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Validation of Boltzmann-Poisson Continuum Code with LIF measurements of Plasma Sheath in an Oblique Magnetic Field[1] SHANE KENILEY, DAVIDE CURRELI, University of Illinois at Urbana-Champaign, Department of Nuclear, Plasma, and Radiological Engineering, DEREK S. THOMPSON, MIGUEL F. HENRIQUEZ, DAVID D. CARON, ANDREW J. JEMIOLO, JACOB W. MCLAUGHLIN, MIKAL T. DUFOR, LUKE A. NEAL, EARL E. SCIME, West Virginia University, Department of Physics, M. UMAIR SIDDIQUI, Phase Four, Inc.
— Here we present the first fully three-dimensional validation of a 1D3V Boltzmann-Poisson continuum solver against 3D LIF measurements of ion and neutral velocity distribution functions taken in a magnetized plasma sheath. The multi-species full-f plasma model is solved with finite volumes in the phase-space and computes the velocity distribution functions of plasma species, facilitating a direct comparison to LIF data in the magnetic presheath. LIF measurements were taken near an absorbing boundary with a magnetic field obliquely incident to the surface. The plasma model incorporates ionization and charge exchange through a BGK collision operator, with reaction rates computed directly through convolution with the distribution functions. Results clearly display the 3D structure of the magnetized sheath, including acceleration along the ExB direction. LIF measurement work was supported by U.S. National Science Foundation Grant No. PHY-1360278.

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