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Profile Consistency and Resistive Relaxation of Field-Reversed Configurations[1] ELENA BELOVA, PPPL — Two-dimensional numerical simulations are used to study resistive evolution and self-organization in Field-Reversed Configurations (FRC). It is shown that FRCs with various initial profiles and separatix shapes obtained by solving the Grad-Shafranov equation, evolve through resistive relaxation toward a specific family of FRC equilibria with flat current profile and approximately elliptic separatrix shape. This class of profiles is shown to be an attractor, and the FRC in the relaxed state evolves in a self-similar manner. Axisymmetric simulation of FRC formation by the counter-helicity spheromak merging also show formation of FRCs with elliptical shape and approximately flat current profiles independent of the initial conditions, implying that this class of equilibria may correspond to a minimum-energy state. Unlike the force-free relaxed states in the low-beta plasmas, two-dimensional FRCs evolve towards zero-helicity, diamagnetic state, in which current is perpendicular to the magnetic field. An attempt is made to describe these states by a relaxation theory with two integral constraints.

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