

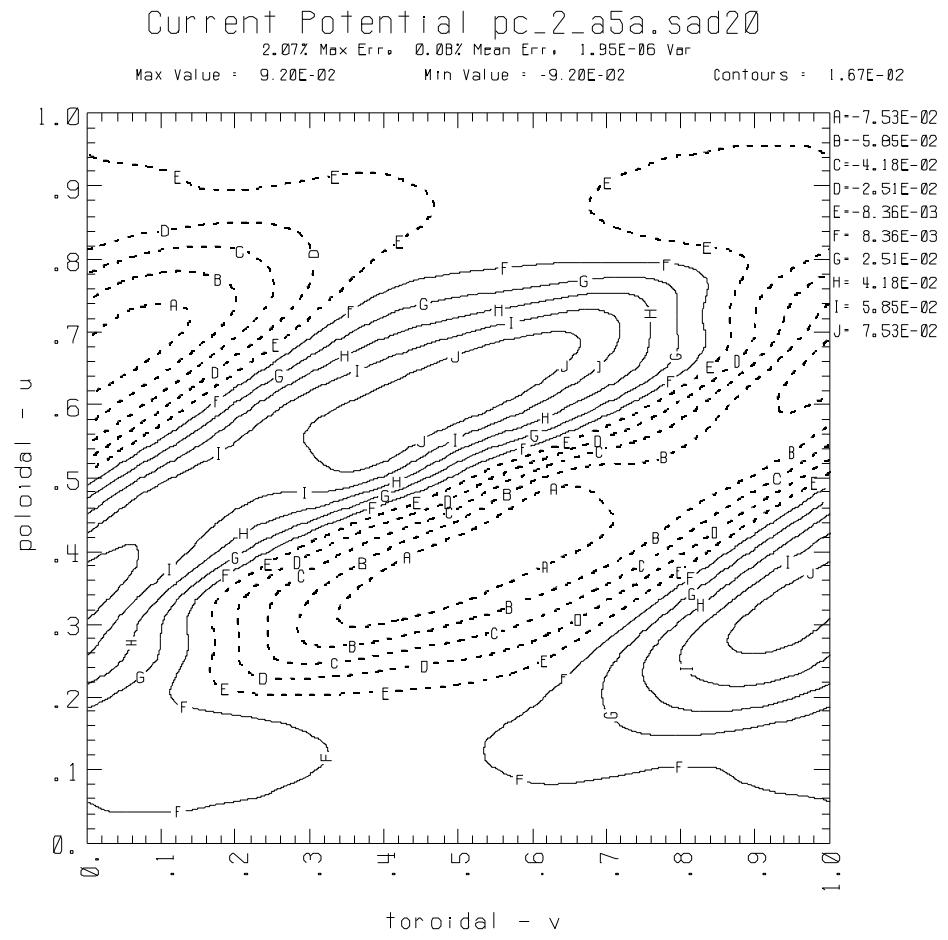
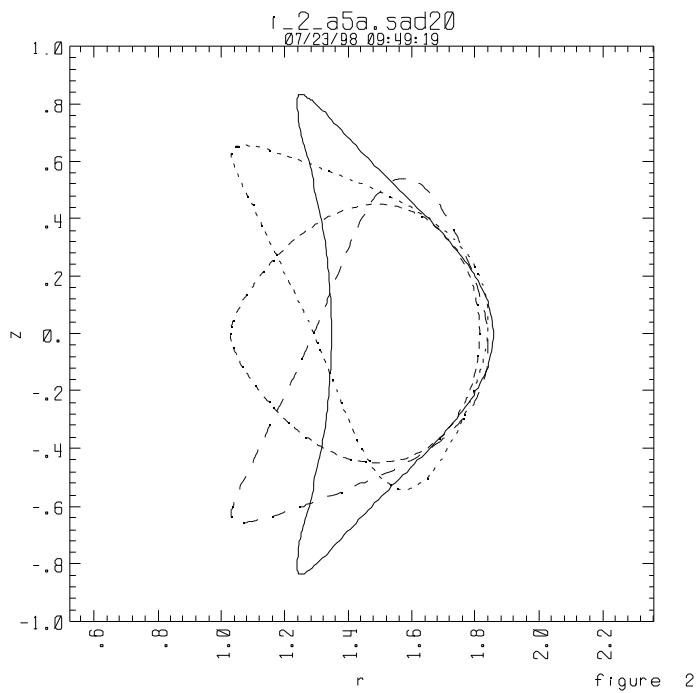
# Coil Configurations

Art Brooks  
September 23, 1998

# Overview

- Comparison of current sheet solutions for 2,3 & 4 period plasma with monotonic & high shear
- 2 Period VMEC Studies
- 3 Period VMEC and AVAC Studies

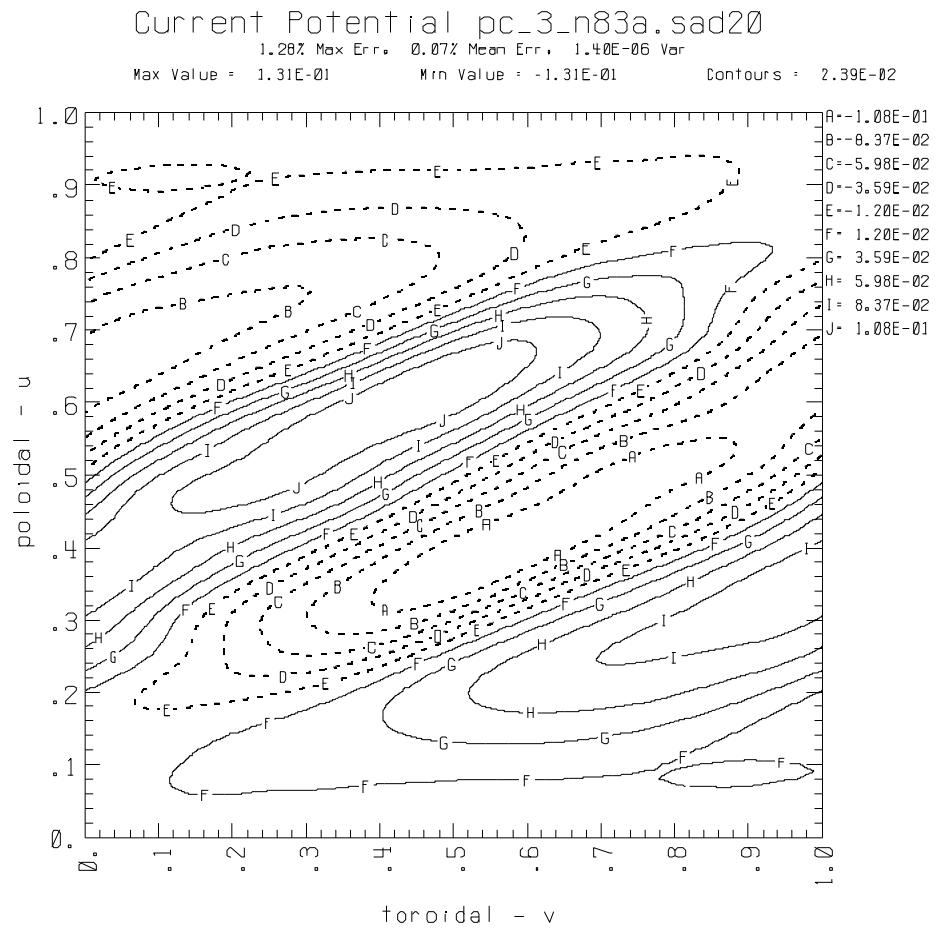
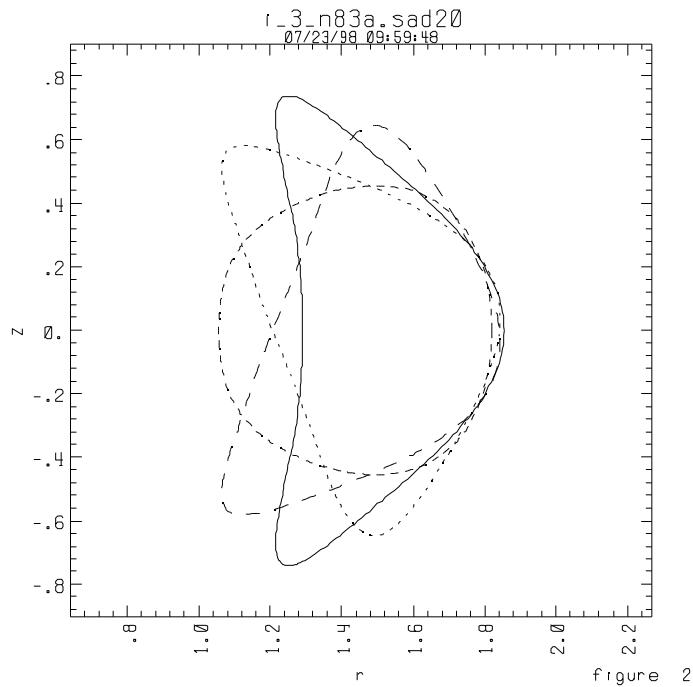
# 2 Period, Monotonic



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3

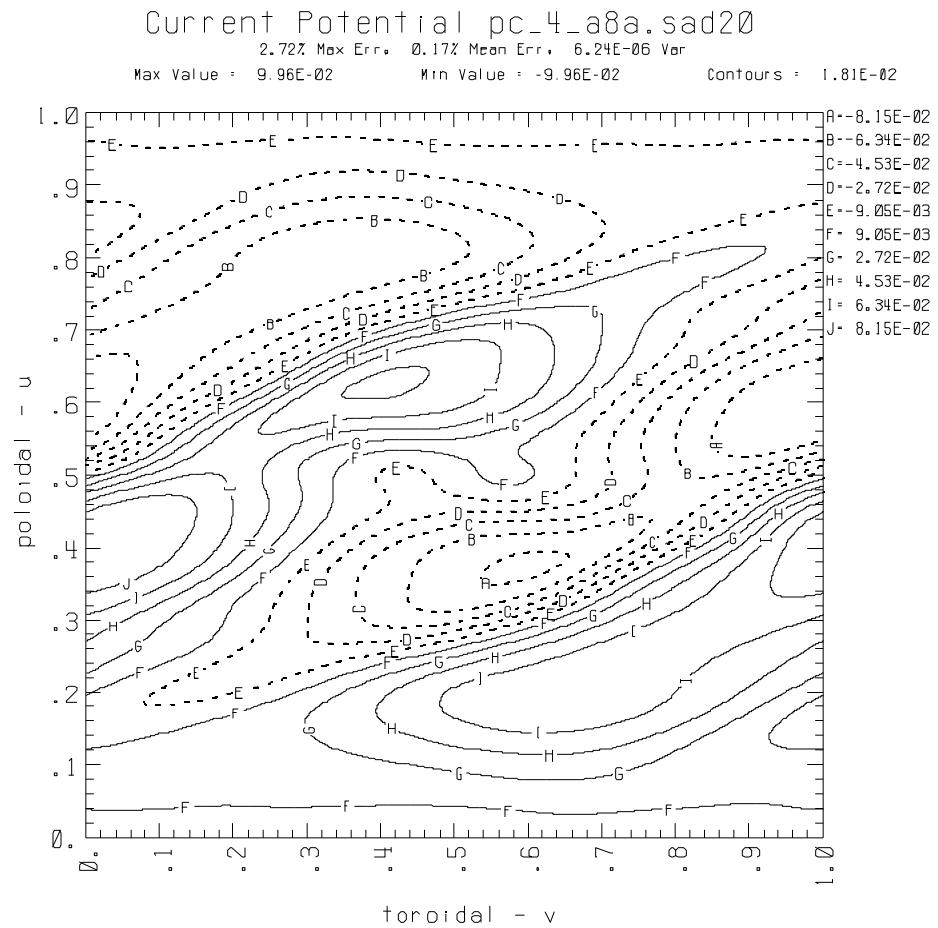
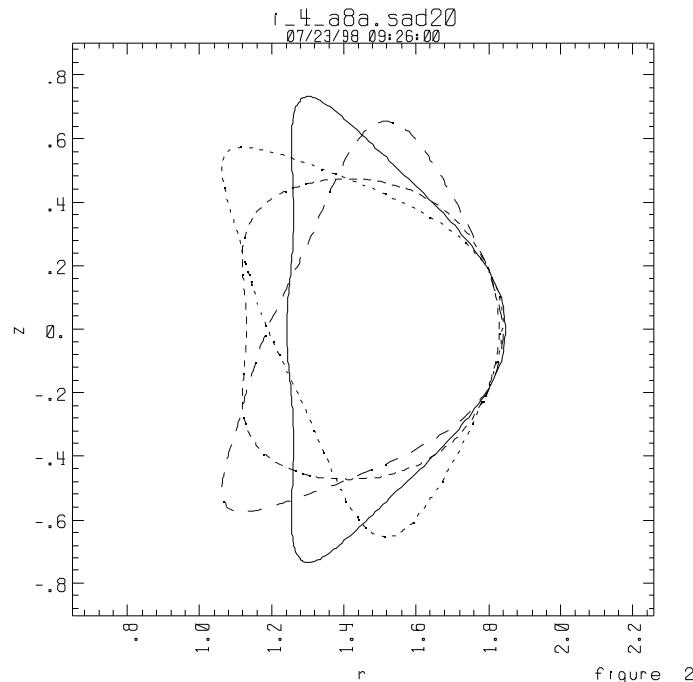
# 3 Period, Monotonic



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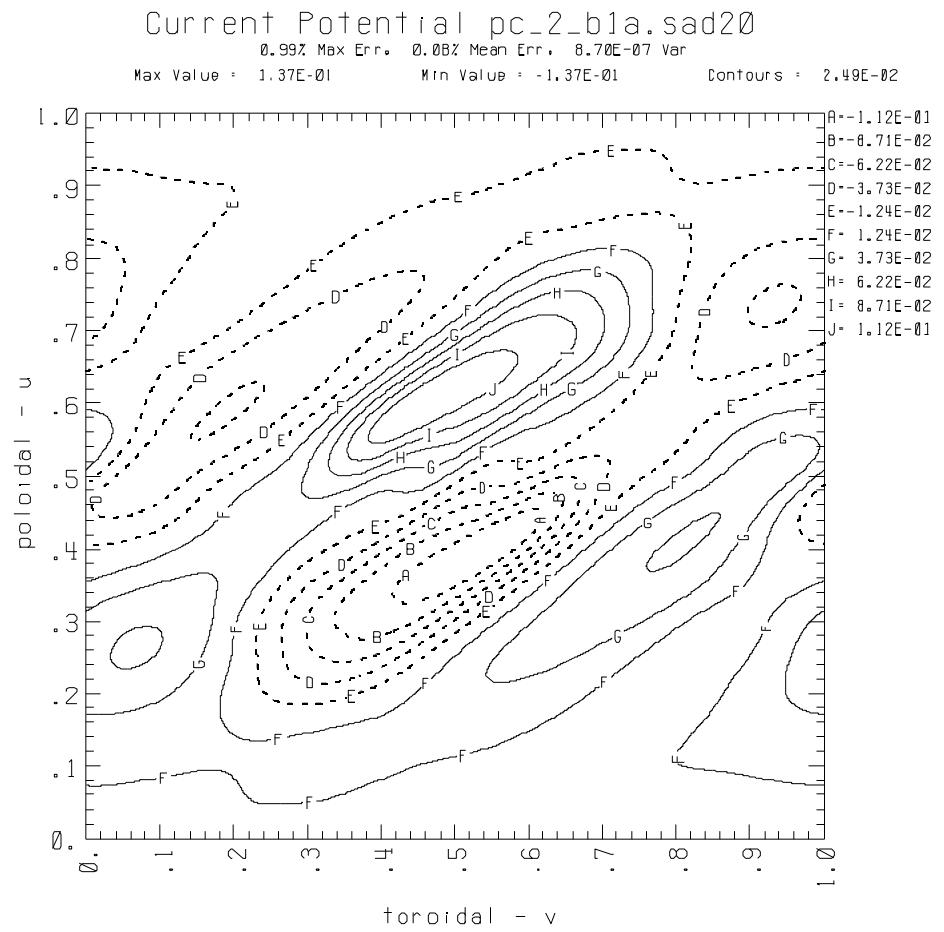
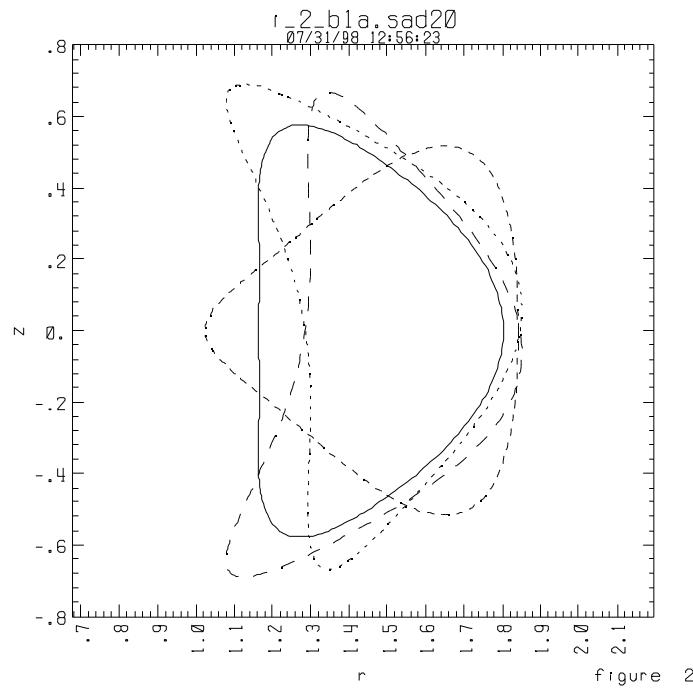
4

# 4 Period, Monotonic

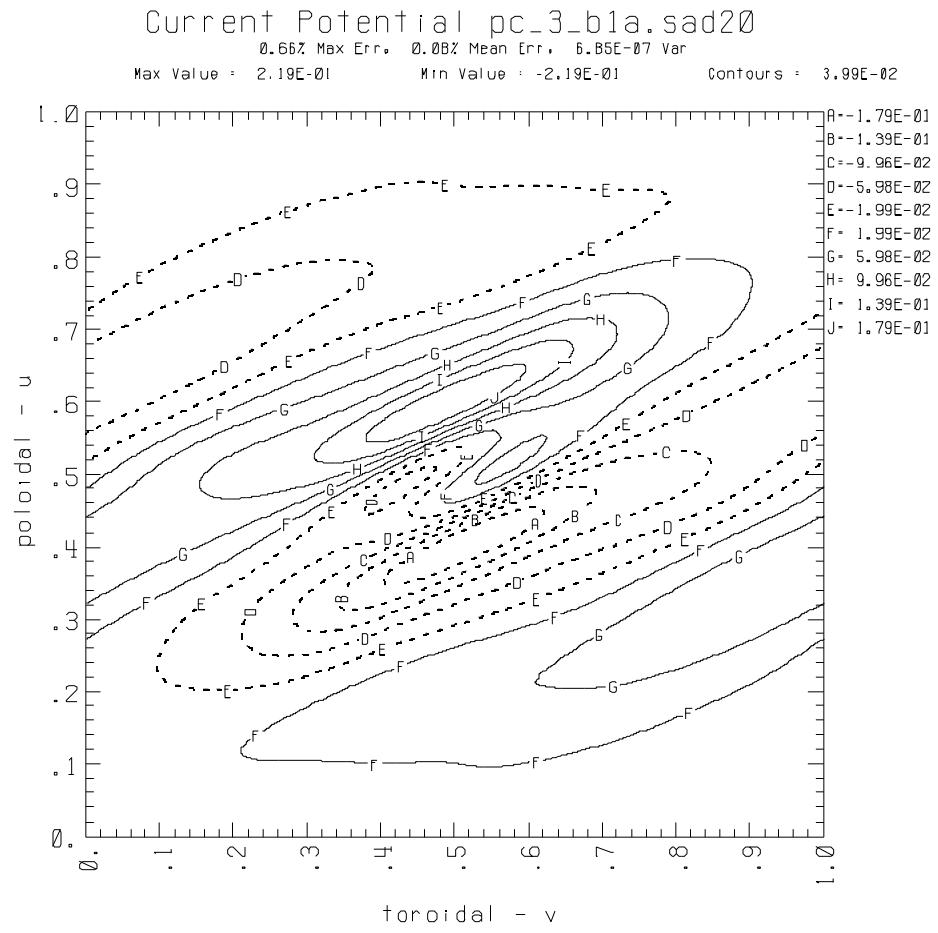
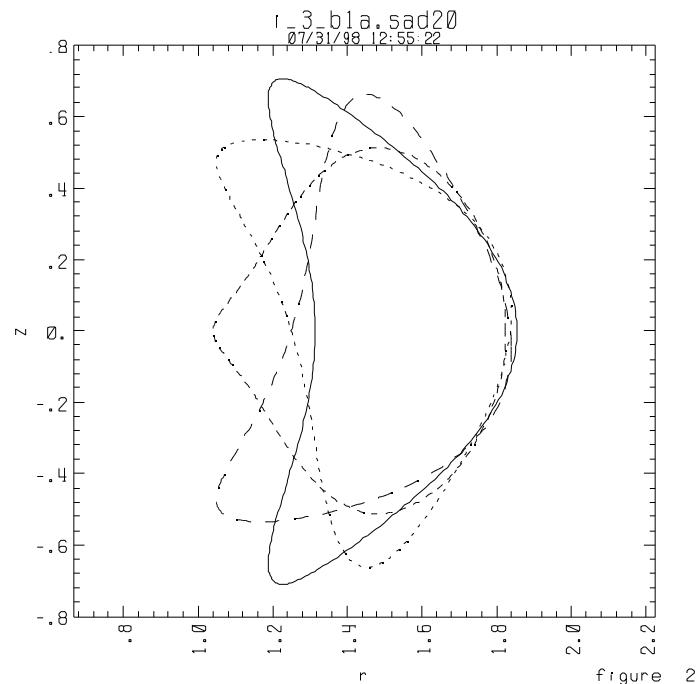


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# 2 Period, High Shear

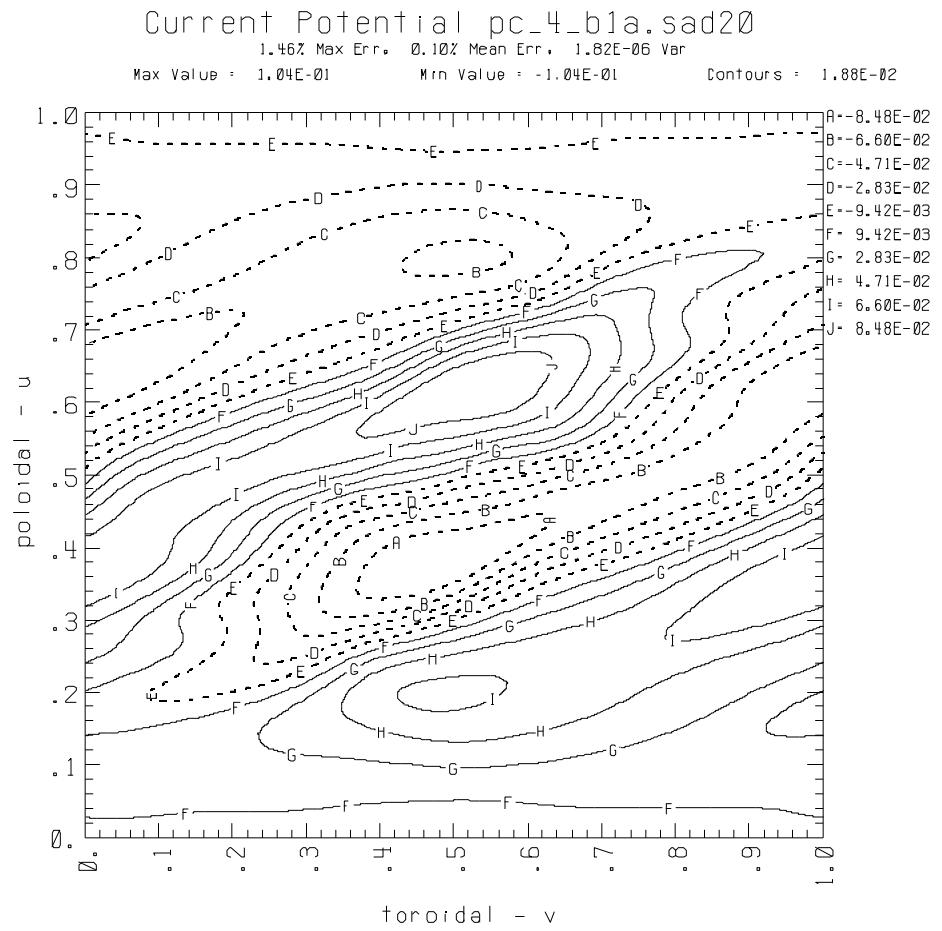
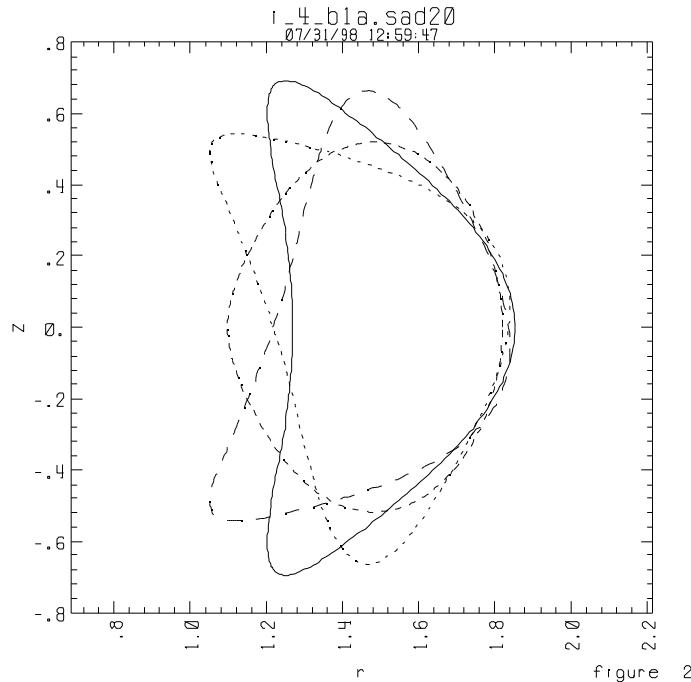


# 3 Period, High Shear



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# 4 Period, High Shear



# Summary of Current Sheet Solutions

Plasma Configuration	# Periods	Errors, %		Current Potential 1/2 Range	TF Current per Period MA	Current Crossing Inboard Midplane MA
		Max	Mean			
Monotonic	2			0.092	3.750	2.76
		2.07	0.08			
		qas2_a5a	1.28	0.131	2.500	3.93
High Shear	3			0.100	1.875	2.99
		2.72	0.17			
		qas3_n83a	0.99	0.137	3.750	4.11
High Shear	4			0.104	2.500	6.57
		1.46	0.10			
		qas4_a8a	0.66	0.219	1.875	3.12

# Coil Design Approach

- Discretize vacuum current sheet solution for saddle and/or helical on 20 cm conforming surface
- Use AVAC / VMEC to verify vacuum surfaces
- Add PF Field and/or optimize coils currents for finite-
- Use VMEC to verify reconstruction

# Improved 3 Period, High Shear in Vacuum

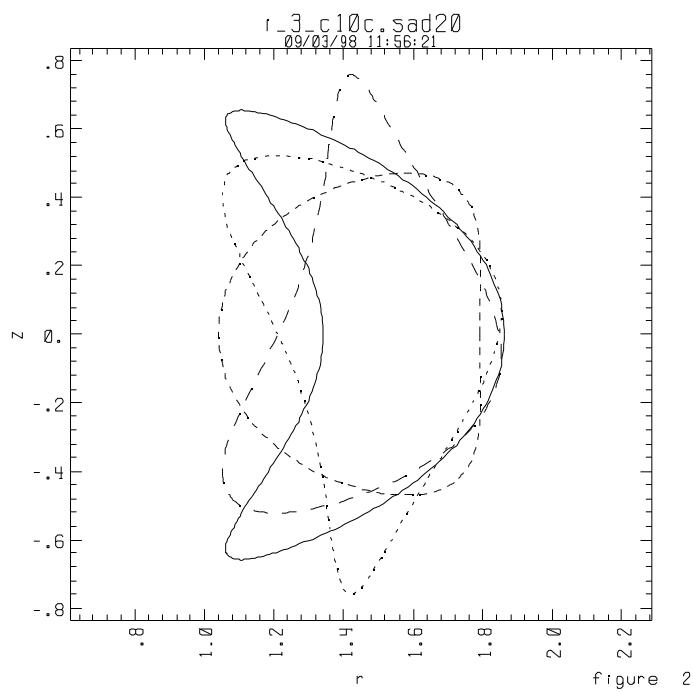
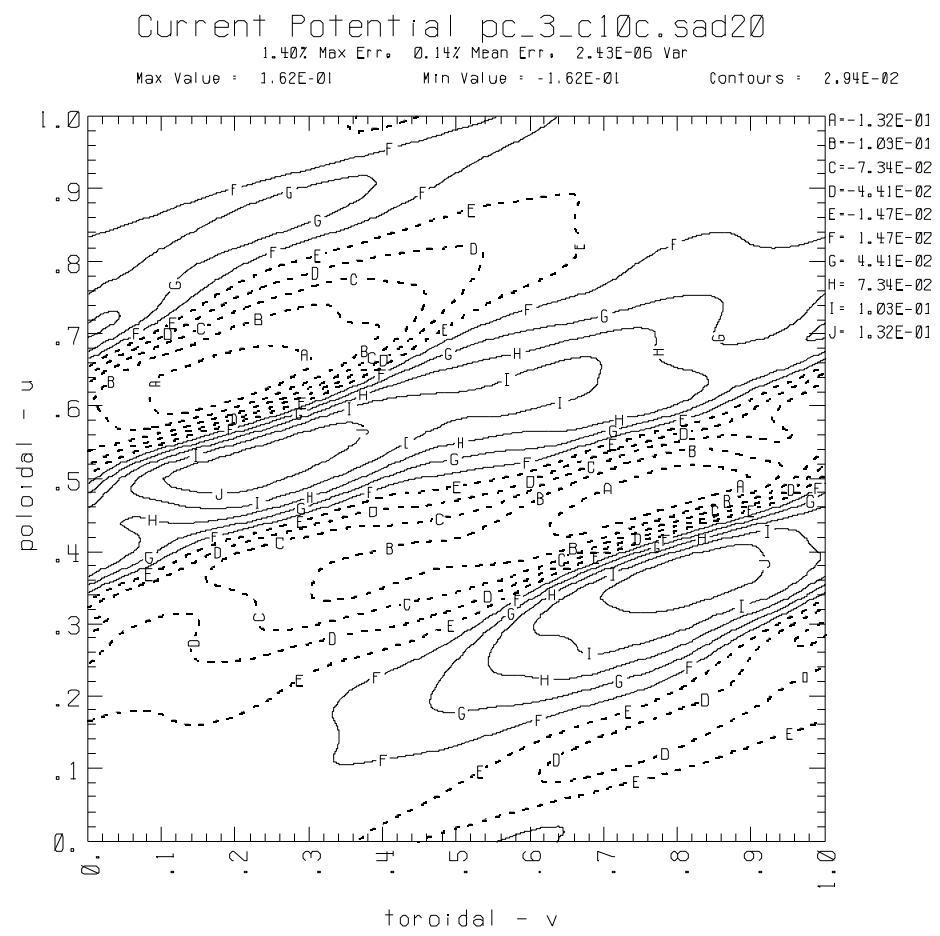
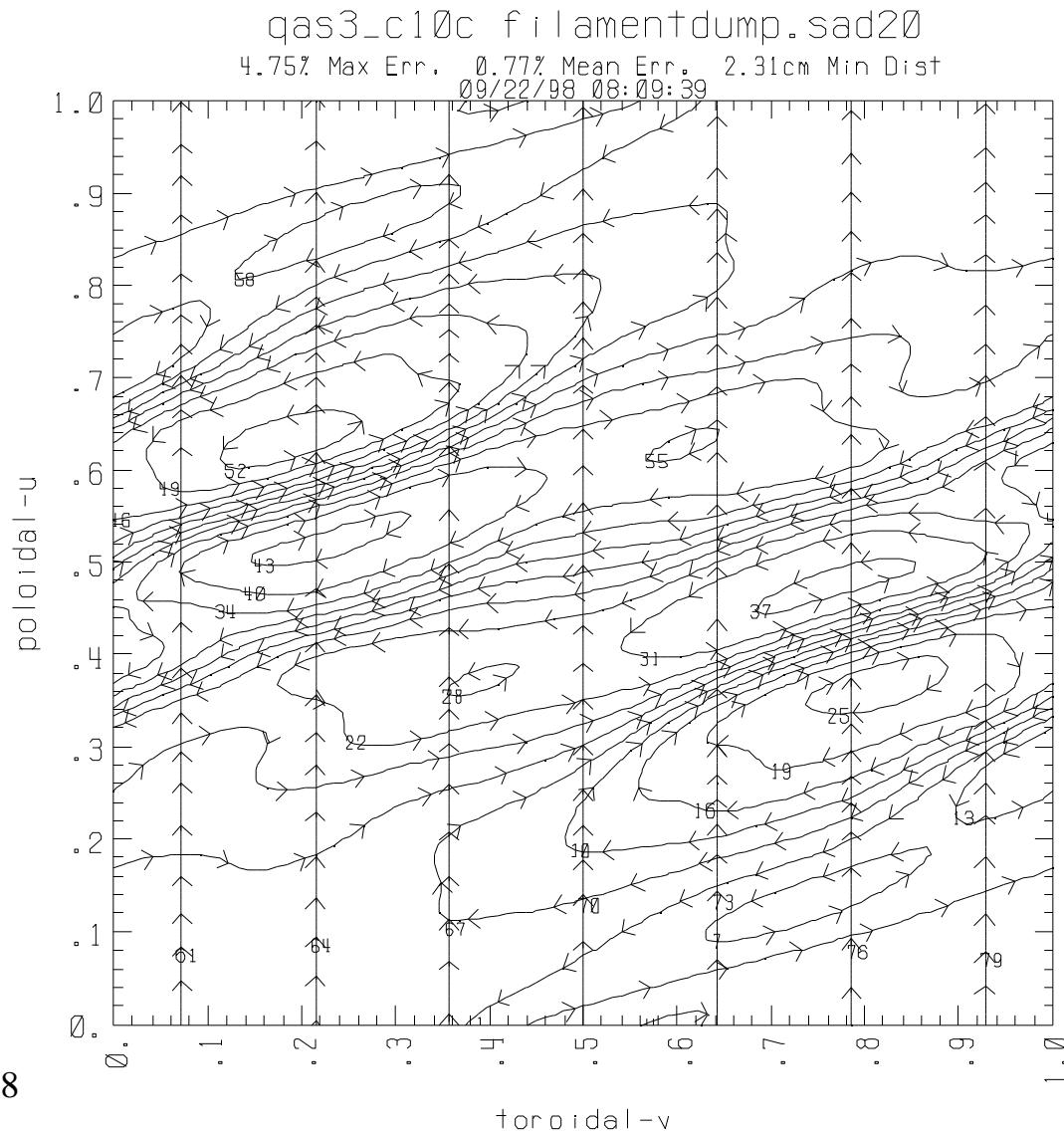


figure 2



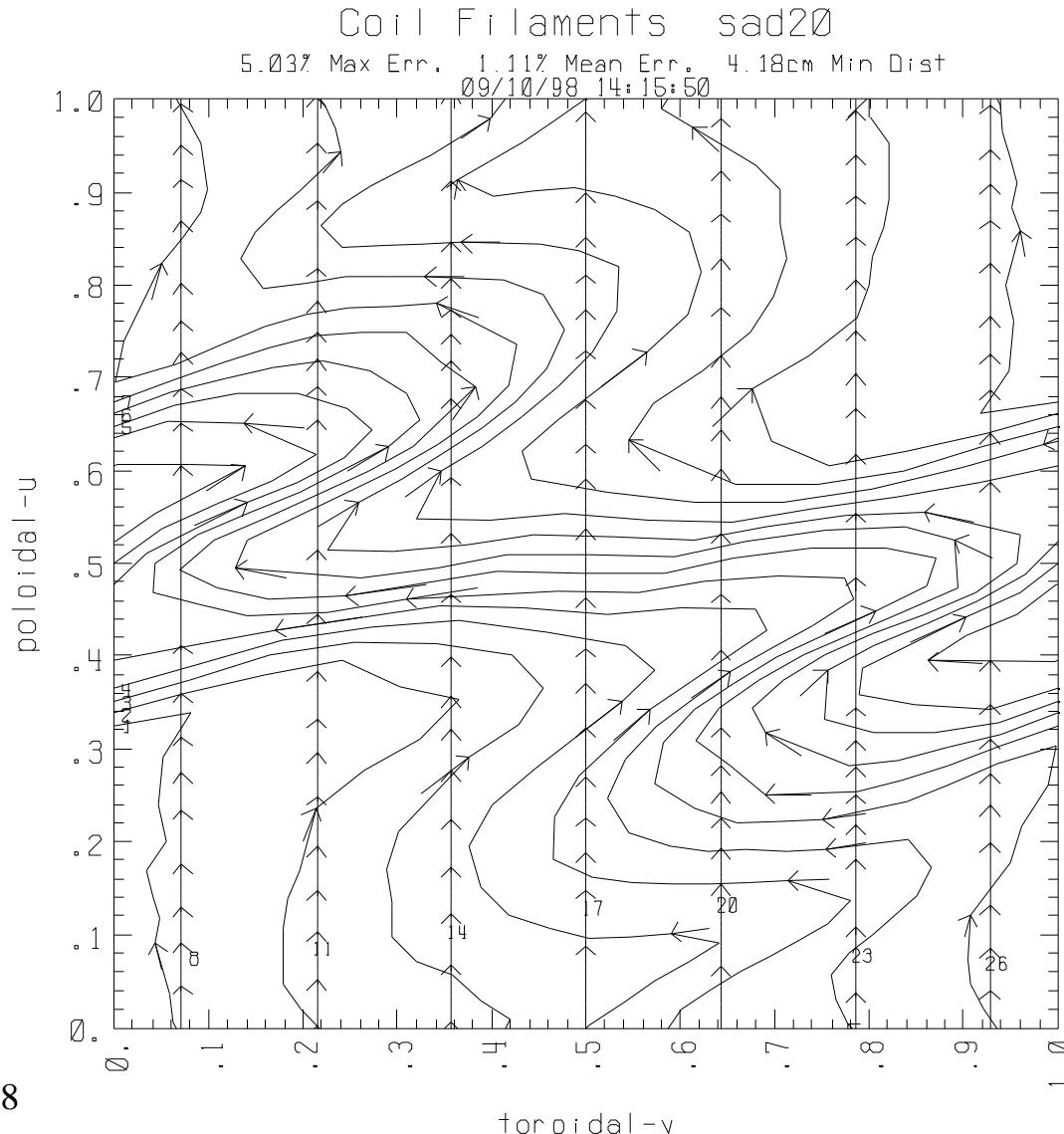
# Saddle Coils



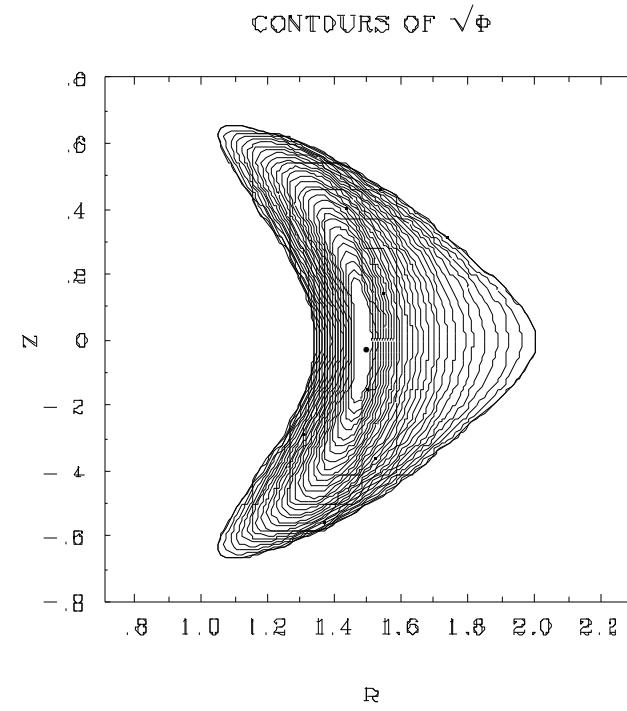
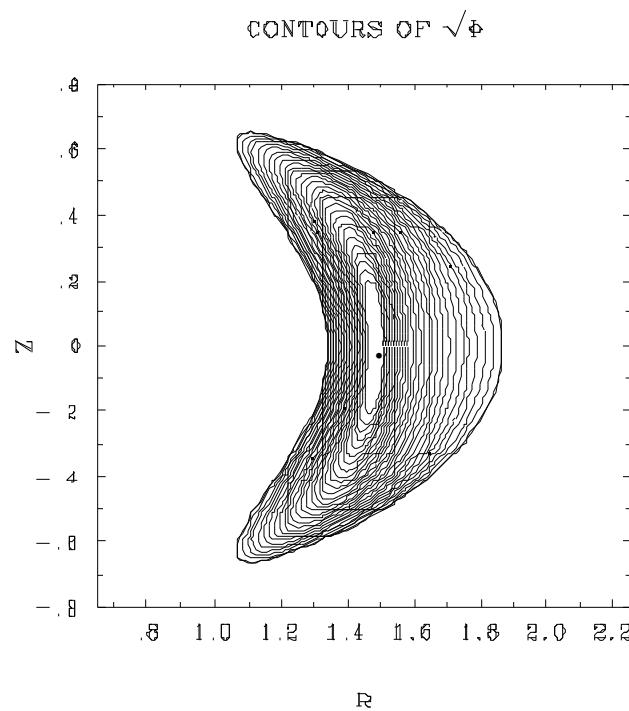
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12

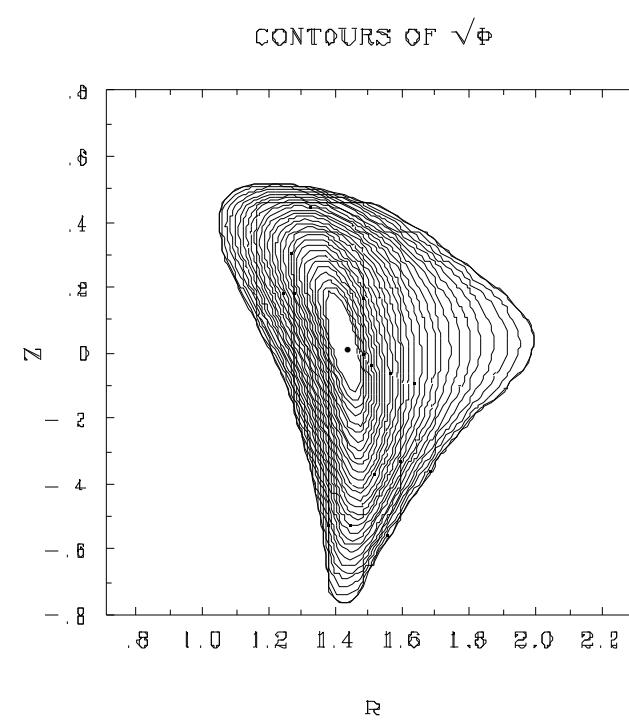
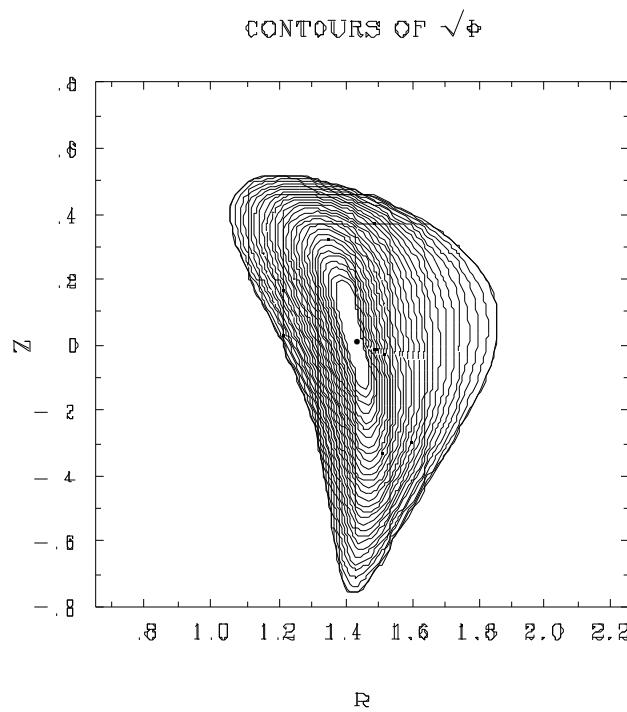
# Helical Coils with 30% TF



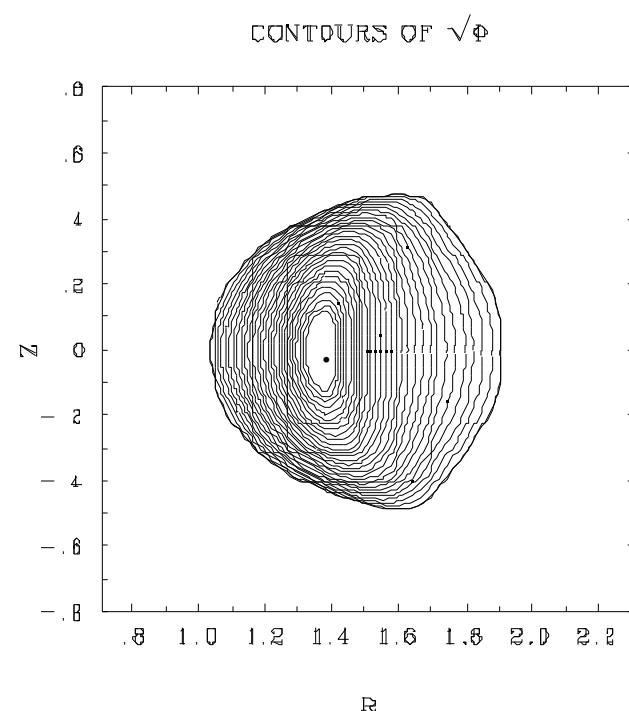
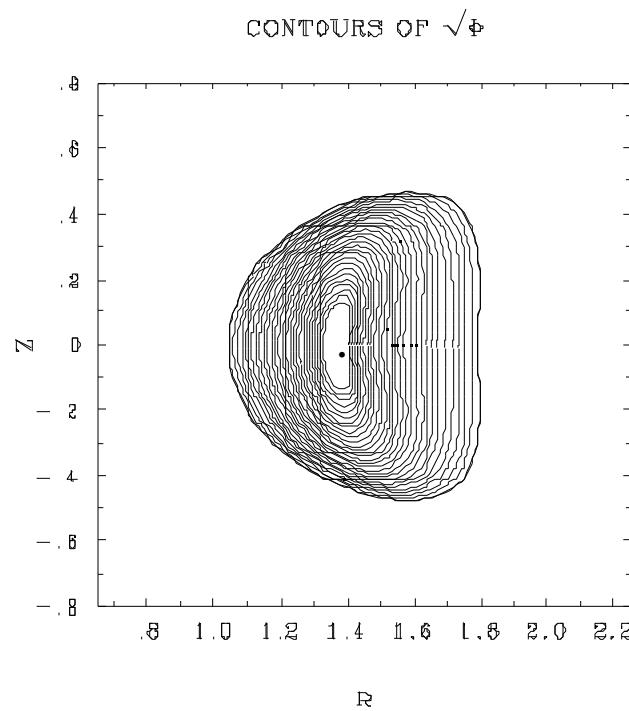
# QAS3\_c10c with Saddles



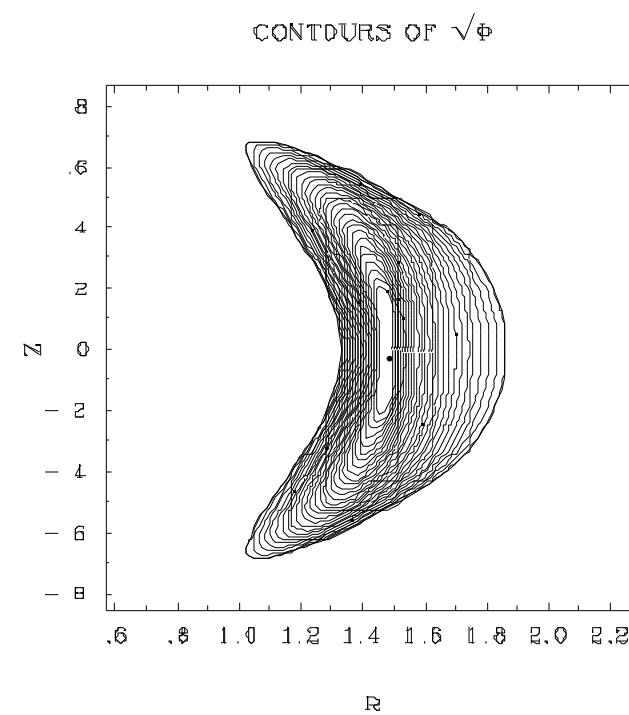
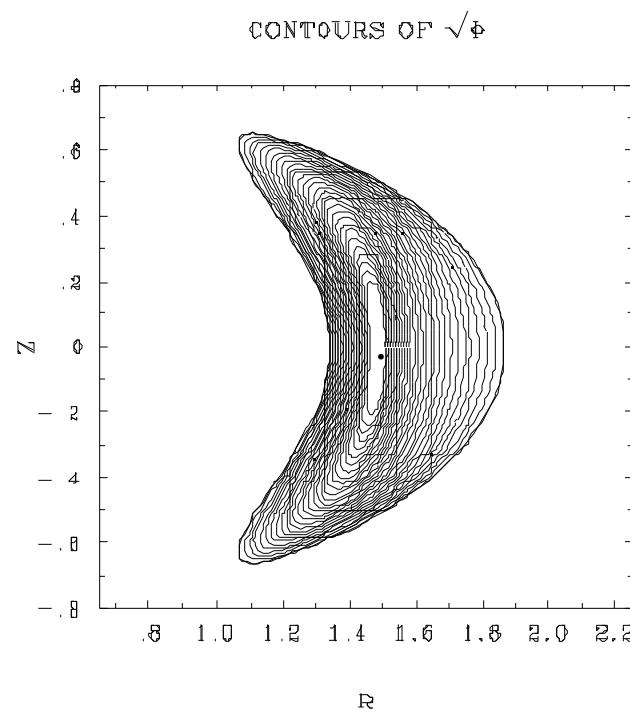
# QAS3\_c10c with Saddles



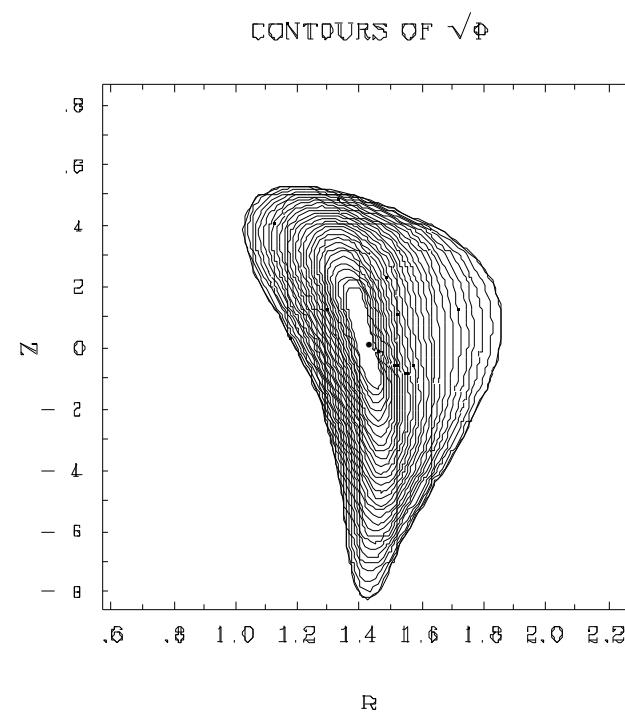
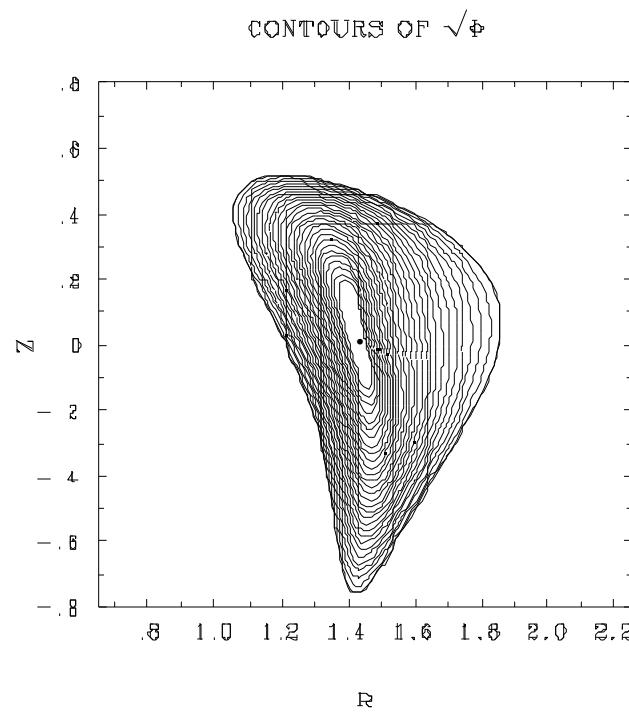
# QAS3\_c10c with Saddles



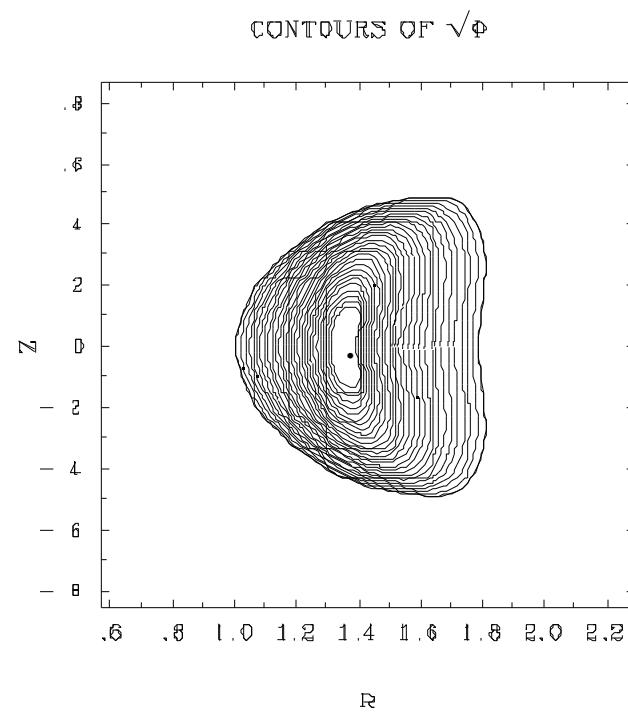
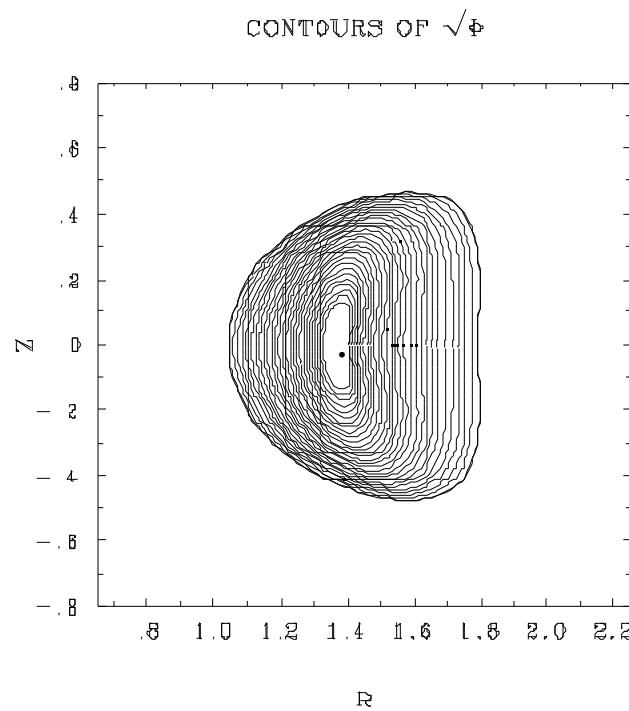
# QAS3\_c10c with Helicals



# QAS3\_c10c with Helicals



# QAS3\_c10c with Helicals

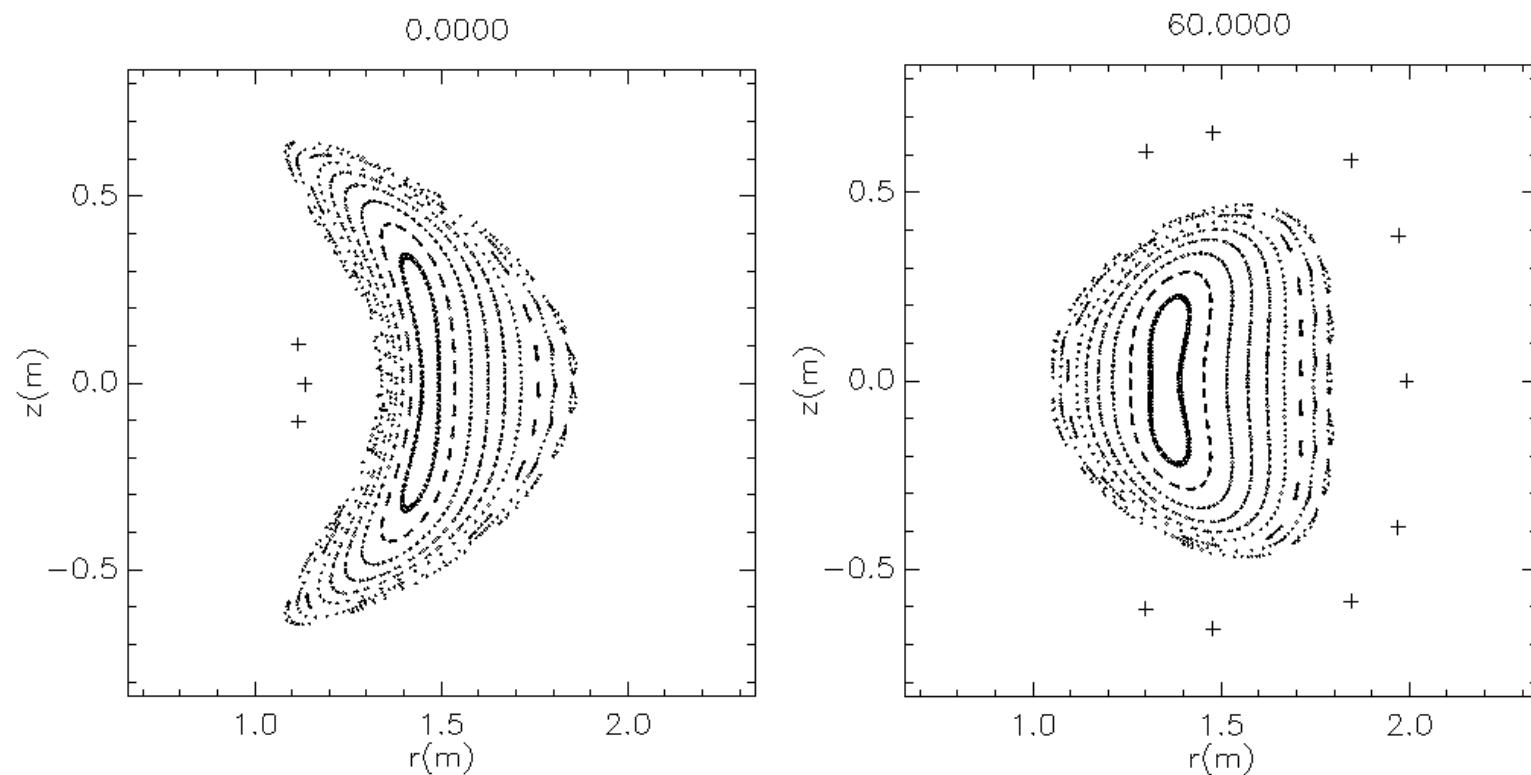


# VMEC Reconstruction

	Fixed Boundary	Saddles Coils	Helicals Coils
R, axis	1.486	1.484	1.477
Aspect Ratio	3.432	3.332	3.273
Volume	5.269	5.916	5.684
iota, s=0	0.044	0.067	0.046
iota, s=1	0.250	0.236	0.289

# AVAC Vacuum Surfaces

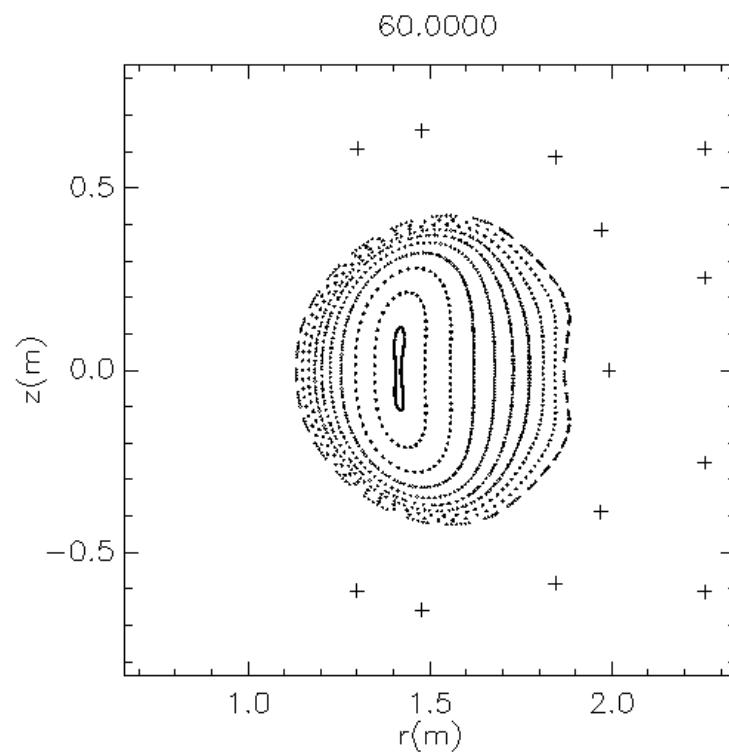
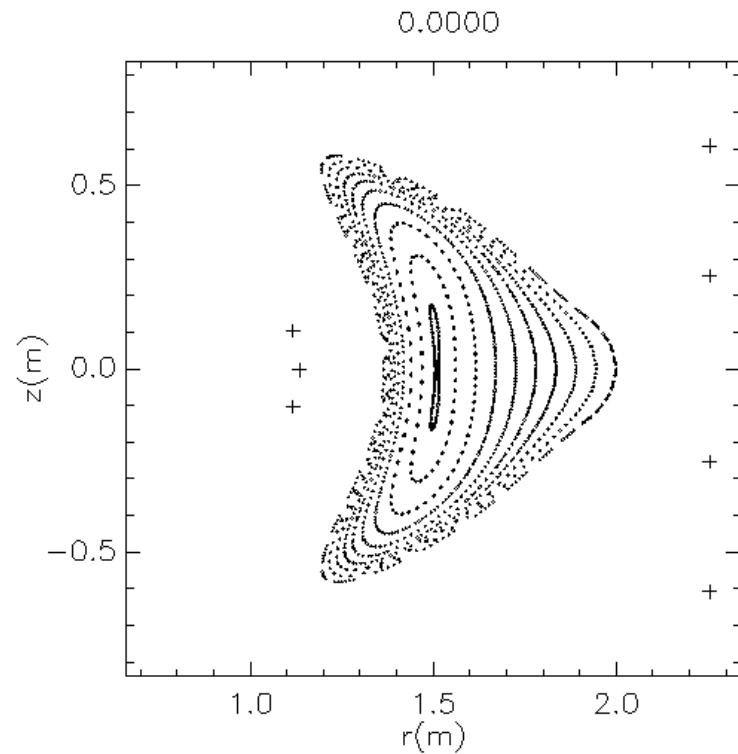
## QAS3\_c10c with Helicals



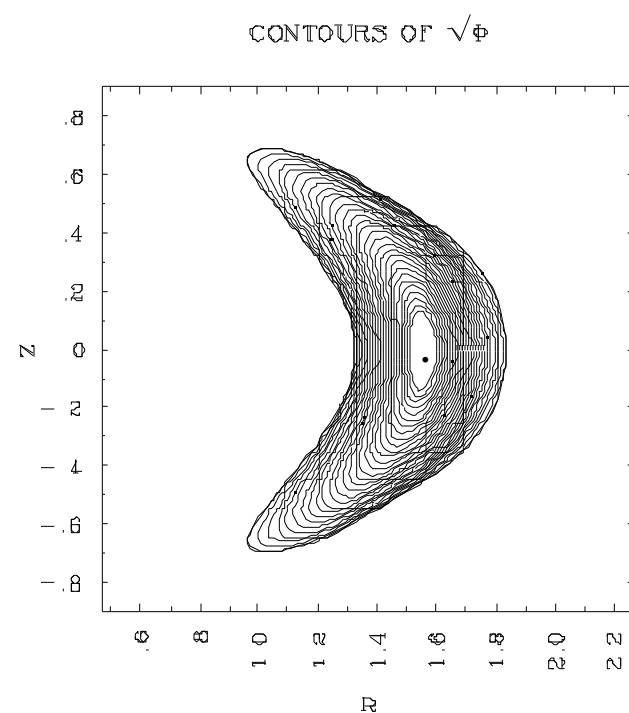
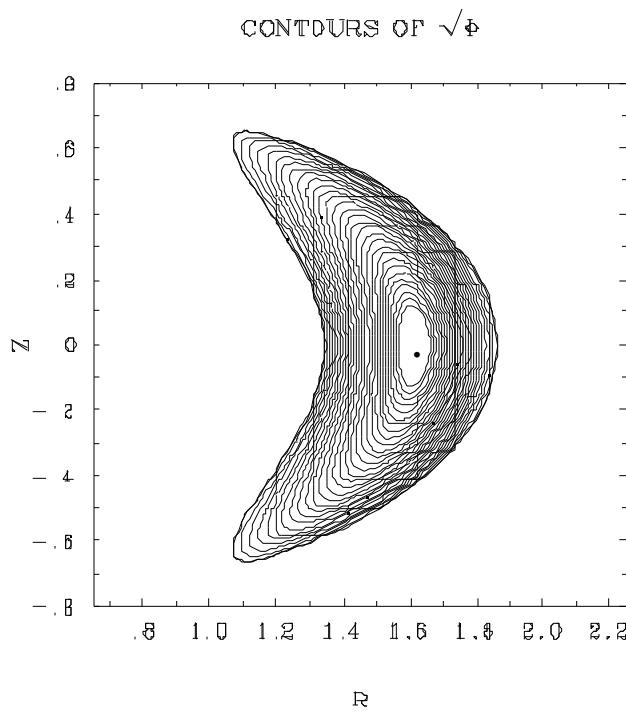
# AVAC Vacuum Surfaces

## QAS3\_c10c with Helicals

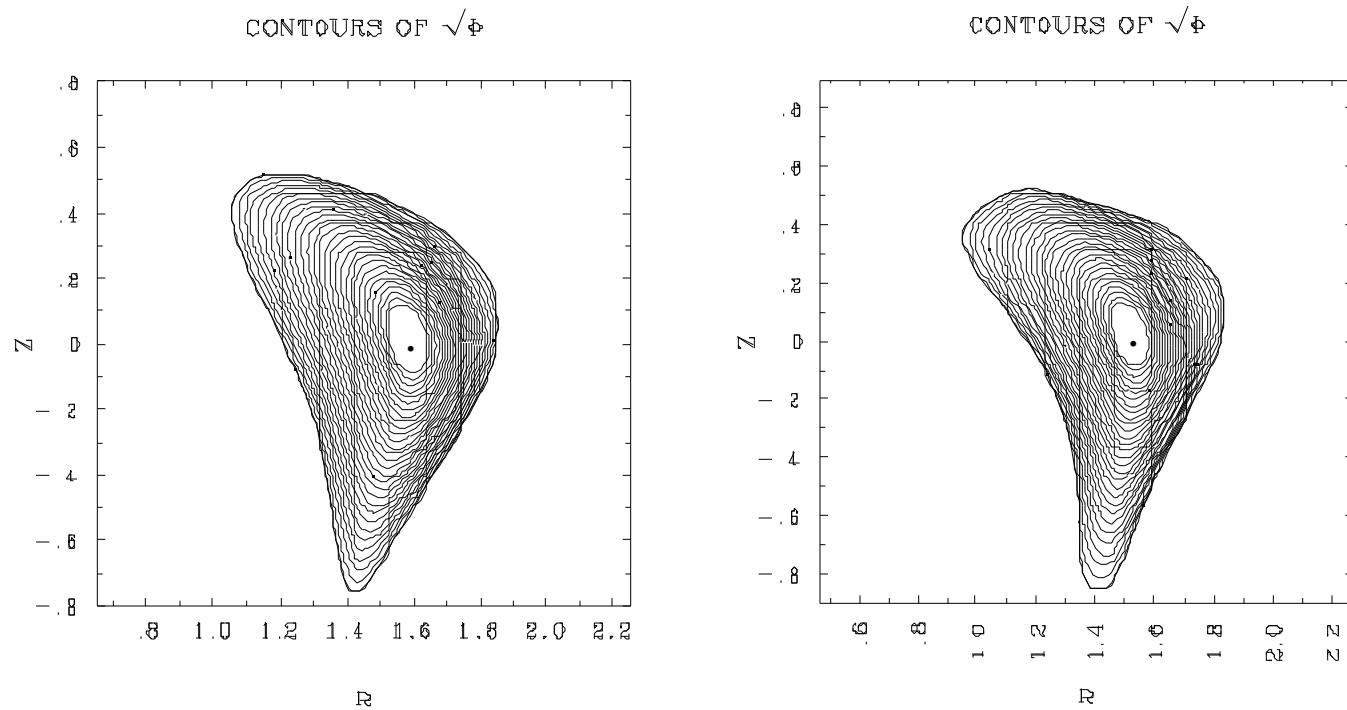
$B_v/B_{tf} = 0.01$



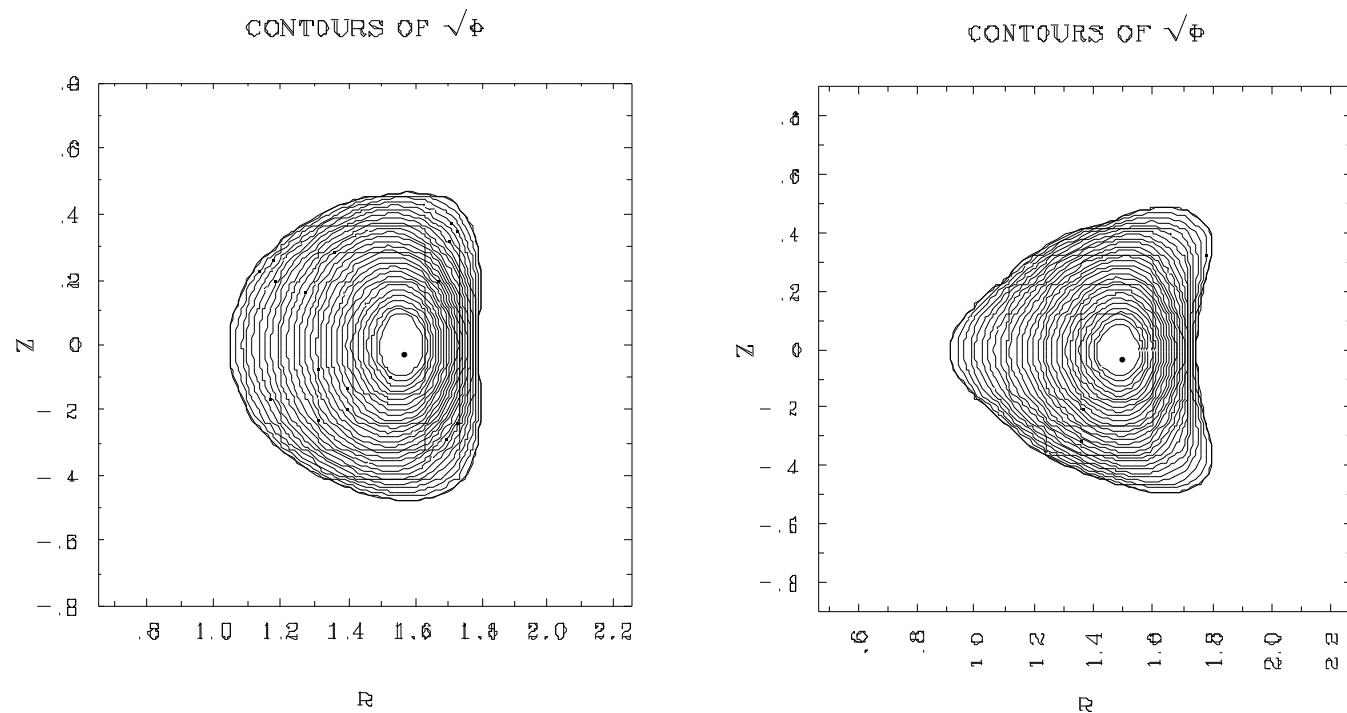
# QAS3\_c10a with Helicals & EF



# QAS3\_c10a with Helicals & EF



# QAS3\_c10a with Helicals & EF

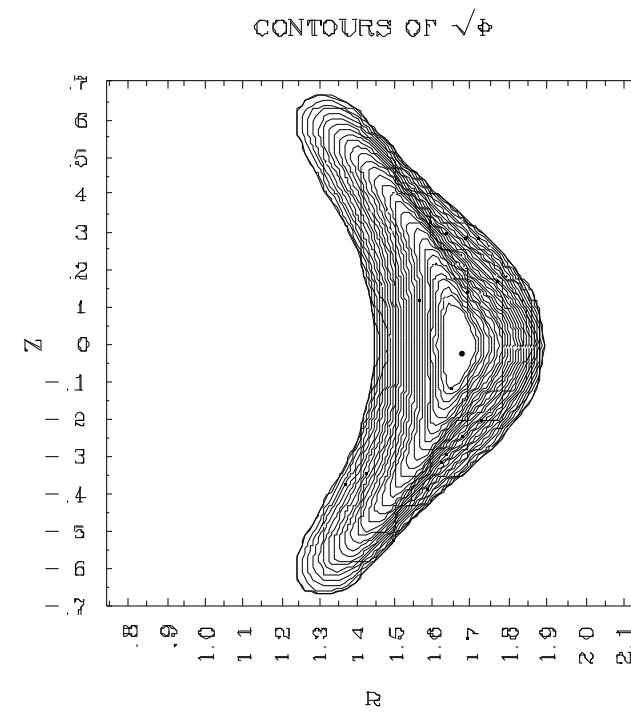
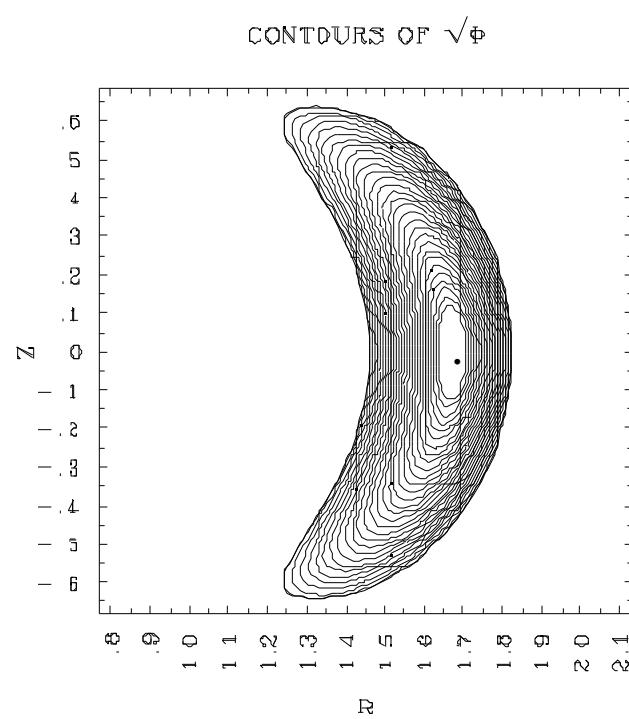


# VMEC Reconstruction

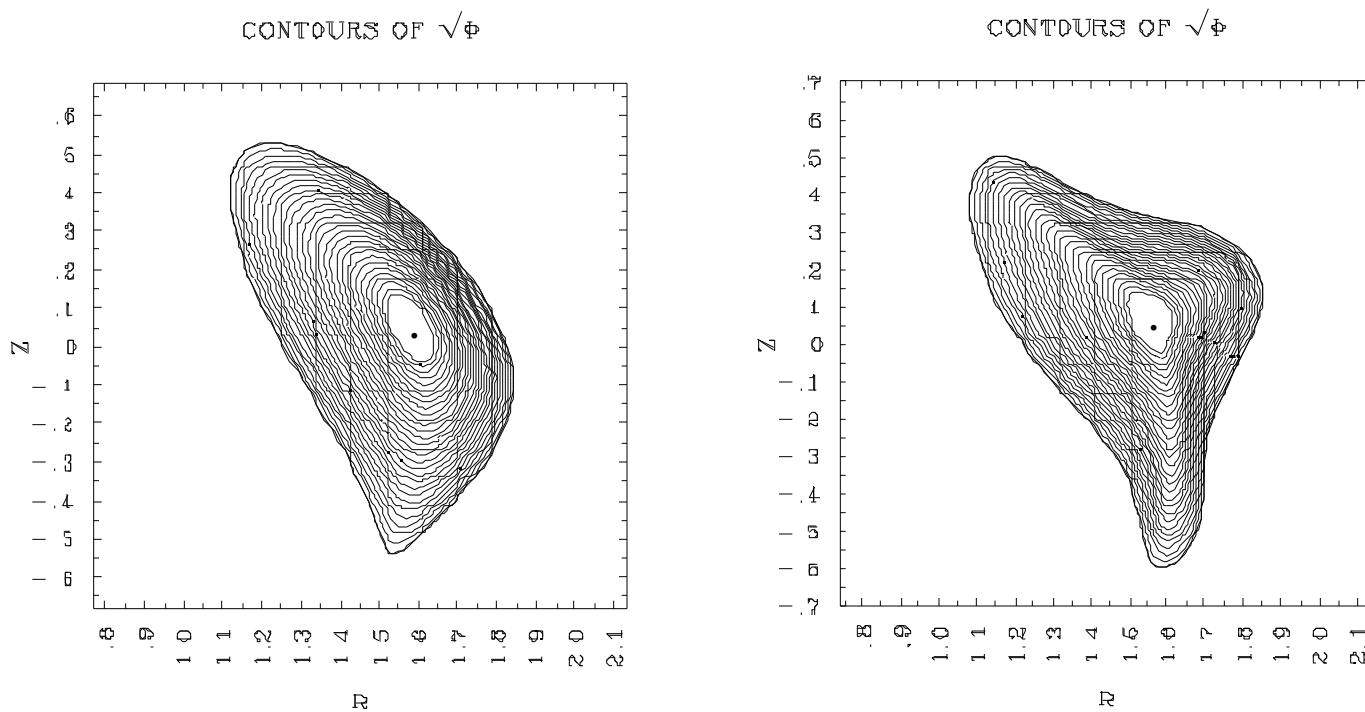
## QAS3\_c10a

	Fixed Boundary	Helicals with EF
R, axis	1.612	1.553
beta	3.920	4.459
Aspect Ratio	3.430	3.195
Volume	5.270	5.570
iota, s=0	0.250	0.278
iota, s=1	0.469	0.600

# QAS2\_d9e with Saddles at Full



# QAS2\_d9e with Saddles at Full



# QAS2\_d9e with Saddles at Full

