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Recent Experimental and Operational Highlights from ADITYA-U Tokamak

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An overview is given of recent experimental results obtained in ADITYA-U tokamak. Significant progress on the development of lower hybrid current drive using a PAM launcher and its related key physics and technologies have been achieved. Steady progress has also been made on scenario development of shaped plasma operations along with a new technique of boronization of vacuum vessel using inductively driven boron powder injector has been experimented with. Another unique method for runway electron mitigation by applying a local vertical field perturbation has been developed and demonstrated (Figure 1). The impact of plasma edge conditions on overall plasma performance is thoroughly investigated by gas-puff induced edge modifications. It has been demonstrated that the sawtooth instability can be stabilised by application of short gas-puff pulses. Exciting new findings related to the observation of a coherent GAM-like mode induced by internal MHD mode growing beyond a threshold, revealed that internal MHD mode can also influence the edge turbulence like the externally applied magnetic perturbations (Figure 2). Anomalous Argon impurity transport is observed in Ohmic discharges of ADITYA-U and Ware pinch is found to responsible for argon accumulation in the core region. The intrinsic edge toroidal rotation reversal has been observed by reversing the plasma current directions. edge region is found to be dependent on edge density. Furthermore, a prototype ITER Hard X-ray monitor has been successful tested in Aditya-U Tokamak, a contribution to the ITER.

References:
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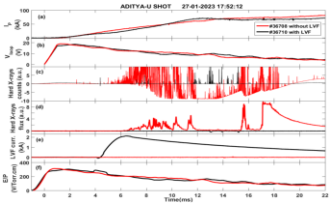

Figure 1. ADITYA-U discharge comparison without LVF (#36708) and with LVF (#36710) showed time traces of (a) plasma current (kA) (b) loop voltage (V) (c) hard X-rays (a.u.) (d) hard X-rays flux (a.u.) (e) LVF perturbation (kA) and (f) ratio E/P (V/Torr.cm).

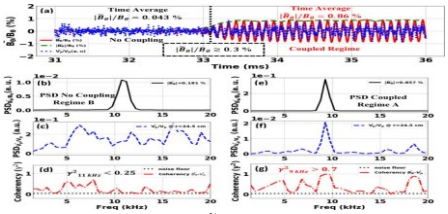

Figure 2. (a) Modulation in $\tilde{V}p$ due to high amplitude of $\tilde{B}_\theta$ for plasma discharge #36628, (b) power spectral density for $\tilde{B}_\theta/B_\theta$, (c) power spectral density for $\tilde{V}_p/V_p$, and (d) coherency between $\tilde{B}_\theta$ and $\tilde{V}_p$ for low MHD activity region $|\tilde{B}_\theta|/B_\theta$=0. 181% in red dash-dot line, (e) power spectral density for $\tilde{B}_\theta$ (f) power spectral density for $\tilde{V}p$. (g) Coherency between $\tilde{B}_\theta$ and $\tilde{V}_p$ for high MHD activity region $|\tilde{B}_\theta|/B_\theta$=0. 86% in red dash-dot line, black dotted line represents the noise floor in coherency estimation