

Contents

<i>Preface</i>	vii
Introduction	1
List of Notations	4
References	5
 CHAPTER 1 / General Theory of Fluctuations	
1. Space-Time Correlation Functions	6
2. Spectral Distribution of the Fluctuations and Energy Dissipation in the Medium	7
3. Properties of the Tensor of the Linear Relating Coefficients α_{ij}	13
4. Two-Particle Green's Function	15
References	18
 CHAPTER 2 / Electromagnetic Fluctuations in Media with Space-Time Dispersion	
1. Dielectric Permittivity Tensor	19
2. The Wave Equation	21
3. Dielectric and Magnetic Permittivities in a Medium with Spatial Dispersion	25
4. Current, Charge, and Field Fluctuations in a Medium	26
5. Fluctuations in an Isotropic Medium	28
6. Inversion of the Fluctuation-Dissipation Theorem	32
References	35
 CHAPTER 3 / Electrodynamical Properties of an Electron Plasma	
1. Space-Time Dispersion in Plasma	36
2. Space-Time Correlation Functions for a System of Noninteracting Particles	37
3. Determination of the Plasma Dielectric Permittivity Tensor	40
4. Electromagnetic Waves in Plasma	45
5. Relativistic Plasma	47
6. Nonequilibrium Plasma and Stability	49
References	53

CHAPTER 4 / **Electromagnetic Fluctuations in an Electron Plasma**

1. Fluctuations in an Electron Plasma	54
2. Charge Density Fluctuations	55
3. Current-Density Fluctuations	58
4. Electromagnetic Field Fluctuations	59
Reference	60

CHAPTER 5 / **Taking Account of Ion Motion. Fluctuations in an Electron-Ion Plasma**

1. Dielectric Permittivities of a Plasma Taking Account of Ion Motion	61
2. Longitudinal Waves in an Electron-Ion Plasma	65
3. Fluctuations in Charge and Current Densities in an Equilibrium Electron-Ion Plasma	67
4. Electron and Ion Density Fluctuations in an Equilibrium Plasma	68
5. Fluctuations in a Nonisothermal Electron-Ion Plasma (Isotropic Case)	71
6. Fluctuations in a Nonisothermal Electron-Ion Plasma (Anisotropic Case)	77
7. Fluctuations in a Nonequilibrium Plasma	79
8. Collective Fluctuations. Effective Temperature	83
9. Field Fluctuations in a Plasma-Beam System	85
References	88

CHAPTER 6 / **Electron Plasma in a Magnetic Field**

1. Plasma Dielectric Permittivity Tensor in a Magnetic Field	89
2. Electromagnetic Waves in a Plasma in a Magnetic Field (without Taking Account of the Thermal Electron Motion)	96
3. Electromagnetic Waves in a Plasma in a Magnetic Field (Taking Account of Thermal Electron Motion)	98
4. Longitudinal Plasma Oscillations in a Magnetic Field	102
5. Electromagnetic Fluctuations in an Electron Plasma in the Presence of a Magnetic Field	106
References	109

CHAPTER 7 / **Electron-Ion Plasma in a Magnetic Field**

1. Taking Account of Ion Motion in a Magnetoactive Plasma	110
2. Ion Cyclotron Resonance	113
3. Magnetohydrodynamic Waves	115
4. Low-Frequency Fluctuations in a Magnetoactive Plasma	119
5. Fluctuations in a Nonequilibrium Magnetoactive Plasma	119
References	122

CHAPTER 8 / Passage of Charged Particles through Plasma

1. Field of Charge in a Plasma. Shielding	123
2. Energy Losses in Charged-Particle Motion in a Plasma	125
3. Polarization Energy Losses of a Fast Particle in a Plasma	126
4. Change in Energy of a Moving Charge due to Field Fluctuations in the Plasma	130
5. Influence of Ions on the Energy Change of a Particle Moving in a Plasma	136
6. Energy Losses of a Charged Particle in a Nonequilibrium Plasma	137
References	138

**CHAPTER 9 / Dynamic Friction and Diffusion
Coefficients in a Plasma**

1. Fokker-Planck Equation	139
2. Dynamic Friction and Diffusion Coefficients in an Electron Plasma	143
3. Friction and Diffusion Coefficients in a Two-Temperature Plasma	145
4. Relaxation Time of a Nonisothermal Plasma	148
References	150

**CHAPTER 10 / Electromagnetic Wave Scattering by
Fluctuations in Plasma**

1. Wave Scattering and Transformation	151
2. Electromagnetic Wave Propagation in a Plasma	152
3. Electromagnetic Wave Scattering. Differential Scattering Coefficient	154
4. Total Scattering Coefficient for an Isothermal Plasma	157
5. Spectral Distribution of Scattering	158
6. Transformation of Transverse into Longitudinal Electromagnetic Waves	164
7. Longitudinal Wave Transformation and Scattering in a Plasma	166
References	167

**CHAPTER 11 / Scattering of Electromagnetic Waves
by Fluctuations in a Plasma in the
Presence of a Magnetic Field**

1. General Formula for the Scattering Cross Section in the Presence of a Magnetic Field	168
2. Electromagnetic Wave Scattering by Density Fluctuations	172
3. Electromagnetic Wave Scattering by Langmuir Fluctuations	175

4. Electromagnetic Wave Scattering by Alfven and Magnetosonic Fluctuations	176
References	178
 CHAPTER 12 / Quantum Plasma. Fluctuations in a Degenerate Electron Gas	
1. Space-Time Correlations of Fluctuations in an Ideal Fermi Gas	179
2. Longitudinal and Transverse Dielectric Permittivities of a Quantum Electron Gas	183
3. Dispersion of Plasma Oscillations	185
4. Fluctuations in a Degenerate Electron Gas	186
References	191
 CHAPTER 13 / Fluctuations in a Superconducting Plasma	
1. Superconducting State in a System of Electrons	192
2. Density Fluctuations in a Superconductor	194
3. Density Fluctuations Associated with Collective Excitations	198
4. Current Fluctuations in a Superconductor	200
5. Electromagnetic Properties of a Superconductor	202
References	205
 <i>Bibliography</i>	206
 <i>Author Index</i>	245
 <i>Subject Index</i>	252