

<<量子场论>>

图书基本信息

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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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