

Abstract Submitted
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Measuring plasma potential with an impedance probe in low density plasma¹ DAVID WALKER, Sotera, inc., DAVID BLACKWELL, RICHARD FERNSLER, WILLIAM AMATUCCI, Naval Research Laboratory — A recent rf technique for determining plasma potential, ϕ_p , using an impedance probe was shown to be independent of probe geometry, magnetic field, and orientation. However, a problem which arises in low density plasma concerns a magnitude mismatch between typical network analyzer input impedance ($Z_0 = 50 \Omega$) and the large value of ac resistance (R_{ac}) which is inversely proportional to n_e . The method relies on finding a minimum in $Re(Z_{ac})$ ^{2,3} which is difficult if R_{ac} is much larger than Z_0 . For low density space plasmas ($10^4 - 10^5 \text{ cm}^{-3}$) values of R_{ac} range to $\text{k}\Omega$ levels. We have developed numerical simulations based on solving the Boltzmann equation in spherical geometry for a given sheath size. These simulations include a presheath and predict values for Z_{ac} which are then used to estimate the error as a function of input impedance based on the error associated with a 50Ω load.

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²*Phys. Plasmas* **17**, 113503 (2010).

³*NRL Memorandum Report 6750-12-9413* (2012).

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