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# DETERMINATION OF THE KINETIC PARAMETERS OF A SUPERSONIC PLASMA FLOW OF A GAS-DISCHARGE SOURCE FROM THE CURRENT MEASURED BY AN INSULATED PROBE SYSTEM

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The aim of this work is to develop a procedure for determining the kinetic parameters of charged particles in a supersonic jet of a gas-discharge source of collisionless plasma by measuring the current collected by an insulated probe system of cylindrical electrodes placed transversely to the jet. Based on the authors' mathematical model of current collection by the above-mentioned probe system and asymptotic solution for the probe current in the electron saturation region, the ion temperature and directed velocity and the electron temperature are related to the measured probe current.

The effect of the probe system parameters and the current and voltage measurment error on the reliability of diagnostics of a diatomic gas-discharge plasma is studied. Within the framework of the probe current collection model for the electron saturation region, numerical and analytical estimates of the errors in determining the kinetic plasma parameters are obtained as a function of the geometric parameters of the probe system, the accuracy of probe current measurement, and the bias potential of the probe relative to the potential of the reference electrode. The measuring-to-reference electrode area ratio and the probe current measurement conditions optimal for adequate estimation of the average kinetic energy and the directed velocity of ions in a supersonic gas-discharge plasma jet are determined. A priori quantitative characteristics of the effect of the probe measurement errors on the reliability of the determination of the charged particle kinetic parameters are given.

The reported procedure and estimates of the error in kinetic plasma parameter determination allow one to choose the probe system parameters and estimate the required measurement accuracy when planning and conducting experiments on laboratory plasma diagnostics.

Keywords: collisionless plasma jet, kinetic energy of charged particles, ion directed velocity, mathematical model of current collection, electron saturation region, parameter determination error estimate.

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