Abstract Submitted
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Model of fusion kinetics for electrostatic inertial confinement discharges in D_2 A.V. PHELPS, JILA, University of Colorado and NIST — A model[1] of the collisional kinetics of low-pressure glow discharges in H_2 is extended to predict the energy spectrum of the protons from the D-D fusion reaction in the deuterium-filled, inertial electrostatic confinement device of Boris et. al.[2] Deuterium and hydrogen cross sections are assumed equal. D^+, D_2^+, or D_3^+ ions injected into a potential minimum created by cathode grid wires produce positive and negative ions, fast neutrals, and electrons. D nuclei undergo D-D fusion reactions with the background D_2 and produce protons with Doppler shifted peaks above and below the reaction energy of 3.02 MeV. The model shows the highest fusion flux, a good fit to the proton spectrum, and at good fit of the calculated[1] anion energy distribution to experiment[3] with D_3^+ injection using an effective discharge voltage of 27 kV for an applied voltage of 70 kV. The calculated proton flux is $\sim 10^{-10}$ of the injected ion flux. Predicted deuterium ion energy distributions are very different from that unfolded[2] from the proton spectrum. With D_2^+ injection, the proton flux is reduced by about an order of magnitude.

[1]A. V. Phelps, *Plasma Sources Sci Technol.* **20**, 043001 (2011).
[2]D. R. Boris, et. al. *J. Appl. Phys.* **107**, 123305 (2010).
[3]D. R. Boris, et. al. *Phys. Rev. E* **80**, 036408 (2009).

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