OVERVIEW of EDGE-LOCALIZED instabilities in globus-m2 [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2023.50.2023.1.1.041

1,2Solokha V.V., 1Kurskiev G.S., 1,2Yashin A.Yu., 1Balachenkov I.M., 1Dyachenko V.V., 1Goryainov V.Yu., 1Gusev V.K., 1Khromov N.A., 1Kiselev E.O., 1Minaev V.B., 1Miroshnikov I.V., 1Novokhatskii A.N., 1Petrov Yu.V., 2Petrov A.V., 2Ponomarenko A.M., 1Sakharov N.V., 1Shchegolev P.B., 1Telnova A.Yu., 1Tkachenko E.E., 1Tokarev V.A., 1Tolstyakov S.Yu., 1Tukhmeneva E.A., 1Varfolomeev V.I., 1Voronin A.V., 1Zhiltsov N.S.

1Ioffe Institute, Saint-Petersburg, Russian Federation, [vsolokha@mail.ioffe.ru](mailto:vsolokha@mail.ioffe.ru)  
2Peter the Great St. Petersburg Polytechnic University, Saint-Petersburg, Russian Federation

The edge-localized modes (ELM) are presented in the spherical tokamak Globus-M2 [1] during high-performance pulses. The talk describes conditions leading to ELMs destabilization of both types: synchronized with internal reconnections [2] and desyncronized standalone ELMs. The investigation utilized Globus-M2 pulses with the plasma current, IP, up to 0.4 MA, and the toroidal magnetic field, BT, up to 0.9 T.

Desyncronized ELMs in Globus-M2 correspond to the type III [3], as the frequency of the desyncronized ELMs was showing linear dependency on the line-averaged density. Synchronized ELMs can’t be assigned to one of the existing types due to their frequency being equal to the sawtooth frequency. The stability of the peeling-ballooning mode in the pedestal was investigated using the Thomson scattering data [4,5] and a 3-field MHD model implemented in the BOUT++ framework [6]. Pulses with synchronized ELMs were found to have peeling-ballooning stable pedestal, while pulses with desynchronized ELMs had the pedestal prone to peeling-ballooning instability which can be expected to have edge-localized mode bursts without any external perturbation.

The influence of impurities on the peeling-ballooning stability is illustrated by the observed transition from desynchronized to synchronized ELMs regimes after the spontaneous influx of carbon. Also, the talk demonstrates limited predictive capability of the EPED model for Globus-M2 ELMs due to the dominant role of the microtearing mode in the edge plasma highlighted by gyrokinetic simulations [7] and experimental measurements.

This work is supported by the RSF grant project No. 18-72-10028. The experimental part of research was provided and supported by Scientific Device “Spherical tokamak Globus-M”.

References

1. Minaev V.B. et al, 2017, Nucl. Fusion, 57 066047
2. Bulanin, V.V. et al, 2021, Plasma Phys. Control. Fusion, 63 122001
3. Maingi R. et al, 2005, Nucl. Fusion, 45 1066
4. Tolstyakov S. et al, 2006, Technical Physics, Vol. 51 No. 7 pp. 846–852
5. Kurskiev G. et al, 2020, Nuclear Inst. and Methods in Physics Research, A 963
6. Dudson B. et al, 2009, Computer Physics Communications, 180 1467–1480
7. Kiselev E. et al, 2019, J. Phys.: Conf. Ser., 1383 012003

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