

Sergio A. Albeverio · Raphael J. Høegh-Krohn
Sonia Mazzucchi

Mathematical Theory of Feynman Path Integrals

An Introduction

2nd corrected and enlarged edition

 Springer

Contents

Preface to the Second Edition	V
Preface to the First Edition	VII
1 Introduction	1
2 The Fresnel Integral of Functions on a Separable Real Hilbert Space	3
3 The Feynman Path Integral in Potential Scattering	19
4 The Fresnel Integral Relative to a Non-singular Quadratic Form	37
5 Feynman Path Integrals for the Anharmonic Oscillator	51
6 Expectations with Respect to the Ground State of the Harmonic Oscillator	64
7 Expectations with Respect to the Gibbs State of the Harmonic Oscillator	69
8 The Invariant Quasi-free States	73
9 The Feynman History Integral for the Relativistic Quantum Boson Field	85
10 Some Recent Developments	93
10.1 The Infinite Dimensional Oscillatory Integral	93
10.2 Feynman Path Integrals for Polynomially Growing Potentials	101
10.3 The Stationary Phase Method and the Semiclassical Expansion	108

10.4 Alternative Approaches to Rigorous Feynman	
Path Integrals	115
10.4.1 Analytic Continuation	115
10.4.2 White Noise Calculus Approach	116
10.4.3 The Sequential Approach	120
10.4.4 The Approach via Poisson Processes	123
10.5 Recent Applications	124
10.5.1 The Schrödinger Equation with Magnetic Fields	124
10.5.2 The Schrödinger Equation with Time Dependent Potentials	125
10.5.3 Phase Space Feynman Path Integrals	130
10.5.4 The Stochastic Schrödinger Equation	133
10.5.5 The Chern-Simons Functional Integral	136
References of the First Edition	141
References Added for the Second Edition	149
Analytic Index	173
List of Notations	177