

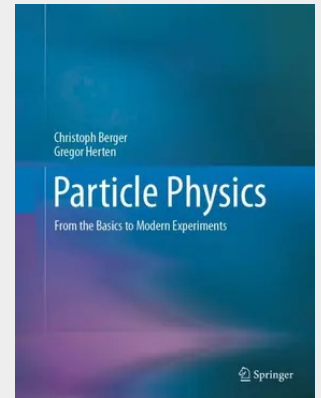
Particle Physics

From the Basics to Modern Experiments

This textbook provides an introduction from the basics to modern experiments and the latest developments in particle physics. Experimental tools such as accelerators and detectors, as well as symmetry principles and their applications, are also thoroughly presented. Additionally, the Standard Model—which largely dominates today's experimental and theoretical discussions—is introduced.

This book explains essential areas of quantum electrodynamics, the quark model, quantum chromodynamics, and the electroweak theory. The Lagrangian formalism formulates the Standard Model as a gauge theory, and the Higgs mechanism is described in detail. Extensive chapters on hadron collider physics and neutrino physics connect to current research and explore possible extensions of the Standard Model in light of recent experimental results. The appealing design of the textbook and the 207 exercises with solution hints and supplements as Jupyter Notebooks on GitHub serve for further in-depth study.

Overview and Tools.- The Scattering Matrix and its Symmetries.- Elementary Quantum Electrodynamics.- Hadrons in Quantum Chromodynamics.- Electrons and Quarks.- From Weak to Electroweak Interaction.- The Standard Model.- Large Hadron Collider (LHC) and Involved Experiments.- Solution Hints for the Exercises.



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