

Reconstruction of Physics Properties From Coils

M. Zarnstorff & L.P. Ku

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Method:

- Free boundary optimization
 - Target ballooning, kink, B_{mn} , A , R_{\min}
 - Check deviation to 18/26 PFC boundary
 - Target RB_T to $1.75m*2T$
 - Fixed pressure & current & profiles; $\beta = 4.1 - 4.2\%$
- Vary all coil currents
- TERPSICHORE $coep=coec=1.02$

- Post-analysis for $N=1$ kink family, transport properties

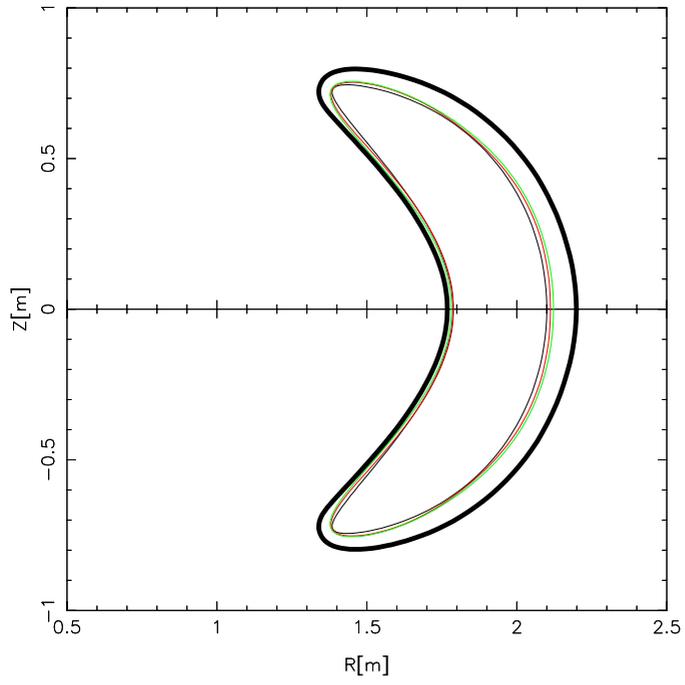
Comparison of Physics Properties for As-Received Modular Coil Designs

	LI383	M2 (09_07_a2)	M3 (10_17_a2)	M4 (11_15_b8)	M5 (12_07_a5)
A	4.36	4.37	4.36	4.32	4.36
β	4.25	4.17	4.15	4.36	4.15
R (m)	1.734	1.733	1.728	1.733	1.730
<a> (m)	0.397	0.397	0.396	0.401	0.396
R-min (m)	1.209	1.217	1.208	1.206	1.210
R-max (m)	2.173	2.151	2.145	2.165	2.148
Z-max (m)	0.764	0.759	0.755	0.765	0.755
$\iota(0)$	0.40	0.40	0.41	0.40	0.40
$\iota(a)$	0.65	0.65	0.65	0.65	0.65
λ , Kink ($\times 10^4$)					
n=1	Stable	Stable	0.23 (1/2, 2/5, 7/11)	0.85 (7/11)	5.0 (1/2, 2/3, 5/8)
n=0	Stable	5.5 (3/5)	7.3 (3/5)	2.5 (3/5)	5.0 (3/5)
λ , Ballooning					
$\zeta = 0$	0.85-0.88; (0.06)	0.91-0.93; (0.01)	0.91-0.93; (0.06)	0.91-0.93; (0.09)	0.91-0.93; (0.09)
$\zeta=60$	0.91-0.96; (0.11)	0.91-0.96; (0.14)	0.91-0.96; (0.17)	0.91-0.96; (0.17)	0.91-0.96; (0.19)
χ^2 , Bmn ($\times 10^4$)					
S=0.3	0.5	0.6	0.8	0.7	1.4
S=0.5	1.7	1.9	2.1	2.1	3.1
S=0.8	6.9	7.0	7.0	7.7	8.6

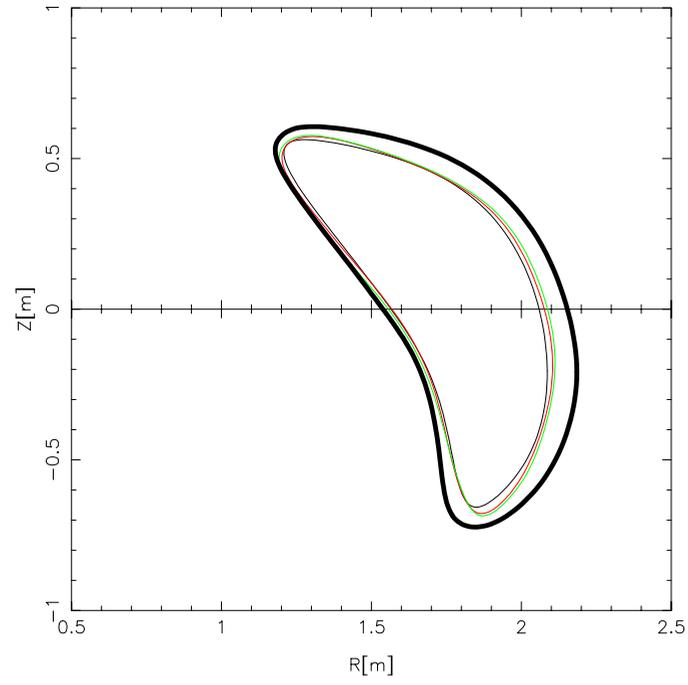
Comparison of Physics Properties for Current Optimized Modular Coil Designs

	LI383	M2.3.Z07 (09_07_a2)	M3.3.Z03 (10_17_a2)	M4.3.Z09 (11_15_b8)	M5.3.K36 (12_07_a5)
A	4.36	4.25	4.16	4.47	4.23
β	4.25%	4.24%	4.10%	4.25%	3.96%
R (m)	1.734	1.738	1.738	1.752	1.761
$\langle a \rangle$ (m)	0.397	0.408	0.418	0.392	0.417
R-min (m)	1.209	1.206	1.196	1.242	1.217
R-max (m)	2.173	2.186	2.208	2.188	2.256
Z-max (m)	0.764	0.772	0.775	0.752	0.779
$\iota(0)$	0.40	0.39	0.41	0.40	0.39
$\iota(a)$	0.65	0.65	0.65	0.65	0.66
λ , Kink					
n=1	Stable	Stable	Stable		Stable
n=0	Stable	Stable	Stable	-6.4e-6	Stable
λ , Ballooning					
$\zeta = 0$	0.85-0.88 (0.06)	Stable	Stable	Stable	Stable
$\zeta = 60$	0.91-0.96; (0.11)	0.92-0.96 (0.07)	Stable	Stable	0.92-0.96 (0.06)
Mercier Index	Stable	>0.88	0.1-0.3, >0.88		0.1-0.3 >0.88
χ^2 , Bmn ($\times 10^4$)					
S=0.3	0.5	0.7	0.8		1.4
S=0.5	1.7	2.2	2.5		3.6
S=0.8	6.9	8.9	10.3		12.1
χ^2 , Bmn lumped	1.5	2.1	2.4	1.8	
τ^{NC} (ms), thermal D, 4% β , 1.2 T (ms)	28	24			
f_{NB} (%), 40 keV H, 4% β , 2 T (%)	16	20			

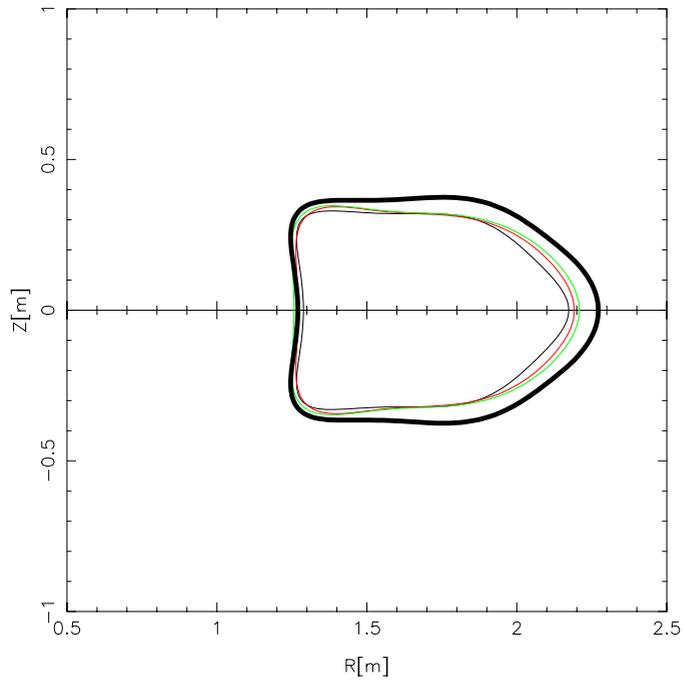
PLASMA BOUNDARY, $\nu = 0.00 * \pi$



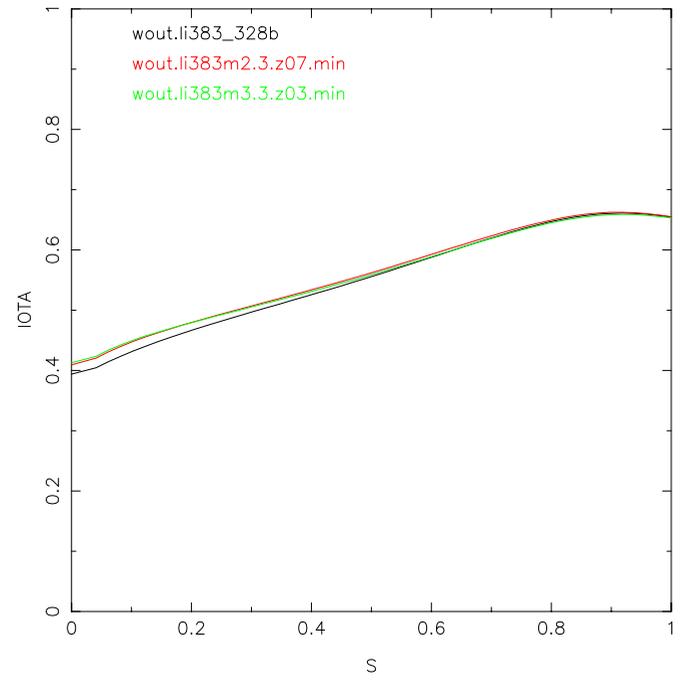
PLASMA BOUNDARY, $\nu = 0.50 * \pi$



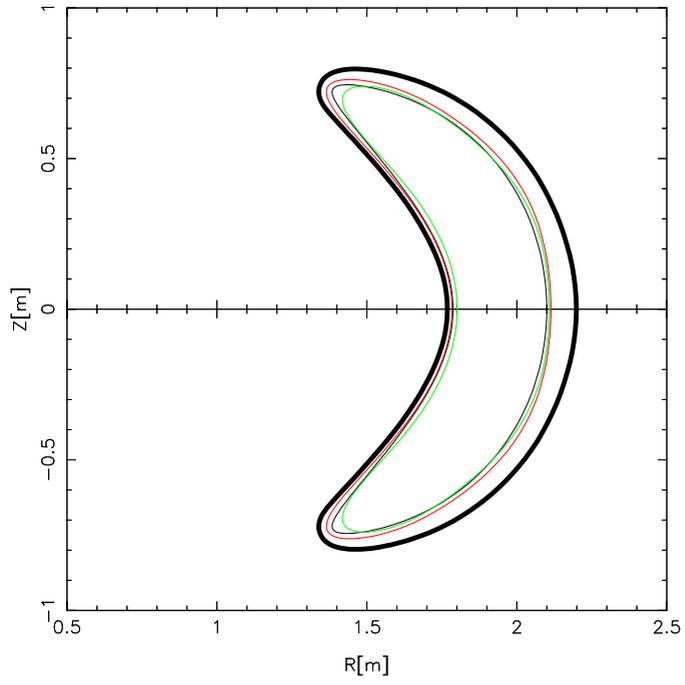
PLASMA BOUNDARY, $\nu = 1.00 * \pi$



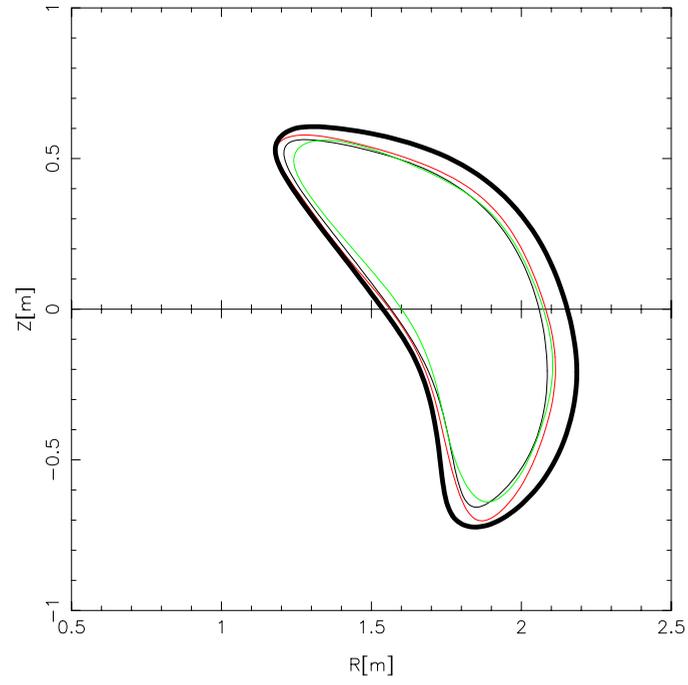
PLASMA PROFILES



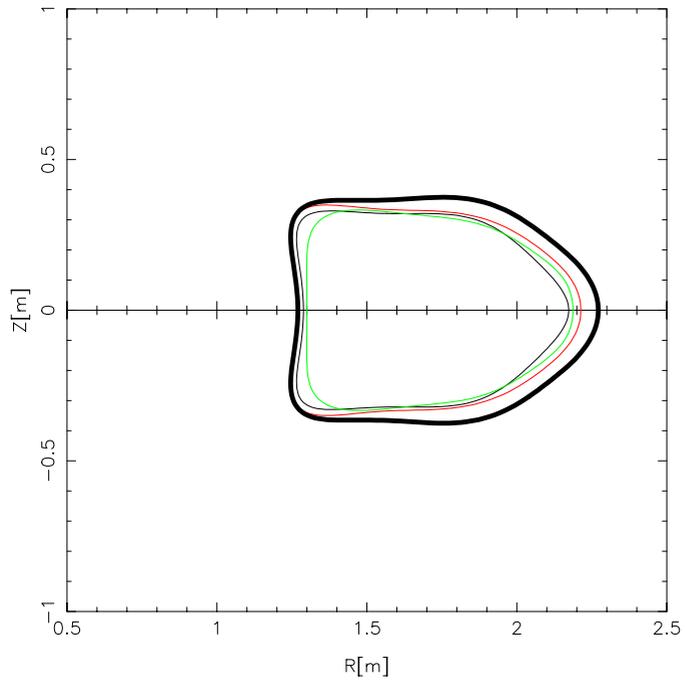
PLASMA BOUNDARY, $\nu = 0.00 * \pi$



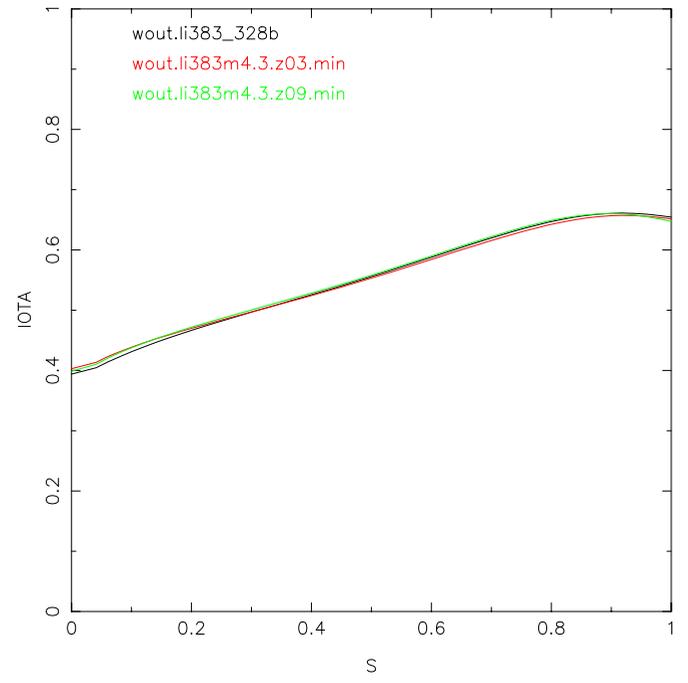
PLASMA BOUNDARY, $\nu = 0.50 * \pi$



PLASMA BOUNDARY, $\nu = 1.00 * \pi$

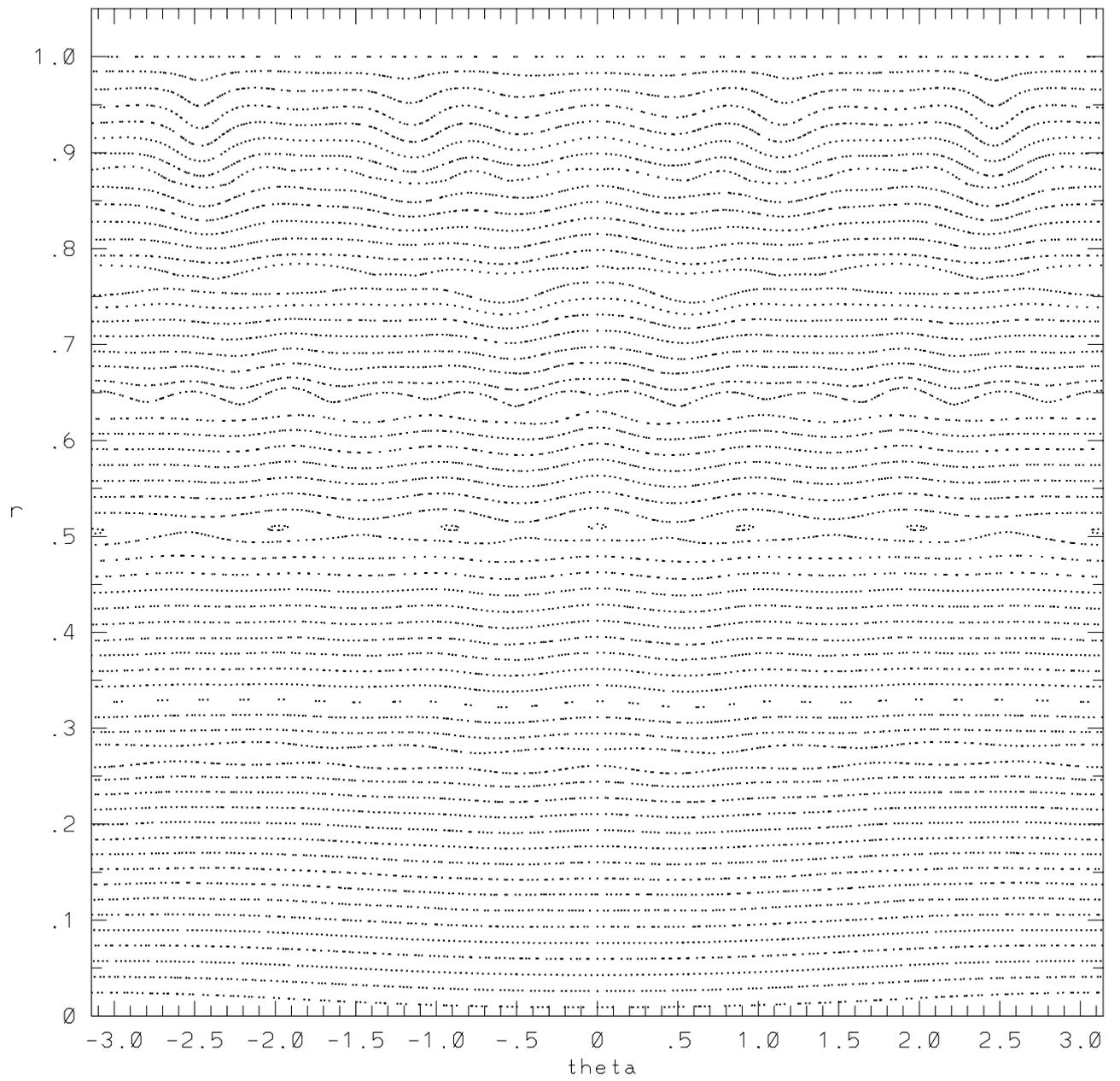


PLASMA PROFILES



Comparison of Some Physics Properties, LI383 vs LI383J3 (Island Optimized)

	LI383	LI383J3
A	4.36	4.42
β	4.25	4.25
R (m)	1.73	1.74
$\langle a \rangle$ (m)	0.40	0.39
$\iota(0)$	0.40	0.39
$\iota(a)$	0.65	0.65
λ , Kink, n=1	Stable	Stable
λ , Kink, n=0	Stable	Stable
Mercier	Stable	>0.90
λ , Ballooning @ 4.25%		
$\zeta=0$	0.85-0.88; 0.06	0.85-0.88; 0.08
$\zeta=60$	0.91-0.96; 0.11	0.91-0.96; 0.10
λ , Ballooning @ 4%		
$\zeta=0$	Stable	Stable
$\zeta=60$	0.93-0.96; 0.10	0.91-0.94; 0.07
χ^2 , Bmn ($\times 10^4$)		
S=0.3	0.52	0.39
S=0.5	1.72	1.69
S=0.8	6.86	8.37
τ^{NC} (ms), thermal D,		
4% β , 1.2 T (ms)	28	
f_{NB} (%), 40 keV H,		
4% β , 2 T (%)	16	



it=200 rpoinc: background coordinates
li383jd

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