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EFFECT OF THE PLASMA SHAPING ON THE EDGE PLASMA STABILITY AT GLOBUS-M2 *)

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The presented report introduces the research of the edge plasma stability at the spherical tokamak Globus-M2 with weakly shaped plasmas.

Experiments at the conventional tokamaks JET and DIII-D [1,2] along with numerical estimations [3] showed that increased triangularity leads to the improved peeling-ballooning stability and suppression of the edge localized modes (ELM). The intrinsic high elongation and triangularity of the spherical tokamak plasmas [4] lead to suppression of flute instabilities and achievement of high beta conditions.

Experiments were conducted at spherical tokamak Globus-M2 to investigate the outgrowth of the low triangularity operation ($\delta\approx0.2$) in contrast to typical medium triangularity operation ($\delta\approx0.4$) and particularly the effect on pedestal stability. Aforementioned deuterium discharges were characterized by plasma current of IP = 0.3 MA, the toroidal magnetic field at axis of BT = 0.7 T and bottom X-point magnetic configuration with collinear ion grad-B drift direction. The plasma was externally heated by the neutral beam injection with particle energy of ENBI = 30 keV and corresponding input power of PNBI = 0.3 MW during the flat-top phase of the discharge. During the H-mode phase of discharge No. 44330 the independent ELM bursts were observed. Along with ELM bursts, the pressure profile exhibited the characteristic pedestal shape. The pedestal height in low triangularity discharges was P = 1.2 kPa, which is three times lower than in medium triangularity discharges [5]. The magnetic configuration reconstruction by PET code [6] showed that low triangularity operation causes decreased values of magnetic shear around 3 in vicinity of separatrix. The magnetic shear decrease and reduced ballooning stability due to the increased plasma volume at the low field side leads to peeling-ballooning mode destabilization at low pedestal height.

The peeling-ballooning mode simulations by means of the magnetohydrodynamic code BOUT++ [7] demonstrated that Globus-M2 edge plasma conditions are destabilizing for peeling-ballooning mode with low toroidal numbers around 5. The triangularity change from $\delta=0.19$ to $\delta=0.22$ induces the increase of critical pressure from P=1.2 kPa до P=1.4 kPa for experimentally observed values of pedestal width.

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