Localization Phenomena in the Quantum Kicked Rotor

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The quantum kicked rotor (QKR) is a paradigm of driven chaotic dynamics. In spite of its nominal simplicity, this system displays a wealth of quantum interference phenomena, including strong Anderson localization. Recent advances in experimentation have made it possible to observe QKR quantum interference in the context of atom optics. In this talk, I will discuss an analytic theory of quantum interference and Anderson localization in the QKR. It will be shown that the system can be effectively mapped onto the theory of a disordered metallic ring subject to an Aharonov-Bohm flux (the persistent current problem). Building on this correspondence, quantitative and non-perturbative results for the system's localization properties can be obtained. We will also discuss analogies as well as a number of striking differences to the physics of disordered metals.