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OV/P-01: Overview of FTU Results

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Since the 2010 IAEA-FEC Conference, FTU has exploited improvements in cleaning procedures and in the density control system to complete a systematic exploration of access to high-density conditions in a wide range of plasma currents and magnetic fields. The line-averaged densities at the disruptive limit increased more than linearly with the toroidal field, while no dependence on plasma current was found, in fact the maximum density of 4.3×10^{20} was reached at $B=8T$ even at the minimum current of $0.5MA$, corresponding to twice the Greenwald limit. The lack of plasma current dependence is due to the increase of density peaking with the safety factor.

Experiments with the 140 GHz ECRH system were focused on the sawtooth period control and on the commissioning of the new launcher with real-time-steering capability that will act as the front-end actuator of a real time system for sawtooth period control and tearing modes stabilization. Various ECRH and ECCD modulation schemes have been used; with the fastest one, the sawtooth period synchronized with the 8 ms modulation period. The observed period variations were simulated using the JETTO code with a critical shear model for the crash trigger. The new launcher is of the plug-in type, allowing quick insertion and connection to the transmission line. Both beam characteristics and steering speed were in line with design expectation. Experimental results on the connection between improved coupling of lower hybrid waves in high-density plasmas and the reduction of spectral broadening of the injected wave have been compared with the results of fully kinetic non-linear model calculations.

The effect of wall conditioning by lithium on MHD activities has been studied by comparing discharges with and without lithium conditioning at low- q and at the density limit. In both cases lithium conditioning has the same effect of reducing MHD modes associated with edge cooling by light impurities as a careful wall preparation. Experiments with the liquid lithium limiter inserted in the SOL, which have shown the formation of a radiative belt that acts as a virtual toroidal limiter, have been interpreted by the edge code TECXY as an effect of strong radiation from Li^+ ions in non-coronal equilibrium.

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