Modeling Two-Charge State Helium Plasmas\textsuperscript{1} GILBERT EM- 
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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 equa-
tions 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 \cite{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 conserva-
tion 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. 

\textsuperscript{1}\cite{1} G.A. Emmert and J.F. Santarius, “Atomic and Molecular Effects on Spherically 

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