Integral Transport Analysis Results for Ions Flowing Through Neutral Gas[1] GILBERT EMMERT, JOHN SANTARIUS, UW-Madison — Results of a computational model for the flow of energetic ions and neutrals through a background neutral gas will be presented. The method models reactions as creating a new source of ions or neutrals if the energy or charge state of the resulting particle is changed. For a given source boundary condition, the creation and annihilation of the various species is formulated as a 1-D Volterra integral equation [1] that can quickly be solved numerically by finite differences. The present work focuses on multiple-pass, 1-D ion flow through neutral gas and a nearly transparent, concentric anode and cathode pair in spherical, cylindrical, or linear geometry. This has been implemented as a computer code for atomic (3He, 3He+, 3He++) and molecular (D, D2, D-, D+, D2+, D3+) ion and neutral species, and applied to modeling inertial-electrostatic connement (IEC) devices. The code yields detailed energy spectra of the various ions and energetic neutral species. Calculations for several University of Wisconsin IEC and ion implantation devices will be presented. [1] G.A. Emmert and J.F. Santarius, "Atomic and Molecular Effects on Spherically Convergent Ion Flow I: Single Atomic Species & II: Multiple Molecular Species", Phys. Plasmas 17, 013502 & 013503 (2010).

John Santarius
UW-Madison

Date submitted: 14 Jul 2017   Electronic form version 1.4