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| 1. Record Nr. | UNISOBSOB005379 |
| Autore | Goethe, Johann Wolfgang : von |
| Titolo | 29 : Januar - October 1818 / Johann Wolfgang Goethe |
| Pubbl/distr/stampa | Weimar, : Hermann Böhlaus Nachfolger, 1999 |
| Edizione | [Weimarer Ausgabe] |
| Descrizione fisica | XII, 428 p. ; 18 cm. |
| Lingua di pubblicazione | Tedesco |
| Formato | Materiale a stampa |
| Livello bibliografico | Monografia |
| Note generali | Ripr. facs. dell'edizione Weimar 1904 |
| 2. Record Nr. | UNINA9910132785603321 |
| Autore | Alvarez-Gaume Luis |
| Titolo | An invitation to quantum field theory // Luis Alvarez-Gaume, Miguel A. Vazquez-Mozo |
| Pubbl/distr/stampa | Berlin ; ; Heidelberg, : Springer, c2012 |
| ISBN | 9783642237287
3642237282 |
| Edizione | [1st ed. 2012.] |
| Descrizione fisica | 1 online resource (XI, 294 p. 91 illus.) |
| Collana | Lecture notes in physics, , 0075-8450 ; ; v. 839 |
| Classificazione | 530
UD 8220
UO 4000
PHY 023f |
| Altri autori (Persone) | Vazquez-MozoM. A (Miguel A.) |
| Disciplina | 530.143 |
| Soggetti | Quantum field theory
Quantum theory |
| Lingua di pubblicazione | Inglese |
| Formato | Materiale a stampa |
| Livello bibliografico | Monografia |
| Note generali | Bibliographic Level Mode of Issuance: Monograph |
| Nota di bibliografia | Includes bibliographical references and index. |
| Nota di contenuto | Why Do We Need Quantum Field Theory After All? -- From Classical to |

Quantum Fields -- Theories and Lagrangian I: Matter Fields -- Theories and Lagrangian II: Introducing Gauge Fields -- Theories and Lagrangian II: The Standard Model -- Towards Computational Rules: Feynman Diagrams -- Symmetries I: Continuous Symmetries -- Renormalization -- Anomalies -- The Origin of Mass -- Symmetries II: Discrete Symmetries -- Effective Field Theories and Naturalness -- Special Topics -- Notation, Conventions and Units -- A Crash Course in Group Theory -- Index.

Sommario/riassunto

This book provides an introduction to Quantum Field Theory (QFT) at an elementary level—with only special relativity, electromagnetism and quantum mechanics as prerequisites. For this fresh approach to teaching QFT, based on numerous lectures and courses given by the authors, a representative sample of topics has been selected containing some of the more innovative, challenging or subtle concepts. They are presented with a minimum of technical details, the discussion of the main ideas being more important than the presentation of the typically very technical mathematical details necessary to obtain the final results. Special attention is given to the realization of symmetries in particle physics: global and local symmetries, explicit, spontaneously broken, and anomalous continuous symmetries, as well as discrete symmetries. Beyond providing an overview of the standard model of the strong, weak and electromagnetic interactions and the current understanding of the origin of mass, the text enumerates the general features of renormalization theory as well as providing a cursory description of effective field theories and the problem of naturalness in physics. Among the more advanced topics the reader will find are an outline of the first principles derivation of the CPT theorem and the spin-statistics connection. As indicated by the title, the main aim of this text is to motivate the reader to study QFT by providing a self-contained and approachable introduction to the most exciting and challenging aspects of this successful theoretical framework.
