Hubbard model and the Mott insulator using a fermionic quantum gas trapped in an optical lattice, measurement of the critical exponent of the correlation length in a Bose gas, first realization of a one-dimensional atomic quantum gas, cavity QED and cavity opto-mechanics with Bose- Einstein condensates, and observation of the Dicke quantum phase transition, et.