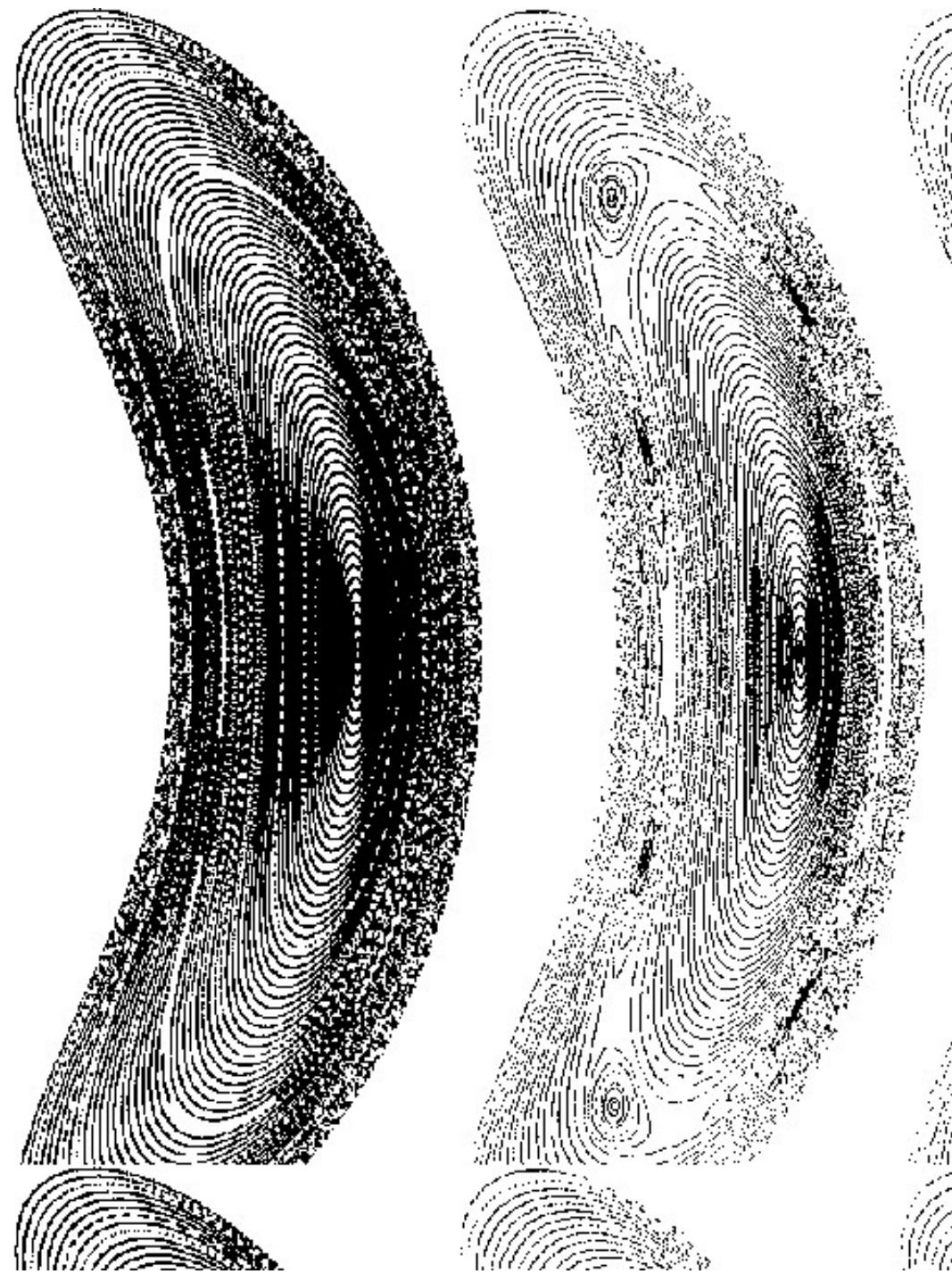
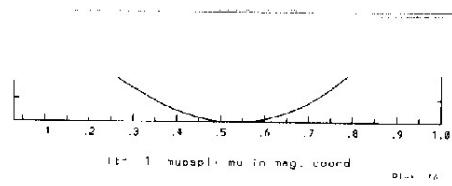
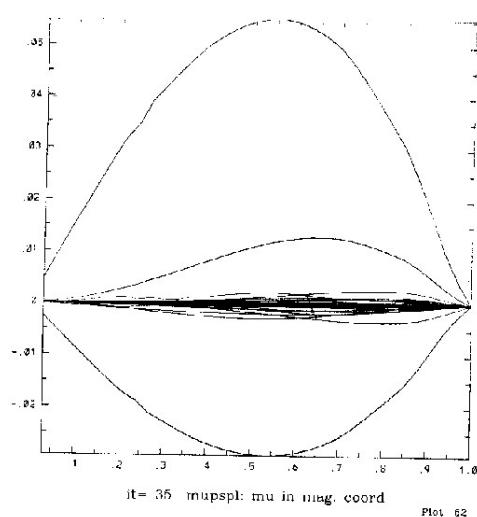
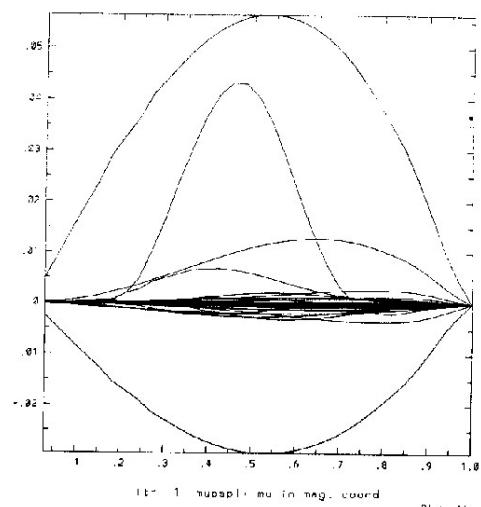


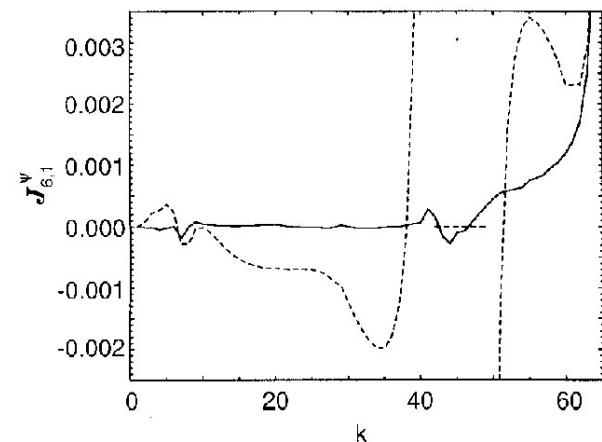
NCSX Team Report: PIES calculations and NIFS-BS calculations

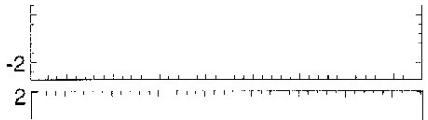
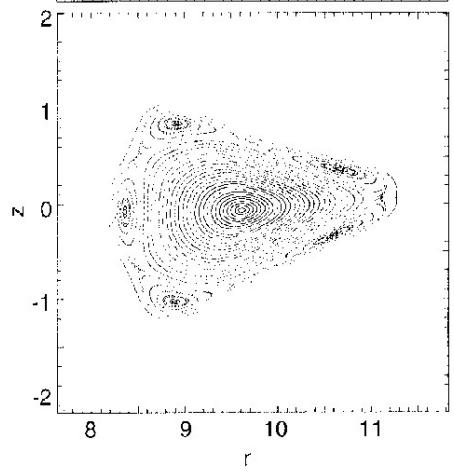
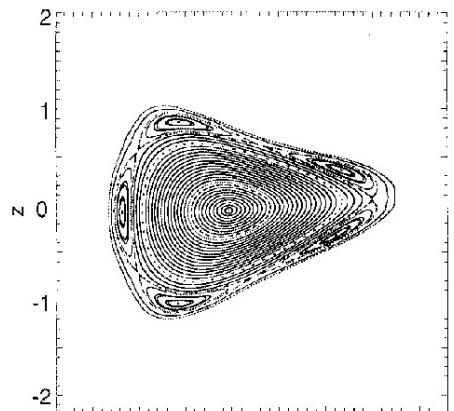
- PIES Code
 - PIES Capabilities - W7X calculation
 - PIES Application to Coil Design Problem

- NIFS-BS Code
 - Review of Resonant Problem
 - Origin Problems - prevented finding a solution with zero current drive
 - Comparison with Tolliver Code (Paul Moroz)
 - Large Effect of Small B_{mn} ($n \neq 0$)

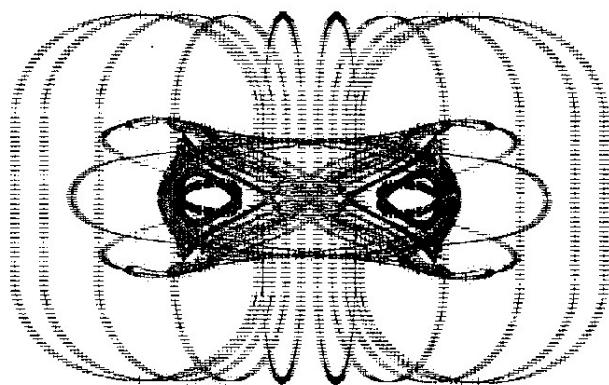




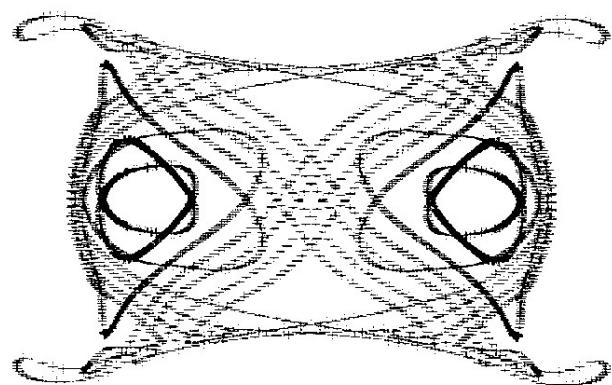




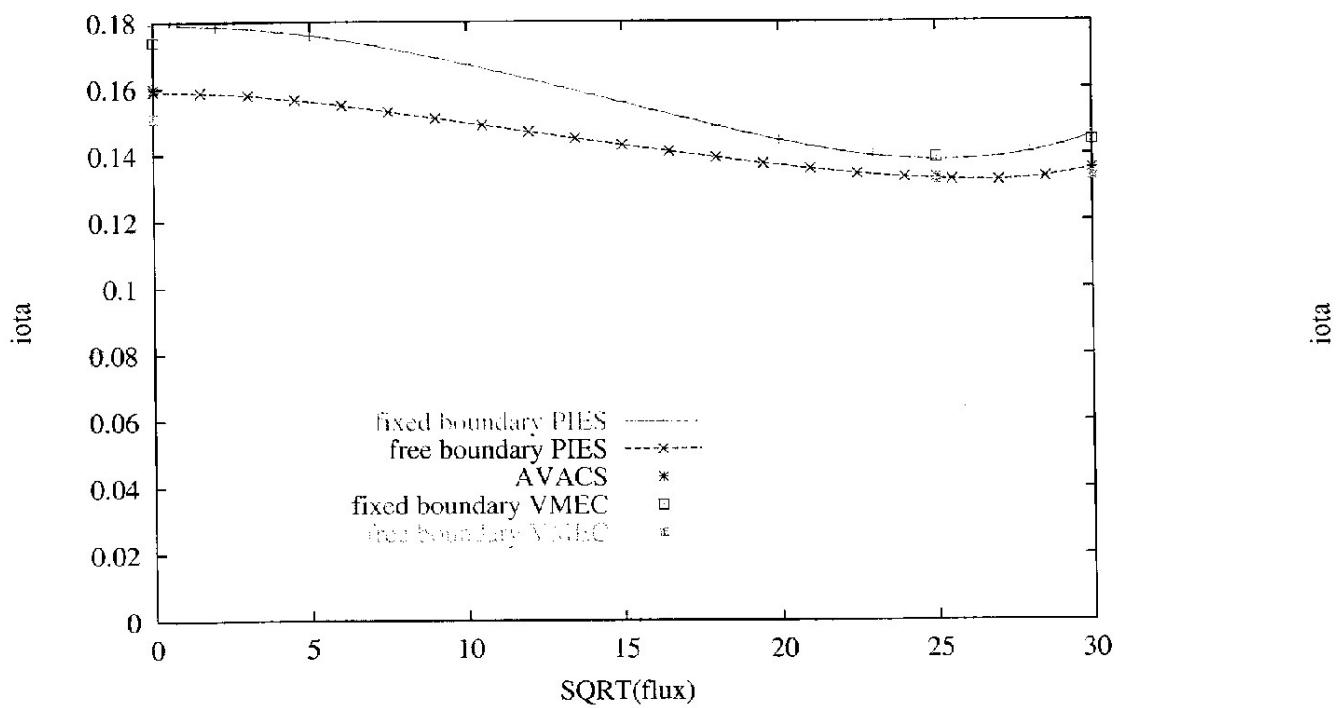
40% Case - All Coils



40% Case - Saddle Coils



40% Case

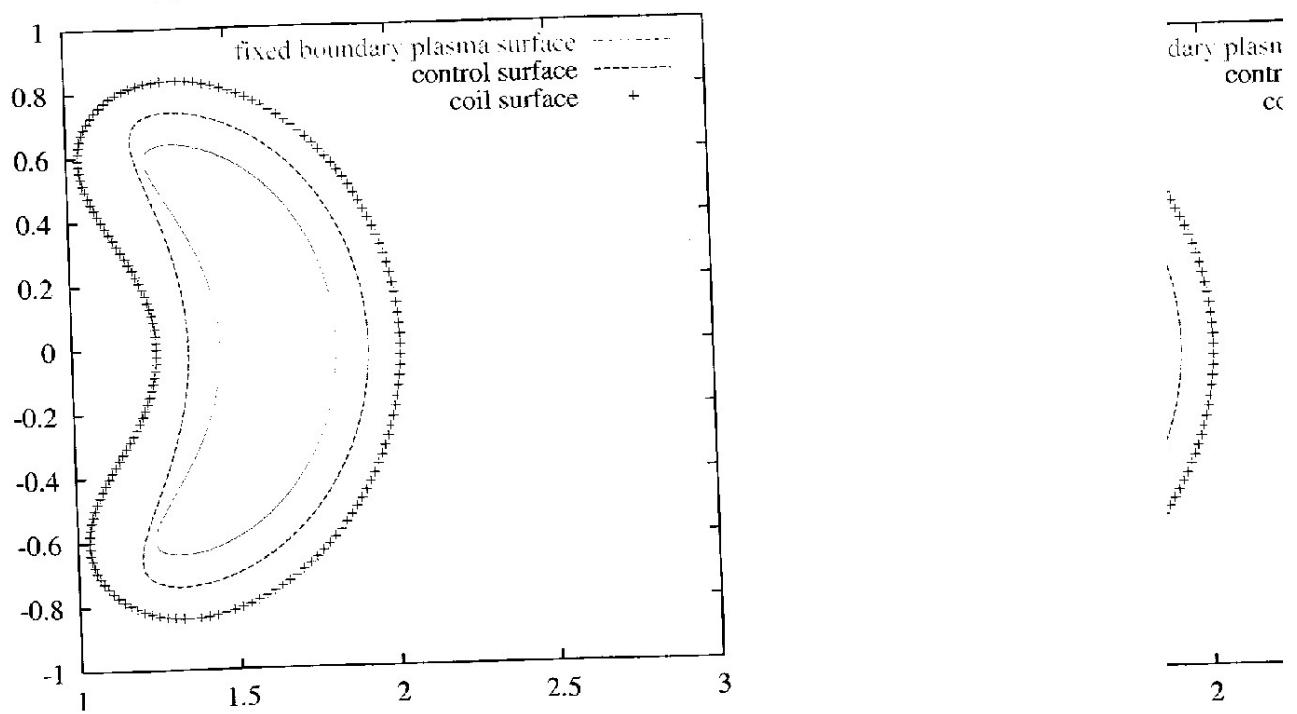


iota profile unchanged when:

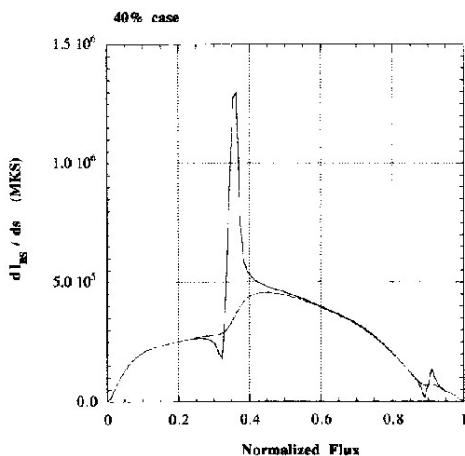
- vary the control surface
 - control surface half way from plasma to coil surface
 - control surface same as coil surface

- vary k, m, n
 - 30, 10, 8
 - 60, 16, 16

40% Case - surface location



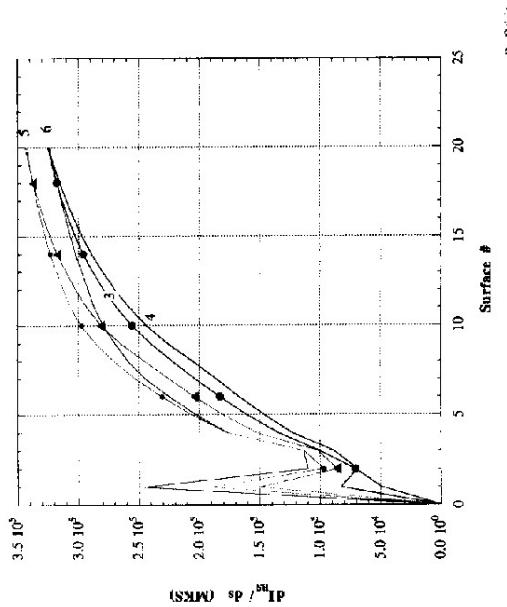
Bootstrap Current - Resonances



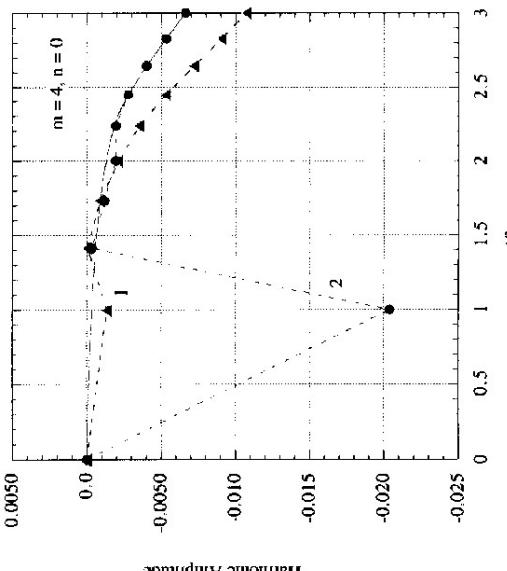
- Strong resonances in collisionless regime - inhibit convergence
- Attenuated by detuning function calculated using physics model due to White *et al*
- Main contribution from drift motion. Need collisions when $s \Rightarrow 0$
- Magnitudes similar to Moroz' prescription

Error Growth Near Magnetic Axis

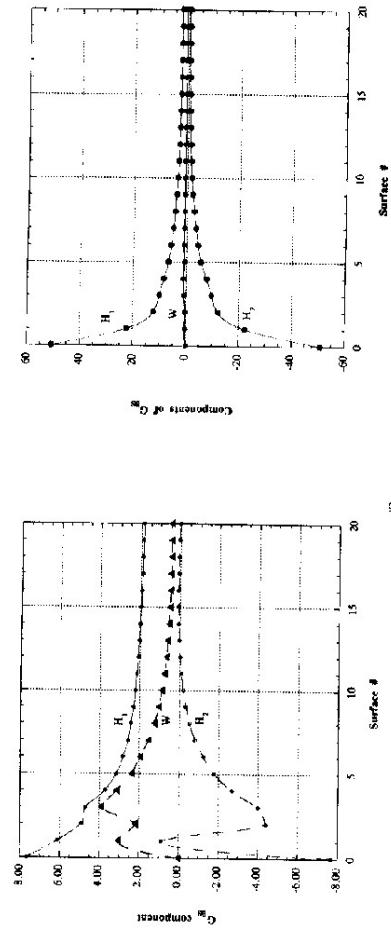
- No convergence without sufficient seed current distributed around center
- When seed current too small, spike appears on bootstrap current density in vicinity of the axis
- This grows catastrophically with successive iterations



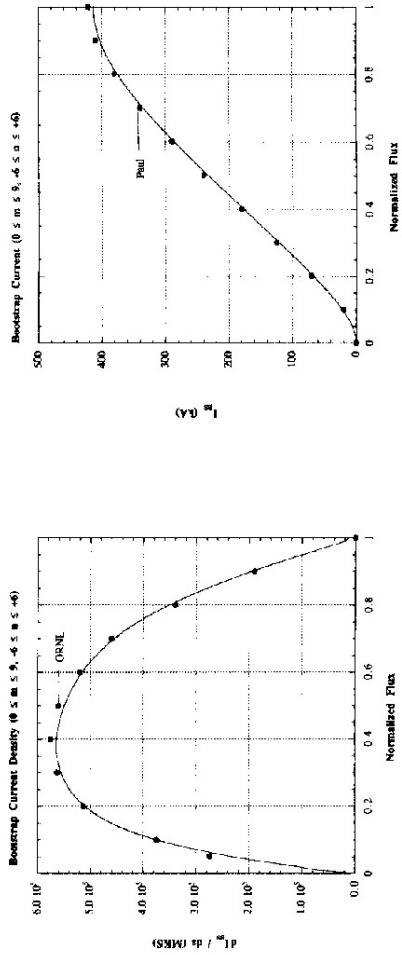
Error Growth in Vicinity of Origin

- Symbols and dotted curve show computed result in immediate vicinity of axis
 - Full curve shows expected analytic behavior
 - $m=4, n=0$ harmonic shown - all others exhibit similar behavior
 - Correct by forcing analytic behavior near magnetic axis
 - Convergence then achieved
- 

Elements of G_{BS} With and Without Smoothing

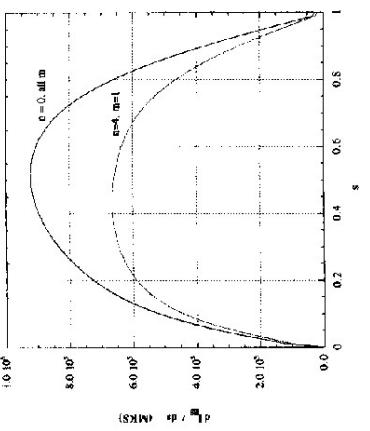
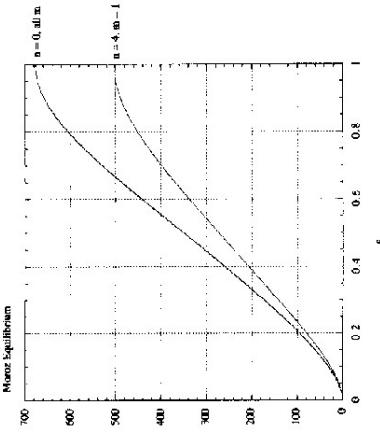


Comparison with Paul Moroz

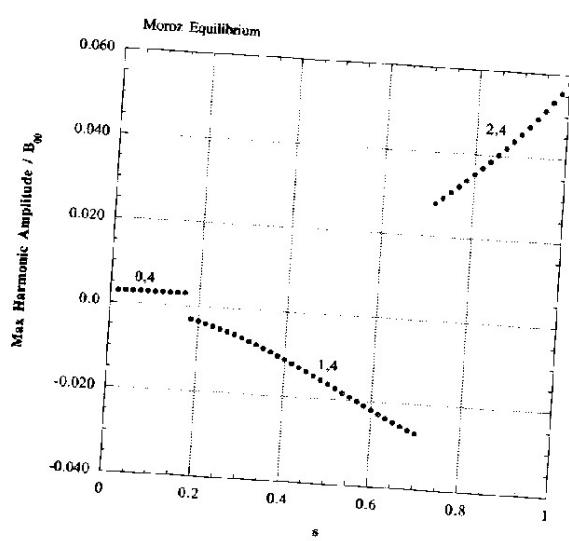


$I_{t\parallel}$: Eff

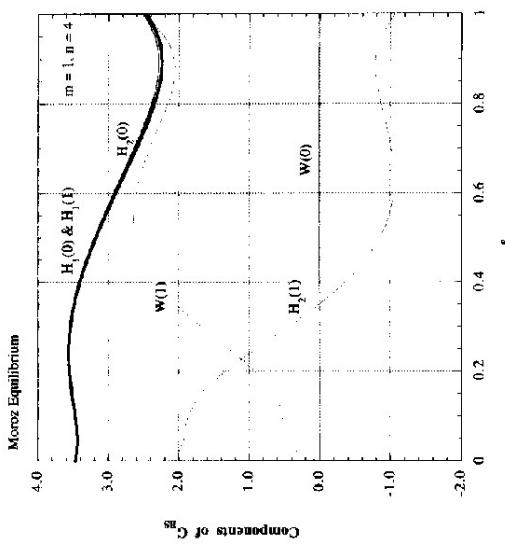
Bootstrap Current : Effect of $n \neq 0$ Harmonics



Maximum Harmonic Amplitude

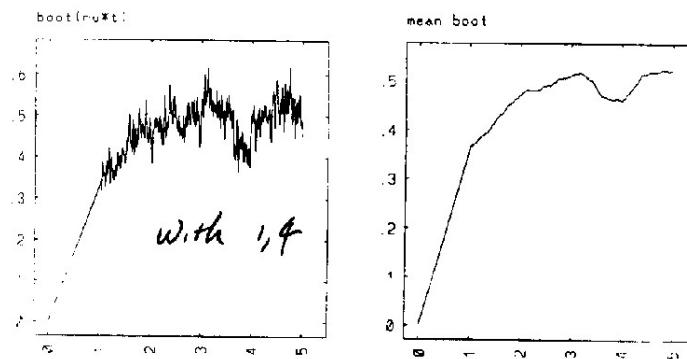


Bootstrap Current : Elements of Geometric Factor

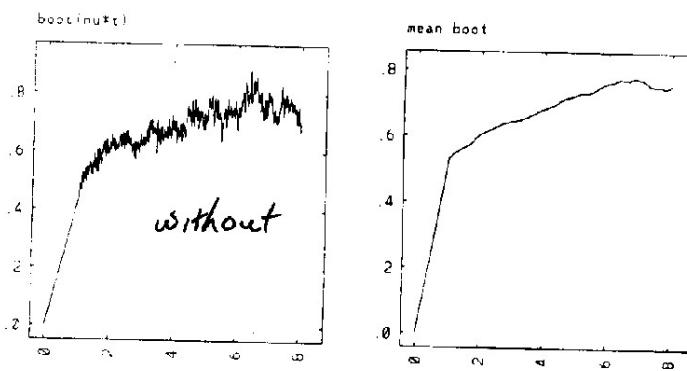


rap C₁

8f Bootstrap Simulation



1,4 causes $\sim 30\%$ decrease



Plans for PIES and NIFS-BS

- PIES
 - Help with coil design
 - Incorporation of NIFS-BS improvements into version in PIES
 - Evaluate NCSX reference design for surface quality
- NIFS-BS
 - Comparison of converged, iterated solution with Tolliver code
 - Verification of large effect of small $B_{mn}(n \neq 0)$