Properties of Alfvén waves in ohmic plasma in the TUMAN-3M tokamak

G.I. Abdullina, L.G. Askinazi, A.A. Belokurov, V.A. Kornev, S.V. Krikunov, S.V. Lebedev, D.V. Razumenko, A.I. Smirnov, A.S. Tukachinsky, N.A. Zhubr

Ioffe Institute, St. Petersburg, Russian Federation

The study is devoted to properties of Alfvén waves (AWs) in ohmic plasma in the TUMAN-3M tokamak [1 – 4]. One of the important parameters of AWs is their location in the poloidal cross-section of the tokamak plasma. This information is necessary for identification the type and source of the observed oscillations. The AW location is found to be in the region $r/a < 0.5$ [4], by matching the frequency calculated from electron density profile to the experimentally measured one. The fact that this region occupies an essential part of plasma cross-section points to the global nature of the mode. Also, this approximately corresponds to the region in which $q \approx 1$. These characteristics make it possible to identify the observed mode as GAE (Global Alfvén Eigenmode), and at the same time, exclude the TAE mode (Toroidal Alfvén Eigenmode). As a result, the distortion of the linear dependence of AW frequency on AW velocity in [3] is eliminated if the local plasma density values in the region of AW propagation are used instead of the chord-averaged values for calculation the AW velocity. Mode structure of AWs, namely poloidal and toroidal mode numbers, was determined with the in-vessel array of sixteen poloidal fast magnetic probes and two toroidal ones.

The dependence of AW frequency on increased carbon impurity content has been studied in deuterium plasma. It is experimentally confirmed that in the case of equal mass-to-charge ratio for both the main and impurity ions AW frequency is independent of the impurity density and is determined by the electron plasma density and the main ion mass.

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[3] Lebedev S.V. et al 2016 Proc. 43rd EPS Conf. on Plasma Phys. P5.036

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