Kinetic and diffusive scaling limits of random Schrödinger evolution

L. Erdös
Mathematical Institut
University of Munich
Theresienstrasse 39
D-80333 München, Germany

Abstract

We investigate the long time evolution of a single quantum particle in a weak random environment with a coupling constant $\lambda \ll 1$. This Hamiltonian dynamics is shown to converge to irreversible kinetic equations in appropriate scaling limits. On the kinetic time scale, $t \sim \lambda^{-2}$, the limiting dynamics is given by the Boltzmann equation for the phase space density of the electronic wave function. On a longer time scale, $t \gg \lambda^{-2}$, the configuration space density evolves according to the heat equation. In the first talk I will present the available results and open questions about this model. In the second talk I will explain some key details of our recent joint work with M. Salmhofer and H. T. Yau. This is the first result, that rigorously derives a diffusive equation from a realistic Hamiltonian quantum dynamics.