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RF inductive probe to measure plasma complex conductivity

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A method for measuring plasma complex electrical conductivity is described by which plasma parameters such as the electron density and the electron-neutral collision frequency can be estimated. The method relies on the measurement of the impedance of an inductive element coupled to the plasma by mutual induction. The mutual inductance due to the plasma coupling is interpreted by applying the complex image method to the plasma medium [1]; it is determined by the plasma skin depth and the distance to the plasma. For high frequency measurements, capacitive coupling must also be accounted for as a first order correction for standing wave (transmission line) effects. It is shown that a hybrid resonant network configuration can be designed to maximize the inductive coupling and minimize the capacitive coupling. [1] Ph. Guittienne, R. Jacquier, A. A. Howling and I. Furno, Plasma Sources Sci. Technol. Vol. 24, 065015 (2015).