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Nota di contenuto	Coherent States in Quantum Physics; Contents; Preface; Part One Coherent States; 1 Introduction; 1.1 The Motivations; 2 The Standard Coherent States: the Basics; 2.1 Schrodinger Definition; 2.2 Four Representations of Quantum States; 2.2.1 Position Representation; 2.2.2 Momentum Representation; 2.2.3 Number or Fock Representation; 2.2.4 A Little (Lie) Algebraic Observation; 2.2.5 Analytical or Fock-Bargmann Representation; 2.2.6 Operators in Fock-Bargmann Representation; 2.3 Schrodinger Coherent States; 2.3.1 Bergman Kernel as a Coherent State; 2.3.2 A First Fundamental Property 2.3.3 Schrodinger Coherent States in the Two Other Representations2.4 Glauber-Klauder-Sudarshan or Standard Coherent States; 2.5 Why the Adjective Coherent?; 3 The Standard Coherent States: the (Elementary) Mathematics; 3.1 Introduction; 3.2 Properties in the Hilbertian Framework; 3.2.1 A ``Continuity'' from the Classical Complex Plane to Quantum States; 3.2.2 ``Coherent'' Resolution of the Unity; 3.2.3 The Interplay Between the Circle (as a Set of Parameters) and the Plane (as a Euclidean Space); 3.2.4 Analytical Bridge; 3.2.5 Overcompleteness and

Reproducing Properties

3.3 Coherent States in the Quantum Mechanical Context3.3.1 Symbols; 3.3.2 Lower Symbols; 3.3.3 Heisenberg Inequalities; 3.3.4 Time Evolution and Phase Space; 3.4 Properties in the Group-Theoretical Context; 3.4.1 The Vacuum as a Transported Probe...; 3.4.2 Under the Action of...; 3.4.3 ... the D-Function; 3.4.4 Symplectic Phase and the Weyl-Heisenberg Group; 3.4.5 Coherent States as Tools in Signal Analysis; 3.5 Quantum Distributions and Coherent States; 3.5.1 The Density Matrix and the Representation ``R''; 3.5.2 The Density Matrix and the Representation ``Q''

3.5.3 The Density Matrix and the Representation ``P''3.5.4 The Density Matrix and the Wigner(-Weyl-Ville) Distribution; 3.6 The Feynman Path Integral and Coherent States; 4 Coherent States in Quantum Information: an Example of Experimental Manipulation; 4.1 Quantum States for Information; 4.2 Optical Coherent States in Quantum Information; 4.3 Binary Coherent State Communication; 4.3.1 Binary Logic with Two Coherent States; 4.3.2 Uncertainties on POVMs; 4.3.3 The Quantum Error Probability or Helstrom Bound; 4.3.4 The Helstrom Bound in Binary Communication

4.3.5 Helstrom Bound for Coherent States4.3.6 Helstrom Bound with Imperfect Detection; 4.4 The Kennedy Receiver; 4.4.1 The Principle; 4.4.2 Kennedy Receiver Error; 4.5 The Sasaki-Hirota Receiver; 4.5.1 The Principle; 4.5.2 Sasaki-Hirota Receiver Error; 4.6 The Dolinar Receiver; 4.6.1 The Principle; 4.6.2 Photon Counting Distributions; 4.6.3 Decision Criterion of the Dolinar Receiver; 4.6.4 Optimal Control; 4.6.5 Dolinar Hypothesis Testing Procedure; 4.7 The Cook-Martin-Geremia Closed-Loop Experiment; 4.7.1 A Theoretical Preliminary; 4.7.2 Closed-Loop Experiment: the Apparatus

4.7.3 Closed-Loop Experiment: the Results

Sommario/riassunto

This self-contained introduction discusses the evolution of the notion of coherent states, from the early works of Schr?dinger to the most recent advances, including signal analysis. An integrated and modern approach to the utility of coherent states in many different branches of physics, it strikes a balance between mathematical and physical descriptions.Split into two parts, the first introduces readers to the most familiar coherent states, their origin, their construction, and their application and relevance to various selected domains of physics. Part II, mostly based on recent origina