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Fakultät für Naturwissenschaften, Fachbereich Physik

Announcement

Relativistic Quantum Electrodynamics

Prof. Dr. Wolfgang Schleich

Description

Students who successfully passed this module

- know the relativistic formulation of quantum mechanics
- know the formalism of second quantization and can perform elementary calculations for electron/positron and photon fields
- know how the coupling between electron and photon fields is established
- understand the theoretical perturbative approach for the electron-photon interaction using Feynman graphs
- are able to reproduce simple Feynman diagrams
- are familiar with the conventions and the mathematical methods relevant for this research area (operator algebra, Fourier integrals, covariant formulation, tensors)

Content

- Relativistic quantum mechanics (Dirac equation)
- Second quantization
- Electron-Photon interaction through the principle of minimal coupling
- Feynman rules and calculation of simple Feynman diagrams
- Techniques and problems of Feynman graphs, renormalization

Prerequisites

Quantum Mechanics course, Classical Electrodynamics course

Literature

- C. Cohen-Tannoudji, B. Diu und F. Laloë: Quantum Mechanics, Vol. I and II (Wiley, New York, 1977)
- L.D. Landau und E.M. Lifshitz: Quantum Mechanics (Pergamon Press, New York, 1958)
- J.I. Sakurai: Advanced Quantum Mechanics (Addison-Wesley, Redwood, 1987)
- C. Itzykson und J.B. Zuber: Quantum Field Theory (McGraw-Hill, New York, 1966)
- F. Mandl und G. Shaw: Quantum Field Theory (Wiley, New York, 1984)

Additional Information

Lecture (3 hours per week) plus Exercise (2 hours per week)
6 ECTS credits

Lecturer

Prof. Dr. Wolfgang Schleich