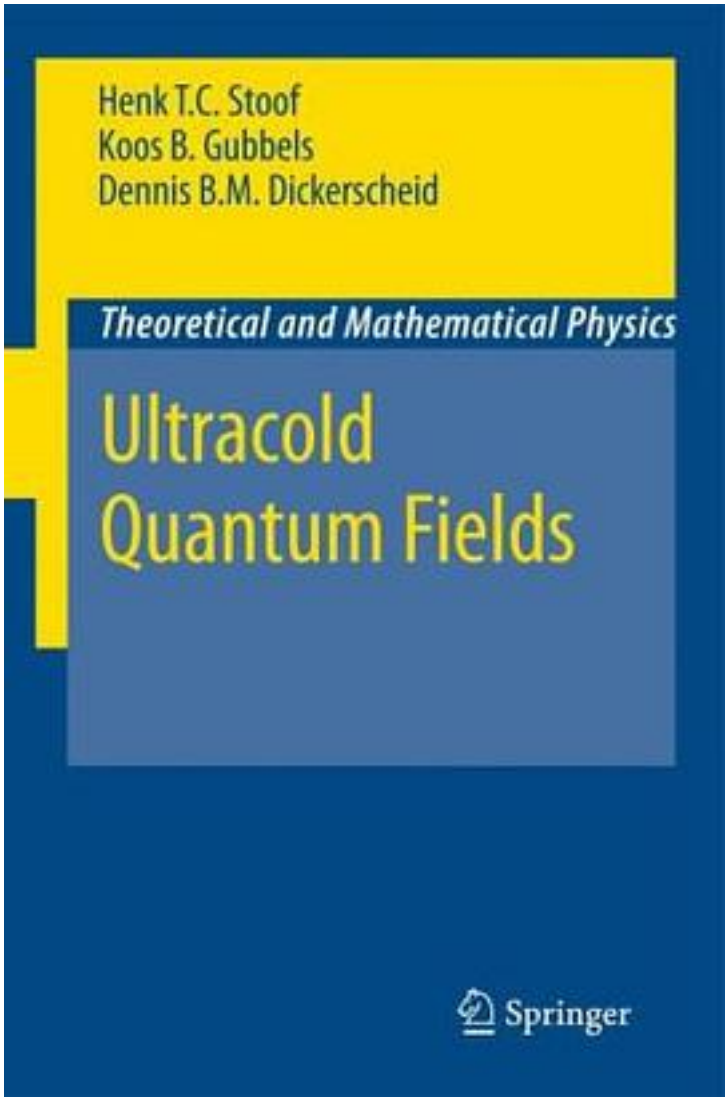
Ultracold Quantum Fields



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"Ultracold Quantum Fields" provides a self-contained introduction to quantum field theory for many-particle systems, using functional methods throughout. The general focus is on the behaviour of so-called quantum fluids, i.e., quantum gases and liquids, but trapped atomic gases are always used as an example. Both equilibrium and non-equilibrium phenomena are considered. Firstly, in the equilibrium case, the appropriate Hartree-Fock theory for the properties of a quantum fluid in the normal phase is derived. The focus then turns to the properties in the superfluid phase, and the authors present a microscopic derivation of the Bogoliubov theory of Bose-Einstein condensation and the Bardeen-Cooper-Schrieffer theory of superconductivity.The former is applicable to trapped bosonic gases such as rubidium, lithium, sodium and hydrogen, and the latter in particular to the fermionic isotope of atomic lithium. In the non-equilibrium case, a few topics are discussed for which a field-theoretical approach is especially suited. Examples are the macroscopic quantum tunnelling of a Bose-Einstein condensate, the phase dynamics of bosonic and fermionic superfluids, and their collisionless collective modes. The book is based upon the notes for a lecture course in the masters programme in Theoretical Physics at Utrecht.

作者介绍:

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