

Contents

An Introduction to Quantum Probability	1
Mark Fannes	
1 Motivation	2
2 Observables	7
3 States and Convexity	12
4 Composite Systems	22
5 Dynamics and Measurements	26
References	38
 Covariant Mappings for the Description of Measurement, Dissipation and Decoherence in Quantum Mechanics	39
Bassano Vacchini	
1 Introduction	39
2 Quantum Mechanics as Quantum Probability	41
3 Open Systems and Covariance	58
References	76
 Quantum Open Systems with Time-Dependent Control	79
Robert Alicki	
1 Introduction	79
2 The Generic Model of CQOS	80
3 Reduced Dynamics	81
4 Markovian Dynamics	83
5 Weak-Coupling Limit for Constant Hamiltonian	85
6 Adiabatic Control in the WCL	88
7 CQOP in Non-Markovian–Born Regime	90
8 Controlled Spin-Boson System	92
References	95

Five Lectures on Quantum Information Applications of Complex Many-Body Systems	97
Sougato Bose	
1 Introduction	97
2 Lecture 1	99
3 Lecture 2	102
4 Lecture 3	107
5 Lecture 4	112
6 Lecture 5	118
References	123
 Non-Markovian Quantum Dynamics and the Method of Correlated Projection Super-Operators	125
Heinz-Peter Breuer	
1 Introduction	125
2 The Standard Projection Operator Method	126
3 Correlated Projection Super-Operators	132
4 Generalization of the Lindblad Equation	136
5 Conclusions	138
References	138
 Testing Quantum Mechanics in High-Energy Physics	141
Beatrix C. Hiesmayr	
1 Short Manual to Neutral Kaons	141
2 Bell Inequalities in High-Energy Physics	156
3 Kaonic Quantum Eraser	172
4 Decoherence and Measures of Entanglement	178
References	182
 Five Lectures on Optical Quantum Computing	187
Pieter Kok	
1 Light and Quantum Information	187
2 Two-Qubit Gates and the KLM Scheme	192
3 Cluster States	198
4 Quantum Computing with Matter Qubits and Photons	204
5 Quantum Computing with Optical Nonlinearities	210
References	218
 Quantum Information and Relativity: An Introduction	221
Daniel R. Terno	
1 Causality and Distributed Measurements	221
2 Quantum Lorentz Transformations	225
3 Implications of Quantum Lorentz Transformations	231
4 Communication Channels	240

Contents	xiii
5 Entanglement and Different Lorentz Observers	241
6 Beyond Special Relativity	243
References	246
Index	249