SPEC computes extrema of the multi-region, relaxed MHD energy principle

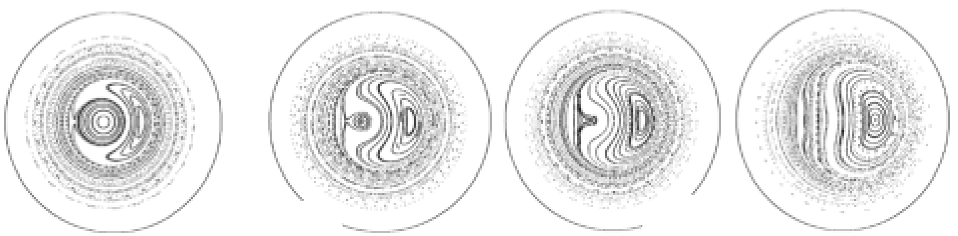
- **The plasma is partitioned into N "relaxed volumes", separated by "ideal interfaces".**

- **Minimize the total energy, subject to the constraints of conserved fluxes and helicity in each region**

$$F \equiv \sum_{i=1}^{N} \left[\underbrace{\int_{\mathcal{V}_i} dv \left(\frac{p}{\gamma - 1} + \frac{B^2}{2} \right)}_{energy} - \frac{\mu_i}{2} \left(\underbrace{\int_{\mathcal{V}_i} dv \ \mathbf{A} \cdot \mathbf{B}}_{helicity} - K_i \right) \right]$$

- In the relaxed volumes, $\nabla \times \mathbf{B} = \mu \mathbf{B}$, and islands, chaotic fields are allowed.
- Across the ideal interfaces, $[[p+B^2/2]]=0$, and pressure gradients are allowed.
- If N = 1 , obtain a globally-relaxed, Taylor state.
- If $N \rightarrow \infty$, recover ideal MHD $\nabla p = \mathbf{j} \times \mathbf{B}$.
- If N = 2 , exlains helical states in RFP

Overview of RFX-mod results,
P. Martin et al., *NF, (2009)*
Fig.6. . . . transition from a QSH state . . to a fully developed SHAx state .



Numerical Calculation using Stepped Pressure Equilibrium Code,
G. Dennis et al., *PRL, (2013)*
Topological features correctly reproduced