Physikalisches Institut
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Albert-Ludwigs-Universität Freiburg

QE

Quantum Efficiency Seminar und Colloquium

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Dynamical and Anderson Localization: Influence of Noise

When dealing with waves or particles in a sufficiently disordered energetic landscape, there appears the effect of spatial localization, first described by Philip W. Anderson. That means, at a certain time scale, the wave stops diffusing in the medium. This effect has recently been observed experimentally, on cold atoms and Bose-Einstein condensates in optical lattices.

In the energy domain, there is a counterpart to this behaviour, called Dynamical Localization. It is observed in driven quantum systems, when the driving or kicking should classically lead to a diffusive, linear gain of energy, though is actually limited by destructive quantum interference. However in both Dynamical and Anderson Localization, noise can destroy the localization and restore diffusive behaviour. For illustration, I will discuss the quantum kicked rotor, whose behaviour without noise is characterized by suppressed diffusion and exponential momentum distributions. With noise, though, it regains chaotic classical dynamics, as described by the Chirikov-Standard map.

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