PHYSIK

THEORETISCH PHYSIKALISCHES KOLLOQUIUM

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Anderson localization of two interacting particles in three-dimensional random potentials

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The diffusion of a wave-packet in a disordered medium can be completely suppressed due to interference effects between the multiple scattering paths. This single-particle effect, called Anderson localization, applies to all sort of wave-like systems, from light in disordered photonic lattices to cold atoms in laser speckle potentials. While in one and in two dimensions all states of a quantum particle are localized by the disorder, in three dimensions there exists a critical value of the energy, where the system undergoes a metal-insulator transition.
In this talk I will discuss the generalization of Anderson localization to systems of two interacting particles – either bosons or fermions with different spin states – moving in a 3D disordered lattice, as described by the disordered Hubbard model. Based on an exact mapping to an effective single-particle model for the center of mass motion, we have computed the precise phase boundary between localized and extended states of the pair.
We show that, for zero total energy of the pair, the transition occurs in a regime where all single-particle states are localized. In particular the critical disorder strength exhibits a non-monotonic behavior as a function of the Hubbard strength |U|, increasing sharply for weak interactions.

Reference : F. Stellin and G. Orso, *Mobility edge of two interacting particles in three-dimensional random potentials*, arXiv:1903.06214.

Gäste sind herzlich willkommen.

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