Safety factor minimum value masurments on globus-m2 tokamak by means of mhd spectroscopy [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2020.47.1.057

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

1Ioffe Institute, St. Petersburg, Russian Federation ,balachenkov@mail.ioffe.ru
2St. Petersburg Peter the Great Polytechnic University, St. Petersburg, Russian Federation

Recent Globus-M2 tokamak experiments provided a number of discharges with increased magnetic field (up to 0.7T). On the current ramp stage of those shots, during neutral beam injection, reversed shear Alfven eigenmodes (RSAE) or Alfven cascades (AC) were being registered [1] by means of the magnetic probe array. There were 3-4 cascade sequences, having $n=2-4$ and $m=3-1$, detected in the discharges under consideration. The cascade modes have been also registered with microwave reflectometer using Dopler backscattering technique.

Alfven cascades arise near the area of safety factor ($q$) minimum, as a result of transformation of geodesic-acoustic mode (GAM) into toroidicity-induced Alfven eigenmode (TAE) [2]. Every cascade is an eigenmode, which frequency increases from initial frequency, that corresponds to GAM frequency, to rms value of GAM and TAE frequencies [3][4], following the linear law. Cascade frequency growth occurs due to the decrease of safety factor values during the discharge. Since RSAE excitation requires zero derivative $dq/dr$, so magnetic probe signal analysis in the moments of the discharges where AC modes has been detected, provides an opportunity to calculate the minimum value of safety factor. Such a technique is called Alfven- or MHD (magnetohydrodynamics) spectroscopy and it is successfully applied on various tokamaks, including spherical ones [2][4]. However, AC modes has not been detected on Globus-M/M2 tokamak until recently, since another RSAE excitation condition is relatively low plasma β (the ratio of plasma pressure to MF pressure) values, which were unreachable in the NBI heated plasmas without increasing of the magnetic field.

The first results of $q\_{min}$determination by means of MHD or Alfven spectroscopy on Globus-M tokamak are presented in this report. Such a method of $q\_{min}$ calculation seems to be the most approachable, since it requires only temperature and density profiles, except magnetic measurements data. This work is provided with a support of RSF grant 17-12-01177.

References

1. Gusev V.K. et al, 20th International Spherical Torus Workshop (ISTW 2019), October 28-31, 2019, Frascati, Italy
2. Sharapov S.E. et al, Physics of Plasmas 9, 2027 (2002)
3. Fredrickson E.D. et al, Phys. Plasmas 14, 102510 (2007)
4. Crocker N. A. et al, Phys. Plasmas 15, 102502 (2008)
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/Mu/ru/BN-Balachenkov.docx) [↑](#footnote-ref-1)