



清华大学高等研究院

Institute for Advanced Study, Tsinghua University

学术报告

Title: Experimental observation of the Coherent Forward Scattering using the atomic kicked rotor

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Abstract

The atomic kicked rotor is a paradigm for studying quantum chaos and Anderson localization phenomena in atomic systems. Carefully engineering the kicked rotor Hamiltonian [1] allowed us to experimentally investigate the coherent nature of the interference paths which represent the building blocks of the localization. In particular, we observed the “enhanced return to the origin” phenomenon, a manifestation of weak localisation closely related to the “coherent back scattering”.

Moreover, more subtle interference mechanisms lead to the so-called “coherent forward scattering” which has been theoretically predicted recently [2]. Under certain conditions, this can represent a genuine signature of Anderson (strong) localisation. We will present the first experimental evidence of the observation of “coherent forward scattering” and discuss two key distinctive features: the characteristic timescale and robustness with respect to time-reversal-symmetry breaking.

[1] C. Tian, A. Kamenev, and A. Larkin, Phys. Rev. B 72, 045108 (2005).

[2] T. Karpiuk, N. Cherroret, K. Lee, B. Gremaud, C. A. Muller, and C. Miniatura, Phys. Rev. Lett. 109, 190601 (2012).