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# Overview of the Recent J-TEXT Results

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The experimental research in recent years on the J-TEXT tokamak are summarized, the most significant results including observation of core magnetic and density perturbations associated with sawtooth events and tearing instabilities by a high-performance polarimeter-interferometer (POLARIS), investigation of a rotating helical magnetic field perturbation on tearing modes, studies of resonant magnetic perturbations (RMP) on plasma flows and fluctuations, and explorations of high density disruptions in ohmic heating and gas puffing discharges.

The POLARIS system developed on J-TEXT has time response up to 1 μs, phase resolution < 0.1o and spatial resolution ˜3 cm (17 chords). Such high resolution permits investigations of fast equilibrium dynamics as well as magnetic and density perturbations associated with magnetohydrodynamic (MHD) instabilities. Based on the measurement, temporal evolution of the safety factor profile, current density profile and electron density profile are obtained during sawtooth crash events as well as disruptions. In addition, core magnetic and density perturbations associated with MHD tearing instabilities are clearly detected. Particle transport due to the sawtooth crashes is analyzed. It found that the sawteeth only partially flatten the core density profile, but enhanced particle diffusion on the time scale of the thermal crash occurs over much of the profile.

The RMP system on J-TEXT can generate a rotating helical field perturbation with a maximum rotation frequency up to 10 kHz, and dominant resonant modes of m/n = 2/1, 3/1 or 1/1. It is found that tearing modes can be easily locked and then rotate together with a rotating RMP. During the mode locking and unlocking, instead of amplifying the island, the RMP can suppress the island width, especially when there is a small frequency gap between the island and the RMP. The effects of RMPs on plasma flows and fluctuations are studied with Langmuir probe arrays at the plasma edge. Both toroidal rotation velocity and radial electric field increase with RMP coil current when the RMP current is no more than 5kA. When the RMP current reaches 6kA, the toroidal velocity profile becomes flatter near the last closed flux surface. The absolute amplitude of Er also significantly decreases at IRMP = 6 kA. At the same time, the behavior of the poloidal and toroidal turbulent stresses from simultaneous probe measurements are consistent with the Er trends. Both LFZF and GAM are also damped by strong RMPs.

Some interesting features of high density disruptions are identified by interpreting the measured POLARIS data and the radiation power measurements. In the density ramp-up phase of a high density disruption shot, an asymmetry of density profile between the Low-Field-Side (LFS) edge (r>0.8a) and the High-Field-Side (HFS) edge (r<-0.8a) would appear and increase gradually. At the same time, an asymmetry of radiation power profile also arises as the result of the asymmetry of density profile at the edge. When the density at the HFS edge increases to nearly twice as large as the density at the LFS edge, a low-frequency (<1kHz) density perturbation suddenly stimulates at the HFS edge and gradually expanded into the center region. The disruption takes place when the density perturbation reaches the location nearly the q=2 surface.

All the details will be presented at the meeting.

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