Principles of Plasma Electrodynamics (Springer Series in Electronics and Photonics)

By A. F. Alexandrov, L. S. Bogdankevich, A. A. Rukhadze

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The manuscript tackles one of the most interesting branches of plasma phys ics, the electrodynamics of the plasma. 99% of matter in the universe occur in the plasma state, - e. g. , stars, gaseous nebulae, interstellar gas. The plasma also widely occurs on earth. Thus, the ionosphere protects human beings from the destroying effects of the solar radiation and provides the long distance radio communication. Plasmas also show up in metals and semicon ductors, and it is difficult to overestimate their importance in our everyday life. But even more important is that the power engineering of the future is connected with plasmas since the plasma is the fuel for thermonuclear reca tions and a practically unlimited source of energy harmless to the environ ment. For the description of a hot plasma a unique logically complete and consistent theoretical model has been developed on the basis of the Maxwell Vlasov equations. We tried to carry this idea through the entire text, which aims to present an orderly exposition of electromagnetic properties of the plasma within the Maxwell-Vlasov model. Both linear and nonlinear elec trodynamics of the plasma are presented. The first part (Chap. 1-5) deals with the linear electromagnetic properties of the plasma in thermodynamic equilibrium. The basic equations of the Maxwell-Vlasov model are introduced and the properties of the plasma in equilibrium are studied in the linear approximation of the electromagnetic field. The second part (Chaps.

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