Vortex confinement of high-pressure plasma in the open trap

1,2Konstantinov S.E., 1,2Beklemishev A.D.

1Budker Institute of Nuclear Physics (BINP), Novosibirsk, Russia,   
2Novosibirsk State University, Novosibirsk, Russia, [s.konstantinov@g.nsu.ru](mailto:s.konstantinov@g.nsu.ru)

Average magnetic hill in the center of axisymmetric open traps makes transverse confinement of plasma difficult, as it leads to flute instability appearance. It was shown in [2] that additional potentials applied to limiter end-plates sufficiently suppress transverse losses. In such impact near-axial plasma gains additional azimuthal speed generated by applied potentials. A flute perturbation blurs before surfacing if shear movement characteristic time is of the order of the instability evolution characteristic time. The FLR effects move rigid mode to the nonlinear saturation state and confines plasma in the vortex stream. Earlier on the theory of vortex confinement used the low pressure equilibrium with β >> 1, in this study we generalized it for β ~ 1 case.

To form the system of equations for plasma vortex flow, we used the Navier-Stocks equation, freezing of the magnetic field, continuity equation, and energy balance averaged along facility axis. The boundary condition takes into account the limiter potential. We linearized the system by dissipative terms to isolate the vortex associated effects.

References

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