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TURBULENCE STRUCTURE IN SPONTANEOUS AND FORCED TRANSIENTS AT THE L-2M STELLARATOR *)

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The results of experiments at the classical quasi-stationary L-2M stellarator are presented [1]. Plasma heating was carried out in the mode of electron-cyclotron resonance heating using two gyrotrons of the MIG-3 complex under conditions of high specific energy supply in the range of 0.8–2 MW/m^3 [2]. In this range of ECR heating capacities, spontaneous transient processes are periodically observed in plasma, leading to a dynamic increase in plasma energy up to 20% [3].

The control system of the gyrotron complex allows to set the time modulation of microwave pulses relative to each other [4]. In this mode, results were obtained on increasing the energy lifetime of the plasma τ_E. The first gyrotron at a fixed power serves for ionization and primary heating of the plasma, the second provides a stationary discharge with a duration of 10 ms. It has been demonstrated that by varying the power of the second gyrotron, there is a possibility of a multiple increase of τ_E [5].

The paper compares the modes with spontaneous and forced transients, respectively, at a constant, abruptly increasing and abruptly decreasing heating power. A search is carried out for the relationship between the evolution of plasma macroparameters (first of all, τ_E) and the parameters of plasma turbulence.

Measurement of microparameters is performed by methods of reverse, small-angle and Bragg scattering of gyrotron radiation [6], as well as by methods of probe measurements and reflectometry. Spectral and correlation analysis of plasma density fluctuations, electric and magnetic fields is presented. Hypotheses about the phenomena contributing to the dynamic change of macroparameters are given. The development of possible local instabilities is considered, as well as the effect of plasma interaction with the walls of the vacuum chamber.

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