Abstract Submitted
for the DPP08 Meeting of
The American Physical Society

Molecular Ion and Non-Zero Birth Velocity Effects in IEC Modeling[1] GILBERT EMMERT, JOHN SANTARIUS, University of Wisconsin — An inertial-electrostatic confinement (IEC) chamber contains nearly transparent, concentric wire grids with a high voltage difference between them. At typical ∼0.3 Pa (∼2 mtorr) pressures, atomic and molecular processes can be important. Source region ions pass through the anode grid as a mixture of D^+, D_2^+, and D_3^+ ions, accelerate radially, and interact with the background gas to produce a cold ions (D^+ and D_2^+) through interactions with the background D_2 gas. These cold ions accelerate and produce additional cold ions through interactions with the background gas. A 1-D model for the effect of various molecular and atomic processes between deuterium ions (D^+, D_2^+, and D_3^+) and the background gas on the performance of spherical, gridded IEC devices has been developed. This formalism includes the bouncing motion of ions in the potential well and sums over all generations of cold ions. This leads to a set of coupled Volterra integral equations, which are solved numerically to yield the energy spectrum of the ion and fast neutral flux plus the neutron production. Recent improvements in the model, including non-zero ion birth velocities, will be discussed. Parametric surveys and comparison with experimental data for the Wisconsin IEC devices will be presented.

[1]Research funded by US DOE grant DE-FG02-04ER54745.

John Santarius
University of Wisconsin

Date submitted: 15 Jul 2008