

Effect of Error Fields on Plasma in Spherical Tokamak Devices and Methods to Compensate Them

Abstract

This project will study how error fields affect plasma behaviour in Spherical Tokamak (ST) devices. Error fields are small unwanted magnetic fields created by coil misalignments, power feed connections, or manufacturing imperfections. Even tiny error fields can cause problems such as locked modes, braking of plasma rotation, and poor confinement.

The project will have two main parts. First, the student will calculate the magnetic fields produced by different coil sets in the tokamak and integrate eddy current modelling in to it. This will involve using Biot-Savart law and numerical methods to model the contribution of each coil. Second, the student will explore compensation techniques using external correction coils and feedback systems.

Student can use AI-based tools to simulate time-varying conditions. This will help predict how error fields change during plasma discharges and how best to correct them in real time.

This work is important for understanding time varying compensation techniques that improve the performance and stability of tokamak devices.

The project is suitable for a BSc Physics student.

Academic Project Requirements:

1) Required No. of student(s) for academic project: 2

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

3) Academic Project duration:

(a) Total academic project duration: 12 Weeks

(b) Student's presence at IPR for academic project work: 2 Full working Days per week

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