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Localization in disordered polaron models

Polaron models describe the motion of a tracer particle interacting with a quantum field. Various tight-binding polaron models with on-site disorder in tracer the particle potential will be discussed. These models provide a framework in which it is possible to realize some ideas related to many-body localization, in particular Fock-space localization bounds. 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 open problems regarding the character of high energy eigenstates will be discussed. (Joint work with Rajinder Mavi.)