Alfven Eigenmodes in the Globus-M2 Spherical Tokamak

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The report presents the latest results of Alfvén modes (AM) research at NBI heating experiments on the upgraded Globus-M2 spherical tokamak [1]. As a result of the tokamak magnetic system modernization, the toroidal magnetic field was increased to 0.8 T and the plasma current to 350 kA. An increase in plasma parameters led to a change in the nature of Alfven modes and the expansion of their frequency spectrum (50–300 kHz). To the toroidal Alfvén eigenmodes (TAE), the so-called Alfvén cascades (AC) were added, which were not previously observed at the Globus-M tokamak. In experiments on current drive by waves of the lower hybrid range (2.45 GHz), modes with a frequency of about 1 MHz, excited by fast electrons, were detected.

To study the spatial structure of AM, Doppler backscattering diagnostics was used [2] with application of a multi-channel reflectometer. Measurements showed that ACs are localized closer to the center of the discharge (in the q_{min} vicinity), in contrast to TAEs located at the periphery. Observation of ACs made it possible to apply the method of MHD spectroscopy to determine the evolution of q_{min} in a discharge.

Using the neutral particle analyzer and a neutron detector, we studied the dependence of fast particle losses initiated by TAEs on the magnetic field and plasma current. It is shown that losses decrease with increasing field and current, demonstrating dependence favorable for compact neutron sources.

[1] V.B. Minaev et al 2017 Nucl. Fusion 57 066047

[2] V.V. Bulanin et al 2019 Tech. Phys. Lett., v.45, 11 p.p. 1107-1110