Journal of Statistical Physics, Vol. 115, Nos. 5/6, June 2004 (© 2004)

Book Review: *Bose–Einstein Condensation*

Bose–Einstein Condensation. Lev Pitaevskii and Sandro Stringari, Oxford University Press, Oxford, 2003.

The book "Bose–Einstein Condensation" by Lev Pitaevskii and Sandro Stringari is an introduction to the phenomenon of the Bose–Einstein condensation (BEC) together with recent applications to the field of ultracold atoms. The book describes fundamental aspects (classical and new) of the BEC, mainly based on mean-field ideas, as well as recent applications to new configurations realized with optical and magnetic trapping. This last part gathers some of the most interesting implications of the phenomenon after its experimental realization in atomic gases, evidencing the rapid development and widespread interest in the field among physicists.

Its content is distributed in two parts focusing on the mentioned aspects which facilitate the task of teaching the subject to the general reader. Part I includes first the statistical mechanics of the ideal Bose gas and the Bogoliubov theory of the interacting gas. Immediately after, the authors present the Gross–Pitaevskii theory, crucial to the characterization of nonuniform gases, which is frequently applied, in the second part of the book, to discuss cases of experimental interest. Superfluidity, strongly connected to BEC, is subsequently discussed. Finally, the authors show how to apply the classical formalism of linear response theory to obtain information about the collective behavior and momentum distribution of the system as well as presenting some features of superfluid helium. The second part first discusses atomic properties related to trapping phenomena in dilute gases and the ideal gas in the harmonic trap. The general formalism for nonuniform gases developed in Part I is next applied to investigate the ground state of interacting bosons in an external potential and to analyze dynamical properties. This part then proceeds to analyze the effect of the interactions on the thermodynamics of the system and the behavior of the quantized vortices. Coherence properties as interference phenomena and Josephson-like effects are extensively treated. This section of the book

0022-4715/04/0600-1763/0 © 2004 Plenum Publishing Corporation

also includes an analysis of the BEC in optical lattices in low dimensions and a complete summary of relevant features of trapped Fermi gases.

The chapters are well organized starting with a short introduction to the different topics. The presentation of the results is remarkable; the wide variety of examples, figures and images showing numerical solutions and experimental results which serve to facilitate the comprehension of the different concepts. A representative list of references is given at the end of the monograph. Some review articles complementing the content of the book are also quoted at the end of the introduction.

The book is highly recommended to specialists in the field who will find in it a self-consistent compendium on the physics of BEC and also to condensed matter physicists familiar with many-body theories who want to learn about the development of this very promising research line.

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