

Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Non-invasive determination of kinetic ion quantities and plasma parameters throughout the plasma sheath and bulk TSANKO VASKOV TSANKOV, UWE CZARNETZKI, Institute for Plasma and Atomic Physics, Ruhr University Bochum, 44780 Bochum, Germany — Ion velocity distribution functions (IVDF) are routinely measured to obtain information about the ions interacting with the surface. Here, we show that in charge-exchange (CX) collision dominated plasmas the distribution of the ions at the walls contains also information about the spatial distribution of the plasma parameters. This information can be extracted with the help of an exact solution of the Boltzmann equation including CX and ionization. Using the translation property of the solution the IVDF at any point in the plasma is reconstructed from the one measured at the wall. These spatially resolved distributions give the ionic parameters (density, mean velocity, energy and temperature) as exact kinetic averages. Further, the electric field, the plasma potential, and the electron density and temperature are also obtained from the IVDF. Good agreement with probe measurements is found. The method is most sensitive in the sheath and the near sheath region where the charge separation can be readily obtained. Results from an inductively-coupled plasma in neon are shown.

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Date submitted: 10 Jun 2016

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