

Contents

1.	Introduction	1
1.1.	Localization of Weakly Nonideal Plasmas in the Density-Temperature Plane	2
1.2.	Occurrence of Weakly Nonideal Plasmas and Phenomena Expressing Non-Ideality	4
2.	Description of Ideal and Weakly Nonideal Plasmas	10
2.1.	Equilibrium Plasma Composition	11
2.2.	Transport Processes in Ideal Plasmas	13
2.2.1.	The Transport Equation	15
2.2.2.	The Electric Transport Coefficients	18
2.2.3.	Evaluation of Transport Cross-Sections	24
2.2.3.1.	Charged Particle Interactions	25
2.2.3.2.	Interactions of Electrons with Neutral Particles	30
2.3.	Non-Ideality Corrections to the Transport Coefficients	34
2.3.1.	Effects of Short-Range Forces	36
2.3.2.	Non-Debye Screening	39
2.3.3.	Electron-Ion Correlation Effects	43
2.3.4.	Corrections for Stronger Non-Ideality	48
3.	Production of Weakly Nonideal Plasmas in the Laboratory	51
3.1.	Behaviour of Nonideal Plasmas under Experimental Conditions	51
3.1.1.	Loss Mechanisms	51
3.1.2.	Radial Temperature Profiles	52
3.1.3.	Time Development and Stability	54
3.2.	Devices	57
3.2.1.	Stationary High-Pressure Arcs	58
3.2.2.	Radiation-Generated Plasmas	59
3.2.3.	Shock Waves	59
3.2.4.	High-Density Plasmas Produced by Adiabatic Compression or Wire Explosion	60
3.2.5.	Pulsed Wall-Stabilized Discharges at High Pressure	60
3.2.5.1.	Limits of the Arc Pressure	61
3.2.5.2.	Discharge Circuits	61

3.2.5.3.	Ignition and Build-Up of the Arc Column	63
3.2.5.4.	Power Ratings and Temperature	65
3.2.5.5.	Discharge Tube	66
4.	Determination of Plasma Parameters	69
4.1.	Temperature	70
4.2.	Pressure	75
4.3.	Particle Number Densities	76
5.	Evaluation of Transport Properties from the Experiment	83
5.1.	Derivation of the Electrical Conductivity from Experimental Data	83
5.1.1.	Integral Method for the Evaluation of the Electrical Conductivity	83
5.1.2.	Trial Function Methods	85
5.2.	Electrical Characteristics of Pulsed Discharges	87
5.3.	Comparison of Published Electrical Conductivities	91
6.	Diagrams of Calculated Conductivities	98
7.	Supplement	101
8.	References	103
9.	Subject Index	113