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Tokamak research in Ioffe Institute

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Research of various aspects of tokamak physics is conducted on small tokamaks at Ioffe Insitute in a wide range of experimental conditions: R/a=1.6, Bt=0.5(1.0) T, Ip=250(500) kA –Globus-M(M2), R/a=2.4, Bt=1.0 T, Ip=150 kA –TUMAN-3M, R/a=7.0, Bt=3.0 T, Ip=25 kA –FT-2 tokamaks. Results obtained in final Globus-M experimental campaign (before upgrade shutdown) with the 25% toroidal magnetic field and plasma current increase up to 0.5 T and 250 kA respectively are presented. In these experiments an overall improvement in plasma performance was observed. Energy confinement time study was performed in both OH and NBI heated H-mode plasma. Strong tau_E dependence on both Ip and Bt was observed, while the dependence on density and absorbed power was similar to the conventional H-mode scaling IPB98(y,2). The lifetime of modes with ITB reached a few confinement times before the q=1 resonant surface appeared in the plasma. Plasma confinement was also studied in the compact TUMAN-3M tokamak. No noticeable isotope effect in particle confinement in hydrogen and deuterium ohmic L-mode was observed. On the contrary, in the ohmic H-mode particle confinement was approximately 1.5 times higher in deuterium than in hydrogen. Study of TAEs on Globus-M was performed at increased magnetic field. The mode character and influence on the fast ions changed with the increase of the Bt and Ip. At TUMAN-3M Ion Cyclotron Emission in OH and NBI heated discharges was studied. Application of the NBI revealed central location of ICE, excitation by sub-Alfvénic beam ions and fine structure of the emission spectral lines. New diagnostics, designed for Globus-M2, were installed and tested on Globus-M. At the FT-2 tokamak the ELMFIRE global gyrokinetic modeling of the OH discharge is compared to the experimental data using the specially developed fast linear version of the X-mode DR synthetic diagnostics. The anomalous absorption of the pump wave in the ECRH experiments due to the parametric excitation of trapped UH waves in the vicinity of the density or magnetic field profile local maximum is considered.

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