The detection of high-frequency alfven oscillations in ohmic and lhcd discharges on globus-m2 tokamak [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2021.48.1.059

1,2Balachenkov I.M., 2Bulanin V.V., 1Gusev V.K., 2Zhiltsov N.S., 1,2Kiselev E.O., 1Kurskiev G.S., 1Minaev V.B., 1Patrov M.I., 2Petrov A.V., 1Petrov Yu.V., 2Ponomarenko A.M., 1Sakharov N.V., 2Yashin A.Yu.

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

High frequency magnetic field oscillations with their frequencies varying in the range of 0.8 – 1.8 MHz have been detected by means of Mirnov coins in LHCD and ohmic discharges with low density have been detected on Globus-M2 tokamak. Observed frequencies significantly exceed frequencies of toroidal Alfven eigenmodes (TAEs) [1] and Alfven cascades (AC) [2] that were observed earlier. Moreover, the amplitude of detected signals turned out to be an order of magnitude lower in comparison with TAE amplitude, which, at the one hand, indicates their low influence on discharge performance, and, at the other hand, complicates their observation. However, the detected instability definitely has Alfvenic nature, since the oscillation frequency correlates with Alfven frequency scaling quite well. The observed oscillations arise as short bursts, which time moments matches with sawtooth crushes on the soft X-ray signals, and, in common, they are quite similar in their properties with oscillations reported from MAST [3], COMPASS [4] and TUMAN-3M [5] tokamaks. The observation of this instability became possible due to the extension of the band pass and digitizing rate of magnetic diagnostics complex, and the extension of toroidal magnetic probe array made us possible to resolve the spatial mode structure in the toroidal direction.

As the most appropriate mechanism of the instability excitation we consider the resonance of the Alfven eigenmode with high energy runaway electron beam. Particularly, this is evidenced by the fact that the oscillations arise in ohmic discharges with low density, when there are good conditions for the electrons to become runaway and when there are no other high energy particles provided. In this work we discuss the possibility of the implementation of the models of resonance interaction of supratermal electrons with Alfven eigenmode at electron orbit precession frequency, presented in [6] and [7] to the Globus-M2 discharge conditions. For the spatial localization of the instability it is planned to apply the Doppler backscattering diagnostic [8] installed on the Globus-M2 tokamak.

This work was financially supported by Russian science foundation (project 17-12-01177-extension).

References

1. Petrov Yu. V. et al, Plasma Phys. Rep. 45, 675–684 (2019)
2. Balachenkov I. M. et al, Tech. Phys. Lett. 46, 1157 – 1161 (2020)
3. McClements K. G. et al, Nucl. Fusion 42, 1155 (2002)
4. Markovic T. et al, 44th EPS Conference on Plasma Physics, Р.5.140 (2017)
5. Tukachinsky A. S. et al, Tech. Phys. Lett. 42, 1167 – 1169 (2016)
6. Chu N. et al, Nucl. Fusion 58,104004 (2018)
7. Wang J. et al, Nucl. Fusion 60, 112012 (2020)
8. Bulanin V.V. et al, Tech. Phys. Lett. 45, 1107 – 1110 (2019)

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