3D DIAGNOSTICS OF ANISOTROPIC ELECTRON AND ION DISTRIBUTION FUNCTIONS IN PLASMA

A.S. Mustafaev, A.Y. Grabovskiy, M.A. Ainov, A.A. Strakhova

National Mineral-Resources University (Mining University), Saint-Petersburg, Russia, rectorat@spmi.ru

This talk generalizes our recent results, obtained in different directions of plasma diagnostics. First-method of flat single-sided probe, based on expansion of the electron velocity distribution function (EVDF) in series of Legendre polynomials. It will be demonstrated, that flat probe, oriented under different angles with respect to the discharge axis, allow to determine full EVDF in nonlocal plasmas. It is also shown, that cylindrical probe is unable to determine full EVDF.

We propose the solution of this problem by combined using the kinetic Boltzmann equation and experimental probe data. Second-magnetic diagnostics. This method is implemented in knudsen diode with surface ionization of atoms (KDSI) and based on measurements of the magnetic characteristics of the KDSI in presence of transverse magnetic field. Using magnetic diagnostics we can investigate the wide range of plasma processes: from scattering cross-sections of electrons to plasma-surface interactions.

Third-noncontact diagnostics method for direct measurements of EVDF in remote plasma objects by combination of the flat single-sided probe technique and magnetic polarization Hanley method.

In plasma of helium and mercury glow discharge probe method has been successfully applied for measurements of electron and ion distribution functions. The reliability of the method has been tested by comparing experimentally measured distributions of electrons and ions with results of theoretical calculations, taking into account ambipolar field in plasma.