Experimental measurement of change in size of plasma column

Abstract

The cross-sectional size of toroidal plasma column has a significant impact on the surrounding magnetic field, especially at the vicinity of the plasma. In our previous studies, this dependency of magnetic field at the proximity of the torus on its cross-sectional area is explored and reported. The radial profile of toroidal current density makes the situation more interesting and hence leaves a vast regime for further studies. Finally, a complete idea on the magnetic topology at the close proximity of a toroidal current is explored.

The numerical observations have enormous scope for the experimental validation with the help of measured data. Aditya-U tokamak is a medium size tokamak, having major and minor radii 75 cm and 25 cm respectively. The machine has a number of magnetic pick-up coils that register the flux linkage, which varies in a wide range of frequencies: starting from very low frequency to few tens of kilo Hertz. The required data needs to be extracted from the superposed fluxes using appropriate data processing.

The first half of the present project is aimed to address the analysis of magnetic pick-up data and hence to attain the required information out of that. Afterwards, the processed data will be used to figure out the magnetic field due to the plasma at different experimental scenarios. Finally, these measurements will be used to validate a number of crucial numerical observations, like, the value of minor radius, effect of cross section on measured fields etc. This will explore the opportunity for establishing experimental techniques to get information about the change in size of the plasma column. Eventually, a real time measurement of the same will be attempted, if it would be found feasible.

Academic Project Requirements:

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

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

3) Academic Project duration:

(a) Total academic project duration: 26 Weeks
(b) Student's presence at IPR for academic project work: 1 Full working Days per week

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