

# Contents

<b>1</b>	<b>Introduction</b>	<b>3</b>
1.1	The Term Plasma . . . . .	3
1.2	Brief history of the Plasma . . . . .	4
1.3	Plasma Types . . . . .	4
1.3.1	Unmagnetized Plasmas . . . . .	5
1.3.2	Magnetized Plasmas . . . . .	5
1.3.3	Thermal Plasmas . . . . .	6
1.4	Plasma Waves . . . . .	6
1.5	Kinetic Theory of Plasmas . . . . .	8
1.5.1	Maxwellian Distribution Function . . . . .	9
1.6	Non-Maxwellian Distribution functions . . . . .	9
1.7	Motivation . . . . .	11
1.8	Layout of the Thesis . . . . .	14
<b>2</b>	<b>Electrostatic Potentials and Energy Loss of a Projectile in Non-Maxwellian Dusty Plasmas</b>	<b>16</b>
2.1	Introduction . . . . .	16
2.2	Mathematical formulation of the problem . . . . .	17
2.3	Derivation of Electrostatic potentials . . . . .	19
2.3.1	Electrostatic potentials of Kappa Velocity Distribution . . . . .	19
2.3.2	Electrostatic potentials of Generalized $(r, q)$ Velocity Distribution	27

2.4	Energy loss of a projectile in Non-Maxwellian Plasma . . . . .	32
2.4.1	Energy loss for Kappa Velocity Distribution . . . . .	33
2.4.2	Energy loss for Generalized $(r, q)$ Distribution Function . . . . .	38
2.5	Numerical Results and Discussion . . . . .	43
<b>3</b>	<b>Generalized Dispersion Relation of Electron Bernstein Waves in Magnetized Non-Maxwellian Plasmas</b>	<b>52</b>
3.1	Introduction . . . . .	52
3.2	Generalized Dielectric Constant in Magnetized Non-Maxwellian Plasmas	53
3.2.1	Dispersion relation of electron Bernstein waves for kappa Distribution Function . . . . .	56
3.2.2	Parallel Propagation in Terms of Kappa Distribution . . . . .	59
3.2.3	Dispersion relation of electron Bernstein waves for $(r, q)$ Distribution	62
3.2.4	Parallel Propagation for $(r, q)$ Distribution . . . . .	66
3.3	Summary and Conclusions . . . . .	71
<b>4</b>	<b>Pure Dust Bernstein Waves in Magnetized Non-Maxwellian Plasmas</b>	<b>73</b>
4.1	Introduction . . . . .	73
4.2	Mathematical formulation of the pure dust Bernstein waves . . . . .	74
4.2.1	Dispersion relation of pure dust Bernstein waves for kappa distribution function . . . . .	74
4.2.2	Dispersion relation of pure dust Bernstein waves for $(r, q)$ distribution function . . . . .	78
4.3	Summary and Conclusion . . . . .	83
<b>5</b>	<b>Summary of the Results and Recommendations for Future Research Work</b>	<b>87</b>