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MHD Simulations of single helicity and quasi-single helicity states in Reversed Field Pinches CHARLES BATHKE, GIAN LUCA DELZANNO, LUIS CHACON, JOHN FINN, RICHARD NEBEL, LANL — We present a systematic MHD study of single helicity (SH) states and quasi-single helicity (QSH) states in RFPs. We begin with cylindrical paramagnetic pinch equilibria with uniform resistivity, characterized by a single dimensionless parameter proportional to the toroidal electric field, or the RFP toroidal current parameter Θ. For sufficiently high Θ, there are several unstable $m = 1$ ideal MHD instabilities, typically one of which is nonresonant, with 1/n just above $q(r = 0)$. We evolve these modes nonlinearly to saturation for low Hartmann number H. We then obtain the $m = k = 0$ quasilinear profiles, which typically have toroidal field reversal, and study their stability. For typical cases, these profiles may remain unstable to tearing modes, but only for sufficiently high H. For lower H these states are stable. We show results indicating the proximity of these thresholds to the thresholds between SH and QSH behavior.

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