STRUCTURE AND EVOLUTION OF ELECTROMAGNETIC PERTURBATIONS IN THE L-2M STELLARATOR PLASMA [[1]](#footnote-1)\*)

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The structure of the plasma volume in the L-2M stellarator is considered under various discharge conditions. The perturbations structure is analyzed using a set of electrostatic (Langmuir) and magnetic probes located in various flanges of the set-up vacuum chamber and spaced in toroidal and poloidal directions. The evolution of magnetic (Bfl) and electric field perturbations (the floating plasma potential Vf is measured) is analyzed in pulses with short-term transport transitions (duration ~ 200 microseconds) [1], data before and after transitions are compared.

Based on the analysis of the Bfl and Vf spectra, as well as the correlation spectra between them, it can be concluded that during the transition process, MHD modes are transformed in the plasma (in the frequency range of 20-40 kHz, the m/n = 2/1 mode is observed at the plasma edge, at frequencies of 80-110 kHz, high modes m/n = 3/2, 4/3 develop at the plasma edge); at the time of transition, the frequency and spatial structure of the modes changes [2].



Fig.1. The wavelet spectrum of correlation between Vf signals from probes spaced by π/2 in the toroidal and π in the poloidal directions. The triangle marks the moment of the transport transition.

The high coherence observed before the transition between Bfl and V~~f~~, as well as between Vf signals from different probes, suggest that before the transition currents excited on extreme rational magnetic surfaces in the frequency range of 20-40 kHz produce plasma fluctuations, which leads to the departure of electrons and to a positive plasma potential Vp. A decrease in turbulence after the transition leads to a decrease in the departure of electrons, i.e. a drop in the positive potential [3].

It is established that the discharge is characterized by a positive potential Vf, which corresponds to a positive Vp, a decrease in the amplitude of Vf is observed during the transport transition. Since the positive plasma potential means that electrons leave more than ions, two effects are possible after the transition - an improvement in electron confinement and a sharp loss of ions at the edge. If an improvement in electron confinement can be associated with a decrease in fluctuations, then the rapid departure of ions can be associated with the effect of plasma interaction with the wall.

References

1. Shchepetov S.V. et al. Plasma Phys. Control. Fusion, 2008, V.50,045001.
2. Shchepetov S.V. et al. Plasma Phys. Reports, 2018, Т.44, с.539-543.
3. Vasilkov D.G. et al. Plasma Phys. Reports, 2013, V.39, с.615-623.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLIX/Mu/ru/BU-Vasilkov.docx) [↑](#footnote-ref-1)