北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Fluctuation theorem in quantum conductors

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Time: 4:00pm, May. 28, 2014 (Wednesday)
时间: 2014年5月28日 （周三） 下午4:00
Venue: Room 607, Science Building 5
地点: 理科五号楼607会议室

Abstract

Recently the exchange fluctuation theorem for the electric current has been demonstrated experimentally in the milli-Kelvin regime by using semiconductor nano-devices, single-electron transistors [1] and an Aharonov-Bohm interferometer [2]. At low temperatures, it turned out that the environmental effect and/or the measurement back action effect cannot be neglected. In the first part of my talk, I will review experiments on the fluctuation theorem of the single-electron transport through a double quantum dot [1]. Then I will discuss the back action effect from the quantum-point contact electrometer [3] and the finite bandwidth effects of the detector [4]. They both effectively enhance the temperature. In the second part, I will explain an experimental demonstration of the quantum fluctuation theorem using the Aharonov-Bohm interferometer [2]. The experiment relay on the magnetic field induced asymmetry out of equilibrium. I will review its theoretical analysis [5] and then I will point out that a quantitative disagreement between the theory and the experiment still remains.

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[4] YU, D. S. Golubev, M. Marthaler, T. Fujisawa, Gerd Schon in "Perspective of Mesoscopic Physics", edited by A. Aharony and O. Entin-Wohlman, (World Scientific, Singapore, 2010) pp. 397-414.
[5] K. Saito, and Y. Utsumi, Phys. Rev. B 78, 115429 (2008); Y. Utsumi, and K. Saito, Phys. Rev. B 79, 235311 (2009).

About the Speaker

2001 Graduate School of Information Sciences, Tohoku University, PhD supervised by H. Ebisawa
2002 Postdoc, Max-Planck-Institut fuer Mikrostrukturphysik, Halle, Patrick Bruno Group
2004 Postdoc, Universitaet Karlsruhe, Gerd Schoen Group
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