Seminar

Institute for Plasma Research

Title : External-q Experiments in Current-less Plasma of Basic Experiments in Toroidal Assembly (BETA)

Speaker: Dr. Pravesh Dhyani
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Date : 14th June 2023 (Wednesday)

Time : 10.30 AM

Venue : Online - Join the talk:
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(Conference ID: 2553523078; Password: 844329)

Abstract:

Tokamaks are believed to be the most viable of magnetic configurations for achieving thermonuclear fusion. The main reason for particle-confinement in tokamaks is due to the formation of magnetic flux surfaces created by an external toroidal B-field and a poloidal B-field created by plasma current, which allows "closed" single particle trajectories. However, such magnetic configurations, qualified by q-profiles or rotational transforms, are marred by MHD instabilities (such as tearing modes).

To understand equilibrium and transport in a magnetic flux surface configuration, but, without the MHD instabilities, we propose an external-q profile experiments in BETA. These experiments aim to study electrostatic instabilities in magnetic geometries relevant to tokamak. For the experiments, a poloidal component of magnetic field will be introduced by installing a toroidal copper conductor at the minor axis of the vacuum vessel. Toroidal current-carrying conductor and its supporting structure have been designed and currently being fabricated. Preparatory ground work has been completed for installing external-q conductors.

Proposed experiments will be performed in electron cyclotron resonance (ECR) produced plasma. A 2.45GHz magnetron source based ECR system has been installed and tested for this purpose. Electric probes such as Mach probe, Reynolds stress probe and triple Langmuir probe, and their electronic circuits have been developed for the measurements of the plasma parameters such as plasma density, floating potential, electron temperature, mean and fluctuations driven flows at quasi-concentric flux surfaces during the external-q experiments.

We report preliminary measurements on radial profiles of plasma density, floating potential, and mean poloidal flows in current filament discharges establish working of probes and newly developed electronic circuits. Design of copper bus bars to carry current to the conductor has been finalized. Procurement of a 3.5kA/10 V power supply for charging the conductor is underway. Status of design of copper bus bars for the central current carrying conductor and procurement status of the power supply will also be briefly addressed.