CEA - Saclay 91191 Gif-sur-yvette Cedex
Service de Physique de l'Etat Condensé
SÉMINAIRE

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Mercredi 11/03/2015, 11h15-12h00

Orme des Merisiers SPEC Salle Itzykson, Bât.774

Quantum Critical Behavior in a Resonant Level Coupled to a Dissipative Environment

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A key property of quantum phase transitions (QPTs) is the possibility to create exotic quantum states at the quantum critical point; these exotic zero temperature states then cause anomalous physical properties at finite temperature. Despite the ubiquity of QPTs in contemporary theoretical physics, obtaining clear experimental signatures has been challenging. I start by presenting a recent experiment in which it was possible to thoroughly characterize a QPT: the system is a fully-tunable single-molecule transistor built from a spin-polarized carbon nanotube quantum dot connected to strongly dissipative contacts [1]. In this system, nonequilibrium properties of the QPT are also probed by applying a large bias. I then turn to the theoretical understanding of this QPT obtained by mapping the problem onto that of a resonant Majorana fermion level in a Luttinger liquid. The unitary conductance obtained in the experiment is seen as a competition between the two leads, much as in the two-channel Kondo problem. The deviations from unitarity at nonzero temperature are connected to residual interactions among the Majoranas; in this way, the experiment observes a signature of Majorana critical behavior.

[1] H.T. Mebrahtu, I.V. Borzenets, D.E. Liu, H. Zheng, Y.V. Bomze, A.I. Smirnov, H.U. Baranger, G. Finkelstein, Nature 488, 61 (2012).
