

Contents

1	Introduction	1
1.1	Background	1
1.2	The Quantum Vacuum Problem.	5
1.3	Massive Gravity	8
1.4	Non-local Gravity	14
1.5	Thesis Summary	15
1.6	Notation and Conventions.	16
	References	17
2	Linear Massless/Massive Gauge Theories	21
2.1	Technical Preliminaries.	22
2.1.1	Inverse Differential Operators	22
2.1.2	Degrees of Freedom, Dynamical and Non-dynamical Fields	25
2.2	Standard Lagrangian Approach	26
2.2.1	Spin 1	26
2.2.2	Spin 2	28
2.3	Canonical Formalism	33
2.3.1	Spin 1	34
2.3.2	Spin 2	35
2.4	Harmonic Formalism	41
2.4.1	Spin 1	42
2.4.2	Spin 2	45
2.4.3	de-Sitter Background	51
2.5	Propagator	56
2.5.1	Spin 1	57
2.5.2	Spin 2	60
2.6	Stückelberg Formalism.	62
2.6.1	Spin 1	63
2.6.2	Spin 2	64

2.7	Non-local Formulation	66
2.7.1	Spin 1	66
2.7.2	Spin 2	70
2.7.3	New Non-local Theory.	76
	References	79
3	Subtleties of Non-local Field Theory	81
3.1	Non-local Actions	81
3.1.1	Schwinger–Keldysh Formalism	81
3.1.2	Formal Action.	85
3.1.3	Non-local Path Integral	87
3.2	Localization	88
3.2.1	Quantization	91
3.3	Constrained Dynamical Fields and Classical Stability	93
	References	97
4	Non-local Gravity	99
4.1	Constructing Generally-Covariant Equations of Motion.	100
4.1.1	Projector-Based Models	100
4.1.2	Action-Based Models.	104
4.1.3	The Necessity of Considering the Scalar Mode	106
4.2	Action-Based Models	107
4.2.1	Constructing the Action	107
4.2.2	Curvature Expansion	109
4.2.3	Choosing A_3 and B_3	110
4.2.4	Localization	112
4.2.5	Ghosts	114
4.2.6	Stability	117
4.3	Projector-Based Models	118
4.3.1	Constructing the Equations	118
4.3.2	Localization	119
4.4	Solar System Constrains	120
4.4.1	No Vainshtein Mechanism	120
4.4.2	Constraints on Z	122
4.4.3	The Potentially Viable Models	123
4.5	The Effect of ξ	125
	References	126
5	Cosmology.	129
5.1	Background Equations	129
5.1.1	Action-Based Model	129
5.1.2	Projector-Based Model.	132
5.2	Numerical Analysis	133
5.2.1	Plots and Tables	135

5.3	Analytic Approximations	139
5.3.1	Action-Based Model	140
5.3.2	The Projector-Based Model	143
5.4	Stability	145
	References	146
6	Conclusions	149
	References	153
	Appendix A: Bi-tensors.	155

Infrared Non-local Modifications of General Relativity

Mitsou, E.

2016, XIX, 173 p. 13 illus. in color., Hardcover

ISBN: 978-3-319-31728-1