Toroidal Alfven Eigenmode study on the Globus-M Spherical Tokamak

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In this report we describe the latest results of investigation of the toroidal Alfvén eigenmodes (TAE), which were identified earlier in experiments with NBI heating on the spherical tokamak Globus-M [1]. The experiments were continued at increased magnetic field from 0.4 to 0.5 T and plasma current from 200 to 250 kA. The mode character has changed with the increase of the field. While the TAE bursts became more frequent, the fast particle losses induced by them became weaker. The dependence of fast particle losses and redistribution induced by TAE on the values of magnetic field and plasma current are presented.

During the last experimental campaign, the multichannel Doppler backscattering reflectometry (DBS) was applied for the first time to study TAE localization [2]. Multichannel probing at frequencies of 20, 29, 39 and 48 GHz was applied. It allowed us to observe the TAE fluctuations at four locations on major radius simultaneously. The measurements have shown that the TAE fluctuations registered by means of DBS are localized on the periphery of the plasma column, in the region of normalized minor radii of ρ=0.5-0.75. Modeling of the Alfven continuum and TAE mode structure for Globus-M conditions were made by means of a software package base on the modified KINX and CAXE codes [3]. Comparison of the experimental data and calculated spectra, as well as the analysis of the structure of the global modes, showed that the oscillation frequencies observed in the experiment are closer to the frequencies of the TAE modes localized near the plasma boundary in the region of magnetic surfaces with safety factor values q = 2.5, 3.5 .

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