DOI: 10.34854/ICPAF.52.2025.1.1.028

RECONSTRUCTION OF CURRENTS DISTRIBUTION IN THE GDT PLASMA USING MAGNETIC DIAGNOSTICS *)

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The “vortex confinement” method is used for the stabilization of plasma against the flute instability on the Gas-dynamic trap (GDT, BINP) [1, 2].This method is realized by creation of radial electric field inside the plasma using annular electrodes that directly contact with the plasma.Besides, in the confinement regimes with shortened anisotropic ions movement region and enhanced relative pressure β [3] plasma is less stable against the flute instability, so “vortex confinement” requires larger gas puffing into a vacuum chamber that increases losses of fast ions through the charge exchange channel.In addition, the ballooning instability can arise when threshold β is exceeded.Therefore, it is actual to consider alternative ways to stabilize the flute instability and measures to suppress the ballooning mode.

In the paper [4] it is theoretically substantiated the method of flute and ballooning (both m=1) modes stabilization by an axisymmetric conducting wall surrounding the plasma.It is required to determine the fast ions pressure radial profile and reconstruct the plasma currents distribution for the cases of several GDT`s magnetic configurations in order to develop conducting MHD stabilizer.Radial β profiles [5] in the GDT central plane were obtained using spectral MSE diagnostic [6].Magnetic field outside the plasma was measured by the set of radial and axial magnetic probes arranged along the trap axis in the fast ions confinement region and by radial probes combined into three azimuthal arrays.The probes placement geometry was chosen on the basis of modelling of the discharges using the DOL code [7].Two azimuthal arrays was located near the planes including calculated maxima of the anisotropic ions pressure in various magnetic configurations of the GDT.Third array was located near the central plane.Such an arrangement of the probes is assumed to allow distinguishing flute and ballooning instabilities from each other.

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