

1. Record Nr.	UNINA9910132244903321
Autore	Kagan M. Yu (Maxim Yu.)
Titolo	Modern trends in superconductivity and superfluidity // M. Yu. Kagan
Pubbl/distr/stampa	Dordrecht, Netherlands : , : Springer, , [2013] ©2013
ISBN	94-007-6961-X
Edizione	[1st ed. 2013.]
Descrizione fisica	1 online resource (XXIV, 550 p. 216 illus.)
Collana	Lecture Notes in Physics ; ; Volume 874
Disciplina	537.623
Soggetti	Superconductivity Superfluidity Physics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Bibliographic Level Mode of Issuance: Monograph
Nota di contenuto	Introduction -- Part I -- Hydrodynamics of rotating superfluids with quantized vortices -- The foundation of Landau theory for superfluid hydrodynamics -- Hydrodynamics of rotating superfluids. - Hydrodynamics of fast rotations -- Opposite case of a single bended vortex line for extremely slow rotations ($\sim C1$) -- Experimental situation and discussion. How to achieve the limit of the fast rotations at not very high frequencies in He II – 3He mixtures and in superfluid 3He-B -- Reference list to Chapter 1 -- 2. Quantum crystals. The search of supersolidity -- Quantum crystals. Phase diagram. The search of supersolidity -- The surface physics of quantum crystals. Atomically smooth and atomically rough surfaces.-Reference list to Chapter 2 -- Melting-crystallization waves on the phase-interface between quantum crystal and superfluid -- Surface hydrodynamics for rough surface at low temperatures -- Surface hydrodynamics of the mobile rough interface at and in the presence of 3He impurities -- Reference list to Chapter 3 -- Quantum hydrodynamics of the p-wave superfluids with the symmetry of 3He-A -- Orbital hydrodynamics of bosonic and fermionic superfluids with the symmetry of A-phase of 3He -- Two approaches to a complicated problem of chiral anomaly, anomalous current in fermionic (BCS) A-phase -- Reference list to Chapter 4 -- Part II -- Bose-Einstein condensation and Feshbach resonance in

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Sommario/riassunto

This book concisely presents the latest trends in the physics of superconductivity and superfluidity and magnetism in novel systems, as well as the problem of BCS-BEC crossover in ultracold quantum gases and high- T_c superconductors. It further illuminates the intensive exchange of ideas between these closely related fields of condensed matter physics over the last 30 years of their dynamic development. The content is based on the author's original findings obtained at the Kapitza Institute, as well as advanced lecture courses he held at the Moscow Engineering Physical Institute, Amsterdam University, Loughborough University and LPTMS Orsay between 1994 and 2011. In addition to the findings of his group, the author discusses the most recent concepts in these fields, obtained both in Russia and in the West. The book consists of 16 chapters which are divided into four parts. The first part describes recent developments in superfluid hydrodynamics of quantum fluids and solids, including the fashionable subject of possible supersolidity in quantum crystals of ^4He , while the second describes BCS-BEC crossover in quantum Fermi-Bose gases and mixtures, as well as in the underdoped states of cuprates. The third part is devoted to non-phonon mechanisms of superconductivity in unconventional (anomalous) superconductors, including some important aspects of the theory of high- T_c superconductivity. The last part considers the anomalous normal state of novel superconductive materials and materials with colossal magnetoresistance (CMR). The book offers a valuable guide for senior-level undergraduate students and graduate students, postdoctoral and other researchers specializing in solid-state and low-temperature physics.
