Extensive Code Benchmarking

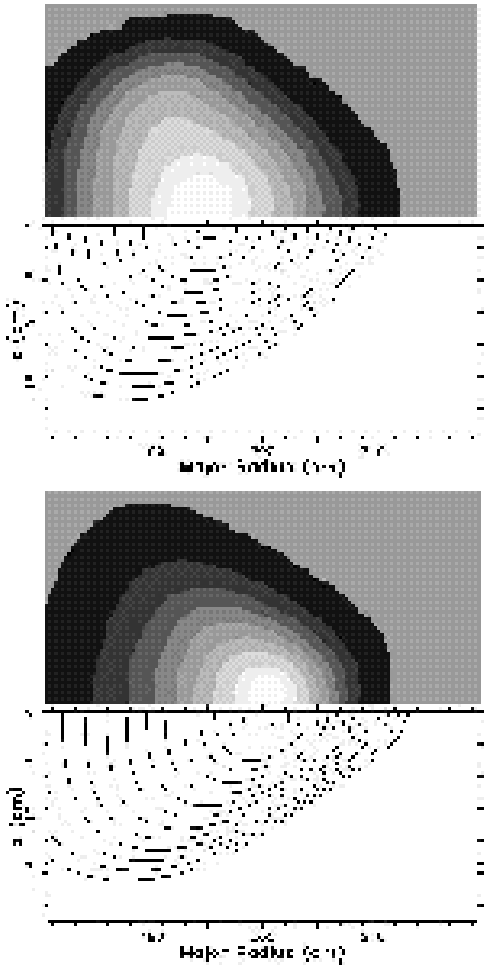
- VMEC has been benchmarked extensively (primarily at large aspect ratio)
  - against 2D (Grad-Shafranov) codes (EFIT, Zakharov code)
  - against 3D BETA code (P.Garabedian)
  - In free-boundary mode, for vacuum configurations against field-line following codes
  - at full beta against PIES (where good surfaces exist) in both fixed and free boundary modes

Experimental Benchmarking

- VMEC is used **extensively** throughout the stellarator community
  - Germany (W7-AS, W7-X), Japan (LHD, CHS), Spain (TJ-II), US (ATF, NCSX, QOS)

- It is both a *design* tool and an *analysis* tool
  - Benchmarked at finite β using x-ray tomography

X-ray Diagnostics on WENDELSTEIN 7-AS



X-ray emissivity contours reconstructed from data of two cameras.

The observed Shafranov shift and surfaces agrees well with VMEC equilibrium calculations

Top: $\beta(0)=1\%$

Bottom: $\beta\ (0)=4.4\%$

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