1. Record Nr. UNINA9910779883503321

Titolo	Complex quantum systems : analysis of large coulomb systems / / editor, Heinz Siedentop, Ludwig-Maximilians-Universitat, Munchen, Germany
Pubbl/distr/stampa	[Hackensack], NJ, : World Scientific, c2013 New Jersey : , : World Scientific, , [2013] 2013
ISBN	981-4460-15-X
Descrizione fisica	1 online resource (xi, 290 pages) : illustrations
Collana	Lecture notes series, , 1793-0758 ; ; v. 24
Disciplina	530.12
Soggetti	Quantum electrodynamics - Mathematics Quantum theory
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	CONTENTS; Foreword; Preface; Stability of Matter Rafael D. Benguria and Benjamn A. Loewe; 1. Introduction: The stability of quantum systems: A historical overview; 2. Stability of Matter: The classical proof of Lieb and Thirring; 2.1. Stability of the hydrogen atom in non-relativistic quantum mechanics; 2.2. Stability of a system of N electrons in non-relativistic quantum mechanics; 2.3. Stability of a many particle system via Thomas-Fermi theory; 2.4. Bibliographical remarks; 3. Lieb-Thirring Inequalities 3.1. Use of commutation methods to prove the Lieb-Thirring inequality for = 3/2 in dimension 13.2. The Eden-Foias bound ([46]); 3.3. Bibliographical remarks; 4. Electrostatic Inequalities; 5. The Maximum Number of Electrons an Atom Can Bind; 5.1. The maximum number of electrons for a one center case in the Thomas-Fermi model; 5.2. Bound on Nc(Z) for the TFW model in the atomic case; 6. The Stability of Matter for a Relativistic Toy Model; 6.1. Bibliographical remarks; 7. A New Lieb-Oxford Bound with Gradient Corrections; Acknowledgments; Appendix: A Short History of the Atom; References Mathematical Density and Density Matrix Functional Theory (DFT and DMFT) Volker Bach1. Introduction; 2. Exchange Correlation and LDA; 3. Kinetic Energy and Lieb-Thirring Inequality; 4. Thomas-Fermi Theory

and Stability of Matter; 5. Hartree-Fock Theory; 6. Correlation Estimate Improving the Lieb-Oxford Inequality; 7. Accuracy of the Hartree-Fock Approximation for Large Neutral Atoms; 8. N-Representability; Acknowledgments; References; On the Dynamics of a Fermi Gas in a Random Medium with Dynamical Hartree-Fock Interactions Thomas Chen; 1. Introduction; Acknowledgment
ReferencesOn the Minimization of Hamiltonians over Pure Gaussian States Jan Derezinski, Marcin Napiorkowski, and Jan Philip Solovej; 1. Introduction; Acknowledgments; 2. Preliminaries; 2.1. 2nd quantization; 2.2. Wick quantization; 2.3. Bogoliubov transformations; 2.4. Pure Gaussian states; 3. Main Result; References; Variational Approach to Electronic Structure Calculations on Second-Order Reduced Density Matrices and the N-Representability Problem Maho Nakata, Mituhiro Fukuda, and Katsuki Fujisawa; 1. Introduction; 2. The Reduced-Density-Matrix Method; 2.1. Pure states and ensemble states 2.2. The first-order and second-order reduced density matrices

Sommario/riassunto

This volume is based on lectures given during the program Complex Quantum Systems held at the National University of Singapore's Institute for Mathematical Sciences from 17 February to 27 March 2010. It guides the reader through two introductory expositions on large Coulomb systems to five of the most important developments in the field: derivation of mean field equations, derivation of effective Hamiltonians, alternative high precision methods in quantum chemistry, modern many body methods originating from quantum information, and - the most complex - semirelativistic quantum electrodynamics.