

Characterization of Helicon Plasma Produced by an $m = 0$ Antenna in Cylindrical Geometry

Abstract

Helicon plasmas are widely studied due to their ability to generate high-density plasmas efficiently and their applications in plasma processing, electric propulsion, and fundamental plasma physics research. The present project aims to investigate the properties of helicon plasma produced using an $m = 0$ antenna in a cylindrical plasma device. Particular emphasis will be placed on understanding plasma production, wave propagation, and the influence of operating parameters on plasma characteristics.

Plasma diagnostics will be performed using a Langmuir probe and a B-dot probe. The Langmuir probe will be employed to determine key plasma parameters such as electron density, electron temperature, plasma potential, and floating potential. The B-dot probe will be used to measure the magnetic field fluctuations associated with helicon wave propagation and to study the spatial structure of the excited waves. Measurements will be carried out over a range of radio-frequency powers, neutral gas pressures, and magnetic field strengths to examine their effects on plasma generation and confinement.

The student will actively participate in the design, fabrication, calibration, and testing of the diagnostic probes, as well as in experimental measurements and data analysis. Through this project, the student will gain practical experience in plasma diagnostics, vacuum technology, RF plasma generation, data acquisition, and the physics of wave-plasma interactions, providing a strong foundation for further research in experimental plasma physics.

Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: M.E./M.Tech Electrical

3) Academic Project duration:

(a) Total academic project duration: 52 Weeks

(b) Student's presence at IPR for academic project work: 5 Full working Days per week

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