

# Contents

<b>1</b>	<b>Introduction</b>	1
1.1	The Homogeneous Universe	1
1.1.1	The Friedmann-Lemaître-Robertson-Walker Metric	2
1.1.2	Comoving Distance and Redshift	3
1.1.3	The Friedmann Equations	4
1.1.4	Observations and the Discovery of Dark Energy	5
1.2	The Large Scale Structure of the Universe	8
1.2.1	Growth of Perturbation in $\Lambda$ CDM	10
1.2.2	Galaxy Surveys	12
1.2.3	Weak Lensing	14
1.3	This Thesis	18
	References	19
<b>2</b>	<b>The Effective Field Theory of Dark Energy</b>	21
2.1	The Unitary Gauge Action	22
2.2	ADM Formalism and the Effective Field Theory of Dark Energy	24
2.2.1	Background Evolution	25
2.2.2	The Quadratic Action	27
2.3	Going from Models to the EFT of DE	32
2.4	Stability and Theoretical Consistency	35
2.5	Evolution of Cosmological Perturbations	37
2.5.1	Vector Sector	37
2.5.2	Tensor Sector	38
2.5.3	Scalar Sector	38
2.6	Conclusions	46
	Appendix	48
	References	50
<b>3</b>	<b>Beyond Horndeski</b>	53
3.1	Horndeski Theories	53
3.2	General Considerations on Higher Order Derivatives	55

3.3	Generalized Generalized Galileons $G^3$ . . . . .	57
3.4	Hamiltonian Analysis . . . . .	58
3.5	Field Redefinitions . . . . .	61
3.6	Linear Analysis and Coupling to Matter . . . . .	64
3.6.1	Stability and Ghosts . . . . .	64
3.6.2	Newtonian Gauge and Einstein Frame . . . . .	65
3.7	Conclusions . . . . .	68
	References . . . . .	68
<b>4</b>	<b>Predictions for Primordial Tensor Modes . . . . .</b>	<b>71</b>
4.1	Introduction to Inflation . . . . .	71
4.1.1	The Horizon Problem . . . . .	72
4.1.2	The Predictions of Inflation . . . . .	73
4.1.3	Characteristics of the Fluctuations . . . . .	74
4.2	Tensor Sound Speed and Quadratic Action . . . . .	79
4.3	Other Operators . . . . .	81
4.4	Conclusions . . . . .	83
	References . . . . .	83
<b>5</b>	<b>Consistency Relations of the Large Scale Structure . . . . .</b>	<b>85</b>
5.1	Deriving Consistency Relations . . . . .	86
5.1.1	Several Soft Legs . . . . .	89
5.1.2	Soft Loops . . . . .	91
5.1.3	Soft Internal Lines . . . . .	92
5.2	Going to Redshift Space . . . . .	95
5.3	Violation of the Equivalence Principle . . . . .	96
5.3.1	A Toy Model . . . . .	97
5.3.2	Estimate of the Signal to Noise . . . . .	101
5.4	Conclusions . . . . .	104
	References . . . . .	105
<b>6</b>	<b>Conclusion . . . . .</b>	<b>107</b>
6.1	Summary . . . . .	107
6.2	Outlook . . . . .	108
	References . . . . .	109
	<b>Curriculum Vitae . . . . .</b>	<b>111</b>

Dark Energy and the Formation of the Large Scale  
Structure of the Universe

Gleyzes, J.

2016, XV, 113 p. 19 illus., Hardcover

ISBN: 978-3-319-41209-2