Finite-Temperature Field Theory

Principles and Applications

Joseph I. Kapusta and Charles Gale

Second Edition

Finite Temperature Field Theory Principles And Applications Cambridge Monographs On Mathematical Physics

Michael Seilmaier

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Finite-Temperature Field Theory Principles and Applications Joseph I. Kapusta,Charles Gale,2011

Finite-Temperature Field Theory Joseph I. Kapusta,1989 Finite Temperature Field Theory develops the basic formalism and theoretical techniques for studying relativistic quantum field theory at high temperature and density

Quantum Field Theory and Critical Phenomena Jean Zinn-Justin,2021-04-15 Introduced as a quantum extension of Maxwell s classical theory quantum electrodynamics has been the first example of a Quantum Field Theory QFT Eventually QFT has become the framework for the discussion of all fundamental interactions at the microscopic scale except possibly gravity More surprisingly it has also provided a framework for the understanding of second order phase transitions in statistical mechanics As this work illustrates QFT is the natural framework for the discussion of most systems involving an infinite number of degrees of freedom with local couplings These systems range from cold Bose gases at the condensation temperature about ten nanokelvin to conventional phase transitions from a few degrees to several hundred and high energy particle physics up to a TeV altogether more than twenty orders of magnitude in the energy scale Therefore this text sets out to present a work in which the strong formal relations between particle physics and the theory of critical phenomena are systematically emphasized This option explains some of the choices made in the presentation A formulation in terms of field integrals has been adopted to study the properties of QFT The language of partition and correlation functions has been used throughout even in applications of QFT to particle physics Renormalization and renormalization group properties are systematically discussed The notion of effective field theory and the emergence of renormalisable theories are described The consequences for fine tuning and triviality issue are emphasized This fifth edition has been updated and fully revised e g in particle physics with progress in neutrino physics and the discovery of the Higgs boson The presentation has been made more homogeneous througout the volume and emphasis has been put on the notion of effective field theory and discussion of the emergence of renormalisable theories **Emergence of Temperature in Examples and Related Nuisances in Field Theory** Tamás Sándor Biró,Antal Jakovác,2019-02-07 Field theory relying on the concept of continuous space and time while confronted with the quantum physical nature of observable quantities still has some fundamental challenges to face One such challenge is to understand the emergence of complexity in the behavior of interacting elementary fields including among other things nontrivial phase structures of elementary matter at high energy density or an atypical emergence of statistical properties e g when an apparent temperature is proportional to a constant acceleration in a homogeneous gravitational field Most modern textbooks on thermal field theory are mainly concerned with how the field theory formalism should be used if a finite temperature is given In contrast this short primer explores how the phenomenon of temperature emerges physically for elementary fields inquiring about the underlying kinetic field theory and the way energy fluctuations and other noise should be handled and it investigates whether and how this harmonizes with traditional field theory concepts like spectral evolution

the Keldysh formalism and phase transitions **Line Defects in Conformal Field Theory** Julien Barrat,2025-01-02 This book investigates conformal line defects in both the weak and strong coupling regimes Conformal field theory finds applications across diverse fields from statistical systems at criticality to quantum gravity through the AdS CFT correspondence These theories are subject to strong constraints enabling a systematic non perturbative analysis Conformal defects provide a controlled means of breaking the symmetry introducing new physical phenomena while preserving crucial benefits of the underlying conformal symmetry Two distinct classes of models are studied First we focus on the supersymmetric Wilson line in N 4 Super Yang Mills which serves as an ideal testing ground for the development of innovative techniques such as the analytic conformal bootstrap The second class consists of magnetic lines in Yukawa models which have fascinating applications in 3d condensed matter systems These systems have the potential to emulate phenomena observed in the Standard Model in a low energy setting **Hamiltonian Mechanics of Gauge Systems** Lev V. Prokhorov,Sergei V. Shabanov,2011-09-22 The principles of gauge symmetry and quantization are fundamental to modern understanding of the laws of electromagnetism weak and strong subatomic forces and the theory of general relativity Ideal for graduate students and researchers in theoretical and mathematical physics this unique book provides a systematic introduction to Hamiltonian mechanics of systems with gauge symmetry The book reveals how gauge symmetry may lead to a non trivial geometry of the physical phase space and studies its effect on quantum dynamics by path integral methods It also covers aspects of Hamiltonian path integral formalism in detail along with a number of related topics such as the theory of canonical transformations on phase space supermanifolds non commutativity of canonical quantization and elimination of non physical variables The discussion is accompanied by numerous detailed examples of dynamical models with gauge symmetries clearly illustrating the key concepts GRIBOV-80 Memorial Volume Yu L. Dokshitzer,P. Levai,J. Nyiri,2011 Vladimir Naumovich Gribov was one of the most outstanding theoretical physicists a key figure in the development of modern elementary particle physics His insights into the physics of quantum anomalies and the origin of classical solutions instantons the notion of parton systems and their evolution in soft and hard hadron interactions the first theory of neutrino oscillations and conceptual problems of quantization of non Abelian fields uncovered by him have left a lasting impact on the theoretical physics of the 21st century Gribov 80 the fourth in a series of memorial workshops for V N Gribov was organized on the occasion of his 80th birthday in May 2010 at the Abdus Salam International Centre for Theoretical Physics The workshop paid tribute to Gribov s great achievements and brought close colleagues younger researchers and leading experts together to display the new angles of the Gribov heritage at the new energy frontier opened up by the Large Hadron Collider The book is a collection of the presentations made at the workshop *Understanding the Origin of Matter* David Blaschke,Krzysztof Redlich,Chihiro Sasaki,Ludwik Turko,2022-09-14 This book aims at providing a solid basis for the education of the next generation of researchers in hot dense QCD Quantum ChromoDynamics matter This is a rapidly growing field at the interface

of the smallest i e subnuclear physics and the largest scales namely astrophysics and cosmology The extensive lectures presented here are based on the material used at the training school of the European COST action THOR Theory of hot matter in relativistic heavy ion collisions The book is divided in three parts covering ultrarelativistic heavy ion collisions several aspects related to QCD and simulations of QCD and heavy ion collisions The scientific tools and methods discussed provide graduate students with the necessary skills to understand the structure of matter under extreme conditions of high densities temperatures and strong fields in the collapse of massive stars or a few microseconds after the big bang In addition to the theory the set of lectures presents hands on material that includes an introduction to simulation programs for heavy ion collisions equations of state and transport properties **Gravity and Strings** Tomás Ortín,2015-03-26 Self contained and comprehensive this definitive new edition of Gravity and Strings is a unique resource for graduate students and researchers in theoretical physics From basic differential geometry through to the construction and study of black hole and black brane solutions in quantum gravity via all the intermediate stages this book provides a complete overview of the intersection of gravity supergravity and superstrings Now fully revised this second edition covers an extensive array of topics including new material on non linear electric magnetic duality the electric tensor formalism matter coupled supergravity supersymmetric solutions the geometries of scalar manifolds appearing in 4 and 5 dimensional supergravities and much more Covering reviews of important solutions and numerous solution generating techniques and accompanied by an exhaustive index and bibliography this is an exceptional reference work **Mathematical Reviews** ,2008 *Thermal Field Theory* Michel Le Bellac,1996 Now in paperback this text introduces the theoretical framework for describing the quark gluon plasma an important new state of matter The first part of this book is a self contained introduction to relativistic thermal field theory Topics include the path integral approach the real and the imaginary time formalisms fermion fields and gauge fields at finite temperature Useful techniques such as the evaluation of frequency sums or the use of cutting rules are illustrated on various examples The second part of the book is devoted to recent developments giving a detailed account of collective excitations bosonic and fermionic and showing how they give rise to energy scales which imply a reorganization of perturbation theory The relation with kinetic theory is also explained Applications to processes which occur in heavy ion collisions and in astrophysics are worked out in detail Each chapter ends with exercises and a guide to the literature

Finite Temperature Field Theory Ashok Das,1997-05-02 This book discusses all three formalisms used in the study of finite temperature field theory namely the imaginary time formalism the closed time formalism and thermofield dynamics Applications of the formalisms are worked out in detail Gauge field theories and symmetry restoration at finite temperature are among the practical examples discussed in depth The question of gauge dependence of the effective potential and the Nielsen identities are explained The nonrestoration of some symmetries at high temperature such as supersymmetry and theories on nonsimply connected space times are also described thoroughly Other topics include 1 1 and 2 1 dimensional

field theories at finite temperature and phase transitions derivative expansion linear response theory and the question of infrared divergences at finite temperature In addition examples of nonequilibrium phenomena are discussed with the disoriented chiral condensates as an illustration This book is a very useful tool for graduate students teachers and researchers in theoretical physics   **CERN Courier** ,1994   The British National Bibliography Arthur James Wells,2006   *High Energy Physics Index* ,1987   **Forthcoming Books** Rose Arny,2003-04   **American Book Publishing Record** ,2003   *Physics Briefs* ,1988   **Books in Print Supplement** ,1988   Subject Guide to Books in Print ,1993

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