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Leading experts from The Physics of Quantum Information network, a European Commission initiative, bring together the most recent results from the emerging area of quantum technology. Written in a consistent style, the book introduces quantum cryptography, quantum teleportation, and quantum computation, considering both theory and the latest experiments.

The Physics of Quantum Information | SpringerLink

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The Physics of Quantum Information: Quantum Cryptography, Quantum Teleportation, Quantum Computation eBook: Bouwmeester, Dirk, Ekert, Artur K., Zeilinger, Anton ...

The Physics of Quantum Information: Quantum Cryptography ...

Fundamentals of quantum information. 01 Mar 1998. The fact that information is physical means that the laws of quantum mechanics can be used to process and transmit it in ways that are not possible with existing systems, says Anton Zeilinger. An entangled state.

Fundamentals of quantum information □ Physics World

Leading experts from The Physics of Quantum Information network, a European Commission initiative, bring together the most recent results from the emerging area of quantum technology. Written in a consistent style, the book introduces quantum cryptography, quantum teleportation, and quantum computation, considering both theory and the latest experiments.

The Physics of Quantum Information - Quantum Cryptography ...

The core theme of this thesis is that quantum information is in a certain sense a combination of two pieces of classical information, information about two physical observables which are complementary in this sense first put forth by Bohr [1, 2, 3] and exemplified by the wave-particle duality in

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the double-slit experiment.

The Physics of Quantum Information - arXiv

The Physics of Quantum Information? does convey a through and authoritative picture of the state of this fascinating futuristic art as we enter the 21st century." - American Scientist "This volume covers Quantum Cryptography Quantum Teleportation and Quantum Computation.

The Physics of Quantum Information - Dirk Bouwmeester ...

Quantum cryptography is a beautiful idea! It covers aspects from fundamental quantum physics to Applied Physics via classical and quantum information theories [1]. During me last ten years, quantum cryptography progressed tremendously, in all directions: from mathematical security proofs of idealized scenarii to commercial prototypes.

Quantum Information Theory - an overview | ScienceDirect ...

Quantum Physics, Thermodynamics, and Information The core creative process in the universe involves quantum mechanics and thermodynamics. To understand information creation, information physics provides new insights into the puzzling " problem of measurement " and the mysterious " collapse of the wave function " in quantum mechanics.

Quantum Physics, Thermodynamics, and Information

In physics and computer science, quantum information is the information of the state of a quantum system. It is the basic entity of study in quantum information theory, and can be

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manipulated using quantum information processing techniques. Quantum information refers to both the technical definition in terms of Von Neumann entropy and the general computational term. Quantum information, like classical information, can be processed using digital computers, transmitted from one location to another

Quantum information - Wikipedia

Physical information is a form of information. In physics, it refers to the information of a physical system. Physical information is an important concept used in a number of fields of study in physics. For example, in quantum mechanics, the form of physical information known as quantum information is used to describe quantum phenomena such as entanglement and superposition.

Physical information - Wikipedia

The coming quantum revolution. Like AI, quantum information science and engineering (QISE) is a rapidly evolving field with tremendous potential benefits. Quantum mechanics describes the laws of physics at microscopic length scales, and QISE researchers like me endeavour to control the systems that obey these fundamental laws. By doing so, we hope to engineer novel quantum devices such as quantum sensors, networks or computers, as well as novel quantum materials with properties that don't ...

Part of the revolution: Black representation in AI and ...

Experimental test of the relation between coherence and path information. Communications

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Physics 1 (2018) J Gao, ZQ Jiao, CQ Hu et al. Probing quantum features of photosynthetic organisms. NPJ QUANTUM INFORMATION 4 (2018) ARTN 60. T Krisnanda, C Marletto, V Vedral et al. Electrically controlled nuclear polarization of individual atoms

Quantum Information | University of Oxford Department of ...

Information is stored, transmitted and processed by physical means. Thus, the concept of information and computation can be formulated in the context of a physical theory and the study of information requires ultimately experimentation. This sentence, innocuous at first glance, leads to non-trivial consequences. Following Moore's law, about every 18 months microprocessors double their speed ...

The Physics of Quantum Information: Quantum Cryptography ...

The coming quantum revolution. Like AI, quantum information science and engineering (QISE) is a rapidly evolving field with tremendous potential benefits. Quantum mechanics describes the laws of physics at microscopic length scales, and QISE researchers like me (Charles Brown) endeavor to control the systems that obey these fundamental laws. By doing so, we hope to engineer novel quantum devices such as quantum sensors, networks, or computers as well as novel quantum materials with ...

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The Physics of Quantum Information: Quantum Cryptography ...

If you are familiar with quantum physics, you know that on very tiny scales, the Universe is very weird. Particles act like particles and waves at the same time. An electron may be in one location,...

Quantum Physics May Upend Our Macroscopic Reality In The ...

In quantum computing, which relies on quantum bits, or qubits, to carry information, the fragile state known as quantum superposition is difficult to maintain and can decay over time, causing a ...

Leading experts from "The Physics of Quantum Information" network, initiated by the European Commission, bring together the most recent results from this emerging area of quantum technology. Written in a consistent style as a research monograph, the book introduces quantum cryptography, quantum teleportation, and quantum computation, considering both theory and newest experiments. Both scientists working in the field and advanced students will find a rich source of information on this exciting new area.

First-ever comprehensive introduction to the major new subject of quantum computing and quantum information.

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Combining physics and philosophy, this is a uniquely interdisciplinary examination of quantum information science. Suitable as both a discussion of the conceptual and philosophical problems of this field and a comprehensive stand-alone introduction, this book will benefit both experienced and new researchers in quantum information and the philosophy of physics.

A new and exciting approach to the basics of quantum theory, this undergraduate textbook contains extensive discussions of conceptual puzzles and over 800 exercises and problems. Beginning with three elementary 'qubit' systems, the book develops the formalism of quantum theory, addresses questions of measurement and distinguishability, and explores the dynamics of quantum systems. In addition to the standard topics covered in other textbooks, it also covers communication and measurement, quantum entanglement, entropy and thermodynamics, and quantum information processing. This textbook gives a broad view of quantum theory by emphasizing dynamical evolution, and exploring conceptual and foundational issues. It focuses on contemporary topics, including measurement, time evolution, open systems, quantum entanglement, and the role of information.

This book approaches condensed matter physics from the perspective of quantum information science, focusing on systems with strong interaction and unconventional order for which the usual condensed matter methods like the Landau paradigm or the free fermion framework break down. Concepts and tools in quantum information science such as entanglement, quantum circuits, and the tensor network representation prove to be highly useful in studying such systems. The goal of this book is to introduce these techniques and show how they lead

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to a new systematic way of characterizing and classifying quantum phases in condensed matter systems. The first part of the book introduces some basic concepts in quantum information theory which are then used to study the central topic explained in Part II: local Hamiltonians and their ground states. Part III focuses on one of the major new phenomena in strongly interacting systems, the topological order, and shows how it can essentially be defined and characterized in terms of entanglement. Part IV shows that the key entanglement structure of topological states can be captured using the tensor network representation, which provides a powerful tool in the classification of quantum phases. Finally, Part V discusses the exciting prospect at the intersection of quantum information and condensed matter physics – the unification of information and matter. Intended for graduate students and researchers in condensed matter physics, quantum information science and related fields, the book is self-contained and no prior knowledge of these topics is assumed.

Formal development of the mathematical theory of quantum information with clear proofs and exercises. For graduate students and researchers.

Quantum physics allows entirely new forms of computation and cryptography, which could perform tasks currently impossible on classical devices, leading to an explosion of new algorithms, communications protocols and suggestions for physical implementations of all these ideas. As a result, quantum information has made the transition from an exotic research topic to part of mainstream undergraduate courses in physics. Based on years of teaching experience, this textbook builds from simple fundamental concepts to cover the essentials of

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the field. Aimed at physics undergraduate students with a basic background in quantum mechanics, it guides readers through theory and experiment, introducing all the central concepts without getting caught up in details. Worked examples and exercises make this useful as a self-study text for those who want a brief introduction before starting on more advanced books. Solutions are available online at www.cambridge.org/9781107014466.

Quantum information is an area of science, which brings together physics, information theory, computer science & mathematics. This book, which is based on two successful lecture courses, is intended to introduce readers to the ideas behind new developments including quantum cryptography, teleportation & quantum computing.

A self-contained introduction to the basic theoretical concepts, experimental techniques and recent advances in the fields of quantum communication, quantum information and quantum computation. The introductory and self-contained character of the contributions should make this book particularly attractive to students and active researchers in physics and computer science who want to become acquainted with the underlying basic ideas and recent advances in the rapidly evolving field of quantum information processing.

Quantum Computation and Quantum Information (QIP) deals with the identification and use of quantum resources for information processing. This includes three main branches of investigation: quantum algorithm design, quantum simulation and quantum communication, including quantum cryptography. Along the past few years, QIP has become one of the most

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active area of research in both, theoretical and experimental physics, attracting students and researchers fascinated, not only by the potential practical applications of quantum computers, but also by the possibility of studying fundamental physics at the deepest level of quantum phenomena. NMR Quantum Computation and Quantum Information Processing describes the fundamentals of NMR QIP, and the main developments which can lead to a large-scale quantum processor. The text starts with a general chapter on the interesting topic of the physics of computation. The very first ideas which sparked the development of QIP came from basic considerations of the physical processes underlying computational actions. In Chapter 2 it is made an introduction to NMR, including the hardware and other experimental aspects of the technique. In Chapter 3 we revise the fundamentals of Quantum Computation and Quantum Information. The chapter is very much based on the extraordinary book of Michael A. Nielsen and Isaac L. Chuang, with an upgrade containing some of the latest developments, such as QIP in phase space, and telecloning. Chapter 4 describes how NMR generates quantum logic gates from radiofrequency pulses, upon which quantum protocols are built. It also describes the important technique of Quantum State Tomography for both, quadrupole and spin $1/2$ nuclei. Chapter 5 describes some of the main experiments of quantum algorithm implementation by NMR, quantum simulation and QIP in phase space. The important issue of entanglement in NMR QIP experiments is discussed in Chapter 6. This has been a particularly exciting topic in the literature. The chapter contains a discussion on the theoretical aspects of NMR entanglement, as well as some of the main experiments where this phenomenon is reported. Finally, Chapter 7 is an attempt to address the future of NMR QIP, based in very recent developments in nanofabrication and single-spin detection experiments. Each chapter is

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followed by a number of problems and solutions. * Presents a large number of problems with solutions, ideal for students * Brings together topics in different areas: NMR, nanotechnology, quantum computation * Extensive references

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