Investigation of different types of filaments during ELM by Doppler backscattering on «Globus-M2» tokamak

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An important goal in the field of controlled fusion is achieving a long-lasting steady-state operation of a fusion reactor. A serious obstacle to this goal in plasma confinement devices, including tokamaks, is edge-localized modes (ELMs) that occur when certain plasma parameters are reached and result in energy and particle losses from the confinement area, as well as an increased thermal load on the wall and divertor of the devices[1]. Spatial structure of ELMs in the form of filaments investigation plays a major role in developing methods for combating these phenomena. It is particularly interesting to study ELM in spherical tokamaks, which are a promising basis for both a fusion power plant and a fusion neutron source.

This paper studies the parameters of filaments which occurs during various types of ELMs during experiments on the spherical tokamak "Globus-M2." For the study, Doppler backscattering diagnostics is used, which is capable of registering filaments in the tokamak plasma[2] and special software for signal processing of this diagnostics. Data on the perpendicular speed to the magnetic field lines and perpendicular size were obtained.

A comparison is made of filaments detected during ELM, synchronized, and desynchronized with sawtooth oscillations[3]. It is shown that the filaments during different types of ELM differ significantly in the velocity perpendicular to the magnetic field lines, as well as in the radial size. The results obtained are compared with the results of the study of filaments on other spherical tokamaks.

The results obtained can be used in further studies of ELMs and their spatial structure.

References

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