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Descrizione fisica	1 online resource (544 p.)
Collana	Theoretical and Mathematical Physics, , 1864-5887
Disciplina	530.8
Soggetti	Quantum theory Physics - Philosophy Mathematical physics Spintronics Functional analysis Quantum Physics Philosophical Foundations of Physics and Astronomy Mathematical Physics Functional Analysis
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Introduction -- Part I Mathematics -- Rudiments of Hilbert Space Theory -- Classes of Compact Operators -- Operator Integrals and Spectral Representations: the Bounded Case -- Operator Integrals and Spectral Representations: the Unbounded Case -- Miscellaneous Algebraic and Functional Analytic Techniques -- Dilation Theory -- Positive Operator Measures: Examples -- Part II Elements -- States, Effects and Observables -- Measurement -- Joint Measurability -- Preparation Uncertainty -- Measurement Uncertainty -- Part III Realisations -- Qubits -- Position and Momentum -- Number and Phase -- Time and Energy -- State Reconstruction -- Measurement Implementations -- Part IV Foundations -- Bell Inequalities and Incompatibility -- Measurement Limitations due to Conservation Laws -- Measurement Problem -- Axioms for Quantum Mechanics -- Index.

This is a book about the Hilbert space formulation of quantum mechanics and its measurement theory. It contains a synopsis of what became of the Mathematical Foundations of Quantum Mechanics since von Neumann's classic treatise with this title. Fundamental non-classical features of quantum mechanics—indeterminacy and incompatibility of observables, unavoidable measurement disturbance, entanglement, nonlocality—are explicated and analysed using the tools of operational quantum theory. The book is divided into four parts: 1. Mathematics provides a systematic exposition of the Hilbert space and operator theoretic tools and relevant measure and integration theory leading to the Naimark and Stinespring dilation theorems; 2. Elements develops the basic concepts of quantum mechanics and measurement theory with a focus on the notion of approximate joint measurability; 3. Realisations offers in-depth studies of the fundamental observables of quantum mechanics and some of their measurement implementations; and 4. Foundations discusses a selection of foundational topics (quantum-classical contrast, Bell nonlocality, measurement limitations, measurement problem, operational axioms) from a measurement theoretic perspective. The book is addressed to physicists, mathematicians and philosophers of physics with an interest in the mathematical and conceptual foundations of quantum physics, specifically from the perspective of measurement theory.

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