The effect of shaping on Reversed Field Pinch dynamics

ROBERT CHAHINE, LMFA, CNRS, Ecole Centrale de Lyon, Université de Lyon, Ecully, France, JORGE A. MORALES, CRPP, EPFL, Switzerland, KAI SCHNEIDER, I2M-CNRS, Centre de Mathématiques et d’Informatique, Aix-Marseille Université, Marseille, France, WOUTER J. T. BOS, LMFA, CNRS, Ecole Centrale de Lyon, Université de Lyon, Ecully, France — Reversed Field Pinch fusion devices (RFPs) are inevitably plagued by magnetohydrodynamic (MHD) instabilities. High resolution numerical simulations of fully nonlinear visco-resistive magnetohydrodynamics using a Fourier pseudo-spectral method with volume penalization [Morales et al. JCP, 2014] are performed. Results of RFP simulations in toroidal geometry were reported in [Morales et al. PPCF, 2014]. Here we consider a cylindrical domain with elliptical cross-section for different aspect ratios. The results illustrate a notable influence of the shape of the cross-section on the nonlinear dynamics of RFPs. The axial mode-spectrum is qualitatively changed in cylinders with elliptic cross-section. The results suggest that shaping could change, and possibly improve the confinement of RFPs. It is certainly possible that specific helical modes can be promoted, approaching thereby a QSH state.

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