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Localization (and resonant delocalization?) for a disordered polaron

Jeffrey Schenker *

jeffrey@math.msu.edu

Polaron models describe the motion of a tracer particle interacting with a quantum field. The Holstein Hamiltonian describes a tight binding particle interacting with a field of harmonic oscillators. We will consider the Holstein Hamiltonian with the addition of on-site disorder in the tracer particle potential. Provided the hopping amplitude for the particle is small, we are able to prove localization for matrix elements of the resolvent, in particle position and in the field Fock space. These bounds imply a form of dynamical localization for the particle position that leaves open the possibility of resonant tunneling in Fock space between equivalent field configurations. Some related deformations of the Anderson model in which we can prove the existence of resonant tunneling will be presented, but the exact nature of the dynamics for the disordered Holstein model remains open.

Joint work with Rajinder Mavi.

*Department of Mathematics, Michigan State University, Wells Hall, East Lansing, MI 48823-1027, USA