Calculation of the Ion Extraction Boundary of a Plasma Ion Source SCOTT KOVALESKI, University of Missouri-Columbia — The hypothesis that an unmagnetized plasma will form a meniscus sheath above an ion extraction aperture on the electric field magnitude contour, $|E| = E_p = T_e/\lambda_D$, is tested. The hypothesis is assumed to be true, that the ion extraction surface of a single aperture ion extraction optic is given by the vacuum Laplace electric field magnitude contour equal to E_p. The ion current extracted from this surface for a single aperture is calculated analytically. The analytically calculated current is compared to a particle-in-cell simulation of ion extraction from a single aperture, for densities ranging from $1.49 \cdot 10^{14}$ to $1.49 \cdot 10^{20} m^{-3}$ and electron temperatures of 1.35 to 2.7 eV. The simulated extraction current and extraction area agrees with the calculated current and area very well, with deviations of only 0.1 to 8 % relative to the simulated value.

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