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# Experimental Results from Aditya and Aditya Upgrade Tokamak

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Several experiments, related to controlled thermonuclear fusion research which are highly relevant for large size tokamaks including ITER, have been carried out in ADITYA, an Ohmically heated circular limiter tokamak. Repeatable plasma discharges of maximum plasma current of ~ 160 kA and discharge duration beyond ~ 250 ms with plasma current flattop duration of ~ 140 ms has been obtained for the first time in ADITYA. Novel experiments related to disruption control are carried out and disruptions, induced by hydrogen gas puffing are successfully mitigated using biased electrode and ICR pulse techniques. Runaway electrons are successfully mitigated by applying a short local vertical field (LVF) pulse. Apart from this, for volt-sec recovery during the plasma formation phase, low loop voltage start-up and current ramp-up experiments have been carried out using ECRH and ICRH. In order to achieve better coupling of lower hybrid waves to the plasma, multiple gas puffs are injected prior to the launch of lower hybrid waves. The experiments showed considerable reduction in the reflection co-efficient indicating better absorption of LH waves in plasma. In addition to that Neon (Ne) gas puff assisted radiative improved confinement mode has also been achieved in ADITYA. Further, the electrode biasing experiments have shown that during transition to better confinement mode, the Drift-Alfven fluctuations are suppressed and the current profile gets modified near the edge plasma region. After successful operation (more than 30,000 discharges) of Aditya tokamak (R0 = 75 cm, a = 25 cm) for over 2 decades, it has been upgraded to a state-of-art machine with divertor configuration and good plasma control to support the future Indian Fusion program [1]. The scientific objectives of Aditya Upgrade tokamak include Low loop voltage plasma start-up with strong Pre-ionization having a good plasma control system. The upgrade is designed keeping in mind the experiments, disruption mitigation studies relevant to future fusion devices, runway mitigation studies, demonstration of Radio-frequency heating and current drive etc. In this paper, experiments in Aditya and Aditya Upgrade tokamaks along with the upgradation will be discussed.

References:

[1] Ghosh J. et al 2016 Upgradation of ADITYA tokamak with limiter configuration to ADITYA upgrade tokamak with divertor configuration 2016 IAEA Fusion Energy Conf. (Kyoto), 17-22 October, 2016 (FIP/P4–46) Nucl. Fusion submitted. Pre-print: https://nucleus.iaea.org/sites/fusionportal/Shared%20Documents/FEC%202016/fec2016-preprints/preprint0720.pdf