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Interaction of power supply generated 10 kHz fluctuation with the diamagnetic drift tearing mode in Aditya-U Tokamak

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The interaction between the external coil generated resonant magnetic perturbation (RMP) and plasma in tokamaks is an active topic in fusion research. RMP technique is used to suppress the tearing mode instability in many tokamaks. Helical coils are installed to perturb the particular mode (m, n) of instability in several tokamaks [1]. Above a threshold value, RMP may bring mode-locking and eventually disrupt the plasma [2]. In Aditya-U tokamak, the interaction between power supply generated 10 kHz fluctuation and plasma has been found accidentally. An IGBT based h-bridge inverter programmable power supply has been installed in Aditya-U to control plasma position in real time [3]. Typical switching frequency of IGBTs is 10 kHz which as a fluctuation in coil current, perturb the drift tearing mode [4] having the similar frequency range. The study has been carried out with the help of three magnetic probes, among them two are located at two different radial positions outside the vessel and other one is located inside the vessel which is one of the garland magnetic probes. Firstly, a particular time duration has been chosen such that 10kHZ fluctuation of FFB coil has the same amplitude in both plasma and vacuum shots. At this particular time duration, the variation of 10kHz magnetic fluctuation generated due to the coil current fluctuation has been studied in three different magnetic probes. It has been found that in presence of plasma, the amplitude of 10kHz fluctuation is higher in the probe located inside the vessel however in the absence of plasma fluctuation is higher in the outside probe. This suggests that plasma enhances the fluctuation through some interaction. The field produced by the fast feedback coils may be little helical in nature due to the orientation of the coils, which may influence the (m,n) tearing modes. A detailed study on the influence of these coil generated fluctuations on the drift tearing mode will be presented in this paper.

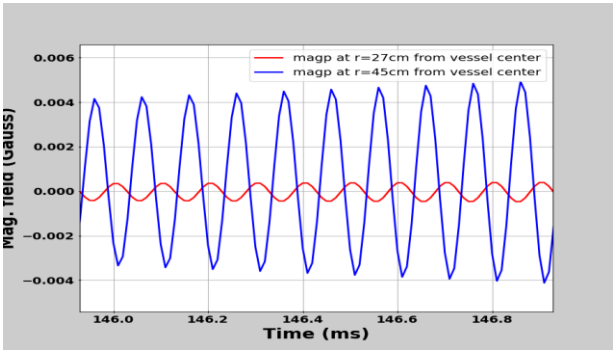

Figure 1: Coil generated fluctuations observed in the pick-up loops located inside and outside the vacuum vessel in presence of plasma.

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