

Abstract Submitted
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Matched dipole probe for precise electron density measurements in magnetized and non-magnetized plasmas¹ DMYTRO RAFALSKYI, ANE AANESLAND, LPP - Ecole Polytechnique — We present a plasma diagnostics method based on impedance measurements of a short matched dipole placed in the plasma. This allows measuring the local electron density in the range from 10^{12} - 10^{15} m^{-3} with a magnetic field of at least 0-50 mT. The magnetic field strength is not directly influencing the data analysis and requires only that the dipole probe is oriented perpendicularly to the magnetic field. As a result, the magnetic field can be non-homogeneous or even non-defined within the probe length without any effect on the final tolerance of the measurements. The method can be applied to plasmas of relatively small dimensions (< 10 cm) and doesn't require any special boundary conditions. The high sensitivity of the impedance measurements is achieved by using a miniature matching system installed close to the probe tip, which also allows to suppress sheath resonance effects. We experimentally show here that the tolerance of the electron density measurements reaches values lower than 1%, both with and without the magnetic field. The method is successfully validated by both analytical modeling and experimental comparison with Langmuir probes. The validation experiments are conducted in a low pressure (1 mTorr) Ar discharge sustained in a 10 cm size plasma chamber with and without a transversal magnetic field of about 20 mT.

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