

<<量子场论>>

图书基本信息

书名：<<量子场论>>

13位ISBN编号：9787510005749

10位ISBN编号：7510005744

出版时间：2010-4

出版时间：世界图书出版公司

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页数：641

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## 前言

Quantum field theory is the basic mathematical language that is used to describe and analyze the physics of elementary particles. The goal of this book is to provide a concise, step-by-step introduction to this subject, one that covers all the key concepts that are needed to understand the Standard Model of elementary particles, and some of its proposed extensions. In order to be prepared to undertake the study of quantum field theory, you should recognize and understand the following equations: This list is not, of course, complete; but if you are familiar with these equations, you probably know enough about quantum mechanics, classical mechanics, special relativity, and electromagnetism to tackle the material in this book. Quantum field theory has the reputation of being a subject that is hard to learn. The problem, I think, is not so much that its basic ingredients are unusually difficult to master (indeed, the conceptual shift needed to go from quantum mechanics to quantum field theory is not nearly as severe as the one needed to go from classical mechanics to quantum mechanics), but rather that there are a lot of these ingredients. Some are fundamental, but many are just technical aspects of an unfamiliar form of perturbation theory. In this book, I have tried to make the subject as accessible to beginners as possible. There are three main aspects to my approach. Logical development of the basic concepts. This is, of course, very different from the historical development of quantum field theory, which, like the historical development of most worthwhile subjects, was filled with inspired guesses and brilliant extrapolations of sometimes fuzzy ideas, as well as its fair share of mistakes, misconceptions, and dead ends. None of that is in this book. From this book, you will (I hope) get the impression that the whole subject is effortlessly clear and obvious, with one step following the next like sunshine after refreshing rain. Illustration of the basic concepts with the simplest examples. In most fields of human endeavor, newcomers are not expected to do the most demanding tasks right away. It takes time, dedication, and lots of practice to work up to what the accomplished masters are doing. There is no reason to expect quantum field theory to be any different in this regard. Therefore, we will start off by analyzing quantum field theories that are not immediately applicable to the real world of electrons, photons, protons, etc., but that will allow us to gain familiarity with the tools we will need, and to practice using them. Then, when we do work up to "real physics," we will be fully ready for the task. To this end, the book is divided into three parts: Spin Zero, Spin One Half, and Spin One. The technical complexities associated with a particular type of particle increase with its spin. We will therefore first learn all we can about spinless particles before moving on to the more difficult (and more interesting) nonzero spins. Once we get to them, we will do a good variety of calculations in (and beyond) the Standard Model of elementary particles.

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### 内容概要

I have tried to make the subject as accessible to beginners as possible. There are three main aspects to my approach. Logical development of the basic concepts. This is , of course , very different from the historical development of quantum field theory , which , like the historical development of most worthwhile subjects , was filled with inspired guesses and brilliant extrapolations of sometimes fuzzy ideas , as well as its fair share of mistakes , misconceptions , and dead ends. None of that is in this book. From this book , you will (I hope) get the impression that the whole subject is effortlessly clear and obvious , with one step following the next like sunshine after refreshing rain.

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## 书籍目录

Preface for students Preface for instructors Acknowledgments Part I Spin Zero 1 Attempts at relativistic quantum mechanics 2 Lorentz invariance (prerequisite: 1) 3 Canonical quantization of scalar fields (2) 4 The spin-statistics theorem (3) 5 The LSZ reduction formula (3) 6 Path integrals in quantum mechanics 7 The path integral for the harmonic oscillator (6) 8 The path integral for free field theory (3, 7) 9 The path integral for interacting field theory (8) 10 Scattering amplitudes and the Feynman rules (5, 9) 11 Cross sections and decay rates (10) 12 Dimensional analysis with  $\hbar = c = i$  (3) 13 The Lehmann-Kallen form of the exact propagator (9) 14 Loop corrections to the propagator (10, 12, 13) 15 The one-loop correction in Lehmann-Kallen form (14) 16 Loop corrections to the vertex (14) 17 Other 1PI vertices (16) 18 Higher-order corrections and renormalizability (17) 19 Perturbation theory to all orders (18) 20 Two-particle elastic scattering at one loop (19) 21 The quantum action (19) 22 Continuous symmetries and conserved currents (8) 23 Discrete symmetries: P, T, C, and Z (22) 24 Nonabelian symmetries (22) 25 Unstable particles and resonances (14) 26 Infrared divergences (20) 27 Other renormalization schemes (26) 28 The renormalization group (27) 29 Effective field theory (28) 30 Spontaneous symmetry breaking (21) 31 Broken symmetry and loop corrections (30) 32 Spontaneous breaking of continuous symmetries (22, 30) Part II Spin One Half 33 Representations of the Lorentz group (2) 34 Left- and right-handed spinor fields (3, 33) 35 Manipulating spinor indices (34) 36 Lagrangians for spinor fields (22, 35) 37 Canonical quantization of spinor fields I (36) 38 Spinor technology (37) 39 Canonical quantization of spinor fields II (38) 40 Parity, time reversal, and charge conjugation (23, 39) 41 LSZ reduction for spin-one-half particles (5, 39) 42 The free fermion propagator (39) 43 The path integral for fermion fields (9, 42) 44 Formal development of fermionic path integrals (43) 45 The Feynman rules for Dirac fields (10, 12, 41, 43) 46 Spin sums (45) 47 Gamma matrix technology (36) 48 Spin-averaged cross sections (46, 47) 49 The Feynman rules for Majorana fields (45) 50 Massless particles and spinor helicity (48) 51 Loop corrections in Yukawa theory (19, 40, 48) 52 Beta functions in Yukawa theory (28, 51) 53 Functional determinants (44, 45) Part III Spin One 54 Maxwell's equations (3) 55 Electrodynamics in Coulomb gauge (54) 56 LSZ reduction for photons (5, 55) 57 The path integral for photons (8, 56) 58 Spinor electrodynamics (45, 57) 59 Scattering in spinor electrodynamics (48, 58) 60 Spinor helicity for spinor electrodynamics (50, 59) 61 Scalar electrodynamics (58) 62 Loop corrections in spinor electrodynamics (51, 59) 63 The vertex function in spinor electrodynamics (62) 64 The magnetic moment of the electron (63) 65 Loop corrections in scalar electrodynamics (61, 62) 66 Beta functions in quantum electrodynamics (52, 62) 67 Ward identities in quantum electrodynamics I (22, 59) 68 Ward identities in quantum electrodynamics II (63, 67) 69 Nonabelian gauge theory (24, 58) 70 Group representations (69) 71 The path integral for nonabelian gauge theory (53, 69) 72 The Feynman rules for nonabelian gauge theory (71) 73 The beta function in nonabelian gauge theory (70, 72) 74 BRST symmetry (70, 71) 75 Chiral gauge theories and anomalies (70, 72) 76 Anomalies in global symmetries (75) 77 Anomalies and the path integral for fermions (76) 78 Background field gauge (73) 79 Gervais-Neveu gauge (78) 80 The Feynman rules for  $N \times N$  matrix fields (10) 81 Scattering in quantum chromodynamics (60, 79, 80) 82 Wilson loops, lattice theory, and confinement (29, 73) 83 Chiral symmetry breaking (76, 82) 84 Spontaneous breaking of gauge symmetries (32, 70) 85 Spontaneously broken abelian gauge theory (61, 84) 86 Spontaneously broken nonabelian gauge theory (85) 87 The Standard Model: gauge and Higgs sector (84) 88 The Standard Model: lepton sector (75, 87) 89 The Standard Model: quark sector (88) 90 Electroweak interactions of hadrons (83, 89) 91 Neutrino masses (89) 92 Solitons and monopoles (84) 93 Instantons and theta vacua (92) 94 Quarks and theta vacua (77, 83, 93) 95 Supersymmetry (69) 96 The Minimal Supersymmetric Standard Model (89, 95) 97 Grand unification (89) Bibliography Index

<<量子场论>>

章节摘录

插图：

## <<量子场论>>

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