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OV/P-06: The Recent Research Work on the J-TEXT Tokamak

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The main results from the J-TEXT tokamak in the last two years, which emphasized the observation and analysis of MHD activity, are summarized and presented in this meeting.
Static resonant magnetic perturbations generated by saddle coil currents are applied to J-TEXT Ohmic plasmas in order to study their influence on MHD instabilities. With sufficiently large RMPs, the m/n=2/1 (m and n are the poloidal and toroidal mode numbers) mode locking is easily obtained. The analysis of the mode locking thresholds varied by scanning of the spatial phase of RMPs shows that the m/n=2/1 component of intrinsic error field of the J-TEXT tokamak is about 0.4Gs. In addition to normal mode locking events, the (partial) stabilization of the m/n=2/1 tearing mode by moderate magnetic perturbation amplitude is observed experimentally. With experimental parameters as input, both the mode locking and mode stabilization by RMPs are also obtained from nonlinear numerical modeling based on reduced MHD equations. It is found that the suppression of the tearing mode by RMPs of moderate amplitude is possible for a sufficiently high plasma rotation frequency and low Alfvén velocity. Gas puffing is also used to affect the MHD activity in J-TEXT. For example, neon gas injection can cause inverse sawtooth-like activity that spreads from the q=1 surface to the axis; in particular, small amplitude m/n=1/1 mode oscillations superimposed on the inverse sawtooth waveform around the q=1 surface are observed after the impurity injection. Nevertheless, other impurities such as helium and argon impurities can't trigger such events. In addition, gas puffing can also be applied to mitigate disruptions, especially on the current quench phase. It is found that no runaway current generation occurs in intentionally provoked disruptions when the toroidal magnetic field is lower than 2.2 T. The runaway currents can be suppressed by the intensive gas puffing of H2.
To meet the requirement of charactering the MHD activity, a far-infrared polarimeter-interferometer has been developed to measure the current density profile, while a tangential X-ray imaging crystal spectrometer (XICS) provides ion temperature and toroidal rotation velocity measurements. First results are obtained with observation of perturbations associated with sawtooth and MHD activities. The details will be given in this meeting.

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