Tennert

Quantum Mechanics IV

From the fundamentals of non-relativistic QED to relativistic quantum mechanics

In a comprehensive presentation, the four volumes of this textbook develop and explore the foundations of non-relativistic quantum mechanics in depth, which makes them also ideally suited as a reference work. The fourth volume begins with a detailed chapter on non-relativistic quantum electrodynamics (QED), traditionally referred to as "quantum theory of radiation", and then leads into relativistic quantum theory. The textbook concludes with a careful treatment of the scope and limitations of relativistic quantum mechanics, as well as a thorough examination of symmetries in relativistic quantum theory. Translated with AI assistance and revised by the author. Special Features: Even complex topics are explained clearly and with illustrating examples. Numerous mathematical digressions elucidate general mathematical concepts. Particular highlights of the book are a detailed discussion of the Lamb shift and the Casimir effect, including the issues of renormalisation that arise in this context, as well as the analysis of the single-particle interpretation in relativistic quantum mechanics and the examination of group contractions in the transition from relativistic to non-relativistic symmetry groups and their representations. Contents: 1.Quantization of the electromagnetic field - 2.Relativistic quantum mechanics - 3.Symmetries in quantum mechanics II Audience: The book is aimed at both undergraduate and graduate students and their instructors. Due to its multi-volume format, the wide range of topics, and references to original scientific papers, it is also a must-have for the bookshelf of anyone working in physics. Previous knowledge: Knowledge of theoretical mechanics, electrodynamics, and special relativity, as well as real analysis, linear algebra, and complex analysis, is assumed.

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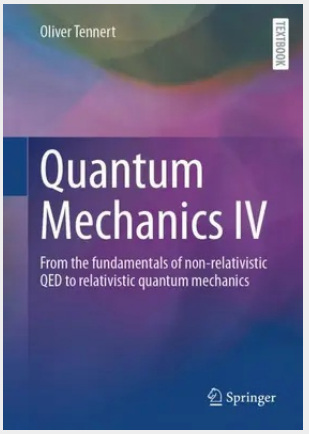

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