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EFFECT OF PLASMA TOROIDAL ROTATION ON TOROIDAL ALFVEN EIGENMODES AT GLOBUS-M2 TOKAMAK *)

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On the Globus-M2 tokamak [1] and earlier on the Globus-M tokamak [2] in discharges with neutral beam injection, toroidal Alfven modes (TAE) were observed [3, 4]. TAEs were observed by magnetic probes and other diagnostics in the frequency range of hundreds of kHz, both in the form of relatively short bursts of oscillations lasting 0.1 – 0.3 ms, and in the form of long-term oscillations (up to 10 ms). Long-lasting TAEs are of interest from the point of view of using these signals for diagnostic purposes, since in some regimes they are observed in the form of non-equidistant harmonics, the frequency of which is expressed by the formula [5]: $f_{lab}^{n} = f_{TAE} + n \cdot f_{Doppler}$, where f_{lab}^{n} is observed frequency of n-th harmonic, f_{TAE} – the frequency of the first harmonic of TAE, a $f_{Doppler}$ – Doppler shift associated with toroidal rotation of the plasma. Thus, the observation of several harmonics allows one to determine both the unshifted TAE frequency and the plasma rotation velocity. This magnetic spectroscopy technique was previously applied both on classical tokamaks, such as DIII-D [5], and on spherical ones, for example, on the NSTX tokamak [6].

In this work, the rotation velocity measurements obtained by the method described above were compared with direct measurements of the toroidal rotation speed at the mode localization radius obtained using CXRS diagnostics [7], and the f_{TAE} frequency was compared with the TAE frequency also calculated at the localization radius. The radial distribution of mode intensity was determined using Doppler backscattering diagnostics. The comparison also took into account the correction [5, 8] for the difference in the rotation velocity of the impurity, which spectral line is used in CXRS measurements, and the main component of the plasma.

As a result, a good agreement between the frequency f_{TAE} obtained experimentally and the calculated frequency of the first TAE harmonic at the localization radius was established. For rotational speed, CXRS measurements and magnetic spectroscopy data were found in satisfactory agreement. Possible reasons of the inconsistency are being discussed.

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