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Review of Recent Experiments on the T-10 Tokamak with All Metal Wall

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Review of the recent experimental results obtained on the T-10 tokamak is presented. To decrease the level of light impurities in 2015 both the rail and circular limiters were replaced with ones made of tungsten. The used tungsten type «POLEMA» as well as the technology of its soldering to the bronze substrate are similar to those applied for the production of the ITER divertor tiles. In the same time a movable lithium limiter was installed in the upper port. This limiter based on capillary-porous structure was made by JSC "Red Star". With the tungsten limiter a considerable increase of the core radiation losses was obtained. Results on prevention of tungsten penetration in the core plasma by central ECRH and by insertion of the lithium limiter are presented in the paper. The efficiency of removal of heavier iron impurity depending on the discharge parameters and the power of the central ECRH was investigated. The maximal decrease of the heavier impurities concentrations is 5. Performed using the canonical profiles model analysis of the experiments on the density profile dynamic upon variation of the ECRH power showed that the density profile stiffness rises linearly with the heating power, while the peaking of the pressure profile in the core plasma asymptotically approaches to the canonical value. Using of bispectral analysis applied to the fluctuations of potential, density and poloidal magnetic field measured with heavy ion beam probe diagnostic showed an existence of three-wave interaction between GAM and broad-band turbulence. Also shown that the GAM amplitude declines with the mean density growth. The investigations of density fluctuation characteristics with correlation reflectometry confirmed a considerable decrease of the fluctuation amplitude together with disappearance of the quasicohherent modes on the inner side of the torus. Modeling showed that this effect can be, to a great extent, explained by nonlocality of reflectometry. Experiments with tangential X-ray detector indicated that abrupt restructuring of the low-m MHD modes and inward plasma shift during an energy quench are accompanied by bursts of the fast-scale (0.5MHz) magnetic fields oscillations. Plasma discharge recovery after an energy quench is demonstrated in the T-10 high density plasma using ECRH auxiliary heating and controllable operation of the plasma current.

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