

Contents

1	The Quantization of a Globally Hyperbolic Spacetime	1
1.1	Introduction	1
1.2	Definitions and Notations	4
1.3	Combining the Hamilton Equations with the Hamilton Constraint	7
1.4	The Quantization	17
1.5	The Second Quantization	35
1.6	The Gravitational Waves Model	40
2	Interaction of Gravity with Yang-Mills and Higgs Fields	51
2.1	Gravity Interacting with Other Fields	51
2.2	The Yang-Mills Functional	54
2.3	The Higgs Functional	62
2.4	The Hamilton Condition	64
2.5	The Quantization	68
2.6	The Spectral Resolution	75
3	The Quantum Development of an Asymptotically Euclidean Cauchy Hypersurface	79
3.1	Spectral Resolution of a Hyperbolic Equation	79
3.2	Existence of a Complete Set of Eigendistributions	82
3.3	Properties of $\sigma(A)$ in the Asymptotically Euclidean Case	93
3.4	The Quantization of the Wave Equation	95
4	The Quantization of a Schwarzschild-AdS Black Hole	99
4.1	The Quantum Model	99
4.2	The Quantization	102
4.3	Transition from the Black Hole to the White Hole	110

5	The Quantization of a Kerr-AdS Black Hole	113
5.1	Rotating Black Holes	113
5.1.1	Notations	117
5.2	Preparations	117
5.3	The Quantization	123
6	A Partition Function for Quantized Globally Hyperbolic Spacetimes with a Negative Cosmological Constant	133
6.1	Trace Class Operators	133
6.2	Trace Class Estimates in \mathbb{R}_+	140
6.3	Trace Class Estimates in \mathbb{R}^n	149
6.4	The Hamiltonians Governing Quantum Gravity	159
6.5	The Partition Function	173
6.6	The Friedmann Universes with Negative Cosmological Constants	183
7	Appendix	187
7.1	The Eigendistributions are Smooth Functions	187
	Bibliography	191
	Index	195
	Symbol Index	199