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Overview of Recent Experimental Results from Aditya Tokamak

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Several experiments, related to controlled thermonuclear fusion research and 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. The discharge reproducibility has been improved considerably with Lithium wall conditioning and improved plasma discharges are obtained by precisely controlling the plasma position. In these discharges, chord-averaged electron density ˜ 3.0 –4.0 x 10ˆ19 mˆ-3 using multiple hydrogen gas puffs, electron temperature of the order of ˜ 500 - 700 eV have been achieved.

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. A thorough disruption database has been generated by identifying the different categories of disruption. Detailed analysis of several hundred disrupted discharges showed that the current quench time is inversely proportional to q_edge. Formation of current filaments are observed during most of the disruptions, which helps in identifying the cause of disruption. 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. Successful recovery of volt-sec leads to achievement of longer plasma discharge durations. In order to achieve better coupling of lower hybrid waves to the plasma, multipl e 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 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. In this paper, all the above mentioned experiments will be discussed.

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