Modeling of lower hybrid current drive in the presence of inductive electric field in the ft-2 and globus-m2 tokamaks [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2020.47.1.020

Teplova N.V., Gusakov E.Z., Gusev V.K., Troshin G.А., Altukhov A.B., Bakharev N.N., Voronin A.V., Diachenko V.V., Esipov L.A., Zhiltsov N.S., Kiselev E.O., Konovalov А.А., Kouprienko D.V., Kurskiev G.S., Lashkul S.I., Patrov M.I., Petrov Yu.V., Sakharov N.V., Tolstiakov S.Yu., Tukhmeneva E.A., Havin V.E.

Ioffe Institute, Saint-Petersburg, Russia, [natalia.teplova@mail.ioffe.ru](mailto:natalia.teplova@mail.ioffe.ru)

The low-hybrid (LH) method of current maintenance [1] can potentially be used as effective technique for current generation at the middle and periphery radii of plasma core for the current profile broadening in ITER, which will operate with heavy hydrogen isotopes [2].

LH method of current generation is widely used nowadays in tokamaks of traditional type, in particular, recently the isotope effect on the LH current drive (LHCD) efficiency dependence on main parameters of hydrogen and deuterium plasmas has been studied at the FT-2 tokamak [3].

The problem of current generation is particularly relevant in application to the spherical tokamaks, which operate at low magnetic field and high density, that leads to reduced accessibility for the pump wave. Experiments on testing lower hybrid wave excitation schemes are held in upgraded Globus-M2 tokamak both ib poloidal and toroidal directions.

To interpret the experimental results indicating the high LHCD efficiency complex simulations of the propagation and absorption of LH waves in the plasma of FT-2 and Globus-M2 were performed. The magnitude and direction of the current generated by the lower hybrid wave were computed using the Fast Ray Tracing Code (FRTC) [4], the calculated using Grill3D [5] LH wave spectrum, and the measured profiles of the plasma parameters. The magnetic equilibrium of the plasma column was provided by the ASTRA code [6] with using of the measured radial profiles of the plasma parameters.

In the present work a new one-dimensional approach to the lower hybrid current drive modelling taking into account the effect of the residual inductive electric field on the electron distribution function, generation of super-thermal electrons and hence on the LHCD efficiency, suggested in [7] is applied to calculate LHCD for hydrogen and deuterium plasmas at FT-2 and Globus-M2 experiments. The simulation results are compared to the experimental data.

The work is supported by RSCF grant 18-72-00117.

References

1. N.J. Fisch, Mod. Phys. Rew. 59 1987
2. P. Bonoli, Phys. Plasmas 21, 2014
3. S.I. Lashkul et al Nucl. Fusion 55 (2015) 073019
4. A.D. Piliya, A.N. Saveliev, JET Joint Undertaking, Abingdon, Oxfordshire, OX14 3EA, 1998
5. M.A. Irzak and O.N Shcerbinin, Nucl. Fusion 35, 1341 (1995)
6. G.V. Pereverzev and P.N. Yushmanov, Automated System for Transport Analysis IPP-Report IPP 5/98, (2002)
7. A.N. Saveliev, EPJ Web of Conferences 157, 03045 (2017)

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