Characterization of ECR and RF Plasma in the Simple Tight Aspect Ratio Machine Assembly (STARMA)

Abstract

The Simple Tight Aspect Ratio Machine Assembly (STARMA) is a compact, table-top toroidal plasma confinement system designed to investigate plasma behaviour in low aspect ratio geometries. The device has a major radius of 10.4 cm and a minor radius of 6.8 cm, giving it an aspect ratio of approximately 1.5, which makes it a tight aspect ratio toroidal system. Such configurations are attractive because they provide insight into plasma stability and confinement characteristics in geometries similar to spherical tokamaks, but at a significantly reduced scale and cost.
Plasma generation in STARMA is achieved using microwave sources at 2.45 GHz employing the electron cyclotron resonance (ECR) frequency at 875 Gauss. The plasma generation using 13.56 MHz will be explored to study ECR heating in a microwave produce plasma. The combination of these microwave systems allows for systematic studies of plasma initiation, heating, and sustainment.
To address issues of charge imbalance and to improve plasma confinement, the system is also equipped with a set of vertical field (VF) coils, which help minimize charge separation effects by generating a corrective vertical magnetic field. Optimizing the VF coil current is crucial for reducing asymmetries and maintaining stable plasma equilibrium within the tight aspect ratio configuration.

Academic Project Requirements:

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

2) Name of course with branch/discipline: M.Sc. Physics

3) Academic Project duration:

(a) Total academic project duration: 35 Weeks
(b) Student's presence at IPR for academic project work: 5 Full working Days per week

Email to: jagabandhu.kumar@ipr.res.in[Guide's e-mail address] and
project_phy@ipr.res.in [Academic Project Coordinator's e-mail address]

Phone Number: 079 -2179 [Guide's phone number]