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Titolo	Levy statistics and laser cooling : how rare events bring atoms to rest / / Francois Bardou [and others] [[electronic resource]]
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Nota di bibliografia	Includes bibliographical references (p. 181-187) and indexes.
Nota di contenuto	Laser cooling -- Subrecoil laser cooling -- Subrecoil cooling and Levy statistics -- Subrecoil laser cooling and anomalous random walks -- Standard laser cooling: friction forces and the recoil limit -- Friction forces and cooling -- The recoil limit -- Laser cooling based on inhomogeneous random walks in momentum space -- Physical mechanism -- How to create an inhomogeneous random walk -- Expected cooling properties -- Quantum description of subrecoil laser cooling -- Wave nature of atomic motion -- Difficulties of the standard quantum treatment -- Quantum jump description. The delay function -- Simulation of the atomic momentum stochastic evolution -- Generalization. Stochastic wave functions and random walks in Hilbert space -- From quantum optics to classical random walks -- Fictitious

classical particle associated with the quantum random walk -- Simplified jump rate -- Trapping and recycling. Statistical properties -- Trapping and recycling regions -- Models of inhomogeneous random walks -- Friction -- Trapping region -- Recycling region -- Momentum jumps -- Probability distribution of the trapping times -- One-dimensional quadratic jump rate -- Generalization to higher dimensions -- Generalization to a non-quadratic jump rate -- Probability distribution of the recycling times -- Presentation of the problem: first return time in Brownian motion -- The unconfined model in one dimension -- The Doppler model in one dimension -- The confined model: random walk with walls -- Broad distributions and Levy statistics: a brief overview.

Sommario/riassunto

Laser cooling of atoms provides an ideal case study for the application of Levy statistics in a privileged situation where the statistical model can be derived from first principles. This book demonstrates how the most efficient laser cooling techniques can be simply and quantitatively understood in terms of non-ergodic random processes dominated by a few rare events. Levy statistics are now recognised as the proper tool for analysing many different problems for which standard Gaussian statistics are inadequate. Laser cooling provides a simple example of how Levy statistics can yield analytic predictions that can be compared to other theoretical approaches and experimental results. The authors of this book are world leaders in the fields of laser cooling and light-atom interactions, and are renowned for their clear presentation. This book will therefore hold much interest for graduate students and researchers in the fields of atomic physics, quantum optics, and statistical physics.