

Contents

NOTE BY SERIES EDITOR	vii
1. Comparison of Plasma and Liquid Turbulence	1
2. General Problems of the Theory of Plasma Turbulence	14
2.1. Excitation of the Turbulent State	14
2.2. Description of Weak Turbulence by the Concept of "Elementary Excitations"	17
2.3. Problems of Correlation Broadening	22
2.4. Problems of Stationary Turbulent Spectra	24
2.5. The Electromagnetic Properties of a Stationary Turbu- lent Plasma	26
3. The Balance Equation for a Turbulent Plasma	27
3.1. The Refractive Index for Waves	27
3.2. Quasi-linear Equations	29
3.3. The Probabilities for Plasmon Emission	32
3.4. The Case of Non-magnetic Particles	35
3.5. Examples of the Quasi-linear Equations	36
3.6. Non-linear Plasmon-Plasmon Interactions	37
3.7. Non-linear Plasmon-Particle Interactions	39
4. Turbulent Collisions and Resonance Broadening	44
4.1. The Balance Equation found by Statistical Averaging	45
4.2. Turbulent Broadening of the Wave-particle Resonance	53
4.3. Broadening of the Wave-Wave Interactions and Corre- lation Functions in a Turbulent Plasma	58
5. The Spectrum and Correlation Functions of Ion-sound Turbulence	62
5.1. Introduction	62
5.2. The Influence of the Turbulent Collisions	65
5.3. The Electron Ion-sound Non-linear Interactions	66
5.4. The Wave-Wave Interaction of Ion-sound Oscillations	69
5.5. The Anomalous Resistivity of the Plasma	70

6. The Spectrum and Correlation Functions of Langmuir Turbulence	74
6.1. The Spectrum of Small-scale Langmuir Turbulence	76
6.2. The Spectrum of Langmuir Turbulence in the Intermediate-scale Region	77
6.3. The Spectrum of Langmuir Turbulence in the Large-scale Region	79
6.4. The Spectrum of Langmuir Turbulence in a Non-isothermal Plasma	82
6.5. The Radiative Type of Langmuir Turbulence Spectra	83
6.6. Stochastic Plasma Heating in the Case of Langmuir Turbulence	87
6.7. Stochastic Acceleration of Fast Particles	88
6.8. Correlation Effects for Langmuir Oscillations	91
7. Electromagnetic Properties of a Turbulent Plasma	93
7.1. Expansion of Turbulent Collision Integrals in Terms of the Turbulent Energy	95
7.2. Effects of Turbulent Resonance Broadening	99
7.3. The Dielectric Constant for Ion-sound Turbulence	99
7.4. Electromagnetic Properties of Langmuir Turbulence	101
8. The Cosmic-ray Spectrum	105
8.1. Energy-dependence of the Acceleration Rate	106
8.2. Energy-dependence of Resonant Wave-particle Interactions	109
8.3. Acceleration by Low-frequency Turbulence	111
8.4. Acceleration by High-frequency Turbulent Oscillations	117
CONCLUSIONS	128
REFERENCES	130
INDEX	133