

Quantum to classical transition in a superdiffusive photonic Quantum Walk

Paolo Mataloni
Physics Department, Sapienza University of Rome

Abstract

Superdiffusion dynamics, intermediate between the standard diffusive regime and the so-called ballistic one, is present in several disordered systems. Discrete quantum walks, whose dynamics can be related to energy transport phenomena, is a unique platform to study the entire set of diffusive and superdiffusive processes by suitably introducing disorder inside the optical lattice, with a resolution which is high enough to clearly distinguish between different disorder regimes. By this approach it has been possible to investigate the region between the diffusive regime, typical of a classical stochastic process, and the so called ballistic behaviour, which is generally expected for the spreading in a quantum process.