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Low-frequency turbulence and non-diffusive cross-field plasma transport in mirror systems V.P. PASTUKHOV, N.V. CHUDIN, Russian Research Centre, Kurchatov Institute, W. HORTON, UT Austin, IFS — Low-frequency (LF) turbulence and the resultant cross-field plasma transport in mirror-based systems are studied on the basis of direct numerical simulations of nonlinear plasma dynamics. Under the low-beta assumption the nonlinear dynamics can be described in a frame of adiabatically reduced one-fluid MHD model (Pastukhov and Chudin, JETP Lett. 82(6), 2005). Simulations of self-consistent plasma evolution have shown formation of large-scale flute-like stochastic vortex structures, which have broad-bend frequency and wave-number spectra and are similar to the intermittent vortex-like structures observed in GAMMA 10 experiments (Cho et al., Phys.Rev.Lett. 94 (8),2005). The simulations were performed both for the conventional tandem mirror configurations and for axisymmetric non-paraxial configurations with a diverter-like separatrix as well. Various regimes of plasma confinement with sheared plasma rotation have been modeled and analyzed. The results obtained show a complex influence of sheared flows on the nonlinear plasma dynamics and the resultant cross-field plasma transport in mirror systems. The ability to control profiles of plasma rotation and sufficiently high dynamic vorticity of sheared flows can lead to turbulence reduction, modification of dominant vortex vorticity structures and transport barrier formation.

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