

IMPROVED ECR EXTRACTION AND TRANSPORT SIMULATIONS USING EXPERIMENTALLY MEASURED PLASMA SPUTTERING

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Abstract

Simulations of beam extraction across a plasma sheath in an ECR ion source are critically dependent upon ion density distributions at the plasma extracting face; however, these distributions have not been measured experimentally. We present a new method of defining the initial distributions for simulation based upon the measurement of biased disc sputter marks. Multi-species beam extraction and transport simulations using these initial conditions will be compared with beam imaging and emittance measurements from the superconducting ECR VENUS at several positions along the beam line illustrating this simple model's ability to reproduce measured beam characteristics such as beam hollowing even though the triangular distributions at plasma extraction are of nearly constant density. The various possible sources of the beam hollowing observed both in simulation and experiment will be discussed. In addition, we will present a generalized method to define the initial distribution at extraction using only magnetic field line tracing and extracting aperture geometry.

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