Single helicity and quasi-single helicity states in RFPs CHARLES
BATHKE, GIAN LUCA DELZANNO, LUIS CHACON, JOHN FINN, LANL —
We present a systematic 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 suficiently
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.

John Finn
LANL