Abstract Submitted
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**Modeling Two-Charge State Helium Plasmas**[1] GILBERT EMMERT, JOHN SANTARIUS, Fusion Technology Institute, Univ. of Wisconsin — A computational model for the flow of energetic helium ions and atoms through a background neutral helium gas is being developed. The essence of the method is to consider atomic reactions as creating a new source of ions or neutrals if the energy or charge state of the resulting particle is changed. A set of conservation equations in a two-dimensional (position – energy) phase space is formulated. Atomic reactions that lead to ions being born with zero kinetic energy are modeled with a 1-D Volterra integral equation [1] that can quickly be solved numerically by finite differences. Atomic reactions leading to ions being born with finite kinetic energy are formulated as source terms in the position-energy phase space. The conservation equations are solved iteratively using the solution to the Volterra equation as a starting point. The current work focuses on multiple-pass, 1-D ion flow through neutral gas in a nearly transparent anode and cathode pair in planar, cylindrical, and spherical geometry for application to $^3$He-$^3$He and D-$^3$He inertial electrostatic experiments.

[1] G.A. Emmert and J.F. Santarius, "Atomic and Molecular Effects on Spherically Convergent Ion Flow I: Single Atomic Species," Phys. Plasmas 17, 013502 (2010)

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