Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Ion extraction and sheath physics in the Inductively Coupled Plasma Mass Spectrometer ROSS SPENCER, Brigham Young University — The plasma in an Inductively Coupled Plasma Mass Spectrometer (ICP-MS) is weakly ionized and supersonic. Just before the ions in the instrument pass into the mass analyzer, the electrons are removed from the plasma by means of an ion lens which has a relatively large negative potential. This step in the process can be modeled by assuming collisionless ions and Boltzmann electrons coupled to the ion density. The calculation is carried out on an axisymmetric grid in cylindrical geometry using a banded-matrix direct solver for Poisson's equation and iterating on the ion trajectories and the electron density until a self-consistent arrangement of ion and electron densities is obtained. This is a sheath calculation, but without the need for a pre-sheath since the plasma has already been accelerated to high velocity before reaching the ion lens. The behavior of this interesting electrostatic sheath for various values of the extraction potential will be discussed.

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Date submitted: 23 Jul 2015 Electronic form version 1.4