

Abstract Submitted
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Ion Sheath Creation in the Inductively Coupled Plasma Mass Spectrometer JOSEPH CHANDLER, Brigham Young University — Between the skimmer cone and the mass analyzer of an Inductively Coupled Plasma Mass Spectrometer (ICP-MS) lies an electrostatic ion lens. This lens uses a large negative potential to remove the electrons from the weakly ionized plasma and to collimate the ions in the plasma, forming a plasma sheath. This interaction can be modeled computationally by using Boltzmann electrons and collisionless ions. Their combined effects can be used to calculate the potential and the ion density within this region. For simplification, this calculation is carried out on a cylindrically symmetric grid. This version of Poisson's equation is a second order nonlinear partial differential equation which is solved using a banded-matrix direct solver. The solution is found by iterating until self-consistent values for the potential as a function of position are obtained. This is a plasma sheath calculation, but no ion pre-sheath is needed due to the supersonic velocities of the ions. By calculating the position of the plasma sheath as a function of the ion lens potential we can better describe how the ion lens directs the ions into the mass spectrometer.

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