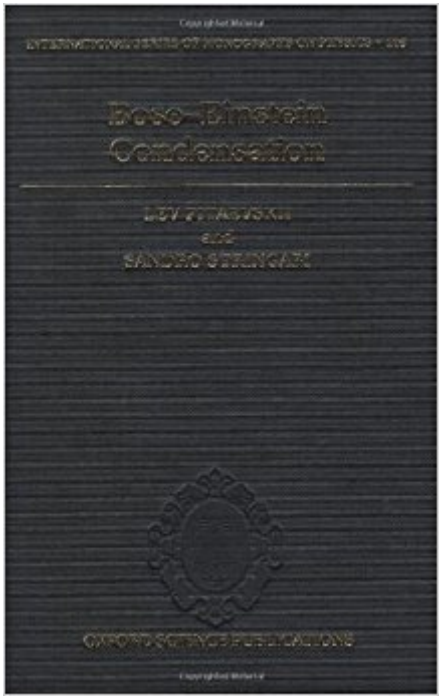
Bose-Einstein Condensation (International Series Of Monographs On Physics)



Synopsis

This book is an introductory text to the physics of Bose-Einstein condensation. This phenomenon, first predicted by Einstein in 1925 has been realized experimentally in 1995 in a remarkable series of experiments whose importance has been recognized by the award of the 2001 Nobel Prize in Physics. The condensate is actually a new state of matter, where quantum-mechanical wave functions of atoms behave as coherent matter waves in the same way as coherent light waves in the case of a laser. The authors provide a theoretical presentation of the main concepts underlying the physics of dilute atomic gases in conditions of extremely low temperatures where quantum effects play a crucial role. The main effort is devoted to discussion of the relevant theoretical aspects exhibited by these systms, such as the concept of order parameter, long range order, superfluidity and coherence. The mathematical formalism is presented in a form convenient for practical use. The book develops the theory of Bose gases starting from the pioneering Bogoliubov approach and gives special emphasis to the new physical features exhibited by non-uniform gases which are produced in the recent experiments with magnetic and optical traps. These features include the determination of the equilibrium profiles, the collective oscillations, the mechanism of the expansion of the gas after releasing the trap, the interference patterns obtained by overlapping two condensates, the rotational properties revealing the effects of superfluidity the Josephson-like phenomena associated with the coherence of the phase, the beyond mean field phenomena exhibited by quantum gases in conditions of reduced dimensionality. The book also discusses the alaogies and differences with the physics of "classical" superfluids like liquid helium and introduces some of the major features of trapped Fermi gases at low temperature, pointing out the consequences of superfluidity.

Book Information

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Customer Reviews

"The book is highly recommended to specialists in the field who will find in it a self-consistent compendium on the physicso f BEC and also to condensed matter physicists familiar with many-bodied theories who want to learn about the development of this very promising research line."--Journal of Statistical Physics"Overall, Bose-Einstein Condensation is clearly written and well focused. It should be accessible to anyone who has had a beginning graduate-level course in quantum mechanics."--Physics Today

L. Pitaevskii: Russian, born in Saratov (Russia) January 18, 1933 S. Stringari: Italian, born in Tarcento (Italy) March 2, 1949

while the book is getting a little old, i find it to be an excellent text. it starts ’gently’ (gently assuming youve had graduate stat mech, and know some many-body or field theory) with the ideal bose gas and the weakly interacting bose gas. they cover landau’s theory of superfluidity and linear response in general before starting with atomic physics for traps and the condensate in a trap. towards the end some of the more ’modern’ topics like mixtures, fermi condensates, phase effects, etc. if you wanted to work in BECs, a firm foundation would be this book plus a small selection of more recent review on topics that are too new for textbooks.ive found it very clear and helpful.

This is not an easy book to read. It starts off with field theory and assumes a lot of knowledge, especially from Landau’s books on fluid mechanics and statistical physics. The format of the writing is concise, almost journal publication style. Chapter 14 on angular momentum and vortices is very slick and hard to follow. Chapter’s 7 and 8 on response theory and 4He introduce a lot of notation and constructs without definition or motivation. Their discussion of mean field theory in BEC, derivation of the Gross-Pitaevskii from the operator formalism, and discussion of Fermi gases is clearer than in the BEC book by Pethick and Smith. There is also a discussion of optical lattices and low dimensions that is not discussed in Pethick and Smith. The other standard topics such as dynamics of a BEC in a harmonic trap are covered better in Pethick and Smith. Cooling is not discussed in this book.

Bose-Einstein Condensation (International Series of Monographs on Physics) Vortices in Bose-Einstein Condensates (Progress in Nonlinear Differential Equations and Their Applications) Einstein Already had it, But He Did not See it: Part 0: The Discarded Term from the Einstein-Hilbert-Action (Einstein had it Book 1) Quantum Electrodynamics: Gribov Lectures on Theoretical Physics (Cambridge Monographs on Particle Physics, Nuclear Physics and Cosmology) Gateway to Knowledge: A Condensation of the Tripitaka, Vol. 1 Frank Einstein and the Electro-Finger (Frank Einstein series #2): Book Two Frank Einstein and the EvoBlaster Belt (Frank Einstein series #4): Book Four Frank Einstein and the BrainTurbo (Frank Einstein series #3): Book Three Frank Einstein and the Antimatter Motor (Frank Einstein series #1): Book One Bose, Spin and Fermi Systems: Problems and Solutions Einstein's Cosmos: How Albert Einstein's Vision Transformed Our Understanding of Space and Time: Great Discoveries Einstein: A Life of Genius (The True Story of Albert Einstein) (Historical Biographies of Famous People) Â¿Quien fue Albert Einstein? / Who Was Albert Einstein? (Spanish Edition) (Quien Fue? / Who Was?) How Einstein gives Dirac, Klein-Gordon and SchrÃ¶dinger: Deriving the SchrÃ¶dinger, Dirac and Klein-Gordon Equations from the Einstein-Field-Equations via an Intelligent Zero The Road to Relativity: The History and Meaning of Einstein's "The Foundation of General Relativity", Featuring the Original Manuscript of Einstein's Masterpiece Hydrodynamic and Hydromagnetic Stability (International Series of Monographs on Physics) Tensors in mechanics and elasticity (Engineering physics; an international series of monographs) Theory of Nonequilibrium Superconductivity (International Series of Monographs on Physics) Tokamaks (The International Series of Monographs on Physics) Fundamental Algebraic Geometry (Mathematical Surveys and Monographs) (Mathematical Surveys and Monographs Series (Sep.Title P)