effect of collisionality on the development of microinstabilities in the globus-m sperical tokamak

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The reason for the loss of heat and particles in tokamaks are various plasma microinstabilities. For this reason, many works were devoted to studying the dependences of the energy confinement time on various plasma parameters (plasma current, toroidal magnetic field, absorbed power, density, elongation, aspect ratio etc) for both traditional and spherical tokamaks, and dependencies on spherical tokamaks differ from dependencies on tokamaks with a traditional aspect ratio [1–4].

This work represents the results of core plasma microinstability simulations at Globus-M. Globus-M was a compact spherical tokamak with typical parameters are as follows: ɛ = 0.24 m / 0.36 m = 0.66, BT = 0.4–0.5 T, Ip = 0.18–0.25 MA, ne = (1–8) · 1019 m–3, PNBI ≤ 1 MW. The H-mode is a common operational regime at moderate densities both in OH and NBI heated discharges. This work concentrated on core plasma microinstability simulations using GKW [5] and GENE code [6] in linear local approximation.

It was found that the TEM mode is unstable in the central and edge regions of the plasma, and also it is suppressed with an increasing of collisionality with the other parameters fixed. At high frequencies, it was found that the ETG mode is also unstable and isn’t responds to a change in collisionality. With an increasing in collisionality, a transition from ITG to TEM mode also occurs.

Comparison with the data of Doppler backscattering diagnostics was done and the influence of E x B on the microinstabilities was analyzed.

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