Seminar

Institute for Plasma Research

Title : Alternate method for RF-assisted current start up in SST-1

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Date : 2nd January 2019 (Wednesday)

Time : 11.00 AM

Venue : Seminar Hall, IPR

Abstract :

An important concern during the low voltage tokamak start-up is the influence of error (stray) magnetic fields that affect not only the breakdown avalanche process but also the development of the current start-up. In SST-1, significant error field (as high as 50G @Bo=1.5T) is present inside the vacuum vessel (breakdown region). There are a few experimental indications shown in the literature that start-up with large error fields, may be improved with the help of increased Electron Cyclotron Resonance (ECR) power. ECR assisted preionization is routinely being used for the plasma formation and current initiation with low loop voltage (4-5V) in SST-1. Other RF-assisted current start-up methods are also being explored in superconducting tokamak, in the presence of error fields. One such RF-assisted method is being developed for SST-1. The system consists of a 3 inch power line having the source frequency of 60MHz and maximum output power 10kW, is being developed to operate in pulsed mode. This system would generate plasma breakdown in the pressure range of 1×10^{-4} - 5×10^{-5} Torr and at the toroidal magnetic field of 1-2 Tesla. The RF source parameters are chosen such as to excite the helicon plasma discharge for achieving the strong pre-ionization in SST-1 expecting the density in the range of 10^{16}-10^{18}/m^3. This compact system would operate at very low power (10kW) as compared to the existing SST-1 ECR system which requires at least 100kW for the plasma breakdown experiments in SST-1. Plasma breakdown may occur at the inboard or outboard location inside the vacuum vessel depended upon the magnitude of error field, where as one expects breakdown to ideally be occurred at the vessel centre. It would be preferred to bring the location of breakdown at the vessel centre by using an additional arrangement for vertical DC electric filed. In this presentation, the design and development of the RF-assisted preionization system would be discussed in detail.