The Fermi polaron: functional RG with full frequency and momentum dependence

Abstract:
A single, non-relativistic down-spin fermion subject to a strong zero-range interaction with a Fermi sea of up-spin fermions forms a polaronic quasiparticle. For this mobile impurity, there is a transition toward a molecular ground state beyond a critical interaction strength. To investigate this transition we have implemented a functional RG to compute the full frequency and momentum dependence of euclidean fermionic and bosonic propagators. We examine the dependence of the polaronic and molecular ground state energies on the coupling strength. Via analytical continuation we are also able to determine the energy of the excited states and discuss their possible decay to the ground state.