

Edge-localized instabilities studies at Globus-M2

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H-mode pulses of Globus-M2 tokamak [1] regularly exhibit a series of edge-localized mode (ELMs) bursts. ELM growth along with the consecutive burst are usually described by the peeling-ballooning mode theory. The peeling-ballooning mode destabilisation is driven by the plasma pressure gradients exceeding the critical values near the separatrix during the H-mode transition and operation. The authors studied ELM bursts at Globus-M2 in pulses with plasma current, I_p , up to 400 kA and toroidal magnetic field, B_T , up to 0.9 T during the external heating power operation provided by neutral beam injection (NBI) and radio frequency waves in the ion-cyclotron range (ICRH).

Two types of ELMs are observed during the Globus-M2 pulses with sole NBI external heating: synchronized with internal reconnections and desynchronized standalone ELMs. Synchronized ELMs appear in conditions correspond to the peeling-ballooning stable plasma, one of the possible destabilisation mechanisms is the current perturbation near separatrix due to the internal reconnection [2]. Desynchronized ELMs in Globus-M2 correspond to the type III [3], as the frequency of desynchronized ELMs was showing linear dependency on the line-averaged density, and desynchronized ELMs appear in marginal stability conditions of the peeling-ballooning mode. The talk demonstrates that EPED model [4] is barely applicable to Globus-M2 pedestal prediction, the main cause of the discrepancies is the destabilised microtearing mode in the pedestal region. The microtearing mode presence is manifested by Mirnov coil measurements demonstrating microtearing mode signature with poloidal/toroidal mode numbers $m/n=10/2$ at 80 kHz frequency and gyrokinetic simulations [5].

The Globus-M2 tokamak has two external heating systems NBI and ICRH, which increase the temperature in parallel and perpendicular to the field line direction, corresponding. In the talk the influence of the pressure anisotropy on the type III ELM development in the Globus-M2.

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References

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