

Study of tearing modes in the spherical tokamak Globus-M2 using Doppler backscattering

A. Ponomarenko¹, A. Yashin¹, I. Balachenkov^{1,2}, G. Kurskiev², E. Kiselev², V. Minaev², A. Petrov¹, Y. Petrov², N. Sakharov², V. Solokha^{1,2}, N. Teplova^{1,2}, N. Zhiltsov²

¹*Peter the Great St. Petersburg Polytechnic University, St. Petersburg, Russian Federation*

²*Ioffe Institute, St. Petersburg, Russian Federation*

e-mail: annap2000dreeonn@gmail.com

Magnetohydrodynamic (MHD) activity of the plasma is investigated as one of the key aspects of fusion reactor steady-state operation. MHD modes are known to limit plasma pressure. More specifically, tearing modes (TMs) can disturb magnetic flux surfaces and trigger a loss of internal transport barriers [1]. On Globus-M2 it was observed that TMs can behave differently depending on the discharge scenario. The modes either can have no significant impact on the plasma, or can affect the plasma dramatically by causing a transition from H-mode to L-mode and a disruption. To investigate the instability, the Doppler backscattering (DBS) method was employed [2]. The DBS diagnostic has become an integral part of plasma research on the largest tokamaks around the world [3], as it has proved useful in allowing a number of problems to be solved and phenomena to be investigated. The authors discuss its technical characteristics and application possibilities, along with techniques that can be employed for plasma oscillatory processes detection and investigation. TM parameters such as frequency, width and localization were measured using DBS. Modelling was also undertaken to obtain the width of the magnetic islands using theoretical models. The modelling results were compared with values from experiments. Additionally, full-wave modelling of processes of backscattering in the case of the presence of NTMs will be shown.

References

- [1] R. J. Buttery et al 2000 Plasma Phys. Control. Fusion 42 B61
- [2] G.D. Conway et al 2004 Plasma Phys. Control. Fusion 46 951
- [3] C. Silva et al 2016 Nucl. Fusion 56 106026