Download File Laser Cooling And Trapping Graduate Texts In Contemporary Physics Pdf Free Copy

Laser Cooling and Trapping Laser Cooling and Trapping Laser Cooling and Trapping Laser Cooling and Trapping of Atoms Laser Cooling and Trapping of Neutral Atoms Laser Cooling and Trapping of Rubidium Atoms Laser Cooling and Trapping of Atoms Laser Cooling and Trapping Laser Cooling and Trapping Development and Upgrade of a Laser Cooling and Trapping System of Ultracold Potassium Atoms Cooling and Trapping of Neutral Atoms Applications of Laser Cooling and Trapping Cooling and Trapping of Neutral Atoms Deceleration, Cooling, and Trapping of Atoms Laser Cooling and Trapping of Rubidium Atoms Laser Cooling and Trapping of Rubidium Atoms Techniques in Laser Cooling and Trapping of Atomic Ytterbium Laser Cooling and Trapping of 87Rb Trapping of Neutral Atoms Development of a Laser Cooling and Magneto-optical Trapping Experiment for Rubidium 87 Atoms Laser Cooling and Trapping in Atomic Rubidium Laser Cooling and Trapping of Metastable Helium Atoms Cooling and Trapping of Atoms and Particles Laser Cooling and Trapping of Barium Cooling and trapping of neutral atoms Optical

Nanomanipulation Laser Cooling and Trapping of Metastable Helium Atoms Narrow Line Magneto Optical Cooling and Trapping of Strongly Magnetic Atoms Laser Cooling and Trapping of Rubidium Atoms Field Guide to Laser Cooling Methods Optical Cooling and Trapping Assembly of Apparatus for Laser Cooling and Trapping of 87Rb Atoms Laser Cooling and Trapping of Neutral Cesium Atoms in Electromagnetic Fields Cold Molecules Laser Sources and Applications Laser Cooling and Trapping of Metastable Neon and Applications to Collision Measurement Laser Cooling and Atom Trapping Atomic Physics Laser Cooling and Magnetic Trapping of Neutral Atoms

This book describes atomic physics and the latest advances in this field at a level suitable for fourth year undergraduates. The numerous examples of the modern applications of atomic physics include Bose-Einstein condensation of atoms, matter-wave interferometry and quantum computing with trapped ions. Provides an overview of the basic principles of laser cooling of atoms, ions, nanoparticles, and solids, including Doppler cooling, polarization gradient cooling, different sub-recoil schemes of laser cooling, forced evaporation, laser cooing with anti-Stokes fluorescence, hybrid laser cooling, and Raman and Brillouin cooling. A magneto optical trap (MOT) is capable of trapping a vapor cloud consisting of atoms cooled down to the micro Kelvin range. Three orthogonal pairs of counter-propagating laser beams of the correct circular polarisation form an optical molasses which facilitates the cooling of neutral atoms. Additionally a spatially non-uniform magnetic field produced by two current carrying coils in a Maxwell gradient configuration is used to trap the cooled atoms. In this report the effects of the trap parameters, including the laser beam intensity and frequency detuning, beam diameter and magnetic field gradient, on the number of trapped atoms are discussed. Secondly the development of an experimental setup for laser cooling and trapping of 87Rb atoms in vacuum with the aid of a MOT is presented. All trap components were implemented and characterised. The vacuum system and trapping chamber in which the cooling takes place were designed and constructed. A rubidium getter to act as a source of atoms was integrated into the vacuum system. The two external cavity diode lasers used for trapping and optical re-pumping were characterised. The optical setup required for the optical molasses was designed, constructed and characterised. Saturated absorption spectroscopy was performed to investigate the hyperfine structure of 87Rb and to frequency lock the lasers. We report on the current status of the project with regards to progress, results and future work. Using laser cooling techniques, we have produced a sample of stopped atoms with sufficiently large density and small velocity width to be useful for loading neutral atom traps. (Author). Work in several areas of laser cooling and trapping of atoms were done during the granting period. Work in atom manipulation with Raman pulses of light, atom interferometers, atomic fountain frequency standards, a new technique in subrecoil laser cooling, novel far detuned optical dipole traps, polymer experiments with single molecules of DNA are described. The work includes seven Physical Review Letters, two Science articles and a cover article for Science. This book provides a broad introductory survey of this remarkable field, aiming to establish and clearly differentiate its physical principles, and also to provide a snapshot portrait of many of the most prominent current applications. Primary emphasis is placed on developing an understanding of the fundamental photonic origin behind the mechanism that operates in each type of effect. To this end, the first few chapters introduce and develop core theory, focusing on the physical significance and source of the most salient parameters, and revealing the detailed interplay between the key material and optical properties. Where appropriate, both classical and photonic (quantum mechanical) representations are discussed. The number of equations is purposely kept to a minimum, and only a broad background in optical physics is assumed. With copious examples and illustrations, each of the subsequent chapters then sets out to explain and exhibit the main features and uses of the various distinct types of mechanism that can be involved in optical nanomanipulation, including some of the very latest developments. To complete the scene, we also briefly discuss applications to larger, biological particles. Overall, this book aims to deliver to the non-specialist an amenable introduction to the technically more advanced literature on individual manipulation methods. Full references to the original research papers are given throughout, and an up-to-date bibliography is provided for each chapter, which directs the reader to other selected, more specialised sources. Intended for advanced undergraduates and beginning graduate students who have some basic knowledge of optics and quantum mechanics, this text begins with a review of the relevant results of quantum mechanics before turning to the electromagnetic interactions involved in slowing and trapping atoms and ions, in both magnetic and optical traps. The concluding chapters discuss a broad range of applications, from atomic clocks and studies of collision processes to diffraction and interference of atomic beams at optical lattices and Bose-Einstein condensation. Recent years have witnessed rapid advances in the development of solid state, fiber, semiconductor, and parametric sources of coherent radiation, which are opening up new opportunities for laser applications. Laser Sources and Applications provides a tutorial introduction to the basic principles of these developments at a level suitable for postgraduate research students and others with a basic knowledge of lasers and nonlinear optics. Encompassing both the physics and engineering aspects of the field, the book covers the nature of nonlinear optical interactions; solid state, fiber, and semiconductor lasers; optical parametric oscillators; and ultrashort pulse generation and applications. It also explores applications of current interest, such as electromagnetically induced transparency, atomic trapping, and soliton optical communications. The First Book on Ultracold MoleculesCold molecules offer intriguing properties on which new operational principles can be based (e.g., quantum computing) or that may allow researchers to study a qualitatively new behavior of matter (e.g., Bose-Einstein condensates structured by the electric dipole interaction). This interdisciplinary book discusse This book presents a collection of papers, written during the last 33 years by Claude Cohen-Tannoudji and his collaborators, on various physical effects which can be observed on atoms interacting with electromagnetic fields. It consists of a personal selection of review papers, lectures given at schools, as well as original experimental and theoretical papers. Emphasis is put on physical mechanisms and on general approaches, such as the dressed atom approach, having a wide range of applications. Various topics are discussed, such as light shifts, level crossing resonances, multiphoton processes, resonance fluorescence in intense laser fields, photon correlations, quantum jumps, radiative corrections, laser cooling and trapping.This volume includes short introductions by the author. Each paper presented in the volume is preceded by a short commentary giving its motivations, explaining how it fits with the general evolution of the research field, and pointing out connections existing between works done at different periods. A variety of calculations have been performed connected with laser cooling of atoms, many of them relevant to the experiments at NBS on this subject. Some of these have been tested and found to agree well with these experiments. We have designed, built, and tested various devices for use in these experiments. We have also done various calculations relevant to magnetic traps for cooled atoms. These are particularly well-suited for laser cooled atoms. Intended for advanced undergraduates and beginning graduates with some basic knowledge of optics and quantum mechanics, this text begins with a review of the relevant results of quantum mechanics, before turning to the electromagnetic interactions involved in slowing and trapping atoms and ions, in both magnetic and optical traps. The concluding chapters discuss a broad range of applications, from atomic clocks and studies of collision processes, to diffraction and interference of atomic beams at optical lattices and Bose-Einstein condensation. This thesis describes work to improve the apparatus that cools and loads potassium atoms onto the atom chip. This work consists of two main thrusts: a laser trap translator to help cool and load atoms onto the atom chip and a temperature stabilization system for the lasers that are used to laser cool potassium atoms. The current iteration of the beam translator has the ability to vertically translate a beam ±4.5 mm relative to its incident height. The translator has been shown to not alter the spatial profile of the beam through interference or obstruction. The translator's rotation has been adjusted to minimize atomic heating once the translator is integrated for use in optical atomic trapping. The translator has been installed on the apparatus but has not yet been tested with ultracold atoms. Furthermore, a feedback system was designed for climate-managing the potassium cooling lasers utilized in the Aubin lab's ultracold apparatus. Intended for advanced undergraduates and beginning graduates with some basic knowledge of optics and quantum mechanics, this text begins with a review of the relevant results of quantum mechanics, before turning to the electromagnetic interactions involved in slowing and trapping atoms and ions, in both magnetic and optical traps. The concluding chapters discuss a broad range of applications, from atomic clocks and studies of collision processes, to diffraction and interference of atomic beams at optical lattices and Bose-Einstein condensation. Laser cooling on weak transitions is a useful technique for reaching ultracold temperatures in atoms with multiple valence electrons. However, for strongly magnetic atoms a conventional narrow-line magneto-optical trap (MOT) is destabilized by competition between optical and magnetic forces. We overcome this difficulty in Er by developing an unusual narrow-line MOT that balances optical and magnetic forces using laser light tuned to the blue side of a narrow (8 kHz) transition. The trap population is spin polarized with temperatures reaching below 2 uK. Our results constitute an alternative method for laser cooling on weak transitions, applicable to rare-earth-metal and metastable alkaline earth elements. This grant was used to support graduate students in training. It was used primarily to support a student, Joel Hensley, who was working on an experiment effort to measure the recoil momentum of an atom when it absorbs a photon.