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Vortex Confinement of Plasmas in Axially Symmetric Mirrors ALEXEI BEKLEMISHEV, PETER BAGRYANSKY, MAXIM CHASCHIN, ELENA SOLDATKINA, Budker Institute of Nuclear Physics — Efforts to optimize operation of the Gas Dynamic Trap with variation of plasma rotation led to discovery of a new way of efficient plasma confinement. Its nature is similar to confinement of material in the dead zone of a vortex flow. It is achieved by applying voltage to the limiters and the endplates of the device, thus creating shear-flow layer, which surrounds the core of the discharge. In this regime the gas-dynamic stabilization is shown to be unnecessary, as the confinement is excellent even with straight field lines in the expanders. While the axisymmetric equilibrium remains unstable, there appears a new dynamic state of confinement with approximate axial symmetry and low convective losses. The needed power consumption is a fraction of parallel ion losses (30kW), while the theoretical scaling predicts the scheme to work even at fusion temperatures. The talk will contain simplified analytic theory of the nonlinear dissipative saturation of the m=1 mode in the presence of the externally-driven vortex flow, and the two-dimensional drift-ordered MHD simulation of the vortex confinement in the GDT.

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